NEC3 Engineering & Construction Contract

Between **ESKOM HOLDINGS SOC Ltd**
(Reg No. 2002/015527/30)

and **[Insert at award stage]**
(Reg No. _____)

for **Engineer, Procure and Construct and Commission a water electrolysis hydrogen generation plant, which must be integrated with the existing renewable power plant for "green H2 production' at Eskom Research and Innovation Center (ERIC) in Rosherville**

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CONTRACT No. **[Insert at award stage]**

C1.1 Form of Offer & Acceptance

- Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract for the procurement of:

Engineer, Procure and Construct and Commission a water electrolysis hydrogen generation plant, which must be integrated with the existing renewable power plant for "green H2 production' at Eskom Research and Innovation Center (ERIC) in Rosherville

The tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto and by submitting this Offer has accepted the Conditions of Tender.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the *Contractor* under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the *conditions of contract* identified in the Contract Data.

Options A	The offered total of the Prices exclusive of VAT is	**R [●]**
	Value Added Tax @ 15% is	**R [●]**
	The offered total of the amount due inclusive of VAT is[1]	**R [●]**
	(in words) **[●]**	

This Offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Contractor* in the *conditions of contract* identified in the Contract Data.

Signature(s) .....

Name(s) .....

Capacity .....

For the tenderer: .....

(Insert name and address of organisation)

Name & signature of witness .....

Date .....

Tenderer's CIDB registration number (if applicable) .....

[1] This total is required by the *Employer* for budgeting purposes only. Actual amounts due will be assessed in terms of the *conditions of contract*.

- Acceptance

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the *conditions of contract* identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the Employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Works Information
Part C4	Site Information

and drawings and documents (or parts thereof), which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed original copy signed between them of this document, including the Schedule of Deviations (if any).

Unless the tenderer (now *Contractor*) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the Parties.

Signature(s) .....

Name(s) .....

Capacity .....

for the Employer

.....
(Insert name and address of organisation)

Name & signature of witness .....

Date .....

Note: If a tenderer wishes to submit alternative tenders, use another copy of this Form of Offer and Acceptance.

- Schedule of Deviations to be completed by the *Employer* prior to contract award

Note:

1. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1	**[●]**	**[●]**
2	**[●]**	**[●]**
3	**[●]**	**[●]**
4	**[●]**	**[●]**
5	**[●]**	**[●]**
6	**[●]**	**[●]**
7	**[●]**	**[●]**

By the duly authorised representatives signing this Schedule of Deviations below, the Employer and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the Employer during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

	- **For the tenderer:**	- **For the Employer**
Signature	.....	.....
Name	.....	.....
Capacity	.....	.....
On behalf of	..... *(Insert name and address of organisation)*	..... *(Insert name and address of organisation)*
Name & signature of witness	.....	.....
Date	.....	.....

C1.2 ECC3 Contract Data

Part one - Data provided by the *Employer*

Clause	Statement	Data
1	**General**	
	The *conditions of contract* are the core clauses and the clauses for main Option	
		A: Priced contract with activity schedule
	dispute resolution Option	**W1: Dispute resolution procedure**
	and secondary Options	
		X1: Price adjustment for inflation
		X2 Changes in the law
		X3: Multiple currencies
		X5: Sectional Completion
		X7: Delay damages
		X13: Performance Bond
		X16: Retention
		X18: Limitation of liability
		Z: *Additional conditions of contract*
	of the NEC3 Engineering and Construction Contract, April 2013 (ECC3)	
10.1	The *Employer* is (Name):	**Eskom Holdings SOC Ltd (reg no: 2002/015527/30), a state owned company incorporated in terms of the company laws of the Republic of South Africa**
	Address	**Registered office at Megawatt Park, Maxwell Drive, Sandton, Johannesburg**
10.1	The *Project Manager* is: (Name)	**[●]**
	Address	**[●]**
	Tel	**[●]**
	Fax	**[●]**
	e-mail	**[●]**

10.1	The *Supervisor* is: (Name)	**[●]**
	Address	**[●]**
	Tel No.	**[●]**
	Fax No.	**[●]**
	e-mail	**[●]**
11.2(13)	The *works* are	**Engineer, Procure and Construct a water electrolysis hydrogen generation plant, which must be integrated with the existing renewable power plant for "green H2 production' at ERIC Rosherville**
11.2(14)	The following matters will be included in the Risk Register	• **1. Interface between Hydrogen and other projects** • **2. Interface with other contractors on site**
11.2(15)	The *boundaries of the site* are	**Part 4: Site Information**
11.2(16)	The Site Information is in	**Part 4: Site Information**
11.2(19)	The Works Information is in	**Part 3: Scope of Work and all documents and drawings to which it makes reference.**
12.2	The *law of the contract* is the law of	**the Republic of South Africa**
13.1	The *language of this contract* is	**English**
13.3	The *period for reply* is	**Two weeks**
2	**The *Contractor's* main responsibilities**	**Data required by this section of the core clauses is provided by the *Contractor* in Part 2 and terms in italics used in this section are identified elsewhere in this Contract Data.**
3	**Time**	
11.2(3)	The *completion date* for the whole of the *works* is Technical Support as and when required- Completion Date is:	**30 April 2028.** **As and when required**

30.1	The *access dates* are:	**Part of the Site**		**Date**
		1	**Whole working Area**	**20 November 2026**
31.1	The *Contractor* is to submit a first programme for acceptance within	**Within two weeks of contract start date the Contractor submitting a programme to Project manager for acceptance**		
31.2	The *starting date* is	**01 November 2026**		

32.2	The *Contractor* submits revised programmes at intervals no longer than	**One week.**
35.1	The *Employer* is not willing to take over the *works* before the Completion Date.	
4	**Testing and Defects**	
42.2	The *defects date* is	**52 weeks after Completion of the whole of the *works*.**
43.2	The *defect correction period* is	**One week**
	except that the *defect correction period* for	**Defect of such a nature that it cannot reasonably be repaired in 1 week, the *Contractor* promptly notifies the *Project Manager* and submits a plan for correcting the Defect.** **The *Contractor* and *Project Manager* agree on a time allowed for defect correction, in addition to the *defect correction period*** **If no agreement is reached in respect of further time allowed, the *defect correction period* remains 1week.**
5	**Payment**	
50.1	The *assessment interval* is	**between the 25th day of each successive month.**
51.1	The *currency of this contract* is the	**South African Rand.**
51.2	The period within which payments are made is	**Four weeks.**
51.4	The *interest rate* is	**the publicly quoted prime rate of interest (calculated on a 365 day year) charged from time to time by the Standard Bank of South Africa Limited (as certified, in the event of any dispute, by any manager of such bank, whose appointment it shall not be necessary to prove) for amounts due in Rands and** **(ii) the LIBOR rate applicable at the time for amounts due in other currencies. LIBOR is the 6 month London Interbank Offered Rate quoted under the caption "Money Rates" in The Wall Street Journal for the applicable currency or if no rate is quoted for the currency in question then the rate for United States Dollars, and if no such rate appears in The Wall Street Journal then the rate as quoted by the Reuters Monitor Money Rates Service (or such service as may replace the Reuters Monitor Money Rates Service) on the due date for the payment in question, adjusted *mutatis mutandis* every 6 months thereafter and as certified, in the event of any dispute, by any manager employed in the foreign exchange department of The Standard Bank of South Africa Limited, whose appointment it shall not be necessary to prove.**

6	**Compensation events**	
60.1(13)	The place where weather is to be recorded is:	**Germiston in Johannesburg**
	The *weather measurements* to be recorded for each calendar month are,	**the cumulative rainfall (mm)** **the number of days with rainfall more than 10 mm** **the number of days with minimum air temperature less than 0 degrees Celsius** **the number of days with snow lying at 09:00 hours South African Time** **and these measurements:**
	The *weather measurements* are supplied by	**the South African Weather Bureau**
	The *weather data* are the records of past *weather measurements* for each calendar month which were recorded at:	**The weather station closest to the Eskom ERIC Building supplied by the South African Weather Bureau**
	and which are available from:	**the South African Weather Bureau**
7	**Title**	**There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data.**
8	**Risks and insurance**	
80.1	These are additional *Employer*'s risks	**None**
9	**Termination**	**There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data.**
10	**Data for main Option clause**	
A	**Priced contract with activity schedule**	**There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.**
11	**Data for Option W1**	
W1.1	The *Adjudicator* is	**the person selected from the ICE-SA Division (or its successor body) of the South African Institution of Civil Engineering Panel of Adjudicators by the Party intending to refer a dispute to him. (see www.ice-sa.org.za). If the Parties do not agree on an Adjudicator the Adjudicator will be appointed by the Arbitration Foundation of Southern Africa (AFSA).**
	Address	**[●]**

	Tel No.	**[●]**
	Fax No.	**[●]**
	e-mail	**[●]**
W1.2(3)	The *Adjudicator nominating body* is:	**the Chairman of ICE-SA a joint Division of the South African Institution of Civil Engineering and the London Institution of Civil Engineers. (See www.ice-sa.org.za) or its successor body.**
W1.4(2)	The *tribunal* is:	**arbitration.**
W1.4(5)	The *arbitration procedure* is	**the latest edition of Rules for the Conduct of Arbitrations published by The Association of Arbitrators (Southern Africa) or its successor body.**
	The place where arbitration is to be held is	**Johannesburg**
	The person or organisation who will choose an arbitrator - if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is	**the Chairman for the time being or his nominee of the Association of Arbitrators (Southern Africa) or its successor body.**

12 Data for secondary Option clauses

X1	**Price adjustment for inflation**	
X1.1(a)	The *base date* for indices is	**One (1) month prior to tender closing of the tender.**

X1.1(c) The proportions used to calculate the Price Adjustment Factor are:

	proportion	**linked to SEISA index for**	**Index prepared by**
	0. 85	**adjustable**	
	0.15	**non-adjustable**	
Total	**1.00**		

X2	**Changes in the law**	**There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.**
X3	**Multiple currencies**	

X3.1 The *Employer* will pay for these items or activities in the currencies stated

Items & activities	**Other currency**	**Maximum payment in other currency**
[●]	**[●]**	**[●]**
[●]	**[●]**	**[●]**
[●]	**[●]**	**[●]**
[●]	**[●]**	**[●]**

X3.1	The *exchange rates* are those published in	**[●] on [●] (date)** **The items & activities will be paid in the other currency** **- to a foreign Bank account nominated by the *Contractor*** **- to a valid SARB approved CFC account in South Africa** **- in accordance with an alternative payment method agreed with the *Employer* before the Contract Date.** **(select one of the three methods as agreed with successful tenderer and delete the others and this note)**		
X5	**Sectional Completion**			
X5.1	The *completion date* for each *section* of the *works* is:	***Section***	**Description**	***Completion date***
		1	**Completion of Detail Designs**	**31 March 2027**
		2	**Procurement of all plant items**	**30 September 2027**
		3	**Complete Construction of the Plant**	**30 March 2028**
		4	**Complete Commissioning & Testing**	**30 April 2028**
X7.1 X5.1	Delay damages for late Completion of the *section*s of the *works* are:	***section***	**Description**	**Amount per day at 0.03% per day**
		1	**Delays in Completion designs**	**Not exceeding 10% of the total of the Prices for Construction at 0.03% per day**
		2	**Procurement of all plant items**	**Not exceeding 10% of the total of the Prices for Construction at 0.03% per day**
		3	**Delays in Completion of Construction**	**Not exceeding 10% of the total of the**

				Prices for Construction at 0.03% per day
		4	**Complete Commissioning & Testing**	**total of the Prices for Construction at 0.03% per day**
	The total delay damages payable by the *Contractor* does not exceed:	**10% of the contract price**		
X13	**Performance bond**			
X13.1	The amount of the performance bond is	**10% of the contract price**		
X15	**Limitation of the *Contractor*'s liability for his design to reasonable skill & care**	**There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.**		
X16	**Retention (not used with Option F)**			
X16.1	The *retention free amount* is	**Nil**		
	The *retention percentage* is	**10% of the contract price**		
X18	**Limitation of liability**			
X18.1	The *Contractor*'s liability to the *Employer* for indirect or consequential loss is limited to:	**R0.0 (zero Rand)**		
X18.2	For any one event, the *Contractor*'s liability to the *Employer* for loss of or damage to the *Employer*'s property is limited to:	**the amount of the deductibles relevant to the event**		
X18.3	The *Contractor*'s liability for Defects due to his design which are not listed on the Defects Certificate is limited to	**The greater of** • **the total of the Prices at the Contract Date and** • **the amounts excluded and unrecoverable from the *Employer*'s assets policy for correcting the Defect (other than the resulting physical damage which is not excluded) plus the applicable deductible as at contract date.**		
X18.4	The *Contractor*'s total liability to the *Employer* for all matters arising under or in connection with this contract, other than excluded matters, is limited to:	**the total of the Prices other than for the additional excluded matters.** **The *Contractor's* total liability for the additional excluded matters is not limited.** **The additional excluded matters are amounts for which the *Contractor* is liable under this contract for** • **Defects due to his design which arise before the Defects Certificate is issued,**		

		• **Defects due to manufacture and fabrication outside the Site,**
		• **loss of or damage to property (other than the *works*, Plant and Materials),**
		  • **death of or injury to a person and**
		  • **infringement of an intellectual property right.**

X18.5	The *end of liability date* is	**(i) Three (3) years after the *defects date* for latent Defects and** **(ii) the date on which the liability in question prescribes in accordance with the Prescription Act No. 68 of 1969 (as amended or in terms of any replacement legislation) for any other matter.** **A latent Defect is a Defect which would not have been discovered on reasonable inspection by the *Employer* or the *Supervisor* before the *defects date*, without requiring any inspection not ordinarily carried out by the *Employer* or the *Supervisor* during that period. If the *Employer* or the *Supervisor* do undertake any inspection over and above the reasonable inspection, this does not place a greater responsibility on the *Employer* or the *Supervisor* to have discovered the Defect.**
Z	**The *Additional conditions of contract* are**	**Z1 to Z15 always apply.**

Z1 Cession delegation and assignment

Z1.1 The *Contractor* does not cede, delegate or assign any of its rights or obligations to any person without the written consent of the *Employer.*

Z1.2 Notwithstanding the above, the *Employer* may on written notice to the *Contractor* cede and delegate its rights and obligations under this contract to any of its subsidiaries or any of its present divisions or operations which may be converted into separate legal entities as a result of the restructuring of the Electricity Supply Industry.

Z2 Joint ventures

Z2.1 If the *Contractor* constitutes a joint venture, consortium or other unincorporated grouping of two or more persons or organisations then these persons or organisations are deemed to be jointly and severally liable to the *Employer* for the performance of this contract.

Z2.2 Unless already notified to the *Employer*, the persons or organisations notify the *Project Manager* within two weeks of the Contract Date of the key person who has the authority to bind the *Contractor* on their behalf.

Z2.3 The *Contractor* does not alter the composition of the joint venture, consortium or other unincorporated grouping of two or more persons without the consent of the *Employer* having been given to the *Contractor* in writing.

Z3 Change of Broad Based Black Economic Empowerment (B-BBEE) status

Z3.1 Where a change in the *Contractor's* legal status, ownership or any other change to his business composition or business dealings results in a change to the *Contractor*'s B-BBEE status, the *Contractor* notifies the *Employer* within seven days of the change.

Z3.2 The *Contractor* is required to submit an updated verification certificate and necessary supporting documentation confirming the change in his B-BBEE status to the *Project Manager* within thirty days of the notification or as otherwise instructed by the *Project Manager*.

Z3.3 Where, as a result, the *Contractor's* B-BBEE status has decreased since the Contract Date the *Employer* may either re-negotiate this contract or alternatively, terminate the *Contractor*'s obligation to Provide the Works.

Z3.4 Failure by the *Contractor* to notify the *Employer* of a change in its B-BBEE status may constitute a reason for termination. If the *Employer* terminates in terms of this clause, the procedures on termination are P1, P2 and P3 as stated in clause 92, and the amount due is A1 and A3 as stated in clause 93.

Z4 Confidentiality

Z4.1 The *Contractor* does not disclose or make any information arising from or in connection with this contract available to Others. This undertaking does not, however, apply to information which at the time of disclosure or thereafter, without default on the part of the *Contractor*, enters the public domain or to information which was already in the possession of the *Contractor* at the time of disclosure (evidenced by written records in existence at that time). Should the *Contractor* disclose information to Others in terms of clause 25.1, the *Contractor* ensures that the provisions of this clause are complied with by the recipient.

Z4.2 If the *Contractor* is uncertain about whether any such information is confidential, it is to be regarded as such until notified otherwise by the *Project Manager*.

Z4.3 In the event that the *Contractor* is, at any time, required by law to disclose any such information which is required to be kept confidential, the *Contractor*, to the extent permitted by law prior to disclosure, notifies the *Employer* so that an appropriate protection order and/or any other action can be taken if possible, prior to any disclosure. In the event that such protective order is not, or cannot, be obtained, then the *Contractor* may disclose that portion of the information which it is required to be disclosed by law and uses reasonable efforts to obtain assurances that confidential treatment will be afforded to the information so disclosed.

Z4.4 The taking of images (whether photographs, video footage or otherwise) of the *works* or any portion thereof, in the course of Providing the Works and after Completion, requires the prior written consent of the *Project Manager*. All rights in and to all such images vests exclusively in the *Employer*.

Z4.5 The *Contractor* ensures that all his subcontractors abide by the undertakings in this clause.

Z5 Waiver and estoppel: Add to core clause 12.3:

Z5.1 Any extension, concession, waiver or relaxation of any action stated in this contract by the Parties, the *Project Manager*, the *Supervisor*, or the *Adjudicator* does not constitute a waiver of rights, and does not give rise to an estoppel unless the Parties agree otherwise and confirm such agreement in writing.

Z6 Health, safety and the environment: Add to core clause 27.4

Z6.1 The *Contractor* undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the *works*. Without limitation the *Contractor*:

- accepts that the *Employer* may appoint him as the "Principal Contractor" (as defined and provided for under the Construction Regulations 2014 (promulgated

under the Occupational Health & Safety Act 85 of 1993) ("the Construction Regulations") for the Site;
- warrants that the total of the Prices as at the Contract Date includes a sufficient amount for proper compliance with the Construction Regulations, all applicable health & safety laws and regulations and the health and safety rules, guidelines and procedures provided for in this contract and generally for the proper maintenance of health & safety in and about the execution of *works*; and
- undertakes, in and about the execution of the *works*, to comply with the Construction Regulations and with all applicable health & safety laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the *Contractor's* direction and control, likewise observe and comply with the foregoing.

Z6.2 The *Contractor*, in and about the execution of the *works*, complies with all applicable environmental laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the *Contractor's* direction and control, likewise observe and comply with the foregoing.

Z7 Provision of a Tax Invoice and interest. Add to core clause 51

Z7.1 Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice in accordance with the *Employer*'s procedures stated in the Works Information, showing the amount due for payment equal to that stated in the payment certificate.

Z7.2 If the *Contractor* does not provide a tax invoice in the form and by the time required by this contract, the time by when the *Employer* is to make a payment is extended by a period equal in time to the delayed submission of the correct tax invoice. Interest due by the *Employer* in terms of core clause 51.2 is then calculated from the delayed date by when payment is to be made.

Z7.3 The *Contractor* (if registered in South Africa in terms of the companies Act) is required to comply with the requirements of the Value Added Tax Act, no 89 of 1991 (as amended) and to include the *Employer*'s VAT number 4740101508 on each invoice he submits for payment.

Z8 Notifying compensation events

Z8.1 Delete from the last sentence in core clause 61.3, "unless the *Project Manager* should have notified the event to the *Contractor* but did not".

Z9 *Employer's* limitation of liability

Z9.1 The *Employer's* liability to the *Contractor* for the *Contractor's* indirect or consequential loss is limited to R0.00 (zero Rand)

Z9.2 The *Contractor*'s entitlement under the indemnity in 83.1 is provided for in 60.1(14) and the *Employer*'s liability under the indemnity is limited.

Z10 Termination: Add to core clause 91.1, at the second main bullet point, fourth sub-bullet point, after the words "against it":

Z10.1 or had a business rescue order granted against it.

Z11 Addition to secondary Option X7 Delay damages (if applicable in this contract)

Z11.1 If the amount due for the *Contractor*'s payment of delay damages reaches the limits stated in this Contract Data for Option X7 or Options X5 and X7 used together, the *Employer* may terminate the *Contractor*'s obligation to Provide the Works using the same procedures and payment on termination as those applied for reasons R1 to R15 or R18 stated in the Termination Table.

Z12 Ethics

For the purposes of this Z-clause, the following definitions apply:

Affected Party means, as the context requires, any party, irrespective of whether it is the *Contractor* or a third party, such party's employees, agents, or Subcontractors or Subcontractor's employees, or any one or more of all of these parties' relatives or friends,

Coercive Action means to harm or threaten to harm, directly or indirectly, an Affected Party or the property of an Affected Party, or to otherwise influence or attempt to influence an Affected Party to act unlawfully or illegally,

Collusive Action means where two or more parties co-operate to achieve an unlawful or illegal purpose, including to influence an Affected Party to act unlawfully or illegally,

Committing Party means, as the context requires, the *Contractor*, or any member thereof in the case of a joint venture, or its employees, agents, or Subcontractor or the Subcontractor's employees,

Corrupt Action means the offering, giving, taking, or soliciting, directly or indirectly, of a good or service to unlawfully or illegally influence the actions of an Affected Party,

Fraudulent Action means any unlawfully or illegally intentional act or omission that misleads, or attempts to mislead, an Affected Party, in order to obtain a financial or other benefit or to avoid an obligation or incurring an obligation,

Obstructive Action means a Committing Party unlawfully or illegally destroying, falsifying, altering or concealing information or making false statements to materially impede an investigation into allegations of Prohibited Action, and

Prohibited Action means any one or more of a Coercive Action, Collusive Action Corrupt Action, Fraudulent Action or Obstructive Action.

Z12.1 A Committing Party may not take any Prohibited Action during the course of the procurement of this contract or in execution thereof.

Z12.2 The *Employer* may terminate the *Contractor*'s obligation to Provide the Services if a Committing Party has taken such Prohibited Action and the *Contractor* did not take timely and appropriate action to prevent or remedy the situation, without limiting any other rights or remedies the *Employer* has. It is not required that the Committing Party had to have been found guilty, in court or in any other similar process, of such Prohibited Action before the *Employer* can terminate the *Contractor*'s obligation to Provide the Services for this reason.

Z12.3 If the *Employer* terminates the *Contractor*'s obligation to Provide the Services for this reason, the amounts due on termination are those intended in core clauses 92.1 and 92.2.

Z12.4 A Committing Party co-operates fully with any investigation pursuant to alleged Prohibited Action. Where the *Employer* does not have a contractual bond with the Committing Party, the *Contractor* ensures that the Committing Party co-operates fully with an investigation.

Z13 Insurance

Z 13.1 Replace core clause 84 with the following:

Insurance cover **84**

84.1 When requested by a Party, the other Party provides certificates from his insurer or broker stating that the insurances required by this contract are in force.

84.2 The *Contractor* provides the insurances stated in the Insurance Table A.

84.3 The insurances provide cover for events which are at the *Contractor*'s risk from the *starting date* until the earlier of Completion and the date of the termination certificate.

INSURANCE TABLE A

Insurance against	Minimum amount of cover or minim limit of indemnity
Loss of or damage to the *works*, Plant and Materials	The replacement cost where not covered by the *Employer*'s insuranc The *Employer*'s policy deductible, as Contract Date, where covered by the *Employer*'s insurance
Loss of or damage to Equipment	The replacement cost
Liability for loss of or damage to property (except the *works*, Plant and Materials and Equipment) and liability for bodily injury to or death of a person (not an employee of the *Contractor*) caused by activity in connection with this contract	Loss of or damage to property *Employer*'s property The replacement cost where not covered by the *Employer*'s insuranc The *Employer*'s policy deductible, as Contract Date, where covered by the *Employer*'s insurance Other property The replacement cost Bodily injury to or death of a person The amount required by applicable l
Liability for death of or bodily injury to employees of the *Contractor* arising out of and in the course of their employment in connection with this contract	The amount required by the applicat law

Z 13.2 **Replace core clause 87 with the following:**
The *Employer* provides the insurances stated in the Insurance Table B.

INSURANCE TABLE B

Insurance against or name of policy	Minimum amount of cover or minimum l of indemnity

Assets All Risk	Per the insurance policy document
Contract Works insurance	Per the insurance policy document
Environmental Liability	Per the insurance policy document
General and Public Liability	Per the insurance policy document
Transportation (Marine)	Per the insurance policy document
Motor Fleet and Mobile Plant	Per the insurance policy document
Terrorism	Per the insurance policy document
Cyber Liability	Per the insurance policy document
Nuclear Material Damage and Business Interruption	Per the insurance policy document
Nuclear Material Damage Terrorism	Per the insurance policy document

Z14 Nuclear Liability

Z14.1 The *Employer* is the operator of the Koeberg Nuclear Power Station (KNPS), a nuclear installation, as designated by the National Nuclear Regulator of the Republic of South Africa, and is the holder of a nuclear licence in respect of the KNPS.

Z14.2 The *Employer* is solely responsible for and indemnifies the *Contractor* or any other person against any and all liabilities which the *Contractor* or any person may incur arising out of or resulting from nuclear damage, as defined in Act 47 of 1999, save to the extent that any liabilities are incurred due to the unlawful intent of the *Contractor* or any other person or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.

Z14.3 Subject to clause Z14.4 below, the *Employer* waives all rights of recourse, arising from the aforesaid, save to the extent that any claims arise or liability is incurred due or attributable to the unlawful intent of the *Contractor* or any other person, or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.

Z14.4 The *Employer* does not waive its rights provided for in section 30 (7) of Act 47 of 1999, or any replacement section dealing with the same subject matter.

Z14.5 The protection afforded by the provisions hereof shall be in effect until the KNPS is decommissioned.

Z15 Asbestos

For the purposes of this Z-clause, the following definitions apply:

AAIA means approved asbestos inspection authority.

ACM means asbestos containing materials.

AL means action level, i.e. a level of 50% of the OEL, i.e. 0.1 regulated asbestos fibres per ml of air measured over a 4 hour period. The value at which proactive actions is required in order to control asbestos exposure to prevent exceeding the OEL.

Ambient Air means breathable air in area of work with specific reference to breathing zone, which is defined to be a virtual area within a radius of approximately 30cm from the nose inlet.

Compliance Monitoring means compliance sampling used to assess whether or not the personal exposure of workers to regulated asbestos fibres is in compliance with the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.

OEL means occupational exposure limit.

Parallel Measurements means measurements performed in parallel, yet separately, to existing measurements to verify validity of results.

Safe Levels means airborne asbestos exposure levels conforming to the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.

Standard means the *Employer*'s Asbestos Standard 32-303: Requirements for Safe Processing, Handling, Storing, Disposal and Phase-out of Asbestos and Asbestos Containing Material, Equipment and Articles.

SANAS means the South African National Accreditation System.

TWA means the average exposure, within a given workplace, to airborne asbestos fibres, normalised to the baseline of a 4 hour continuous period, also applicable to short term exposures, i.e. 10-minute TWA.

Z15.1 The *Employer* ensures that the Ambient Air in the area where the *Contractor* will Provide the Services conforms to the acceptable prescribed South African standard for asbestos, as per the regulations published in GNR 155 of 10 February 2002, under the Occupational Health and Safety Act, 1993 (Act 85 of 1993) ("Asbestos Regulations"). The OEL for asbestos is 0.2 regulated asbestos fibres per millilitre of air as a 4-hour TWA, averaged over any continuous period of four hours, and the short term exposure limit of 0.6 regulated asbestos fibres per millilitre of air as a 10-minute TWA, averaged over any 10 minutes, measured in accordance with HSG248 and monitored according to HSG173 and OESSM.

Z15.2 Upon written request by the *Contractor*, the *Employer* certifies that these conditions prevail. All measurements and reporting are effected by an independent, competent, and certified occupational hygiene inspection body, i.e. a SANAS accredited and Department of Employment and Labour approved AAIA. The *Contractor* may perform Parallel Measurements and related control measures at the *Contractor*'s expense. For the purposes of compliance the results generated from Parallel Measurements are evaluated only against South African statutory limits as detailed in clause Z15.1. Control measures conform to the requirements stipulated in the AAIA-approved asbestos work plan.

Z15.3 The *Employer* manages asbestos and ACM according to the Standard.

Z15.4 In the event that any asbestos is identified while Providing the Services, a risk assessment is conducted and if so required, with reference to possible exposure to an airborne concentration of above the AL for asbestos, immediate control measures are implemented and relevant air monitoring conducted in order to declare the area safe.

Z15.5 The *Contractor*'s personnel are entitled to stop working and leave the contaminated area forthwith until such time that the area of concern is declared safe by either Compliance Monitoring or an AAIA approved control measure intervention, for example, per the emergency asbestos work plan, if applicable.

Z15.6 The *Contractor* continues to Provide the Services, without additional control measures presented, on presentation of Safe Levels. The contractually agreed dates to Provide the Services, including the Completion Date, are adjusted accordingly. The contractually agreed dates are extended by the notification periods required by regulations 3 and 21 of the

Asbestos Regulations, 2001.

Z15.7 Any removal and disposal of asbestos, asbestos containing materials and waste, is done by a registered asbestos contractor, instructed by the *Employer* at the *Employer*'s expense, and conducted in line with South African legislation.

C1.2 Contract Data

- Part two - Data provided by the *Contractor*

[Instructions to the contract compiler: (delete this notes before issue to tenderers with an enquiry) Whenever a cell is shaded in the left hand column it denotes this data is optional. If not required select and delete the whole row, otherwise insert the required Data.]

Notes to a tendering contractor:

1. Please read both the NEC3 Engineering and Construction Contract (April 2013) and the relevant parts of its Guidance Notes (ECC3-GN)[2] in order to understand the implications of this Data which the tenderer is required to complete. An example of the completed Data is provided on pages 156 to 158 of the ECC3 (April 2013) Guidance Notes.
2. The number of the clause which requires the data is shown in the left hand column for each statement however other clauses may also use the same data
3. Where a form field like this [ ] appears, data is required to be inserted relevant to the option selected. Click on the form field ***once*** and type in the data. Otherwise complete by hand and in ink.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

-	- **Statement**	- **Data**
10.1	The *Contractor* is (Name): Address Tel No. Fax No.	
11.2(8)	The *direct fee percentage* is The *subcontracted fee percentage* is	**%** **%**
11.2(18)	The *working areas* are the Site and	
24.1	The *Contractor's* key persons are: 1 Name: Job: Responsibilities: Qualifications: Experience:	

[2] Available from Engineering Contract Strategies Tel 011 803 3008, Fax 011 803 3009 or see www.ecs.co.za

	2 Name: Job Responsibilities: Qualifications: Experience:	**CV's (and further key persons data including CVs) are appended to Tender Schedule entitled .**		
11.2(3)	The *completion date* for the whole of the *works* is			
11.2(14)	The following matters will be included in the Risk Register			
11.2(19)	The Works Information for the *Contractor*'s design is in:			
31.1	The programme identified in the Contract Data is			
A	**Priced contract with activity schedule**			
11.2(20) 11.2(30)	The *activity schedule* is in The tendered total of the Prices is	**(in figures)** **(in words), excluding VAT**		
	- **Data for Schedules of Cost Components**	*Note "SCC" means Schedule of Cost Components starting on page 60, and "SSCC" means Shorter Schedule of Cost Components starting on page 63 of ECC3 (April 2013).*		
A	**Priced contract with activity schedule**	**Data for the Shorter Schedule of Cost Components**		
41 in SSCC	The percentage for people overheads is:	**%**		
21 in SSCC	The published list of Equipment is the last edition of the list published by The percentage for adjustment for Equipment in the published list is	**Minus %**		
22 in SSCC	The rates of other Equipment are:	**Equipment**	**Size or capacity**	**Rate**

61 in SSCC	The hourly rates for Defined Cost of design outside the Working Areas are **Note: Hourly rates are estimated 'cost to company of the employee' and not selling rates.** **Please insert another schedule if foreign resources may also be used**	**Category of employee**	**Hourly rate**
62 in SSCC	The percentage for design overheads is	**%**	
63 in SSCC	The categories of design employees whose travelling expenses to and from the Working Areas are included in Defined Cost are:		

C1.3 Forms of Securities

Pro formas for Bonds & Guarantees

For use with the NEC3 Engineering & Construction Contract

[Note to contract compiler:
Once it has been decided which securities are required for this contract delete from this file the ones not required, revise the notes below accordingly and delete this note.]

The *conditions of contract* stated in the Contract Data Part 1 include the following Secondary Options:

Option X4: Parent company guarantee
Option X13: Performance Bond
Option X14: Advanced payment to the *Contractor*

Each of these secondary Options requires a bond or guarantee "in the form set out in the Works Information". Pro forma documents for these bonds and guarantees are provided here for convenience but are to be treated as part of the Works Information.

Option X16: Retention (not used with Option F)

The *Contractor* may provide a Retention Money Guarantee in the form stated here. When the *Employer* receives and accepts a Retention Money Guarantee exactly in the form stated he will instruct the *Project Manager* not to assess any amount be retained in terms of secondary Option X16.

The *Contractor* shall guarantee his ASGI-SA Obligations by providing the *Employer* with an ASGI-SA Guarantee in the form provided here.

[Note to contract compiler: If there are no ASGI-SA Obligations in this contract, delete the above statement]

The organisation providing the bond / guarantee does so by copying the pro forma document onto his letterhead without any change to the text or format and completing the required details. The completed document is then given to the *Employer* within the time stated in the contract.

Pro forma Performance Bond – Demand Guarantee (for use with Option X13)

(to be reproduced exactly as shown below on the letterhead of the Contractor's Parent Company)

Eskom Holdings SOC Ltd
Megawatt Park
Maxwell Drive
Sandton
Johannesburg Date:

Dear Sirs

Reference No. **[●]** *[Drafting Note: Bank reference number to be inserted]*

Performance Bond – Demand Guarantee: *[Drafting Note: Name of Contractor to be inserted]*

Project [ ] Contract Reference: …… *[Drafting Note: Contractor contract reference number to be inserted]*

In this Guarantee the following words and expressions shall have the following meanings:-

"Bank" - means [●], [●] Branch, (Registration No. [●]); [Drafting Note: Name of Bank to be inserted]

"Bank's Address" - means [●]; [Drafting Note: Bank's physical address to be inserted]

"Contract" – means the written agreement relating to the Project, entered into between Eskom and the Contractor, on or about the [●] day of [●] 200[●] (Contract Reference No. [.]as amended, varied, restated, novated or substituted from time to time; [Drafting Note: Signature Date and Contract reference number to be inserted]

"Contractor" – means [●] a company registered in accordance with the laws of [●] under Registration Number [●]. [Drafting Note: Name and details of Contractor to be inserted]

"Eskom" - means Eskom Holdings SOC Ltd, a company registered in accordance with the laws of the Republic of South Africa under Registration Number 2002/015527/30].

"Expiry Date" - means the date on which the Defects Certificate is issued in terms of the Contract.

"Guaranteed Sum" - means the sum of R [●] ([●] Rand);

"Project" - means [insert if applicable.].

At the instance of the Contractor, we the undersigned _____ and _____, in our respective capacities as _____ and _____ of the Bank, and duly authorized thereto, confirm that we hold the Guaranteed Sum at the disposal of Eskom, as security for the proper performance by the Contractor of all of its obligations in terms of and arising from the Contract and hereby undertake to pay to Eskom, on written demand from Eskom received prior to the Expiry Date, any sum or sums not exceeding in total the Guaranteed Sum.

A demand for payment under this guarantee shall be made in writing at the Bank's address and shall:

be signed on behalf of Eskom by a Group Executive, Divisional Executive, Senior General Manager, General Manager or its delegate;

state the amount claimed ("the Demand Amount');

state that the Demand Amount is payable to Eskom in the circumstances contemplated in the Contract.

Notwithstanding the reference herein to the Contract the liability of the Bank in terms hereof is as principal and not as surety and the Bank's obligation/s to make payment:

is and shall be absolute provided demand is made in terms of this bond in all circumstances; and

is not, and shall not be construed to be, accessory or collateral on any basis whatsoever.

The Bank's obligations in terms of this Guarantee:

shall be restricted to the payment of money only and shall be limited to the maximum of the Guaranteed Sum; and

shall not be discharged and compliance with any demand for payment received by the Bank in terms hereof shall not be delayed, by the fact that a dispute may exist between Eskom and the Contractor.

Eskom shall be entitled to arrange its affairs with the Contractor in any manner which it sees fit, without advising us and without affecting our liability under this Guarantee. This includes, without limitation, any extensions, indulgences, release or compromise granted to the Contractor or any variation under or to the Contract.

Should Eskom cede its rights against the Contractor to a third party where such cession is permitted under the Contract, then Eskom shall be entitled to cede to such third party the rights of Eskom under this Guarantee on written notification to the Bank of such cession.

This Guarantee:

shall expire on the Expiry Date until which time it is irrevocable;

is, save as provided for in 0 above, personal to Eskom and is neither negotiable nor transferable;

shall be returned to the Bank upon the earlier of payment of the full Guaranteed Sum or expiry hereof;

shall be regarded as a liquid document for the purpose of obtaining a court order; and

shall be governed by and construed in accordance with the law of the Republic of South Africa and shall be subject to the jurisdiction of the Courts of the Republic of South Africa.

Any claim which arises or demand for payment received after expiry date will be invalid and unenforceable.

The Bank chooses domicilium citandi et executandi for all purposes in connection with this Guarantee at the Bank's Address.

Signed at _____ Date _____

For and behalf of the Bank

Bank Signatory: _____ Bank Signatory: _____

Witness: _____ Witness: _____
Bank's seal or stamp

Pro forma Retention Money Guarantee (may be used when Option X16 applies)

(to be reproduced exactly as shown below on the letterhead of the Bank providing the Guarantee)

Eskom Holdings SOC Limited
Megawatt Park
Maxwell Drive
Sandton
Johannesburg Date:

Dear Sirs

Reference No. **[●]** *[Drafting Note: Bank reference number to be inserted]*

Retention Money Guarantee: *[Drafting Note: Name of Contractor to be inserted]*

Project [ ] : Contract Reference: *[Drafting Note: Contractor contract reference number to be inserted]*

In this Guarantee the following words and expressions shall have the following meanings:-

"Bank" - means [●], [●] Branch, (Registration No. [●]); [Drafting Note: Name of Bank to be inserted]

"Bank's Address" - means [●]; [Drafting Note: Bank's physical address to be inserted]

"Contract" – means the written agreement relating to the Project, entered into between Eskom and the Contractor, on or about the [●] day of [●] 200[●] (Contract Reference No. ……. as amended, varied, restated, novated or substituted from time to time; [Drafting Note: Signature Date and Contract reference number to be inserted]

"Contractor" – means [●] a company registered in accordance with the laws of [●] under Registration Number [●]. [Drafting Note: Name and details of Contractor to be inserted]

"Eskom" - means Eskom Holdings SOC Limited, a company registered in accordance with the laws of the Republic of South Africa under Registration Number 2002/015527/30

"Expiry Date" - means the date on which the Defects Certificate is issued in terms of the Contract.

"Guaranteed Sum" - means the sum of R [●] ([●] Rand); [Drafting Note: Insert amount of Retention Money Guarantee.].

"Project" - means the……..

At the instance of the Contractor, we the undersigned _____ and _____, in our respective capacities as _____ and _____ of the Bank, and duly authorized thereto, confirm that we hold the Guaranteed Sum at the disposal of Eskom, as security for the proper performance by the Contractor of all of its obligations in terms of and arising from the Contract and hereby undertake to pay to Eskom, on written demand from Eskom received prior to the Expiry Date, any sum or sums not exceeding in total the Guaranteed Sum.

A demand for payment under this guarantee shall be made in writing at the Bank's address and shall:

be signed on behalf of Eskom by a director of Eskom or his authorised delegate.

state the amount claimed ("the Demand Amount');

state that the Contractor has failed to carry out his obligation(s) to rectify certain defect(s) for which he is responsible under the Contract (and the nature of such defect(s)) alternatively that the Demand

Amount is payable to Eskom in the circumstances contemplated in the Contract.

Notwithstanding the reference herein to the Contract the liability of the Bank in terms hereof is as principal and not as surety and the Bank's obligation/s to make payment:

is and shall be absolute provided demand is made in terms of this bond in all circumstances; and

is not, and shall not be construed to be, accessory or collateral on any basis whatsoever.

The Bank's obligations in terms of this Guarantee:

shall be restricted to the payment of money only and shall be limited to the maximum of the Guaranteed Sum; and

shall not be discharged and compliance with any demand for payment received by the Bank in terms hereof shall not be delayed by the fact that a dispute may exist between Eskom and the Contractor.

Eskom shall be entitled to arrange its affairs with the Contractor in any manner which it sees fit, without advising us and without affecting our liability under this Guarantee. This includes, without limitation, any extensions, indulgences, release or compromise granted to the Contractor or any variation under or to the Contract.

Should Eskom cede its rights against the Contractor to a third party where such cession is permitted under the Contract, then Eskom shall be entitled to cede to such third party the rights of Eskom under this Guarantee on written notification to the Bank of such cession.

This Guarantee:

shall expire on the Expiry Date until which time it is irrevocable;

is, save as provided for in **0** above, personal to Eskom and is neither negotiable nor transferable;

shall be returned to the Bank upon the earlier of payment of the full Guaranteed Sum or expiry hereof;

shall be regarded as a liquid document for the purpose of obtaining a court order; and

shall be governed by and construed in accordance with the law of the Republic of South Africa and shall be subject to the jurisdiction of the Courts of the Republic of South Africa.

Any claim which arises or demand for payment received after expiry date will be invalid and unenforceable.

The Bank chooses domicilium citandi et executandi for all purposes in connection with this Guarantee at the Bank's Address.

Signed at _____ Date _____ Bank's seal or stamp

For and behalf of the Bank

Bank Signatory: _____ Bank Signatory: _____

Witness: _____ Witness: _____

Pro forma ASGI-SA Guarantee

(to be reproduced exactly as shown below on the letterhead of the Bank providing the Guarantee)

Eskom Holdings Limited
Megawatt Park
Maxwell Drive
Sandton
Johannesburg Date:

Dear Sirs

Reference No. **[●]** *[Drafting Note: Bank reference number to be inserted]*

Pro-Forma ASGI-SA Guarantee: *[Drafting Note: Name of Contractor to be inserted]*

Project [ ] Contract Reference: **[●]** *[Drafting Note: Contractor contract reference number to be inserted]*

1. In this Guarantee the following words and expressions shall have the following meanings:-

1.1 "Bank" - means [●], [●] Branch, (Registration No. [●]); [Drafting Note: Name of Bank to be inserted]

1.2 "Bank's Address" - means [●]; [Drafting Note: Bank's physical address to be inserted]

1.3 "Contract" – means the written agreement relating to the Project, entered into between the *Employer* and the *Contractor*, on or about the [●] day of [●] 200[●] (Contract Reference No. **[●]** as amended, varied, restated, novated or substituted from time to time; [Drafting Note: Signature Date and Contract reference number to be inserted]

1.4 "*Contractor*" – means [●] a company registered in accordance with the laws of [●] under Registration Number [●]. [Drafting Note: Name and details of Contractor to be inserted]

1.5 "*Contractor's* ASGI-SA Obligations" – means the *Contractor's* ASGI-SA Obligations under and as defined in the Contract.

1.6 "*Employer*" - means Eskom Holdings Limited, a company registered in accordance with the laws of the Republic of South Africa under Registration Number 2002/015527/06.

1.7 "Expiry Date" - means the [●] day of [●] 200[●]; [Drafting Note: anticipated date of issue of ASGI-SA Performance Certificate to be inserted.]

1.8 "Guaranteed Sum" - means the sum of R [●] ([●] Rand);

1.9 "Project" – means the ……

2. At the instance of the *Contractor*, we the undersigned _____ and _____, in our respective capacities as _____ and _____ of the Bank, and duly authorized thereto, confirm that we hold the Guaranteed Sum at the disposal of the *Employer*, as security for the proper performance by the *Contractor* of the *Contractor's* ASGI-SA Obligations and hereby undertake to pay to the *Employer*, on written demand from the *Employer* received prior to the Expiry Date, any sum or sums not exceeding in total the Guaranteed Sum.

3. A demand for payment under this guarantee shall be made in writing at the Bank's address and shall:

3.1 state the amount claimed ("the Demand Amount');

3.2 state that the Demand Amount is payable to the *Employer* in the circumstances contemplated in

the Contract.

4. Notwithstanding the reference herein to the Contract the liability of the Bank in terms hereof is as principal and not as surety and the Bank's obligation/s to make payment:

4.1 is and shall be absolute provided demand is made in terms of this bond in all circumstances; and

4.2 is not, and shall not be construed to be, accessory or collateral on any basis whatsoever.

5. The Bank's obligations in terms of this Guarantee:

5.1 shall be restricted to the payment of money only and shall be limited to the maximum of the Guaranteed Sum; and

5.2 shall not be discharged and compliance with any demand for payment received by the Bank in terms hereof shall not be delayed, by the fact that a dispute may exist between the *Employer* and the *Contractor*.

6. The *Employer* shall be entitled to arrange its affairs with the *Contractor* in any manner which it sees fit, without advising us and without affecting our liability under this Guarantee. This includes, without limitation, any extensions, indulgences, release or compromise granted to the *Contractor* or any variation under or to the Contract.

7. Should the *Employer* cede its rights against the *Contractor* to a third party where such cession is permitted under the Contract, then the *Employer* shall be entitled to cede to such third party the rights of the *Employer* under this Guarantee on written notification to the Bank of such cession.

8. This Guarantee:

8.1 shall expire on the Expiry Date until which time it is irrevocable;

8.2 is, save as provided for in **0** above, personal to the *Employer* and is neither negotiable nor transferable;

8.3 shall be returned to the Bank upon the earlier of payment of the full Guaranteed Sum or expiry hereof;

8.4 shall be regarded as a liquid document for the purpose of obtaining a court order; and

8.5 shall be governed by and construed in accordance with the law of the Republic of South Africa and shall be subject to the jurisdiction of the courts of the Republic of South Africa.

8.6 Any claim which arises or demand for payment received after expiry date will be invalid and unenforceable.

9. The Bank chooses domicilium citandi et executandi for all purposes in connection with this Guarantee at the Bank's Address.

Signed at _____ Date _____

For and behalf of the Bank

Bank Signatory: _____ Bank Signatory: _____

Witness: _____ Witness: _____
Bank's seal or stamp

PART 2: PRICING DATA
ECC3 Option A

Document reference	Title	No of pages
C2.1	Pricing assumptions: Option A	
C2.2	The *activity schedule*	

C2.1 Pricing assumptions: Option A

How work is priced and assessed for payment

Clause 11 in NEC3 Engineering and Construction Contract, (ECC3) Option A states:

Identified and defined terms 11

11.2 (20) The Activity Schedule is the *activity schedule* unless later changed in accordance with this contract.

(27) The Price for Work Done to Date is the total of the Prices for

- each group of completed activities and
- each completed activity which is not in a group.

A completed activity is one which is without Defects which would either delay or be covered by immediately following work.

(30) The Prices are the lump sum prices for each of the activities on the Activity Schedule unless later changed in accordance with this contract.

This confirms that Option A is a lump sum form of contract where the work is broken down into activities, each of which is priced by the tendering contractor as a lump sum. Only completed activities are assessed for payment at each assessment date; no part payment is made if the activity is not completed by the assessment date.

Function of the Activity Schedule

Clause 54.1 in Option A states: “Information in the Activity Schedule is not Works Information or Site Information”. This confirms that specifications and descriptions of the work or any constraints on how it is to be done are not included in the Activity Schedule but in the Works Information. This is further confirmed by Clause 20.1 which states, “The *Contractor* Provides the Works in accordance with the Works Information”. Hence the *Contractor* does **not** Provide the Works in accordance with the Activity Schedule. The Activity Schedule is only a pricing document.

Link to the programme

Clause 31.4 states that “The *Contractor* provides information which shows how each activity on the Activity Schedule relates to the operations on each programme which he submits for acceptance”. Ideally the tendering contractor will develop a high level programme first then resource each activity and thus arrive at the lump sum price for that activity both of which can be entered into the *activity schedule*.

Preparing the *activity schedule*

Generally it is the tendering contractor who prepares the *activity schedule* by breaking down the work described within the Works Information into suitable activities which can be well defined, shown on a programme and priced as a lump sum.

The *Employer*, in his Instructions to Tenderers or in a Tender Schedule, may have listed some items that he requires the *Contractor* to include in his *activity schedule* and be priced accordingly.

It is assumed that in preparing his *activity schedule* the *Contractor:*

- Has taken account of the guidance given in the ECC3 Guidance Notes pages 19 and 20;
- Understands the function of the Activity Schedule and how work is priced and paid for;
- Is aware of the need to link the Activity Schedule to activities shown on his programme;
- Has listed and priced activities in the *activity schedule* which are inclusive of everything necessary and incidental to Providing the Works in accordance with the Works Information, as it was at the time of tender, as well as correct any Defects not caused by an *Employer's* risk;
- Has priced work he decides not to show as a separate activity within the Prices of other listed activities in order to fulfil the obligation to complete the *works* for the tendered total of the Prices.
- Understands there is no adjustment to the lump sum Activity Schedule price if the amount, or quantity, of work within that activity later turns out to be different to that which the *Contractor* estimated at time of tender. The only basis for a change to the Prices is as a result of a compensation event.

An activity schedule could have the following format:

Item No.	**Programme Reference**	**Activity description**	**Price**

A Microsoft spreadsheet is provided with the enquiry and the spreadsheet is encouraged to populate the summary. A printout of the spreadsheet can be added to this section.

C2.2 the *activity schedule*

Use this page as a cover page to the *Contractor*'s *activity schedule*.

PART 3: SCOPE OF WORK

Document reference	Title	No of pages
	This cover page	1
C3.1	*Employer*'s Works Information	
C3.2	*Contractor*'s Works Information	
	Total number of pages	

C3.1: EMPLOYER'S WORKS INFORMATION

Contents

1. Description of the works

1.1. Executive overview

Eskom Holdings SOC Ltd (the "Employer") desires to engage the services of an Engineering, Procurement and Construction (EPC) Contractor (the “Contractor”) to undertake, under an EPC Contract (the “Contract”) for the complete detailed engineering design, procurement, manufacturing, sourcing and supply of mechanical, process, electrical, control and instrumentation (C&I), civil and structural work, shipment, transportation, unloading, erection, quality assurance, on- and off-site testing, painting, finishing, installation, integrations with existing infrastructure, testing, commissioning, onsite operational training, certification and handover, hazardous zone classification of the hydrogen generation plant, completion until the end of the Defects Liability Period, making good defects and warranty cover during the Defects Liability Period, and other works (altogether defined as the “Works”) necessary to construct a Renewable Hydrogen Facility (the “Plant”), and any additional infrastructure (the “Project”). The Contractor must integrate the Plant with the existing solar photovoltaic (PV) plant and Battery Energy Storage System (BESS).

The Project is to be situated at Eskom Research and Innovation Centre (ERIC), Rosherville, Johannesburg.

The full scope is presented in Annexure A, **Specification for Renewable Hydrogen Facility 240-RT&D-151.** This document must be read in conjunction with the requirements as specified in the **Hydrogen System Standard 240-56227413**.

1.2. Employer’s objectives and purpose of the works

Renewable (green) hydrogen production is a key priority to achieve net zero carbon emissions by 2050 in South Africa. It will directly contribute to Eskom’s decarbonisation strategy and enable renewable energy deployment as it presents an excellent medium to long-term energy storage. Developing a pilot Renewable Hydrogen Facility (RHF) will present Eskom with an informed pathway to plan for the adoption of green hydrogen present an opportunity to understand legislative requirements and regulations related to renewable hydrogen, and to develop internal skills through hands on participation through a pilot and demonstration.

1.3. Interpretation and terminology

The following abbreviations are used in this Works Information and in **Specification for Renewable Hydrogen Facility 240-RT&D-151**

Abbreviation	Explanation
AC	Alternating current
AIAA	American Institute of Aeronautics and Astronautics
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ABD	Availability Block Diagram
bar	Bar
BESS	Battery Energy Storage System
BOM	Bill of materials
C&I	Control and instrumentation
CAD	Computer-aided design
CM	Configuration management
CMS	Control and Monitoring System
CoE	Centre of Excellence

CoC	Electrical Certificate of Compliance
CPU	Central processing units
DC	Direct current
DVD	Digital versatile disk
ECA	Electrical Contractors' Association
EPC	Engineering design, procurement, and construction
ERIC	Eskom Research and Innovation Centre
EWDL	Engineering Work Design Lead
FAT	Factory Acceptance Testing
FMECA	Failure Mode Effects and Criticality Analysis
GA	General Arrangement
GPS	Global Positioning System
GUI	Graphical User Interface
HMI	Human Machine Interface
HVAC	Heating ventilation and air conditioning
IEC	International Electrotechnical Commission
IED	Intelligent electronic device's
ISO	Internation Organisation for Standards
ITP	Inspection and Test Plans
kA	kiloampere
kPa	kilopascal
kW	kilowatt
kWh	kilowatt hour
l/h	Litres per hour
LDE	Lead Discipline Engineer
LOSS	Limits of Supply and Services
LV	Low voltage
mA	milliampere
MCB	Miniature Circuit Breakers
MCCB	Moulded Case Circuit Breakers
MDT	Mean Down Time
MTTF	Mean Time to Failure
MTTR	Mean Time to Repair
MV	Medium Voltage
MWh	Megawatt hour
O&M	Operational and maintenance
OEM	Original Equipment Manufacturer
OHS Act	Occupational Health and Safety Act
PSR	Plant Safety Regulations
P&ID	Piping and instrumentation diagrams
PV	Photo Voltaic
QCP	Quality Control Plans
R&D	Research and Development
RAID	Redundant array of independent disks
RAM	Reliability, Availability and Maintainability

RE	Renewable energy
RHF	Renewable Hydrogen Facility
RT&D	Research, Testing and Development
SANS	South African National Standards
SCADA	Supervisory Control and Data Acquisition
SIL	Safety Integrity Level
UPS	Uninterruptible power supplies
USB	Universal serial bus
VDSS	Vendor Document Submission Schedule
VPN	Virtual private network

2. Management and start up

2.1. Management meetings

Regular meetings of a general nature may be convened and chaired by the *Project Manager* as follows:

Title and purpose	**Approximate time & interval**	**Location**	**Attendance by:**
Risk Reduction Meeting	As per NEC 3 procedure	**Site or where instructed by the *Project Manager***	*Employer.* ***Project Manager* (*Supervisor* & SHE officer) optional** *Contractor.* • **Project Director, Site Manager, Contract Manager, Site *Supervisor*/s, Scheduler and SHE Manager**
Progress meetings	Monthly or as instructed by the *Project Manager*	**Site or as instructed by the *Project Manager***	*Employer.* ***Project Manager* (*Supervisor* & SHE officer) optional** *Contractor.* • **Project Director, Site Manager, Contract Manager, Site *Supervisor*/s, Scheduler and SHE Manager**
Integration Meeting	Monthly or as instructed by the *Project Manager*	**Site or as instructed by the *Project Manager***	*Employer.* ***Project Manager Supervisor* SHE officer** *Contractor.* **Project Manager, Site Manager, Site *Supervisor*, Scheduler and SHE Manager**

Health, Safety and Environmental meetings	As stipulated in (SHE specification)	**Site or as instructed by the *Project Manager***	*Employer.* ***Project Manager Supervisor*** **SHE officer** *Contractor.* **Project Manager, Site Manager, Site *Supervisor*, Scheduler and SHE Manager**

Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the *works*. Records of these meetings shall be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting.

All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the *conditions of contract* to carry out such actions or instructions.

The *Project Manager* prepares minutes of meetings for all meetings held between *Employer* and *Contractor*.

The minutes of a meeting contain all significant aspects of the meeting recorded together with any actions placed and is presented to the *Contractor* for signature at the next project meeting. After the *Contractor* has signed the minutes of meeting, the minutes are to be officially published.

The *Contractor* shall attend regular site meetings with the *Project Manager* and *Supervisor* where the progress of construction will be reviewed. Such meetings shall be held monthly and may be attended by representatives of the *Employer*.

The *Contractor* shall also attend weekly meetings with the *Supervisor* and provide, prior to each meeting as required by the *Project Manager*, detailed programmes showing separately the various activities of the *Contractor* anticipated over the forthcoming two-week period as well as the progress achieved over the preceding week relative to the programme applicable to that period

2.2. Documentation control

2.2.1. Documents for providing the Works

The *Contractor* shall compose and submit all Documentation and Technical Information required throughout the project.

All documents supplied by the *Contractor* shall be subject to *Employer's* approval. The language of all documentation shall be in English. Metric/SI units shall be used throughout the *Contractors*' Documentation. The *Contractor* shall include the drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his *Sub-contractors*.

In Providing the *Works*, all documentation and data prepared and submitted by the *Contractor* conforms with and adheres to the requirements of:

- On receipt of documentation from the Project Manager, the Contractor verifies receipt of all transmitted documentation, including document status/revision. The Contractor advises the Project Manager in writing of any discrepancies, omissions or poor quality in the documentation.
- The Contractor shall prepare and submit information to complete the Definition of the works and Services at Pre-Construction Stage, Pre-Commissioning stage, post Commissioning stage and Handover phase.

- Where entries are shown in both stages, First Stage information shall be regarded as provisional and shall be updated and finalized in the Last Stage. Where entries are not shown in both stages, information is required only at that stage and the information shall be regarded as finalized at the relevant stage.
- The Project Manager ensures that the document schedule is maintained and kept up to date for the duration of the contract.
- Prior to commencement of any Works, the Contractor confirms with the Project Manager that the Contractor is in receipt of and is working to the latest revision of all necessary documentation. All rectification undertaken by the Contractor resulting from a failure to do so will be to the Contractor's account.
- In cases where modifications or additions are required on Site, a Field Engineering Query will be submitted by the Contractor. The Project Manager will issue the required instruction and documentation. The Contractor will neatly mark up, on the latest edition and revision of such documentation as may be impacted, all field changes undertaken in the course of the construction and these mark-ups will be submitted as part of "As Built" documentation at the final hand over.
- Each supplier of documentation and data to the project is responsible for ensuring that all documentation and data submitted conforms to the Project Standards and data quality requirements in terms of numbering, uniqueness, quality, accuracy, format, completeness and currency of information. Data not meeting the Project Standards and data quality requirements will be cause for rejection and returned to the Contractor for corrective action and resubmission.
- Should any change be made to documentation or data, which has already been submitted to the Contractor, then new or revised documentation or data shall be issued by the Project Manager to replace the outdated information.
- All drawings must comply with the Employer's CAD Standard.
- The Contractor ensures that the Microsoft Office 2019, and Microsoft Project 2010 or earlier software and suitable 'IT' Infrastructure are in place to support the electronic transmission of documentation.
- Electronic files submitted to or from the Project Manager, Contractor, and Employer are free of any known viruses and extraneous "macros".

2.2.2. Transmittal

An incoming transmittal note accompanies all documentation submitted, by the *Contractor*. Upon receipt of the transmittal, the *Employer* signs to indicate acknowledgement of receipt and returns this to the *Contractor.*
The *Contractor* ensures that the incoming transmittal contains the following minimum metadata:

- Transmittal title
- Transmittal number and revision
- Contract title
- Contract number
- Purpose
- Originator's/ Sender contact information
- Issue status
- Authorisation date
- Number of sets of attached documents

All Project documents (soft copies and hard copies) submitted, are listed on the transmittal with the following metadata fields:

- Title of the document
- Document Unique Identification number
- Revision number
- Name of Discipline
- Reason for issuing/submission
- Sender's detail
- Sent date
- Recipient's Details
- Date received
- Quantity of documentation referenced on the transmittal
- Number of copies
- Format/medium submitted

- Sender signature
- Recipient signature, once submitted, to acknowledge receipt

The *Contractor* compiles and submits all the documentation, for the various phases of the Project, in accordance with the agreed Programme. Documentation and drawings are programmed for delivery to meet the milestone dates and in accordance with the agreed MDL, that is to be developed by the *Contractor*.

The *Contractor* includes the *Employer's* drawing number in the drawing title block. This requirement only applies to design drawings developed by the *Contractor* and his Sub-*Contractor*s. It does not apply to drawings developed by manufacturers for equipment and material such as valves, instruments, etc. Drawing numbers will be assigned by the *Employer* as drawings are developed.

2.2.3. Email Subject

The email subject shall as a minimum, contain the following: **(Project Name_Discipline_Subject)**

Documentation is submitted to the *Project Manager*, as well as to the centralised and on-site Documentation Centres, by way of the following media:

- Electronic copies are submitted to both on site Documentation Centres, and to the Project Manager as well through generic email address (HYPERLINK "mailto:edrmsharedservices@eskom.co.za" edrmsharedservices@eskom.co.za).
- Electronic copies too large for email (above 6 Megabytes|), are delivered by large file transfer protocol.
- Hard copies are submitted to the Project Manager, accompanied by the Transmittal Note. These transmittals are also scanned and a copy sent to the project e-mail address as per the first bullet.

2.2.4. Identification of the Documentation

The document will have the following as a minimum attributes on the cover page:

- Title of the document
- Document Unique Identification number (Employer's number)
- Contractor Document number, if applicable
- Document status
- Revision number
- Document Type
- Document security level
- Document revision table/history
- Page number on the footer
- Document Author/Authoriser/
- Document Originator Contractor

The following additional attributes are important for technical documents: Package/System name, sub-system if applicable

- Contractor name
- Contractor number
- Plant Identification Codes

2.2.5. Format and Layout of Documents

For consistency, it is important that all documents used within a specific domain follow the same layout, style and formatting standard.

All Documents shall be equipped with an index where applicable. Such index shall be hyperlinked in electronic formats of the Documents. The *Contractor* shall submit the final Documentation in electronic format and on paper copies as shown in the table below.

	Paper Copies	**Flash Disk**

ITEM	Number	Size	Number
Documents	2	A4/A3	3
Reports, Calculations and Technical Documents	2	A4	3
Programmes and Work Plans	2	A3/A4	3
Method Statements	2	A4	3
Technical Data	2	A4	3
Drawings	2	A2/A3	3
Manufacturer's Information	2	A4	3
Controls & Wiring Diagrams	2	A3/A4	3
Scada Software	-	-	3
Antivirus Software	-	-	3
Test Certificates	2	A4	3
Commissioning Records	2	A4	3
O&M Manuals	2	A4	3
Guarantees & Warranties	2	A4	3
Reference Codes, Standards and Guides	2	-	3

The *Contractor* shall employ all appropriate project electronic document handling systems for the transmission of the Documentation. Any or all of the *Contractor's* Documents may be reviewed by the *Employer* to verify compliance with the Works Information Document and accordance with the Design Intent. All *Contractor's* Documents selected for review will be given a status mark as shown in the table below.

STATUS MARK	REVIEW COMMENT	MEANING
'A'	No comment	The *Contractor* may proceed.
'B'	Comments as noted	The *Contractor* may proceed at their own risk, incorporating the comments in a timely manner, and resubmit.
'C'	Re-submit before	The *Contractor* must resubmit before proceeding.

Any incomplete or substandard submissions will automatically be given 'C' status. The *Contractor* shall allow a period for the *Employer* to review and comment on the *Contractor's* submitted Documents, as shown in the table below.

TYPE OF SUBMISSION	WORKING DAYS	FROM
Contractors' Documents	5	Before date required by the Contractor
Draft O&M Manuals, draft record drawings and performance data	5	Before start of testing and commissioning

Commissioning & Testing Records	5	After tests
Input to the project Health & Safety File	5	Before construction commences
'A' Status O&M Manuals and Record Drawings	5	Before Practical Completion

Comments given by the *Employer* do not relieve the *Contractors* of their responsibilities and obligations regarding the execution of *the works* and compliance with the Contract Documentation and the Works Information Document. Comments given by the *Employer* do not constitute a Change under the Contract.

2.2.6. Drawings

The creation, issuing and control of all Engineering Drawings will be in accordance to the latest revision of the *Employer*'s standard: 240-86973501 (Engineering Drawing Standards – Common Requirements).

All *Contractor*s are required to submit electronic drawings in Micro Station (DGN) format, and scanned drawings in pdf format. No drawings in TIFF, AUTOCAD or any other electronic format will be accepted. Drawings issued to the *Employer* may not be "Right Protected" or encrypted**.**

2.2.7. Engineering Change Management

All Design change management shall be performed in accordance to the latest revision of the Eskom Project Engineering Change Management Procedure (240-53114026). and the *Employer* shall ensure that *Contractor* is provided with latest revisions of this procedure. Any uncertainty regarding this procedure should be clarified with the *Employer*. All design reviews will be conducted according to the Design Review Procedure (240-53113685).

2.2.8. Handover requirements

The *Contractor* is required to handover documentation in such a way that it is compatible with Eskom Quality systems.

2.3. Health and safety risk management

The *Contractor* shall comply with the: **Construction Work Contractor SHE Specification** requirements **240 RTD 790.**

2.4. Environmental constraints and management

The Contractor shall comply with the: **Environmental Management Plan (EMP) for RT&D Construction Work Requirements 240 RTD 791.**

2.5. Quality assurance requirements

The Contractor and all sub-Contractors shall comply with the requirements listed in the Employer's Quality requirement standard, 'Supplier Contract Quality Requirements Specification', document identifier **240-105658000** Supplier Quality Management Specification

2.6. Programming constraints

The programme is to be submitted for acceptance in accordance with Core Clause 31 in the Engineering and Construction Contract, in terms of which resources to complete each activity must be clearly identified. The *Contractor* will allow two weeks of the starting date for compiling a schedule to be reviewed by Eskom every two weeks to ensure accuracy. The *Contractor* will be expected to use the allowed time from start date to prepare a proper schedule by interfacing with all relevant stakeholders. It is suggested that Gantt or bar chart formats be used for project planning, while progress graphs/schedules be submitted at monthly project meetings to monitor progress.

The programme is to include all the requirements of clause 31.2 of the Engineering and Construction Contract.

- Progress

Eskom will monitor the process of compiling a schedule of the contract on a weekly basis by means of a report from the *Contractor*. A weekly progress report is to be submitted to the *Project Manager*.

The *Contractor* monitors progress weekly in conjunction with the *Supervisor*. A weekly progress report is to be submitted to the *Project Manager*.

The *Contractor* submits his record of Work Done to Date (verified by the *Supervisor*) to the *Project Manager* on the 20th of each month. (The application is to have the same format as the relevant Activity Schedule, and show present, previous and total quantities to date).

2.7. Contractor's management, supervision and key people

The *Contractor* shall submit an organizational structure showing his human resources and their lines of authority/communication.

The *Contractor* shall ensure that they comply with the registration of identified personnel as per the requirements of the South African Council for the Project and Construction Management Professions (SACPCMP) as gazetted in Project and Construction Management Professions Act No. 48 of 2000, Section 18(1) (a) or (b) and (c).

The following are the categories that must be registered

- Construction Manager (CM), reference to Construction Regulation GNR. 84 of 7 February 2014 section 8(1), in terms of appointment and registration in terms section 18(1) (c) of the Act 48 of 2000.
- Construction Health and Safety Manager (CHSM), registration in terms section 18(1) (c) of the Act 48 of 2000.
- Construction Health and Safety Officer (CHSO), reference to Construction Regulations GNR.84 of 7 February 2014 section 8(6), and in terms section 18(1)(c) of the Act 48 of 2000

2.8. Invoicing and payment

Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice showing the amount due for payment equal to that stated in the *Project Manager's* payment certificate.

The *Contractor* shall address the tax invoice to Eskom Holdings SOC Ltd and include on each invoice the following information:

Name and address of the *Contractor* and the *Project Manager;*
The contract number and title;
Contractor's VAT registration number;
The *Employer*'s VAT registration number 4740101508;
Description of service provided for each item invoiced based on the Price List;
Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
(add other as required)

Add procedures for invoice submission and payment (e. g. electronic payment instructions)

2.9. Insurance provided by the *Employer*

Refer to clause 8 Contract Data (Part one – Data provided by the Employer).

For all Employer Insurance related queries, contact:

- Cluster Manager
- Eskom Insurance Management Services
- Eskom Holdings SOC Ltd
- Megawatt Park
- 011 800 2714

2.10. Contract change management

As per NEC

2.11. Provision of bonds and guarantees

The form in which a bond or guarantee required by the *conditions of contract* (if any) is to be provided by the *Contractor* is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

The *Employer* may withhold payment of amounts due to the *Contractor* until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the *Contractor* by the *Project Manager* to receive and accept such bond or guarantee. Such withholding of payment due to the *Contractor* does not affect the *Employer*'s right to termination stated in this contract.

2.12. Records of Defined Cost, payments & assessments of compensation events to be kept by the *Contractor*

A risk register is to be kept by the *Contractor* in which all events are recorded. Records of events that could give rise to Compensation Events are to be kept up to date for inspection by the *Supervisor* and/or *Project Manager* at all times and this is to be kept in a risk register. This is not for inspection purposes but for management as per core clause 16.

2.13. Training workshops and technology transfer

Refer to the Specification for Renewable Hydrogen Facility Requirements 240-RT&D-151 for training related requirements, including, but not limited to, sections 3.31 and 3.9

3. Engineering and the Contractor's Design

The *Employer's* design requirements are provided in the Specification for Renewable Hydrogen Facility 240-RT&D-151 and the Hydrogen System Standard 240-56227413

3.1. Parts of the *works* which the *Contractor* is to design

The *Contractor* is responsible for the design of the entire *Works*. Please refer to Specification for Renewable Hydrogen Facility 240-RT&D-151 and the Hydrogen System Standard 240-56227413 for the respective design requirements

3.2. Procedure for submission and acceptance of *Contractor*'s design

The *Contractor'*s design shall comply with all design requirements stated in Specification for Renewable Hydrogen Facility 240-RT&D-151 and the Hydrogen System Standard 240-56227413.

A detailed design phase shall precede the construction phase of the Project during which the design report and drawings are submitted to the *Employer* for acceptance. The design review period by the employer is 30 days.

3.3. Other requirements of the *Contractor*'s design

The Contractor is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) g to fulfil the duties described therein. Any risk associated with the Contractor's design shall be highlighted to the Employer together with mitigation measures. These risks shall be included in the project risk register

3.4. Use of *Contractor*'s design

The Contractor to allow the Employer to use detailed designs, drawings and all relevant documents for operational, maintenance purposes and for future developments whenever required. Copy rights to remain with the Employer

3.5. Design of Equipment

3.6. As-built drawings, operating manuals and maintenance schedules

All As-built drawings, operational manuals and maintenance schedules shall be provided to the Employer in adherence with the applicable requirements stated in the relevant section of the Specification for Renewable Hydrogen Facility 240-RT&D-151.

4. Procurement

4.1. General

4.1.1. Minimum requirements of people employed on the Site

People employed on site shall have all relevant documents as required by law for employment within the country, i.e. relevant work permits and Identifications.

4.1.2. BBBEE and preferencing scheme

The contractor will be required to maintain or improve the BBBEE level for the duration of the contract.

4.1.3. SUPPLIER DEVELOPMENT LOCALISATION AND INDUSTRIALISATION (SDL&I)

SDL&I mandate is to achieve maximum and sustainable local development impact through leveraging Eskom's procurement spend in a manner that allows flexibility within the business in order to accommodate government local development initiatives and policies.

As a State-Owned Enterprise, ESKOM supports Government's socio-economic development initiatives that it addresses through Supplier Development and Localisation objectives, which include enterprise development, transfer of skills, job creation, incubation, localisation of procurement initiatives and industrialisation.

For the purposes of tendering, the *tenderer* must demonstrate the manner in which the SD&L requirements will be met in due course in an implementation program. If the *tender* is awarded all SD&L undertakings (the *Contractor*'s SD&L Obligations) must be made by the *Contractor* at the time of contracting

4.1.3.1. SDL&I Undertaking

The SDL&I undertaking generally identifies the following areas for SDL&I evaluation. These are procurement from EMEs, QSEs, LMEs (Generic); local content of the tender as a whole; Job creation and Skills Development commitments of the tenderer.

Targets and weighting are set for each individual project.

Tenderers who complete and submit the undertaking as required, but who do not meet Eskom's targets, will not be disqualified. SDL&I undertakings do not form part of scoring but commitments will form part of contractual obligations.

Definitions and Interpretation

The definitions below shall be referred to in the interpretation of this document. The targets for EMEs, and QSEs are a percentage of the local content portion of the tender only.

4.1.3.2. Qualifying Small Enterprises (QSE)

The Codes define a QSE as any enterprise with annual total revenue of between R10 million and R50 million.

A QSE with at least 51% black ownership qualifies as a Level 2 contributor.

A QSE with 100% black ownership qualifies as a Level 1 Contributor.

A QSE that is regarded as a specialized enterprise with at least 75% black beneficiaries qualifies as a Level 1 contributor with B-BBEE level of 135% in terms of the Codes of Good Practice.

A QSE that is regarded as a specialized enterprise with at least 51% black beneficiaries qualifies as a Level 2 contributor with B-BBEE level of 125% in terms of the Codes of Good Practice.

A QSE is required to submit a sworn affidavit confirming their annual total revenue of between R10 million and R50 million and level of black ownership or a B-BBEE level verification certificate to claim points as prescribed by regulation 6 and 7 of the Preferential Procurement Regulations 2017.

4.1.4. Large Measured Entity (LME) /Generic

A generic Enterprise's B-BBEE compliance is measured using the Generic Scorecard. The Generic scorecard is based on five elements each of which has an assigned weighting which correlates with the importance of that specific element and a set target.

A generic Enterprise has a annual turnover that is more than R 50 million rands.

4.1.5. SDL&I Progress Report

Means the Contractor's SDL&I progress report

4.1.6. Local Content

- Goods made in South Africa (from local raw materials).
- Only good that are made within the borders of SA can be claimed to be local content.
- Local Content (is mainly based on local manufacturing, there must be value addition to the product.
- LC is measured on the product which must be manufactured in South Africa at a specified minimum threshold (LC).
- LC percentage is determined based on the availability of input materials.
- Assembly of products is considered to have some level of local content.
- Example where 100 local content is required, no imports are allowed all materials including the production process must be local.
- If local content is less than 100 imported raw materials can be used without any Exemption.
- Key to protect local industry against imports, build industrial capacity, create jobs and contribute to the economic growth in South Africa.

4.1.6.1. Local Procurement

Local Procurement Content" refers to value added in South Africa by South African resources. Where a single contract involves a combination of local and imported goods and/or services, Tenderer's response must be separated into its components as per the Price Schedule included with the tender documents. Local procurement content is total spending minus the imported component.
Tenderers are required to submit its proposals in the table below.

Local Procurement Content	Eskom target	Tenderer Proposal
	80%	

4.1.7. Tenderers procuring from entities with a minimum 51% black ownership

Subcontracting refers to activities which tenderers outsource to other enterprises in its supply chain during the execution of the contract scope of work.
The contractor can also achieve subcontracting requirements by claiming invoices paid to service providers of indirect expenses that it incurs in the operation of its business. Such expenses may include courier

services, training, transport costs, facility management, office /property rental, cleaning, gardening, ICT services.

Procurement from black Designated Group	Eskom Target	Tenderer Proposal
Black Owned	4%	
Black Women Owned	3%	
Black Youth Owned	2%	
Black Persons with Disability	1%	

4.1.8. Designated products:

The contractor indicate below Designated Components

Commodity	Components	Local Content Threshold
Furniture Products: Office Furniture	Melamine office desk with drawers	70%
	High back upholstered chair with arms on 5 star base	65%
	Side upholstered chair – sleigh base with arms	70 %
	Steel / Wood stationery cupboard or drawers filling cabinet	100%
Electrical and Telecom Cables	Power Cables: Low Voltage,	90 %
	Power Cables: Low cost reticulation	90 %
	Telecom Cables: Optic Fiber Cables	90 %
	Telecom Cables: Copper Telecom Cables	90 %
Valves products and actuators	Valves	70 %
	Manual or pneumatic actuator	70 %
Steel Products and Component	Fabricated Structural Steel	100 %
	Joining / Connecting Components	100 %
	Roof and Cladding	100 %
	Fasteners	100 %
	Wire Products	100 %
	Ducting and structural Pipework	100 %
	Gutters, downpipes and launders	100 %
	Primary sheet products	100 %
Plastic Pipes	Polyvinyl Chloride (PVC) pipe	100 %
	Hige Density Polyethylene (HDPE) pipe	100 %
	Polypropylene (PP) pipe	100 %
	Glass reinforced Plastic (GRP) pipe	100 %

Cement	Cement	100 %

4.1.9. Imported Goods and Services

Imported goods and services" means, but is not limited to: Goods and services directly imported into South Africa.

Goods which although stored in South Africa are produced and/or wholly manufactured outside the borders of South Africa and/or have a minimum of 50% (fifty percent) of production costs (including labour) incurred outside of South Africa and payable to foreign residents and/or foreign registered entities;

Goods that have been "substantially transformed" outside of South Africa. Substantially transformed refers to the irreversible incorporation of imported components in the goods, with the labour costs and profit content earned by foreign residents and/or foreign registered entities exceeding 50% (fifty percent) of the Contract Amount and/or the significant assembly and manufacture of the goods occurring outside of South Africa's borders; and/or

Services with at least 50% (fifty percent) of the labour cost incurred outside of South Africa's borders and/or with at least 50% (fifty percent) of the service fee payable to foreign residents and/or foreign registered entities, regardless of whether the service involves domestic capital goods or other domestic costs

4.1.9.1. Final Review

Final Review means the review (to be conducted at the completion date of the whole of works by the Project Manager) of the Contractor's performance in respect of the Contractor SDL&I Obligations

4.1.9.2. Skills Development

This is the requirement that tenderers commit to train certain individuals in specified trades.

The requirement is that the targeted numbers of individuals are trained and complete practical tasks to achieve the outcome of passing a trade test and qualifying as an artisan, or the equivalent for any other required skill.

As part of this contract, the contractor will be required to develop the skills:

Tenderers are required to submit proposals for the skills types / occupations and the number of candidates to be developed. The candidates shall be currently unemployed graduates from school, Universities and technical, vocational, education and training (TVET) campuses. The threshold will be as follows to ensure successful implementation of this initiative:

- ✓ Successful tenderer will be obligated to **skill one** candidate for every **R 5**
- ✓ **Million** received cumulatively ; The supplier will be required to implement this requirement a month after the threshold is reached.
- ✓ This obligation will be for the duration of the contract; however, the supplier needs to demonstrate positive progress on a monthly basis.

Type of skill / Occupations	Number of candidates

The process of developing these skills shall involve the participation by tenderers directly and through their supply network. In certain cases, the SETAs accredited training providers can be approached to participate in developing critical and scarce skills.

Skills development of candidates must represent the demographics of the country, South Africa.

Note: that these targets for skills development candidates categorically exclude Eskom employees and registered learners. The tenderers are required to take full responsibility for the total cost of developing the requisite skills, and Eskom shall not make any financial contribution towards the fulfilment of this obligation. Tenderers also are advised to approach their relevant SETAs to access grants, subsidies, and incentives as well as South African Revenue Services for tax rebates that are earmarked for skills development initiatives

4.1.10. Contractor's SDL&I Commitments

Means those commitments regarding local content, skills development, Job creation and procurement from EMEs and QSEs made by the Contractor in his tender submission and used by the Employer for the purposes of calculating the Contractor's SD&L score in the tender evaluation process

4.1.11. Contractor's SDL&I Obligations

Means those obligations of the Contractor regarding local content, skills development and procurement from QSEs and EMEs derived from Contractor's SDL&I Commitments and agreed between the Contractor and the Employer.

4.1.12. Certificate of Fulfilment

Means the certificate issued by the Employer after the Final Review as evidence of the Contractor's successful fulfilment of the Contractor SDL&I Obligations.

4.1.12.1. SDL&I Progress Reports

The Contractor shall submit monthly SDL&I progress reports to the Project Manager. SDL&I progress reports shall be submitted by the 7th (seventh) day of the month following the months to which the report relates. Each report shall include:

4.1.13. An executive summary

Charts and detailed descriptions of the progress in narrative format, including each stage of progress of the Contractor SDL&I Obligations, the meeting (or delay in the meeting) of anticipated dates and targets (as set out in the program) and any documents, statistics or other form of verification of the dates and targets to be provided in respect thereof.

Percentage progress and the actual or expected dates of commencement of any of the major stages making up the Contractor SDL&I Obligations.

Schedule of forecast and actual, together with a 3 (three) month look-ahead of major activities and events; Comparisons of actual and planned progress in terms of the Implementation Program.

4.1.14. Details of actual and planned resources

An Affidavit from the sub-Contractors stating the work that has been subcontracted to meet the Contractor's SDL&I obligations.

A schedule identifying all details of persons in the process of undergoing or who have successfully completed the Skills Transfer for the relevant period (including details of their personal information and certified copies of their test results and certificates received);

A risk register and assessment dealing with all areas of concern which may cause delays to the fulfilment of the SDL&I obligations and details of the corrective or other measures being adopted, or to be adopted to mitigate or overcome such delay; and such other matters and information (including schedules and charts) as the Project Manager may require to be included in the SDL&I progress report from time to time.

An electronic copy and two hard copies of each SDL&I progress report shall be submitted to the Project Manager.
Additional Reports

The Project Manager shall be entitled to request the Contractor to provide additional reports when in his opinion they are warranted to monitor the progress of the fulfilment of the Contractor SD&L obligations.

4.1.14.1. The Final Review

The parties' record that the purpose of the final review is for the Project Manager to determine whether the Contractor has fulfilled the Contractor's SDL&I obligations as at completion date.

The Contractor shall provide the Project Manager with the following documentation to be used by the Project Manager as a basis for the final review:

A consolidated SDL&I progress report recording all steps taken to meet the Contractor's SD&L obligations from the starting date to the completion date including all information and supporting documentation

All of the SDL&I progress reports provided by the Contractor during the course of the contract and any other additional report, documentation or information that the Project Manager deems to be reasonably relevant to the conduct of the final review (to be provided by the Contractor at least 21 (twenty-one) business days prior to the final review). The Project Manager shall notify the Contractor of such request by way of written notice at least 30 (thirty) business days prior to the final review.

The Employer shall, in its reasonable discretion, conduct the final review by comparing those Contractor's SDL&I obligations actually fulfilled by the Contractor as at the time of the final review against with the Contractor's SDL&I obligations as a whole.

The Project Manager shall notify the Contractor of its findings on the final review by way of written notice within 30 (thirty) business days of the final review. The notice shall contain the Project Manager's reasons for its findings.

Should the final review reveal that the Contractor has not fulfilled and/or complied with any of the Contractor's SD&L obligations as at the completion date:

The Contractor shall be in breach of a material obligation under the contract and the Employer shall be entitled to have immediate recourse to and make a claim against the whole of the retention as the penalty for the Contractor's breach of the Contractor SDL&I obligations.

Should the final review reveal that the Contractor has fulfilled and/or complied with all of the Contractor's SDL&I obligations as at the completion date, the Employer shall issue a certificate of fulfilment.

4.1.15. SDL&I Penalty and Performance Security

As security for the fulfilment of all SDL&I obligations, Eskom will apply a penalty of 1.5% of every invoice amount (excluding VAT) for failure to submit SDL&I performance reports every quarter; or failure to meet the SDL&I obligations in a contract.

4.2. Subcontracting

4.2.1. Preferred subcontractors

Mandatory subcontracting on contracts above R30 million is a condition for this contract.

If feasible to subcontract for a contract above R30 million, Eskom:
a) must apply subcontracting to previously designated groups.
b) must advertise the tender with a specific condition for contract award that the successful
c) tenderer must subcontract a minimum of 30% of the value of the contract to:
d) an EME or QSE.
e) an EME or QSE, which is at least 51% owned by black people.
f) an EME or QSE, which is at least 51% owned by black people who are youth.
g) an EME or QSE, which is at least 51% owned by black people who are women.
h) an EME or QSE, which is at least 51% owned by black people with disabilities.
i) an EME or QSE, which is 51% owned by black people living in rural or underdeveloped areas or townships.
j) a cooperative, which is at least 51% owned by black people.
k) an EME or QSE, which is at least 51% owned by black people who are military veterans.
l) more than one of the categories referred to in paragraphs (a) to (h).

Tender Returnable if the above element is a requirement.
- Proof of a sub-contract agreement/s must be submitted.
- CSD report of subcontractors
- Sub-contractor/s B-BBEE certificate / affidavit must be submitted.

Subcontracting, in this instance, will be treated as a condition for contract award. A supplier awarded a contract may not subcontract more than 25% of the value of the contract to any other entity that does not have an equal or higher B-BBEE status level of a contributor than the supplier concerned unless the contract is subcontracted to an EME that has the capability and ability to execute the subcontract.

4.2.2. Subcontract documentation, and assessment of subcontract tenders

The Contractor shall manage his sub-Contractors in the same way that the Employer manages the Contractor. Special attention must be given to the management of the sub-Contractors' SHEQ compliance.

The Contractor will be required to subcontract a minimum of 30% of the contract and the following designated groups will be targeted and this will be a condition of tender:
- an EME or QSE which is at least 51% owned by black people;
- an EME or QSE which is at least 51% owned by black people who are youth;
- an EME or QSE which is at least 51% owned by black people who are women.
- an EME or QSE which is at least 51% owned by black people with disabilities.
- an EME or QSE which is 51% owned by black people living in rural or underdeveloped areas or townships.
- a cooperative which is at least 51% owned by black people.
- an EME or QSE which is at least 51% owned by black people who are military veterans.
- an EME or QSE

4.2.3. Limitations on subcontracting

Proof of a sub-contract agreement will be required as proof of meeting the 30% minimum requirement

4.3. Plant and Materials

4.3.1. Quality

The Contractor shall comply with the 240-105658000 Supplier Quality Management Specification issued by the Employer

4.3.2. Plant & Materials provided "free issue" by the *Employer*

No Plant and material will be provided "free issue" to the Contractor for this Contract. All Plant and Material is to be provided by the Contractor

4.3.3. *Contractor*'s procurement of Plant and Materials

All transportation to site of plant and material required for this project will be by means of road transport. The Contractor must familiarise himself with the road conditions to site.

The Contractor must prepare a fenced off storage yard on or off-site for the off-loading and safekeeping of all plant and material delivered to site. Material must be off loaded and stored separately in areas allocated for this purpose. The Contractor must manage such storage areas as to ensure safety compliance as well as security of the plant and material.

The Contractor shall comply to document "240-105658000 Supplier Quality Management Specification in works information during fabrication, supply and delivery of foundation steelwork, reinforcing, earthing devices and all other foundation related material. All copper will be supplied by the Contractor

4.3.4. *Spares* and consumables

Refer to the Specification for Renewable Hydrogen Facility 240-RT&D-151.including, but not limited to, section 3.2 and Section 4

4.4. Tests and inspections before delivery

All the testing as required by the relevant specifications as indicated in the document shall be done by the *Contractor.*

Refer to the applicable section(s) of the Renewable Hydrogen Facility 240-RT&D-151.including, but not limited to, section 3.8 for the various tests and inspection requirements prior to delivery.

4.5. Marking Plant and Materials outside the Working Areas

The *Contractor* shall mark all Equipment, Plant and Material which is outside of the working area destined for the works.

Refer to the Renewable Hydrogen Facility 240-RT&D-151.including but not limited to, sections 3.7.1.1

4.6. *Contractor's* Equipment (including temporary works).

The *Contractor* shall ensure the provision of suitable construction equipment for the construction of the works.

a) The Contractor provides all Equipment that is required to complete the works.
b) The Contractor shall ensure that all his construction labour and equipment remains within the fenced off allocated construction area.
c) The Contractor shall ensure that any staff, labour, or equipment moving outside his allocated construction site does not obstruct the normal operation of the ADF or the power station. Any additional access routes required must be coordinated with the Project Manager.
d) The Contractor must keep daily records of his equipment used on Site and the Working Areas (distinguishing between owned and hired Equipment) with access to such daily records available for inspection by the Project Manager at all reasonable times.

e) All Equipment used by the Contractor in providing the Works shall comply with the General Machinery Regulation 4 of the Occupational Health and Safety Act (Act 85 of 1993).

4.7. Cataloguing requirements by the *Contractor*

Not Applicable

5. Construction

5.1. Temporary works, Site services & construction constraints

5.1.1. *Employer*'s Site entry and security control, permits, and Site regulations

Access to the site is controlled and it is governed by the terms and conditions lay down by Eskom security officials. The proposed site will be shown to the Contractor during the site meeting or clarification meeting by the Employer.

The Contractor liaises with SHE Practitioner/Officers for Safety Induction prior work to commence. During Safety Induction, site access permits with a copy of the medical and a certified ID copy/passport (not older than three months) should be handed to the SHE Practitioner/Officer for approval.

The Contractor employees will take the signed site access documents to security reception official in order to finalize their site access. The Contractor ensures that all its employees carry their site access forms with them all the time. The Contractor is subjected to alcohol testing on a daily basis. The Contractor submits his application for vehicle permit to the Project Manager. The personnel and vehicles entering and leaving the site are subjected to routine searches.

The Contractor obtains a "Gate Removal Permit" from the Project Manager before materials and equipment can be removed from site. The "Gate Removal permit" gives itemised list of materials and equipment to be removed from site.

The Contractor ensures that a tool list is available on the day of arrival and that all tools are captured on the tool list. The tool list will be handed over to the Reception Security official that will stamp the tool list. The tool list will be kept safe and will be used when tools needs to be remove from site.

5.1.2. Restrictions to access on Site, roads, walkways and barricades

The Contractor complies with the Site Regulations as per Employer's Safety Health Specification 240 RTD 790.

Any subject within the authority of the Project Manager may be addressed by a Site Regulation.

Before work starts on Site, a kick-off meeting is held with the Contractor and the Project Manager, to explain in detail all requirements of the Site Regulations.

The Contractor is issued with a copy of the current Site Regulations at the project kick-off meeting.

5.1.3. People restrictions on Site; hours of work, conduct and records

The *Contractor* must clearly indicate its proposed working hours in the Tender and specifically in the programme provided with the Tender. After award the *Contractor* will adhere to these agreed working hours and keep detailed and accurate records of compliance herewith. The *Contractor* ensures that the *Supervisor* must sign these records daily and the *Project Manager* and *Supervisor* must have access to these records at any time.

The *Contractor* indicates any shift work or extended working hours required in order to meet with the required completion dates of the Package Order. The *Project Manager* and SHEQ manager's permission to work these hours are obtained prior to working such hours..

The *Contractor* keeps records of his people on Site, including those of his Sub-*Contractor*s which the *Project Manager* or *Supervisor* have access to at any time. These records will be needed when assessing compensation events.

5.1.4. Health and safety facilities on Site

Refer to the SHE specification, EMP, South African Government Guidelines and Directions on Management of COVID-19 and other epidemic outbreaks, World Health Organisation Guidelines, the latest Disaster Management Act and applicable government regulations. The Contractor shall appoint the security for the site camp and plant and material.

5.1.5. Environmental controls, fauna & flora, dealing with objects of historical interest

The environmental controls shall be complaint to the following:

- As per ESKOM RT&D Waste Management Procedure
- National Environmental Management Act (NEMA, Act No. 107 of 1998).
- National Environmental Management Waste Act (NEMWA, Act No. 59 of 2008

5.1.6. Title to materials from demolition and excavation

As per Clause 73.2 the *Contractor* has no title to materials from excavation and demolition

5.1.7. Cooperating with and obtaining acceptance of Others

Other Contractors are working in the same area as the work of this contract. In this regard, the Contractor co-ordinates his work with the Project Manager to maintain harmonious working conditions on Site.

During the progress of the works the Contractor provides access to Others who also execute work in the same area, on an as and when required basis.

The Contractor makes his own assessment of the problems and difficulties which may be encountered for providing access to and interfacing with Others (this includes access difficulties experienced during construction or commissioning phase.

5.1.8. Publicity and progress photographs

The taking of photographs at ERIC including the Project *works* is restricted and subject to the approval by the *Project Manager*.

For the purpose of the Progress Reporting Requirements, the *Project Manager* may prohibit the taking of such photographs and/or require that all such photographs be taken by an official *Employer* photographer. In the latter event, the *Contractor* is required to make arrangements directly with the photographer for the taking of the photographs required by the *Contractor* for the purpose of the Progress Reporting Requirements.

5.1.9. *Contractor*'s Equipment

The Contractor provides all Equipment that is required to complete the works.

a) The Contractor shall ensure that all his construction labour and equipment remains within the fenced off allocated construction area.
b) The Contractor shall ensure that any staff, labour, or equipment moving outside his allocated construction site does not obstruct the normal operation at ERIC. Any additional access routes required must be coordinated with the Project Manager.
c) The Contractor must keep daily records of his equipment used on Site and the Working Areas (distinguishing between owned and hired Equipment) with access to such daily records available for inspection by the Project Manager at all reasonable times.

d) All Equipment used by the Contractor in providing the Works shall comply with the General Machinery Regulation 4 of the Occupational Health and Safety Act (Act 85 of 1993).

5.1.10. *Equipment* provided by the *Employer*

No Equipment will be supplied by the Employer; however the Employer does reserve the right to negotiate with the Contractor that different equipment be used of another origin for whatever purpose that may become apparent at the time.

The Contractor supplies all equipment including cranes, scaffolding and other earthmoving equipment for the construction of the works.

5.1.11. *Site* services and facilities

5.1.11.1. Site Yard

Site Yard for the Contractor shall conform to the Employer's Safety Health and Environmental Specification 240 RTD 790-. It is required, for the proper co-ordination and execution of the works that the Contractor has an office on site for the duration of the Contract.

A site will be made available to the Contractor for his yard within ERIC security area. The proposed site will be shown to the Contractor during site meeting or clarification meeting. The yard is a raw site in size agreed upon by the Contractor and Project Manager and will be used by the Contractor for the establishment of his offices, workshop and stores.

The Contractor's yard is subject to periodic inspection by the Project Manager/delegated person.

The location of the nearest, power distribution point, storm water channel and road access point is indicated by the Employer. The Contractor is responsible for connection to the closest point of supply.

5.1.11.2. Supply of Electricity

Electricity will be made available for construction purposes from power points which will be indicated by the Project Manager. The Contractor is responsible for the provision of the reticulation system from the point of supply. Both 220 (AC) Volt and 380 (AC) Volt are available on request. All points of supply requested by the Contractor are provided in terms of quantity and location at the discretion of the Project Manager.

No guarantees of power supply quality are given and power supply breaks of some duration may occur without warning. Planned outages are also a possibility. The Contractor makes arrangements at his own expense to improve continuity and quality of power where necessary for any reason and no claim of any nature relating to power failures is considered.

No connection is made to the permanent installation at ERIC without the prior acceptance of the Project Manager.

The power supply is managed in accordance with the latest revision of the Eskom safety regulations i.e.:
a) 32-846, Operating Regulations for High-Voltage Systems.
b) COC for the site installation is required prior to power being switched on.

5.1.11.3. Lighting

The Contractor at his own expense provides temporary local lighting in accordance with the requirements of the OHS Act as amended. The Project Manager provides no local lighting. All construction lighting is the responsibility of the Contractor.

5.1.11.4. Water

The Contractor shall make provision for supplying both potable and construction water. The Contractor supplies at his own cost all the necessary connections, fittings, piping work, temporary plumbing and pumps necessary to supply to the various points where it is required. The Contractor is responsible for maintaining this equipment and for removing it at Completion of the whole of the works.

5.1.11.5. Roads

The Contractor provides temporary access points from the prescribed routes and roads to the points where the Contractor is required to perform work, having first obtained permission in writing from the Project Manager.

5.1.12. Facilities provided by the *Contractor*

It is required, for the proper co-ordination and execution of the works that the *Contractor* has an office on Site for the duration of the contract.

The Contractor includes in his establishment prices for all further treatment of the yard areas that he considers necessary for his entire operation throughout his period of occupation and under all weather conditions. The *Contractor* also includes for all security fencing, security and access arrangements. The yard will be kept clean and tidy at all times, this will include all workshops and storage areas under the control of the *Contractor*. Maintenance of the yard is the *Contractors* responsibility and is for the *Project Managers* acceptance.

Outfall drainage of all surface run-off drains is constructed by the *Contractor* to the acceptance of the *Project Manager* to minimise erosion and to effect control of contaminated water. The *Contractor's* plan for the layout of his yard area are accepted by the *Project Manager* prior to occupying the yard and the *Contractor* does not occupy any site area other than that allocated to him. The *Contractor's* plan states fully what measures are taken regarding removal and storage of topsoil, stabilisation of eroded areas and further loss of topsoil.

The *Contractor* complies with the environmental policy given in the Site Regulations. The *Contractor* provides, erects and maintains for his own use adequate size office accommodation and stores together with such drainage, lighting, heating, and hot and cold water services as may be required. Provision is also made for adequate parking and a turning area adjacent to all the aforesaid structures. The *Supervisor* prior to commencement of any work on Site accepts all designs and layouts for these provisions.

The *Contractor* dismantles and clears the yard of all such temporary structures and associated foundations and infrastructure at the direction of the *Supervisor* on Completion of the whole of the *works*. No such dismantling and clearance work is carried out without prior acceptance from the *Supervisor*.

The *Contractor* shall make provision for carrying out of all quality control testing required in terms of the works involved. This shall include, but is not limited to, the following:

- Soil grading analysis from 0.075 mm up to 100 mm as per TMH 1 A.
- Soil grading analysis from 0.002mm up to 0.075nn as per TMH 1A5.
- Soil testing for Atterberg limits as per TMH 1 A2-A4.
- Soil density testing (nuclear and sand replacement as per TMH 1 A10).
- Soil testing for moisture content.
- DCP testing.
- In situ permeability testing on all facilities.

The *Contractor* shall either provide a laboratory on site or may make use of approved external laboratories (SANAS accredited) and/or laboratories of other contractors on site subject to the approval of the *Supervisor*.

Results of permeability testing will only be accepted if carried out by an accredited laboratory

5.1.12.1. Employers Site Office

The Contractor shall provide and erect Site Offices for the Employer. The layout of the Employer's offices are to be approved by the Project Manager prior to erection.

5.1.12.2. Telecommunications

Neither a network point nor a telephone is available on site. Should the Contractor require one, he is to make his own arrangements with relevant authorities. Arrangements may also be made to use the telephones of the ERIC if they are available.

Should the Contractor wish to use radio communication equipment on site, he will make his own arrangements with the relevant authorities. In this case, he is requested to liaise with the head of security at the station to ensure that there is no interference with existing channels or equipment.

5.1.12.3. Sanitary Facilities and Refuse

The Contractor is to supply own sanitary facilities at his contractor's yard. A refuge control system will be established by the Contractor. All waste and refuge will be collected and disposed of as directed by the Project Manager, at the Power Station refuse disposal site

5.1.12.4. Equipment/Appliances

Any electrical Equipment, or appliances, used by the Contractor conforms to the applicable OHS Act safety standards and is maintained in a safe and proper working condition. The Project Manager has the right to stop the Contractor's use of any electrical Equipment, or appliance, which, in the opinion of Project Manager, does not conform to the foregoing. Inspection of equipment/appliance will be done as required by OSH Act.

The Employer may assist the Contractor with the off-loading of equipment, plant and material but the responsibility for off-loading remains with the Contractor.

Any special tools and equipment to be used on site for the execution of the works is the responsibility of the Contractor.

5.1.13. Survey control and setting out of the *works*

The Project Manager designates the working area boundary limits and assigns for the Contractor's use access roads, parking areas, storage areas, existing facilities areas and construction areas. The Contractor does not trespass in or on areas not designated for his work.

The Contractor is responsible for keeping Contractor's personnel out of areas not designated for Contractor's use, except, in the case of isolated work located within such areas for which the Contractor is authorised to do so.

The control points will be established by the Contractor. Land surveys will be done by the Contractor before and after clear and grub, before and after topsoil strip and after final excavation before construction commences.

The Contractor will ensure that application for excavation permit is done well in advance before any excavation work can start in an area. The Employer will need the drawings of the work to be conducted in the area to show the Excavation authorised person of ERIC the drawings so that an excavation permit can be issued. A copy of the excavation permit with the drawings will be handed to the Employer for record keeping.

5.1.14. Underground services, other existing services, cable and pipe trenches and covers

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5.1.15. Control of noise, dust, water and waste

The Contractor maintains a high standard of cleanliness during the conduct of his activities at ERIC. This includes areas allocated for storage of materials, site offices etc. to the satisfaction of the Project Manager. The Contractor keeps these areas clean and free from accumulation of waste materials and refuse regardless of the source.

The Contractor ensures during sweeping and dusting, that a minimum amount of dust is liberated into the atmosphere. Cleaning by vacuum cleaners is preferred and the use of compressed air for cleaning is prohibited.

The Contractor is responsible for the prompt removal of all waste to a designated disposal area. The disposal area will be on or in the vicinity of the Power Station and be indicated by the Project Manager.

For the purpose hereof, “waste” any matter, whether liquid or solid or any combination thereof, which is a by-product, emission, residue or remainder of any process or activity carried out in connection with the works and which is not reused on the Site in the in the ordinary course of carrying out the works within seven days of production.

The Contractor provides an adequate number of marked bins and containers at offices, in yards, at workshops and on the Site for the temporary storage of waste. These bins and containers are subject to approval by the Project Manager. The Contractor is required to segregate certain items of waste by type as designated by the Project Manager.

Bins and containers are emptied and waste removed to the designated area at least once a week. All the waste removed to the designated area at least once a week. All the temporary storage areas for bins and containers are kept tidy and must not constitute a nuisance to others. The Contractor takes all required steps to avoid spillage of waste alongside the bins and containers during removal and disposal thereof.

All waste that cannot be contained in either a bin or container is placed on a temporary waste site which the Project Manager identifies. The waste is removed as soon as possible but in any event at least once a week. No burning of waste is allowed at the Power Station.

Hazardous waste is dealt with in accordance with the safety, health and/or environmental requirements of the works and the Contractor is solely responsible for the proper disposal thereof. Hazardous waste will be disposed of at an authorised landfill site. Waste manifest will be kept for record keeping and hand over at the end of the Project.

Controlling water from excavations is done as required by the Environmental legislation and only after a method statement to this regard has been accepted by the Project Manager.

The Contractor must ensure that adequate pumping capacity is provided for the continual pumping of water from excavations. Water may be contaminated and should not be discharged into the environment unless tested.

5.1.16. Giving notice of work to be covered up

After construction the Contractor is to rehabilitate any damage caused to the environment to the satisfaction of the Supervisor. The remedial works are to be “signed-off” by both parties before acceptance. The contractor to take note of the QITP`s requirements relating to earthing, earth crimpets and clamps, which needs to be inspected prior to closing of trenches.

5.1.17. Hook ups to existing works

The Contractor complies with Eskom Life Saving Rules and will report any non-conformance

5.2. Completion, testing, commissioning and correction of Defects

5.2.1. Work to be done by the Completion Date

On or before the Completion Date the *Contractor* shall have done everything required to Provide the Works except for the work listed below which may be done after the Completion Date but in any case before the dates stated. The *Project Manager* cannot certify Completion until all the work except that listed below has been done and is also free of Defects which would have, in his opinion, prevented the *Employer* from using the *works* and Others from doing their work.

	Item of work	**To be completed by**
	As built drawings of whole of works	Within seven days after Completion
	Performance testing of the *works* in use as specified in the Works Information.	See performance testing requirements.

5.2.2. Use of the *works* before Completion has been certified

On or before the Completion Date the Contractor shall have done everything required to provide the Works. The Project Manager cannot certify Completion until all the work has been done and is also free of Defects

5.2.3. Materials facilities and samples for tests and inspections

The Contractor shall be responsible for the strength and quality of all materials used and workmanship employed. The Contractor shall be responsible for the stability of the permanent works and the temporary works. The fact that the Employer has not objected during the construction period to any materials and/or workmanship employed by the Contractor and even though such materials and/or workmanship has been inspected by the Supervisor shall not relieve the Contractor of such responsibility.

5.2.4. Commissioning

Commissioning is required before completion for all Mechanical, Control & Instrumentation and Electrical equipment/ installations work as specified within the scope of work and specification for the respective disciplines.

5.2.5. Start-up procedures required to put the *works* into operation

The Contractor gives the Project Manager written notice that the works are ready for energisation. Such notice will suit the requirements of the Employer.

No alterations or adjustments will be made to the works after functional checks are done without the Project Manager's written permission.

At this stage the following must have been achieved:

a) Installation and pre-commissioning completed.
b) Testing report and the associated certificates received.
c) Signed erection and safety clearance certificates.
d) Final Draft of the Technical, Operating, Maintenance manuals delivered.
e) All Quality Control Plan (QCP) documentation received.

5.2.6. Take over procedures

Take-over of The Works will be in accordance NEC procedures. The Contractor advises the Supervisor when the Works is available for final inspection

5.2.7. Access given by the *Employer* for correction of Defects

NEC Clause 43.4 requires that the *Project Manager* arranges for the *Employer* to allow the *Contractor* access to and use of a part of the *works* which has been taken over if needed to correct a Defect

5.2.8. Performance tests after Completion

The Contractor shall carry out necessary tests after completion to demonstrate that the performance of the Plant is in accordance with the Employer's Works Information requirements.

The Contractor will be required to provide a detailed method statement on how this verification will be achieved and any instrumentation/equipment required shall be part of the system provided by the Contractor.

5.2.9. Training and technology transfer

The *Contractor* provides training on the equipment and systems included as part of the *works* to the various categories of the *Employer's* technical staff (operators, maintenance and engineering personnel) for the duration of the *works*.

Training provided by the *Contractor* is directly applicable to the actual equipment supplied for the *works*. Generalised training based on similar equipment is not acceptable. The local facilities for training provided by the *Employer* is a suitably sized air-conditioned room, as well as trainee and trainer desks, an overhead projector and flipchart or white board. The number of personnel to be trained is as per the table below.

Table of Technical staff to be addressed in Training Proposal

Department	Number of Personnel
Operators	10
Maintenance	10
Engineering	10

The *Contractor* submits to the *Project Manager* for acceptance a detailed training programme as well as a prospectus for each course. Course material is provided for the number of trainees as per the table above.

The training schedule is incorporated in the Accepted Programme.

5.2.10. Operational maintenance after Completion

The contractor provides operational maintenance after completion of works.

6. Plant and Materials standards and workmanship

The *Contractor* shall ensure that all equipment, components materials services and workmanship are supplied designed, manufactured, installed and tested in accordance with the latest applicable IEC, SANS standards, International Codes, and Standards listed.

a) The Contractor shall ensure appropriate certification and independent testing has been carried out on any materials and products proposed.
b) The Contractor shall ensure materials and products used are suitable for the service conditions.
c)
d) The Contractor shall ensure that all Works, materials, parts, components etc. supplied shall be new.
e) The Contractor shall ensure materials and products delivered to site bear the manufacturer's name, brand name and any other data required to verify that their performance and specification complies with the requirements of this document and the Employer’s Project Specific Requirements.
f)
g) The Contractor shall follow manufacturers' instructions on the use of materials and products.
h)
i) The Contractor shall ensure the same manufacturer is used for materials or products of a similar type and that identical parts of similar products are interchangeable.
j) The Contractor shall ensure that materials and components are transported and stored in accordance with manufacturer’s guidelines.
k) The Contractor shall provide suitable packaging for the protection of all materials and equipment during delivery, storage, and where exposed to damage on site. The Contractor shall return re-usable packaging to the supplier. The Contractor shall take particular care to protect and maintain plant and equipment delivered early.
l) The Contractor shall examine materials and products supplied when delivered to site and immediately prior to installation. The Contractor shall replace any damaged or faulty materials or products.

7. List of drawings

7.1. Drawings issued by the *Employer*

This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this contract.

Note: Some drawings may contain both Works Information and Site Information.

Drawing number	Revision	Title
228-EE-2024-01	**0**	Single Line Diagram: MV Reticulation Schematic
228-EE-2024-04		North West Sub – Equipment Layout
228-EE-2024-08		Single Line Diagram: North West Sub LV-DB
USL V1 2024		Research Facility

7.2. Standards and Specifications

Refer to the Specification for Renewable Hydrogen Facility Requirements 240-RT&D-151 for standards and specifications requirements.

It is the *Contractor's* responsibility to ensure that they are in possession of the latest revision of these documents.

PART 4: SITE INFORMATION

Document reference	Title	No of pages
	This cover page	1
C4	Site Information	
	Total number of pages	

PART 4: SITE INFORMATION

General description

For the general description of the Project and the required Site Information please refer to Section 3.1 of the Specification for Renewable Hydrogen Facility 240-RT&D-151.

Eskom Research and Innovation Centre (ERIC) at Rosherville illustrating the RHF location.

Existing buildings, structures, and plant & machinery on the Site

The hydrogen generation plant must integrate with existing infrastructure (water, electricity, etc) and other research plants including the solar PV plant and battery energy storage plant at ERIC. For information on the existing infrastructure and the interconnection requirements refer to Specification for Renewable Hydrogen Facility 240-RT&D-151.

The following drawing provides further information on the existing infrastructure.
Electrical Integration:

- 228-EE-2024-01: Single Line Diagram: MV Reticulation Schematic
- 228-EE-2024-04: North West Sub – Equipment Layout
- 228-EE-2024-08: Single Line Diagram: North West Sub LV-DB

Subsoil information

For geotechnical information relating to the project area, please refer to Solar PV Facilities, Geotechnical Investigation Report, by Worley Parsons Resources & Energy completed in 2013

Hidden services

For the location of hidden services please refer to the drawing: Research Facility USL V1 2024

Other reports and publicly available information

None

ANNEXURE A

Eskom	**Technical Specification**	**Research, Testing and Development**

Title: **Specification for Renewable Hydrogen Facility**

Document Identifier: **240-RT&D-151**

Alternative Reference Number:

Area of Applicability: **Research, Testing and Development**

Functional Area: **TS&RM – Gas and Renewables**

Revision: **2**

Total Pages: **47**

Next Review Date: **Not Required**

Disclosure Classification: **Controlled Disclosure**

Content

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1. Introduction

Renewable (green) hydrogen production is a key priority to achieve net zero carbon emissions by 2050 in South Africa. It will directly contribute to Eskom's decarbonisation strategy and enable renewable energy deployment as it presents an excellent medium to long-term energy storage. Eskom already has experience in operating small kW electrolysers at the Power Stations to produce grey hydrogen, however there are still various challenges across all areas to integrate the value chain and produce renewable hydrogen, at medium and large scale (megawatt to gigawatt size) that needs to be resolved.

Developing a pilot Renewable Hydrogen Facility (RHF) will present Eskom with an informed pathway to plan for the adoption of green hydrogen at a scale, time and cost that is competitive against alternate options such as hydrogen produced from fossil fuels (grey hydrogen). It will also present Eskom with an opportunity to understand legislative requirements and regulations related to renewable hydrogen, and to develop skills through Eskom's participation in the key national initiatives in South Africa such as the South African Hydrogen Society Roadmap and South African Hydrogen Valley.

2. Supporting Clauses

2.1. Scope

Eskom Research, Testing and Development (RT&D) requires the engineering design, procurement, and construction (EPC) to be conducted for a hydrogen generation plant to form part of the RHF at Eskom Research and Innovation Centre (ERIC), in Rosherville. The hydrogen generation plant should be modular and integrated with the existing solar Photo Voltaic (PV) plant and Battery Energy Storage System (BESS) to form a RHF.

The hydrogen generation plant to be supplied must consist of five sub-systems:

1. Electrical Configuration,
2. Energy Management System,
3. Hydrogen production, (including water demineralisation and storage)
4. H_2 storage,
5. H_2 End use workstation.

The entire hydrogen system must comply with the Eskom's Hydrogen systems standard (240-56227413), where deviations are expected this must be declared during tendering.

2.1.1. Purpose

The purpose of this document is to provide the technical specification/Works Instruction for the design, procurement, testing, commissioning, and handover of the hydrogen generation plant which is to form part of the integrated Renewable Hydrogen Facility at ERIC. The plant health of the cell stacks must be monitored and the data recorded in order to evaluate the impact on the cell stack health as part of a RHF application.

2.1.2. Applicability

This document shall apply to the Renewable Hydrogen Facility at the Eskom Research and Innovation Centre.

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] OSH Act 83 of 1995: The Occupational Health and Safety Act 83 of 1995.
[3] 32-520 Occupational Health and Safety Risk Assessment Procedure
[4] 32-95 Occupational Health and Safety Incident Management Procedure
[5] 240-56227413 Hydrogen Systems Standard
[6] 240-56536505 Hazardous Location Standard
[7] 240-49230046 Failure Mode and Effect Analysis (FMEA) Guideline
[8] 240-49230030 Reliability Engineering Analysis Guideline
[9] 240-49230111 Hazard and Operability Analysis (HAZOP) Guideline
[10] 240-56364545 Structural Design and Engineering Standard.
[11] 240-53113685 Eskom design review procedure
[12] 240-44682650 Process Control Manual to Provide Engineering during Project Sourcing.
[13] 240-53665024 Engineering Quality Manual
[14] 240-53114026 Eskom Project Change Management Procedure
[15] 240-53114002 Engineering Change Management Procedure
[16] 240-98784903 RT&D Quality Management System Manual Document Identifier
[17] 240- 86973501 Engineering drawing standard
[18] 240-71432150 Plant Labelling Standard
[19] 240 -60782552 Process Flow Standard
[20] 240-56355754 Field Instrument Installation Standard
[21] 240-56355815 Control & Instrumentation Field Enclosures and Cable Termination Standard

[22] 240-56356376 Site commissioning for low pressure services
[23] SANS 10108: Classification of Hazardous Location (Electrical Plant)
[24] 240-56227443: Requirements for control and power cables for power stations
[25] 240-57617975: Procurement of Power Station LV Motors Low Voltage Electric Motors
[26] 240-56357424: MV and LV Switchgear Protection Setting Standard
[27] 240-56364444: Standard Minimum requirements for Metering of Electrical Energy and Demand.
[28] 240-56227516: LV Switchgear Control Gear Assembly Associated Equipment for Voltage – 1000 V AC and 1500 V Standard
[29] 240-56356396: Earthing and lightning Protection Standard
[30] 240-55714363: Coal Fired Power Stations Lighting and Small Power Installation Standard
[31] 240- 56241933 Control of Welding during Construction, Repair and Maintenance Activities Standard
[32] 240-106628253 Standard for Welding Requirements on Eskom Plant
[33] 32-373 IT and OT Third Party and Remote Access Standard Rev 5
[34] 240-79669677 Demilitarized Zone Designs for Operational Technology Rev 2
[35] 240-55410927 Cyber Security Standard for Operation Technology
[36] 240-56737448 Fire Detection and Life Safety Design Standard
[37] 240-54937439 Eskom Fire Protection / Detection Assessment standard
[38] 240-56737654 Inspection Testing and Maintenance of Fire Detection Systems Standard
[39] 240-56355910 Management of Plant Software
[40] IEC 62381 Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)
[41] 240-145581571 Standard for the Identification of the Contents of Pipelines and Vessels
[42] 240-165573930 Hydrogen plant pressure equipment preparation and pressure testing
[43] 240-56355728 Human Machine Interface Design Requirements Standard
[44] 240-56355541 C&I Computer and Equipment Rooms Civil and General Building Requirements Guideline
[45] 240-56355888 Temperature measurement system installation standard
[46] 240-56355843 Pressure measurement system installation standard
[47] 240-115583001 LV Switchgear Technical Schedule A&B
[48] 240-56360086 Stationary Vented Nickel Cadmium Batteries Standard
[49] 240-56360034 Stationary Vented Lead Acid Batteries Standard
[50] 240-51999453 Standard Specification for Valve-Regulated Lead Acid Cells
[51] 240-53114248 Thyristor and Switch Mode Chargers

2.2.2. Informative

[1] 240-RTD126 Research Testing and Development Renewable Hydrogen Facility Concept Design Report
[2] 240-RTD-124 Stakeholder Requirements Definition for Renewable Hydrogen Facility
[3] 240-53114193 Occurrence and Incident Management Procedure
[4] 240-53114192 Corrective and Preventive Procedure

[5] 240-53114194 Control of Nonconforming Product Procedure
[6] 240-53114190 Internal Audit Procedure

2.3. Definitions

Renewable (Green) Hydrogen	-	Renewable hydrogen is produced by water splitting via electrolysis and produces only hydrogen and oxygen. The electricity supply for electrolysis should be from renewable energy sources
Grey Hydrogen	-	Natural or synthetic gas is separated into hydrogen and carbon dioxide, while the carbon dioxide is emitted into the atmosphere
Contractor	-	Company Successful in obtaining a contract with Eskom as defined in Eskom Procurement and Supply Management Procedure: 32-1034.
Employer	-	Eskom Holdings
Equipment List	-	A list of codes allocated to components for each scope of delivery or system, this list shall but include documents such as cable schedules, valve schedules, etc.

2.4. Abbreviations

Abbreviation	Explanation
AC	Alternating current
AIAA	American Institute of Aeronautics and Astronautics
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ABD	Availability Block Diagram
bar	Bar
BESS	Battery Energy Storage System
BOM	Bill of materials
C&I	Control and instrumentation
CAD	Computer-aided design
CM	Configuration management
CMS	Control and Monitoring System
CoE	Centre of Excellence
CoC	Electrical Certificate of Compliance
CPU	Central processing units
DC	Direct current
DVD	Digital versatile disk
ECA	Electrical Contractors' Association
EPC	Engineering design, procurement, and construction
ERIC	Eskom Research and Innovation Centre
EWDL	Engineering Work Design Lead

Abbreviation	Explanation
FAT	Factory Acceptance Testing
FMECA	Failure Mode Effects and Criticality Analysis
GA	General Arrangement
GPS	Global Positioning System
GUI	Graphical User Interface
HMI	Human Machine Interface
HVAC	Heating ventilation and air conditioning
IEC	International Electrotechnical Commission
IED	Intelligent electronic device's
ISO	Internation Organisation for Standards
ITP	Inspection and Test Plans
kA	kiloampere
kPa	kilopascal
kW	kilowatt
kWh	kilowatt hour
l/h	Litres per hour
LDE	Lead Discipline Engineer
LOSS	Limits of Supply and Services
LV	Low voltage
mA	milliampere
MCB	Miniature Circuit Breakers
MCCB	Moulded Case Circuit Breakers
MDT	Mean Down Time
MTTF	Mean Time to Failure
MTTR	Mean Time to Repair
MV	Medium Voltage
MWh	Megawatt hour
O&M	Operational and maintenance
OEM	Original Equipment Manufacturer
OHS Act	Occupational Health and Safety Act
PSR	Plant Safety Regulations
P&ID	Piping and instrumentation diagrams
PV	Photo Voltaic
QCP	Quality Control Plans
R&D	Research and Development
RAID	Redundant array of independent disks
RAM	Reliability, Availability and Maintainability
RE	Renewable energy
RHF	Renewable Hydrogen Facility
RT&D	Research, Testing and Development
SANS	South African National Standards
SCADA	Supervisory Control and Data Acquisition
SIL	Safety Integrity Level
UPS	Uninterruptible power supplies
USB	Universal serial bus

Abbreviation	Explanation
VDSS	Vendor Document Submission Schedule
VPN	Virtual private network

2.5. Roles and Responsibilities

Engineering Work Design Lead (EWDL) - is responsible for compiling the Technical Specification.
Gas and Renewables Centre of Excellence (CoE) Manager - is responsible for reviewing and authorising the Technical Specification.
Lead Discipline Engineer (LDE) – Provide discipline specific specifications for the Works Information.
Contract Manager – Will be responsible for the management of the contractor appointed to implementation of the Works Information

2.6. Process for Monitoring

The process for monitoring will comply with the Design Review Procedure (240-53113685) and Process Control Manual to Provide Engineering during Project Sourcing (240-44682650). The procedure will be monitored via 240-53665024: Engineering Quality Manual and self-assessments and Project Definition Readiness Assessment. Areas where the Engineering Quality Manual does not allow for Pilot & Demonstration (excluding safety aspects), the project will not comply to the procedure, but to an equivalent procedure that does allow for Pilot and Demonstration.

2.7. Related/Supporting Documents

N/A

3. General Requirements

3.1. Project Description

Eskom Research and Innovation Centre in Rosherville was chosen as the preferred location and is in the south of Johannesburg, near the N3 and N17 highways, see **Figure 1**. The facility also falls in an industrial hub with Transnet and other industries nearby that can be used to drive the hydrogen economy.

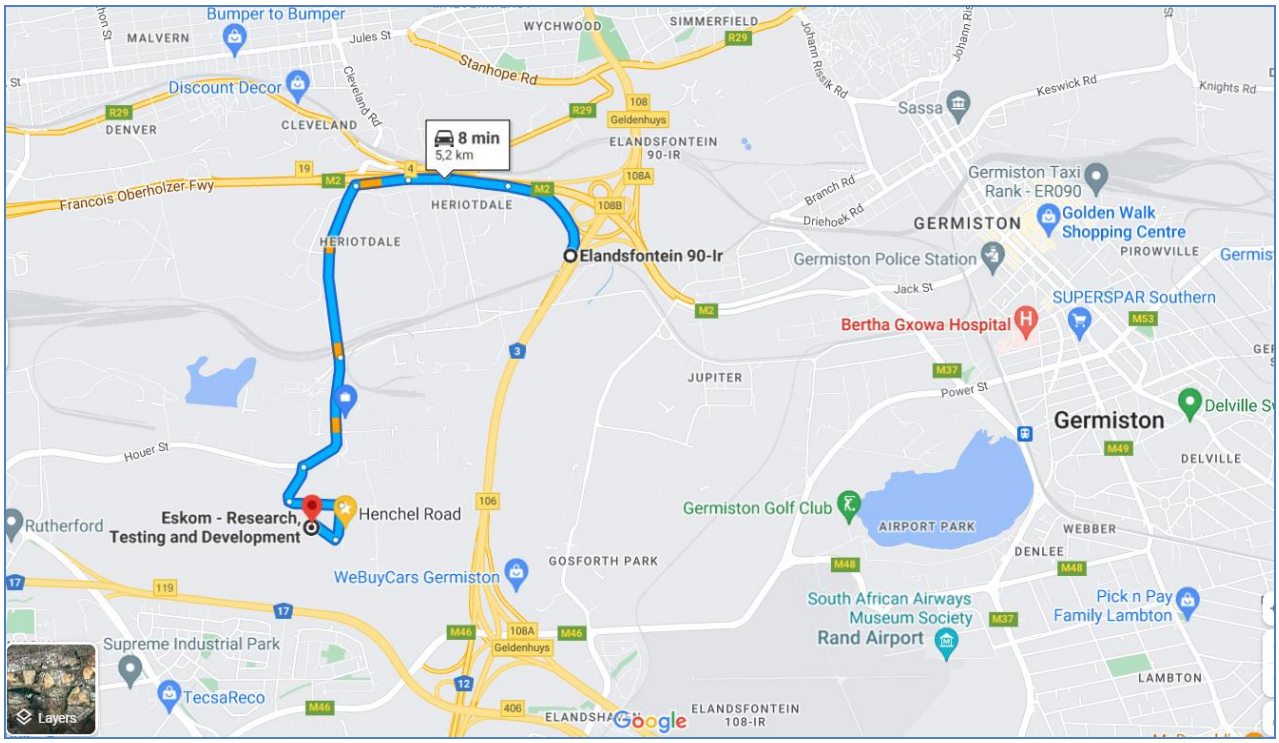

Figure 1: Eskom Research and Innovation Centre (ERIC) Location, Rosherville, Johannesburg, South Africa

The infrastructure already installed at ERIC enables Eskom to develop a renewable hydrogen facility (RHF). Electrolysis is predominantly used to produce Renewable Hydrogen and can be easily integrated into the existing system, as proposed in the concept of the RHF is shown in **Figure 2**.

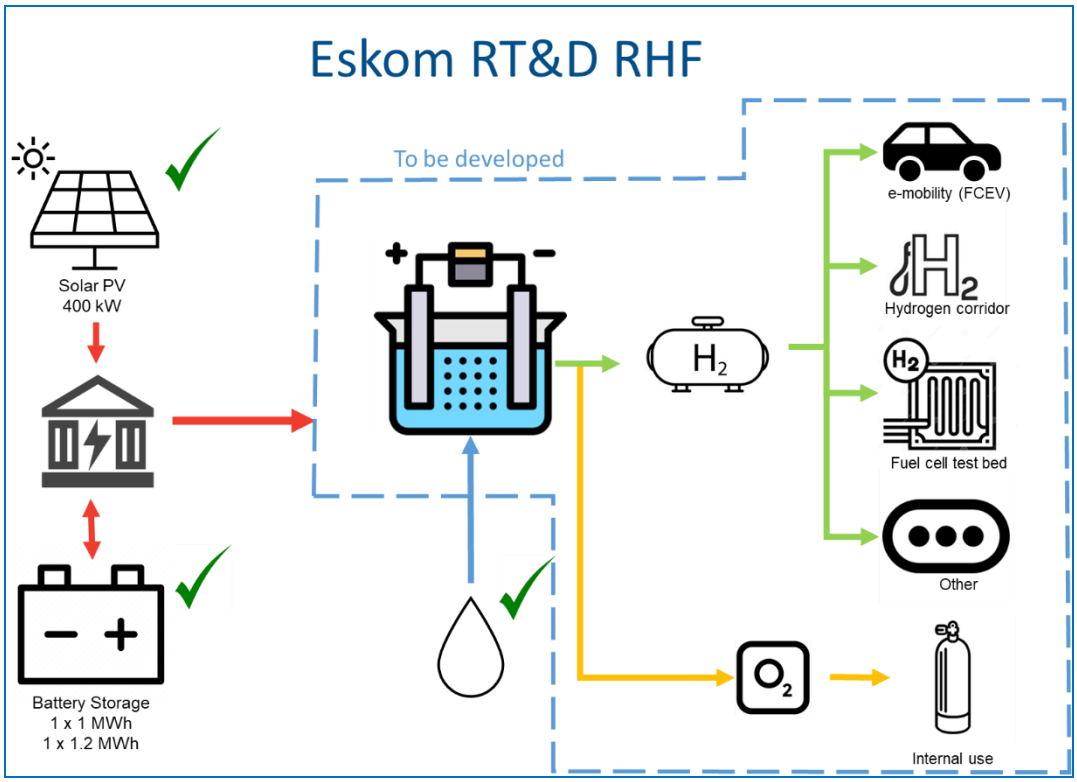

Figure 2: RHF Proposed Layout

The infrastructure available at the ERIC facility that can be integrated and interfaced with the hydrogen generation plant, is shown in **Figure 3** below and includes:

1. 400 kW solar Photo-Voltaic (PV) plant,
2. 2.2 MWh battery storage, (consisting of two units, one with a capacity of 1.2 MWh, discharge rate of 200 kW and 78-81% roundtrip efficiency. The other unit has a 1 MWh capacity, discharge rate of 200 kW and 65 – 72% roundtrip efficiency)
3. Electrical network via the NW substation
4. Municipal water supply (the demin water plant as illustrated below will not be included in the overall RHF
5. Fire detection and protection system,
6. IT network, and
7. maintenance, security and other support.

Figure 3: ERIC, RT&D premises at Rosherville for RHF implementation

The hydrogen generation plant must be located next to the solar PV plant on the eastern side as shown on the image, since this will allow ease of access from the main entrance and will also have the visual benefit of an integrated system.

The R&D plant will be used for technology understanding within an integrated system, training and skills development and the application of regulations and standards for green certification, as well future end use research. The project will entail the integration of the electrical configuration, electrical management system and the operation of the electrolyser(s). This will enable practical research to establish the optimal configuration between renewable energy requirements and batteries capacity, for a desired electrolyser(s) availability, while avoiding premature electrolyser degradation. The production of 'Green hydrogen' can also be used to stimulate end use application in the area.

3.2. Contractor Requirements

The EPC contractor must demonstrate experience in engineering, procurement and construction contracts for electrolysis and hydrogen storage plants. This can be demonstrated by providing project detail of successfully executed projects including: the name of company where the project was executed, project description, construction period, operational performance of that plant, contract value, contact person, contact number, contact email (contactable reference from projects already executed).

Where the EPC Contractor will use a sub-contractor, the scope of the subcontractor must be clearly defied during the tendering phase. The full company profile and work experience of the sub-contractor must be provided as per the paragraph above.

The original equipment manufacturer (OEM) for all major plant and equipment must be stated during the tendering phase. The detail of the local agents for the electrolyser as well as other major plant and equipment must be provided. Details of the local service and maintenance capability of these local agents as well as spares holding must also accompany the tender. Direct communication channel between the end-user and OEM for technical support must be possible and facilitated by the contractor. The contractor must also provide details on the frequency of OEM's visits to South Africa to audit end-user satisfaction with Local Company.

The Contractor must ensure that only qualified personnel with the relevant experience (relevant to this project and technology utilised) are included in design, construction, commissioning, and operation of the plant. The contractor is to provide detailed CVs of each personnel responsible for the works including the project organogram to indicate the role of each person on this project. If any replacement is required during the course of the project, the Contractor ensures that the replacement has equivalent or higher experience and qualifications than the one replaced.

3.3. Scope of Work

The scope of work describes the major activities, plant and material that falls within the scope of the Contractor. It is the responsibility of the Contractor to ensure that all the activities are carried out and all equipment, plant and materials are supplied to complete the works in every respect. The contractor will be required to design, source, supply, install and commissioning a Hydrogen Generating Plant which is fully compliant to the specification 240-56227413: Eskom Hydrogen Systems Standard. Compliance is required to be illustrated as part of tender submission i.e. P&IDs, control philosophy and detailed maintenance manuals.

The Works comprise the complete detailed engineering design, manufacturing, sourcing and supply of mechanical, process, electrical, control and instrumentation (C&I), civil and structural work, shipment, transportation, unloading, erection, quality assurance, on- and off-site testing, painting, finishing, installation, integrations with existing infrastructure, testing, commissioning, onsite operational training, certification and handover, and hazardous zone classification of the hydrogen generation plant. The Works include all matters which, although not expressly provided for, can be reasonably inferred from the contract for the final plant needed. The only exclusions being items or services excluded or specifically stated to be free issued or to be provided by the Employer or by others.

3.3.1. Contractors Scope

The works comprises the following:

a) On commencement of the contract the contractor is to submit a schedule indicating key deliverables and date, for approval by the contract manager.

b) The Contractor's registered professionals shall provide services in accordance with ECSA Code of Conduct (Act No. 46 of 2000) and guidelines for registered professionals as well as the Construction Regulations (Act No. 85 of 1993).

c) The contractor will complete a Detailed Engineering Design for the hydrogen generation plant in line with 240-56227413 Hydrogen System Standard and the plant specific requirement detailed in this Works Information. (Note: All plant, materials and equipment are required to be designed to a minimum requirement for maintenance and operator intervention)

d) As part of the contractor's design, a hazardous zone classification must be done, and the classification report submitted to the Contract Manager for approval. All electrical and C&I equipment selected for the classified areas must comply with the area classification requirements and applicable standards. The design must cater for minimising the electrical and C&I equipment in hazardous zones by locating this equipment in less hazardous zones.

e) The contractor will generate the QCP and ITP indicating all hold points. This package will be reviewed and approved as part of the detailed design.

f) This design will be submitted to Eskom for a Detailed Engineering End-of-phase Review. (as per the end-of phase design review in the 240-53114002: Engineering Change Management Procedure). All review comments and recommendation will be submitted to the contractor to update their design before the design can be signed off and finalised.

g) Only after sign-off of the detailed design by Eskom may the contractor commence with procurement, manufacture or supply of equipment.

h) The contractor will be required to include site establishment for the required facilities to be used by the contractor. This will include all earth work as determine to be necessary during the detailed design.

i) The contractor is fully responsible for transportation, delivery, offloading and securing assets prior to or during construction at ERIC. Acceptance and sign off of all delivered equipment must be facilitated by the contractor. All assets must be kept in a secure location until required for installation.

j) The contractor is fully responsible for all construction and installation activities this is to include rehabilitation, waste removal and disposal during the construction and commissioning phase.

k) The contractor is responsible for the design and connection of all interfacing and integration points with existing plant. This include both physical connections as well as data transfer and acquisition system, as detailed in this document. Should an outage be required for this activity the contractor will make the necessary arrangements with the contract manager. Outages need to be scheduled well in advance (2 months at least for electrical), as it entails shutting down power to some critical other RTD services. These are to be minimised to be the bare minimum

l) Commissioning, testing and optimisation activities must be carried out in the presence of the appointed Eskom representatives. The Contractor shall test and submit all performance data as proof that the installed Works meet the Employer's requirements, standards and specifications.

m) The contractor must supply a portable impedance measuring meter.

n) The contractor must supply a spare cell stack or set of cells stacks prepared for long-term storage (5 years). The long-term storage procedure must be submitted as part of the tender submission.

o) All special tools required for the maintenance activities shall be supplied.

p) The contractor must provide training of the Employer's personnel in the operation and maintenance of the hydrogen generation plant, as well as administration and engineering of the system. This can include classroom training but must be primarily based on site with the fully installed and commissioned equipment. Training should continue for a period of 1 month or until the Eskom personal can be certified as competent and technical assistance must be provided for all defect or warranty claims after handover.

q) Handover of the plant to Eskom will take place after the Eskom personal are fully trained and competent. During handover the contractor must provide as-built drawings, operating and maintenance procedures, training manual and list of critical spares.

r) During construction activities all Safety, Health, Environmental and Quality requirement must be adhered to in line with this works information and local legislation.

s) The contractor is fully responsible for all other activities as detailed in this works information including plant labelling, corrosion protection, safety and plant signage, access control.

t) All quality requirements must be met in term of the quality management system and documentation management requirements as detailed in the works information.

3.3.2. Functional Specification for Plant

In addition to complying with the requirements of 240-56227413 Hydrogen System Standard the plant consists of the following (illustrated in **Figure 4**):

a) Complete hydrogen generating plant.

- Power supply unit: The power requirement for the electrolyser and auxiliary plant must not exceed 50kW.
- The Proton Exchange Membrane (PEM) or Anion Exchange Membrane (AEM) water electrolysis technology is preferred for the RHF. Pressurised Alkaline Electrolyser shall be considered as an alternative.
- The configuration could be at maximum 1 x 50kW electrolyser, with multiple cell stacks (minimum two) or smaller electrolysers, that provides a total hydrogen output of approximately 24kg/day at a 99.9% purity. If more than one electrolyser is installed it should be independent with the ability to operate and test them separately.
- The hydrogen produced shall be at a minimum pressure of 27 bar with no compression and have minimum purity of 99.9% by volume and a dew point of 50°C or better at 101.4 kPa.
- Balance of plant and interfacing designs, manufacturing, as well as installation of piping, joints, fittings, valves, and instrumentation must conform to all requirements as stipulated in 240-56227413: Eskom Hydrogen Systems Standard.
- The contractor must provide cell stack close loop cooling and gas close loop cooling.
- The hydrogen generation plant must include all auxiliary plants as prescribed by the OEM including but not limited to, deminerilize water plant and storage, H_2 gas dryer, heat exchangers, etc. (Municipal water will be supplied to the Hydrogen plant)
  - Water Demineralization water treatment plant must have conductivity monitoring.
  - Demineralization water tank must include flushing facility before plant startup.
- A heated dryers is not a requirement for the RHF but a de-oxidiser with heating element is.
- Safe plant operation must be ensured by on-line monitoring and data logging of all critical parameters, gas analysing and automatic control of the hydrogen system. The hydrogen generating plant needs to be controlled by a dedicated control system and the bulk storage, metering, and reticulation needs to be controlled by a separate control system with the required interfaces between the two control system in order to ensure safety.

- The design of the hydrogen generating system must prevent unnecessary stopping of the plant to optimise cell stack life expectancy and limit venting to atmosphere. The control philosophy must consider plant operational limits that are not a safety related issues, under these conditions it is preferable that the plant reduced production rate rather than trip.
- Inert gas purging facilities: In accordance with 240-56227413 Hydrogen System Standard, during system failure the plant must be purged with nitrogen prior to restart. Therefore, the automatic nitrogen supply system must be incorporated into the design.
- The hydrogen plant must be within a cabinet, in a container with all associated H_2 production equipment. The H_2 plant is considered to be a temporary / mobile plant that can be relocated to a different site in future. This container must include a heating, ventilation and air conditioning (HVAC) system as required to control the temperature and humidity within the container during operations and to ensure there is no accumulation of gas at any point within the container.
- The contractor is to supply all consumables and critical spare required to perform a repair within 48hours for the first two years of operations. A full service must be done in month 23 and shall form part of maintenance training.

b) The Hydrogen generation plant must indicate what the safe turndown rate is, under safe operational condition. Allowance should be made for the employer to test the plant below the design turndown rate, in a controlled manner to assess the limit. Safety control limits on the gas purity should not be compromised during such testing, the plant should trip automatically when unsafe conditions are reached.

c) A flexible and adjustable energy management (load profile) system must be provided to simulate a renewable load following profile to test the plant under variable load conditions. Allowance should also be made for the electrolysers to load-follow the PV plant's electricity production to allow for ramp-up and ramp-down capability testing via control panel.

d) The C&I integration / interface with the existing PV Solar plant and BESS must allow for future green certification. Therefore, the SCADA system must include a smart metering system to measure or account for renewable energy (as per certification requirements), i.e. the system must record power production from the PV plant and charge / discharge profiles for the BESS to allow for a calculated net green hydrogen production.

e) The hydrogen production plant needs to be set-up as a research plant with the required additional on-line monitoring and data logging with an uninterruptable power supply and can be independent of the hydrogen production plant control system.

- The plant health of the cell stacks must be monitored and a data recorded must be provided in order to capture the data in order to evaluate the impact on the cell stack health as part of a RHF application.

- The cell stacks need to be supplied with on-line voltage monitoring and data logging between each anode and cathode, therefore the cell stack needs to provide voltage monitoring points for each anode and cathode. These measuring points shall be wired to a terminal box located outside the process plant. The measuring points shall be clearly marked, and location on each cell stack indicated on a drawing.
- A portable impedance measuring device shall be supplied with the supply of the plant. The individual cell voltages and impedances shall be measured and recorded as part of the FAT. The current density throughout the cell stacks must be measured and recorded. The data must be downloadable in an excel file format and clearly identified.
- It will be required that different load profiles to be uploaded to the hydrogen generating plant in order to evaluate the performance of the cell stacks under different conditions (Hydrogen production capacity vs time).
- Each hydrogen production plant output purity must be measured to 0.1% accuracy, including oxygen content and must form part of the safe plant operation philosophy.
- The hydrogen purity directly after each cell stack shall be measured in ppm. The hydrogen content within the oxygen stream shall be measured in ppm. These values shall be through on-line instrumentation for data capturing.
- Control and instrumentation. On-line water temperature monitoring exiting cell stack and entering the water demineralization water treatment plant.

f) Hydrogen metering and pressure reducing station must be provided.

g) The new plant and metering panel must be hosted in separate containments (cabinets) with the required ventilation to dilute hydrogen leakages to outside flammable mixture and monitoring, hydrogen leak and fire detection that reduces the risk of a flammable or an explosive mixture accumulating.

h) Contractor's design and supply scope shall include:

- Hydrogen Generating Plant related drawings, control philosophy, operating and detailed maintenance manuals package,
- Receiver valve, metering panel and five of multicylinder pack connection panels (including flexible hose connections to cylinder packs) design, drawings, control philosophy, operating and detailed maintenance manuals package.
- Automatic inert gas purging connection panel.
- Bulk storage vessel and metering panel manual purging connections and multicylinder connection panel including flexible hoses and pressure regulators etc.
- Demineralized water treatment plant.
- Compressor for

- A hazardous zone classification must be done and the classification report submitted.
- Integrate the plant with the required available facilities i.e. current water supply systems, electrical supply connections and the storage vessels.
- Integrate the control and monitoring of the new plant with control centre.
- All electrical and C&I equipment selected for the classified areas must comply with the area classification requirements and applicable standards.
- The design must cater for minimising the electrical and C&I equipment in hazardous zones by locating this equipment in less hazardous zones.

i) All control and monitoring data must be accessible via remote login.

j) Hydrogen bulk storage

- H_2 storage must be at the electrolyser operating pressure. (no additional compression)
- The hydrogen storage must be provided and shall not exceed 80 m^3 with a minimum operating pressure of 27 bar. Three storage tanks each with a capacity of 24m^3 must be supplied, this is to ensure that total storage capacity remains below the trigger for an environmental authorisation.
- The produced hydrogen should be continuously dried and stored in a bulk storage vessel.

k) An end-user testing facility must be provided. This should be a containerised facility which is a laboratory type workspace and should cater and testing of end-use application, (i.e. fuel cells, small desk / lab scale devices, hydrogen appliances etc.) on a “plug and play” principle. This location will be open for the testing of future technologies. This facility must be equipped with test benches with hydrogen connection points, and access to overall plant test data. The facility must be designed to allow staff occupation in the facility during testing, therefore it must contain benches and chairs, windows, ventilation, lighting and air conditioning.

l) A container must be provided as a control room which will house all electrical and monitoring equipment.

- An additional independent roof structure must be installed above this container to provide addition temperature control. This roof structure must extend beyond the container (along the length and at the entrance) to create a shaded area the same size as the container to allow for group gatherings under cover.
- All containers should include HVAC system and an appealing “green” look.

m) The contractor is to make provision for roads and parking, access control to the facility (which should include a 2m fence and lockable gate), lighting, security cameras, all associated civil works, electrical works, mechanical installations, reticulation, valves, cabling, cable racks, instrumentation, monitoring systems, software, etc as defined in this works information.

n) Fire protection and detection system must be integrated with the existing system at ERIC. Local alarms and strobe must also be provided at the facility, that must be visible for security or any passer-by.

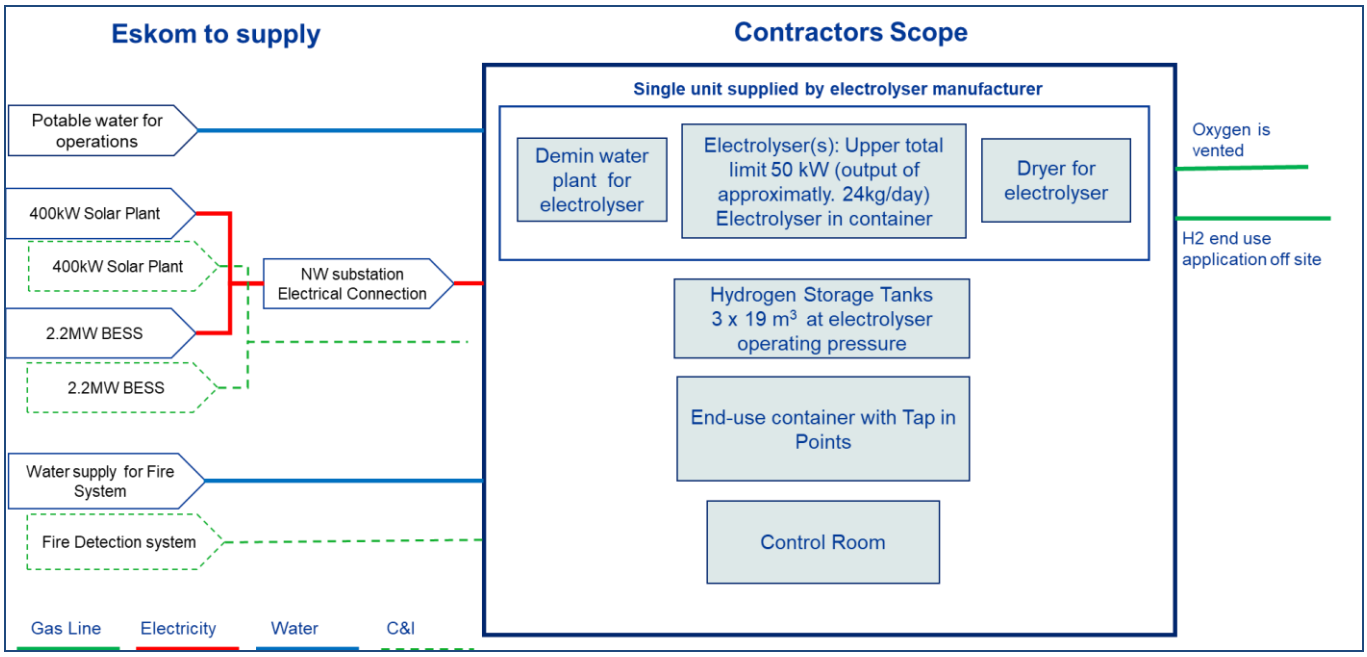

Figure 4: Block flow diagram of the main elements of the scope of work.

3.3.3. Additional Requirements

The following additional requirements are for noting:

a) Where the document is not clear about the work to be performed, it is the Contractor's responsibility to confirm requirements with the Employer's Contract Manager and Engineering representative via Request for Information process. The Contractor Shall only act upon confirmation by receipt of an Engineering Instruction via the Contract Manager. Incorrect work done (where Engineering Instructions were not issued) shall be moved/removed/replaced/changed/reinstalled by the Contractor at his cost.

b) All referenced Eskom Standards shall be made available to the Contractor.

c) The contractor is to comply with the 240-53113685 Eskom Design Review Procedure and Project Engineering Change Management Procedure in addition to the Contractor's own engineering governance processes.

d) Defects and maintenance (after commissioning but before handover) to be done by the contractor. There will be a defect period of 52 weeks after hand over.

3.3.4. Limits of Scope and Supply

The Limits of Supply and Services (LOSS) and the termination points are specified in the LOSS Diagram in the documentation package. Where these limits are not explicitly specified it is the Contractor responsibility to liaise with the Employer to determine the location and details for all the terminal points. The Contractor shall comply with the connection details of the lead discipline when completing the detailed design, the design of the connections shall be approved by the relevant parties which are responsible for the supply of services up to the relevant terminal point.

Other Limits of Supply and Services for the completion of the Plant may arise as the detailed design progresses and shall be provided by the Contractor within the Contract price.

3.4. Safety Requirements

The contractor shall comply to the most stringent requirements applicable in the latest revision of Eskom Hydrogen Systems Standard, site specific procedures and stipulations of the OSH Act.

3.5. Quality Requirements

3.5.1. Quality Management System

The project shall be subject to Internation Organisation for Standards (ISO) ISO 9001 Quality Management Systems Standard and will be subjected to internal Eskom and external certification audits. Compliance with the following procedures is required, RT&D Quality Management System Manual Document Identifier: 240-98784903 and Eskom Quality Management policies and procedures. The procurement and project quality requirement shall also comply Eskom Supplier Quality Management Procedure: QM58.

Quality Control Plans (QCPs) / Inspection and Test Plans (ITPs) indicating respective hold points, witness points and review points must be submitted by the appointed Contractor for approval by the Employer. This will be used to ensure that an Employer representative is present for the inspection of the various activities during the construction, installation, commissioning, and handover of the plant.

3.5.2. Inspection

Inspection activities and hold points during manufacturing and construction shall be managed according to the QCP and ITP agreed upon by the Contractor and the Employer in the Project Schedule.

The Contractor shall be required to maintain inspection databases where all records of inspection are maintained as required quality management systems.

3.5.3. Data Books

The Contractor shall develop and implement a system for collation or quality verification records, including change management records, into Manufacturing, Construction and Commissioning Record Books (Data Books).

Data Books shall be maintained by the Contractor to substantiate conformance to product specifications and requirements. All records shall be safely stored (easily retrievable) following the final completion of the works at handover. These records shall include as a minimum:

- Quality Management documentation as specified in the Quality Management Requirements
- Safety clearances (to be granted prior commissioning)
- Construction, layout and component approvals
- Routine test certificates
- Construction and as-built drawings and approvals
- Statutory certification
- Data Books (Record Books)

3.6. Drawing Requirements

The creation and control of all Engineering Drawings shall be in accordance with the latest revision of 240-86973501 (Engineering Drawing Standards – Common Requirements). The Contractor shall provide detailed “As Required” arrangement/dimensional drawings for each part of work to be done. No work will commence without approval of these drawings approved by the Contract Manager and Engineering representative of the Employer.

After the works has been completed, detailed “As-built” drawings shall be provided by the Contractor. The “As-built” drawings are subject to the Employer’s Engineering representative comments and approval. All drawings shall indicate all the new installation/modified parts as well as enough of the existing pipework to which the items are connected. This shall be done in sufficient detail to easily identify the location of the installation.

All drawings shall contain the following as a minimum:

- Description of component with labelling number.
- Layout of the pipework with dimensions and angles.
- Bill of materials (BOM) for all components traceable to the layout. BOM should include size, schedule, pressure rating or class, material, quantity etc.
- Design and operating pressures and temperatures.

- Proof Pressure Test requirements and pressures.
- Design Code.
- All drawing revisions must be provided as paper copies in original (in all cases at least A3) size as well as provided in .pdf format.
- All drawing must also be provided in Computer-aided design (CAD) format such as DGN (or similar digital format).

All required drawings shall be prepared in accordance with the requirements as specified in the Engineering Drawing Office and Engineering Drawing Standard (240-86973501). A drawing register (Master Document List, with document titles, document revision, status, transmittal details and project phase) which records the drawing's information shall be maintained by the Contractor.

The contractor is to provide a document list, showing format, project phase of when review is required. Drawings to be prepared will include and not be limited to:

- Equipment drawings,
- Equipment lists,
- Isometric drawings and piping and instrumentation diagrams (P&ID),
- Electrical Drawings,
- Loop drawings,
- Cabinet drawings,
- Cable schedule,
- Data sheets,
- Calibration certificates,
- Acceptance test procedures,
- Network architectures,
- Location drawings,
- Instrument list,
- Equipment list,
- Critical spares list,
- Original Equipment Manufacturer (OEM) manuals and part catalogues,
- Set point and parameter lists,
- Three dimensional drawings requirements - DGN model.

3.7. Configuration Management Requirements

3.7.1. Configuration Management Plan

The Contractor shall prepare a configuration management (CM) plan utilizing ISO 10007 as a reference guide for the scope of work. The CM plan shall include the following:

- A complete and comprehensive description of the Contractor's document numbering conventions and revision schema.

- A description of the electronic data management system(s) that the Contractor will use for the management of documents and/or configuration items.
- A description of the configuration management activities which will be undertaken by the Contractor as well as a rough timescale thereof.
- A description of the baselines that will be established and the content of these baselines.
- The release procedure for product configuration information.
- The method for processing changes, emanating both internally and from sub-suppliers.
- The method for collecting, recording, processing and maintaining the data necessary for producing configuration status accounting records.
- The definition of the content and format for all configuration status accounting reports.
- A list of audits which will be conducted to ensure adherence to the CM plan.

3.7.1.1. Plant Labelling

The plant signage, posting and labelling requirements are stipulated in the Hydrogen System Standard (240-56227413)

- Each Hydrogen system and control areas must have signage, placards, postings, and labels displayed, so employees shall be aware of the potential hazards in the area. The location of Hydrogen systems shall be permanently placard as follows:
    - HYDROGEN-FLAMMABLE GAS-NO SMOKING- NO OPEN FLAMES
    - Each portable container shall be legibly marked with the name "HYDROGEN". Each manifold Hydrogen supply unit shall be marked with the name "HYDROGEN" such as: "This unit contains Hydrogen" (OHSACT; NFPA). Placards must be of sufficient size and colour that they are readily visible to employees entering the work area.
- All plant to be fitted with the KKS labelling consistent with the Eskom standards for unique identification.
- Coding shall be used on all drawings, isometrics, schedules, documents, operating and maintenance manuals.
- The identification of contents of pipelines shall be in accordance with 240-145581571.
- Identification shall include colour banding, code by stencilling or labelling and flow direction arrows.
- All pipework shall be provided with markings, labels or colour coding indicating the contents thereof.

3.7.1.2. Plant Designation within Documentation

The Contractor shall prepare a list of codes allocated to components for each scope of delivery or system (this list shall be referred to as equipment list in the rest of this document for simplicity, but includes documents such as cable schedules, valve schedules, etc.). The equipment list shall be submitted with the original implementation documentation describing the design of the system (e.g.

process and instrumentation diagram, single line diagram, etc.). The Contractor shall ensure that the equipment list accurately represents the implementation documentation which it accompanies. The content of the lists will be agreed to per discipline with the Employer. As a minimum, the equipment list shall include:

- The labelling codes of all components within the relevant scope or system,
- The full verbal description of each component,
- The abbreviated description of each component,
- The approval status of each component, in alignment with the list of approval statuses specified for document.

3.7.2. Documentation Submission

All documents shall be submitted to the Project manager, the language of all documentation is required to be in English. The Contractor shall submit the Vendor Document Submission Schedule (VDSS) to the Project manager. The VDSS is revisable, and changes shall be discussed and agreed upon by all parties and properly documented. Changes in the VDSS include additional documentation to be submitted, changes in submission dates, corrections in documentation descriptions and document numbers; etc. The contractor shall be responsible for the management of the schedule i.e., to create a document register that shall be used to plan and track submission progress of documentation as per the committed dates on the VDSS.

3.7.3. Transmittal

The Contractor shall list all project documents (soft copies and hard copies) for submittal on the transmittal with the following metadata fields:

- Title of the document,
- Document Unique Identification number,
- Revision number,
- Name of Discipline,
- Reason for issuing/submission,
- Sender’s detail,
- Sent date,
- Recipient’s Details,
- Date received,
- Quantity of documentation referenced on the transmittal,
- Number of copies,
- Format/medium submitted (e.g.: paper, Flash drive, Electronic Transfer, etc.),
- Sender signature, and
- Recipient signature, once submitted, to acknowledge receipt.

Drawing numbers shall be assigned by the Employer as drawings are developed. The project name shall be listed on all drawings, including manufacturers' drawings. A separate sheet may be attached to the submittal if needed to adequately list all tag numbers associated with the drawings such as valves or instruments which may have numerous tag numbers associated with it.

The language of all documentation shall be in the English language. The units of measure shall be metric. The Contractor retains project design calculations and information for the entire life cycle of the plant and provides these to the Employer on prior written notice at any time notwithstanding the expiry or termination of the contract.

3.7.4. Engineering Change Management

All Design change management shall be performed in accordance with the latest revision of the Eskom Project Change Management Procedure (240-53114026) and the Employer shall ensure that the Contractor is provided with the latest revisions of this procedure. Any uncertainty regarding this procedure shall be clarified with the Employer and clarification updates should be reflected in updated versions of this procedure.

3.8. Testing Requirements

The Works shall undergo Factory Acceptance Testing (IEC 62381 FAT Procedure) in accordance with the requirements and procedures specified in the Employer's Requirements and the requirements that are specified by the Contractor in his Tender. The Contractor shall submit his proposed requirements for all the tests to be conducted to the Contract Manager and Engineer's representative for acceptance. These requirements shall be developed to demonstrate that the Works meet the requirements stated in this document. As a minimum Pressure Equipment Regulations must be adhered to. The test certificate including the performance tests shall be issued and shall be included in the data book.

3.9. Training Requirements

The Contractor shall provide training on the permanent works to operating, maintenance and engineering personnel. Training provided by the Contractor shall be practical, hands-on and directly applicable to the Permanent Works. The training must take place in South Africa. The person responsible for presenting the training is trained, competent and certified by the OEM. General training based on similar works is not acceptable.

The Contractor shall provide all course material including manuals. The course material shall be in English and shall include all third-party documentation. A copy of the training documentation shall be supplied for each trainee with an additional three master sets for the Employer's library and training department. This training shall include the knowledge and skills to enable individuals to adjust the internal parameters of the equipment to meet specific field conditions and to load firmware upgrades as and when required. The necessary configuration tools shall be provided to authorize staff to change these internal parameters. Trained and authorized personal will be issued the required passwords to effect the changes.

The dates for training shall be included and shown in the Contractor's programme. The supply of drafts, pre-print proofs and printed copies of training documentation shall be planned by the Contractor in such a way that this is complete before commissioning of the unit commences.

There must be cost line items for each discipline of training so that the scope and expectations are clear. Training may have to be provided in phases – upfront and as systems become available. Training manuals shall be continuously updated by the Contractor until the date of issue of the Performance Certificate for the whole of the Works.

4. Technical Requirements

4.1. Operating Philosophy

The operation of the plant shall be fully automatic with system start/stop initiated from the local control station which is connected to the PLC of the PV plant. Local/Remote selection will be done at one location in the plant. The control system for the receiver filling and that of the generating plant shall be integrated to optimise the life of the cell stack and to ensure safe plant operation.

The hydrogen generating plant shall trip and purge automatically on low hydrogen purity (less than 99.5%). Under no circumstance will it be allowed that contamination in the hydrogen and oxygen lines exceeds 1.6% during the transient state, and less than 1% during steady state. The contamination on the hydrogen and oxygen lines will not be able to exceed 1% measure directly after the cell stacks.

The Eskom Hydrogen standard listed the following critical items for the safe operation of a hydrogen plant, and no plant shall operate without meeting these requirements:

- Oxygen content measurement of produced Hydrogen after the cells on atmospheric electrolysers.
- Hydrogen purity after the dryers including oxygen content (before bulk storage).
- Minimum flow through analysers is ensured.
- Hydrogen leak detection.
- Water seals (or flashback arrestors) on all vents.
- Approved area classification.

- Hydrogen fire detection.
- Hydrogen in oxygen measurement on the oxygen stream.
- Minimum quantity of inert gas connected to perform emergency purge on production.
- Plant Safety Regulations (PSR) integration

4.1.1. Receiver Operating Philosophy

The hydrogen will be stored in a pressure storage system that is equivalent to the electrolyser operating pressure minimum 27 bar, while the oxygen produced will be vented to atmosphere. The hydrogen from the pressure storage tank can be supplied to the end-uses that include a golf cart, fuel cells and appliances. The design will allow for the hydrogen to be compressed to 700 bar and will be stored in a high-pressure storage facility.

The metering station is responsible for reducing the pressure from the pressure storage to the required pressure for usage adjustable from 2.7 MPa to 1 MPa. At the metering station, the hydrogen as well as the oxygen purity is monitored to ensure that the correct purity of gas is being provided to the end user.

4.2. Mechanical and Process Requirements

4.2.1. Design Parameters

The renewable hydrogen facility shall be sized based on the renewable energy production capacity of the existing 400 kW Solar PV plant. The renewable energy will be stored in the Battery Energy Storage System to enable a continuous supply to the RHF. The steady state RE supply to the plant is anticipated to be 50 kW. The electrolyser(s) shall be designed for the least amount of cost to consume 50 kW; therefore, the configuration could be at maximum 1 x 50 kW electrolyser, with multiple cell stacks (minimum two) or smaller electrolysers. The design should allow for three (3) electrolyser connection points, although the additional electrolysers will not be constructed during the initial phase of the project. The hydrogen produced shall be at a minimum pressure of 27 bar with no compression and have minimum purity of 99.9% by volume and a dew point of 50°C or better at 101.4 kPa. The hydrogen storage must be provided and shall not exceed 80 m^3 with a minimum operating pressure of 27 bar.

4.2.2. Piping System

The piping system shall comply with the requirements stated in the Eskom Specification for Hydrogen Systems 240-56227413. All welded joints shall be 100% x-rayed. The following requirements are additional to the Specification for Hydrogen Systems.

4.2.2.1. Hydrogen pipes

The piping shall be stainless steel as per Eskom Specification for Hydrogen Systems 240-56227413. The piping selection should consider stress, temperature, pressure failures and other conditions considered to characterise hydrogen embrittlement failures including hydrogen purity.

The hydrogen facility piping systems and hydrogen transportation pipes shall include safeguards in accordance with American Society of Mechanical Engineers (ASME) ASME B31.3 for the protection of the people and property against harmful consequences of piping failures. The pipework, valve and fittings shall be rated at 1.5 times the maximum operating pressure as specified in the Hydrogen systems standard 240-56227413, section 3.14.1.

All the piping and components shall be labelled, tagged, and coded as per the American National Standards Institute (ANSI) and American Institute of Aeronautics and Astronautics (AIAA) ANSI/AIAA G-095-2004-Section 4.10 and the standards specified therein.

4.2.2.2. Pipe Supports

The design of piping support members shall account for all loads acting on such supports and the supports shall be of materials suitable for the service conditions. Pipe support locations shall be shown on all general arrangement and elevation drawings, along with each support mark or reference number.

4.2.2.3. Holding down and Foundation Bolts

Holding down of the pipes, where required shall be designed and fabricated from materials suitable to secure the plant item in its designed operating position under all operating and environmental conditions.

4.2.2.4. Bolts, Nuts, Washers, Studs and Threads

All bolts, nuts, washers and studs shall be sized and be of material satisfactory for the maximum and varying operating and environmental conditions. They shall comply with the requirements of South African National Standards (SANS) SANS 1700 and the relevant standards specified therein, unless otherwise specified in these requirements or on approved drawings.

4.2.2.5. Trenches and Covers

Piping between the containers shall be placed in a new trench. The trenches are to be covered with removable grating.

4.3. Control and Instrumentation Design

C&I design entails all components from the field measurements to the human machine interface in the control room that interprets it as usable process data. These include instruments, junction boxes, cabling and trunking, Supervisory Control and Data Acquisition (this should be a PLC based SCADA) and the operator Human Machine Interface (HMI). The onsite Control and Monitoring System (CMS) or SCADA will perform the data acquisition and monitoring of equipment function that includes:

- Electrical low voltage (LV) and Medium Voltage (MV) switchgear,
- Electrical Protection,
- Energy measurement and metering,
- Uninterruptible power supplies (UPS),
- Internal environmental parameters measurement of equipment cabinets,
- PV and BESS systems
- Fire detection system, and
- HVAC system

The plant design includes a control room with two operator stations. Under normal operating conditions, the plant operates automatically with minimum operator intervention.

4.3.1. Control Room Design (Layout)

The containerised control room is of a modern, ergonomic design and complies to international standards (ISO 11064: Ergonomic design of control centres), Eskom Guideline (240-56355541: C&I Computer and Equipment Rooms Civil and General Building Requirements Guideline) and engineering best practices. The equipment/server room caters for (but is not limited to) the following cabinets:

- CMS server cabinet (servers, thin clients, etc),
- CMS network cabinet (network switches, splice trays and patch panels),
- CMS UPS system cabinet,
- IT/IM network cabinet, and
- Network cabinet for Eskom approved gateway/ remote terminal unit (RTU).

4.3.2. Network Architecture

The network is single fault tolerant and forms the backbone CMS network to enable data communication between the field equipment and CMS servers through a PLC. Any fault in a single segment of the network should not cause data communication failure between the control room and the plant. The core network allows for duplex communication. The network is compatible with simple network management protocol version 3 (SNMP v3) and internet protocol version 6 (IPv6). The RHF plant contains the CMS network panel that connects the various plant subsystems and the following signals:

- All PV signals from the PV plant that are deemed essential,
- All energy storage information from the BESS facility located within the premises that are deemed essential,
- Electrical protection signals that include status display signals and control signals
- All information from the demineralised water treatment plant that is deemed essential to produce green hydrogen, and
- All other information that is deemed necessary for successful implementation and operation of the RHF.

The CMS network panel is installed inside the server room that forms part of the overall control room. Active cooling of the equipment is required. The panel interfaces to:

- Switchgear breakers and status indication relays (including intelligent electronic devices (IED)),
- Protection systems,
- UPSs,
- Fire Detection panel, and
- HVAC panel.

There is one pair of redundantly configured CMS servers and one pair of redundantly configured network switches that will be installed in the server room to store plant data, process plant data and present information to the operator via the HMI on the operator stations. It is preferred that a master slave redundant configuration is employed for the network switches and servers located at the server room. Each CMS server includes a plant information server which will store all plant production data for the lifespan of the plant. The plant is required to have two operators, therefore thin client computers will be required for the operators in the control room. A single CMS software application will be installed onto the CMS servers for control and monitoring of all plant equipment.

At an operational level, redundancy will be employed such that any failure of a server, thin client, or network switch should not result in loss of operating, monitoring and protection of the plant. A common network switch is installed in the network cabinet of the server room for interfacing to the following systems:

- Global Positioning System (GPS) based time synchronisation,
- Control building HVAC system,
- Server room UPS monitoring system,
- HVAC panel, and
- Network printer.

An Operational Technology firewall, webserver and virtual private network (VPN) gateway are required for highly secured and stable connectivity of the RHF plant to the internet. The Eskom Cyber Security, DMZ, IT/OT and third-party interface standards are to be complied with.

4.3.3. Electrical Interface

The electrical interface is as per section 4.5.3, applicable standards and good engineering practices shall apply. All protection status, start and stop, and power measurement (active, apparent and reactive power) signals are monitored and displayed through the SCADA PLC and HMI provided by the contractor.

4.3.4. Control and Monitoring System Servers

There will be one pair (2) of redundantly configured CMS servers. The servers are required to operate as primary-standby configuration. The standby server will continue full operation of the CMS if the primary server fails to operate “normally” as required. A high-speed watchdog interface will interconnect both servers to establish a dual redundant configuration. Each server machine of the redundant pair includes the following hardware:

- Redundant central processing units (CPUs),
- Redundant array of independent disks (RAID) configuration,
- Redundant power supplies with dual power input ports,
- 19” rack-mountable enclosers,
- Onboard memory (solid state) to continuously process and store all real time plant data for the lifespan of the plant, and
- Removable media storage such as digital versatile disk (DVD) writer and front accessible universal serial bus (USB ports).

The dual redundant CMS servers will accomplish multiple functions that includes:

- Hosting the latest Windows operating system,
- Hosting a single CMS application software for operating and monitoring of all plant equipment,
- Hosting antivirus software,
- Store all engineering logic and CMS network configuration settings,
- Processing of plant data via the redundant information servers and storage of data onto the CPU database,
- Communicating to the thin clients for plant operation and network configuration,
- Network configuration, logic development, mimic development, antivirus and software updates,
- Automatic copying of data from the CPU’s built-in historian onto the removable media at pre-configured intervals, and

- Saving information, backing up of data onto removable media, closing all running applications and shutting down the CPU in an automatic sequence after detecting the loss of input power to the UPS system.

The operating system and application software versions will be confirmed during tender clarifications.

4.3.5. Operator System Thin Clients

The requirements for the Operator System Thin Clients includes the following:

- The HMI Thin Clients are the end-user interfaces to the plant. The HMI thin clients are configured for the end users to access the applications running on the server using the login credentials (i.e. Username and password).
- Two HMI Thin clients will be installed in the PV plant Control Room for parallel redundancy. If one HMI Thin client is faulty, the redundant thin client is online and available for use to the end user.
- Five HMI Thin client licences will be provided for remote users to access the SCADA server from the network in line with all IT governance standards e.g. 32-373: Information Security –IT/OT and Third Party Remote Access Standard.
- The following services will be granted to the user groups based on the client to server login credentials:
    - Operating personnel – HMI application,
    - Maintenance personnel – HMI application, copying and backup capabilities and administration.
    - Engineering personnel – Full read and write access to all applications or services on the server.
- All HMI thin clients will operate simultaneously.
- The Microsoft Windows standard interface will be deactivated for operating personnel.

4.3.6. Thin Client Hardware

Each thin client will meet the following hardware requirements:

a. 1 x thin client terminal.
   · Capable of connecting 4 display monitors
b. 2 x 32” display monitors
   · 1440p LED
   · 16:9 aspect ratio
c. 1 x USB keyboard
d. 1 x USB mouse

The hardware of both HMI thin clients will not share the same power source. Both HMI thin clients will be supplied from independent power sources as far as possible. The HMI thin client's

hardware will be installed on the operator desks in the Control Room. The layout of the HMI thin clients' hardware must be ergonomically friendly to the end users.

4.3.7. HMI Application Software

4.3.7.1. General

The general requirements for the HMI Application Software are:

- The HMI application will be the graphical user interface to the plant.
- Upon starting the HMI application, the following functionality will be granted to the end users based on the login credentials:
  - Operator personnel – Full monitoring and operating,
  - Maintenance personnel – Full monitoring, and system administration
  - Engineering personnel – Full monitoring operating and engineering.
- The functionality provided by the HMI will include, but is not limited to the following:
  - Operating functionality,
  - Indication,
  - Alarming,
  - Trending,
  - On-load plant performance information,
  - Event viewing (including operator action events),
  - List of forced signals, and
  - Access to historical operating data.
- All operator actions will be logged.
- Selection of any HMI graphic will not require more than two keystrokes.
- The archiving of analogue tags is at a resolution of 1 second and all other events at a resolution of 1 millisecond

4.3.7.2. Response Times

All hardware and software will be specified to achieve the following response times:

- The response times for command outputs (running time command for HMI up to signal change at the field device) must not exceed 2s.
- The response time for updating of variables in HMI displays (running time of signal from signal change on the field device to change of the appropriate variables on the video display) must not exceed 2s.

- The maximum time taken to completely populate an HMI graphic with dynamic data will not exceed 2s.
- The average time taken to completely populate any HMI graphic with dynamic data will be less than 1s.
- The maximum time taken to completely populate a trend with dynamic data will not exceed 3s.
- The average time taken to completely populate any trend with dynamic data will be less than 1,5s.

4.3.7.3. Graphical User Interface

The Graphical User Interface (GUI) requirements are:

- The HMI GUI conforms to proven and best industry practices for SCADA systems.
- The Human Machine Interface Design Requirements Standard (240-56355728) can be used as a guideline to adhere to the following:
    - Alphanumeric characters,
    - Numeric Data,
    - Abbreviations and acronyms,
    - Labels,
    - Icons and symbols,
    - Colours for HMI graphics,
    - Cursors,
    - HMI graphics,
    - Menus,
    - Windows, and
    - Errors.
- The GUI will display the following information as a minimum:
    - Main overview window:
        - Plant map window,
        - Plant control window (i.e., voltage, current, frequency, setpoints, etc.), Automatic/Manual control mode, Local (Plant operator) or remote (SO) Control selection and status,
        - Status of main MV/HV breakers/isolators,
        - Summary alarm list showing high priority and rationalised alarms,
        - Trend window,
        - Redundant hardware status, and

- Selection of any graphic on the main overview window will take the user to a more detailed graphic of information for the selected window.

- Plant Control Window:
  - Remote/Local control mode selection and indication, and
  - Automatic or manual mode selection and indication.
- Plant Electrical Line Diagram Window:
  - Displays the entire electrical reticulation of the plant, and
  - Clicking on a specific switchgear, transformer, meter, etc opens the field device window displaying information relating to the devices, etc.
- SCADA Network Line Diagram Window:
  - Displays the entire SCADA network of the plant, and
  - Clicking on a specific network device (e.g. network switches, Server, Control Systems) opens the device window displaying information relating to the devices, etc.
- Auxiliary and Ancillary Services Windows:
  - Displays the indications of the uninterruptible power supplies,
  - Displays the indications of the Auxiliary power distribution boards,
  - Displays the indications of the equipment environmental condition monitoring systems,
  - Displays the indications of the fire detection and alarm systems, and
  - Displays the indications of the HVAC systems.
- Alarms window:
  - Displays all alarms that require operator intervention,
  - Alarms are automatically ordered according to their priority, and
  - Clicking on an alarm provides an alarm response window.
- Individual Alarm Response Window:
  - Displays the possible causes of the alarms,
  - Displays the mitigation actions to attend to the alarm,
  - Includes a facility to suppressor disable a nuisance alarm for a temporary period, and
  - Historical alarms over a defined calendar period must be available for display.
- Trend Window:
  - Includes real time trending of user selectable parameters,

- Includes historical trends of user selectable parameters over a defined calendar period, and
- Each parameter must be clearly distinguishable in colour from the other parameters.

4.3.8. Field Devices

4.3.8.1. Requirements For Field Instrumentation

All pressure, temperature flow and level measurements are installed in line with the guidelines listed below, OEM's recommendations and good engineering practices:

- Temperature measurement system installation standard (240-56355888).
- Pressure measurement system installation standard (240-56355843).
- Field instrument installation standard for junction boxes and cable termination (240-56355815).
- Field equipment installation standard (240-56355754).
- The level of redundancy of the field installation is such that it is equal or better to the availability of the mechanical plant. The Safety Integrity Level (SIL) rating of all field measurements is such that it matches or is better than the specified mechanical design reliability figures.

In addition to the requirements of the abovementioned standards, the field equipment installed shall satisfy the following criteria:

- All field equipment operates over an ambient temperature range of: -10°C to 70°C.
- All field equipment is installed in a suitable location ensuring that it operates in an environment within the parameters stipulated by the manufacturer.
- Where harsh environmental conditions are not avoidable, the field equipment is designed for operation in that environment must be used.
- All field equipment is suitable for use in the zone in which it is installed. The zone classifications are as per SANS 10108 (5th edition 2005)
- All field equipment excluding junction/splitter boxes and their electrical connections are rated IP 65 or better.
- Junction/splitter boxes and their electrical connections are rated IP 66 or better.
- All IP ratings are as per SANS 60529.
- All field equipment is Ex rated for zone 1 operation

The instrumentation provided is standardised to the maximum extent possible

4.3.8.2. Requirements For Actuators

All actuators used for the RHF are electrical and fulfil the following requirements for actuators:

- The correct sizing, adaptability and suitability of all actuators are provided as part of the works.
- All actuators provided meet the requirements of the valves and dampers that they operate.
- Actuators are rated for the following duty classifications as per specification International Electrotechnical Commission (IEC) IEC 60034-1 (11th Edition 2004/04):
    - Short - time duty (S2-15min).
    - Intermittent duty (S4-25% ED); up to 1200 starts per hour; no. of starts depending on actuator size and output speed.
- Position transmitters of the two-wire type for the actuators are provided.
- All flanges and gearboxes from the actuator to the damper shaft or valve spindle are provided.
- Dimensions of the shafts and technical details such as turning direction, multi-turn, quarter turn, standard linear turn (not modified multi-turn) is determined during the detailed engineering phase.
- Direct mounted flanged type actuators are used for binary dampers with a keyed adaptive coupling (damper shaft/actuator shaft).
- The actuator is secured on a mounting which is included as part of the works.
- The weight of the actuator does not compromise the valve & pipe structure on which it is mounted.
- The design and sizing of actuators considers the duty cycle for the plant operation.
- Actuators are designed and selected such that no overheating occurs under worst-case conditions.
- The environmental conditions are considered. Where harsh environmental conditions exist, only actuators designed to operate in such environments must be used.
- All special tools (other than the normal hand tools) are provided by the Contractor at Completion.
- All electrical actuators conform to the following requirements as a minimum:
    - All actuator motors run with the correct rotation for the required direction irrespective of the connection sequence of the power supply.
    - To ensure the integrity of the enclosure, setting of limits and configuration of the indication contacts is carried out without removal of any covers.
    - The actuator incorporates local controls for open, close, and stop and a local/stop/remote mode selector.
    - This mode selector is lockable in any of the following positions:
        - local control
        - stop (no electrical operation)
        - remote
    - All electrically driven modulating actuators provided have integrated switchgear and thermal overload protection.

- Thyristor based integrated switchgear is provided for all electric power actuators.
- For analogue controlled electric actuators, an analogue 4-20mA command signal is employed for positioning the valve/damper.
- Control actuators that operate on a high duty cycle must be rated for high duty operation.
- Standardisation is achieved by selecting the minimum number of actuators that can cover all the load requirements for the entire plant.
- The internal limit switches on the actuators must be micro switches.

4.3.8.3. Hydrogen and Oxygen Analysers

The Hydrogen and Oxygen analysers requirements include:

- All analysers have a local display.
- All analysers can be configured either through local push buttons on the analysers or remotely through the operator workstations.
- All the engineering tools for programming and configuring the analysers are provided.
- All analysers have the following parameters available for configuration:
- High and low measuring range,
- High and low display range,
- Engineering units,
- Temperature at measurement cell (where applicable),
- Offset adjustment on temperature measurement (where applicable),
- Offset adjustment on measured value, and
- Indication of measurement device health.
- The output signal of all the analysers is a load independent direct current 4 to 20 mA signal.
- The output signal is also a rising linear and falling linear signal.
- The enclosures provide clear visibility of the local displays of the enclosed analysers.
- All analyser installations are in line with the Hydrogen systems standard (240-56227413).
- All analysers are Ex rated for zone 1 operation

4.4. Electrical Design

The electrical configuration of the RHF plant shall be integrated with the existing 400 kW Solar Photo-Voltaic (PV) plant, the 2.2 MWh battery storage BESS plant and reticulation of the ERIC facility by complying to all the requirements, standards stipulated to ensure the safe and efficient operation of the plant. Where required for integrations with existing infrastructure, outages need to be scheduled well in advance (2 months at least for electrical), as it entails shutting down power to some critical other RTD services. Outages are to be minimised to be the bare minimum. The requirements include all the electrical and auxiliary equipment as it deemed necessary by the

Project (also covered in various sections of the systems of the document). Unless otherwise stated all electrical equipment necessary for the safe and efficient working of the hydrogen plant shall be provided according to the Hydrogen System Standard 240-56227413.

4.4.1. Integration to NW Substation (PV Plant Infra-structure)

In order to integrate the electrical supply of the new RHF to the existing PV electrical infra-structure, the new RHF plant Contractor is to retrofit the MCCB inside the functional unit of the existing Essential Board (rated 400 V AC, Fault rating of 30kA) in the North West Substation. The Contractor will also install a new power cable from the retrofitted MCCB at 400V Essential Board at the current North-West Substation to the new position of the RHF plant.

4.4.2. Integration to BESS Infra-structure

The BESS system will load follow the PV plant and produce the power required by the RHF plant for the duration required and according to the load variations.

4.4.3. Installation at the New RHF Facility

At the suitable position of the RHF plant the Contractor is to design, supply and install an outdoor LV switchgear and Controlgear Assemblies. Where cascading of the Moulded Case Circuit Breakers (MCCB) with Miniature Circuit Breakers (MCB), proper selection of protection curves to be evaluated and implemented.

The LV Switchgear and Controlgear Assembly shall comply to the Eskom standard 240-56227516 LV Switchgear Control Gear Assembly Associated Equipment for Voltage –1000V and 1500 V Standard. The Contractor to fill in 240-115583001 LV Switchgear Technical Schedule A&B. Section **5.1** of the LV Switchgear Technical Schedule A&B is not applicable. The MCCBs to be used in the LV Switchgear and Controlgear Assembly shall be motorized to allow for remote closing and tripping.
All signals both control and indications to be wired to the SCADA system.

4.4.4. Cabling Requirements

Cabling, racking, routing and cable terminations to be done in accordance with the standard 240-56227443 Requirements for Control and Power Cables for Power Stations Standard and SANS 10142-1 The wiring of Premises Part 1 Low Voltage Installations.

4.4.5. Protection Requirements

Protection shall be in accordance with 240-56357424 MV and LV Switchgear Protection Settings Standard.

4.4.6. Power Demand Monitoring and Metering

Smart meters will be connected on the incomer circuit of the RHF 400V LV Switchgear to measure and monitor power consumption from the renewable energy in accordance with the standard 240-56364444: Standard Minimum requirements for Metering of Electrical Energy and Demand.

4.4.7. Design Operating Philosophy

Contractor to keep abreast of changes happening in the projects pertaining to the current renewable infrastructure (PV and BESS) to ensure the electrical design aligns to all the affected changes. The electrical design shall be capable to integrate to the current and future modification of the current renewable infrastructure.

4.4.8. Stand-by and DC Requirements

Unless otherwise specified, auxiliary equipment shall be supplied with power through the substation alternating current (AC) and direct current (DC) supply routed from the AC & DC distribution board. The required power shall comply to the following applicable standards.

Equipment	Technical Standard
Nickel Cadmium Batteries	240-56360086, Stationary Vented Nickel Cadmium Batteries Standard
Vented Lead Acid Batteries	240-56360034, Stationary Vented Lead Acid Batteries Standard
Valve Regulated Lead Acid Batteries	240-51999453, Standard Specification for Valve-Regulated Lead Acid Cells
Power Electronics	240-53114248, Thyristor and Switch Mode Chargers, AC/DC to DC/AC Converters and Inverter/Uninterruptible Power Supplies Standard

4.4.9. Earthing and Lightning

The Contractor shall design and install the earth mat for the new RHF plant in accordance with 240-56356396.

4.4.10. LV Motors

LV motors required by the new plant to be design and installed to suite all the requirements as per the standard 240-57617975.

4.4.11. Load Requirements

The estimated total power consumption of the RHF plant is 130kW, however, the Contractor shall calculate the total power consumption and if the power consumption exceeds the estimated 130kW, the Contractor shall notify the Employer.

4.4.12. Small Power and lighting Requirements

The contractor shall design the lighting according to the 240-55714363 Coal Fired Stations Lighting and small Power Installation Standard.

The Contractor shall fill in Technical Schedule A&B and Appendix C of the 240-5571436 Standard in line with the VDSS and submit to the Employer to evaluate compliance.

4.5. Civil and Structural Requirements Scope

4.5.1. Plant Layout

The Contractor develops a concept layout for acceptance by the Project Manager. The layout consists of all plant, foundation and integrations of the various services required. The Contractor considers the drainage requirements, daily operations and maintenance of the ERIC facility while developing the layout. Where applicable, the Contractor conducts Ground Penetration Radar (GPR) Scans to detect possible underground services and structures, to avoid clashes and to allow for connecting to existing services if needed.

4.5.2. Civil Engineering

The plant is considered temporary with a lifespan of approximately 15 years. The Contractor appoints a Professional Engineer with the required experience to design the required foundations for the plant, possible modifications to existing structures and civil infrastructure, as well as ensure the site has adequate drainage and develop the required temporary road network to access and maintain the plant.

The Contractor designs and installs a removable shelter above the C&I Control Room container with adequate gas venting and the ability to dismantle in the event that the end-user changes the container.

The Contractor encloses the site with a perimeter fence and allows for adequate access gates in line with the daily operations and maintenance requirements of the plant.

All design works are to be in accordance with the Eskom Standard 240-56364545 - Structural Design and Engineering Standard.

All designs produced are reviewed for acceptance from the Employer as per the Eskom design review procedure 240-53113685. Acceptance of the design by the Employer does not release the Contractor from design liability.

4.6. Construction Criteria

During construction the contractor must comply with:

- The contractor is responsible for the design, engineering, manufacture, quality control, procurement, handling, shipment and transport to/from site, storage, offloading, construction and erection, finishing, installation, commissioning, testing, optimisation and handover of equipment, tools, and materials for the works.
- The Contractor shall ensure compliance to SACPCMP (Act 48 of 2000)
- The Contractor constructs and erects the works in accordance with the Contractor's accepted design and takes cognisance of SANS 2001 and SANS 10400.
- All works are designed for constructability, reliability, and maintainability.
- The Contractor designs and procures all construction material and equipment required to perform the works.
- The Contractor identifies and includes all items required to form a complete, reliable, fit for purpose operating works, which complies with the requirements as stipulated in this Works Information.
- The Contractor provides all engineering calculations, drawings (hard and soft copy) models, inspection/quality reports, construction records, commissioning test reports, and other documentation as required by the scope of works.
- The Contractor provides dimensioned general arrangement drawings of the designed remedial works and detailed drawings of all components of the works, sufficiently detailed for the preparation of maintenance and operating procedures.
- The Contractor supplies drawings and documentation as specified in the Works Information. This includes, but is not limited to, General Arrangement (GA) drawings, fabrication drawings, construction drawings, as built drawings, maintenance and operating manuals for the fabrication and installation of the works.
- The Contractor's appointed Professional Engineer provides technical oversight during fabrication and construction.
- Other Plant and Materials or items associated with this works is utilised with prior approval from the Project Manager.
- The Contractor performs Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) of the Plant and Materials.
- The Contractor designs and provides all falsework and formwork and any other necessary temporary works for the safe execution of the works.

4.7. Fire Protection

4.7.1. Fire Protection / Detection Assessment

A Fire Protection / Detection Assessment shall be done for the complete plant that is being provided. The assessment shall follow the requirements as set out in the Eskom Fire Protection / Detection Assessment standard 240-54937439. This assessment can also be presented in the form of a Fire Risk Evaluation showing how the fire system measures provided as part of the plant provides for risk mitigation and control measures.

A fire risk evaluation shall be performed by the Contractor; the report shall be submitted to the Engineer for approval as part of the detailed design process. The evaluation should result in a list of recommended fire prevention and protection features to be provided, based on acceptable means for the control of, ignition sources, fire and any hazards. The fire protection provided should be determined through an analysis of local conditions of hazards within the plant, exposure to other properties, the effectiveness of plant fire brigades, time of response and portable effectiveness of fire departments.

The provided fire risk management should focus on inherent process safety of the facility and as far as practically possible passive fire protection measures.

4.7.2. ERIC Site Existing Fire Protection and Fire Detection

4.7.2.1. Fire Protection System

The existing fire protection system on site is supported by a fire water tank fed by the municipal mains and a fire water pumping facility feeding fire water onto the ERIC premises. Technical specifications of this facility are as follows:

- Fire water steel panel tank volume – 144m3
- Pumping of fire water on site is supported as follows:
    - 1 x Jockey pump providing system pressure.
    - 1 x Main Electrical fire water pump rated at 124m3/h @ 69H.
    - 1 x Main Diesel fire water pump rated at 124m3/h @ 69H.

The fire protection hydrants provided on site are fed from a 150NB main pipeline.

4.7.2.2. Fire Detection System

The site is equipped with an existing Ziton ZP3 fire detection system. The Fire Detection/Protection Assessment executed by the Contractor shall investigate expandability of the existing fire detection system to cater for the proposed fire detection at the Hydrogen plant. Due to the volatile nature of Hydrogen, pre-warning such as Hydrogen leak and accumulation detection is preferred above smoke and/or flame detection.

By virtue of the DEOL (Department of Employment and Labour) mandate to SAQCC, any person designing, installing, commissioning, or maintaining Fire Detection Systems needs to be registered with SAQCC Fire according to SAQCC Fire rules and levels. Furthermore, contractors shall have an established installation base within South Africa.

All equipment and materials offered shall be locally supported by Original Equipment Manufacturers (OEM) or their officially appointed agents to ensure proper support and service.

All miscellaneous equipment shall be EN 54 certified. This includes cabling, trunking, conduits, cable trays, fixing hardware, general wiring, network equipment and fibre optics.

4.7.3. Contractors Scope for Fire System

The contractor must ensure that the following criteria are met.

- Perform a Fire Protection / Detection Assessment as per the Eskom Fire Protection / Detection Assessment Standard.
- Fire Protection and Fire Detection systems provided as part of the solution must comply with the requirements as set out in the Eskom Fire Protection and Eskom Fire Detection Design Standards.
- The Fire Protection / Detection Assessment with suggested fire systems as part of the system being provided must be accepted by the Employer.
    a. Passive fire protection (spatial separation, fire walls, bunding, drainage etc) should be incorporated as part of the design as far as possible negating requirements for active systems.
    b. Manual fire protection (hydrants, hose reels, fire extinguishers) must be supplied in and around the contracted facility as determined by the Fire Protection / Detection Assessment. Water supply for hose reels and hydrants will be connected to the site existing fire water supply.
    c. Fire Protection and Fire Detection Systems must integrate with existing infrastructure on ERIC site.
- All required safety signs must also be supplied as part of this scope. Safety signs must be compliant to SANS as per Eskom Standard requirements.

4.8. Spares and Maintenance Requirements

The EPC contractor shall take the maintenance philosophy into consideration in the final selection. A detailed maintenance programme for a 15 year life span shall be compiled. It shall consist of the component list, model numbers and technical description including details of critical spares. Routine maintenance of the plant equipment shall be required at 6 months intervals for minor maintenance and yearly for major maintenance interventions.

4.9. Technical Risk Assessments

The contractor shall evaluate project risks and provide a risk register and baseline risk assessment.

4.9.1. HAZOP Studies

The Contractor shall carry out formal Hazard and Operability (Hazop) Studies. These studies shall be done in accordance with the requirements as laid down in the Eskom Hazop Guideline: 240-49230111.

4.9.2. FMECA (Failure Mode Effects and Criticality Analysis)

The Contractor shall carry out formal Failure Mode Effects and Criticality Analysis (FMECA). These studies shall be done in accordance with the requirements as laid down in the Eskom FMECA guideline: 240-49230046.

4.9.3. HAZLOC

The contractor shall carry out formal HAZLOC (Hazardous Locations) Study according to the following Standard: 240-56536505. It is the contractor's responsibility to ensure that all electrical and instrumentation equipment on the hydrogen plant comply with relevant hazardous locations South African National Standards referred to on 240-56536505.