Eskom	Strategy	Engineering

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Compiled by	Functional Responsibility	Authorised by
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Date: 2025/01/28	Date: 2025/01/28	Date: 2025/02/03

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1. INTRODUCTION

The excitation system forms part of the export system of the power station unit and is a critical component to the working mechanism of the generator. Medupi Power Station has six 940 MVA synchronous generators which are connected to the national grid. The purpose of the excitation system is to control the stator voltage of a generator.

The present excitation system is of the static type, which means that the main winding output of the generator is used to supply voltage to the excitation system. This is then rectified and supplied to the rotor windings via the brushgear. The AVR automatically adapts the excitation to meet the requirements of the generator. It varies the field current to meet the demand which allows the generator to be adequately controlled and operated anywhere within the generator capability diagram. Failure of the excitation system will result in a Unit trip.

2. SUPPORTING CLAUSES

The scope of this document is to define and document the Tender Technical Evaluation Strategy for the supply of the Medupi Power Station Excitation System.

2.1 SCOPE

The document describes the acceptable and unacceptable risks and qualifications and /or conditions.

The Tender Technical Evaluation Strategy will define the following technical evaluation criteria:

- Mandatory Evaluation criteria
- Qualitative Evaluation criteria
- TET Member Responsibilities
- Acceptable/Unacceptable Qualifications

No changes will be permitted to be made to the evaluation criteria once the Technical Evaluation Strategy is approved by the relevant Engineering Group Manager.

2.1.1 Purpose

The purpose of this Tender Technical Evaluation Strategy is to define the Mandatory Evaluation Criteria, Qualitative Evaluation Criteria and TET member responsibilities for tender technical evaluation. The technical evaluation strategy serves as basis for the tender technical evaluation process.

2.1.2 Applicability

This document applies to the Tender Evaluation Team for Regulators in accordance with the authorised procurement strategy.

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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] 240-48929482: Tender Technical Evaluation Procedure

[2] ISO 9001 Quality Management Systems

[3] 32-727 Eskom SHEQ Policy

[4] 240-168966153: Generation Tender Technical Evaluation Procedure

[5] 240-48929482 Tender Engineering Evaluation Procedure

[6] 241-2022610 Medupi Power Station Excitation Replacement Technical Specification

2.2.2 Informative

[7] NEC 3 Supply Contract

[8] 32-1033 Eskom Procurement and Supply Chain Management Policy

[9] 32-1034 Eskom Procurement and Supply Chain Management Procedure

[10] Eskom Standard 34-402 Standard for Non-lethal Energised Perimeter Detection System

2.3 DEFINITIONS

2.3.1 Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

Mandatory Evaluation criteria**:** (gatekeepers) are ‘must meet’ criteria.

Qualitative Evaluation criteria**:** are weighted evaluation criteria used to identify the highest technically ranked tenderer after determining that all the Mandatory Evaluation Criteria have been met.

2.4 ABBREVIATIONS

Abbreviation	Description
NEC	New Engineering Contract
TET	Technical Evaluation Team

2.5 ROLES AND RESPONSIBILITIES

As per 240-48929482: Tender Technical Evaluation Procedure

2.6 PROCESS FOR MONITORING

N/A

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2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. TENDER TECHNCIAL EVALUATION STRATEGY

3.1 TECHNICAL EVALUATION THRESHOLD

The minimum weighted final score (threshold) required for a tender to be considered from a technical perspective is 70%. A weighted score-card approach is used to evaluate the technical compliance of the tenders against the specifications. Tenderers must achieve a total weighted score of 70% or more to qualify for further evaluation.

The evaluation of the tender submissions will be based on the tenderer's ability to meet the Eskom Procurement and Supply Chain Management Procedure (32-1034) in conjunction with the Preferential Procurement Policy Framework Act (PPPFA), No.5 of 2000.

Note: Tenderers will be expected to score at least a minimum threshold of 70% points to proceed to the next phase. If tenderers score below 70%, points will be considered technically unacceptable. However, if all the received tenders score less than the threshold Eskom reserves the rights to negotiate with the tenderer who scored the most points.

3.2 TET MEMBERS

Table 1: TET Members

TET number	TET Member Name	Designation
TET 1	Simangaliso Nkosi	Chief Technologist – PTM Central (Excitation Control Systems)
TET 2	Gomotso Phokojoe	Kusile Senior Electrical Engineer
TET 3	Ntando Mbatha	Medupi System Engineer
TET 4	Frans Molebale	Medupi Senior Advisor
TET 5	Eddie Sebola	Kusile Senior Advisor
TET 6	Thambo Shiba	Medupi Configuration Management LDE
TET 7	Chuma Xayimpi	Kusile Configuration Management LDE
TET 8	Pakgadi Legodi	Medupi Civil LDE
TET 9	Lelethu Thipa	Kusile Civil LDE
TET 10	Lucky Mmadihlaba	Medupi C&I LDE
TET 11	Nzuzo Ndlovu	Kusile C&I LDE
TET 12	Chuma Ndzala	Medupi HVAC LDE
TET 13	Kunaal Dharamraj	Kusile HVAC LDE

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3.3 SCORING METHOD

Table 2 Scoring Method

Score	(%)	Definition
5	100	**COMPLIANT** Meet technical requirement(s) AND. No foreseen technical risk(s) in meeting technical requirements.
4	80	**COMPLIANT WITH ASSOCIATED QUALIFICATIONS** • Meet technical requirement(s) with; • Acceptable technical risk(s) AND/OR; • Acceptable exceptions AND/OR; • Acceptable conditions.
2	40	**NON-COMPLIANT** • Does not meet technical requirement(s) AND/OR; • Unacceptable technical risk(s) AND/OR; • Unacceptable exceptions AND/OR; • Unacceptable conditions.
0	0	**TOTALLY DEFICIENT OR NON-RESPONSIVE**

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3.4 MANADATORY TECHNICAL EVALUATION CRITERIA

All tenders will need to pass the mandatory section, the mandatory evaluation will be on a YES/NO basis as to whether the criteria are met or not. An assessment of “NO” against criteria will immediately disqualify the submission and no further assessment will be made. Refer to Table 3 for mandatory requirements.

Table 3: Mandatory Technical Evaluation Criteria

No.	Mandatory Technical Criteria Description	Tender Returnable	Criteria Motivation
1	Compliance to main international standards.	The excitation system complies with IEEE 421/IEC60034-16, SANS 60076, IEC 61850 standards, South African Grid Code Version 10.1 requirements, and Eskom standards.	Regulatory requirements and compliance to Eskom standards ensure the system is fit for purpose.
2	The tenderer providing the excitation system product is the OEM or authorised/licensed supplier.	The excitation system product provided by the tenderer bears the tenderers trademark and is the OEM, or alternatively, a signed letter is provided by the tenderer stating that they are authorised/licensed to supply, design and commission the associated excitation system product.	OEMs may refuse to support a product provided by an unauthorised supplier. This poses a significant risk to the integrity of the product provided and may also affect aftersales support negatively.
3	Remaining product life of more than 15 years after commissioning.	Schedule B	Investment protection to ensure that the system is supported for its design life.
4	A completed Schedule B is submitted as part of the Tender documents.	Schedule B	Required information to evaluate tenders is provided in a standard manner.

3.5 QUALITATIVE TECHNICAL EVALUATION CRITERIA

Table 4: Qualitative Technical Evaluation Criteria

Scoring criteria for qualitative assessment for each point below	<u>All criteria scoring will except number 23</u>: Full score = Compliant 0 = non-compliant *<u>For criteria number 23, scoring will as follow:</u>* 5 = Compliant 4 = Alternative Proposed with in minimum specification 2 = Alternative proposed that does not meet required specification 0 = non-compliant

No.		Qualitative Technical Evaluation Criteria	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
1		**General Requirements**		**4.80**
	1.1	Compliance to the specified Codes and Standards.	Refer to 241-2022610	0.48
	1.2	Delivery and Execution Capability	Refer to 241-2022610	0.48
	1.3	Installation method statement	Refer to 241-2022610	0.48
	1.4	System integration	Refer to 241-2022610	0.48
	1.5	All testing and commissioning requirements are met	Refer to 241-2022610	0.48
	1.6	All documents will be supplied as per the VDSS	Refer to 241-2022610	0.48
	1.7	Provide information on training to be provided i.e., training schedule	Refer to 241-2022610	0.48
	1.8	Spares available for duration of project execution as well as the for the design life of the ES which is a minimum of 15 years.	Refer to 241-2022610	0.48
	1.9	Reference list submitted indicating similar projects completed	Refer to 241-2022610	0.48

No.		Qualitative Technical Evaluation Criteria	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	1.1	Provide the product life cycle plan and technical support for the entire product life cycle	Refer to 241-2022610	0.48
2		**Supply of Scope**		**3.6**
	2.1	Design services for the system	Refer to 241-2022610	0.45
	2.2	Manufacturing & FAT	Refer to 241-2022610	0.45
	2.3	Shipping & transport	Refer to 241-2022610	0.45
	2.4	Removal and Installation	Refer to 241-2022610	0.45
	2.5	Cabling & racking	Refer to 241-2022610	0.45
	2.6	Testing & commissioning	Refer to 241-2022610	0.45
	2.7	Documentation & Settings	Refer to 241-2022610	0.45
	2.8	Special tools if required	Refer to 241-2022610	0.45
3		**Training & Documentation**		**2.6**
	3.1	Drawings will be supplied in both .pdf and DGN format	Refer to 241-2022610	0.52
	3.2	Mathematical Laplace models will be provided as part of the works	Refer to 241-2022610	0.52
	3.3	Engineering staff that can be trained - 8	Refer to 241-2022610	0.52
	3.4	Maintenance staff that can be trained - 12	Refer to 241-2022610	0.52
	3.5	Operating staff that can be trained - 15	Refer to 241-2022610	0.52
4		**Software and Licensing**		**2.69**
	4.1	Proprietary software licences will be provided	Refer to 241-2022610	0.94
	4.2	Operating system licence for PCs will be provided	Refer to 241-2022610	0.59
	4.3	Software migration plan to later operating systems when the operating system becomes obsolete	Refer to 241-2022610	1.16
5		**Engineering and Special Tools**		**2.36**
	5.1	Computer based systems have solid state drives	Refer to 241-2022610	0.59
	5.2	Duplicate internal cloned drive will be provided	Refer to 241-2022610	0.59

No.		Qualitative Technical Evaluation Criteria	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	5.3	3 x Notebook PCs included as special tools (fully licenced and configured as an Engineering tool)	Refer to 241-2022610	0.59
	5.4	Minimum of two tool sets will be supplied as required for maintenance activities	Refer to 241-2022610	0.59
6		**Functional requirements**		**5.6**
	6.1	Control system and settings are digital	Refer to 241-2022610	0.7
	6.2	Both channels each have an AVR and FCR in which any one is the master and the other is constantly following.	Refer to 241-2022610	0.7
	6.3	AVR has to be PID controller	Refer to 241-2022610	0.7
	6.4	FCR at least a PI controller	Refer to 241-2022610	0.7
	6.5	Test mode available on both channels	Refer to 241-2022610	0.7
	6.6	Voltage sensing three phase line-line	Refer to 241-2022610	0.7
	6.7	Stable parallel operation of machines possible without cross connection of measurement or control circuits.	Refer to 241-2022610	0.7
	6.8	PSS is of the 2B type supplied as specified by IEEE 421.5–2005	Refer to 241-2022610	0.7
7		**Redundancy**		**3.65**
	7.1	Controller electronics redundant for each channel	Refer to 241-2022610	0.73
	7.2	Converters bridges have at least N-1 redundancy	Refer to 241-2022610	0.73
	7.3	Cooling fans are redundant and have separate supplies for main and backup cooling fans	Refer to 241-2022610	0.73
	7.4	I/O modules for each channel are separate	Refer to 241-2022610	0.73
	7.5	Power supplies for each channel are separate	Refer to 241-2022610	0.73
8		**Conceptual Proposal by Contractor**		**2.36**
	8.1	Product offered for implementation technical and functional descriptions are provided for in the proposal.	Refer to 241-2022610	0.59
	8.2	Single line diagram is included in the proposal and applicable to the Medupi plant setup.	Refer to 241-2022610	0.59
	8.3	Plant interfaces are clearly indicated by means of the single line diagram or block diagrams.	Refer to 241-2022610	0.59

No.		Qualitative Technical Evaluation Criteria	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	8.4	Excitation system cubicle general layout, dimensions and weight are provided.	Refer to 241-2022610	0.59
9		**Interface Requirements**		**5.5**
	9.1	All networking components are provided by the Contractor	Refer to 241-2022610	0.55
	9.2	Communications protocol options provided	Refer to 241-2022610	0.55
	9.3	Time synchronization NTP	Refer to 241-2022610	0.55
	9.4	All control & tripping are done via hardwired methods	Refer to 241-2022610	0.55
	9.5	Digital inputs are Opto-couplers	Refer to 241-2022610	0.55
	9.6	Hardwired analogue quantities are 4-20mA	Refer to 241-2022610	0.55
	9.7	Outputs are relay contacts	Refer to 241-2022610	0.55
	9.8	Confirmation that all selected alarm signals will be interfaced to the unit control system via bus communication (PROFiBUS DP- CM104 communication module), except the alarms that have been strategically selected to be hardwired.	Refer to 241-2022610	0.55
	9.9	Analog indications are provided	Refer to 241-2022610	0.55
	9.10	Remote access to the system (only view and trending) and not compromising system security.	Refer to 241-2022610	0.55
10		**Control and Monitoring**		**6**
	10.1	Local HMI/GUI for local control and monitoring	Refer to 241-2022610	0.6
	10.2	Self-monitoring is provided to initiate channel changeover	Refer to 241-2022610	0.6
	10.3	VT fuse failure during initial excitation and once excited.	Refer to 241-2022610	0.6
	10.4	Lack of voltage sensing at start-up provided and described in detail.	Refer to 241-2022610	0.6
	10.5	Pre-set available in all modes (AVR, FCR & Test)	Refer to 241-2022610	0.6
	10.6	Soft start to pre-set in AVR mode	Refer to 241-2022610	0.6
	10.7	Built in step functions with adjustable limits	Refer to 241-2022610	0.6
	10.8	Converters have conduction or pulse monitoring	Refer to 241-2022610	0.6
	10.9	Field over current protection is also provided by an independent device	Refer to 241-2022610	0.6

No.		Qualitative Technical Evaluation Criteria	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	10.1	When the unit is on load and the HV breaker opens when the ES is in FCR mode, the FCR will go to a pre-set point.	Refer to 241-2022610	0.6
11		**Alarm and Status Indications**		**2.6**
	11.1	Remote comms alarms provided	Refer to 241-2022610	0.5
	11.2	Remote comms statuses provided	Refer to 241-2022610	0.5
	11.3	Local alarms provided on excitation HMI	Refer to 241-2022610	0.8
	11.4	Local statuses provided on excitation HMI	Refer to 241-2022610	0.8
12		**Fault Recorder**		**3.9**
	12.1	Minimum digital quantities	Refer to 241-2022610	0.39
	12.2	Minimum analogue signals	Refer to 241-2022610	0.39
	12.3	Minimum recording window	Refer to 241-2022610	0.39
	12.4	Trigger criteria	Refer to 241-2022610	0.39
	12.5	Pre-trigger	Refer to 241-2022610	0.39
	12.6	Export files as Comtrade	Refer to 241-2022610	0.39
	12.7	Time stamping of all events	Refer to 241-2022610	0.39
	12.8	Time synch to NTP	Refer to 241-2022610	0.39
	12.9	Local and remote data retrieval possible	Refer to 241-2022610	0.39
	12.1	Number of minimum events	Refer to 241-2022610	0.39
13		**Limiter and Protection Requirements**		**5.9**
	13.1	Flux limiter	Refer to 241-2022610	0.59
	13.2	Load angle/ Q(P)	Refer to 241-2022610	0.59
	13.3	Minimum field current limiter	Refer to 241-2022610	0.59
	13.4	Maximum field current limiter	Refer to 241-2022610	0.59
	13.5	Stator current limiter	Refer to 241-2022610	0.59
	13.6	Convertor DC short circuit protection	Refer to 241-2022610	0.59

No.	Qualitative Technical Evaluation Criteria		Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	13.7	Excitation transformer overcurrent protection in line with requirements	Refer to 241-2022610	0.59
	13.8	Over temp of converter, excitation transformers and rotor	Refer to 241-2022610	0.59
	13.9	Internal arc detection	Refer to 241-2022610	0.59
	13.1	Over voltage protection of converter and field winding	Refer to 241-2022610	0.59
14		**Field Flashing and soft start requirements**		**2.76**
	14.1	Field flashing monitoring provided	Refer to 241-2022610	0.69
	14.2	AC field flashing option provided	Refer to 241-2022610	0.69
	14.3	Adjustable ramp rate for soft start.	Refer to 241-2022610	0.69
	14.4	Flux limiter has priority over soft start	Refer to 241-2022610	0.69
15		**Field Suppression**		**2.2**
	15.1	Electronic crowbar provided	Refer to 241-2022610	1.1
	15.2	Circuit activation upon off or trip command	Refer to 241-2022610	1.1
16		**Limiter and protection requirements**		**2.67**
	16.1	Two independent trip coils	Refer to 241-2022610	0.9
	16.2	Control interlock when unit is synchronised	Refer to 241-2022610	0.59
	16.3	Auxiliary contacts (4 sets of N/O and N/C)	Refer to 241-2022610	0.59
	16.4	Mechanical operations counter included, non-resettable	Refer to 241-2022610	0.59
17		**Power Supplies**		**1.71**
	17.1	Auxiliary power supply transformers dry type	Refer to 241-2022610	0.57
	17.2	Diode decoupling after galvanic isolation	Refer to 241-2022610	0.57
	17.3	Overload indication and protection provided	Refer to 241-2022610	0.57
18		**Converter Assembly**		**2.04**
	18.1	Rated ambient operating temperature 40°C	Refer to 241-2022610	0.51
	18.2	Polarity changeover links are provided	Refer to 241-2022610	0.51
	18.3	Shunt for field current measurement provided	Refer to 241-2022610	0.51

No.	Qualitative Technical Evaluation Criteria		Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)
	18.4	6 pulse full wave Thyristor controlled type or IGBT pulse width modulator	Refer to 241-2022610	0.51
19		**Cubicles**		**3.43**
	19.1	Pad-lockable handles are provided to all cubicle doors	Refer to 241-2022610	0.49
	19.2	Segregation of excitation transformers provided	Refer to 241-2022610	0.49
	19.3	All cubicle doors supervised via limit switches	Refer to 241-2022610	0.49
	19.4	Framework is hot dipped galvanised	Refer to 241-2022610	0.49
	19.5	IP rating of excitation cubicles IP54CH	Refer to 241-2022610	0.49
	19.6	Panel compartment separation as per requirement	Refer to 241-2022610	0.49
	19.7	Material minimum thickness as per specification	Refer to 241-2022610	0.49
20		**Cooling Systems & Filtering**		**2.64**
	20.1	Cubicle filters easily replaceable/serviceable	Refer to 241-2022610	0.66
	20.2	Automatic changeover of main cooling fans to backup fans possible	Refer to 241-2022610	0.66
	20.3	Convertor stacks are NOT water cooled	Refer to 241-2022610	0.66
	20.4	Convertor airflow sensing is provided	Refer to 241-2022610	0.66
21		**Points of Isolation**		**0.99**
	21.1	DC field to the rotor circuit can be isolated with a padlock (positive and negative leg).	Refer to 241-2022610	0.99
22		**C&I**		**10**
		Complete Alarm list submitted with new alarms indicated.		10
23		**HVAC**		**10**
		See table below		10
24		**Civils**		**10**
		Excitation system complies with the current room dimensions and no modification is needed.		10
	TOTAL			**100.00**

No.	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)	Sub criteria weighting (%)	
23	**HVAC**		**10**		
23.1	**HVAC methodology**		**6%**		
	The contractor submits a detailed methodology for the HVAC scope of the project. If part of the works are to be subcontracted, the contractor must detail the specific works that are sub contracted. A letter of agreement between the contractor and sub-contractor must be provided. The method statement must cover as a minimum: Execution plan i.e. high-level work breakdown of deliverables as per technical specification. a) HVAC system re-design including heat loads up to equipment selection and design layouts b) Testing, installation, commissioning and balancing of HVAC system c) Maintenance and spares requirements d) Civil design e) Electrical design f) C&I design			100	5 = Excellent response which demonstrates the ability to deliver the service far more than minimum requirements. 4 = Good response detailing clearly how the service will be delivered above and beyond the minimum requirements. 2 = Barely adequate levels of required scope proposal. 0 = Less than minimum level of required scope proposal or irrelevant.

No.	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)	Sub criteria weighting (%)	
23.2	**General requirements**		**4%**		
23.2.1	**Organogram**				
	Organogram of the Proposed. Full Time Multidisciplinary. Project Team that includes each individual's years of relevant experience	Provide complete project team structure (organograms) and CVs based on the full scope of work i.e., site team organogram and design team organogram. CVs for engineers are not required in this section as its already evaluated on the mandatory. Organograms should clearly distinguish between all required engineering disciplines. Letter confirming the availability of the project team for the duration of the project. It is noted that team members may only be replaced with individuals of equal or higher levels of competence, after Client approval. Project team to include the following as minimum: • Mechanical, civil, electrical engineer • Site manager • General HVAC foreman • HVAC mechanical testing and commissioning technician. • HVAC electrical and electronics testing and commissioning technician • Quality Control Inspector • Project Manager/Contracts Manager • Project Planner • SHEQ team • Configuration and Document Management (KKS coding). • Quantity Surveyor/Cost Engineer		50	5 =All key project professional CVs submitted 4 = 8 out of 10 CVs received with relevant experience to the project 2 = 7 out of 10 CVs received with relevant experience to the project 0 = less than 7 CVs received and/or no relevant experience to the project

No.	Qualitative Technical Criteria Description	Reference to Technical Specification / Tender Returnable	Criteria Weighting (%)	Sub criteria weighting (%)	
23.2.2	Lead time	Lead time to mobilise team to execute the site investigations and design work after contract award.		50	5 = 1 week or less 4 = Between 1 and 2 weeks 2 = Between 3 and 4 weeks 0 = More than 4 weeks

3.6 TET MEMBER RESPONSIBILITIES

Table 5: TET Member Responsibilities

No		TECHNICAL CRITERIA	TET 1	TET 2	TET 3	TET 4	TET 5	TET 6	TET 7	TET 8	TET 9	TET 10	TET 11	TET 12	TET 13
1		**General Requirements**													
	1.1	Compliance to the specified Codes and Standards.	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.2	Delivery and Execution Capability	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.3	Installation method statement	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.4	System integration	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.5	All testing and commissioning requirements are met	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.6	All documents will be supplied as per the VDSS	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.7	Provide information on training to be provided i.e., training schedule	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.8	Spares available for duration of project execution as well as the for the design life of the ES which is a minimum of 15 years	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.9	Reference list submitted indicating similar projects completed	X	X	X	X	X	X	X	X	X	X	X	X	X
	1.10	Provide the product life cycle plan and technical support for the entire product life cycle	X	X	X	X	X	X	X	X	X	X	X	X	X
2		**Supply of Scope**													
	2.1	Design services for the system	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.2	Manufacturing & FAT	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.3	Shipping & transport	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.4	Removal and Installation	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.5	Cabling & racking	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.6	Testing & commissioning	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.7	Documentation & Settings	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.8	Special tools if required	X	X	X	X	X	X	X	X	X	X	X	X	X
3		**Training & Documentation**													
	3.1	Drawings will be supplied in both .pdf and DGN format	X	X	X	X	X	X	X	X	X	X	X	X	X
	3.2	Mathematical Laplace models will be provided as part of the works	X	X	X	X	X	X	X	X	X	X	X	X	X
	3.3	Engineering staff that can be trained - 8	X	X	X	X	X	X	X	X	X	X	X	X	X

	3.4	Maintenance staff that can be trained - 12	X	X	X	X	X	X	X	X	X	X	X	X	X
	3.5	Operating staff that can be trained - 15	X	X	X	X	X	X	X	X	X	X	X	X	X
4		**Software and Licensing**													
	4.1	Proprietary software licences will be provided	X	X	X	X	X								
	4.2	Operating system licence for PCs will be provided	X	X	X	X	X								
	4.3	Software migration plan to later operating systems when the operating system becomes obsolete	X	X	X	X	X								
5		**Engineering and Special Tools**													
	5.1	Computer based systems have solid state drives	X	X	X	X	X								
	5.2	Duplicate internal cloned drive will be provided	X	X	X	X	X								
	5.3	3 x Notebook PCs included as special tools (fully licenced and configured as an Engineering tool)	X	X	X	X	X								
	5.4	Minimum of two tool sets will be supplied as required for maintenance activities	X	X	X	X	X								
6		**Functional requirements**													
	6.1	Control system and settings are digital	X	X	X	X	X								
	6.2	Both channels each have an AVR and FCR in which any one is the master and the other is constantly following.	X	X	X	X	X								
	6.3	AVR has to be PID	X	X	X	X	X								
	6.4	FCR at least PI	X	X	X	X	X								
	6.5	Test mode available on both channels	X	X	X	X	X								
	6.6	Voltage sensing three phase line-line	X	X	X	X	X								
	6.7	Stable parallel operation of machines possible without cross connection of measurement or control circuits	X	X	X	X	X								
	6.8	PSS is of the 2B type supplied as specified by IEEE 421.5–2005	X	X	X	X	X								
7		**Redundancy**													
	7.1	Controller electronics redundant for each channel	X	X	X	X	X								
	7.2	Converters bridges have at least N-1 redundancy	X	X	X	X	X								
	7.3	Cooling fans are redundant and have separate supplies for main and backup cooling fans	X	X	X	X	X								
	7.4	I/O modules for each channel are separate	X	X	X	X	X								
	7.5	Power supplies for each channel are separate	X	X	X	X	X								
8		**Conceptual Proposal by Contractor**													
	8.1	Product offered for implementation technical and functional descriptions are provided for in the proposal.	X	X	X	X	X								

	8.2	Single line diagram is included in the proposal and applicable to the Medupi plant setup.	X	X	X	X	X									
	8.3	Plant interfaces are clearly indicated by means of the single line diagram or block diagrams.	X	X	X	X	X									
	8.4	Excitation system cubicle general layout, dimensions and weight are provided.	X	X	X	X	X									
9		**Interface Requirements**														
	9.1	All networking components are provided by the Contractor	X	X	X	X	X									
	9.2	Communications protocol options provided	X	X	X	X	X									
	9.3	Time synchronisation NTP	X	X	X	X	X									
	9.4	All control & tripping are done via hardwired methods	X	X	X	X	X									
	9.5	Digital inputs are Opto-couplers	X	X	X	X	X									
	9.6	Hardwired analogue quantities are 4-20mA	X	X	X	X	X									
	9.7	Outputs are relay contacts	X	X	X	X	X									
	9.8	Confirmation that all selected alarm signals will be interfaced to the unit control system via bus communication (PROFiBUS DP- CM104 communication module), except the alarms that have been strategically selected to be hardwired	X	X	X	X	X						X	X		
	9.9	Analog indications are provided	X	X	X	X	X									
10		**Control and Monitoring**														
	10.1	Local HMI/GUI for local control and monitoring	X	X	X	X	X									
	10.2	Self-monitoring is provided to initiate channel changeover	X	X	X	X	X									
	10.3	VT fuse failure during initial excitation and once excited.	X	X	X	X	X									
	10.4	Lack of voltage sensing at start-up provided and described in detail.	X	X	X	X	X									
	10.5	Pre-set available in all modes (AVR, FCR & Test)	X	X	X	X	X									
	10.6	Soft start to pre-set in AVR mode	X	X	X	X	X									
	10.7	Built in step functions with adjustable limits	X	X	X	X	X									
	10.8	Converters have conduction or pulse monitoring	X	X	X	X	X									
	10.9	Field over current protection is also provided by an independent device	X	X	X	X	X									
	10.10	When the unit is on load and the HV breaker opens when the ES is in FCR mode, the FCR will go to a pre-set point.	X	X	X	X	X									
11		**Alarm and Status Indications**														
	11.1	Remote comms alarms provided	X	X	X	X	X						X	X		
	11.2	Remote comms statuses provided	X	X	X	X	X						X	X		

	11.3	Local alarms provided on excitation HMI	X	X	X	X	X					X	X		
	11.4	Local statuses provided on excitation HMI	X	X	X	X	X					X	X		
12		**Fault Recorder**													
	12.1	Minimum digital quantities	X	X	X	X	X								
	12.2	Minimum analogue signals	X	X	X	X	X								
	12.3	Minimum recording window	X	X	X	X	X								
	12.4	Trigger criteria	X	X	X	X	X								
	12.5	Pre-trigger	X	X	X	X	X								
	12.6	Export files as Comtrade	X	X	X	X	X								
	12.7	Time stamping of all events	X	X	X	X	X								
	12.8	Time synch to NTP	X	X	X	X	X								
	12.9	Local and remote data retrieval possible	X	X	X	X	X								
	12.10	Number of minimum events	X	X	X	X	X								
13		**Limiter and Protection Requirements**													
	13.1	Flux limiter	X	X	X	X	X								
	13.2	Load angle/ Q(P)	X	X	X	X	X								
	13.3	Minimum field current limiter	X	X	X	X	X								
	13.4	Maximum field current limiter	X	X	X	X	X								
	13.5	Stator current limiter	X	X	X	X	X								
	13.6	Convertor DC short circuit protection	X	X	X	X	X								
	13.7	Excitation transformer overcurrent protection in line with requirements	X	X	X	X	X								
	13.8	Over temp of converter, excitation transformers and rotor	X	X	X	X	X								
	13.9	Internal arc detection	X	X	X	X	X								
	13.10	Over voltage protection of converter and field winding	X	X	X	X	X								
14		**Field Flashing and soft start requirements**													
	14.1	Field flashing monitoring provided	X	X	X	X	X								
	14.2	AC field flashing option provided	X	X	X	X	X								
	14.3	Adjustable ramp rate for soft start.	X	X	X	X	X								
	14.4	Flux limiter has priority over soft start	X	X	X	X	X								
15		**Field Suppression**													
	15.1	Electronic crowbar provided	X	X	X	X	X								
	15.2	Circuit activation upon off or trip command	X	X	X	X	X								

16		**Limiter and protection requirements**													
	16.1	Two independent trip coils	X	X	X	X	X								
	16.2	Control interlock when unit is synchronised	X	X	X	X	X								
	16.3	Auxiliary contacts (4 sets of N/O and N/C)	X	X	X	X	X								
	16.4	Mechanical operations counter included, non-resettable	X	X	X	X	X								
17		**Power Supplies**													
	17.1	Auxiliary power supply transformers dry type	X	X	X	X	X								
	17.2	Diode decoupling after galvanic isolation	X	X	X	X	X								
	17.3	Overload indication and protection provided	X	X	X	X	X								
18		**Converter Assembly**													
	18.1	Rated ambient operating temperature 35°C	X	X	X	X	X								
	18.2	Polarity changeover links are provided	X	X	X	X	X								
	18.3	Shunt for field current measurement provided	X	X	X	X	X								
	18.4	6 pulse full wave Thyristor controlled type or IGBT pulse width modulator	X	X	X	X	X								
19		**Cubicles**													
	19.1	Pad-lockable handles are provided to all cubicle doors	X	X	X	X	X								
	19.2	Segregation of excitation transformers provided	X	X	X	X	X								
	19.3	All cubicle doors supervised via limit switches	X	X	X	X	X								
	19.4	Framework is hot dipped galvanised	X	X	X	X	X								
	19.5	IP rating of excitation cubicles IP54CH	X	X	X	X	X								
	19.6	Panel compartment separation as per requirement	X	X	X	X	X								
	19.7	Material minimum thickness as per specification	X	X	X	X	X								
20		**Cooling Systems & Filtering**													
	20.1	Cubicle filters easily replaceable/serviceable	X	X	X	X	X								
	20.2	Automatic changeover of main cooling fans to backup fans possible	X	X	X	X	X								
	20.3	Convertor stacks are NOT water cooled	X	X	X	X	X								
	20.4	Convertor airflow sensing is provided	X	X	X	X	X								
21		**Points of Isolation**													
	21.1	DC field to the rotor circuit can be isolated with a padlock (positive and negative leg).	X	X	X	X	X								
22		**C&I**													
	22.1	Complete Alarm list submitted with new alarms indicated.	X	X	X	X	X					X	X		

23		**HVAC**														
	23.1	See HVAC TEC table	X	X	X	X	X							X	X	
24		**Civils**														
	24,1	Excitation system complies with the current room dimensions and no modification is needed.	X	X	X	X	X			X	X					

3.7 FORESEEN ACCEPTABLE / UNACCEPTABLE QUALIFICATIONS

3.7.1 Risks

Table 6: Acceptable Technical Risks

Risk	Description
1.	**N/A**

Table 7: Unacceptable Technical Risks

Risk	Description
1.	Technical specification that does not meet the scope of work.

3.7.2 Exceptions / Conditions

Table 8: Acceptable Technical Exceptions / Conditions

Risk	Description
1.	Declining to provide technical details accurately deemed intellectual proprietary
2.	In case of an obsolete specification, the supplier may provide proof from the manufacturer about obsolescence and new data sheets for the new specification will be acceptable.

Table 9: Unacceptable Technical Exceptions / Conditions

Risk	Description
1.	Deviation without technical qualification not accepted.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation	Signature
Jappie Morudu	Procurement Manager	
Lebo Pebane	Materials Management Manager	
Pontsho Letsholonyane	Contract Manager	
Portia Lutumbu	Electrical Maintenance Manager	
Kgalake Koma	Officer Procurement	

5. REVISIONS

Date	Rev.	Compiler	Remarks
January 2025	1	N. Mbatha	Final document for Authorisation

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Date	Rev.	Compiler	Remarks
October 2024	0	C. Matthee	Draft

6. DEVELOPMENT TEAM

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

7. ACKNOWLEDGEMENTS

None..

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