Eskom	Scope Of Work	Research, Testing and Development

Title: **Provision of Detailed Design, Technical support, Supply and Delivery for the Wind Measurements at Arnot and Camden Power Stations**

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1. INTRODUCTION

Eskom is undertaking the development of wind energy projects at Two (2) of its power station sites, namely Camden and Arnot. As part of the wind resource assessment campaign, Eskom will deploy Two (2) 160-meter guyed lattice meteorological masts and a single mobile Remote Sensing System (LiDAR unit) across these sites.

The objective is to establish high-quality, long-term wind measurement infrastructure to support feasibility studies, bankable resource assessments, and eventual project development.

This Scope of Work (SoW) pertains to **Package 1: Engineering and Data Management**, under a two-package structure, where:

1) **Package 1** (current scope) covers detailed engineering design, supply and delivery, construction supervision, commissioning supervision, operation, maintenance, and data management for a period of two years.
2) **Package 2** will address the physical construction, installation, and commissioning of the measurement infrastructure. Package 2 is not part of this scope.

The wind measurement infrastructure will be deployed as follows:

- **Camden Power Station:** One (1) met mast
- **Arnot Power Station:** One (1) met mast

Additionally, one (1) mobile LiDAR unit will be utilised rotationally across all two (2) sites to supplement the met mast data, enable vertical wind profiling beyond 160 meters where required, and support data correlation during mast installation sequencing.

1.1 Site Locations

Site 1: Camden PS

Camden PS is situated about 18km from Ermelo and 106km from eMkhondo (Piet Retief) in the Mpumalanga Province of South Africa next to the N2 national road between Mpumalanga and KwaZulu Natal. The GPS coordinates for the power plant is 26°34'58.56"S, 30°03'34.98"E. The elevation is 1667m above mean sea level.

Figure 1: Camden PS Proposed Met Mast

Site 2: Arnot PS

Arnot PS is situated about 50km East of Middleburg in the Mpumalanga Province of South Africa. The GPS coordinates for the power plant are 25°57'12.56"S,29°50'4.97"E. The elevation is 1677m above mean sea level.

Figure 2:Arnot PS Proposed Met Mast Location

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the package 1 scope of work (SoW) for the detailed engineering design, supply and delivery, construction supervision, commissioning supervision, as well as the two

(2) year operation, maintenance, and data management of the wind measurement infrastructure, comprising the 160-meter meteorological masts and the mobile LiDAR unit.

2.2 PURPOSE

The purpose of this document is to define the Scope of Work and outline the technical requirements for the detailed engineering design, supply & delivery, construction supervision, commissioning supervision, as well as the two (2) year operation, maintenance, and data management of the wind measurement infrastructure, comprising the 160-meter meteorological masts and the mobile LiDAR unit.

2.3 APPLICABILITY

This document applies to Camden PS, Arnot PS and Research, Testing and Development

2.4 NORMATIVE/INFORMATIVE REFERENCES

NORMATIVE

[1] ISO 9000: Quality Management Systems.

[2] Occupational Health and Safety Act (Osh Act; Act 85 of 93)

[3] World Bank Report Rev Camden Thermal Power Plant Technical Analysis on retiring and repurposing four coal plants, South Africa (30. November 2022)

[4] 240-6860471: Design Base Standard

INFORMATIVE

[5] 240-53113953 Manage Engineering Accountability Procedure

[6] 240-53114026 Project Engineering Change Management Procedure

[7] 240-53114002 Engineering Change Management Procedure

[8] 240-50317699 Manage Technical Queries Procedure

[9] 240-53114194 Control of Non-conforming Product

[10] 240-53113685 Design Review Procedure

[11] 240-48929482 Tender Technical Evaluation Procedure

[12] 240-49910527 Procedure for Plan and Select Technologies

[13] 240-76992014 Project/Plant Specific Technical Documents and Records Management Work Instruction.

[14] Department of Environmental Affairs, National Environmental Management Act, 1998, (Act 107 of 1998), Amendment of the Environmental Impact Assessment Regulations Listing Notice 1 of 2014

2.5 DISCLOSURE CLASSIFICATION

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

2.6 INTERPRETATION AND TERMINOLOGY

Term	Definition
LIDAR	LIDAR (Light Detection and Ranging) is a remote sensing device that measures wind speed and direction in the atmosphere using laser beams. It *Works* by emitting short pulses of laser light into the atmosphere and measuring the time it takes for the light to bounce off aerosols or molecules in the air. By analyzing the Doppler shift of the returned signals, the instrument can determine the speed and direction of the wind at various altitudes.

2.7 ABBREVIATIONS

Abbreviations	Description
ATNS	Air Traffic Navigation Services
CAA	Civil Aviation Authority
C&I	Control and Instrumentation
CAD	Computer Aided Design
COC	Certificate Of Compliance
IEC	International Electronical Commission
OHSA	Occupational Health and Safety Act
PS	Power Station
ECSA	Engineering Council of South Africa
NEMA	National Environmental Management Act
LV	Low Voltage
LED	Light Emitting Diode
SANS	South African National Standards
SoW	Scope of Work
OHSA	Occupational Health and Safety Act
P&ID's	Piping and Instrumentation Diagrams
PFD	Process Flow Diagram

PPE	Personal Protective Equipment
PTW	Permit To Work
QA	Quality Assurance
QC	Quality Control
QCP	Quality control program/plan/procedure

OEM	Original Equipment Manufacturer
SHE	Safety, Health & Environmental
SHEQ	Occupational Safety, Health, Environmental, and Quality
SOW	Scope Of Work
LIDAR	Light Detection and Ranging
WGS	World Geodetic System
TMH	Technical Methods for Highways

3. SCOPE OF WORK

The Scope of Work outlines the primary responsibilities assigned to the Contractor. It is the *Contractor's* responsibility to ensure that all activities necessary for the successful completion of the Works are carried out in full compliance with these Employer's Requirements.

The *Contractor's* scope of work includes, but is not limited to, the following activities:
Managing and delivering all aspects required for the successful completion of the Project. This includes, but is not limited to: conducting studies, developing designs, performing engineering services, securing permits and licenses, overseeing manufacturing, conducting factory acceptance testing, arranging shipping to site (including customs clearance and import duties), project management, cost tracking, supervision, documentation, workforce management, supervision of on-site construction and installation, progress reporting, supervision of commissioning, risk management, final testing, handover, training, and any other tasks necessary for the execution of the Works.

Exclusions:
The Scope of Work: site construction, erection, installation and commissioning works are not included in this package and are the responsibility of the Package 2 Contractor.

The Contractors *works* comprises the following:

a) Detailed Engineering Design

- Geotechnical investigations into all areas required for the Contractor's design. The geotechnical investigation Works will also include geophysical surveying to ensure that no underground services are impacted during the geotechnical investigation
- Site specific structural and geotechnical design of 160 m guyed lattice towers (including foundations and anchoring systems).
- Development of mast layouts compliant with the applicable IEC 61400-12-1 and IEC 61400-50 series including:
    - Sensor configuration (height, orientation, boom length)
    - Logger and power system layout
    - Communication and remote access architecture
- Design of solar PV and battery backup systems to power both the met masts and the mobile LiDAR unit.
- Incorporate Eskom's operational and SHEQ requirements into design.
- All designs must be prepared and signed off by a registered ECSA professional engineer.
- Develop the detailed Scope of Work for Package 2 based on the approved engineering designs.
- The Contractor's design is required to be accepted by the Employer before any procurement and construction begins.

b) Permitting and Licensing

- Obtain all necessary permits, licenses, and approvals from relevant authorities.
- Ensure compliance with all legal, regulatory, and project specific requirements.

c) Procurement, Manufacturing, and Factory Testing

- Procure all plant, equipment, and materials as specified.
- Manage manufacturing processes, ensuring all items conform to design and quality requirements.
- Carry out factory acceptance testing (FAT) for critical components, with full documentation and quality records.

d) Logistics and Delivery to Site

- Package, label, and prepare all goods for transport in accordance with technical and safety standards.
- Arrange for shipping and delivery to site, including handling of customs clearance
- Provide advance notice and coordination with the Package 2 Contractor for delivery timelines and storage requirements.

e) Construction Supervision

- Provision of full-time or part-time construction supervision services during the implementation of Package 2.
- Oversee foundation works, mast erection, sensor mounting, cabling, and commissioning activities.
- Ensure compliance with approved engineering designs, IEC standards, and Eskom SHEQ protocols.
- Validate installation quality, inspect critical stages, and confirm correct tensioning, alignment, grounding, and boom orientation.
- Sign off on as-built documentation and installation records.

f) Project Management and Reporting

- Manage project integration, schedule, cost, quality, resources, procurement and risks.
- Maintain open communication with the Employer and Package 2 Contractor, providing regular progress updates.
- Prepare and deliver all required technical and quality documentation.

g) Handover and Integration with Package 2

- Coordinate closely with the Package 2 Contractor to ensure that site delivery, storage, and handover of equipment and documentation are seamless and timely.
- Participate in joint planning meetings and interface management with Package 2.
- Support Package 2 during the installation and commissioning phase by providing technical assistance, clarifications, and training as required.

h) Integration and Coordination with Package 2

- The Package 1 Contractor shall ensure all designs, documentation, and deliveries are fully aligned with the requirements and schedule of Package 2.
- Interface and coordination protocols will be developed and agreed to facilitate smooth transitions and minimise risks at all package interfaces.

- Package 1 will participate in handover inspections, perform integrity checks, technical reviews, and commissioning support activities with Package 2.

i) Operation and Maintenance (Two-Year Period)

- Operate and maintain all two meteorological masts and the mobile LiDAR unit for 24 months post-commissioning.
- Conduct periodic inspections, system diagnostics, calibration checks, battery maintenance, and cleaning of sensors and panels and other maintenance related tasks of the installed equipment.
- Respond to faults and ensure system availability.
- Maintain spares inventory and fault response plan;
- Submit quarterly O&M reports detailing system health, maintenance performed, incidents, and downtime analysis.

j) Wind Data Management and Reporting

- Ensure continuous recording, storage, quality assurance, and secure transmission of wind data.
- Apply data validation, flagging, and quality control in accordance with IEC and industry best practices.
- Apply data validation protocols (e.g., range checks, flagging, filtering), aligned with industry best practices.
- Provide Eskom with unrestricted access to the data, both during and after the contract period;
- Submit validated monthly wind data reports, with accompanying system availability summaries and calibration records.
- Assign qualified personnel with minimum 3 years' experience in wind resource analysis and reporting
- Provide a detailed analysis report on the available wind resource.

k) Skills transfer and training to

- Prepare Eskom to operate, maintain and support the installed system.
- Eskom Employees on wind data measuring monitoring services and analysis.
- Provide Eskom with operating and maintenance manuals, training manuals, technical manuals, spares list, design drawings & diagrams, Engineering baseline management documents, Plant Risks and mitigation plans.

4. MANAGEMENT AND START UP

4.1 QUALITY MANAGEMENT

The *Employer* places emphasis on the provision of a comprehensive Quality Management System (QMS) for all phases of the project. The QMS shall comply with the requirements of ISO 9001. The Contractor and all of the *Contractors'* suppliers shall hold a valid certificate of compliance for their QMS to the requirements of ISO 9001:2008. The *Employer* may at his sole discretion carry out an audit any supplier or sub-supplier QMS for compliance.

Documents submitted for review and acceptance by the *Project Manager* after the Contract Date and prior to the commencement of work.

The *Contractor* submits a fully detailed Quality Control Plan for acceptance within two weeks of the Contract Date.

No work is allowed on Site until the *Employer* accepted the Quality Control Plan.

The *Contractor* utilises the *Employer's* quality documentation or NEC forms whichever applicable for requesting access, erection checks etc. These request forms are to be submitted to the *Supervisor* at least one week prior to the requested activity, or as agreed to by the *Project Manager*.

Apart from any statutory data packages required, the *Contractor* also compiles a data package of the relevant drawings, test certificates etc. for each section of work which is to be reviewed and signed off by the *Supervisor* at erection check stage prior to the commencement of the commissioning phase.

4.2 CONFIGURATION AND DOCUMENTATION MANAGEMENT

Any documents received during the *Works* such as datasheets, drawings, operating manuals, maintenance manuals for equipment supplied must be stored in accordance with the station specific configuration management procedure.

4.2.1 Documentation Management

The *Contractor* establishes a document tracking system to record the dates for the supply and receipt of all drawings and requests for information.

4.2.1.1 Document identification

The *Contractor's* documents and all documentation in the Master Document List (MDL) template are sent to the Employer. The *Contractor* provides all documentation/drawings in accordance with the Vendor Document Submittal Schedule (VDSS). The *Contractor's* documents and all documentation are sent to the Employer in the Master Document List (MDL) template. The VDSS is revisable and changes must be discussed and agreed upon by all parties. Changes in the VDSS can be additional documentation

4.2.1.2 Documents Submission

All project documents must be submitted to the delegated *Employer* Representative with transmittal note according to Project/Plant Specific Technical Documents and Records Management Work Instruction (240-76992014). To portray a consistent image, it is important that all documents used within the project follow the same standards of layout, style and formatting as described in the Work Instruction above. The *Contractor* is required to submit electronic documents using SharePoint Transmittal and Eskom large file transfer system http://zendto.eskom.co.za. Hard copies must be delivered to the delegated *Employer* representative with the transmittal note.

4.2.1.3 Drawings Format and Layout

- The creation, issue and control of all Engineering Drawings will be in accordance to the latest revision of 240-86973501 Engineering Drawing Common Requirements Standard.
- Drawings issued by the Contractor will be a minimum of one hardcopy and an electronic copy in native CAD (.dwg/. dgn) format. No drawings in .tiff or any other electronic format will be accepted.
- Issued drawings will not be “Right Protected” or encrypted.
- All drawings are A3 size unless otherwise stated. The Contractor shall use the Employer border frame for all drawings and the Contractor insert their own title block also on the frame. The title block of the Contractor contains the following: Contractor drawing number, Contractor drawing description, Contractor drawing revision, Contractor drafts person signature and date, Contractor’s drawing verifier signature and date and Contractor’s drawing approver signature and date.
- All drawings shall have a grid and referencing indicating the drawing number, sheet number and grid code for all contents etc.
    - The Contractor shall not provide any drawing to the Employer if the drawing was not signed by the Contractor’s draft person, Contractor’s drawing verifier and the Contractor’s drawing approver.
    - The *Contractor* awaits acceptance, during the period of reply specified in the Contract, prior to submitting a final drawing for construction.
    - Updated versions of a document or drawing must include a compilation of any comments provided by the Employer regarding the preceding version, if applicable, along with the Contractor's response/actions taken. Modifications must be documented in a revision table within each drawing or document

4.2.2 Plant Identification

4.2.2.1 Plant Coding Allocation

Coding of the design will be based on the Power stations specific coding system and the Employer will undertake the coding in line with Power Stations Label Specification and Plant Codification Procedure (240-64550692). The coding system shall be applied during the design review stage(s) and cross referenced to all arrangement drawings, schematics, wiring diagrams, instructions, and manuals and where practical to spare parts list/manuals. The *Contractor* will be required to include allocated coding to the electronic design drawings.

4.2.2.2 Configuration change control

Any changes to the design baselines will be formally managed according to the Employer Project Engineering Change Procedure (240-53114026). All design reviews will be conducted according to the Design Review Procedure (240-53113685).

4.3 ENVIRONMENTAL CONSTRAINTS AND MANAGEMENT

The *Contractors* adheres to all applicable Environmental Acts including all latest amendments and regulations in the *services* including but not limited to the following:

- National Environmental Management Act (NEMA)– Act 107 of 1998
- National Water Act - Act 36 of 1998
- National Environmental Management: Waste Act - Act 59 of 2008
- National Environmental Management: Biodiversity Act (NEMBA), Act 10 of 2004
- National Environmental Management: Protected Areas Act (NEM:PAA), Act 57 of 2003

4.4 CONTRACTOR'S MANAGEMENT, SUPERVISION AND KEY PEOPLE

1) The Contractor is required to submit a preliminary organogram together with CVs of all key persons including Subcontractor's at tender stage and two (2) weeks after contract award.
2) The organogram submitted at tender stage is required to contain the following key people as a minimum:
   - Project Manager
   - Lead Mechanical Design Engineer
   - Lead Civil/Structural Design Engineers
   - Lead Electrical Design Engineer
   - Lead Control & Instrumentation Design Engineer
   - Lead Geotechnical professional
   - Wind Resource Analyst/Engineer
   - Commissioning engineer/technician/technologist
   - Maintenance engineer/technician/technologist
   - Operations engineer/technician/technologist

All lead design Engineers are professionally registered as an Engineer with ECSA

5. ENGINEERING AND THE CONTRACTOR'S SERVICES

5.1 CONTRACTORS DETAILED DESIGN SCOPE

The *Contractor* is required to carry out a detail design for execution for acceptance. The *Contractor* is to carry out this work in accordance with the requirements and standards indicated in section 11.0 and with the required legal and statutory requirements.

The *Contractor's* scope of work included but is not limited to:

- Detail design, supply, supervision of construction work, supervision of commissioning work, maintenance, operating, wind resource assessment, quality control, of the *works* for a fully operational and functional Plant (including C&I, Electrical, Mechanical and Civil/Structural),
- The *works* is designed for constructability, supportability, operability, availability, reliability, and maintainability.

5.1.1 Responsibility for Design

1) The Contractor takes full professional accountability and liability for all designs done by the Contractor.

2) All designs, design reports, Construction drawings, as built drawings and other deliverables as indicated in the latest revision of 240-86973501 prepared by the Contractor are signed off by an ECSA Professionally registered Engineer who takes full professional accountability for the designs.

3) The Contractor's design is required to be in accordance with all National Standards and Specifications referenced in this Scope as well as the Employer's Standards referenced in Annexure in 11.0. Specifications referenced within referenced documents are also adhered to.

5.1.2 Meteorological Masts Locations

The Contractor shall confirm the location provided by Eskom. The mast location selection shall comply to the IEC 61400-12 standard.

The location shall take into consideration but not limited to the following:

- The mast shall be located in areas with non-complex terrain and minimal obstacles.
- The mast shall be placed in the main wind direction with no obstructions ahead of the mast as per the IEC 61400-12 standard.
- The mast shall be placed away from obstacles that could create turbulence.
- The placement of the mast shall be in the wind turbine placement area or as close as possible to it at the highest point.

The mast shall be placed away from power lines (outside servitude areas) and environmental sensitive areas as defined in NEMA.

5.1.3 Site Conditions

- The *Contractor* ensures that the structures are designed to accommodate the site-specific ambient conditions.
- The site design life for the Met guyed Lattice Tower shall be a minimum of twenty (20) years.

5.1.4 Guyed lattice meteorological towers

The scope of the tower is described below but not limited to the following:

- Design and supply of a climbable guyed three-face lattice tower of 160m total height. Guyed Lattice tower climbing steps shall be incorporated for ease of maintenance, repairs, and upgrades and not applicable where the tower is designed to be climbable.
- Design, fabricate, inspect/test, supply of a Remote Sensing system (lidar units)
- The design of the structure shall also comply to Eskom Structural Design and Engineering Standard 240-56364545
- Geotechnical investigation for tower foundation design
- Tower foundation design and supervision of civil construction work
- Tower grounding with lightning protection.
- All guy wires, anchors, and other equipment with adequate climatic protection required for installation.
- Aviation lighting system conforming to South African CAA requirements in Technical Standard CAR 139.01.33 including LED lights, solar panels, battery backup, and lighting controller.
- Aviation painting conforming to South African CAA requirements in Technical Standard CAR 139.01.33
- Climbing safety system.
- Fabrication of booms and risers for meteorological equipment per site.
- To stabilise the met masts, each mast will have ground anchors. The guy wires attach the met mast tower to the ground at different heights.
- All required tower erection and boom mounting hardware with adequate climatic protection suitable to both sites.
- Provide all required instrumentation, cables, and instrument enclosures and detailed specifications.
- Data logger and enclosure and detailed specifications.
- Communications equipment and detailed specifications.
- Met guyed Lattice Tower shall be galvanised to applicable ISO 1461 for all sites.
- All the Meteorological guyed Lattice Tower and Lidar unit shall be provided with power using solar panels and battery backups.
- Guyed Met Lattice Tower supplied shall be designed in accordance with British Standard 8100 & British Standard 5950 or relevant South African standard. Type test certificates of the Met guyed Lattice Tower shall be submitted for review and acceptance by Eskom. The site design life for the Met guyed Lattice Tower shall be **at least twenty (20) years**.

- . Six monthly routine inspection and maintenance of the tower and its instrument for a two-year period after commissioning which include but not limited to structural and guy wires inspection and maintenance.

5.2 SPECIFICATIONS OF GUYED LATTICE METEOROLOGICAL TOWERS

5.2.1 Tower

Towers will be standard guyed three face lattice type with total height of 160 meters. The Contractor to provide tower engineering, design, and certification. Scope includes tower and guy anchor foundation design and geotechnical investigation. Tower scope includes finish painting and solar powered lighting system. Marking and lighting shall conform to CAA requirements in Technical Standard 139.01.33. Tower will include an integral climbing safety system.

5.2.2 Booms

The Contractor shall determine the number of instrument mounting booms required per tower that will be supplied per site. Final boom design is the responsibility of Contractor. Boom and riser design should be per recommendations of IEC 61400-12-1, 2017. Adapters may be required for instrument mounting. Boom design should minimize boom deflection during normal operation. Boom designs should be submitted for review and accepted by Eskom before fabrication.

5.2.3 Instrumentation and Mounting Heights

The Contractor shall determine the suitable type, quantity and placement height of all meteorological sensors and data loggers. **Not limited to**, the Contractor should cater for six (6) wind vanes, six (6) Anemometers, three (3) Temperature/ Relative Humidity, three (3) Barometric Pressure Instruments and one (1) Leaf Wetness sensor. The instrumentation required must be adequate for the required height (160m) of the meteorological mast.

At each met mast site, the instruments should be oriented facing the predominant wind direction. "Predominant Wind Direction" describes the direction in which the wind blows from most of the time. To position the measuring instruments, the Contractor must use weather station wind data (Wind rose) to determine which wind direction is predominant.

The data from the met masts will be automatically routed to the datalogger which transfers the data to a server and then to a receiving base for monitoring and analyses.

In addition to the instruments, the following will be installed on the mast:

- Solar panel and battery to provide power to the mast, enabling it to transmit the daily data file.
- Lightning rod at the tip of the mast to conduct lightning down the mast through a copper cable, which is earthed at the foundation.
- Aviation (obstacle) lighting and visibility markers will be provided in compliance with the CAA regulations.

- Adapters may be required for instrument mounting. The Contractor shall provide all adapters for sensor installation with the data sheets (It shall form part of the design package submitted to Eskom for approval).

5.3 METEOROLOGICAL SENSORS AND DATA LOGGER

- Design, procurement of anemometers, wind vanes, and other sensors as described in the attached summary of instrumentation and mounting heights.
- All required adapters and sensor cabling for the sensors, including sufficient cable slack.
- Procurement and supply of a micro-logger including solar panels, battery, and terminal block, and weather tight enclosure.
- Mounting brackets for enclosure.
- Compact Flash module and Compact Flash card for local data storage.; and should be capable of storing data for a minimum period 30 days without overwriting the stored data.
- GPRS modem and antenna compatible with South African GSM cellular service
- Data logger maybe setup to continuously transmit to a central gateway device which can then upload the data to a local network or cloud using ethernet or cellular.
- Micro-logger programming
- Confirm Sensor installation and commissioning
- The Contractor shall provide all datasheets (It shall form part of the design package submitted to Eskom for approval).

5.4 LIDAR UNIT AND SOFTWARE SERVICE WARRANTY AND SUPPORT

The contractor supply a functional Lidar unit which is powered by a solar system and has a trailer for transporting . The Lidar unit is mobile and will move from one site to another to further reduce wind resource uncertainty. The contractor is responsible for moving the Lidar unit from identified sites.

The Lidar units shall be supplied with appropriate software service warranty and support for two-year period. The two-year term commences upon commissioning of the Lidar Units at its first measurement site or test location. The appropriate software shall allow the team to monitor the Lidar daily and report any issues to Employer within 24hours of business for rapid repair or other remedial action if required. It shall also allow to carry out remote diagnostics to ensure that problems are rectified as efficiently as possible in the field. The Contractor shall also provide after sale service and support. The Contractor will provide any software upgrades supportable by the Employer's software system at no charge to the Employer. All warranty repairs shall cover all events arising from normal operation of the appropriate software system at no cost to the Employer. If a warranty repair trip is needed, the contractor will schedule the trip to occur as fast as practicable at no charge to the Employer. Labour, transport and spare parts for warranty repairs will be for Contractor's expense.

The Contractor shall provide an option to Eskom to enable to view live data performance, analysis features; fast data export and secure data storage from software. The Contractor must also provide to Eskom a second option for File Transfer Protocol (FTP). This shall enable quick download of data on a monthly period from an FTP site rather than accessing live software.

The software online system shall provide access to a web-based wind data service with functionality for:

- Data uploading from wind data measurement devices
- Data archiving of wind data
- Data review of current and historical data
- Data export and downloading
- Analytics, such as custom reporting and charting

5.5 CONTRACTORS WORKS EXPERIENCE

1) The Contractor must demonstrate a minimum of three years' experience in supplying, installing and commissioning of meteorological towers of heights ≥ 100m and sensors successfully.
2) The Contractor must have traceable references adequately proving that at least One (1) or more contracts of similar scope (Erecting of a Met Mast Towers of height ≥100m) were successfully completed with added experience in the Towers maintenance and wind data monitoring, evaluating, and reporting.
3) The contractor ensures that all installations of the meteorological towers, booms and sensors shall comply with IEC 61400- 12-1. Met guyed Lattice Tower supplied shall be designed in accordance with British Standard 8100 & British Standard 5950 or relevant South African standard.

5.6 RESPONSIBILITY FOR DESIGN

1) The Contractor takes full professional accountability and liability for all Works performed.
2) All designs, design reports, Construction drawings, as-built drawings and other deliverables as indicated in 10.2 prepared by the Contractor are signed off by an ECSA Professionally registered Engineer who takes full professional accountability for the designs.
3) The Contractor's design and execution of the Works is required to be in accordance with all National Standards and Specifications referenced in this Scope as well as the Employer's Standards referenced in Annexure 17. Specifications referenced within referenced documents are also adhered to.
4) All the designs are subjected to the Employer's acceptance prior to the Execution of the Works as per the conditions of NEC3 Engineering Construction Contract
5) Prior to the execution of the Works, the Contractors detailed design of the Works shall be executed only and once review & approval of the designs has occurred. The review & approval shall be submitted to the employer.
6) The Contractor is solely responsible for providing the protection of the equipment from damage or loss due to weather, fire, theft, unexplained disappearance or similar during the execution of the Works
7) The liability of the use of such equipment in the execution of the Works shall remain that of the Contractor.
8) The Contractor's Professional Engineer conducts the necessary inspection during execution to the sign-off and certify the Works

6. DESIGN SERVICES

6.1 Design Considerations

The design should consider the followings considerations

6.1.1 General Design and Manufacturing Process Constraints

In providing the *works*, the *Contractor* is fully responsible for the delivery to, offloading and storage of all plant, equipment and materials required for the *works* on site. The *Project Manager* reserves the right to carry out any checks of his/her own on any plant, equipment and materials that have been delivered to site for the *works*.

The *Contractor* is fully responsible for the Supervision of installation of all mechanical, civil, electrical, process control and instrumentation components, equipment and material as well as the interfacing and tie-ins with existing plant and equipment as required for the *works*.

The *Contractor* is responsible for the complete optimisation of the *works* to meet or exceed the guaranteed performance levels.

6.1.2 Engineering Design

The Contractor shall be responsible for the detailed design & manufacture of the new 160m 1000/484 guyed lattice mast.

- All design drawings must be done in Computer Aided Drawing (CAD) and A0 pdf format and provided to Eskom electronically. Drawings must be Microstation/Bentley view compatible.
- The Contractor must specify the necessary corrosion control measures to be applied on the tower structure.
- The contactor must comply with the Civil Aviation Organisation Authority) stipulations on obstruction painting and obstruction lighting. Lighting must be supplied in 24Vdc if possible.
- The Contractor must clearly specify the tower structure base foundation requirements and the appropriate concrete (minimum 25 MPa) and steel design thereof. Provide Y-bar detailing and cover per environmental exposure class.
- The Contractor must ensure that the design includes adequate information concerning the structure and any materials and substances.
- The Contractor shall consider the risks involved with the different methods of construction when selecting appropriate design features and materials.
- The Contractor shall make clear the principles of the design and describe any special requirements or assumptions made for the purposes of construction, maintenance, and eventual removal.
- The Contractor must take cognisance of the geotechnical investigation findings on soil and wind conditions at identified site for purposes of determining bearing pressures (vertical and horizontal), other sub-surface conditions, the suitable foundation type (reinforced concrete blocks, standard pad and column, raft, preset rock anchors or piles), construction materials and installation method.

6.1.3 Civil & Structural Design

The *Contractor* is responsible for the Civil and Structural detailed design.

6.1.3.1 General

1) All structures shall be designed in accordance with the following code of practice (latest revisions:
   - The design of the structure shall also comply to Eskom Structural Design and Engineering Standard 240-56364545
   - Vertical, wind and seismic loading: SANS 10160 . Basis of structural design and actions for building and industrial structures.
   - Concrete work: SANS 10100:2000. The structural use of concrete.
   - Steel work: SANS 10162: 2011. The structural use of steel.

   Other acceptable international codes of practice and/or standards may be used in cases where the above codes do not cover the design requirements.
2) Construction shall be carried out in accordance with the relevant sections of SANS 1200, standardized specification for civil engineering construction. Where feasible, the Contractor shall minimise the construction footprint to within the final guy wire spread, including laydown area.
3) The Contractor is responsible for the detailed design of the entire Works.

4) The Contractor is required to submit detailed drawings for construction signed by an ECSA registered Professional Engineer/Technologist. These drawings are in accordance with the Constructability Assessment Guideline (240-107981296)
5) The Contractor is required to submit a comprehensive design report signed by an ECSA registered Professional Engineer
6) Design reports include all information related to the design including but not limited to the following:
    - Project name
    - *Contractor*'s name
    - Contract No.
    - Date of calculation
    - Revision No.
    - Name of the item
    - Page No.
    - Assumptions used for design purposes.
    - Codes and standards used.
    - Computer programmes used.
    - Loading imposed by structures, plant and equipment during the erection, commissioning, operation and maintenance.
    - Safety factors and combinations of loads used.
    - Detailed calculations of all components
    - Settlement of plant and equipment foundations
    - Reference sources (including textbooks and design manuals used)
    - Reference to the appropriate drawings
    - Selected materials and finishes.
    - Manufacturer's technical specifications
    - Survey drawings
    - Design criteria/parameters
    - Design models
    - Software input information
    - Software outputs
    - Sources of information and any record of other information associated with the completed *Works*.
7) The Contractor also adheres to the requirements for design reports indicated in 240-56364545
8) - Structural Design and Engineering Standard.
9) The detailed design report in conjunction with the drawings contains sufficient information at a level of detail allowing a complete re-analysis and redesign of the infrastructure.
10) The Contractor submits all calculations files, software models, and drawings in native electronic format to the Employer. The Contractor considers the Employers Design Review Procedure (240-53113685) as stipulated in Section 3 of the NEC Document.

6.1.3.2 Geotechnical and Geophysical Survey Investigation

- The Contractor is required to conduct geotechnical investigations for all areas required for the Contractor's design. The geotechnical investigation *Works* will also include geophysical surveying to ensure that no underground services are impacted during the geotechnical investigation.
- The geotechnical investigation work shall be performed by a person registered with the South African Geomatics Council. In instances where the work is performed under the direction, control and supervision of a professional practitioner or technologist, the professional practitioner will be responsible for signing off the geotechnical report
- The Geomatics practitioner/Technologist has a minimum of 3yrs relevant experience in geotechnical studies.
- Letter of intent signed by both parties is required where subcontractor/s will be used.
- The geotechnical investigation is required to be in accordance with the following:
- SAICE Site Investigation Code: 2010
- All drilling is conducted in accordance with CSRA: Standard Specification for Sub-surface Investigations, 2010
- All laboratory testing is conducted in accordance with the latest standard methods and procedures as outlined by the appropriate authorities (B.S/ Eurocode equivalent, A.S.T.M, A.A.S.H.T.O, I.S.R.M, S.A.B.S / S.A.N.S)
- All Soil profiling is conducted in accordance with guidelines outlined in: Jennings, J.E, Brink, A.B.A, & Williams, A.A.B, (1973) "Revised Guide to Soil Profiling for Civil Engineering purposes in Southern Africa" Trans. S.A.I.C.E, Vol. 15, No. 1, pp 3 – 12.
- All rock core logging is conducted in accordance with guidelines outlined in: Brink, A.B.A, & Bruin, R.M.H, (2002) Second Impression: "Guidelines for Soil and Rock Logging in South Africa, Proceedings of Geoterminology Workshop 1990" S.A.I.E.G. – A.E.G. – S.A.I.C.E.

All *services* are conducted in accordance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993) as amended.

6.1.3.2.1 Surveying

- The *Contractor* is responsible for conducting all additional surveys required for the detailed design of the *Works*. The level of detail of the survey conducted is as required for the detailed design.
- It is the *Contractor's* responsibility for the detection and protection of underground and above ground services.
- Geophysical scanning is done by the *Contractor* to locate sub-surface utilities both metallic and non-metallic prior to any excavations.
- The type of Geophysical scanning employed is at the discretion of the *Contractor*, taking note of the required output. The *Contractor* therefore considers the working environment prior to selection of test methodology and equipment.
- The *Contractor* considers possible signal interferences which may be experienced by the geophysical scanning equipment caused by equipment, and services stray current in and around the areas.
- The *Contractor* submits the results of the scanning to the *Employer* and indicates any possible services which may interfere with the geotechnical investigations or construction of the designs

- The Contractor must submit a digital terrain model (DTM), contour maps (0.5m intervals) and CAD Drawings. All surveys are done using the WGS 84 LO29 coordinate system and are in accordance with TMH 11

6.1.3.2.2 Geotechnical Investigation Report

After completion of field *Works* and laboratory testing, the *Contractor's Professional registered* professional (SACNASP) is required to prepare and submit a consolidated geotechnical report based on the field *Works* conducted. Information and interpretive results are to be clearly distinguished in the report.
The geotechnical report is to includes but not limited to the following:

1) Site Location.
2) Site Description (this shall include observed relief, vegetation, drainage, manmade features).
3) Geological Setting
    - Regional Geology,
    - Local Geology and Geo-hydrology.
    - All geo-hydrological information is to be conducted by the contractor.
    - Regional Geological Hazards,
4) Surface and sub-surface conditions as determined by intrusive ground testing. This shall include:
    - classification and description of all pertinent geotechnical properties
    - discussions of loads, settlements, settlement versus time,
    - all groundwater and process water intersection, quantification, and source thereof,
    - GPR (Ground penetration radar) to detect underground voids for sinkhole risk
5) Detailed results and discussions of all in situ and laboratory tests, classifications, and stability of the existing structure
6) All field data and laboratory results are to be included in the appendices.
7) The laboratory conducting the testing must be SANAS accredited

6.1.3.3 Underground and other existing services

1) It is the Contractor's responsibility for the detection and protection of underground and above ground services.
2) Geophysical scanning is done by the Contractor to locate sub-surface utilities both metallic and non-metallic prior to any excavations.
3) The type of Geophysical scanning employed is at the discretion of the Contractor, taking note of the required output. The Contractor therefore considers the working environment prior to selection of test methodology and equipment.
4) The Contractor considers possible signal interferences which may be experienced by the geophysical scanning equipment caused by equipment, and services stray current in and around the areas.

5) The Contractor submits the results of the scanning to the Employer and indicates any possible services which may interfere with the geotechnical investigations or construction of the designs

6.1.3.4 Associated Civil and Structural Infrastructure

1) The Contractor is responsible for the design of all associated Civil and Structural infrastructure required for the Mechanical, Electrical and Control & Instrumentation works.
2) The Contractor is responsible for the analysis and verification of any existing infrastructure impacted by the works as well as any modifications required taking full accountability for any changes made to existing infrastructure.
3) The Contractor includes provisions to manage stormwater runoff around the met masts structural foundations.
4) The contractor ensures that adequate fencing around the critical infrastructure is incorporated into the design

6.1.4 Electrical Detailed Design

The *Contractor* is responsible for the electrical detailed design.

6.1.4.1 General Requirements

1) All electrical designs shall be submitted to the Employer for acceptance.
2) Layout drawings that indicate the coordinate location of electrical equipment, every junction box, cable connection points and termination requirements, including lighting and small power in auxiliary bay if applicable.
3) Arrangement and wiring diagrams are required for each skid, junction box, cubicle, and lighting and small power device.
4) Schematics and details required for design of the electrical circuits that will ensure the correct functionality of the equipment.
5) Single Line Diagram depicting source of power supply for the major equipment.
6) Recommended spares list is required.
7) Contractor shall hold a design review for conducting an in-depth contract compliance review of the plant, allowing the Employer to gain a clear understanding of the overall design.
8) The review shall be after the completion of the design, the preliminary outline drawings, and the rating plate drawings.
9) The Contractor shall demonstrate how the system functions reliably within the operating requirements and meet the performance guarantees. There shall be sufficient information for each major element available to review the design for functionality and for future reference such as maintenance. The Contractor will make available documentation for on-site review.
10) The Contractor shall make available the calculations and information for the detailed design verification. This part of the design review will take place in the Contractor's design offices.
11) The Contractor as a minimum shall consider the following:

- Site Assessment

- Conduct a thorough site assessment to determine the solar radiation, shading, and other environmental factors that may affect the solar PV system performance.
- Determine the optimal location for the solar PV system installation to maximize energy production and minimize the potential for shading and other adverse factors.

- Load Assessment
  - Determine the power requirements for the wind mast tower instruments, including data loggers, anemometers, wind vanes, temperature and humidity sensors, and any other equipment requiring power supply.
- System Design
  - Size the solar PV system based on the power requirements of the wind mast tower and RS system instruments in conjunction with the site's solar radiation data.
  - Ensure that the design adheres to relevant local, regional, and national codes, local& international standards and regulations.
  - Design the system to operate reliably, minimizing downtime and ensuring continuous data collection from the wind mast tower instruments.
  - The Employer proposes that the solar PV be mounted on the wind met mast tower and the remote sensing system structure.

6.1.4.2 Battery Tripping Units (BTUs) and DC to AC Inverter Functional Requirements

1) Should there be a requirement of BTUs for DC supply, the Contractor shall design the BTUs and comply with 240-56176852 – Essential Power Supplies for Power Stations Standard.
2) An essential service single line diagram detailing the distribution of the DC supplies shall be submitted to the Employer.

6.1.4.3 Cabling

1) The Contractor shall design all cables with clamps, lugs and fittings.
2) The Contractor shall design the cable routing and racking or supports, cleat in position with approved straps.
3) The Contractor shall submit cable schedules, cable routing, cable connection and termination block diagrams for review and acceptance by the Employer showing items interconnected and the cables provided. Each cable shall be numbered and coded, including the applicable general arrangement, wiring, circuit, and cabling drawing numbers.
4) Power and control cables shall comply with Eskom standard 240-56227443 Requirements for Control and Power Cables for Power stations Standard.
5) The Contractor shall submit cable design calculations to the Employer for review and approval before installation.

6.1.4.3.1 Cable Terminating Facilities

1) The Contractor shall design cabling to allow cable approaches accommodating cable-bending radii as per the cable manufacturer's requirements or SANS 10142-1, whichever is greater.
2) The Contractor shall make provision for terminals to accommodate cable cores with cross-sectional areas two sizes larger than that required for the current rating of the device.

6.1.4.3.2 Cable Termination Protection

Cable terminating facilities on the plant shall be IP65 designed, dust and vermin proof and impervious to liquid ingress.

6.1.4.4 Earthing and Lightning

1) The Contractor shall perform a design of the earthing system in accordance with the Wind met mast best practice for the area around the System.
2) The Contractor shall provide details of their specific earthing system requirements, philosophy, and details of earthing systems to Employer.
3) The Contractor shall design earthing and lightning protection in accordance with Eskom standard 240-56356396 Earthing and Lightning Protection.
4) The Contractor shall furnish details of the earth and lightning protection design to the Employer for acceptance for implementation.
5) The Contractor installs lighting that is suitable for the area of application, readily accessible for maintenance, and standardized as much as possible, to keep the luminaires and lamp spares to a minimum.

6.1.4.5 Lighting and Small Power

Should there be a requirement of lighting and small power:

1) The Contractor shall provide small power reticulation and architectural lighting design for the solar powered flood lights with daylight sensor surrounding the met mast and the RS system. The Contractor to ensure that the lights are within the security system.
2) The Contractor shall design lighting and small power in accordance with Eskom standard 240- 55714363 Coal Fired Power Stations Lighting and Small Power Installation Standard and SANS 10389-2 – Exterior Lighting Part 2: Exterior Security Lighting.

6.1.4.6 Low Voltage Motors

Should there be a requirement of LV motors, the Contractor shall ensure that LV motors are designed in accordance with 240-57617975 - New Low Voltage Motors Procurement Standard.

6.1.4.7 C&I interface

The *Contractor* must make provision for the C&I equipment requiring power supply in the electrical design and provide the C&I interface for the control, monitoring and operation of the system. This will include development of I/O block/s.

6.1.5 Control and Instrumentation Design

The Contractor determines the final positioning and orientation of the equipment ensuring compliance to the IEC 61400-12-1 -1

The following general design requirements are applicable to all aspects of the C&I design

1) All field equipment is installed in a suitable location.
2) The Contractor shall ensure field equipment operates in an environment within the parameters stipulated by the manufacturer.
3) Where harsh environmental conditions are unavoidable, the field equipment shall be designed for operation in that environment.
4) All IP ratings are as per SANS 60529
5) All supplied field equipment, excluding Junction Boxes (JBs) and their electrical connections are rated IP 65 or better.
6) Field equipment situated outdoors, or in adverse environments, must be provided with additional protection hoods and enclosures.
7) All supplied field equipment operates over an ambient temperature range of: -10oC to 70oC.
8) The equipment layout shall be such that when mechanical work is performed, no C&I equipment shall be damaged.
9) The supplied field equipment provided shall be standardised to the maximum extent possible
10) The Contractor as part of the scope of work provides a detailed design report prior to execution of the works during the detail design scope freeze.
11) All the documents required to be submitted by the Contractor during the design freeze shall be supplied as part of design data pack.
12) The detail design report shall be in line with Eskom detail design report template (240-49910707)
13) All field equipment installations are required to comply with Field Instrument Installation Standard, 240-56355754.
14) All instrumentation shall be provided with a nametag/plate.
15) All instrumentation must use either 24V for binary feedback or 4-20mA for analogue feedback.

6.1.5.1 General Junction Box and Termination Requirements

Junction boxes are rated IP 65. The Contractor to comply with this standard 240-563555: Junction box and cable termination.

- The *Contractor* uses spare terminals in the existing junction box for interfacing the C&I plant to the C&I control system.
- The *Contractor* uses compression cable glands for cable entries on junction boxes to maintain the junction box IP rating.
- The *Contractor* provides additional terminals in the junction box if necessary to complete the C&I interface requirements.
- The *Contractor* uses terminal lugs for C&I cables according to 240-56227443 - Requirements for Control and Power Cables for Power Stations.
- The *Contractor* shall supply and install new junction boxes where required in accordance to Eskom standards.

6.1.5.2 Enclosures/ Panels

- The Contractor to design and install panels that will house the battery, inverter, data loggers, modem etc. to prevent damage from environmental factors.
- The Contractor to position the housing must be accessible to allow ease of maintenance but must also be kept high enough to the position of the housing must be accessible to allow ease of maintenance but must also be kept high enough to avoid theft and vandalism void theft and vandalism.
- All enclosures for electrical/instruments shall be IP65 for better ingress protection.
- The Contractor to ensure sufficient cooling to avoid damage of electronic equipment due to heat.

6.1.5.3 C&I Cabling & Racking Requirements

- All Cable Installation and instrumentation cables shall be flame retardant low smoke type and comply with 240-56227443: Requirements for Control and Power Cables for Power Stations Standard. Instrument cabling to be installed with due respect for safety, reliability, access, maintenance, environmental conditions and best practices. All cabling must be suitably protected against mechanical damage, chemicals, dust build-up and heat.
- The *Contractor* shall provide the design, supply, supervise installation, termination, labelling, supervise testing and commissioning of all cabling.
- Cables are according to 240-56227443 Requirements for Control and Power Cables for Power Stations.
- New cable routes shall be designed such that equipment can be removed for maintenance without causing damage to the cables.
- Cable conduits shall be provided.
- Durable cable numbering/labelling shall be provided for all installed cables entering junction boxes.
- The cable numbering/labelling shall be such that cable maintenance is easily achieved.
- All cables, as a minimum, shall be insulated with flame-retardant, halogen-free PVC outer sheath.
- All field cabling shall have a minimum of 2 pairs (UVG2ACM).
- Internal cores of all multi-core cables shall be colour coded.
- The management, design expertise, supply and supervision of installation for all cables, cabling and routing shall be provided by the *Contractor.*
- All installed cables are tested and Certificates of Compliance are issued prior to commissioning of any instrument.
- All cables provided are secured with suitable cable glands, straps or clamps on racks, in cubicles, switchgear rooms, control rooms, equipment rooms etc.
- Transducer cabling is required to be installed with due respect for safety, reliability, access, maintenance, environmental conditions and best practice.
- All cabling is required to be suitably protected against mechanical damage, chemicals, dust build-up and heat.

- Cables are required to only be terminated in instruments, junction boxes or other approved equipment.
- No intermediate cable joints are permitted.
- Cables connected to instruments are required to be installed with a loop of cable to provide sufficient slack for re-making the cable connection if the instrument is removed and to allow for removing the instrument without electrical disconnection.
- Cables are required to be routed separately from electrical power cables and crossovers that bring signal and power cables into close proximity shall be made at right angles.

6.1.5.4 Cable Glands

- The *Contractor* provides stainless steel cable glands for use with cable installations.
- The *Contractor* uses cable glands for all cable entries.

6.1.5.5 Cable Racks

- The *Contractor* provides cable racks where required according to 240-56227443 Requirements for Control and Power Cables for Power Stations.

6.1.5.6 Cable Conduit

- The *Contractor* provides cable conduit or trunking where cables may be exposed to damage during normal plant operation.
- The *Contractor* provides galvanised cable conduit or trunking where necessary.
- The cable conduit or trunking is according to 240-56227443 Requirements for Control and Power Cables for Power Stations.

6.1.6 Mechanical Design

The Contractor as part of the scope of work provides a detailed design report prior to execution of the works during the detail design scope freeze. All the documents required to be submitted by the Contractor during the design freeze shall be supplied as part of design data pack.

6.1.6.1 Welding (If required)

- Welding is in accordance with 240-56241933, “Control of welding during construction, repair and maintenance activities standard.
- Welding is in accordance with 240-83539994, “Eskom NDT personnel approval for quality related special processes on Eskom plant standard.
- Welding is in accordance with 240-56246601, “Qualification, certification and accreditation requirements for personnel and entities performing welding elated work on Eskom plant standard.

- Welding is in accordance with 240-83540088, “Requirements for non-destructive testing on Eskom plant standard.”
- Welding is in accordance with 240-106628253, “Standard for Welding Requirements on Eskom Plant.”

6.1.6.2 Fire Protection (If required)

The Contractor performs a Fire protection and detection assessment in accordance with 240-54937439 and implements the outcome of the fire protection and detection assessment. Should there be any requirement for fire protection, the following standard must be adhered to:

- 240-54937450: Fire Protection & Life Safety Design Standard

The Contractor’s design includes all the documents specified in the VDSS. The Contractor’s design includes the part of the works already constructed by others.

6.1.6.3 Corrosion Protection

- All steel work is required to be hot dipped galvanised including grating.
- All galvanising is required be done in accordance with SANS 121. Preparation of steel prior to galvanising and coating thickness is also required to be in accordance with SANS 121

6.1.6.4 Detailed Design Deliverables

- The *Contractor* establishes a document tracking system to record the dates for the supply and receipt of all design drawings, calculations, requests for information and design documentation.
- The *Contractor* produces the following deliverables as part of the scope:
  - Completed detailed design file.
    - Design drawings
    - Preliminary O & M manual
    - Electrical load schedule
    - Arrangement and wiring diagrams are required for each skid, junction box, cubicle, and lighting and small power device.
    - Single Line Diagram depicting source of power supply for the major equipment.
    - Priced bill of quantities
    - Document submittal schedule indicating when all documents will be submitted.
    - Drawing Register indicating when drawings will be submitted.
    - General Arrangement Drawing of System and boundaries.
    - Quality Control Plan and Inspection and Test Plan

- Commissioning procedures or construction method statement
- Technical, Operation and Maintenance Manuals of all plant equipment
- Control Philosophies
- Maintenance Philosophy
- Field termination drawings

- Works Information for Construction in NEC3 format including all construction specifications

6.2 PROCEDURE FOR SUBMISSION AND ACCEPTANCE OF CONTRACTOR'S DESIGN

1) The Contractor submits all designs to the Employer for record purposes. The designs submitted are complete packages with all elements (drawings, calculations) included.
2) The Employer conducts a high-level review of the drawings. The Employer reserves the right to review any design in the detail that is deemed necessary. The Employer accepts no accountability and liability due to the review of any designs or if any acceptance is given.
3) The Contractor is the Design Authority as defined in the Design Review Procedure 240-53113685 for the works. In terms of the Construction Regulations, the Employer's review of the Contractor's design does not influence the design as only the Contractor can amend, update and revise the design. The Contractor remains the "Designer" as per the Construction Regulations, the Employer is not the "Designer". The Contractor is responsible for following this design procedure and submits all the necessary information to the Employer to allow the following reviews to be conducted:

- Design Freeze Review
- System Integrated Design Review
- The *Contractor* considers this review process in the schedule

4) The following process will be followed during submission of documents:

- The *Contractor* submits the documents/drawings to the *Employer's* Document Controller.
- The *Employer's* Document Controller registers the documents.
- The *Employer's* Document Controller will supply the documents/drawings to all relevant parties within the *Employer's* project team.
- The *Employer's* project team reviews the documents/drawings and will submit all comments or inputs to the *Contract Manager* who submits to the *Contractor* for consideration.
- If the Employer finds major deficiencies in the submitted documents/drawings, the *Contractor* revises the documents/drawings and resubmits to the Employer.
- The Employer reviews the documents/drawings and if no major deficiencies are found, the *Contractor* organises a review session.
- The Employer and the *Contractor* conduct a review.
- If any fundamental errors were found in the review or further actions are required, the *Contractor* record all concerns raised and revises the documents/drawings.
- The *Contractor* organises a review session once all documents/drawings have been revised according to the concerns raised by the Employer.
- If no fundamental errors were found in the documents/drawings during the review session, the *Contractor* compiles the review minutes/report and submits it to the Employer.
- The Employer's Document Controller registers the report.

- The Employer's project team reviews the *Contractor*'s report/minutes. If the report/minutes are not acceptable, the *Contractor* revises the report/minutes and resubmits to the Employer.
- The Employer will accept the *Contractor*'s documents/drawings once the report/minutes are accepted by the Employer's project team.

5) The Contractor is to implement the following activities for acceptance:

- The *Contractor* reviews, stamps, dates and signs to signify his approval and submit in the manner required by the Employer in an orderly sequence so as to cause no delay in the work, all *Contractor*'s drawings, equipment selections and/or samples required by the Works or subsequently by the Employer. *Contractor*'s drawings, equipment selections and samples are to be properly identified as specified or as the Employer may require.
- At the time of submission, the *Contractor* informs the Employer in writing of any deviation in the *Contractor*'s drawings, equipment selection or samples from the requirements of the Works.
- Each individual plant & material selection submission is to be accompanied by a copy of the applicable detailed technical specification. Each clause of this specification to be marked "Complies" or "Does not comply", complete with reason stated, alternative offered and countersigned by the *Contractor*.
- Plant & material selection submissions are to be indexed like the index for plant & material part of the "Operating Instructions and Maintenance Manual".
- The *Contractor* is required to submit two copies of drawings and plant & material selections along the channels agreed.
- By submitting drawings, plant & material selections and/or samples, the *Contractor* represents that he has determined and verified all site measurements, site instruction criteria, materials, catalogue numbers and similar data, and that he has checked and co-ordinated each services drawing and sample with the requirements of the Works.
- The Employer reviews *Contractor*'s drawings, plant & material selections and samples so as to cause no delay, but only for conformance with the design of the Works. The Employer's approval of a separate item does not indicate approval of an assembly in which the item functions.
- The *Contractor* makes any corrections required by the Supervisor and re-submits the required number of corrected copies of the *Contractor*'s drawings, plant & material selections or new samples until approved. The *Contractor* directs specific attention in writing on resubmitted drawings to revisions other than the corrections required by the Supervisor on previous submissions.

6) A design report will be compiled on the Eskom Template 240-59083262 by the Contractor for submission to the Employer

7) In addition to the internal design review and change management system of the Contractor the Eskom Design Review Procedure 240-53113685 and Project Engineering Change Procedure (240-53114026) must be implemented

8) During the design process, if tools are required which have intellectual property, the Contractor will provide the details in terms of acquiring the intellectual property or offer an alternative tool or design calculations that will yield the same results to assist with the reviewing process by the Employer.

6.2.1 Engagement with Environmental Authorities

1) The Contractor considers in the schedule that the Contractor's design will be submitted to the relevant regulatory authorities by the Employer for authorisation.

2) The Contractor continually updates the designs as required based on the Employer's engagement with the authorities until authorisation of the designs are obtained.

6.3 OTHER REQUIREMENTS OF THE CONTRACTOR'S DESIGN

6.3.1 Operating and Maintenance Manual

The *Contractor* provides operating and maintenance manuals, as well as an Operating Technical Specification for the new Plant. The *Contractor* provides 4 hard copies and an electronic copy.

The procedures are provided by the original equipment manufacturer detailing descriptions of operating and maintenance work. The procedure covers the requirements for maintenance of the equipment over the design life.

6.3.2 Maintenance Schedule

The Contractor provides a maintenance strategy for the life expectancy of the meteorological masts and lidar unit with a summary schedule. The Contractor provides the life expectancy of the equipment. The Contractor lists maintenance spares (with detailed specifications) for the life expectancy of the equipment.

6.4 DESIGN OF EQUIPMENT

All designs of equipment by the *Contractor* shall be used only and once review & approval of the designs has occurred. The review & approval shall be submitted to the *employer*.

- The *Contractor* is solely responsible for providing the protection of the equipment from damage or loss due to weather, fire, theft, unexplained disappearance or similar during the execution of the works
- The liability of the use of such equipment in the execution of the works shall remain that of the *Contractor*.

6.5 PLANT, EQUIPMENT AND MACHINERY REQUIRED TO PERFORM THE SERVICES

All plant, machinery and equipment required to perform the services are provided by the *Contractor*.

6.6 DATA BOOKS

The *Contractor* submits data books to the *Employer* for their review for all equipment and works undertaken with the applicable requirements and specifications.

Apart from any statutory data packages required, the *Contractor* also compiles and signs off a data package of the relevant drawings, test certificates etc. to the *Employer* for acceptance. These include, but are not limited to:

- Geotechnical Investigations
- Surveys
- Approved ITP's, QCP's.
- Method statements and specifications adhered to.
- Risk assessments.
- Approved Drawings.
- Design Calculation Reports
- Inspection Reports.
- Corrosion Protection Consumables Certificates.
- Calibration Certificates.
- Notifications.
- Modifications.
- Concessions.
- Technical Queries, Engineering Responses and communications with *Employer*
- Non-conformance reports.
- Internal Release Notes.
- Transport notifications.
- Calculations for any temporary works that may be required for the safe execution of the works.

6.7 T RAINING AND TECHNOLOGY TRANSFER

- The *Contractor* shall train Eskom Personnel in all components and functions of the Plant i.e. Data monitoring and evaluating, method of maintenance, fault finding, correction, routine maintenance etc. Training will include familiarization with documentation (maintenance plan, procedures.).
- The *Contractor* shall provide training to Eskom personnel in the following:
- Data monitoring, collection, analysis, and verification
- Maintenance of the Tower

As part of added value, the *Contractor* shall propose training to be offered.

6.8 SUPPLY AND IMPLEMENTATION SUPERVISION

The Contractor shall provide all equipment, tools, and spares necessary for discharging his responsibilities in carrying out the Works, including commissioning, being responsible for loading, transportation, unloading, on-Site storage of all supplied equipment including modules, mounting racks, inverters, and all the other equipment.

6.8.1 Procurement

The Contractor is required to provide all equipment, in strict accordance with the approved drawings and specifications. Every supplied component must be designed, manufactured, and tested to the most recent and relevant SANS, IEC, or other applicable standards, and should carry CE marking where appropriate.

When selecting equipment and components, the Contractor must prioritise ease of maintenance and, wherever possible, utilise locally available facilities and after sales technical support.

In addition to the equipment and components explicitly listed in the Employer's Requirements, the Contractor is responsible for supplying any additional items necessary to ensure the safe, reliable, and efficient construction and operation of the Project, taking into account a 20-year design life from the Date of Completion.

The Contractor shall keep the Employer informed regarding all procurement activities, including timely ordering, tracking, unloading, handling, storage, and management of equipment and supplies essential for the successful completion of the Works. All packing, shipping, handling, and site logistics must adhere to the manufacturer's recommendations as well as all applicable laws, regulations, permits, codes, and standards.

Prior to dispatching any Main Equipment from the factory, the Contractor shall conduct a factory inspection. A report detailing the inspection results, confirming compliance with the Inspection and Test Plan (ITP), Quality Plan, and relevant manufacturing standards must be submitted to the Employer before authorising shipment.

6.8.2 Transportation Of Goods and Materials

6.9.2.1 General Requirements

The Contractor is fully responsible for safely transporting all goods and materials to the Project Site, including obtaining all required permits and approvals from relevant authorities for these movements. The Contractor must review and evaluate the selected transport routes for their ability to accommodate the dimensions and weights of the loads. Securing necessary permissions from

regulatory bodies for use of these routes is the Contractor's duty. The Contractor is accountable for ensuring the suitability and safety of all public and private roads used to deliver equipment from the point of origin, such as the port or manufacturer, to the Site.

A comprehensive Traffic Management Plan must be developed in accordance applicable Laws, Permits, and Codes and Standards for best practice traffic management procedures

during construction, including a traffic incident response plan

All costs associated with the importation and transportation of equipment, materials, plant, and any items required for the Works including storage fees, handling charges, and customs duties are to be borne by the Contractor.

Each item must be appropriately packaged and protected during transit, handling, and storage, following the recommendations provided in the original equipment manufacturers(OEM) documentation.

The Contractor is required to take all necessary precautions to ensure the safe handling and storage of hazardous or dangerous goods, strictly adhering to applicable health and safety legislation and minimizing environmental impact.

6.9.2.2 Offloading and Handling

Upon receipt, the Contractor must implement and maintain a system for the correct preservation, segregation, and handling of all goods and materials through delivery, storage, and eventual supervision of installation. This is to prevent loss, damage, deterioration, or theft during the project's lifecycle.

The Contractor is responsible for all offloading and on-site handling activities, including the provision of cranes and suitable equipment for construction, installation, testing, and commissioning of the Works. Any temporary storage structures or prepared hard standing storage areas required for safe material handling and storage shall be provided and maintained by the Contractor.

All items must be offloaded and handled according to their respective OEM manuals and guidelines.

6.8.3 Roads

The Contractor must ensure the adequacy and suitability of all public and private roads required for the delivery of equipment and materials to and from the Site, and secure all necessary permissions related to their use.

Any restrictions regarding height, width, or weight for vehicles or transported items must be identified and addressed by the Contractor. Should upgrades or modifications to existing infrastructure (roads, railways, or quays) become necessary, the Contractor shall carry out such works. A detailed transportation study must be undertaken and submitted to the Employer for information.

For all access and private roads used for project activities, the Contractor must restore their condition to that which existed prior to commencement of the Works. This will include documenting pre-existing conditions with surveys, photographs, and aerial imagery, with records shared with the Employer.

The Contractor is required to comply with all legal and regulatory obligations related to traffic, transport, and access for workers, equipment, and materials. All public, private, and site roads must be kept clear of debris and spills, with ongoing dust suppression measures implemented as needed.

All vehicles used on site must be roadworthy, appropriately insured, and operated only by trained and certified personnel.

6.8.4 Supervision Scope

The supervision scope includes but not limited to the following:

- Enquiries Clarification including review of method statements and inspection plans;
- Construction and commissioning monitoring of the detail design including:
  - Full-time representation on site by a construction monitoring team including:
    - Monitoring of installation of equipment;
    - Weekly review and sign-off of Quality Control documentation;
    - Weekly review of data book documentation;
  - Site inspections by design engineer and Professional Engineers;
  - Laboratory verification testing to verify the properties of the materials as well as analysis of results if needed;
  - Technical responsibility for engineering changes including attendance of technical meetings and input into Eskom documentation including Engineering Change Notices (ECNs) and Engineering Responses (ER). Technical input into claim adjudication where requested by Eskom. Technical input into quantities where requested by Eskom.
- Technical compliance in terms of environmental authorisation licences;
- Risk identification, monitoring and mitigation;
- Performance of duties required as Designer in terms of the Construction Regulations 2014 including:
  - Carry out the necessary inspections at appropriate stages to verify that the construction of the scope of works is carried out in accordance with the design;
  - Stop any Contractor from executing any construction work which is not in accordance with the relevant design`s health and safety aspects;
  - In the final inspection of the completed structure, include the health, safety and environmental aspects of the scope of works as far as reasonable practicable, declare the structure safe for use, and issue a completion certificate to the client;
- Draft a constructability report;
- Review and approval of QCP/ITP for construction
- Plant inspections at QCP hold points
- Independent checks tests and surveys
- Technical oversite of Contractor’s Programme.
- Detail records of construction activities
- Design modifications
- Monitoring of all information required for the measurement of quantities (includes Material Certification Approvals)
- Finalisation of civil construction drawings reinforced Concrete details and schedules.
- Construction camps drawings for all the packages

- Assist of evaluation and procurement activities on site (as needed),
- Ensure data book review and close out of constructed works
- Monitoring of all information required for the measurement of quantities (includes Material Certification Approvals)
- As-built documentation review and drafting including:
    - Review and approval of as-built surveys;
    - Drafting of as-built drawings;
    - Drafting of construction completion report;
    - Defects report at handover stage;
    - Commissioning Acceptance and Operational Readiness report.
- Produce final as-built drawings (signed by professionally registered designer),
- Head Office project management of the Contract.
- Project readiness
- Surveyor to be part of the team for independent confirmatory survey.

Project Management:

Project management is broken down as follows:

- Invoicing including all backup documentation such as signed timesheets and payment certificates
- Arranging access for site visits
- Management of contract including discussions on program, variations, cash flow and contracts
- General project communication regarding historic decisions, actions and documentation:
- Report back on project progress

Technical support:

Technical support is broken down as follows:

- Managing interfaces with other Contractors at battery limits
- Technical meetings
- Input into Eskom documentation including ECNs and ERs
- Technical input into claim adjudication
- Technical review of specific quantity measurements submitted by the Contractor
- Drafting requirements for ECNs and ERs
- Correspondence between parties including formal letters
- Reviewing method statements
- Research time for specific queries

- Updates on the project specification

6.8.5 Deliverables

The deliverables for the above scope will be as follows:

- Manufacturing Documentation requirements may include but not be limited to – Data Books, Quality Control Plans (QCPs), Inspection and Test Plans (ITPs), Material Specification sheets, Manufacturing methods and plans.
- Construction Documentation requirements may include but not be limited to – Plant Layout and General arrangement drawings, Construction/installation methods and plans.
- Commission Documentation requirements may include but not be limited to – System commissioning procedures, safety clearance documentation, pre-commissioning inspection reports.
- Testing Documentation requirements may include but not be limited to – All pre-commissioning tests, performance tests, acceptance testing and non-destructive testing, reports. All test procedures and methods can also be included here.
- Operating Documentation requirements may include but not be limited to – Operating manuals and procedures.
- Maintenance Documentation requirements may include but not be limited to – Maintenance manuals and procedures.
- Handover Documentation requirements may include but not be limited to – All documents pertaining to the works which could include all Design, Manufacturing, Construction, Commissioning Testing, Operating and Maintenance documents (As-Designed, As-Built, As-Commissioned Documentation Package).
- Decommissioning Documentation requirements may include but not be limited to – Decommissioning manuals and procedures.
- Health and Safety Documentation requirements may include but not be limited to – All necessary and regulatory health and safety procedures required for conducting the works.
- Quality Documentation requirements may include but not be limited to – Quality Control Plans (QCPs), Inspection and Test Plans (ITPs) and all other Standards, Processes and Procedures that are required to ensure the technical integrity and quality of the Design, Manufacturing, Construction, Commissioning Testing, Operating and Maintenance of the works.

6.8.6 Roles and Responsibilities

The roles and responsibilities of the *Contractor* are as follows

Role as Engineering Support during Construction	**Requirements of Role**
Site Communications	The Contractor directs all communications to the Service Manager.
Technical Assurance	The Contractor ensures that the civil engineering construction is done in accordance to the Detailed Design and therefore aligns to the Works Information technical specifications.
Attendance to site meetings	The Contractor attends all technical and progress meetings which require Engineering attendance or input as and when required.
Handling of technical queries and resolutions	The Contractor assesses the query versus the Detailed Design and determines how the query is to be resolved (interface is made with the responsible Designer to ensure that the necessary checks have been completed).
Review of as built information and update of drawings	The Contractor reviews the as built information against the required design to ensure that the construction has been done in accordance to the detailed design. The Contractor will produce as-built drawings signed by a professionally registered designer.
Independent checks of tests and survey / Laboratory verification of tests	The Contractor may conduct additional tests and surveys to verify the Contractors findings. This is done at the discretion of the Contractor based on the results received to ensure adequate Technical Assurance is conducted.

6.9 DATA MANAGEMENT AND TOWER MAINTENANCE DOCUMENTS

- The Contractor shall ensure that data retrieval occurs at least once daily to guard against data loss, corruption, calibration deviations, and instrument malfunctions.
- Eskom shall be granted access to download, monitor and analyse the meteorological masts and lidar unit data during and after contract expiry date.
- Data transmission is to be executed electronically via GSM connection.
- The Contractor to provide all raw and processed data to Eskom monthly.
- The Contractor to log and report all maintenance activities.
- The Contractor shall maintain a suitable inventory of spare parts readily available for instrument replacements for the 2-year period.

6.10 PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

Eskom provides numerous internal standards and specifications to which the *Contractor* must adhere to. The documents listed below in section 11 which are not internal to the employer the *Contractor* at his own expense and must source and adhere to them during the execution of the scope of *works*.

Where a SANS standard referenced has been replaced by a newer standard, the *Contractor* is required to adhere to the latest revision of the newer standard. Where a SANS standard referenced is composed of several parts, all applicable parts are to be adhered to.

7. AUTHORISATION

This document has been seen and accepted by:

Name and surname	Designation
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8. REVISIONS

Date	Rev.	Compiler	Remarks
April 2023	1	KR Mokhwazo	First Issue to the Market
October 2024	2	KR Mokhwazo	Contract negotiations unsuccessful due to tendered project exceeding current market value. Limited tender response due to the absence of CIDB registration by key industry participants.
August 2025	3	P Mamathoni	Reissue of Tender. The Scope of Work has been divided into two separate packages: Package 1: Engineering and Data Management; Package 2: Construction. This Scope of Work pertains specifically to Package 1
October 2025	4	P Mamathoni	The scope is updated to remove Tutuka from the scope as there is no Grid clearance

9. DEVELOPMENT TEAM

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

- Kgaugelo Sokhulu
- Sibusiso Maphumulo
- Phathutshedzo Mamathoni

10. ACKNOWLEDGEMENTS

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11. ANNEXURES: EMPLOYERS STANDARDS

Number	Title
General	
240-53113685	Design Review Procedure
240-53114002	Engineering Change Management Procedure
240-105658000	Supplier Quality Management Specification
240-109607332	Eskom Plant Labelling Abbreviation Standard
240-53114026	Project Engineering Change Management
240-66920003	Documentation Management Review and Handover Procedure for Gx Coal Projects
240-71432150	Plant Labelling Standard
240-76992014	Project / Plant Specific Technical Documents and Records Management Work Instruction
240-93576498	AKZ/KKS Coding Standard
32-136	*Contractor* Health and Safety Requirements
240-86973501	Engineering drawing Standard – Common Requirements
36-681	Generation Plant Safety Regulations
240-83539994	Standard for Non-Destructive Testing (NDT) on Eskom Plant

Civil & Structural	
240-56364545	Structural Design and Engineering Standard
240-107981296	Constructability Assessment Guideline
240-57127955	Geotechnical and Foundation Engineering Standard
240-57127953	Execution of Site Preparation and Earth *Works* Standard
240-57127951	Standard for the Execution of Site Investigations
240-91244751	Specification for Geotechnical Investigations Standard
SANS 10120 Series	Code of practice for use with standardized specifications for civil engineering construction and contract documents
SANS 10400	The Application of the National Building Regulations
SANS 1200 Series	Standardised specification for civil engineering construction
SANS 1921 Series	Construction and management requirements for *Works* contracts
SANS 2001-BE1	Construction *Works* Part BE1: Earth *Works* (general)
SANS 2001-BS1	Construction *Works* Part BS1: Site clearance
SANS 2001-CC1	Construction *Works* Part CC1: Concrete *Works* (structural)
SANS 2001-CS1	Construction *Works* Part CS1: Structural steelwork
SANS 2001-DP3	Construction *Works* Part DP3: Cable ducts
Electrical	
240-56356396	Earthing and Lightning Protection Standard
240-55714363	Coal Fired Power Stations Lighting and Small Power Installation Standard
240-56227443	Requirements for Control and Power Cables for Power stations Standard
SANS 10313	Protection against lightning - Physical damage to structures and life hazard

SANS 10142-1:	The wiring of premises - Part 1: Low-voltage installations
Control & Instrumentation	
240-563555	Junction box and cable termination standard
240-56227443	Requirements for Control and Power Cables for Power Stations Standard.
240-40643427	Coding and Labelling Standard.
240-56355754	Field Instrument Installation Standard
Mechanical	
32-632	Requirements for Non-Destructive Testing (NDT) on Eskom Plant
240-56241933	Control of Plant Construction, Repair and Maintenance Welding Activities
240-56246601	Personnel and Entities Performing Welding Related Special Processes on the Employer's Plant
SANS 1091	National colour standards of paint
SANS 10140-1:	Identification colour markings Part 1: General
SANS 10140-2	Identification colour marking Part 2: Identification of hazards and equipment in work situations
SANS 10142-1:	The wiring of premises - Part 1: Low-voltage installations
SANS 60364	Low-voltage electrical installations
SANS 10160-3:	Basis of structural design and actions for buildings and industrial structures - Part 3: Wind actions
240-106365693	Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings
Fire Protection	
SANS 246	Code of Practice for Fire Protection for Electrical Equipment Installations
IEC Standards	
IEC 61853-1	Photovoltaic (PV) module performance testing and energy rating - Part 1: Irradiance and temperature performance measurements and power rating
IEC 61730-1 and IEC 61730-2	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction; Part 2: Requirements for testing

IEC 62109-1 and IEC 62109-2	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements; Part 2: Particular requirements for inverters
IEC 61400-50-2,	Wind energy generation systems – Part 50-2: Wind measurement – Application of ground-mounted remote sensing technology
IEC 61400-50-1,	Wind energy generation systems – Part 50-1: Wind measurement –Application of meteorological mast, nacelle and spinner mounted instruments
IEC 61400-12-1 -1,	Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines
IEC 61400-12-1 -2	Wind Turbines –Part 12-2: Power performance of electricity-producing wind turbines based on nacelle anemometry
IEC 61400-12-1 -3	Wind energy generation systems – Part 12-3: Determination of mechanical loads on wind turbines

IEC 61215	Terrestrial photovoltaic (PV) modules – Design qualification and type approval
IEC 60060-1:	High-voltage test techniques - Part 1: General definitions and test requirements
IEC 60870-5-x:	Telecontrol equipment and systems - Part 5: Transmission protocols (various parts, depending on the specific protocol used for communication)
IEC 62305:	Protection against lightning (various parts, depending on the specific requirements)
IEEE (Institute of Electrical and Electronics Engineers) Standards	
IEEE 802.3:	Ethernet standard for data communication and networking
IEEE 802.11:	Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications
IEEE 802.15.4:	Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs)
IEEE 1003.1:	Standard for Information Technology - Portable Operating System Interface (POSIX)