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1. MAIN ELECTRICAL SYSTEM DESCRIPTION

1.1 MV SWITCHGEAR

The existing Medium Voltage switchgear (11kV) at MWP is of metal enclosed assembly, for indoor use. It makes use of vacuum and withdrawable circuit breakers. Refer to drawing number 0.50/2001 (Megawatt Park Phase 1 & 2, 11kV Network) for illustration of MV reticulation at Megawatt Park).

The MV switchgear is used throughout MWP to supply, transformer feeder circuits and board-to-board feeder circuits forming part of the 11kV ring. Existing MV switchgear is not Internal Arc Compliant and has surpassed its lifespan of 30 years. The primary deficiency pertains to the switchgear components which have reached their end-of-life expectancy and obsolete.

1.2 TRANSFORMERS

The transformers are fed from the Medium Voltage switchgear via power cables. The voltage from the 11kV board is step down to 400V via Oil Filled Transformers and thus supply any loads vial the main Low Voltage Boards or Distribution Boards. The connection from the low voltage site of the transformer to the Low Voltage Board is by means of busbars. Refer to drawing number 0.50/2001 (Megawatt Park Phase 1 & 2, 11kV Network) for illustration of existing transformer ratings at Megawatt Park).

The existing transformers at MWP are Oil Filled transformers and have surpassed their economical design life. In certain plant areas the transformers are showing visible oil leakages.

1.3 MAIN LOW VOLTAGE SWITCHGEAR

The existing main LV switchgear at MWP is of Metal Enclosed assembly, for indoor use, rated 400V. The main LV boards are fed directly from the step-down transformers via busbars. The main LV Boards are located on the basement at MWP which supplies the 400V Distribution Boards located on various levels at MWP. The 400V Distribution Boards provides small power and lighting requirements for each section at MWP. The existing LV switchgear has surpassed their lifespan of 20 years and mainly consist of obsolete F/E isolator switches instead of the modern rotary isolator switches.

1.4 DIESEL GENERATORS

Diesel generators are mainly used to supply backup power for all the essential loads when normal supply is lost. There are two (2) existing old diesel generators located at the basement of block A and block B, rated 440kVA (Detroit) and 800kVA (Deutz) which are both not functional respectively. The two (2) existing diesel generators have surpassed their lifespan of 30 years.

Block C and D also contain two (2) existing diesel generator (one functional and the other is not functional). On Block C and D, loads which were feeding from the nonfunctional diesel generator have been transferred to the functional diesel generator. Block E (conference area including club house building/gym area do not have diesel generators). Two (2) new diesel generators for Data Centre (2 x 2000kVA) have been recently installed and commissioned to replace the existing two (2) x containerised 1250kVA Diesel Generator sets. The two (2) containerised diesel generators (1250kVA) are still in a good condition.

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1.5 POWER CABLES AND CABLE RACKS

The installed power cables at MWP, for MV applications are XLPE throughout and PVC for low voltage cables. The MV cables sizes were standardised when they were installed. The standardised sizes for existing MV cables are:

- 120mm^2 (4C x 120mm^2 cable (11kV Ring Main, with 70mm earth cable))
- 95mm^2 (MV Panel to Transformers) and 70mm^2 (earth cable size), 21 meters.

For provisional MV and LV cable schedules and estimated cable lengths, refer to Appendix A9.

2. *EMPOYER'S* AND THE *CONTRACTOR'S* DESIGN

2.1 BATTERY LIMITS

Project's battery limit is as depicted below:

- Replacement of two (2) medium voltage incomer cables with 2 X 300mm2 , Al 3C XLPE, insulated PVC bedded, steel wire armoured, PVC Sheathed, 6.25/11kV cables. For detailed scope of work, refer to report number **363-ERE-CEEC-D00035-29.**
- Replacement of existing is medium voltage switchgear and associated battery tripping units as depicted in Appendix A2 and A3.
- Replacement of oil filled transformers with dry type transformers as depicted in Appendix A5.
- Replacement of main low voltage board or Distribution Board as depicted in Appendix A6.
- Replacement of diesel generators for block A and block B as depicted in Appendix A8.
- Testing and replacement of all outgoing low voltage cables from the main low voltage board, if deemed necessary.

2.2 ASSUMPTIONS

Electrical designs assumptions are as follows:

- Any process plant upgrade shall not exceed the maximum capacity of existing transformers which provide bulk power supply for main low voltage boards

2.3 *EMPLOYER'S* DESIGN

The Employer will provide the following documentation/drawings for information sharing and for review by the Contractor:

- Appendix A1.1: Existing MWP MV Reticulation Single Line Drawing
- Appendix A1.2: Proposed MV Reticulation for block A and block B _ Excluding Block C – E
- Appendix A2: Proposed sizing for MV Switchgear (List of MV Boards)
- Appendix A3. MV Switchgear Schedules
- Appendix A4: Existing and Proposed Substation Layouts (Main MV Substation Room)
- Appendix A5: Transformer Technical Schedule AB
- Appendix A6.1: Proposed sizing for LV Switchgear (List of LV Boards)
- Appendix A7: LV Cables Technical Schedule AB including power cables testing guideline for Eskom Real Estate.

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- Appendix A8.1: Diesel Generators preliminary sizing schedule AB
- Appendix A8.2: Diesel Generators Technical Schedule AB
- Appendix A9: MV and LV provincial cable schedules
- Appendix A10: List of Electrical Design Drawings for Block A – Block D
- Appendix A11: Typical Electrical Vendor Documents Submittal Schedule (VDSS)
- Appendix A12: Relevant Eskom Standards
- Appendix A13: Compliance Schedule for all systems or deviations if any
- Appendix B: Preliminary Load Flow Study results
- Appendix C: Preliminary Short Circuit Study results

All Employer information and property made available to the Contractor, including the work done by the Contractor for the Employer, is confidential and may not be disclosed to anyone unless authorised by the Project Manager.

2.4 PARTS OF THE *WORKS* WHICH THE *CONTRACTOR* IS TO DESIGN

The Contractor is responsible for the design, submit detailed design report, procurement and manufacturing, factory acceptance testing, transportation and delivery to Site, off-loading, decommissioning of existing equipment, installation, perform site acceptance testing, commissioning and plant optimisation of the following as a minimum:

a) Review and validate the preliminary Power System studies (load flow and faut level studies).

b) MV Switchgear panels in accordance with:
   i. SANS / IEC 62271 for Air Insulated Switchgear (AIS)
   ii. Battery Tripping Units in accordance with (240-53114248) or any SANS related standard
   iii. Complete MV Boards Technical Parameters (Appendix 2)
   iv. Complete Switchgear Schedules (Appendix A3).

c) Transformers design in accordance with SANS60076-11 and complete Appendix A5

d) Main LV Switchgear or Distributions Boards in accordance with SANS 61439, SANS 60947, SANS 61641 and SANS 1973, and complete Appendix A6.

e) Diesel Generators in accordance with 240-62772909 (Stationery Diesel Generators) and SANS SANS 8528 (Reciprocating internal combustion engine driven alternating current generating sets _ all parts) and complete Appendix A8.

f) Layout of the switchboards and panels,

g) Protection and control schemes in accordance with 240-56227589 (List of Approved Electronic Devices to be used on Eskom Power Stations Standard)

h) Power cables (MV cables and LV cables) in accordance with 240-56030635 or SANS 1339 (XLPE cables) and 240-56227443 / SANS 1507, SANS 1574 and complete Appendix A7.

i) Review, validate and update of Employer's preliminary design drawings as depicted in Appendix A10.

j) Earthing and lightning in accordance with 240-56356396.

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k) Provision of all Technical Documents for handover in accordance with Appendix A11.

l) Complete Appendix A13: Full Compliance to Employer's requirements for all affected electrical systems and submit deviation for review by Employer during tendering stage,

2.4.1 MV boards general requirements

Replacement of Medium voltage switchgear shall be in accordance with IEC 62271 all parts.

All MV switchgear shall be designed for a nominal voltage according to SANS 1019 and SANS 62271, to be internal arc certified IAC AFRL according to SANS 62271-200 and to withstand a short-circuit current of minimum 10% higher than required by calculations for a duration of three (3) seconds. A type test certificate compliant with SANS shall be supplied for the unit(s) offered.

The room layout drawings are provided by the Contractor, and the *Contractor* ensures that the new switchgear fit into the allocated space.

General requirements for MV boards include but not limited to the following:

- The Contractor designs medium voltage switchgear that comply with 62271 all parts.
- The *Contractor* confirm Compliance for MV Switchgear replacement in accordance with SANS 62271 and provides reasons for any deviations.
- The MV Switchgear must be of a type tested design as per IEC 62271-200 as a minimum.
- The Contractor designs associated protection schemes for MV boards and submit for review and acceptance by Employer during detail design stage.
- The Contractors specifies the floor smoothness required by switchgear panels to ensure that their integrity is not compromised for the duration of its design life. The Contractor assesses in the substations and provides switchgear unit-struts and solution required for ensuring that the floor level is even and within the required tolerances.

2.4.1.1 Ratings and operating conditions

- Preliminary panel ratings are in Switchgear Schedules in Appendix 3 and preliminary Technical Parameters in Appendix 2.
- Ratings for switching devices are in accordance with SANS 62271.
- The system characteristics and operating conditions are stipulated in SANS 62271.
- Switchgear operating and service conditions are also stipulated in SANS 62271.

2.4.1.2 Panel designs and construction

Panel design and construction of the switchgear shall be as per SANS 62271. The switchgear is for indoor use, air and gas insulated, metal-enclosed and internal arc classified in accordance with IEC 62271-200.

IP rating shall be IP42 and colour coding for 11kV Switchgear shall be G29 (light grey) for standardisation with the new MV switchgear recently installed at MWP Data Centre.

2.4.1.3 Special consideration for internal arc proof design

The Contractor complies with the internal arc requirements according to SANS 62271. The following special requirements are considered:

a) If required, the Contractor determines the requirements for the openings on the substation walls for venting ducts.

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b) These openings are adequate for the effective release of the gases and vapour from the substation when internal arcing occurs.

c) The Contractor illustrates that the design of the venting systems caters for the effective release of pressurised gases during arcing conditions. Results from theoretical calculations and/or simulations done in this regard are provided to the Employer for acceptance.

Pressure relief flaps in a power compartment are designed such that the gasses are not directed to any other compartment during an internal arc fault. Each functional unit contains the arc without spreading it to any other functional unit. Due to the internal arc classification and for maintenance purposes, no VT or earthing device is installed within the pressure relief area on top of any functional unit.

All Switchboards with fault rating of 31.5kA and above are equipped with exhausting ducts to channel the hot gasses generated by internal arc fault to the outside of the substation. The design of switchboard with fault rating below 31.5kA allows for venting to the inside of the substation subject to Eskom's acceptance. In such a case, proof that it is safe to do so is provided.

For substations with soft ceilings and/or windows, venting is directed to the outside of the substation via the exhausting duct. Personnel require free access to the low voltage compartment and the IAC requirements are upheld.

2.4.1.4 Circuit breakers

Existing circuit breakers ratings are provided as per Switchgear Schedules in Appendix 3 and new breakers shall comply with SANS 62271.

2.4.1.5 Earthing devices

The switchgear design includes busbar and cable earthing devices as an integral part of the associated functional unit. The earthing devices shall be design as per SANS 62271.

2.4.1.6 Accessories

Each functional unit is equipped with accessories to meet the design requirements, and the accessories shall comply with SANS 62271.

2.4.1.7 Main MV Substation Room Layout

Refer to Appendix A4 for the proposed equipment layout inside the main MV Substation room based on the selected technology by the Employer. The *Contractor* shall create the equipment room layout for MV Substations and further verify the *Employer's* proposed layout and updated the room layout based on the final designs by the Contractor. Contractor shall create equipment layouts for all the MV boards forming part of the replacement scope.

2.4.1.8 Self-Contained Battery and Charger Units (SCBC units)/BTUs

Each MV substation contain Self-Contained Battery and Charger Units (SCBC units) or Battery Tripping Units which shall be replaced as part of the MV switchgear. Existing rating for BTU installed inside the Southwest MV Substation, on block C and D are as follows:

- AC input: 230V AC, 19A,
- DC Output: 110V DC, 25A,
- No of cells: 86 Cells

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The Contractor shall be responsible for sizing all Self-Contained Battery and Charger Units for each substation and ensures that the battery chargers comply with the battery charger requirements as stipulated in SANS 1652 as well as associated battery bank standard (SANS 1632-3 (Vented Type Nickel Cadmium cells)) or any other SANS related standards.

Colour coding for BTU shall be G29 (light grey) for standardisation with the new Battery Tripping Unit recently installed at MWP Data Centre.

2.4.1.9 MV breakers controls

Existing MV breakers on the MV Boards are manually operated which impose a safety risk for operators. The new operating philosophy requires all the breakers to be manually operated and further have option for remote operation.

2.4.1.9.1 Remote Hand-Held Control Units

Only three (3) hand-held remote-control unit for switching all circuit breakers and earth switches are proposed to be submitted as part of the works. The minimum length of the lead cable shall be 30 meters, ending in a male connector, suitable to connect to the female receptacle mounted in the front LV compartment door.

The hand-held unit shall be fitted with:

- Green push button with the "I" symbol, for closing of circuit breakers and earth switches.
- Red push button with the "O" symbol, for tripping/opening of circuit breakers and earth switches.

2.4.1.10 Isolation and de-isolation of 11kV breakers

The Contractor shall be responsible to provide an authorized personnel with appropriate personal protective equipment for performing switching activities (isolate, rack out, lock, unlock, rack in and de-isolate) on the 11kV breakers.

2.4.2 Transformers

Design and manufacturing of new dry type transformers shall be in accordance with the requirements of SANS 60076-11.

Contractor shall complete and submit Technical Schedule AB (Appendix A5) for each rating of dry type transformer.

2.4.3 Main LV Boards

Replacement of main Low voltage switchgear or Distribution boards shall be in accordance with SANS 61439, SANS 60947, SANS 61641 and SANS 1973.

Contractor shall complete and submit Technical Schedule AB (Appendix A6) for the main LV boards.

The Contractor shall provide the equipment layout drawings for all low voltage boards forming part of the replacement scope and ensures that the new switchgear or distribution boards fit into the allocated space.

The *Contractor* shall further provide the following as a minimum:

- Detail schematics using the typical schematics as baseline
- Technical Schedule B (completed as per requirements of schedule A)
- Switchgear Schedules

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- Maintenance and Operating Manuals
- General Layout drawing of the switchgears and panels
- Protection and control schemes in accordance with the protection functional and interface block diagrams.

Form of separation shall be in accordance with SANS 61439-2, for different sections and sub-section. Form of separations shall be as follows:

- Incoming functional unit (incomer and bus-section panels) shall have a Form 4b.
- Outgoing functional units shall have a minimum of Form 3b.
- MCB groups shall have a minimum of Form 2b.
- For control panels with fault rating below 10kA, form of separation shall have a minimum of Form 1 or as agreed with the user.

The finished external colour of the AC Distribution Board shall be Light Orange, except for mounting plates and other supporting structures, which can be galvanised or alloy cold zinc steel. The base-frame shall be painted black.

The finished external colour of the DC Switchgear shall be A11: Signal Red to SANS 1091

2.4.3.1 Incomer protection and Feeder protection for ACB's

The incomers must have an electronic protection relay. Incomer protection scheme has the following functions: Three phase definite time under voltage, definite time overcurrent, IDMT overcurrent and definite time and IDMT earth fault. The IDMT overcurrent and earth fault is set as main protection for the arc detection interlock and back-up protection for downstream circuits.

The measuring elements are adjustable to operate in the voltage ranges as specified on the standards and have drop-off/pick-up ratios greater than 95%. Setting adjustment is preferably continuously variable, but if adjusted in steps, these do not exceed 10%. In addition, the IED's have binary input facilities for external trip and close signals.

2.4.3.2 Chop-over circuits (if applicable)

The chop-over between the diesel generator and the normal 400V supply, and vice versa, must be accomplished within the shortest time possible to avoid unavailability.

Before components like a chop-over system can be installed it must be of a proven design. Proof must be provided that a component was installed at another power station of similar size and type for at least a year without any deficiencies or failures.

2.4.3.3 Harmonics

The harmonic distortion of the supply voltage under normal operation shall be as stipulated on the LV Switchgear standard.

2.4.3.4 Stabilized power supplies

Sizing of the stabilising power supply shall be done by the Contractor. The sizing must be sufficient to ensure that no functional unit will change status from closed to open due to a voltage drop (to 0 V) of the supply for 5 seconds. The voltage must be maintained at 230 V plus minus 5% during the 5 seconds.

Control circuits are in general of a standard type. For each circuit the specific standard drawing relating to a particular circuit shall be submitted by the Contractor, and it will correspond to one of the Standard Schematic Diagrams.

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Where DC control voltages are specified, the control equipment must be rated for continuous operation and comply with the DC voltage variations.

2.4.3.5 Special requirements

- The Contractor must ensure that all equipment supplied will grade in terms of 240-56227426. This includes grading with upstream and downstream equipment not affected by this contract.
- The switchgear is of the PTTA free standing, front-operated, and rear-access cabling type. Power cables for both DC and AC are bottom entry. Control cables are either top or bottom entry.
- The transformer incomer switches are withdrawable air-break circuit breakers (ACB), with external protection relays, as specified in the Switchgear schedules and in the standard schematics.
- Interlocking must be as per relevant SANS standards. There must be mechanical interlocking between busbar earth switch and all incomers or bus-sections on the switchgear.
- All MCB's must have bolt-on covers, i.e. it must require a tool to open the compartment. All MCB's must have individual lockout facility in the off position only.
- Busbar earth switches complete with necessary interlocking are required for each switchgear. The earth switches must be fully type-tested at rated fault level and time specified for the switchgear.
- Indication and monitoring:
    i. Incomers must have no voltage and current indication.
    ii. Cable live indicators are required on switchgear-to-switchgear feeders.
    iii. Busbar voltage indication on transformer incomers is required as indicated in the schedule.
    iv. Ammeter indication is required on all motor starters.
    v. MCB monitoring is required.
- The IP rating shall be specified in accordance with relevant SANS standards. The switchgear will interface with any remote system via hard wiring. Recommended IP rating is IP42.
- Local / manual and remote electrical control is required on both the incomer and the bus-section. Remote operation shall be as defined in section 2.4.1.9.1
- All MCB, fuse curves, CFS curves and protection relays curves must be provided by the

  Contractor. These curves must be given to the Employer in a hard copy format (as part of the technical manual). Equations must be provided by the Contractor to reconstruct these curves in Excel. The equations must start from the lowest possible current of operation up to the designed fault level of the switchgear.
- The Contractor must provide a test bench for withdrawable circuits. This bench will be used to test the withdrawable functional circuits.
- Energy meter shall be installed on the main incomer on the LV Board for monitoring of electrical consumption. The energy meter shall have the capability to interface with the Building Management System.

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2.4.3.6 Design acceptance

The Employer reviews and accepts the following set of drawings, per switchgear, before any manufacturing can take place:

a) schematic/key cabling diagrams for each circuit; this must include all the wire numbers, termination numbers, termination strip numbers, fuse sizes and spare contacts;

b) switchgear schedule for each switchgear with reference to component schedule.

c) component schedule for each circuit;

d) General Arrangement drawings of cable terminations.

2.4.3.7 Hold Points

- After manufacturing of the 380V Switchgear and installation of equipment and wiring. Functional testing of all circuits and trays.
- Factory testing of the LV Board
- Inspection prior to delivery of any Switchgear to site
- After each 380V Switchgear has been installed

2.4.4 Diesel Generators

Replacement of existing Diesel Generator shall be done in accordance with the Specification for Stationery Diesel Generator Systems (240- 62772907) or any relevant SANS Standards. The Contractor shall be responsible to verify and validate the preliminary generator system designs as depicted in drawing number 230311–E–E–200-E, sheet 1 of 10, drawing number 230311-E-E-4B1-R, drawing number 230311-E-E-4P1-E and proposed single line drawing of diesel generators for block A and B as depicted in figure 1 below and provide resizing if deemed necessary. Contract completes and submits Technical Schedule AB (Appendix A8) for each diesel generator forming part of replacement. Recommended starting system for each diesel generator is battery starting system and the Contractor shall be responsible to provide sizing for the batteries and battery type. The Contractor shall provide the overall single line drawing for electrical system which indicate the point of connection for each diesel generator.

The following Employer's requirements shall be taken into consideration when sizing the diesel generators:

- New diesel generators design for Block A and Block B are expected to supply all the loads for the Blocks except for chiller and boiler plant.

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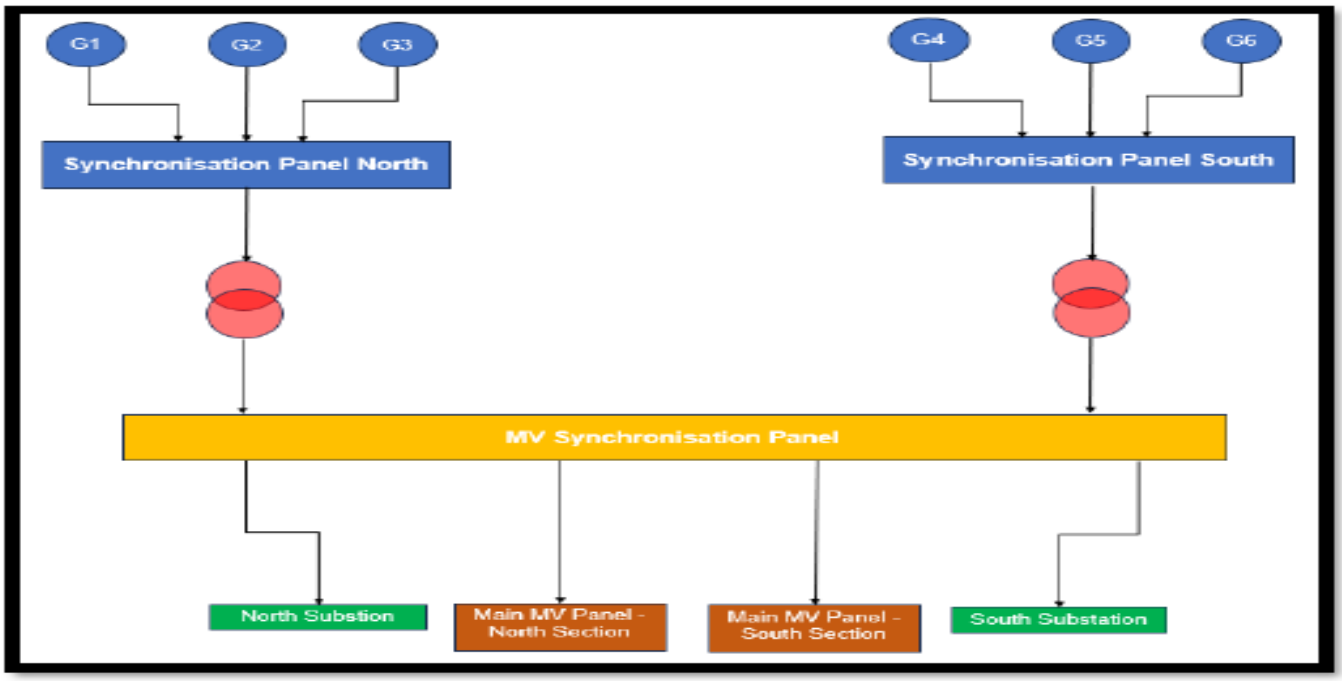

Figure 1: Preliminary design reticulation for block A and block B diesel generators

Preliminary *Employer's* designs for diesel generator backup for block A and block require 6 x 800kVA diesel generator sets to cater the total diversified load of 3673kVA, to ensure each diesel generator is not loaded at more than 80% capacity. The total running capacity for all diesel generators shall be 3840kVA.

The generators are proposed to be installed on the southern side of block B due to space constrains with the MWP campus. To avoid the high costs of low voltage distribution, 2 x 2500kVA step up transformers be installed to transform the voltage from 400V to 11kV as depicted figure 1 above.

Each generator shall be equipped with 1000 litre base mounted tank, which will provide a runtime of between 6 to 8 hours of backup power. A receiving bulk fuel tank with a capacity of 9000 litres is recommended to be installed centrally, from which the day tanks will be filled automatically, and this will provide a total estimated runtime of 80% load of +/- 13 hours. The bulk tank is limited to 9000litres due to existing site fuel storage capacity of 69 000 litres and in accordance with SANS 10131, a maximum of 85 000litres can be stored above ground without the need for Environmental Impact Assessment (EIA).

Contractor shall be responsible for decommissioning and preservation of existing diesel generators in block A and block B.

Diesel generators synchronisation panels, as depicted in figure 1 are proposed to be located inside existing rooms as indicated on drawing number 230311-E-E-4B1-R area 2. The existing room is recommended to be partitioned for separating the synchronisation panels for medium voltage and low voltage. Contractor shall further evaluate the option of installing the synchronisation panels within suitable containers that contains sufficient cooling system and lighting. The option of utilizing containers for housing the synchronisation panels shall be submitted as an alternative option for review and acceptance by the Employer.

2.4.4.1 Technical deliverables during the bidding phase

The following 2 option shall form for part of technical deliverables during the bidding stage for evaluation:

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- Option 1: Contractor to review and validate the following proposed design for Installation of 6 x Diesel Generators to back the entire Block A and Block B:
    - Drawing number 230311–E–E–200-E, sheet 1 of 10, (Diesel Generator System Design _ SLD)
    - Drawing number 230311-E-E-4P1-E (Proposed positions for Diesel Generators _ Block A and B backup)
- Option 2: Contractor to submit propose designs for Diesel Generator Backup for entire MWP Buildings (Block A to Block E) for review and acceptance by Employer

Employer shall review the submitted options and advice the project manager on the recommended option for implementation.

2.4.5 Earthing and lighting designs

The Contractor shall verify the existing earthing integrity for all equipment forming part of replacement and restore to acceptable condition, in accordance with 240-56356396 (Earthing and Lightning Protection Standard) or any other SANS related standards. All new electrical equipment shall be bonded to existing earth mat and earth continuity test conducted for assurance. Test results shall be submitted to the Employer for review and validation.

Due to high rate of copper theft at various sites, alternative materials such as aluminium can be considered for replacement of stolen copper. Refer to section 3.2.5, table 3 of 240-56356396 (Earthing and Lightning Standard) for equivalent cross sectional area of copper versus aluminium conductors.

2.4.6 Protection requirements

The Contractor to design the protection for the scope of this project such that it complies with the requirements of the MV and LV protection philosophy.

Protection relays shall comply with “List of Approved Electronic Devices to be used on Eskom Power Stations Standard (240-56227589)”. The protection relays must be on the Employer’s approved protection relay list which is contained in the standard “List of Approved Electronic Devices to be used on Eskom Power Stations Standard (240-56227589)”.

2.4.7 Power Cables and cable racks

Scope of work on power and control cables is as follows:

- MV Incomer cables:
    - Replacement of two (2) medium voltage incomer cables with 2 X 300mm2, Al 3C XLPE, insulated PVC bedded, steel wire armoured, PVC Sheathed, 6.25/11kV cables. For detailed scope of work, refer to report number 363-ERE-CEEC-D00035-29.
- Power cables and control cables within MWP Campus:
    - The power cables will be reused as far as possible
    - MV and LV power cables will be cut back, joined and terminated on the new MV and LV Switchgear were deemed necessary.
    - All MV and LV power cables will access the new MV switchboards via existing cable tunnels or core drilling via the bottom of the substation.
    - All control and protection cables will be replaced with new cables and these cables will be bottom or top entry, depending on the strategy of execution.

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- The existing servitudes will be reused as far as possible, for power, control and communication cables.

➢ Refer to Appendix 9 for existing provisional MV and LV cable sizes, Appendix A3 (existing MV cable sizes) and Appendix A6.2 (existing LV cable sizes)

Existing MV cables between MV Switchgear and Transformers as well as between the two (2) MV Boards (board to board feeder) will be tested and condition assessed and report sent to the Employer for decision making if the cables must be retained or replaced. All outgoing Low Voltage power cable from the main Low Voltage Board will be tested and condition assessed and report sent to the Employer for decision make if the cables must be replaced or not. Damaged power cables will be joined where required and the control cables will be replaced. Joining of control cables is not allowed.

All Power, Protection, Control and DC cables will be routed in separated cable racks or trays and will be correctly supported to prevent stress on the conductors and insulation material. Provision for new racks will be made where required. The existing cable route will be utilised, and new route will be determined where required.

Testing of existing power cables shall be done as per the reference Employer cable testing guideline (363-ERE_DDDD-D00185-8). All cabling scope will be in accordance with SANS 1339 (MV cables _ XLPE) and SANS 1507 including SANS 1574 for LV cables, PVC.

2.4.8 Power System Study

Preliminary power system studies (Appendix B _ Load Flow study, Appendix C _ Short Circuit study) were conducted by consultants. The outcome of the study indicates that there is still spare capacity on the main MV Boards to supply the new blocks (Block F and G). Due to the plans to construct new blocks at MWP, the Contractor is required to validate the existing power system studies and amend where necessary. The outcome of the study (fault levels) shall be used to validate the kA ratings of the MV and LV Boards. Power system study report shall be shared with the Employer for review and validation prior the manufacturing stage of electrical equipment.

2.4.9 Constructability analysis

The Contractor shall submit detail method statement for replacement of MV boards.

The proposed sequence for replacement of electrical equipment is as follows:

➢ Replace mail low voltage boards first,

➢ Secondly, replace transformers

➢ Thirdly, replacement of medium voltage boards

➢ Lastly, replacement of diesel generators.

2.4.9.1 Mobile Substation

Safety measures shall be taken into consideration for gradually swinging the supplies from the existing MV boards (11kV) in case the replacement on the boards are not completed within the specific period required to return electrical supply. Due to space constrain on the existing switchgear rooms, the option of purchasing or renting a mobile substation is recommended to gradually swing over the supplies from the old switchgears to the temporary mobile substation. The rating of the MV board to be mounted on the mobile substation shall be based on existing boards with maximum busbar rating as well as the switchgear with the most number of panels (South or North main MV Board).

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2.4.9.2 MV boards replacement strategy

The MV boards will be replaced per sections, starting with downstream MV boards (boards with 4 panels), followed by MV boards feeding from the 11kV ring (11kV South board, 11kV North board and 11kV HV Board II), and lastly replacement of the main MV boards (11kV main North Board and 11kV main South Board). During the swing over of cables from the main MV boards to the mobile substation, there will be a downtime of approximately not more than 8 hours, and these activities are recommended to be done over the weekends. High level replacement strategy for main MV Boards (South main MV Board and North main MV Board) are as indicated in the following table:

PANEL NUMBER	PURPOSE	CURRENT STATUS	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7
0	Eskom Incomer No. 3	On	Off	Replace	T&C	On	On	On	On
1	Ring 3 - Phase 2 NM Substation	On	Off	Replace	T&C	On	On	On	On
2	Ring 2 - Main DB Kitchen Substation	On	Off	Replace	T&C	On	On	On	On
3	Main DB-NE Section 1 (Transformer 1)	On	Off	Replace	T&C	On	On	On	On
4	Airconditioning DB - Section 1 - Transformer 2	On	Off	Replace	T&C	On	On	On	On
5	Boiler 1 - Transformer 3	On	Off	Replace	T&C	On	On	On	On
6	Ring 1 - Supply to North Substation	On	Off	Replace	T&C	On	On	On	On
7	Eskom Incomer No. 1	On	Off	Replace	T&C	On	On	On	On
8	Bus Section	Off	Off	Off	Off	Off	Replace	T&C	Off
9	Eskom Incomer No. 4	Off	Off	Off	Off	Off	Replace	T&C	Off
10	Ring 1 - Supply to South Substation	On	On	On	On	On	Replace	T&C	On
11	Boiler 2 - Transformer 4	On	On	On	On	On	Replace	T&C	On
12	Airconditioning DB - Section 2 - Transformer 5	On	On	On	On	On	Replace	T&C	On
13	Main DB-NE Section 2 (Transformer 6)	On	On	On	On	On	Replace	T&C	On
14	Ring 2 - Hort. Substation East	On	On	On	On	On	Replace	T&C	On
15	Ring 3 - Phase 2 NW Substation	On	On	On	On	On	Replace	T&C	On
16	Eskom Incomer No. 2	On	On	On	On	On	Replace	T&C	On

2.4.10 Building Management System

All new devices installed must be BMS communication enabled via Modbus TCP/IP (Ethernet) and/or BACnet/IP (Ethernet) protocols. The Contractor's scope includes the supply, installation, configuration, points list/register map, mapping, commissioning and any proprietary tool needed to setup the module. In special cases, with approval, Modbus RTU (RS-485) or BACnet MS/TP

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(RS-485) could be acceptable. The interface from the communication module to the Building Management System (BMS) will be done by others.

2.4.11 Electrical Method statement

The *Contractor* shall provide detailed method statements on how he intends to carry out the works; this shall apply for all the electrical systems and any part of the works as provided in the conditions of contract. Method Statements shall be provided for:

- All activities associated with the decommissioning of existing electrical systems.
- All activities associated with the installation and commissioning of electrical systems.

2.4.12 Mechanical requirements

Mechanical requirements to support the replacement of electrical systems (MV and LV switchgear, transformers and diesel generators) is as depicted in the following sub sections:

2.4.12.1 Diesel generator system requirements

With reference to the Employer preliminary designs for diesel generator system, as depicted on drawing number 230311- E- E- 200-E Generator Plant – Fuel, the Contractor scope of wok includes but not limited to the following:

- Sizing, design, supply, installation and commissioning of the pumps, non-return valves, pressure relief valves for the fuel system.
- Sizing, supply, installation and commissioning of all associated components and steel piping for the diesel generator system.

2.4.13 Fire Protection requirements

2.4.13.1 Switchgear replacement background

Existing MV switchgear installed at MWP are air insulated switchgear and each MV boards and LV boards are installed in separate rooms as depicted on drawing number 0.50/12242. With reference to section 5.2.4 of 240-54937450 (Fire Protection Standard), in general switchgear rooms does not require fixed fire protection based on the risk and critically of the plant and only gas suppression systems are required. The existing switchgear rooms contain fire extinguishers which are mounted on the wall. There is no evidence that the existing switchgear rooms were constructed with walls, doors and floors which has a minimum of 2-hour fire resistance.

Furthermore, there is existing fire detection system for both MV and LV rooms which is functional. The system provides early warning of possible fire.

2.4.13.1.1 Contractor scope of work

There is no anticipated scope of work for Contractor within the switchgear rooms related to fire protection system.

Replacement of existing fire extinguishers shall be the responsibility of *Employer*.

Since these are existing buildings, replacement of doors and coating of walls and floors for compliance with a minimum of 2-hour fire resistance are recommended to be done as part of a separate project.

2.4.13.2 Transformer replacement requirement

Similarly, oil filed existing transformers are installed in separate rooms as depicted on drawing number 0.50/12242. Existing oil filled transformers shall be replaced with dry type transformers

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to minimise the fire risk as stipulated in section 5.7.1 of 240-54937450 (Fire Protection Standard).

Like switchgear rooms, transformer rooms also contain a fire detection system which provides early warning of possible fire.

2.4.13.2.1 Contractor scope of work

With reference to table 2, section 5.7.1 of 240-54937450 (Fire Protection Standard), only passive fire protection and manual fire protection is required for indoor installation of dry type transformers.

- Furthermore, replacement of existing fire extinguishers shall be the responsibility of *Employer.*
- Contractor shall be responsible for decommissioning and preservation of existing fixed fire protection system within the transformer rooms.

Since these are existing buildings, replacement of doors and coating of walls and floors for compliance with a minimum of 2-hour fire resistance are recommended to be done as part of a separate project.

2.4.13.3 Diesel generator system background

Diesel is classified as a CLASS II combustible liquid which has a higher flash point and therefore poses less of an explosion risk. Preliminary designs for diesel generator systems were conducted as depicted on drawing number 230311- E- E- 200-E Generator Plant – Fuel.

As per the preliminary designs, each generator (6x) shall be equipped with 1000 litre base mounted tank, with a receiving bulk fuel tank with a capacity of 9000 litres to be installed centrally, from which the day tanks will be filled automatically. The bulk tank is limited to 9000 litres due to existing site fuel storage capacity of 69 000 litres and in accordance with SANS 10131, a maximum of 85 000litres can be stored above ground without the need for Environmental Impact Assessment (EIA).

A deluge/foam fire protection system is not mandated for a single 10000 litre above-ground diesel storage tank provided it is properly installed to code with appropriate separation distances and secondary containment.

2.4.13.3.1 Contractor scope of work

The Contractor shall review and validate the designs before implementation.

During the review, validation, designs, manufacturing, installation and commissioning process, the Contractor shall ensure the diesel storage tank bunding, corrosion protection and separation distances are compliant with SANS 10089 Parts 1 to 3, specifically on the following:

- SANS 10089-1: Storage of diesel tanks above-ground
- SANS 10400 Part T: General requirements for safety distances, fire resistance and structural elements for diesel storage locations.

Contractor to consider segregating the diesel generators from each other by space / 2 hr rated fire walls. The Contractor shall review and validate the proposal is to install as a minimum FIRE WALLS to be placed on 3x sides of each of the generators (minimum 1 m higher that the generator).

Contractor to conduct a risk assessment to determine if the proposed location for fuel tank is located close to critical infrastructure or other flammable materials and provide guidance for review and acceptance by the Employer.

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The Contractor shall confirm the configuration for tank construction (e.g. double skinned, construction material), and paint specification prior manufacturing for review and acceptance by the Employer.

Contractor shall be responsible for decommissioning and preservation of existing diesel generators for block A to block B as stipulated in section 1.4 above. The Contractor shall also be responsible to decommission and remove the exiting fixed fire protection located in the existing diesel generator rooms.

2.4.13.4 Cabling requirements

2.4.13.4.1 Cabling requirements background

As stipulated in electrical section 2.4.7 existing power cables will be tested and replaced if deemed necessary and new power cables installed where applicable.

2.4.13.4.2 Contractor scope of work

Contractor shall manufacture, supply and install 2 hour rated fire barriers where power cables penetrate through the walls and floors.

Installation of 2 hour rated fire barriers on cable tunnels between adjacent rooms to be considered later once all the refurbishment projects for MWP are completed. Installation of the barrier now will hinder other projects as there are several cables expected to utilize the existing cable tunnels.

Contractor shall seal and apply a fireproof coating of approximately 1 meter on all existing and new power cables (1m from the penetration area) forming part of the scope of work which penetrate through the walls and floors.

2.4.14 Civil and structural requirements

The Civil Contractor scope or works contain but not limited to the following:

- Core drill any walls or concrete slaps where new MV and LV power cables may be required to be routed from the boards to the field equipment where existing cable trenches and cable racks may not be used.
- Cable trenches requirement (if applicable):
  - Laying of underground cables in trenches shall be done in compliance with SANS 10198-8 (Cable Laying and Installation).
  - Cables laid at the bottom of the trench will lay on a 150mm sand layer. Contractor shall only be allowed to reduce the 150mm sand layer requirement under prior approval from the Employer and under proper technical justification based on the Thermal Resistivity (TR) of the backfill material.
  - MV cables (if applicable) will lay at the bottom of the trench, at a minimum depth of 1000mm.
  - LV (DC and AC) cables to be a minimum of 300mm above the MV cable layer and laid at a minimum depth of 600mm.
  - The depth of signal tape must be at least 200mm above cables and 300 mm below the surface to warn contractors of the presence of cables. Trenches greater than 1 m wide should have two or more equally spaced warning tapes above the cables.
  - If applicable, distance between DC and AC cables will be a minimum of 200mm (from nearest duct or cable edge).

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- ❖ Fibre optic cables must be separated 125 mm from low voltage cables and medium voltage cables if applicable.
- ❖ Where power cables had to cross the roads, cables shall be laid in cased ducts concreted along their entire length. The depth from the top of the protection tube to the surface shall be not less than 0.80m.
- ❖ If applicable, conductive (copper) signal cables will lie at least 200mm apart from LV cables.
- ❖ Minimum separation from the cables (LV or MV) to the excavation walls, shall be not less than 50 mm.
- ❖ If applicable, the contractor shall displace cables horizontally through the different layers (MV cables should be accessible for repair without causing damage to the cables above).
- ❖ All cables to be surrounded by soft sand backfill (a fine-fill material to be used for MV and LV cables). The thickness of the sand backfill above the cables shall align with the requirements of the trench design study and the TR of the sand backfill shall be as per the requirements of the trench design study. Under no circumstances will river-sand or any soil with unsuitable TR shall be allowed.
- ❖ Earthing, where applicable, will be laid at the lowest layer of the trenches.
- ❖ Trenches shall be backfilled with clean fill material free from aggregate, debris, organic material, and stones. Trenches shall be backfilled in layers of no more than 150 mm each and mechanically compacted to 93% of maximum density at optimum moisture content, to avoid cavities that may cause collapse of trench top due to settling of the soil.

- ➢ The weights for new equipment (MV and LV switchgear) are currently unknown. The calculated weight for existing MV boards (Incomer and Feeder panels are 1700kg (each) i.e 1000mm (length) x 1540mm (width). The Contractor shall validate once the new weights are obtained for new equipment that the civil infrastructure is not compromised by the proposed equipment. With the new technology, the anticipation is to obtain new equipment (1300kg i.e 800mm (length) x 1540mm (width) that weighs less than existing equipment.
- ➢ The Contractor shall ensure in all the substation where new MV and LV boards are installed; the floor is smooth enough to ensure that the equipment integrity is not compromised for the duration of its design life
- ➢ Excavate, design and construct a concrete foundation where required for all new equipment. The minimum strength of concrete shall be 35 MPa.
- ➢ Construct a bund wall for main fuel diesel tank.

Civil and structural designs shall be done in accordance with the following standards:

- ➢ SANS 10160-1: 2001 (Basis of structural design and actions for buildings and industrial structure, Part 1: Basis of structural designs)
- ➢ SANS 10160-2: 2001 (Basis of structural design and actions for buildings and industrial structure, Part 2: Self weight imposed)
- ➢ SANS 10400: The application of National Building Regulation
- ➢ SANS 10198-8: Cable Laying and Installation
- ➢ 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings

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- SANS 10111 Engineering drawing principles
- SANS 684 Structural steel paint
- SANS 1200 (series) Standardised specification for civil engineering construction
- SANS 10109-1 Concrete floors Part 1: Bases to concrete floors

Experience and competency

The Contractor submits the following:

- Submits a Curriculum Vitae (CV) with a minimum of five (5) years relevant experience for Civil Engineer/Technologist. The Civil Engineer/Technologist to be professionally registered with the Engineering Council of South Africa (ECSA). Copy of valid ECSA registration certificate to be submitted.
- List of verifiable project references (minimum of x3 projects) demonstrating experience and competency in similar projects)

2.4.15 Plant labelling and coding

Plant labelling including KKS coding for all new equipment shall be done in accordance with the Plant labelling standard (240-71432150).

2.4.16 Procedure for submission and acceptance of Contractor's design

2.4.16.1 Technical Schedules A and B

Technical Schedules A&B are compulsory tender returnable, whereby schedule A is the particulars of the Employer's requirements and schedule B is the guarantees and technical particulars of equipment offered by the Contractor.

i. Where there is insufficient space provided in Schedule B, particulars must be furnished on a separate sheet clearly marked with the number of schedules A item they refer to.
ii. Schedule B for all Technical Schedules must be completed in full by the Contractor.
iii. If the Contractor does not fully comply with Employer's requirements, those deviations must be clearly stated in the deviation schedule. Where the Contractor proposal is essentially equivalent to the requirements of the Employer, such deviations must be shown as clarifications
iv. If a blank space is left in Schedule B next to Employer's requirements listed in Schedule A it is assumed that the Contractor does comply with this requirement.

NOTE! As per the technical schedules A and B, the information is to be provided by the Contractor. All information is required to be provided with the proposal. Any information not final should be marked "preliminary/not final".

2.4.16.2 Vendor Document Submittal Schedule (VDSS)

The Employer shall submit the Vendor Document Submission Schedule (VDSS), Appendix A11 to the Contractor as part of tender indicating the minimum documents to be exchanged between the Employer and Contractor. The Contractor shall submit the updated Vendor Document Submission Schedule (VDSS) to the Employer for review and acceptance with additional documentation recommended by the Contractor.

The submission date for the updated VDSS by the Contractor to the Employer shall be agreed between the Contractor and the Project Manager. The Employer will pre-allocate document numbers on the VDSS and send back to the Contractor through the delegated Employer's Representative. The VDSS is revisable, and changes must be discussed and agreed upon by

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all parties. Changes in the VDSS can be additional documentation to be submitted, changes in submission dates or corrections in documentation descriptions, document numbers, etc. The Contractor's VDSS shall indicate the format of documents to be submitted.

2.4.17 Other requirements of the Contractor's design

All the design solutions are developed by the relevant Professional Engineers or Professional Engineering Technologist at all design stages; the associated Professional Engineer / Professional Technologist will form part of the *Contractor's* supervision team and inspect and sign off the various quality documents.

2.4.18 Tests

The Contractor shall arrange and conduct the Factory Acceptance Tests (FATs) for all electrical systems and invite the Employer to witness certain activities. The Contractor installs systems and equipment on at the factory, in accordance with Employer's master programme to which the Contractor align his own program and schedule.

The Contractor performs Site Integration Test.

The Contractor completes hand over certification with the Employer.

The Contractor is required to include all technical information in all relevant design handover packs. In addition, the Contractor is to include all construction and erection documents of all relevant design handover packs.

The Contractor shall complete Quality Control Plans (QCPs) and Inspections and Test Plans (ITPs) (at a check sheet level) before contract award. These shall be reviewed, and Employer comments addressed (by the Contractor) and signed off by the Employer within 30 days after contract award.

2.4.19 Commissioning

The Contractor shall be responsible for hot and cold commissioning of all electrical equipment and thus ensure a fully functional system that is integrated to existing site systems.

2.4.20 As-built drawings, operating manuals and maintenance schedules

At Take-over, the *Contractor* provides two full sets of as-built documentation as hard copies and electronic PDF and native CAD formats (DGN or .DWG which must be compatible with Bentley MicroStation) to the *Employer*.

The Operating and Maintenance Manual must describe how the plant is to be operated and by whom, as well as the desired level of training and orientation required for the building occupants. The operation and maintenance manuals are to consist of the following as a minimum:

a. List of Contents (Index)
b. Introduction
c. General description of the functions of each of the systems including detailed description of each element of each system, how it functions, how it operates and how to maintain it and what attic stock or tools to carry.
d. Full as-built drawings and detailed drawings, brochures and catalogues for each system and each element of each system.
e. The format of the O & M documentations is to be A4 and be a specially bound document with hard cover and with metal ring binding. (All drawings and details are to be reduced to A3 format and folded into A4 format.)
f. The names, addresses and telephone/fax numbers/email addresses of all responsible persons and manufacturers/suppliers are to be listed in the O&M manual.

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g. A full list with reference numbers is to be included to enable the O&M staff to order materials and spares.
h. Colour diagrams are be provided to illustrate the operation and function of each system with reference to the relevant as-built drawings or brochures of Plant and Materials. These diagrammatic drawings must also indicate the locations of valves with their numbers.
i. outlines all the required maintenance activities for the complete works as well as the frequency of such activities and by whom

2.5 LIST OF LONG LEAD ITEMS

- Medium Voltage Switchgear: 24 months
- Transformers: 5 – 6 months
- Main Low Voltage Switchgear, Protection system (IEDs), Self-Contained Battery and Charger Units: 18 months
- Diesel Generators: 3 – 4 months
- Power cables: 1 - 2 months

2.6 LIST OF DRAWINGS

2.6.1 Documentation issued by the *Employer*

Refer to Appendix A10 for List of applicable electrical drawings to be issued by the Employer on request. This is the list of documents issued by the *Employer* at or before the Contract Date and which apply to this contract.

Document number	Revision	Title
0.50/45006 Sheet 1	0	Megawatt Park Site Plan Layout Drawing
0.50/2001	0	Megawatt Part Phase 1 & 2, 11kV Network

2.7 APPLICABLE NATIONAL AND ESKOM STANDARDS

The *Contractor* is required to adhere to the latest editions of standards as referenced in this section. within, the following SANS standards, codes of practice, regulations & standards:

Where there is contradiction between the *Employer's* standards, SANS standards and this report, this report shall take precedence, followed by Eskom standard and lastly the SANS or IEC standards. The contractor shall ensure that they are acquainted with the contents of such documents.

Eskom Standard	
Number	**Tittle**
240-53114248	Valve Regulated Lead Acid Batteries
240- 62772907	Stationery Diesel Generators
240-56227589	List of Approved Electronic Devics

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240-56030635	MV Power Cables
240-56227443	LV Power Cables
240-56356396	Earthing and Lightning Protection
240-56227426	Management of Power Station MV and LV Protection and Settings
240-54937450	Fire Protection Standard
240-106365693	Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings
240-71432150	Plant Labelling and Coding Standard
363-ERE_DDDD-D00185-8	Power Cables (MV and LV) Testing Guideline
GGR 0992	Plant Safety Regulations
D-DT-085	MV and LV Power Cables Trenches Details

International and National Standards	
Number	**Tittle**
IEC 60071	Insulation Co-ordination
IEC 60060-1	High voltage test techniques Part 1: General definitions and test requirements
IEC 60269	Low-voltage fuses
IEC 60529	Degrees of protection provided by enclosures (IP code)
IEC 60898	Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations
IEC 60947	Low voltage switchgear and control gear-Part 2 (circuit-breakers)
NRS002	Graphic symbols for electrical diagrams
SANS 152	Low-voltage air-break switches, air-break disconnectors, air-break switch disconnectors and fuse-combination units
SANS 156	Moulded case circuit breakers.
SANS 1091	National colour standards for paint
SANS 1507	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1900/3300 V)
SANS 1574	Electric flexible cables
SANS 10108	The classification of hazardous locations and the selection of electrical apparatus for use in such locations
SANS 10142-1	Wiring of premises Part 1: Low-voltage installation
SANS 10198	Part 13 - The selection handling and selection of electric power cables of rating not exceeding 33 kV
SANS 60439	Low-voltage switchgear and control gear assemblies
SANS 10142-2	The wiring of premises Part 2: MV installation above 1kV ac not exceed 22kV ac and upto and including 3MVA installed capacity

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International and National Standards	
Number	**Tittle**
SANS 62271 -1	High Voltage Switchgear and Control gear – Part 1: Common Standards
SANS 62271 -100	High Voltage Switchgear and Control gear – Part 100: High Voltage Alternating Current Circuit Breakers
SANS 62271 -102	High Voltage Switchgear and Control gear – Part 102: Alternating Current Disconnectors and Earthing Switches
SANS 1652	Battery Charger
SANS 62040	Uninterruptible Power Supplies
SANS 1632-3	Vented Type Nickel Cadmium cells
SANS 61869-1	Instrument Transformers Part 1: General Requirements
SANS 61869-2	Instrument Transformers Part 2: Additional requirements for current transformers
SANS 61869-3	Instrument Transformers Part 3: Additional requirements for inductive voltage transformers
SANS 1019	Standard Voltages, Currents and Insulation Levels for Electricity Supply
SANS 1195	Busbars
IEC 60038	Standard Voltages
SANS 60269	Low Voltage Fuses
SANS 61439-1	Low Voltage Switchgear and Control gear assemblies – Part1: General Rules
SANS 1339	Electric cables: Cross linked polyethylene (XLPE) insulated cables for voltages from 3.8/6.6kV to 19/33kV MV.
SANS 60076-11.	Power Transformers Part 11: Dry type transformers
SANS 1973-1	Low Voltage Switchgear and control assemblies, with rated short time withstand current exceeding 10kA
SANS 61641	Guide for testing LV Switchgear under conditions of arcing due to internal fault.
SANS 1507	Electric cables with extruded solid dielectric insulation for fixed installation (300/500V to 1900/3300)

2.8 REVISION

Date	**Rev**	**Compiler**	**Remarks**
May 2026	1	D Kunene	Final Report
July 2026	2	D Kunene	Report updated to include electrical priority list and consolidated CCCC comments.

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October 2026	3	D Kunene	Section 2.4.1.10 was included. Substation room cooling requirements remove in section 2.4.12.1

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