## 1. SCOPE OF WORKS AND AREAS OF FOCUS - NGR

| Region/s | Scope of Works | Size | Yes/ No |
|---|---|---|---|
| | | | |
| NGR | Roof top Solar Plant – Grid tied | 20 kW | **Yes** |
| | Battery back-up | 2 Hours | **Yes** |
| | Technical and Operational Training | Official attendance of Solar course | **Yes** |

**The scope of work consists of:**

- Installation of photovoltaic solar plant system – 20KW
- Battery Backup as specified in BoQ.
- Training of PRASA personnel to SAPVIA standard

### 4.1 INSURANCE REQUIREMENTS FOR THE PROJECT

PRASA, as the Employer/Principle, can take out insurances.

### 4.2 TARGETED AREA BY THIS PROJECT

**NGR Region Roof top installation**

| *NGR* | Size of Installation | Single/ Three Phase | Roof Type |
|---|---|---|---|
| Centurion | 20 KWp | 3 Phase | Tiles |
| Eerste Fabrike | 20 KWp | 3 Phase | Tiles |
| Silverton | 20 KWp | 3 Phase | Tiles |
| Rissik | 20 KWp | 3 Phase | IBR |

### 4.3 PRASA'S RESPONSIBILITIES

The Contractor to be provided with the scope of work, specification, bill of quantities, and site access by Prasa PM .

### 4.4 EXTENT AND COVERAGE OF THE PROPOSED PROJECT

**The project will cover the following areas:**

- The rooftop of railway Station

### 4.5 MEASUREMENTS AND PAYMENT

The appointed service provider will be notified of a brief in terms of payment.

### 4.6 FORM OF CONTRACT

The form of contract shall be CIDB.

## 5 SPECIFICATION OF THE WORK OR PRODUCTS OR SERVICES REQUIRED

As laid down in BoQ.

### 5.1 TECHNICAL INFORMATION TO BE PROVIDED WITH TENDER

The Bidders shall submit the following document as part of the evaluation.

- Organisational Experience with solar installation.
- Organisational Experience with electrical installation for substation, electrical reticulation, building electrical reticulation, etc.
- Certified certificates for the required resources (academic and professional)
- Team organogram
- Method statement with Risk assessment and safety plan
- Project programme

## 6 TECHNICAL SPECIFICATIONS RELATED TO THIS PROJECT

The design for this project shall meet technical capabilities & performance requirements. The site requires 3-phase 20 KW / 625kVA, 400V on site. High voltage lithium iron phosphate batteries to be used. High cycle life with high rate of charge and discharge. 10-year warranties on batteries required. Supplier to be able to offer nationwide back and support and maintain appropriate levels of spares and inventory. Batteries to be highly

compatible to specified inverter ito communications and operations. EMS to be able to provide remote monitoring, management and diagnostics and data resolution. Battery BMS modules to have intelligent touchscreen display and wifi enabled monitoring. Batteries to be easily transported and be able to fit into rack mounted cabinets that can fit through a standard single door. System architecture is to enable scalable battery design allowing for easy future addition to storage capacity should this be required. Batteries to have standard on board BMS voltage protection, current limiting, with electronic circuit breakers. Batteries to exceed 6000 cycles @50% DOD (Degree of depletion) and have design life of ~15 years. The site required 20 KW / 625kVA, 400V on site. Therefore, by design the following shall be provided.

**Proposed 550Wp tier one , Grade A solar panels to be used.**

**The following shall also be required from the contractor:**

- The contractor shall submit shop drawings for PRASA's approval prior to any procurement. No equipment shall be ordered prior to PRASA's official written approval.
- The shop drawings to be in full compliance with the general requirements and performance specifications as set out in this RFQ document.
- The Contractor takes complete liability for patent and latent defects.
- The designs to be signed off and approved by a respective ECSA (Engineering Council of South Africa) registered Professional Engineer or Professional Engineering Technologist.
- The installation shall be carried out and approved by the electrician and someone with green card or an energy specialist.
- All the design, fabrication, construction etc. conforms to the relevant legislative requirements, SANS Standards and SABS codes.
- The PV Plant and documents are appropriate labelled and in a coherent manner.
- The PV Plant is designed with due consideration to the site environmental conditions.
- Appropriate care is exercised, and confirmation is made to site measurements before proceeding with design & manufacture of the complete works as dimension accuracy.
- The design provides performance guarantee for minimum of 99.5% as annual plant availability. Plant availability is measured in terms of time during which the plant is supplying energy as per demand.

- The design and construction of the PV Plant complies with current standards and statutory obligations arising from current legislation and regulations, including statutory legislation and codes of practice, and relevant South African and international standards.

**Material Quality Specification**

- All components and materials supplied are designed, manufactured, and tested in accordance with the latest applicable IEC and SANS standards.
- Equipment Products, Components and/or Accessories conform to all applicable Product Safety Standards appropriate for the intended markets.
- Materials and products used are suitable for the service conditions.
    - All *works*, materials, parts, components etc. supplied/replaced be new, both in the construction of the PV Plant and maintenance of the PV Plant throughout the Operation Maintenance Period.
- Any materials or substances that are generally known at the time of use to be deleterious, a health risk, or a fire hazard, either in use or in their manufacture.
- Where possible, all materials used are recyclable.
- Substances known to deplete the ozone layer, whether specifically excluded from use by current EC legislation, as refrigerants or foaming or filling agents for insulation.
- Any materials or substances that support mould, bacterial growth or vermin or cause objectionable odours under service conditions.
- Materials and products delivered to site bear the manufacturer's name, brand name and any other data required to verify that their performance and specification complies with the requirements of this document.
- Materials and products are appropriately CE/UL marked and/or SABS approved.
- Follows the manufacturers' instructions on the installation and use of materials and products.
- Selects materials & products regarding standardisation and availability of spare parts and for ease of maintenance.
- Use the same manufacturer for materials or products of a similar type and that identical parts of similar products are interchangeable.
- Materials and components are transported and stored in accordance with manufacturer’s guidelines.

- Provides suitable packaging for the protection of all materials and equipment during delivery, storage, and where exposed to damage on site. The Contractor returns re-usable packaging to the supplier. The Contractor takes particular care to protect and maintain plant and equipment delivered early.
- Examines materials and products supplied when delivered to site and immediately prior to installation. The *Contractor* replaces any damaged or faulty materials or products.
- Stores all materials on raised boarded platforms under weatherproof covers and/or according to manufacturers' specifications.
- Protects all materials and equipment which may be exposed to damage, inclement weather, or ultraviolet light.
- Ensures that sensitive plant and equipment items not to be exposed to dirt or dust at any time to maintain manufacturers' warranties and long-term reliability.
- Replaces/Repairs any damage to finished materials and replace equipment prior to Final Completion of the project.
- Provides the critical spare parts, provided by the bidder during tender submission, on site upon Final Completion.

**Building Works**

**Installation of new Roof Sheeting - Design Statement**

Prior to commencement of new solar panels installation on the identified roof location, existing deteriorated roof sheeting shall be removed and replaced with new.
All building works to be carried out in conjunction with Architect and Structural engineer drawings and specification, works to comply with South African Building Standards.

All buildings, structures, cable trenches/routings, and service routes which are incorporated in this contract are functionally and efficiently located and that each building/component is sized for optimum space usage.
All design, fabrication, construction etc. conforms to the relevant legislative requirements, SANS Standards and SABS codes.

**Mounting Structure**

- Designs, procures, and construct the most efficient means for mounting PV modules.
- The mounting structure is of roof mounted, fixed type and facing North where possible. Should north facing orientation not be possible, then both west and west orientations on at least 2 strings to be designed. The structure withstands all possible static, dynamic, and seasonal loads at site condition.
- All PV mounting structures are off-the-shelf products as much as possible.
- The proposed mounting structures (product) have proven track record and the product have been installed in PV projects for more than 100 KW capacity.
- The mounting structures are designed for optimum PV module orientations.
- The row-to-row distance is selected to minimize the shading losses.
- The mounting structure is designed for minimum 25 years of operation and the Contractor provides minimum 5 years as warranty on material/product.
- The mounting structure solutions which is efficient, cost effective and reliable. The design reduces installation time and material waste.

**Electrical Works**

- This section defines the electrical works for the Project.
- All design, fabrication, construction etc. conforms to the relevant legislative requirements, SANS Standards and SABS codes.

**Photovoltaic (PV) Capability**

The PV capacity of 20 KW (twenty kilowatt) system. The DC capacity is the sum of nominal power of all modules to be installed.

**Photovoltaic (PV) Module**

- The solar panel minimum wattage shall be 550Wp per panel.
- Supply and install the PV Modules to achieve the specified levels of performance for the required design life of 25 years under the prevailing site environmental conditions to be determined with minimum 12-year warranty on panels provided.
- PV Modules technology is either of monocrystalline silicon (c-Si) type. All PV modules supplied for the Plant are of the same type, size and from a single manufacturer.

- The module manufacturer complies with followings.
  - Has been producing PV modules commercially for last five years,
  - Has an experience in minimum of 50 MWp cumulative capacities in PV installation.
- The PV modules minimum guarantees from the manufacturer are.
  - Power Output Warranty: maximum power output degradation of 10% and 20% of rated peak power respectively for 10 years and 25 years operational period.
  - Linear Degradation: first year degradation not more than 3.0% and linear degradation from second year and onwards not more than 0.75% per year.
  - Workmanship guarantee: Product guarantee against manufacturing defects for a minimum of 10 years.
  - Positive tolerance: rated power output tolerance must be positive e.g. 0/+5%.
- The module rated peak power (defined at STC condition) is used to determine the peak power of the Plant. The peak power is the sum of the manufacturer's name plate data sheets for each individual module.
- The flash test data from manufacturer (measurement according to IEC 60904 part I) for each module to be installed in the project. The sum of power in flash test data is equal to or higher than peak power of the Plant.
- All modules to have valid industry standard certifications; IEC 61215 and IEC 61730, issued by reputable testing institutions according to IEC.
- The module arrangements to be decided to minimize the losses due to mismatching. Proper sorting method and only modules from the same set is used in in the same string.
- All transportation, storage, handling, and installation of the modules to be in accordance with the specifications from the manufacturer, as to not to void the module manufacturer's warranty.

| **Solar Panels** |
|---|
| **Minimum Requirements. Must be the same or higher** |
| **Peak power (Pmax): 550W or higher** |
| Mono-crystalline type |
| Efficiency - 20% minimum |
| Open Circuit Voltage (Voc): 45.9V |
| Max Power Voltage (Vmp): 41.77V |

| Solar Panels |
|---|
| **Minimum Requirements. Must be the same or higher** |
| Short Circuit Current (Isc): 18.57A |
| Max Power Current (Imp) :15.57A |
| Power Selection: 0 ~+ 5W |
| Power tolerance - +/-5 W |
| IEC 61215-1/1-11-2;2016 and IEC 6173D-1/2;2016 |
| Safety class based on IEC 61140: Class II |
| Maximum System voltage: 1000V or higher |
| Maximum Over current protection Rating: 25A |
| Power Production tolerance: +_3% |
| Open circuit voltage Tolerance: +_2% |
| Short Circuit Current tolerance: +_4%<br>Fire performance - Class C as per IEC 61730<br>Front cover - 3.2 mm tempered glass<br>Frame - Anodized aluminium alloy, crossbar enhanced<br>Application class – A<br>Junction box - IP68, 3 bypass diodes.<br>Temperature Co-efficient = -0.37 % (Pmax), -0.29 % (VOC) and 0.05 % (ISC)<br>Operating temperature - 40 to +85 degrees Celsius |

**DC Combiner box**

- The DC combiner boxes are designed for use for external condition with a design lifetime of 25 years.
- The combiner box includes string fuse for each string. The fuse rating is sized according to the requirement from module and inverter manufacturer.
- The DC combiner box includes lightning current and overvoltage surge arrestor.

- The DC combiner box includes array on-load disconnect switch, which is accessible without opening the combiner box. This switch allows for isolating array connected to box for maintenance and emergency purpose and is lockable.
- The combiner boxes are equipped with sun shields where exposed to direct sunlight. To prevent overheating inside the boxes, reduced terminal occupancy is considered. The place of installation location must be easily accessible and offer a secure base for working on the device.
- The cable labelling and single line diagram of connections inside the combiner box is kept on each combiner box.

**Inverters and inverter-charger**

- Selects hybrid Inverters with proven track records in terms of performance and operation.
- PRASA has adopted similar or equivalent to engineering design to DEYE, SUNSYNK, SOLIS.
- Where specific municipalities or electricity authorities have specified certain brand or product names of Solar systems, then it's incumbent of PRASA to align to such.
- Provide an inverter arrangement that gives overall optimal energy yield over the life of the Project, considering the site conditions and the proposed module layouts.
- All inverters installed are of same type, size and from a single manufacturer.
- Inverters selected for the installation to conform to the following specifications.
    - Inverter is selected with respect to local climatic and environmental condition and is equipped to operate in high temperature regions,
    - The inverter power is not derated for the temperature range between -10°C and +40°C.
- Inverters selected for the installation has a minimum of 5 years product guarantee against manufacturing defects.
- Inverters can log performance parameters (input power, output power). The data storage management process and stores the operating data of the inverter.
- The inverter manufacturer's warranties for the site-specific environment and installation type to be confirmed.
- The inverters comply with all relevant national and international certificate labels and suitable of installation in South Africa.

- All transportation, storage, handling, and installation of the inverters are in accordance with the specifications from the manufacturer, as to not to void the inverter manufacturer's warranty.
- The solar charge controller shall be at least 30kW.
- The Inverter-charger shall be of 20kW.

The solar inverters shall be installed on the load side of the inverter-chargers and must comply with the following:

Provision of at least 130% on invertor output for PV is required for inverters to meet the minimum specification.

No transformer required - the hybrid inverter is sufficient for office type electrical loads – transformer-based inverter only required for high startup motor type loads

| INVERTERS | | |
|---|---|---|
| **Item No.** | **Description** | **Minimum Requirements** |
| **1** | AC (Grid-connected) | |
| 1,1 | Apparent power | 110kVA |
| 1,2 | Rated power | 20kW |
| | Grid voltage | 380VAC - 400VAC |
| 1,3 | Rated voltage | 400V |
| 1,4 | Rated current | 144A per Inverter |
| 1,5 | Voltage range | 360V - 440V |
| 1,6 | Rated frequency | 50/60Hz |
| 1,7 | Frequency range | 45~55/55~65Hz |
| 1,8 | THDI | <3% |
| 1,9 | PF | 0.8lagging - 0.8leading |
| 1,10 | AC connection | Three phase 4-wire + protective earth |
| 1,11 | AC input | 200kVA |
| 1,12 | Adjustable grid code selection | Yes |
| 1,13 | Transformer less topology | Yes |
| 1,14 | DC/AC output converter | True three-phase bridge topology |
| 1,15 | AC connection type | Aluminium and copper up to 240mm$^2$ |
| 1,16 | Anti-islanding protection | Yes |
| 1,17 | Efficiency | 98,40% |
| 1,18 | Night consumption | < 0.6 W |
| 1,19 | Wireless remote monitoring | Yes, with Wi-Fi logger card |
| 1,20 | User interface | 4 x LED & web interface |

| INVERTERS | | |
|---|---|---|
| **Item No.** | **Description** | **Minimum Requirements** |
| | | |
| **2** | **DC (Battery and PV)** | |
| 2,1 | Max. PV open-circuit voltage | 1000V DC |
| 2,2 | Max. PV power | 150kWp |
| 2,3 | PV MPPT voltage range | 480V - 8050V DC |
| 2,4 | Number of independent MPPT | 6 per inverter |
| 2,5 | DC input pairs per MPPT | 4 |
| 2,6 | DC switch rating per MPPT | 50A or higher |
| 2,7 | Max DC input power | 17500kW per MPPT |
| 2,8 | Battery voltage range at Max. charge power | 500V - 600V |
| 2,9 | Battery voltage range | 352-600V |
| 2,10 | Max. charge power | 150kW |
| 2,11 | Max. discharge power | 110kW |
| 2,12 | Max. charge current | 300A |
| 2,13 | Max. discharge current | 313A |
| 2,14 | Reverse polarity protection | Yes |
| 2,15 | Lifetime free online monitoring | Yes |
| 2,16 | DC input individual current monitor | Yes (individual string current monitoring) |
| | | |
| **3** | **General Information** | |
| 3,1 | Protection degree | IP54 |
| 3,2 | Noise emission | <65dB(A)@1m |
| 3,3 | Operating temperature | -25 °C~+60 °C |
| 3,4 | Cooling | Forced air |
| 3,5 | Relative humidity | 0-95% non-condensing |
| 3,6 | Maximum operating altitude | 2000 m without derating |
| 3,7 | Dimension (W/H/D) | 1200/1900/800mm |
| 3,8 | Weight | 1025kg |
| 3,9 | Build-in transformer | Yes |
| 3,10 | Transfer between on/off grid | Automatic≤10ms |
| 3,11 | Standby consumption | <30W |
| 3,12 | Detachable wiring box | Yes |
| 3,13 | Relative humidity | 0 to 100 % condensing |
| 3,14 | Cooling | Forced air |
| 3,15 | Input and output surge protection | Yes, pluggable Type 2, monitored |
| 3,16 | Photovoltaic array isolation control | as per IEC 62109 |
| 3,17 | Safety standard | IEC 62109-1 & 2 |
| | | |
| **4** | **Communication** | |

| INVERTERS | | |
|---|---|---|
| **Item No.** | **Description** | **Minimum Requirements** |
| 4,1 | Display | Touch screen |
| 4,2 | Communication | RS485/CAN |

**AC combiner panel**

AC combiner panels will have individual incoming circuit breakers for each solar inverter. The incoming circuit breakers shall have isolation behaviour and be suitably selected to allow spare capacity when compared to the solar inverter output as well as being correctly selected to protect the AC cable.

The AC combiner panel shall be fitted with busbars to combine the incoming AC circuits before entering the main output AC circuit breaker. The busbars shall be rated at 1.6 A/ $mm^2$ and be suitably supported for the site-specific prospective fault current (short-circuit current).
Neutral and earth bars will be of the same rating as the phase busbars. All busbars and wiring shall be adequately rated and suitably supported. The minimum busbar fault current rating shall be 10 kA.

The main output AC circuit breaker shall have isolation behaviour. Suitable busbar extensions shall be fitted to the circuit breaker for easy termination / connection of the outgoing AC cabling.

The AC combiner panel shall be fitted with a power meter on the main output AC circuit breaker that measure current, voltage, power factor, kVA, kW, kVAr as well as maximum values.

**Solar modules and installation**

Solar modules must be the mono-crystalline type and comply with the following:

- Maximum system voltage : 1000 V
- Efficiency : 20% minimum
- Fire performance : Class C as per IEC 61730

- Tier rating : 1
- Application class : A
- Power tolerance : +/- 5 W
- Cell arrangement : 144
- Front cover : 3.2 mm tempered glass
- Frame : Anodized aluminium alloy, crossbar enhanced
- Junction box : IP68, 3 bypass diodes.
- Cable : 4 or 6 mm2
- Connector : T4 series
- Temperature Co-efficient : -0.37 % (Pmax), -0.29 % (VOC) and 0.05 % (ISC)
- Operating temperature : -40 to +85 degrees Celsius

Bidders must provide solar panel that are same or higher of the above specification. This is linked and depends on the proposed structure and required supply.

The solar modules shall be installed on a suitable mounting system. The mounting system shall be certified and have appropriate installation instructions. Weather conditions must be considered when the mounting system is designed to match the installation site's weather conditions.

Solar modules must be installed in neatly arranged rows with consideration for cleaning, servicing, and maintenance. For this reason, access paths must be included in the design. A maximum linear string must have an access path every 50m. The design must be submitted for approval to the engineer prior to ordering and installation of any equipment.

Where appropriate, permanent safety lines or anchors for temporary safety line must be included in the design and the Contractors offer.

The Contractor shall provide the weight of all equipment in their data sheets as part of the quotation submission.

**Inverter-Charger**

Three phase inverter-chargers must comply with the following:

- Inverter size : 20 KW / as per designs
- Parallel operation possibility : Yes
- Power control : Yes
- Remote monitoring : Yes
- Remote control : Yes
- Remote configuration : Yes (with configurable access levels)
- AC Input /Output voltage range : 220V 380V, 230V/ 400V (3L +N+PE)
- AC Input frequency : 45Hz to 65Hz
- DC Input voltage range : 160 to V to 700V
- DC Charge current : 37A
- Safety standard : IEC 6219-1/2
- Efficiency : less than or equal to 97.5 %
- IP rating : 65
- Anti-islanding : Yes
- Overload capacity : 110% for 10min / 120% for 1min
- Cooling : Intelligent air cooling
- Maximum altitude : 2000m
- Interface : Touch screen

**Cabling**

- The design and installation of power and control cables and execution of associated work is in accordance with relevant SANS Standards and cables are SABS approved.
- All cables in the Plant are fastened adequately to avoid swinging and tension and durable mounted in such a way as to protect them from rodent attack, weathering and UV radiation.

- All cables are uniquely numbered (permanent labelling) to facilitate later traceability & fault location. Circuits and cables are planned and installed to ensure accessibility and ease of maintenance.
- Electrical conductors are selected with an insulation level applicable to the system voltage for which they are used and capacities suitable for the load being served. The type of cable used is determined by individual circuit requirements and individual equipment manufacturer's recommendations. Current carrying conductors are either copper or aluminium.

**DC Connectors**

- Modules connectors and DC cables connectors are compatible and from the same manufacturer throughout the project.
- To use cables with connectors which are contact-proof and designed to avoid corrosion.

DC cabling and installation shall comply with the following:

- DC cable standard : IEC 62930
- Installation standard : IEC 60364-4
- DC voltage rating : 1000 V
- Cable size : minimum 6 $mm^2$
- Connectors : MC4
- Junction boxes : IP65, UV and weatherproof
- Cable installation: on roof : Below solar modules allowed.
- Cable installation: from solar modules to DC isolators: Galvanized conduit
- Cable installation : Earth- and short-circuit proof.
- Cable installation : UV and weatherproof
- Parallel strings with : Fused on positive and negative poles PV rated DC fuses.
- Field array enclosures : Must include surge protection and fuse protection of strings.
- Earthing earth : Galvanized conduits to be bonded with strapping

- Earthing : All solar modules to have individual earth wires to structure
- Earthing : Mounting structure to be earthed with minimum 16 $mm^2$ wire

All connections and extensions to be done with T4 connectors. No joining or extending of solar cable to be done with terminals or strip connectors.

**Lithium-Ion Battery**

Only lithium iron phosphate batteries will be considered. As charging and discharging voltages and currents are critical to batteries these must be considered in the selection of the battery. The battery backup time to be sized to meeting design criteria.
The battery shall be Lithium-Ion (LiFe PO4) that operates for at least 6000 cycle at 50% Depth of Discharge (DoD), and or 5500 cycles at 80% DoD and minimum of 10-years lifespan. The maximum load duration shall be 5 minutes per 30-minute cycle, 2 x maximum overload to handle for 2 seconds. The fly leads minimum to be 1800mm long, power cable Red – positive, black – negative.

**The battery shall comply with the following:**

Nominal voltage - 2-Hour's backup supply for a 20 KW solar plant, (minimal battery storage capacity of 40 KW battery storage capacity, 80% DOD (ie. Min 50 Kwh total capacity).

- Nominal voltage : 512 V (to suit inverter - charger)
- Charge / Discharge current : to meet recharge design criteria.
- Cooing fan : No
- Enclosure : Heavy duty custom made; powder coated
- External interface : CAN Bus
- Protection : Electronic Circuit breaker, BMS voltage protection, current limiting
- Remote tripping over CAN Bus : Yes
- Manual reset : Yes
- Cell under- & over voltage protection : Yes
- Built-in temperature protection : Yes
- Minimum SOC control : Yes

- Human machine interface : Yes, with 0-100% state of charge indication
- Wi-Fi remote monitoring : Yes
- Warranty : +10 years / 6000 cycles, 80% DoD
- Service life : >20 years at low cycle.
- Mounting : Floor standing

The following shall form part of the battery equipment.

- **Control interface** - RJ45 Socket x 2 – CAN Bus for Interfacing with Compatible Inverters and System Controllers, connection of parallel batteries.
- **Protection** - Shunt Trip Circuit Breaker sized to suit max current, can be tripped by BMS if critical fault, manual reset. Includes overcurrent, cell under and over voltage, temperature, weak cell detection, minimum SOC control.
- **Human Interface** - State of Charge Display (0 to 100%), Error light, Error Reset Button, Serial RS232 Plug for Programming (note the Lite 80/56 has a CAN port for programming and not a serial port), Wi-Fi remote monitoring.
- **Warranty** - 10 years 6000 cycles for average 80% DoD, and max 90% DoD
- **Service Life** - >15 years (>5 500 cycles) expected life at 80% DoD (1), >20 years (>7 500 cycles) at 50% DoD.
- **Essential Accessories** – These shall be required for battery connection to the PC - Lite 5/4 up to Lite 60/42 - Serial RS232 to USB adapter (must be the brand supplied by same supply that supplies the batteries). CANdapter as per the battery supplier (must be the brand supplier that supplies the batteries and shall be supplied with battery). CAN Bus Termination Resistor (as per the battery supplier) – one required per battery, must be the brand supplied by same supply that supplies the batteries) and must be included with the battery package.

| Lithium-Ion Battery | |
|---|---|
| **Description** | **Requirements** |
| Battery Size | 2-Hour's backup supply for a constant 20kW load min 50 kwh total capacity for 40 Kwh usable capacity at 80%. |
| Nominal voltage | 512 V |
| Enclosure | Heavy duty custom made; powder coated to fit through standard single door (Standard server cabinet width as per spec BOQ) |
| External interface | CAN Bus |
| Protection | Circuit breaker with shunt |
| Remote tripping over CAN Bus | Yes |
| Manual reset | Yes |
| Cell under- & over voltage protection | Yes |
| Built-in temperature protection | Yes |
| Minimum SOC control | Yes |
| Human machine interface | Yes, with 0-100% state of charge indication |
| Wi-Fi remote monitoring | Yes |
| Warranty / Lifetime | + 10 years / 7 500 cycles at 50% DoD or 5 500 cycles at 50% DoD |
| Mounting | Floor standing |

**Earthing**

- Earthing system for the PV Plant that eliminates the risk to personnel or animals of electric shock under normal operating conditions as well as fault conditions. Furthermore, the earthing system ensures the functionality of electrical protection equipment during electrical faults.
- The designs of the earthing system in accordance with Solar PV industry best practice and in compliance with SANS 10200:1985 and SANS 10292:2001.

**Surge and Lightning Protection**

- The lightning protection systems to be according to relevant SANS standards. The lightning protection system protects the equipment and project against damage caused by lightning strikes.
- Overvoltage protection is installed at DC side as well as AC side of the inverter, DBs and within the PV arrays.

### 6.1.1 CONTRACT PRICE ADJUSTMENT

Not applicable. Only applicable if the project is over 12 months period.

## 7 EVALUATION AND SCORING METHODOLOGY

The evaluation of the Bids by the evaluation committees will be conducted at various levels.

The following levels will be applied in the evaluation:

| LEVEL | DESCRIPTION |
|---|---|
| **Verify completeness** | The Bid is checked for completeness and whether all required documentation, certificates; verify completeness warranties and other Bid requirements and formalities have been complied with. Incomplete Bids will be disqualified. |
| **Verify compliance** | The Bids are checked to verify that the essential RFP requirements have been met. Non-compliant Bids will be disqualified. |
| **Detailed Evaluation of Technical** | Detailed analysis of Bids to determine whether the Bidder can deliver the Project in terms of business and technical requirements. **The minimum threshold for technical evaluation is [70%], any bidder who fails to meet the minimum requirement will be disqualified and not proceed with the evaluation of Price and Specific Goals.** |
| **Specific Goals** | Evaluate Specific Goals |
| **Price Evaluation** | Bidders will be evaluated on price offered. |
| **Scoring** | Scoring of Bids using the Evaluation Criteria. |
| **Recommendation** | Report formulation and recommendation of Preferred and Reserved Bidders |
| **Best and Final Offer** | PRASA may go into the Best and Final Offer process in the instance where no bid meets the requirements of the RFP and/or the Bids are to close in terms of points awarded. |
| **Approval** | Approval and notification of the final Bidder. |

## 8 THE NATIONAL INDUSTRIAL PARTICIPATION PROGRAMME

The National Industrial Participation (NIP) Programme, which is applicable to all government procurement contracts that have an imported content, became effective on the 1 September 1996. The NIP policy and guidelines were fully endorsed by Cabinet on 30 April 1997. In terms of the Cabinet decision, all state and parastatal purchases / lease contracts (for goods, works and services) entered after this date, are subject to the NIP requirements. NIP is obligatory and therefore must be complied with. The Industrial Participation Secretariat (IPS) of the Department of Trade and Industry (DTI) is charged with the responsibility of administering the programme.

## GENERAL MAINTENANCE ACTIVITIES BUT NOT LIMITED TOO: -

| Sub-system or component | Maintenance action | Frequency |
|---|---|---|
| Site | Verify:<br>Cleanliness (accumulation of debris around and or under array | Monthly |
| Inverters | Check fan and cooling elements | Monthly |
| PV modules | Verify cleanliness (dust or fungus) | Monthly |
| | Check for visual defects including<br>- fractures<br>- browning<br>- moisture penetration<br>- frame corrosion | Monthly |
| Wiring installation | Verify mechanical integrity of conduits | Monthly |
| | Verify insulation integrity of cables installed without conduit | Monthly |
| | Check String boxes for:<br>- tightness of connections;<br>- water accumulation/build-up;<br>- integrity of lid seals;<br>- integrity of cable entrance and/or conduit sealing<br>- integrity of clamping devices | Monthly |
| | Verify:<br>Surge arresters for degradation | |
| | Check connections for<br>- tightness of connections;<br>- corrosion | Monthly |
| **Sub-system or component** | **Maintenance action** | Monthly |
| Electrical characteristics | Measure open circuit voltages | Monthly |

| | | |
|---|---|---|
| | Measure short circuit currents | Monthly |
| Protective devices | Verify integrity of fuses | Monthly |
| | Verify operation of MCCB | Monthly |
| | Verify operation of solar array isolation device | Monthly |
| | Verify tightness and integrity of bolts and other fastening devices | Monthly |
| Mounting structures | Inspect for corrosion | Monthly |
| Monitoring and control system | Visual inspection of hardware | Monthly |
| | Remotely check integrity of system communication | Monthly |
| | Integration with existing Backup generator | Monthly |