

TENDER FOR TURNKEY DESIGN SUPPLY, INSTALLATION & COMMISSIONING OF 47.355 KWP GRID CONNECTED SOLAR PHOTOVOLTAIC POWER GENERATING PLANT UNDER NEW METERING ALONG WITH 5 YEARS COMPREHENSIVE OPERATION AND MAINTENANCE AT RAMNAGAR LUBE TERMINAL, KOLKATA, WEST BENGAL.

TECHNICAL SPECIFICATION OF SOLAR PV PLANT

1. SOLAR PHOTOVOLTAIC MODULES

- The solar photovoltaic modules to be used for the project should be of Mono Perc Crystalline technology only.
- The Solar PV Module should contain high power silicon cells. The Solar cells shall have surface anti-reflective coating to help absorb more light in all weather conditions.
- The rated capacity of the Solar Modules should be equal to or greater than 385Wp. Solar Modules to be used have to be framed only.
- Solar Module should be laminated using established polymer (EVA) and Pedlar / Polyester laminate.
- Module should be PID Free and of positive Tolerance only.
- Modules should have an efficiency of not less than 18.5 % and the fill factor should be equal to or above 75%.
- The SPV Module should be tested and should have IEC test certificate from any recognized IEC accredited test centres. The Test certificates can be from any NABL/ BIS accredited Testing / calibration laboratories. The test certificates should have validity of at least 6 months from the date of submission of the tender document.
- The SPV modules should confirm to the minimum technical specification laid down by MNRE.
- SPV Modules shall be certified as per IEC 61215, IEC 61730 and IEC 61701 amended up to date or equivalent standards.
- The PV Modules shall be tested for Salt Mist Corrosion Test as per MNRE requirement.

- The Solar Modules offered shall have a Power warranty of 25 years. Solar PV modules must be warranted for their output peak watt capacity, which should not be less than 90% of the name plate rated capacity at the end of 10 years and not less than 80% of the rated name plate capacity at the end of 25 years. All specifications refer to the Standard Test Conditions (STC).
- The Solar PV Modules should also be warrantied against manufacturing defects and workmanship for 10 years.

2. TECHNICAL SPECIFICATION FOR INVERTERS

- The Inverter/s used should be robust, intelligent On-grid string inverters manufactured by reputed local and international companies having sales and service office in India. The inverter/s must conform to the IEC 61683 and IEC 60068-2, IEC 62116, IEC 61727. The typical specifications required are as under:
- The inverters should be string inverters only with IP65 or IP67 rating for outdoor applications with rated AC Output capacities from 15kW to 30 kW.
- All inverters should be 3 phase, 415V, 50Hz AC output with LED/LCD display.
- Minimum Start Voltage should be between 200V to 400 V
- MPPT Range 350V-800V (Wider range is preferred)
- Maximum Input Voltage: 1000V DC
- Euro / CEC Efficiency above 97%
- Frequency: 50Hz +/- 1.5%
- Power Factor > 0.99
- THD < 3%
- Ambient Temperature range: -20⁰ C to + 60⁰ C
- Warranty: 5 Years Comprehensive.
- Integrated Ground Fault Protection
- In built DC Surge protection or external in Array Junction Box.
- Anti Islanding Feature
- Transformerless
- Over Voltage/ Under Voltage Protection
- Auto Shut down in case or Over Heat/ Over Temperature.
- The inverter/s should be equipped with an inbuilt web based data logger or should be compatible with an external datalogger along with appropriate softwares log data and to generate reports/ graphs for AC generation in kWh, Peak daily KW, monthly generation in kWh, annual generation in kWh and other features.

3. TECHNICAL SPECIFICATION FOR SOLAR MODULE MOUNTING STRUCTURE

- Supply of complete solar module mounting structure, hardware etc. shall be suitable for ground mounting as per site requirements.
- The structure shall be designed with a fixed angle of tilt of minimum 5°. The structure should be so designed that the lower end of the module should be facing South.
- Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the structure foundation.
- The steel structures shall be fabricated of structural steel as per latest BIS 2062 (amended up to date) galvanised in compliance of BIS 4759 (amended up to date) or should be coated with Epoxy resin paint if the structure is site fabricated.
- For factory fabricated structure, the support material should be Hot Dipped Galvanized with minimum 70 micron coating thickness.
- The Structure should be fabricated from ISI marked M.S angles/ channels or Pre Galvanized extruded sections. The minimum thickness of galvanization for MS or MS extruded sections should be of 70 microns.
- All fixing fasteners and nuts and bolts should be of SS 304 only.
- The structure should be designed so that the lower end of the Solar Module is above the parapet wall height and should have minimum ground clearance of not less than 500 mm.
- The foundation and structure should be designed by a licenced structural engineer giving due consideration to the weight of the module, the weight of the structure assembly, maximum wind speed of the area, seismic factors of the site, as all structural/ Civil considerations for ensuring the safety and durability of the Structure.
- The structure along with the foundation blocks are to be designed to withstand wind speed up to 180 Km/hr or higher.
- The design of the structure and foundation should meet IS 800- 2007 Standards. The design calculations, STADD calculations and the wind speed analysis for the foundations & solar mounting structure shall be signed and sealed by the RCC Structural consultant of the supplier and submitted before the despatching the Solar Module mounting structure to site.
- The foundation pedestals where-ever necessary shall be concrete.

4. TECHNICAL SPECIFICATION - CABLES & ELECTRICAL CONTROLS

- All the necessary Solar DC cables / wires shall be supplied shall be of stranded Copper conductor only according to IEC 60228, with XLPO insulation, UV resistant and resistant against water, oil & salt, Halogen free, Low smoke emission and flame retardant features. Positive and Negative Solar DC cables and wires have be routed through suitable separate flexible PVC pipes/ Cable trays etc. Solar DC cable / wire maximum temperature rating should be +120⁰ C. The solar DC cables should be carry TUV certification.
- AC cables from Inverter to Inverter Interactive Panel should be 1.1kV grade, 4C stranded copper conductor, of suitable rating as per requirement. PVC Cables should be approved as per IS 1554 (Part 1) -1988.
- 4/ 3.5 core XLPE Copper / Aluminium Armored cable of suitable thickness is to be used from Inverter Interaction Panel to the Main L.T Panel approved as per IS:7098 (Part 1) - 1988.
- All connections should be properly made through suitable lug/terminal crimped with use of suitable proper cable glands.
- The size of cables/wires should be designed considering the line loses, maximum load on line, keeping voltage drop within permissible limit and other related factors. Maximum permissible line losses should be less than 3%.
- The cables and wires should be ISI marked and confirm to latest BIS standards as required by MNRE for Solar applications. The ambient temperature ranges of the cables and wires to be used should be from -5⁰ C to + 90⁰ C and above only.
- All cables shall be of low smoke FRLS type & shall be routed through sand filled trenches between Inverters upto the Main LT Panel and existing LT Panels.

5. LIGHTNING, SURGE & OVER VOLTAGE PROTECTION

- The SPV power plants shall be provided with lightning & over voltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc.
- Suitable equipments for AC and DC Surge Protection should be provided with the system.
- The area of the Solar PV Yard/ Array shall be suitable protected against lightning by deploying required number of Lightning Arrestors. Lightning arrestors should be as per IEC 62305.The protection against induced high-voltages shall be provided by use of metal oxide varistors (MOV's) and suitable earthing so that induced transients find an alternate route to earth.

- The lightning Masts/ Conductors shall be made as per applicable Indian Standards/ International standards to ensure complete protection of the Solar PV Yard and equipments/components therein.
- Necessary concrete foundation for securely holding the lightning conductor in position taking into consideration the wind speed in the area. Necessary guy wires should be given to ensure that the lightning conductor remains in position in event of heavy winds.

Each Lightning Arrestor must be connect to 2 separate earth pits through suitable size copper cables/wire. The same should be confirm to necessary IS standards.

6. EARTHING PROTECTION

- The earthing pit shall have to be made as per Amendment No.2 dated 2nd January 2010 to IS: 3043 – 1987. The earthing system network / earth mat shall be of interconnected mesh of GI Flats buried in the ground in the plant. Suitable size of GI Flats to be used for the interconnection. The earth conductors shall be free from pitting, laminations, rust, scale and other electrical mechanical defects.
- Metallic frames of all electrical equipment shall be earthed by 2 separate and distinct connections to the earthing system, each of 100% capacity.
- Metallic sheaths/ screens and armour of multicore cable shall be earthed at both ends.
- Neutral connections and metallic conduits / pipes shall not be used for equipment earthing.
- Connections between earth leads and equipment shall be normally of bolted type.
- Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150mm.
- Minimum spacing between electrodes shall be 2000 mm.
- Necessary test point provision shall be made for bolted isolated joints of each earthing pit for necessary periodic checking of earth resistance.
- In compliance to Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
- The Solar structure, inverter, lighting arrester should have the separate earth pits. The number of earthpits is to be decided by the Bidder as per the requirements of the electrical inspector /CEIG or any concerned statutory body for the region.
- All the array structures, equipments & control systems should be compulsorily connected to the earth. The earthing arrangement should also be approved by the electrical inspector.
- The approved drawings from electrical inspector/ CEIG must be submitted to HPCL on completion of the project.

- Total plant earthing system shall be designed to give an earth resistance of less than 1 ohm all along with earth mesh.

7. TECHNICAL SPECIFICATION OF DC COMBINOR BOX (If required)

- The DC Combinor box should be dust, vermin & water proof as per IP65 rating and should be made of FRP/ABS plastic (Test certification is required for IP65 degree of protection).
- Suitable Fuses/ MCB's should be provided for each string.
- A DC Surge Protection Device Class II should be provided in the Combinor for grounding the surges to protect the inverter.
- It should have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables.
- Suitable markings to be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification. ^[11]_[SEP]
- Necessary Fire Protection / burning behavior in the event of internal faults: Glow wire test in accordance with IEC 60 695-2-11-UL Subject 94 at 960 C, flame retardant & self-extinguishing.
- Other protection: Temperature Tolerance range: - 40 deg C to + 120 deg C ^[11]_[SEP] Chemical Resistance: Acid, Lye, Petrol, Mineral Oil & partially resistant from Benzene. UV behavior: UV stabilized, even after many years there is no sign of brittleness.

8. AC DISCONNECT BOX

- This shall consist of box of suitable powder coated metal casting to house 4 Pole MCB's of 40A and 63 A each. MCB's of reputed brands are to be used.
- The cable entry should have proper double compression metallic glands.
- AC SPD in each box should be of Type II category.
- Protection –IP-21 for indoor mounting, wall or floor mounting depending on site.
- Separate gland plate for cable glands.
- Material- CRCA sheet 14/16 gauge
- Paint- Power coated Siemens grey.

9. SOLAR LT METERING PANEL

- This shall consist of box of suitable powder coated metal casting. Suitable MCB's/ MCCB's of reputed brands are to be used.

- The cable entry should have proper double compression metallic glands. Aluminium / Copper Bus bars of suitable dimensions are to be used.
- Incomer – Suitable 4 Pole, switchgears, energy meter with suitable CT's (in case of Solar Generation Meter as required by local DISCOM, MFM with Voltage, Current, kWh, KVA etc readings on LED display, indicating lamps for all phases,
- Outgoing- Suitable 4 pole MCCBs
- Main bus bar- with suitable current carrying capacity, TPN Electrolytic aluminum bus bar.
- Protection –IP-21 for indoor mounting, wall or floor mounting depending on site.
- Separate gland plate for cable glands.
- Material- CRCA sheet 14/16 gauge
- Paint- Power coated Siemens grey.

10. WEATHER DATA & REMOTE DATE MONITORING SYSTEM

- The performance and generation of the Solar PV Plant can be monitored remotely by the data logger which is provided within the inverter or can be an externally mounted device. However to integrate the inverter data with the weather data, an external datalogger will be required.

The Remote Monitoring system shall comprise of the following main components:

- The inverter logs the data and transmits the same to the Data logger. Data Logger can be inbuilt or can be externally mounted in an IP 65 enclosure.
- Data logger gathers information and monitors the performance of the inverter. It also supports measurements from the external sensors. The data can be acquired remotely via a modem.
- Remote monitoring equipment to measure following weather related parameters:
 - Solar radiation (in plane of array)
 - Module temperature
 - Ambient Temperature
 - Wind Speed
- The data can be stored on a PC or on cloud using the software provided by the datalogger manufacturer.
- HPCL will have to provide static or dynamic, firewall free IP address for data communication and remote monitoring of the Solar PV Plant.

Tender No. : 2100007-HB-14665



Tender Published On : 07-Jul-2021 10:25

Site survey				
Sl.No.	Description	Attached File	Set Value	Supporting Doc. Req'd
1	Site survey	site survey.pdf	-	No



PREPARED BY



A. SITE SURVEYING

The HCPL Ramnagar Lube Plant is situated in city of Kolkata in the Indian State of West Bengal. A site survey was conducted on 16th June 2020 by Maxwell Team. The site was surveyed to identify suitable areas for setting up Solar PV Plants of 20 kWp to 40 kWp capacities. The rooftops that were identified are 1. Substation room 2. VCB room 3. Administrative building.

The map below shows the areas that are identified for setting up Solar PV Plants in the terminal area:



Tender No. : 21000007-HB-14665



Tender Published On : 07-Jul-2021 10:25

Module layout

Sl.No.	Description	Attached File	Set Value	Supporting Doc. Req'd
1	Module layout	Module layout.pdf	-	No