

Scope of work

- 1) Comprehensive Maintenance Contract (CMC) for five years (extendable for further two years, one year at a time) : CMC of Roof Top solar system installed at 10 locations as detailed below will start after successful completion of repair works:

| Sr. No. | Location | Installed capacity (Kw) | Make & no. of inverter | Make of solar panel |
|---------|--|-------------------------|------------------------|---------------------|
| 1 | ST. Marry School | 45 | Delta / 1 | HERO,VIKARM,300W |
| 2 | IES School (Secondary) | 36 | Delta / 1 | HERO,VIKARM,300W |
| 3 | IES School (Primary) | 20 | Fronius/1 | KEC,WAAREE,250W |
| 4 | Officers Club | 30 | Fronius/1 | KEC,WAAREE,250W |
| 5 | Staff Club | 20 | Fronius/1 | KEC,WAAREE,250W |
| 6 | MP Hall | 40 | Fronius/2 | KEC,WAAREE,250W |
| 7 | Shopping Complex & Maint. Office | 126 | Fronius/5 | KEC,WAAREE,250W |
| 8 | POC Canteen Building (Inside Port) | 50 | Fronius/2 | KEC,WAAREE,250W |
| 9 | Port Users building | 96 | Delta/3 | HERO,VIKARM,300W |
| 10 | POC building (Inside Building - Seamen's Building) | 31 | Fronius/1 | KEC,WAAREE,250W |

The CMC shall include the following:

- A) The following items are covered under manufacturer's (O.E.M) warranty/AMC and are not covered under this contract.
- Solar Grid Inverters
 - Solar Modules
 - Surge protection Devices provided on the AC and DC, Supply of AC & DC SPD's.
- B) However, the regular inspection of Solar modules & Inverter, providing necessary feedback on the issues from time to time to the O.E.M and will follow up on the warranty claim, if any, with the O.E.M on behalf of the JNPA. If there is any replacement of the Solar Modules, Inverter and **related spare parts** by the O.E.M, labour charges for replacement (labour only) are covered under Comprehensive AMC.
- C) The following products if damaged during the CMC period are covered in the Comprehensive Annual Maintenance contract:
- Solar DC Cables
 - MC4 Connectors
 - MCB's and MCCB's for Solar Plant
 - Solar Module Mounting Structure
 - Earthing pits.
 - Lugs, terminals and electrical and mechanical hardware items.

D) The annual maintenance contract will include the following:

Preventive maintenance as detailed below and Breakdown maintenance (on call basis)

i) Solar Panels:

- a) Yearly measurement of string currents to be undertaken as part of preventive maintenance. And during breakdown maintenance it will have to be done as per need to identify faulty strings.
- b) In case of faulty strings, connectors/ fuse at junction box to be checked for failure and to be replaced accordingly.
- c) Fortnightly cleaning of solar panels with water and other approved cleaning agents to be done if required. For this purpose, JNPA shall supply water free of cost. Water tap terminals shall be provided by JNPA in the proximity of selected building. Vendor shall arrange its own hose/ pipe for cleaning purposes. **Complete washing facility installed at all ten locations, will have to be maintained by the contractor.**
- d) Quarterly checking for loose structural nuts and bolts and retightening.
- e) Tightening of cable terminations at junction box (during preventive maintenance cycle (
- f) Vendor personals shall take utmost precautions to avoid any damage to the system while cleaning and other maintenance activity. Damaged solar modules to be replaced as per conditions, if under warranty.

E) Inverters:

- a) Periodic measurement of voltage/current at critical locations (as per OEM instruction) for timely identification of abnormality. (as per preventive maintenance schedule)
- b) Cleaning of inverter regularly against dust deposition.
- c) Cleaning of Fans
- d) Checking for any loose connections and retightening at the inverter terminals.

F) Spare Management: Critical spares to be identified in consultation with OEM and JNPA and need to be maintained at plant in order to minimize the outage time in case of any fault or breakdown:

- Solar DC Cable- 100 m
- Solar MC 4 Connectors- 10 pairs
- Switchgear (MCB's, MCCB's) – 1 No of each quantity
- Lugs – 10% of total quantity of every size used in the project.
- Zinc Oxide spray – 5 cans for Solar MMS touch up.
- AC SPD- 1 Sets
- DC SPD's- 1 Sets

G) Safety:

- a) Earth Resistance Measurement: Earth resistance of earthing electrodes to be measured periodically measurement in connected mode on monthly basis and in disconnected mode on quarterly basis. Acceptable value of earth resistance for solar array is less than 5 ohms. Digital earth resistance tester of reputed make to be used for measurement.
- b) Earthing continuity in PV module structures: Quarterly visual check of GI wires and to check electrical continuity using multimeter between module structures to be undertaken.
- c) Availability of safety gadgets like hand gloves, safety helmet, proper tools and tackles etc. to be maintained at site.

H) Tools & measuring instruments:

Following minimum tools & measuring instruments in addition to others required at site to be maintained always: AC-DC clamp meter, earth resistance tester, Electrical Megger, spanner set, screw driver set, crimping tool, Allen key set, rough file kit, cutting pliers, nose pliers PV tool etc.

I) Records to be maintained:

For analysis purpose following records should be maintained at plant level

- a) Generation On & Off time
- b) Energy generation
- c) Fault details: Type of faults, time of faults & its duration iv) Daily report of energy generated.
- d) Generation and archiving of detailed record of various parameters by the SCADA system and providing it to JNPA. The in station operator shall also prepare other format of reports as per instruction of JNPA.

J) Others

- a) Half yearly Functional Checks of Protection circuits and Breakers.
- b) Checking for loose structural nuts and bolts and cable terminations between PV modules, PV arrays, line accessories and associated switchgear etc. Retightening connection and replacing cables/MC4 connectors if necessary.
- c) The repair/replacement work shall be completed within 48 hours from the time of reporting the fault by service Engineer / Team.
- d) Vendor's Engineer will have to visit site every quarter and carry out maintenance and health assessment of the complete system.
- e) Touchup painting of structures with galvanized zinc paint / epoxy.
- f) Regular trimming of trees wherever required during the entire period of contract.

K) The expected activities and the periodicity for carrying out the activities during the CMC Contract will be as under:

| Sr.No | Activity | Periodicity |
|-------|--------------------------------|-------------|
| 1. | Measurement of string currents | Weekly |
| 2. | cleaning of solar panels | Fortnightly |

| | | |
|------|--|---------------------|
| 3. | checking for loose structural nuts and bolts and retightening. | Monthly |
| 4. | Earth Resistance Measurement in connected mode | Monthly |
| 5. | Earth Resistance Measurement in disconnected mode | Quarterly |
| 6. | visual check of GI wires and checking of electrical continuity using multimeter between module structures | Quarterly |
| 7. | Inverter cleaning and performance check | Once in Four Months |
| 8. | Checking DC SPD's | Once in Four Months |
| 9. | Visit of Vendor's Engineer | Quarterly |
| 10. | Visual Inspection of Modules | Once a year |
| 11. | Checking string voltages of modules | Once a year |
| 12. | Functional Checks of Protection circuits and Breakers | Half Yearly |
| 13. | Checking the DC cable connections from Modules to Inverter | One in a year |
| 14. | Checking and tightening of AC Connections at inverter input | Twice a year |
| 15. | Checking and tightening AC Connections at Inverter Interaction Panels, Grid Interaction Panel | Thrice a year |
| 16.. | Checking AC SPD's in IIP's and GIP's | Thrice a year |
| 17. | Cleaning of IIP's and GIP's | Thrice a year |
| 18. | Checking voltages and currents at all Panels | Once a year |
| 19. | Checking and tightening connections for structural/body earthing, lightening arrestor, inverter and panels | Once a year |
| 20. | Checking/ tightening of Modules bolts | Once a year |
| 21. | Random Check of Module Mounting structure | Once a year |
| 22. | Earth pit n inspection and testing | Once a year |
| 23. | Overall performance of the Solar PV Plant | Thrice a year |
| 24. | Plant Fitness report | Yearly |
| 25. | Any unscheduled repair maintenance | On call. |

Repairing of the rooftop solar system wherever required by replacing the faulty spare from the spares removed from the Administration Building Roof Top solar during the currency of contract. Dismantling of solar system at Administration building & shifting the spares to safe place.

2) **Repairing of Solar System:** Repairing of solar systems by Changing of all cable trays to FRP with cement blocks support. The details are as follows:

- a) No. of Cable trays – 144 nos., length of each tray is 3 meters & size 150mm x 50mm
- b) C Type Cable Clamp - Size: 150mm (Width) x100mm (Height) = 288 no's
- c) Cable Cover (Size: 150mm x 50mm) = 144 no's
- d) All DC cables to be put in these trays or rewired as per inverter locations.

In view of above it is proposed to obtain budgetary offers for estimation preparation by floating the Scope of work as detailed in para 1 & 2 above and price schedule (as given below) on CPP Portal E publishing.

Price Schedule:

| Sr. No. | Description | Cost | GST | Total |
|---------|--|------|-----|-------|
| 1 | CMC for five years for solar plants installed at 10 Locations (Total Capacity 494Kw) & as per Scope of work (as mentioned in Para 1) | | | |
| 2 | Repairing of solar system as mentioned under Sr. No. 2 | | | |
| 5 | Total | | | |

Bidders are requested to submit the budgetary offers on mail
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