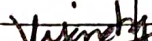






# BHARAT HEAVY ELECTRICALS LIMITED

RENEWABLE ENERGY GROUP, CFP RUDRAPUR

DOCUMENT No.	REG2021-20210367	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION FOR O&M OF RTS AT 500KWP FORT WILLIAM KOLKATA			NAME	Vijendra	Alok Kumar	Ayan Deb Barma
TITLE  OPERATION AND MAINTENANCE				SIGN			
				DATE	18/11/21	18/11/21	18/11/21
				GROUP	REG	W.O. No	

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Rev No.	Date	Altered	Checked	Approved
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	TECHNICAL SPECIFICATION	Doc. No.	REG2021-20210367
		Part	01
Rudrapur	GROUP : REG(Renewable Energy Group)	Rev no	00

**Operation and Maintenance till 29.02.2024 of 500 KWp roof top Grid  
Connected solar systems at Fort William MES Kolkata**

**IMPORTANT NOTE**

**“BIDDERS ARE REQUESTED TO VISIT ALL THE SITES IN PERSON AND THEN SUBMIT THEIR  
BEST OFFER. ANY TYPE OF DENIAL /OBJECTION WILL NOT BE ENTERTAINED AFTER  
FINALIZATION OF ORDER.”**

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### 1. Site Details:

Sl No	Site Location	System Capacity (KWp)	Type
1	MES Kolkata	500	Roof Top
Total Capacity		500	

### 2. Scope of Operation and Maintenance:

The successful bidder shall be responsible for all the required activities for successful operation and maintenance of the Rooftop Solar PV system for a period of mentioned in below table from the date of mobilization at site or from **10 days** from the date of work order, whichever is earlier.

<u>S. No</u>	<u>Description</u>	<u>CMC end date</u>	<u>Module Cleaning frequency</u>
1	500KWp	29-02-2024	weekly

### Building wise details:

Sl No	Location	No of Floors	SPV capacity KWp
1	Building-1 (Royal Barrack)	GF+FF+SF	200
2	Building-2 (North Barrack)	GF+FF+SF	150
3	Building-3 (South Barrack)	GF+FF+SF	150

### Scope of Work at locations are as follows:

- a. Weekly Module cleaning
- b. **Monthly visit which includes following work:**
  - i. To check and rectify and ensure the healthiness of the system.
  - ii. All electrical connections are working properly, inverter healthiness and rectification
  - iii. Submission of customer signed monthly visit reports
  - iv. Customer Signed monthly generation reports
  - v. Collecting the generation data of each roof and submission to BHEL on monthly basis.

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**2.1 Periodic cleaning of solar modules:** The modules shall be cleaned with a periodic interval of **7 days** for roof top system or as and when required as per actual site conditions. It's the responsibility of the bidder to get the modules cleaned during O & M Period. During cleaning bidder has to inform to BHEL for event of cleaning and also provide proof of cleaning. Same data is required along with the invoices to process the bill.

**2.2** O&M of Solar Power Plant shall be compliant with grid requirements.

**2.3** Deputation of experienced technicians during the O&M at project site.

**2.4** Immediate action for repair/replacement of defective Modules, Invertors/PCUs and other equipment as below:

- a) To communicate with manufacturer of the equipment regarding the defective item and its repair/replacement.
- b) Inform BHEL about defective items.
- c) To note down error codes as displayed in inverters.
- d) Regular check of all earthing joints and material.
- e) Immediate jointing/welding of earthing strip if found damaged.

**2.5** Immediate action shall be taken for removal of new plants/vegetation at site that will be causing shadow on PV panels or causing problem for operation of the plant.

**2.6** Supply of all spares **as per spare list in Annexure II.**

**2.7** All the instruments required for O&M for the healthy operation of the Plant shall be maintained by the Bidder. The testing equipment must be calibrated once in a year from NABL accredited labs and the certificate of calibration must be kept for reference as required.

**2.8** **If negligence/ mal-operation on part of the Bidder's operator results in failure of equipment, such equipment should be repaired/replaced by the Bidder free of cost.**

**2.9** A maintenance record register is to be maintained by the operator with effect from starting of O&M period to record the daily generation, regular maintenance work carried out as well as any preventive and breakdown maintenance along with the date of maintenance, reasons for the breakdown, duration of the breakdown, steps taken to attend the breakdown, etc.

**2.10** *For any issues related to operation & maintenance, a dedicated/toll-free number shall be made available to the BHEL/Customer to **resolve within 72 hours.***

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**2.11** If any jobs covered in O&M Scope as per NIT are not carried out by the contractor/Bidders during the O&M period, the Engineer-In-Charge shall take appropriate action as deemed fit. BHEL/Customer reserves the right to make surprise checks/inspection visits at its own or through authorized representative to verify the O&M activities being carried out by the Bidder. Failure to adhere to above guidelines will result in penal action including debarring from participation in next tender.

**2.12** The Operation & Maintenance of Solar Photovoltaic Power Plant would include wear, tear, overhauling, machine breakdown, smooth operation of plant during this O&M period.

**2.13** The contractor shall be kept **01 set of maintenance tools as per Annexure II** at site for day to day maintenance purpose at no extra cost.

**2.14** Contractor/Bidder will have to take custody of BHEL supplied items at site, i.e. Cables, Modules etc, during whole O&M period.

**2.15** Bidder has to provide monthly generation record with customer sign for the all the project.

**2.16** During O&M, If, BHEL supplied items get defective, same shall be supplied by BHEL and replacement shall be done by Bidder without any additional cost. Information of defective items shall be provided by Bidder within 24 Hrs.

**2.17** Periodic cleaning of solar modules. The modules shall be cleaned with a periodic interval of **7 days** or as and when required as per actual site conditions. It's the responsibility of the bidder to get the modules cleaned during O & M to achieve desired CUF. Based on the generation reports CUF will be calculated for year.

**3. Penalty Clause:** If bidder fails to meet scope mentioned above, BHEL will charged penalty on the bidder as follows: -

**3.1 On cleaning:** - Delay in the cleaning of Module BHEL will claim @1500 per day. Delay shall be counted after 7 days from the last reporting cleaning mail/Information.

**3.2 Complain:** Bidder has to inform to BHEL for any defects arise in the system due to on performance of the equipment's within 24 Hrs. this will monitored by BHEL by DATA logging system which is available at site. If the Bidder fails to inform this fault BHEL will claim @1500/- per day till the information received to BHEL.

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**Elaboration of penalty as follows:**

- A) For Example, if bidder informs BHEL on dated 1/11/21 for weekly cleaning and starts cleaning and provides the proof of cleaning to BHEL then BHEL will assume that bidder will start next cleaning on 08/11/2021. If Bidder doesn't inform BHEL for next cleaning on due date, then BHEL will consider the delay from the 08/11/2021. However, it's up to bidder that modules are cleaned in a week or in less days there is no objection from BHEL.
- B) For example, if any technical issue/defect arises on 1/11/21 then bidder to inform BHEL by 2/11/21. But if bidder inform the same by 4/11/21 then BHEL will consider the number of delays starting from the defect/ technical problem reported at site.

any defects and technical issues for O&M arises then its bidder's responsibility to inform and provide the technical details to BHEL so that BHEL can lodge the complains on time for resolution.

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### **Annexure-I**

#### **OPERATION AND MAINTENANCE GUIDELINES OF ROOF TOP/GRID CONNECTED PV PLANTS**

For the optimal operation of a PV plant, maintenance must be carried out on a regular basis. All the components should be kept clean. It should be ensured that all the components are fastened well at their due place.

Maintenance guidelines for various components viz. solar panels, inverter, wiring etc. are discussed below:

#### **1. SOLAR PANELS:**

Although the cleaning frequency for the panels will vary from site to site depending on soiling, it is recommended that:

- The panels are to be cleaned at least once every fifteen days for rooftop and weekly for ground mounted systems.
- Any bird droppings or spots should be cleaned regularly. Use soft water and a soft sponge or cloth for cleaning.
- Do not use detergent or any abrasive material for panel cleaning. Iso-propyl alcohol may be used to remove oil or grease stains.
- Do not spray water on the panel if the panel glass is cracked or the back side is perforated.
- Wipe water from module as soon as possible.
- Use proper safety belts while cleaning modules at inclined roofs etc.
- The modules should not be cleaned when they are excessively hot. Early morning or Late evening is particularly good time for module cleaning.
- Check if there are any shade problems due to new vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.
- Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.
- Never use panels for any unintended use, e. g. drying clothes, chips etc. Ensure that monkeys or other animals do not damage the panels.
- Periodic check for tightness of all nuts and bolts (Specially for mounting nuts and bolts of Panels and structure)

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## 2. CABLES AND CONNECTION BOXES:

- Check the connections for corrosion and tightness.
- Check the connection box to make sure that the wires are tight, and the water seals are not damaged.
- There should be no vermin inside the box.
- Check the cable insulating sheath for cracks, breaks or burns. If the insulation is damaged, replace the wire.
- Make sure that the wire is clamped properly regularly and that it should not rub against any sharp edges or corners.
- If some wire needs to be changed, make sure it is of proper rating and type.

## 3. INVERTER:

- Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush.
- Check functionality of fans regularly and clean the fans when needed.
- Check that vermin have not infested the inverter. Typical signs of this include spider webs on ventilation grills or wasps 'nests in heat sinks.
- Check functionality, e.g. automatic disconnection upon loss of grid power supply, at least once a month.
- Verify the state of DC/AC surge arrestors, cable connections, and circuit breakers.

## 4. SHUTTING DOWN THE SYSTEM:

- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- To the extent possible, system shutdown will not be done during day time or peak generation.

## 5. Submission of O & M Report (OMR)

- The successful bidder shall submit the O&M report/log books/register mandatorily to BHEL.

**Note: A site register at all sites shall be maintained by the bidder in which all O&M activities shall be noted and shall be signed by the primary customer.**

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### **INSPECTION AND MAINTENANCE SCHEDULE:**

Component	Activity	Description	Interval	By
PV Module	Cleaning	Clean any bird droppings / dark Spots on module	Regularly	User/ Technician
	Cleaning	Clean PV Modules with plain water or mild dish wash detergent. Do not used brushes, any types of solvent, abrasives, harsh detergent	Fortnightly or as per site conditions	User/ Technician
	Inspection for plants > 100 kWp	Use infrared camera to inspect for hot spots , by pass diode failure.	Annual	User/ Technician
PV Array	Inspection	Check the PV Modules and racks for any damage, note down location & Serial No. Of damaged modules	Quarterly	User/ Technician
	Inspection	Determine if any new objects such as vegetation growth are causing shading of the array and remove them if possible	Quarterly	User/ Technician
	Vermin Removal	Remove bird nest or vermin from array or rack area	Annual	User/ Technician
Junction Boxes	Inspection	Inspect electrical boxes for corrosion or intrusion of water / insects	Annual	Electrician
		Seal boxes if required	Annual	Electrician
		Check position of switches and breakers	Annual	Electrician
		Checks operation of all protection devices	Annual	Electrician
Wiring	Inspection	Inspect cabling for signs of cracks, defects, loose connections, overheating ,short or open circuit and ground faults	Annual	Electrician
Inverter	Inspection	Observed instantaneous operational indicators on the face plate of the inverter to ensure that the amount of power being generated is typical of conditions.	Monthly	Electrician

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		Inspect inverter housing or shelter for physical maintenance if requires.	Monthly	Electrician
	Service	Clean or replace any air filters	As needed	Electrician
Instruments	Validation	Spot check monitoring instruments ( Pyrometer etc. ) with standard instruments to ensure that they are operational and within specifications	Annual	PV Specialist
Isolation Transformer	Inspection	Inspect transformer, temperature gauges , breaker, meter , connections	Annual	Electrician
Tracker ( if present)	Inspection	Inspect gears, gears boxes, bearing as required	Annual	Technician
	Service	Lubricate tracker mounting bearings, gear box as requires	Annual	Technician
Plant	Monitoring	Daily operation & performance monitoring	Daily	Site In-charge
	Data logger and weather monitoring	Check wiring and other equipment's	Monthly or as required	Electrician
Spare Parts	Management	Manage inventory of spare parts	As needed	Site In-charge
Log Book	Documentation	Document all O&M activities in the log book available to all service personnel.	Continuous	Site In-charge

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## **SOP OF O&M**

SOP for undertaking O&M job at MES Kolkata roof top solar power plant as follows however this will not relieve the bidder from any other work arising in the project related O&M.

- 1) Email to customer before visiting the premises/site.
- 2) Intimate plant installation manager/in charge and obtain work permit. In case, permission is not given – then intimate BHEL.
- 3) Record work done through photographs and as mentioned in technical spec.
- 4) Obtain Signature of concerned installation officer. In case there is problem in getting signature, then intimate BHEL immediately and record in email
- 5) Providing the monthly generation data
- 6) Submission of generation reports to customer and obtaining signatures on reports
- 7) Weekly cleaning and intimation to BHEL and submission of proof for cleaning
- 8) O&M Manuals will be given to bidder during the O&M starting period and its responsibility of the bidder to follow the manuals

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## Annexure II

### SPARE AND MAINTENANCE TOOLS

#### Spare List:

1. **MCCB: (Minimum inventory to be maintained all the time during the maintenance period)**

Sl. No.	MCCB Rating	Qty.	Make
1	4P 50 Amp	03	ABB/L&T/Schnider
2	4P 100 Amp	03	ABB/L&T/Schnider

2. **MC4 Connectors:** 20 Nos.
3. **SPD Type II –** 05 Nos.
4. Fuses, Cable glands and lugs of suitable sizes, nuts and bolts of suitable sizes.
5. For other items other than mentioned here, please check General conditions of the contract

#### Maintenance Tools:

1. Screw driver set suitable for the junction box, combiner box etc.
2. Allen Key set suitable for the junction box, combiner box etc.
3. Multimeter and clamp-meter for day to day maintenance and routine check of the electrical equipment's.
4. Infrared camera to check hot spots.

#### Note:

1. *The successful bidder shall supply & keep ready stock of tools, tackles and essential spares that will be needed for the day-to-day maintenance of the solar PV system. Above minimum set of spares shall be maintained in the plant itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished to maintain above quantity.*
2. *Bidder shall provide calibration certificate of all tools within 30 days from the date of Work order.*
3. *Bidder shall renew the calibration certificate before the expiry date of current certificate and submit the same to BHEL.*

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- Provide details of any replacement of systems/components, damages, plant/inverter shut down (planned/forced), breakdown, etc under remarks.

Date:

Signature of the Authorized  
signatory of the Bidder