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Operation and Maintenance for 05 Years of 1420 KWp roof top and ground mounted solar systems at different locations of ONGC nazira,

1. Lakwa 2. Nazira & 3. Sibsagar

Assam

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:

List of site locations for Operation and Maintenance of Roof top and Ground Mounted System with plant capacityis as below:

Sl No	Site Location	System Capacity (KWp)	Type
1	Regional Office Base, Nazira	38	Roof Top
2	C Type Quarters, Nazira	90	Roof Top
3	Helipad Field, ONGC Colony, Nazira	135	Ground Mounted
4	ONGC Guest House, Nazira	10	Roof Top
5	ONGC Hospital, Shivsagar	118	Roof Top
6	Captive Power Plant (CPP) Lakwa	214	Roof Top
7	ETP Lakwa	109	Roof Top
8	GGS III, Lakwa	87.3	Roof Top
9	GGS VIII, Lakwa	68	Roof Top
10	GGS IV, Lakhmani	114	Roof Top
11	Drilling Tool Yard Shivsagar (DTYS)	60	Roof Top
12	GGS I, Rudrasagar	48.8	Roof Top
13	GGS II, Rudrasagar	108	Roof Top
14	GGS II, Geleky	40	Roof Top
15	Central Work Shop (CWS), Shivsagar	96	Roof Top
16	Officers' Club, Shivsagar	86	Roof Top
	Total Capacity	**1422.1**	

Sitewise details with No. of roofs and equipment lists is as per Annexure I.

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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 and ground mounted Solar PV system for a period of 5 years from the date of mobilization at site or from 10 days from the date of work order, whichever is earlier.

2.1 O&M practices shall be strictly followed as per **Annexure II**.

2.2 O&M of Solar Power Plant shall be compliant with grid requirements to achieve committed energy generation.

2.3 Deputation of qualified and experienced engineer/technicians till the O&M period at project site.

2.4 Periodic cleaning of solar modules: The modules shall be cleaned with a periodic interval of 15 days for roof top system and weekly for ground mounted 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.

To maintain the maximum generation of the plant to meet the desired CUF.

2.5 Periodic checks of the Modules, PCUs and BOS shall be carried out as a part of routine preventive and breakdown maintenance.

2.6 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.

2.7 *Immediate action shall be taken for removal of new plants/vegetation at site that will be causing shadow on PV panels (specially in ground mounted system) or causing problem for operation of the plant.*

2.8 Supply of all spares **as per spare list in Annexure III**.

2.9 All the testing instruments required for Testing, Commissioning and 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.

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2.10 ***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.***

2.11 Online Performance Monitoring, controlling, troubleshooting, maintaining of logs & records. 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.

2.12 *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****. Also, an email ID shall be provided by the bidder as optional contact for recording of complains and other official communications. If not attended within such stipulated time, a complaint may be raised by BHEL/ONGC , pursuant to which, a penalty of Rs.* ***25 per kw / day*** *or more shall be imposed. If the outage of the plant is more than 30 days continuously, then the* ***50% CPBG amount shall be encashed*** *by BHEL and If the outage is exceeding more than 60 days than* ***complete CPBG amount shall be encashed*** *by BHEL.* This will be applicable till 5 years of O&M as per the scope of the NIT.

2.13 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.

2.14 The Operation & Maintenance of Solar Photovoltaic Power Plant would include wear, tear, overhauling, machine breakdown, smooth operation of plant for a period of 5 years.

2.15 The contractor shall supply ***01 set of maintenance tools as per Annexure III*** to the primary customer and ***01 set of maintenance tools as per Annexure III*** shall be kept at site for day to day maintenance purpose at no extra cost. 01 set supplied to the primary customer shall be kept at the place identified by the user.

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

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Annexure-II

OPERATION AND MAINTENANCE GUIDELINES OF 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)

- **For Ground Mounted Plant-** ***The Contractor shall plan for one wash of all solar PV modules on weekly basis. For this, the Contractor shall construct and operate suitable litre capacity RCC/ Sintex water tank and pump.***

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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 monthly O&M report mandatorily to BHEL as per the format enclosed at annexure-IV. Non-submission of the report shall be considered as —breach of contract and shall attract punitive actions as per the relevant provisions of the contract including

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 (Pyranometer 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 equipments	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

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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Annexure III

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 25 Amp	03	ABB/L&T/Schneider
2	4P 50 Amp	03	ABB/L&T/Schneider
3	4P 100 Amp	03	ABB/L&T/Schneider
4	4P 125 Amp	03	ABB/L&T/Schneider
5	4P 250 Amp	01	ABB/L&T/Schneider

2. **MC4 Connectors:** 50 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 **Chapter 15 (Page 32/41)** of 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 equipments.
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 by BHEL to maintain above quantity.***
2. *Bidder shall provide calibration certificate of all tools within 30 days from the date of Work order. Bidder shall renew the calibration certificate before the expiry date of current certificate and submit the same to BHEL.*

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Annexure IV

Monthly O & M Report
(Part A)

Month and year:
Name of the bidder:
NIT/PO ref no.:
Project Capacity:
Name & Address of the site:

Component	Activity	Description	Date	Name & Signature	Remarks
PV Module	Cleaning	Immediately clean any bird droppings / dark Spots on module			
	Cleaning	Clean PV Modules with plain water or mild dish wash detergent. Do not used brushes, any types of solvent, abrasives, harsh detergent			
	Inspection for plants > 100 kWp	Use infrared camera to inspect for hot spots , by pass diode failure.			
PV Array	Inspection	Check the PV Modules and racks for any damage, note down location & Serial No. Of damaged modules			
	Inspection	Determine if any new objects such as vegetation growth are causing shading of the array and remove if any			
	Vermin Removal	Remove bird nest or vermin from array or rack area			
Junction Boxes	Inspection	Inspect electrical boxes for corrosion or intrusion of water / insects			
		Check position of switches and breakers			
		Checks status of all protection devices			

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Wiring	Inspection	Inspect cabling for signs of cracks, defects, loose connections, overheating ,short or open circuit and ground faults			
		Observe instantaneous operational indicators on the faceplate			
Inverter	Inspection	Inspect inverter housing or shelter for physical maintenance if requires.			
	Service	Clean or replace any air filters			
Instruments	Validation	Verify monitoring instruments (Pyranometer etc) with standard instruments to ensure that they are operational within tolerance limits			
Isolation Transformer	Inspection	Inspect transformer, temperature gauges , breaker, meter , connections			
Tracker (if present)	Inspection	Inspect gears, gears boxes, bearing as required			
	Service	Lubricate tracker mounting bearings, gear box as requires			
Plant	Monitoring	Daily operation & performance monitoring			
	Data logger and weather monitoring	Check wiring and other equipments			
Spare Parts	Management	Manage inventory of spare parts			
Log Book	Documentation	Document all O&M activities in the log book available to all service personnel.			

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

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- ***Daily register is to be maintained by the bidder at each location***. The same may be inspected by BHEL/ONGC or its authorized representative at any time 5 years of O&M period. The Register will have the information about the daily generation, Inverter downtime if any, grid outages.

(Part B)

Sl. No.	Date	Generation kWh	Grid outage (hh:mm)	Inverter down period (hh:mm)	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

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Total generation for the month in kWh:
Cumulative generation since commissioning in kWh:
CUF for month in %:
Cumulative CUF since start of O&M in %:

Date:

Signature of the Authorized
signatory of the Bidder

Signature and seal of Bidder

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3. LIST OF ENCLOSURES:

Following enclosure makes the part of REG1920-20190160

3.1. Annexure – I: Detail of site and Roof

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Annexure I

SL . NO	Location	Site Address	Building Name	No of Roof	MODULE	DCDB	Inverter				ACDB
							Sungrow		KACO		
							10KW	20KW	30KW	50KW	
Lakwa											
1	Lakwa	CPP LAKWA ONGC Nazira,	Control Room	1	220	2		1		1	2
	Lakwa	CPP LAKWA ONGC Nazira,	New Roof	1	98	1			1		1
	Lakwa	CPP LAKWA ONGC Nazira,	Accomodation	1	48	1		1			1
	Lakwa	CPP LAKWA ONGC Nazira,	Substation	1	328	2				2	2
2	Lakwa	ETP LAKWA ONGC Nazira,	Substation	1	162	1				1	1
	Lakwa	ETP LAKWA ONGC Nazira,	Control Room	1	104	1			1		1
	Lakwa	ETP LAKWA ONGC Nazira,	Service Bldg.	1	84	1			1		1
3	Lakwa	GGS 3 LAKWA ONGC	Control Room	1	120	2		2			2
	Lakwa	GGS 3 LAKWA ONGC	Substation	1	140	2		2			2
	Lakwa	GGS 3 LAKWA ONGC	DG Room	1	20	1	1				1
4	Lakwa	GGS 4 Lakhmani, ONGC	Control Room	1	136	1				1	1
	Lakwa	GGS 4 Lakhmani, ONGC	Admin Block	1	68	1		1			1
	Lakwa	GGS 4 Lakhmani, ONGC	Substation	1	166	1				1	1
5	Lakwa	GGS 8 LAKWA ONGC	Admin Block	1	68	1		1			1
	Lakwa	GGS 8 LAKWA ONGC	Substation	1	152	1				1	1
	Lakwa Total			**15**	**1914**	**19**	**1**	**8**	**3**	**7**	**19**
Nazira											
6	Nazira	Helipad Field, ONGC Colony,		1	428	3				3	3
7	Nazira	C-Type Quarters , ONGC	Building 1	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 2	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 3	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 4	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 5	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 6	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 7	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 8	1	32	1	1				1
	Nazira	C-Type Quarters , ONGC	Building 9	1	32	1	1				1
8	Nazira	ONGC Regional Office Base 2	Slanted RCC	1	104	1			1		1
	Nazira	ONGC Regional Office Base 3	RCC Roof	1	28	1	1				1
				1							
9	Nazira	Guest House , ONGC	RCC Roof	1	32	1	1				1
10	Geleki	GGS 2 Geleki ONGC	Substation	1	68	1		1			1
	Geleki	GGS 2 Geleki ONGC	Control Room	1	64	1		1			1
	Nazira Total			**16**	**1012**	**17**	**11**	**2**	**1**	**3**	**17**
Sivsagar											
11	Rudrasagar	GGS I Rudrasagar, ONGC	Substation	1	66	1		1			1
	Rudrasagar	GGS I Rudrasagar, ONGC	Control Room	1	64	1		1			1
	Rudrasagar	GGS I Rudrasagar, ONGC	Fire water Pump house	1	28	1	1				1
12	Rudrasagar	GGS II Rudrasagar, ONGC	Conference hall	1	104	1			1		1
	Rudrasagar	GGS II Rudrasagar, ONGC	Control Room	1	104	1			1		1
	Rudrasagar	GGS II Rudrasagar, ONGC	Substation	1	60	1		1			1
	Rudrasagar	GGS II Rudrasagar, ONGC	Service Building	1	32	1	1				1
	Rudrasagar	GGS II Rudrasagar, ONGC	Office Building	1	60	1		1			1
13	Sibsagar	Drilling Tool Yard, Sivasagar,	1	1	190	2	1			1	2
14	Sibsagar	ONGC Hospital , Sivasagar,	1	1	376	3		1		2	3
15	Sibsagar	Officer club	Tin shed	1	273	3	1	1		1	3
16	Sibsagar	CWS	Tin shed	3	306	3			3		3
	Sibsagar Total			**14**	**1663**	**19**	**4**	**6**	**5**	**4**	**19**
				Total	**4589**	**55**	**16**	**16**	**9**	**14**	**55**

Summary Items

Sl No	Item	10 KWp	20 KWp	30 Kwp	50 KWp		Total
1	Sungrow Inverter	16	16	0	0		32
2	Kaco Inverter	0	0	9	14		23
3	ACDB	16	16	9	14		55
4	DCDB	16	16	9	14		55
5	Module					4589	

Sl. No	City
1	Lakwa
2	Nazira
3	Sibsagar
	Total

		Earthing									
	LA	AC	DC	TF	LA	Isolator	WMS	Data Logger	SPV Capacity (KWp)	Site rating Cumilative (KWp)	Location Cumilative (KWp)
		1	1			2			69		
	1	1	1		2	1	1	5	30	214	
		1	1			1			15		
		2	2			2			100		
		1	1			1			51		
	1	1	1		2	1	1	3	33	109	
		1	1			1			26		
		1	1			1			38		592
	1	1	1		2	1	1	3	44	87	
		1	1			0			6		
		1	1			1			44		
	2	1	1		4	1	1	3	21	114	
		1	1			1			52		
		1	1						20		
	1	1	1		2		1	2	48	68	
	6	16	16	0	12	14	5	16	597	592	592
	1	2	2	1	2	1	1	1	135	135	
		1	1						10		
		1	1						10		
		1	1						10		
		1	1						10		
	2	1	1		4		0	9	10	90	
		1	1						10		
		1	1						10		
		1	1						10		313
		1	1						10		
	1	1	1		2	1	1	2	30	38	
		1	1			0			9		
	1	1	1		2		0	1	10	10	
	1	1	1		2		0	2	20	40	
		1	1						21.4		
	6	16	16	1	12	2	2	15	315	313	313
		1	1			1			20		
	2	1	1		4	1	1	3	20	49	
		1	1			0			8.82		
		1	1						30		
		1	1						30		
	2	1	1		4		1	4	20	108	
		1	1						10		517
		1	1						20		
	1	1	1		4		1	2	60	60	
	1	2	2		2	3	1	2	118	118	
	1	1	1		2		1	2	86	86	
	1	2	2		2		1	1	96	96	
	8	14	14	0	18	5	6	14	519	517	517
	20	46	46	1	42	21	13	45	1431	1422	1422

Summary					
Roof	Module	ACDB	DCDB	Inverter	Remarks
15	1914	19	19	19	
16	1012	17	17	17	1 Ground
14	1663	19	19	19	
45	4589	55	55	55	