

Uttar Pradesh New & Renewable Energy Development Agency
Vibhuti Khand Gomti nagar Lucknow
FY 2023-24

Discovered Rate of Off-Grid Solar Power Plant(Govt Buildings)FY 2023-24								
Plant Capacity Range(KW)	Base Rate Excluding GST (Rs/KW)	GST @ 12% on 70% amount	GST @ 18% on 30% amount	Rate Discovered including GST (Rs/KW)	Contingent charges @ 3% + GST			Total Cost including all taxes and Centage charges (Rs/KW)
					Contingent charges @ 3%	Contingent charges tax @ 18% (Rs)	Total Contigent Charges	
1 KW TO 10 KW	142080.00	11934.72	7672.32	161687.04	4262.40	767.23	5029.63	166716.67
11 KW TO 50 KW	137280.00	11531.52	7413.12	156224.64	4118.40	741.31	4859.71	161084.35
51 KW TO 75 KW	138850.00	11663.40	7497.90	158011.30	4165.50	749.79	4915.29	162926.59

Supply, erection, testing and commissioning of OFF Grid Solar PV Power Plants of various capacity including comprehensive warranty maintenance for 5 years at various places in the State of Uttar Pradesh.

Part-4 SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

SCOPE OF WORK:

The scope of work includes design, supply, and installation, commissioning of Solar Photovoltaic Power Generators/Plants including 05 years comprehensive warranty and maintenance in various tehsils/block offices /Institutions, individual beneficiary and at locations anywhere in the State of Uttar Pradesh as directed by UPNEDA at sites identified by UPNEDA as per the following specifications.

GENERAL TECHNICAL SPECIFICATION:

A standalone solar photovoltaic power generator/plant proposed comprises of solar PV modules of given capacity, with battery bank, PCU with necessary control electronics, interconnecting wires / cables, module mounting structures, necessary grounding /earthing etc.

Sl.No	Solar PV module Array Capacity (Wp)	PCU Capacity with MPPT and DC to AC Invertor	Battery Bank Capacity /Configuration
			Lithium Ferro phosphate (Lifepo4)
		(VA)	Voltage in V
1	1000 (with Lithium battery)	1250	24, 160 AH
2	2000 (with lithium Battery)	2500	48, 160 AH
3	3000 (with lithium Battery)	3750	48, 240 AH
4	4000 (with Lithium Battery)	5000	96, 160 AH
5	5000 (with lithium Battery)	6250	96, 200 AH
6	6000 (with lithium Battery)	7500	120, 200 AH
7	8000 (with lithium battery)	10000	120, 240 AH
8	10000 (with lithium Battery)	12500	180, 200 AH
9	15000 (with lithium Battery)	18750	240, 240 AH
10	20000 (with lithium Battery)	25000	240, 320 AH
11	25000 (with lithium Battery)	31250	240,400 AH
12	30000 (with lithium Battery)	37500	240, 480 AH
13	40000 (with lithium Battery)	50000	240, 640 AH
14	50000 (with lithium Battery)	62500	240, 800 AH
15	55000 (with lithium Battery)	68750	360 ,600 AH
16	60000 (with lithium Battery)	75000	360 ,640 AH
17	65000 (with lithium Battery)	81250	360 ,690 AH
18	70000 (with lithium Battery)	87500	360 ,720 AH
19	75000 (with lithium Battery)	93750	360 ,800 AH

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A. MINIMAL TECHNICAL REQUIREMENTS/ STANDARDS:

1. SPV MODULES:

- i. Only indigenous modules (Both cell and Module) of reputed brand (IEC/BIS Tested) shall only be used in the project. The wattage of each module should be at least 250 Wp of 72 cell and open circuit voltage of the PV modules under STC should be at least 42.0 Volts. The module efficiency should not be less than 15% and the fill factor should not be less than 0.70.
- ii. Crystalline high power/efficiency cells > 16% shall be used in the Solar Photovoltaic module.
- iii. The PV modules will be warranted for a minimum period of 25 years from the date of supply. (Output wattage should not be less than 90% at the end of 10 Years and 80% at the end of 25 years.
- v. The terminal box on the module shall be designed for long life out door operation in harsh environment should have a provision for opening for replacing the cable, if required.
- vi. The offered module shall be in accordance with the requirements of MNRE.
- vii. The module should be tested according to latest edition of IEC 61215 edition II / IS 14286 for Crystalline cell. The bidder shall submit appropriate valid test certificates. The minimum validity of test report should be till March 2020.
- viii. PV modules must qualify to IEC 61730 Part 1- requirements for construction & Part 2 – requirements for testing, for safety qualification. The bidder shall submit appropriate valid test certificates.
- ix. The offered Solar module performance test report issued from authorized MNRE/NABAL test lab should be submitted..
- x. Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided and if required, blocking diode(s) may also be provided.
- xi. The peak power point voltage and the peak power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.
- x. IDENTIFICATION AND TRACEABILITY

Each PV module must have sticker inside the module with the following information:

- i. Name of the manufacturer of PV Module
- ii. Month and year of the manufacture of module
- iii. Made in India
- iv. Unique Serial No and Model No of the module

Following data maybe provided out site in such a way that it should not pull out during harsh environmental condition)

- (i) Peak Wattage, I_m , V_m and FF for the module
- ii. UPNEDA logo

Test reports/ certificate from IEC/NABL/MNRE accredited laboratory to be mandatorily enclosed for relevant IEC/equivalent BIS Standards.

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2 BATTERY- Lithium ferro Phosphate:

The battery should Lithium Ferro phosphate (Lifepo4) having capacity motioned in the chart at standard conditions. The battery Voltage & AH can be changed keeping the overall KWH same. The voltage selection should be close to Vm of combinations of modules having 72 cells. The configuration of battery assembly should be as per requirement of capacity. The cell should be prismatic type having capacity not less than 40 Ah The other feature of the battery should be:

Sr No.	Description	Specification
1	Battery Configuration minimum cell capacity	3.2V- 40 AH; LiFePO4
2	Working Temperature Range (both for charging & discharging)	0-60 Deg C
3	Storage Temperature Range	@ 0-40 Deg- 6 months
4	Cycle Life (Full charge to full discharge @ 25 deg C before capacity of battery falls below 75%)	more than 3000 Cycles
5	Battery Warranty	5 years
6	Type of Cell	Prismatic

Depth of Discharge : up to 85%
 Maximum Discharging rate : up to C rate of battery Capacity
 Maximum Charging Rate : upto 0.5 C rate of battery capacity

The Lithium iron phosphate battery needs a very good “Battery Management Systems” BMS to ensure the proper charging and discharging of each cell of battery with temperature compensation. This battery also needs constant current and constant voltage charging methodology related to upper voltage limit of battery. BMS primary focus is therefore on the safety and the protection of the battery pack, to minimize the risk of sudden failure and to maximize the life cycle of the battery. The secondary function of the BMS is to perform battery diagnosis, such as state of charge (SOC) estimation, state of health (SOH) estimation and state of power (SOP) estimation. Hence a very good battery management system to be incorporated and got it tested with battery from MNRE/NABAL accredited lab as per IEC/BIS standard. The BMS of the LFP battery must also communicate with PCU in some standard protocol like RS485/ 232 or CAN so that PCU can adapt to requirements of battery and extend its life. Communication between PCU and BMS and the compatibility of 2 should be ensured.

The Valid test report as BIS of at least 3.2-volt 40 Ah cell from MNRE/NABAL accredited lab should be submitted along with tender.

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3. Power Conditioning Unit (PCU) cum Invertor

The Power conditioning unit (PCU) should have inbuilt charge controller and Invertor of capacity & ratings as specified in the Table for various capacity of Solar Power Plants.

The PCU will have following features:

The PCU should be dual input type, Bi-directional converter, synchronized with Grid Hybrid type such that the Input PF is close to 0.95 with Low THD where under normal condition the input is fed from a SPV panel and in the absence of SPV power or low SPV power conditions an external AC source can be used for battery charging at C-10 rates so as to reduce the charging time. However the charger circuit must communicate with BMS and control charging profile keeping in mind the SOC of each cell, The charging rate will thus start tapering till charge completion and the State-of-charge (SOC) shall also be available locally on display as well as remotely (if required).

In case the PV power generated at any instant of time is more than the battery charging power required, this excess PV power shall be used to share the AC load the output of the Inverter output.

All these operation should be automatic. When battery bank is fully charged, the PCU should have the feature to feed the power generated from solar to load and draw the additional power from main supply to meet the load requirements in the case load is more than solar energy produced. Thus the electricity consumption from grid shall be reduced.

Solar-Hybrid MPPT charger PCU. The synchronization of BMS and PCU is important aspects and it must be ensured. Considering the importance of this aspect the firm can choose the battery voltage keeping the total watt-hour capacity same.

ii. Output voltage 230V+2% of modified/ pure sine wave for single phase PCU & 415 V +2%.for three phase PCU.

i. Output frequency: 50 Hz+-0.5 Hz

ii. THD (Current): less than 3% for non-linear load

iii. Efficiency: >90% of PCU at full load for PCU >10 KVA capacity

iv. >85% for PCU <10KVA capacity

v. Indicator:

Array charger on

Battery charging

Inverter ON

Load on solar/ battery

Grid charger on

Load on Grid

Grid on

Fault

Xii Display parameters

Charging current

Charging voltage

Voltage of PV panels

Output voltage

Grid voltage

Power output in KW

Energy delivered in Kwh

xiii. MIMIC Diagram: To indicate power flow and operation of the charge controller/ battery

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charger; shall have provision for visual indications of existing power input/output through MIMIC diagram .

- Full Protection against polarity reversal of PV array and battery, Over Current, Short Circuit, Deep Discharge, Input Surge Voltage , open circuit, accidental short circuit and night time leakage of current from battery to module.

Adequate protection shall also be incorporated under no-load conditions (i.e. when the system is ON & the load is removed).

The PCU charge controller must be synchronize with Battery Management System (BMS).

The PCU/ inverters should be tested from the MNRE / NABL /BIS /IEC accredited testing calibration laboratories.

Vx. SURGE PROTECTION

Internal surge protection shall consist of three MOV type surge arrestors connected from +ve and –ve terminals to earth (via Y arrangement) or other suitable devices should be provided.

xvi.EARTHING PROTECTION

Each array structure of the PV yard and metal casing should be grounded/ earthed properly as per IS:3043 latest edition.

xvii. Necessary earthing/ grounding is to be provided on the body of the inverter.

a. The quality and standards of the system will be strictly adhering to the national/international standards specified as per MNRE Govt. of India norm.

B. BALANCE OF SYSTEM (BOS) ITEMS/ COMPONENTS:

The BOS items / components of the SPV power plants/ systems deployed must conform to the latest edition of IEC/ Equivalent BIS Standards/ MNRE specifications / as specified below:

BOS Item / System	Applicable BIS /Equivalent IEC Standard Or MNRE Specifications	
	Standard Description	Standard Number
Charge Controller/MPPT units	Environmental Testing	IEC 60068-2 (1,2,14,30) / Equivalent BIS Std.
Power Conditioners/ Inverters**including MPPTand Protections.	Efficiency Measurements	IEC 61683 / IS 61683
	Environmental Testing	IEC 60068-2 (1, 2, 14, 30)/Equivalent BIS Std.
Storage Batteries	Lifepo4 (Lithium Battery)	Ferro phosphate Battery
		IS 16270 /IS 16046 (Part 2): 2018/IEC 62133-2017/BIS standard
Cables	General Test and Measuring	IEC 60227 / IS 694
	Method PVC insulated cables for working voltage up to and including 1100 V and UV resistant for outdoor installation	IEC 60502 / IS 1554 (Pt. I & II

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Switches/Circuit	General Requirements	IEC 60947 part I,II, III /
Breakers/Connectors	Connectors safety	IS 60947 Part I,II,III
	A.C. /D.C.	EN 50521
Junction Boxes /Enclosures for inverters/Charge Controllers/Luminaries	General Requirements	IP 54(for outdoor)/ IP 21(for indoor) as per IEC 529

**In case if the Charge controller is in-built in the inverter, no separate IEC 62093 test is required and must additionally conform to the relevant national/international Electrical Safety Standards wherever applicable.

C. Mounting Structure

The module & frame structure shall be mild steel, hot dipped galvanized (120 micron) with corrosion resistant painting for holding the PV modules.

ii. Each panel frame structure shall be so fabricated as to be grouted on ground on its legs. The size of angle iron/C channel should not be less than 40X40X5 mm. Anti-Theft Nut Bolts of SS (with washers) should be used for mounting modules for better theft proofing. Regarding civil structures the bidder need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof.

ii. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m². The minimum front clearance of the structure from the roof level should be 300 mm.

iii. The legs of the structures made with hot dip GI angles will be fixed and grouted in the RCC foundation columns made with 1:2:4 cement concrete. The foundation should be as per design of structure to withstand maximum wind loading.

iv. There shall be a minimum air gap of 3+/- 0.3-cm between the facing edges of two adjacent modules on all sides.

v. Each panel frame structure shall have inclination between 20- 40 degrees depending on the site location seasonal load requirement. A weather proof junction box as per the relevant ISI specifications, to be provided where the module terminals shall be interconnected and output taken.

vi. All nuts bolts and fasteners should be made of stainless steel.

vii. The structure should be designed to allow easy replacement of any module and shall be aligned with site requirement.

viii. The structure should be designed for simple mechanical and electrical installations. It will be designed to withstand severe cyclone/ storm with the speed max.150 Km/hr. as per IS 875 part 3.

x. The systems should be installed at ground level / roof top at least the height of 45Centimeter with a CC block of 30X30X30 Cm with each support.

E. Electrical connections

High quality ISI mark copper wires/cables of reputed makes are to be provided for connecting Solar Modules, from junction box to PCU, and Battery.

A suitable connection point shall be provided to the consumer from PCU, at a distance not more

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than 05 meters, from where consumer shall have its own wiring to the use points.

F. Junction Boxes:

The junction boxes for 5KW and above are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of polycarbonate/GRP/FRP/Powder Coated Aluminum/cast aluminum alloy with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JBs shall be such that input & output termination can be made through suitable cable glands. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Each Junction Box shall have High quality Suitable SPDs fuses on +ve side. Suitable Reverse Blocking Diodes. The Junction Boxes shall have suitable arrangement for disconnection for each of the groups.

Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification. DC DPBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 for outdoor and IP54 for indoor protection. The bus bars are made of copper of desired size. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better should conform to Indian Electricity Act and rules (till last amendment).

Connecting cables PVC insulated copper cables (ISI marked) for: The cable should be used as per site considering the maximum permissible loss up to 2%, however for 5 KW plant the minimum cable should be as follow.

Module interconnections (4.0 mm copper single core multi strand),

Module parallel interconnection (10 mm copper single core multi strand)

Array or AJB to PCU (16 mm copper two cores)

Battery to PCU (16 mm copper single core multi strand) might be double cables if required PCU to load / change over switch (Single core copper cable 6.0 mm multi strand) as per requirement of site.

ACDB : ACDB must have load mains change over switch for manual bypass

DATA ACQUISITION SYSTEM / PLANT MONITORING

i. Data Acquisition System shall be provided for each of the solar PV plant having capacity 10 KW or above.

ii. Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis. Metering and Instrumentation for display of systems parameters and status indication to be provided.

iii. Solar Irradiance: An integrating Pyrometer / Solar cell based irradiation sensor (along with calibration certificate) provided, with the sensor mounted in the plane of the array.

Readout integrated with data logging system.

iv. Temperature: Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system

v. The following parameters are accessible via the operating interface display in real time separately for solar power plant:

a. AC Voltage.

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- b. AC Output current.
- c. Output Power
- d. Power factor.

- e. DC Input Voltage.
- f. DC Input Current.
- g. Time Active.
- h. Time disabled.
- i. Time Idle.
- j. Power produced

The PCU should have data logging facilities for BMS also in order to monitor the performance of battery. Data Acquisition System shall be provided for each of the solar PV plant having capacity 10 KW or above, plant monitoring will be remote through web based GPRS Monitoring. Also the data shall be recorded in a common work sheet chronologically data wise. The data file shall be MS Excel compatible. Remote Server and Software for centralized internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system.

G. OTHER FEATURES

A toll free number (i.e. 1800 180 0005) of IVRS of UPNEDA and 14 digit UID number of minimum computer font size 72 or 13 mm (issued/provided by UPNEDA) is to be embossed/punch in front of battery box by contractor/ bidder, which in case of non-working/operational problems etc of system will be dialed by the beneficiary etc to lodge a complaint in respect of system problems. The IVRS will divert the complaint to Contractor/ bidder through E mail, SMS etc. The contractor/ bidder will have to rectify the same to make/ restore the system to working position within 72 hours in the warrantee period of 5 years, failing which the system may be get rectified on contractor/ bidder cost and the cost will be recovered by contractor/ bidders pending claims what so ever and appropriate action as per noncompliance etc of agreement will be considered/taken.

H. INSTALLATION OF SYSTEM:

The system should be properly installed at site. The SPV module mounting structure should be properly grouted depending upon the location and requirement of the site. The grouting should be such that it should withstand the maximum wind speed /storm. Adequate space should be provided behind the PV module/array for allowing un-obstructed air flow for passive cooling. Cables of appropriate size should be used to keep electrical losses to a bare minimum. Care should be taken to ensure that the battery is placed with appropriate leveling on a structurally sound surface. All wiring should be in a proper conduit or capping case. Wire should not be hanging loose. Any minor items which are not specifically included in the scope of supply but required for proper installation and efficient operation of the Solar Power Generator/Plant system are to be provided by the manufacturer as per standards.

I. ELECTRIC CABLE

All the cables shall be supplied conforming to IEC 60227– IS 694 / IS 1554 – IS / IEC 60502 shall be of 650 V/ 1.1kV grade as per requirement. Only PVC copper cables shall be used.

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J. WARRANTY

The mechanical structures, electrical works including power conditioners/inverters/charge controllers/ maximum power point tracker units/distribution boards/digital meters/ switchgear/ storage batteries, etc. and overall workmanship of the SPV power generator/Plant system must be warranted against any manufacturing/ design/ installation defects for a minimum period of 5 years.

K. TRACEABILITY OF THE PRODUCT TO BE SUPPLIED

In order to prevent the misuse of the product such as unauthorized sale or diversion to the open market, the following incorporation shall be made in the product.

- a) Engraving (or) Screen printing of UPNEDA at a suitable place on the main components viz SPV Panel, battery, PCU to be used in the installation of the solar power pack.
- b) The unique system ID number as provided by UPNEDA shall be permanently pasted (or) marked on each component of the system.

Make of Items must be as per the BIS/ MNRE technical specification and equivalent make offered by the bidders in the Bid. The Bidders may change the make of items with the permission of competent authority of UPNEDA as and when required on valid circumstances conditions, the bidder shall provide Test Certificate of the proposed make of item issued from MNRE authorized testing center or NABL accredited test lab.

Off-Grid Firm Details Year 2023-24

S.No.	Firm Name	Firm Address	Email Id	Ranking	Capacity
1	M/S KLK Ventures Pvt. Ltd.	1517, Hemkunt Chambers 89, Nehru Place, New Delhi-110019	info@klkindia.com	L-1	1-10
2	M/S Servotech Power System Ltd.	806,8th Floor,Crown Height,Hotel Crown Plaza,Sector-10, Rohini, New Delhi-110085	sarika78@servotechindia.com	L-2	
3	M/S Jaiswal Battery Service	11,Church Bulding,Hazratganj,lucknow-226001	brawnsolartech@gmail.com	L-3	
4	M/S KLK Ventures Pvt. Ltd.	1517, Hemkunt Chambers 89, Nehru Place, New Delhi-110019	info@klkindia.com	L-1	11-50
5	M/S Easy Photovoltech Pvt. Ltd.	'Sun Park'' Khasra No. 98, Sikhera Road, Industrial Area, Modinagar, Ghaziabad-201204	vinod@easyphotovoltech.com	L-2	
6	M/S Servotech Power System Ltd.	806,8th Floor,Crown Height,Hotel Crown Plaza,Sector-10, Rohini, New Delhi-110085	sarika78@servotechindia.com	L-3	
7	M/S Intecco Technical Services Pvt. Ltd.	102,Mahaveer Arcade,Picnic Spot Road, Faridi Nagar,Lucknow-226015	intecco.ashish07@gmail.com	L-4	
8	M/S Jaiswal Battery Service	11, Church Building, Hazratganj, Lucknow-226001	brawnsolartech@gmail.com	L-5	
9	M/S Rich Phytocare Pvt. Ltd.	D 11-12,4th Floor,Vibhuti Khand, Gomti Nagar, Lucknow-226010	officelucknow@richphytocare.com	L-6	
10	M/S Lord's Mark Industries Pvt. Ltd.	D-2168, Indira Nagar, Lucknow-226016	lordsmarkindustries@gmail.com	L-7	
11	M/S Easy Photovoltech Pvt. Ltd.	'Sun Park'' Khasra No. 98, Sikhera Road, Industrial Area, Modinagar, Ghaziabad-201204	vinod@easyphotovoltech.com	L-1	51-75
12	M/S KLK Ventures Pvt. Ltd.	1517, Hemkunt Chambers 89, Nehru Place, New Delhi-110019	info@klkindia.com	L-2	
13	M/S Paawan Energy India Pvt. Ltd.	Near Sarvoday School,New Shambhoo Nagar,Shikohabad-Firozabad-283135	info@paawanenergy.com	L-3	
14	M/S Servotech Power System Ltd.	806,8th Floor,Crown Height,Hotel Crown Plaza,Sector-10, Rohini, New Delhi-110085	sarika78@servotechindia.com	L-4	
15	M/S Sunrover Pvt. Ltd.	1/173 C, Priyadarshani Colony, Sitapur Road, Aliganj, Luckonw226020	info@sunrover.in	L-5	
16	M/S Lord's Mark Industries Pvt. Ltd.	D-2168, Indira Nagar, Lucknow-226016	lordsmarkindustries@gmail.com	L-6	
17	M/S Jaiswal Battery Service	11, Church Building, Hazratganj, Lucknow-226001	brawnsolartech@gmail.com	L-7	