NOTICE INVITING TENDER

State Bank of India, Local Head office, Premises & Estate Deptt. Lucknow invites two-bid online tenders through GeM portal for Supply, Installation, Testing & Commissioning of **Off-Grid Roof Top Solar (PV) Power system with Hybrid Inverter and 240V 200Ah (48KWH) LiFePo4 battery back up** at **State Bank of India, Rural Self Employment Training Institute (RSETI), Puraina, Dist Maharajganj** Uttar Pradesh.The other details of the tender are as under:

1.	**Scope of Work**	a) Supply, Installation, Testing and Commissioning of OFF-GRID **10 KWp (Mono C-Si PERC panel 545 watt or above) and with 240V 200Ah (48KWH) LiFePo4 battery back up with suitable rack.** b) Plant with SIM based remote monitor feature with one year recharge by vendor. c) Solar plate Cleaning arrangement at rooftop with CPVC water pipe. Water pump of required capacity to be provided, if needed. d) Graph of hourly solar power generation, E-day, E-total (Kwh) solar power generation details on inverter LED display simultaneously must be available.
2	**a) Tender invitation**	**Date and Time as per GeM portal**
	b) Tender technical bid opening	**Date and Time as per GeM portal**
	c) Technical bid clarification time	2 days(48 hours) from technical scrutiny
	d) Price bid opening	After technical scrutiny and clarification
3	a) Earnest Money Deposit (EMD)	**Rs. 14,000-00 (Rupees Fourteen Thousands only)** to be submitted in the form DEMAND DRAFT in FAVOUR " **AGM (Premises & Estate), LHO, Lucknow** and payable at **Lucknow. Exempted for Micro and Small enterprises with uploading valid MSME/UDYAM registration certificate**
	b) Experience	**Minimum two years.as on 31.10.2024**
	c)Turnover	**Rs. 5.00 lacs**
	d) OEM Authorization	**Authorization certificate from OEM for Panels, Inverter battery should be submitted.**
4	Initial Security Deposit (ISD)	**2% of contract value (without GST value)** to be submitted in the form DEMAND DRAFT in FAVOUR "**The AGM(Premises & Estate), LHO, Lucknow** and payable at **Lucknow.** With-in 7 days from date of receipt of work order.
5	Security Deposit (SD)	**a) 5% of contract value** (without GST value) which (con-

		tract value, shall be deducted from final bill). SD shall be released without interest after 62 months from date of COMMISIONING subject submission to satisfactory per-formance and monthly cleaning report. **b)** Security deposit shall be forfeited in case i) Monthly cleaning work not done. ii) Quarterly preventive checking not completed. Cleaning and preventive checklist duly signed by User(respective branch) to be submitted at this office timely af-ter each service.
6	Time of completion of work	**30 days** from the date of generation of contract
7	Liquidate Damage(LD)	0.5% per week subject to maximum 5% of contract value.
8	Warranty period	60 months from the date of commissioning solar power plant
9	Place of opening of tender	The Asstt. General Manager (P&E), SBI, 1st Floor, B wing, Local Head Office, Motimahal Marg, Lucknow-226001 07408408060 agmpne.lholuc@sbi.co.in
10	Contact person (SBI)	**Ramji Sharan** Dy. Manager (Electrical), SBI, 1st Floor, Local Head Office, Motimahal Marg, Lucknow-226001 7408403577 ramji.sharan@sbi.co.in

Note.

AGM (Premises & Estate)

ELIGIBILITY CRITERIA

1. **TURNOVER :** The Bidder should have minimum average annual turnover of **Rs. 5.0 Lacs** during last 3(three) Financial years (2021-22, 2022-23 & 2023-24) (Copies of balance sheet and profit and loss sheet to uploaded of above period only)

2. EXPERIENCE: 02 Years as on 31.10.2024.

3. The bidder must have full-fledged registered office in any of location **with-in geographical area of UTTAR PRADESH**. Copy of electricity bill/GST certificate/ trade license /House& water tax/ESI/PF registration receipt etc to be uploaded. Document should not be more than 3 months old from date tender floating. **(Additional DOC 1).**

4. GST registration Certificate.

5. BOQ compliance and all tender terms conditions duly stamped and signed to be up loaded.

TECHNICAL SPECIFICATIONS

1.1 INTRODUCTION:

In off grid- connected Solar Photo-Voltaic (SPV) systems, **solar energy is fed into the building loads through net meter** that are connected to the public electricity grid through a service connection with surplus energy being fed into the grid and shortfall being drawn from the grid. Fee for net-meter and net billing process shall be paid by the Bank, however application submission, liaisioning for obtaining feasibility approval and net meter installation shall be in scope of bidder. **Obtaining NOC from UPPCL /Directorate of Electrical Safety, Uttar Pradesh shall be in the scope of vendor. The cost of net meter supply, installation and testing, liaisoning and necessary approvals is to be borne by the bidder.**

1.2 QUALITY AND WORKMANSHIP:

Solar PV modules are designed to last 25 years or more. It is therefore essential that all system components and parts, including the mounting structures, cables, junction boxes, distribution boxes and other parts also have a life cycle of at least 25 years. Therefore all works shall be undertaken with the highest levels of quality and workmanship. During inspection of Bank Engineer and its representatives will pay special attention to neatness of work execution and conformity with quality and safety norms. Non-compliance works will have to be redone at the cost of the Installer.

1.3 DEFINITION:

A Off- Grid Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, Life Batteries and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid tied SPV system is without battery and should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipments/components.

- Solar PV modules consisting of required number of **Mono C-Si PERC PV modules** with Linear performance warranty.
- Off Grid Power Conditioning (Inverter) Unit with 4G/5G SIM based Remote Monitoring System.
- Mounting structures.
- Junction Boxes.
- Earthing and lightening protections (both DC & AC sides).
- IR/UV protected PVC Cables, pipes and accessories.
- Water pipeline with necessary pump etc for cleaning of solar plates.
- Data acquisition system

1.4 **SOLAR PHOTOVOLTAIC MODULES:**

1.4.1 The PV modules used must qualify to the latest edition of IEC PV module qualification test or equivalent BIS standards **Mono Perc C-Silicon** Solar Cell Modules IEC 61215/IS14286. In addition, the modules must conform to IEC 61730 Part-2- requirements for construction & Part 2 – requirements for testing, for safety qualification or equivalent IS.

a) For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701.

b) The total solar PV array capacity should not be less than allocated capacity (kWp) and should comprise of solar **Mono C-Si PERC** modules of minimum **545 watt or above** wattage. Module capacity less than minimum **545 watts** will not be accepted.

c) Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.

d) PV modules must be mandatorily tested and approved by one of the IEC authorized test centers.

e) The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.

f) The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. Bank shall allow only minor changes at the time of execution.

1.4.2 **Other general requirement for the PV modules and subsystems shall be the Following:**

a) The rated output power of any supplied module shall have tolerance of +/- 3%.

b) 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.

c) The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-

pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.

d) IV curves at STC should be provided by bidder.

1.4.3 Modules deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each modules (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).

a) Name of the manufacturer of the PV module.

b) Name of the manufacturer of Solar Cells.

c) Month & year of the manufacture (separate for solar cells and modules).

d) Country of origin (separately for solar cells and module).

e) I-V curve for the module Wattage, Im, Vm and FF for the module.

f) Unique Serial No and Model No of the module.

g) Date and year of obtaining IEC PV module qualification certificate.

h) Name of the test lab issuing IEC certificate.

i) Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001.

1.5. ARRAY/MODULE MOUNTING STRUCTURE:

i. **Hot dip galvanized GI structures** shall be used for mounting the modules/ panels/arrays. Each structure will have angle of inclination as per the site conditions to take maximum insolation.

ii. The Mounting structure must be Non-invasive Ballast Type and any sort of penetration of roof to be avoided. The design details are as follows:

a. The inclination of module should be within 10-15 degrees.

b. The upper edge of the module must be covered with wind shield so as to avoid bulk air ingress below the module. Slight clearance must be provided on both edges (upper & lower) to allow air for cooling.

iii. The mounting structure should be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.

iv. The fasteners should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels.

v. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m2. The load shall be well distributed so that point loads are well within the limits.

vi. The minimum clearance of the structure from the roof level should be in between 70-150 mm.

vii. The structures should be laid on the rooftop on weather resistant FRP mountings which should be non-penetrating type and proper drainage of rain water over terrace through the installation area should be maintained.

viii. The structures should be suitably loaded with reinforced concrete blocks of appropriate weight made out of M25 concrete mixture.

ix. Special care should be taken while designing all structures for modules to cater to heavy rainfall.

x. The array shall be located sufficiently inside the boundary wall of the terrace (parapet wall) and should not be projecting out. PV array shall be installed in the terrace space free from any obstruction and/or shadow. PV array shall be installed utilizing optimum terrace space to minimize effects of shadows due to adjacent PV panel rows.

xi. Adequate spacing shall be provided between two panel frames and rows of panels to facilitate personnel protection, ease of installation, replacement, cleaning of panels and electrical maintenance.

xii. Additional waterproofing shall be provided in the areas where RCC blocks are placed on the terrace.

xiii. The minimum clearance between lower edge of PV panel and terrace ground level shall be 150 mm to allow ventilation for cooling, also ease of cleaning and maintenance of panels as well as cleaning of terrace.

xiv. The PV array structure design shall be appropriate with a factor of safety of min. 1.5.

xv. Each array may be provided with two bird repellents spikes at a level higher than the upper edge of the array. The location of the spike should be selected for minimum shadow effect.

xvi. The support structure shall be free from corrosion when installed.

xvii. PV modules shall be secured to support structure using screw fasteners and/or metal clamps. Screw fasteners shall use existing mounting holes provided by module manufacturer. No additional holes shall be drilled on module frames. Module fasteners/clamps shall be adequately treated to resist corrosion.

xviii. Adequate spacing shall be provided between any two modules secured on PV array for improved wind resistance.

xix. The structure shall be designed to withstand operating environmental conditions for a period of minimum 25 years.

xx. The structure should be appropriately designed to withstand high wind velocities up to 200 km per hour. (The bidder is required to submit a certificate from an authorized chartered engineer with regards to the strength and durability of the structure)

1.6 **JUNCTION BOXES (JBs):**

a. The junction boxes are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy/PC 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.

b. 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. Single / double compression cable glands. Provision of earthing. It should be placed at 5 feet height or above for ease of accessibility.

c. Each Junction Box shall have High quality Suitable capacity Metal Oxide Varistors (MOVs) /SPDs, suitable Reverse Blocking Diodes. Suitable earthing should be provided to SPD. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups.

d. 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.

1.7 DISTRIBUTION BOARD:

i. Distribution panel to receive the DC output from the array field.

ii. DC DPBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. The bus bars are made of copper of desired size and suitable capacity.

a) Arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The vendor should provide concrete foundation 500mmx500mmx500mm to increase the strength. Non-invasive strictures are recommended to avoid leakage in roof.

b) The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.

c) Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Necessary protection towards rusting need to be provided either by coating or anodization.

d) The fasteners used should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels. Lay out should allow for easy access for panel cleaning.

e) Regarding civil structures the bidder need to take care of the load baring capacity of the roof and need arrange suitable structures based on the quality of roof.

f) The total load of the structure (when installed with PV modules) on the terrace should be within permissible limit.

g) The minimum clearance of the structure from the roof level should be 300 mm.

h) CBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

1.8 **AC DISTRIBUTION PANEL BOARD:**

a. Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.

b. All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.

c. The changeover switches, cabling work should be undertaken by the bidder as part of the project.

d. All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz

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e. The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

f. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.

g. Should conform to Indian Electricity Act and rules (till last amendment).

h. All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions

Variation in supply voltage	+/- 5 %
Variation in supply frequency	+/- 3 Hz

1.9. PCU/ ARRAY SIZE RATIO:

a) **Total Inverter capacity should be greater than or equal to the Rooftop Power Plant Capacity.**

b) **Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.**

1.10 PCU/ Inverter:

Hybrid Inverter

From Future Grid Connectivity Point of view it is proposed that a hybrid Inverter shall be utilized for Off Grid Solar Plant project. A Hybrid Solar PV power plant system comprises of C-Si (Crystalline Silicon) Solar PV modules with intelligent Inverter having MPPT technology and Intentional Islanding feature and associated power electronics, which feeds surplus generated AC power to the Grid and islands when the Grid is not available. During grid supply outage the system operates in off-grid mode using battery. Other than PV Modules and Inverter/Inverters, the system consists of a Battery Bank, Module Mounting Structures, appropriate DC and AC Cables, Array Junction Boxes (AJB) / String Combiner Boxes (SCB), AC and DC Distribution Box, Lightning Arrester, Earthing Systems, etc.

The system should be capable for exporting surplus generated solar power into the Grid, whenever the Grid is available and islands/disconnect whenever the grid is not available. The Hybrid power plants shall be capable of giving a battery backup of minimum three hours considering full load operation. The capacities of battery are defined above.

Note:-

1. The inverter kW rating shall be equal to the plant capacity in kW.
2. The hybrid inverter, without grid connectivity, shall be capable of powering the load during the daytime through solar energy and at night via battery backup. The option for grid connectivity is reserved for potential future use.

Hybrid Inverter Specifications:

All the Inverters should contain the following clear and indelible Marking Label & Warning Label as per IS16221 Part II, clause 5. The equipment shall, as a minimum, be permanently marked with:
a. The name or trademark of the manufacturer or supplier.
b. A model number, name or other means to identify the equipment.
c. A serial number, code or other markings allowing identification of manufacturing location and the manufacturing batch or date within a three-month time period.
d. Input voltage, type of voltage (A.C. or D.C.), frequency, and maximum continuous current for each input.
e. Output voltage, type of voltage (A.C. or D.C.), frequency, maximum continuous current, and for A.C. outputs, either the power or power factor for each output.
f. The Ingress Protection (IP) rating.
The Hybrid inverter output shall be 415 VAC, 50 Hz, 3 phase or 230 VAC, 50 Hz, 1 phase as per client requirement.
The hybrid inverter should fulfill all technical requirements for grid connection, including the option to enable/disable export to the grid. Additionally, it should provide intentional islanding capabilities and have the facility to connect to a battery bank.

The Hybrid inverter shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of inverter component failure or from parameters beyond the inverter's safe operating range due to internal or external causes. As SPV array produce direct current electricity, it is necessary to convert this direct current into alternating current and adjust the voltage levels to match the grid voltage. Conversion shall be achieved using an electronic Inverter and the associated control and protection devices. All these components of the system are termed the "Power Conditioning Unit (PCU)". In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to the power conditioning unit/inverter The Inverter output should be compatible with the grid frequency. Typical technical features of the inverter shall be as follows:

- Switching devices: IGBT.
- Control: Microprocessor /DSP.
- Nominal AC output voltage and frequency: 415V, 3 Phase, 50 Hz (In case single phase inverters are offered, suitable arrangement for balancing the phases must be made.).
- Output frequency: 50 Hz.
- Grid Frequency Synchronization range: + 3 Hz or more.
- Ambient temperature considered: -20o C to 80o C.
- Humidity: 95 % Non-condensing.
- Grid Frequency Tolerance range: + 3 or more.
- Grid Voltage tolerance: - 20% & + 15 %.
- No-load losses: Less than 1% of rated power.
- Inverter efficiency (minimum): >93%.

- THD: < 3%.
- PF: > 0.95.

a. Three phase PCU/ inverter shall be used with each power plant system (10kW and/or above) but In case of less than 10kW single phase inverter can be used.

b. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown.

c. The output of power factor of PCU inverter is suitable for all voltage ranges or sink of reactive power, inverter should have internal protection arrangement against any sustainable fault in feeder line and against the lightning on feeder.

d. Built-in meter and data logger to monitor plant performance through external computer shall be provided.

e. The power conditioning units / inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068-2(1,2,14,30) /Equivalent BIS Std.
f. The charge controller (if any) / MPPT units environmental testing should qualify IEC 60068-2(1, 2, 14, 30)/Equivalent BIS std. The junction boxes/ enclosures should be IP 65(for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications.

g. The PCU/ inverters should be tested from the MNRE approved test centers / NABL /BIS /IEC accredited testing calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses.

1.11 BATTERY- Lithium Ferro Phosphate :

The battery should Lithium Ferro phosphate (Lifepo4) having capacity as motioned below 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 72/144 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:

S. No.	. Description	Specification
1.	Battery Configuration minimum cell capacity	240V 200Ah (48KWH) LiFePo4 No. of batteries shall be dependent on the battery specifications. However minimum 100 Ah and 40V battery should be provided
2.	Working Temperature Range (both for charging & discharging)	0-55 Deg C
3.	Storage Temperature Range	@ 0-35 Deg- 6 months
4.	Cycle Life (Full charge to full discharge @ 25 deg C before capacity of battery falls below 70%)	≥ 6000 Cycles (25 deg C+_2deg C, 0.5C/1C, 90% DOD 70%EOL)
5.	Battery Warranty	The LFP batteries shall be warranted for atleast 8 years.
6.	Type of Cell	Prismatic
7.	Indicator	(05 LED)(SOC 20%-SOC 100%), LED Indicator(03) Working, Alarming, Protecting

8.	Protection	IP20 and above

- **Depth of Discharge: minimum 90%**
- **Maximum Discharging rate: up to C/3 rate of battery Capacity**
- **Maximum Charging Rate: upto C/2 rate of battery capacity**
- **Battery should have built in BMS system**
- **Suitable rack should be provided by the vendor**

The Lithium Ferro 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.

1.12 DATA ACQUISITION SYSTEM / PLANT MONITORING:

i. Graphical representation of hourly solar power generation, with details of E-day, E-total (Kwh) solar power generation details simultaneously on inverter LED display.

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

iii. Data from the inverter shall be uploaded to internet via sim card based device. The monitoring details with login ID and password should be shared with the Bank.

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

1. AC Voltage.
2. AC Output current.
3. Output Power.
4. Power factor.
5. DC Input Voltage.
6. DC Input Current.
7. Time Active.
8. Time disabled.
9. Time Idle.
10. Power produced
11. Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage.

v. All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and log-

ging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.

vi. Remote Monitoring and data acquisition through Remote Monitoring System software at the Bank location with latest software/hardware configuration and service connectivity for online /real time data monitoring/control complete to be supplied and operation and maintenance/control to be ensured by the supplier. Provision for interfacing these data on [NAME OF THE ORGANISATION] server and portal in future shall be kept.

1.13 POWER CONSUMPTION:

Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any excess power can be exported to grid. . Decisions of appropriate authority like DISCOM, state regulator may be followed.

1.14 PROTECTIONS:

The system should be provided with all necessary protections like earthing, Lightning, and grid islanding as follows:

1.14.1 LIGHTNING PROTECTION:

The SPV power plants shall be provided with lightning & overvoltage 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,. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305 standard. Lightening conductor should be made of 25 mm dia 4000mm long GI spike as per Provision of IS 2309-1969. Necessary concrete foundation to be provided for holding Lightening conductor considering the wind speed. It should be earthed through 20x3 GI flat from pit with proper insulation. Height of Lightening conductor from array structure should be min 4 meter.

1.14.2 SURGE PROTECTION:

Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and –ve terminals to earth (via Y arrangement)/ SPD (tipe II). SPD should be provided in AC and DC side of solar PV system. It should have protection voltage of 2.5kv and nominal discharge current of 5kA (8/20) micro sec. SPD earthing terminals should be connected to earthing system.

1.14.3 EARTHING PROTECTION:

a. Each array structure of the PV yard should be grounded/ earthed properly as per IS: 3043-1987. In addition the lighting arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of Bank engineer as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly. Minimum 03 GI pipe earth pit to be provided as per relevant IS code.

b. Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earthing points are bonded together to make them at the same potential.

1.15. Grid Islanding:

a. In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This prevents the DC-to-AC inverters from continuing to feed power into small sections of the grid, known as "islands." Powered islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection), disconnection due to under and over voltage conditions shall also be provided.

b. A manual disconnect 4pole isolation switch (MCB/ MCCB) as per max inverter output current beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

1.16 CABLES:

Cables of appropriate size to be used in the system shall have the following characteristics:

i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards.
ii. Temp. Range: –10oC to +80oC.
iii. Voltage rating 660/1000V.
iv. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation Flexible.
v. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.

Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified.

The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25 years.

The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant provided by the bidder. Any change in cabling sizes if desired by the bidder/approved after citing appropriate reasons. All cable schedules/layout drawings approved prior to installation.

Multi Strand, Annealed high conductivity copper conductor PVC type A pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below: BoS item / component Standard Description Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V ,UV resistant for outdoor installation IS /IEC 69947.

The size of each type of DC selected shall be based on minimum voltage drop however the maximum drop shall be limited to 1%.

The size of each type of AC cable selected shall be based on minimum voltage drop however the maximum drop shall be limited to 2%.

1.17 TOOLS & TACKLES AND SPARES:

Operation and maintenance guide and consumable spares like fuses should be provided by vendor.

1.18 DANGER BOARDS AND SIGNAGES:

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Three signage shall be provided one each at battery –cum- control room, solar array area and main entry from administrative block. Text of the signage may be finalized in consultation with Bank.

1.19 DRAWINGS & MANUALS:

Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

I. Approved ISI and reputed makes for equipment be used.

II. For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to Bank before progressing with the installation work.

1.20 PLANNING AND DESIGNING:

i. The bidder should carry out the considering optimal usage of the space, material & labour. The bidder should submit the array layout, drawings along with shadow analysis report to Bank for approval. Bidders should submit detailed SLD for approval.

ii. Bank reserves right to change/modify sub-systems and components at any stage as per the local site conditions/ requirements.

iii. The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder shall submit three sets and soft copy in CD of final drawing for formal approval to proceed with installation work.

1.21 DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT:

i. The Contractor shall furnish the following drawings Award/Intent and obtain approval.

ii. General arrangement and dimensioned layout Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc. Structural drawing along with foundation details for the structure.

iii. Itemized bill of material for complete SV plant covering all the components and associated accessories.

iv. Layout of solar Power Array.

1.22 Safety - The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

QUALITY CERTIFICATION, STANDARDS AND TESTING FOR GRID-CONNECTED ROOF-TOP SOLAR PV SYSTEMS/ POWER PLANTS

Quality certification and standards for grid-connected rooftop solar PV systems are essential for the implementation of this technology. Hence, all components of grid-connected rooftop solar PV system/ plant must conform to the relevant standards and certifications given below:

Solar Monocrystalline PV Modules/ Panels	
IEC 61215/ IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61646 / Equivalent IS (Under Dev.)	Thin Film Terrestrial PV Modules
IEC 62108	Concentrator PV Modules & Assemblies
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61853- Part 1/ IS 16170: Part 1	Photovoltaic (PV) module performance testing and energy rating –: Irradiance and temperature performance measurements, and power rating
IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH3) Corrosion Testing (As per the site condition like dairies, toilets)
IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing
Solar PV Inverters	
IEC 62109-1, IEC 62109-2	Safety of power converters for use in photovoltaic power systems – Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems; Part 2: Particular requirement for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)
IEC/IS 61683 (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
IEC 62116/ UL 1741/ IEEE 1547 (as applicable)	Utility-interconnected Photovoltaic Inverters - Test Procedure of Is- landing Prevention Measures
IEC 60255-27	Measuring relays and protection equipment – Part 27: Product safety requirements
IEC 60068-2 / IEC 62093 (as applicable)	Environmental Testing of PV System – Power Conditioners and Inverters
Fuses	
IS/IEC 60947 (Part 1, 2 & 3), EN 50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): a) Low-voltage Switchgear and Control-gear, Part 1: General rules b) Low-Voltage Switchgear and Control-gear, Part 2: Circuit Breakers c) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests

IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
Surge Arrestors	
BFC 17-102:2011	Lightening Protection Standard
IEC 60364-5-53/ IS 15086-5 (SPD)	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
IEC 61643-11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods
Cables	
IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)/ IEC69947 (as applicable)	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
BS EN 50618	Electric cables for photovoltaic systems
(BT(DE/NOT)258)	mainly for DC Cables
Earthing/ Lightning	
IEC 62561	Series (Chemical earthing) (as applicable)
IEC 62561-1	Lightning protection system components (LPSC) - Part 1: Requirements for connection components
IEC 62561-2	Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes
IEC 62561-7	Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds
Junction Boxes	
IEC 60529 IEC 529	Junction boxes and solar panel terminal boxes shall be of the thermoplastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use
Energy Meter	
IS 16444 or as specified by the DISCOMs	A.C. Static direct connected watt-hour Smart Meter Class 1 and 2—Specification (with Import & Export/Net energy measurements)
Solar PV Roof Mounting Structure	
IS 2062/IS 4759	Material for the structure mounting
IEC 62548	PV arrays – Design requirements

APPROVED MAKE

1	Solar PV modules (mono crystalline only)	Vikram Solar/ Waaree Solar/ Goldi Green Technologies/ Tata Power Solar Systems Ltd./ BEL/ BHEL/ Renewsys / REIL/ Adani/Blue Bird or equivalent MNRE ALMM approved

2	Inverters:	DELTA/ SMA/Deye/Radius /Solar age /Polycab/ k solare/ Sungrow/Growatt or equivalent BIS approved / relevant IEC approved
3	DC cables	Havells/ Polycab/ KEI /Finolex/L&T/ KEI/ KEC/ UNIVER-SAL/ NICCO Equivalent
4	AC Distribution Board	Legrand/Schneider/ MDS/Hager/L&T/ABB or Equivalent BIS approved
5	DC Distribution Board	Legrand/Schneider/ MDS/ Hager/ L&T/ABB or Equivalent BIS approved
6	LV Switchgear	ABB/L&T/Schneider/ MDS or Equivalent approved
7	String Combiner Box	Robotina/Trinity Touch/Hensel/Cape Electric, AKG or Equivalent BIS approved
8	Weather Monitoring station	Pyranometer: Kipp & Zonnen or Equivalent
9	Energy Meter	Secure/L&T/Schneider/ABB or Equivalent
11	Connectors	MC4/or Equivalent
12	Surge protection (SPD)	MDS/ L&T/ Hager/ Schneider/ABB/Legrand/HPL or Equivalent
13	Solar Charge Controller	Morningstar/ Schneider/ Blue Sky/ Genasun/ Midnite So-lar/ Outback Power/ Magnum Energy or Equivalent
14	Batteries(LiFePO4)	Deye/Waree/Exide/Luminous/Amar Raja/Okaya
Important: Please Tick (/) the make of materials considered in the Tender. **The vendor has to comply with all State & Central Government norms for choosing the make, supply and erection.**		

Note: -

1. The contractor should obtain prior approval from SBI before placing order for any specific materials. All materials should conform to relevant standards and codes of BIS. Materials with I.S.I. mark shall be used duly approved by the SBI Engineer.
2. Any material is found to be not up to the mark, the contractor will have to produce original bills/certificate from the manufacturer or his authorized Distributor for authenticity and genuineness of the material for consideration and as per make approved by the SBI. The same will not be considered for payment.

Signature of contractor With Seal