

- 11** During site inspection by WBSEDCL's staff/ authorized representative, if the systems are found uninstalled and false report of installation and commissioning is submitted to WBSEDCL for claiming payment, Chief Engineer,SPGD,WBSEDCL is empowered to forfeit entire performance guarantee amount up to 100% & to terminate the Empanelment and black list the bidder from participating in WBSEDCL tender for at least three years.
- 12** Bidders are required to quote rates inclusive of Comprehensive Maintenance Contact (CMC) for the period of **five years** for the system. The rates quoted shall be inclusive of charges for providing Routine Maintenance services at the beneficiary's end as per site requirements to ensure smooth and satisfactory performance of the system. Replacement of any components of the system is included in the scope of work of CMC.
- 13** The capacity reserved for category-A : Category-B bidders may be in ratio i.e. approximately aggregate 35 MW capacity to be allocated for Category-A agencies and approximately aggregate 15 MW to be allocated for the Category-B agencies. However, actual allocation will be reviewed time to time allocation to the category –B. However, if required in future, Category-A bidder may be allowed for execution of capacity originally allocated to category –B bidders. Similarly, Category-B bidder may be allowed for execution of capacity originally allocated to category –A bidders. In such case, the shortfall of SD is required to be paid by the Agency.
- 14** The online registration of the applications of the beneficiaries for category A & B bidders shall be stopped once the above referred aggregate capacity is reached/registered on the online portal.
- 15** The incremental additional structure required by the beneficiary shall be at the cost of the beneficiary. In case of incremental additional structure, the design of such structure shall be got approved from the Structural Engineer for its strength as per Technical specification.
- 16** Enhancement of the capacity of the system installed earlier is allowed subject to fulfillment of the terms and conditions as may be specified by the WBSEDCL.
- 17** Training of representative of the beneficiary on the aspect of primary trouble shooting and Do's & Don'ts of the SPV systems, including general operation and maintenance, including lodging complaints & primary reporting. Details of the SPV System components in printed copy shall be given to the Beneficiaries to educate them.
- 18** The Bidders shall provide one copy of the instruction and operation & routine maintenance manual in Bengali with each system installed. These manuals shall contain all the relevant details and drawings required for proper maintenance of the system.

19 Stage wise Payment Schedule for the amount towards Project CAPEX under the non-subsidy part required to be collected by the Agency from consumer is as under: -

Stage	Particular	Payment by Consumer to Agency
Satge-1	Immediately after Registration at WBSEDCL by consumer	(20% - amount of deposit paid by consumer to WBSEDCL*)
Satge-2	At the time Supply of M.M.S at consumer's premises	20%
Satge-3	At the time of Supply of Modules at Consumer's premises	20%
Satge-4	At the time of Installation of SPV System	20%
Satge-5	At the time of Commissioning of System	20%

TECHNICAL SPECIFICATIONS FOR GRID CONNECTED SPV SYSTEMS

The specifications of SPV systems, for which EOI are invited, are as under. The self certified Test Report(s) of each of the components/ systems mentioned shall be submitted before starting System installation. To ensure optimum performance of the solar installation and its related safety aspects, the provisions of the publication of GERMI on “Best Practices in Operation and Maintenance of Rooftop Solar PV systems in India” published in May, 2018 be followed.

The proposed projects shall be commissioned as per the technical specifications given below. Any short comings will lead to cancelation of Empanelment as may be decided by WBSEDCLs. The specifications, in the WBERC Regulation on Net Metering shall also be applicable.

DEFINITION:

A Grid Tied 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, and Controls & Protections, interconnect cables, solar meter, bi-directional energy meter 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 daytime. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should confirm to the BIS, IEC, or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipment/components.

- Solar PV modules consisting of required number of Crystalline PV modules.
- Grid interactive Power Conditioning Unit with Remote Monitoring System.
- Mounting structures.
- Junction Boxes.
- Earthing and lightening protections.
- IR/UV protected PVC Cables, pipes and accessories.
- Solar Meter and Bi-directional Energy Meter

1. SOLAR PHOTOVOLTAIC MODULES:

1.1.1 The PV modules and Solar Cell used should be made in India. Necessary documents in this regards must be provided to WBSEDCL.

Violation of norms of Domestic Content Requirement (DCR) UNDER Solar PV projects will lead to penalties and actions as mentioned in office memorandum of MNRE GOI vide letter no. 283/2018-GRID SOLAR dated 20th February, 2018 as under:

- a) Filing of criminal case under IPC 420 and related Sec.
- b) Blacklisting of developers for period of 10 years
- c) Forfeiting of relevant bank guarantee(s)
- d) Disciplinary case against the Officers of concerned CPSU/ State Govt.
- e) Any other action , in addition to those above

SPV Modules and Solar Cells used for this Scheme shall be domestically manufactured as per MNRE's requirement. The Empanelled Agencies shall require to submit the Self declaration, regarding the Modules and Solar cells used under the Scheme are "Made in India", from the concerned manufacturer of Solar Modules, supplied for this scheme of GoWB/GOI, before commissioning of the System. Violation of this condition will be reported to the MNRE and GoWB for taking actions against the Manufacturer of the Solar Modules and Empanelled Agency. Such firm and Empanelled Agency may be put under the black list or stop deal list as may be decided by the WBSEDCL Authority.

In absence of the ALMM, the Empanelled Agencies shall have to submit self-declaration regarding domestically manufactured Cell and Modules used in the SPV System in this project. Whenever, the ALMM list published by the MNRE, the Model and Manufactures of the Module and Cell shall be from the ALMM only used in the SPV System in this project. Bidders may consider the MNRE Office Memorandum F.NO. 283/54/2018 – Part 1 dated 10th March 2021.Approved Models and Manufacturers of Solar Photovoltaic Modules

“The PV modules (Monocrystalline or Polycrystalline) used shall conform to the latest edition of IEC 61215 and IS 14286 (Terrestrial photovoltaic (PV) modules – Design qualification and type approval). The PV modules shall also conform to IS/ IEC 61730 (Photovoltaic (PV) module safety qualification: Requirements for construction and testing).”

1.1.2. The PV modules used must qualify to the latest edition of IEC PV module qualification test or equivalent BIS standards Crystalline Silicon Solar Cell Modules IEC 61215 and IS14286, IEC 61853-Part I, IS 16170-Part I for Photovoltaic (PV) module performance testing and energy rating, Irradiance and temperature performance measurements, and power rating, In addition, the modules must conform to IEC61730 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 crystalline modules of **minimum 300 Wp**. Module capacity less than 300 watts shall not be accepted

- c) Protective devices against surges (SPD) at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.
- d) PV modules must be tested and approved by one of the IEC/BIS 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.
- g) The PV Module efficiency should be higher than 15%.
- h) Other general requirement for the PV modules and sub systems shall be the following:
 - I. The rated power of solar PV module shall have maximum tolerance upto +3%. No negative tolerance in the rated capacity of solar PV module is allowed.
 - II. The peak-power point voltage and the peak-power point current of any supplied module string (series connected modules) shall not vary by + 2% from the respective arithmetic means for all modules and/or for all module strings, as the case may be.
 - III. I-V curves at STC shall have to be provided by bidder.
 - IV. Minimum certified PV module efficiency shall be 15% for crystalline. The temperature co-efficient power of the PV module shall not be less than -0.43% /°C.
 - V. All PV modules should carry a performance warranty of >90% during the first 10 years, and >80% during the next 15 years. Further, module shall have performance warranty of >97% during the first year of installation. Degradation of module should not be more than 1 % per annum.
 - VI. The PV modules shall be equipped with IP67 or higher protection level junction box with a minimum of 3 (three) numbers of bypass diodes of appropriate rating and appropriately sized output power cable with min. 1.2 meter length and MC4 solar connectors.

1.1.3. Modules deployed must use a RF identification tag and Barcode sticker. 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, I_m , V_m 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

1.1.4. Warranties:

- a) Material Warranty:
 - i. Material Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than five (05) years from the date of commissioning.
 - ii. Defects and/or failures due to manufacturing
 - iii. Defects and/or failures due to quality of materials
 - iv. Non conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owners sole option.
- b) Performance Warranty:
 - i. The predicted electrical degradation of power generated not exceeding 20% of the minimum rated power over the 25 year period and not more than 10% after ten years period of the full rated original output.

2. ARRAY STRUCTURE:

- a) Supply, installation, erection and acceptance of module mounting structure (MMS) with all necessary accessories, auxiliaries and spare part shall be in the scope of the Empanelled Agency.
- b) Hot dip galvanized MS mounting structures shall be used for mounting the modules/ panels/arrays. Each structure should have angle of inclination as per the site conditions to take maximum insolation. However to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements. MMS shall be made of hot dip Galvanized steel per ASTM A123. HDGI zinc coating shall be as per IS 4759. Necessary testing provision for MMS to be made available by Bidder at site during third party inspection. All bolts, nuts, panel mounting clamps fasteners shall be of stainless steel of grade SS 304 and must sustain the adverse climatic conditions.
- b) The Mounting structure shall be so designed to withstand the max speed of the wind zone of the location where a PV system is to be installed in W.B. It may be ensured that the design has been certified by a recognized Lab/ Institution in this

regard. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.

- c) The mounting structure steel shall be as per latest IS 2062: 2011 and hot dip galvanization of the mounting structure shall be in compliance of latest IS 4759 or Cold Rolled Pre galvanized structure material is also allowed as per IS 277:2003.

The Rectangular/ square/ circular hollow pipe section used for the structure should have a minimum thickness of 2.0 mm. Other than above, the material thickness should be minimum 2.5 mm.

The Structure design and drawing shall be duly stamped by licensed Structural designer is required to be submitted to the concerned WBSEDCL by the Empanelled Agency before installation for all types of structure arrangements including the extension made, as per specification.

In case much time is required during this process for drawing and design approval, the Empanelled Agency can submit the Certificate from the Structural Designer at the time of subsidy claim subject to submitting the broad design & drawing in advance before installation with an under-taking to meet all technical aspects as per the EOI specification to concerned WBSEDCL.

3. Mounting Arrangement:

- a. Mounting arrangement for RCC-flat roofs :- The Structure should be made in-situ installation/removable concrete ballast made of PCC (1:2:3).
- b. Mounting arrangement for metal sheet roofs: - The structure should have sufficient stability and wind withstanding capacity with ensuring that the roof remains water proof.
- c. Mounting arrangement for ground installations: - The structure should be made by in-situ installation/ removable concrete ballast made of PCC (1:2:3); assuring enough ground clearance to prevent damage of the module through water, animals and other environmental factors. Minimum 300 mm Ground Clearance have to be maintained.
- d. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Aluminum structures also can be used which can withstand the wind speed of respective wind zone. Necessary protection towards rusting need to be provided either by coating or anodization.
- e. 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.

- f. 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.
- g. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m².
- h. The minimum clearance of the structure from the roof level should be 300 mm.
- i. The module mounting structure shall be made of GI medium class pipe (as per IS 1239 and Zinc coating as per IS 4736) / GI channel/ GI Square section. The grouting of the structure shall be done with PCC 1:2:3, which shall withstand the wind speed of respective wind zone.
- j. MMS design should conform IS 875.
- k. The Empanelled Agency shall be fully responsible for any damages to SPV System caused due to high wind velocity within guarantee period as per technical specification.
- l. The parameters of prevailing wind speed, floor conditions, load, and upward lift should be taken in to consideration while preparing the design.
- m. PV array structure shall be designed and positioned such that the PV modules are completely shadow-free solar during generation hours of 10 AM to 4PM (minimum). Further, all the installation shall be provided with a Shadow Analysis report generated from a map based software at the particular coordinates. The report generated from map based software's like Pathfinder, Helioscope, Sun Analyzer, etc. shall be preferred.

4. JUNCTION BOXES (JBs):

- a. The junction boxes are to be provided in the PV array for termination of connecting cables. The Junction Boxes (JBs) shall be made of 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 JB's shall be such that input & output termination can be made through suitable cable glands. Suitable markings shall be provided on the busbars for easy identification and cable ferrules will be fitted at the cable termination points for identification.
- 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.
- c. For array junction box/ PV combiner box, Empanelled Agency may also provide polyamide glands and MC4 Connectors. The rating of the junction box shall be suitable with adequate safety factor to interconnect the Solar PV array

- d. Each Junction Box shall have High quality Suitable capacity
- e. SPDs. The Junction Boxes shall have suitable capacity disconnectors.
- f. 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.
- g. Junction boxes shall be mounted on the MMS such that they are easily accessible and are protected from direct sunlight and harsh weather.

5. DC DISTRIBUTION BOX (DCDB):

- a. DC Distribution Box (DCDB) to receive the DC output from the PV array field.
- b. DC DBs shall be dust & vermin proof conform having IP 65 protection.
- c. The bus bars are made of EC grade copper of required size. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

6. AC DISTRIBUTION BOX (ACDB):

- a. AC 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 IEC60947:2019, 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
- 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 CEA safety regulations (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: +/- 10 %
 - Variation in supply frequency: +/- 3 Hz

- i. The inverter output shall have the necessary rated AC surge arrestors and MCB/ MCCB. MCB shall be used for currents up to 63 Amperes, and MCCB shall be used for currents greater than 63 Amperes. RCCB shall be used by the Agency if required for successful operation of the PV system

7. PCU/ARRAY SIZE RATIO:

The recommended the solar PV array capacity in KW shall be in a range of 100%-110% of inverter capacity. i.e if the Inverter Capacity is 5 KW, then the Solar PV array capacity should be from 1 KWp to 500 KWp. For Subsidy calculation Minimum of following three shall be considered.

1. Applied SPV Capacity in KW at the time of registration.
2. solar PV array capacity in KWp
3. Inverter Capacity in KW

8. PCU/INVERTER:

i. Marking:

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 trade mark of the manufacturer or supplier;
- b) A model number, name or other means to identify the equipment,
- c) A serial number, code or other marking 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 As per IS 16221 (minimum IP 65)

Marking shall be located adjacent to each fuse or fuse holder, or on the fuse holder, or in another location provided that it is obvious to which fuse the marking applies, giving the fuse current rating and voltage rating for fuses that may be changed at the installed site.

Particulars	Details
Switching devices	IGBT
Control	Micro processor /DSP
Nominal AC output voltage	For 3-phase/ 1phase :- 415V / 240 V
Output frequency	50 Hz
Grid Frequency Synchronization range	+ 3 Hz or more

Ambient temperature considered	-20° C to + 50° C
Humidity	95 % Non-condensing
Protection of Enclosure	IP-65(Minimum).
Grid Frequency Tolerance range	+/- 3 or more
No-load losses	Less than 1% of rated power
Inverter Efficiency(minimum)	<p style="text-align: center;">(Above 10 kW)</p> <p>Peak Efficiency At least 97%, measure as per IEC 61683 Euro Efficiency At least 97%, measure as per IEC 61683</p> <p style="text-align: center;">(Below 10 kW)</p> <p>Peak Efficiency At least 97%, measure as per IEC 61683 Euro Efficiency At least 97%, measure as per IEC 61683</p>
THD (At rated power)	<3%
PF	>0.9
Communication interface	RS 485 with Modbus
Display type	LCD for data display. LCD / LED for status Display for string inverters
Protections	<p>Over voltage (both input and output)</p> <p>Over current (both input and output)</p> <p>Over/Under grid frequency</p> <p>Over temperature</p> <p>Short circuit</p> <p>Lightening</p> <ul style="list-style-type: none"> • Surge voltage induced at output due to external source <p>Anti-islanding</p>
IEC Standards	IEC 61727-UL 1741, IEC 62109, IEC 61000, IEC 60068
Recommended Alert/Indications	<p>Inverter ON</p> <p>Grid ON</p> <p>Inverter Under / Over Voltage</p> <p>Inverter Overload</p> <p>Inverter Over Temperature</p>

Recommended LCD Display on Inverter	Output power (W) Daily Energy (Wh) cumulative energy (Wh) DC voltage (V) DC current (A) AC voltage (V) AC frequency (Hz) AC current (A) Cumulative hours of operation (h).
-------------------------------------	--

- a) The inverter shall have an RS-485 interface and support communication of its operational parameters and logs over Modbus protocol. The register mapping/memory mapping of the inverter data shall be made available by the Empanelled Agency from the inverter supplier to the WBSEDCL.
- b) Three phase PCU/ inverter shall be used with each power plant system above 6KW and In case of 6 KW or less Capacity single phase inverter shall be used. In case of capacity addition of existing Solar plant, if the existing inverter is required to be replaced, the cost same is to be borne by consumer up on mutual agreement with Agency and consumer.
- c) Also, the beneficiary is having 3-phase connection and demanding SPV Capacity 5 KW or below, in that case, 1-phase/ 3phase inverter shall be allowed. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown.
- d) 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 sustain fault in feeder line and against the lightning on feeder.
- e) Built-in/External meter and data logger to monitor plant performance through external computer shall be provided.
- f) 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.
- g) 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.
- h) The PCU/ inverters should be tested from the MNRE approved test centers /NABL /BIS
- i) /IEC accredited testing- calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses. Valid type test report shall be submitted by the empanelled agency before commissioning of the SPV System.
- j) All inverters shall be IEC 61000 compliant for electromagnetic compatibility, harmonics, Surge, etc.
- k) Maximum Power Point Tracker (MPPT) shall be integrated in the PCU/inverter to maximize energy drawn from the array.
- l) The PCU/ Inverter shall have overloading capacity of minimum 10%.

- m) All Capacity and range of Inverter must have Compatible remote Monitoring and data acquisition System software,
- n) Remote Monitoring through online and data acquisition facility both online and offline to be provided by Inverter company.
- o) All inverter should capable of store last one year data.

9. INTEGRATION OF PV POWER WITH GRID:

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case of grid failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid. Once the grid comes into service PV system shall again be synchronized with grid supply and load requirement would be met to the extent of availability of power. 4 pole isolation of inverter output with respect to the grid power connection need to be provided, as per regulation.

10. DATA ACQUISITION SYSTEM / PLANT MONITORING

- a) Data Acquisition System shall be provided for each of the solar PV plant.
- b) Remote Monitoring and data acquisition through Remote Monitoring System software at the owner /WBSEDCL 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 CP. Provision for interfacing these data on WBSEDCL server and portal in future shall be kept as per requirement.
- c) Installation agency shall ensure that Inverter should have provision of remote monitoring of inverter data through sim card. Required website/mobile app platform, where the user (Consumer) can access the data, should be provided/explained to consumer while installation by Empanelled Agency. Additionally, if inverter has the facility of in-built wi- fi module, that should also be explained to the consumer. Recurring cost of sim card shall be borne by consumers. All the inverter data should be made available to WBSEDCL for monitoring by giving web access.
- d) **The contractor shall pay the rental charge of the SIM card for web connectivity in order to transfer of data related to Web Based Remote Monitoring System. The contractor shall also pay the rental charges for server of the web based remote monitoring system for storing and access the data till next Five years. The contractor can clame rental charge of the SIM card from beneficiary through mutual understanding as part of nonsubsidised expenditure..**