

(Effective w.e.f. 06-01-2025)

Sr. No.	Particulars	Remarks
1.	Tender Notice No.	HIMURJA (F-7) /GCRS Plant/2025-26
2.	NIT Date	06-01-2025
3.	Mode of Tender	Online Open Tender
4.	Cost of Tender Document (Non-refundable) (to be submitted online)*	Rs. 20,000
5.	Earnest Money Deposit (EMD) (to be submitted online)	Rs 5,00,000
6.	Date of Start of downloading tender document and time.	10-01-2025 at 10.00 AM onwards
7.	Last Date & Time of downloading of document	06-02-2025, 12 Noon
8.	Last date & time for submission of technical and financial bid.	06-02-2025, 05.00 PM
9.	For online submission of EMD & Tender Document cost, detail of account is as under: In case of above, the bidder has to pay through RTGS/NEFT, as per the given date & time schedule, in the account of Director HIMURJA, A/c No 55070883802, IFSC Code- SBIN 0014639, SBI, Kasumpti, Shimla-09	On or before last date of submission of Technical Bids & Financial Bids i.e. 06-02-2025, 05.00 PM
10.	Date & time of opening of Technical Bid(s) (Part-I)	07-02-2025 (11.00 AM)
11.	Date & time of opening of Financial Bid(s) (Part-II)	Will be intimated later
12.	Validity of Rates/empanelment	One year from opening of price bid

A. Information to Bidders:

The Bidders can download the tender document from the portal: <https://hptenders.gov.in>, which will be available on portal under the Department Non-Conventional Energy Sources

* Tender document cost once paid/deposited will not be refunded in any case/circumstances.



(HP Govt. Energy Development Agency)
Urja Bhawan, Block 8-A, SDA Complex
Kasumpti, Shimla, HP-171009

E-Tender Document

No. HIMURJA (F-7)/GCRTS Plant/2025-26

for

“Design, supply, erection, testing and commissioning including warranty, comprehensive operation & maintenance of Grid-Connected Rooftop Solar Plant of different capacities to be installed on the rooftops of the Domestic/Government/ Institutional or other buildings all over the State of HP on full cost basis”.

Address for communication:

The Chief Executive Officer,
Urja Bhawan, Block 8A, SDA Complex,
Kusampati, Shimla, HP-171109
Telephone No.: 0177-2628074
E-mail: himurja-hp@nic.in
Website: himurja.hp.gov.in

Supply, installation and commissioning of Grid connected Rooftop Plants

A. NECESSITY FOR THE TENDER

The Ministry of New and Renewable Energy, Govt. of India is promoting the Grid connected Rooftop Solar **programme** in the country and the Ministry has set a target of 40 GW to be achieved through grid connected rooftop plants by the year 2026. The present rate contract for Grid connected Rooftop Solar Plants in the State will be expired on 15.03.2025. This new tender is necessitated to determine the lowest rate for different capacities for the “Design, manufacture, supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of Grid connected Rooftop Solar Power plant ranging from 1 kW to 50 kW under Net Metering scheme and above 50 kW up to 500 kW under Net Billing scheme to be installed on the rooftops of the Domestic/Government/**Institutional** or other buildings, all over the State of HP on full cost basis.

B. SCOPE OF WORK:

HIMURJA invites bids for Design, manufacture, supply, erection, testing and commissioning including warranty, comprehensive operation & maintenance for a period of 05 years of Grid connected Rooftop solar plants of capacities ranging from 1 kW to 50 kW under Net Metering scheme and above 50 kW up to 500 kW under Net Billing scheme to be installed on the rooftops of the Domestic/Government/Institutional or other buildings, all over the State of HP on full cost basis. The bids are invited to determine the lowest rates for different capacities of Grid Connected Rooftop Plants to be installed on full cost basis.

Sr. No.	Group of Size/capacity
1.	1 kW to 3 kW
2.	> 3 kW to 10 kW
3.	> 10 kW to 50 kW
4.	> 50 kW to 100 kW
5.	>100 kW to 500 kW

Himurja will empanel five firms on the lowest received / approved rates. Consent will be sought from the firms who are L-2 to L-5, whether they are willing to work on the lowest / approved rates. If any of the L-2 to L-5 firms are not willing to accept the lowest received / approved rates, then consent will be sought from the next firm (L-6) & so on. The firms will advertise their products with different Domestic/Government/Institutional or other consumers and seek funds for installation of GCRTS Plants. The Firms will request the Domestic/Government/Institutional or other consumers to deposit the funds alongwith 5% depts. charges with Sr. Project Officer / Project Officer /Head Office HIMURJA along with recommendations that the order may be given to the concerned firms. The supply orders for the supply, installation and commissioning of the Grid connected Rooftop Plants to be installed on full cost basis will be placed to firm for which recommendation have been received by Sr. Project Officer / Project Officer /Head Office HIMURJA. In case funds are received directly without any recommendations the work will be awarded to the L-1 by Sr. Project Officer / Project Officer /Head Office HIMURJA.

The firm will carry out the design, supply, erection, testing and commissioning including

warranty, comprehensive operation & maintenance for a period of 05 years for the Grid Connected Rooftop Solar power plant and shall make all necessary arrangement for evacuation and injection of surplus power to the grid at the inter-connection point/points as agreed with HPSEBL.

1. The detailed Scope of Work shall essentially cover but not be limited to:

Upon receipt of the proposal from the beneficiary, concerned Sr. Project Officer/Project Officer, HIMURJA will check the feasibility and the energy bill for ascertaining the capacity of the plant. After confirmation of the same, the Sr. Project Officer/Project Officer will inform the firm who will then affirm the capacity of the grid connected rooftop plant as per the sanctioned load of the building and will check the necessary parameters required for the interconnection of the rooftop plant with the HPSEBL grid. The firm will also obtain the Net-metering approval from concerned Sub Division of HPSEBL for providing grid connectivity/net-metering. Accordingly, supply orders will be placed by the concerned Sr. Project Officer/Project Officer, HIMURJA for installation of the Grid Connected Rooftop Plant after ascertaining the documents submitted by the beneficiary and the firm.

The firm will carry out the installation of the plant as per the technical specification prescribed in the tender document. In case of any dispute, relevant MNRE/BIS/ISI/NABL/ISO/ IEC/IS specification shall be followed and work shall be carried out to the reasonable satisfaction of the engineer in charge. The firm shall complete the work of Design, supply, civil work, erection, testing and commissioning of grid connected rooftop solar plant within 90 days from the issuance of the supply order. In event of failure to install and commission the RTS system within the mentioned timeframe, the liquidated damages will be imposed and may also lead to disqualification of the firm at the sole discretion of HIMURJA.

The work covers design, manufacture, supply, installation, commissioning and Comprehensive Maintenance Contract (CMC) for 05 (Five) Years. The firm shall establish a service Centre in the districts in which they are setting up plants to cater the 5 Years CMC. The details of all such service centers (address, contact no. etc.) will be made available to the concerned Sr. Project Officer/Project Officer, HIMURJA in the districts and also on the website of the HIMURJA. All the material required for the installation of solar power plant as per the work order issued shall be kept at site in custody of the firm. HIMURJA shall not be responsible for any loss or damage of any material during the installation. The firm shall be responsible and take an insurance policy for transit-cum-storage- erection for all the materials. The firm shall take entire responsibility of electrical safety of the installations including connectivity with the grid and follow all the safety rules and regulations applicable as per Indian Electricity Act-2003 and prevailing CEA guidelines and amendments, it shall be responsibility of the firm to take NOC from concerned authority and engage person as per provisions as per in CEA Rules and Regulations.

The firm shall ensure proper safety of all the workmen, material, plants and equipment belonging to him/her. In case any accident occurs during the construction/erection or during guarantee period for work undertaken by firm thereby causing any minor or major or fatal accident will be

the responsibility of the firm. The successful firm shall follow and comply with the employer's safety rules relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment. The firm shall also arrange all certificates and test reports of the module and inverter and other equipment. The firm must adhere to the Operation and Maintenance procedure of this document.

The various capacity of the grid connected rooftop solar power plant shall be as under:

Sr. No.	Group of Size/capacity
1.	1 kW to 3 kW
2.	> 3 kW to 10 kW
3.	>10 kW to 50 kW
4.	>50 kW to 100 kW
5.	>100 kW to 500 kW

The firm will design, manufacture, supply, erect, test and commission and make all necessary arrangement for evacuation and injection of surplus power to the HPSEBL grid at the interconnection point.

C. SITE/PROJECT LOCATION:

It is important to note that the firm will be required to supply, install and commission the Grid connected Rooftop Plants anywhere in the State of Himachal Pradesh capacities ranging from 1 kW to 50 kW under Net Metering scheme and above 50 kW up to 500 kW under Net Billing scheme to be installed on the rooftops of the Domestic/Government/Institutional or other buildings, all over the State of H.P. on full cost basis.

D. INFORMATION TO THE FIRM/BIDDER

1. Earnest Money Deposit:

Bid accompanied by earnest money/bid security of Rs. 5,00,000 (Rupees Five Lac only) to be submitted online only, shall be accepted. The earnest money/bid security is required to protect the HIMURJA against risk of Bidder's conduct which would warrant the security's forfeiture. No interest will be paid on Earnest Money. Unsuccessful Bidder's earnest money/bid security will be discharged/returned as promptly possible as but not later than thirty (30) days after the expiration of the period of bid validity prescribed by the HIMURJA subject to receipt of request letter from the bidder.

The bid security may be forfeited:

- a) If a Bidder withdraws its bid during the period of bid validity specified by the bidder on the Bid Form.
- b) In case, successful Bidder fails to sign the Contract agreement.

The Earnest Money Deposit of the firm will be adjusted in the performance security and will be refunded after the warranty period of five years.

2. Duration of bid

The bid will remain valid for one year from the date of opening the financial bid, and the same can be extended beyond 12 months if required. In the event that any bidder withdraws its bid within the validity period or fails to accept an order within validity, the earnest money will be forfeited.

3. Payments

Payment shall be made in the currency specified in the Contract in the following manner:

- i) On delivery: Fifty percent (50%) of the contract price shall be paid on receipt of the goods and material in good condition and upon submission of bills duly verified by concerned Sr. Project Officer/Project Officer, HIMURJA, HP.
- ii) On Final Acceptance: Forty percent (40%) of the contract price shall be paid after completion of the following formalities :-
 - Erection, testing and successful commissioning of the power plant
 - Completion of training of concerned department personal for operation & maintenance.
 - The balance payment will be released after submission of consolidated commissioning certificates to be issued by the concerned department beneficiary and duly verified by the Sr. Project Officer/Project Officer, HIMURJA, HP.
- iii) Balance 10% will be retained as performance security which will be released after 05 years warranty period.

Penalty for delay in supply and installation of the Rooftop Solar Plant

- a) A penalty for delay will be deducted at the rate of 1% per week of the total value of the supply order, up to a maximum of 5% for a delay of five weeks, if the firm fails to commission the Rooftop Solar Plant complete in all respect at the site of beneficiaries within 90 days from the issue of the award letter. However, under force majeure events and reasons not attributable to the supplier extension may be granted with the approval of the competent authority.
- b) Any outstanding amount from the firm will be deducted from any payment due to the firm. The payment of deductions for such damages shall not relieve the firm from its obligations to complete the work or from any other of its obligations and liabilities under the contract.
- c) In the event of the firm failing to complete the work assigned to it even 5 weeks after the stipulated time period of 90 days, a notice will be issued to the firm to show cause as to

why the work assigned to it may not be rescinded, the EMD/performance security deposited by the firm may not be forfeited, and the agreement signed with the firm may not be terminated. In case the reply submitted by the firm to the Show Cause Notice is not found to be satisfactory, then the supply order issued to the firm will be rescinded, the EMD/performance security deposited by the firm for that work will be forfeited, and the agreement signed with the firm will be terminated. In addition, the firm will be blacklisted and will not be allowed to participate in any of the tenders floated by HIMURJA.

- d) All disputes relating to this contract shall be subject to the jurisdiction of the courts in Shimla.

4. Eligibility criteria:

- The bidder should have a minimum cumulative financial turnover of Rs. **1.5 Crores**, in the last three Financial Years i.e. (2020-21, 2021-22 and 2022-23).
- The bidder should have experience of similar works i.e. supply, installation, testing and commissioning of minimum 100 kW capacity (aggregate) of Grid Connected Rooftop Plant in last five years. The plants should be working satisfactorily. Proof of execution of similar nature of work with copy of certificates of satisfactory completion & performance from an authority for whom work was executed including agreement amount, date of start & completion along with bid.
- The bidder should have a service centre in the State for carrying out repair and maintenance of the Plant with qualified staff. The details of the service centre are to be mentioned in the bid. If not having, the same has to be opened within one month of work order.

5. Clarification of Bids:

During evaluation of the bids, the HIMURJA may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing, and no change in the prices or substance of the bid shall be sought, offered, or permitted. If the firm does not respond to the clarification, the firm will be considered as non-responsive and the bid shall be rejected out rightly.

At any time prior to the submission of the bid or prior to the opening of the financial bid HIMURJA may for any reason whether at its own initiative or in response to a clarification requested by the bidders may modify the bid document by amendments. The amendment will be notified in writing or by fax to all prospective bidders who have received the bid documents and will be binding on them. HIMURJA will bear no responsibility or liability arising out of non receipt of the same in time or otherwise.

6. Evaluation and Comparison of Bids

HIMURJA will evaluate and compare bids which have been determined to be substantially responsive. The detailed techno-commercial analysis of the bid shall be carried out by the HIMURJA.

7. HIMURJA's Right to Accept Any Bid and to Reject Any or All Bids

HIMURJA reserves the right to accept or reject any bid, and to cancel the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders.

8. BID SUBMISSION BY THE BIDDER

Bids are required to be submitted online mode for each part separately. Strict adherence to the formats wherever specified, is required. Wherever, information has been sought in specified formats, the Bidder shall refrain from referring to brochures/pamphlets. Non-adherence to formats and/or submission of incomplete information may be a ground for declaring the Bid as non-responsive. Each format has to be duly signed and stamped by the authorized signatory of the Bidder then scanned and uploaded in the Techno- Commercial Bid Part.

The Bidder shall furnish documentary evidence in support of meeting Eligibility Criteria as indicated in the RFP. Bidder shall also furnish unconsolidated/consolidated audited annual accounts in support of meeting financial requirement, which shall consist of unabridged balance sheet, profit and loss account, profit appropriation account, auditor report, etc., as the case may be of Bidding Company or Financially Evaluated Entity for any of the last three (3) financial years immediately preceding the Bid Deadline which are used by the bidder for the purpose of calculation of Annual Turnover or of last Financial Year in case of Net Worth.

HIMURJA will not be responsible for any delay in online submission of the bids due to any reason whatsoever.

9. Signing of Contract

The successful bidder will sign the contract within Two weeks (14) days from the date of acceptance letter issued to the firm.

10 Performance Security

10% of the total cost will be retained as performance security which will be released after 05 years warranty period on recommendations of the concerned Sr. Project Officer/Project Officer.

TECHNICAL SPECIFICATIONS

The proposed projects shall be commissioned as per the technical specifications given below:

1. DEFINITION

A Roof Top Solar (RTS) Photo Voltaic (PV) system shall consist of following equipments/ components:

1. Solar Photo Voltaic (SPV) modules consisting of required number of Crystalline PV modules
2. Inverter/PCU
3. Module Mounting structures
4. Solar Meter and Bi-directional meter
5. Array Junction Boxes
6. DC Distribution Box
7. AC Distribution Box
8. Protections- Earthing, Lightning, Surge
9. Cables
10. Drawing & Manuals
11. Miscellaneous

1. Solar PV modules

- The PV modules and Solar Cell used should be made in India. (Mono crystalline only).
- The PV modules used must qualify to the latest edition of IEC standards or equivalent BIS standards, i.e. IEC 61215/IS14286, IEC 61853-Part I/IS 16170- Part I, IEC 61730 Part-1 &Part 2 and IEC 62804 (PID). For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701.
- The rated power of solar PV module shall have maximum tolerance up to +3%.
- The peak-power point current of any supplied module string (series connected modules) shall not vary by +1% from the respective arithmetic means for all modules and/or for all module strings (connected to the same MPPT), as the case may be.
- The peak-power point voltage 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 (connected to the same MPPT), as the case may be.
- The temperature co-efficient power of the PV module shall be equal to or better than- 0.45%/°C.
- Solar PV modules of minimum capacity 250 Wp to be used.
- The PV Module efficiency should be minimum 16%.
- Solar PV modules of minimum fill factor 75%, to be used.
- All electrical parameters at STC shall have to be provided.
- The PV modules shall be equipped with IP 65 or better protection level junction box with required numbers of bypass diodes of appropriate rating and appropriately sized output power cable of symmetric length with MC4 or equivalent solar connectors. The IP level for protection may be chosen based on following conditions:
 - i. An IP 65 rated enclosure is suitable for most outdoor enclosures that won't encounter

extreme weather such as flooding.

- ii. An IP 67 rated enclosure is suitable at locations which may encounter temporary submersion at depths of up to one meter.
- iii. An IP 68 enclosure is recommended if there may exist situations of submergence for extended periods of time and at substantial depths.

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 the module below 1 % per annum.

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:

- Defects and/or failures due to manufacturing.
- Defects and/or failures due to quality of materials.
- Nonconformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will **replace the solar** module(s), at the Owners sole option.
- PV modules must be tested and approved by one of the NABL accredited and BIS approved test centers.
- Modules deployed must use a RF identification tag laminated inside the glass. The following information must be mentioned in the RFID used on each module:
 - i. Name of the manufacturer of the PV module
 - ii. Name of the manufacturer of Solar Cells.
 - iii. Month & year of the manufacture (separate for solar cells and modules)
 - iv. Country of origin (separately for solar cells and module)
 - v. I-V curve for the module Wattage, I_m , V_m and FF for the module
 - vi. Unique Serial No and Model No of the module
 - vii. Date and year of obtaining IEC PV module qualification certificate.
 - viii. Name of the test lab issuing IEC certificate.
 - ix. Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001.
 - x. Nominal wattage +3%.
 - xi. Brand Name, if applicable.

Other details as per IS/IEC 61730-1 clause 11 should be provided at the appropriate place. In addition to the above, the following information should also be provided:

- i. The actual Power Output P_{max} shall be mentioned on the label pasted on the back side of PV Module.
 - ii. The Maximum system voltage for which the module is suitable to be provided on the back sheet of the module.
 - iii. Polarity of terminals or leads (colour coding is permissible) on junction Box housing near cable entry or cable and connector.
- Unique Serial No, Model No, Name of Manufacturer, Manufacturing year,

Make in India logo and module wattage details should be displayed inside the laminated glass.

2. Inverter/PCU

- Inverters/PCU should comply with applicable IEC/equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683, IS 16221 (Part 2), IS 16169 and IEC 60068-2(1,2,14,30) /Equivalent BIS Std.
- Maximum Power Point Tracker (MPPT) shall be integrated in the inverter/PCU to maximize energy drawn from the array. Charge controller (if any) / MPPT units environmental testing should qualify IEC 60068-2(1, 2, 14, 30)/Equivalent BIS standard.
- The junction boxes/enclosures should be IP 65 or better (for outdoor)/ IP 54 or better (indoor) and as per IEC 529 Specifications.
- All inverters/PCUs shall be IEC 61000 compliant for electromagnetic compatibility, harmonics, Surge, etc.
- The PCU/ inverter shall have overloading capacity of minimum 10%.
- Typical technical features of the inverter shall be as follows:
 - i.** Switching devices: IGBT/MOSFET
 - ii.** Control: Microprocessor/DSP
 - iii.** Nominal AC output voltage and frequency: as per CEA/State regulations
 - iv.** Output frequency: 50 Hz
 - v.** Grid Frequency Synchronization range: as per CEA/State Regulations
 - vi.** Ambient temperature considered: -20°C to 60°C
 - vii.** Humidity: 95 % Non-condensing
 - viii.** Protection of Enclosure: IP-54 (Minimum) for indoor and IP-65(Minimum) for outdoor.
 - ix.** Grid Frequency Tolerance range: as per CEA/State regulations
 - x.** Grid Voltage tolerance: as per CEA/State Regulations
 - xi.** No-load losses: Less than 1% of rated power
 - xii.** Inverter efficiency (Min.): >93% (In case of 10 kW or above within-built galvanic isolation)>97% (In case of 10 kW or above without in built galvanic isolation)
 - xiii.** Inverter efficiency (minimum): > 90% (In case of less than 10 kW)
 - xiv.** THD: < 3%
 - xv.** PF: > 0.9 (lag or lead)
 - xvi.** Should not inject DC power more than 0.5% of full rated output at the interconnection point and comply with IEEE 519.
- The output power factor of inverter should be 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.
- 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:
 - i.** The name or trademark of the manufacturer or supplier;

- ii. A model number, name or other means to identify the equipment,
 - iii. A serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a three- month time period.
 - iv. Input voltage, type of voltage (a.c. or d.c.), frequency, and maximum continuous current for each input.
 - v. 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.
 - vi. The Ingress Protection (IP) rating
- 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.
 - In case the consumer is having a $3-\phi$ connection, $1-\phi/3-\phi$ inverter shall be provided by the firm as per the consumer's requirement and regulations of the State.
 - Inverter/PCU shall be capable of complete automatic operation including wake- up, synchronization & shutdown.
 - The Inverter should have a 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. Additionally, if inverter has the facility of in-built wi-fi module, that should also be explained to the consumer. On demand, Inverter should also have provision to feed the data to the remote monitoring server using relevant API/ protocols. All the inverter data should be available for monitoring by giving web access.
- **Integration of PV Power with Grid & Grid Islanding:**
 - i. The output power from SPV would be fed to the inverters/PCU which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization.
 - ii. 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, if not available in inverter.
 - iii. MCB/MCCB or a manual isolation switch, besides 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.
- 3. **Module Mounting Structure (MMS):**
 - 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 work of

the firm.

- Module mounting structures can be made from three types of materials i.e. Hot Dip Galvanized Iron, Aluminum and Hot Dip Galvanized Mild Steel (MS). However, MS will be preferred for raised structure.
- MMS Steel shall be as per latest IS 2062:2011 and galvanization of the mounting structure shall be in compliance of latest IS 4759. MMS Aluminum shall be as per AA6063 T6. For Aluminum structures, necessary protection towards rusting needs to be provided either by coating or anodization.
- All bolts, nuts, fasteners shall be of stainless steel of grade SS 304 or hot dip galvanized, panel mounting clamps shall be of aluminum and must sustain the adverse climatic conditions. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts.
- The module mounting structures should have angle of inclination as per the site conditions to take maximum insolation and complete shadow-free operation during generation hours. However, to accommodate more capacity the angle of inclination may be reduced until the plant meets the specified performance ratio requirements.
- The Mounting structure shall be so designed to withstand the speed for the wind zone of the location where a PV system is proposed to be installed. The PV array structure design shall be appropriate with a factor of safety of minimum 1.5.
- The upper edge of the module must be covered with wind shield so as to avoid build air ingress below the module. Slight clearance must be provided on both edges (upper & lower) to allow air for cooling.
- Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The firm shall be fully responsible for any damages to SPV System caused due to high wind velocity within guarantee period as per technical specification.
- The structures shall be designed to allow easy replacement, repairing and cleaning of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels. Necessary testing provision for MMS to be made available at site.
- 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.
- The structure shall be designed to withstand operating environmental conditions for a period of minimum 25 years.
- The Rooftop Structures maybe classified in three broad categories as follows:

i. Ballast structure

- a. The mounting structure must be Non-invasive ballast type and any sort of penetration of roof to be avoided.
- b. The minimum clearance of the structure from the roof level should be in between 70-150 mm to allow ventilation for cooling, also ease of cleaning and maintenance of panels as well as cleaning of terrace.
- c. The structures should be suitably loaded with reinforced concrete blocks of appropriate weight made out of M25 concrete mixture.

ii. Tin shed

- a. The structure design should be as per the slope of the tin shed.
- b. The inclination angle of structure can be done in two ways-
 - Parallel to the tin shed (flat keeping zero-degree tiling angle), if the slope of shed in proper south direction
 - With same tilt angle based on the slope of tin shed to get the maximum output.
- c. The minimum clearance of the lowest point from the tin shade should be more than 100 mm.
- d. The base of structure should be connected on the Purlin of tin shed with the proper riveting.
- e. All structure members should be of minimum 2 mm thickness.

iii. RCC Elevated structure: It can be divided into further three categories:

A. Minimum Ground clearance (300MM – 1000 MM)

- a. The structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. The gap between module should be minimum 30MM.
- b. Base Plate – Base plate thickness of the Structure should be 5MM for this segment.
- c. Column – Structure Column should be minimum 2MM in Lip section / 3MM in C-Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
- d. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in C-Channel section. The minimum section should be 70MM in Web side (y-axis) and 40MM in flange side (x-axis).
- e. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 60MM in Web side and 40MM in flange side in Lip section.
- f. Front/back bracing – The section for bracing part should be minimum 2MM thickness.
- g. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.
- h. For single portrait structure the minimum ground clearance should be 500MM.

B. Medium Ground clearance (1000MM – 2000 MM)

- a. Base Plate – Base plate thickness of the Structure should be Minimum 6MM for this segment.
- b. Column – Structure Column should be minimum 2MM in Lip section / 3MM in C-Channel section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
- c. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in C-Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
- d. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
- e. Front/back bracing – The section for bracing part should be minimum 2MM thickness.
- f. Connection – The structure connection should be bolted completely. Leg to rafter

should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

C. Maximum Ground clearance (2000MM – 3000 MM)

- a. Base Plate – Base plate thickness of the Structure should be minimum 8 MM for this segment.
- b. Column – Structure Column thickness should be minimum 2.6MM in square hollow section (minimum 50x50) or rectangular hollow section (minimum 60x40) or 3MM in C-Channel section.
- c. Rafter - Structure rafter should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
- d. Purlin - Structure purlin should be minimum 2MM in Lip section. The minimum section should be 80MM in Web side and 50MM in flange side in Lip section.
- e. Front/back bracing – The section for bracing part should be minimum 3MM thickness.
- f. Connection – The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

D. Super elevated structure (More than 3000 MM)

Base structure

- a. Base Plate – Base plate thickness of the Structure should be 10MM for this segment.
- b. Column – Structure Column minimum thickness should be minimum 2.9MM in square hollow section (minimum 60x60) or rectangular hollow section (minimum 80x40).
- c. Rafter - Structure Rafter minimum thickness should be minimum 2.9MM in square hollow section (minimum 60x60) or rectangular hollow section (minimum 80x40).
- d. Cross bracing – Bracing for the connection of rafter and column should be of minimum thickness of 4mm L-angle with the help of minimum bolt diameter of 10mm.

Upper structure of super elevated structure –

- a. Base Plate- Base plate thickness of the Structure should be minimum 5MM for this segment.
- b. Column- Structure Column should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
- c. Rafter- Structure rafter should be minimum 2MM in Lip section / 3MM in Channel section. The minimum section should be 70MM in Web side and 40MM in flange side in Lip section.
- d. Purlin-Structure purlin should be minimum 2MM in Lip section. The minimum section should be 60MM in Web side and 40MM in flange side in Lip section.
- e. Front/back bracing- The section for bracing part should be minimum 2MM thickness.
- f. Connection-The structure connection should be bolted completely. Leg to rafter should be connected with minimum 12 diameter bolt. Rafter and purlin should be connected with minimum 10 diameter bolt. Module mounting fasteners should be SS-

304 only and remaining fasteners either SS-304 or HDG 8.8 Grade.

If distance between two legs in X-Direction is more than 3M than sag angle/ Bar should be provide for purlin to avoid deflection failure. The sag angle should be minimum 2MMthick, and bar should be minimum 12Dia.

Degree- The Module alignment and tilt angle shell be calculated to provide the maximum annual energy output. This shall be decided on the location of array installation.

Foundation- Foundation should be as per the roof condition; two types of the foundation can be done- either penetrating the roof or without penetrating the roof.

- g. If penetration on the roof is allowed (based on the client requirement) then minimum 12MM diameter anchor fasteners with minimum length 100MM can be use with proper chipping. The minimum RCC size should be 400x400x300 cubic mm. Material grade of foundation should be minimum M20.
- h. If penetration on roof is not allowed, then foundation can be done with the help of 'J Bolt' (refer IS 5624 for foundation hardware). Proper Neto bond solution should be used to adhere the Foundation block with the RCC roof. Foundation J - bolt length should be minimum 12MM diameter and length should be minimum 300MM.

➤ **Material standards:**

- iv. Design of foundation for mounting the structure should be as per defined standards which clearly states the Load Bearing Capacity & other relevant parameters for foundation design (As per IS 6403 / 456 / 4091 / 875).
- v. Grade of raw material to be used for mounting the structures so that it complies the defined wind loading conditions (As per IS 875 - III) should be referred as follows (IS 2062 – for angles and channels, IS 1079 – for sheet, IS 1161 & 1239 for round pipes, IS 4923 for rectangular and square hollow section)
- vi. Test reports for the raw material should be as per IS 1852 / 808 / 2062 / 1079 / 811.
- vii. In process inspection report as per approved drawing & tolerance should be as per IS 7215.
- viii. For ascertaining proper welding of structure part following should be referred:
 - a. D.P. Test (Pin Hole / Crack) (IS 822)
 - b. Weld wire grade should be of grade (ER 70 S - 6)
- ix. For ascertaining hot dip galvanizing of fabricated structure following should be referred: -
 - a. Min coating required should be as per IS 4759 & EN 1461.
 - b. Testing of galvanized material
 - Pierce Test (IS 2633)
 - Mass of Zinc (IS 6745)
 - Adhesion Test (IS 2629)
 - CuSO4 Test (IS 2633)
 - Superior High-Grade Zinc Ingot should be of 99.999% purity (IS 209) (Preferably Hindustan Zinc Limited or Equivalent).

- x. Foundation Hardware – If using foundation bolt in foundation then it should be as per IS 5624.
- Design Validation- The Structure design and drawing should be duly verified by a licensed Structural designer before installation for all types of structure arrangements including the extension made, as per specification.

4. Metering

- The Rooftop Solar Plant system shall consist of the following energy meters:
 - i. **Bi-Directional meter:** To record import and export units
 - ii. **Solar meter:** To keep record for total generation of the plant.
- The installation of meters including CTs & PTs, wherever applicable, shall be carried out by the firm as per the terms, conditions and procedures laid down by the concerned SERC/DISCOMs.

5. Array Junction Boxes:

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 bus-bars for easy identification and cable ferrules will be fitted at the cable termination points for identification.

Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP 65 or better standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry, Single /double compression cable glands should be provided.

Polyamide glands and MC4 Connectors may also be provided. The rating of the junction box shall be suitable with adequate safety factor to interconnect the Solar PV array.

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.

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):

May not be required for small plants, if suitable arrangement is available in the inverter.

DC Distribution Box is to be provided to receive the DC output from the PV array field.

DCDBs shall be dust & vermin proof conform having IP 65 or better protection, as per site conditions.

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 inverter along with necessary surge arrestors. MCB shall be used for currents up to 63 Amperes, and MCCB shall be used for currents greater than 63 Amperes.

6 AC Distribution Box (ACDB):

AC Distribution Panel Board (DPB) shall control the AC power from inverter, and should have necessary surge arrestors, if required. There is interconnection from ACDB to mains at LT Bus bar while in grid tied mode.

All switches and the circuit breakers, connectors should conform to IEC 60947:2019, part I, II and III/ IS 60947 part I, II and III.

The isolators, cabling work should be undertaken as part of the project.

All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on $1-\phi/3-\phi$, 415 or 230 volts, 50 Hz (or voltage levels as per CEA/State regulations).

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

All indoor panels will have protection of IP 54 or better, as per site conditions. All outdoor panels will have protection of IP 65 or better, as per site conditions.

Should conform to Indian Electricity Act and CEA safety regulations (till last amendment).

All the 415 or 230 volts (or voltage levels as per CEA/State regulations) AC devices / equipment like bus support insulators, circuit breakers, SPDs, Voltage Transformers (VTs) etc., mounted

inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions.

- i. Variation in supply voltage: as per CEA/State regulations
- ii. Variation in supply frequency: as per CEA/State regulations
The inverter output shall have the necessary rated AC surge arrestors, if required and MCB/MCCB. RCCB shall be used for successful operation of the PV system, if inverter does not have required earth fault/residual current protection.

7 Protections

The system should be provided with all necessary protections like earthing, Lightning, and Surge Protection, as described below:

Earthing Protection

- i. The earthing shall be done in accordance with latest Standards.
- ii. Each array structure of the PV yard, Low Tension (LT) power system, earthing grid for switchyard, all electrical equipment, inverter, all junction boxes, etc. shall be grounded properly as per IS 3043-2018.
- iii. All metal casing/ shielding of the plant shall be thoroughly grounded in accordance with CEA Safety Regulation 2010. In addition, the lightning arrester/masts should also be earthed inside the array field.
- iv. Earth resistance should be as low as possible and shall never be higher than 5 ohms.
- v. For 10 KW and above systems, separate three earth pits shall be provided for individual three earthings viz.: DC side earthing, AC side Earthing and Lightning arrester earthing.

Lightning Protection

- i. The SPV power plants shall be provided with lightning & over voltage protection, if required. The main aim in this protection shall be to reduce the overvoltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmospheric disturbances etc.
- ii. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors (LAs). Lightning protection should be provided as per NFC17-102:2011/IEC 62305 standard.
- iii. The protection against induced high-voltages shall be provided by the use of Metal Oxide Varistors (MOVs)/Franklin Rod type LA/Early streamer type LA.
- iv. The current carrying cable from lightning arrester to the earth pit should have sufficient current carrying capacity according to IEC 62305. According to standard, the minimum requirement for a lightning protection system designed for class of LPS III is a 6 mm² copper/16 mm² aluminum or GI strip bearing size 25*3 mm thick). Separate pipe for running earth wires of Lightning Arrester shall be used.

Surge Protection

- v. Internal surge protection, wherever required, shall be provided.
- vi. It will consist of three SPD type-II/MOV type surge arrestors connected from +ve and –ve terminals to earth.

8 CABLES

All cables should conform to latest edition of IEC/equivalent BIS Standards along with IEC 60227/IS 694, IEC 60502/IS 1554 standards.

Cables should be flexible and should have good resistance to heat, cold, water, oil, abrasion etc.

Armoured cable should be used and overall PVC type 'A' pressure extruded insulation or XLPE insulation should be there for UV protection.

Cables should have Multi Strand, annealed high conductivity copper conductor on DC side and copper/FRLS type Aluminum conductor on AC side. For DC cabling, multi-core cables shall not be used.

Cables should have operating temperature range of -10°C to +80°C and voltage rating of 660/1000 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 less than 2% (DC Cable losses).

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%.

The electric cables for DC systems for rated voltage of 1500 V shall conform to BIS 17293:2020.

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

All cable trays including covers to be provided.

Thermo-plastic clamps to be used to clamp the cables and conduits, at intervals not exceeding 50 cm.

Size of neutral wire shall be equal to the size of phase wires, in a three phase system.

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

9 DRAWINGS & MANUALS:

Operation & Maintenance manual/user manual, Engineering and Electrical Drawings shall be supplied along with the power plant.

The manual shall include complete system details such as array layout, schematic of the system, inverter details, working principle etc.

The Manual should also include all the Dos & Don'ts of Power Plant along with Graphical Representation with indication of proper methodology for cleaning, Operation and Maintenance etc.

Step by step maintenance and troubleshooting procedures shall also be given in the manuals.

Firm should also educate the consumers during their AMC period.

10 Miscellaneous:

Connectivity: The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the SERC regulation for Grid connectivity and norms of DISCOM and amended from time to time.

Safety measures: Electrical safety of the installation(s) including connectivity with the grid must be taken into account and all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA Safety Regulation 2010 etc. must be followed.

Shadow analysis: The shadow analysis report with the instrument such as Solar Path finder or professional shadow analysis software of each site should be provided and the consumer should be educated to install the system only in shadow free space. Lower performance of the system due to shadow effect shall be liable for penalty for lower performance.

Fire fighting system - Portable fire extinguishers/sand buckets shall be provided wherever required as per norms.

Quality Certification, Standards and Testing for Grid-Connected Rooftop Solar PV Systems/Power Plants

Solar PV Modules/Panels	
IEC61215 and IS14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61701:2011	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61853-1:2011/ IS16170-1:2014	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 (asper the site condition like dairies, toilets etc)

IEC61730-1,2	Photovoltaic (PV) Module Safety Qualification– Part1: Requirements for Construction, Part2: Requirements for Testing
IEC 62804	Photovoltaic (PV) modules- Test method for detection of Potential-induced degradation. IEC 62804-1: Part 1: Crystalline Silicon
Solar PV Inverters	
IEC62109orIS: 16221	Safety of power converters for use in photovoltaic power systems –Part1: General requirements, and Safety of power converters for use in photovoltaic power systems Part2: Particular requirements for inverters. Safety compliance (Protection degree IP65 or better for outdoor mounting, IP54 or better for indoor mounting)
IS/IEC61683latest (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90- 100% Loading Conditions)
IEC 60068-2 /IEC62093 (as applicable)	Environmental Testing of PV System- Power Conditioners and Inverters
IEC 62116:2014/ IS16169	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures
Fuses	
IS/IEC60947(Part1, 2 &3), EN50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): 1) Low-voltage Switch gear and Control-gear,Part1:Generalrules 2) Low-Voltage Switch gear and Control-gear, Part2: Circuit Breakers 3) Low-voltage switchgear and Control- gear, Part3:Switches, disconnectors switch-disconnectors and fuse-combination units 4) EN50521:Connectorsforphotovoltaicsystem-

	Safety requirements and tests
IEC60269-6:2010	Low-voltage fuses-Part6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
Solar PV Roof Mounting Structure	
IS2062/IS4759/AA6063 T6	Material for the structure mounting
Surge Arrestors	
BFC17-102:2011/ NFC 102:2011/ IEC 62305	Lightening Protection Standard
IEC 60364-5-53/ IS15086-5(SPD) IEC 61643- 11:2011	Electrical installations of buildings-Part5-53: Selection and erection of electrical equipment-Isolation, switching and control Low-voltage surge protective devices- Part11:Surgeprotectivedevices connected to low-voltage power systems-Requirements and test methods
Cables	
IEC 60227/IS 694, IEC60502/IS 1554 (Part 1&2)/IEC69947(as applicable)	General test and measuring method for PVC(Polyvinylchloride) insulated cables (for working voltages upto and including1100V, and UV resistant for outdoor installation)
BSEN 50618	Electric cables for photovoltaic systems (BT(DE/NOT)258),mainly for DC Cables
Earthing/Lightning	
IEC 62561/IEC 60634 Series(Chemical earthing) (as applicable)	IEC 62561-1: Lightning protection system components (LPSC) - Part: Requirements for connection components IEC 62561-2: Lightning protection system components (LPSC) – Part 2:Requirementsfor conductors and earth electrodes IEC 62561-7: Lightning protection system components (LPSC) - Part 7:Requirementsforearthingenhancingcompounds
Junction Boxes	
IEC 60529	Junction boxes and solar panel terminal boxes shall be of the thermo-plastic type with IP 65 or betterprotectionforoutdooruse,andIP54 or better protection for indoor use

General Particulars of the bidder

Sr. No.	Particulars	Details
1.	Name of the Company	
2.	Registered Office Address	
3.	E-mail ID	
4.	Web site	
5.	Authorized Contact Person(s) with name, designation Address and Mobile Phone No., E- mail address/ Fax No. to whom all references shall be made	
6.	Year of Incorporation	
7.	Have the bidder/Company ever been debarred By any Govt. Dept. / Undertaking for undertaking any work	
8.	Reference of any document information attached by the Bidder other than specified in the RFP.	
9.	Details of the Ownership structure (Details of persons owning 10% or more of the Total Paid up equity of the Bidding Company in the Format as below	Yes/No
10.	Whether company is MSME as on the bidding date	Yes/No
11.	Whether the Company has valid GST Registration Number (Enclose a Copy)	
12.	PAN number (enclosed a copy)	
13.	Bank Account Details	

Please strike-off whichever is not applicable.

Signature:

Name:

Designation with Seal:

Operation and Maintenance Guidelines of Grid Connected PV Plants

1. For optimal operation of PV plant, maintenance must be carried out on a regularly.
2. All the components should be kept clean. It should be ensured that all the components are fastened well at their due place.
3. Maintenance guidelines for various components viz. solar panels, inverter, wiring etc. are discussed below:

SOLAR PANELS

Although the cleaning frequency for the panels will vary from site to site depending on soiling, **the following is recommended for optimum performance:**

- i. The panels are cleaned at least once every fifteen days.
- ii. Any bird droppings or spots should be cleaned immediately.
- iii. Use water and a soft sponge or cloth for cleaning.
- iv. Do not use detergent or any abrasive material for panel cleaning.
- v. Iso-propyl alcohol may be used to remove oil or grease stains.
- vi. Do not spray water on the panel if the panel glass is cracked or the back side is perforated.
- vii. Wipe water from module as soon as possible.
- viii. Use proper safety belts while cleaning modules at inclined roofs etc.
- ix. The modules should not be cleaned when they are excessively hot. Early morning is particularly good time for module cleaning.
- x. Check if there are any shade problems due to vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.
- xi. Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.
- xii. Never use panels for any unintended use, e. g. drying clothes, chips etc.
- xiii. Ensure that monkeys or other animals do not damage the panels.

CABLES AND CONNECTION BOXES

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

INVERTER

- i. The inverter should be installed in a clean, dry, and ventilated area which is separated from, and not directly above, the battery bank.
- ii. Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush.
- iii. Check that vermin have not infested the inverter. Typical signs of this include
- iv. Spider webs on ventilation grills or wasps' nests in heat sinks.
- v. Check functionality, e.g. automatic disconnection upon loss of grid power supply, at least once a month.
- vi. Verify the state of DC/AC surge arrestors, cable connections, and circuitbreakers.

SHUTTING DOWN THE SYSTEM

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

INSPECTION AND MAINTENANCE SCHEDULE:

Component	Activity	Description	Interval	By
PV Module	Cleaning	Clean any bird droppings /dark spots on module	Immediately	Beneficiary
	Cleaning	Clean PV modules with plain water or mild dish washing detergent. Do not use brushes, any types of solvents, abrasives, or harsh detergents.	Fortnightly	Beneficiary
	Inspection (for plants > 100kWp)	Use infrared camera to inspect for hot spots; bypass diode failure	Annual	Technician

Component	Activity	Description	Interval	By
PV Array	Inspection	Check the PV modules and rack for any damage. Note down location and serial number of damaged modules.	Annual	User/Technician
	Inspection	Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible.	Annual	User/Technician
	Vermin Removal	Remove bird nests or Vermin from array and rack area.	Annual	User/Technician
Junction Boxes	Inspection	Inspect electrical boxes for corrosion or intrusion of water or insects. Seal boxes if required. Check position of switches and breakers. Check operation of all protection devices.	Annual	Electrician
Wiring	Inspection	Inspect cabling for signs of cracks, defects, loose connections, overheating, arcing, short or open circuits, and ground faults.	Annual	Electrician
Inverter	Inspection	Observe	Quarterly	Electrician
Component	Activity	Description	Interval	By

		Instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Inspect Inverter housing or		
		shelter for physical maintenance, if required.		
Inverter	Service	Clean or replace any air filters.	As needed	Electrician
Instruments	Validation	Spot-check monitoring instrument (pyranometer etc.) with standard instruments to ensure that they are operational and within specifications.	Annual	PV Specialist
Transformer	Inspection	Inspect transformer oil level, temperature gauges, breather, silica gel, meter, connections etc.	Annual	Electrician
Tracker (if present)	Inspection	Inspect gears, gear boxes, bearings as required.	Annual	Technician
	Service	Lubricate tracker mounting bearings, gearbox as required.	Bi- annual	Technician
Plant	Monitoring	Daily Operation and Performance Monitoring	Daily	Beneficiary

Inverter	Inspection	Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Inspect Inverter housing or shelter for physical maintenance, if required.	Quarterly	Electrician
Inverter	Service	Clean or replace any air filters.	As needed	Electrician
Instruments	Validation	Spot – check monitoring instruments (pyranometer etc.) with standard instruments to ensure that they are operational and within specifications.	Annual	PV Specialist
Transformer	Inspection	Inspect transformer oil level, temperature gauges, breather, silica gel, meter, connections etc.	Annual	Electrician
Tracker (if present)	Inspection	Inspect gears, gear boxes, bearings as required.	Annual	Technician
	Service	Lubricate tracker mounting bearings, gearbox as required.	Bi-annual	Technician
Plant	Monitoring	Daily Operation and Performance Monitoring	Daily	Beneficiary
Spare Parts	Management	Manage inventory of spare parts.	As needed	Site in charge
Log book	Documentation	Document all O&M activities in a workbook available to all service personnel	Continuous	Site in charge

Operation and Maintenance Guidelines of Grid Connected PV Plants

- i. Periodic cleaning of solar modules, preferably once every fortnight. As this task has to be done by the beneficiary, the firm shall apprise the beneficiary on the importance and proper technique for cleaning.
- ii. O&M of Solar Power Plant shall be compliant with grid requirements to achieve committed energy generation.
- iii. Periodic checks of the Modules, PCUs and BoS shall be carried out as a part of routine preventive and breakdown maintenance.
- iv. Immediate replacement of defective Modules, Invertors/PCUs and other equipment as and when required.
- v. Supply of all spares, consumables and fixtures as required. Such stock shall be maintained for all associated equipment and materials as per manufacturer/ supplier's recommendations.
- vi. All the equipment testing instrument required for Testing, Commissioning and O&M for the healthy operation of the Plant shall be maintained by the Bidder. The testing equipment must be calibrated once every 2 years from NABL accredited labs and the certificate of calibration must be kept for reference as required.
- vii. If negligence/ mal operation on part of the Bidder's operator results in failure of equipment, such equipment should be repaired/ replaced by the Bidder free of cost.
- viii. If any jobs covered in O&M Scope as per RFP are not carried out by the contractor/ Bidders during the O&M period, the Engineer-In-Charge shall take appropriate action as deemed fit.
- ix. HIMURJA reserves the right to make surprise checks/ inspection visits at its own or through authorized representative to verify the O&M activities being carried out by the Bidder. Failure to adhere to above guidelines will result in penal action including debarring from participation in next tender.

Quality Certification, Standards and Testing for Grid-connected Rooftop Solar PV

Systems/Power Plants

Quality certification and standards for grid-connected rooftop solar PV systems are essential for the successful mass-scale implementation of this technology. It is also imperative to put in place an efficient and rigorous monitoring mechanism, adherence to these standards. Hence, all components of grid-connected rooftop solar PV system/ plant must conform to the relevant standards and certifications given below:

Modules/Panels	Solar PV
EC 61215/ IS 4286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
EC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
EC 61853- Part 1/IS 16170: Part 1	Photovoltaic (PV) module performance testing and energy rating: Irradiance and temperature performance measurements, and power rating
EC 62716	Photovoltaic (PV) Modules – Ammonia (NH ₃) Corrosion Testing (As per the site condition like dairies, toilets)
EC 61730-1,2	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing
EC 62804	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation. IEC TS 62804-1: Part 1: Crystalline silicon (mandatory for applications where the system voltage is > 600 VDC and advisory for installations where the system voltage is < 600 VDC)
EC 62759-1	Photovoltaic (PV) modules – Transportation testing, Part 1: Transportation and shipping of module package units

Solar PV	
Inverters	
IEC 62109-1, IEC 62109-2	<p>Safety of power converters for use in photovoltaic power systems –</p> <p>Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems</p> <p>Part 2: Particular requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)</p>
IEC/IS 61683 (as applicable)	<p>Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)</p>
BS EN 50530 (as applicable)	<p>Overall efficiency of grid-connected photovoltaic inverters:</p> <p>This European Standard provides a procedure for the measurement of the accuracy of the maximum power point tracking (MPPT) of inverters, which are used in grid-connected photovoltaic systems. In that case the inverter energizes a low voltage grid of stable AC voltage and constant frequency. Both the static and dynamic MPPT efficiency is considered.</p>
IEC 62116/ UL 1741/ IEEE 1547 (as applicable)	<p>Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures</p>
IEC 60255-27	<p>Measuring relays and protection equipment – Part 27: Product safety requirements</p>
IEC 60068-2 (1, 2, 14, 27, 30 & 64)	<p>Environmental Testing of PV System – Power Conditioners and Inverters</p> <p>a) IEC 60068-2-1: Environmental testing - Part 2-1: Tests - Test</p>

	<p>A: Cold</p> <p>b) IEC 60068-2-2: Environmental testing - Part 2-2: Tests - Test B: Dry heat</p> <p>c) IEC 60068-2-14: Environmental testing - Part 2-14: Tests - Test N: Change of temperature</p> <p>d) IEC 60068-2-27: Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock</p> <p>e) IEC 60068-2-30: Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)</p> <p>f) IEC 60068-2-64: Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance</p>
IEC 61000 – 2,3,5 (as applicable)	Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) testing of PV Inverters
Fuse	
IS/IEC 60947 (Part 1, 2 & 3), EN 50521	<p>General safety requirements for connectors, switches, circuit breakers (AC/DC):</p> <p>a) Low-voltage Switchgear and Control-gear, Part 1: General rules</p> <p>b) Low-Voltage Switchgear and Control-gear, Part 2: Circuit Breakers</p> <p>c) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units</p> <p>d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests</p>
IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
Surge Arrestors	
IEC 62305-4	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	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)	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	Junction boxes and solar panel terminal boxes shall be of the thermo-plastic type with IP 65 protection for outdoor use. 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

PROJECT REPORT FORMAT**Format for Summary Project Report
for****Grid Connected Rooftop Solar Plants**

1. Name of firm:
2. Tender no.
3. Project details (Site location & Address):
4. Brief about the Rooftop Solar Power Generation System:
5. Details of the beneficiary:
6. Specifications of the Components and Bill of Material/ Quantities:

S. No.	Component	Specifications	Quantity	Make
A	Solar PV module			
A.1	Aggregate Solar PV capacity (kWp)			
B	Grid Tie inverter (Type and Capacity)			
B.1	Aggregate Inverter capacity (kVA)			
C	Module mounting structure			
D	Array Junction Box			
E	AC Distribution Board			
F	Cable (All type)			
G	Earthing Kit (maintenance free)			
H	Meters			
I	Online monitoring system			
J	Any other component			
K	Transformer			

7. Unit cost of solar power generation:
8. Expected output/annum:
9. Respective drawings for layout, electrical wiring connections, earthing, components etc.
10. Connectivity details with grid and metering arrangement (with sketch diagram)
11. Copy of electricity bill of the beneficiary and consumer number
12. Any other information.
13. Documentary proof regarding beneficiary type as per of the tender document.

Project Completion Report for Grid-Connected Rooftop

Financial year * :			
Approval No. * :			
Proposal Title :			
Installed by agency :			
Title of the Project* :		SPV Capacity (kWp)*:	
Category of the organization/ beneficiary*:		Name of the contact person* :	
Address of contact person* :			
State* :		District/City*:	
Mobile* :		Email*:	
Aadhaar Card Number (For Residential) Copy to be attached.		Latitude:	
		Longitude:	
Other info			
Electricity Distribution Company Name :		Sanction Load	
Electricity consumer account no. as per electricity bill :			

Technology Description & System Design /Specification			
(Compliance to BIS/ IEC Standards is mandatory – Attach Copies)			
1. Solar PV Module:			
Power of each PV Module / Nos.(Wp)* / Make			
Cumulative Capacity of Modules(kWp):			
Solar cell technology :		Tilt Angle of Modules:	
Module efficiency (in Percentage) :		Azimuth	
Indigenous or imported		RFID passed inside or outside:	
2. Inverters:			
Type of inverter :			
Power of each PCU/ Nos. of inverters (kVA)* / Make			
Capacity/Power of PCU/inverters (kVA) :		Type of Charge Controller / MPPT	
Inverter efficiency (Full load) :			

(in percentage)			
Grid connectivity level phase	Single Phase/ Three Phase	Grid connectivity level Voltage	230 V/ 415 V
3. Mounting Structures			
Type		Surface Finish	
Material		Wind Speed Tolerance	
4. Cables:			
DC Cable Make & Size		Length:	
AC Cable Make & Size (Inverter to ACDB)		Length:	
AC Cable Make & Size (ACDB to Electric Panel)		Length:	
Conductor	Multi strand high conductivity Copper	Insulation/sheath	PVC /XLPE Insulated
5. JUNCTION BOX & DISTRIBUTION BOARDS			
Type	weatherproof, dust & vermin proof	Nos.:	
Make			
6. EARTHING & LIGHTNING PROTECTION			
EQUIPMENT EARTHING			
AC (Nos.)		Earth Resistance	
DC (Nos.)		Earth Resistance	
LIGHTNING ARRESTORS (LA)			
Type			
LA (Nos.)		Earth Resistance	

(Signature of Firm)

With Stamp

Annex: Copy of System test & Earth test reports (annexed)

Commissioning Test Report kW

Inverter Testing (DC) Side: Nos. of Inverter..... Nos.

Inverter S. No.	Capacity	String 1: Voc	String 2: Voc	Remark

Inverter Testing (AC) Side – Single / Three Phase

Inverter S. No.	Capacity	R – Y/ P- N	Y – B	B - R	R – N	Y – N	B - N	Remark

ACDB & Meter Panel Testing – Single / Three Phase

	R – Y/ P-N	Y – B	B - R	R – N	Y – N	B - N	Remark
ACDB I/C (V)							
ACDB O/G(V)							
Meter Panel I/C							
Meter Panel O/G							

Earthing Pit Details: Nos. of Earth Pit.....Nos.

	Earthing AC	Earthing DC	Earthing LA	Remark
Earth Test Value (Ohm)				

Sign

Site Engineer

Joint Inspection Report

It is to certify that a Grid Connected Solar PV Power Plant has been installed with following details:

1. Name of the beneficiary: _____
2. Address of installation with pin code: _____
3. Electricity consumer number: _____
4. Solar PV module capacity (DC): _____ kWp
5. Inverter capacity (AC) (Nominal output power): _____ kW
6. Date of installation: _____
7. Date of commissioning (after installation of net-meter): _____
8. Date of Joint inspection: _____
9. Metering arrangement: _____ (Net meter/Gross meter/Netbilling)

The above system is as per BIS/MNRE specifications and has been checked for its performance on _____ and it is working satisfactorily.

COSUMER**FIRM****HIMURJA****Sign****Name****Designation**

Date

Seal

It is to certify that the above system has been purchased with following details:

1. Total project cost ₹ _____

FIRM**CONSUMER****Sign****Name****Designation**

Date

Seal

Reference Bidders' Declaration Format associated with Implementation of ALMM Order

(on the letter head of the bidder) Declaration

To whomsoever this may concern

Reference: (RFP no. and description)

1. We hereby declare that we are fully aware of the binding provisions of the ALMM order and the Lists there under, while quoting the rate in the tender no. HIMURJA (F-7) / GCRTS Plant / 2025-25 floated by Project Manager (Solar).
2. We understand that the List – I (Solar PV Modules) of ALMM Order, Annexure – I of the O M, issued by MNRE on 10th March 2021 will be updated by MNRE from time to time. We also understand that the Modules to be procured for this project, shall be from the List – I of the ALMM order applicable on the date of invoicing of such modules.
3. We further understand and accept that we shall be liable for penal action, including but not limited to blacklisting and invocation of Performance Bank Guarantee, if we are found not complying with the provisions of ALMM Order, including those mentioned above.

Name:

Designation: Organization:Date:

(Signature and Stamp)

Undertaking/Self- Declaration for domestic content requirement fulfillment

(On a plain Paper)

This is to certify that M/S.....[Company Name] has installedKW [Capacity] Grid Connected Rooftop Solar PV Power Plant for..... [Consumer Name] at [Address] under sanction number.....dated.....[sanction date] issued by... [DISCOM Name].

It is hereby undertaken that the PV modules installed for the above-mentioned project are domestically manufactured using domestic manufactured solar cells. The details of installed PV Modules are follows:

1. PV Module Capacity:
2. Number of PV Modules:
3. Sr No of PV Module
4. PV Module Make:
5. Purchase Order Number:
6. Purchase Order Date:
7. Cell manufacturer's name
8. Cell GST invoice No

The above undertaking is based on the certificate issued by PV Module manufacturer/supplier while supplying the above-mentioned order.

I,on behalf of M/S.....[Company Name] further declare that the information given above is true and correct and nothing has been concealed therein. If anything is found incorrect at any stage then the due Central Financial Assistance (CFA) that I have not charged from the consumer can be withheld and appropriate criminal action may be taken against me and my company, as per law, for wrong declaration. Supporting documents and proof of the above information will be provided as and when requested by MNRE/state implementing agency.

(Signature With official Seal)For M/S.....
Name.....
Designation.....
Phone.....
Email.....

DECLARATION BY THE BIDDER

I/We__(herein after referred to as the bidder) being desirous of bidding for the design, manufacture, supply, erection, testing, installation and commissioning of SPV power plants 1 kW to 50 kW under Net Metering scheme and above 50 kW upto 500 kW under Net Billing scheme in different parts in H.P including warranty period of 5 years as shown in scope of bid specification. We have fully understood the nature of the work and carefully noted all the terms and conditions, specifications etc. as mentioned in the bid documents, hereby declare that:-

1. The bidder is fully aware of all the requirements of the bid documents and agrees with all the provisions of the bid documents.
2. The bidder is capable of executing and completing the work as required in the bid.
3. The bidder accepts all risks and responsibilities directly or indirectly connected with the performance of the bid.
4. The bidder is financially solvent and sound to execute the bid.
5. The bidder is sufficiently experienced and competent to perform the contract to the satisfaction of HIMURJA.
6. The information and statements submitted with the bid are true.
7. The bidder has not been debarred from similar type of work by any Govt. Dept./Agency/Organization.
8. This offer will remain valid for acceptance for 12 (Twelve) months from the date of finalization of the bid and can be extended further.
9. The bidder gives the assurance to execute the bided work as per the specifications, terms and conditions and in exact configuration of the sample submitted on award of the work.

(Signature of Bidder)with designation

UNDERTAKING TO BE FURNISHED BY BIDDERS

I/We, M/S with

Registered office at undertake to ensure generation of electrical energy from the Solar Power Plant of 1 kW to 50 kW under Net Metering scheme and above 50 kW upto 500 kW under Net Billing scheme to be installed on the rooftops of the Domestic/Government/Institutional or other buildings all over the State of HP on full cost basis by us as per the details / technical specifications given in Bid document.

Authorized Signatory Name of the
Company with stamp

Financial Bids

Name of Work: To determine the lowest rate for “Design, manufacture, supply, erection, testing and commissioning including warranty, operation & maintenance for 5 years of Grid Interactive Rooftop Solar Power Plants of capacities ranging from 1 kW to 50 kW under Net Metering scheme and above 50 kW upto 500 kW under Net Billing scheme **to be installed on the rooftops of the Domestic/Government/Institutional or other buildings all over the State of HP on full cost basis.**

We give our unconditional financial rates including all taxes and duties in response of this tender Document issued by HIMURJA. The rates are FOR destination at the sites of the beneficiaries including transportation and insurance etc.

1. For RTS Plants

Sr. No.	Particulars of Work	Rate per KW in INR
1	Above 1 kW up to 3 kW	
2.	Above 3 kW up to 10 kW	
3.	Above 10 kW up to 50 kW	
4.	Above 50 kW to 100 kW	
5.	Above 100 kW up to 500 kW	

(Note: The above rates are inclusive of all the taxes, duties and cost for the installation of bi-directional meter/solar meter including testing etc.)

SignatureName
Designation with Seal