



# Gujarat Energy Transmission Corporation Ltd.

Transmission Circle office, 66KV Himatnagar-1 Substation Compound,  
Nr. Motipura Circle, N H -8, Motipura,  
Himatnagar-383

Corporate Identity No (CIN) : U40100GJ1999SGC036018

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**TRANSMISSION CIRCLE OFFICE,  
HIMATNAGAR – 383001**

**Tender Number- 2024-25/HTC/126**

## **TECHNICAL BID**

**Name of Works - Survey, Design, Supply, Installation, Testing, commissioning with Comprehensive Maintenance contract of 5 years for Solar Rooftop projects at Various locations under Himatnagar TR. Circle.**

## **TENDER NOTICE No: 2024-25/HMT/T-126**

Superintending Engineer, Himatnagar invites "On line Tenders" (e-tendering) for the work of "Survey, Design, Supply, Installation, Testing, commissioning with Comprehensive Maintenance contract of 5 years for Solar Rooftop projects at Various locations under Himatnagar TR. Circle." Bidders should fulfill the all Qualification requirement criteria given in the tender document, otherwise their bid will not be considered & price bid will not be opened.

Tender Papers & Specifications may be down loaded from Web site <https://getco.nprocure.com> (For view, down load and on line submission) and GUVNL / GETCO web sites [www.gseb.com](http://www.gseb.com) & [www.getcogujarat.com](http://www.getcogujarat.com) (For view & download only).

**All tender documents (Notarized/ Self-attested copies of original – as specified in tender document) are to be upload through online only (Mandatory) on n-procure portal. Tender fee & EMD should to be submitted online via RTGS/NEFT/IPMS. No Tender Fee/ EMD accepted physically or by Demand Draft. For any query addressed to: The Superintending Engineer (TR), Gujarat Energy Transmission Corporation Limited, Circle Office, SHAMLAJI HIGHWAY Road, Himatnagar – 383001.**

**No physical bid submission required.**

Tender No.	Name of Work	Estimated Cost Rs.	Time Limit	Tender Fee + GST (Rs.)	E.M.D. Rs.
2024-25/HMT/T-126	Survey, Design, Supply, Installation, Testing, commissioning with Comprehensive Maintenance contract of 5 years for Solar Rooftop projects at Various locations under Himatnagar Tr. Circle	97,54,419.60	270 Days	5000.00 + 900.00 Rs. 5900.00/-	97,545/-
1	On line (E-tendering) tender/ offer submission last date up to 16.00 hours only (This is mandatory)			30.12.2024	
2	Date of opening of online Tender fee/ EMD and Technical bid at 16.05 Hours.(If Possible)			30.12.2024	
3	Tentative Date of on – line opening of Price bid			Shall be intimated separately.	

### **IMPORTANT:**

1. All the relevant documents including tender copy to be submitted though ONLINE only. No physical documents to be submitted by bidder.
2. All the online Annexures to be filled properly and notarized/ self-attested copies of original documents as per tender requirement must be attach with online form only. It shall be sole responsibility of the bidder that the uploaded scanned documents (in PDF form) remain legible (readable) and should not be password protected.
3. Tender will be evaluated on Data/ Details/ Documents of the on-line submission. For any discrepancy between online & Submitted documents, Online offer is considered as final. This is intended for transparency and speedy evaluation of the bids. Instead of simply confirming / attached in bid / refer physical offer, the Bidder shall fill in the particulars against appropriate place in respect of each line appearing in each online annexure. Wherever required, bidder shall invariably have to upload supporting

authentic documents in the online bid. (In the absence of required details in the online annexure, the purchaser has every right to evaluate the bids accordingly and bidder cannot raise any objection against any point during evaluation.)

4. Bidder has to submit Tender Fee & EMD through online payment methods only. Copy of payment to be attached with online bid documents.
5. **Payment of Tender Fee & EMD (Earnest Money Deposit):**  
Payment option for submission of Tender fees & EMD should be Online i.e. by **RTGS/NEFT only**.

**GETCO, Himatnagar Beneficiary Bank detail for online payment are as under:**

1	Name of Bank	BANK OF BARODA
2	Name of Branch	HIMATNAGAR
3	Branch Code	8407
4	MICR Code	383012006
5	IFSC Code	BARB0VJHIMM (5th Digit in IFSC code Is ZERO)
6	Name of Account	THE SUPERITENDING ENGINEER, GUJARAT ENERGY TRANSMISSION CORPORATION LTD
7	Account No.	84070200001468
8	GST No	24AABCG4029R2ZC

After payment through RTGS/NEFT, Bidder has to provide following details by e-mail on the same date of payment so payment receipt can be generated. Mail should on below mail addresses with contains details:

Sr.	Required Details
1	Name & Address of the bidder
2	Bidder GST No
3	Tender No with due date
4	Mode of Transfer
5	Ref. ID with Bank Details
6	Paid Amount
7	Payment against ( <b>Tender Fee / EMD</b> )

Mail to: Copy to:

- a. [setrhmt.getco@gebmail.com](mailto:setrhmt.getco@gebmail.com)
- b. [decmhmt.getco@gebmail.com](mailto:decmhmt.getco@gebmail.com)
- c. [aohmt.getco@gebmail.com](mailto:aohmt.getco@gebmail.com)

Bidders are requested to remain in touch with the web-site for any amendment / corrigendum or extension of due date etc.

6. No physical tender shall be accepted / opened. Online bid receipt after due time of tender or any other reasons and the Corporation shall not assume any responsibility for late receipt.
7. The GETCO reserves the right to award the work to one or more bidders, considering their technical and financial capacity OR to reject any or all tenders or accept any tender without assigning any reason thereof.

Any technical questions, information and clarifications that may be required pertaining to this enquiry should be referred to:

**The Superintending Engineer,  
Gujarat Energy Transmission Corporation Limited,  
Circle Office, SHAMLAJI HIGHWAY road, Himatnagar, - 383001.**

**GUJARAT ENERGY TRANSMISSION CORPORATION LIMITED**

**INTEGRITY PACT**

**OUR ENDEAVOUR**

To create environment where Business Confidence is built through Best Business Practices and is fostered in an atmosphere of trust and respect between providers of goods and services and their users for the ultimate benefit of society the nation.

<b><u>GETCO COMMITMENT</u></b>	<b><u>PARTY'S COMMITMENT</u></b>
<ul style="list-style-type: none"><li>• To maintain the highest ethical standards In business and professional</li></ul>	<ul style="list-style-type: none"><li>• Not to bring pressure / recommendations outside GETCO to influence its decision.</li></ul>
<ul style="list-style-type: none"><li>• Ensure maximum transparency to the Satisfaction of stakeholders.</li></ul>	<ul style="list-style-type: none"><li>• Not to use intimidation, threat, inducement or Pressure of any kind on GETCO or any of its employees under any circumstances.</li></ul>
<ul style="list-style-type: none"><li>• To ensure to fulfill the terms of agreement / contract and to consider objectively the viewpoint of parties.</li></ul>	<ul style="list-style-type: none"><li>• To be prompt and reasonable in fulfilling the contract, agreement, legal obligations.</li></ul>
<ul style="list-style-type: none"><li>• To ensure regular and timely release of payment on due dates for work done.</li></ul>	<ul style="list-style-type: none"><li>• To provide goods and / or services timely as per agreed quality and specifications at minimum cost of GETCO.</li></ul>
<ul style="list-style-type: none"><li>• To ensure that no improper demand is made by employees or by anyone on our behalf.</li></ul>	<ul style="list-style-type: none"><li>• To abide by the general discipline to be maintained in our dealings.</li></ul>
<ul style="list-style-type: none"><li>• To give maximum possible assistance to all the Vendors / Suppliers / Service provider and other to enable them to complete the contract in time.</li></ul>	<ul style="list-style-type: none"><li>• To be true and honest in furnishing information including payment to agents / sub-agent.</li></ul>
<ul style="list-style-type: none"><li>• To provide all information to suppliers/ contractors relating to contract / Job which facilitate him to complete the contract / job successfully in time.</li></ul>	<ul style="list-style-type: none"><li>• Not to divulge any information, business details available during the course of business relationship to others without the written consent of GETCO.</li></ul>
<ul style="list-style-type: none"><li>• To ensure minimum hurdles to Vendors/ suppliers / contractors in complete of agreement / contract / work order.</li></ul>	<ul style="list-style-type: none"><li>• Not to enter into carter / syndicate / understanding whether formal / non-formal so as to influence the price.</li></ul>
_____ Seal & Signature (GETCO Authorized Signatory)	_____ Seal & Signature (Party's Authorized Person)
Name:	Designation:

## Technical Specification

**Survey, Design, Supply, Installation, Testing, commissioning with Comprehensive Maintenance contract of 5 years for Solar Rooftop projects at Various locations under Himatnagar Tr. Circle.**

The location wise assorted rating of the solar rooftop system for which the rates shall be discovered are as follows.

Sr.	Description of Item	Proposed Capacity (KW)
	<b>Survey, Design, Supply, Installation, Testing, commissioning with Comprehensive Maintenance contract of 5 years for Solar Rooftop projects at Various locations</b>	
1	220 KV Dhansura S/s under Dhansura Division	40
2	220 KV Bhutiya S/s under Idar Division	40
3	220 KV Vijapur S/s under Vijapur Division	25
4	132kv Vishnagar S/s under Vijapur Division	25
5	66kv Panol under Idar Division	10
6	66kV Delwada S/S under Jamla Division	10
7	66Kv Kalidungri S/s under Agiyol Division	10
8	66Kv Raygadh S/s under Agiyol Division	10
9	66kV Vadagam under Dhansura Division	10
10	66kV Naniisrol S/S under Dhansura Division	10
11	66 KV Vadasan S/s under Vijapur Division	10
12	66kv Moti Adraj S/s under Jamla Division	10
13	66kv Itala S/s under Jamla Division	10
	<b>Total KW</b>	<b>220 KW</b>

**Note:** - (Project capacity will be considered in AC. Payment to Bidder will be done on AC Capacity Registered, DC Capacity Installed, and Invertor Installed, whichever will be less.)

The broad specifications of the system (Detailed Specifications are given in the Tender elsewhere) shall be as follows:

- 1) **Solar PV Modules:** - Poly Crystalline make solar module not less than 300 Wp each and having valid IEC certificate. (Certificate to be submitted on shortlisting of successful Tenders). **The PV Cell and the modules shall be of INDIAN MAKE.** Necessary documents in this regards must be provided to GEDA/GETCO.

The bidder shall be required to submit the Self declaration, regarding the Modules and Solar cells used under this supply are “**Made in India**”, from the concerned manufacturer of Solar Modules, before commissioning of the System. Such firm and Shortlisted bidder, those violate the requirement of Indian Make Solar Cell and Module shall be put under the black list, and or stop deal list as may be decided by the GEDA/GETCO.

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

The ALMM list is published by the MNRE vide Notification No. 283/54/2018-Grid Solar-Part (1) Dated 30-12-2021 and the notification for the same is also published by the MNRE vide Notification No. 283/54/2018-Grid Solar-Part (2) Dated 13-01-2022. The Model and Manufactures of the Module and Cell shall be from the ALMM only used in the SPV System in this project.

In absence of the ALMM, the shortlisted bidder shall have to submit self-declaration regarding domestically manufactured Cell & Modules used in the SPV system in this project. Whenever, the ALMM list published by the MNRE, the model and manufacturers of the module and cell shall be from the ALMM only used in the SPV system in this projects.

- 2) **Inverter:** - IEC certified inverter with in-built anti-islanding facility of Rated capacity  $\pm 10\%$  of the aggregate capacity of the modules.
- 3) **Mounting structure:** - The mounting (Rectangle pipe/square pipe / circular pipe) with requisite cross bars, nuts and bolts etc. shall be pre-galvanized or galvanized. The Rectangular /square / circular hollows pipe section used for the structures should have a minimum 2.5 mm. A certificate of a structural engineer certifying the strength and stability of the mounting structure to withstand the weight and wind speed of 150 km/hour throughout the life span of 25 years of the system, shall be submitted by the vendors. The ground clearance of the bottom most edge of solar panel shall not be less than 1200 mm.
- 4) AC, DC cable shall be of ISI mark and reputed make.
- 5) Lightning arrestor shall be provided for each of the Solar Rooftop installations. It shall be of ISI mark and reputed make.
- 6) The system cost shall be inclusive of supply of solar modules, invertors, mounting structure, AC DC cables in RPVC conduit, ACDB, DCDB, Earthing, LA, Bidirectional

meter, Solar AC Meter and its installation as per requirement on location. No any differential/additional Charges for LT Bidirectional meter will be reimbursed. The rate quoted per kW for each project should be inclusive of all taxes. No rate revision under this tender will be allowed in any circumstances.

- 7) The scope of regular cleaning of the modules for five years shall also be in the scope of Bidder. The arrangement of required water etc. for regular cleaning of the modules shall be in the scope of the Bidder.
- 8) It shall be responsibility of the bidder to clean the modules throughout the five year CMC period to insure a capacity utilization factor of 17% on annual basis to be measured at inverter/ solar meter. Until the end of fifth year, inclusive of degradation, if any, of the module and/ or inverter. The bidder shall ensure shadow free installation and easy access to the system monitoring, repairs etc.
- 9) It shall be mandatory for the vendor to visit the system installation site every 3 month and submit a report to GEDA duly signed by the authority of beneficiary agency/ office for the system working satisfactorily, in prescribed format, including the electricity generation record of the solar meter and Bi-directional meter reading.
- 10) The Capacity utilization factor (CUF) of the solar power plant shall not be less than 17% on annual basis, during the five year of CMC period. The CUF shall be maintained at 17% and necessary efforts shall be made to achieve it by the bidder. In case the system fails to attain the required CUF annually, the system shall be deemed to underperforming. The calculation of the CUF shall be on the basis of the generation recorded by the inverter/ solar system AC meter. The shortfall of energy to achieve 17% CUF on the yearly basis shall be compensated by the bidder to GEDA at the rate equivalent to the prevailing DISCOM tariff during the year. Failing which GEDA may invoke the entire Performance Bank Guarantee

## **SCOPE OF THE WORK**

The work is to be carried out on 'Turn Key Basis' which includes survey, design, supply of SPV systems with all accessories and equipment, metering, installation, testing, commissioning and maintenance services for 5 years, of the GETCO's identified sites with free replacement warranty on spare parts against manufacturing defects for five years. It also includes obtaining permission of concern DISCOM and Chief Electrical Inspector (CEI) approvals. Which includes,

- a) Survey of identified sites/ prospective beneficiaries of GETCO.
- b) Preparation of Detailed Project Report (DPR) of the proposed Proposal of SPV Power plant.
- c) Registration of the Project on GEDA online portal with necessary fees, Obtaining No objection certificate, net metering connectivity agreements from concerned DISCOM for grid connectivity and CEI's approval and payment of CEI Inspection Charges etc. EXCEPT charges for Strengthening of the DISCOM Network.
- d) The work covers Design, supply, installation, commissioning and comprehensive maintenance for FIVE years, including grid connectivity charges, meter charges etc.
- e) Design, supply, civil work, erection, testing and commissioning of SPV grid connected Power Plant as per schedule given in the work order.
- f) Installation of solar meter and bi-directional meters along with second line of protection in the system such as SPD etc.
- g) Installation of Remote Monitoring facility along with necessary dongle etc. for the period of 5 years.
- h) The scope of the work covers cleaning and washing of the Photovoltaic Modules regularly (two times in a month) to ensure annual capacity utilization factor of 17% during the five years CMC.

**i) Completion period:**

The Projects completion period including at all locations shall be 270 days (Separate Time period given by each Location if required) from the date of placement of order, completion should mean, commissioning of the system, meaning commencement of injection of power to grid. The delay if any in the specific completion period shall be dealt with on the basis of the certified documentary evidence of the single line diagram (SLD) drawing, submission and approval to CEI, estimate generation and payment to DISCOM and application submission and approval of CEI for charging of system.

**For different site location you have to provide separate gang. Within 270 days' time limit you have to complete work of Both locations.**



## **Qualification Requirement**

1. **Registration**: - The Bidder shall be strictly a Registered with GEDA.
2. **Experience**: The Bidder should have designed, supplied, installed & commissioned Grid connected Solar PV Power Projects having aggregate capacity not less than 80 KW in residential Sector during last three years in any Government department of Gujarat.
3. **Solvency**: Latest bank solvency certificate not older than 1 Year from any Nationalized/ Scheduled Bank of a sum of minimum 20 % of the estimated cost shown in the tender.
4. **Provident Fund Code**: Separate provident fund code number towards firm registered with Regional P. F. Commissioner.
5. **Financial Statement**: The Bidder should submit certified photocopy of audited financial statement i.e. IT Return, Balance sheet with profit and loss account of last three Years. In case, audit is not mandatory, bidder should submit photocopy of financial statements i.e. Balance Sheet & Profit & Loss Account
6. **Nature of Firm**: Attested copy of Partnership Deed, Power of Attorney, if any, for signing the bid documents in case of partnership firm & self-affidavit for proprietorship firm. MOA/AOA shall be submitted in case it is corporate entity. All such documents shall have to be NOTARISED.
7. **I.T.PAN CARD**: The bidder should submit the attested Photocopy of PAN Card of their firm.
8. **GST Registration**: The bidders should submit the certified copy of GST registration of their firm.
9. **Electrical contractor's license**: The bidders should submit the attested copy of GOG Electrical Contractor licenses of firm with latest validation.

**The bidders must be attach and submit all above documents scanned copy on n-procure and certified/self-verified copy of all documents to be submitted with Technical bid online only. Detail bifurcation for documents requires in form of online & physical attached herewith.**

## **CHECK LIST OF DOCUMENTS SUBMISSION**

<b>No.</b>	<b>Particulars</b>	<b>Check Mark</b>
1	Transaction detail of Tender Fee Amount (Online payment receipt)	
2	Transaction detail of EMD Amount (Online payment receipt)	
3	Registration document as Approved Contractor –of GEDA	
4	Work completion certificate in Form No.3A (Experience Certificate as main contractor) only as Per Qualification Requirement	
5	Bank Solvency Certificate	
6	GST Registration Number Documents	
7	Nature of Firm: Partnership deed/Latest Form-G/ POA/Authorized Signatory Certificate for Partnership	
	Self-Affidavit/POA/Authorized Signatory Certificate for Proprietorship	
8	Provident Fund Code Number Documents	
9	PAN Number Document	
10	Income Tax Return, Profit Loss Accounts and Balance sheet of Last Three Financial Years	
11	Electrical Contractor License	
13	Filling all Annexure	

## **TECHNICAL SPECIFICATIONS OF GRID CONNECTED SPV SYSTEM**

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 Roof Top 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 GETCO. The specifications, in the GERC Regulation on Net Metering shall also be applicable.

### **1. 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 conform to the BIS, IEC, or international specifications, wherever such specifications are available and applicable. Solar PV system shall consist of following equipment/components.

1. Solar Photo Voltaic (SPV) modules consisting of required number of Crystalline PV modules.
2. Inverter and Remote Monitoring System.
3. Module mounting structures.
4. Energy 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.

### **a. 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 GETCO.

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 20<sup>th</sup> February, 2018 as under:

- a) Filing of criminal case under IPC 420 and related Sec.
- b) Blacklisting f 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 must be used for this Scheme shall be domestically manufactured as per MNRE's requirement. The Empaneled 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 GoG/GOI, before commissioning of the System. Violation of this condition will be reported to the MNRE and GoG for taking actions against the Manufacturer of the Solar Modules and Empaneled Agency. Such firm and Empaneled Agency may be put under the black list or stop deal list as may be decided by the DISCOM Authority.

In absence of the ALMM, the Empaneled 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.

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

- a) 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
- b) Protective devices against surges (SPD) at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.-Surge Protective Device (SPD) of appropriate capacity & type shall be provided either in the inverter or in DC Junction Box for protection against surges. Low voltage drop bypass diodes shall be provided.
- c) PV modules must be tested and approved by one of the NABL accredited and BIS Approved test centers.
- d) The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.
- e) The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid.
- f) The PV Module efficiency should be higher than 16 %.  
Solar PV modules of minimum fill factor 75%, to be used.
- g) 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 up to +3%.
  - II. 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.

III. All electrical parameters at STC shall have to be provided.

Minimum certified PV module efficiency shall be +17 % for crystalline The temperature co-efficient power of the PV module shall be equal to or better than -0.45%/°C

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.

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.

1.1.3. Modules deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each module (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
- j) Nominal wattage +3%.
- k) Brand Name, if applicable.

Other details as per IS/IEC 61730-1 clause 11 should be provided at appropriate place. The actual Power Output  $P_{max}$  shall be mentioned on the label pasted on

the back side of PV Module. In addition to the above, the following information should also be provided:

- i. Polarity of terminals or leads (color coding is permissible) on junction Box housing near cable entry or cable and connector.
- ii. The Maximum system voltage for which the module is suitable to be provided on the back sheet of the module.

#### 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:**

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.

### **Module Mounting Structure (MMS):**

- 3.1. 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.
- 3.2. Module mounting structures can be made from two types of materials. They are Hot Dip Galvanized Iron or Hot Dip Galvanized Mild Steel (MS). However, MS will be preferred for raised structure.
- 3.3. MMS Steel shall be as per latest IS 2062:2011 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
- 3.4. 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 electrolytic ally compatible with the materials used in the module frame, its fasteners, nuts and bolts.
- 3.5. 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.

- 3.6. 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.
- 3.7. 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.
- 3.8. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The Empaneled Agency shall be fully responsible for any damages to SPV System caused due to high wind velocity within guarantee period as per technical specification.
- 3.9. 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.
- 3.10. 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.
- 3.11. The structure shall be designed to withstand operating environmental conditions for a period of minimum 25 years.
- 3.12. Material standards:
  - i. 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).
  - ii. 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)
  - iii. Test reports for the raw material should be as per IS 1852 / 808 / 2062 / 1079 / 811.
  - iv. In process inspection report as per approved drawing & tolerance should be as per IS 7215.
  - v. 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)
  - vi. 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).

vii. Foundation Hardware – If using foundation bolt in foundation then it should be as per IS 5624.

3.13. 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.

**3. 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 bus bars 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 should be provided.
- c) For array junction box/ PV combiner box, Empaneled 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) 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.
- e) Junction boxes shall be mounted on the MMS such that they are easily accessible and are protected from direct sunlight and harsh weather.

**4. DC DISTRIBUTION BOX (DCDB):**

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

- 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 or better protection, as per site conditions.
- 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 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

**5. 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 degrees 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 as per site conditions.
- 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.
  - a. Variation in supply voltage : +/- 10 % as per CEA/State regulations.
  - b. Variation in supply frequency : +/- 3 Hz as per CEA/State regulations.
- i) 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.

**6. 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 5 KW to 5.5 KW.

**7. Inverter and Remote Monitoring System: -**

**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, A serial number, code or other marking allowing identification of manufacturing location and the manufacturing batch or date within a twelve-month time period.
- c) Input voltage, type of voltage (AC or DC.), frequency, and maximum continuous current for each input.
- d) Output voltage, type of voltage (AC. or DC), frequency, maximum continuous current, and for a.c. outputs, either the power or power factor for each output
- e) The Ingress Protection (IP) rating
- f) As per IS 16221

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/MOSFET
Control	Microprocessor /DSP
Nominal AC output voltage	For 3-phase/ 1 phase: - 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)	<b>(Above 10 kW)</b> Peak Efficiency At least 97%, measure as per IEC 61683 Euro Efficiency At least 96%, measure as per IEC 61683
THD	<3%
PF	>0.9
Communication interface	RS 485 with Modbus
Display type	LCD for data display. LCD / LED for status display
Protections	<ul style="list-style-type: none"> <li>• Over voltage (both input and output)</li> <li>• Over current (both input and output)</li> <li>• Over/Under grid frequency</li> <li>• Over temperature</li> <li>• Short circuit</li> <li>• Lightning</li> <li>• Surge voltage induced at output due to external source</li> <li>• Anti-islanding</li> </ul>
Recommended Alert/Indications	<ul style="list-style-type: none"> <li>• Inverter ON</li> <li>• Grid ON</li> <li>• Inverter Under / Over Voltage</li> <li>• Inverter Overload &amp;</li> <li>• Inverter Over Temperature</li> </ul>
Recommended LCD Display on Inverter	<ul style="list-style-type: none"> <li>• Output power (W)</li> <li>• Daily Energy (Wh)</li> <li>• cumulative energy (Wh)</li> <li>• DC voltage (V) &amp; DC current (A)</li> <li>• AC voltage (V), AC frequency (Hz)</li> <li>• AC current (A)</li> <li>• Cumulative hours of operation (h).</li> </ul>

- 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 Empaneled Agency from the inverter supplier to the DISCOMs/GUVNL.
- 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/3pahse inverter shall be used as per market availability. 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) 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.
- d) Built-in meter and data logger to monitor plant performance through external computer shall be provided.
- e) The power conditioning units / inverters should comply with applicable IEC/equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068-2(1,2,14,30) /Equivalent BIS Std.
- f) The charge controller (if any) / MPPT units environmental testing should qualify IEC 60068-2(1, 2, 14, 30)/Equivalent BIS std. The junction boxes/enclosures should be IP 65(for outdoor)/ IP 54 (indoor) and as per IEC 529 Specifications.
- g) The PCU/ inverters should be tested from the MNRE approved test centers /NABL /BIS /IEC accredited testing- calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses. Valid type test report shall be submitted by the empaneled agency before commissioning of the SPV System.
- h) All inverters shall be IEC 61000 compliant for electromagnetic compatibility, harmonics, Surge, etc.
- i) Maximum Power Point Tracker (MPPT) shall be integrated in the PCU/inverter to maximize energy drawn from the array.
- j) The PCU/ Inverter shall have overloading capacity of minimum 10%
- k) The allowable capacity of inverter shall be (+15/-10 %) of registered AC Capacity.

#### **8. 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 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.
- A manual disconnect 4 pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

## **1. DATA ACQUISITION SYSTEM / PLANT MONITORING**

- i. Data Acquisition System shall be provided for each of the solar PV plant.
- ii. Remote Monitoring and data acquisition through Remote Monitoring System software at the GETCO 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 Empaneled Agency. Provision for interfacing these data on GETCO server and portal in future shall be kept as per requirement.
- iii. Empaneled agency shall ensure that Inverter should have provision of remote monitoring of inverter data through sim card or through Wi-Fi. Required website/mobile app platform, where the user (Consumer) can access the data, should be provided/explained to consumer while installation by Empaneled Agency. The facility of in-built Wi-Fi module or communication through sim-card should also be explained to the consumer.  
Recurring cost of sim card/Data pack for communication shall be borne by consumers. All the inverter data should be made available to GETCO for monitoring by giving web access by sharing the user ID and password. SIM-card cost, Periodic data charges towards data pack and Internet/Wifi connectivity for maintaining Remote Monitoring System shall be the responsibility of Beneficiary.

## **10. METERING:**

- a) The bi-directional electronic energy meter (0.5S class) shall be installed for the measurement of Import/Export of energy in co-ordination with GETCO.
- b) Reverse power relay shall be provided by bidder (if necessary), as per the local DISCOM requirement.

A Roof Top Solar (RTS) Photo Voltaic (PV) system shall consist of following energy meters:

- i. Net meter: To record import and export units
  - ii. Generation meter: To keep record for total generation of the plant.
- 3.14. The installation of Generation meters including CTs & PTs, wherever applicable, shall be carried out by the Empaneled Vendor as per the terms, conditions and procedures laid down by the concerned GERC/GETCO.

## **11. POWER CONSUMPTION:**

- a) Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any surplus power can be injected in to the grid.

## **12. PROTECTIONS**

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

### **12.1. 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, atmosphere 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 arrestor 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 mm<sup>2</sup> copper/ 16 mm<sup>2</sup> aluminum or GI strip bearing size 25\*3 mm thick). Separate pipe for running earth wires of Lightning Arrestor shall be used.

### **12.2. SURGE PROTECTION**

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

### **12.3. 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. separate three earth pits shall be provided for individual three earthing viz.: DC side earthing, AC side earthing and lightning arrester earthing.

### **12.4. GRID ISLANDING:**

- i. 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 immediately. 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 Anti islanding features. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.
- ii. A manual disconnect 4 / 2 pole isolation switch (RCCB may also be used) beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance.