

No.1/27/01-PCB/Tech /17039

Dated: 23/12/2021

TENDER NOTICE
(E-Tendering Mode Only)

The Member Secretary, Goa State Pollution Control Board invites the tender for upgrading the installed 45 kWp on-grid Solar System to ensure 24x7 power supply for GSPCB Data Center (O&M) with 5 years warranty at Goa State Pollution Control Board (GSPCB) Building, Saligao, Bardez, Goa.

Sr. No.	Name of Work	Estimated Cost	Earnest Money Deposit	Cost of Tender Document	Tender Processing fee
			Mode of Payment : e-Payment Only		
1.	For upgrading the installed 45kWp on-grid Solar System to ensure 24x7 power supply for GSPCB Data Center (O&M) with 5 years warranty at Goa State Pollution Control Board (GSPCB) Building, Saligao, Bardez, Goa.	Rs.22,97,200/-	Rs.45,944/-	Rs. 1,000/-	Rs. 3000/-

* Time For completion – 45 days

TENDER SCHEDULE

1. The last date of online submission of tender is **31/12/2021** upto 17:00 hrs.
2. The date & time of opening of online tender is **03/01/2022** at 11:30 hrs in the office of the Member Secretary, GSPCB.

The online application: The bidder should scan & upload all the documents as per Annexure III on the e-Tender website i.e. eprocure.goa.gov.in. If the Bidder fails to submit the (online) required documents as above, the bidder is likely to be rejected at the discretion of the Member Secretary, GSPCB.

Member Secretary
GSPCB

DETAILED TENDER NOTICE

NAME OF WORK

Upgrading of 45 KWP on-grid solar system to ensure - 24X7 power supply for GSPCB Data Center (O&M).

- A. Supply, installation, testing and commissioning of (10 KW x 2) online solar PCU RMPPT, DSP based design pure sine wave, with built in charge controller 3 phase in 1 phase out -5 years warranty
- B. Supply, mounting and designing of strings with 400 Watt mono crystalline panels with allied connectors and fittings - 25 years performance warranty.
- C. Supply, installation, testing and commissioning of Lithium battery with battery management system - 5 years warranty.
- D. Supply, installation and testing of AC & DC Cable termination with 25 MM conduit pipes, copper coated lugs, soldering and crimping.

1. Eligibility Criteria

- 1.1 Bidder should be empanelled with GEDA for the installation Solar PV Grid Connected Power system.
- 1.2 Bidder should have experience of designing, fabrication, supply, installation, testing and commissioning of solar PV grid tied systems. The bidder should also have experience of operation & maintenance after sale & services in the field of supply of Grid connected Solar PV systems.
- 1.3 The bidder should have installed at least one grid connected system minimum capacity of 10kW and above or he should have installed more than 10KWp cumulative capacity Off-grid/Hybrid solar PV system in the last two years.
- 1.4 The bidder should be financially sound to execute the contract arising out of this Tender.
- 1.5 The bidder should have service centre or his authorized qualified staff within a radius of 20 KM after the installation of system.
- 1.6 All above criteria should be strictly followed. Bidder should quote only if he is eligible.

2. SCOPE OF WORK

1. Supply, Installation, Testing and Commissioning of (10kW x 2) online Solar PCU RMPPT, DSP based Design Pure Sine Wave, with built in Charge Controller 3 Phase in 1 Phase out
2. Supply, Mounting and Designing of Strings with 400 Watt Monocrystalline Panels with allied Connectors and fittings
3. Supply, Installation, Testing and Commissioning of Lithium Battery with Battery management System
4. Supply, Installation and Testing of AC & DC Cable Termination with 25mm Conduit Pipes, Copper Coated Lugs, Soldering and Crimping at Goa State Pollution Control Board (GSPCB), Saligao, Bardez, Goa including Operation & Maintenance (O&M) of the project for a period of 5 years.

This would inter-alia include:

- 2.1 Before quoting the rates bidder should visit the site to understand and get idea of actual site conditions.
- 2.2 Supply of the complete systems, including all necessary components, subcomponents, spares, tools etc. as per technical specifications given elsewhere in this document.
- 2.3 The said Upgradationsystem is required to be installed on the slopping south facing roof sheet on the GSPCB Building. The solar PV required to be fitted on the metal sheets using seam clamps of extruded aluminium.
- 2.4 The solar PV panels are required to be installed in such a way that it should not disturb the aesthetic view of the GSPCB Building.
- 2.5 No damage in any way should be caused to the building while installation of Solar PV panels or any other equipment. If any damage done it will wholly be the responsibility of the bidder and cost shall be recovered from the bidder.
- 2.6 Supply of the complete systems Solar Off grid PCU, Solar Hybrid Inverters, Lithium Battery Bank, including all necessary components, subcomponents, spares, tools etc. as per technical specifications given elsewhere in this document.
- 2.7 The Solar panels should be installed at a suitable inclination to maximize annual energy output, withstand wind speeds upto 150 Km/hr and arrangement should be made for easy accessibility at all location for periodic cleaning & maintenance.
- 2.8 All works required for proper installation of Solar PV Power Plant including necessary civil and welding works for mounting structures of solar module shall be done by the bidder. The entire work shall be performed on turnkey basis. All the works related to the proper installation and functioning of the system shall have to be carried out by the bidder in the prices offered by him.
- 2.9 All necessary electrical wiring from electrical distribution box up to PCUs of Solar PV Power Plant upto Solar PCU and AC Supply to Server Room shall have to be provided by the bidder.
- 2.10 Any additional works not covered above, but necessary for the functioning of the system and required as per specification incorporated. The items of minor nature, which are not mentioned should be mentioned and shall be incorporated by the bidder.
- 2.11 All the information furnished and document produced with the Tender shall be in English language only. The Tender notice and Tender document shall form a part of contract agreement.
- 2.12 The SPV panels to be used for the installation of additional 10kWp should be mono crystalline indigenous along with the other Equipment and Battery Bank for the system must be made in India.
- 2.13 The Operation & Maintenance of Solar Photovoltaic Power Plant would include cleaning of solar panels, wear, tear, overhauling, machine breakdown, insurance, and replacement of defective modules, invertors /Power Conditioning Unit (PCU), spares, consumables & other parts for a period of 5 years
- 2.14 The supplied materials should strictly comply with the specifications as mentioned in the bid; otherwise the material would be liable for rejection.
- 2.15 Any clarification on the technical specification and general terms and conditions may be clarified in writing from GSPCB.
- 2.16 The successful bidder requires submitting the single line diagram of the Off-grid and Hybrid Equipment along with Lithium Battery Bank before the commencement of the work.
- 2.17 Any additional works not covered above, but necessary for the functioning of the system and required as per specification incorporated. The items of minor nature, which are not mentioned should be mentioned and shall be incorporated by the bidder.

3. INSTRUCTION TO THE BIDDERS

- 3.1 Information and Instructions for bidders posted on website shall form part of bid document.
- 3.2 Those bidders not registered on the Eprocure website mentioned above, are required to get registered beforehand.
- 3.3 The intending bidder must have / obtain a valid Class-III digital signature to submit the bid.
- 3.4 Part-I Technical Bid should contain all the details as per Annexure. Bidders are required to Scan & Upload all document as per Annexure.
- 3.5 Part-II Financial Bid containing only on-line price bid schedule as per BOQ.
- 3.6 If Tender Fee & Earnest Money Deposit not received before tender opening, the tender submitted through e-tendering will be rejected and same will not be considered for further processing.
- 3.7 All the information furnished and document produced with the Tender shall be in English language only.
- 3.8 The conditional tenders will be rejected out rightly.
- 3.9 The time period of completion of work will be 45 days from the date of issue of work order.
- 3.10 Prices quoted must be firm and fixed. No price variation / escalation shall be allowed.
- 3.11 The person signing the tender shall be deemed that he has the authority to sign the tender on behalf of the said company. Letter of Authority to be attached.
- 3.12 On opening date, the bidder can login and see the bid opening process.
After opening of bids he will receive the competitor bid sheets.
- 3.13 Bidder must ensure to quote rate of each item.
- 3.14 The bidder shall be responsible for the correctness and genuineness of the documents uploaded during tender submission. Any discrepancies in the matter will be liable for rejection and suitable action.
- 3.15 Any clarification on the technical specification and general terms and conditions may be clarified in writing from GSPCB five days prior to opening of Technical bid.
- 3.16 All pages of the General Terms & Conditions and Technical Specifications mentioned in the bid documents must be signed & sealed by the authorized person on behalf of the Bidders and same should be uploaded as per the tender.
- 3.17 All above criteria should be strictly followed. Bidder should quote only if he is eligible.

For detailed tender notice and participation please visit the Tender website eprocure.goa.gov.in

For details please contact the Member Secretary, GSPCB.

The Member Secretary of GSPCB reserves the right to accept or reject any or all the tenders in part or full without assigning any reasons whatsoever.

GENERAL TERMS AND CONDITIONS

1. Rate:

The offer should indicate the unit cost of the system and Installation & Commissioning charges inclusive of all taxes.

2. Sales Tax & Duties etc.:

All Taxes and duties as prescribed both under Central and State Government sales tax rules would be applicable.

3. Earnest Money Deposit (EMD):

Earnest Money Deposit: - The bidder shall have to furnish earnest money deposit of 2% of the estimated amount. Mode of Payment towards

EMD: To be paid online through e-payment mode via NEFT/RTGS/net banking with pre-printed challans available on e-tendering website and directly credit the amount to ITG account as generated by challans for NEFT/RTGS. EMD in any other form will not be accepted. The tenders without earnest money deposit will be summarily rejected. EMD would be refunded to the unsuccessful Bidder without any interest and will be adjusted against Security Deposit (SD) in case of successful bidder after finalization of tender.

4. Forfeiting of EMD:

The EMD paid or submitted by the bidder shall be forfeited if:

- a) In any case if the bidder withdraws his tender before finalization of work order.
- b) The bidder does not accept Letter of Intent and / or work order whatever may be the case.
- c) The bidder violates any of the provisions of the terms and conditions of this tender.
- d) The bidder fails to deposit requisite Security deposit.
- e) The bidder fails / refuses to execute the order as herein, the bidder shall be deemed to have abandoned the contract & such an act shall amount to and be construed as the bidder's calculated and wilful breach of contract, the cost and consequence of which shall be to the sole account of the bidder and in such an event the GSPCB shall have full right to claim damages thereof in addition to the forfeiture of EMD.

Following categories of firms are exempted from payment of Earnest Money Deposits.

- a) Government and Semi Government undertakings.
- b) SSI Units permanently registered with the Director of Industries, Goa for the solar PV grid/Off-grid/Hybrid connected power plant manufactured/supplied by them.
- c) SSI Units registered with NSIC located anywhere in the Country for the solar PV grid/Off-grid/Hybrid connected power plant manufactured/supplied by them.

- d) The Manufacturers/Suppliers claiming exemption from payment of EMD should produce the necessary Registration Certificate from the appropriate authority.

5. Security Deposit (SD) :

- a) The successful bidder shall be required to execute an Agreement with the GSPCB, within fifteen days of the date of the receipt of the work Order. The draft agreement shall be provided by the GSPCB after the acceptance of the work order by successful bidder. The successful bidder shall have to deposit Security Deposit (SD) equivalent to 5% of the work order value within 10 days from the date of receipt of the work order by way of demand draft of nationalized bank in favour of Member Secretary, GSPCB. The EMD of such successful bidders shall be released on submission of SD.
- b) Failure to comply with the terms of security deposit shall result into cancellation of work order without any further reference to the bidder and the EMD shall be forfeited.
- c) In case of premature termination of the contract, the SD will be forfeited and the GSPCB will be at liberty to recover the loss suffered by it & if additional cost is to be paid, the same shall be recovered from the bidder.

6. Operation & Maintenance (O & M) Guidelines to be Mandatorily Followed by Bidders

- a) The bidder shall be responsible for all the required activities for successful operation and maintenance of the Rooftop Solar PV/Solar PCUs and Lithium Battery Bank system for a period of 5 years.
- b) The bidder shall depute a qualified and experienced engineer/ technicians till the O&M period at project site.
- c) The modules shall be cleaned with a periodic interval of 90 days. It's the responsibility of the bidder to get the modules cleaned during O & M Period.
- d) Immediate replacement of defective modules, cards of Invertors/PCUs and other equipment as and when required.
- e) The deputed personnel shall have to keep daily log sheet for the power plant as per format to be supplied after commissioning of the power plant.
- f) The deputed personnel shall be in a position to check and test all the equipment regularly, so that, preventive actions, if any, could be taken well in advance to save any equipment from damage. Any abnormal behaviour of any equipment shall be brought to the notice of Officer of the GSPCB official immediately for appropriate action.
- g) During operation & maintenance period of five years of the power plant, if there is any loss or damage of any component of the power plant due to miss management/miss handling or due to any other reasons, what-so-ever, the supplier/firm shall be responsible for immediate replacement/rectification. The damaged component may be repaired, if it is understood after examination that after repairing performance of the component shall not be degraded, otherwise the defective component shall have to be replaced by new one without any extra cost.
- h) Supplier should enlist the safety measures to be followed during operation and maintenance of the plant.

7. Validity of Offer :

The offer must be kept valid for a period of three months from the date of opening of the technical bid. No escalation clause except the admissible tax component under the period of consideration would be accepted. The validity can be further extended with mutual consent as per merit of the case.

8. Warranties and Guarantees:

The bidder shall provide warranty covering the rectification of any and all defects in the design of equipment, materials and workmanship including spare parts for a period of 5 years from the date of commissioning of the plant. The SPV module shall be guaranteed performance for 25 years. The equipment's or components, or any part thereof, so found defective during guarantee period shall be forthwith replaced free of cost by the successful bidder to the satisfaction of the Member Secretary, GSPCB. The successful Bidder has to transfer all the Guarantees /Warranty certificates of the different components to the GSPCB of the project. All warranty from the manufacturer have to be fully endorsed by the bidder. Warranty certificate to the above effect must be furnished along with the commissioning reports to GSPCB.

The performance profile for solar power production for the first 10 years and then at every year onwards till 25 years should be submitted.

In case of solar off-grid PCU if the spares are not available or the Inverter cannot be repaired the bidder should replace the faulty inverter with new one at his own cost. The Bidder shall attend the complaints and undertake the repairs within 48 hours from the receipt of the complaint telephonically or in writing from the GSPCB.

If the complaints are not attended within 48 hours, then penalty charges at the rate of 0.05% per week of the total cost will be deducted from Bidder Performance Bank Guarantee (PBG). Further, if the Bidder does not attend complaints within 15 days of the time period then the repair work will be carried out by GSPCB from any other Manufacturer/Supplier and the respective billing amount will be deducted by GSPCB from the PBG of the Bidder. In such cases the Bidder is also liable to be blacklisted.

9. Expected Electrical Energy Generation and Power Backup:

The bidder has to submit an undertaking regarding minimum 80 units of electricity generation per day with a Backup of 12 hours of uninterrupted power supply to server room. The bidder may indicate the guaranteed electrical energy generation from their system after making proper assessment. The assessment for such deficiencies will be made on yearly basis. Further, if any deficiency in the generated electrical energy output, the bidder has to increase the number of SPV modules so as to reach upto the minimum electrical energy generation with its own cost.

10. Time of Completion, Penalty and Termination of Contract :

The successful bidder shall complete (a) Supply, Installation, Testing and Commissioning of (10kW x 2) online Solar PCU RMPPT, DSP based Design Pure Sine

Wave, with built in Charge Controller 3 Phase in 1 Phase out (b) Supply, Mounting and Designing of Strings with 400 Watt Monocrystalline Panels with allied Connectors and fittings (c) Supply, Installation, Testing and Commissioning of Lithium Battery with Battery management System (d) Supply, Installation and Testing of AC & DC Cable Termination with 25mm Conduit Pipes, Copper Coated Lugs, Soldering and Crimping at GSPCB building **within 45 days** from the date of issue of work order. In case of delay beyond scheduled commissioning period, the Bidder shall be liable for penalty.

If the supplier fails to commission the sanctioned project within specified time, penalty on per day basis calculated for the Security Deposit on a 45 days period would be levied. After 45 days the project will get cancelled and the Security Deposit amount would be forfeited.

11. Force Majeure :

The supplier of the Solar PCU, Lithium Battery Bank and Hybrid PCU system shall not be charged with liquidated damages nor shall his security for performance be forfeited when failure of the supplier in making delivery is due to any event beyond the control of the supplier and could not have been foreseen, prevented or avoided by a prudent person. These include, but are not restricted to acts of God, acts of public enemy, acts of Government, fires, floods, epidemics, strikes, freights, embargoes and unusually severe weather.

12. The Makes of various Item shall be as under:

Sr. No.	Disruption	Make
1.	SPV Modules	The Photovoltaic modules must be made in India and tested & approved by one of the IEC authorized test center, Test Certificates can be from any of the NABL / BIS accredited testing / calibration lab. The SPV modules to be supplied should be approved from MNRE.
2.	Power Controlling Unit (Invertors)	Approved by MNRE
3.	Switchgear for AC Distribution Panel	ABB/ SIEMENS / Schneider Electric/ Polycab/ L&T/C&S/ HENSEL as per ISI standards
4.	Cables	Finolex / Havells/ Polycab and should be ISI/TUV Approved.
5.	Housing cabinets	The field array junction boxes will comply with IP65 standard. The electronics including inverters, CPU, charge controllers, MPPTs, AC & DC distribution boxes should comply IP21 for indoor and IP 65 for outdoor applications.
6.	Surge Protection Devices	CITEL/ PHOENIX/DEHN/ OBO/ SCHNEIDER Devices ELECTRIC/ ABB/HAGER
7.	Solar Power Conditioning	MNRE approved , > 90% efficiency

13. Terms of Payment :

- a) 30% of the project cost will be released after receipt of material at site in good condition along with relevant documents to the satisfaction of Member Secretary, GSPCB.
- b) 45% of the project cost will be released after the successful installation, testing and commissioning of the solar plant and satisfaction by Member Secretary, GSPCB.
- a) 15% of the project cost will be release after the installation of PCU and Lithium Battery Bank and connected to Server.
- c) 10% of the project cost shall be made after a trial run and found perfectly functioning as per design specifications.

Deduction:-

- Taxes will be deducted as per the Govt. rule and regulations.

14. Limitation of Liabilities :

GSPCB, will, in no case be responsible for any accident fatal or non-fatal, caused to any worker or outsider in course of transport or execution of work and during the O&M period to follow. All the expenditure including treatment or compensation will be entirely borne by the Executants. The Executants shall also be responsible for any claims of the workers including PF, Gratuity, ESI & other legal obligations.

15. Insurance :

The Bidder shall be responsible and take an Insurance Policy for transit-cum-storage-cum-erection for all the materials to cover all risks and liabilities for supply of materials on site basis, storage of materials at site, erection, testing and commissioning.

The Bidder shall also take insurance for Third Party Liability covering loss of human life, engineers and workmen and also covering the risks of damage to the third party/material/equipment/properties during execution of the Contract. Before commencement of the work, the Bidder will ensure that all its employees and representatives are covered by suitable insurance against any damage, loss, injury or death arising out of the execution of the work or in carrying out the Contract. Liquidation, Death, Bankruptcy etc., shall be the responsibility of Bidder.

16. Material :

The material to be used in the manufacture of the equipment to be supplied against contract shall be of the good quality conforming to BIS/foreign standard and carry certification/making wherever applicable. The firm/agency shall be solely responsible for the procurement of material required for the purpose.

The design shall comply with all statutory requirements, safety codes, regulating bodies, whether or not explicitly specified in this document. Any observations noticed shall immediately be brought to the notice of the GSPCB at the time of submission of tender.

Any supplies which have not been specifically mentioned in this Contract but which are necessary for the design, engineering, manufacture, supply & performance or completeness of the System and O&M shall be provided by the Bidder without any extra cost and within the time schedule for efficient and smooth O&M of the SPV plant. The ladder for cleaning of the SPV panels at each roof should be provided by supplier.

The firm must produce the genuity certificates from the original equipment manufacturer for major equipment including gate pass, excise and custom clearance certificates etc.

17. Test Certificates and Instruction Book :

The manufacturer/agency shall furnish to the GSPCB the following documents along with the consignment:

- a) Printed Pamphlets/Catalogues: 2 Copies for each item of equipment.
- b) Instruction Book for operation and maintenance of complete system.
- c) Drawing of all the equipment.
- d) Any other relevant information to be incorporated at the time of placing the purchase order 2 copies.

18. Jurisdiction :

In case of any dispute arise in the documentation and during implementation, commissioning and completion all the matter will be resolved under Goa Jurisdiction only.

19. Other Conditions :

- i. The Successful Bidder shall not transfer, assign or sublet the work under this contract or any substantial part thereof to any other party without the prior consent of GSPCB in writing.
- ii. Since the installation is within the sensitive area, the Successful Bidder or its subcontractors shall not display the photographs of the work and not take advantage through publicity of the work without written permission of GSPCB.
- iii. The Successful Bidder or its subcontractors shall not make any other use of any of the documents or information of this contract, except for the purposes of performing the contract.

20. Evaluation of Offer :

- a) Conditional bids will be summarily rejected.
- b) Subsequently, the technical bids will be evaluated by the tender Evaluation Committee of the GSPCB on the basis of technical bid and technical specifications. The authority for the acceptance of the tender rests with GSPCB.

The tenders received will be evaluated by GSPCB Committee to ascertain the best acceptable tender in the interest of GSPCB.

- c) Financial bids of only the technically qualified Bidder will be opened for evaluation in the presence of qualified Bidder.

However, GSPCB shall not be bound to accept the lowest or any other tender or to assign any reason for non-acceptance or rejection of a tender. GSPCB reserves the right to accept any tender in respect of the whole or any portion of the work specified in the tender paper.

TECHNICAL SPECIFICATION

The proposed projects shall be commissioned as per the technical specifications given below. Any shortcomings will lead to cancelation of payment full or part as decided by GSPCB & Competent Authority's decision will be final and binding on the successful Bidder.

i)	Address of the Site	GSPCB Building, Saligao, Bardez Goa.
ii)	Installation of SPV panels	Roof top as per the site available.
iii)	Solar isolation levels	5.50 (kWh/Sq. Mtr./day)
iv)	Ambient temp	Max. 32°C, Min. 18°C
v)	Latitude	15.53
vi)	Longitude	73.79
vii)	Tilt Angle	As per the roof space available.
viii)	Feeding Point	Main/sub ACDB to the server circuit

NOTE: BIDDER MUST VISIT THE SITE BEFORE QUOTING THE RATES, OTHERWISE IT WILL BE ASSUMED THAT THE PARTY HAS ALREADY VISITED THE SITE BEFORE QUOTING THE TENDER, AN UNDERTAKING TO BE FURNISHED ACCORDINGLY

Definition

A Solar online UPS & PCU with Solar Photo Voltaic (SPV) power system consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Solar online UPS & PCU with SPV system is with Lithium battery and should be designed with necessary features to supplement the grid power during day time and backup during grid failure. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable. The Solar PV system shall consist of following equipment's/components.

- Solar PV modules consisting of required numbers of Monocrystalline PV cells

- Solar online UPS Power Conditioning Unit
- Mounting structures
- Junction Boxes.
- Earthing and lightening protections.
- IR/UV protected PVC Cables, pipes and accessories

1.1 **Warranty:**

- 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 sale to the original customer ("Customer")
 - 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)/PCUs/Hybrid Inverter/Lithium Battery fails to conform to this warranty, the manufacturer will repair or replace the solar module(s) /PCUs/Hybrid Inverter/Lithium Battery, at their own cost.
- b) **Performance Warranty:**
 - i) The predicted electrical degradation of power generated not exceeding 20% of the minimum rated power over the 25 year period and not more than 10% after ten years period of the full rated original output.

2. **Array Structure :**

- a) Modules shall be mounted on a non-corrosive support structures towards due south and at a suitable inclination to maximize annual energy output.
- b) Support structures shall be manufactured with Aluminium of suitable size as per the IS standard. Structure shall be designed for mounting of offered Solar Modules.
- c) The solar panels are required to be installed on the south facing roof of the Building. The solar PV required to be fitted on the metal sheets using seam clamps of extruded aluminium.
- d) The Solar panels should be installed on the roof in such a way that it should withstand wind speeds upto 150 Km/hr and should be easily accessible for cleaning SPV panels.
- e) The fasteners used should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels.
- f) The space between two consecutive rows should be such that each panel is directly accessible from atleast one side and adequate distance between 2 rows for a person to comfortable & stand.
- g) Regarding civil structures the bidder need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof.
- h) The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m².

3. **Junction Boxes :**

The junction boxes shall be dust, vermin and waterproof and made of FRP / Thermo Plastic. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification. Each main junction box shall be fitted with appropriate rating blocking diode. The junction boxes shall be of reputed make and should be as per IP 65 (for outdoor), IP 21 (for indoor) & as per IEC 62208.

The junction boxes shall have suitable arrangement for the Following:

- Combine groups of modules into independent charging sub-arrays that shall be wired to the controller.
- Provide arrangement for disconnection for each of the groups.
- Provide a test point for each sub-group for quick fault location.
- To provide group array isolation.
- The rating of the JB's shall be suitable with adequate safety factor to inter connect the Solar PV array.

4. DC Distribution Board:

- a) DC Distribution panel to receive the DC output from the array field.
- b) DC DBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. The bus bars are made of copper of desired size as per IS standards. Suitable capacity MCBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

5. AC Distribution Panel Board:

- a) AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors.
- b) All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- c) The change over 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, 1500 VDC Maximum Voltage.
- e) The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.
- f) All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
- g) Should conform to Indian Electricity Act and rules (till last amendment).
- h) All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions

Variation in supply voltage	+/-10%
-----------------------------	--------

Variation in supply frequency	+/- 0.5Hz
-------------------------------	-----------

6. Power Consumption :

The Hybrid Inverter shall control generated power consumption, priority need to give for internal consumption of GSPCB Building first and thereafter any excess power can be exported to grid.

7. Surge Protection

Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and -ve terminals to earth (via Y arrangement)

8. Earthing Protection

Each array structure of the PV yard should be grounded/ earthed properly as per IS: 3043-1987. In addition the lighting arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of Department/SECI as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly.

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

9. Cables :

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

- i) Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards.
- ii) Sizes of cables between array interconnections, array to junction boxes, junction boxes to inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum (2%).
- iii) For the DC cabling, XLPE or, XLPO insulated and sheathed, UV-stabilized single core multi-stranded flexible copper cables shall be used; Multi-core cables shall not be used.
- iv) For the AC cabling, PVC or, XLPE insulated and PVC sheathed single or, multi-core multi stranded flexible copper cables shall be used; Outdoor AC cables shall have a UV stabilized outer sheath.
- v) The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use. Outer sheath of cables shall be electron beam cross-linked XLPO type and black in colour.
- vi) The DC cables from the SPV module array shall run through a UVstabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.

- vii) Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers.
- viii) All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermoplastic clamps at intervals not exceeding 50 cm; the minimum DC cable size shall be 4.0 mm² copper; the minimum AC cable size shall be 4.0 mm² copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires.
- ix) Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified. In addition, cable drum no. / Batch no. to be embossed/ printed at every one meter.
- x) All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, humidity, dirt, salt, burial and attack by moss and microbes for 25 years and voltages as per latest IEC standards. DC cables used from solar modules to array junction box shall be solar grade copper (Cu) with XLPO insulation and rated for 1.1kV as per relevant standards only.
- xi) The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant shall be provided by the bidder. Any change in cabling sizes if desired by the bidder shall be approved after citing appropriate reasons. All cable schedules/ layout drawings shall be approved prior to installation.
- xii) Multi Strand, Annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below:

BoS item	component	Standard	Description	Standard Number	Cables	General Test and Measuring Methods,
	PVC/XLPE insulated cables for working Voltage up to and including 1100 V, UV resistant for outdoor installation	IS /IEC 69947.				
- xiii) The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%.
- xiv) The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%.

10. Danger Boards and Signage :

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date.

11. Drawings & Manuals :

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

- c) For complete electro-mechanical works, Bidder shall supply complete design, details and drawings for approval to GEDA before progressing with the installation work

12. Planning & Designing :

- d) The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labor. The bidder should submit the array layout drawings along with Shadow Analysis Report to GSPCB for approval.
- e) GSPCB reserves the right to modify the design, Layout and specification of sub-systems and components at any stage as per site conditions/requirements.
- f) The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder submit three sets and soft copy in CD of final drawing for formal approval to proceed with construction work.

13. Drawings to be furnished by Bidder after Award of Contract

The contractor shall furnish the following drawings after the award of contract

- a) General arrangement and dimensioned layout.
- b) Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- c) Structural drawing along with foundation details for the structure.
- d) Itemized bill of material for complete SV plant covering all the components and associated accessories.
- e) Layout of solar Power Array
- f) Shadow analysis of the roof.