“APPAREL EXPORT PROMOTION COUNCIL”

TECHNICAL BID DOCUMENT FOR DESIGN, SUPPLY, INSTALLATION & COMMISSIONING OF 176 KWp GRID CONNECTED ROOFTOP SOLAR POWER PLANT INCLUDING 5 YEARS MAINTENANCE AND PERFORMANCE WARRANTY CONTRACT (MPWC) AND INTEGRATION TO GRID AT APPAREL HOUSE, SECTOR-44, GURUGRAM, HARYANA 122003

Date of Advertising of Bid Document **(Technical Only)**	11.04.2025
For Query/Clarification, please contact to Sh. Srikant, (9868207280).	Any working day during 10am to 5pm
Last Date for submission of Bid Document (Technical Only) at tender@aepcindia.com	03.05.2025
Date of opening of Bids (Technical Only)	05.05.2025
Last Date of submission of Financial Bid	To be informed later
Date of opening of Financial Bid	To be informed later

Bid Document (Technical Bid Only)

Work: DESIGN, SUPPLY, INSTALLATION & COMMISSIONING OF 176 KWp GRID CONNECTED ROOFTOP SOLAR POWER PLANT INCLUDING 5 YEARS MAINTENANCE AND PERFORMANCE WARRANTY CONTRACT (MPWC) AND INTEGRATION TO GRID AT APPAREL HOUSE, SECTOR-44, GURUGRAM, HARYANA 122003

1. Apparel Export Promotion Council invites Technical Bids for Design, supply, installation & commissioning of 176 kWp Grid Rooftop connected Solar Power Plant including 5 years Maintenance and Performance Warranty Contract (MPWC) and integration to Grid from reputed firms at Apparel House, Sector-44, Institutional Area, Gurugram, Haryana 122003

   The Technical Bids should be submitted in the prescribed format of Bid Document along with company/firm profile at **tender@aepcindia.com** latest by 03.05.2025

   The Technical Bids will be opened on 05.05.2025 at 11.30 AM at Apparel House, Sector-44, Gurgaon - 122003 in the presence of such agencies who may wish to be present.

   Technical Bid received to any other mail id shall be liable to be rejected by the Tender Opening Committee.

2. **Scope of Work:**

   1. Detailed Inspection of The Apparel House to study the feasibility of maximum solar power generation
   2. Design of a grid connected rooftop solar power plant to the vicinity of 176kWp and give a detailed presentation to the AEPC management for confirmation to proceed with the project. General Specification required is detailed at Annexure-II
   3. Supply, Installation, Testing and Commissioning of the approved design of solar power plant
   4. All safety circuitries and necessary interlocking shall be energized by the contractor. The entire network shall be connected with the DHBVN grid.
   5. All necessary procedures for getting the DHBVN connection shall be be taken care by the contractor. All payments and cost (except statutory payments) shall be deemed to be included in the bid and scope of work.
   6. All other works and related materials required for the execution and completion of the job shall be supplied by the contractor.
   7. Works shall be executed in a planned and phased manner so as not to disturb or affect the functioning of the office.
   8. Providing training to staff assigned by AEPC
   9. Maintenance of the Solar plant for 5 years including all spare parts and consumables.

3. **Eligibility Criteria**

   (i) The bidder should be Registered Company/Firm/Corporation in India with supporting documents. Cumulative Experience of the Bidders should be of executing contracts of Grid connected Rooftop Solar Power Plants (installed & commissioned) for a minimum of 05

years. The Bidders should have designed, supplied, installed & commissioned and tested a minimum of 100 kWp on grid connected Rooftop Solar Power Plant in Govt. aided/Govt. Institution/ Private Institution etc.

(ii) Bidder should have Test Reports for the components of Grid connected Rooftop Solar Power Plant like PCU/Inverter, PV module, Energy Meter/Net Meter, ACDB, DCDB etc. from an approved/competent testing centres as per requirements under the JNNSM scheme of the MNRE, GOI.

(iii) **The Bidder should have valid GST Registration certificate**. A copy of which should be enclosed.

(iv) Average Turnover of the Company/Firm/ Corporation in the last three financial years (2021-22, 2022-23 & 2023-24) should be at least **10.00 (Ten) crores**.
(A summarized sheet of turnover certified by registered CA should be compulsorily enclosed)

(v) Experience certificate/Work Order of 03 similar work executed/Work order (Only 100kWp or above of individual contract shall only be considered).

(vi) Declaration on company letter head that the firm has not been blacklisted by anyone.

All above eligibility criteria shall be supported by relevant documentary proof.

4. Evaluation Criteria

Only agencies satisfying all the eligibility criteria will be considered and agency will be contacted to quote in the Financial Bid. The financial bids shall be sought later and the lowest bidder shall be awarded the purchase/work order. AEPC reserves the right to call for a detailed presentation from the bidders at any stage before finalization. The decision of the AEPC shall be final and binding on all.
The Technical Bid will be opened on 24.04.2025 at Apparel House, Sector-44, Gurgaon.

5. Validity

The Bid Document shall remain valid for a period of 6 months from the date of submission of bid.

6. Earnest Money Deposit

(i) The Earnest Money of Rs.1,00,000/- (Rupees One Lakh only) to be transferred electronically through RTGS/NEFT as per Bank details given below:

Bank & Branch	Indian Overseas Bank, Sec-44, Gurgaon, Haryana
IFSC	IOBA0001804
SB Account No.	180401000020000
Account holder Name	Apparel Export Promotion Council

(ii) Startups and Micro and Small Enterprises (MSEs)as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME)are exempted from EMD upon submission of valid Registration Certificate from MSME/NSIC Department.

(iii) It may be noted that any Quotation without Earnest Money except MSME Firms is liable to be rejected at the discretion of AEPC.

(iv) The EMDs of the unsuccessful bidders will be refunded by way of RTGS/NEFT without any interest within 30 days of finalization of work award.

(v) The EMD of the successful agency shall be returned upon receipt of requisite **Performance Security Deposit.**

7. Performance Security Guarantee.

(i) The amount of Performance Security Deposit would be 10% of the total contract value (except maintenance contract) and the Earnest Money deposited by the successful Tenderer shall be retained as part of Performance Guarantee. In case, the amount of EMD happens to be less than 10% of the total contract value, the adequate security deposit amount shall be deposited by the selected agency before the commencement of the work.

(ii) Non submission of performance security Deposit within 7 days of issue of work award letter would be liable for cancellation of work award at the discretion of Council

(iii) The said amount of Performance Security Deposit shall be interest free and no interest will be paid by AEPC.

(iv) Performance security deposit shall be retained during the Defect Liability Period. Defect Liability period shall be 12 (Twelve) months from the date of issuance of actual work completion certificate by Engineer-in-charge, AEPC. The Performance security shall be returned after successful completion of the defect liability period.

8. Safety, Security and protection for the environment:

The contractor throughout the execution and completion of the works and remedying of any defects therein have full regard for the safety of the persons entitled to be on the site and keep the site in an orderly state appropriate to the avoidance of danger to such person's provide and maintain at his own cost all necessary requirements and watching them where necessary required, take all reasonable steps to protect the environment on and off the site and to avoid damage to persons or to the property of the council or other resulting from noise or other cause arising as a consequence of this methods or repairs

9. Other terms and conditions:

i. The bid should be submitted on firm's letter head as per the prescribed format along with address, telephone number, GST no. etc.
ii. Bids should be submitted in the prescribed formats only. The bids submitted in any other format will not be accepted.
iii. The contract can be terminated by this office at any time without assigning any reason, if the work/product of the supplier is not found satisfactorily. In this connection, the decision of Secretary General AEPC shall be final and binding on the agency.
iv. The agency has to carry out the repairs/replacement informed by the office (AEPC) at the cost of agency during the defect liability period of 12 months. If the agency do not carry out the rectification/replacement during the Defects Liability Period, the AEPC shall have the right to get such defective equipment rectified/replaced after giving due notice in writing to the agency and recover the cost of repairs/replacement from agency.
v. After expiry of last date, no Quotes/bids will be entertained.
vi. The contractor should consider the rates of genuine items and shall be deemed to be inclusive

of manpower, material, machinery, tools and tackles, all taxes, duties, freight, insurance etc.

vii. No escalation of amount of whatsoever nature shall be payable due to any reason.

viii. Contractor's job will also include removing of all malba and debris arising in the process of the said work including cleaning of floor/tiles/carpet to remove stains, at no extra cost.

ix. Contractor will arrange proper ladders, scaffolding at his own cost and will take all safety measures like safety belts, extra labor to hold ladders/jhoolas etc. If it is observed that work is proceeding without adequate safety precautions, work may be stopped by AEPC Sr. Engineer and in such cases, contractor will be solely responsible for delay and its consequences thereof.

x. The Contractor will be fully responsible for any casualty during the work or any other accident which occurs due to any reason. The Council will not be responsible and liable for the same.

xi. Any damage done to the existing walls, floors, equipment or to the building particularly due to negligence on the part of the Contractor or its worker shall be entirely responsibility of the firm to repair, rectify or replace the same free of cost immediately without any delay.

xii. The contractor will ensure and responsible to complete the work within a specified time and will not delay or leave the work mid-way for which no payment will be made to the contractor.

xiii. The contract as a whole or part thereof is **non transferable.**

xiv. The contractor is advised to visit and examine the site of works between 10 am to 4 pm at his/their cost and obtain for himself on his own responsibility all information that may be necessary for preparing the bid.

xv. The contractor shall be deemed to have inspected the site before hand and taken into account all relevant factors pertaining to the work in the preparation and submission of the bid. The quantities mentioned are tentative and the bidder is encouraged to bid after taking into account all factors and ascertain the work in its entirety. Any major deviation in the quantum of work shall be brought to the notice before accepting of the work award. Acceptance of work award shall be indicative of confirmation of the quantum of work and no additional payment in this regard shall be made. Bidders are also encouraged to quote as lumpsum amount instead of unit rates.

xvi. The material shall be got approved prior to its use from the Engineer in charge of the Council. The material shall be in the original packing from the manufacturer clearly indicating manufacturing date, expiry date and price etc. Any items found defective will be replaced free of cost to the satisfaction of the Council's authorities.

10. Time for Completion

The work shall be completed within a period of 04 months (120 days) and shall start from the date of issue of the letter of commencement and shall stand terminated after the expiry of the period. If the allotted work not completed within the time as specified in the work order then the liquidity damage @1% of the value of works per week to maximum of 10% of contract value will be imposed on the contractor.

11. Liquidity for damage for delay

If the contractor fails to attend any complaint or defect in due course of time and if in the opinion of the engineer delay is on the part of the contractor, the council can impose liquidated damages on the contractor.

12. Default of Contractor

If the performance of the contractor is not found satisfactory or if the contractor fails to meet/fulfill any terms/conditions/obligations laid down in the bid document, the contractor shall be served a notice to take a corrective action within 7 days. If the contractor fails to rectify or conform, the employer shall be at liberty to terminate the contract without any further notice. In the event of termination due to default of the contractor, the employer shall be at liberty to be the balance work done through other means at the cost, risk and responsibilities of the contractor. In the event of loss/damage of building, equipment etc of the employer due to negligence/carelessness of the contractor's staff then the contractor shall compensate loss to the employer.

13. Labour Safety:

Contractor shall undertake all safety precaution during the execution of the work. In case of injury to any person contractor shall always have arrangement to take him to hospital for treatment at his own cost. Contractor will be fully responsible for any repercussions which may arise as a result of violation of any safety norms on his parts.

14. Terms of payment

The terms of payment shall be as follows:

a) 70% of Material Cost shall be released after receipt of materials in full.
b) 30% of Material Cost and 100% of Installation & Commissioning Cost shall be released after successful installation and commissioning of the systems including integration to Grid and duly verification TDS will be deducted as per the provisions of Income Tax act, as amended from time to time.
c) Maintenance cost shall be released annually in 04 installments over a period of 05 years (i.e every year after the completion of second year till the end of fifth year)

15. Arbitration:

AEPC has the right to accept or reject any tender in whole or part or reject it entirely without assigning / specifying any reason thereof. In the event of any dispute or difference arising between the AEPC and contractor out of or relating to or in respect of the contract, the same shall be referred to the arbitration of the sole arbitrator to be appointed by the AEPC in accordance with the Arbitration and Conciliation Act, 2015, as amended. The arbitrator shall give reason for the award which shall be final and binding between the AEPC and Contractor. The venue of such arbitration shall be at Apparel House, Gurgaon, Haryana.

Further, the Courts at Gurugram, shall have jurisdiction to try and or entertain any matter of disputes arising out of and or relating to and or in connection with the contract and shall be governed by Indian Law.

Manoj Kumar
Jt. Director
Apparel Export Promotion Council

Annexure-I

TECHNICAL BID

S. No.	Particulars	Self-attested copy
1	**Earnest Money deposit (EMD) (Startups and MSME registered vendors exempt subject to furnishing of MSME /NSIC Registration document)**	Rs. 1,00,000/- transfer through RTGS/NEFT vide UTR No.: Dated:
2	**Name of the Company / firm with complete address and number of years in business of solar power plant SITC**	
3	**Name & Designation of Contact Person Mobile No (s) of the Contact Person e-mail address**	
4	**MSME Registration Status (Registered or not Registered)**	
5	**Self-attested copy of GST registration**	**Yes/ No**
6	**Average Turnover of the Company/Firm/ Corporation in the last three financial years (2021-22, 2022-23 & 2023-24) should be at least 10.00(Ten) crores.**	
7	**03 No.s Experience Certificate/work order of similar work (100kWp and above individual contract shall only be considered)**	**Yes / No**
8	**Self-Certification on company letter head that the firm has not been blacklisted by anyone**	**Yes / No**
9	**Bank details for refund of Earnest Money Deposit (EMD), in case of unsuccessful bidder**	**Name of Bank:** **Branch:** **Accountholder Name:_____** **Account No.:_____** **IFS Code:_____**
10	**Test reports for the components of Grid connected Rooftop Solar Power Plant like PCU/Inverter, PV module, Energy Meter/Net Meter, ACDB, DCDB etc. from an approved/competent testing centers as per requirements under the JNNSM scheme of the MNRE, GOI.**	**Yes / No**

Signature of Authorized Signatory

NAME OF THE AGENCY WITH SEAL

Annexure–II

TECHNICAL SPECIFICATIONS OF THE PROPOSED POWER PLANT PROJECT

The proposed projects shall be commissioned as per the technical specifications given below: Grid connected Solar Power Plant. Any shortcomings will lead to cancelation of subsidy in full or part as decided by AEPC & the decision will be final and binding on the bidder.

A. GRID CONNECTED SOLAR POWER PLANT;

1. **DEFINITION -** A Grid Tied Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Grid Inverter/Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT) and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid tied SPV system is without battery and should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.
Solar PV system shall consist of following equipment/components.
   a) Solar PV modules consisting of required number of Crystalline PV modules.
   b) Grid interactive Inverter/Power Conditioning Unit with Remote Monitoring System.
   c) Mounting structures.
   d) Junction Boxes.
   e) Earthing and lightening protections.
   f) IR/UV protected PVC Cables, pipes and accessories.

1.1. SOLAR PHOTOVOLTAIC MODULES:

1.1.1. The PV modules used should be made in India.

1.1.2. The PV modules used must qualify to the latest edition of IEC PV module qualification test or equivalent BIS standards Crystalline Silicon Solar Cell Modules IEC 61215/IS14286. In addition, the modules must conform to IEC 61730 Part-1- requirements for construction & Part 2 – requirements for testing, for safety qualification or equivalent IS.
   a) For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701
   b) The total solar PV array capacity of the 100 kWp Grid connected SPV power plant should comprise of Mono crystalline SPV modules of minimum 500 Wp or above wattage. **Module capacity less than minimum 500 watts should not be accepted**.
   c) Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.
   d) PV modules must be tested and approved by one of the IEC authorized test centers.
   e) The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.
   f) The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. AEPC shall allow only minor changes at the time of execution.
   g) Other general requirement for the PV modules and subsystems shall be the Following:
      i. The rated output power of any supplied module shall have tolerance of +/- 3%.
      ii. The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than

2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.

iii. The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.

iv. I-V curves at STC should be provided by bidder.

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

a) Name of the manufacturer of the PV module
b) Name of the manufacturer of Solar Cells.
c) Month & year of the manufacture (separate for solar cells and modules)
d) Country of origin (separately for solar cells and module)
e) I-V curve for the module Wattage, Im, Vm and FF for the module
f) Unique Serial No and Model No of the module
g) Date and year of obtaining IEC PV module qualification certificate.
h) Name of the test lab issuing IEC certificate.

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 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) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owners sole option

b) Performance Warranty:

i. The predicted electrical degradation of power generated not exceeding 20% of the minimum rated power over the 25 year period and not more than 10% after ten years period of the full rated original output.

2. ARRAY STRUCTURE

a) The Solar Modules shall **ground mounted** inside the campus of Apparel House, Gurugram. Each structure should have angle of inclination as per the site conditions to take maximum insolation. However to accommodate more capacity the angle of inclination may be reduced until the plant meets the specified performance ratio requirements.

b) 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 (like Gurugram-wind speed of 70-80 km per hour). It may be ensured that the design has been certified by a recognized Lab/ Institution in this regard and submit wind loading calculation sheet to AEPC. Suitable fastening arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed.

c) Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Aluminium structures also can be used which can withstand the wind speed of respective wind zone. Necessary protection towards rusting need to be provided either by coating

or anodization.

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

e) Regarding civil structures the bidder need to take care of the load bearing capacity of the SPV Modules and structures.

f)

3. **JUNCTION BOXES (JBs)**

a) The junction boxes are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JBs shall be such that input & output termination can be made through suitable cable glands.

b) Copper bus bars/terminal blocks housed in the junction box with suitable termination threads Conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single / double compression cable glands. Provision of earthings. It should be placed at 5 feet height or above for ease of accessibility.

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

d) Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.

4. DC DISTRIBUTION BOARD (DCDB):

a) DC Distribution panel to receive the DC output from the array field.

b) DCDBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. The bus bars are made of copper of desired size. 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 (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 IEC 60947, part I, II and III/ IS60947 part I, II and III.

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

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

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 +/- 3 Hz

6. PCU/ARRAY SIZE RATIO:

a) The combined wattage of all inverters should not be less than rated capacity of power plant under STC.

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

7. **PCU/ Inverter:**

As SPV array produce direct current electricity, it is necessary to convert this direct current into alternating current and adjust the voltage levels to match the grid voltage. Conversion shall be achieved using an electronic Inverter and the associated control and protection devices. All these components of the system are termed the "Power Conditioning Unit (PCU)". In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to the power conditioning unit/inverter should also be DG set interactive. If necessary, Inverter output should be compatible with the grid frequency. Typical technical features of the inverter shall be as follows:

- Switching devices : IGBT/MOSFET
- Control : Microprocessor /DSP
- Nominal AC output voltage and frequency : 415V, 3 Phase, 50 Hz
- 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-20(Minimum) for indoor
  : IP-65(Minimum) for outdoor.
- Grid Frequency Tolerance range : + 3 or more
- Grid Voltage tolerance : - 20% & + 15 %
- No-load losses : Less than 1% of rated power
- Inverter efficiency(minimum) : >93% (In case of 10kW or above)
- Inverter efficiency (minimum) : > 90% (In case of less than 10 kW)
- THD : < 3%
- PF : > 0.9

a) **2(two) Nos. of 88 kW each Grid interactive Solar PCU/ inverter (3- phase) shall be used for the 176 kW power plant system.**

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

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

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

e) The power conditioning units / inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068- 2(1,2,14,30) /Equivalent BIS Std.

f) The charge controller (if any) / MPPT units environmental testing should qualify IEC 60068- 2(1, 2, 14, 30)/Equivalent BIS Std. The junction boxes/ enclosures should be IP 65 (for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications.

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

8. TRANSFORMER:

A Transformer of minimum capacity of 175 kVA shall be installed during the installation of the Grid connected Solar Power plant to enable Grid injection at 11 kV level.

9. INTEGRATION OF PV POWER WITH GRID:

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

10. DATA ACQUISITION SYSTEM / PLANT MONITORING

i. Data Acquisition System shall be provided for each of the solar PV plant.

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

iii. Solar Irradiance: An integrating Pyranometer / Solar cell based irradiation sensor (along with calibration certificate) provided, with the sensor mounted in the plane of the array. Readout integrated with data logging system.

iv. Temperature: Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system

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

- AC Voltage.
- AC Output current.
- Output Power
- Power factor.
- DC Input Voltage.
- DC Input Current.
- Time Active.
- Time disabled.
- Time Idle.
- Power produced
- Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage.

vi. All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.

vii. PV array energy production: Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.5 accuracy class.

viii. Computerized DC String/Array monitoring and AC output monitoring shall be provided as part of the inverter and/or string/array combiner box or separately.

ix. String and array DC Voltage, Current and Power, Inverter AC output voltage and current (All 3 phases and lines), AC power (Active, Reactive and Apparent), Power Factor and AC energy (All 3 phases and cumulative) and frequency shall be monitored.

x. Computerized AC energy monitoring shall be in addition to the digital AC energy meter.

xi. The data shall be recorded in a common work sheet chronologically date wise. The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.

xii. All instantaneous data shall be shown on the computer screen.

xiii. Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.

xiv. Provision for Internet monitoring and download of data shall be also incorporated.

xv. Remote Server and Software for centralized Internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system.

xvi. Ambient / Solar PV module back surface temperature shall be also monitored on continuous basis.

xvii. Simultaneous monitoring of DC and AC electrical voltage, current, power, energy and other data of the plant for correlation with solar and environment data shall be provided.

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

11. NET METERING:

a) A bidirectional electronic Energy Meter/ Net Meter (0.5 S class) shall be installed by the successful bidder for the measurement of Import/Export of energy.

b) The bidder must take approval/NOC from the Concerned DISCOM for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to AEPC before commissioning of SPV plant.

c) Reverse power relay shall be provided by bidder (if necessary), as per the local DISCOM requirement.

12. POWER CONSUMPTION:

a) Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any excess power can be exported to grid. Finalization of tariff is not under the purview of AEPC or MNRE. Decisions of appropriate authority like DHBVN, state regulatory commission may be followed.

13. PROTECTIONS:

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

13.1. LIGHTNING PROTECTION

The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305 standard. The protection against induced high-voltages shall be provided by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

13.2. SURGE PROTECTION

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

13.3. EARTHING PROTECTION

i. 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/AEPC as and when required after earthing by calibrated earth tester. PCU, ACDB and DCDB should also be earthed properly.

ii. 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.

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 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.

ii. A manual disconnect 4pole 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

14. CABLES

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

i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards

ii. Temp. Range: –10oC to +80oC.

iii. Voltage rating 660/1000V

iv. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation

v. Flexible

vi. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use. Outer sheath of cables shall be electron beam cross- linked XLPO type and black in colour.

vii. 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.

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

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

x. Multi Strand, Annealed high conductivity copper conductor PVC type 'A' pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below: BoS item / component Standard. Description

Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V ,UV resistant for outdoor installation IS /IEC 69947.

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

xii. 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 %.

15. CONNECTIVITY

The maximum capacity for interconnection with the grid at a specific voltage level shall be as specified in the Distribution Code/Supply Code of the State and amended from time to time. Following criteria have been suggested for selection of voltage level in the distribution system for ready reference of the solar suppliers.

Plant Capacity	Connecting voltage
Up to 8 kW	240V-single phase or 415V- three phase at the option of the
Above 8 kW and up to 75 kW	415V – three phase supply
Above 75 kW upto 500 kW	33 kV/11 kV as per DISCOM rules

a) Utilities may have voltage levels other than above, DHBVN may be consulted before finalization of the voltage level and specification be made accordingly.

16. TOOLS & TACKLES AND SPARES:

a) After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the bidder for maintenance purpose. List of tools and tackles to be supplied by the bidder for approval of specifications and make from AEPC/ owner.

b) A list of requisite spares in case of PCU/inverter comprising of a set of control logic cards,

IGBT driver cards etc. Junction Boxes. Fuses, MOVs / arrestors, MCCBs etc along with spare set of PV modules be indicated, which shall be supplied along with the equipment. A minimum set of spares shall be maintained in the plant itself for the entire period of warranty and Operation & Maintenance which upon its use shall be replenished.

17. DANGER BOARDS AND SIGNAGES:

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

18. DRAWINGS & MANUALS:

a) Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied(Soft copies of all as built drawings in .pdf and CAD shall be provided by the bidder after completion) Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

b) Approved ISI and reputed makes for equipment be used.

c) For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to AEPC/owners before progressing with the installation work.

19. PLANNING AND DESIGNING:

The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labour. The bidder should submit the array layout drawings along with Shadow Analysis Report to AEPC/Owner for approval.

a) AEPC reserves the right to modify the landscaping design, Layout and specification of sub- systems and components at any stage as per local site conditions/requirements.

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

20. DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT

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

b) General arrangement and dimensioned layout.

c) Schematic drawing showing the requirement of SPV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.

d) Structural drawing along with foundation details for the structure.

e) Itemized bill of material for complete SPV plant covering all the components and associated accessories.

f) Layout of Solar Power Array

g) Shadow analysis of the roof.

21. SAFETY MEASURES:

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

22. DISPLAY BOARD

The bidder has to display a board at the project site (above 25 kWp) mentioning the following:

a) Plant Name, Capacity, Location, Type of Renewable Energy plant (Like Grid tied Rooftop solar power plant etc.), Date of commissioning, details of tie-up with transmission and distribution companies, Power generation and Export FY wise.

b) Financial Assistance details from AEPC/MNRE/Any other financial institution apart from loan. This information shall not be limited to project site but also be displayed at site offices/head quarter offices of the successful bidder.

c) The size and type of board and display shall be approved by Engineer-in charge before site inspection.

23. ONLINE MONITORING

Real time monitoring system shall be taken into account for monitoring the Grid connected solar power plant. The cost of Online (Remote) Monitoring shall be borne by the successful bidder

24. FIVE YEARS MAINTENANCE & PERFORMANCE WARRANTY CONTRACT (MPWC)

24.1 The Maintenance and Performance Warranty Contract (MPWC)

a. After the works are awarded to the successful Bidder/Bidders, he/they enter into a Maintenance & Performance Warranty Contract (MPWC) with AEPC which includes the scope of operation and maintenance of the SPV Power Plant for a period of 5(five) years. The date of MPWC period shall begin from the date of actual commissioning of the Solar Power Plant. The Maintenance & Performance Warranty Contract shall include servicing & replacement guarantee for parts and components (such as electronics, PCU/Inverter, Transformer etc.) of Solar Power Plant for 5 years from the date of installation. For PV modules, the replacement guarantee is for 25 years.

b. The Contractor should train a person from the AEPC for day today operation, troubleshooting, maintenance etc. at the SERVICE CENTRE for attending any fault as and when occurred.

c. The maintenance service provided shall ensure proper functioning of the grid connected SPV Power Plant as a whole. All preventive/routine maintenance and breakdown/corrective maintenance required for ensuring maximum uptime shall have to be provided by the Contractor. AEPC will provide the format of Maintenance sheet for submitting the Performance Report quarterly. The Contractor shall furnish a Performance Report duly attested by the Beneficiary alongwith the hard copy/printout of performance data of the Plant for every (6 months) shall be submitted to AEPC half yearly within 15th day of following month during the MPWC period. The Maintenance and Performance Warrantee Contract (MPWC) shall have two distinct components as described below.

24.2 Preventive/Routine Maintenance

This shall include activities such as, cleaning and checking the health of the SPV Power plant, cleaning of module surface, tightening of all electrical connections, changing of tilt angle of module mounting structure, and any other activity that may be required for proper functioning of the SPV Power Plant as a whole.

24.3 Breakdown/Corrective Maintenance

a. Whenever a complaint is lodged by the consumer, the bidder shall attend to the same within a reasonable period of time 3 days and in any case the breakdown shall be corrected within a period not exceeding 7 days from the date of complaint.

b. The bidder shall maintain the following facilities at the local Service Centre for ensuring highest level of services to the end user;

(i) Adequately trained manpower, specifically trained by the bidder for carrying out the service activities.

(ii) Adequate provisions for record keeping, which shall inter-alia, include the following:

(a) Details of system supplied within the command area of the service station including full name and address of consumer, system and sub-system serial numbers and records of routine maintenance carried out (duly signed by the consumer). These records shall include voltage, current, specific gravity, indicator charge, full glow, inverter operation, electronics, etc.

(b) History record sheets of maintenance done.

(iii) Adequate spares and manpower for ensuring least down time of an individual system.

(iv) The Service Center shall send summary service reports to AEPC on quarterly basis. These reports shall include the following information:

(a) Number/Type of components of the Plant covered by the Service Center.

(b) Number/Type of components/systems working satisfactorily on the reporting date.

(c) Number of complaints received during the period of reporting.

(d) Number of complaints attended during the period of reporting.

(e) Major cause of failure, as observed

(f) Major replacement made during the reporting period. Separate report shall be submitted for each type of systems manufacture wise in case the service center caters to the requirement of more than one manufacture

(g) Hard copy/printout of the daily performance data of the Plant for the last quarter.

24.4 The records maintained at the Service Center shall be available from time to time to AEPC.

24.5 The date of MPWC maintenance period shall begin on the date of actual commissioning of the SPV systems. If during the MPWC period, the Solar Power Plant becomes non-functional due to any defect or shortage of spares etc. for a period more than 1 week then the time duration of this non- functional period will be extended in the MPWC period.

24.6 Any payment for release of MPWC charges will not be entertained or put up to Higher Authority of AEPC without the Performance Report duly attested by the authority of
Beneficiary.

24.7 Bidder shall furnish details of infrastructure that are presently available for establishing of Service Centers.