

TENDER DOCUMENT

Thapar University
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To

TENDER ENQUIRY FOR PROVIDING 15 KW GRID CONNECTED ROOFTOP SOLAR PV PLANT

Sir/Madam,

1. This Institute is interested in providing 15 KW Grid connected rooftop solar PV Plant.
2. Please quote your best offer based on specifications as given in tender documents by 14 January 2016

(NP Singh)
Head Commercial
Thapar University

15 KW GRID CONNECTED ROOFTOP SOLAR PV PLANT

ELIGIBLE TENDERERS

The tenderer shall provide sufficient documentary evidences to satisfy the following conditions that the tenderer:

1. Is a registered firm in India and is operational for more than last 03 years.
2. The tenderer fulfills the terms and conditions of eligibility as in accordance with the directions of Ministry of New and Renewable Energy Government of India. Is a **registered channel partner/ dealer** of MNRE.
3. Tenderer should have valid PANCARD Copy.
4. Proof of registration with ESIC ,PF, SERVICE TAX ,SALES TAX,VAT & LBT (Self Attested Copies to be submitted along with the tender)
5. Has experience of supply and maintenance/after sale services in the field of supply/installation of standalone/ Off grid Solar PV / Grid tie systems of more than 500 KW cumulative capacity in the last three years. Copies of work order executed in last three years, to be submitted. Proof of having successfully completed similar works during last 3 years .
6. Average annual financial turn over during the last 3 years should be at least of 03 Crore.

****IMPORTANT NOTES:**

- 1.APPROVAL OF PROJECT FROM MNRE & RELEASE OF SUBSIDY AMOUNT AT THE EARLIEST is the responsibility of the tenderer. (pls state realistic time frame for receipt of subsidy).
- 2.Excel sheet giving the ROI of the project to be attached.
- 3.All approvals if any from PSPCL/ State /Central Govt to be obtained by the tenderer.
- 4.Minimum guarantee of generation per year to be given.
- 5.Detailed technical specifications of the system offered should be given.

TECHNICAL SPECIFICATIONS

1.0 FOREWORD

This non- conventional source of energy will reduce the burden on conventional sources. It is therefore, prudent to provide Grid connected solar power generating system to generate electricity from solar system to meet the electrical load requirement of the building whilst remaining connected to the electrical network. A grid connected system will run in parallel to the grid (LT Bus) rather than separate to it, will supplement the electricity energy generated from SOLAR during sunny days thus saves the conventional energy.

2.1 REFERENCE STANDARDS:

IS : 12834 : 1989 (reaffirmed 2000)	Solar Photovoltaic Energy Systems- Terminology
IEC : 61215 Ed 2 or Latest	Crystalline silicon terrestrial photovoltaic (PV) modules- Designqualification and type approval
IEC : 60904-I (2006)	Photovoltaic Devices-Part-I: Measurement of Photovoltaic current–Voltage Characteristic
IS : 9000	Basic environmental testing procedure for Electronic andelectrical items
IS : 9000	Safety Guidelines for grid connected photovoltaic systemsmounted on the buildings
IEC 60364-7-712 (1997)	Electrical Installations of Buildings Part 7: requirements forspecial installations or locations Section, 712: Photovoltaic power supply systems
IEC 60364-4-41	Protection against electric shock
IEC 61730	PV Module Safety Qualification
PV Module Safety Qualification IEC 61701	Resistance to Salt mist and corrosion
UL 1703	Comply with the National Electric Code (NEC), OSHA and National Fire Prevention Association.

**TECHNICAL SPECIFICATION FOR PROVIDING 15 KW GRID CONNECTED
ROOFTOP SOLAR PV PLANT**

Ser No	REQUIREMENT	MAKE , MODEL , No of items , Enclosed signed stamped technical data sheet for all items given below.
1	On grid solar PV panels of 15 KW MONO / POLY of minimum 250 Wp solar panel of EFF >15.4 % FF >0.72 with RFID tag and positive tolerance. (Green Brilliance, EMVEE, Titan, Vikram, Shan or Equivalent make)	
2	3 Phase GRID tie transformer less string inverter with RS 485, wired/wireless connectivity to local LAN. To be self synchronization with grid / DG , two MPPT Inputs. Integrated string monitoring of V, Amp, Power in KW, KWH, DC surge protection type II, efficiency > 97 % (SMA, DELTA, REFUSolar, Bonfiglioli, KACO or Equivalent make)	
3	Fixed angle structure as per latitude of the location with civil work made of galvanized steel / FRP / Aluminum to SP Solar PV panel. No penetration of roof is allowed.	
4	Cables(Finolex or Equivalent make) & hardware (loss<2% on DC side, minimum 6 mm copper cable to be used).AC side 1.1 grade heavy duty stranded copper conductor ,XLPE insulated, galvanized steel wire/ strip armored flame retardant low smoke 9FRLS) extruded PVC type ST-1 outer sheathed.	
5	Surge protector inbuilt Type 2 (CITEL, COOPER BUSSMAN, OBO NBETTERMANN or internal to string inverter.)	
6	Earthing Kit (TWO separate System earth and equipment earth to be provided . PV panels & mounting structure to also be proper earthed as per manufacture instructions) All earths to be bonded together to prevent potential difference. (less than 1 ohms)	
7	Lightning protection	
8	Junction box of ABB/ Hensel or Equivalent make	

9	3 Ph L&T/HPL make energy meter	
10	All govt permissions to be obtained by supplier	
11	Certificate for minimum guaranteed generation per year to be given.	
12	APPROVAL OF PROJECT FROM MNRE & RELEASE OF SUBSIDY AMOUNT AT THE EARLIEST is the responsibility of the tenderer. (pls state realistic time frame for receipt of subsidy)	
13	Excel sheet giving the ROI of the project	

3. SYSTEM DESCRIPTION

Solar Photo Voltaic (SPV) system shall consist of mainly the following:-

- 3.1 Solar panels
- 3.2 Module mounting structure
- 3.3 Junction boxes
- 3.4 Earthing System
- 3.5 Lightning Arrestors
- 3.6 Power conditioning unit string inverter
- 3.7 Export metering
- 3.8 Cable and other accessories

The PV array converts the light energy of the sun to DC power. The module mounting structure shall be used to hold module in position. The DC power shall be converted to AC to supply the electrical loads connected like computers, lights, fans etc. within the **E & F BLOCK BUILDING** premises. The system offered should be capable to export excess power to the grid in future, if required. At present Solar panels shall be integrated within the premises, LT power supply bus fed from electricity authority (PSPCL) / DG Set. DC distribution board shall be provided in between solar array and string Inverter. It shall have DC MCCB of suitable rating for connection and disconnection of array section. The string inverter (preferably of SMA make) shall have one common multi display meters for measuring the different string voltage and string current, Kw, KWh, 3 ph energy meter. AC distribution board shall be provided in between string inverter and loads depending on load.

No electrical storage batteries shall be required as electricity generated by the solar panels will be fed to supply building load.

SPV Module:

■ Individual Solar PV module should be of capacity not less than 250Wp confirming to IEC: 61215 Ed 2 or latest-Edition II, IEC 61701, IEC: 61730-I: 2007, IEC: 61730-II: 2007, UL 1703 certified, manufactured in India in a plant certified under ISO 9001: 2008 & ISO 14001 and also type tested by any one of the three accredited test laboratories under Ministry of New & Renewable Energy, Govt. of India. Solar PV module should be mono / polycrystalline Si solar cell of appropriate size and number so as to accommodate in the minimum space of Rooftop area.

■ SPV modules of similar output with not more than + 3% tolerance in single string shall be employed to avoid array mismatch losses.

■ The solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions.

■ Photo/electrical conversion efficiency of SPV module shall not be less than 15.4 % with only positive tolerance.

■ Fill factor of the module shall not be less than 72%.

■ Each module shall have low iron tempered glass front for strength & superior light transmission. It shall also have touch multi-layered polymer back sheet for environmental protection against moisture & provide high voltage electrical insulation. Transitivity of glass shall be not less than 91%.

■ Module junction box (weather resistant) shall be designed for long life outdoor operation in harsh environment.

■ The bird spike shall be provided to avoid bird sitting on the solar modules at the highest point of the array/module structure.

■ The PV modules shall be suitable for continuous outdoor use.

■ The bidder shall provide the sample solar PV module electrical characteristics including current-voltage (I-V) performance curves and temperature

■ Coefficients of power, voltage and current. However, the tabulated document with all the relevant data like voltage, current, power output for all the modules also to be provided.

■ The PV modules shall be equipped with bypass diode to minimize power drop caused by shade.

■ SPV module shall be highly reliable, light weight and shall have a service life of more than 25 years. SPV modules shall have a limited power loss of not more than 10% of nominal output at the end of 10 years and of not more than 20% of nominal output at the end of 25 years. The rated output of any supplied module shall not vary more than 3-5% from the average power rating of all ratings. Each modules, therefore, has to be tested and rating displayed. The yearly degradation should not be more than 01 % .

■ Whenever more than one module is required, identical modules shall be used.

■ The solar modules shall have suitable encapsulation & sealing arrangements, to protect the silicon cells from complete moisture proofing (IP 65) for the, entire life of solar modules.

■ The terminal box on the module should have a provision for opening for replacing the cable, if required.

■ The array structure shall be grounded properly using maintenance free earthing kit as per IS: 3043 – 1987, tested & certified by CPRI.

Module Mounting Structure:

The array structure shall be so designed that it will occupy minimum space without scarifying the output from SPV panels. The structure shall be designed to allow easy replacement of any module & the array structure should be fabricated out of hot dipped galvanized MS angles/ channel of suitable size. However the metallic portion exposed after cutting/ drilling may be treated with cold zinc paint to prevent rusting at those locations. The foundation for module mounting structure shall be preferably 1:2:4: RCC construction or any other combination based on the local site condition requirement for which design details shall be submitted.

■ The support structure design & foundation shall be designed to withstand windspeed upto 200 kmph.

- The clearance of the lowest part of the module structure & the developed ground level shall not be less than 500 mm.
- The module alignment & tilt angle shall be calculated to provide the maximum annual energy output. This shall be decided based on the location of array installation.
- All fasteners shall be of stainless steel of grade SS 304.
- The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS4759.
- Design drawing with material selected shall be submitted for prior approval of client.

JUNCTION BOXES :

■ The array junction boxes shall be dust, vermin & waterproof & made of FRP/ABS plastic. Each solar array shall be provided with fuses of adequate rating to protect the solar arrays from accidental short circuit.

■ MOVs shall be used at the terminals of array junction boxes for external over voltage protection.

■ The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming & outgoing cables.

■ Suitable markings are provided on the bus bar for easy identification & cable ferrules shall be fitted at the cable termination points for identification.

■ The array junction box should be preferably having maximum 08 inputs and 01 output with MOV and terminal block.

STRING INVERTER:

The string inverter should be provided to convert DC power produced by SPV modules, in to AC power. The string inverter should be grid interactive and also DG set interactive if necessary. Inverter output should be compatible with the grid frequency. Typical technical features of the inverter shall be as follows:

GRID TIED GRID TIE SYSTEM:

Sr. No.	Specification Input DC	15kW
1	Max DC power @ cosO= 1	15300 W
2	Max input voltage	1000 V
3	MPP voltage range /rated input voltage	320 -800 V /600 V
4	Min input v / initial input V	150 v/ 188 v
5	Max input current input A/ input B	22-25 A/ 10 to 15 A
6	No of independent MPP inputs / string per MPPT	2/A:4,B:1
	Specifications Output AC	
7	Rated power(@ 230 V ,50 Hz)	15000 W
8	Nominal AC voltage	3/N/PE;230/410V
9	Nominal AC voltage range	160-280 V
10	AC power freq / range	50 Hz +/- 2 Hz
11	Rated power freq/ rated grid voltage	50 Hz/230 V
12	Max output current	25 A
13	Power Factor at rated power	1
14	Ambient room temperature	5 to 55 deg C
15	Inverter efficiency(min)	>98 %
	Protection In built in string inverter	
16	DC disconnect/ ground fault monitoring/grid monitoring	
17	DC surgearrester type II	
18	DC reverse polarity protection/AC short cct capability	
19	All pole sensitive residual current monitoring unit	
20	Graphic display	DC, AC- A &V , Kw, KWH , all string features to be displayed

Protection-

Earthing Protection:

■ The array structure of the PV yard shall be grounded properly using adequate number of earthing kits. All metal casing / shielding of the plant shall be thoroughly grounded to ensure safety of the power plant

■ The Earthing for array and distribution system & Power plant equipment shall be made with GI pipe, 4.5 m long 10 mm diameter including accessories and providing masonry enclosures with cast iron cover plate having locking arrangement, water in pipe using charcoal or coke and salt as required as per provisions of IS:3043.

Necessary provision shall be made for bolted isolating joints of each Earthing pit for periodic checking of earth resistance

■ Each array structure of the SPV yard shall be grounded properly. The array structures and the lightning conductors are to be connected to earth through 25 mm X 5mm GI strip.

■ The string inverters /PCU and all equipment inside the control room to be connected to earth through 25 mm X 5mm tinned copper strip including supplying of material and soldering. As earth bus is provided inside the control room with 25 mm X 5mm tinned copper strip.

In compliance to Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.

Lightning Protection:

The SPV Power Plant shall be provided with lightning & over voltage 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.

Metal oxide variastors shall be provided inside the Array Junction Boxes. In addition suitable MOV's also shall be provided in the Inverter to protect the inverter from over voltage.

Cables and accessories

All the cables shall be supplied conforming to IEC 60189 / IS 694 / IS 1554 or IS / IEC 69947 shall be of 650 V/1.1 kV grade as per requirement. Only PVC copper cables shall be used. The size of the cables between array interconnections, array to junction boxes, junction box to PCU, PCU to ACDB etc shall be so selected to keep the voltage drop and losses to the minimum.

The bidder shall supply installation accessories, which are required to install and successfully commission the power plant.

Cables & Wiring

All cables to be supplied should be as per IEC 60189 / IS 694 / IS 1554 or IS / IEC 69947 and should have proper current carrying capacity. The cable shall be PVC insulated PVC sheathed copper conductor.

1. All wiring in the control room shall be carried out with minimum 4 sq. mm. PVC insulated copper flexible FRLS conductor in surface/recessed steel conduct in control room &

solar hut. All wiring shall be done with an appropriate size Cu conductor as earth wire. All wirings whether it is indoors or outdoors are to be casing capping system. As and when required flexible pipe may be used.

2. All cables and wires used shall be of copper conductors of suitable cross-section with cross linked polythene or polyvinyl insulated with polyvinyl sheath.

Stranded and flexible cable shall be used. Non-stranded cable shall not be acceptable expect otherwise mentioned and permitted. Buried underground cables shall be armored. Unarmored buried underground cable shall be enclosed with suitable conduits. Unless, otherwise, specified, all other interconnecting cables shall be armored.

3. Conductor size of cables and wires shall be selected based on efficient design criteria such that the overall electrical energy loss in any section of cable or wire is shall be less than 3% under the designed operating conditions. Conductor size of less than 4 sq. mm shall not be accepted.

4. Cable/wire connections shall be soldered, crimp-on type or split bolt type. Wire nut Connections shall not be used.

5. All cables shall be adequately supported. Outside of the terminals/panels / enclosures shall be protected by conduits. Cables shall be provided with dry type compression glands wherever they enter junction boxes/panels/enclosures.

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7. All cables shall be suited marked or coded for easy identification. Cables and wires shall conform to the relevant standards suppliers to specify the specification.

The wiring must be carried out in casing capping only

Distribution System-

1. Single line diagram of the AC Distribution line shall be attached along with general point wiring diagram of sample room with the Technical details.
2. Details of cable used for the distribution and transmission purpose along with their current carrying capacity and make shall be enclosed.

3. Supply installation of Energy meter from reputed company. The energy meter shall be tested by State Electricity Board (SEB) and sealed by SEB. Testing certificate shall be submitted

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 out going 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:

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

SCHEDULE OF PRICES
15 KW GRID CONNECTED ROOFTOP SOLAR PV PLANT

Ser .no	Description of Supplied items	Total Qty	TOTAL PRICE
1	LUMP SUM AND FIRM Ex-work prices for design, engineering, manufacture's works, supply, storage, delivery at site including packing, forwarding, transportation to site, erection, testing, commissioning, insurance during all stages ,05 yr warranty, for the 15KW grid connected solar PV plant on turnkey basis as defined in scope of technical Specifications		
2	Excise duty		
3	VAT / CST @ as applicable		
4	Installation charges		
5	Service tax		
6	Any other taxes and levies		
7	Transportation to site		
8	Transit / comprehensive insurance		
9	O & M charges for 05 yr including manpower, spare etc.		
10	TOTAL PAYABLE AMOUNT		
11	30 % MNRE SUBSIDY		
12	Extended warranty of 5 yr on expiry of the above		

SIGN OF TENDERER
WITH STAMP