



DELHI POLICE PUBLIC SCHOOL

B-4, SAFDARJUNG ENCLAVE, NEW DELHI-110029

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M/S _____

Ref. No.: DPPS/ 626

Date: 17/7/23

Subject: Design, Supply, installation, testing & commissioning of roof top Photo voltaic Solar power plant at Delhi Police Public School at Safdarjung Enclave, New Delhi.

Sir/Madam,

Your sealed quotations are invited from reputed and experienced contractors for design, supply, installation, testing & commissioning of roof top Photo voltaic solar power plant at Delhi Police Public School at Safdarjung Enclave, New Delhi for Delhi Police Public School, Safdarjung Enclave, New Delhi-110029. The detailed technical specification and terms & conditions etc. are as under:-

Sr. No.	Item Description	Unit	Qty.	Solar Plant Capacity (Kwp)
1	Design, Supply, Installation, Testing and Commissioning (DSITC) of Grid Connected Roof top mounted DC Solar PV-module-based power supply system of capacity with modules fixed in anodized aluminium / galvanised GI frame complete as required including elevated structural support systems for all components as per site conditions, including Grid Tie /modular inverters with at least 25% standby/spare capacity with required communication/ data/control/power cables , safety system for reverse power protection, min IP65 rated DC DB/ JB for connection of modules to inverters through DC copper cables of suitable size laid in HDPE pipes, meters, surge & lightning protection system, earthing of modules & structures as per specifications, LT/HT evacuation & injection at suitable injection point /evacuation point as per	Rs.	16 lakhs	

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<p>site conditions, etc. at solar power plant as well as at evacuation point as per MNRE guidelines . Auxiliary & Control Supply System, Data Logger System & web based Remote Monitoring System, etc. as per technical specifications. Approvals from DISCOMs & other statutory agencies, transportation material, etc. & any other items/accessories/services required for successful commissioning of solar power plant complete as required and as per technical specifications and other terms & conditions of the contract.</p> <p>*Note- The Amount/budget i.e. Rs.1600000/- (inclusive of GST) is fixed. Bidder bid maximum capacity of solar plant (in Kwp) within this budget.</p>			
Total installation Solar Plant Capacity (in Kwp)=			

The last date for submission of duly filled sealed quotation is 04.08.2023 upto 1.00 pm. The sealed quotation will be opened on same day at 1.30 pm in the school premises, in the presence of duly constituted committee and vendor/representatives of the vendor.

In case the due date is declared a holiday, quotation shall be opened on next working day at the given time. The quotation and other details are also available on school website (www.delhipolicepublicschool.com) for downloading.

For more information and clarification, kindly visit the school personally on working days between 9.00 am to 02.00 pm. Contact can also be made to 8130996770 and 7683071791 number or email id- dppscool@gmail.com.


Ruby Malhotra

(Head of School)

TECHNICAL SPECIFICATIONS

The electrical Installation work shall be carried out in accordance with IS (Indian standard Code) of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of DISCOM/CERC/SERC/MNRE regulations as applicable with up to date amendments.

The work in general shall be carried out as per following Specifications.

- a) IS / IE / IEC rules & Acts.
- b) DPPS Specifications as stipulated in tender document.
- c) CPWD General Specifications for electrical works.
- d) DISCOM/CERC/SERC/MNRE regulations.

Wherever these specifications call for a higher standard of material and or workmanship than those required by any of the above-mentioned regulations and specification then the specification hereunder shall take precedence over the said regulations and standards. The bidder is advised to visit the site for further details and required to quote accordingly.

Power Evacuation & Injection: - Power evacuation and injection shall be done at 415 V level or as per site conditions to the available suitable major power source/panel at site. The evacuation of particular site location shall preferably be done with the available capacity LT panel of that same site. Suitable capacity three phase energy meters along with all other accessories are to be provided for each site separately for metering of energy generation.

Before execution of work, agency has to submit the design of the proposed solar power plant along with layout, Single Line Diagram, make, model, rating etc. of equipment offered for entire solar system and get approved from Admin office/Estate officer.

Approvals- Approval/NOC from the Concerned DISCOM/CEA for the connectivity, technical feasibility, and synchronization of SPV plant with distribution network and submit the same to DPPS before commissioning of SPV plant.

Submission & obtaining the approval of electrical schematic of installation as well as power evacuation scheme for the approval of statutory authorities & respective DISCOMs as per the local law / by-laws at conceptual & commissioning level.

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

For Auxiliary power supply and control voltage required during the start-up and pre-commissioning stage etc, suitable size and rating, cables shall be laid in HDPE pipe/trench/wall from the nearest DPPS source to the Invertor/Power Conditioning Unit.

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Provision of required size & specifications of HDPE pipes/cable tray/PVC duct for laying of AC & DC Cables in solar farm yard, without any extra cost.

Design & providing of the civil foundations for outdoor installation/equipment/ switchgears as per site conditions.

Earthing and lightning protection as per CPWD / NBC specifications.

Solar PV System (Plant): A Grid Tied Solar Roof Top Mounted Photo Voltaic (SPV) power Source (Plant) shall consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, Controls & Protections, interconnecting 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 boxes, switches, PCUs etc., should conform to the latest BIS or IEC or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipment/components (but not limited to them);

- a) Solar PV modules consisting of required number of **Mono-PERC** type PV modules.
- b) Mounting structures
- c) DC Cables & Accessories, Junction Boxes, switching filters.
- d) String Monitoring Units (Monitoring for each string).
- e) Grid interactive Power Conditioning Unit with Remote Monitoring System & Invertors.
- f) Data logger System required hardware /accessories in control room for local monitoring.
- g) Sub-station equipment required for completion of work in all respects.
- h) LT Cables and accessories as per site requirements and design.
- i) Power Evacuation arrangements at voltage level mentioned as per TS - 5 approved solar system design and actual site requirement.
- j) Earthing and lightning protections for the complete plant.
- k) Pipes and accessories for laying of power Cables, communication cables and control cables as per design and site.
- l) Data Logger System as per the solar power system requirement.
- m) All works related to provision of net metering with respective DISCOMs (as per SERC norms) including supply & fixing of Net Meter, if required.
- n) Any other item(s) or work, which is not specifically mentioned but essentially required for completion of the work

1. SOLAR PHOTOVOLTAIC MODULES:

The Solar PV module comprises of PV cells connected in series combination to achieve the required module power output. PV cells directly produce DC power on receipt of solar irradiation. The PV cells in a module shall be protected by encapsulation between glass and back sheet. The glass shall

be made of high transitivity and front surface shall give high encapsulation gain.

The technical details of Solar PV Modules shall be as given below;

Sl. No.	Description	Details
1	Type of SPV Module	Mono-PERC or better as per present in market
2	Peak Power rating of Module	Shall not be less than 500Wp
3	Module Efficiency	Minimum 19.50% with temperature coefficient of Pmax better than -0.30% per degree Celsius Or 20% with temperature coefficient of Pmax equal to or better than -0.40% per degree Celsius
4	Fill Factor	0.75 (Minimum)

The Solar PV Modules should be Mono-PERC type of preferred make and suitable for grid connected type to be used. The PV modules used must qualify to the latest edition of IEC/BIS PV module qualification test or equivalent BIS standards Modules IEC 61215/IS14286/BIS. In addition, the modules must conform to IEC 61730 Part-1-requirements TS - 6 for construction & Part 2 - requirements for testing, safety qualification or equivalent IS with up to date amendments.

- i) PV modules shall be designed to be used in a highly corrosive atmosphere as per site conditions throughout its lifetime of 25 years and they must qualify to IEC 61701/IS 61701/BIS standard.
- ii) PV Modules shall not contain hazardous levels of environment toxic materials and should be salt mist corrosion proof.
- iii) The allocated space for each plot shall be used to generate the maximum solar energy by selecting the optimum capacity solar PV modules and should comprise of solar Mono-PERC modules of minimum 500 Wp and above wattage. Module capacity less than minimum 500 Wp shall not be accepted.
- iv) Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.
- v) PV modules must be tested and approved by one of the IEC/BIS/NABL/MNRE authorized test centres.
- vi) The module frame shall be made of corrosion resistant materials, preferably having anodized aluminium.

Material & performance warranty for Solar PV Modules:

a) Warranty of Solar PV Modules:

- i) **Performance Warranty:** The **Solar PV Modules warranty shall be for 25 (Twenty-Five) years.** PV modules used in the solar power plants / systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 12 years

- and 80% at the end of 25 years.
- ii) Material Warranty: The bidder should warrant solar Module(s) to be free from defects and or failures as specified below for a period not less than Two years (02) from the date of commissioning of the plant;
 - a. Defects or failures due to manufacturing
 - b. Defects or failures due to quality of materials
 - c. Non-conformity to specifications and requirements due to faulty design, manufacturing, inspection or installation process.
 - iii) If the solar modules fail to confirm to the above material warranty, the bidder shall repair or replace solar modules free of cost.

ARRAY STRUCTURE

- a) Hot dip galvanized GI mounting structures to be used for mounting the modules/ panels/arrays. Each structure should have angle of inclination as per the site conditions to take maximum insolation. However, to accommodate more capacity the angle inclination may be reduced until the plant meets the specified performance ratio requirements.
- b) The Mounting structure shall be so designed to withstand the wind velocity where a PV system is proposed to be installed. Suitable fastening arrangement such as grouting should be provided to secure the installation against the specific wind speed. The mounting structure and foundation etc. shall withstand design wind speeds.
- c) The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759. Minimum thickness of galvanization for hot dip galvanized sections is minimum 80 Microns.
Minimum height to be maintained at the lower level of the module shall be 500mm. The entire structure including the array shall be earthed to two independent earth electrodes and all earth electrodes shall be interconnected.
- d) Structural material shall be corrosion resistant and electrolytic ally compatible with the materials used in the module frame, its fasteners, and nuts & bolts. Necessary protection towards rusting needs to be provided either by coating or iodization.
- e) All fasteners used in the structure and module mounting shall be made of SS 304 grade and shall meet appropriate standards. The array structure shall be designed in such a way that it occupies minimum space without sacrificing the output from SPV panels.
- f) The structure shall be designed for easy replacement of any module considering other modules. Structural foundation shall be designed based on the structure investigation reports and the design calculations/ drawings shall be got approved.
- g) The structure shall be so designed that it facilitates easy maintenance and easy washing of the panels etc. as required.
- h) Regarding civil structures the bidder need to take care of the building structure and need to arrange suitable structures based on the

approved / vetted design. Agency shall make suitable size of PCC foundation or other suitable mounting arrangement as per the vetted design keeping in view of load requirement & wind speed of the area.

h) PCU/ Inverter:

As SPV arrays 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 of suitable capacity with modular construction (with minimum 25% spare capacity) 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:

PCU Mounting	As per design
Switching devices	IGBT/MOSFET
Control	Microprocessor /DSP
Nominal AC output voltage and frequency	As per OEM, 3 Phase, 50 Hz
Output Frequency	50 Hz
Grid Frequency Synchronization range	As per CEA / State Regulations
Ambient temperature considered	-20 deg C to 60 deg C
Humidity	95 % Non-condensing
Protection of Enclosure	IP-54(Minimum) for indoor. IP-65(Minimum) for outdoor.
No-load losses	Less than 1% of rated power
Inverter efficiency (minimum)	>93% (In case of in-built galvanic isolation) >97% (without inbuilt galvanic isolation)
THD	< 3%
PF	> 0.9
MPPT Voltage range (V) :	480 to 800
Capacity / wattage of String Inverter to be used(before procurement the agency should submit the technical data sheet and take the approval from AO)	As per OEM
Grid Voltage tolerance :	As per CEA / State Regulations

Maximum power point tracker (MPPT) shall be integrated in the PCU to

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maximize energy drawn from the Solar PV array. The MPPT voltage window shall be sufficient enough to accommodate the output voltage of the PV array at extreme temperatures prevailing at site.

The PCU output shall always follow the grid in terms of voltage and frequency. The operating voltage and frequency range of the PCU shall be sufficient enough to accommodate the allowable grid voltage and frequency variations.

The PCU/ inverters should be tested from the MNRE approved test centres/ NABL /BIS /IEC accredited testing-calibration laboratories.

INTEGRATION OF PV POWER WITH GRID:

The output power from SPV would be fed to the inverters which convert DC produced by SPV array to AC and feed it into the respective LT panel after synchronization to the required voltage. 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 and shall automatically synchronize after grid restoration.

EARTHING AND LIGHTING PROTECTION SYSTEM

Each array structure and modules of the PV yard shall be grounded properly as per NBC-2016/ CPWD specification. The material used for TS - 16 earthing shall be GI plate and strip.

All cables shall be laid in HDPE pipes or cable tray as per approved layout. For laying of cables under floor, concrete, on array structure HDPE pipe shall preferably be used.

Annual CUF Guarantee:

The Contractor guarantees the minimum 18% annual CUF committed herein over the Defect Liability Period ("Annual CUF Guarantee") from the date of Acceptance. In the event the CUF is less than the Guaranteed CUF of 18%, the Contractor shall immediately, upon demand, indemnify the Employer, as liquidated damages and not as penalty, amounts equivalent to remuneration of the equivalent Energy.

Capacity Utilization Factor (CUF) for Solar Plant shall be calculated for each individual site as per the following formula.

$$CUF = E_{ac} / \{8760 \times P_{ac} \times (1 - DF \times (N - 1)) \times RCF\}$$

where, Each is the number of units recorded in the plant end ABT meter excluding auxiliary consumption, kWh

8760 refers to the number of hours in non-leap year. It shall be replaced by 8784 hours during leap year P_{ac} is the plant AC capacity, kW

DF is module degradation factor, as per MNRE norms

N is the number of years of operation after operational acceptance of the plant

RCF is the Radiation Correction Factor:

$$RCF = \frac{dIrradiation}{ReferenceIrradiation}$$

Reference Irradiation for the site = Long Term Average Annual GHI (kWh/m²) at the site as per Solar GIS database.

Note:

CUF shall be calculated on annual basis from the date of operational acceptance of the plant till the end of defect liability period.

Module degradation factor will not be considered for first year CUF calculation. It is the Contactor's responsibility to envisage and install extra DC capacity to accommodate any degradation during first year.

Liquidated Damages for Shortfall in Annual CUF for Solar PV Plant

If the Contractor fails to achieve guaranteed annual CUF at the end of First Year, the Contractor shall pay compensation to the DPPS (amount to be deducted from the security deposit at the end of DLP), an amount equal to the NPV of the estimated shortfall in cash flow resulting over the period of 25 years due to reduced Plant CUF, calculated equivalent to monetary loss incurred.

Penalty:

Penalty during defect liability period against breakdown of other Infrastructure of Plant facilities that don't affect the generation of power directly, such as but not limited to civil infrastructure, water supply system/network, other Infrastructure developed by the Contractor under scope of said solar power plant work at the respective location, shall be penalized @ Rs. 250 per day for non-compliance with periodical Preventive Maintenance Schedule (Initiation/Completion of Scheduled maintenance Activity as agreed under this Contract) beyond 48 hours at the respective location. Cumulative value of such penalty shall be limited to Security deposit amount.

Performance Warranty for other equipment / accessories:

The mechanical structures, electrical works including power conditioners/ inverters/ charge controllers/ maximum power point tracker units/ distribution boards/ digital meters/ switch gear/ storage batteries, cables etc. and over all workmanship of the SPV power plants/ systems must be warranted against any manufacturing/ design / installation defects for a minimum guaranteed period of 02 years.

MAINTENANCE DURING DEFECT LIABILITY PERIOD:

The successful bidder shall provide maintenance of SPV Plant(s) along with grid connecting system for a period of Two (02) years from date of successful completion after trial run and commissioning of plant. During defect liability period, DPPS personnel shall have unrestricted entry to the solar plant any time. DPPS may suitably depute its personnel to associate with maintenance activities. All records of maintenance must be maintained by the contractor which can be accessed by DPPS on demand. The Contractor will be responsible for all the required activities at his own cost for the optimum energy generation etc. during the defect liability period by deputing required worker as and when required. The bidder shall be responsible for supply of all spare parts, repairs/ replacement of any defective equipment(s) at his own cost as required from time to time during the defect liability period.

The contractor shall be responsible for the maintenance of the entire Solar PV plant(s) during the defect liability period. The brief scope of works is listed below. The details shall be further elaborated by the bidder in the maintenance SOP to be submitted to DPPS for approval for ensuring successful operation of SPV Plant for optimum energy generation.

SYSTEM PERFORMANCE DURING DEFECT LIABILITY PERIOD:

The Contractor shall be required to maintain, ensure and evaluate the PR for the entire year during defect liability period as per the PR Test Method Specified. The Contractor shall be liable to pay liquidated damages to DPPS for loss in revenue due to lower generation and failure on the part of the contractor not able to maintain the plant to the required Performance Ratio. Monetary compensation shall be computed as the difference between the guaranteed value and actual value multiplied by the energy tariff at which DPPS procures the same from DISCOMs of respective states plus a penalty of 10% for the period of six months prior to the conducting the PR Test. Penalty will be charged if the evaluated PR at the end of each year falls below the stipulated values given in the above table. DPPS reserves the right to deduct such penalty from the retention amount of the Contractor or any other amount during the defect liability period. Decision of DPPS in this regard is final and binding on the part of the contractor.

The amount of solar power generation month-wise based on the installed capacity, required performance ratio, capacity utilization factor, Global Horizontal Irradiation/Insolation GHI (Month wise), Collector Plane Irradiation/Insolation CPI (Month wise) & other requirements as specified in the contract and industry norms etc (as being followed in MNRE & CERC guidelines etc) shall be worked out and will become the part of maintenance manual to meet the required targets and also base document for performance monitoring at all sites. The maintenance manual shall be prepared by the contractor before start of defect liability period.

Terms & Conditions: -

1. The words " Design, Supply, installation, testing & commissioning of roof top Photo voltaic Solar power plant at Delhi Police Public School at Safdarjung Enclave, New Delhi " of Delhi Police Public School, B-4, Safdarjung Enclave, New Delhi should be mentioned at the top of the envelope. The same should be addressed to, The Principal, Delhi Police Public School, Safdarjung Enclave, New Delhi-110029.
2. The bid received after scheduled time/date shall not be entertained.
3. Conditional bid will not be accept.
4. The rates mentioned in tender is including GST as applicable.
5. The Amount/budget i.e. Rs.1600000/- (inclusive of GST) is fixed. Bidder must bid maximum capacity of solar plant (in Kwp) within this budget.
6. 10% of final bill to be deducted as a security deposit for the DLP period and same to be released after successfully of DLP period.
7. The DLP period shall be 24 months (2 years).



8. The vendor must be registered with GST and registration certificate for the same must be attached with the bid.
9. No advance payment shall be made at any cost.
10. Payment shall be release only after satisfactory report of the committee appointed by the school.
11. The price quoted by the vendor should include the transportation as well as installation charges or any other hidden charges. Hence, it will be responsibility of the vendor to transport and install the glasses at his own cost. No extra payment shall be made to vendor in this regard.
12. The Technical Specifications and quality of the solar plant should be strictly according the tender requirement.
13. The solar plant shall be done as per mentioned technical specification in this tender.
14. The school management or purchase committee reserves the right to reject any quotation without assigning reason.
15. Details of tender are also available on school's website www.delhipolicepublicschool.com.
16. In case of any dispute, decision of the school authority shall be final and binding.
17. The vendor must abide by all the terms and conditions of the school strictly.
18. No payment shall be made, if the work is not as per the specification or satisfactorily.
19. In case of the clashing of the power plant capacity/bid, company having the highest Term over shall be given preference. If there is further clash decision of the tender committed shall be final. Tender committee may award tender to any contractor, taking into consideration the experience, quality of work etc.
20. All disputes are subjected Delhi jurisdiction.

CHECKLIST

INTRESTED BIDDERS ARE REQUESTED TO SUBMIT THE QUOTATIONS ALONG WITH THE FOLLOWING DOCUMENTS IN A SEALED ENVELEOPE AND DOCUMENTS SHOULD BE PROPERLY PAGINATED:

- A. COMPANY PROFILE.
- B. GST REGISTRATION CERTIFICATE.
- C. PAST WORK/EXPERIENCE WITH ANY INSTITUTION OR AUTHORITY.
- D. COPY OF TERMS AND CONDITIONS DULY SIGNED WITH THE SEAL OF THE FIRM, AS A TOKEN OF ACCEPTANCE OF TERMS

AND CONDITIONS.

- E. CERTIFICATE OF NO BLACK LISTING/CRIMINAL CASE ETC.
- F. QUOTATION SHALL CONTAIN CAPACITY OF PLANT (Kwp) CLEARLY MENTIONED AND SUBMITTED IN THE SEPARATE ENVELOPE.

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