MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

RE- QUOTATION CALL FOR

SUPPLY, ERECTION, TESTING AND COMMISSIONING INCLUDING FIVE YEARS INSURANCE AND COMPREHENSIVE OPERATION AND MAINTENANCE OF 02 KW OFF-GRID ROOF TOP SOLAR POWER PLANT, AT VIDHYA MANDIR HASNE – DHANGARWADA , G.P. HASNE, TAL.RADHANAGARI, DIST. KOLHAPUR.

Quotation Ref. No: DOK/Technical/Desk -1/2023-24/VMHR

DIVISIONAL OFFICE

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

MAHARASHTRA, KOLHAPUR

(A Government of Maharashtra Institution)

Address: **C.S.NO.249/A–1/55, E WARD, MHADA COMPLEX, NAGALA PARK,**

NEAR ZILLA PARISHAD, KOLHAPUR-416003 (M.S)

Contact No. **0231-2680009,**

Email: **medakolhapur@mahaurja.com**

Website (for Tender): **https://mahatenders.gov.in**

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

RE- Quotation Call

Sub: Supply, Installation, Testing & Commissioning of Total 02 KW Off-Grid Roof Top Solar Power Plant, at Vidhya Mandir Hasne – Dhangarwada , G.P. Hasne, Tal.Radhanagari, Dist. Kolhapur – Invitation to Quote

With reference to subject matter, we would like to invite your quotes in sealed condition for undertaking the work with given technical specifications and technical standards with following terms and conditions –

- **Details and Dates: -**

<table>
<tr><td rowspan="2">1</td><td rowspan="2">System details</td><td>Type of System</td><td>Name of Site</td><td>Project Capacity</td></tr>
<tr><td>Off-Grid</td><td>Vidhya Mandir Hasne - Dhangarwada</td><td>02 Kwp</td></tr>
<tr><td>2</td><td colspan="2">Estimated Cost</td><td colspan="2">3,00,466/- (Inclusive of all taxes and charges)</td></tr>
<tr><td>3</td><td colspan="2">Date and time for submission of quotations.</td><td colspan="2">From 30/01/2024; 10:00 Hrs to 05/02/2024 18:00 Hrs</td></tr>
<tr><td>4</td><td colspan="2">Date and time for opening of quotations.</td><td colspan="2">06/02/2024; 10:00 Hrs</td></tr>
<tr><td>5</td><td colspan="2">Security Deposit</td><td colspan="2">10,000/- (to be deposited by online mode in favor of Maharashtra Energy Development Agency, Kolhapur)</td></tr>
<tr><td>6</td><td colspan="2">Address for communication and for quotation opening</td><td colspan="2">Maharashtra Energy Development Agency, Divisional Office Kolhapur SR.No. 249/A-1/55, E Ward, MHADA complex, Nagala Park, Near Zilla Parishad, Kolhapur-416003</td></tr>
<tr><td>7</td><td colspan="2">Site location</td><td colspan="2">• Vidhya Mandir Hasne , Tal.Radhanagari, Dist. Kolhapur</td></tr>
</table>

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

1. ELIGIBILITY CRITERIA –

The manufacturer/supplier shall be eligible to quote for this work provided fulfilment of following.

1. Shall have a registered firm/company with GST registration within Kolhapur division.
2. Shall provide brief information in prescribed format (enclosed).
3. Shall not be black listed in any govt and/or other organizations.
4. Shall provide documentary proof about having experience of supply, installation and commissioning of minimum 05 KW of SPV Solar Power Plants.
5. Shall have an annual average turnover of Rs. 10 lakh per year for FY 2022-23 duly certified by chartered accountant.
6. Shall provide self-attested copy of IT returns for FY 2022-23 (Assessment year 2023-24)
7. Shall have arrangement of providing after sales service in area of installation of systems.
8. Start-Up's Entrepreneur/Enterprises are eligible for the Exemption in Work Experience and Annual Turn Over as per govt. terms.
9. Start-ups who are participating in this tender and seeking exemptions of Work Experience and Annual Turn Over, should have registered Electrical Contractor licence and shall submit the valid registration certificate.

2. TERMS AND CONDITIONS –

1) Location for installation of Solar Power Plants and battery bank shall be assigned immediately by the user agency to the selected manufacturer/supplier to get the work done in stipulated time.
2) The installation of Solar Power Plant should be done in excellent manner and meet technical standards prescribed by the MEDA.
3) As per the technical criteria set by the Ministry of New and Renewable Energy, Govt. of India the solar modules should fulfill the IEC standards and shall be procured from manufacturer providing module with RFID tag.
4) The manufacturer/supplier shall provide valid test certificate of inverter from govt. approved test centers.
5) The manufacturer/supplier shall provide Solar Modules from the approved Manufacturers which are enlist in MNRE's ALMM list.
6) If the Solar Power Plant does not function as per given standards then the loss incurred shall be borne by the supplier and paid to Vidhya Mandir Hasne- Dhangarwada , Tal.Radhanagari, Dist. Kolhapur.
7) If contractor fails to complete the work then Security Deposit will be forfeited and contractor shall be blacklisted.
8) Supplier shall give training of system operation to a person duly nominated by user agency and same shall be informed to divisional office Kolhapur.

9) The Contractor / Agency should successfully complete the project within timeframe set out by the MEDA. For this purpose, contractor/Supplier shall provide Activity Bar Chart within a week time after issue of Work Order.

10) The manufacturer/supplier shall provide the user manual, warranty card to the user agency and copy of same shall be provide to MEDA Kolhapur.

11) The manufacturer/supplier shall visit the site and ensure scope of work before submission of quote against the enquiry. In this context, the manufacturer/supplier should submit the Site Visit Report in given prescribed format along with this quote.

12) The work being of limited nature and to seek prompt after sales service the manufacturer/supplier within Kolhapur/Sangli District will be preferred while allotting the work against the invited quotes. Required documentary proof in this matter need to be submitted by concerned manufacturer/supplier along with quote.

13) The Contractor shall provide the detailed information about Company/firm in attached Format (Contractor's Information sheet)

14) ***The manufacturer/supplier shall submit their quotations in two different sealed envelopes i.e. First envelop shall contains documents a per the technical eligibility criteria and Second envelop shall contain Financial details (quoted rate)***.

15) The manufacturer/supplier should mention the subject on each sealed envelope i.e Technical Envelop and Financial Envelop.

16) The financial envelop of technically qualified manufacturer/suppliers will only be opened.

3. INSURANCE:

1. The manufacturer/supplier shall provide insurance coverage ex-factory until commissioning of project and acceptance for replacement or repair of any part of the consignment due to Natural calamity, theft, damage, fire, burglary.
2. It is the responsibility of successful manufacturer/supplier to drawn the insurance of SPV system in the name of MEDA Kolhapur on behalf of user agency (name of the user agency to be mentioned in insurance policy) from the date of commissioning up to 05 Years period covering the natural calamity, theft, burglary, fire and damage of project. The Successful manufacturer/supplier should pay the necessary insurance premium for the said project.
3. A letter from the insurance company mentioning their inability to provide continuous 05 years of insurance shall be submitted by the manufacturer/supplier, in case one year of insurance is submitted against the work order. In such case, the successful manufacturer/supplier has to ensure that the successive insurance is drawn before the expiry of each insurance.
4. Any complaint registered due to Natural calamity, theft, damage, fire, burglary by user agency shall be attended by the manufacturer/supplier and claims be settled with insurance company accordingly.
5. ***In case of any loss encountered by the project due to natural calamities, theft, burglary, fire and damage etc. the manufacturer/supplier shall be responsible for filing the insurance claim with the respective insurance company and ensure to get compensation for loss in the project equipment***.

4. COMPREHENSIVE MAINTENANCE CONTRACT (CMC)

1. The complete and commissioned Off Grid Solar PV Power Plant must be guaranteed against any manufacturing/ design/ installation defects for a minimum period of 5 years.
2. PV modules used in Solar PV Power Plant must be guaranteed 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.
3. During the CMC period, MEDA will have all the rights to cross check the performance of the Solar PV Power Plant. MEDA may carry out the frequent inspections of the Solar PV Power Plant installed. If during such inspection if any part is not found as per the specified technical parameters, MEDA will take the necessary action. The decision of MEDA in this regard will be final and binding on the manufacturer/supplier.
4. Successful manufacturer/supplier shall have to provide office address and name of technical person with contact who is operating in Kolhapur district/division for timely maintenance of SPV system.
5. During the CMC period, timely cleaning of SPV panels (once in fortnight) of system shall be responsibility of user agency.
6. Whole responsibility about timely recharge of the SIM of RMS system shall be with the user agency.
7. After site visit manufacturer/supplier shall submit plant visit report to MEDA duly certified by authorized person of the concern user agency.
8. If any problem occurs in working of SPV System or its estimated energy saving is not getting achieved then Successful manufacturer/supplier shall attend the system and rectify the problem immediately.
9. After the completion of the CMC period (after 05 Years) User Agency will completely responsible for maintenance and repair etc. of the system.
10. In case if Contractor/ Supplier fail to provide service during the CMC period, the Performance Bank Guarantee and Security Deposit shall be forfeited and Contractor/ Supplier shall be blacklisted.

5. TERMS OF PAYMENT:

A. 80% of the total cost will be released after successful installation and commissioning of the system duly certified by manufacturer/supplier, Officer of MEDA & authorized person of User Agency along with submission of Joint Inspection Report ,Photos, Tax Invoice, one week energy generation report ,Insurance policy documents (covering Natural calamity, damage, fire, burglary) effective from date of commissioning up to the CMC period i.e. upto 5 Years, Warranty Cards,Manuals,List of Solar Modules numbers,Test Reports, undertaking of CMC for 5 years from date of commissioning of project and receipt of stamp duty paid to Stamp Collector, Kolhapur.

B. 20% of the total cost shall be released on receipt of two month successful performance report generated automatically through Remote Monitoring System (RMS) or manually which should be duly certified by manufacturer/supplier,

Officer of MEDA & authorized person of User Agency and submission of performance bank guarantee of 10 % of total project cost from any Nationalized/Scheduled Commercial Bank valid for period of 5 years from date of commissioning of project.

6. **DEDUCTION:**-

i. The TDS at the source will be deducted as per the Govt. rule and regulations.

ii. MEDA will issue necessary certificates of TDS deduction.

iii. C' / 'D' form will not be issued by MEDA.

7. BILLS TO BE ON PRINTED FORM (TAX INVOICE) :

- Contractor/Supplier/Installer shall submit the Tax Invoice in terms of the 70:30 ratio for basic amount i.e. 70% for goods and 30% for services, respectively by adding applicable GSD on renewable energy projects (i.e. 12% GST on Goods and 18% GST on Services).
- Contractor/Supplier/Installer shall submit the two separate Tax Invoices of 80% and 20% amount while releasing the 80% and 20% payment respectively(Do not submit the Tax Invoice of 100% amount while releasing the first stage 80% payment).

8. SECURITY DEPOSIT –

i. A sum of **10,000 /-** shall be deposited by the selected manufacturer/supplier as security deposit by online mode in favor of 'Maharashtra Energy Development Agency, Kolhapur on or before issuing of Work Order.

ii. If the contractor fails to execute the work in given time or terminates the order prematurely then the security deposit will be forfeited and contractor shall be blacklisted and no excuses will be entertained.

iii. The security deposit will be returned to the contractor without interest after successful commissioning (i.e. all work is completed as per terms and conditions of work order) of system and receipt of two month successful performance report duly signed by user agency, MEDA official and representative of the contractor.

9. PENALTY –

- A penalty of 1/2% of the total project cost shall be imposed on the contractor against a delay of one week in project completion subject to a maximum of up to 10% of the total project cost. In case the penalty exceeds 10% of the total project cost, the given order will be canceled & the security deposit will be forfeited and the Contractor/ Supplier shall be blacklisted.

10. TIME FRAME:

- The successful Manufacturer/supplier will be required to commission the project within 45 Days from the date of issue of work order.

11. **EXTENSION** :

- If project is not commissioned within the given time frame due to any inevitable reasons then contractor shall seek the time extension for the project at least 07 Days in advance before expiry of project completion period (45 Days) by giving satisfactory reasons for same. **However if the time extension is not taken before the project**

completion period then the penalty clause of work order shall be effective till the request is applied for the extension with MEDA.

12. STAMP DUTY :

- The successful bidder has to pay the applicable stamp duty as per Maharashtra Stamp Act clause 10. D. (1) to the Stamp Collector Kolhapur against this work contract and the receipt of same has to be produced along with the first payment invoice to our office.

13. SITE VISIT :

The bidder should visit the site & carryout the survey along with officials of user agency (as mentioned in scope of work) and upload the duly completed site visit report along with photographs (with Lat. And Long.) indicating that the survey is carried by the bidder as per given formate**.**

14. CHECK LIST OF DOCUMENTS TO BE FURNISHED WITH QUOTATION –

- PAN and GST Details.
- Copy of IT Returns.
- Declaration on company letter head.
- Contractors Information Sheet.
- Annual Turnover Certificate.
- Work Experience Details.
- Site Visit Report.(in format)

We look ahead to seek your sealed quotation on or before 11/09/2023 till 18 Hrs.

Thanking you,

Sd/-

Divisional General Manager

MEDA, Divisional Office,

Kolhapur

Encl. :-

1. Contractor Information Sheet.
2. Declaration Format.
3. Annual Turn Over certificate format.
4. Site Survey Form.
5. Technical Specifications of Grid Connected and Off –Grid Solar System.

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

CONTRACTOR'S INFORMATION

Sr.No	Particulars	
1	Name of Firm	
2	Details of Mailing Address	
3	Firm Status (PSU/Incorporate/Ltd/Pvt.Ltd/LLP/Partnership/Proprietory)	
4	Name & Designation Of Contact Person	
5	Contact No.	
6	E-mail Address for correspondence	
7	Firm website Address	
8	Firm registration No/ROC Establish Year of firm	
9	PAN No.	
10	GST No.	
11	Turnover (in Rs.) for FY 2021-22 and 2022-23	
12	Skilled manpower	
13	*Experience in SPV Power Pack (On-Grid) in Kwp	
14	*Experience in SPV Power Pack (Off-Grid) in Kwp	

Authorised Sign and Stamp

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

DECLARATION

(On company's letter head)

To,

Divisional General Manager,
Divisional Office Kolhapur
Maharashtra Energy Development Agency
(A Government of Maharashtra Institution)
Address: C. S. No. 249/A – 1/55, E Ward, Mhada Complex, Nagala Park, Near Zilla Parishad, Kolhapur - 416003

Respected Sir/Madam,

1. We have carefully read and understood all the terms and conditions of the quotation and hereby convey our acceptance to the same.
2. The information / documents furnished along with our offer are true and authentic to the best of my knowledge and belief, We are well aware of the fact that furnishing of any false information/ fabricated document would lead to rejection of our quotation at any stage besides liabilities towards prosecution under appropriate law.
3. We have apprised our self fully about the job to be done during the currency of the period of agreement and also acknowledge bearing consequences to of non-performance or deficiencies in the services on our part.
4. We have no objection, if enquiries are made about the work listed by us.
5. We have not been barred or blacklisted by any Government Agency / Department/ PSU or any such competent Government authority, organization where we have worked. Further, if any of the partners/directors of the organization /firm is blacklisted or having any criminal case against them, our quote shall not be considered. At any later point of time, if this information is found to be false, Divisional General Manager, Divisional Office Kolhapur, Maharashtra Energy Development Agency, may terminate the assigned contract immediately.
6. We have not been found guilty by a court of law in India for fraud, dishonesty or moral turpitude.
7. We agree that the decision of Divisional General Manager, MEDA, Divisional Office Kolhapur, in selection of quotation and shall final and binding to us.

For
(Company Name)

Name of signing authority / Designation / Place / Date

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

Annual Turnover

Each Contractor must fill in this form including private/public limited company.

- **Annual Turnover Data for the FY 2021-21,2022-23**
- **Name of Company :**

Year	**Rs in Lacs**
2021-22	
2022-23	

The information supplied should be the Annual Turnover of the Contractor in terms of the amounts billed to clients for each year for work in progress or completed.

Signature of Applicant

Certified by Applicant's Auditor

(Affix Stamp)

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

SITE VISIT REPORT

(To be submitted on letterhead of contractor)

Date:

_____

To,
The Divisional General Manager,
Divisional Office Kolhapur,
Maharashtra Energy Development Agency
(A Government of Maharashtra Institution)
Address: C. S. No. 249/A – 1/55, E Ward, Mhada Complex, Nagala Park, Near Zilla Parishad, Kolhapur – 416003.

Sub. : Site Visit Report for Installation and Commissioning of 2 Kwp SPV Off Grid Roof Top Solar Power Plant at Vidhya Mandir Hasne , Tal.Radhanagari, Dist. Kolhapur**.**

Ref.: Quotation Call No. ……Date:

Sir,

This has reference to above referred quotation call for Installation and Commissioning of total 02 Kw. capacity SPV Off Grid Roof Top Solar Power Plant at Vidhya Mandir Hasne , Tal.Radhanagari, Dist. Kolhapur in state of Maharashtra.

I / We hereby declare that we have visited the site.

I / We have made my ourselves acquainted with site conditions, approach to site, requirement

of area, availability of water, requirement of quotation conditions etc.

I / We have verified all details required to execute the project.

I / We have no problems in undertaking the project and complete them in the given time period.

Thanking you

Yours faithfully,
(Signature of Contractor)
Name of Contractor ----------
Designation ----------
Seal:

Signature of User Agency authorities.
Seal:.....

MAHARASHTRA ENERGY DEVELOPMENT AGENCY, KOLHAPUR

TECHNICAL SPECIFICATIONS

(Roof Top Off-Grid SPV Power Plant (02 Kwp Off-grid):

1. SOLAR PHOTOVOLTAIC MODULES:-

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

b. 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.

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

d. The total solar PV array capacity should not be less than 02 Kwp respectively, should comprise of solar crystalline modules of minimum 250 Wp and above wattage. Adequate protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.

e. PV modules must be tested and approved by one of the IEC authorized test centers.

f. The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.

g. Other general requirement for the PV modules and subsystems shall be the Following:

h. The rated output power of any supplied module shall have tolerance within +/-3%.

i. 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.

j. 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

2. PV MODULES:

a. The PV modules must conform to the latest edition of any of the following / equivalent BIS Standards for PV module design qualification and type approval:
   • Crystalline Silicon Terrestrial PV Modules IEC 61215 / IS14286

b. In addition, the modules must conform to IEC 61730 Part 1-requirements for construction & Part 2 - requirements for testing, for safety qualification.

c. Identification and Traceability:
   Each PV module must use a RF identification tag (RFID), which must contain the following information:

   (i) Name of the manufacturer of PV Module
   (ii) Name of the Manufacturer of Solar cells
   (iii) Month and year of the manufacture (separately for solar cells and module)

(iv) Country of origin (separately for solar cells and module)
(v) I-V curve for the module
(vi) Peak Wattage, Im, Vm and FF for the module
(vii) Unique Serial No and Model No of the module
(viii) Date and year of obtaining IEC PV module qualification certificate
(ix) Name of the test lab issuing IEC certificate
(x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.

It may be noted that from 1st April 2013 onwards; RFID shall be mandatory placed inside the module laminate

3. BATTERY BANK:

- The batteries shall be solar photovoltaic batteries of LiFePO4 type and made of hard rubber container.
- Storage batteries should conform IEC 61427 / IS 1651 / IS 13369 as per specifications.
- The batteries shall use 12V and battery capacity is to be designed at C/10 rate with end cell cut off voltage of 1.85 V per cell.
- Battery terminal shall be provided with covers.
- Batteries shall be provided with micro porous vent plugs with floats.
- Charging instructions shall be provided along with the batteries.
- Suitable carrying handle shall be provided.
- A suitable battery rack with interconnections & end connector shall be provided to suitably house the batteries in the bank.
- The batteries shall be suitable for recharging by means of solar modules via incremental / open circuit regulators.
- Manufacturer/supplier shall mention the design cycle life of batteries at 80%, 10% and 20% depth of discharge at 27 deg. C.
- The batteries shall be designed for operating in ambient temperature of site .
- The self discharge of batteries shall be less than 3 % per month at 20 deg. C and less than 6% per month at 30 deg. C
- The charge efficiency shall be more than 90% up to 70% state of charge.
- The topping up frequency shall be 12 – 18 months.
- The batteries shall consist of individual cells, which can be carried separately with ease while transporting.
- Offered batteries shall comply to the following:
- 10 % of DOD: 7200 cycles
- 50 % of DOD: 3000 cycles
- 80 % of DOD: 1500 cycles
- The Battery Bank shall be designed to provide Min. 6 Hrs backup. Manufacturer/supplier to provide battery sizing details along with their offer. The distance between two batteries may be kept 6 inches & vice versa.
- There will be one battery bank comprising of capacity 24 V/300 Ah or 48 V/ 150 Ah for 02 kWp SPV Power Plant SPV Power Plant. The batteries should be of LiFePO4 type and shall have long service life. The cells should confirm IEC 61427 / IS 1651 / IS 13369 and as per specification given below shall be provided.Battery protection panel

- The battery protection panel shall be made of CRCA sheet having two incoming and two outgoing terminals. There shall be 2 Nos. HRC fuses of suitable rating with fuse holder/base etc as required. 2 poles MCB/ MCCB can also be used for isolation purpose in stead of fuses, if required.

Container	Polypropylene Co-polymer / hard rubbers with carrying handle.
Cover	Protective cover of polypropylenes against dirt & possible short circuit.
Terminals	Made of lead alloy suitable for bolted connection. The terminals should be greased with petroleum gel.
Electrolyte	Battery grade Sulphuric acid
Self Discharge	Less than 3% per month at 20 degree C
Life expectancy	1500 cycle duty at 27degree C at 80% DOD 3000 cycle duty at 50% DOD
Voltage	12 Volt
Approval	Batteries shall have to be approved by ERTL or CPRI or SEC or any MNRE approved test centres
Service Life	Should perform satisfactory for a minimum period of 5 year under operating conditions as mentioned.

4. BALANCE OF SYSTEM (BoS) ITEMS/ COMPONENTS:

Details of Power Conditioning Units:

a. General:

As SPV array produce direct current. It is necessary to convert this direct current into alternating current and adjust the voltage levels before powering equipment designed for nominal mains AC supply. 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” OR simply PCU. In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to maximize Solar PV array energy input into the System. PCU should conform IEC 61683, IEC 60068 as per specifications.

PCU refers to combination of charge controller, inverter and AC charger and shall be supplied as integrated unit or separate units.

Power Conditioning Unit (Solar Charge Controller + Inverter)	
Switching device	MOSFET/IGBT
Type	MPPT based PWM charger to charge battery bank

Input voltage from PV array	90 V DC for 02 kWp unit (The voltage variation shall be as per change in array output)
Protections	Short circuit protection Input under voltage / Deep discharge of battery Input surge voltage protection Over current Battery reverse polarity protection Solar array reverse blocking diode (provided in array junction box) DC rated fuse at input and AC rated fuse at output with suitable contactor/solid-state switches for safe start-up & shutdown of system Load surge current Over temperature Under / Over output voltage Under / Over frequency Automatic / manual isolation at input & output Suitable protection for solid-state switching devices
Dielectric strength	1.1kV between input/output and ground with EMI protections removed
Cooling	Solar natural and Forced air cooling with temperature sensitive fan operation
Ambient operation (max)	50° C
Relative humidity	95% maximum
Assembly & mounting	As per normal industry practice
Finish	Epoxy powder coating
Cable entry	From rear 200mm above ground level
Load test at factory	Minimum 6 hours at full load
Features	Stand-alone and hybrid mode of operation. High quality with high efficiency and reliability Microprocessor based intelligent controller Self monitoring capability. Integral design with MPPT solar charge controller and inverter Highly reliable & efficient solid-state switching devices Rated for continuous operation at full load High over-load capability of 200% surge for 10 seconds Inverter output power factor of 0.8 lag Automatic re-start facility after over load triggered shutdown
Efficiency	90% at rated load and normal operating conditions 85% (min) at 25% load and nominal input voltage with UPF load
%THD	Sine-wave output with 3% THD at full load UPF and nominal input voltage
Output voltage	230 (+12.5-20%)V AC
Output frequency	50Hz $\pm$ 0.5Hz

%Regulation	5% against input voltage and load variation
Indications	As many as possible with relevance
AC charger input	240 V AC, 50 Hz from AC mains grid
Enclosure	IP 22 (For indoor application)
Weight / Dimension	The details of the inverter will be provided in the specification / user manual
Battery type	LiFePO4 type

b. Maximum Power Point Tracker (MPPT)

Maximum power point tracker shall be integrated into the PCU to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor / micro-controller based to minimize power losses. The details of working mechanism of MPPT shall be mentioned.

The efficiency of the Charge controller (MPPT based with data logger) shall not be less than 94% and shall be suitably designed to meet array capacity.

MPPT must conform IEC 62093, IEC 60068 as per specifications.

c. Inverter

i. Inverters shall be of very high quality having high efficiency and shall be completely compatible with the charge controller and distribution panel.

ii. Inverter should conform IEC 61683, IEC 60068 as per specifications.

iii. The inverter shall be designed for continuous, reliable power supply as per specifications. The inverter shall have high conversion efficiency from 25 percent load to the full rated load. The efficiency of the inverter shall be more than 90% at full load and more than 88% at partial load (50%-75%). The supplier shall specify the conversion efficiency in the offer.

iv. The inverter shall be designed for extreme temperatures.

v. The Inverter shall have internal protection arrangement against any sustained fault in the feeder.

vi. The dimension, weight, foundation details etc. of the inverter shall be clearly indicated in the detailed technical specification.

vii. Each solid-state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter.

viii. Supplier shall indicate tripping voltage & start up voltage for the inverters & this should be perfectly matched with the recommendation of battery manufacturers.

ix. The PCU shall be mounted on a suitable reinforced concrete pad inside control room not susceptible to inundation by water. All cable entry to and from the PCU shall be fully sheathed to prevent access of rodents, termites or other insects into the PCU from bottom/top of the PCU in form of a detachable gland plate.

x. For the Monitoring of Unit generated provision of Ah meters at input side shall be accomplished with Energy meter and voltmeters at suitable place and included in the technical specification clearly.

xi. Provision for the Equalizing Charging of battery periodically shall be made and state clearly in the technical details.

xii. The manufacturer/supplier shall furnish details of proper operation, maintenance and troubleshooting details to MEDA.

xiii. The inverter will be highly efficient. The inverter should conform IEC 61683 / IEC 60068 and should be based on PWM technology and using IGBT. Inverters would display its own parameters and also the parameters of battery bank connected to the inverter. The inverter's capacity should be minimum 2 KVA for 2 KW SPV power plants. The inverters should be designed to be completely compatible with the charge controllers and distribution panels and are of integrated design.

xiv. Salient features of the Inverters shall be as follows:

Nominal Capacity	02 KVA minimum (for 02 kWp capacity)
Input / Voltage	150 V DC Nominal (for both SPV Plants) The voltage variation shall be as per change in array output.
Regulation	From minimum to maximum voltage 1%
Output frequency	50 Hz +/- 0.5 Hz
Overload Capacity	200% for 30 Second.
Efficiency	80% at 50% of load and More than 92% at full load 0.8 PF
Short Circuit Protection	Circuit Breaker and Electronics protection against sustained fault.
Low Battery Voltage	Automatic Shut Down
Total Harmonic Distortion	Less than 3%
Over Voltage	Automatic Shut Down
AC over Current/Load	Automatic Shut Down
Protection	Over Voltage both at Input & Output Over Current both at Input & Output Over Frequency Surge voltage inducted at output due to external source.
Protection Degree	IP65
Instrumentation & Indication	Input & Output voltage, Input & Output Current, Frequency, Power output, different status of inverter, kind of fault by audio signal.

d. Junction Boxes

The junction boxes shall be dust, vermin and waterproof and made of FRP / Thermo Plastic. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the

cable termination points for identification. Each main junction box shall be fitted with appropriate rating blocking diode. The junction boxes shall be of reputed make and should be as per IP 65 (for outdoor), IP 21 (for indoor) & as per IEC 62208.

The junction boxes shall have suitable arrangement for the Following:

Combine groups of modules into independent charging sub-arrays that shall be wired to the controller.

Provide arrangement for disconnection for each of the groups.

Provide a test point for each sub-group for quick fault location.

To provide group array isolation.

The rating of the JB's shall be suitable with adequate safety factor to inter connect the Solar PV array.

e. Charge Controller Unit:

- The Charge Controller shall be dual input type; however the input is fed from a SPV panel only for battery charging. A selector switch shall be provided for choosing between those modes. The charge controller shall be preferably PWM type employing IGBT switching elements.
- Charge controller should conform IEC 62093 / IEC 60068 as per specification.
- The charging sequence from SPV array or external AC source shall be as follows:
- Salient features of the Charge Controller shall be as follows:
- Switching elements IGBT
- Type of Charger: PWM
- Input :From PV 02 KWp 90V nominal DC from Solar PV array
- Output Voltage: Suitable for charging 24 V/300Ah or 48 V/150 Ah for 2 kWp SPV array.
- Protections : Short Circuit, Deep Discharge, Input Surge Voltage, Over Current (load), Battery Reverse Polarity, Solar array reverse polarity.
- Indication : String 'ON', Main 'ON', Charging 'ON', 80% Charged, 100% Charged, Charger Overload, Battery On Trickle.
- Battery disconnected / Fault Battery Reverse Polarity, Low Solar Power, System Fault and Charger over Temperature and Input Over / Under Voltage (for AC).
- MIMIC Diagram : To indicate power flow and operation of the charge controller/ battery charger; shall have provision for visual indications of existing power input/output through MIMIC diagram.
- Manufacturer/supplier may design Power Conditioning Unit (PCU), which consists of a solar charge controller & inverter as per design mentioned above. In addition, it should have a Grid Charger.
- It provides the facility to charge the battery bank through Solar only. The PCU continuously monitors the state of Battery Voltage, Solar Power output and the loads. Due to sustained usage of power, when the Battery Voltage falls below a preset level, the PCU will automatically transfer the load to the grid power.

f. Cables & Wirings:

a. All cables shall be supplied conforming to IEC 60227/ IS 694 & IEC 60502/ IS 1554. Voltage rating: 1,100V AC, 1,500V DC.

b. For the DC cabling, Solar Cables, XLPE or XLPO insulated and sheathed, UV stabilised single core flexible copper cables shall be used. Multi-core cables shall not be used.

c. For the AC cabling, PVC or XLPE insulated and PVC sheathed single or multi-core flexible copper cables shall be used. Outdoor AC cables shall have a UV-stabilised outer sheath.
d. The DC cables from the SPV module array shall run through a UV stabilised PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.
e. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers.
f. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm. The minimum DC cable size shall be 6.0 mm2 copper. The minimum AC cable size shall be 4.0 mm2 copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires. The following colour coding shall be used for cable wires:
    - DC positive: red (the outer PVC sheath can be black with a red line marking)
    - DC negative: black
    - AC single phase: Phase: red; neutral: black
    - AC three phase: Phases: red, yellow, blue; neutral: black
    - Earth wires: green
g. Cables and conduits that have to pass through walls or ceilings shall be taken through a PVC pipe sleeve.
h. Cable conductors shall be terminated with tinned copper end-ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.
i. All wiring in the control room shall be carried out with minimum four sq. mm. PVC insulated copper 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.
j. Buried underground cables shall be armoured. Unarmoured buried underground cables shall be enclosed with suitable conduits. Unless, otherwise, specified, all other interconnecting cables shall be armoured.
k. 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 2% under the designed operating conditions. Conductor size of less than 6 sq. mm shall not be accepted.
l. Cable/wire connections shall be soldered, crimp-on type or split bolt type. Wire nut connections shall not be used.
m. 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.

n. The wiring must be carried out in casing capping only.

g. Distribution System:

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

h. Earthing and lightning protection:

a. Earthing is essential for the protection of the equipment & manpower. Two main grounds used in the power equipments are:
   - System earth
   - Equipment earth

b. System earth is earth which is used to ground one leg of the circuit. For example in AC circuits the Neutral is earthed while in DC supply +ve is earthed.

c. In case of equipment earth all the non-current carrying metal parts are bonded together and connected to earth to prevent shock to the man power & also the protection of the equipment in case of any accidental contact.

d. To prevent the damage due to lightning the one terminal of the lightning protection arrangement is also earthed. The provision for lightning & surge protection of the SPV power source is required to be made.

e. In case the SPV Array cannot be installed close to the equipment to be powered & a separate earth has been provided for SPV System, it shall be ensured that all the earths are bonded together to prevent the development of potential difference between any two earths.

f. Earth resistance shall not be more than 1 ohm. It shall be ensured that all the earths are bonded together to make them at the same potential.

g. The earthing conductor shall be rated for the maximum short circuit current. & shall be 1.56 times the short circuit current. The area of cross-section shall not be less than 1.6 sq mm in any case.

h. The array structure of the PV modules shall be grounded properly using adequate numbers of earthing pits. All metal casing/ shielding of the plant shall be thoroughly grounded to ensure safety of the power plant.

i. 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, watering 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.

j. 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.

k. The inverters and battery charger and all equipment inside the control room and battery 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.

l. In compliance to Rule 61 of Indian Electricity Rules, 2004 (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.

m. Lightning: 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.

n. 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.

i. Lightning & Over Voltage Protection System:

The SPV power plant should be provided with Lightning and over voltage protection. Connected with proper earth pits. The main aim of over voltage protection is to reduce the over voltage to a tolerable level before it reaches the PV or other sub-system components. The source of over voltage can be lightning or other atmospheric disturbance.

The lightning Conductors shall be made of 25 mm diameter 1000 mm long GI spike as per provisions of IS 3070. Necessary concrete foundation for holding the lightning conductor in position to be made after giving due consideration to maximum wind speed and maintenance requirement at site in future. The lightning conductor shall be earthed through 20 mm X 3 mm thick GI flat earth pits/earth bus made with 25 mm X 5 mm GI flats.

5. **FIRE EXTINGUISHER (01 Nos) :-**

Ext Supplying & erecting Carbon Dioxide (CO_2) fire extinguisher of 4.5 kg. capacity cartridge type conform to IS 2878/15683 complete erected with necessary clamp made from 50 x 6 mm. M. S. flat with nut & bolts grouted in wall complete.

6. MAIN FEATURES & OPERATING MODE

PCU should gives preference to the solar power as the first input to load and extra energy produced by solar is used to charge the battery bank. The second preference is given the battery. In the absence of both solar and battery the power from grid will be feed to the load.

The PCU always gives preference to the solar power and will use Grid power only when the solar power / battery charger is insufficient to meet the load requirement.

7. MODULE MOUNTING STRUCTURE

Hot dip galvanized iron mounting structures may be used for mounting the modules / panels / arrays. These mounting structures must be suitable to mount the SPV modules / panels / arrays on the roof top, on the ground or on the poles / masts, at an angle of tilt with the horizontal in accordance with the latitude of the place of installation.

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 (wind speed of 150 km/ hour). It may be ensured that the design has been certified by a recognized Lab/ Institution in this regard.

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 with thickness of 80 microns as per IS 5905. All fasteners shall be of Stainless steel - SS 304.

The foundation for Module Mounting structures shall be 1:2:4 PCC Construction. There shall be minimum necessary clearance between ground level and bottom edge of SPV modules.

8. ORIENTATION AND TILT OF PV MODULE

Modules alignment should be due south and tilt angle shall be 12 - 16 degrees with horizontal.

9. DC DISTRIBUTION BOARD (DCDB)

A DCDB shall be provided in between PCU and Solar Array. It shall have MCCB of Suitable rating for connection and disconnection of array section. It shall have meters for measuring Array voltage and Array current.

10. AC DISTRIBUTION LINE

The generated electricity from these Power Plants will be utilized for illumination of Streets / Indoor Lighting, Fans, Computers, Internet modem, Printer within allowable practice limit. Necessary electric cable / connection shall be supplied / made by the manufacturer/supplier for illumination of existing streetlights / indoor lights.

11. OPERATION MANUAL

An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the Solar PV Power Plant and detail of Wiring and Connection Diagrams will also be provided with the manual.

12. COMPREHENSIVE MAINTENANCE CONTRACT (CMC)

- The complete Solar PV Power Plant must be guaranteed against any manufacturing/ design/ installation defects for a minimum period of 5 years.
- PV modules used in Solar PV Power Plant must be guaranteed 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.

13. <u>DISPLAY BOARD :-</u>

Providing and fixing board displaying information, such as 'Name of work, Tender cost, Name of Contractor, Work completion and liability period etc', having rectangular shape of 1.20mx0.90m size made out 18gauge(1.25mm) thick mild steel sheet painted with one coat of Zinc chromate stoving primer and two coats of enamel paint on front side and grey stove enamel on back side and border/messages/symbols etc. with approved colour shade paint complete, on M.S.angle of size35x35x3mm frame with properly cross braced M.S. angles ofsize35mmx35mmx3mm duly painted including Two M.S. angle iron posts of size 65mmx65 mmx 6mm, 3.65m long painted with alternate black and white bands of 25 cm width including all fixtures etc. and fixing the boards in 1:4:8 concrete block of size 60 cm x 60 cm x 75cm including, excavation, refilling, transportation, and labor etc complete.

14. TEST REPORTS

Test certificates from MNRE approved test centres only will be considered valid.

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