

**OFFICE OF THE PROJECT DIRECTOR, LADAKH RENEWABLE ENERGY DEVELOPMENT
AGENCY, LADAKH AUTONOMOUS HILL DEVELOPMENT COUNCIL (LAHDC), LEH-
LADAKH**

NIT NO: 02 of 2018-19

For and on behalf of the Chief Executive Councillor/Chairman, LAHDC, Leh sealed tenders affixed with Rs.5/= revenue stamps are invited from reputed Solar Photo Voltaic (SPV) Module manufacturers for the supply and installation of SPV Power Plants of 12.5Kwp & 10 Kwp capacity. The firm must have ISO 9001 and ISO 14001 certification, manufacturing facilities for SPV Module in India & should have a service centre at Leh. The tenders should be addressed to the Project Director, Ladakh Renewable Energy Development Agency, Leh, Ladakh J&K and should reach the office of the same on 16-06-2018 before 2:00 p.m. and shall be open on same day or any other day as convenient to the committee members as per the following terms/conditions and specifications:

Power Plant Location

<i>S. No.</i>	<i>Name of Establishment</i>	<i>Block</i>	<i>Power Plant Capacity (kWp)</i>	<i>Distance from Leh (km)</i>	<i>Type of Road</i>
1	50 BRTF, Leh-Ladakh	Leh	20	240	Motorable
2	50 BRTF, Leh-Ladakh	Leh	10 (2Nos)	240	Motorable

1. Scope of Work

- i) The broad scope of the works includes the design, procurement, supply, installation and commissioning, testing and operation and maintenance for a period of 3 years of 20 Kwp & 10Kwp Solar Photovoltaic Power Plant to be commissioned at SKUAST, Leh-Ladakh, Jammu & Kashmir.

2. Minimum Criterion for Bidding

The bidder must have following minimum criterion for bidding:

- a. The company make for solar equipment must have ISO 9001 certification for quality management systems.
- b. The company make for solar equipment must have ISO 14001 certification for environmental requirements.
- c. The bidder must have annual turnover of Rs. 50.00 Lakhs in the last financial year.
- d. Indian manufacturers and engineering procurement contractors of solar PV projects can participate in the bidding. Certification of the same should be attached.
- e. The bidder must ensure solar module manufacturing facility in India and offered modules should be manufactured in accordance with IEC 61215 Edition II for meeting quality standards of crystalline silicon solar cell modules.
- f. The bidder must qualify to IEC 61730 (Part I and Part II) for safety qualification testing.
- g. The bidder must have experience of supplying, installing and commissioning Solar Photo-Voltaic Power Plants industry for more than 2 years in India.
- h. The successful bidder must set up a service centre in Leh with necessary spares parts for repairing and maintenance of the system during 5 years of maintenance period.
- i. The bidder must be a total integrated system designer installer which are inclusive of solar modules, solar charge controller, power conditioning units, junction boxes, and mounting

- structures and monitoring equipment /authorised dealer having the certificate of experience in the field for SPV necessary documents must attached with the NIT.
- j. The bidder must ensure that the battery manufacturer/supplier has ISO 9001 certification and the batteries are manufactured as per relevant BIS standards.
 - k. Company authorized dealers of reputed engineering procurement contractors and/or integrated system designers/companies are allowed to participate in the tender having experience in the field.
 - l. Detailed specifications of the following components of the power plant must be made available during the tender opening date. For those bidders having tenders submitted without the detailed specification of the components, the price bid shall not be opened.
 1. Detailed Specification of the solar panel quoted for each power plant
 2. Detailed Specification of the battery quoted for each power plant
 3. Detailed Specification of PCU for the power plant to be submitted
 - m. Bidder/Manufacturer must be MNRE enlisted manufacturer or having authorised dealership of MNRE Enlisted contractor/company.

3. Experience of the Bidder

- a. A comprehensive list of past projects implemented, by the bidder in India or abroad, indicating clients, dates, size of projects and any other relevant material should be included in the offer.
- b. The bidder must have sufficient experience and expertise in the field of SPV Power Plants and should have completed the supply, installation and commissioning and maintaining at least two SPV power plants with battery back-up of minimum 10 kWp capacity. Records shall be produced for the same.

I. INSTRUCTIONS, TERMS AND CONDITIONS:

1. The tender should be in three parts viz. Part I, Part II and Part III as described in Clause 2 below. These should be in separate envelopes duly super-scribed as Part I, Part II and Part III, NIT No. and due date. Sealed envelopes containing all the three parts should then be placed in a larger envelope, which should be sealed, and super-scribed by the given NIT No., due date and name of the tenderer. **Tenders not submitted along these lines shall not be opened.**

Clause 2

2. **PART I:** - Part I of the tender should be super-scribed as “***Part I, Technical Details for NIT No. 01 of 2018-19***” and should contain

Technical Details:

- a. The ISO 9001 certificate for solar module and equipment manufacturer to be enclosed
- b. The ISO 14001 certificate for solar module and equipment manufacturer to be enclosed
- c. The bidder must ensure that the battery manufacturer/supplier has ISO 9001 certification and batteries; certificate to be enclosed.
- d. The bidder must have turnover of Rs. 50.0 Lakhs in the last financial year.
- e. PV Modules shall be manufactured in India and the bidder shall have a module manufacturing facility in India and offered modules shall be manufactured in accordance with IEC 61215 Edition II and IEC 61730 (Part I and Part II); necessary certificates to be enclosed.

- f. The bidder must use solar modules and other balance of system (BoS) components that qualify to the latest edition of BIS or IEC standards; relevant test reports and necessary certificates to be enclosed.
 - g. The bidder must have PV modules tested at one of the IEC approved test centres. Test certificates to be enclosed.
 - h. The bidder must provide details of service centre in Leh prior to the date of submission of tender; details of the service centre, address etc. must be enclosed. The service centre shall be examined as a part of the technical evaluation.
 - i. The bidder must be a total integrated system designer inclusive of solar modules, solar charge controllers, junction boxes and mounting structures. Necessary documentation must be enclosed.
3. ***PART II:*** Part II of the tender should be super scribed as “***Part II, Commercial Bid for NIT No. 01 of 2018-19***” and should contain:
- a) Earnest Money Deposit
 - b) Income Tax Clearance Certificate
4. ***PART III:*** Part III of the tender should be super-scribed as “***Part III, Price Bid for NIT No. 01 of 2018-19***” and should contain the price bid for the product as per the bill of material for each power plant, & strictly as per the price bid format given in the NIT. The price quoted should include the operation and maintenance contract for 3 years. The supplier has to quote clearly the F.O.R at the site of installation, inclusive of all taxes.
5. The tender should be addressed to **Project Director, LREDA-LAHDC Leh**. Both inner and outer covers duly sealed and super-scribed and sent either under registered cover or cast in the tender box kept in the office of the **Project Director, LREDA-LAHDC Leh**.
6. The tenderer shall ensure timely receipt of tender in the office of the **Project Director, LREDA-LAHDC, Leh**, the tenders received by hand or by post after due date of receipt of tenders shall not be entertained even if the tender has been posted/ dispatched much before the due date of receipt.
7. The tenders will be opened on **16-06-2018 after 2pm** in the Office of the **Project Director, LREDA-LAHDC Leh** on the date of opening of the tenders only the technical and the commercial parts (Part-I & Part-II) shall be opened in the presence of the tenderers who may be present, the price bid (Part-III) shall be opened only in case of such tenderers who on scrutiny of Part-I & Part-II of their offer are found to have qualified for opening of the price bid on the same day at the Project Director’s office or any other day at the discretion of the purchasing committee. In case the due date of opening of the tenders falls on a holiday being declared subsequently, the tenders will be opened on the next working day.
8. Tenders must be complete in all respects; all the terms and conditions of tender including the technical specifications should be carefully studied for the sake of submitting complete and comprehensive tender documents. Failure to comply with any of terms and conditions or instructions of the offer with insufficient particulars which are likely to render fair comparison of tender as a whole impossible may lead to rejection even if otherwise it is a competitive offer/tender.

9. Telegraphic tenders or the tenders of such tenderers who have not purchased tender document shall not be entertained. Any request by post or by hand or telegraphically for any modification addition or deletion etc. in the tenders shall not be considered.
10. The tenders shall be prepared in a formal manner with all quotations written both in figures & words. The tenders shall be typed or written in ink, any tender written by pencil shall be rejected. There shall be no erasures or overwriting and if corrections are made the same shall be neatly done and attested. A systematic form of totalling shall be adopted to avoid any ambiguity. The detailed description of the equipment offered shall be given Rank charge, if any shall be debited to the account of the tenderer.
11. The tenderer shall furnish an affidavit duly attested by notary that design of their equipment is free from legal encumbrances and that no legal case of any kind of litigation regarding the patent design is pending in any court of law.
12. No tenderer unless otherwise specified in these specifications, terms and conditions shall be exempted from depositing earnest money.
13. The tenderer must set up a service centre with all repairing facilities in Leh.
14. No claim shall be laid against the department either in respect of interest or depreciation in value for the amount of security deposit and or earnest money. In the case of bank deposits the department shall not be responsible for any loss on account of failure of the bank.

II. SPECIAL INSTRUCTIONS:

- a. Tenders not submitted on the lines indicated above are liable to be rejected without any correspondence.
- b. The purchaser reserves the right to order additional quantity or reduce the quantity of the material advertised at the time of placement of order for which the quoted rate shall be valid.
- c. All legal proceedings in connection with the order, tender will be subject to the jurisdiction of local court of Jammu and Kashmir State alone.
- d. The purchaser reserves the right to divide the order between two or more tenders for 100% achievement.
- e. In case of any doubt, dispute or differences arising out of the contract, the same shall be referred to the Finance Commissioner (Planning) and Ladakh Affairs Department, J&K Government for the decision under J&K State Arbitration Act.
- f. The purchaser shall not be bound to accept the lowest or any tender and reserves to itself the right of accepting the whole or a portion of any of the tender, as it may deem fit, without assigning any reason thereof.
- g. Any form of canvassing by the tenderers to influence the consideration of their tender shall liable to summery rejection.
- h. In order to avoid delay caused by postal correspondence and to expedite the process, the purchaser may require the successful tenderer to hold technical & commercial negotiations and convey the decision/acceptance on behalf of the tenderer, with the Purchase Committee.
- i. The condition hereafter deal with systems details and supplementary conditions of the contract in addition to those stipulated in foregoing clauses which along with schedules and annexure, shall be deemed to form part of detail specification for equipment. The tenderer are advised to study and familiarize themselves with the terms & conditions of the tender.

- j. All material shall be of standard quality in the market and be capable of satisfactory operation when exposed to the local atmospheric conditions at site.
- k. The tenderer is required to submit a statement of facts in details as to their previous experience in performing a similar or comparably work and business and technical similar or comparable work and business & technical organization. Financial resources and manufacturing facilities available to be used in performing the contract shall be submitted at the time of the tender
- l. Force majeure clause shall apply.
- m. No other conditions except those mentioned above will be acceptable.
- n. Offers not complying with the delivery schedule shall be considered non-responsive and shall not be evaluated
- o. Offers not providing clause by clause compliance shall be considered non-responsive and shall not be evaluated
- p. Offers not providing minimum array capacity of designated rating (Wp) shall be considered non-responsive and shall not be evaluated
- q. Offers not submitted as per price bid format shall be considered non-responsive and shall not be evaluated.

III. EARNEST MONEY:

1. Tenders shall be accompanied with the earnest money **Rs. 1,25,000.00 (Rupees One Lakh only)** in the form of CDR/FDR/DD pledged to the Project Director, LREDA-LAHDC, Leh.
2. Tenders not accompanied with the required amount of earnest money will be rejected and their price bid shall not be opened.
3. The earnest money of the tenderers shall be forfeited if they withdraw their tender or raise the prices of their offer within the validity period. The earnest money shall also be forfeited in case of the tenderers who do not comply with the purchase order placed on them within the validity period of the offer or violate any terms and conditions contained herein for this, purchase order shall be deemed to have been placed from the due date of letter of intent.
4. Earnest money deposit shall be released in favour of the unsuccessful tender(s) within one month after the final acceptance of the tender.

IV. SECURITY DEPOSIT:

1. The successful tenderer(s) earnest money shall be withheld as security deposit at the time the contract is allotted. The earnest money shall be released till the time of submission of security deposit.
2. Security Deposit of Rs. 3,00,000/- in the form of a CDR/FDR or Demand Draft shall be submitted by the successful bidder.
3. Security deposit shall be furnished within one month from the date of detailed purchase order. Failure to do so within the stipulated period will make the contract liable for cancellation together with forfeiture of EMD at the discretion of chairman purchase committee.

V. WARRANTY:

1. **The mechanical structures, electrical works including inverters/charge controllers/power conditioning unit/ maximum power point tracker, distribution board/digital meters/, storage batteries, monitoring equipment and overall workmanship of the solar power plants must be warranted for a minimum of 5 years.**

2. PV modules used in solar power plants must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
3. Necessary maintenance spares for five years trouble free operation shall also be supplied with the system with monthly report shall be submitted to the office.
4. The supplier shall be responsible to replace free of cost (including transportation and insurance expenses) to the purchaser whole or any part of supply which under normal and proper use becomes dysfunctional.
5. In case the supplier fails to rectify/replace the defective/damaged equipment including transit damage, shortages within one month from the date of intimation of such shortage/damage, they shall have to pay interest to Project Director, LREDA-LAHDC, and Leh @3% per month on the value of such materials.

VI. OPERATION AND MAINTENANCE:

1. The supplier shall be responsible for the operation & maintenance of the systems for a period of 5 years from the date of commissioning of the systems. The price quoted by the supplier should include the Operation & Maintenance for 3 years. The manufacturer will submit a quarterly report about the maintenance of the system.
2. The bidder shall give the details of their service centres in Leh district and ensure that all the essential men and materials are placed to ensure quick and efficient operation after sales service.
3. A list of employed men with designations, contact numbers, office address etc., who shall be responsible for operation and maintenance activities, shall be submitted to LREDA. Registration details of the service centre/s shall be given at the time of bidding.
4. During the Operation and Maintenance period, the supplier shall train local personnel for operation and maintenance. An explanation of preventative maintenance schedule, plan of operation, scope and implementation of the after sales service is to be defined and properly documented.
5. Compensation for persons employed by the successful bidder for operation & maintenance shall be under the scope of the company for the period of operation and maintenance.

VII. SALES TAX ETC:

1. The rates offered by the tenderer for design, manufacturing, supply, installation, commissioning, construction of civil works and operation and maintenance should be inclusive of all taxes, F.O.R. at the site.

VIII. DELIVERY OF THE POWER PLANT:

1. The completion and delivery of the power plant shall be within 4 months from the allotment of work.
2. In case of failure to deliver in full the required supplies on order, the purchaser shall have the right to make a risk purchase at the cost of supplier and/or cancel the contract and claim reasonable compensation/damages. The contract of supply shall be repudiated if the supplies are not made within the prescribed period and to the satisfaction of the purchasing officer.

IX. VALIDITY:

1. The tender should be unconditionally valid for a period of 6 months from the date of opening of the tenders. The quoted price per system as such shall be firm and not variable with the market price.

2. The rates approved as per the NIT year would be valid for further purchase of the systems during the validity period. Any tenderer revising the offer within the validity period, without prejudice to other remedies available with the department is likely to be blacklisted.

X. PAYMENT SCHEDULE:

1. 60% shall be released on receipt of the material at the site, 35% after the installation and commissioning and 5% shall be released after successful completion of 3 years of operation and maintenance (this may be released in five equal instalments at the end of each year on submission of documentary evidence confirming successful O&M during that year). In case mobilization advance is required by the successful bidder, 10% shall be released upon submission of a bank guarantee of an equal amount valid for a period of 1 year and shall be deducted from the payment after the receipt of materials. The bank guarantee shall be released after the settlement for the receipt of material.

XI. PENALTY:

1. In case of failure on the part of the tenderer to make supplies and execute the work in full, part thereof within the delivery schedule stipulated in the purchase order, penalty @ 0.5% per week of undelivered portion subject to a maximum of 15% of the cost of undelivered portion shall be levied.

XII. CHANGES:

1. No variation or modification or waiver of any of the terms and provisions of these specifications shall be deemed valid unless mutually agreed upon in writing by both the purchaser and the supplier.

XIII. PACKING:

1. The bidder shall be responsible for assuring that all commodities shipped are properly packed and protected to prevent damage or deterioration during shipment. Packaging and shipping costs shall be borne by the supplier. Customs clearance and all costs and actions associated with import duties, taxes and processing of documents are to be borne by the bidder. The supplier shall be responsible for all the damages/losses if any. All crates shall be marked with proper signs indicating UP and DOWN sides of the packing and also unpacking instructions considered necessary by the supplier.

XIV. INSURANCE:

1. The bidder shall provide insurance coverage ex-factory until commissioning, and acceptance for replacement or repair of any part of the consignment due to damage or loss.

XV. HEALTH, SAFETY AND ENVIROMENT:

1. The bidder shall submit the following before starting the installation of the power plant.
 - Safety and Environment policy of the Company
 - HSE Manuals for Installation
 - Emergency Management Plan

XVI. CLEAN DEVELOPMENT MECHANISM (CDM) BENEFITS:

- All CDM/Carbon Trading benefits from the installation, commissioning and operation of SPV Power Plants shall be the property of the beneficiary.

XVII. MATERIAL INSPECTION:

- The material inspection shall be done at the factory location before shipment of the material from factory location. The material inspection charges (boarding /lodging) for two representatives from LREDA have to be borne by the successful tenderer.

XVIII. AGREEMENT:

- The successful tenderer(s) shall be required to execute an agreement on a valid stamped paper for strict compliance of the terms and conditions of the contract, vis-à-vis the NIT and the supply order within seven days of placement of the order

XIX. TECHNICAL SPECIFICATION: (refer to Annexure I for 20 Kwp SPV Plant and Annexure II for 10Kwp SPV Plant)

Sd/-
Project Director,
LREDA-LAHDC
Leh-Ladakh

ANNEXURE I – TECHNICAL SPECIFICATIONS FOR SOLAR POWER PLANTS

**PREPARED BY
Ladakh Renewable Energy Development Agency
LAHDC, LEH, LADAKH**

1. Bill of Material

1.1 List of Components of a Typical Solar Power Plant

BILL OF MATERIAL FOR 20 kW_p SOLAR POWER PLANT

Sl. No	Description	Total Qty	UOM
1	Solar module - (minimum 160Wp, crystalline)	20	kWp
2	Module mounting structure	Suitable for above	set
3	Array Junction Box - ABS Plastic	Suitable for S.No 1	nos
4	Main Junction Box - ABS Plastic	1	no
5	PCU (240VDC, 20kWp with built in charge controller, MPPT, 415V AC 50 Hz, 15 kVA inverter and charger)	1	no
6	1C X 4 Sq.mm. Poly Ethylene Cu.cable	165	m
7	2C X 10 Sq.mm. Poly Ethylene Cu.cable	40	m
8	1C X 25 Sq.mm. Poly Ethylene Cu.cable	80	m
9	2C X 16 Sq.mm. Poly Ethylene Cu.cable (for PCU output)	30	m
10	AC Distribution Board with MCB, voltmeter, ammeter and energy meter for PCU output	1	no
11	DC Distribution Board	1	No
12	240V, 600 Ah @ C10 LMLA Type with rack and accessories	1	set
13	Earthing kit	1	set
14	Lightning and overvoltage protection	1	set
15	Installation kit	1	set
16	PCU spares	1	No

BILL OF MATERIAL FOR 10 kW_p SOLAR POWER PLANT

Sl. No	Description	Total Qty	UOM
1	Solar module - (minimum 160Wp, crystalline)	10	kWp
2	Module mounting structure	Suitable for above	Set
3	Array Junction Box - ABS Plastic	Suitable for S.No 1	Nos
4	Main Junction Box - ABS Plastic	1	No
5	PCU (120 VDC, 10 kWp with built in charge controller, MPPT, 230 V AC 50 Hz, 10 kVA inverter and charger)	1	No
6	1C X 4 Sq.mm. Poly Ethylene Cu.cable	180	M
7	2C X 10 Sq.mm. Poly Ethylene Cu.cable	40	M
8	1C X 25 Sq.mm. Poly Ethylene Cu.cable	80	M
9	2C X 16 Sq.mm. Poly Ethylene Cu.cable (for PCU output)	30	M
10	AC Distribution Board with MCB, voltmeter, ammeter and energy meter for PCU output	1	No
11	DC Distribution Board	1	No
12	120V, 500 Ah @ C10 LMLA Type with rack and accessories	1	Set
13	Earthing kit	1	Set
14	Lightning and overvoltage protection	1	Set
15	Installation kit	1	Set
16	PCU spares	1	No

All the cables listed above are indicative only. It may vary during the time of installation.

1.2 The bidder is responsible for arranging all the hardware, accessories, measuring instruments or any other item needed for successful installation/ commissioning/ operation and maintenance of the power plant.

A complete Bill of Materials inclusive of Solar PV Modules, array Junction box, main junction box, cables, Battery bank, PCU, Array mounting structures etc. shall be provided along with the offer. The numbers of each component proposed for supply shall be clearly specified.

2. Scope of Work

This job involves by means of the enclosed specification, design, manufacture, supply, installation, commissioning of the Solar PV Power Systems with 5 years warranty period including 5 years of operation and maintenance.

The Scope of Work shall include the following,

- a. Design, manufacture and supply of Solar PV Power Plant
- b. Detailed planning for smooth execution of the project
- c. Performance testing of the complete system & warranty of the system for 5 years faultless operation
- d. Risk liability of all personnel associated with the implementation realization of the project
- e. Operation & Maintenance of the Power Plant for 5 Years including 5 years of warranty period.

3. Technical Specifications of Major Components of Solar PV Power Plant

1	Solar PV modules and array
2	Module mounting structures for Solar PV Modules
3	Junction Boxes
4	Power Conditioning Unit
5	Battery Bank with Accessories
6	Solar Distillation Plant
7	DC & AC Distribution Boards
8	Cables and installation accessories
9	Earthing and lightning protection
10	Battery and Control Room

a. SOLAR PV MODULES & ARRAY

Crystalline high power cells shall be used in the Solar Photovoltaic module. Each solar module shall consist of redundantly interconnected photovoltaic cells and peak power rating shall not be less than 160W. **However, higher wattage modules shall be preferred.**

To connect the solar modules interconnection cables shall be provided. Photoelectric conversion efficiency of SPV module shall be greater than 13%. Modules shall be made of high transmissivity glass front surface giving high encapsulation gain and silicon rubber edge sealant for module protection and mechanical support.

All materials used shall have a proven history of reliable and stable operation in external applications. It shall perform satisfactorily in relative humidity up to 100% with temperatures between -30 Deg C and +85 Deg C and with stand gust up to 200km/h from the back side of the panel.

Solar module shall be crystalline type, employing lamination technology using established polymer (EVA) and tedlar laminate.

Sample modules, representative of the production processes employed in the manufacture of the offered module shall be in accordance with the requirements of IEC 61215-Edition II for quality of crystalline silicon solar cell modules, IEC 61730 (Part I and Part II). The bidder shall submit appropriate certificates.

Other General Requirements of PV module

- The rated output power of any supplied module shall not vary more than 3-5% from the average power rating of all modules.
- The module frame shall be made of corrosion resistant materials, which are electrolytically compatible with the structural material used for mounting the module.
- Protective devices against surges at the PV module shall be provided, if required. Low voltage drop bypass and / or blocking diode(s) may also be provided, if required.
- Module Junction box (weather resistant) shall be designed for long life outdoor operation in harsh environment.
- PV modules used in solar power plants must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
- The solar modules shall have suitable encapsulation and sealing arrangements to protect the silicon cells from the environment. The arrangement and the material of encapsulation shall be compatible with the thermal expansion properties of the silicon cells and the module framing arrangement/material. The encapsulation arrangement shall ensure complete moisture proofing for the entire life of the solar modules.
- Each module shall have low iron tempered glass front for strength and superior light transmission. It shall also have tough multi layered polymer back sheet for environment protection against moisture and provide high voltage electrical insulation.
- The fill factor of modules shall not be less than 0.70.
- Other balance of systems components (BoS) must qualify to the latest edition of BIS or IEC standards issued in this regard.
- Array capacity shall not be less than the designed capacity and number of modules required shall be worked out accordingly.

- Each PV module must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions.)
 - 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. Wattage, I_m , V_m 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.

Data sheet shall be furnished duly filled as follows:

1)	Mounting arrangement for Solar module		
2)	Solar module frame material		
3)	Module type		
4)	Module dimensions		
5)	No. of solar cells per module		
6)	Solar cell manufacturer type		
7)	Make of Solar module		
8)	Peak power voltage (V_{mp}) at 25 Deg C		
9)	Peak Power current (I_{mp}) at 25 Deg C		
10)	Open circuit voltage (V_{oc}) at 25 Deg C		
11)	Short circuit current (I_{sc}) at 25 Deg C		
12)	Weight of each module		

Orientation and Tilt of PV Module

Modules alignment and tilt angle shall be calculated to provide the maximum annual energy output at site.

b. MODULE MOUNTING STRUCTURE

- The array structure shall be made of hot dip galvanized MS angles of size not less than 50 mm x 50 mm x 6 mm size. The minimum thickness of galvanization shall be at least 70 microns. All nuts & bolts shall be made of very good quality stainless steel. The minimum clearance of the lowest part of the module structure and the developed ground level shall not be less than 500 mm.
- Leg assembly of module mounting structure made of different diameter galvanized tubes may be accepted. The work should be completed with supply, fitting fixing of clamps, saddles, nut & bolts etc. While quoting the rate,

the bidder may mention the design & type of structure offered. All nuts & bolts shall be made of high quality stainless steel.

- The structure shall be designed to allow easy replacement of any module and shall be in line with site requirements.
- The structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site.
- The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels. At the same time it should withstand wind speed up to maximum 150 km/h.
- The drawings along with detailed design shall be submitted to LREDA for approval before starting the execution work. The supplier/manufacturer shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings. The work will be carried out as per designs approved by LREDA.
- PCC ARRAY FOUNDATION BASE: The legs of the structures made with GI angles will be fixed and grouted in the PCC foundation columns made with 1:2:4 mix of cement concrete. The minimum clearance of the lowest part of any module structure shall not be less 500 mm from ground level. While making the foundation design, due consideration shall be given to weight of module assembly, maximum wind speed of 150 km/hr and seismic factors for the site.
- The bidder can visit the site before quoting rate for civil works. After taking in to consideration all aspects of the site, condition of soil etc., the bidder shall quote for civil works. No extra claim shall be entertained at post project stage. The foundation design of module structure design shall be submitted to LREDA for approval. The work will be carried out as per designs approved by LREDA.

c. JUNCTION BOXES

The junction boxes shall be dust, vermin and waterproof and made of FRP / ABS / 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. 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.
- Metal oxide variastors shall be provided inside the Array Junction Boxes.

d. POWER CONDITIONING UNIT

As SPV array produces 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 the PCU. In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), to maximize Solar PV array energy input into the System. PCU refers to combination of charge controller and inverter and shall be supplied as integrated unit or different units of charge controller and inverter depending on rating and size of the power plant.

Maximum Power Point Tracker (MPPT)

Maximum Power Point Tracker (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 MPPT shall not be less than 94% and shall be suitably designed to meet array capacity.

Inverter

- Inverters shall be of very high quality, having high efficiency and shall be capable of running in isolated mode. The inverter should be completely compatible with the charge controller and distribution panel.
- 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 80% at partial load (50%-75%). The supplier shall specify the conversion efficiency in the offer.
- The inverter shall be designed for high altitude and extreme temperatures of the district of Leh.
- The inverter shall have internal protection arrangement against any sustained fault in the feeder.
- The dimension, weight, foundation details etc. of the inverter shall be clearly indicated in the detailed technical specification.
- The inverter shall have provision for input & output isolation.
- 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.
- Supplier shall indicate tripping voltage & start up voltage for the inverters & this should be perfectly matched with the recommendation of battery manufacturers.
- 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 the form of a detachable gland plate.
- Under conditions with the battery in a "Full State of Charge" the available solar power shall supply the site load via the inverter with the excess solar power (if any) being exported to the grid.
- The contractor shall furnish details of proper operation, maintenance and troubleshooting details to LREDA.
- The contractor shall intimate LREDA prior to dispatch of the inverter for inspection. Shop tests on the inverter shall be conducted in the presence of the authorized representative of LREDA in order to verify the capacity and proper working of all control and protection arrangement.
- **All PCU or inverter replacements and spares shall be made readily available in Leh**

e.

BATTERY BANK

- The battery shall be Low maintenance lead acid Battery made of suitable acid resistant plastic material.
- The tensile strength of the material of the container shall be such that it can handle the internal pressure of the cell in extreme working conditions. The cell/mono-block shall not show any deformity, cracking or bulge on the side under all working conditions.

- The battery shall be provided with a pressure regulation valve, which shall be self-re-sealable and flame retardant. The valve unit shall be such that it cannot be opened without a proper tool.
- The cell/mono-block covers shall be made of suitable plastic material compatible with the container material and permanently sealed with the container. It shall be capable to withstand internal pressure without bulging or cracking. It shall also be fire retardant.
- The batteries shall use 2V cells and battery capacity is to be designed at C10 rate with end cell cut off voltage of 1.80V / cell.
- Charging instructions shall be provided along with the batteries.
- Suitable carrying handle shall be provided.
- The batteries shall be suitable for recharging by means of solar modules via solar charge regulators and be such that it cannot be opened without a proper tool.
- Offered batteries shall comply to the following:
 - 10 % of DOD: 7200 cycles
 - 50 % of DOD: 3000 cycles
 - 80 % of DOD: 1200 cycles

Bidder shall mention the design cycle life of batteries at 80%, 50% and 10% depth of discharge at 25 deg. C.

- The self-discharge of batteries shall be less than 3 % per month at 27 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 batteries shall be designed for operating in ambient temperature of site in the district of Leh.**
- The batteries shall consist of individual cells, which can be carried separately with ease while transporting.
- The batteries shall be designed such that cells of capacity up to 1500 Ah shall be suitable for horizontal or vertical stacking as per requirement.

The minimum rating of the battery bank for each type of power plant shall not be less than the rating shown in system design details and BOM.

Battery Rack & Accessories

Battery interconnecting links shall be provided for interconnecting the cells in series and in parallel as needed. Connectors for inter cell connection (series / parallel) shall be maintenance free screws. Insulated terminal covers shall be provided.

f. DC & AC Distribution Boards

DC Distribution Board (DCDB)

- The DC DB shall be provided in between PCU and Solar Array. This can be integrated in the PCU also, to save space.
- It shall have MCCB of suitable rating for connection and disconnection of array input.

AC Distribution Board (ACDB)

- An ACDB shall be provided in between PCU and Loads.
- It shall have MCB/MCCB of suitable rating for connection and disconnection of PCU from load.
- It shall have MCB's to supply power to control room loads such as exhaust fans, lighting loads and power plug sockets.
- It shall have energy meter to record energy supplied to loads

g. Cables and Accessories

All the cables shall be supplied conforming to IS 1554 / 694 Part 1 of 1988 & shall be of 650 V/ 1.1 kV grade as per requirement. Only PVC/polyethylene copper cables shall be used.

The size of the cables between array interconnections, array to junction boxes, junction boxes to PCU 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.

h. Earthing and Lightning Protection

Earthing: 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.

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.

4. Documentation

Two sets of installation manual / user manual shall be supplied along with the each power plant. The manual shall include complete system details such as array lay out, schematic of

the system, inverter details, working principle etc. Step by step maintenance and troubleshooting procedures shall be given in the manuals.

PRICE BID FORMAT:

S.NO	DESCRIPTION	PRICE BID(RS.)
1.	Total Cost as per bill of materials 20Kwp as per (Annexure I) inclusive of all taxes applicable (FOR Site)	
2.	Installation and commissioning including electrical works for completion of jobs	
3.	Operation and maintenance for 3 years	
4.	GRAND TOTAL	

S.NO	DESCRIPTION	PRICE BID (RS.) Unit	Total for 2Nos
1.	Total Cost as per bill of materials 10Kwp as per (Annexure) inclusive of all taxes applicable (FOR Site)		
2.	Installation and commissioning including electrical works for completion of jobs		
3.	Operation and maintenance for 3 years		
4.	GRAND TOTAL		