
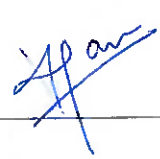




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TECHNICAL SPECIFICATION FOR SUPPLY OF 550 Wp PV MODULES

REVISION DETAILS: (01)	Prepared by: MDS 	Reviewed by : VJ 	DATE 15.07.2025
	Approved by: PM 	ISSUED ENGG	


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1. PRE-QUALIFICATION CRITERIA

Sl. No	Particulars	Bidder's confirmation
1.	The offer shall be quoted only by the original PV module manufacturer enlisted in ALMM List 1 and shall have annual manufacturing capacity of 350 MW minimum.	PV module supplier name: Manufacturing Plant Location: Manufacturing capacity / annum : Website:
2.	<p>Price Variation Clause :</p> <p>Price variation clause will be applicable for the unit rate in PO to take care of market trend in PV Module price.</p> <p>The Price Variation Clause will adjust the unit rate based on market changes in solar cell prices, as published on www.infolink-group.com/spot-price/ under "P Type cell" or "N Type cell," as applicable.</p> <p>The base price will be average price of the same solar cell technology as on tender date.</p> <p>The variable portion of PV module price will be adjusted (up or down) for each supply lot in a 1:1 ratio with the change in average price of the corresponding solar cell as on two weeks before LR date. This adjustment is capped at a maximum of 10%.</p>	Accepted / Not accepted

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2. TECHNICAL REQUIREMENTS:

Sl. No	Item	Remarks
1	PV Module Configuration	Crystalline photovoltaic modules comprising an appropriate number of solar cells in a series-parallel configuration to deliver the required power output. The module laminate shall be of a dual-glass (glass-to-glass) construction. The bill of material shall be as per bidder's approved IEC certification. Please enclose: i. Module overall assembly drawing with mounting holes ii. Data sheet with typical electrical characteristics, I-V curves, temperature coefficients etc.
2	Power Output	550 Watts and above, in 5 Watt band only. No negative tolerance accepted.
3	System Voltage	Modules shall be suitable for 1500V DC System Voltage application.
4	Efficiency	20% (min)
5	Fill Factor	0.8 (min)
6	Temp coefficient of Power	-0.40% or better
7	Operating Conditions	Modules shall be able to perform satisfactorily in relative humidity up to 85% with temperature between -10°C to +60°C and shall withstand adverse climatic conditions, such as high speed wind with dust/sand particles, saline climatic/soil conditions etc.
8.1	IEC Certifications	The PV modules supplied shall be with valid latest IEC certifications as below. <ul style="list-style-type: none"> IS 14286 (Part 1)- 2019 Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval Part 1 – Test Requirements IS 14286 (Part 1/Sec 1)-2019 Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval Part 1 – Test Requirements Section 1- Special requirements for testing of crystalline silicon photovoltaic (PV) modules

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		<ul style="list-style-type: none"> IS 14286 (Part 2)- 2019 Terrestrial Photovoltaic (PV) Modules – Design qualification and type approval Part 2 – Test Procedures IS/IEC 61730 – 1 - 2016 Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction IS/IEC 61730 – 2 - 2016 Photovoltaic (PV) module safety qualification – Part 2: Requirements for Testing IEC 61701 – Edition 2.0 2011-12 Salt mist corrosion testing of photovoltaic (PV) modules IEC 62804 – 1: 2015 Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon <p>The vendors shall use raw materials for manufacture of PV modules as per approved IEC Bill of Materials (CDF).</p>
8.2	BIS Registration	As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, Government of India, PV Modules used in the grid connected solar power projects in India shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards. Enclose copy of BIS Registration for PV modules
8.3	ALMM Listed PV modules	In line with Office Memorandum No. 283/54/2018- Grid Solar ("Approved Models and Manufactures of Solar Photovoltaic Modules Order, 2019), dated 2nd January 2019 and subsequent amendments thereto issued by MNRE, Govt of India, the bidder shall comply with the relevant clause(s) on supply of PV modules. The offered PV modules shall be listed in ALMM List I
9	Module Safety Class	Safety Class - II
10	BILL OF MATERIALS	
10.1	Solar cells	Technology : Monocrystalline/ MonoPERC / TOPCon Technology Pl. indicate Cell Source : Size of Cells : Half cell or full cell configuration: Cell efficiency : No. of busbars Enclose a copy of Solar cell data sheet with electrical parameters.

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10.2	EVA	Fast cure type, UV resistant, Gel content > 70 %.
10.3	Glass	The glass used shall have transmittance of above 90% and with bending less than 0.3% to meet the specifications. Thickness shall be minimum 2.0mm for glass to glass framed module
10.4	Back Glass	The back glass shall be heat strengthened. In case of glass-to- glass frameless module, the back glass shall have a minimum thickness of 2.5mm and for glass to glass framed modules, the back glass minimum thickness shall be 2.0mm.
10.5	PV Module Frame	Corrosion resistant, anodized Aluminum. The anodizing thickness shall be 15 microns or better.
10.6	Junction box	<p>IP67 grade with min 3 bypass diodes, UV resistant & weather-proof</p> <p>Junction box shall have two 4 sq mm UV resistant cables of minimum 1.6 meter length and plug-in connectors.</p> <p>Cables shall be of solar grade and shall conform to specification IEC 62930/ EN 50618 standards</p>
10.7	Adhesive for framing, junction-box fixing and potting	As per manufacturer's IEC test report
10.8	RFID	<p>Each PV module deployed must use a Radio Frequency identification (RFID) tag for traceability. RFID shall either be placed inside the laminate or behind name plate sticker or behind bar code label pasted on the back glass of PV module and must be able to withstand harsh environmental conditions during the module lifetime.</p> <p>RFID tag shall contain the following information:</p> <ol style="list-style-type: none"> Name of module manufacturer with country of origin Month & year of manufacture of modules Name of cell manufacturer with country of origin Month & year of manufacture of cells IV curve Wattage, I_{max}, V_{max}, V_{oc}, I_{sc}, & fill factor Module model number Unique serial number Date of obtaining IEC qualification certificates

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		j. Name of test lab issuing IEC certificates k. Other relevant information etc. on traceability of solar cells and module as per IOS 9000 series
10.9	Nameplate	Each module shall be provided with a name plate label (sticker) containing the following information: <ul style="list-style-type: none"> a. Name of module manufacturer b. Module model number c. Overall Dimension d. Weight e. P_{max}, V_{oc}, I_{sc}, I_{max} & V_{max} f. System Voltage g. Relevant standards and certifying lab name h. Warnings, if any i. Other relevant information, etc Nameplate shall be clearly visible and shall not be hidden by equipment wiring. It shall be durable for the entire life of panel.
10.10	BOM as per CDF of IEC Certificate	Solar cells and module materials shall be used as per approved CDF as per IEC Certificate.
10.11	RFID Reader	1 number of hand-held RFID reader (gun type) compatible to read module IV data (at the site) stored in RFID tags to be supplied at free of cost. All associated software, cables and accessories shall also be provided at free of cost for displaying and downloading RFID data from the RFID reader.
10.12	.PAN File	.PAN file for each module wattage offered shall be provided for carrying out PVSYS calculations at our end.
10.13	Mounting hole Pitch	Pl. provide mounting hole pitch details. Horizontal : Vertical : Mounting hole size :

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3. QUALITY ASSURANCE

Module Quality Plan, Data Sheet and GTP shall be subject to customer's approval. Each lot of modules shall be subject to pre-dispatch inspection by BHEL and BHEL customer or any third party.

Quality plan will include the following:

- I. Incoming Quality Checks on bought out item
- II. In-process Quality Checks
- III. Sample tests on final product by the customer

4. WARRANTY

Product warranty shall be for 10 years and performance warranty shall be for 25 years.

PV modules supplied must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and not less than 80% at the end of 25 years from the completion of the trial run. Degradation of PV module for first year shall be limited to 2.5%. Modules that do not meet the above criteria shall be replaced free of cost at BHEL's/customer's sole discretion.

5. INSURANCE FOR POWER OUTPUT WARRANTY


To ensure faithful performance of PV modules, the successful bidder must submit PV Module Insurance with a coverage of minimum 6 % of total order value of the module supplies envisaged under the contract for 25 years, with the end customer as its beneficiary. Any financial implication encountered due to insurance shall be borne by the bidder.

The following clauses are to be complied:

- 1) Insurance to be provided through any agency in MNRE approved list, issued vide OM dated 26.02.2024.
- 2) In case of insolvency of the bidder, the end customer under the terms of the insurance policy against Module Performance and Warranty shall be entitled to raise a claim against the Module Warranty Insurance Policy and in order to benefit from the coverage provided by the aforementioned policy. The bidder shall be responsible for maintaining the coverage provided under the Module Warranty Insurance Policy at all times, at its cost and expense.
- 3) Further, the bidder to note that end customer requires the following to be complied while covering the Warranty/Guarantee/Performance of the supplied goods under the insurance:
 - a) Single Insurance Policy for Product Warranty/Guarantee and performance before dispatch of the first lot of PV Modules Insurance.
 - b) The Insurance Policy shall be valid for a minimum period of twenty five (25) years from the date of receipt of last batch/lot of equipment at site.
 - c) The premium charges, recurring charges, any other expenditure under the Insurance Policy shall be covered by the Contractor.
 - d) The insurer must continue to compensate end users for warranty claims for the product quality and/or performance even if contractor ceases to exist as an independent operating company.

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- e) The insurance shall be non-cancellable by the insurer and shall provide third party bankruptcy rights.
- f) Coverage under the insurance policy shall be immediate, without any waiting period.

6. PACKING & IDENTIFICATION OF PV MODULE

PV modules shall be packed in seaworthy packaging using triple-wall corrugated cardboard cartons mounted on durable wooden or plywood pallets.

- a. Each carton shall contain modules of identical power rating band (e.g., ± 5 W) to facilitate uniform deployment.
- b. Packaging shall be designed to withstand multi-modal transportation, including long-haul trucking on rough or remote roads, and protect against mechanical shock, vibration, and environmental exposure
- c. Pallets and cartons must allow safe stacking and forklift handling, and be secured using suitable strapping or wrapping to prevent shifting during transit and storage
- d. Each carton shall be clearly labelled with the following information:
 - Manufacturer's name and logo
 - Number of modules per carton
 - Module model/type
 - Power rating (W)
 - Serial numbers of the enclosed modules
 - Handling instructions and orientation marks (e.g., "This Side Up", "Fragile")

All packaging materials shall be weather-resistant and suitable for outdoor storage without compromising module safety or quality.

Modules found to be damaged upon unpacking at the project site shall be replaced by the manufacturer at no additional cost, in accordance with the supply contract and product warranty terms.

7. GENERAL CONDITIONS

PV Modules shall be manufactured at the vendor's works only.

Manufacturing clearance shall be given only after approval of manufacturing quality plan, Pre-Shipment inspection plan and approval of drawings and datasheet by BHEL's customer.


8. MODULE RATINGS OFFERED

Pl. fill the table as below for the module wattage ratings offered.

Module Type (model No):

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Module rating	Wattage	Quantity in MWp


9. ENCLOSURES :

Documents checklist to be submitted along with the offer:

Sl. No.	Document
1.	Supporting document for PV module manufacturing capacity
2.	Signed copy of BHEL Specification PS-439-1440 Rev. 01 for confirming to supply as per BHEL Specification.
3.	IS/IEC and BIS certificates.
4.	Approved CDF (Bill of Materials) of PV modules as per IEC/IS certificates.
5.	Over all PV module assembly drawing indicating mounting hole pitch & data sheet for PV modules.
6.	Third party verified .PAN files for each wattage of PV modules offered.
7.	Data sheet for Solar cells used for manufacturing PV modules.
8.	PV module installation and O&M manual
9.	Soft copy of all above documents and IEC test reports to be sent by e-mail to the email id as mentioned in tender documents.

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10. Confirmation by the vendor :

Sl. No.	Item	Acceptance by the Module manufacturer (Yes / No)
1.	PV Module model number:	
2.	Crystalline PV Modules with power output \geq 550 Wp in 5 watts bands.	
3.	Crystalline PV Modules suitable for 1500 V System Voltage application	
4.	Availability of IEC and IS test certificates and IEC Test reports with CDF.	
5.	PV Modules registered with BIS (Bureau of Indian Standards)	
6.	Junction box cable length : 1.6 metres minimum	
7.	RFID Tag be inside the laminate	
8.	Supply of 1 no. of hand held RFID reader	
9.	Adherence to Manufacturing Quality Plan and Pre-Shipment Inspection as per customer	
10.	Bill of materials as per subset of the CDF of the IEC Certificates	
11.	Third Party Insurance for Power Performance warranty of PV modules	

11. Compliance

Sl. No.	Particulars	Bidder's Confirmation
1.	Compliance to BHEL Specification PS- 439- 1440 Rev. 01	<p style="text-align: center;">Yes / No</p> <p style="text-align: center;"><i>Please indicate deviations, if any.</i></p>

Signature of Tenderer with stamp

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