Bharat Heavy Electricals Ltd.,

(A Government of India undertaking)

Electronics Division

PB No.2606, Mysore Road, Bangalore-560026, India

Ref: MDSSCPV004/01
Date: 19.10.2016

Addendum to RFQ: MDSSCPV004 dated 08.10.2016

Following revisiona are incorporated in the tender terms and conditions:

1. Pre qualification criteria, sl no. 02 is revised.
2. Clause No. 10 of special terms (Quantity splitting) is deleted. The 100% of RFQ quantity will be ordered on L1 vendor only.

   Accordingly, BHEL purchase specification PS 439 353 and techno-commercial bid template are revised and uploaded in BHEL's online tender portal (https://bheleps.buyjunction.in/). Bidders have to submit their offer using the revised formats.

All other terms and conditions of RFQ remain unchanged.

Enclosures:

1. BHEL purchase specification PS 439 353 Rev 01
2. Techno-commercial bid template Rev 01

AGM (SC&PV/MM)

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ITEM: 300 to 315-WATT MULTI-CRYSTALLINE PV MODULE

1.0 PRE-QUALIFICATION CRITERIA CHECK-LIST

Sl. No	Particulars	Bidder's confirmation
1	The offer shall be submitted only by the original Indian PV module manufacturers. Any offer received from other than Indian PV module manufacturers shall be rejected.	Please mention Manufacturing plant location: (Name of PV module manufacturer, complete address & contact details with email address)
2	Vendor should have a minimum of 100 MW/annum automated in-house PV module manufacturing facilities.	Please mention Automated PV module manufacturing capacity in MW : _____
3	The offered PV modules shall be manufactured at the vendor works in India. Imported solar cells can be used for manufacture of PV modules.	Yes / No
4	The vendor shall have the following valid IEC certifications for the offered PV modules. i) IEC 61215:2005 – Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval ii) IEC 61730 – 1:2004 - Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction iii) IEC 61730 – 2:2004 - Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing iv) IEC 61701:2011 – Salt mist corrosion testing of photovoltaic (PV) modules v) IEC 62804 – Test method for detection of Potential Induced Degradation (PID) of PV module	Yes / No **Valid IEC Test Certificate and test report to be attached with the offer and also the corresponding approved bill of materials (BoM) or Constructional Data Format (CDF) as per IEC test report from the accredited test lab.**
5	Vendor should have manufactured and supplied solar PV modules of rating 300 Wp or above during the last 3 years	Yes / No Supporting documents in the form of Purchase Order or Delivery Challan or Invoice to be enclosed.

Note:

1. Pre-qualification will be carried out based on the details furnished by the vendor / inspection of the company / product if required by BHEL and at its sole discretion.
2. The Pre-qualification criteria are mandatory requirements and the technical bids will be considered only if all the above pre-qualification criteria are met.

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2.0 TECHNICAL REQUIREMENTS

Sl. No	Item	Remarks
2.1	PV Module Configuration	PV modules (safety class-II) with 72 nos. of 156-mm multi-crystalline silicon solar cells in 12*6 series configuration. The module outline and BOM / CDF shall be as per vendor's approved IEC certification. BHEL shall not supply PV cells or any other raw materials.
2.2	Power Output	300 W, 305 W, 310 W and 315 W (no negative tolerance allowed)
2.3	Fill Factor	73% (min)
2.4	Module efficiency Cell efficiency	≥ 15 % at STC ≥ 17 % at STC
2.5	Temp coefficient of power	Less than - 0.50% / °C
2.6	**Bill of Materials:**	
2.6.1	Solar cells	156-mm multi-crystalline silicon solar cells (Solar cells can be imported as per IEC approved CDF)
2.6.2	EVA	Fast cure type, UV resistant
2.6.3	Glass	Toughened, low iron, high transmittance (≥ 90 %) AR coated glass. Minimum thickness of glass shall be 4.0 mm with bending less than 0.3 %.
2.6.4	Back Sheet	Colour: White, Thickness: 300 microns (min) 3 layered structure: outer layer of fluoropolymer, middle layer polyester (PET) based & inner layer of fluoropolymer or UV resistant polymer. TUV-certified for partial discharge test for system voltage ≥ 1000 V DC. Water vapour transmission rate : ≤ 3 gm / m^2 / day
2.6.5	PV Module Frame	Corrosion resistant anodized aluminium (corner block type) Anodizing thickness: 15 microns (min) Mounting holes pitch (centre to centre) shall be as per BHEL's requirement. • Vertical/Length side: 1200 ± 2.0 mm • Horizontal/Width side: 956 ± 2.0 mm Drain holes and earth/grounding holes to be provided.
2.6.6	Edge sealing of the PV modules	The sealant used for edge sealing of the PV module laminate with frames shall have excellent moisture ingress protection with good electrical insulation (break down voltage ≥ 15 kV / mm) and good adhesion strength.
2.6.7	Junction box	Rated voltage: 1000 V DC. IP67 grade, UV resistant and shall conform to the following requirement: 4 Terminals, 3 bypass diodes 2 X 1 metre 4 sq. mm Cu cable 2 nos. of MC4 or MC4 compatible connectors Junction box cable shall be as per TUV Specification 2 Pfg 1169/08.2007.
2.6.8	Junction box Fixing	Silicone sealant.
2.6.9	RFID Tag	As per clause 3.2 on the following page

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3.0 OTHER REQUIREMENTS

1. SPV module shall perform satisfactorily in relative humidity up to 95 % and temperatures between -10°C & +85°C (module temperature), and shall withstand gust up to 150 kmph on the surface of the panel. SPV module shall have module safety class-II.

2. Radio-frequency Identification: Each PV module deployed must use a RFID tag for traceability. The RFID must be laminated inside or outside the PV module and must be able to withstand harsh environmental conditions during the module lifetime. RFID tag must contain the following information:

   i. Name of the manufacturer - PV module
   ii. Name of the manufacturer - Solar Cells
   iii. Month & year of the manufacture (separately for solar cells and modules)
   iv. Country of origin (separately for solar cells and module)
   v. I-V curve for the module
   vi. Peak 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.

3. Rating Stickers: All individual modules shall be provided with rating sticker label at the back of module which shall provide the information given below for identification. They shall be clearly visible and shall not be hidden by equipment wiring. Type of labels and fixing of labels shall be such that they are not likely to peel off/ fall off during the life of the panel.

   i. Manufacturer's name
   ii. Model number
   iii. Overall dimensions (W x L x D)
   iv. Weight (kg)
   v. Maximum power (P_{max}) , Voltage (V_{mp}), Current (I_{mp})
   vi. Short circuit current (I_{sc}), open circuit voltage (V_{oc})
   vii. Main system voltage
   viii. Relevant standards, certification lab name
   ix. Warnings (if any)

4. Modules should have manufacturer's logo on it.

5. The modules should be 100% PID (Potential Induced Degradation) tolerant and should comply with IEC 62804.

6. Electro-luminescence (EL) & potential induced degradation (PID) tests during manufacturing of solar PV modules shall be carried out by BHEL / BHEL customer.

7. Joint inspections and testing will be done by BHEL / BHEL's customer at the manufacturer's workshop on regular basis for quality assurance and testing. Following tests as per relevant Indian Standard shall be carried out on certain number of modules from a lot (decided by BHEL's customer):

   i. Visual inspection
   ii. Performance test of the modules at STC and NOCT with sun simulator of class B or better as per Indian Standard
   iii. Performance test of the modules at low irradiance (200 W/m sq) with sun simulator of class B or better as per Indian Standard.
   iv. Dielectric withstand test
   v. Continuity and leakage current test
   vi. Insulation resistance test
   vii. Wet leakage current test
   viii. Mechanical load test.
   ix. Any other test as desired by BHEL's customer.

8. BHEL's customer may select certain number of modules delivered at site on random basis for conducting performance test of those modules from any accredited test laboratory of MNRE/NABL. If there are any discrepancy found in the test results and the values specified by the vendor, the vendor will be bound to accept the decision made by BHEL's customer in respect of taking further course of action.

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4.0 FUNCTIONAL REQUIREMENTS

Sl No.	Item	Description
1	Product warranty	The manufacturer should warrant the solar modules to be free from the defects and/or failures specified below for a period not less than five (05) years from the date of sale. i. Defects and/or failures due to manufacturing ii. Defects and/or failures due to quality of materials iii. Non conformity to specifications due to faulty manufacturing and/or inspection processes.
2	Performance (power) warranty	Each solar PV modules used in solar power plants/ systems must be warranted for at least 90 % of its rated power after initial 10 years and 80 % of its rated power after 25 years from the completion of trial run at site / date of final commissioning. If modules fails to exhibit such power output in the prescribed time span, the vendor will be bound to replace the PV modules with no extra cost claimed at BHEL's customer's sole discretion.
3	Grouping of PV Modules	PV Modules shall be grouped and supplied in 5 watt power output bands as below. No negative tolerance is allowed. 300 watts - 300-304.99 Watts 305 watts - 305-309.99 Watts 310 watts - 310-314.99 Watts 315 watts - ≥ 315 Watts Each 5 watt band shall be a minimum of 1.375 MW and in multiples thereof. Module wattage identification stickers of size 15 X 15 mm to be affixed on the module frames (longer arm) and sticker of size 100 x 100 mm shall be affixed on the carton packing box based on power output bands as below. 300 Watts – **P07** 305 Watts - **P08** 310 Watts - **P09** 315 Watts - **P10**
4	Packing	Modules to be packed in suitable carton box. Modules of the same wattage group to be packed in a box. Same module wattage sticker of size 100*100 mm shall be affixed on the carton box. The carton box should display the manufacturer's name, number of modules, Serial number, Power Output, etc.

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5.0 QUALITY ASSURANCE

Sl No.	Item	Description
5.1	Pre-dispatch inspection by BHEL / customer at vendor's works	BHEL/BHEL's customer shall carry out pre-dispatch inspection (visual and electrical) of every lot at vendor's works.
5.2	Performance of SPV module at STC	1) I-V Characteristics of PV module: Shall be inspected/ verified at vendor's works under STC by BHEL/Customer. 2) Sun simulator should be calibrated by a reference PV module tested at MNRE/UL India/TUV Rheinland India/other reputed test lab as per IEC guidelines.
5.3	Visual characteristics	Each PV module shall be free from the following visual defects: Cell breakage/cracks, air bubbles or de-lamination, cells overlapping one another or cells touching the edge frame, scratches on the frame and/or glass, excessive or uneven glue marks on glass or frame, inconsistent cell colors etc. The module shall be complete in all respects.
5.4	IR-HV-IR test	Check the insulation between the shorted terminals of junction box and aluminum frame at 1000 V DC before and after HV test. Test module to withstand High Voltage of 3000V dc as per IEC 61215. Apply 3000 V DC for 1 minute between the shorted terminals of junction box and aluminum frame. There should not be any di-electric break down.
5.5	Other tests	Electro-luminescence (EL) & potential induced degradation (PID) tests, di-electric withstand test, continuity and leakage current test, insulation resistance test, wet leakage current test, mechanical load test, performance of the PV modules at NOCT and at low irradiance (200 w /m^2) etc.
5.6	Acceptance Quality Plan and sampling size	As per BHEL customer requirement
5.7	Test Reports	I-V test reports shall be provided by the vendor for all the PV modules.

6.0 COMPLIANCE / DEVIATION STATEMENT

Sl. No.	Particulars	Bidder's Confirmation
1.	**Confirmation to BHEL Specification PS- 439- 353 in totality**	Yes / No

Note: Any deviation from the above specifications shall be clearly brought out by the supplier below.

_____

Signature of Tenderer with stamp

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7.0 GENERAL CONDITIONS

1. PV Modules shall be manufactured in India at the vendor's works only.
2. Manufacturer of the PV modules shall have ISO 9001:2008 or ISO 14001 certification for their manufacturing unit for PV modules.
3. The PAN file of the solar module shall be provided.
4. Paper traceability / Mass balance sheet for PV module materials including solar cells with invoices, quantities and test certificates shall be provided.
5. Manufacturing clearance shall be given only after approval of manufacturing quality plan, approval of drawings and datasheet by BHEL / BHEL's customer and after sample PV Module approval.
6. Any additional tests / type tests required by BHEL / BHEL's customer shall be complied and borne by the vendor.

Details to be furnished along with the technical offer

1. Valid IEC Test Certificate, IEC type test reports for IEC 61215, IEC 61730, IEC 61701 and IEC 62804 standards and Constructional Data Form (CDF) / Bill of material as per IEC 61215 test report.
2. Data sheet or catalogue and overall assembly drawing.
3. ISO 9001:2008 or ISO 14001 certification for the PV module manufacturing unit.
4. Details of manufacturing & test facilities / equipment available.

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8.0 IEC TYPE TEST APPROVED BILL-OF-MATERIAL / SUPPLIER LIST

Sl. No.	Item	Sub-Vendor Name (to be mentioned by PV Module supplier)
1.	Solar Cells	(Solar cells can be imported)
2.	Front Glass	
3.	Fast cure EVA sheet	
4.	Back sheet	
5.	Interconnect & bus-bar	
6.	Junction Box (4 terminals, 3 diodes)	
7.	Aluminium frames	
8.	Sealant	

Note:

1. **Vendors shall manufacture & supply PV modules using the above mentioned materials only (as per approved Constructional Data Form (CDF) of IEC test certificate/report).**

2. **Sample PV module approval required from BHEL before bulk manufacturing and supply.**

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9.0 CHECK LIST FOR ENCLOSURES

Sl. No.	Enclosure	Vendor Confirmation for enclosing the document (Yes / No)
1.	Confirming to BHEL purchase specification PS-439-353 with seal and sign on every page and filling up the required details	
2.	IEC 61215, 61730, 61701, 62804 test certificates and test reports	
3.	IEC approved constructional data form or bill of materials	
4.	Data sheet / catalogue for the offered PV module	
5.	Overall assembly drawing of the offered PV module	
6.	ISO 9001:2008 or ISO 14001 certificate	
7.	Details of manufacturing facilities / equipment 1. Tabber / Stringer 2. Laminator 3. Framing Station 4. Other equipment	
8.	Details of Testing facilities / equipment 1. EL tester 2. Sun Simulator 3. PID Tester 4. HV Tester 5. Other Test equipment	

Techno commercial bid Rev 01

BHEL RFQ No. MDSSCPV004 dated 08.10.2016
Item: Multi PV Module (300-315 W) - DCR Module

	Terms and conditions	Bidder's confirmation/ deviation, if any.
1	**Terms of payment:** 100% with 45 days credit after receipt and acceptance of items at BHEL Project Site office. For any deviations, Loading Factor will be applicable, Please refer page 05, Doc no: SCPV: PV Module: 001 - Rev00)	**Acceptable/ Not acceptable**
2	**Terms of Delivery:** FOR project site. The site addresses as below, i. Plot No. 3481 Location-Lower Mejia, Mouza-Mejia, Bankura, West Bengal ii. Chharrah Purulia, West Bengal *Transit Insurance will be bourne by BHEL	**Acceptable/ Not acceptable**
3	**Validity:** Quotation should remain valid for a minimum period of 90 days from the RFQ due date.	**Acceptable/ Not acceptable**
4	**Delivery Schedule:** BHEL requires first delivery of 10.8 MW commencing from Six weeks from the date of MQP (Manufacture quality plan) approval by customer and thereafter 10.8 MW in the following month. In case of order splitting, each lot quantity will be split in the same ratio.	**Acceptable/ Not acceptable**
5	**Penalty for delayed delivery:** 0.5 % per week for undelivered portion subject to a maximum of 10 %. Loading factor will be applicable for non-acceptance of penalty clause, Non- Acceptance: 10% Partial non Acceptance (X%): (10- X)%	**Acceptable/ Not acceptable**
6	**Acceptance of Reverse Auction:** BHEL EDN reserves the right to adopt Reverse Auction at any point of time after technical evaluation, at its discretion. BHEL may also open the price bids at its discretion.	**Acceptable/ Not acceptable**
7	**Taxes and Duties:** Please indicate applicable taxes and duties and the prevailing rates	**ED:** **VAT/CST:** **Any other (Please specify):**
8	**Sales Tax: (To be filled by Indian suppliers Only)** If Sales Tax is applicable, indicate prevailing rate of Sales Tax against Form C. For issue of form "C", vendor has to furnish "E1/E2" form.Please confirm that "E1/E2 Sale form" will be submitted. Wherever E1/E2 transactions are made, CST paid by sub vendor will not be reimbursed (As it is input cost to vendor)	**Acceptable/ Not acceptable**
9	**Price basis:** Price is to be quoted on per Kilowatt basis. Purchase order will be placed on “Kilowatt” basis. Price shall remain firm till completion of supply of total ordered quantity.	**Acceptable/ Not acceptable**
10	**Integrity Pact:** The bidder shall sign an “INTEGRITY PACT” in the formats enclosed.	**Acceptable/ Not acceptable**
11	**Pre-shipment inspection:** Pre-shipment inspection at vendor’s works will be carried out by BHEL / BHEL’s customer. Required assistance for testing will have to be provided by the vendor at the time of pre-shipment inspection.	**Acceptable/ Not acceptable**
12	**Deviations in BHEL terms:** Deviation (if any) w. r. t. our technical & commercial requirements shall be specifically mentioned in a separate sheet marked as ‘Exceptions & Deviations’.	**Acceptable/ Not acceptable**
13	**Quantity tolerance:** BHEL EDN reserves the right to increase/ decrease the order quantity by maximum 5% during the execution of purchase order, but before the completion.	**Acceptable/ Not acceptable**