



BHEL Electronics Division, Bangalore invites Expression of Interest (EOI) for supply of PV grade wafers.

EOI NO and date	SCPVMM0003 dated 06.07.2017
EOI due date	26.07.2017 (Wednesday), 13.00 hours (Indian Time)
SUBMISSION OF EOI	The EOI and supporting documents shall be submitted to BHEL EDN before the due date by post/ email.
Address for Communication & Contact Person in BHEL	Mr. Muhammed Shakir/ Mr. Ramachandra, SC&PV MM Department, BHEL Electronics Division, PB NO 2606, Mysore road, Bangalore-560 026. INDIA Email: muhammedshakir@bheledn.co.in / ramachandra@bheledn.co.in Telephone number: +91 80 26989665/ +91 80 26998476 Fax: +91 80 26989217

REQUEST FOR EXPRESSION OF INTEREST **FOR SUPPLY OF PV-GRADE WAFERS**

1.0 COMPANY INTRODUCTION

Bharat Heavy Electricals Limited (BHEL) is a leading Government of India-owned public sector undertaking. BHEL is an integrated power plant equipment manufacturer and one of the largest engineering & manufacturing organizations in India, catering to the infrastructure sectors of Indian economy viz. energy, transportation & industry. The energy sector covers generation, transmission and distribution equipment for hydro-, fossil and gas fuels. BHEL has been in this business for more than 50 years and BHEL manufactured sets account for nearly 70% of total power generated in India. For more details about the company & its range of products, kindly visit www.bhel.com.

1.1. ABOUT BHEL-ELECTRONICS DIVISION

BHEL-Electronics Division (BHEL-EDN), a unit of BHEL, was established in 1976 at Bangalore (India), with the objective of being a nodal agency for electronics in BHEL & to provide a strong base in the areas of automation and power electronics. Many of the power plants and industries in the country today are equipped with electronics products and systems manufactured and supplied by EDN.

EDN also has a strong presence in the field of transportation for more than a decade and has been supplying vehicle control electronics and GTO/IGBT based converters for Indian Railways. EDN is also into manufacturing of semiconductor devices and PV modules and has executed several solar power projects on turnkey basis till date. BHEL has been contributing to the national initiatives for developing and promoting renewable energy based products on a sustained basis for the past three decades.

1.2. PV BUSINESS IN BHEL-EDN

BHEL-EDN is engaged in semiconductor processing and manufacturing since 1978 and is one of the pioneering organizations in the country in this area. Commencing in the year 1983, the division has continuously worked in the field of solar cells, PV modules and PV systems and developed its own in-house technology. The efficiency levels reached with in-house R&D efforts are on par with international standards. PV modules manufactured by EDN have been type-tested & certified by international agencies as per latest IEC standards.

EDN is one of the few organizations in the country which has developed expertise in the silicon value chain, i.e., from wafer-to-power plant which involves design, supply, commissioning and O&M of solar PV power plants. The company has installed more than 340 MW of solar power with system size varying from kW scale to several MW and has about 130 MW PV power plant orders presently under execution. It has a dedicated team of R&D and field engineers who help to maintain global standards with a defined R&D road map to address the market needs and requirements. The company has enhanced its solar cell manufacturing capacity to 105 MW in January 2017.

2.0 SCOPE OF SUPPLY

BHEL-EDN intends to procure high quality photovoltaic-grade **multi-crystalline** (156.75mm square) **wafers** for manufacturing of high efficiency multi-crystalline cells in-house. The projected annual requirement is around 25 million wafers (~100MW). This call for Expression of Interest (EOI) seeks responses from interested parties (*manufacturers only*) for empanelment with the company. Purchase of wafers shall be done from time to time based on BHEL's actual requirement.

3.0 PRE-QUALIFICATION CRITERIA (PQC) :

PQC is as mentioned under Annexure-I.



4.0 DOCUMENTS TO BE SUBMITTED

The offer shall necessarily include the following documents:

1. Brief introduction of the company, product profile etc.
2. Compliance sheet for Pre-Qualification Criteria (PQC) - refer Annexure-I.
3. Technical Offer: Detailed technical specification enclosed at Annexure-II for reference. Please enclose additional documents such as technical datasheets if necessary.
4. General information & contact details – refer Annexure-III.
5. Commercial Offer: Detailed commercial terms to be enclosed at Annexure-IV.
6. Checklist – refer Annexure V.

5.0 INSTRUCTION FOR OFFER SUBMISSION

EOI may be sent through post to the following address or through email to muhammedshakir@bheledn.co.in / ramachandra@bheledn.co.in

SC&PV – MM Department,
NEB V floor, BHEL-EDN,
PB no 2606, Mysore Road,
Bangalore – 560 026, India
Contact Person: Mr. Muhammed Shakir M K
Phone: 0091-80-2699-9665, 0091-96208-79978

The EOI in sealed envelope or through e-mail shall reach us before 13.00 hours, **26th July, 2017** and the same shall be opened on the same day at 13.30 hours by BHEL.

6.0 EVALUATION

1. The EOI received from various wafer manufacturers shall be scrutinized and offers meeting BHEL requirement will be qualified.
2. Qualified vendors may be called for discussions. Sample submission will be required for final evaluation.
3. After final techno-commercial evaluation, vendors shall be recommended for online registration at BHEL and vendor will be invited to enter into a techno-commercial MOU.

7.0 DISCLAIMER

1. The EOI **does not** constitute 'an invitation of offer' or 'Purchase order' for supply of PV wafers. This is not a contract nor a tender. The sole intended purpose of this document is enlistment of new vendors.
2. There may be deviations / changes in specification during actual tendering for the supply of PV wafers.

ANNEXURE-I



PRE-QUALIFICATION CRITERIA


Sl. no	Particulars	Bidder's confirmation
1	<p>The offer shall be submitted only by the original wafer manufacturers.</p> <p>In case the original manufacturer wishes to engage service of any agent, the manufacturer shall respond in writing directly to BHEL authorizing the agent to respond on its behalf. In such cases, any agent cannot represent more than one manufacturer at any time.</p>	<p><Name of PV module manufacturer, complete address & contact details with email address</p> <p>Name & address of agent, contact details with email address (if applicable)></p>
2	Vendor should have a minimum of 500 MW/annum automated in-house PV-grade multi-crystalline wafer manufacturing facilities.	<multi-crystalline wafer manufacturing capacity in MW/annum: _____ >
3	Vendor should have supplied at least 25 million of 156/156.75 mm multi crystalline solar silicon wafers to reputed solar cell manufacturers.	Documentary evidence to be provided (PO details or delivery details, etc)
4	Wafer supplied shall be suitable for processing solar cells with average efficiency higher than 18%.	Certificate from customer to be enclosed.
5	Supplier shall replace visually defective solar wafers (broken, chips, etc.) found during opening of the wafer packets at the time of actual use at BHEL.	Undertaking letter to be provided

Authorized Signatory

ANNEXURE-II

DETAILED TECHNICAL SPECIFICATION

		PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS		PS- 439 - 093	
				REV. 05	
				PAGE 01 OF 02	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">COPY RIGHT AND CONFIDENTIAL</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>		TECHNICAL SPECIFICATION			
		MATERIAL : 156.75 mm square high-efficiency multi-crystalline silicon wafer			
		APPLICATION : It is used as starting material for solar photovoltaic cell production			
		SL. NO.	CHARACTERISTICS	VALUE / UNIT	TESTING METHODS REF. STANDARDS.
		1.0	APPEARANCE	As cut cleaned	Unaided visual inspection.
		1.1	SURFACE CONDITION		
		Wafers after slicing shall be subjected to detergent solution cleaning process and ultrasonic degreasing process for removal of greases, stains etc. It shall be not be subjected to any kind of chemical etching.			
		1.2	SAW MARKS DEPTH	≤15 microns	Visual inspection & surface profiling.
		2.0	DIMENSIONS		
		2.1	Size (Side to Side)	156.75±0.25 mm	Vernier / Go-No Go gauges
2.2	Shape	Square			
2.3	Thickness	200±20 microns	ASTM-F533		
2.4	TTV (Total Thickness Variation)	≤30 microns	ASTM-F533		
2.5	BOW	≤50 microns	ASTM-F534		
		(05) Spec. revised for 156.75 mm dimension.		APPROVED BY : SR.	
		PREPARED	ISSUED	DATE	
		JRS	Engg.	05-07-2017	

				PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS		PS- 439 - 093	
						REV. No. 05	
		A4 - 10				PAGE 02 OF 02	
		3.0 CHARACTERISTICS					
		3.1 TYPE		P(Boron doped)		ASTM-F42	
		3.2 RESISTIVITY		0.8 – 3.5 ohm.cm		Four point probe	
		3.3 OXYGEN CONCENTRATION		<=1 * 10 ¹⁸ Atoms/CM ³		ASTM-F121	
		3.4 CARBON CONCENTRATION		<=1 * 10 ¹⁸ Atoms/CM ³		ASTM-F123	
		3.5 Brick Life time		>= 4 micro seconds		ASTM F28-91	
		4.0 PACKING					
		1. Wafers shall be kept sealed in polythene / polypropylene sachets.					
		2. Each sachets shall have not more than 100 wafers with a label giving manufacturer name, Ingot no., quantity and wafer characteristics.					
		3. Sachets shall be packed in thermocole boxes with soft spacers on both ends or in polyethylene foam packing to absorb transit handling shocks. Final packing shall be in carton/wooden cases for easy handling. Wooden cases shall be suitable for air freight.					
		4. Each lot must be accompanied with a test certificate certifying the wafer characteristics.					
		5.0 NOTE					
		1. Wafers shall be free from edge chips, cracks, micro cracks, pin holes, stains, water marks and any other contamination.					
		2. Supplier shall replace free of cost the defective wafers found in the packets at the time of actual processing of the wafers into solar cells.					
		6.0 SAMPLING SIZE FOR INSPECTION					
		I. Visual Inspection :					
		Single Sampling Plan as per IS:10673-1983, General Inspection Level II, AQL 2.5 %.					
		II. Dimension and Resistivity measurement :					
		Single Sampling Plan as per IS:10673-1983, Special Inspection Level S-4, AQL 2.5 %.					



ANNEXURE-III

GENERAL INFORMATION & CONTACT DETAILS

1.0	General information	
	1.1. Name of company	
	1.2. Year of Establishment	
	1.3. Address: Telephone: Fax: E-mail: Website:	
	1.4. Factory / Works: Address: Telephone: Fax: E-mail: Website:	
	1.5. Chief Executive:	
2.0	Contact Details	
	Name(s): Official capacity: Address: Telephone: Fax: E-mail:	

Authorized Signatory



ANNEXURE-IV

COMMERCIAL TERMS

1.	Terms of Payment	
	For Foreign Vendors BHEL Standard terms of payment is 100% against sight draft with 45 days Credit	Bidders's confirmation
	For Indigenous Vendors BHEL Standard terms of payment is 100% direct payment with 45 days credit Advance payment will not be accepted	Bidders's confirmation
2.	Terms of Delivery	
	For Foreign Vendors CIF, ICD Bangalore (Incoterms 2010)	Bidders's confirmation
	For Indigenous Vendors Door Delivery to BHEL Stores, Bangalore with Freight and Insurance paid.	Bidders's confirmation

Authorized Signatory



ANNEXURE-V

CHECK LIST

Sl. no.	Description / Enclosures	Whether submitted
1	Company introduction with product profile	YES / NO
2	Annexure 1 - PQC Criteria – compliance	YES / NO
3	Annexure 2 - Brief Technical Specification – compliance	YES / NO
4	Annexure 3 – General information & contact details	YES / NO
4	Annexure 4 – Commercial terms	YES / NO
5	Annexure 5 – This checklist	YES / NO
6	Any other document	<please specify>

Authorized Signatory