Subject: Expression of Interest (EOI) for Consultancy for Solar Silicon Wafer Plant

Due Date of submission: 10.06.2015 (Wednesday), 13.00 hours (Indian Time)

1) INTRODUCTION

BHEL, Electronics Division, Bangalore, a unit of Bharat Heavy Electricals Ltd, MAHARATNA Public Sector Undertaking under Government of India proposes to establish Solar Silicon Wafer Plant for manufacture of 156-mm size multi crystalline solar grade silicon wafers with an annual capacity of 240-MW. The wafer plant is proposed at Bhandara, Maharashtra, India (90 KM from Nagpur). This Expression of Interest (EOI) seeks response for providing consultancy for the above Solar Silicon Wafer Plant.

1.1) 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 and manufacturing organizations in India, catering to the infrastructure sectors of Indian economy viz. energy, transportation, industry and non-conventional energy. 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. Nearly 68% of the equity of BHEL is owned by the Government of India. The company has 17 manufacturing units, 4 power sector regions, 8 service centers, 10 overseas offices and 15 regional offices, besides host of project sites spread all over India and abroad. The annual turnover of BHEL for the year 2013-14 **was Rs. 40338 Crores (US $ 6.3 Billion),** with profit before tax of Rs. 5014 Crores (**US $ 0.78 Billion)**. BHEL's highly skilled and committed manpower of approximately **44,908** employees, the best of manufacturing facilities and practices together with the latest technologies, has helped BHEL to deliver a consistent track record of performance. With the current order book of approximately Rs. 1,00,000 Crores (**US $ 15.62 Billion),** BHEL is poised for excellent future growth. More details about the entire range of BHEL's products and operations can be obtained by visiting our web site **www.bhel.com**.

1.2 About Electronics Division unit of BHEL

Electronics Division (BHEL-EDN) (www.bheledn.com**),** 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 and to supplement the Company's pioneering efforts in the above mentioned core sectors. Many of the power plants and

industries in the country today are equipped with electronics products and systems that have been manufactured and supplied by BHEL EDN.

EDN supplied equipment accounts for about 63 % of total Control & Instrumentation(C&I) equipments in the country and continue to be the leader in power industry for last one decade. We also have a strong base in Photovoltaics which was started first time in INDIA by BHEL in 1983. Today EDN has an installed PV module manufacturing capacity of 26 MW per annum besides executing MW sized power plant systems from concept to commissioning on turnkey basis. BHEL-EDN also manufactures space grade solar modules and battery, which are being used in various satellites launched by Indian Space Research Organization (ISRO). We also have a good international reference by way of our exports to Europe, Middle-East and South-East Asian markets. EDN has been accredited with ISO 9001, ISO 14001 and OHSAS 18001 standard certifications.

1.3 About Experience of BHEL in Solar Photovoltaics

BHEL's entry into the Solar Photovoltaic business sector has been in line with its commitment to the development and manufacture of various forms of power generation equipment. Its Electronics Division (EDN) at Bangalore is engaged in Semiconductor processing and manufacturing since 1978 and is one of the pioneering organizations in the country in this area. With the experience generated in the field of Semiconductor materials, processing and product engineering, EDN-BHEL is one of the first companies in the country to foresee the Solar Photovoltaic as a major segment of energy portfolio. 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 at par with International standards. Solar cells/PV modules manufactured by BHEL are characterized and type tested by International agencies (such as ECN, Netherlands, TUV Rheinland, Germany and UL India, Bangalore) as per IEC 61215, IEC 61730, and IEC 61701 standards for design qualification & type approval, safety standards and salt mist corrosion respectively for its crystalline Silicon PV modules. The reliability of system engineering capability is proven through various projects undertaken on EPC & which are approved with BHEL designed systems.

BHEL is one of the few organizations in the country which has developed expertise in the critical parts of the silicon value chain, viz., wafer-to-power plant which involves supply, design, commissioning and O&M of MW-size PV power plants. BHEL offers turnkey solutions for Solar PV plants from concept to

commissioning and has installed about 61 MWp of Solar PV power plants till date for system size from kWp to MWp rating and has about 58 MW PV power plant orders presently under execution. It has a dedicated team of R&D and Field engineers that helps it to identify and maintain global standards with a defined R&D road map to address the market needs and requirements. More details of Photovoltaic products can be found at www.bheledn.com.

2.0 Indicative Scope of Consultancy

The indicative scope of consultancy for 240-MW annual capacity multi crystalline solar silicon wafer plant shall necessarily consist of the following recommendations.

1. Technology for processes such as casting, bricking, squaring, grinding, slicing, cleaning, etc. in the manufacturing of 156-mm multi crystalline silicon wafers.
2. Process flow
3. Equipment, utilities and facilities required along with detailed specification and recommended vendors
4. Factory Utility Matrix (FUM) like power, compressed air, water, exhaust, etc.
5. Equipment operation and maintenance requirements including critical spares
6. Process control methods and process yield in casting and slicing of wafers
7. Automation requirements
8. Bill of materials (Raw materials like poly feed stock, dopant and consumables like Crucibles, wires, slurry, coolant, etc.) for manufacturing wafers along with specification, recommended vendors with cost estimates
9. Overall plant layout to suit the land available
10. Shop floor and utility plant layout
11. Building dimensions (LxWxH) and special construction requirement like foundation for shop floor, Utility, stores, Finished goods, Office, etc.
12. Vetting of Offers from vendors for equipment, utilities, materials,etc.
13. Power quality and UPS requirements
14. Special tools, jigs and fixtures
15. Gas and chemical delivery systems
16. Slurry recovery system
17. Argon Recycling system
18. Waste disposal systems
19. Water reclamation systems
20. Scrubbers, Exhaust and Effluent treatment plant systems
21. Manpower requirements for operation, maintenance, planning, office, etc.
22. Testing & Characterization facilities and R&D lab requirements
23. Pollution control and Statutory approval requirements

3.0 Pre-Qualification Criteria for the Consultant:

The consultant shall be either an original manufacturer of solar grade silicon wafers or a consultancy organization engaged in offering consultancy services for establishing solar silicon wafer plant.

Pre-Qualification Criteria for original solar silicon wafer manufacturer

- Original manufacturer of solar grade multi crystalline silicon wafers and should have an operational solar silicon wafer plant with an annual production capacity not less than 200 MW.
- The wafer manufacturer should have manufactured and supplied a cumulative of 400-MW of multi crystalline solar silicon wafers to various customers during the period from 1st January 2011 to 31st December 2014.

Pre-Qualification Criteria for Consultancy organization

- The consultancy organization should have offered cumulatively at least two consultancy services for establishment of multi crystalline solar silicon wafer plant during the period from 1st January 2011 to 31st December 2014.
- Consultancy services offered during the period from 1st January 2011 to 31st December 2014 shall include at least 1 operational multi crystalline solar silicon wafer plant for an annual production capacity not less than 100 MW.

4.0 Instructions to the respondent to EOI for submission of offer

The respondents shall submit their offers with following:

(a) Annexure-1: "Prequalification criteria" duly filled by the bidder with signature and seal.

(b) Annexure-2: Indicative Scope of consultancy duly signed.

(c) Annexure-3: "Company profile" duly filled up by the bidder with signature and seal on each page along with documentary proof for meeting Pre-Qualification Criteria, customer reference lists, customer certificates, consultancy projects executed and annual reports.

(d) Annexure-4: "Checklist" duly filled up by the respondent with signature and seal.

7.0 The consultant shall submit their response in a sealed cover to BHEL on or before 13.00 hours, June 10, 2015 and the same shall be opened on the same day at 13.30 hours by BHEL.

Your response may please be sent to the following address:

S.Ravi
AGM (SC&PV-Engg.)
BHEL, EDN,
Mysore Road,
Bangalore – 560 026
India
Phone: 0091-80-26989164, 0091-9449869621
Fax: 0091-80-26989217
Email: ravis@bheledn.co.in

8.0 EVALUATION

a) The Expression of Interest (EOI) received from various agencies shall be scrutinized and shortlisted based on qualifying criteria specified in EOI. BHEL may request the shortlisted Consultants for further discussions and presentations.

b) Detailed Tendering will be done by BHEL among qualified agencies from the EOI as per BHEL policy and guidelines. Offers, thus obtained, would be evaluated as per laid down procedure to select the Consultant.

9.0 DISCLAIMER

a) The EOI does not constitute an invitation of offer in relation to the aforesaid work. This is not a contract or agreement of any kind whatsoever.

b) There may be deviations or changes in any of aforementioned information during actual tendering for the consultancy services.

Annexure-1

Pre-Qualification Criteria Confirmation by the responding Party (1.1 or 1.2)

S No	Description	Response
1.1	**Original solar silicon wafer manufacturer**	Yes / No Name of your company : Address : e-mail : Website :
	i)Operational multi crystalline solar silicon wafer plant with an annual production capacity not less than 200 MW.	Yes / No Multi Wafer plant annual capacity : (Pl. provide documentary evidence)
	ii)The wafer manufacturer should have manufactured and supplied atleast a cumulative of 400-MW of multi crystalline solar silicon wafers to various customers during the period from 1st January 2011 to 31st December 2014.	Yes / No Supplied Quantity : Year 2011 : Year 2012 : Year 2013 : Year 2014 : (Pl. provide documentary evidence)
1.2	**Consultancy organization**	Yes / No Name of your company : Address : e-mail : Website :
	i)The consultancy organization should have offered cumulatively atleast two consultancy services for establishment of multi crystalline solar silicon wafer plant during the period from 1st January 2011 to 31st December 2014.	Yes / No Details of Consultancy services offered for multi crystalline solar silicon wafer plant: (Pl. provide documentary evidence)
	ii) Consultancy services offered during the period from 1st January 2011 to 31st December 2014 shall include atleast 1 operational multi crystalline solar silicon wafer plant for an annual production capacity not less than 100 MW.	Yes / No Operational Solar silicon wafer plant capacities for which consultancy services offered : (Pl. provide documentary evidence)

Authorised Signature

Annexure-2

Indicative Scope of Consultancy for Solar Silicon Wafer Plant

We (Consultant) confirm that we can offer consultancy to BHEL for 240-MW annual capacity multi crystalline wafer plant for the following requirements.

1. Technology for processes such as casting, bricking, squaring, grinding, slicing, cleaning, etc. in the manufacturing of 156-mm multi crystalline silicon wafers.
2. Process flow
3. Equipment, utilities and facilities required along with detailed specification and recommended vendors
4. Factory Utility Matrix (FUM) like power, compressed air, water, exhaust, etc.
5. Equipment operation and maintenance requirements including critical spares
6. Process control methods and process yield in casting and slicing of wafers
7. Automation requirements
8. Bill of materials (Raw materials like poly feed stock, dopant and consumables like Crucibles, wires, slurry, coolant, etc.) for manufacturing wafers along with specification, recommended vendors with cost estimates
9. Overall plant layout to suit the land available
10. Shop floor and utility plant layout
11. Building dimensions (LxWxH) and special construction requirement like foundation for shop floor, Utility, stores, Finished goods, Office, etc.
12. Vetting of technical offers received from the vendors for equipment and utilities
13. Power quality and UPS requirements
14. Special tools, jigs and fixtures
15. Gas and chemical delivery systems
16. Slurry recovery system
17. Argon Recycling system
18. Waste disposal systems
19. Water reclamation systems
20. Scrubbers, Exhaust and Effluent treatment plant systems
21. Manpower requirements for operation, maintenance, planning, office, etc.
22. Testing & Characterization facilities and R&D lab requirements
23. Pollution control and Statutory approval requirements

Authorised Signature

Annexure-3

Format for filling up Company Profile

1.0	**General information**	
	1.1 Name of company	
	1.2 Address: Telephone: Fax: E-mail: Website:	
	1.3 Factory / Works: Address: Telephone: Fax: E-mail: Website:	
	1.4 Chief Executive:	
	1.5 Contact person(s) Name(s): Official capacity: Address: Telephone: Fax: E-mail:	
	1.6 Year of establishment of the company	
2.0	**FINANCIAL INFORMATION:**	
2.1	Annual turnovers, and profit-after-tax for last 3 years: (Attach copies of audited Balance Sheet and P&L Account) Year-1: Year-2: Year-3:	

Authorised Signature

Annexure 4

CHECK LIST

Sl. No.	Description	Whether submitted
1	Covering letter signed by an authorized signatory on company letter head listing clearly the enclosures	YES / NO
2	Details as per Annexure 1- PQC Criteria	YES / NO
3	Details as per Annexure 2- Indicative Scope of Consultancy	YES / NO
4	Details as per Annexure 3- Company Profile	YES / NO

Authorised Signature