



EXPRESSION OF INTEREST

FOR

**Design, Development, Manufacture, Testing & Commissioning
of
Control Cards for Traction Application
and
Complete Transfer of Technology to BHEL.**

Issued by:

**Bharat Heavy Electricals Limited
BHEL-Electronics Division, Mysore Road,
Bangalore - 560026, India
(hereinafter referred to as 'BHEL')**

Having registered office at

BHEL House, Siri Fort New Delhi-110049, India

DISCLAIMER

All information contained in this EOI provided / clarified are in good interest and faith. The information contained in this Expression of Interest document or subsequently provided to Applicant(s), whether verbally or in documentary or any other form, by or on behalf of BHEL, is provided on the terms and conditions set out in this EOI and such other terms and conditions subject to which such information is provided.

The purpose of this EOI is to provide interested parties with information that may be useful to them in the formulation of their application for qualification and subsequent selection pursuant to this EOI. This EOI is not an offer by BHEL to the prospective Applicant(s) or any other person. This EOI is neither intended nor shall it be construed as creating or requiring any ongoing or continuing relationship or commitment with any party or person. This is not an offer or invitation to enter into an agreement of any kind with any party.

Though adequate care has been taken in the preparation of this EOI document, the interested firms shall satisfy itself that the document is complete in all respects. The information is not intended to be exhaustive. Interested Agencies are required to make their own enquiries and assumptions wherever required. Intimation of discrepancy, if any, should be given to the specified office immediately. If no intimation is received by this office by the date mentioned in the document, it shall be deemed that the EOI document is complete in all respects and firms submitting their interest are satisfied with the EOI Document in all respects.

The issue of this EOI does not imply that BHEL is bound to select and shortlist Applicant(s) for next stage or to enter into any agreement(s) with any Applicant(s). BHEL reserves all right to reject any applications submitted in response to this EOI document at any stage without assigning any reasons thereof. BHEL also reserves the right to withhold or withdraw the process at any stage. Neither BHEL nor its employees and associates will have any liability any loss, expense or damage which may arise from or be incurred or suffered in connection with anything contained in this EOI document or any matter deemed to form part of this EOI document, the information and any other information supplied by or on behalf of BHEL. BHEL accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance/use of any statements/information contained in this EOI by the Applicant. BHEL is not making any representation or warranty, express or implied, as to the accuracy or completeness of any information/statements made in this EOI.

The Applicant shall bear all its costs associated with or relating to the preparation and submission of its Application including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by BHEL or any other costs incurred in



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connection with or relating to its Application. All such costs and expenses will remain with the Applicant and BHEL shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by an Applicant in preparation or submission of the Application, regardless of the conduct or outcome of the EOI.

BHEL

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1.0 INTRODUCTION

This Expression of Interest (Eoi) seeks response from Design Consultant Agencies / Original Equipment Manufacturer (OEMs) who are involved in designing or have past experience in designing & manufacturing of Control Cards for Traction / Rolling Stock Applications.

2.0 ABOUT BHEL

Bharat Heavy Electricals Limited (BHEL) is a Central Public Sector Enterprise, wherein Government of India is holding 63.17% of its equity. It is an integrated power plant equipment manufacturer and one of the largest engineering and manufacturing companies of its kind in India having a turnover of about USD 5 billion. The company is engaged in the design, engineering, manufacture, construction, testing, commissioning and servicing of a wide range of products and services for the core sectors of the economy, viz. Power, Transmission, Industry, Transportation, Renewable Energy, Oil & Gas and Defense with over 180 product offerings to meet the needs of these sectors.

Since its inception in 1964, BHEL has been the solid bedrock of evolution of India's Heavy Electrical Equipment industry. BHEL has a mammoth 20,000 MW per annum capability for manufacturing of power generation equipment. A widespread network of 17 manufacturing units, 2 repair units, 4 regional offices, 8 service centres, 1 subsidiary, 4 overseas offices, 6 joint ventures, 15 regional marketing centres and current project execution at more than 150 project sites across India and abroad corroborates the humongous scale and size of its operations.

With key focus on project execution, the worldwide installed base of power generating equipment supplied by BHEL has exceeded 178 GW. BHEL's equipment that account for about 60% of the country's total generation from thermal utility sets (coal based), stand a testimony to its valuable contribution towards nation building. BHEL's global competitiveness has established its footprint in all the inhabited continents with references in 82 countries.

The high level of quality & reliability of BHEL products is a testimony to its adherence to international standards by acquiring and adapting some of the best technologies from leading companies in the world including General Electric, Siemens AG, Mitsubishi Heavy Industries Ltd. etc., together with technologies developed in its own R&D centres. BHEL invests more than 2.5% of turnover on R&D and innovation.

BHEL has been designing and manufacturing rolling stock for rail and urban transportation. BHEL has also been manufacturing Motors, Power electronics and Controllers for various transportation applications at its various factories. BHEL also has a Battery Packaging facility for space applications.

In transportation sector, BHEL is into the manufacture of complete electric and diesel electric locomotives and electrical assemblies/components including traction motors, traction transformers, power & auxiliary converters and controls, gear wheels etc.

At Jhansi plant, we manufacture complete Electric Locomotives upto 6000 HP rating for mainline application of Indian Railways, Diesel Electric Locomotives from 350 HP to 3100 HP rating. Till date, we have supplied more than 370 nos. of main line electric locomotives Indian Railways and more than 250 nos. of diesel electric locomotives for shunting operations to different industries. We are currently executing an order for manufacture of complete Electric Locomotive of 6000 HP. Our Jhansi plant with an installed capacity of 75 nos. locomotives per year. At Jhansi, we have complete state-of-the-art facilities for manufacturing, fabrication and testing of bogies, loco shells, under frames and other mechanical components of locomotives. We have recently developed India's first state-of-the-art WAG7 Electric Locomotive with regenerative capabilities. We have also developed India's first Traction Motor for 9000HP Electric Locomotives.

At Bhopal and Bengaluru plants, among electrical propulsion equipment, we manufacture and supply traction motors, traction transformers, power converters(IGBT/GTO) & controls, auxiliary converters(IGBT/GTO) and vehicle control units for electric locomotives, diesel electric locomotives, EMUs, DEMUs & and metros trains of Indian Railways. Our manufacturing range includes conventional DC drive, IGBT based 3-phase drive equipment upto 6000HP rating. BHEL has also been in the forefront of providing maintenance and spares/replacement support to Indian Railways for their locomotive fleet. We have full-fledged service department located at major centres in the country.

More details about the entire range of BHEL's products and operations can be obtained by visiting our web site www.bhel.com.

3.0 Scope of Cooperation

- 3.1** In order to meet upcoming market requirements in 3-phase IGBT based propulsion system including TCMS for various EMUs like Metro / Metrolite / Semi high speed Trainsets and Rapid Rail Transit System (RRTS) segment in India and abroad, BHEL intends to enter into a Technology Transfer Agreement (TTA) for developing the Control Cards (as described in Section 3.4 of this document) required for Traction Application for which this Expression of Interest (hereinafter referred to as the "EOI") has been issued.
- 3.2** The intent of this EOI is to invite applications from interested organizations / companies / consultants who are willing to Partner with BHEL for Design, Development, Manufacturing, Testing & Commissioning of Control Cards and Complete Transfer of Technology (Hardware/Manufacturing Information and Software Source Code with Design document) to BHEL.
- 3.3** Indicative Credentials of the participant for Development of Control Cards is to be submitted as per the format in Annexure-1.

3.4 Brief Description of Control Cards

Control Cards for Traction Application means PCB Cards which are required for Controlling Traction Converter/Inverter, Auxiliary Converter/Inverter and Train Control & Monitoring System (TCMS) along with Input/output (both analog & digital) Controller Cards complying to Train Communication Network standard IEC 61375. All these cards should be suitable to work under harsh conditions complying to IEC 61373 as required for Rolling Stock Applications.

Control Cards for Traction Converter/Inverter System:

- The card shall be robust complying to IEC 60571 and IEC 61373 applicable to rolling stock application.
- The card shall have the capability to process by taking the field inputs (Analog/Digital) and appropriately generating output for controlling the Power Electronics Circuit (Typically IGBT Power Modules).
- The control card shall have the following intelligent IC's / Processors to address the following functions:
 - a) DSP – For Processing mathematical algorithms written in Matlab/Simulink
 - b) Microcontroller - For handling communication interfaces.
 - c) FPGA – Interface with Field Signal Interfaces (Analog/Digital) and communication between Microcontroller, DSP and memory chips
- The card shall have the communication capabilities to interact within the equipment and also with vehicle network. Following communication interfaces shall be implemented in the card:
 - a) CAN
 - b) Serial (RS 232)
 - c) Serial (RS 485)
 - d) Ethernet as service port
 - e) HDLC
 - f) MVB communication
 - g) Ethernet communication Interface
- Other features required on the board:
 - 1) USB 2.0
 - 2) Digital and Analog I/O
 - 3) The microcontroller shall have RTC
 - 4) Battery slot

The chosen partner(s) shall also be required to provide due support to BHEL for fulfilling the contract obligations to the end customer (User Railways).

4.0 INSTRUCTION TO APPLICANTS:

- 4.1** Reputed business entities may submit their application as per **Annexure -1 & Annexure – 2** (along with supporting documents for PQR) by Post / e-mail so as to reach us on or before **21st August 2020 (before 13:00 Hrs)** at the following address:

Mr. R. Shekar, AGM
Traction Engg., NEB – 6th Floor
Bharat Heavy Electricals Limited
Electronics Division,
P.B. No. 2606, Mysore Road
Bangalore - 560026, India.
Email: shekar.r@bhel.in / hshekhar@bhel.in
Phone: +91 80 26989210 / +91 80 26989566

- 4.2** The details submitted by the Applicant(s) shall be complete in all respects and BHEL may seek clarifications/additional information as considered necessary. Such clarifications/additional information must be provided within one week of BHEL request.
- 4.3** The EOI process involves seeking willingness of interested parties and selecting one or more party(ies) amongst all who make an application in response to this EOI.
- 4.4** Any request for further information or clarification on the EOI document may be submitted to the above mentioned official within one week from the date of issue of EOI.
- 4.5** Responses to EOI are to be submitted in English only. Supporting documents, as required, should also be in English language. In case of some documents being available in languages other than English, the Applicant shall necessarily provide duly authenticated translated version of the same in English.
- 4.6** Duly authorized representative of the Applicant(s) shall sign on each page of the document. Response to EOI should be prepared in such a way so as to provide a straight forward, concise description of Applicant's capabilities.
- 4.7** Notwithstanding anything contained in this EOI, BHEL reserves the right to accept or reject any Application and to annul the EOI Process in whole or part, at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons thereof.
- 4.8** BHEL reserves the right to verify all statements, information and documents submitted by the Applicant in response to the EOI. Any such verification or lack of such verification by BHEL shall not relieve the Applicant of his obligations or liabilities hereunder nor will it affect any rights of BHEL.



- 4.9** The EOI process shall be governed by, and construed in accordance with, the laws of India and the Courts at Bangalore, Karnataka shall have exclusive jurisdiction over all disputes arising under, pursuant to and/ or in connection with the EOI process.
- 4.10** All costs incurred for participation in the EOI shall be borne by the Applicant(s).
- 4.11** BHEL at its discretion may extend the due date for submission of EOI and the decision of BHEL in this respect would be final & binding on the respondents.
- 4.12** In case any amendment/corrigendum issued to this EOI, it shall be notified only at www.bhel.com

5.0 Pre-Qualifying Requirements (PQR):

PQR responses to be submitted as per Annexure-2. It is desired that the prospective partner/ respondent meet the pre-qualification requirement supported with relevant documents/ credentials/ certificates for further consideration as per the conditions stipulated in Annexure-2.



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Annexure-1

Information to be submitted by Applicant

1. Name of the Company:
2. Legal status of the Company:
3. Brief description of the Company including details of its business groups/subsidiaries/affiliates:
4. Date of Incorporation:
5. Date of Commencement of Business:
6. Full address including Telephone nos. / Fax nos.:

Registered Office:

Head Office:

Address for communication:

Contact Details:

Office Address in India, if any:

7. Documents to be enclosed:
 - a) Technical Credentials – Relevant Product/System catalogues, Experience /Reference List, Copies of Customer Certificates, Engineering strengths, quality accreditations, etc.
 - b) Financial Credentials – Copies of Audited Financial statements (Annual Reports) for last 3 years, Credit Rating, Market share (Domestic/International), Segmental Revenue in the applied category(ies).
 - c) Other documents considered relevant to meet PQR and support evaluation criteria.

(Sign & Company Seal)

Authorized signatory

Pre-Qualification Requirements

Sl.no.	Requirement	Applicant's Response	Supporting document
1)	Electronic Control Cards:		
1.1	Be a Designer / Design Consultant / OEM for complete/partial electronic control cards used in Traction/Rolling Stock applications.		
1.2	Has sufficient engineering /design/ manufacturing capabilities for design, development, manufacturing, testing and commissioning of proposed scope of work/cooperation.		
1.3	Has not been blacklisted / banned for business dealings by any Government Department of India.		
1.4	No previous contract has been terminated or part terminated due to bidder's failure.		
1.5	Has not suffered insolvency / bankruptcy.		
1.6	Respondent must have positive net worth as of last financial year.		
1.7	Bidder shall agree for Technology transfer including IPR/Patents related to the development of control cards under the scope of EOI. Technology transfer could be done either by ToT or BSA as suitable. Bidder shall mention any pre requisite condition to be fulfilled by BHEL for Technology Transfer.		
1.8	All the design documents to be shared with BHEL related to components and electronics cards (Including Software/Firmware Source Code along with Design Document, Hardware components details, Schematic circuit diagram, Assembly drawing, Heat loss calculation, internal interface communication and any other related studies/documents). Complete methodology, architecture and application software & firmware used, shall be shared with BHEL.		
1.9	Hardware information of electronic control cards should be shared with BHEL. Type test and routine test information at component level shall be provided.		
1.10	Bidder shall provide Electronic control cards Hardware update and support.		
1.11	Software documentation for Control cards including software logic, software validation, software quality plan, safety analysis etc. should be submitted. Bidder to provide Control cards software (along with		

Annexure-2

	Source Code) required to provide required functionality as detailed in the scope. Bidder shall provide training to BHEL engineers for tuning and controls over further updation.		
1.12	Bidder shall provide Electronic cards firmware update and support.		
1.13	Bidder shall provide complete details to BHEL to enable to establish control cards software simulation facility and carryout software simulation testing in Lab environment for validation.		
1.14	Bidder shall have full involvement, support and responsibility in combined designing, joint development, card level testing, component level testing, firmware development and take responsibility regarding the scope.		
1.15	Reliability and component obsolescence: Bidder shall provide following a) Warranty obligation b) Fine tuning of the control card circuit to address the reliability issues c) Support for addressing component obsolescence Failure of control cards during warranty obligation shall be formulated during the detailed scope discussions. However, any warranty obligations arising out of inadequacy of design should be with the bidder. Bidder should provide support for any fine tuning required to meet the reliability/ customer requirement.		
2)	Bidder shall provide Interface related information regarding internal communication between the components and their handshaking protocols used in the control cards as required.		
3)	Bidder confirms to submit his commercial offer on BHEL request within 2 weeks Few tentative details are mentioned in Annexure. In case additional details are required by Bidder. List of details required to submit commercial offer for electronic control cards to be provided along with EOI response in advance.		

(Sign & Company Seal)

Authorized signatory