



Expression of Interest (Eol) for Technology Tie-up for Electric Buses

Subject: Technology Tie-up for Electric Buses.

1) Introduction:

This Expression of Interest (Eol) seeks response from Original Equipment Manufacturer (OEMs) of Electric Buses meeting the requirements of this Eol and are willing to be associated with BHEL through a License & Technology Collaboration Agreement on long term basis to enable BHEL to design, engineer, integrate, manufacture, assemble, type test (homologation) through suitable certifying agency(ies), carry out routine testing and servicing of Electric Buses. BHEL intends to manufacture Electric Buses {In this Eol “Electric Buses” means air conditioned pure Electric Buses (with Li Ion battery technology) and does not include hybrid Electric Buses}.

1.1 About Bharat Heavy Electricals Limited (BHEL):

BHEL is a leading state owned company of India, wherein Government of India is holding 63.06% of its equity. BHEL is an integrated power plant equipment manufacturer and one of the largest engineering and manufacturing organization in India, catering to the core infrastructure sectors of Indian economy viz. energy, transportation, heavy engineering industry, defense, renewable and non-conventional energy. The energy sector covers generation, transmission and distribution equipment for thermal, gas, hydro, nuclear and solar photo voltaic. BHEL has been in this business for more than 50 years and BHEL supplied equipment’s account for more than 57% (approx. 180 GW) of the total thermal generating capacity in India. BHEL is also listed on Indian stock exchanges. BHEL has 17 manufacturing units, 2 Repair Units, 4 power sector regions, 8 service centers, 3 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 2017-18 was US\$ 4.16 Billion*. BHEL’s highly skilled and committed manpower of approx 37500; state-of-the-art manufacturing facilities and latest technologies helped BHEL to deliver a consistent track record of performance since long. To position leading state owned companies as Global Industrial giant and as a recognition for their exemplary performance, Government of India categorized BHEL as “Maharatna Company” in 2013.

Our ongoing technology tie-ups with leading technology providers include GE Technology GmbH, Switzerland (for Once through Boilers and Coal Pulverisers); Siemens, Germany (for Steam Turbines, Generators and Condensers); Metso Automation Inc., Finland (for Control & Instrumentation); MHI, Japan (for Pumps); MHPS, Japan (for Flue Gas Desulfurization Systems); Vogt Power International, USA (for HRSG); GENP, Italy (for Compressors); TLT Turbo GmbH, Germany (for Fans), Sheffield Forge Masters International, UK (for Forgings); ISRO, India (for space grade li Ion cells); HLB Power Co.Ltd, Korea (for Gates and Dampers) and Kawasaki Heavy Industries Ltd., Japan (for Stainless Steel Metro Coaches & Bogies).

More details about the entire range of BHEL’s products and operations are available at www.bhel.com.

1.2 Manufacturing Facilities at BHEL:

BHEL has 17 manufacturing units, 2 Repair Units spanning across India equipped with state-of-the-art manufacturing facilities for manufacturing Power Plant Equipment, various Industrial products and Defence related Products. The high level of quality & reliability of BHEL products is due to adherence to international standards by acquiring and adapting some of the best technologies from leading companies in the world, together with technologies developed in its own R&D centres.

(*Note: Currency conversion rate considered: 1 US \$= Rs. 66.93 (approx.) as on 2nd June 2018)



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BHEL divisions like Manufacturing units, Engineering centres and Business Sectors like Power Sector, Industry sector, International Operations are accredited to Quality Management Systems (ISO 9001). Major Manufacturing units and Power Sector Regions are also accredited to Environmental Management Systems (ISO 14001) and Occupational Health & Safety Management Systems (OHSAS 18001).

2) **Scope of cooperation:**

BHEL is seeking response from OEMs for Electric Buses through a License and Technology Collaboration Agreement.

Prospective collaborator shall be responsible for transferring necessary know-how & know-why to enable BHEL to design, engineer, integrate, manufacture, assemble, type test (homologation) through suitable certifying agency(ies), routine testing and servicing of Electric Buses. BHEL intends to cater to domestic market in India as well as overseas market.

Interested manufacturers meeting the Pre-Qualification Requirements (PQRs) are invited to submit their offer in response to this Eol. Indicative scope of technology transfer is stipulated in **Annexure-1**.

Upon receipt of responses against this Eol, BHEL will review the responses to ascertain suitability of the offer and shortlist prospective collaborator for further discussions. Detailed discussions on commercial and other terms and conditions to finalize the Technology Collaboration Agreement (TCA) shall be held with shortlisted prospective collaborator. The detailed terms and conditions for such a paid-up license agreement shall be mutually agreed upon.

3) **Pre-Qualification Requirements (PQRs):**

Prospective Collaborator should meet all Pre-Qualification Requirements as mentioned below:

- 3.1 Prospective Collaborator should have designed, engineered, integrated, manufactured/ assembled and supplied minimum 100 Nos. of Electric Buses (5m -18 meter) in last 5 years.
And
- 3.2 Prospective Collaborator should have designed, engineered, integrated and manufactured/ assemble at least one (01) variant of 9m or above Electric-Bus which has successfully completed min. 25000 KM of operation on or before the closing date of this Eol. (A certificate/letter from the end user/customer certifying successful completion of min 25000KM, while meeting all the performance parameters to be enclosed).
And
- 3.3 Prospective Collaborator should have obtained necessary certification for homologation of at least two (02) nos. Electric-Bus variants of 9m or above (designed, engineered, manufactured/ integrated by prospective collaborator) from the approving authority(ies) such as Automotive Research Association of India (ARAI) or International Centre for Automotive Technology (ICAT) or approving authority(ies) in country where buses have been supplied and are in operation. (Certificates to be enclosed).

4) **Brief Description of Eol Process:**

The interested prospective collaborators shall ensure that their response along with following annexures are received by BHEL on or before 25th June 2018:

- i. Annexure-1- Indicative Scope of Technology Transfer
- ii. Annexure-2- Broad technical capabilities of prospective collaborator for Electric Buses
- iii. Annexure-3- Complete reference list of Electric Buses



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The response shall necessarily be accompanied with details on following:

- I. Company background
- II. Product profile
- III. Electric-Buses being offered along with its technical details
- IV. Reference list of customers
- V. Relevant certificates
- VI. Annual audited financial reports for last three (03) years including auditor's report

In case any amendment/corrigendum issued to this Eol, it shall be notified only at www.bhel.com.

5) Schedule of Eol & contact details

5.1 Schedule of Eol:

The schedule of Eol shall be as follows -

Sl No.	Description	Date
1.	Issue of Eol document	04.06.2018
2.	Last date for Submission of Eol response	25.06.2018

5.2 Contact Details:

The respondent shall submit their response with all annexures duly signed to the following official:

General Manager Technology Licensing, Joint Ventures, Mergers & Acquisitions, Corporate Technology Management, Bharat Heavy Electricals Limited (BHEL), BHEL House, Siri Fort, New Delhi 110049 (India) Tel: +91 11 6633-7210/ 7213 E-Mail: techeoi@bhel.in

6) Miscellaneous:

6.1 Right to accept or reject any or all Applications:

- i. Notwithstanding anything contained in this Eol, BHEL reserves the right to accept or reject any application and to annul the Eol process and reject all applications, at any time without any liability or any obligation for such acceptance, rejection or annulment and without assigning any reasons, thereof. In the event that BHEL rejects or annuls all the applications, it may at its discretion, invite all eligible prospective collaborators to submit fresh applications.
- ii. BHEL reserves the right to disqualify any applicant during or after completion of Eol process, if it is found there was a material misrepresentation by any such applicant or the applicant fails to provide within the specified time, supplemental information sought by BHEL.
- iii. BHEL reserves the right to verify all statements, information and documents submitted by the applicant in response to the Eol. 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.

6.2 Governing Laws & Jurisdiction:

The Eol process shall be governed by, and construed in accordance with, the laws of India and the Courts at New Delhi (India) shall have exclusive jurisdiction over all disputes arising under, pursuant to and / or in connection with the Eol process.



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Annexure-1

Indicative Scope of Technology Transfer

1.	<p>Transfer of state-of-the-art technology to design, engineer, integrate, manufacture, assemble, Prototype Homologation, Performance test/field trials, repair, service, troubleshooting of Electric-Buses.</p> <p>The scope shall include but not limited to know-how and know-why for design & manufacturing of chassis and body building, transfer of knowledge for sizing and selection of various components/subsystems like Battery, Battery Management System (BMS), Chargers, Vehicle Management System(VMS), Traction Motors, controller, Power trains, Drive train, Air conditioning, complete body etc.</p>
2.	<p>Design the Electric-Bus and/or carry out necessary modifications in its existing designs to suit the requirements of Indian conditions (Environmental/ Geographic/ Road) and standards as per the specifications shared by BHEL.</p>
3.	<p>Training of BHEL engineers at collaborator's design office and manufacturing/assembly facilities to help them imbibe and assimilate the technology for Electric Buses.</p>
4.	<p>Assist BHEL during prototype integration, manufacturing, assembly, testing at BHEL works and homologation process at test facilities of certifying agency(ies) by way of deputing technical experts.</p>
5.	<p>Assistance to BHEL in setting up the manufacturing/assembly/testing facility for Electric Buses. The Technology partner should provide list and technical specification for the necessary plants and machinery, testing area etc. required for setting up the facility.</p>
6.	<p>Transfer of improvements/modifications/developments/upgradations to meet market requirements and environmental norms / statutory requirements etc. during the period of collaboration.</p>
7.	<p>Transfer of knowledge/information to assist BHEL in identifying suppliers/sub-vendors to source/procure bought out components, subcomponents and systems/sub systems for E-buses. Sharing information about his established vendor chain and assist BHEL in having a tie-up with them at suitable costs, if required.</p>
8.	<p>Transfer of necessary computer programs related to E-bus electrical, mechanical calculations and sizing, selection of the equipment/ components for E-buses.</p>
9.	<p>Provide suitable assistance during tendering process in terms of preparation of techno-commercial offers, back-up bid guarantees (if required) etc.</p>
10.	<p>Provide assistance in getting requisite approval for engineering documents, electrical schematics and any other interface/ protocol drawings required, preparation of techno-commercial offers, approval of vendor for different components/subsystem etc.</p>
11.	<p>Deputation of collaborator's experts either at BHEL's works to assist in design, engineering, manufacturing, assembly, quality control, homologation for Electric Buses etc. Collaborators services may also be required at customer premises to assist BHEL Engineer.</p>



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12.	Provide technical support through engineering services from collaborator's design office for design vetting of engineering documents prepared by BHEL engineers for various customer orders.
13.	Transfer of maintenance and troubleshooting information. Sharing of methodology, to resolve such issues.
14.	Provide detailed write-up on control philosophy, operation and maintenance for E-buses including service instructions for all equipment's etc., detailed manual for trouble shooting and problem solving methods.
15.	Provide operation and maintenance instructions, sequential procedures and videos / slide shows on integration, quality check list / manual, dos and don'ts etc.
16.	Provide operation procedures & practices for interface with EV chargers.
17.	Charging protocols should be as per internationally accepted protocols.
18.	Provide list of recommended spares for operation and maintenance of Electric Bus for seven (07) years of normal operation.
19.	Provide assembly/integration manual including 3D models and animations, presentation material, technical brochures, sales promotion videos and marketing information.

(SIGNATURE)

Broad technical capabilities of prospective collaborator for Electric Buses

Sl. No.	Description	Response (YES/NO) and remarks if any.
1.	Whether prospective collaborator has designed, engineered, integrated, manufactured/ assembled and supplied minimum 100 Nos. of Electric Buses (5m -18 meter) in last 5 years.	Y/N
2.	Whether Prospective Collaborator has designed, engineered, integrated and manufactured/ assemble at least one (01) variant of 9m or above Electric-Bus which has successfully completed min. 25000 KM of operation on or before the closing date of this Eoi.	Y/N
3.	Whether Prospective Collaborator has obtained necessary certification for homologation of at least two (02) nos. of Electric-Bus variants of 9m or above (designed, engineered, manufactured/ integrated by prospective collaborator) from the approving authority(ies) such as ARAI or ICAT or approving authority(ies) in country where buses have been supplied and are in operation.	Y/N
4.	Whether prospective collaborator has its own manufacturing facility for manufacturing chassis of Electric Bus.	Y/N
5.	Whether prospective collaborator has capabilities and facilities for body making of Electric Bus.	Y/N
6.	Whether prospective collaborator has its own Integration, assembly, testing facility for Electric Bus.	Y/N
7.	Whether prospective collaborator has the capability for selection of battery types and sizing calculation capability w.r.t specified parameters like range, acceleration, gradability etc. for Electric Buses.	Y/N
8.	Whether prospective collaborator has experience of using different kind of Li-Ion battery chemistry for the Electric Buses?	Y/N
9.	Whether prospective collaborator has the capability for sizing /selection of traction motors, controllers w.r.t. specified parameters like range, acceleration, gradability, environmental and geographic conditions etc.	Y/N
10.	Whether prospective collaborator has the capability of Sizing /selection of battery management system.	Y/N
11.	Whether prospective collaborator has the capability for carrying out all relevant mechanical and electrical analysis like stability analysis, aerodynamics studies, etc.	Y/N



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12.	Whether prospective collaborator is an OEM of Electric Buses for overall length: <ul style="list-style-type: none">• Greater than 12 meters• 12 meter• 9 meter• Less than 9 meters	Y/N Y/N Y/N Y/N
13.	Whether prospective collaborator has obtained or applied for the certification from ARAI/ other approving authority for the Electric Bus in India.	Y/N
14	Whether prospective collaborator has supplied electric vehicles other than E-Buses. If yes, reference list may be provided.	Y/N
15	Whether audited financial report of latest 3 year have been enclosed with the response?	Y/N

(SIGNATURE)



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Annexure -3

Reference list of Electric Buses

Sl.No	Bus Model	Name of Customer /Country	Bus Dimensions (sitting capacity)	No. of Buses supplied	Type of Battery used (Battery Chemistry & capacity)	Traction motors (Type & Rating)	Weight of each Electric Bus	Charging type, standard, time (protocol /Minutes (Km)	Range in single charge and energy consumption	Homologation agency of the model	Cumulative Kms of successful operation till date