

**EXPRESSION OF INTEREST**

**FOR**

**Partnering with BHEL**

**ON**

**Design, Development, Manufacture, Testing and Commissioning of Propulsion System (Traction Converter, Auxiliary Converter and TCMS), and Bogie for Semi High Speed Train Sets (Train 18) of 160 Kmph**

**Issued by:**

**Bharat Heavy Electricals Limited,**

**Mysore Road, Bangalore -560026 (hereinafter referred to as 'BHEL')**

**also**

**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 Bidder(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 Bidder(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 Bidder(s) for next stage or to enter into any agreement(s) with any Bidder(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 Bidder. 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 Bidder 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 connection with or relating to its Application. All such costs and expenses will remain with the Bidder and BHEL shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by an Bidder in preparation or submission of the Application, regardless of the conduct or outcome of the EOI.

## **1.0 INTRODUCTION**

This Expression of Interest (Eoi) seeks response from Design Consultants/Original Equipment Manufacturer (OEMs) who are involved in designing or have past experience in designing or manufacturing of Propulsion System of Semi High Speed Train Sets.

## **2.0 ABOUT BHEL**

Bharat Heavy Electricals Limited (BHEL) is a Central Public Sector Enterprise, wherein Government of India is holding 63.06% 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 Defence 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 up to 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 up to 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 centers 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](http://www.bhel.com).**

### **3.0 PURPOSE**

- 3.1 BHEL is a regular supplier of traction propulsion equipment to Indian Railways' production units for manufacturing of EMUs by them.
- 3.2 Indian Railway is on a rapid expansion and modernisation drive for its rolling stock to increase the average speed of operations and to enhanced safety and comfort of passengers. In this regard they intend to switchover from existing EMU Stock having operation speed potential of 120 KMPH to EMU / Train Sets having operational speed of 160 KMPH.
- 3.3 **Indian Railways has floated tender no: WTA-515** for Design, Development, Manufacture, Supply, Integration, Testing and Commissioning of IGBT based 3-phase propulsion, control and other equipment for train sets suitable for operation on 25 KV AC OHE system conforming to RDSO specification No. RDSO/PE/SPEC/EMU/0196-2019 (Rev.0) along with addendum/corrigendum including CMAC for 44 Rakes with quantity distribution tentatively as 24 nos. of 16 car rakes for ICF, 10 nos. of 16 car RAKES for MCF and 10 nos. of 16 car rakes for RCF. All tender documents are uploaded in IREPS website. Link:  
  
<https://www.ireps.gov.in/epns/nitViewAnonyms/rfq/nitPublish.do?nitId=3294376&activity=viewNIT>
- 3.4 The intent of this Expression of Interest hereinafter referred to as the "EOI" is to invite applications from interested organizations / companies who are willing to Partner with BHEL for identified scope of bidder for execution of contracts for the above mentioned Train Sets:

S.N.	Item	Scope of Partnership
1	Traction Converter (TC) and Auxiliary Converter (AC)	Design, development, manufacture, testing and commissioning of Converters. Tentative Rating of Underslung Traction Converter and Auxiliary Converter is 700KVA and 300 KVA respectively. Detailed scope to be finalised in partnership agreement.
2	Train Control and Management System (TCMS)	Design, development, testing and commissioning of TCMS Hardware, software and integration of propulsion and other systems. Detailed scope to be finalised in partnership agreement.
3	Bogie	Design, development, testing, commissioning and integration of Bogie for semi high speed train-18 as per Indian Railways specification referred elsewhere in the EOI.

- 3.5 Interested organizations / companies/parties may submit their proposal for either Sl.no. 1 or 2 or 3 or any combination of these.
- 3.6 BHEL shall select suitable partner(s) who meet Pre-Qualification Criteria (PQR) for the intended business tie-up and shall enter into a Memorandum of Understanding (MoU)/ Pre-bid tie-up with selected partner(s).
- 3.7 The chosen partner(s) shall also be required to enter into **mutually exclusive pre-bid tie up arrangement** with BHEL to provide due support for fulfilling the contractual obligations of BHEL to the customer i.e. Indian Railways. Preference shall be given to the bidders who are willing for joint consortium bidding. Also the selected bidder, after entering into a mutually exclusive agreement with BHEL, cannot quote directly or enter into any kind of joint arrangement with any other party for the above mentioned Train Sets tender.
- 3.8 All other items of Tender (Motor, Transformer and rest of the equipment, other than TC, AC, TCMS & bogie are in BHEL's scope.
- 3.9 In case bidder proposes split of supply between BHEL and bidder, a corresponding Business Proposal model (Transfer of Technology / Business Sharing Agreement) also need to be indicated. BHEL has manufacturing facilities to manufacture all equipment covered in this EOI document.

#### 4.0 Scope of Activities for mentioned Tender:

*Indicative scope split for items in EOI proposal* R -> Responsible, S -> Support

Sl No	Scope	M/s BHEL	M/s Bidder	Remarks
1	System Engineering includes performance calculation, equipment and component selection, sizing, rating calculations, weight balancing, cable rating finalization etc.	S	R	
2	Layout of equipment	S	R	
3	Train Schematics (Power, control & Communication ) & harness and wiring chart	S	R	
4	RDSO/ICF approval of design documents	R	S	
5	Development of DDU software	S	R	
6	Hardware Design and software for Traction converter	S	R	
7	Manufacture of Traction convertor			Dependent on Business Association
8	Hardware Design and software for Auxiliary converter	S	R	
9	Manufacture of Auxiliary convertor			Dependent on Business Association
10	Hardware Design, software and Communication interface for TCMS	S	R	
11	Manufacture of TCMS			Dependent on Business Association
12	Combined system testing	R	S	
13	TCMS testing at test bed	S	R	
14	Bogie design	S	R	
15	Manufacture of Bogie			Dependent on Business

				Association
15	Installation & Erection of equipment	R	S	
16	Pre-commissioning of prototype rake at ICF	R	S	
17	Commissioning of prototype rake at User Railway including system integration.	R	S	
18	Vehicle testing trial of prototype rake	R	S	
19	Setting up of office at User railway	R		
20	Installation, Erection & commissioning of series TRAIN SETS	R	S	
21	Commissioning of series TRAIN SETS	R	S	
22	Warranty support	R	S	
23	After Sales support/CAMC	R	S	
24	Training	R	S	
25	Technical support for designed life of equipment	S	R	

Please note that the list is not exhaustive and additional activities may be added if deemed necessary to meet tender requirements.

**Bidders can indicate suggested scope division in case of any difference from the one indicated above, however the same shall be subject to BHEL evaluation and acceptance.**

**Detailed scope to be finalised in partnership agreement.**

## 5.0 INSTRUCTION TO BIDDERS:

### 5.1 Offer to be submitted in Three (I,II & III) parts:

**Part-I:** Submit the following along with supporting documents:

1. General Information (**Annexure-1**)
2. Pre-Qualification Requirements (**Annexure-2**)
3. Business Proposal model (Transfer of Technology/Business Sharing Agreement) with comments on Scope split. In case bidder proposes split of supply between BHEL and

bidder, same to be indicated. BHEL has manufacturing facilities to manufacture all equipment covered in this EOI document.

**Part-II:**

1. i) Technical Offer for proposed partnership,  
ii) Clause wise comments for RDSO Spec no: RDSO/PE/SPEC/EMU/0196-2019 (Rev.0) along with addendum/corrigendum for Bidders' quoted scope  
iii) Questionnaire (**Annexure-3**)
2. Commercial Offer for proposed partnership (Unpriced)

**Part-III:** Password Protected Price Offer for Proposed partnership.

*Note: Password to be provided after requested by BHEL through written communication.*

BHEL shall verify & evaluate General information, Pre-qualification requirements submitted by all interested Bidders

After evaluation, BHEL shall scrutinize Business proposal, technical offer & unpriced commercial offer of eligible Bidders.

BHEL shall request for password for Priced offer from the Bidders through written request only from selected Bidders who emerges after evaluation of technical and unpriced commercial offers.

Evaluation criteria for Bidders shall be as mentioned in **Annexure-4**.

Commercial terms – Payment terms, Liquidated Damage, Delay term are provided in **Annexure-5**.

- 5.2 Reputed business entities may submit their offer in Part I & Part II (refer 5.0 above) by Post / e-mail so as to reach us on or before **16<sup>th</sup> October 2020** at the following address:

Mr. Kathavarayan T, Senior Deputy General Manager and  
Ms. Poornima. S, Manager  
Bharat Heavy Electricals Limited,  
Electronics Division, PB No 2606,  
Mysore Road, Bangalore -560026,  
India.

Email: [kathavarayan@bhel.in](mailto:kathavarayan@bhel.in) Phone: +91 9945568518  
[spoornima@bhel.in](mailto:spoornima@bhel.in) Phone: +91 9538063232

- 5.3 The details submitted by the Bidder(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 5 days of BHEL request.
- 5.4 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.
- 5.5 Any request for further information or clarification on the EOI document may be submitted to the above mentioned official within 07 days from date of issue of EOI.
- 5.6 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 Bidder shall necessarily provide duly authenticated translated version of the same in English.



- 5.7 Duly authorized representative of the Bidder(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 Bidder's capabilities.
- 5.8 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.
- 5.9 BHEL reserves the right to verify all statements, information and documents submitted by the Bidder in response to the EOI. Any such verification or lack of such verification by BHEL shall not relieve the Bidder of his obligations or liabilities hereunder nor will it affect any rights of BHEL.
- 5.10 The EOI process shall be governed by, and construed in accordance with, the laws of India and the Courts at New Delhi shall have exclusive jurisdiction over all disputes arising under, pursuant to and/ or in connection with the EOI process.
- 5.11 All costs incurred for participation in the EOI shall be borne by the Bidder(s).

**General Information to be submitted by Bidders**

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:
  - Place of address where local content is added:
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).

(Sign & Company Seal)

Authorized signatory

### Pre-Qualification Requirements

S.N.	Requirement	Bidder's Response	Supporting document
1	Be a Designer / Design Consultant / OEM for complete/partial propulsion system installed in Train Sets with service speed of 160 kmph or more.		Self-certification
2	Must have executed at least ONE (01) project, supplying the complete/partial propulsion system installed in Train Sets with service speed of 160 kmph or more and the executed project must be running successfully anywhere across the world in the last FIVE (05) years from the date preceding submission of this EOI.		Copies of Purchase order & completion certificate for orders executed by bidder shall be provided.
3	Has sufficient engineering/design/manufacturing capabilities for design, development, manufacturing, testing and commissioning of proposed scope of work.		Self certification
4	Has not been blacklisted / banned business dealings by Ministry of Railways or any Government Department of India.		Declaration on company's letter head.
5	No previous contract has been terminated either in full or part due to Bidder's failure.		Declaration on company's letter head.
6	Has not suffered insolvency / bankruptcy.		Declaration, Copy of Audited Balance sheet.
7	Respondent must have positive net worth as of last financial year.		Declaration, Copy of Audited Balance sheet.
8	Provide local content as percentage for Bidder's scope of work. (Minimum: 50%) Place of Address where local content is added to be mentioned.		
9	Must submit confirmation abiding Rule 144 (xi) of GFR 2017 for Bidder's scope.		
10	Must meet all requirements mentioned in Eligibility criteria of Railway Board tender for Train Sets: WTA-515 for the proposed scope.		

Any other documents considered relevant to meet PQR and to support evaluation criteria are to be submitted.

**NOTE :** Bidders with deviations to the above mentioned PQR are also encouraged to submit their proposal. However acceptance/suitability of such responses shall rest with BHEL and same decision shall be final and binding.

(Sign & Company Seal)

Authorized signatory

## Questionnaire

Sl.no.	Query description	Yes/No	Remarks
<b>1)</b>	<b>Traction and Auxiliary convertor:</b>		
1.1	Bidder shall agree for Technology transfer including IPR/Patents related to the development of equipment under the scope of EOI. Technology transfer could be done by ToT as suitable. Bidder shall mention any pre requisite condition to be fulfilled by BHEL for Technology Transfer.		
1.2	All the design documents to be shared with BHEL including components and electronics cards. (Including Temperature simulations for various equipment, Harmonic estimation and control, Battery and Battery charger capacity calculations, Auxiliary Load calculation and Any other studies required by the RDSO specification). Calculations regarding performance / equipment sizing and rating requirements for Traction and Auxiliary convertor to meet RDSO specification shall be carried out by Bidder. Complete methodology and software if any used shall be shared with BHEL. All the documents will be shared with BHEL for review and submission to customer.		
1.3	Manufacturing information of converter and the electronic cards should be shared with BHEL. Type test and routine test information at component level and at the equipment level		
1.4	Software documentation including source code for Traction and Aux converters should be provided. Bidder to provide Traction and Auxiliary converter software required to maintain the trains by BHEL. Bidder shall provide Traction, Auxiliary Convertor software details, documents and training for tuning and controls over further updating.		
1.5	Bidder shall provide Electronic cards firmware, GERBER update and support.		
1.6	Bidder shall have full involvement, support and responsibility in System testing, Erection, commissioning and Train level customer testing and take responsibility regarding the scope.		
1.7	Reliability and component obsolescence: Bidder shall provide following a) RAMS and MTBF Calculations as per specification b) Warranty obligation c) Fine tuning of the equipment to address the reliability issues		

	d) Support for addressing component obsolescence Failure of equipment 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		
<b>2)</b>	<b>TCMS hardware and Software:</b>		
2.1	Bidder shall agree for Technology transfer including IPR/Patents related to the development of equipment under the scope of EOI. Technology transfer could be done by ToT as suitable. Bidder shall mention any pre requisite condition to be fulfilled by BHEL for Technology Transfer.		
2.2	Bidder shall provide all necessary details to meet customer requirement as mentioned RDSO specification related to TCMS e.g. software logic, software validation, software quality plan, safety analysis etc. mentioned in RDSO specification clause 1.7 & 4.9 .		
2.3	Bidder shall provide source code and control cards for TCMS, application software development (Including DDU software). Necessary training to be provided. Bidder shall provide TCMS Hardware Firmware update and support.		
2.4	Bidder shall provide complete details to BHEL to enable to establish TCMS software simulation facility and carryout TCMS software simulation testing in Lab environment for validation.		
2.5	Bidder scope shall include integration of TCMS with other systems like traction system, brake system, door system, Passenger Information system etc as mentioned in RDSO specification.		
2.6	Bidder shall have full involvement, support and responsibility in combined system testing, TCMS testing Erection, commissioning and Train level customer testing and take responsibility regarding the scope.		
2.7	Reliability and component obsolescence: Bidder shall provide following e) RAMS and MTBF Calculations as per specification f) Warranty obligation g) Fine tuning of the equipment to address the reliability issues h) Support for addressing component obsolescence Failure of equipment 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.		
3)	Bogie : Design, development, testing, commissioning and integration of Bogie for semi high speed train-18 as per Indian Railways specification referred elsewhere in the EOI.		
4)	Bidder shall provide Interface related information regarding Traction motor, Traction transformer or any other equipment interfacing with Traction, Auxiliary convertor & TCMS as required.		
5)	List of details required to submit commercial offer for Traction, Auxiliary Convertor, and TCMS to be provided along with questionnaire response in advance. Supplier to consider TCMS components like VCU Controller, Ethernet switches, Gateways, Repeaters, Connectors etc. based on his Network Architecture and RDSO specification requirements.		

**Points to consider:**

- 1) OHE system is 25 kV AC Traction.
- 2) Traction transformer and Traction motor are in BHEL scope. Their Design rating shall be finalised based on Performance Calculations, provided by the selected partner.
- 3) The maximum current drawn by a 16car loaded Train to meet the performance requirements of this specification at 22.5 kV shall not exceed 540 Amp (RDSO clause 2.6.2).
- 4) The efficiency of the complete auxiliary converter system including sine filter shall not be less than 94% at full load. (RDSO Clause 3.5.11.2).
- 5) The peak efficiency of traction system consisting of traction transformer, traction converter (line side converter and drive side inverter) and traction motor shall not be less than 87% at one operating point in the maximum power zone of the driving operation characteristics under loading conditions specified in clause 2.2 with a line voltage as per clause 2.6. (RDSO clause 3.5.11.1)
- 6) Battery charger, auxiliary transformers and filters for feeding auxiliary loads shall be part of scope of supply of Auxiliary convertor. Battery charger shall have sufficient rating to feed battery of 500-600Ah for at least 3 hours.
- 7) Tentative estimated requirement of Analog/Digital I/Os for TCMS is as follows :

	DTC	NDTC	MC	TC	Per 16 Car Rake [2x(DTC + MC + TC + MC)+ 2x(NDTC + MC + TC + MC)]
<b>Total Digital I/Ps</b>	248	112	128	112	2192
<b>Total Digital O/Ps</b>	96	64	64	64	1088
<b>Total Analog I/Ps</b>	12	8	8	8	136

Exact number of I/Os shall be finalized during detailed design stage.

## Evaluation Criteria

Notes for evaluation:

1. Price bid:

Price bid will be invited only from shortlisted Bidders, meeting the pre-qualification criteria and conforming to all Railway tender technical requirements for equipment in Bidder's scope. BHEL's decision regarding shortlisting of Bidders shall be final and binding.

Shortlist bidders shall submit their price bids (Part III) within 5 working days from the date of communication from BHEL.

2. Evaluated price:

For each equipment, i.e Traction Converter, Auxiliary Converter, TCMS & Bogie, per set cost will be evaluated bidder wise.

**Per set cost is calculated as below:**

For Traction converter: Total cost for the equipment (required to meet complete tender scope) divided by 352, which is nos. of TCs required as per Tender.

For Auxiliary converter: Total cost for the equipment (required to meet complete tender scope) divided by 176, which is nos. of ACs required as per Tender.

For TCMS: Total cost for the equipment (required to meet complete tender scope) divided by 44, which is nos. of TCMS required as per Tender.

For Bogie: Total cost for the equipment (required to meet complete tender scope) divided by 44, which is nos. of Bogies required as per Tender.

Bidder's quoted price shall Include supply of main equipment +spares, service (engineering, documentation, testing, freight, installation/ commissioning, AMC of equipment), training and other costs applicable for finalized bidder's scope as per scope matrix. The pricing indicated by bidder shall be inclusive of cost for support for integration of Bidder's equipment with rest of equipment forming part of Train Set tender.

3. Evaluation:

Step 1: Per set cost of Traction Converter+ Auxiliary converter is tabulated bidder wise and ranked from lowest (L1) to highest (H1) after applying loading factors as detailed in Tables A to C.

Step 2: Per set cost of TCMS is tabulated bidder wise and ranked from lowest (L1) to highest (H1) after applying loading factors as detailed in Tables A to C.

Step 3: Per set cost of Bogie is tabulated bidder wise and ranked from lowest (L1) to highest (H1) after applying loading factors as detailed in Tables A to C.

4. Final selection of partner(s):

The bidder ranked L1 will be selected for pre-bid tie up, for the individual equipment or the combination thereof subject to loading criterion given below :

- a) Traction Converter + Auxiliary Converter
- b) Train Control Management System
- c) Bogie

**Loading criteria Table-A**

BIDDER'S QUOTED SCOPE	Loading factor on quoted price for non-inclusion of complete scope	Remarks
Traction Converter+ Auxiliary Converter+ TCMS + Bogie	NIL	<p>Evaluated price:</p> <p>Includes supply (main equipment +spares), service (engineering, documentation, testing, freight, installation/ commissioning, AMC of equipment), training and other costs quoted by Bidder as applicable.</p> <p>Loading factor will be applied on the per set derived cost for bidder's scope.</p>
Traction Converter+ Auxiliary Converter+ Bogie	1%	
Traction Converter+ Auxiliary Converter+ TCMS	1%	
Any other combination of equipment	4%	

**Loading criteria Table-B (Related to consortium bidding with BHEL)**

- a) For bidders accepting consortium bidding along with BHEL to participate in the tender, **no loading will be applied.**
- b) For bidders not accepting consortium bidding along with BHEL to participate in the tender, loading will be applied @ 2% on the per set cost for bidder's scope equipment.



Loading criteria Table-C (Related to payment terms)

- c) For bidders accepting BHEL's proposed payment terms, no loading will be applied.
- d) For bidders taking deviation on BHEL's proposed payment terms, loading will be applied. The loading factors will be informed before submission of price bid.

BHEL

### Commercial Terms

Sl. No	Commercial Term	BHEL's Condition	Response
1	Delivery Period – for documentation & supply	As per IR schedule	
2	Delivery Terms (in case of Bidder's supply)	(Door Delivery to BHEL/Ex-Works)	
3	Transit Insurance (in case of Bidder's supply)	In case of DDL, Bidder's scope.	
4	Bid security Bond ( <b>To be submitted by the successful bidders only</b> )	1% of the bid value	
5	Performance (Warranty) Bank Guarantee ( <b>To be submitted by the successful bidders only</b> )	10% of the bid value as per NIT document clause 14.1 b (3)	
6	Warranty	As per Clause A	
7	Payment Terms	As per Clause B	
8	Price Variation Clause	As per Clause C	
9	Inspection	By BHEL/RDSO/RITES/ICF/MCF /RCF as applicable.	
10	Validity of the offer	180 Calendar days from the date of opening of PQR.	
11	Liquidated Damages for failure in warranty:	As per Clause D	
12	Penalty for Delay	The cumulative maximum penalty shall be limited to 20% of the billing amount.	

#### **Clause A-Warranty:**

16.1. General: The bidder shall warrant that every equipment supplied is free from defects and faults in design, material, workmanship and manufacture and shall be of highest grade and consistent with

the established and generally accepted standards for goods of the type ordered. The bidder shall provide Comprehensive warranty of 36 months from the date of delivery or 24 months from the date of commissioning of the Train sets whichever is earlier. To this effect, the B.G as mentioned in clause 13.1(i& ii)-payment terms under part-II (section-I - 'Special Conditions to tenders') will be taken as security.

16.2. Service Engineering: The Contractor shall provide service engineering in EMU/MEMU car sheds, India or wherever the Train sets shall be maintained, with round the clock availability of qualified engineers at the nominated EMU/MEMU car shed for first 2 (two) years from the date of commissioning of Trainset and with all the spares, tools and instruments necessary to attend any defects.

16.3. Notice of defects: If any defect appears or damage occurs, the Purchaser or his authorized representative shall immediately notify the Contractor and shall confirm such notification of defects in writing.

16.4. Action: The Contractor shall immediately on receipt of the above referred notice depute his Engineer to start action for rectification of defects under warranty.

16.5. Repair/replacement: The contractor's liability in respect of any complaints, defects and/or claims shall be limited to the replacement/repair of defective part only to the extent that such replacement or repairs are attributable from faulty workmanship or material or design in the manufacture of the stores, provided that defects are brought to the notice of the contractor according to clause 16.1 above during the warranty period. The Contractor shall be responsible for all defects except those arising out of faulty operation or maintenance or normal wear and tear.

The contractor shall, if required, replace or repair the stores or such portion thereof as rejected by the purchaser free of charge at the ultimate destination. The custom duties and clearance charges will be to the Contractor's account. If re-export is required it will be done by the Contractor at his cost.

In order to avoid the Motor/Driving car being out of operation for unduly long periods, the Purchaser may allow the Contractor to use the spare parts available with the consignee. The Contractor commits himself to replace these borrowed parts within a reasonable time period not exceeding 60 days.

If the contractor so desires, the replaced parts can be taken over by him or his representative in India or disposed as he deems fit at the time of replacement of stores/parts. No claim whatsoever shall lie on the purchaser for the replaced parts thereafter. The purchaser shall extend all necessary and timely assistance by way of issue of any certificate or documents required to re-export the replaced parts if so desired by the contractor.

The warranty herein contained shall not apply to any material which shall have been repaired or altered by the purchaser or on his behalf in any way without the consent of the Contractor, so as to affect the strength, performance or reliability or defects caused to any part due to misuse, negligence or Accident.

All replacement and repairs that the purchaser shall call upon the Contractor to deliver or perform under this warranty shall be delivered and performed by the Contractor within 3 months promptly and satisfactorily, by borrowing, if necessary, the components from the Consignee. The Contractor shall replace the borrowed components free of charge within a reasonable period of time not exceeding 60 days.

Prompt clearance of the warranty replacement on arrival at Port/Airport shall be the responsibility of the contractor or his representatives after payment of Customs and other duties as applicable".

The decision of the Purchaser in regard to contractor's liability and the amount, if any, payable under this warranty shall be final and conclusive.

**Clause B - Payment Terms:**

**Note: Following are extracted from the Railways tender document. In the event of consortium bidding, bidder shall abide by the payment terms in toto for bidder's quoted scope. If pre-bid tie up does not involve consortium bidding, bidder's payment against the scope will be released within 15 days of BHEL receiving the payment from Railways after completing the applicable milestone event/s. Bidder to indicate acceptance of the payment terms indicated below for his applicable scope. In the event of any deviation, loading factor will be applied on the bidder's quoted price. Methodology of loading will be informed before price bid submission.**

i) For Equipment of the prototype rakes (02):

(a) 80% of the total value of the equipment shall be paid against submission of the following documents. The payment is to be released for complete rake set and not for part supplies. The documents required for claiming 80% payment are as under:-

1. Proof of receipt of material at ICF i.e. Receipted Challan duly signed by a nominated Gazetted Officer.
2. Inspection Certificate (in Original) issued by the Inspecting Officer.
3. One (1) original & three (3) copies of Contractor's invoice.
4. Contractor's certificate that the materials in the invoice are for full rake set &
5. Contractor's certificate that the amounts claimed in the invoice are correct in terms of the contract.
6. RDSO certificate for technical clearance of prototype.

(b) Balance 20% of the total value of the equipment shall be paid after successful commissioning along with 100% value of supervision of installation and commissioning charges. The commissioning Certificate shall be issued by the Principal Chief Electrical Engineer/Integral Coach Factory, Chennai. The payment shall be subject to submission of the following documents:-

1. One (1) original & three (3) copies of Contractor's invoice for balance 20%.
2. Commissioning Certificate issued after successful commissioning. Commissioning Certificate shall be issued by the Principal Chief Electrical Engineer/ICF.
3. Warranty Bank Guarantee equivalent to 10% value of the equipment (Annexure-4)
4. Contractor's certificate that the amounts claimed in the invoice are correct in terms of the contract.
5. Acceptance note/Receipt note issued by the consignee.
6. RDSO certificate for successful trial run.

ii) For the equipment of the balance rakes:

(a) 80% of the total value of the equipment shall be released against proof of inspection and receipt of material against following documents:-

1. Proof of receipt at ICF/MCF/RCF i.e. Receipted Challan duly signed by a nominated Gazetted Officer.
2. Inspection Certificate (in Original) issued by Inspecting Officer.
3. Contractor's certificate that the amounts claimed in the invoice are correct in terms of the contract.
4. One (1) original & three (3) copies of Contractor's invoice.
5. Contractor's certificate that the materials in the invoice are for full rake set.

(b) Balance 20% of the total value of equipment shall be released after successful commissioning along with 100% value of supervision of installation and commissioning charges. Commissioning Certificate shall be issued by Principal Chief Electrical Engineer (PCEE) /Integral Coach Factory, Chennai/Modern Coach Factory, Rae Bareli/ Rail Coach Factory, Kapurthala against submission of following documents:-

1. One (1) original & three (3) copies of Contractor's invoice.
2. Warranty Bank Guarantee as per Annexure-4 for 10% value of the equipment.
3. Contractor's certificate that the amounts claimed in the invoice are correct in terms of the contract.
4. Certificate regarding receipt of equipment by ICF/MCF/RCF
5. Commissioning Certificate issued by Consignee (Acceptance note/Receipt note issued by the consignee) Principal Chief Electrical Engineer (PCEE) /ICF/MCF/RCF as above.

NOTE: All payments are to be released for complete rakes and not for part supplies.

14.2. For items of Spares & Tools and Special Tools & Instruments and other items not forming part of Rake Set:

(a) 90% Payment for items of Spares & Tools shall be made against following documents:-

1. Delivery Challan duly signed by a nominated Gazetted Railway officer.
2. Inspection Certificate (in Original) issued by Inspecting Officer.
3. One (1) original & three (3) copies of Contractor's invoice.
4. Contractor's Certificate that the amount claimed in the invoice are correct in terms of the contract.

(b) Balance 10% payment shall be made on receipt and acceptance of the items and on submission of Warranty Bank Guarantee for 10% value of the spares and tools and special tools and instruments.

Payment for Training:

Payment for the cost of training shall be released after successful completion of every 50 man days training. The payment will be made by respective Principal Financial Adviser/ Integral Coach Factory, Chennai/ Modern Coach Factory, Rae Bareli/ Rail Coach Factory, Kapurthala as the case may be. The following documents are required to be submitted while claiming payment:

1. Certificate issued by the Principal Chief Electrical Engineer, Integral Coach Factory, Chennai/Modern Coach Factory, Rae Bareli/ Rail Coach Factory, Kapurthala, certifying that firm had imparted mandatory 50 man days training to IR personnel.

2. One (1) Original and three (3) copies of Contractor's invoice, duly signed.
3. Contractor's Certificate that the amount claimed in the invoice are correct in terms of the contract.

**Clause C – Price Variation Clause:**

**This will be applicable for bidder's quoted scope.**

The base date for calculation purpose shall be considered as two months prior to date of tender opening (17/11/2020). The indices used will be as per IEEMA wherever applicable. The formula and indices as applicable on base date are given

Power electronics products including converters

$$P = Po/100 (16+26(C/Co)+13(Al/Alo)+9(IM/IMo)+18(FE/FEo)+ 18 (W/Wo))$$

Wherein

P - Price Payable as adjusted in accordance with the variation clause

Po - Price quoted / confirmed. -

C - Price of covered copper conductor strip

Al - Price of bus bar grade Aluminium

I M - Price of Insulating Material

FE - Iron, & Ferro alloy index

W - Consumer Price Index

Note: Rates published by IEEMA as prevailing on the first working day by the calendar month covering the date, 3 months prior to the date of delivery shall be applicable.

**Clause D Liquidated Damages for failure in warranty:**

**Bidder shall indicate full acceptance of the below terms for bidder's quoted scope. No deviation in this regard shall be accepted.**

Equipment:

Supplier shall be liable to pay the Liquidated Damages as per the conditions laid in this clause and sub-clauses. The Liquidated Damage, under this clause, shall be applicable not only during warranty period but also during the service period of 6 months from date of completion of field/service trials of one(16 car) prototype Train set as stipulated or from the date of commencement of supply of series supply of rakes. The provisions of Clause 9.1 shall cease to be effective once the failure of equipment is categorized as type defect in accordance with the 9.2. Under these conditions, the liquidated damage shall be governed by the Clause 9.2 (iii) only, as under.

1. Liquidated Damages against Down Time for supplied Equipment :-

(i) All replacement and repairs that the purchaser shall call upon the supplier to deliver or perform under this warranty shall be delivered and performed by the supplier within 30 days promptly and satisfactorily, by borrowing, if necessary, the components from the spares as may be available with the purchaser.

(ii) However, the supplier shall also maintain their own bank of spares at the places, to be decided mutually with the purchaser, to ensure timely replacement/repairs of defective equipment under warranty obligations.

(iii) In case, any coach is rendered unserviceable due to failure of supplied equipment under warranty for more than 15 days due to non-availability of replacement/warranty spares or any other reason covered under warranty obligations, the supplier shall be liable to pay a Liquidated Damages of 0.015% of the contract value per two weeks equivalent to contract value of equipment applied to each basic unit for the entire down time period from Day one. The Liquidated Damages shall be levied for every 1 week or part thereof beyond 15 days subject to the maximum of 2% of total contract value of equipment applied to each basic unit during the warranty period. The Trainset coach shall be considered “unserviceable” from the time it is declared unfit for normal service till it is certified fit for traffic use.

(iv) Any spare part borrowed from the Purchaser shall be replaced within 2 months failing which a Liquidated Damage as would have been applicable for the down time of a basic unit shall be applicable.

## **2. Liquidated Damages due to Type Defect for Equipment :-**

(i) The assessment of type defect of equipment, defined as at (ii) under, shall be made only after the date of completion of the supply of at least 20% of the total equipment sets as per the Schedule of requirements as provided in tender document vide para -2 item details.

(ii) Type defect- Failure of major equipment viz. transformer, power & auxiliary converter-inverter, traction motor, auxiliary machines, electronics, and pantograph, within the warranty obligations, shall be considered a “type defect”, if the Failure Rate Percentage per equipment per year as calculated on the basis of actual population of the equipment in service and for a period of every 3 months, starting from date of completion of the supply of first 20% equipment sets, as per (i) above, is more than 10%. In the event of a defect of an equipment being categorized as “Type Defect”, the supplier shall essentially review the design of the equipment on the basis of failure investigations and shall carry out mutually agreed modifications on all equipment irrespective of the lapse of their warranty period. The replaced/modified equipment shall qualify for the warranty obligations.

(iii) In case of type defect, if the hourly availability of the Train sets fitted with supplied equipment goes down by 5% (due to reasons attributable to the supplier viz., design, manufacturing, quality control and materials, etc) of the total rakes fitted with supplied equipment, for every additional rake becoming unserviceable, the supplier shall be liable to pay liquidated damage of 0.5% of the contract value of one 16 Car rake equipment set for every fortnight or part thereof subject to the maximum 5% of the total contract value of one 16 Car rake equipment set. The Purchaser/IR shall promptly notify the Supplier about a particular defect being classified as a type defect.