



**Expression of Interest for technology tie-up for Gas Turbine of 1.25 MW  
Maximum Continuous Rating at 35 Deg C ambient air & sea water  
temperature suitable for marine (defence) applications**

**Extension of due date for EoI**

**Subject: Expression of Interest for technology tie-up for Gas Turbine of 1.25 MW Maximum Continuous Rating at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications**

This has reference to the Expression of Interest (EoI) published on BHEL's website i.e. www.bhel.com Ref No.: BHEL/AA/TL/0505 dated April 25, 2023, seeking interest from OEMs for technology tie-up for Gas Turbine of 1.25 MW Maximum Continuous Rating at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications.

The due date for receiving the proposals against the EoI has now been extended up to **May 23, 2023 (Tuesday)**.

Interested OEMs/Prospective Collaborator(s) meeting the Prequalification Requirements (PQR) as specified below are requested to submit its response to the EoI at below mentioned address (in hard/soft copy) along with following documents latest by **May 23, 2023 (Tuesday)**.

1. Company background
2. Product Profile
3. Technical details of GT being offered for TCA
4. Data sheet, performance curves, functional write up, catalogues, general arrangement drawing etc of Gas Turbine of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature and its auxiliaries
5. Annual audited financial reports for last 3 (three) years

**Contact details for submission of response and for seeking clarifications are as below:**

**Senior Deputy General Manager (CTM)**

Corporate Technology Management,  
Bharat Heavy Electricals Limited (BHEL),  
BHEL House, Siri Fort, New Delhi 110049  
Tel: +91-11- 66337213 / 66337339  
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**Bharat Heavy Electricals Limited**  
**(A Government of India Undertaking)**

**Delhi – 110 049**

**India**

**Notice for inviting**

Expression of Interest for Technology tie-up for Gas Turbine of  
1.25 MW suitable for marine (defence) applications

Eol Ref No.: BHEL/AA/TL/0505

Date: 25 April, 2023



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**SECTION-1  
Disclaimer**

The information contained in this Expression of Interest (Eoi) document provided to the Prospective Collaborator(s), by or on behalf of Bharat Heavy Electricals Limited (BHEL) or any of its employees or advisors, is provided to the Prospective Collaborator(s) on the terms and conditions set out in this Eoi document and all other terms and conditions subject to which such information is provided.

1. The purpose of this Eoi document is to provide the Prospective Collaborator(s) with information to assist the formulation of their proposal. This Eoi document does not purport to contain all the information each Prospective Collaborator may require. This Eoi document may not be appropriate for all persons, and it is not possible for BHEL, its employees or advisors to consider the business/investment objectives, financial situation and particular needs of each Prospective Collaborator who reads or uses this Eoi document. Each Prospective Collaborator should conduct its own investigations and analysis and should check the accuracy, reliability and completeness of the information in this Eoi document and where necessary obtain independent advice from appropriate sources.
2. BHEL, its employees and advisors make no representation or warranty and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of the Eoi document.
3. BHEL may, in its absolute discretion, but without being under any obligation to do so, modify, amend or supplement the information in this Eoi document.
4. The issue of this Eoi does not imply that BHEL is bound to select and shortlist any or all the Prospective Collaborator(s). Even after selection of suitable Prospective Collaborator, BHEL is not bound to proceed ahead with the Prospective Collaborator and in no case be responsible or liable for any commercial and consequential liabilities in any manner whatsoever.
5. The Prospective Collaborator(s) shall bear all costs associated with the preparation, technical discussion/presentation and submission of response against this Eoi. BHEL shall in no case be responsible or liable for these costs regardless of the conduct or outcome of the Eoi process.
6. Canvassing in any form by the Prospective Collaborator(s) or by any other agency on their behalf shall lead to disqualification of their Eoi.
7. Notwithstanding anything contained in this Eoi, BHEL reserves the right to accept or reject any application and to annul the Eoi 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.
8. BHEL reserves the right to disqualify any applicant during or after completion of Eoi process, if it is found there was a material misrepresentation by any such applicant or the



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applicant fails to provide within the specified time, supplemental information sought by BHEL.

9. 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.



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**SECTION-2**  
**SCHEDULE OF EoI PROCESS & CONTACT DETAILS**

**2.1 Schedule of EoI process:**

The schedule of activities during the EoI Process shall be as follows:

Sl. No.	Description	Date
1.	Issue of EoI document	25 April, 2023
2.	Last date of submission of EoI response	16 May, 2023

**2.2 Contact Details:**

**Senior Deputy General Manager (CTM)**  
Corporate Technology Management,  
Bharat Heavy Electricals Limited (BHEL),  
BHEL House, Siri Fort, New Delhi 110049  
Tel: +91-11- 66337213 / 66337339  
Mobile: +91 7838293011  
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**SECTION – 3**

**Details of Expression of Interest**

**3.1 Introduction:**

This Expression of Interest (Eoi) seeks response from Original Equipment Manufacturers (OEMs), who are willing to be associated with BHEL through a license & technology collaboration agreement on long term basis, to enable BHEL to Design, Engineer, Manufacture, Assemble, Test, Supply, Field Install, Commission, Repair, Service and Retrofit Gas Turbine of 1.25 MW Maximum Continuous Rating (MCR) at 35 Deg C ambient air & sea water temperature and its auxiliaries. The Gas Turbine should be suitable for marine (defence) applications.

**3.2 About BHEL:**

BHEL is a leading state owned company, wherein Government of India is holding 63.17% 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 account for more than 57% (approx. 180 GW) of the total thermal generating capacity in India. BHEL has 16 manufacturing units, 4 power sector regions, 8 service centers and 15 regional offices besides host of project sites spread all over India and abroad. The annual turnover of BHEL for the year 2021-22 was around US \$2.65 Billion\*.

BHEL's highly skilled and committed manpower of approx. 30000; state-of-the-art manufacturing, R&D 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. 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 centers.

Our ongoing major technology tie-ups include agreements with Siemens Energy Global GmbH & Co. KG., Germany (for Steam Turbines, Generators and Condensers); MHI, Japan (for Flue Gas Desulfurization Systems); Leonardo S.p.A, Italy (for Super Rapid Gun Mount);

*[\*Note: Currency conversion rate considered: 1 US \$=Rs. 76.20 as on 31<sup>st</sup> March 2022]*



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GE Tech GmbH, Switzerland (for Steam Turbine for Nuclear Power Plant); Vogt Power International, USA (for Heat Recovery Steam Generators); Indian Space Research Organization (ISRO), India (for Space Grade Lithium-Ion Cells); CSIR-IIP, India (PVSA based Medical Oxygen Plant); NANO Company Ltd., Korea (for SCR Catalysts); HLB Power Company Ltd., Korea (for Gates and Dampers); Kawasaki Heavy Industries, Japan (for Stainless Steel Coaches for Metros); Valmet Automation Oy, Finland (for DCS System), Babcock Power Environmental Inc., USA (for Selective Catalytic Reduction Systems) and Sumitomo SHI FW Energia Oy, Finland (for CFBC Boiler).

**More details about the entire range of BHEL's products and operations can be viewed by visiting our web site [www.bhel.com](http://www.bhel.com)**

### 3.3 BHEL in Defence Sector :

BHEL has been in defence business since more than three decades with proven track record of being competitive, adherence to quality, reliable supplies and life time product support. BHEL has long term association with Indian Defence Forces and key Indian organisations like Defence Research and Development Organisation (DRDO), Hindustan Aeronautical Limited (HAL), Defence Shipyards etc. for various projects including but not limited to the following:

1. BHEL has been manufacturing and supplying 76/62 Super Rapid Gun Mount since 1994 in collaboration with M/s Leonardo, Italy.
2. BHEL has also developed Integrated Platform Management System for Warships.
3. BHEL has also manufactured and supplied Armoured Recovery Vehicles to Indian Army.
4. BHEL was part of development team for Main Battle Tank (MBT) Arjun and has supplied gun control system for MBT Arjun.
5. BHEL has the capability for castings & forgings for defence and strategic applications.
6. BHEL has designed, engineered, manufactured and supplied launchers for Trishul Missile & Brahmos Missiles.
7. BHEL has designed, engineered, manufactured and supplied permanent magnet based motors & frequency converters, bidirectional converters, alternators, mechanical auxiliaries, turbines, turbo-generators, condensers etc. for warship and submarines.
8. BHEL is one of the selected few organisation with proven capability of design, engineering, manufacturing & testing of compact heat exchangers & pump modules for aerospace applications.
9. BHEL has long term association with various Indian Space Research Organisation (ISRO) centres and is a regular manufacturer and supplier of space grade Li-ion cells and batteries, solar panels for satellites and launch vehicles, hot forming of titanium shells/ domes and cryogenic tanks.





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10. BHEL has core capability for machining and fabrication of exotic materials including Al-alloys, Titanium alloys etc.

### **3.4 BHEL experience in Gas Turbine manufacturing:**

BHEL has been manufacturing heavy duty Gas Turbines since 1986 at its Heavy Power Equipment Plant (HPEP) located at Hyderabad, the capital city of state of Telangana, under a licensing agreement with M/s General Electric, USA. BHEL has successfully established manufacturing of various models of Gas Turbines ranging from 25 MW to 297 MW and has supplied over 240 units to various customers in India and abroad.

### **3.5 Scope of Cooperation:**

BHEL is seeking Expression of Interest(s) from Original Equipment Manufacturer(s) (OEMs) / Prospective Collaborator(s) for Technology Collaboration Agreement (TCA) on long term basis for state-of-the-art Gas Turbine of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature and its auxiliaries.

The TCA shall enable BHEL to Design, Engineer, Manufacture, Assemble, Test, Supply, Field Install, Commission, Repair, Service and Retrofit Gas Turbine of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature and its auxiliaries. The Gas Turbine should be suitable for marine (defence) applications.

The current requirement of Gas Turbines is against retro fitment of GTG on Indian Naval Ships. The Request for Proposal (RFP) has been issued by Indian Navy which requires 16 Nos of Gas Turbine (GT) of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature to be manufactured over 05 years. Out of these 16 GTs, 12 GTs are intended for the main GTG, 03 GTs for Base and Depot (B&D) spares and 01 GT for Navy Trials. As indicated by Indian Navy, it is expected that the next lot of requirement will be for 20 Nos of GTs. Subsequently, more GTGs may be added for upcoming Indian Naval Ship based on level of Indigenisation and performance of offered product and service. As per conditions of RFP, there should be at least 60% Indigenous content (IC) of the commercial value for these Gas Turbines.

Prospective Collaborator shall be required to undertake the Field Evaluation Trials (FET) of the Gas Turbine & Gear Box conducted by Indian Navy. The FET will be held in India and the GT is required to be proved on a test bed. Post award of contract, OEM is expected to help BHEL to integrate the Gas Turbine with indigenous alternator, controls and other auxiliaries to meet the Indian Navy's RFP requirement. Detailed requirement for Field Evaluation Trials during technical evaluation and manufacturing of First of Production Model post award of contract is placed at **Annexure-1**

Interested OEMs/Prospective Collaborator(s) meeting the Prequalification Requirements (PQR) as specified below are invited to submit their response to this EoI.

Upon receipt of response(s) against this EoI, BHEL will review the response(s) to ascertain suitability of the offer and shortlist Prospective Collaborator(s) for further discussions.



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Detailed discussions on commercial and other terms and conditions to finalize the Technology Collaboration Agreement (TCA) shall be held with shortlisted Prospective Collaborator(s). The detailed terms and conditions for such a paid-up license agreement shall be mutually agreed upon. Indicative scope of technology transfer is given in **Annexure-2**.

### **3.6 Prequalification Requirements (PQR):**

The Prospective Collaborator(s) must meet all the following qualification requirements as on the date of submission of EoI **(to be substantiated by suitable documentary evidence)**:

- a) The Prospective Collaborator must be an OEM of the Gas Turbines.

AND

- b) The Prospective Collaborator must have designed, manufactured and supplied at least five (05) Gas Turbines capable of generating 1.25MW at 35 Deg C ambient air & sea water temperature under operating conditions as specified in technical specifications at **Annexure-3**. Out of these five (05) Gas Turbines, at least one (01) Gas Turbine should have a proven track record of at least 50000 hours of fleet operations on HSD fuel as on date of closing of this EoI and the maintenance philosophy must be suitable for the Time Between Overhaul (TBO) specified in technical specifications at **Annexure-3**. Gas Turbines which are not yet marinized can be considered, provided marinization is feasible on the design.

### **3.7 Instructions:**

- 3.7.1** The interested Prospective Collaborator(s) should submit their response(s) along with following enclosed annexures on or before **16 May 2023**:

**Annexure-1:** Detailed requirement for Field Evaluation Trials during Technical Evaluation and manufacturing of First of Production Model post award of contract.

**Annexure-2:** Indicative Scope of Technology Transfer.

**Annexure-3:** General technical specifications of Gas Turbine proposed for TCA.

**Annexure-4:** Prospective Collaborator's Experience in the field of Gas Turbine proposed for TCA.

**Annexure-5:** Reference List: Prospective Collaborator's major supplies in last 10 years.

- 3.7.2** The response shall necessarily be accompanied with following details:

1. Company background
2. Product Profile
3. Technical details of GT being offered for TCA
4. Data sheet, performance curves, functional write up, catalogues, general arrangement drawing etc of Gas Turbine of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature and its auxiliaries
5. Annual audited financial reports for last 3 (three) years



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- 3.7.3 Language:** All correspondences and documents related to the EoI response shall be in English language, provided that any printed literature furnished by the Prospective Collaborator(s) may be written in another language, as long as such literature is accompanied by a translation of its pertinent passages in English language in which case, for purposes of interpretation of the bid, the English translation shall govern.
- 3.7.4** The Prospective Collaborator(s) shall abide by the terms & conditions, as applicable, of the EoI.
- 3.7.5** All pages of the response against this EoI shall be duly signed by the authorised signatory.
- 3.7.6** Multiple proposals from the same Prospective Collaborator should not be submitted.
- 3.7.7** BHEL at its discretion shall inspect the Prospective Collaborator's works/office/reference site premises for the purpose of evaluation, as deemed necessary before selection of Collaborator. BHEL decision in this regard shall be final.
- 3.7.8** Any Prospective Collaborator which has been debarred/blacklisted by Central/State Governments of India or by any entity controlled by Central/State Governments of India from participating in any of their project, as on date of submission of EoI, shall not be eligible to submit the EoI.
- 3.7.9** BHEL shall receive applications pursuant to this EoI in accordance with the terms set forth herein, as modified, altered, amended and clarified from time to time by BHEL, and all applications shall be submitted in accordance with such terms on or before the date specified in this EoI for submission of applications.

**In case any amendment/corrigendum to this EoI is issued, it shall be notified only at [www.bhel.com](http://www.bhel.com)**

**3.8 PROCESS TO BE CONFIDENTIAL:**

Information relating to the examination, clarification, evaluation and comparison of EoI and recommendations shall not be disclosed to Prospective Collaborator(s). Any effort by Prospective Collaborator(s) to influence BHEL in processing of EoI or selection decisions may result in the rejection of the response against EoI.

**3.9 GOVERNING LAWS & JURISDICTION:**

The EoI 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 EoI process.



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Annexure-1

**Detailed requirement for Field Evaluation Trials during Technical Evaluation  
and manufacturing of First of Production Model post award of contract**

**Equipment offered will have to undergo 03 stages of Trials**

1. Field Evaluation Trials (during technical evaluation)
2. First of Production Model Trials (after award of contract)
3. Acceptance Trials (after award of contract)

*NOTE: Reference standards that are to be followed are listed out in the RFP. However major requirements are already brought out in the RFP. Any further details if sought by OEMs can be shared after signing a Non-Disclosure Agreement (NDA).*

**1. Field Evaluation Trials (FET)**

For an equipment to be introduced in service, it is mandatory that it successfully clears all stipulated tests/trials/evaluations as per RFP. The intent of the FET is to ascertain the capability of the firm to produce all the equipment intended for the Gas Turbine Generator set. **The trial has to necessarily be carried out in India.** The test procedure however can be submitted by the OEM for review and acceptance.

**2. First of Production Model Trials (FoPM Trials - After Award of Contract)**

The L1 firm upon conclusion of contract would be required to demonstrate the FoPM trial on one GTG towards accord of bulk production clearance. This test will involve type-testing and trials to establish performance data, life expectancy, and operation & maintenance characteristics of the GTG set. The test procedure however can be submitted by the OEM for review and acceptance. This test will also involve an endurance test required to be conducted for a duration of 1000 hrs. The equipment undergoing FoPM would not be accepted as deliverable under the contract.

**3. Acceptance trials (After Award of Contract)**

**a. Factory acceptance trials (FAT)**

This will involve tests and pre-dispatch inspections to ascertain the performance of the unit in line with those achieved during the FoPM trials. The unit will be tested at various loads up to 110% of nominal power. The test procedure however can be submitted by the OEM for review and acceptance.



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**b. Ship board trials**

This will involve shipboard trials to ascertain the performance of the unit in line with those achieved during the FAT. The test procedure however can be submitted by the OEM for review and acceptance. The following aspects are to be essential part of this procedure:

- i. Shipping in / Shipping out
- ii. Installation
- iii. Integration with ship based systems
- iv. Trials are required up to rated power

**Cost Sharing for Trials**

As per Indian Navy's RFP requirement, FET, FoPM and Acceptance trials are to be carried out. The cost incurred for carrying out all above shall be shared as per individual scope of work proportionately.

**Signature & Seal:**

Authorized Signatory of the Prospective Collaborator



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**Annexure-2**

**Indicative Scope of Technology Transfer**

a)	Licensing & transfer of state of the art technology relating to Design, Engineer, Manufacture, Assemble, Test, Supply, Field Install, Commission, Repair, Service and Retrofit Gas Turbines of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications and its auxiliaries.
b)	Transfer of improvements/modifications/developments/up gradations to be carried out by the Prospective Collaborator(s) during the period of TCA for taking care of new market requirements and obsolescence. Subsequent updates required due to component obsolescence or updates implemented by Prospective Collaborator(s) due to safety consideration would also be provided.
c)	Assistance in planning & establishing the new manufacturing, assembly and testing facilities & processes/ suitable augmentation at BHEL's existing facilities/processes by way of expert advice in terms of identifying, sizing & selection and preparation of specification of equipment / machinery required for manufacturing, their layout and foundation etc. Deputation of Collaborator's expert for commissioning of the manufacturing facilities, design of special tools and dies, jigs & fixtures etc.
d)	Support through engineering services from Prospective Collaborator's design office / manufacturing facilities for licensed product.
e)	Training of BHEL engineers to Design, Engineer, Manufacture, Assemble, Test, Supply, Field Install, Commission, Repair, Service and Retrofit Gas Turbines of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications and its auxiliaries.
f)	Deputation of Prospective Collaborator's experts to assist BHEL in absorbing the technology for Gas Turbines of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications and its auxiliaries.
g)	Transfer of applicable Proprietary software/computer programs including logics and source code, if any.
h)	During the field trials and regular operation, if any modifications/updates are carried out to improve the performance/reliability of the system the same shall also be transferred to BHEL with complete know-how.
i)	Technology being proposed should be the latest/ state-of-the-art being marketed by the Prospective Collaborator (s).
j)	Transfer of information to enable BHEL to source/procure those items, which Prospective Collaborator sources from other vendors (as these are not manufactured by the Prospective Collaborator) for use in Gas Turbines of 1.25 MW MCR at 35 Deg C ambient air & sea water temperature suitable for marine (defence) applications and its auxiliaries.

**Signature & Seal:**

Authorized Signatory of the Prospective Collaborator



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**Annexure-3**

**General technical specifications of Gas Turbine proposed for TCA**

a)	Construction features of the Gas Turbine should be suitable for the marine (defence) application capable of operating under following conditions:	
1.	Temperature	Ambient Air : -40 Deg C to +40 Deg C Sea water : -2 Deg C to +35 Deg C
2.	Relative Humidity at 35 Deg C	95%
3.	Engine room Temperature	+0 Deg C to +55 Deg C
4.	Salinity of fresh water used for cooling	Upto 1000 ppm
5.	Salinity of sea water used for cooling	≤ 37000 ppm
6.	Fuel contamination	Total water : 200 ppm Dirt after filtration at 10 micron : 2.5 mg/L
7.	Emergency operation	30 min even in case of fire
8.	Fungus & corrosion Resistance	Engine components should consist of non-nutrient material which are resistant to fungus & corrosion while operating in sea conditions for entire service life
9.	Condition of inclination	Static trim : 5 degrees unlimited time Dynamic trim : 15 degrees by aft & 20 degrees by forward Static heel : 15 degrees unlimited time Dynamic roll : Up to 45 degrees (± 22.5 degrees) no impact on operation
10.	Extreme temperature condition during storage	+0 Deg C to +70 Deg C
b)	The Maximum Continuous Rating (MCR) of the Gas Turbine should be 1.25 MW at 35 Deg C ambient air & sea water temperature.  (Gas Turbine Models upto 2.5 MW also could be considered in consultation with end customer, if it can be accommodated in the available envelope).	
c)	Duct losses to be considered for rated performance – Inlet : 300 mm Exhaust : 400 mm	
d)	Must have AC starting system with variable frequency drive (VFD). Total blackout start through battery backup is also to be catered to.	
e)	Emergency operation : Gas Turbine should withstand overload upto 110% of rated power for at least a duration of 5 minutes in case of an emergency.	



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f)	Efficiency: Considering the Gas Turbine is expected to operate in open cycle mode, efficiency of the engine should be best in class. A minimum of 22% efficiency and specific fuel consumption (SFC) < 450 g/kW-Hr at peak load operation is expected.								
g)	Fuel: Should be capable of combusting Low sulfur High Flash High Speed Diesel.								
h)	Emissions limits - NO <sub>x</sub> : 150 ppm and CO : 35 ppm								
i)	Maximum permitted Exhaust Temperature : 600 Deg C								
j)	The dimensions of the Gas Turbine Generator (GTG) train are desired to be within 6110 mm length, 2210 mm width and 2905 mm height. (The Gas Turbine air intake, exhaust and other auxiliaries not included).								
k)	Dimensions to be matched at intake : 400mm x 800mm								
l)	Maximum weight of the Gas Turbine : ≤ 16 tons								
m)	Maximum vibrations: 4.5 mm/sec (rms) [Horizontal & Vertical]								
n)	Salt intake: Gas Turbine shall operate satisfactorily throughout its operating range at environment conditions with air containing salt and dust in concentrations up to 5.3 x 10 <sup>5</sup> kg of salt per m <sup>3</sup> of air. Maximum degradation in performance permitted after 10 hrs of continuous operation is 5% in power & 5% in specific fuel consumption. Compressor washing system should restore the performance.								
o)	Water ingestion: Gas Turbine shall operate satisfactorily throughout its operating range with up to 5% the total airflow weight in the form of water (liquid and vapor).								
p)	Service life: 1. The Gas Turbine shall have an assured service life of at least 80,000 hrs 2. Mean Time Between Overhauls (MTBO) should be greater than 40,000 Hrs. 3. Duty cycle (for catering to TBO) should not be less than 0.075 cycles /year (Reasonable deviations to this requirement can be considered based on end customer approval.)								
q)	Shock Acceptance Criteria: <b><u>As per Indian Navy Shock Grade 'A' curves</u></b>								
	<table border="1"> <thead> <tr> <th>Acceleration / Deceleration</th> <th>Limiting Value (g)</th> </tr> </thead> <tbody> <tr> <td>Vertical Acceleration</td> <td>61</td> </tr> <tr> <td>Horizontal Acceleration</td> <td>35</td> </tr> <tr> <td>Vertical Deceleration</td> <td>11</td> </tr> </tbody> </table>	Acceleration / Deceleration	Limiting Value (g)	Vertical Acceleration	61	Horizontal Acceleration	35	Vertical Deceleration	11
Acceleration / Deceleration	Limiting Value (g)								
Vertical Acceleration	61								
Horizontal Acceleration	35								
Vertical Deceleration	11								
r)	The Gas Turbine should be of proven design with the fleet leader having completed at least 50000 hrs.								
s)	OEM should have capability of providing On-site maintenance of Combustion & Hot Gas Path components.								
t)	Gas Turbines with efficiency improvement systems like regenerative cycles can also be considered, however reliability of operation shall need to be ensured.								
u)	The engine should primarily be suitable for power generation application.								

**Signature & Seal:**

Authorized Signatory of the Prospective Collaborator





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Annexure-4

Prospective Collaborator's Experience in the field of Gas Turbine proposed  
for TCA

Sl. No.	Requirement	Prospective Collaborator's response YES/NO and remarks, if any
a)	Whether the Prospective Collaborator is an Original Equipment Manufacturer (OEM) of proposed Gas Turbine.	
b)	Whether documentary evidence to substantiate the below PQRs has been submitted by Prospective Collaborator:  1) The Prospective Collaborator must be an OEM of the Gas Turbines. 2) The Prospective Collaborator must have designed, manufactured and supplied at least five (05) Gas Turbines capable of generating 1.25MW at 35 Deg C ambient air & sea water temperature under operating conditions as specified in technical specifications at <b>Annexure-3</b> . Out of these five (05) Gas Turbines, at least one (01) Gas Turbine should have a proven track record of at least 50000 hours of fleet operations on HSD fuel as on date of closing of this EoI and the maintenance philosophy must be suitable for the Time Between Overhaul (TBO) specified in technical specifications at <b>Annexure-3</b> . Gas Turbines which are not yet marinized can be considered, provided marinization is feasible on the design.	
b)	Whether the Prospective Collaborator agrees for technology transfer as per scope given in <b>Annexure-2</b> .	
c)	Whether information on market share has been enclosed.	
d)	Whether Prospective Collaborator's detailed reference list have been enclosed.	
e)	Whether Prospective Collaborator's annual audited financial reports for last 3 years have been enclosed.	
f)	Whether the Gas Turbine offered for technology transfer is the latest being marketed by the Prospective Collaborator.	



**Expression of Interest for technology tie-up for Gas Turbine of 1.25 MW  
Maximum Continuous Rating at 35 Deg C ambient air & sea water  
temperature suitable for marine (defence) applications**

g)	Whether customers (end users) letters / documentary evidence for satisfactory operation of Gas Turbine model which is being offered to BHEL under this EoI have been enclosed.	
h)	Whether the Prospective Collaborator owns the IPRs for the technology being proposed for transfer under the Technology Collaboration Agreement (TCA) or have an unencumbered right from the owner of the IPRs to sub-license the technology, if applicable.  If yes, whether list of such IPRs is enclosed.	

**Signature & Seal:**

Authorised Signatory of the Prospective Collaborator



Expression of Interest for technology tie-up for Gas Turbine of 1.25 MW  
Maximum Continuous Rating at 35 Deg C ambient air & sea water  
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**Annexure-5**

**Reference List:** The Prospective Collaborator shall furnish a summary of their product reference as detailed below for major supplies in last 10 years

Sl. No.	Project name / location	Rating of Gas Turbine	Year of Supply	Year of Commissioning

**Signature & Seal:**

Authorized Signatory of the Prospective Collaborator