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**Subject: Technology Collaboration for Air Separation Unit (ASU)**

**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, to enable BHEL to design, engineer, manufacture, assemble, quality control, test, supply, install, erect, commission, repair, service and retrofit state of the art Air Separation Unit (ASU) to meet market requirements.

1.1) Bharat Heavy Electricals Limited (BHEL) is a leading state owned company, 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, defence, renewable and non-conventional energy. The energy sector covers generation, transmission and distribution equipment for hydro, thermal, 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 % of the total thermal generating capacity in India. BHEL is also listed in stock exchanges of India. The company has 17 manufacturing units, 4 power sector regions, 8 service centers, 8 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 2014-15 was **US\$ 5.04 Billion\***, with profit before tax of **US\$ 349 Million\***. BHEL's highly skilled and committed manpower of approximately **44900** employees, the state of art manufacturing facilities and latest technologies, has helped BHEL to deliver a consistent track record of performance. To position leading state owned companies as Global Industrial giant & as a recognition for their exemplary performance, Government of India categorized BHEL as "Maharatna Company" in 2013, empowering the company with enhanced autonomy in decision making. With the current order book exceeding **US \$ 16.1 Billion\***, BHEL is poised for excellent future growth. Our ongoing major technology tie-ups include agreements with GE, USA (for gas turbines); Siemens, Germany (for steam turbines, generators and condensers); Metso Automation Inc., Finland (for control & instrumentation); Alstom, France (for Super-Critical Boilers & pulverisers); MHI, Japan (for pumps); MHPS, Japan (for Flue Gas Desulfurization Systems); Vogt Power International, USA (for HRSG); GENP, Italy (for compressors); Turbo Lufttechnik, Germany (for fans) and Sheffield Forge masters International, UK (for forgings). 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).

**1.2) About HPVP unit of BHEL:**

Bharat Heavy Plate and Vessels Limited (BHPV) based at Visakhapatnam, Andhra Pradesh, erstwhile a wholly owned subsidiary of BHEL has been merged with BHEL with effect from 30<sup>th</sup> Aug 2013. Consequent to the Merger, BHPV has become 17<sup>th</sup> manufacturing unit of BHEL and is now known as "Heavy Plates and Vessels Plant (HPVP)" ([www.bhelviz.co.in](http://www.bhelviz.co.in)).

HPVP's strategically located manufacturing facility at Visakhapatnam is accredited with ISO 9001 and has supplied numerous quality process plant equipment, cryogenic, combustion, oil & gas systems on turnkey basis and provided services suited to specific requirements of its customers.

The major products of HPVP include crude stabilization unit, gas sweetening & LPG recovery plant, LPG terminal (storage and handling facilities), flue gas conditioning skid,

**[\*Note: Currency conversion rate considered: 1 US \$=Rs 62.59 as on 31<sup>st</sup> March 2015]**

ammonia storage systems (double wall storage tanks), desalter plant, evaporators, mounded LPG storage facilities, vacuum ejector and condensers systems, Sulfur Recovery Unit (SRU)/Amine Regen Unit (ARU)/Sour Water Stripper (SWS) packages, group gathering / gas collecting stations, skid mounted packages for oil & gas/fertilizer industries and process equipment for off shore platforms etc.

### 1.3) Experience of HPVP in Cryogenic Equipment:

Erstwhile BHPV (now HPVP) has been an established manufacturer of Cryogenic equipment since 1971. HPVP had a technology collaboration with Air Liquide of France for Air Separation Units of capacities ranging from 5 Tons Per Day (TPD) up to 2200 TPD to produce Oxygen, Nitrogen and Argon. This enabled HPVP to supply about 24 nos. of tonnage ASUs till date including 1x890 TPD ASU to National Fertiliser Limited, Panipat; 2x550 TPD ASU to Bokaro Steel Plant and 3X 500 TPD ASU to Vizag Steel Plant in India.

HPVP's range of other cryogenic equipment include purge gas recovery units for separation of hydrogen from Purge gas of Ammonia plants using Naphtha or natural gas as feedstock, cryo storage tanks of horizontal and vertical designs starting from 500 liters up to 200,000 liters capacity to hold liquid Oxygen, Nitrogen & Argon and large field-erected cryogenic storage tanks of 320 Tonnes to 2000 Tonnes capacity.

- 1.4) In order to meet upcoming market requirements in Industry segment and to upgrade the state of art technology for ASU, BHEL intends to enter into a technology collaboration agreement with a leading Original Equipment Manufacturer (OEM). The scope of technology collaboration shall enable BHEL to design, engineer, manufacture, assemble, quality control, test, supply, install, erect, commission, repair, service and retrofit of ASUs. The detailed terms and conditions for such a paid-up license agreement shall be mutually agreed upon.

### 2) Scope of cooperation :

BHEL seeks a partner for entering into a Technology Collaboration Agreement (TCA) for state of the art & proven ASU. The duration of the TCA shall be around 10 years. Business sharing option, during the initial period of technology assimilation by BHEL can also be considered. Indicative scope of technology transfer for ASU along with its associated subsystems is given in Annexure-1.

### 3) Prequalification requirements (PQR):

The prospective collaborator shall meet the following conditions as on the date of submission of Eoi:

- 3.1) Prospective collaborator should have at least 10 years of experience in designing, engineering, manufacturing, supply, erection & commissioning, performance testing, operation and maintenance of state of the art ASU for Industrial applications.
- 3.2) For High Purity Nitrogen (HPN) Plant:

The prospective collaborator should have designed, engineered, manufactured, supplied, tested, erected and commissioned at least one no. (1) Cryogenic Air Separation Unit in the last four (4) years, having combined production capacity of minimum 2000 Nm<sup>3</sup>/hr (GAN+LIN) of Nitrogen with minimum purity of 99.99%, which should have been in satisfactory operation for a minimum period of one (1) year as on the date of closing of this Eoi. (To be substantiated by an end user certificate.)

**For Oxygen Plant:**

The prospective collaborator should have designed, engineered, manufactured, supplied, tested, erected and commissioned at least one no. (1) Air Separation Unit of minimum 500 TPD capacity with internal compression technology for production of Oxygen along with Nitrogen and Argon with minimum purity of 99.5% for Oxygen and 99.7% for Nitrogen with structured packing in all the distillation columns. The plant should have been in satisfactory operation for a minimum period of one (1) year as on the date of closing of this Eoi. (To be substantiated by an end user certificate.)

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

The interested prospective collaborators shall ensure that their response along with annexures is received by BHEL on or before **August 31, 2015**. The response shall necessarily be accompanied with details on company background, technical features/product catalogue, information on market share, reference list as per Annexure-4 and annual audited financial reports for last 3 (three) years including auditor's report.

In case any further information is needed, kindly feel free to contact us.

The respondent shall submit their offer with all annexures duly signed.

**Your response may be sent to the following address:**

General Manager  
Technology Licensing & Joint Ventures  
Bharat Heavy Electricals Limited  
BHEL House, Siri Fort  
New Delhi - 110049  
India  
Phone: +91 11 66337809  
Mob: +91 9871094069  
Fax: +91 11 26492974  
Email: [shakil@bhel.in](mailto:shakil@bhel.in)

**Annexure-1**

**Indicative Scope of Technology Transfer**

a)	Licensing & transfer of state of the art technology relating to the design, engineer, manufacture, assemble, quality control, test, supply, install, erect, commission, repair, operate and retrofit of the ASU
b)	Transfer of applicable computer programs including logics and source code if any
c)	Transfer of improvements/modifications/developments/up gradations carried out by the OEM over the duration of the technology transfer for taking care of new market requirements and obsolescence.
d)	Transfer of Site feedback and troubleshooting information
e)	Training of BHEL engineers in the design, engineer, manufacture, assembly, quality control/quality assurance, testing, installation, erection, commissioning, maintenance & operation of the above ASU
f)	Deputation of OEM's experts to assist BHEL in absorbing the technology for licensed products
g)	Support through engineering services from OEM's design office / manufacturing facilities for licensed products
h)	Transfer of information to enable BHEL to source/procure those items, which the OEM sources from outside (as these are not manufactured by the OEM) for use in the ASU

(SIGNATURE)

Annexure -2

OEM's Experience in the field of ASU

Sl. No.	Requirement	OEM's response YES/NO and remarks if any
(a)	Whether the prospective collaborator is an Original Equipment Manufacturer (OEM) of ASU	
(b)	Whether the OEM has an experience of minimum 10 years in the designing, engineering, manufacturing, supply, erection & commissioning, performance testing, operation and maintenance of ASU	
(c)	Whether details of company background, product catalogues have been enclosed	
(d)	Whether information on market share has been enclosed	
(e)	Whether OEM's detailed reference list have been enclosed	
(f)	Whether OEM's annual audited financial reports for last 3 years have been enclosed	
(g)	Whether a summary of experience & reference as per Annexure-4 have been enclosed	
(h)	Whether the ASU offered for technology transfer is the latest being marketed by the OEM	
(i)	Whether customers (end users) letters / documentary evidence for satisfactory operation of ASU have been enclosed for meeting PQR as mentioned in clause 3 of this Eol.	
(j)	Whether the prospective collaborator owns the IPRs for the technology being proposed for transfer under the Technology Collaboration Agreement (TCA) or have unencumbered right from the owner of the IPRs to sub-license the technology, if applicable.  If yes, list of such IPRs to be enclosed.	

(SIGNATURE)

Annexure -3

Essential technical features of ASU proposed for TCA

Sl. No	Technical Feature	Yes or No	Remarks if any
1	MP & LP columns with packings		
2	Argon columns with packings		
3	Oxygen plants with internal compression		
4	ASU with auto control through DCS based control system with manual override facility		
5	ASU and HPN plants designed for optimisation of power consumption  The power consumption/ tonne of Nitrogen production in case of Nitrogen plants and power consumption/ tonne of Oxygen production in case of Oxygen plants may be furnished.		

(SIGNATURE)



Expression of Interest (Eoi) for  
Technology Collaboration Agreement (TCA)

Annexure -4

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

Sl. No	Project name / location	Capacity of gaseous and liquid O <sub>2</sub> /N <sub>2</sub> /Ar	Storage capacity	Year of supply	Year of Commissioning

(SIGNATURE)