Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, Tamil Nadu, India

TITLE **Joint Working in the area of DeNOx System**	Phone: +91 431 2575756 Email : pss@bheltry.co.in

	Reference Number: Enquiry :BHEL-T/DeNOx/2016	**Enquiry Date: 18.03.16**	**Due date for submission of Documents: 30.04.16**
You are requested to quote the Enquiry number date and due date in all your correspondences. This is only an Expression of Interest and not an order			

Expression of Interest (EOI) is invited by BHEL from DeNOx system designers, to work jointly with BHEL on design & engineering of DeNOx systems meant for power plants, and its integration with the boiler, on a project to project basis

BHEL terms & conditions and all annexures can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units) Bharat Heavy Electricals Limited) under enquiry reference "**BHEL-T/DeNOx/2016**"	
Responses should reach us before 14:00 hours on the due date	Yours faithfully, For **Bharat Heavy Electricals Limited** The AGM/Marketing (FB) Bldg 24, BHEL, Tiruchirapalli-620014 Ph: 0431- 2575756, Fax: 0431- 2576809 Email: pss@bheltry.co.in

Notice Inviting Expression of Interest (EOI) for Joint Working in the area of DeNOx System

EOI Reference Number
BHEL-T/DeNOx/2016
March 18, 2016

Bharat Heavy Electricals Limited,
High Pressure Boiler Plant-Trichy

1.0 About BHEL

BHEL is a leading Public Sector Undertaking under Ministry of Heavy Industries and Public Enterprises, Government of India. BHEL is an integrated power plant equipment manufacturer and one of the largest engineering and manufacturing organizations in India. We are 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 (Railway), Renewable Energy, Oil & Gas and Defence. The Power sector covers generation, transmission and distribution equipment for hydro, fossil, and gas fuels. BHEL has been in this business for more than 50 years and BHEL supplied equipment account for 61 % of the total thermal generating capacity in India. Nearly 68% of the equity is owned by the Government of India. The company has 17 manufacturing units, 4 power sector regions, 8 service centers, 10 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 Rs 30947 Crores (US$ 4.94 Billion approx.). BHEL's highly skilled and committed manpower of approximately 47000 employees, the best of manufacturing facilities and practices together with the latest technologies, has helped BHEL to deliver a consistent track record of performance. More details about the entire range of BHEL's products and operations can be obtained by visiting our web site www.bhel.com.

2.0 About HPBP, BHEL Trichy

High Pressure Boiler Plant (HPBP) is one of the major units of BHEL. It is one of the leading boiler manufacturers in the world providing total boiler island solutions for utility, industrial, captive power and heat recovery applications. At present, Trichy unit is designing & manufacturing sub-critical boilers, industrial boilers, CFBC (Circulating Fluidised Bed Combustion) boilers, Heat Recovery Steam Generators (HRSG), state-of-art Once-through supercritical boilers and is working on Advanced Ultra Supercritical boilers. It also designs/manufactures Advanced Technology Products like Nuclear Steam Generators, Valves for Power and Industrial applications and Seamless Steel Tubes. The Unit has been accredited with ISO 9001, ISO 14001, OHSAS 18001 and ISO 27001 standard certifications.

3.0 Background for this Expression of Interest (EOI)

Recently, Ministry of Environment and Forest (MoEF), Government of India has notified new norms for NOx (oxides of Nitrogen) emission for thermal power plants. The new norms on NOx levels as notified by MoEF are given below:

Thermal Power Plant installation Period	New Standards on NOx
Installed before 31st December, 2003	600 mg/Nm^3
Installed after 1st January,2003, up to 31st December, 2016	300 mg/Nm^3
To be installed from 1st January, 2017 onwards	100 mg/Nm^3

The Trichy Unit of BHEL is responsible for providing total solution for the boiler island. BHEL Trichy therefore intends to shortlist firms, through this EOI, to work jointly with BHEL on design & engineering of DeNOx systems meant for power plants, and its integration with the boiler, on a project to project basis, to meet the above mentioned emission norms.

4.0 Eligibility Criteria

The parties meeting all the below mentioned criteria shall be eligible to respond to this EOI:

4.1 The respondent should be an expert in system engineering of SCR (Selective Catalytic Reduction) and / or SNCR (Selective Non-Catalytic Reduction) and should have designed these systems separately or in combination.

4.2 The respondents with system engineering capability for SCR should have carried out system design of SCR located at air pre-heater inlet and also at tail-end (after ESP) in typical utility boilers.

4.3 The respondent should have carried out system design of DeNOx systems for boilers and this DeNOx system should be working satisfactorily for more than one year as on the date of issue of this EOI.

4.4 Respondents should be capable of designing SCR/SNCR system to meet the specifications given in Annexure I.

4.5 Respondents should be financially sound with positive Net Worth.

5.0 Terms of reference

5.1 BHEL would be the prime bidder for supply of DeNox systems. The respondent should be ready to work jointly with BHEL and support BHEL in the areas of system design, inspection, testing, commissioning, trouble shooting, and quality assurance methods for the DeNOx system.

5.2 The respondent should be ready to provide a "Letter of Comfort/Letter of Support" for extending pre-requisite performance guarantees and warranties in respect of the entire DeNOx system as a total system designer and guarantees & warranties for specific equipment, if any supplied by the respondent, if in case BHEL's customers insist on such a condition.

5.3 BHEL has the capability to manufacture catalyst for SCR. System designs offered by the respondent should be generic in nature so that BHEL can use in-house produced catalyst or bought out catalyst or combination of both wherever required. The respondent should be ready to provide Specification and testing/quality check for the catalyst (produced by BHEL/bought out).

6.0 Documents to be attached along with the response:

6.1 Covering Letter signed by an Authorised Signatory on Company letter-head agreeing to the terms of reference of this EOI.
6.2 Confirmation from respondent about meeting requirements of each item mentioned in the technical specification at Annexure I. Deviations, if any, shall be mentioned clearly.
6.3 Technical Write-up describing features of DeNOx system being offered.
6.4 Company Details including address, details of contact person(s), product profile (brochures/catalogues), organisation structure and copies of audited Balance Sheet and P&L Account for the last 3 years.
6.5 Reference list shall be furnished as per Annexure-III.
6.6 Performance certificate from customers or alternate proof of performance

7.0 EOI Process

7.1 BHEL Trichy will analyse the responses received towards this EOI to shortlist the respondents.
7.2 Respondents may be asked to make presentation to BHEL, if required.
7.3 Competitiveness, technical suitability and agreement to commercial terms & conditions would be considered for shortlisting joint working partners from among the respondents.

8.0 Governing Laws & Jurisdiction

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

9.0 Last Date for receipt of response

The last date for receipt of consolidated response to EOI at BHEL-Trichy is 30th April 2016 14:00 Hours.

10.0 Mode of Submission of Documents

In sealed cover to the contact person / mail to the e-mail ID so as to reach on or before the date mentioned above. The cover shall be super-scribed with Reference number and the words "Expression of Interest – DeNOx system". In case of offer by e-mail, the words "Expression of Interest – DeNOx system" shall be in the Subject field of e-mail. The documents as above should be submitted in a sealed envelope and should bear the name, e-mail ID, address and telephone number of the respondent. The envelope should be addressed to "**Additional General Manager, Marketing (FB), High Pressure Boiler Plant, Trichy, Tamil Nadu, India, 620014"**. In case of submission of EOI through e-mail, hard copy along with printout of e-mail shall be sent by post or courier so as to reach the contact person on or before 10th May 2016.

CONTACT PERSON

Mr P S Seshadri
Additional General Manager (Marketing/FB)
High Pressure Boiler Plant
Trichy
Tamil Nadu, India
620014
Phone: 0431-2575756
E-mail: pss@bheltry.co.in

11.0 Disclaimer

11.1 The information contained in this EOI or subsequently provided to respondent(s), whether verbally or in document or in any other form, by or on behalf of BHEL or any of its employees or advisors, is provided to respondent(s) on the terms and conditions set out in this EOI and such other terms and conditions subject to which such information is provided.

11.2 This EOI is neither an agreement nor an offer by BHEL to the prospective respondent(s) or any other person. The purpose of this EOI is to provide interested parties with information that may be useful to them in the formulation of their response for qualification pursuant to this EOI.

11.3 BHEL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any respondent upon the statements contained in this EOI.

11.4 The issue of this EOI does not imply that BHEL is bound to select and shortlist respondent(s) for next stage or to enter into any joint working agreements with shortlisted respondent(s).

11.5 BHEL at its discretion may extend the due date for submission of EOI and the decision of BHEL in this respect would be final and binding on the respondent(s).

11.6 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 parties/respondents to submit fresh responses.

11.7 BHEL reserves the right to disqualify any respondent during or after completion of EOI process, if it is found there was a material misrepresentation by any such respondent or the respondent fails to provide, within the specified time, supplemental information sought by BHEL.

11.8 BHEL reserves the right to verify all statements, information and documents submitted by the respondent in response to this EOI. Any such verification or lack of such verification by BHEL shall not relieve the respondent of his obligations or liabilities hereunder nor will it affect any rights of BHEL.

11.9 The respondent shall bear all costs associated with the preparation, technical discussion/presentation and submission of response/quote. BHEL shall in no case be responsible or liable for these costs regardless of the conduct or outcome of the EOI process.

11.10 Canvassing in any form by the respondent or by any other agency on their behalf may lead to disqualification of their response/quote.

Annexure- I

Specification for Engineering of DeNOx System using SCR and/or SNCR for Boiler Applications

1. Background:

BHEL Trichy is a total solution provider for boiler islands in power projects. BHEL Trichy is currently interested in engaging Vendors who can carry out total engineering for the DeNOx system using SCR and/or SNCR for new boilers under construction/design and as retrofit for boilers already commissioned.

2. Typical input parameters:

Refer attached Annexure - II.

3. Battery Limits:

Following shall be the Battery limits for the Engineering scope:

a) Beginning at the Ammonia injection manifold flange on the flue gas duct
b) Ending at the outlet of the catalyst elements as the case may be
c) Complete Ammonia handling & storage system
d) Catalyst handling system, if any
e) Catalyst Management System
f) All associated control and instrumentation

4. Deliverables

4.1 Basic engineering

The basic engineering documentation package shall consist of:

a) CFD flow modelling and reporting, simulation.
b) Basic drawings of internal flow conditioning devices, if any, required in order to maintain catalyst performance guarantee as required.
c) Specification of ammonia injection and mixing system (inside flue gas duct or reactor) on the basis of the CFD study result.
d) Piping & Instrumentation diagram (P&ID).
e) Process Flow Diagram (PFD).
f) SAMA (Scientific Apparatus Makers' Association) diagram describing the system control logic.
g) Review (for process requirement) of final reactor (along with BHEL produced SCR modules) drawing prepared by BHEL.

h) Basic Engineering spec for the various bought out sub systems & ensuring completeness of the DeNOx system.

All documentation to be provided in PDF and/or DWG format.

Optional: Physical flow modelling and reporting, simulation of 1 case 1/10th size.

4.2 Inputs required for Detailed Engineering by BHEL:

The inputs required by BHEL for carrying out detailed engineering of the system shall address in detail the following aspects:

a) Sizing of SCR / SNCR / Combined System for DeNOx including catalyst support and accessories as required. Detailed Specification of SCR catalyst such as: Type, Configuration/Geometry, Characteristics, Catalyst Volume, Size, Pitch & Wall Thickness of Honeycombs or Plate type, Module Size, Module Weight, Module Arrangement, Number of layers, Space velocity etc
b) Locating NO_x, NH_3 & O_2 Analysers and Temperature and Pressure measurement instruments at inlet and outlet as specified in the P&ID
c) Recommended locations for other measurements
d) Ammonia storage facilities (anhydrous, aqueous, urea) & Ammonia consumption rate (kg/hr)
e) Ammonia loading into storage tank (from tanker, rail driver or other)
f) Ammonia gas preparation (ammonia evaporator, urea decomposer or other)
g) Ammonia evaporation and flow control systems
h) Dilution air and pre-mixing system
i) Compliance with local and national codes and requirements
j) Safety requirements including incorporation of local and national requirements
k) Stream tables
l) Soot blowers
m) Control system
n) Instrumentation and instrument specifications (including instruments for NOx, SOx & NH_3 measurement)
o) Interconnecting piping
p) Power and control cables between equipment
q) Civil work and foundations
r) Insulation and cladding
s) Supplies of utilities and required tools and equipment
t) Erection supervision & commissioning advice
u) Required space for various systems in the plant & location of the same.
v) Power requirement (kW)

Annexure- II

Typical Data for Selection of De-NOx System

Sl No	Description	Units	Load
			BMCR-DC
1	Flue gas flow at Economiser Outlet	kg/hr	2731017
2	Typical Range of Flue gas temperature entering SCR	deg C	240 to 350
3	Flue gas temperature entering SCR	deg C	324
4	Total Volumetric Gas Flow at Sl No 3	m^3/hr	4636701
5	Total Volumetric Gas Flow	Nm^3/hr	2122078
6	Flue gas constituents, Wet Basis - % By Weight		
i	CO_2	%	21.852
ii	N_2	%	68.913
iii	O_2	%	3.458
iv	SO_2	%	0.174
v	H_2O	%	5.603
7	SO_3 in Flue gas at SCR Inlet @ 6% O_2 (Considering 1.5 % Conversion)	ppm	10.08
8	Inlet (APH) Particle Dust Concentration	gm/Nm^3	73.9
9	NO_x concentration to SCR Inlet	mg/Nm^3	300
10	NO_x required at Chimney	mg/Nm^3	<100

Fuel Analysis details are given in the next 2 pages

DESCRIPTION (Source / Type)	UNIT	DESIGN COAL	WORST COAL	BEST COAL
PROXIMATE ANALYSIS				
Fixed carbon	%	29	26	25.5
Volatile matter	%	20	19	27.5
Moisture	%	9	12	12
Ash	%	42	43	35
Total	%	100	100	100
HHV	kcal / kg	3455	3220	4250
LHV	kcal / kg			
Ash	kg / 10^6 kcal			
ULTIMATE ANALYSIS				
Carbon	%	37.6	33.5	41.7
Hydrogen	%	2.1	2.4	3.4
Sulphur	%	0.55	0.45	0.25
Nitrogen	%	1.5	1.3	1.0
Oxygen (difference)	%	7.25	7.35	6.65
Moisture	%	9	12	12
Ash	%	42	43	35
Carbonates	%			
Phosphorous	%			
HARD GROVE INDEX		53	50	49
ASH CHARACTERISTICS				
IT - Initial deformation temp.	°C	1150	1100	1200
ST - Softening temp. H = W	°C	-	-	-
HT - Hemispherical temp. H = W / 2	°C	1300	1250	1350
FT - Fusion temp.	°C	>1400	>1400	>1400
ASH CONSTITUENTS (avg)				
A - $Si\ O_2$	%	58.7		
A - $Al_2\ O_3$	%	28.35		
B - $Fe_2\ O_3$	%	7.41		
B - CaO	%	1.07		
B - MgO	%	0.7		
B - $Na_2\ O$	%	0.72		
B - $K_2\ O$	%			
A - TiO_2	%	2.06		
P_2O_5	%	0.40		
SO_3	%	0.0		
Others	%	0.59		
Base / Acid Ratio				
Fe_2O_3 / CaO Ratio				
Chloride				

DESCRIPTION (Source / Type)		**UNIT**	**Imported Coal**		
PROXIMATE ANALYSIS					
Fixed carbon		%	40		
Volatile matter		%	26		
Moisture		%	30		
Ash		%	4		
Total		%	100		
HHV		kcal / kg	5000		
LHV		kcal / kg			
Ash		kg / 10^6 kcal			
ULTIMATE ANALYSIS					
Carbon		%	47.72		
Hydrogen		%	2.38		
Sulphur		%	0.22		
Nitrogen		%	1.58		
Oxygen (difference)		%	14.1		
Moisture		%	30		
Ash		%	4		
Carbonates		%			
Phosphorous		%			
HARD GROVE INDEX					
ASH CHARACTERISTICS					
IT - Initial deformation temp.		°C			
ST - Softening temp.	H = W	°C			
HT - Hemispherical temp.	H = W / 2	°C			
FT - Fusion temp.		°C			

Annexure III - Experience List for DeNOx Sytem Supplier

Sl No	Name and Address of the plant	Ash %	Unit Rating MW	No of units	Type of Boiler: Tower / Two pass/ CFBC / BFBC	Supply type: New / Retrofit	Commissioning Date	Type of NO_X control system: SNCR / SCR / Combination of SNCR & SCR	Inlet Ash Loading g/Nm3	Inlet NO_x mg/Nm3	Outlet NO_x mg/Nm3	Type of Catalyst	Catalyst Supplier	Reagent Type	Scope of work: Engineering & Supply / Supply / System Integrator