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ENQUIRY

RD:DP:MPX:F-04

To

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Pin

Email :

Attn. .

Enquiry No:	Enq Date:	Due Date:	Delivery By:
500890651	08-NOV-08	04-DEC-08	

PLEASE SUBMIT YOUR QUOTATION IN SEALED COVER SUPERSCRIBED WITH ENQUIRY NO, ENQUIRY DATE AND DUE DATE SUBJECT TO OUR TERMS AND CONDITIONS ENCLOSED, FOR THE FOLLOWING MATERIALS SO AS TO REACH US ON OR BEFORE THE DUE DATE BY 12 NOON. THE TENDERS WILL BE OPENED AT 2 PM ON THE SAME DAY

PLEASE GIVE REFERENCE OF ENQ NUMBER , ENQ .DATE AND DUE DATE IN ALL YOUR CORRESPONDENCE FOR PROMPT ACTION. IN CASE IF YOU ARE NOT MAKING THE OFFER PLEASE POST A REGRET LETTER AND RETURN THE DOCUMENTS.

SL NO	DESCRIPTION / SPECIFICATION	UNIT	QTY
1	INTEGRATED MULTIDISCIPLINARY DESIGN AND ANALYSIS SOFTWARE FOR COMPRESSORS AND PUMPS WITH DYNAMIC LINKING OF THE FOLLOWING MODULES AND OPTIMISATION WITH AN INTERACTIVE DATABASE AS PER ENCLOSED SPECIFICATION ES_01 A) MEAN LINE DESIGN AND ANALYSIS SOFTWARE FOR COMPRESSORS B) MEAN LINE DESIGN AND ANALYSIS SOFTWARE FOR PUMPS C) 3D DESIGN AND ANALYSIS SOFTWARE FOR COMPRESSORS & PUMPS D) COMPUTATIONAL FLUID DYNAMIC SOFTWARE FOR COMPRESSORS & PUMPS E) PRE-AND POST PROCESSOR SOFTWARE FOR FEM ANALYSIS F) ROTOR DYNAMIC SOFTWARE G) REAL GAS PROPERTIES MODULE SOFTWARE H)COMPREHENSIVE MULTIDISCIPLINARY OPTIMISATION SOFTWARE I) INTERFACE SOFTWARE FOR DESIGN & ANALYSIS OPTIMISATION	SET	1

NOTE: PLEASE SUBMIT YOUR OFFER IN TWO PARTS AS PER GENERAL TERMS AND CONDITIONS OF ENQUIRY & CONTRACT FOR THE PURCHASE OF GOODS/SERVICES IN SEPARATE SEALED COVERS AS DETAILED BELOW:

1) FIRST COVER SHALL CONTAIN THE FOLLOWING:

A) TECHNICAL COMMERCIAL BID ALONG WITH COMPLIANCE STATEMENT, MENTIONING APPLICABLE DUTIES, TAXES ETC., AND DELIVERY TIME CLEARLY, (TERMS, CONDITIONS AND COMPLIANCE FORM ENCLOSED)

B) A COPY OF THE PRICE BID WITHOUT THE PRICES (UNPRICED PRICE BID)

2) SECOND COVER CONTAINING PRICE BID

3) IF THE PRICE BID IS FOUND TO BE DIFFERENT FROM THE UNPRICED PRICE BID IN ANY WAY, YOUR OFFER WILL BE REJECTED

4) GUARANTEE CERTIFICATE : REQUIRED

5) MANUFACTURER'S TEST CERTIFICATE : REQUIRED

6) ERECTION & COMMISSIONING : REQUIRED

IMPORTANT: TAXES & DUTIES QUOTED BY YOU WILL BE TAKEN FOR COST EVALUATION AND ORDER PLACEMENT AND NO CHANGE WILL BE ENTERTAINED LATER EXCEPT IN THE CASE OF CHANGES MADE BY THE GOVERNMENT. CHANGES IN TAXES AND DUTIES BECAUSE OF THE CHANGES IN TURNOVER ETC ALSO WILL BE TO THE SUPPLIER'S ACCOUNT. IN CASE NO TAX/DUTY IS INCLUDED, A SELF DECLARATION FOR THE EXEMPTION MAY BE ATTACHED ALONG WITH THE OFFER.

AS WE ARE ENGAGED IN R&D ACTIVITY "C" FORM WILL NOT BE ISSUED

PLEASE FILL UP THE ENCLOSED VENDOR REGISTRATION FORM AND SEND IT ALONG WITH YOUR QUOTATION. OTHERWISE YOUR QUOTATION WILL NOT BE CONSIDERED. (IGNORE THIS IF YOU HAVE ALREADY SUBMITTED THIS FORM)

Yours faithfully
for
BHARAT HEAVY ELECTRICALS LTD

KAKKAR PK
Sr Manager
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	PURCHASE SPECIFICATION	Rev. 0
	Integrated Multidisciplinery Design & Analysis Software for compressors and pumps	Dt. 6.10.2008
	Item Code No. ES01_08	Specification No. COECP_ ES01

- **General:**

The following specification covers the software requirement for advanced design and analysis of multistage centrifugal compressors and pumps for process industries, and power plant applications. In such **multistage machines** the flow path elements of the **first stage** consists of an inlet casing flow guide, impeller, diffuser and return channel. The **intermediate stages** consists of inlet eye, impeller, diffuser and return channel and the **last stage** consists of inlet eye, impeller, diffuser and return channel followed by discharge volute.

The software envisaged shall cover the following **segments** of design and performance evaluation of the **above three types of stages**

1) Aero thermodynamic analysis and mean line design with the latest correlations and modelling concept
2) Streamline curvature design and analysis of the 3D flow path
3) 3D model and mesh generation and CFD analysis of the flow passage
4) Pre and Post processors for Stress analysis of the impellers with external FEM software
5) Rotor dynamic analysis of the shaft and rotor systems
6) Integrated design optimization at various levels with embedded multidisciplinary optimization software.

The software should be capable of individual design and aerodynamic analysis of the flow path elements of one, two or multiple stages at a time. The combined multistage analysis should be possible in both 1D and 3D platform. The maximum number of stages shall be **at least ten and three stages** for combined mean line design-analysis and for 3D design respectively. All the above segments of the software should be combined with dynamic linking and seamless data transfer within a single and fully integrated user interface. Provision should be available for automatic grid generation. The grid should be well integrated to the 3D blading and mean line design. Automatic updating of 3D geometry and mesh should be available with Update of the mean line design with CFD results. The software package should have a Built in CFD solver fully integrated with mean line, 3D blading and grid generation, with specific post-processing suitable for compressors and pumps.

The package shall have the following standard identifiable software or modules to meet the above six segments of design and performance evaluation.

a) Mean line design and analysis software for compressors
b) Mean line design and analysis software for pumps
c) 3D design and analysis software for compressors & pumps
d) Computational Fluid Dynamics Software for Compressors & Pumps
e) Pre-and post processor software for FEM analysis
f) Rotor dynamic software
g) Real gas properties module software
h) Comprehensive Multidisciplinary optimisation software
i) Interface software for design & analysis / optimisation

Prepared by	BR Manohar	Approved by	A Dasgupta
Turbomachinery Laboratory		COE for Compressors and Pumps	
Corporate R&D Division, BHEL, Vikasnagar, Hyderabad 500093			

- Technical specifications:

(a) Mean line design and analysis software for compressors

- Meanline code should be capable to predict design and off design performance and also have built in mapping for generating the performance curves & velocity triangles at both impeller inlet & exit. Updating with each iterative parameter change should occur automatically.
- Meanline code should be capable of design and analysis of various components in single and multistage machines for Radial & Mixed flow.
- Meanline design to 3D blading data transfer should be automatic and support direct interface with standard optimization software supplied and embedded by the vendor.
- Meanline code should have a fluid properties module integrated with meanline software for evaluating performance with real fluid properties.(consisting of (a) Real fluid properties data bank for hydrocarbons and refrigerants and their mixtures (b) Dynamic calculation of state point properties)
- Meanline design & analysis software should have direct interface with the existing analysis software at BHEL for calculation of Stresses
- Mean line codes should have option to model Advanced vane less diffuser, low solidity diffuser, cascade diffuser, wedge diffuser, generic, foil & Conical diffuser, IGV modeling, seal models & leakage iteration, advanced return channel
- Interactive & user friendly mode of DATA entry should be made available.
- The software should support two-elements-in-series (TEIS) rotor diffusion modeling or equivalent, two-zone loss modeling or equivalent, disk friction, exit mixing, volutes, inducer choke, stall, thrust, and other fundamental fluid dynamic aspects of compressor performance.
- The software shall display plotting of performance maps with surge margin to facilitate review of performance and comparison of multiple designs or analyses versus test data.
- It should be able to create multiple number of filters, selecting what to display as well as customizing the labels. Blade angles and velocity triangles may be viewed at both the impeller inlet and exit.
- Control of software should be possible to be accomplished from an external program through industry-standard Object Linking and Embedding (OLE) automation. External programs can be written in Visual Basic, C++, FORTRAN, or any other language which supports Microsoft's OLE standard.
- Software shall provide with an initial calculation of mechanical properties of the design in terms of Stress, vibration, and fatigue limit estimates and also provide access to a wide database of customizable material properties.
- The software should be capable of modeling the following stage elements of multi stage m/c's in one form or the other

    - Radial or axial inlet guide vanes
    - Open or closed impellers
    - 2D or 3D impellers
    - Front and rear seals (multiple)

- Diffusers
  - Generic
  - Low solidity vaned
  - vaneless
  - wedge/channel
  - cascade
  - conical
  - 90 degree bends
  - 180 degree bends
- Exit elements
  - collector
  - volute
  - combustor
  - return channel
- Various leakage paths
- Multistage compressors

- Loss models should be available in the software for calculating the following losses such as : Incidence loss model, Deviation loss model, Secondary loss model, profile loss model, End wall loss model, shock loss model, wet loss model, Partial admission loss model, part span shroud loss model. Vendor should confirm that the above loss models are available and list the method for calculating the losses.
- Vendor should specify the post processing options available in the meanline codes.
- Result output should be in three formats : module wise, stage wise & component wise
- Software should be able to predict stall & choke point
- Results output should be in text format & spread sheet format
- Multiple axis mapping option should be available for different speed lines for a range of mass flow rate.
- Once a stage model is designed it should be possible to generate the following from the menu for the next stage of compression:
  - Cloning
  - Scaling (up or down)

b) Mean line design and analysis software for pumps

This software shall have similar features as that of Compressors except that the fluid to be handled is water. The vendor shall indicate the availability of features associated with design of pumps such as cavitation prediction, net positive suction head etc.

c) 3D design and analysis software for compressors & pumps

1. 0 The 3D blade design software should have the following features

- 3D Blading software should be capable of designing 3D models of stage flow path elements like inlets, impellers, inducers, diffusers, crossovers, nozzles, and volutes.
- An integrated quasi-3D flow solver for real-time fluid dynamic loading calculations should be included, as is a separate boundary layer solver.
- Ruled element, with option to have rulings independent from leading and trailing edges
- Bowed or sculpted element, with arbitrary number of mid-span sections
- Flow cuts and radial trims
- NACA 65-series airfoil & wedge diffusers
- Swept leading and trailing edges
- Multiple, offset, and independent splitter blades
- Fillets with constant or variable radius and aspect ratio
- Entire stage and multiple stages in one file
- Design with blade angle **(β)** or wrap angle (θ)
- Loading calculations included
- Throat area checking, solids passing for pumps
- 2D or axial element impellers
- Standard cross sections are included for compressors with DCA, MCA, NACA 65 profiles and arbitrary vane cross sections generated with Bezier curves.
- Smooth 3D blade surfaces generated from NURBS fit of cross sections
- 3D throat area calculation and passage width vs. span plotting.
- 3D Blade design software should **be capable of** having a direct interface with the existing standard 3D model generation software packages like IDEAS, UG-NX,PRO-E.
- The software should have the provision in the menu for switching over the results to CFD analysis & Stress analysis

2. Ruled 3D impeller vane elements with option to have rulings independent from leading and trailing edges
3. Bowed or sculpted elements with arbitrary number of mid-span sections

4. Flow analysis should be carried out with inviscid streamline curvature solver for axisymmetric through flow analysis. Industry standard loss and deviation models for compressors should be available, as is the ability to substitute user-defined loss models and custom through flow solvers.

5. The software should support seamless interface to Fluent and interfaces to pass geometry to Numeca and CFX TurboGrid. Full-featured optimization and robust design capabilities with iSIGHT or similar optimisation package should be provided. Geometry transfer to and from major CAD systems should be supported.

d) Computational Fluid Dynamics Software for Compressors & Pumps

The computational fluid dynamic software should have the following features

- Software shall include fully-integrated through flow analysis, with built-in standard loss and deviation correlations, allowing multistage analysis of both compressors and pumps. Choked components should also be handled. Solution setup and results display shall be completely automated.
- Software should be built-in transonic blade to blade quasi-3D Navier-Stokes CFD analysis. This blade to-blade solver should take into account variable stream tube thickness as well as the 2D blade profiles. The solution setup and results display shall be completely automated.
- CFD software should generate rapid design-level CFD calculations quickly and easily with fully automatic pre-processing.
- Software should have fully automatic mesh generation and post processing capability
- Support splitter and non splitter designs
- Blade-to-blade and hub-to-tip grid clustering
- Bowed blading capability
- Intelligent adaptive default settings: optimal default settings for the CFD solver parameters provided, including grid size, grid stretching factor, turbulent eddy size, CFL, artificial viscosity coefficients, and multigrid parameters.
- Sophisticated advanced batch run queue management shall be available with a number of design or operating condition variations to be queued for later execution.
- Automatic **Turbo machinery**-specific post processing computations shown in a flexible spreadsheet view for easy interpretation and comparison of results, such as pressure ratio and efficiency with focus on compressors and pumps.

e) Pre-and post processor software for FEM analysis

The pre- and post-processor module should provide flexible parametric modeling of radial and mixed-flow compressor and pump impellers. The module should generate complete ready-to-run FEA models. A model mesh shall be built and then material properties, boundary conditions, and loading shall be applied. The model generated should support FEA packages like ANSYS®,SOLID WORKS, NASTRAN and ABAQUS®.

- Mesh generation should be automated with fully structured grid.
- Boundary condition set up should be automatic and software should have direct interface to transfer the boundary condition, aerodynamic loading to the FEA solver. Software should import fluid velocity, pressure, temperature and properties from the integrated software system or CFD results. Combined with user definition of the pressure and fluid temperature on platform and shroud, the program shall compute convection heat transfer coefficients for flow path, platform, and shroud
- Software should provide flexible parametric modeling of Radial blades for all products of compressors, fans, pumps & Turbines. Detailed solid models with high-quality structured meshing, boundary conditions, aerodynamic loading, and probabilistic material models to work with a wide range of centrifugal and mixed flow designs.
- The geometry should include shroud, blade, back face, bore and fillets. Software should provide complete model generation with nodes, elements, materials, loads, and boundary conditions.
- Numerous geometry options should be available for balance rings, counter bore, leading edge, etc. vendor should specify the options available
- Blade fillets should be modeled with a detailed structured mesh. The fillet could be circular or elliptical, with fully varying size. Fillet mesh density should be fully controllable.
- Software should have automatic post processing for Cyclic stress, blade vibration &Disk Vibration.

f) Rotor dynamic software

Rotor dynamics software should have the following features:

- Capability to compute time transient motion by direct mass, stiffness matrix approach
- Same Model May Be Used for Torsional, As Well as Lateral Vibrations
- Multi-Lobe, Tilting Pad, and Pressure Dam Bearings, Including Temperature Effects
- Extensive Table of Lubricant Properties
- Capability for Larger Models With Maximum of 25 Shafts, and 200 Elements With Up to 20 Sub-Elements Each
- Improved Computational Speed
- Advanced Tools Section for Disk Properties, Alford Forces, and Damper Calculations
- Active Magnetic Bearings
- Rotor Response Plots Showing Relative Displacements, Velocity, or Acceleration
- Bearing Forces Transmitted
- Squeeze Film Damper K&C Calculation Under Tools for a Given Eccentricity Ratio With Various Types of Motion and Damper Configurations
- Data Shown in the Output Plots Can Be Exported to an ASCII Output File
- Critical Speed Map should have the Capability to Vary All or Some Stiffnesses and Hold Others Fixed to Analyze Multiple-Shaft Systems
- Enhanced Graphics and Output Capabilities
- User-Friendly Bearing Data Input Menu
- Metric or English Units in the Design Tools (Aerodynamics, Rolling Elements, Disks, Dampers)
- Multi-Plane, Multi-Speed, Least-Squared-Error Rotor Balancing
- Enhanced Help Section and Manual of Command Structure
- Compatibility with the existing Rotor dynamics software at BHEL

CRITICAL SPEED ANALYSIS

- Spline Curve Fitting of Modes
- Bearing and Shaft Strain Energy
- Kinetic Energy Distribution
- Critical Speed Maps With User-Defined Bearing K Plot Superimposed
- Flexibly-Attached Disks

CRITICAL SPEED ANALYSIS

- Spline Curve Fitting of Modes
- Bearing and Shaft Strain Energy
- Kinetic Energy Distribution
- Critical Speed Maps With User-Defined Bearing K Plot Superimposed
- Flexibly-Attached Disks

LATERAL RESPONSE

- Axial Flow Seals
- Open- and Closed-End Squeeze Film Dampers
- Turbochargers With Enhanced Floating Ring Bearings
- Linear or Nonlinear Rolling Element Bearings
- Nonlinear Plain and Squeeze Film Dampers for Synchronous Response
- Shaft Unbalance Response Including Shaft Bow, Radial Unbalance, and Disk Skew Enhanced Plotting Capability for Rotor Response, Bearing Forces Transmitted, and 3-Dimensional Animated Mode Shapes Caused by Unbalance

TIME TRANSIENT ANALYSIS

- Advanced Numerical Integration Method With Choice of Runge-Kutta, Newmark-Beta, and Wilson-Theta
- Variable Rotor Speed for Shutdown and Run-up Analysis
- Evaluation of Orbiting Time-Dependent Forces
- Nonlinear Rolling Element Bearing Module for Analysis of Dead Band Effects and Simulated Rubs
- Nonlinear Analysis of Generalized Magnetic Bearings
- ***Simulation of Loss of Magnetic Bearing During Shutdown***

FLUID FILM BEARINGS

Complete Bearing Calculations for Constraint or Variable Viscosity Conditions for:

- Plain Bearing
- Multi-Lobed Bearing
- Offset Half Bearing
- Tilting-Pad Bearing
- Pressure Dam Bearing
- Squeeze Film Dampers
- Turbulent Flow Axial Seals

TOOLS FOR ROTOR DYNAMIC ANALYSIS

- Alford Aerodynamics
- Wachel Aerodynamics
- Deep-Groove or Angular Contact Ball Bearing
- Self-Aligning Ball Bearing
- Spherical Roller Bearing
- Straight Roller or Tapered Roller Bearing
- Liquid Annular Seal - Dynamic Coefficients
- Squeeze Film Damper Design Tools
- Inertia Properties of Homogeneous Solid
- Effective Bearing Impedance for (Brg+Support) Systems
- Elliptical orbit Analysis
- Balancing Calculation

g) Real gas properties module software

Fluid properties module to be integrated with meanline software and 3 D design/analysis software for evaluating performance with real fluid properties. The module consists of (a) Real fluid properties data bank for hydrocarbons and refrigerants and their mixtures (b) Dynamic calculation of state point properties.

h) Comprehensive Multidisciplinary optimisation software

The integrated design system should be embedded with a comprehensive MDO optimization package for easy optimisation of various parameters at meanline or 3D design phase. The salient features of the optimisation package are given below.

The software should be able to integrate and automate BHEL design process end to end, with in-house codes, CAD and CAE systems.

1. The software should have design drivers for DOE, Optimization, Reliability and Robust design studies, approximation models etc to tackle Multi objective Multi disciplinary optimization problems.

2. The software should support collaborative design environment having a backend RDBMS to store, share and reuse library of components, processes, Results etc between users.

3. The software should be able to decompose the process into multi hierarchical or parallel task and subtask and should be able to run it individually and together.

4. The task should be executed in a runtime working directory to avoid file and data conflicts during parallel execution.

5. The software should have scalable future ready capabilities like direct integration with BHEL system, web based collaborative environment etc.

6. Should be able to run on multiple platform windows, Linux and UNIX on a distributed and parallel environment.

User Interface

- Intuitive Graphical User Interface defines process flow and data Flow separately
- Automatic and manual mapping of parameters and files between tasks
- Customizable ,Drag and Drop, cut paste user interface

Process Integration

- Should be able to demonstrate with the design and analysis software workflows
- Process or components should be able to publish in a database and checked out and reused
- Should demonstrate distributed and parallel execution.
- Logical process control with branching and looping option like *IF, Case, While and for statements.*
- Windows and UNIX shell scrip support.
- Standard output and error stream monitoring while execution.
- Should have inbuilt pause/delay options with conditions like file existence or find a string in a file
- Read and write data from SQL compliant RDBMS.
- Should be able to create own integration component and reuse it.

File parsing

- Read/ Write capability from *fixed* and *dynamic* ASCII files with minimal or no coding
- Data mining using logically controlled branching and looping option like *IF, While, For or Case statements* from ASCII files.
- Data Read/Write using *multi dimensional arrays up 4*
- Bidirectional Parsing for input and output files
- File parsing should be able to saved and reused partially or completely.

Problem Formulation:

- Design variables should be able to define as *Real, Integer, Discrete data sets and strings*.
- Should be able to define units for parameters which eliminate unit conversions.
- Constrains and objectives should have options for prioritization and normalization.

Design Exploration:

- Should have design drivers for DOE, Optimization, Approximation, Reliability and Robust design studies.
- The design drivers should be able to define as main task or subtasks and options to execute individually and completely.
- Tasks should be controlled by more than one design drivers sequentially.
- Should be able to control any design drivers with another design driver (Optimization for optimization)
- Should be able to integrate external design driver algorithms.

Optimization:

Should have all the following techniques

- Gradient based Techniques.
- Exploratory Techniques
- Hybrid techniques such as Pointer automatic optimizer
- Specific algorithms for multi objective optimization and trade off
  - **Design of Experiments (DOE):**
    - Orthogonal Arrays
    - Central Composite Design
    - Latin Hypercube, including Optimal Latin Hypercube
    - Full and Fractional Factorial Design
    - Trade/Parameter Studies
- Should be able to input an existing data File (User-supplied DOE matrix) for DOE studies and post processing.
- Ability to estimate best design, screen design variables & automatically start an optimization
- Should be able to automatically create approximation models while DOE.
- Should be able to integrate custom DOE techniques for a given problem setup.
- DOE runs should be able to run parallel

Approximation:

- Response Surface Modelling (1st – 4th order) -User Selectable terms
- RBF Neural Networks

- Visualization option for Approximation models created.
- Should be able to construct approximation models from user-supplied datasets
- Approximation models should be seamlessly coupled with Optimization, DOE and other drivers like loops and update itself during the run which periodically validates with actual model.
- Approximation model error analysis.
- Approximation model extrapolation.

Reliability and Robust design studies:

- Six Sigma Analysis and Six Sigma based Optimization
- Monte Carlo Simulation
- Stochastic Design Improvement

Post Processing:

- Real-time problem monitoring with customizable graphs and tables
- Correlation study and maps between design variables and responses.
- Options to sort and filter results.
- Retrieve previous run results from database and results grouping
- Retrieve CAD/CAE model of any run and visualize.
- Automated word report generation

Scalability

- Software should have centralized database vault which can share components, process and results across various users in the organization.
- The software should have collaborative web based interface which can execute process in a centralized server and get back and analyse the results.
- The software should be able to handle distributed processing across geographically separated locations over secured internet or intranet.

i) Interface software for design & analysis / optimisation

The software segments mentioned in the sections A to G should have dynamic linking with seamless data transfer capability and the capability should be achieved as either a single package or a cluster of packages with interlinking facility provided by the vendor himself to integrate them.

General conditions:

1. The vendors are requested to interact with the user group before submission of the quotation to make sure that the specifications are understood.
2. One Sample Problem to be solved and results furnished for evaluation of the integrated software as being technically compliant within ten days from the date of opening of technical bid. BHEL reserves the option of rejecting the bid in case the sample problem is not solved within the stipulated time.
3. A demo package with the solved sample problems should be made available within a week from the date of opening of technical bid for 2 weeks in BHEL so as to evaluate the same.
4. Methods of validation of results from the offered software to be spelt out in the technical bid.
5. The packages should be warranteed and supported for a period of at least one year. During this period, the updates and support services for all the modules shall be provided by the vendor free of cost.
6. The amount of annual maintenance charges payable after the first year, for subsequent 5 years should be spelt out clearly and they would be binding during the tenure by an agreement.
7. The software shall be used on Local Area Network (LAN) and the license should be single user floating type. **The users shall also be able to use the modules independently**. Vendors to confirm the same in the technical bid.
8. Microsoft windows environment shall be used for the operating system. However vendor has to specify the OS requirements and the hardware configuration in the technical bid.
9. The hardware configuration shall be provided at the time of placement of order and the vendor is responsible for the installation and commissioning of the software in the hardware platform.
10. Multicore capability for enhanced process speed of the solver should be quoted separately as an option if applicable.
11. Vendors shall offer their quotation for the scope detailed above(A to H in Page 1). However BHEL reserves the option of placing the order, for either the entire scope or part there of. Hence vendors are advised to offer quotation segment wise
12. The vendors are required to submit the quotation in two parts- Part A : Technical bid and Part-B: price Bid. Unpriced price bid to be enclosed to the technical bid.
13. Vendors to establish the credibility of the integrated software in terms of user list. BHEL reserves the option to accept or reject the bid if the software is not used by reputed manufacturers of turbomachinery.
14. Vendors to provide a technical compliance statement along with the technical bid.
15. Free training to working engineers for duration of 3 days.
16. Software deliverable include host of User documentation and host of tutorials.

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RD:MPX:F-20 **General Terms and Conditions of Enquiry & Contract for the Purchase of Goods/ Services**

1. The quotation and any order resulting from this enquiry shall be governed by these General Terms and Conditions of enquiry and contract for the supply of goods and the supplier quoting against this enquiry shall, unless specifically stipulates any different terms or conditions, be deemed to have read and agreed to the same.
2. Sealed quotations in double cover with tenderer's distinctive seal, superscribing enquiry number, date and due date are to be submitted so as to reach on or before due date & time, addressed to **Additional General Manager(MM) and Head, Bharat Heavy Electricals Limited, Corporate Research & Development Division, Vikasnagar, Hyderabad, Andhra Pradesh, India – PIN–500 093, India.**
   In the case of **Two-part bid**, each inner cover shall clearly be labeled as a) **Technical & Commercial Bid** containing technical data/ drawings/ catalogues/ quality plans along with commercial terms and conditions & copy of the price bid with the price columns left blank (unpriced price bid), b) **Price bid** containing prices quotes. Installation and/or Commissioning charges shall be spelt out in absolutely lucid terms, taking into account total charges, rather than quoting vaguely, such as charges per man-day or charges per engineer per day etc. **If the price bid was found later to be different from the unpriced price bid in any way, the offer will be rejected summarily.**
3. **Tender/ Technical bid Opening**: Unless specified otherwise, tenders/ technical bids will be opened on appointed date and time as mentioned in the enquiry or as communicated changed date/time, if any, in the presence of such of those tenderers who may be present.
4. **Delayed/ Late Tender**: Tenders, which have been posted by registered post through the postal department in time before opening date but received after tender opening, shall be treated as regular tenders. Other tenders received after tender opening time shall be treated as late tenders and normally they may be rejected.
5. The Quotation should be free from overwriting and erasures. Corrections and additions, if any, must be attested. Supplier should indicate in the quotation dimensions (Size), weight, rate etc., in the metric system unless the enquiry calls for different unit.
6. **Validity of Quotation**: All quotations shall be kept open for acceptance for a period of ninety days from the date of opening of Tenders/ Technical bid and this shall be deemed to be an express condition of all quotations. The rate shall be quoted in both figures and in words.
7. In the case of Two-part bid, the vendor should furnish technical clarifications, if any, within stipulated time mentioned, failing which, it will be construed that the vendor is not interested in the tender and BHEL shall not consider the offer for further evaluation.
8. **Revision of Pricebid**: In the event of any bidder, after finalizing the technical specifications and scope of supply, opting to revise and submit their latest price bid, then BHEL reserves the right to open their original / previous price bid also while evaluating revised bid.
9. **Pricebid Opening**: Unless specified otherwise in the enquiry, the Price bids of technically qualified vendors shall be opened with prior intimation in the presence of such of those tenderers who may be present.
10. **Conformity to Specifications**: The material should be of the best quality and shall be conforming to our specification given in our enquiry. Unless otherwise agreed upon by BHEL, no payment shall be due by BHEL in respect of any sample. Offers without details of specifications/ applicable catalogues will not be considered and are liable to be rejected.
11. **Terms of Delivery**: All suppliers shall quote the lowest prices on ex-works and FOB/FCA basis. Foreign suppliers will also indicate their Indian agent's name and address with percentage of agency commission out of the quoted price, if any. Name and Address of the supplier's Bankers address should also be given. Indian suppliers for the indigenously manufactured/ imported stock shall quote on Ex-works /Free-on-Rail/Road /FOR-destination basis, indicating packing & forwarding charges, if any, separately.
12. **Taxes and Duties**: Unless specified otherwise in the enquiry, BHEL do not provide "C" or "D" Form as it is engaged in R&D. All Indian suppliers shall clearly mention current Sales Tax/ VAT, Excise Duty, and Service Tax etc, if any, payable in addition to the quoted price and indicate applicable rates/ percentage, item-wise clearly. It will be paid only if Registration Number under State(TIN)/ Central Sales Tax or Service Tax is specifically mentioned in the Bill/Invoice. Vendors without a Sales Tax/VAT registration and applicable Service Tax registration will not be considered.
13. **Insurance:** Insurance will be arranged by BHEL in case of Ex-Works as well as FOB basis supplies.
14. **Terms of Payment:** Full payment will be made within 30 days after receipt, inspection and acceptance of the material (and where involved, Erection and commissioning of the material/ equipment at BHEL/Destination) though Electronic Fund transfer (RTGS/NEFT/SEFT) with bank charges to the supplier's account. For foreign suppliers, the preferred payment term will be on Sight Draft basis and bank charges inside India will be to BHEL account and outside India will be to supplier's account.
15. Suppliers shall quote competitive price and best delivery for all the items mentioned in the enquiry. BHEL reserves the right to reject partial quotations and to place order on overall landed cost basis. Correct date of effecting supplies in the event of an order should be indicated in the offer. If the supplier's quoted terms are different from BHEL standard payment terms (Refer #14 above), interest @11% per annum (or as indicated in the enquiry) will be loaded to the quoted prices for difference of payment period.
16. **Packing**: The supplier shall be responsible for the goods being properly and adequately packed so as to prevent any loss, damage or deterioration during transit and indicate packing charges, if any, separately.
17. **Part/ Split Ordering**: BHEL reserves right to Order part of the item/ quantity of the enquiry and split the order among qualified vendors.
18. In case the goods enquired are on Rate Contract basis with any other unit of BHEL, such fact should be clearly indicated in the quotation giving full particulars of Rate Contract number, validity and price and also your willingness to comply with order if placed against such Rate Contract. A true copy of Rate contract signed by the supplier should be sent with the quotation.
19. **Inspection**: On receipt, the goods shall be subjected to inspection and also test, if necessary, and our decision regarding the acceptability of the goods shall be final and binding on the suppliers.
20. **Penalty for late delivery**: The time stipulated for delivery of goods shall be deemed to be the essence of the contract and delivery must be completed within the stipulated date/s. In the event of supplier's failure to supply the goods by the stipulated date/s , a penalty of ½% per week for the delayed no of weeks or part thereof for the undelivered portion of PO subject to a maximum of 10% of total order value shall be levied at the discretion of BHEL.
21. **Withdrawal from the Contract:** In case the supplier withdraws the quotation after its acceptance by BHEL or fails to supply the goods as per the terms and conditions of contract, or at any time repudiated the contract wholly or in part, BHEL shall be at liberty to cancel the Purchase Order and to recover from the supplier the extra cost and other loss, incidentals due to the breach of contract on the part of the supplier through risk purchase.
22. **Guarantee/ Warranty certificate and Manufacturer's Test report**: Invariably in all cases where it is so stipulated, the supplier should furnish Guarantee/ Warranty certificate valid for a period of 18 months from date of supply or 1 year from the date of receipt, acceptance and commissioning(or more, if provide by oem) whichever earlier and manufacturer's Test report along with the goods, failing which, BHEL shall have the right to reject the goods.
23. All ferrous/ non-ferrous items shall be colour coded as per bureau of Indian standards/ or IS standards/ BHEL Standards.
24. **Recovery of Dues**: BHEL shall recover any amount due from the supplier or any amount outstanding to the credit of the supplier with BHEL R&D unit or any other BHEL unit(s) and/or by legal action.
25. **Arbitration & Forum for Legal Proceedings**: All disputes arising in connection with indigenous/ foreign supplies shall be settled through arbitration held at Hyderabad, AP, India and arbitration shall be appointed by Arbitration Tribunal of the Federation of Andhra Pradesh Chambers of Commerce and Industry, Hyderabad, AP, India. The Courts at Secunderabad/ Hyderabad, AP, India shall have jurisdiction in respect of any suit or other legal proceeding arising from or relating to this contract

The rights and remedies of BHEL stated in these General terms and conditions shall be in addition and supplemental to its rights and remedies under law and custom or usage of trade or business and shall in no way be deemed to limit, curtail, supercede or derogate from its said rights and remedies.

RD:MPX:F-18

BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE R&D Division
Vikasnagar, Hyderabad, Andhra Pradesh, India – 500093.,

IMPORTED

Suppliers' compliance statement to basic conditions of enquiry (to be submitted along with Technical & Commercial bid)

Enquiry number: **Enquiry dt:**

(In case Order to be placed on the Principal and foreign currency)

Condition	BHEL R& D's terms	Supplier's compliance (indicate Yes/No. if 'No', state terms desired)
1. Validity of offer	90 days from the tender opening date (or as per enquiry)	
2. Delivery requirements	FCA – Nearest International Airport (or as indicated in the enquiry)	
3. Warranty	Unless specifically mentioned in the enquiry, all supplied items to be provided with warrantee for one year (or more, if provided by the OEM) from the date of acceptance/ commissioning. In case of equipment involving erection and commissioning, warrantee shall be for 18 months from the date of dispatch or 12 months from the date of commissioning, whichever is earlier	
4. Terms of payment	Sight draft. All bank charges inside India will be to BHEL R&D account and outside India will be to the supplier's account. Documents through State Bank of India, Trade Finance Central processing Cell (TFCPC), Opp. Anand Theatre, Secunderabad, Andhra Pradesh, India-500003. SWIFT Code: SBININBB602, Phone: 91-40-27816795, FAX: 91-40-27720459	
5. Agency commission	Pl specify Indian agency commission charges, if any, in percentage of quotation. The same shall be paid to the agency in Indian Currency only.	
6. Erection/ Commission	As per enquiry	
7. Documentation	As per enquiry	
8. Insurance	BHEL will arrange Insurance based on intimation to our Insurance agency. Address of the agency will be mentioned in the Purchase Order.	
9. Penalty for late delivery	0.5% per week beyond the delivery date on undelivered portion subject to a maximum of 10% of the total order value.	

* BHEL R&D reserves the right to reject any offer due to non-compliance with the above conditions and/or non-receipt of this form in duly filled condition
* Any other elements of cost in addition to the above may please be specified in detail

(Signature and Stamp/ Seal of Vendor)

RD:MPX:F-17

BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE R&D Division
Vikasnagar, Hyderabad – 500093, India.

Suppliers' compliance statement to basic conditions of enquiry (to be submitted along with Technical & Commercial bid)

Enquiry number:: **Enquiry date::**

(In case Order to be placed on Indian supplier in Indian currency)

Condition	BHEL R& D's terms	Supplier's compliance (indicate Yes/No. if 'No', state terms desired)
1) Validity of offer	Unless specifically mentioned in the enquiry, 90 days from the tender opening date	
2) Delivery requirements	Free delivery at our stores or FOR destination (or as indicated in the enquiry)	
3)Warranty	Unless specifically mentioned in the enquiry, all supplied items to be provided with warrantee for one year (or more, if provided by the OEM) from the date of acceptance/commissioning. In case of equipment involving erection and commissioning, warrantee shall be for 18 months from the date of despatch or 12 months from the date of commissioning, whichever is earlier	
4) Terms of payment	Unless specifically mentioned, full payment will be made within thirty days after receipt, inspection and acceptance of the material at BHEL R&D (and where involved, erection and commissioning of the material/equipment at BHEL/destination), by EFT/RTGS with bank charges, if any, to supplier's account.	
5) Taxes & Duties	Unless specifically mentioned in the enquiry, we do not provide 'C' or 'D' form. Supplier to specify rates of taxes and duties element wise and related percentages. Terms like "inclusive" or "extra" are not acceptable. Please mention "NIL" if taxes/ duties are exempted/ not applicable.	
6) Penalty for late delivery	0.5% per week beyond the delivery date on undelivered portion subject to a maximum of 10% of the total order value	

* BHEL R&D reserves the right to reject any offer due to non-compliance with the above conditions and/or non-receipt of this form in duly filled condition
* Any other elements of cost in addition to the above may please be specified in detail

(Signature and Stamp/Seal of Vendor)

RD:DP:MPX:F-14

BHARAT HEAVY ELECTRICALS LTD.
Corp. R&D DIVISION
VIKAS NAGAR,
HYDERABAD- 500 093 (INDIA)

SUPPLIER REGISTRATION FORM

(FOREIGN SUPPLIER)

ALL COLUMNS SHOULD BE PROPERLY FILLED IN THE SPACE PROVIDED FOR. WHEREVER IT IS NOT APPLICABLE PLEASE WRITE "NOT APPLICABLE". INCOMPLETE OR INCORRECT FORMS MAY NOT BE CONSIDERED.

1.0 GENERAL INFORMATION:

1.1 ….NAME OF COMPANY

1.2 ….DETAILS OF HEAD OFFICE:

ADDRESS :
TELEPHONE :
FAX :
.EMAIL :
.WEB SITE :

1.3 ….DETAILS OF FACTORY/WORKS:

ADDRESS :
TELEPHONE :
FAX :
.EMAIL :
.WEB SITE :

1.4 ….DETAILS OF MARKETING AGENT

ADDRESS :
TELEPHONE :
.FAX :
.EMAIL :
.WEB SITE :

1.5 CHIEF EXECUTIVE

1.6 CONTACT PERSON(S)
FOR PRODUCT OFFERED
NAME(S)
OFFICIAL CPACITY
ADDRESS:
TELEPHONE
FAX
E-MAIL

1.7 YEAR OF ESTABLISHMENT

1.8 PRODUCTION CAPACITY PER ANNUM

1.9 PARTICULARS OF PRODUCT INCLUDING
SPECIFICATION AND RANGE OFFERED
FOR REGISTRTION
(ATTACH BROUCHERS AND CATALOGUE)

1.10 NAME(S) OF BANKERS

1.11 BANKER'S CERTIFICATE

1.12 PORT OF LOADING

1.13 NEAREST AIRPORT

1.14 NAME OF THE INDIAN AGENT, IF ANY
WITH AUTHORISATION LETTER

2.0 FINANCIAL INFORMATION

2.1 …TOTAL CAPACITY

2.2 …ANNUAL TURN OVER FOR LAST 3 YEARS

2.3 …WHEHER CREDIT LICENSE ACCEPTABLE YES/NO

3.0 QUALITY MANAGEMENT SYSTEMS
ENCLOSED FORMAT PART-B

3.1 EXPERIENCE LIST FOR SAME/SIMILAR ITEMS
TO BE ENCLOSED

4.0 …..**FUTURE EXPANSION PLANS:**
(GIVE DETAILS)

5.0 LIST OF ENCLOSURES:
INCLUDING BROUCHERS, CATALOGUES, TECHNICAL
LITERATURE ETC.

6.0 ANY OTHER INFORMATION

SIGNATURE OF SUPPIER (AUTHORIZED SIGNATORY)

NAME
DESIGNATION
DATE
…….OFFICIAL SEAL

Note: Please attach separate sheets, if space found is inadequate

BHARAT HEAVY ELECTRICALS LTD.
Corp. R&D DIVISION
VIKAS NAGAR,
RD:DP:MPX:F-13 **HYDERABAD- 500 093 (INDIA)**
Ph: 040 – 23778474, Fax: 040 – 23770698, email: mpx@bhelrnd.co.in

VENDOR REGISTRATION FORM

(Indigenous supplier)

[FORM TO BE SUBMITTED* BY THE BIDDER ALONG WITH TECHNICAL-BID]

Before filling, please refer to instructions on page-4

1.0 VENDOR PROFILE:

1.1 Name and address of the vendor:

_____

_____

_____

Phone Nos.:
Fax No.:
Email: 1. 2.

1.2 Local representative name & address in Hyderabad/ Secunderabad:

_____

_____

_____

_____

Phone Nos.:
Fax No.:
Email:
Contact person:
Mobile No.:

2.0. TYPE OF ORGANIZATION:

PROPRIETORSHIP	COMPANY	SISTER CONCERN (mention vendor registration number of main organization)	
PARTNERSHIP	CORPORATION	Small Scale Industry	ANY OTHER (Please specify)

In case of SSI unit, copy of registration to be enclosed.

3.0 ANNUAL TURN OVER:

#	Year	Turn-Over
1	Current Year(budgeted)	
2	Previous year (200 - 0)	
3	Prior Year (200 - 0)	

4.0 NAME AND ADDRESS OF THE BANKER:

1. Bank Name
2. Branch name
3. Account number
4. Account Type
5. MICR Code:
6. IFSC Code(RTGS/NEFT):
7. Bank Phone number(s),

Blank cheque, duly cancelled, to be enclosed.

Please note that all payments shall be made through Electronic clearance services to your above account against the orders executed, if any.

5.0 REGISTRATION PARTICULARS (relevant copies to be enclosed)

5.1 IT Permanent Account No.(PAN):
5.2 State sales tax/VAT Registration No.:
5.3 Central Sales Tax Registration No.
5.4 ED Registration No.
5.5 Service Tax Registration No.:
5.6 PF Account No.:
5.7 Labour Licence No.:
5.8 **ESI Account No.:**

6.0 CONTACT PERSON: S/Sri

Designation::: Phone/ Mobile No. :

7.0 TOTAL NUMBER OF EMPLOYEES:

Graduates (Engr./Scientists/ Mgmt/Fin.)	Consultants	Workers		
		Sup./Skilled	Semiskilled	Unskilled

8.0 WISH TO REGISTER FOR SUPPLIES/SERVICES:

#	**Service/Supplies**	**Capacity**
1		
2		
3		
4		
5		
6		
7		

9.0 REFERENCE LIST :

(Only recognized public and private sector companies, attach if printed copy available)

#	Customer	Volume / Year
1		
2		
3		
4		
5		
6		
7		

10.0 INFRASTRUCTURE / FACILITIES:

#	Facility (with specifications)	Age/ Year procured
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

11.0 REGISTRATION WITH OTHER BHEL UNIT/UNITS:

#	Unit	Registration No.	Year
1			
2			
3			
4			

12.0 ANY OTHER INFORMATION :

DECLARATION:

The information furnished above is true and authentic.

(CEO / PROPRIETOR)

SEAL:

DATE:

The competent authority reserves the right to accept or reject the registration. Registered vendors will be informed by mail / email, as convenient. Contact AGM (MM) for clarification/ additional information on registration.

A separate communication will be sent to you in case of non-registration, citing reasons thereof.

Instructions

1. Answer all items; use NA for items not applicable.
2. BHEL units do not require this registration.
3. Use additional sheets for want of space if required.
4. Attach copies of latest document s in respect of items 5.0 (Registration no.s)
5. Photographs of registered office and the chief executive/proprietor shall be furnished.
6. Use A4 sheets for this document and the enclosures.

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* REGISTERED BIDDERS, HAVING BHEL (R&D) REGISTRATION NO. OR HAVE SUBMITTED THIS FORMAT FOR REGISTRATION, NEED NOT FURNISH THIS INFORMATION AGAIN