

REQUEST FOR QUOTATION



BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER:
KMVM900153

RFQ DATE :
12.DEC.2008

Due Date
21.JAN.2009
Time: 13:00 HRS

VENUE :
NEW ENGG. BLDG

MMI:PU:RF:003

(for all correspondence)
Purchase Executive : VEERACHARI KM
Phone : 080-26998663
Fax : 00918026740138
E-mail: veerachari@bheledn.co.in

Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no.and due date, should reach us on or before the due date by **13.00** hours IST and will be opened on the same day

1. TENDER / OFFER SHALL BE SUBMITTED IN TWO PARTS.
2. QUOTATIONS MAY BE SUBMITTED BY OEM OR THEIR AUTHORISED DEALERS.
3. VENDOR IS EXPECTED TO HAVE ESTABLISHED SALES,SERVICE AND SUPPORT NETWORK PREFERABLY, IN INDIA. A LIST OF THE SAME NEEDS TO BE ENCLOSED WITH THE OFFER.
4. A LIST OF REFERENCES INCLUDING CUTSTOMER#S DETAILS LIKE CONTACT, MACHINES INSTALLED, DATE OF INSTALLATION IN INDIA AND ABROAD SHALL BE SUBMITTED THAT ESTABLISHES THE SATISFACTORY PERFORMANCE OF SUPPLIER#S EQUIPMENT FOR AT LEAST THREE YEARS.
5. VENDOR IS ADVISED TO GO THROUGH THE GENERAL TERMS AND CONDITIONS DOCUMENT CPD-00 ENCLOSED WITH RFQ.
6. BHEL RESERVES THE RIGHT TO RESORT TO REVERSE AUCTION BEFORE THE PRICE BID OPENING.
7. VENDOR HAS TO CONFORM TO ALL THE CLAUSES LISTED IN THE TECHNO-COMMERCIAL TERMS (ANNEXURE-B OF DOCUMENT CPD-00). DEVIATIONS, IF ANY, TO BE HIGHLIGHTED AND BROUGHT OUT CLEARLY.
8. VENDOR HAS TO CONFORM TO ALL THE CLAUSES IN THE PURCHASE SPECIFICATIONS.
9. DELIVERY REQUIRED: WITHIN 12 WEEKS FROM THE DATE OF PURCHASE ORDER.
10. TERMS OF PAYMENT: 90% WITHIN 30 DAYS AND 10% AGAINST SUBMISSION OF PBG.

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	CU9095003788 Multi Disciplinary system simulation SW Multi Disciplinary system simulation software as per PS-445-092	1	NO	1	01.APR.2009

Total Number of Items - 1

Please note that the tender will be opened in the presence of the bidders or his authorised representatives (maximum two per organisation) who choose to be present with authorisation letters. Refer annexure for the terms and conditions.


Preference will be given to vendors who accepts our standard payment terms i.e.100% payment - 30 days after receipt of material at our works subject to acceptance.

Please specify Terms of delivery, Excise duty, sales tax, Ex-BHEL, Ex-works surcharge, Insurance,P&F, Freight and other taxes very clearly .

- i). This is only RFQ not an order.
- ii). In all correspondence quote RFQ No. & due date.
- iii). In Quotation BHEL material code / RFQ Sl. No. should be mentioned clearly.
- iv). Quotation Envelope / Fax not superscribed with RFQ No.and due date is liable for rejection.
- v). Quotation should remain valid for a minimum peiod of 90 days from due date.
- vi). In case of non-receipt of Quotation or regret letter for 3 consecutive RFQs you are liable to be removed from our vendors list.

For and On behalf of BHEL.

REQUEST FOR QUOTATION

	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: KMVM900153 RFQ DATE : 12.DEC.2008	Due Date 21.JAN.2009 Time: 13:00 HRS VENUE : NEW ENGG. BLDG		
MMI:PU:RF:003		(for all correspondence) Purchase Executive : VEERACHARI KM Phone : 080-26998663 Fax : 00918026740138 E-mail: veerachari@bheledn.co.in			
Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. The quotation must be enclosed in a sealed envelope / Fax superscribed with RFQ no.and due date, should reach us on or before the due date by 13.00 hours IST and will be opened on the same day					
Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
vii). All Prices should be written in words and numbers.					
viii). Excise Chapter Heading should be mentioned for all items where VAT is applicable .					
Vendors list to whom RFQ has been sent:					
1. BHEL, Electronics Division (X563699) - 6400007317					

For and On behalf of BHEL.



A4 – 10

**PURCHASE SPECIFICATION
FOR
MULTI DISCIPLINARY SYSTEM
SIMULATION SOFTWARE**

P.S NO. : PS/445/092

REV. NO : 00

PAGE 01 OF 11

1.0 Introduction:

BHEL Electronics Division proposes to procure Multi Disciplinary System Simulation Software for the simulation of Power Electronic Systems comprising of Traction Drives and Electrical Machines.

2.0 Scope:

The scope of the specification covers supply, installation, testing, commissioning & training of the Multi Disciplinary System Simulation Software for COE as per the following specifications.

2.1 Circuit Simulation package (Electro-mechanical Simulation & Analysis) for schematic capture of any power electronic system. The package shall be coupled to Electromagnetic and Thermal Analysis package.

2.2. 3Dimensional/2Dimensional Electromagnetic Simulation and Analysis Software Electromagnetic package to analyse electrical machines, transformers and reactors. Thermal Analysis package shall accept 3D drawings of components/sub systems like heatsinks (water cooled or air cooled or heat pipe heatsink). This package should be integrated with the circuit simulation package such that the heat dissipated in the power semiconductor devices is transferred to the thermal analysis package automatically so that the hot spots and temperatures in 3D is indicated by the thermal analysis package of the component/sub systems.

2.3 Software for 3D/2D parasitic Extraction & Electromagnetic circuit generation. This package should also be able to extract resistance, Inductance and capacitance of 3D model of sub systems using different materials (like Copper/Aluminium busbar, Al Heatsink, laminated busbars for IGBTs etc.). This package shall be integrated with the circuit simulation package such that the extracted RLC parameters are incorporated within the circuit and simulation is carried out iteratively to achieve the desired results.

3.0 Pre Qualification Criteria:

3.1 The vendor shall be an Original Equipment Manufacturer(OEM). Only the OEM or their authorized dealers in India along with an authorization letter can submit offers. An authorized Representative/Dealer in India, cannot quote for the same equipment from more than one OEM. Authorization letter must be submitted along with the technical offer.

3.2 Foreign OEM shall have Authorized Indian dealer(s) / representative(s) for after- sales service and support. The authorization letter for the dealer/ representative shall be provided from OEM. This letter must be part of technical offer.

3.3 The tenderer must have supplied similar systems either in India or anywhere in the world during the last 5 years.
The tenderer has to submit:

REVISIONS 00 DT: 19.11.2008

APPROVED BY:


V.VENKATESH /DGM

PREPARED BY:


K. VENKATESHALU/DY.MGR


ISSUED BY

TRACTION


DATE


19.11.2008


COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.
It must not be used directly or indirectly in anyway detrimental to the interest of the company.


		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 02 OF 11
<p style="text-align: center;">COPYRIGHT AND CONFIDENTIAL</p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</p>		(a) Year of Supply (b) User /Customer contact details		
		<p>3.4 The vendor shall submit detailed technical literature /data sheet /Write-up of the proposed system.</p> <p>3.5 The vendors are requested to interact with the user group before submission of the quotation to make sure that the specifications are understood.</p> <p>3.6 BHEL will provide a sample 3D model for Simulation. The proposed software shall be capable (but not limited to) to simulate and this simulated results will be used as one of the benchmark to qualify the proposed system. The vendor may download the documents from the web site and interested vendor shall request in writing, alongwith prequalification documents specified in clauses 3.1 to 3.3 above, to BHEL for the softcopy of the 3D Model.</p> <p>Vendor is required to simulate these circuits and submit the simulated results along with the offer for technical evaluation/capability of the proposed offer. BHEL reserves the option of rejecting the bid in case the sample circuit simulation is not furnished.</p> <p>3.7 A demo package, free of cost, with the solved sample problems, should be made available after opening of the technical bid for a period of two weeks in BHEL for evaluation. The Technical support shall be provided by the vendor during this evaluation period.</p> <p>3.8 Methods of validation of results from the offered software to be spelt out in the technical bid. Vendor can submit benchmarking or publication of results in any international/national journals and conferences as methods of validation.</p> <p>3.9 The vendors are required to submit the offer in two parts - Part A- Techno Commercial (or technical) bid and Part B: Price bid. Unpriced price bid to be enclosed in the technical bid.</p> <p>3.10 The items covered under all the clauses in this specification, except clause no.4.3.6 & 10.0, are mandatory. The items covered under clause no 4.3.6 & 10.0 are optional. Vendors shall submit their quotation for the scope detailed (both for mandatory and optional items) in this specification. However BHEL reserves the option of placing the order, for either the entire scope or part thereof. Hence vendors are required to offer quotation segment wise (for segment wise items, refer clause no 5.0). For arriving at final price and comparison of price bid, only the prices of mandatory items will be considered. Ordering of Optional items will be at BHEL's discretion</p> <p>3.11 Vendors are required to provide a clause wise technical compliance statement along with the technical bid. Technical compliance shall be supported by technical data sheets, technical write-ups, proposed system configuration writeup.</p> <p>3.12 The vendor or their authorized service representatives shall have trained engineers in India for commissioning & service for the offered package and shall be in a position to provide prompt after sales service and technical support for installations. The vendor shall furnish, along with the offer, the details of no. of trained engineers present in</p>		


		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 03 OF 11
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		<p>India, inventory levels to support for spares.</p> <p>3.13 If required by BHEL, the vendor shall arrange for a demonstration of the similar systems operating in India OR a certificate from customer for satisfactory performance may be submitted.</p> <p>3.14 The proposal shall be for complete system with total integration responsibility. In the event, any vendor proposing third party software, then it is the vendor's responsibility to ensure the total integration of such third party software with his system and demonstrate the total functionality. Vendor shall also submit list of such third party software along with the offer. An undertaking is required to be submitted by the vendor stating that vendor will take the responsibility of ensuring the integration of total system due to any future upgradations/changes in the third party software.</p> <p>NOTE: 1. The Pre qualification criteria, as specified in clause 3, are <u>mandatory requirements</u> and the <u>technical bids will be evaluated only when the Pre Qualification criteria are met.</u> 2. Pre qualification will be carried out based on the details furnished by the vendor / feedback from their customers / inspection of the company / product if required by BHEL and at its sole discretion.</p> <p>4.0 Functional Requirement:</p> <p>4.1 2 and 3-Dimensional Electromagnetic Simulation and Analysis Software</p> <p>4.1.1 Features</p> <p>4.1.1.1 The software should operate with user friendly interface designed for easy navigation, project setup and management.</p> <p>4.1.1.2 Should have an ability to do schematic capture of different electromechanical designs</p> <p>4.1.1.3 Should incorporate meshing using tetrahedral meshing or fast meshing algorithms.</p> <p>4.1.1.4 Fault -tolerant meshing algorithms, mesh-generation feedback and mesh-based model resolution</p> <p>4.1.1.5 Should be able to solve for both 3D and 2D arbitrary models.</p> <p>4.1.1.6 Use generalized solution convergence criteria</p> <p>4.1.1.7 Utilize model healing and more robust meshing</p> <p>4.1.1.8 Must have the capability to provide integrated parametrics, sensitivities and optimization functions or integrate with other tools to provide the same functionality.</p> <p>4.1.1.9 Should have the ability to capture and analyze the following properties of the design under analysis</p> <ol style="list-style-type: none"> 2D DC Conduction Paths 2D AC Conduction Paths 2D Static Thermal Properties 2D/3D Thermal Properties 2D/3D AC & DC Magnetostatic Properties 2D/3D Electric Fields 2D/3D Transient Currents 2D/3D Eddy Currents <p>4.1.1.10 Should be able to provide the following kinds of statistical and electromagnetic analysis either standalone or in conjunction with other tools:</p> <ol style="list-style-type: none"> 2D Parametric Analysis 2D/3D Thermal stress analysis Parametric, sensitivity and Optimization analysis 		


		 <p>A4 – 11</p>	<p align="center">PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE</p>	<p>P.S NO. : PS/445/092</p> <p>REV. NO : 00</p> <p>PAGE 04 OF 11</p>
<p align="center">COPYRIGHT AND CONFIDENTIAL</p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</p>		<p>4.1.1.11 Should be able to provide outputs to and take inputs, in industry standard formats, from other tools which do</p> <ol style="list-style-type: none"> 1. Electromechanical simulation 2. Thermal simulation 3. 2D/3D FEA/FEM design and analysis tools 4. Circuit analysis . Supplier should indicate clearly in the offer linkage to simulation software in the present version or next released version. 5. Software shall help to determine the 2D/3D equivalent circuits of the design under analysis <p>4.1.2 The tool should have the following features</p> <p>4.1.2.1 Low frequency electromagnetic field simulation and analysis for 3D/2D structures</p> <p>4.1.2.2 Ability to do transient - nonlinear analysis with: Motion—rotation, translational, non-cylindrical rotation</p> <p>4.1.2.3 Provide External circuit coupling</p> <p>4.1.2.4 Permanent magnet demagnetization analysis</p> <p>4.1.2.5 Computation of core losses using electrical and magnetic parameters</p> <p>4.1.2.6 Ability to do lamination modeling for 3D structures</p> <p>4.1.2.7 Provide AC electromagnetic analysis of structures influenced by skin / proximity effects, eddy / displacement currents</p> <p>4.1.2.8 Provide magneto static non-linear analysis with automated equivalent circuit model generation</p> <p>4.1.2.9 If possible the software Provide electric field transient, electrostatic / current flow analysis with automated equivalent circuit model generation</p> <p>4.1.2.10 Provide viewer for display of data / visualization of simulation results of</p> <ol style="list-style-type: none"> 1. Field visualization and animations (shaded, contour and vector plots) 2. Mesh visualization (full, partial) 3. Current, induced voltage, flux linkage 4. Power loss, stored energy 5. Core loss, eddy, excess, hysteresis loss (including the minor loop effects) 6. Impedance, inductance, capacitance 7. Force, torque 8. Custom reports of user-defined solution data <p>4.1.3 Drawing Capabilities in the solid modeler</p> <p>4.1.3.1 Dynamic geometry rotation</p> <p>4.1.3.2 Point-and-click object selection/shading</p> <p>4.1.3.3 Macro recording and scripting.</p> <p>4.1.3.4 Parameterized macros</p> <p>4.1.3.5 True surface geometry, if feasible.</p> <p>4.1.3.6 Context-sensitive help</p> <p>4.1.3.7 IGES, SAT, SLD and STEP file format import</p> <p>4.1.4 Material Library</p> <p>4.1.4.1 Should contain commonly used materials</p> <p>4.1.4.2 Customization for library materials</p> <p>4.1.4.3 Contain Linear and nonlinear material</p> <p>4.1.4.4 Modeling capability for nonreciprocal devices, if feasible.</p> <p>4.1.4.5 Parameters for materials to include permittivity, permeability, electric and loss tangents</p>		


		 <p>A4 – 11</p>	<p align="center">PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE</p>	<p>P.S NO. : PS/445/092</p> <p>REV. NO : 00</p> <p>PAGE 05 OF 11</p>
<p align="center">COPYRIGHT AND CONFIDENTIAL</p> <p align="center">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</p>		<p>4.1.4.6 Material types should include homogenous, inhomogenous, anisotropic, non-isotropic, conductive, resistive and semiconductor based</p> <p>4.1.5 Mesh Generation</p> <p>4.1.5.1 Accurate, fast and a utomatic mesh generation with manual meshing to increase the accuracy.</p> <p>4.1.5.2 Materials sensitive refinement and singularity order pickup , if feasible.</p> <p>4.1.5.3 Skin-depth seeding capability</p> <p>4.1.5.4 Tetrahedrons refinement</p> <p>4.1.5.5 Fault tolerant meshing, if feasible.</p> <p>4.1.5.6 Manual meshing capability and if possible Adaptive meshing.</p> <p>4.1.5.7 Solve structures with irregular or curved Surfaces.</p> <p>4.1.6 Electric transient's solver</p> <p>4.1.6.1 Include scripting capability</p> <p>4.1.6.2 Include RZ support for AC conduction</p> <p>4.1.6.3 Controls to set minimum adaptive passes and converged passes</p> <p>4.1.6.4 Animated field plots of parametric solutions</p> <p>4.1.6.5 Integration with circuit analysis tools , if feasible.</p> <p>4.1.7 Post Processing Capabilities</p> <p>4.1.7.1 Should be able to solve and simulate the magnetic fields that arise from DC current sources, permanent magnets and externally applied fields in electromagnetic devices.</p> <p>4.1.7.2 Should be able to automatically calculate force, torque, inductance and saturation in devices containing Linear, Non-linear and anisotropic materials.</p> <p>4.1.7.3 The post processor should provide plots of Flux lines, B and H fields, energy Densities and Saturation in magnetic devices.</p> <p>4.1.7.4 Should allow calculation of complex arithmetic, trigonometric functions, surface and volume integrations, computation of tangents to curved lines, and normal to any curved surface.</p> <p>4.1.7.5 Calculate metrics like power dissipation, stored energy, and cavity Q for low frequencies.</p> <p>4.2 Electromechanical Simulation and Analysis Software</p> <p>4.2.1 Simulation Software for simulation of mixed signal systems with provision for simulation of electrical, mechanical and software controlled systems with the following features.</p> <p>4.2.2 The tool should be capable of analysis of systems that include designs to large systems that include electrical, mechanical, hydraulic, software-controlled systems, and other technologies. The user interface should be intuitive and graphical with access to viewers, libraries, analysis toolboxes and solvers. Provide highly accurate and efficient results. Include performance analysis capabilities using steady-state, time, frequency, statistical quality, reliability and controls analyses. Allow interoperability, common modeling language, information sharing, and standard library support with other mechanical CAD and EM simulation and analysis tools.</p> <p>4.2.3 Feature</p> <p>4.2.3.1 Should include graphical User Interface for Schematic Entry/Capturing the design schematic into the simulator.</p> <p>4.2.3.2 Include a component Library comprising of commonly used electronic,</p>		


		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 06 OF 11
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		<p>electrical, electro mechanical, electro optical and control system blocks.</p> <p>4.2.3.3 Include a template library providing the ability to use existing components to create customized component libraries.</p> <p>4.2.3.4 Include a simulation module and analysis package to perform</p> <ol style="list-style-type: none"> 1. Steady state DC analysis 2. Transient and AC analysis 3. Noise analysis, if possible. 4. Fourier spectral analysis 5. Frequency response analysis 6. Parameter variation analysis <p>4.2.4 Include an event based, industry standard algorithms like the Calaveras algorithm to enable full mixed-signal, continuous-time, differential equation simulation and analysis.</p> <p>4.2.5 Should allow simultaneous event processing to solve Boolean logic and continuous mathematical expressions and relationships.</p> <p>4.2.6 Use multiple robust-solution algorithms sequentially to solve convergence and difficult simulation issues such as sharp signal transitions</p> <p>4.2.7 Allow the users to develop new models using standard languages like MAST and VHDL -AMS languages and edit existing models.</p> <p>4.2.8 Import Spice or Matlab models for usage with the tool. Develop models based on component data characteristics.</p> <p>4.2.9 Graphical interface for displaying simulation results and measuring / calculating and analyzing the simulation results and saving the results. View net list and other reports.</p> <p>4.2.10 The simulation software shall have following minimum Network Elements</p> <p>4.2.10.1 Tools</p> <ol style="list-style-type: none"> i) point on wave ii) 3-phase bus iii) 1-phase bus iv) Multiplex bus v) User code block vi) subsystems vii) IN/OUT ports viii) Meters /Scope for monitoring <p>4.2.10.2 Sources and Machines</p> <ol style="list-style-type: none"> i) AC source (programmable) ii) Current Source (programmable) iii) Synchronous thermal machines (multimass) iv) Synchronous Hydraulic Machine v) Synchronous cross-compound vi) Voltage controlled sources vii) Current controlled sources <p>4.2.10.3 Lines</p> <ol style="list-style-type: none"> i) Frequency distributed lines ii) Coupled Lines (6, 9 and 12 Phases) iii) PI section (6, 9 and 12 Phases) iv) Marti Lines (6 Phases) v) DC line vi) All models shall have internal breakers for faults 		

		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 07 OF 11
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company. </p>		<div data-bbox="329 283 542 310">4.2.10.4 Passives</div> <div data-bbox="407 310 805 478"> <ul style="list-style-type: none"> i) Ground ii) RLC series (all combinations) iii) RLC shunt (all combinations) iv) Mutual Inductor v) Non-Linear Resistor vi) different filter configuration </div> <div data-bbox="329 504 649 531">4.2.10.5 Loads and Motors</div> <div data-bbox="407 531 703 699"> <ul style="list-style-type: none"> i) Harmonic Load ii) Arc Furnace iii) DC Motor iv) Induction Motor v) Dynamic load vi) Synchronous motor </div> <div data-bbox="329 724 545 751">4.2.10.6 Switches</div> <div data-bbox="407 751 935 945"> <ul style="list-style-type: none"> i) 6 Pulse ii) 12 Pulse iii) Breakers iv) Switches (all configurations) v) 2 and 3 level IGBT/GTO/Thyristor Bridge vi) Routers vii) Multiplexers/Demultiplexers </div> <div data-bbox="329 970 609 997">4.2.10.7 Miscellaneous</div> <div data-bbox="407 997 763 1108"> <ul style="list-style-type: none"> i) Frequency measurement ii) Digital In/Out iii) Analog In/Out iv) V/I Measure </div> <div data-bbox="329 1134 602 1161">4.2.10.8 Transformers</div> <div data-bbox="407 1161 815 1413"> <ul style="list-style-type: none"> i) 2 or 3 windings ii) Linear iii) Saturation iv) Hysteresis v) Tap changers vi) Constant Voltage Transformer vii) Current Transformer viii) Potential Transformer ix) Phase Shifter </div> <div data-bbox="329 1438 1304 1497">4.3 3D Coupled Thermal and Stress Analysis Software for Electromagnetic application</div> <div data-bbox="329 1522 1289 1581">4.3.1 The Software should be able to analyse thermal and stress coupled to Electromagnetic Simulation.</div> <div data-bbox="329 1606 1403 1633">4.3.2 The thermal analysis capabilities should include nonlinear steady state and transient thermal </div>		

		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 08 OF 11
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company. </p>		<p>analysis, including all heat transfer mechanisms: conduction, convection and radiation mechanism only on boundaries.</p> <p>4.3.3 The software should allow the user to utilize power-loss and core-loss distribution information obtained from electromagnetic simulations, as a heat source for thermal analysis. The tool should be able to generate a complete thermal profile of a device, including overall temperature distribution and location of hot and cold spots for any instant in time. Obtain temperature distribution at selected time steps to calculate the corresponding deformation and thermally induced structural static stress which can evaluate the resulting altered electrical performance. Provide 3D steady state and transient thermal analysis for all types of heat-transfer applications.</p> <p>4.3.4 Solvers should be able to evaluate the induced mechanical stress and resulting deformation. The linear stress analysis capability should be able to analyze deformation and stress due to electromagnetic force density distribution, thermal deformation, and structural stress due to temperature distribution.</p> <p>4.3.5 Features</p> <p>4.3.5.1 Analysis of Heat-transfer mechanisms</p> <ol style="list-style-type: none"> a. Conduction b. Convection c. Radiation <p>4.3.5.2 Support Volumetric and surface source/boundary conditions</p> <p>4.3.5.3 Support functional convection coefficient</p> <p>4.3.5.4 Include calculation of user-specified electromagnetic/thermal variable load sequencing</p> <p>4.3.5.5 Temperature-dependent thermal conductivity</p> <p>4.3.5.6 Indication of the following parameters in easily viewable / graphical format</p> <ol style="list-style-type: none"> 1. Average temperature 2. Temperature of hot/cold spots 3. Coordinates of respective spots <p>4.3.5.7 Calculation of temperature and heat-flow distributions</p> <p>4.3.6 Stress Solver (Optional)</p> <p>4.3.6.1 The software should include static and linear stress-analysis engines. This engine should accept input from the EM solver engine for coupled solution sequences and for analyzing stress due to electromagnetic force, short-circuit-induced mechanical stress and structural stress due to temperature. Linear stress analysis should clearly indicate situations where electromagnetic forces and thermal stresses do not push the electrical component into the plastic deformation regime.</p> <p>4.3.6.2 Features</p> <ol style="list-style-type: none"> i. Provide Executive parameters <ol style="list-style-type: none"> a. Maximum principal stresses b. Orientation of principal planes c. Maximum von Mises stresses ii. Display coordinates of the respective maximum stresses iii. Calculate deformation and von Mises stress distributions <p>4.3.7 Optimisation Package</p> <p>Must provide optimization capability to provide integrated parametric, optimization, sensitivity, statistical and tuning analysis/functions.</p>		

		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 09 OF 11
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		<p>4.3.7.2 Features</p> <ul style="list-style-type: none"> i. Should have parametric analysis with the following capabilities: <ul style="list-style-type: none"> a. User-specified range and number of steps for parameters b. Automatic analysis of parameter permutations ii. Should have optimization analysis with the following capabilities: <ul style="list-style-type: none"> a. User-selectable cost functions and goal objective b. Quasi-Newton method Optimization c. Sequential Nonlinear Programming (SNLP) d. Integer-only Sequential Nonlinear Programming iii. Should have Sensitivity analysis capability with following features <ul style="list-style-type: none"> a. Design variations to determine sensitivities: b. Manufacturing tolerances c. Material properties iv. Should have Statistical analysis with the Design performance distribution versus parameter values v. Provide parameter sweeps and optimization in an easy manner vi. Provide sensitivities, statistical and tuning analysis <p>4.4 Software for 3D/2D Parasitic Extraction and Electromagnetic Circuit Generation</p> <p>4.4.1 This software should have the capability for 3D parasitic extraction from cables, busways for power distribution, busbar for power electronics applications, internal connections of power modules, printed circuit board (PCB) connections, electronic and microelectronic circuits such as wire bondings. The software should extract the RLCG parameters from an interconnect structure and automatically generate an equivalent SPICE sub-circuit model. These models will be used to perform circuit analysis with the circuit simulation software. It should allow studying parasitic effects of cables, optimize the cable paths, decrease copper mass and study radiated fields by the system.</p> <p>4.4.2 Features</p> <ul style="list-style-type: none"> 4.4.2.1 Analyse 3D electromagnetic fields using Method of Moments (MOM) or Fast Multipole Methods (FMM) or using PEEC Method (Partial Element Equivalent Circuit) 4.1.2.2 Analyse proximity and skin effect, dielectric and ohmic loss and frequency dependence 4.1.2.3 Provide pushbutton 3D extraction of resistance (R), inductance (L), capacitance (C) and conductance (G) matrices 4.1.2.4 Provision for calculation of <ul style="list-style-type: none"> 1. Per-unit-length RLCG parameters for transmission lines 2. Provide Characteristic impedance (Z0) matrices 3. Calculate Propagation speed, delay, attenuation, effective permittivity, if feasible. 4. Differential and common-mode parameters, if feasible. 5. Near- and far-end crosstalk coefficients, if feasible. 6. Surface roughness modeling, if feasible. 4.4.2.5 Create equivalent 2D and 3D circuit models (SPICE sub-circuits/laddertype lumped models) 4.4.2.6 Provide EMI/EMC for high-power applications 4.4.2.7 The software should be able to extract parasitics from high-power bus bars and 		

		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 10 OF 11
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		<p>cables and create Spice models for use by the circuit simulation software</p> <p>4.4.2.8 Generate frequency-domain S-parameters of the design</p> <p>4.4.2.9 Provide easy and simple to use display of data/visualization of results such as</p> <ol style="list-style-type: none"> 1. Matrices of parasitics 2. Current and voltage visualization for conductors 3. Vector and magnitude field plots <p>4.4.2.10 Capacitance solver should solve for C and G due to lossy dielectrics if possible</p> <p>4.4.2.11 Provide frequency-dependent dielectric loss model, if feasible.</p> <p>4.4.3 Platform and Operating System Support</p> <p>4.4.3.1 The tools should be compatible with 64 bit CPU architecture platforms with single, dual-core or quad-core processors on Windows / Linux / Unix platforms and provide the ability to run distributed parallel processes.</p> <p>4.5 Software Licensing</p> <p>4.5.1 The vendor shall offer all the software's with PERPTUAL license (life time without any renewal).</p> <p>4.5.2 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.</p> <p>4.5.3 Microsoft windows environment shall be used for operating system. However vendor has to specify the OS requirements and the hardware configuration in the technical bid.</p> <p>5.0 Deliverables</p> <p>5.1 Software's on CD (3 Nos) and License</p> <p>5.2 Three sets of original printed user manuals.</p> <p>5.3 Softcopy of user manual on CD.</p> <p>5.4 Workstation (Qty- 2Nos)</p> <p>Processor : minimum 64 Bit CPU.</p> <p>Speed : Minimum 2GHz.</p> <p>RAM Memory : Minimum 2 GB.</p> <p>HDD : Minimum 160 GB SCSI with Controller</p> <p>Monitor : Minimum 21" colour monitor, high resolution 1920 X1440</p> <p>CD Drive : Combo Drive CD-R/CD-RW</p> <p>I/O card : Adequate I/O facility, Controllers, Dual network Interface cards etc.</p> <p>Accessories : As required if any.</p> <p>6.0 Pre-Inspection and Training:</p> <p>BHEL Engineers will inspect before dispatch based on the agreed test protocol. The supplier shall provide training for three BHEL personnel at the premises of manufacturer in the field of complete operation and maintenance of the equipment for a cumulative period of 30 man working days free of cost at the said premises. Travel and living expenses shall be borne by BHEL. Detailed structure of the training shall be finalised with the vendor after the placement of purchase order.</p>		

		 A4 – 11	PURCHASE SPECIFICATION FOR MULTI DISCIPLINARY SYSTEM SIMULATION SOFTWARE	P.S NO. : PS/445/092 REV. NO : 00 PAGE 11 OF 11
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		<p>7.0 Installation and commissioning: Installation, testing, commissioning & demonstration the performance of the software at BHEL site.</p> <p>8.0 Warranty & Annual Maintenance</p> <p>8.1 The vendor shall quote with warranty of one year. During warranty period, the vendor will provide all technical updates and technical support free of cost.</p> <p>8.2 At the end of warranty period of one year, Annual Maintenance Contract (AMC) shall start. Vendor shall submit year wise charges of AMC for next five years and they would be binding during the tenure by an agreement. This agreement is binding on the vendor even if the company is acquired by other company. The payment of AMC charges shall be payable after the first year and beginning of every maintenance year. Vendor may note, for arriving at Lowest bid price (L1), this AMC charges for 5 years will be added with the basic software cost.</p> <p>9.0 Documentation</p> <p>9.1 Information required along with techno-commercial offer without which offer is liable for rejection</p> <p>9.1.1 Supplier shall furnish clause wise confirmation/comments to this technical specification. Deviation, if any, shall be clearly brought out indicating the clause no., original specification, deviation sought with proper technical backup (catalog, technical brochure, International standards etc) for seeking such a deviation. If no deviations are required, then supplier shall furnish a certificate indicating "<u>No Deviations requested and we comply fully with all the technical requirements of this specification no. PS/445/0 93</u>".</p> <p>9.1.2 Supplier shall take a copy of this specification and sign on each page and submit the signed copy along with the offer.</p> <p>9.1.3 Service contact details in India and abroad.</p> <p>9.2 Information required after the placement of order.</p> <p>9.2.1. Quality Plan and Test Protocol for BHEL's approval as per clause 13.0</p> <p>10.0 Optional Item</p> <p>10.1 Software for Design and Optimization process for Rotating Electric Machines. Vendor shall quote for suitable Software program that shall be used for the design and optimization process of rotating electric machines. With this software, it shall be possible to calculate machine performance, make initial sizing decisions, etc. The vendor shall submit detailed technical datasheets, writeup alongwith the offer. The specification shall be finalised in consultation with the vendor after the submission of the technical bid.</p>		

General Terms & Conditions for Supply of Imported & Indigenous Capital Items (Two part bid)

Bidders are required to read the general terms & conditions carefully and submit their quotation covering all the points. Any order resulting from this enquiry shall be governed by the general terms and conditions listed below.

1. TWO PART BID: Quotation shall be submitted in two part bid i.e.

- a) **Techno-commercial i.e., Un-priced Bid:** Techno-commercial bid shall be submitted with complete description of the equipment, specification compliances to the enquired specification and all the commercial terms & conditions indicated in the **QUOTATION FORMAT (ANNEXURE - A / ANNEXURE - B)** preferably in the same format. Any other enclosure, which the supplier wishes to submit like product catalogue, technical literature etc., may also be submitted in a sealed envelope super scribed clearly as **“TECHNO-COMMERCIAL BID” with RFQ No. and DUE DATE.** Un-priced copy of price bid (without price) shall also be enclosed with the techno-commercial bid i.e. a copy of the price bid without prices.

Confirmation to BHEL specifications shall be indicated by the vendor in the respective columns provided in the purchase specification wherever applicable. Deviations to the specification / item description, if any shall be brought out clearly indicating **“DEVIATION TO BHEL SPECIFICATION”** without fail as a part of technical offer.

Compliance to Pre-qualification criteria (if applicable) shall also be enclosed with the Techno-commercial bid.

Manufacturer's name, their trade mark and brand if any, should be invariably mentioned in the tender and illustrative leaflets giving technical particulars etc., are to be attached to the tender to facilitate consideration of the offer.

b) Price Bid :

Price bid should contain basic unit prices, discount if any, applicable taxes & duties, packing & forwarding charges (if applicable), Freight & insurances (if applicable) FOB charge (if applicable) etc., in a sealed envelope super scribed clearly as **“PRICE BID” with RFQ No. and DUE DATE.** Installation, commissioning, start-up and training charges (if any) shall also be included in the price bid.

Please indicate the rates in both figures and words. However in case of difference / discrepancy, the rates indicated in figures shall be considered as correct.

Both these sealed envelopes [(a) Techno-commercial i.e., un-priced Bid and (b) Price Bids] shall be kept in a single sealed envelope and superscribed clearly with **RFQ No. and DUE DATE.**

2. The above sealed envelope (Tender) shall reach our office on or before the due date by **13:00 hrs.** Quotations are to be dropped in the tender box marked for the OPENING ON respective days i.e., MONDAY / WEDNESDAY / FRIDAY kept at BHEL-EDN's Reception area of our works with caption "CE, M&C, SC&PV, TSC, DEFENCE, TELECOM, CPD". Quotations also can be dispatched by Couriers / Registered post / FAX / e mail to the Purchase Executive indicated in the RFQ. Late Tenders i.e. Tenders received after due date & time are liable to be rejected.
3. The rates quoted against each item shall be in the same units stated in the enquiry. If the quotations are submitted in any other unit than specified, relationship between two sets of units must be furnished in the offer.
4. As far as possible, the quotations shall be free from corrections / overwriting. Corrections if any should be initialed with your seal and signature. Any typographical errors, totaling mistakes, currency mistakes, multiplication mistakes, summary mistakes observed in your priced bids, BHEL may consider whichever is beneficial to BHEL for evaluation.
5. Quotations are to be duly signed. Unsigned bids/offers are liable for rejection.
6. All the bidders or their authorized representatives (with authorization letter from their principals) can witness opening of techno-commercial bid on the due date.
7. After evaluation of techno-commercial bids, price bids of only those which are technically & commercially accepted, will be opened on a subsequent date, which will be intimated to the concerned in advance for witnessing of price bid opening.
8. The quantities in each item to be purchased may vary from quantities enquired according to the actual requirement at the time of placing the purchase order. Quantity discount if any should be mentioned in your offer.
9. BIDDERS (for indigenous purchase) shall indicate clearly Excise duty, Education cess, Sales Tax/VAT, Octroi, Entry tax, Service Tax as applicable for the quoted items. In the absence of clarity of these, any claim at a later date will not be entertained. Any changes in Taxes and duties after award of the contract will not be considered except such are those, which are imposed by Govt., notification within the contractual delivery. Seeking price amendments for change in Excise duty due to crossing of turnover limits will not be considered under any circumstances.
10. **TOTAL COST TO BHEL:** Purchase order will be placed on the lowest bidder (L1) only among the technically & commercially accepted offers. Lowest Bid (L1) is determined on the basis of the total cost to BHEL.

(a) FOR FOREIGN PURCHASE:

Total cost to BHEL = Total basic value in foreign currency + FOB charges (if any) + Packing & Forwarding charges (if any) + Cost Insurance Freight (CIF) + Basic Custom Duty (BCD) + Counter Veiling Duty (CVD) + Educational Cess + Special Additional Duty (SAD) + Entry TAX + Service TAX (if applicable) + Loading factors for deviations to commercial terms & conditions.

Note: Exchange rate ruling on the date of Tender opening (Techno-commercial / un-priced Bid) will be considered for converting foreign currency to Indian currency. Exchange rates published in Economic Times (TT selling) will be considered.

(b) FOR INDIGENOUS PURCHASE:

Total cost to BHEL = Total basic value + Packing & forwarding charges + Excise duty Education cess + sales Tax/VAT + Octroi + Exit/Entry tax + Freight & Insurance + Service Tax (if applicable) + Loading factors for deviations to commercial terms & conditions.

11. FIRM PRICE: Rates quoted should be firm and no enhancement in the rates and changes in the techno-commercial terms will be allowed once the quotation is accepted and order is placed.

If Installation & Commissioning is in supplier's scope, then the price shall remain FIRM till commissioning & handing over of the complete system.

12. TERMS OF PAYMENT:

(a) FOR FOREIGN PURCHASE:

Payment will be made against “**SIGHT DRAFT**” on presentation of documents to our bankers. Payment through LC is also made subject to loading factors as per **Clause 26 (Ai)**.

The payment terms are as follows:

- a) 100% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Nil shortage certificate, Certificate of country of origin etc., (where commissioning & warranty is NOT involved).
- b) 90% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Warrantee certificate, Nil shortage certificate, Certificate of country of origin etc., & 10 % on submission of Performance Bank Guarantee (PBG) (where commissioning is NOT involved).
- c) 75% against complete dispatch documents i.e. AWB / BOL, Invoice, Packing list, Warrantee certificate, Nil shortage certificate, Certificate of country of origin etc., 15% on successful installation, commissioning and start-up trials & 10% on submission of Performance Bank Guarantee (PBG).
- d) If PBG is not submitted by the vendor, then the final 10% payment will be made against submission of supplementary invoice after warranty period + 6 months of claim period.

(b) FOR INDIGENOUS PURCHASE:

- a) 100% within 30 days from the date of receipt of equipments / materials (where commissioning & warranty is NOT involved).
- b) 90% within 30 days from the date of receipt of equipments & balance 10% against submission of PBG (where commissioning is NOT involved).
- c) 75% within 30 days from the date of receipt of equipments, 15% after the successful installation, commissioning & start-up trials & balance 10% against submission of PBG (wherever commissioning & warranty are involved).

- d) If PBG is not submitted by the vendor, then the final 10% payment will be made against submission of supplementary invoice after warranty period + 6 months of claim period.

13. ADVANCE PAYMENT: Quotations with payment terms of “Advance” or “Inland Letter of Credit” will not be considered and such offers are liable for rejection commercially.

14. PENALTY: Failure to supply the item within the delivery date specified in the purchase order will make the supplier liable to an unconditional penalty of ½% (One half percent) of the basic value of the goods in arrears per week subject to a maximum of 10%.

If pre-shipment inspection is involved, date of issue of pre-shipment call by the vendor along with test certificates / test reports / certificate of conformance / calibration reports as proof of completion will be treated as date of dispatch for the purpose of penalty calculation.

In the absence of reports stated above, actual date of inspection will be considered as date of dispatch for penalty calculation.

15. PBG: Performance Bank Guarantee (PBG) to be submitted as per the BHEL prescribed format given in **ANNEXURE - D / ANNEXURE - E** for 10% of the basic equipment value obtained from any BHEL member banks.

PBG shall be valid for 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier. The PBG shall also have 6 months claim period from the date of dispatch / commissioning.

The Bank Guarantee shall be submitted directly to the concerned Purchase Executive by the issuing Bank with their forwarding letter.

16. WARRANTY: Goods dispatched shall have warranty period of 12 months from the date of dispatch or as mentioned in the RFQ.

17. TERMS OF DELIVERY:

(a) FOR IMPORTED PURCHASE:

Price offered shall be for goods packed and delivered **F.O.B.** (named international Airport) including packing, forwarding, Handling, Ancillary charges like processing of Sight Draft, Letter of credit (L/C) if applicable, negotiation of bank documents, Export declaration, Certificate of origin etc.

Packing shall be Airworthy & Roadworthy, best suitable for trans-shipment and to prevent transit damages.

Vendors shall indicate the name of International Airport.

Note: Name of International Airport has to be selected from any one of the airports indicated in the table provided in **ANNEXURE - C** herewith.

(b) FOR INDIGENOUS PURCHASE:

Equipment shall be delivered on EX-EDN/BHEL, Bangalore basis, inclusive of packing & forwarding charges.

Packing shall be Road / Air / Rail worthy, best suitable for transshipment and to take care of transit damages.

Dispatch the consignments through EDN/BHEL approved transporters on Door Delivery basis furnished below.

1. M/s Awagaman Road Carriers Ltd., Bangalore. (AWG)
2. M/s BLR India pvt., Ltd., Bangalore. (BLR)
3. M/s Delhi Assam Roadways corporation Ltd., Bangalore. (DRL)
4. M/s Indo Arya Central transport Ltd., Bangalore. (IACT)
5. M/s Prakash parcel Services, Bangalore. (PPS)
6. M/s Road Carrier of India, Bangalore. (RCI)
7. M/s Union Roadways Ltd., Bangalore. (URL)

Small consignments can be dispatched through M/S First Flight Couriers Ltd.

Transit insurance shall be arranged by BHEL. Vendor shall intimate the dispatch details to BHEL immediately after effecting shipment, to arrange transit insurance accordingly.

18. DELIVERY REQUIREMENT: Equipment shall be delivered, as per the delivery schedule indicated in the RFQ.

19. VALIDITY: Quotation should remain valid for a period of **90 days** from the date of technical bid opening.

20. BHEL reserves the right to RE-FLOAT/REJECT/CANCEL the TENDER ENQUIRY (RFQ) without assigning any reason or cause thereof. Quotes received against this TENDER ENQUIRY are subject to and governed by all these terms and conditions. BHEL's decision will be final in awarding of the contract and binding on all vendors.

21. REVERSE AUCTION: BHEL reserves the right to resort to reverse auction / online Bidding before opening of price bid.

22. POST-ORDER REQUISITES:

- a) Pre-shipment inspection at vendor's works, if required, will be carried out by BHEL. Required assistance will have to be provided by the vendor at the time of pre-shipment inspection.
- b) Test certificates, Calibration certificates and warranty certificates as stipulated at the time of ordering shall be furnished.
- c) Items shall be dispatched by Air/Road/Sea worthy packing. Any damage and later rejection, due to poor / improper packing shall be to supplier's account.
- d) Any damage/rejection should be made good or replaced immediately without any extra cost to BHEL.
- e) Wherever commissioning is involved, it shall be carried out by the vendor's qualified engineers. Scope of work includes installation, commissioning and start-up trials till satisfactory performance level is reached as certified by BHEL.
- f) BHEL will not be responsible for any loss, damage or injuries to vendor's personnel sustained during installation / commissioning / start-up trials. Vendor shall ensure compliance with all statutory requisites as laid down by local bodies, state & Central Government.
- g) Performance Bank Guarantee to be executed on Rs.100/- non-judicial stamp paper as per BHEL prescribed format as given as Annexure (c).

23. Any dispute arising out of this contract shall be referred to the sole arbitration of Head of Materials Management, Control Equipment, BHEL, EDN, Bangalore or any other officer nominated by him and his decision shall be final and binding on the parties. The venue of the arbitration in all cases shall be Bangalore.

24. All suits in respect of the above lie in the court of Jurisdiction of Bangalore (India) only.

25. Equipment shall comply with the standard requirements of ISO 14001 & OHSAS 18001.

26. **REGRET LETTER:** In case, the supplier is unable / not willing to quote (for BHEL's registered vendors), a letter of regret shall be sent.

27. LOADING FACTORS:

Loading factors as detailed below will be added to the quoted price (basic) to evaluate the lowest quote for non compliance of BHEL standard commercial terms.

A(i). For non compliance of standard Terms of payment (For Foreign Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	100% against "SIGHT DRAFT" on presentation of dispatch documents to our Bankers.	(a) 100% Through Letter of Credit (LC)	(a) 3.50 %
2	90% against "SIGHT DRAFT" + 10% against PBG (wherever PBG is involved)	(b) 90% Through Letter of Credit (LC)	(b) 2.25 %
3	75% against "SIGHT DRAFT" + 15% after commissioning + 10% against PBG (wherever commissioning & PBG is involved)	(c) 75% Through Letter of Credit (LC)	c) 1.875 %

A(ii). For non compliance of standard Terms of payment (For Indigenous Purchase Orders)

Sl. No.	BHEL standard term	If you quote	Loading factor in % for non-compliance
1	100% within 30 days from the date of receipt (credit payment)	Payment through bank	2 % x percentage quoted through bank
		Payment against proforma invoice	1.25 % x percentage quoted through proforma invoice
2	90% within 30 days from the date of receipt + 10% against PBG (wherever PBG is involved)	Payment through bank	2 % x percentage quoted through bank
		Payment against proforma invoice	1.25 % x percentage quoted through proforma invoice
		100% within 30 days from the date of receipt & PBG	Nil

3	75% within 30 days from the date of receipt + 15% after commissioning + 10% against PBG (wherever commissioning & PBG is involved)	Payment through bank	2 % x percentage quoted through bank
		Payment against proforma invoice	1. 25 % x percentage quoted through proforma invoice
		100% within 30 days and after commissioning & PBG	Nil

B. For non compliance of Penalty clause:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Penalty of 0.5% per week subject to max. of 10% on the basic value of the items not supplied /delayed	Not agreed.	10 %
		5% max., agreed.	5%
		Other than the above.	10% - (minus) agreed max. %

C. For non compliance of Performance Bank Guarantee (PBG):

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format.	Not agreed.	10 %
		5% agreed.	5 %
		Other than the above.	10% - (minus) agreed max. %

D. For Non conformance to delivery requirement indicated in the RFQ:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	Delivery requirement as indicated in the RFQ in number of weeks from the date of issue of PO or from the document approval	Not agreed for the stipulated delivery in the enquiry	1 % per week up to max. of 10% for the difference in period

E. For non compliance of Warranty:

Sl. No.	BHEL standard term	If you quote	Loading factor for non-compliance
1	12 months from the date of dispatch or as indicated in the RFQ	Not agreed.	6%
		Less than 12 months or as indicated in the RFQ	0.5 % per month for the difference in period

ANNEXURE - A

TECHNICAL BID (TO BE ENCLOSED WITH TECHNO-COMMERCIAL BID)
(for Foreign Purchase Orders)

Sl. No.	Particulars	Bidder's confirmation
1	Price basis: Firm i.e., from the date of PO to completion of supply [Price Variation Clause (PVC) not acceptable]	Acceptable / Not acceptable
2	Terms of Payment: Against "SIGHT DRAFT" on presentation of documents to our bankers. (a) 90 % is payable on negotiation of complete set of original documents & balance 10% against submission of PBG (where commissioning is NOT involved). (b) 75 % is payable on negotiation of complete set of original documents, 15% after satisfactory commissioning & balance 10% against submission of PBG (wherever commissioning & PBG is involved). (c) Deviation if any please specify Note: Refer clause 12 above .	(a) Acceptable / Not acceptable (b) Acceptable / Not acceptable (c)
3	BHEL's penalty clause: (a) Delay in delivery as per PO delivery date will result in penalty of 0.5 % per week subject to maximum of 10% on the value of the items not supplier/delayed. (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
4	Performance Bank guarantee: PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format as detailed in clause 15 .	Yes / No
5	Terms of delivery: (a) F.O.B international Airport/Seaport as per clause 17 Indicate name of International Airport/Seaport (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
6	Warranty: (a) 12 months from the date of dispatch (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
7	Delivery period: Indicate number of weeks from the date of issue of Purchase order	_____Weeks
8	Validity: (a) Quotation should remain valid for a period of 90 days from the due date (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)

Signature of renderer / with seal

ANNEXURE - B

TECHNICAL BID (TO BE ENCLOSED WITH TECHNO-COMMERCIAL BID)

(For Indigenous Purchase Orders)

Sl. No.	Particulars	Bidder's confirmation
1	Price basis: Firm i.e., from the date of PO to completion of supply [Price Variation Clause (PVC) not acceptable]	Acceptable / Not acceptable
2	Excise duty: If applicable indicate %.	Applicable / Not applicable ED: _____%
3	Sale tax: If applicable indicate %	Applicable / Not applicable (a) VAT _____% (b) CST _____% against form C
4	Payment terms: (a) 90 % basic + 100% taxes, duties & freight charges within 30 days from the date of receipt & balance 10% against submission of PBG (where commissioning is NOT involved) (b) 75 % basic + 100% taxes, duties & freight charges within 30 days from the date of receipt, 15% after satisfactory commissioning & balance 10% against submission of PBG (wherever commissioning & PBG is involved). (c) Deviation if any please specify Note: As per clause 12	(a) Acceptable / Not acceptable (b) Acceptable / Not acceptable (c)
5	BHEL's penalty clause: (a) Delay in delivery as per PO delivery date will result in penalty of 0.5 % per week subject to maximum of 10% on the value of the items not supplier/delayed. (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)
6	Performance Bank guarantee (PBG): PBG for 10% of the basic material cost shall be furnished in the BHEL prescribed format as per clause 15 .	Yes / No
7	Terms of delivery: (a) Ex EDN / BHEL, Bangalore (Free delivery to EDN/BHEL Bangalore including packing & forwarding charges) (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
8	Warranty: (a) 18 months from the date of dispatch or 12 months from the date of commissioning (b) Deviation if any Please specify	(a)Acceptable / Not acceptable (b)
9	Delivery period: Indicate number of weeks from the date of issue of Purchase order	_____ Weeks
10	Validity: (a) Quotation should remain valid for a period of 90 days from the due date (b) Deviation if any Please specify	(a) Acceptable / Not acceptable (b)

Signature of renderer / with stamp

ANNEXURE - C

LIST OF INTERNATIONAL AIRPORTS

Sl. No	Country	Air Ports
1	Austria	Vienna, Linz, Graz
2	Australia	Sydney, Melbourne, Perth
3	Belgium	Antwerp, Brussels
4	Canada	Toronto, Montreal
5	China	Shangai
6	Cyprus	Lamaca
7	Czech Republic	Prague (Via Frankfurt)
8	Denmark	Copenhagen
9	Egypt	Cairo
10	Finland	Helsinki
11	France	Paris (Rossy), Lyon
12	Germany	Darmstadt, Manhiem, Nurnberg, Hamburg, Stuttgart, Munich, Koln, Dusseldorf & Hannover, Frankfurt, Berlin
13	Hongkong	Hongkong
14	Italy	Rome, Milan, Turin, Bologna, Florence
15	Ireland	Dublin
16	Isrel	Telaviv
17	Japan	Tokyo, Osaka
18	Malaysia	Kaulalampur, Penang
19	Neatherlands	Amsterdam, Rotterdam
20	Newzealand	Auckland
21	Norway	Oslo
22	Oman	Muscat
23	Philiphines	Manila
24	Romania	Bucharest
25	Russia	Moscow
26	Saudi Arabia	Riyad
27	Singapore	Singapore
28	Slovakia	Bartislawa
29	South Africa	Johannesburg, Durban
30	South korea	Kimpo
31	Spain	Barcelona
32	Sweden	Stockholm, Gothenburg, Milano
33	Switzerland	Basle, Zurich, Geneva
34	Taiwan	Taipei
35	U.A.E.	Dubai
36	U.K.	Landon (Heathrow), Newcastle, Oxford, Cheltham, Bristol, Wellingborough, Birmingham, East Midland, Manchester, Leeds, Glasgow.
37	U.S.A.	Newyork, Chicago, Sanfrancisco, Los Angeles, Atlanta
38	Ukraine	Kiev

ANNEXURE-D

PERFORMANCE BANK GUARANTEE
(FOR FOREIGN PURCHASE ORDERS)

BANK NAME AND ADDRESS

Bharat Heavy Electricals Limited (BHEL),
Electronics Division,
PB No. 2606,
Mysore Road,
BANGALORE- 560 026
INDIA

Dear Sir,

Ref: CONTRACT PERFORMANCE GUARANTEE.

WHEREAS you have entered into a contract reference No PO NO. _____ with M/s _____ having its registered office at _____ for the supply of _____ as detailed in your purchase order No. _____ which is hereinafter referred to as "the said contract" and WHEREAS M/s _____ has undertaken to produce a Bank Guarantee for 10% (Ten Percent) of _____ the contract price amounting to _____ (_____) to secure its obligations to Electronics Division, BHEL having its registered office at New Delhi for the performance of the contract including the warranty of the equipment supplied, We _____ Bank , _____ hereby expressly, irrevocably and unreservedly undertake and guarantee as principal obligors on behalf of M/s _____ that in the event Bharat Heavy Electricals Ltd. (B.H.E.L.) declares to us in writing that M/s _____ has not fulfilled any obligation according to the contractual obligation of the said contract, to pay you on demand and without demur to Bharat Heavy Electricals Ltd., Electronics Division , Mysore Road, P.B.No. 2606, Bangalore-560 026, India an amount of _____ (in words _____) subject to as may be determined below:

- 1) Notwithstanding any right M/s. _____ may have directly against you or any disputes raised by M/s _____, Your written demand shall be conclusive evidence to us that repayment is due under the terms of the said contract and shall be binding on us.
- 2) We shall not be discharged or released from this undertaking and Guarantee by any arrangements, variations made between you and M/s. _____ with or without our consent and Knowledge or by any alterations in the obligations of M/s. _____ by any forbearance whether as to payment, time, performance or otherwise.
- 3) This guarantee shall remain valid until the end of twenty-four weeks after the close of the warranty period or until the same is reported by BHEL to us whichever is earlier.

- 4) We agree and undertake not to revoke this guarantee during its validity unless discharged in writing by you subject to the provision of clause (7) below.
- 5) This guarantee shall be a continuing guarantee subject to the foregoing and shall not be discharged by any change in the constitution of the Bank or M/s. _____.
- 6) This guarantee shall be governed by and constructed in accordance with the Laws of India.
- 7) At any time _____ Bank may render this guarantee null and void by paying to Bharat Heavy Electricals Ltd. the full amount being _____ (in words _____)

For and on behalf of Bank
by its Authorised Signatory

Note:

- (1) To be executed in INR 100 Non-Judicial stamp paper by any authorized Indian Bank.
- (2) To be submitted directly by banker to concerned executive in purchase dept., Please give BHEL address to banker.
- (3) Do not enclose with Bank document.
- (4) Any Modification & omissions to this are not permitted

ANNEXURE - E

PERFORMANCE BANK GUARANTEE
(FOR INDEGENOUS PURCHASE ORDERS)

THIS DEED OF GUARANTEE made and executed on the _____ day of _____ (year), by the _____ (Bank), registered under the Companies Act 1956/Nationalised Bank constituted under the Banking Companies (acquisition and transfer of undertakings) Act constituted under the State Bank of India Act / Subsidiary Banks Act, having its registered / head office at _____ represented herein by its Branch Manager / authorised representative Sri. _____ & Sri. _____ (Hereinafter called 'guarantor ' which term shall mean and include its successors and assigns)

IN FAVOUR OF BHARAT HEAVY ELECTRICALS LIMITED

_____ (Buyer's Name), a company registered under the companies Act, 1956 having its registered office at BHEL House at Siri Fort , New Delhi-100 049 and its Electronics Division at Mysore road, Bangalore-26 (hereinafter referred to as the 'Company' Which term shall include its successors and assigns):

Whereas the company has placed an order on _____ (State the name of the company / firm and its address) (hereinafter referred to as the 'Supplier' which term shall mean and include its liquidators, successors and assign) for the supply of system under order / Contract No _____ Dt _____.

AND WHEREAS the supplier has agreed to supply the materials and carryout the works as detailed and in accordance with the terms set out in the said order/contract.

AND WHEREAS the company is not required to pay to the supplier a sum of Rupees _____ being the 10% of the value of the goods supplied / Works performed / Services rendered under the said order / contract between the supplier and the company, till the company is satisfied with the mechanical Warranties and the performance standards stipulated in the said order / contract between the company and the supplier has been duly fulfilled, except against a Bank Guarantee for the said sum of Rs _____ in favour of the company by reputed Bank, in which case the company has agreed to make payment to the supplier of the said sum of Rupees _____ being (...%) of the value of the goods supplied / Works performed / Services rendered under the agreement between the supplier and the company and the Guarantor has at the request of the supplier, agreed to furnish this Guarantee subject to the terms and conditions stated below:

NOW THIS DEED WITNESSES THAT IN pursuance of the above said agreement, the guarantor hereby agrees and covenants With company is as follows :-

- 1) That during the period this contract of Guarantee remains effectual, the guarantor shall be liable in respect of the amount due and owing to the company in respect of the payments to the extent of Rs _____ (in words) _____ against any loss or damage caused to or suffered by the company by reasons of any breach of the terms of the said order / contract / Agreement by the supplier.
- 2) The Guarantor hereby undertakes to pay the amounts due and payable under this guarantee without any demur, merely on demand from the company intimating that the amount claimed is due by way of loss or damage caused to or suffered or would be caused or suffered by the supplier of any terms contained in the said order / contract. Any such demand made on the

guarantor shall be conclusive as regards the amount due and payable by the Guarantor irrespective of the fact whether the Contractor / supplier admits or denies.

- 3) The Guarantor further agrees that the agreement herein contained shall remain in force and effect till all the supplies to be made / Works to be performed / Services to be rendered under the said order / contract / agreement are completed to the entire satisfaction of the company or till company certifies that the terms and conditions of the said order / contract / agreement have been fully and properly carried out by the said supplier and accordingly discharges the Guarantee. Unless a demand or claim under this guarantee is made on the guarantor in writing on or before the expiry of claim period indicated in clause 6 below , the guarantor shall be discharged from all the liability under this guarantee thereafter.
- 4) The guarantor further agrees with the company that the company shall have the fullest liberty without the consent of the guarantor and without effecting in any manner the obligations of the guarantor hereunder to vary any of the terms of the said order / contract / agreement or extend the time of performance by the said supplier from time to time or refrain from exercising the power exercisable by the company against the said supplier or to forebear or omit to enforce any of the terms and conditions relating to the said order / contract / agreement, and the guarantor shall not be relieved of its liability in whole or in part , by reason of any act, commission or forbearance on the part of the company or by reason of any such variation, or extension being granted to the said supplier or by reason of any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the guarantor.
- 5) The guarantor undertakes not to revoke this guarantee during its currency except with the previous consent of the company in writing.
- 6) Notwithstanding anything herein above contained, the liability of the guarantor under these presents is restricted to Rs_____. The guarantee shall be in force till its expiry on _____ unless a demand is made on the guarantor within SIX months from the date of expiry, all the liability of the guarantor under this guarantee shall stand fully discharged. The decision of the claimant in regard to breach of contract is final and binding on the Bank.

IN WITNESS whereof, the guarantor, acting through its authorised representative has executed this deed of Guarantee on the day, month and year first above written.

(Seal of the Bank to be affixed)

WITNESS

1.

2.

ANNEXURE - F

BHEL MEMBER BANKS

PBG SHALL BE ISSUED FROM THE FOLLOWING BANKS OR THEIR BRANCH OFFICES ONLY

State Bank of India, CAG Branch 10 th Floor, Vijaya Building Barakamba Road, NEW DELHI - 110 001	Deutsche Bank, Tolstoy Marg, NEW DELHI - 110 001
Canara Bank, 74, Janpath, NEW DELHI - 110 001	HDFC Bank Ltd, 5 TH floor, H T House, K G Marg, , NEW DELHI - 110 001
Punjab National Bank, 74 Janpath, NEW DELHI - 110 001	CITI Bank NA, Jeevan Vihar Building, Sansad Marg NEW DELHI - 110 001
Bank of Baroda, Corporation Banking Branch, 11 th Floor, BOB Building, Sansad Marg, NEW DELHI - 110 001	Standard Chartered Bank, H2, Block Connaught Place NEW DELHI - 110 001
State Bank of Hyderabad, Surya Kiran Building, K G Marg, NEW DELHI - 110 001	ICICI Bank Ltd, ICICI Tower, Bisham Pitamah Marg, Pragati Vihar, NEW DELHI - 110 003
State Bank of Mysore, Antrikash Bhawan, K G Marg, NEW DELHI - 110 001	IDBI Bank Ltd, 19 K G Marg, Surya Kiran Building, NEW DELHI - 110 001
State Bank of Mysore, Industrial Finance Branch, 18, Ramanashree Arcade,, M G Road, BANGALORE 0 560 001	HSBC Ltd, ECE House, 28K G Marg, NEW DELHI - 110 001
State Bank of Travancore, Travancore House, IF Branch, NEW DELHI - 110 001	
