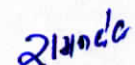
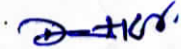


Technical Pre-Qualifying Requirements (PQR)**REF:** Replacement of obsolete feed Motor, Drive, PLC and Measuring system of H. Boring machine, Model – 2620B, Plan no. – 3/2-079, BHEL, Haridwar.

Sl. No	Description	Accepted (Yes/No)	Deviation	Remarks
1.	<u>QUALIFYING CONDITIONS</u>			
1.1	a) The Bidder must have successfully Supplied & commissioned machine tools (Horizontal Boring machine/Vertical boring machine/Planer machine/ Plano milling machine/Grinding machine/Drill Machine/Machining Center/ Lathe machine) with Motor, Drive & PLC System during last seven years as on the date of tender opening. b) The above commissioned machines should be running satisfactorily for at least 6 months prior to tender opening date. 6 months period will be calculated on the basis of commissioning certificates/ performance certificates/ e-mail from bidder's customers provided/received. c) Bidder to provide P.O. / W.O copies and commissioning/ performance certificates for satisfactory operation of the above retrofitted machines along with name, address & contact details including e-mail IDs, telephone numbers of their customer*. In case commissioning/performance certificate is not provided, e-mail confirmation from customer of bidder will be considered as commissioning/performance certificate. E-mail IDs should preferably be based on the customer's domain name. *Customer would mean the eventual user who is using the referred machine. d) BHEL reserves the right to verify the information provided through suitable means viz. e-mail, telephonically or visit of BHEL team as per the discretion of BHEL. All the papers must be self-attested by the bidder along with company seal.			<u>Bidder to provide details & comply</u>


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Name of project: Replacement of Obsolete feed motor, drive, PLC and measuring system of H. Boring machine, Model – 2620B,
Plan no. – 3/2-079

Brief About Existing Machine:

Make & model: Russian H. Boring M/c, Model 2620B. **Functions:** Drilling, Boring, countersinking, reaming, facing.

Headstock & Spindle feed (Y & Z Axes): Axis selection by selector switch. Feed powered by Siemens 611 drive with 1FT5 motor (named as feed motor) with feed, set up & rapid functions (Feed Motor Detail: Siemens brushless servomotor 1FT5102-1AF71-1FA0 Mo=27Nm Mn=25 Nm Io=25A nN=3000/min Nmax=4900/min).

Facing head Radial tool slide: Powered by the same motor fitted for headstock and spindle feed travel with feed, set up & rapid functions.

Table: No. of Axes 3 (U-longitudinal movement, V-cross movement & B-Rotary movement), Table Size: 1120x900. Max weight bearing capacity 2000 kg. Table Longitudinal & cross movement powered with same motor (fitted for feed, set up & rapid movement of Headstock & Spindle feed (Y & Z Axes) as well as facing head radial tool slide) with inching & regular operation mode. For rotary movement of the table(B-Axis) separate induction motor have been used which runs only in inching mode.

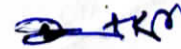
Therefore, single AC Servo Motor is being used for feed, set up & rapid movement of Headstock (Y – Axes), Spindle feed (Z -Axes), Table Longitudinal (U-Axis), Table cross (V-Axis) and facing head radial tool slide of the machine. The selection of axis is being performed by 5 position selector switch mounted on operator control desk.

Spindle Rotation: Powered by USSR make Double speed 3 phase Induction Motor Type- A61-4/2, 1470/2920 RPM, 7.5/10 KW. Mechanical RPM shifting range (1-23 steps), Spindle RPM 12.5 – 2000 achieved by 23 gear steps and double speed of motor in both directions. Spindle motor braking: Dynamic Braking Resistance Method.

Requirement: Replacement of Obsolete feed motor, drive, PLC and measuring system of machine with Latest servo drive & servo motor for feed, spindle drive for existing spindle motor, PLC, measuring system, new operator panel, new electrical cabinet and complete rewiring of machine with field devices.


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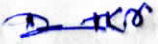

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1.0 Scope of Supply:

Sr. No.	Item description	Qty	Vendor compliance
1.1	AC Servo motor flange mounted natural cooling type of Siemens/ABB/Rexroth make of rating (Mo=27 Nm or more, Mn=25 Nm or more, Io=25A or more nN=3000/min Nmax=4900/min or more) for feed, set up & rapid operation. Any mounting brackets/flange/couplings (if require) for mounting of this motor will be in vendor's scope. <u>Vendor to note that this single AC Servo Motor will be used for feed, set up & rapid movement of Headstock (Y – Axes), Spindle feed (Z -Axes), Table Longitudinal (U-Axis), Table cross (V-Axis) and facing head radial tool slide of the machine. The axis selection will be performed by 5 position selector switch.</u> Note: -Existing Motor Detail: Siemens brushless servomotor 1FT5102-1AF71-1FA0 Mo=27 Nm, Mn=25 Nm, Io=25, nN=3000/min Nmax=4900/min	1 set	
1.2	Complete Servo Drive of suitable capacity with regenerating braking of Siemens/ABB/Rexroth make for servo motor mentioned above at S. No. 1.1 above. Drive shall have at least 4 nos. Digital Input, 4 nos. Digital Output, 2 nos. Analog Inputs and 2 nos. Analog Outputs. Note: -Existing Drive Detail: Siemens make 611A Drive (U/E Mod INT/EXT 10/25KW; PM-6SN11131AB01 -OBA0; LT-6SN1123-0AA0-OCA0)	1 set	
1.3	SWITCHGEARS FOR SPINDLE MOTOR CONTROL: 15KW VFD drive, Siemens/ ABB/ Rexroth make to run existing AC induction motor used for spindle rotation. - Breaking unit/ resistance module of same make for above drive. - As the spindle motor is of double speed (1470 RPM & 2920 RPM) and hence the offered Drive should have capability to run with two different set of parameters (One set of parameter corresponding to 1470RPM of motor & another corresponding to 2920RPM of motor). The selection of the RPM (1470 RPM / 2920 RPM) will be made through existing limit switch feedback. - Vendor to note that for one set of parameter there should be provision to vary the speed of the motor between 0 to 1470 RPM & for another set of parameter there should be provision to vary the speed of the motor between 0 to 2920 RPM.	1 set	


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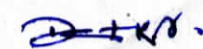

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1.4	HEADSTOCK HYDRAULIC PUMP UNIT: vendor has to supply hydraulic unit of Hydac/Rexroth/yuken/Parker /Hawe make for headstock lubrication having flow capacity 15 LPM or more at operating pressure of 5KG. Vendor has to supply Flow switch and Digital pressure switch (of above make) for operating range 0 to 30KG pressure.	1 set	
1.5	Pre-assembled cables for AC servo motor: Siemens / Lapp make preassembled signal & power cables of approximate length 10 mtrs each for motor supplied against para No. 1.1 above.	2 set	
1.6	A.) DC Power supplies: Siemens/ Phoenix/ Schneider/ Meanwell/M-system make regulated din mounted DC Power supplies 1) 24V/12.5A for Clutches -----2 Nos. 2) 24V/12.5A for PLC I/Os. -----2 Nos. 3) $\pm$ 10VDC for Drive reference.....2Nos. B.) 10K multi turn digital POT of Accu-Dial make - 5 Nos.	1 Set	
1.7	PLC: Latest Siemens/ABB make PLC consisting of one CPU & at least 80 DI & 56 DO along with other accessories.	1 Set	
1.8	RELAY BOARD: Phoenix/ Schneider make fusible Relay module each with 8 relays to provide supply to field devices, contactors, indicating lamps etc. All PLC power outputs to be routed to the machine through these Relay boards.	7 set	
1.9	Operator panel: Design and supply of operator panel with engraved front plate (Anodized Aluminium 3 mm thick) having all the existing functions, incorporating the following items a) Control On PB, control OFF PB, (LED illuminated type) Drive Reset Button, Emergency off PB b) Inching & regular rotation SS, Spindle rotation forward & reverse PB, stop PB, 10K multi turn digital POT of Accu-Dial make. c) 5 position selector switch for Axis selection (Table Long/Table cross/Head stock/ Spindle feed/Face plate) d) Axes FEED/SETUP/RAPID SS, Feed regulator 10K multi turn digital POT of Accu-Dial make. e) Feed forward, Feed reverse & feed stop push button f) Three position TOGAL switch & LED illuminated push button for manual feed of selected axis (Table Long/Table cross/Head stock/ Spindle feed/Face plate) g) M/c light SS & any other switch/function found necessary at the time of finalization of operator panel design. h) Drive Fault indication/Fault reset push button Final lay out of the operator panel shall be approved by BHEL before dispatch of material Note:-	1 Set	


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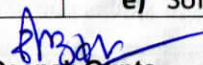
	1. All the above supplied push buttons should be LED illuminated type and they get illuminated while operating them as per functional requirements of the machine. 2. For first position of TOGAL switch after pressing the manual feed push button the selected axis (Table Long/Table cross/Head stock/ Spindle feed/Face plate) will run with the help of manual lever at slow speed & for second position of TOGAL switch manual operation of only spindle feed will take place with comparatively higher speed and manual feed of remaining axis will not work. For third position of TOGAL switch no any axis will move in manual feed mode.		
1.10	Electrical Panel: a) Rittal make fitted with fans for proper cooling & Pre wired with PLC, Tube light for illumination while door opened, 5 Amp service socket & Electronic braking unit etc. b) Rotary Power dis-connector of 100A rating for mains power switching On/off. c) Siemens/ Schneider/ GE / ABB make switchgear (25% overrated than existing load) (Single phase preventer, MCBs, Overloads, Automats, Contactors, and Relays etc.) d) Control voltage isolation transformer (415V to 24V AC) for switchgears inside panel of suitable rating (control voltage must be 24 Volt DC inside the cabinet). e) Copper Cable of 3.5 cores of reputed make and suitable rating (approx 20 mtr length) routed through underground conduit for connecting Control panel to Main power supply along with proper laying and termination. f) Copper lugs and copper wires for wiring inside panel. g) The cabinet shall have digital energy meter, preferably of Siemens SENTRON-make to measure active, reactive, apparent power, level of harmonics, voltage & current. Energy meter shall be supplied along with CT. h) GI/MS Flat/wire for Earthing of whole machine along with panel to be connected to existing earthing point/column (approximate length 50m).	1 Set	
1.11	ELECTRICAL WIRING AND CABLING Complete laying for the whole machine including all power cables for induction motors, power & signal cable for servo motor, control & signal cables for micro switches, Limit switches, pressure switches, indicating bulbs, TBs, JB's required for the commissioning of the above package. The cables and wiring is required to be of Lapp/ Finolex make.	1 Set	
1.12	LIMIT/MICRO SWITCHES/PUSH BUTTONS/ SELECTOR SWITCHES/ INDICATION LED: a) End Limit switches for headstock, Spindle feed, table cross & longitudinal movements. b) All of the Limit & Micro switches irrespective of its condition and location. c) Standard Push buttons / selector switches/ LED indication lamps of Siemens/L&T make only having dia 22.5 mm. Note: The Limit & Micro switches supplied above should be of Siemens/BCH/ L&T make only.	1 set	

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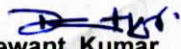
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1.13	Conduits: - Metallic rubberized leak proof conduits with glands for all the cables including cables in the drag chain as well as control cables. 20-meter Metallic leak proof conduits of dimension about 29mm*34.5mm 20 Nos. of Metallic glands of suitable size for fitting properly on the metallic conduit supplied against para no. (b) above. Drag Chain: IGUS/ Kableschlepp make of suitable size and length for table longitudinal movement.	1 Set	
1.14	Machine lights: LED machine lamp of 45Watt / 230V rating to be mounted on the machine column top.	1 Set	
1.15	Measuring System of Heidenhain/ Fagor /Electronica-make for Position Feedback: (These feedback signals shall be used for display of traverse position of all the Axes on DRO). - Digital Read Out for 3 axes;7-digit display having calibration feature and accepting TTL input complete with power cord for display of positions of table longitudinal travel, table cross travel & Head stock travel. - Linear Magnetic/Glass scale with sensor and housing to provide protection against dust, oil and coolant for traverse length of 1290 mm; Resolution 5 microns, Accuracy +/- 10 µm per meter; for longitudinal travel of table. - Linear Magnetic/Glass scale with sensor and housing to provide protection against dust, oil and coolant for traverse length of 1430 mm; Resolution 5 microns, Accuracy +/- 10 µm per meter; for the cross travel of table. - Linear Magnetic/Glass scale with sensor and housing for traverse length of 1180 mm; Resolution 5 microns, Accuracy +/- 10 µm per meter; along with a protective tape for the vertical traverse of the headstock. - Shielded and armored Signal cables of suitable length for interfacing of scale signals with DRO. Cables shall be preassembled with required connectors. - Isolation transformer of suitable VA rating, 415 V/220V for DRO supply. - Brackets/supports/guides for mounting of the scales and sensors shall be supplied by the vendor. Desired accuracy of the scales shall be demonstrated on the machine. Sufficient number of matching male and female connectors and cable shall be included in the supplies to take into account extension cables which are likely to be connected to the sensor cable.	1 set	
1.16	Documents & backup: as per the following details: - Hard copy of Electrical wiring, layout diagram, PLC program with cross reference and comments----- 3 copy each. - Hard copy of drive's parameter, installation and commissioning and troubleshooting manual ----- 3 copy each. - Hard copy of all the drawing of flanges / couplings used for motor mounting. ---3 copy - Soft copy of all above documents and backup of final PLC program on 32 GB pen drive - 1 no. - Software and cables required for taking back-up and editing of PLC program with USB port of Laptop.	1 set	


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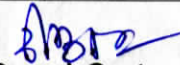

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	f) Software and cables required for taking back-up and commissioning of drive with USB port of Laptop.		
1.17	<u>OTHER FEATURES:</u>		
1.17.1	Design and supply of intermediate flanges, couplings and any other parts required for motors mounting are in the scope of supply.	1 Set	
1.17.2	Set of keys for Electrical cabinet & Operator Panel locks.	2 Sets	
1.17.3	Lapp make hose pipes, DIN rails, cable ducts, insulated lugs, printed ferrules and other material required for the wiring of machine, Electrical & Operator panels as per requirement.	1 Set	
1.17.4	Party shall supply all clamps, fixtures and fasteners required to complete the replacement work.	1 Set	
1.17.5	Vender has to supply all the material stated above, even if it is not required in vender's scheme for retrofitting. Any other material required for retrofitting of the machine and not covered here has to be supplied by vendor without any cost to BHEL.		

2.0 SCOPE OF WORK

S.No.	Activities	Vender compliance
2.1	Dismantling and removal of old Electrical panels, operator panel switch gear along with old cabling and wirings.	
2.2	Cleaning of complete machine, trench and its accessories.	
2.3	Installation of new electrical panel along with the PLC. The Location of Electrical panels are as below: a) Single Main panel at the vacated position incorporating drives, switch gear for axis & table control, items required for machine spindle forward and reverse rotation & braking system, relays boards, PLC, switchgears etc. with door mounted ACs of adequate capacity.	
2.4	SPINDLE MOTOR CONTROL: The spindle motor is to run at double speed (1470 RPM & 2920 RPM). The selection of the RPM (1470 RPM / 2920 RPM) will be made through existing limit switch feedback. depending upon selection of gear by operator, it should follow the below defined conditions: a) The motor will run in lower or higher RPM is decided by combination sequence of three micro switch individual positions. b) Command for stopping motor is to be ensured if gear is to be shifted without stopping the spindle rotation motor.	

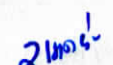

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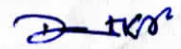

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	c) If the micro switches combination decides to run motor in higher RPM, even in that case the motor starts in lower speed and later shifted to High RPM with the help of Timers. The motor switchgears must provide inching operation mode and should provide braking facility for instant stop when stop command is given.	
2.5	SAFETY INTERLOCKS: a) Any feed must not get started until the spindle is in rotation mode. b) The jog mode must be provided with spindle motor to ensure proper shifting and motor must take run command for regular mode after taking feedback of proper gear shifted. c) All of the axis (Y, Z, and U, V) travels must be interlocked with end limit switches to avoid any over travel to reach mechanical stops. d) The emergency button must off the complete control voltage to avoid any accidents. f) The main spindle rotation motor must stop if gears are disengaged for gears shifting. g) Any abnormality on the machine should be indicated by indicating lamp, PLC alarms. h) All of the operations/selections must have their indications on the control panel by illuminated type push buttons with LEDs.	
2.6	Design, manufacturing and Installation of new operator panel supplied as per 1.9 of Scope of Supply. Note: Vender has to get approval from BHEL for design & mounting system with location of new operator panel prior to its manufacturing.	
2.7	Complete Cabling and wiring of PLC, Drive system, spindle motors, Operator panel, field devices. Laying and routing of new conduits, cables from electrical panel to machine and operator console. Refurbishment and rewiring of all the terminal boards, Junction Boxes etc.	
2.8	Demonstration of all functional features of newly wired Machine. Prove-out of the auxiliary functions (facing head, tool slide, Table movement, lubrication of spindle gear box etc.).	
2.9	Development of total new electrical scheme to control the spindle rotation with braking and its interfacing with mechanical gear changing and ensuring of proper shifting.	
2.10	Complete wiring of machine switchgears and synchronizing its operation simultaneous with spindle rotation.	
2.11	Design and development of any mechanical/ electrical / electronic modifications wherever / if required to execute the above work.	
2.12	<i>Any minor work not covered in the scope of work but later found necessary for the completion of the project shall be executed by vender without any additional charges.</i>	

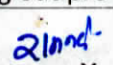

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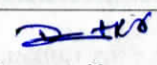

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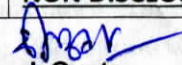
3.0	WARRANTY: Party shall stand warranty for all the supplied material and work done for a period of one year from the date of successful commissioning of the material and final acceptance as per clause no. 5 & 6.	
4.0	TRAINING: Party shall impart training to BHEL staff for Operations of machine to 2 no. of operators for 3 days at BHEL works.	
5.0	PROVE-OUT OF MACHINE FUNCTIONS: Demonstrations of following a) Spindle rotation functions in inching & regular mode, CW/CCW rotation, Single to double speed changeover and braking. b) All axes in feed, set up & Rapid function up to desired travel speed. c) Over travel limit switches.	
✓ 6.0	FINAL ACCEPTANCE:	
6.1	Party shall undertake commissioning of all the supplied components at HEEP, BHEL, Hardwar. All material required for commissioning of the system with the machine shall be arranged by the party free of cost and obligation. All commissioning materials shall be arranged by party for successful running of the machine.	
6.2	Existing machine logic, Electrical logic and technological processes have to be retained.	
6.3	Final Acceptance shall be at HEEP, BHEL, Haridwar after: a) Upon completion of the scope of supply and scope of work at BHEL. b) Final acceptance shall include clearance of all pending issues related to the contract. c) Successful commissioning & Demonstration of various cycles and control functions as envisaged in the technical scope. Party shall demonstrate operation of all parts of the system supplied along with all the features of the machine. After settlement of all pending issues related to the purchase order, a certificate for Completion of works in all respect shall be released within 15 days by Production and Maintenance personnel of BHEL which will be the referred document for Final Acceptance and final payment to the Bidder.	
7.	DELIVERY: (IF DELIVERY PERIOD IS NOT OFFERED/ ACCEPTABLE, OFFER WILL BE REJECTED):	
7.1	Execution of Project: 30 days from date of release of machine for work. The delivery period of work for the purpose of LD as per clause 8 shall be considered from the date of handing over of the machine to vendor for start of work to the date of final acceptance.	
8.0	LATE DELIVERY PENALTY (LD) CLAUSE:-	
8.1	As per clause 9 of standard "General instruction and standard terms and condition for bidding against tender enquiry (GISTC)". LD will also be applicable for delay in works (as per clause no. 7.1 above). Any delay due to reasons attributed to BHEL will not be accounted in delivery period. This period will be excluded for the purpose of calculating LD. For more details check the following link: https://www.bhelhwr.co.in/bhelweb/uploads/GISTC_IND_TE_Ver_Sept18.pdf	
9.0	PRE-DISPATCH INSPECTION:	
9.1	Pre-dispatch inspection of all the items covered under Scope of Supply clause 1 shall be carried out by BHEL representatives at party's works.	
9.2	Supplier shall formally invite BHEL for carrying out pre- dispatch inspection.	

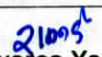

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9.3	Before inviting BHEL for pre dispatch inspection vendor will submit Bill of material(BOM) & copy of electrical drawing/ schematic of machine for scrutiny at least 7 days prior to the proposed PDI date.	
9.3	Deputed BHEL persons will do pre acceptance at vendor works and give despatch clearance.	
9.4	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.	
10.0.	<u>VENDOR'S OBLIGATION:</u>	
	The vendor shall bring all types of hand tools including pneumatic/electrical drill machines, Laser equipment's, and grinders along with general purpose measuring instruments and testing equipment with them for successful commissioning of the machine & supplied system.	
11.0	<u>BHEL'S OBLIGATION:</u>	
11.1	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.	
11.2	Crane facility and lifting tackles like slings, rope, D-Shackles shall be made available while working in BHEL premises only.	
11.3	Facilities of minor welding, brazing, minor machining facility required for rectification/fitting of supplied material, subject to the extent available in BHEL, shall be provided in BHEL premises only.	
11.4	Any civil work required for the erection of panel shall be done by BHEL.	
11.5	Electrical Input Power Supply: 415 volt $\pm$ 10 %; 50 Hz, 3 phase, 3 wire A.C. power supply, water & Compressed air at a pressure of 5 kg./cm ² shall be provided by BHEL at one point only.	
11.6	Consumables like lubricants, kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises.	
11.7	The above requirements should be informed by the vendor in advance.	
12.0	<u>GENERAL CONDITIONS:</u>	
12.1	A point wise compliance statement shall be submitted by the party with reference to the above scope of supply against each clause/ sub-clause with relevant details & comments. Non-compliance to any of the clauses & quoting inadequate quantity can lead to dis-qualification of the offer.	
12.2	The Vendor is advised to inspect the machine prior to quoting to ascertain all the relevant details required for successful completion of the work.	
12.3	The Vendor should submit their best price at this stage itself and they will not be allowed to revise the price. Any revision / discount given by the vendor subsequently will be ignored.	
13.0	<u>INTELLECTUAL PROPERTY RIGHTS:</u> Each party shall retain its unrestricted right title, ownership and interest in its intellectual property. Nothing in this work shall be construed to grant to the other party any right or license in the intellectual property right of the other party.	
14.0	<u>NON DISCLOSURE AGREEMENT</u>	

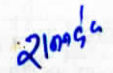

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All drawing and Technical Documents relating to the product or it's manufacture submitted by one party to the other, prior or subsequent to the formation of contract, shall remain property of the submitting party. Drawing technical documents or other technical information received by one party, shall not without the consent of the party, by used for any other purpose than that, for which they were provide. Such technical information shall not without the consent of the submitting party, otherwise be used or copied, reproduced, transmitted or communicated to a third party. Patterns supplied by BHEL will remain BHEL' s property which shall be returned by the bidder on demand to BHEL. Bidder shall in no way share or used such intellectual property of BHEL to promote his own business with others. BHEL reserves the right to claim damage from the bidder,,or take appropriate penal action as deemed fit against the bidder, for any infringement of the provisions contained herein.


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