

Technical Specification for 10 MTPH Gas Fired Boiler			Vendor to Confirm/specify/submit	Deviation
1.0 DESCRIPTION				
1.1	Boiler should be horizontal, three pass, fully wet back, smoke tube steam boiler, with reversal chamber, hinged ceramic lined front doors, smoke chamber with soot cleaning door, one Manhole, two head hole on the boiler shell to inspect the internal of the boiler, one access opening at the back of the IRC to inspect the internal of the furnace, automatically controlled, with dual/mono block gas burner capable of firing Natural gas, provision of LDO firing, Skid mounted.	Bidder to confirm		
2.1	Boiler should be complete with all mountings, accessories, controls etc.	Bidder to confirm		
3.1	Boiler construction should be in accordance with the latest revision of Indian Boiler Regulations 1950. All materials used should be approved and tested as per relevant existing codes. All the welded joints should be as per code requirement.	Bidder to confirm		
4.1	Boiler should be designed and constructed to generate steam at efficiency of 92 +/- 1% on net calorific value (NCV) basis. Efficiency should be demonstrated as per standard BS - 845 part 1-indirect method.	Bidder to confirm		
1.1 TECHNICAL SPECIFICATION				
1	Boiler Type	Three pass wet back smoke tube boiler		
2	Design Code	IBR		
3	Capacity Steam Output F & A 100 °C	kg/hr 10000		
4	Design Pressure (Min.)	kg/cm2 (g) 10.5		
5	Safety valve set pressure	kg/cm2 (g) 10.5		
6	Efficiency on NCV as per BS845 on 100% LDO firing only (With HRU)(Min.)	% 92		
7	Efficiency on NCV as per BS845 on 100% NG firing only (With HRU)(Min.)	% 92		
8	Dryness Fraction (Min.)	% 98		
9	Heat Output	kcal/hr Bidder to quote		
10	Volumetric Heat Release Rate	kcal/hr.m3 Bidder to quote		
11	Fuel	NG		
12	NCV of fuel considered -NG	kcal/NM3 8500		
13	Fuel Consumption -NG	Nm3/hr Bidder to quote		
14	Fuel consumption at maximum output - NG	Nm3/h Bidder to quote		
15	Fuel supply rate - pressure and flow rate	m bar & kg/hr Bidder to quote		
16	Electric Supply	AC, 3Phase, 415+/-5%V, 50+/-3% HZ, 4 Wire System		
17	Feed water pump motor	kw Bidder to quote		
18	FD fan motor	kw Bidder to quote		
19	Heating surface area - Boiler	M ² Bidder to quote		
20	Length	mm Bidder to quote		
21	Width	mm Bidder to quote		
22	Height	mm Bidder to quote		
23	Approx. Dry weight	Kgs Bidder to quote		
24	Flooded weight	Kgs Bidder to quote		
25	Burner turn down ratio	1 : 3 Bidder to confirm		
26	Safety valve (Inlet/Outlet) size	mm Bidder to quote		
27	Quantity of safety valves - 2nos	Nos Bidder to quote		
28	Main stop valve size	NB Bidder to quote		
29	Blow down valve size	NB Bidder to quote		
30	Auxiliary valve size	NB Bidder to quote		
31	Water level gauge - Twin column type, size	NB Bidder to quote		
32	Flue gas outlet flange - dimensions mm	mm Bidder to quote		
33	Flue gas duct dia	mm Bidder to quote		
34	Feed water pump type/make vertical multistage stainless steel centrifugal pump		Bidder to quote	
35	Feed water pump head	meter WC Bidder to quote		
36	Feed water flow	LPH Bidder to quote		
37	Total connected load	kw Bidder to quote		
38	Chimney height	meter Bidder to quote		
39	Type of foundation		To be mentioned	
40	Foundation for feed water pump		To be mentioned	
1.2 Preferred Make of bought out components				
MECHANICAL				
1	Feed pumps		To be mentioned	
2	Direct Water level gauge		To be mentioned	
3	IBR Plates		To be mentioned	
4	Tubes (ERW)		To be mentioned	
5	Burner		To be mentioned	
6	VALVES		To be mentioned	
7	IBR valves		To be mentioned	
8	Safety valves		To be mentioned	
9	Blow down valves		To be mentioned	
ELECTRICALS				
1	Motors	ABB / Siemens / GE / Rockwell Automation / Bharat Bijlee / Marathon / Kirloskar		
2	Relays / Circuit Breaker / MCCB / MCB / Contactors / Lamps / PB / SFU / Timer / Fuses	ABB / Siemens / L&T / Schneider / GE / Legrand		
3	Switches	Kaycee / Salzer / ABB		
4	Meters	AE / Secure / Rishabh / Schneider / L&T		
5	PLC, SCADA, HMI	Siemens / ABB / Allen-Bradley		
6	Control & Power Cables	KEI / Havells / Polycab / Finolex / Gemscab / Cords		
7	Terminal Blocks	ABB / L&T / Elmex / Connectwell		
8	Desktop PC	Dell / HP / Lenovo		
INSTRUMENTS				
1	Temp. gauges	E&H/Baumer/Honeywell/Wika/Yokogawa		

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2	Pressure gauges	E&H/Baumer/Honeywell/Wika/Yokogawa		
3	Thermocouples	E&H/Baumer/Honeywell/Wika/Yokogawa		
4	Pressure Switch	E&H/Baumer/Honeywell/Wika/Yokogawa		
5	Pressure Transmitter	Wika/Edward/Pfeiffer/honeywell/Yokogawa		
6	RTD	E&H/Baumer/honeywell/Wika/Yokogawa		
7	Fusible Plug	To be mentioned		
8	Level Gauge	Honeywell/Yokogawa		
9	Level switch	E&H/Truman/Honeywell		
10	Limit switch	BCH/Siemens/ABB/L&T/Honeywell		
11	Draught gauge	Wika/Switzer/honeywell/yokogawa		
12	Vortex Flow meter(Steam & water)	ABB/Yokogawa/Honeywell/E&H		
13	Digital Multimeter	Fluke/Hicki/Keysight		
1.3 SCOPE OF SUPPLY				
1	Gas fired package boiler complete with all accessories as specified such as fuel system, FD fan, boiler mountings, motors, starters, etc. Foundation bolts for all items to be supplied.	By supplier		
2	Fined Tube Economizer with casing, tubes & headers and stubs & attachments	By supplier		
3	Two nos. feed water pump of adequate capacity and rating complete with motor, stators etc. Piping from feed water header to Pump Inlet, required Valves and Strainer in the feed water line. Feed water piping from feed water pumps to inlet of Economizer & from economizer outlet to Shell inlet, Pressure gauges at outlet of pumps, Isolation valves for pressure gauges.	By supplier		
4	In Gas firing system the burner offered is Pressure jet burner of step less modulation type. The burner fires the gas into the furnace. A flame sensor on the burner as a part of flame failure safety control, Burner with combustion air fan, Servomotors for gas valve, air damper & combustion head optimizer Ignition transformer and Ignition electrodes, Gasket for burner flange, Gas flow meter, VFD on FD Fan	By supplier		
5	Gas Train to regulate the Gas Pressure from 2.5 bar to 100-150 mbar. Gas Train should consists of double shut of valves, Automatic leakage detector for main gas valves (pressure switch) Ignition gas valve (Pilot valve), Pressure switches for gas (min, max), Gas Filter, Safety Relief Valve, Gas flow control valve	By supplier		
6	ELECTRICAL CONTROL PANEL Power cum control panel, free standing type confirming to IP 42 with MCB/MCCB. The panel should be made out of 14 / 16 SWG CRCA sheets, metal clad, dust & vermin proof, powder coated, Siemens gray color and with neoprene gaskets. Power & Control section physically isolated with partition plate, power section provided with a main incomer Isolating switch with MCCB, required switch gears for all the feeders housed in the power section, burner management system along with necessary start stop button, auxiliary contactor, and control circuit of all motors, indication lamps & hooter for the alarm, thermal Overload Relays, MCB's and Contactors should be housed in the control section.	By supplier		
7	PLC BASED CONTROL PANEL The PLC Control Panel shall comprise of centralized Hot-Redundant Failsafe dual CPU in fully wired panel with pluggable type DIN rail mounted interposing relays in a ready to connect state to the field I/Os. Redundant power supply at each level (such as CPU rack, I/O Racks), together with all Panel Accessories.	By supplier		
8	PLC Panel Enclosure: 1 no. a) A fully wired electrical control panel of suitable size housing complete PLC system, I/O modules, power supplies, relays contactors, fuse, TB etc. along with other accessories as per requirement. b) The TBs, relays, modules installed in the panel should be properly tagged, wires should have printed ferrules, all control cable should be properly dressed and routed through cable trays. c) Aux 240VAC single phase socket point inside PLC panel should be provided. d) Panel Illumination LED lamp 20W through door close switch for each section. e) Input Supply 415 VAC. Suitable 415V/230V Isolation Transformer shall be provided. f) Panel AC: Rittal make Panel AC of suitable capacity. Enclosure Acceptable Make: Rittal/BCH/ABB/Schneider	By supplier		

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9	<p>PLC CPU Rack: The fault tolerant PLC shall comprise of the following:-</p> <ul style="list-style-type: none"> i) Hot-Redundant Failsafe CPUs: 2 Nos ii) Independent Power Supply module for CPU: 2 Nos. iii) CPU racks: 2 Nos. iv) Memory Card suitable to project requirement, 2 Nos. v) Backup battery for the CPUs: 2 Nos. <p>PLC acceptable makes: Siemens /Schneider/ABB/Allen-Bradley only.</p>	By supplier		
10	<p>PLC Input, Output Rack: The PLC I/O Rack shall comprise of the following:-</p> <ul style="list-style-type: none"> i) I/O Rack Power Supply Module: As per requirement ii) 24 VDC Digital Inputs : As per requirement iii) 24 VDC Digital Outputs. As per requirement iv) Analog Input 16 bit resolution: As per requirement v) Analog Outputs 16 bit resolution: As per requirement. x) Input/Output rack suitable for above I/O's. <p>Note: All field Connections to be wired to PLC Inputs/Outputs shall be routed through fused TB's having fuse failure indicator.</p>	By supplier		
11	<p>Accessories of PLC: The PLC shall be supplied with the following accessories:</p> <ul style="list-style-type: none"> i) Interface for Tele-diagnostic service support through internet for troubleshooting of PLC system. ii) PLC programming software with communication adapters/cables, Lifetime license key/dongle, CD etc. including all software required to program PLC and HMI stations, third party device. 			
12	<p>DIN rail mounted PLC-INTERFACE Relay: All the PLC outputs shall be wired to the field, through PLC-INTERFACE Relay for protection against interference currents or interference voltages on the control side. Consisting of basic terminal block with Push-in connection and plug-in miniature relay with power contact of 6A and 10 A, 230 V AC changeover contact as per requirement.</p> <p>Typical specs shall be as follows:</p> <ul style="list-style-type: none"> a) Coil Voltage: 24VDC b) Contact Single Changeover Contact (Main contact silver tin oxide (AgSnO2), lead contact tungsten) <p>Acceptable makes: Phoenix Contact/Siemens/ABB/Schneider/Allen-Bradley.</p>	By supplier		
13	<p>1 KVA Online UPS system for PLC panel: 1 No.</p> <ul style="list-style-type: none"> a) UPS Type: True Sinewave Online UPS. b) Backup: 60 Min c) Battery: Sealed SMF battery bank. (inclusive) d) Technology: IGBT based control. e) Input: 230VAC, 1-ph, +/-10% f) Output: 230VAC+-1% Sinewave. f) Battery Rack: suitable for housing all SMF batteries, h) Other accessories: I/O cables, battery isolators and AC power distribution board. i) Acceptable makes <ul style="list-style-type: none"> - UPS make.- Microtek/Luminous/Emerson/APC/Aplab. - Battery make- Exide, Yuasa, Panasonic. only. 	By supplier		
	HMI TOUCH PANEL AND ASSOCIATED ITEMS FOR CONTROL DESK:	By supplier		
14	<p>Fully configurable 22" color HMI Touch Panel is to be installed on the Control panel. They shall be supplied housed in a Sheet Metal/Moulded PVC enclosure such that it ergonomically gells with surrounding. In addition one 27" All-in-One Desktop PC will be required for overall operation and monitoring of Boiler and PLC programming/troubleshooting. The HMI Panel and 27" All-in-One Desktop PC shall communicate with PLC over Ethernet.</p> <p>Detailed Specifications and Scope of Supply for HMI and its communication network are as under:</p>	By supplier		

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15	<p>Fully configurable 22" color HMI Touch Panel: 1 Nos This HMI shall be suitable for configuring MIMIC Screens for Independent Control, Visualisation & Metering of boiler and its associated auxiliary equipments. MIMICS of Functions like boiler steam pressure control, drum water level control, burner sequence control, controlled shutdown, flame failure monitoring, burner interlock, Feeder ON/Off, alarms and interlocks, Flue gas temperature and all Line Instrumentation parameters, Feedbacks, selections, DI/DO/AI/AO values, steam parameters, Gas usage metering, Steam totaliser values etc of Boiler system are to be configured on the HMI & SCADA panel. The typical specification for HMI shall be as under:</p> <p>a) Display: Widescreen TFT, 16 million colors, LED backlighting. b) Size: 22" c) Resolution (W x H in pixels): Minimum 1,280 x 800 d) MTBF ⁹¹ backlighting (in h): Minimum 80,000 Hrs e) Process Functionality: Process Pictures, Tags, Vector Graphics, Bar charts, Trend diagram, Faceplates. f) Connectivity: With standard PLC over ethernet/Profinet g) Programming/Configuration: With any SCADA or dedicated software. h) Input Power Supply 230VAC/24VDC. If 24VDC model is offered, suitable Regulated Power supply shall be considered for HMI i) Acceptable makes: Siemens /Schneider/ABB/Allen-Bradley only. Further PLC and HMI should be of same make</p>		By supplier		
16	<p>27" All-in-One Desktop PC: This PC shall be used for overall display of selection, control and status of boiler & Auxiliary equipments's. Necessary MIMIC screens will have to be configured for the purpose as per BHEL requirement during commissioning. This PC shall be equipped with licenced fully functional SCADA package for display, configuration and online diagnostics of the PLC System by Operator /Engineer. This PC shall also communicate with PLC over Ethernet/Profinet. Typical Specification of All in One 27" FHD Desktop PC shall be (11th Generation Core i7 Processor/ 16GB RAM/1TB SSD/2GB Integrated Graphics/OS : Windows 10 + MS Office). Acceptable make: Dell/HP/Lenovo</p>		By supplier		
17	Operator Desk with 2 chairs. Acceptable makes: Godrej/Durion		By supplier		
18	<p>Wiring Accessories: All the accessories like Cable glands, Cable markers, Ferules, Lugs, Legends for Control & Signalling devices of 2.3.1 & 2.3.2 etc as per requirement shall be in scope of vendor.</p>		By supplier		
19	<p>PLC/SCADA/HMI :SCOPE OF WORK: PLC Programming as per BHEL requirement for safe selection, control and visualisation of Supplied 10MTPH Boiler and its associated Auxiliaries/equipments from SCADA control desks & HMI.</p>		By supplier		
20	Design and development of HMI Screens for Boiler operation, Visualization and control, MIMIC Screens shall be ergonomically designed having Complete realtime information of critical parameters. Separate Screens shall also be provided for DI/DO/AI/AO live status in SCADA for troubleshooting purposes.		By supplier		
21	Faults/Error Messages will have to be configured for easy fault identification and diagnosis.		By supplier		
22	Commissioning and proveout of complete system. All interlocks to be checked and validated for their effective functioning by physical operation.		By supplier		
23	<p>Other Instruments Steam totaliser Flow Meter Feed Water totaliser Flow Meter Oxygen Analyzer Online stack monitoring system (Sox, Nox) Drum Level Controller Pressure Transmitter on Shell Fluke Digital Multimeter</p>		By supplier		
24	Feed Water Tank of 30 KL capacity with supporting structure. Atmospheric Deaerator Head & Steam injection system.		By supplier		
25	LP dosing system consists of Dosing pump with 100 ltrs. tank, valves and fittings, Motorized Agitator		By supplier		
26	Supply of Inter connecting piping, Drain & vent piping for safety valve discharge to atmosphere, Boiler air vent to atmosphere, Shell drain & Continuous blow down to blow down pit, Mobrey and gauge glass drain, Common drain to blow down pit, Sample Cooler with piping for Blow Down piping, fittings etc.,		By supplier		
27	Items required for installation, commissioning & start up of boiler		By supplier		
28	Insulation & cladding on boiler, flue gas duct, steam piping, water piping, drain vent piping		By supplier		

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29	Self-supported chimney made out of MS sheet of 30-mtr height with suitable diameter. Chimney shall be complete with step ladder up to 30 mtrs, aviation lamp (Neon), lighting arrestor, necessary foundation bolts & platforms at suitable heights. Chimney to be painted internally and externally with heat resistance anti corrosive paint.		By supplier		
30	Power cabling from control panel to all drive motors for boiler, cable armored with copper conductor Control cabling from control panel to boiler mounting instruments, cable armored with copper conductor		By supplier		
31	Earthing GI flat 25mm x3mm, Earth Pits		By supplier		
32	Lighting (indoor & outdoor as required), Lighting fixtures, Switchboards, Ceiling Fans, Wall Mounted Fans, Exhaust Fans as required		By supplier		
33	Cable tray for above cabling		By supplier		
34	Structural supports for cabling tray, ducting, piping		By supplier		
35	Ladder & catwalk to operate the valves & fittings mounted on the boiler		By supplier		
36	Accessories - List to be provided		To be mentioned		
37	Mountings & Fittings - List to be provided		To be mentioned		
38	Test certificates - After placement of P.O. and at the time of commissioning conformation to be provided.		To be mentioned		
39	P & I Diagram, General Arrangement and terminal point / Hook Up drawing, Foundation drawings for all equipment and boiling house layout, Boiler control Panel SLD diagram, Boiler Control Logic detail and diagram Installation, operation and Maintenance Manual (3 Copy+ 1 soft Copy)		To be mentioned		
DOCUMENTATION:					
40	Complete Electrical Schematic Drawings, PLC Project backup file, HMI & SCADA project backup file in Soft copies with comments in English, PDF copy of PLC Ladder and screens of HMI/SCADA, all loaded in one USB 32GB Pen drive. Ghost image backup of SCADA PC for system restoration in case of PC's hard disk failure. A spare hard disk loaded with above Ghost image file is to be supplied. Note: *All the documentation/backup files etc shall be "As finally Commissioned" **PLC project backup should not be password Protected.				
41	A complete set of IBR drawings and we will furnish documents certified by the Inspecting Authority of the State of its origin. Boiler IBR Folder at the time of dispatch (original)		To be mentioned		
42	1. Training of user's for plant operation and Maintenance. 2. PLC & SCADA Project backup/restore/online diagnosis training to Electronics maintenance.		To be mentioned		
1.4 SERVICES					
1	Installation & Commissioning of the boiler The erection & commissioning of the items as supplied under this specification is the responsibility of executing party, to the satisfaction of the customer. Erection shall be carried out according to well-established practices. Providing erection tools tackles. Hoists, derricks, slings scaffolding, rigging tools, welding sets, instruments, appliances, consumables etc. required for erection, inspection, testing and commissioning to accomplish the work, Providing complete supervisory personnel. Ensuring pre-commissioning checks, trial run of all rotating equipment		By supplier		
2	IBR Approval of boiler upto provisional firing order.		By supplier		
3	All IBR formalities at site and its registration		By supplier		
1.5 GUARANTEES					
1	The boiler should be guaranteed for trouble free operation for a period of 2 year from the date of handing over.		By supplier		
2	Performance guarantee runs should be conducted as per BS 845 part1 -1987 indirect test method after one month of continuous trouble free operation		By supplier		
3	Any defect due to faulty material / bad workmanship should be rectified free of cost to the entire satisfaction of the purchaser.		By supplier		
1.6 SAFETY INTERLOCKS					
SI No	Unsafe condition	Instrument	Action		
1	Low water level in the boiler	Water Level controller	Alarm & burner trip		
2	Extra low water level in the boiler	Fusible plug	Fusible plug blow, burner trip, boiler trip & FD fan stops		
3	Flame failure	Flame sensor	Alarm & burner trip		
4	Steam Pressure high	Pressure Transmitter	Burner Modulates the gas firing		
5	Steam pressure very high	Safety valve	Lift		
6	Gas Pressure Low	Pressure Switch	Burner trip		
7	Combustion air pressure low	Pressure switch	Alarm & burner trip		
8	Stack temp. high	Temperature switch	Alarm & burner trip		
1.7 INSTRUMENTATION					

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1.0 DESCRIPTION					
1	Water level controllers	2nos	For feed water operation and low water level alarm		
2	Over-ride controller	1no	for lock-out under extra low water level alarm		
3	Steam pressure gauge with cock	1no	For display of boiler steam pressure		
4	Water level gauge assembly	2nos	For display of water level in the boiler		
5	Switch gears, relays, connectors	1set	For individual controls of equipment through control panel		
6	Audio / visual alarm	1set	In case of unsafe operation for lock-out under extreme conditions		
7	Pressure and temp. gauge with thermostat	1set	For burner operation		
8	Control panel	1no	For housing above instruments and switch gears		
9	Steam to fuel ratio monitoring system	1no	To monitor and display the boiler efficiency on-line, using necessary meters, instrumentation and hardware		
2.0 BATTERY LIMITS -SUGGESTED					
1	Feed water	Inlet of common Feed Water Tank			
2	Steam	At the junction of existing steam line (less than 50m from MSSV outlet)			
3	Exhaust Steam/Air vent	Up to safe Elevation (1 mtrs above valves)			
4	Flue Gas	Outlet of common Chimney			
5	Fuel	Inlet of gas train			
6	Electrical power	Inlet of control panel			
2.1 EXCLUSIONS - TO BE INDICATED					
3.0 Qualification Requirements:					
SI No	BHEL Standard Terms & Conditions	Supplier's confirmation Yes / No	If Yes ,Documentary Evidence to be provided for Compliance		
1	Only original equipment manufacturer(OEM) ,who has supplied,installed and commissioned atleast one number gas based IBR boiler having capacity of 10 MPTH or heigher within the past seven years from the date of opening of this enquiry shall be eligible for participating in this tender. Following documents in this regards will have to be enclosed along with technical offer. A. Purchase order copy. B. Commissioning /completion certificate issued by coustomer. C.Succesfull performance certificate of plant for two years of operation after commissioning/completion.				
4	BHEL reserve the right to verofy information submitted by vendor.In case the information is found to be false/ incorrect, the offer shall be rejected				

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