Bharat Heavy Electricals Limited

(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA

An ISO 9001 Company

CAPITAL EQUIPMENT / MATERIALS MANAGEMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 79 38 Fax : +91 431 252 00 31 Email : tvenkat@bheltry.co.in Web : www.bhel.com

TWO PART BID Tender to be submitted in two Parts	**Enquiry Number:** **2851400027**	**Enquiry Date:** **26.02.2014**	**Due date for submission of quotation:** **03.04.2014**

You are requested to quote the Enquiry number date and due date in all your correspondence. This is only a request for quotation and not an order.

Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Item	Description	Qty.	Delivery Required	Delivery Terms Required
10	**Real Time Radiography (RTR) System with 320 KV X-ray Units and Digital Panel as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)**	**3 Nos.**	**8 months from the date of Purchase Order**	**F.O.R, BHEL Stores, PEFP Bhandara.**
20	**Real Time Radiography (RTR) System with 320 KV X-ray Units and Digital Panel as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)**	**1 No.**	**6 months from the date of Purchase Order**	**F.O.R, BHEL Stores, Trichy.**

Important points to be taken care during submission of offer:-

1. **Compliance Form No. BND/IMP/01 & BND/IND/01A and Annexure II (Details of Company Performance) to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**
2. **Material shall be delivered to**

→ **For Item Sl.No.10 (3 Nos.): FOR, BHEL Stores, POWER EQUIPMENT FABRICATION PLANT, BHARAT HEAVY ELECTRICALS LIMITED, Mundipar- 441804, Taluka: Sakoli, District: Bhandara, Maharashtra State.**

→ **For Item Sl.No.20 (1 No.): FOR ,BHEL Stores, HIGH PRESSURE BOILER PLANT, BHARAT HEAVY ELECTRICALS LIMITED, Tiruchirappalli- 620014, Tamilnadu State.**

3. **EMD for this Tender will be Rs. 2,00,000.00/-**
4. **Offer shall be evaluated for both items (Sl.No.10 & 20) as a single package (Overall L1 basis).**
5. **The time period required for Erection & Commissioning of the item shall be 2 months for Item Sl.No.10 (3 Nos.) and 3 weeks for item Sl.No.20 (1 No.) from the date of intimation from BHEL requesting supplier to depute Service Engineers about site readiness**
6. **All updates, amendments, corrigenda, etc., (if any), for each tender will be posted only on the above websites from time to time, as and when required, until each tender is opened. There will be no publication of such updates, amendments, corrigenda, etc., through newspapers or any other media.**

BHEL's General guidelines / instructions (refer MM/CE/GENL/001-EMD) including bank guarantee formats and list of consortium banks, commercial terms check-list can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2851400027"

Tenders should reach us before 14:00 hours on the due date
Tenders will be opened at 14:30 hours on the due date
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

Sr. Manager / Capital Equipment / MM
T. VENKATESWARAN
Senior Manager
Capital Equipment / MM
BHEL, Tiruchirappalli - 620 014.

PART A

QUALIFYING CRITERIA FOR THE SUPPLY OF REAL TIME RADIOSCOPY (RTR) SYSTEM WITH 320KV CONSTANT POTENTIAL X-RAY EQUIPMENT WITH SWIVELING ARRANGEMENT AND DIGITAL FLAT PANEL DETECTOR FOR INDUSTRIAL APPLICATIONS.

SECTION – I

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the Real time radioscopy (RTR) system with 320kv constant potential x-ray equipment with swiveling arrangement and digital flat panel detector for industrial applications.

S. No.	REQUIREMENTS	VENDOR COMMENTS
1.0	The BIDDER / VENDOR shall have a minimum of Three Years (past 3 yrs) of Continuous Experience in the Design, Manufacture of "Real Time Radioscopy System (RTR) with 320kV constant potential X-Ray system and Digital Flat Panel systems". Vendor to indicate the actual No. of years of experience in this field.	
2.0	Only those vendors (**OEMs**), who have manufactured and commissioned **at least ONE "Real Time Radioscopy System (RTR) with 320kV constant potential X-Ray system and Digital Flat Panel system"** in the last five years (as on original date of opening of Tender) shall quote.	
3.0	Vendor shall submit at least one Performance Certificate from any of their customers, for satisfactory performance of "RTR with 320kV constant potential X-Ray system with Digital Flat Panel System" with in the last five years and is working satisfactorily for a minimum period of one year from the date of commissioning (as on original date of opening of tender). For obtaining the Performance certificate, a suggestive format is provided.	
4.0	BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.	

SECTION – II

Bidder to provide the following details:

S. No.	PARTICULARS	VENDOR COMMENTS
5.0	YEAR of LAUNCH of the Model quoted against this ENQUIRY	
6.0	Number of "Real Time Radioscopy System(RTR)with 320kV constant potential X-Ray system and Digital Flat Panel systems" supplied, installed and commissioned till date, in the QUOTED MODEL	
7.0	Details of Design Set-Up and Technology Back-Up assured for the PRINCIPAL Equipment Maker	
8.0	Details on International Standards followed in Design of the System	
9.0	Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed)	
10.0	Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centers in India and Asia	
11.0	Any Additional Data to supplement the manufacturing capability of the BIDDER	

PERFORMANCE CERTIFICATE

(On Customer's Letter Head)

1. Vendor of the Equipment :

2. Make & Model of the Equipment :

3. Month & Year of Commissioning :

4. Application for which Equipment is used :

5. Jobs Performed by the Equipment
   a. Job material :
   b. Job thickness :
   c. Voltage/constant potential of the equipment:

6. Performance of the Equipment : Satisfactory /
   (Strike off whichever is not applicable) Not Satisfactory

7. After Sales Service : Satisfactory /
   (Strike off whichever is not applicable) : Not Satisfactory

8. Any other remarks :

Contact details of issuing authority
Name & Designation:
Office No/Mobile no:
Email Id:

Signature and seal of authority
Issuing the performance certificate

PART-B

TECHNICAL SPECIFICATIONS FOR REAL TIME RADIOSCOPY (RTR) SYSTEM WITH 320KV CONSTANT POTENTIAL X-RAY EQUIPMENT WITH SWIVELING ARRANGEMENT AND DIGITAL FLAT PANEL DETECTOR FOR INDUSTRIAL APPLICATIONS.

Qty 4 Nos.

SI No.	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [with Complete Technical Details]
1.0	Description of the Real Time Radioscopy System	The Real Time Radioscopy System,(RTR) consists of an X-Ray Source(320 kV constant potential X-Ray system with swiveling arrangement)and an Imaging System (Digital Flat Panel Detector).The output of the overall system shall be Digital Radioscopic Image meeting the sensitivity as well as other requirements ,as outlined subsequently in this technical specification. Section-I: 320 kV constant potential X-Ray system Section-II: Digital Flat Panel Detector	
2.0	Area of Application	Online Radioscopic Inspection of Straight Tube Butt welds in Steel for detection of defects and to meet the 2% quality level (IQI Sensitivity ASTM 2-2T) as per ASME section V.	
2.1	Job Details	Butt Welds of Seamless Steel Tubes of Diameter 25.4 mm to 89 mm and Double wall Thickness ranging from 8mm to 30 mm.	

Section –I: 320 kV Constant Potential X-Ray system

Sl. No	PARTICULARS	BHEL SPECIFICATIONS	BIDDER's OFFER [with Complete Technical Details]
3.0	Principle of Operation	320 kV constant potential X-Ray equipment is the Radiation source in the RTR system .It Generates continuous X- rays by bombardment of high speed electrons on high atomic number Target (Tungsten) and it will have 100% duty cycle.	
4.0	Design Base	Constant potential Bi polar metal ceramic X ray tube with capacity 320 kV/10mA (by varying potential difference across the electrodes (15 kV to 320 kV) with varying tube current 0.5 to 10 mA High frequency: 40 kHz technology for stable output, low ripple and better sensitivity.	
5.0	Equipment Configuration	The minimum desired features are enlisted below	
5.1	Operating Parameters	**Tube voltage:** Minimum 15 kV to 320 kV(Variable insteps of 1 kV). **Tube Current** Minimum 0.5 mA to 10mA (Variable in steps of 0.1mA).	

5.2	Focal Spot	Dual focal spot preferable (with large focus 1.8 mm and mini focus 0.8mm) as per IEC 336	
5.3	Tube current	To be specified by supplier for large focus and mini focus at 320kV.	
5.4	Exposure Time	Digital display: 1 Second, in steps up to 60minutes	
5.5	Pre warning	1 to 30 seconds	
5.6	Programmed operation	For storing 100 data sets, with read out message for error (Having password protection), supplier to specify	
5.7	Inherent filter	Preferably Beryllium filters. Supplier to specify	
5.8	High voltage connections	Two plugs socket with locking lever and safety features, to be specified by the bidder.	
5.9	High Voltage cables	High Voltage cables to have Anode and Cathode connections with 10 meters in length, both ends Rubber cone covered plugs.	
5.10	Dose output with inherent filter	Supplier to specify	
5.11	Dose-Rate	in Sv/min (R/ min) at 1 M with and without filter different KV and mA-Supplier to specify	
5.12	Leakage level radiation (at full load)	Shall not exceed 1R / 1Hour /1metre from focal spot.	
5.13	Control Unit	Digital Control Unit containing Power Module, Control Module [having clear labels in English], Control Cabinet [with table top], Standard Operating Programs, Inter- Connecting Cables [with length of approximately 20 meters], Control Unit Lock & Key, etc.	
5. 14	Cooling Unit	a. Heat Exchanger Type oil Cooling Unit with air (suitable fans for air cooling), suitable rating and efficient coolant(oil) pump for 45 deg. C, to meet the peak-load operational requirements. Supplier shall give the specification and the standards for the oil used for cooling. b. The unit shall have the in-built warning system for unit failure, low level of coolant(oil), lack of flow, leakage, etc. and connected with the tripping mechanism of the main equipment. c.BIDDER to furnish complete details on the Cooling System with Accessories provided and to list down Essential Spares like Cooling Fans, pair of Coolant Circulation ,Hoses with end connectors, etc.	
5.15	Flash Lamp	A Warning Flash Lamp with fail-proof safety circuit shall be supplied with 20-meter long cable.(Supplier has to specify the equivalent Indian dealer for future procurement).	
5.16	X-Ray Unit	a. A suitably designed Manipulator having arrangement for swiveling from + **45** Degrees to	

	Manipulator	**Zero** and then to – **45** Degrees, for the movement of the X-Ray Head. b.The Manipulator has to be operated from the Control Room.	
6.0	Weight	Supplier to specify.(For X-Ray Tube and generators)	
7.0	Safety interlocks	Built in safety interlocks to switch off the system in case of emergency and with Safety door interlocks.	
7.1	Input Electric Power Supply	a. BHEL will provide Electric Input Power Supply at ONE POINT only, With 230V ± 10 % , 50 Hz, Single Phase AC through a 3 wire system [Phase, Neutral & Protective Earthing]. **O R** With 415V ± 10 % , 50 Hz, Three Phase AC through a 3 wire system [No Neutral Conductor, 4^{th} wire for Protective Earthing]. b. BIDDER to take supply from this SINGLE Point to all the sub-systems of the equipment through proper step-up or step-down transformers.	
7.2	Ambient Condition	a.The uncontrolled ambient room conditions are : 1)Temp:18 to 40° C 2)Relative Humidity : 45 to 85 %	
7.3	Accessories	BIDDER to list down (with UNIT RATE) the various ACCESSORIES to be procured with the EQUIPMENT to enhance the Operating Efficiency and Features of the OFFERED EQUIPMENT, over and above those mentioned in the SPECIFICATIONS.	
7.4	Safety and Quality Standards	a. Supplier to ensure Safety and Quality of X-Ray System, which shall conform to International Standards. b. Conformance certificate to be given along with the equipment	
7.5	Type approval	Supplier shall confirm that the quoted model has the type approval from Atomic Energy Regulatory Board, India and the copy of this certificate shall be furnished along with the offer.	
8.0	**Scope of supply**	Number of X-Ray systems- One for each RTR system Following (Sl. No 1 to 20)shall be supplied compulsorily with each X-Ray equipment: 1. X ray head as per BHEL specifications -1 No 2. High voltage cathode Generator – 1 no. 3. High Voltage Anode generator – 1 no. 4. High Voltage Cables: 1 pair. 5. Power connection cable – 1 no. 6. Digital Control unit – 1 no. 7. Cooling system – 1 no.	

		8. Warning flash lamp 9. Manipulator having swivel arrangement from +45 degrees to Zero to – 45 degrees, for movement of x-ray head to be operated from control room. 10. HT Silicon paste:1 kg (in 100 grams pack) 11. Service tool kit 12. Necessary Standard/Certificate traceable to National/International Standard. 13. Optional/Compulsory Accessories 14. Spares & Consumables As per clause - 10.0 15.Lead shutters (X & Y movement) mounted on the X-Ray port, operable from the control room 16. Inspection at Supplier's works 17.Installation, Commissioning & Performance Prove-Out and Training on Operation, Trouble Shooting & Maintenance 18.Documentation: Testing & Calibration Certificates: O & M Manuals [3 Sets] 3 Copies (In English) of the Operation, Maintenance & Service Manuals for the total system containing Electric Schematics, Circuit Diagrams, PCB Drawings, Trouble Shooting Charts ,complete technical specification of each component/bought-out item, supplier's address of each bought out item, part number. Exploded view of the generators, X-ray head and other modules should be provided. Mechanical Sub-Assemblies, Rating of Bought-Out Items, etc. shall be supplied, at the time of inspection by BHEL Engineers. In addition, one SOFT COPY of all the above documents should be supplied in CD. 19)Radiation Safety equipments. a) Radiation Zone monitor(Wall mountable)range 0 to 100mR/hr (log scale)-1 No b) Radiation Survey meters (Ionization Type) with range 0 to 50 mSv /hr-1 No. 20) Isolation Transformer: Suitable KVA rating – 1 no.	
9.0	Consumables for Main Equipment & Accessories	BIDDER has to list down the CONSUMABLES to be used in the Operation of the Equipment and QUOTE with UNIT RATE for all the listed consumables, to be procured with the equipment.	
10.0	Spares for Main Equipment & Accessories	a.BIDDER has to list down the SPARES under Mechanical, Electrical & Electronic Category for Main Equipment & Accessories for Equipment Operation in 3 shifts a day and 365 days in a year.	

		b. BIDDER has to compulsorily quote & supply the following Commissioning Spares per X-Ray equipment with the TECHNICAL OFFER: (applicable for item '1' to '9') 1) High Voltage Cables for 320kV - 1 Pair 2) All types of PCBs for X-Ray Control System- 1 set. 3) Critical Spares for X-Ray Head and HT Transformer-1 set. 4) Cooler flow switch-1 no. 5) Temperature switch -1 no. 6) lead shutter motors-2 no.s 7) All Signal Cables - 1 set. 8) All Fuses & Limit switches – 1 set. 9)If the system is through programmable microprocessor/Microcontroller based, pre-programmed IC should be given as spare- 1 no. 10)Additionally 2 No. of High Voltage Cathode generators and Anode Generators common for the total set of 4 RTR systems.	
11.0	Other conditions	a) Supplier should give spares support for minimum 5 years from the PO placing. If the Bidder is not an OEM, bidder shall have back-to-back agreement with the OEM to provide service and spare support for at least 5 years for the offered solution. Bidder shall give an undertaking to provide the agreement on award of contract. b) The OEM / OEM Authorised bidder should guarantee the quick availability of after sales service supports as well as the availability of spares. c) For the bought out items, supplier shall specify the part numbers, complete specification, contact address details with e-mail id and contact numbers. d) Supplier shall supply the test kit and special tools for troubleshooting of the total system	

Section –II: DIGITAL FLAT PANEL DETECTOR FOR REAL TIME RADIOSCOPY SYSTEM
Compatible with 320 kV X Ray constant potential system

S. No.	PARTICULARS	BHEL SPECIFICATIONS	Bidder's OFFER [With Complete Technical Details]
12.0	Principle of Operation	The Digital Flat Panel Detector is an imaging device in lieu of Photographic film / Image intensifier used for RTR of welds. X-Rays are made to pass through the weld and the image of the weld is captured concurrently with x ray irradiation. The Flat Panel Detector converts X ray image into Visible Digital Image and displays On a computer monitor.	
13.0	Radioscopic Technique	Double wall double Image Technique to achieve 2% Penetrometer sensitivity.	
14.0	Mechanical specification	The Flat Panel with an active area of 200 x 200 mm, with weight less than 20kg,with power supply connector, trigger connector, provision for grounding, plug for potential equalization mounted on Flat Panel. Electronics of the system (such as chip on board module (COB) for charge amplifiers and rod drivers, Pre-controlling COBs, PCB signal generation, Main PCB for interconnecting all the PCBs, FPGA control and HIIB generation) shall preferably be mounted beside the active area, to avoid the direct exposure to radiation. Flat Panel Housing shall be of preferably Aluminum. The sensor/scintillator shall be protected. Supplier to specify the size of the Panel.	
14.1	Operating Parameters for Flat Panel	(a) Input X Ray Radiation 15 to 320 kV, @intensity 0.5-10mA (b) Environmental condition: Temperature-Room Temperature (18-40 ^{0} C) RH maximum 85%; Mains supply 230V ± 10 % Frequency: 50 Hz	
14.2	Technical Features	As follows.	

14.2.1	Flat Panel Detector System	The Flat Panel system shall include: (1) **Acquisition System** including (a) Detector Panel (b) Panel Controller (c) Panel Temperature Control (d) Real Time Image Display monitor and Real Time Image Controller (e) Acquisition Control Station (Computer, software and data interface cables) (f) Mechanical fixture for mounting the panel in line with the X-Ray system, and connected to swiveling arrangement of the X-Ray Head such that the Source to detector distance and height can be adjusted. Shutter operation (4 shutters) should be provided to move along X (left, right), Y (up, down) directions. Each shutter should be independently operable. (2) **Image Review Station to Review images** (a) Computer with CD archival unit, monitor, keyboard and mouse (b) Image Review Software Data and image storage and back up management system essential	
14.2.1.1	Detector specification	**(1)(a) Detector Panel:** **Receptor type:**Amorphous Silicon **Conversion screen (Scintillator):** supplier to specify **Active area:** 200 x 200 sq mm(minimum) (Supplier to specify) **Pixel matrix:** 1024 x 1024(minimum), (supplier to specify) **Pixel pitch:** 200micron or lesser (supplier to specify) **Other selectable fields:** supplier to specify. **Controllable detector adjustments:** Offset,Gain,Non linearity,pixel correction.(Supplier to specify) **Electronics:** ADC – Atleast 14-bit Dark current- <1pA/Pixel Saturation charge of ASIC- Supplier to specify **Applicable fields of X-Ray voltage:** 15kV to 320kV. **Conversion factor:** - supplier to specify in Cd/M^2 / μGy/second **Limiting visual resolution:** Supplier to specify(Without magnification & With magnification)	

		Modulation Transfer Function (MTF)-Supplier to specify **Non Linearity:** <+- 2% **Dynamic Range:** Atleast 3500:1. **Integral distortion in percentage** *(%)*- Supplier to specify. **Mode:** Real Time (Dynamic). **Frames Rate:** 30 Frames/Second.(Supplier to specify the Frame rate to achieve the real time image) **Integration time:** Supplier to specify corresponding to 30frames/second **Image Capturing Time:** Supplier to specify **Shutter arrangement to be operated from control room-** Specify whether it is an integral part of the system or not. It is to be separately quoted if it is not a part of the system, but as an accessory. (Supplier to specify.)	
		BLOOMING: Confirm that there will not be any blooming of the quoted Digital Flat Panel, due to direct exposure of it, when used without masking the job, up to 320 kV of X-Ray Voltage. How ever the filters (Aluminium, Copper etc.) can be used at the X-Ray port for controlling the Blooming. Clearly specify any other method including softwares which can be used to avoid the blooming problem and ensuring an image free from blooming meeting 2% penetrameter sensitivity requirement.	
		LAG - Preferably <10%. Supplier to specify	
		Signal to Noise Ratio: Supplier to specify	
14.2.1.2	Mechanical Fixture over which Flat Panel is mounted	The flat Panel shall be mounted on a Mechanical fixture in line with the X-Ray system, and connected to swiveling arrangement such that 1) Source to detector distance shall be adjusted between 700 to 1250mm (X ray head and detector must be in line while swiveling) 2) Height - adjustable between 1 to 1.5 meter. NOTE: The Inner dimensions of the exposure hall is apprx. 4 x 3 meters.	

14.2.1.3	Acquisition Station	**(a)Acquisition Control Computer-** • PC system with over 3GHz processor, with Industrial Rack mount chassis, dual processors, min 4GB RAM, min 500 GB and above hard disc capacity with Additional Graphics Card, DVD/CD, 100Base T network interface with RJ-45 socket, minimum 1280x1024 pixel &0.25mm(maximum) pitch antiglare flicker free TFT/LCD color monitor, key board and optical mouse. The acquisition system shall have sufficient disk space for temporary storage of over 1 lakh full frame digital radiographs. -Supplier to specify • Display: preferably, Automatic Gray scaling (16 to 8 bit conversion) for monitor display (supplier to specify)	
		(b) Acquisition Control Software- • With graphical user interface. The software shall include a sequenced, graphical user interface to guide the operator through system initialization, calibration and validation, plus selection of each part. • Real Time Images shall be displayed on a monitor connected directly to detector controller for Real time Image Processing, and to average and store multiple static images. Dimensions, spec of material, work station, image numbering, with reset facility for auto change. All pass word protected. • Automatic image numbering (continuous serial number by default) with pass word protected reset facility (reset facility is meant to allow the authorized user to set a new image number, when the need arises), option to rename an image by the authorised operator(Eg: by adding suffix A, B etc.) • Every image file shall have a unique identification name/number such that an external program, can access/retrieve/search an image by its name.	
14.3	Review Station	Image Review station shall be networked to acquisition station, and static images shall be automatically transferred to review station after acquisition. **(a)Review station computer**: (The system shall have the following minimum specifications Hard drive- over 3 GHz processor, 4 GB (min) RAM, MIN 500GB hard disc, with Additional Graphics Card • Archival drive-DVD/CD Reader and Writer. • Monitor, key board, mouse	

		(b)Review software: It shall be compatible with NIMA DICOM3.0 standard and with ASTM DICONDE standard for image format and functionality. It shall have the facility to make the image automatically available in BMP, JPEG and TIFF image file format for use in standard applications. Image Processing functions: The software should be capable of performing the following functions Noise reduction through integration. Contrast enhancement Edge enhancement 16 bit filter capability, with different Kernel sizes. Low pass filter, high Pass filter, median, crisping, pseudo 3D etc. 8-bit type predefined filters for all type of image processing.	
14.4	Dose overload	(Supplier to specify)	
14.5	Temperature control system	The ambient temperature can be up to 40^0 c. The detector shall have a low maintenance, closed loop temperature regulating system, and triple regulated power supplies to stabilize detector operation.	
14.6	Input Electric Power Supply	230 ± 10 % V, 50 Hz, Single Phase AC through a 3 wire system [Phase, Neutral & Protective earthing]	
14.7	Calibration	Factory calibration	
14.8	Ambient Condition	The uncontrolled ambient room conditions are: Temperature: 18 to 40 ° C, Relative Humidity: 45 to 85 %	
14.9	Accessories	BIDDER to list down (with UNIT RATE) the various ACCESSORIES to be procured with the EQUIPMENT to enhance the Operating Efficiency and Features of the OFFERED EQUIPMENT, over and above those mentioned in the SPECIFICATIONS.	

15.0	Scope of supply	Total number of Flat Panel systems-1 No for each RTR system Following (items 'a' to 'g') shall be supplied compulsorily with each Equipment: a) Digital Flat Panel System as per specification–online UPS 2KVA/for 1hr back up required.-1 No b) Power cables as well as other required inter connecting cables – 1 set c) Remote Controlled Lead Shutter for Flat Panel -1 No d) Mountable operator control panel with keypads and cables.-1 No e) Necessary Standard / Certificates traceable to National / International Standards. f) 3 Copies (In English) of the Operation, Maintenance & Service Manuals for the total system containing Electric Schematics, Circuit Diagrams, PCB Drawings, Trouble Shooting Charts , complete technical specification of each component/bought-out item, supplier's address of each brought out item, part number. Exploded view of the digital flat panel and other modules should be provided. Mechanical Sub-Assemblies, Rating of Bought-Out Items, etc. shall be supplied, at the time of inspection by BHEL Engineers. In addition, one SOFT COPY in CD to be supplied for each equipment g)Spares -1 set for each Flat panel system as per clause 17.0 <u>Accessories:</u> 1 set per equipment 1) Duplex wire type IQI EN 462 Part 5 2) Converging Line pair Quality indicator 3) Linearity Quality indicator	
16.0	Consumables for Main Equipment & Accessories	BIDDER has to list down the CONSUMABLES to be used in the Operation of the Equipment and QUOTE with UNIT RATE for all the listed consumables, to be procured with the equipment.	

17.0	Spares for Main Equipment & Accessories	BIDDER has to list down the SPARES under Mechanical, Electrical & Electronic Category for the Main Equipment & Accessories for Equipment Operation in 3 shifts a day and for 365 days in a year. b. BIDDER has to compulsorily quote & supply for the following Commissioning Spares with the TECHNICAL OFFER: Items 'a' to 'd' should be given for each RTR system. a) Digital flat panel power supply unit – 1 no . b) Complete set of signal cables (from Digital flat panel to Computer, Power supply to Flat panel)- 1 set c) Complete set of PCBs for digital flat panel, power supply and computer–1 set. d) Complete set of fuses-1set.	
18.0	Performance Prove-Out at BHEL	The Supplier has to conduct demonstration of the following in accordance with ASME Boiler and Pressure vessel code section V. **Resolution of the Digital Flat Panel System:** Resolution shall be minimum 2.5 line pair /mm. (at MTF>20%) **IQI Sensitivity-** 2 - 2T(2%), using ASTM strip hole type pentameters for Single wall Steel thickness ranging from 4 to 12 mm.	
19.0	Inspection & Acceptance	The over all system and accessories shall be offered for Inspection to BHEL Engineers at vendor's works. The RTR system (consisting of the items described as per section – I and Section-II) shall be demonstrated for it's Performance Prove-Out using the samples of Steel tubular butt weld joints with single wall thickness ranging from 4 to 12 mm, and using a Double Wall Double Image Technique, to meet the quality requirements a specified in Clause 18.0.	
20.0	Installation and commissioning	The over all RTR system and accessories (consisting of the items described as per section –I and Section-II) is to be installed & commissioned at BHEL Works, by the supplier.	
21.0	Documentation in ENGLISH Language	3 Copies (In English) of the Operation & Maintenance Manuals containing Electric Schematics, Circuit Diagrams, PCB Drawings, Trouble Shooting Charts, Mechanical Sub-Assemblies, Rating of Bought-Out Items, etc. shall be supplied, at the time of inspection by BHEL Engineers. In addition, one SOFT COPY in CD to be supplied per equipment	
22.0	Performance Guarantee	The over all RTR system and accessories (consisting of the items described as per section –I and Section-II, including Bought-Out Items) are to be guaranteed for its performance	

		for a minimum period of twelve months from the date of commissioning at BHEL Works.	
23.0	Service and Spares Support Requirements	Vendor shall ensure after the guarantee period, through trained service personnel in India for next 5 years as and when need arises. Spares to be made available with in 1 week.	
24.0	Training on Operation & Maintenance	Complete Training for BHEL Engineers is to be given on Operation & Maintenance of the OFFERED system.	
25.0	Annual Maintenance Contract - AMC	The BIDDER shall quote separately for AMC(as optional) for RTR and digital flat panel system for 4 years in preventive and breakdown maintenance after the warranty period. Detailed scope of supply for AMC with time period to be provided by the bidder.	
26.0	Safety and Quality Standards	Supplier to ensure that Safety and Quality of Digital Flat Panel shall conform to International Standards. Conformance certificate to be along with the equipment.	