# TECHNICAL SPECIFICATIONS for 300KV CONSTANT POTENTIAL X-RAY EQUIPMENT for industrial applications.

| S. No. | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
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| **1.0** | Area of Application | The 300kV Constant potential X-Ray system is used for Film Radiography of welded joints Boiler Components having steel thickness up to 40mm. | |
| **2.0** | Principle of Operation | 300 kV constant potential X-Ray equipment is used as the Radiation source in Film Radiography. It generates continuous X- rays by bombardment of high speed electrons on high atomic number Target (Tungsten) | |
| **3.0** | Design Base | Constant potential Bi polar metal ceramic X ray tube with capacity 300 kV/10mA (by varying potential difference across the electrodes (15 kV to 300 kV) with varying tube current 0 to 10mA<br>High frequency: 40KHz technique for out put stability, low ripple and better sensitivity. | |
| **4.0** | Equipment Configuration | The minimum desired features are enlisted below | |
| **4.1** | Operating Parameters | **Tube voltage:** Minimum 15 kV to 300 kV (Variable insteps of 0.2kV).With reproducibility ~(+ or -)0.01% of max kV value at constant temperature.<br>**Tube Current:** Minimum 0.5 mA to 10mA (in ~0.1mA steps from 0.5mA to maximum value at operating voltage.). With reproducibility ~(+ or -)2 µA | |
| **4.2** | Focal Spot | Dual focal spot preferable (with large focus 1.8mm and mini focus 0.8 mm) .Measurement as per IEC 336 . | |
| **4.3** | Tube current | To be specified by supplier for large focus and mini focus at 300kV. | |
| **4.4** | Emergent Beam Cone angle | ~ $40^0$ | |
| **4.5** | Exposure Time | Digital display: 1 Second, in steps up to 60minutes | |
| **4.6** | Pre warning | 1 to 30 seconds | |
| **4.7** | Programmed operation | For storing 100 data sets, with read out message for error (With passwords), supplier to specify | |
| **4.8** | Inherent filter | Preferably Beryllium filters. Supplier to specify | |
| **4.9** | High voltage connections | Two plugs socket with locking lever and safety features, to be specified by the bidder. | |
| **4.10** | High Voltage cables | High Voltage cables to have Anode and Cathode connections with 10 meters in length, both ends Rubber cone covered plugs. | |
| **4.11** | Dose out put with inherent filter | Radiation output data at various kV at 1 m from focal spot to be furnished. Supplier to specify | |

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| **4.12** | Dose-Rate | in Sv/min (R/ min) at 1 M with and without filter - Supplier to specify | |
| **4.13** | Leakage level radiation (at full load) | Leakage radiation levels measured at a distance of 1m at max voltage of 300kV and max current at that voltage be given. These should be within limits prescribed by AERB.During installation this must be demonstrated. Shall not exceed 1R / 1Hour /1metre from focal spot. | |
| **4.14** | Control Unit | Digital Control Unit containing Power Module, Control Module [with clear text in English], Control Cabinet [with table top], Standard Operating Programs, Inter- Connecting Cables [with length of approximately 20 meters], Control Unit Lock & Key, etc.<br>Display must be LCD, with RS 232C Interface. With provisions for adjusting kV, mA, time & to select focal spot. Direct interface with PC & selections of parameters through PC required. Provision for recording the exposure parameters and their recollection. Text messages of faults be displayed for rectification. Built in automatic warm-up program. Auto-trip facility at higher target loadings & higher target/cooling oil temperatures. | |
| **4.15** | Cooling Unit | a. Heat Exchanger Type Cooling Unit with suitable rating and efficient coolant pump, to meet the peak-load operational requirements.<br>b. The unit shall have the in-built warning system for unit failure, low level of coolant, lack of flow, leakage, etc. and connected with the tripping mechanism of the main equipment.<br>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. | |
| **4.16** | Flash Lamp | A Warning Flash Lamp with fail-proof safety circuit shall be supplied with 20 meter long cable. | |
| **4.17** | Gate Limit Switch | Gate Limit Switch connection to be provided | |
| **4.18** | Penetrating Power | Penetrating power for 10 Minutes. Exposure for steel [EFD=700 mm, film type Agfa D7, Optical density=2.0, Lead screens 0.1 mm (F) and 0.15 mm (B) at standard film processing parameters] | |
| **5.0** | X-Ray Unit Manipulator | A suitably designed Hydraulic Manipulator having arrangement for vertical position adjustment of the X-Ray head. | |
| **6.0** | Weight | Low weight & portable. Max. weight approximately 120kg(cathode),170kg(anode)(Supplier to specify.) | |
| **7.0** | Safety interlocks | Built in safety interlocks to switch off the system in case of emergency and safety with door interlocks. | |
| **8.0** | Input Electric Power Supply | a. BHEL will provide Electric Input Power Supply at ONE POINT only, With 230 ± 10 % V, 50 Hz, Single Phase AC through a 3 wire system [Phase, Neutral & Protective Earthing].<br>**O R**<br>With 415 ± 10 % V, 50 Hz, Three Phase AC through a 3 wire system [No Neutral Conductor, $4^{th}$ wire for Protective Earthing]. | |

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| | | 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. | |
| **9.0** | Ambient Condition | a.The uncontrolled ambient room conditions are :<br>1)Temp:18 to 45° C<br>2)Relative Humidity : 45 to 85 %<br>b.BIDDER to specify the atmospheric conditions, as the working environment for the OFFERED Equipment to deliver precise results and serve for a prescribed life of the Equipment. | |
| **10.0** | 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. | |
| **11.0** | Safety and Quality Standards | a. Supplier to ensure Safety and Quality of X-Ray System, which shall conform to International Standards.<br>b. Conformance certificate to be given along with the equipment | |
| **12.0** | Scope of supply | Following shall be supplied compulsorily with the Equipment:<br>1. X ray head as per specifications<br>2. High voltage Generators<br>3. High Voltage Cables: 1 pair.<br>4. Power connection cables: 1no<br>5. Digital Control unit<br>6. Cooling system:<br>7. Warning flash lamp<br>8. Programmable motor control Diaphragm<br>9. Hydraulic Manipulator for vertical movement (height adjustment) of x-ray head.<br>10. HT Silicon paste: 1 kg (in 100 grams pack)<br>11. Service tool kit<br>12.Necessary Standard / Certificate traceable to National/International Standard.<br>13. Optional / Compulsory Accessories<br>14. Spares & Consumables<br>15. Inspection at Supplier's Works & Training<br>16. Installation, Commissioning & Performance Prove-Out and Training on Operation, Trouble Shooting & Maintenance<br>17.Documentation: Testing& Calibration Certificates<br>18. O & M Manuals [3 Sets]<br>19. Zone monitor 1 no with power source and battery | |

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| **13.0** | 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. | |
| **14.0** | Spares for Main Equipment & Accessories | a. 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.<br>b. BIDDER has to compulsorily quote for the following Commissioning Spares with the TECHNICAL OFFER:<br>1) High Voltage Cables for 300kV - 1 Pair<br>2) All types of PCBs for X-Ray Control System<br>3) Critical Spares for X-Ray Head and HT Transformer<br>4) Cooling System<br>5) All Signal Cables - 1 No. each<br>6) All Fuses – 3 Sets. | |
| **15.0** | Inspection | The X-Ray system and accessories (consisting of the items mentioned in the scope of supply) shall be offered for Inspection by BHEL and Performance Prove-Out. | |
| **16.0** | Installation and commissioning | The X-Ray system and accessories (consisting of the items mentioned in the scope of supply) is to be installed & commissioned at BHEL Works, FREE OF COST, by the Service Engineer of the SUPPLIER. | |
| **17.0** | 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. | |
| **18.0** | Performance Guarantee | The X-Ray system and accessories (consisting of the items mentioned in the scope of supply) are to be guaranteed for its performance for a minimum period of two years from the date of performance acceptance at BHEL Works. | |
| **19.0** | 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 arise. Spares to be made available with in 1 week. | |
| **20.0** | Training on Operation & Maintenance | Complete Training for 2 BHEL Engineers is to be given on Operation & Maintenance of the OFFERED Training has to be provided at BHEL Works, after the successful commissioning of the Equipment & Accessories. | |
| **21.0** | Annual Maintenance Contract - AMC | The BIDDER has to QUOTE for AMC with detailed scope of work. | |

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| **22.0** | Safety and Quality Standards | Supplier to ensure that Safety and Quality of X-Ray system and accessories (consisting of the items mentioned in the scope of supply) shall conform to International Standards. Conformance certificate to be along with the equipment. | |
| **23.0** | Qualifying criteria | Bidder has to comply with the qualifying criteria as mentioned in Annexure-I of this specification. | |

# Annexure-I
# to
# 300KV Constant Potential X-Ray system

## QUALIFYING CRITERIA

## SECTION – I

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the Optical Vacuum Spectrometer.

| S. No. | REQUIREMENTS | VENDOR's COMMENTS |
|---|---|---|
| **1.0** | The BIDDER / VENDOR shall have a minimum of FIVE Years of Continuous Experience in the Design, Manufacture of 300kV Constant Potential X-Ray systems. Indicate the actual experience. | |
| **2.0** | The BIDDER / VENDOR shall have supplied at least one number of 300kV Constant Potential X-Ray systems within the last five years. Indicate the number of equipment (of QUOTED MODEL) sold in India & Other Countries. | |
| **3.0** | Reference List of Customers and Performance Certificate from CUSTOMERS (minimum 2 Customers) with full contact details of CONTACT PERSON. | |

## SECTION – II

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser :

| S.No. | REQUIREMENTS | VENDOR's COMPLIANCE |
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| **1.0** | The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical **[with PART A & PART B]** & Commercial and Price Bid. The Technical Offer shall be in line with the BHEL Technical Specifications and the Guidelines or Annexure mentioned, wherever applicable. | |

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| **2.0** | The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer. | |
| **3.0** | The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for fourYears, from the date of commissioning of the equipment at BHEL Works. | |
| **4.0** | The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria | |
| **5.0** | The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of Scope of Supply. | |
| **6.0** | The reference List of Customers shall be accompanied with the details (Phone Number / E-Mail ID) of the CONTACT PERSON for cross reference by BHEL | |

## Section-III

In addition, the Bidder has to give the following details, along with technical bid:

| S. No. | PARTICULARS | VENDOR's RESPONSE |
|---|---|---|
| **1.0** | Number of Years of Experience of the BIDDER/ VENDOR in the field of design, manufacture and supply of '300kV Constant Potential X-Ray system' | |
| **2.0** | YEAR of LAUNCH of the Model quoted against this ENQUIRY | |

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| **3.0** | Is there any other model launched after the quoted Model? Otherwise, indicate the likely year in which the next model is likely to be launched | |
| **4.0** | Number of 300kV Constant Potential X-Ray systems supplied, installed and commissioned till date, in the QUOTED MODEL | |
| **5.0** | Number of 300kV Constant Potential X-Ray systems supplied, installed and commissioned till date for the following category of CUSTOMERS (within INDIA):<br>a) Government Organisations<br>b) Private Sector Companies [Large Scale Industries] | |
| **6.0** | Number of 300kV Constant Potential X-Ray systems supplied, installed & commissioned till date in the following Category (around the GLOBE) :<br>a) Universities<br>b) R&D Labs<br>c) Reputed Heavy Engineering Works / Manufacturing Firms | |
| **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** | Comprehensive Details on Performance Testing - of the Equipment quoted, to be ensured in presence of BHEL Executives, prior to dispatch from Supplier's Works | |
| **10.0** | Details of Quality System followed (Kindly furnish the salient aspects of the QA system followed) | |
| **11.0** | Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centers in India and Asia | |
| **12.0** | Any Additional Data to supplement the manufacturing capability of the BIDDER | |