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<p style="text-align: center;"> Copyright and Confidential The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company. </p>	<h1>Technical Specification for Fire Detection & Alarm System</h1> <h2>Project: 2 x 660MW Udangudi STPP</h2>
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Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
	Raviteja J	D V Prashant	P ChandraSekhar	30.06.2022

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1.1 INTENT OF SPECIFICATION:

Design, Engineering, Manufacturing, Assembly, System Integration, testing at vendor works, Inspection by Purchaser, Supply (Packing and Transportation to site), Installation Support and Commissioning of Fire Detection and Alarm (FDA) System.

1.2 The material supply and installation shall be done as per the applicable codes and standards. Responsibility of the bidder is up to final handover of FDA systems to End user.

1.3 Training of End user / Purchaser's manpower to operate and maintain the system.

1.4 Supply of complete documentation covering Design, Sizing, Installation, Operation and maintenance aspects, Engineering documents including Technical data sheets, catalogues/brochures, As-built drawings, O&M manuals & Device charts of the system and tests carried out during Commissioning.

2 PROJECT DESCRIPTION

Owner	Tamil Nadu Generation & Distribution Corporation Ltd.
Project	2 x 660 MW Udangudi STPP
Location	Udangudi, Tamil Nadu
Nearest Railway Station	Thiruchendur (approx.12 kms from site)
Nearest Airport	Vagaikulam (approx.60 kms from site)
Nearest Harbour	Tuticorin (approx.45 kms from site)
METEOROLOGICAL CONDITIONS	
Ambient Air Temperature	
Maximum dry bulb temperature	41°C
Minimum dry bulb temperature	17°C
Relative humidity	
Mean Maximum humidity (Summer)	84%
Mean Minimum humidity (Summer)	62%
Maximum humidity (Monsoon)	97%
Minimum humidity (Monsoon)	45%
Rainfall	
Annual rainfall (Maximum)	718.2 mm
Annual Rain fall (Minimum)	384.1 mm
Twenty four (24) Hour max	138.2 mm
High Flood Level	
High Flood Level for site	RL 2.450 m
Wind	
Mean Wind Speed (max)	20.6 km/h
Wind direction	North, North East, North West, East

3 INSTRUCTIONS TO BIDDERS

3.1 This specification shall be read in conjunction with all its annexures listed later in this specification. In case of any discrepancy arising between this specification & its annexures, the most stringent of all (as

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determined by purchaser) shall be followed and the decision of Purchaser shall be final & binding on Bidder, without any cost & delivery implications. Further, if a requirement in this specification or any of the annexures, calls for a decision from the Purchaser, it shall be bidder's sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries (Annexure-E) within one week of issue of Enquiry, so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

- 3.2 Offers with incomplete information as mentioned in this specification are likely to be rejected outright without any further interaction with the Bidder.
- 3.3 All materials supplied under this contract shall be new and unused.
- 3.4 All equipment/items as applicable, shall be UL/FM/VDs approved.
- 3.5 Any technical features [over & above BHEL enquiry specification requirements] proposed by Bidder will not be given preference for the purpose of evaluation.
- 3.6 Bidder must submit the "Duly filled & Signed copy of Checklist" (Annexure-I) along with necessary supporting documents compulsorily as part of their technical offer without which offer is liable for rejection without any further interaction with the Bidder
- 3.7 All mounting hardware/ accessories/fittings etc. required for the erection of Fire Detection & Alarm System shall be included in the scope of bidder and the same shall be included in the base price even if such items are not explicitly mentioned in this specification.
- 3.8 The Bidder shall accept full responsibility for the faultless working of all the equipments and the FDA system as a whole.
- 3.9 Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.
- 3.10 The design information, specifications and drawings indicate the "Minimum" requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.
- 3.11 Deviations, if any, shall be clearly brought out only in Deviation format (Annexure- [J]). Any deviation or clarification shall be raised in pre-bid stage only as mentioned in 3.1 above.

4 CODES, STANDARDS & REGULATIONS

The design, engineering, installation, testing, commissioning of the package shall be as per all relevant & applicable codes/standards, however specifically the following to be followed:

- 4.1 Tariff Advisory Committee (TAC)/LPA India/NFPA USA
- 4.2 Underwriters Laboratories (UL)-USA,
- 4.3 VDS Standards,
- 4.4 Loss Prevention Certification Board (LPCB),
- 4.5 Factory Mutual (FM),
- 4.6 Indian Electricity (Supply) Act (IEA)
- 4.7 Rules for Fire Alarm System of India, and
- 4.8 IS 2189 (Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System- Code of Practice).
- 4.9 Any other equivalent internationally recognized body acceptable to BHEL/End customer.

5 List of Annexures

Document No.	Document Name
Annexure – [A]	Bill of material [for Main Supply + Mandatory Spares]
Annexure – [B]	Technical Specification for FDA System
Annexure – [C]	Price Bid format [for Main Supply + Mandatory Spares + Services]
Annexure – [D]	Schematic Diagram for Fire Detection & Alarm System

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Annexure – [E]	Pre Bid Query Format
Annexure – [F]	Master Document Schedule
Annexure – [G]	Vendor List
Annexure – [H]	Quality Requirements
Annexure – [I]	Checklist
Annexure – [J]	Deviation Format
Annexure – [K]	Specification for Fibre Optic Cable
Annexure – [L]	Specification for PC & Printer
Annexure – [M]	Specification for 24 V DC Power Supply Modules with Battery Back Up
Annexure – [N]	Typical Erection/Mounting Drawings of FDA components

6 SCOPE MATRIX :

Sl. No	Description	Engineering by	Supply by	Erection by	Supervision of Erection by	Commissioning by	Remarks
[A]	Fire Detection & Alarm System						
1	FDA System [Fire alarm panels, repeater panel, Operating Station, Softwares along with Dongle, third party interfaces and their Networking].	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
2	Loop configuration duly vetted by FDA OEM to finalise number of loops	Bidder (Note-3)	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
3	Detectors, control modules, hooters, call points & all other devices	BHEL	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
4	Network Components like Switches, LIUs, Patch Cards, Media converters, etc. required for networking of Fire Alarm panels, Repeater Panels, PC and third party interfaces.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
6	Network & Fiber optic Cables	Bidder	Bidder	BHEL (Note-4)	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
7	a. Erection hardware & cable terminations (lugs, glands, splicing kits etc.) required for all FDA items supplied under this contract b. Erection hardware (saddle with saddle bars and screws) for BHEL supplied cables.	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	Refer Annexures for inputs
8	a. Special Tools & Tackles as required for erection & commissioning	Bidder	Bidder	BHEL	Bidder (Note-1,2)	Bidder + BHEL (Note-2)	-

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	b.Items required for testing (like smoke detector testing kit, heat detector testing kit)and maintenance of FDA components						
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Notes:

- 1) Termination including its accessories for all types of cables at bidder-supplied items/panels shall be in Bidder scope.
- 2) **Details of typical Erection/Mounting drawings of FDA components are furnished in Annexure-M. Bidder to note that the items mentioned in the Erection/Mounting drawings are minimum. Bidder to also note that, detailed Erection/Mounting drawings as per the make of FDA components selected shall be furnished along with its BOM post order during detailed engineering.**
- 3) BHEL will provide the necessary man power required for commissioning. However, system commissioning shall be done by bidder only.
- 4) Any special activities involved in erection like FO cable splicing, termination, etc. shall be by bidder.
- 5) All commissioning spares as required during erection and commissioning of all the systems are included in bidder's scope & shall be supplied along with the main supply/package and deemed included in the main package.

7 TECHNICAL SPECIFICATIONS

S. No.	System	Technical specifications
[A]	Fire Detection & Alarm System	
1	Bill of material	Refer Annexure-[A] of this specification for <u>Main Supply + Mandatory Spares</u>
2	Technical requirements	1) Refer Annexure-[B] & [D] of this specification 2) Software Licenses shall be valid for life time. 3) Bidder to confirm that entire FDA System shall be subject to approval by TAC accredited agency to qualify maximum premium discount. Responsibility to get approval from TAC Accredited agencies shall rest on BHEL. However all technical support and necessary documentation for obtaining such approvals are in bidder's scope. 4) Addressable type repeater panel in fire station with power supply system (batteries and battery chargers, suitable for providing battery backup of 24 hours (stand by) and 30 minutes (in alarm conditions), etc.
3	Cables used in FDA system	Following cables shall be supplied by BHEL for LOOP and POWER cables of FDA system. FDA components shall be suitable for termination of below mentioned cables: Loop Cable: 2C x 1.5 Sqmm (Screened & twisted armoured cable) Power Cable: 2C x 2.5 Sqmm (Armoured cable)
5	Network Switch	All the network switches shall be of high quality and shall be sized to meet the functional requirements as specified. All the interconnecting cables between network switches shall be fiber optic only. All fiber optic cables shall be terminated directly to network switches through optical fiber port without using media converters. Bidder to ensure that minimum 100% cores are kept as spares in all type of optical fiber cables.
6	Junction Boxes	<u>Junction Box in Fuel Tank areas:</u>

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		Application: for housing modules of Probe detectors (refer page-5 of Annexure-[N]) IP Class: IP 65 Flameproof Size: 375mm x 375mm (typical)
10	Fibre Optic cables along with HDPE conduits	Refer Annexure-[K] of this specification for details of Fibre Optic cable. HDPE conduit shall be 2" rodent proof.
11	Operator Workstation & A4 size color laser Printer along with Commissioning software, Graphic software i.e., (GUI) Software	Refer Annexure-[L] of this specification Software : a General MS Windows latest version, MS-Office, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. b Application software - to suit project specific requirement Any other software required for complete functioning of the FDA system shall also be in the scope of the bidder. Free upgrades to new versions and introductory training for the new version of the software and programming software shall be provided free of cost during the warranty period.
12	Laptop along with Fire Alarm Panel Commissioning Software License /Dongle	The screen size of the laptops should be 15 – 17 inches. All the Laptop will also be used as pluggable temporary programmer's station and operator station functionalities of the programming stations mentioned in the specifications shall be provided (including requisite license). Laptop shall have the latest Windows OS with requisite license. Laptop shall be compatible with FDA Graphics software.
13	Furniture for Operator Workstation & Printer	Required furniture for mounting of HMI peripherals shall be provided. Chairs: Industry standard revolving chairs with wheels (reputed make) and with provision for adjustment of height (hydraulically/gas lift) shall be provided for the operators, unit-in-charge & other personnel in control room area. These shall be designed for sitting for long duration such that these are comfortable for the back. Chair pedestal shall be made of 5mm thick MS plate covered with poly-propylene cladding. Arm-rests in one piece shall be of poly-urethane and twin wheel castor of glass filled nylon. The exact details shall be finalized & approved by Employer during detailed engineering. Tables -- Industry standard tables of reputed make
14	Mini-UPS for Operator Workstation & Printer (To be sized by bidder)	Online Interactive UPS with 30 mins. battery backup on machine load (for PC & its printer)
15	Spike arrester cum distribution board	spike arrester cum distribution board for extending power supply to PC (CPU, Monitor), Printer and FAPs Spike arrestor to be fixed to the furniture table being supplied.
	24 V DC Power Supply Modules with Battery Back Up	

8 BIDDER'S SCOPE OF SERVICES

- 8.1 Supervision of erection & commissioning, performance guarantee testing & trial run, final handing over to end customer and training for the supplied systems shall be included in bidder's scope of Service.

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- 8.2 Number of man days and number of visits as specified in the “Annexure-[B] of this specification” shall be considered. However, either or both of the number of man days or no. of visits may increase / decrease based on the actual site requirement. Unit rate quoted shall be applicable for this purpose.
- 8.3 Bidder to mobilize concerned competent person for supervision of Erection & commissioning activities at site within a period of 7 days of receipt of intimation in this regard from BHEL.
- 8.4 Bidder to note that the supervision charges for erection & commissioning shall consists of the following:
- Per day supervision charges of an Engineer including all other expenses like boarding, lodging, local travel, insurance etc.
 - Travel expenses (inclusive of any clearance charges like Visa fee etc, insurance) from / to vendor works to site.
 - Vendors shall arrange their own Test equipment's, commissioning tools, manpower etc as required.
 - Vendor is also required to provide on the job training to Purchaser /End Customer's operation personnel by associating them in all the day to day pre-commissioning, commissioning and maintenance activities and process operations (like control system operation, trouble procedures, emergency procedures, safety requirements etc.). Training certificate alongwith Dongle for the trained persons is to be provided by the bidder. Per man-day charges quoted by bidder shall also be applicable for the Training charges/rates.

Above services shall be ordered by BHEL Site at the time of commissioning. However, vendor shall submit the price offer for the Services as per “Annexure-[B] of this specification” and same shall be considered for L1 evaluation.

- 8.5 Per diem charges shall be applicable from the day bidder's person reaches site, up to the day he leaves the site.
- 8.6 All payments towards supervision of E&C shall be made only after BHEL-site supervision.

9 MANDATORY SPARES

The Spares shall be as per this Specification & “Annexure-[A] of this specification”.

10 DOCUMENTATION

- 10.1 Following information/documents to be included with offer without which the bid is liable for rejection:
- Duly filled & Signed copy of Checklist(Annexure-I)
 - Duly Signed Deviation format (Annexure-J) indicating “NO DEVIATION”.
 - Duly Signed Unpriced price schedule (ANNEXURE-C) indicating “QUOTED”.
 - Documents in support of Pre-Qualification Criteria
- 10.2 Documentation after P.O. Placement
- Submission of documents as per “Master documents schedule” (which will be finalized in Kick-off meeting after award of the contract) within 2 weeks of placement of LOI (for approval by BHEL and / or BHEL's customer in 4 sets)
 - Further BHEL will provide comments on vendor submitted document within 15 days for revision & resubmission. Vendor shall follow up with BHEL for non-receipt of comments/approvals.

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- c. Revised drawings / Documents shall be submitted by Bidder in 07 days of receipt of comments / observations from BHEL. BHEL shall revert within 15 days on receipt of these revised documents / drawings from vendor for approvals.
- d. All the approvals required for manufacturing shall be completed within 4 months from P.O to meet the P.O delivery schedule. Accordingly, vendor shall ensure the submission of approval category documents (which are required for manufacturing) and obtain their approvals.
- e. Vendor shall obtain final approvals on all technical and quality aspect documents before inspection dates.
- f. It is vendor's responsibility to obtain approvals from BHEL as earliest as possible to meet PO delivery schedules. Accordingly, vendor to plan and execute the supplies in time.
- g. Erection drawings for FDA components indicating erection hardware to be submitted for approval.
- h. Drawings of furniture for PC and printer to be submitted for approval

10.3 Documents to be submitted along with the Consignment.

(Note: submission of these documents are commercially linked) - all in 16 sets (2 sets to be included with dispatch consignment and balance to BHEL Purchase department).

- a. Complete O& M manual.
- b. Approved Engineering documents
- c. Test Certificates documents
- d. As-Built documents
- e. Guarantee certificates
- f. 3 sets of CD-ROM – containing O&M manual and Engineering documents (1 set to be included with item dispatch and balance to BHEL purchase department).

11 MARKING, PACKING AND DESPATCH

- 11.1 All items shall be marked (stamped/etched) in accordance with the applicable code/standard/specification. In addition, the item code, if available, shall also be marked.
- 11.2 For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.
- 11.3 Part number/Dispatch link-up of all the equipments/items supplied and also their co-relation with system/drawing/approved BOQ.
- 11.4 Paint or ink for marking shall not contain any harmful metal or metal salts which can cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.
- 11.5 The equipment shall be transported to site by the vendor in fully assembled condition. However, in case some components are liable to be damaged during transit, the same shall be dismantled and supplied separately, to be reassembled at site the vendor. Assembly of the item supplied loose at site and repairing of any item damaged during transport shall be in the vendor's scope. The vendor shall send each consignment to site with a detailed packing list.
- 11.6 All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to the finish. Crates/cases shall have skid bottom for handling.
- 11.7 Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

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11.8 The equipment/items may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

11.9 The following minimum packing procedures shall be followed:-

- a. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kinds.
- b. All items shall be protected from rust, corrosion, and mechanical damage during transportation and handling.
- c. Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.
- d. All electrical, instrumentation etc., shall be properly packed to prevent damage during transport, storage, handling at site.
- e. All the items which the Bidders considered liable to be damaged during shipment or storage, shall be packaged for separate shipment. If instruments are removed from the panel, they and their connection shall be suitably tagged to ensure simple re installation at the job site. Each instrument shall be sealed in plastic bags containing moisture absorbing desiccants.
- f. It shall be bidder's sole responsibility to protect all the material during period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and including delays in transit.
- g. Mandatory Spare parts shall be packaged separately and clearly marked as 'Mandatory Spares'.
- h. If mandatory spare items are ordered, same shall be sent in pre-decided lots in containers/secure boxes distinctly marked in GREEN color with boldly written "S" mark on each face of the containers /secure boxes
- i. Commissioning spares, Tools & tackles to be packed separately & suitably tagged.

12 TESTING, INSTALLATION, COMMISSIONING & ACCEPTANCE

Final Inspection including document verification as per approved QAP shall be carried out by CUSTOMER /CONSULTANT/ CUSTOMER's Third Inspection Agency & BHEL/BHEL's Third Party Inspection Agency at vendor works.

13 SYSTEM INTEGRATION TEST (SIT)

- 13.1 The Fire alarm equipment including various sub units shall be completely wired and interconnected for the purpose of integrated tests.
- 13.2 Fire and fault alarm conditions shall be simulated on each line and channel and the complete operational sequence shall be checked. The channels shall be tested for their capability for various detector combinations and types of detectors.
- 13.3 The following tests shall be simulated, including any other test as required:
 - a. Single Fire Alarm, Multiple alarms in single loop & multiple loops
 - b. Single fault and Multiple faults (Earth fault, open circuit and short circuit fault)
 - c. Multiple alarms & Multiple faults
 - d. System diagnostic tests
 - e. System response time, time taken for sound mute/ acknowledge & reset actions at various locations etc. shall be checked.

14 ACCEPTANCE CRITERION:

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- 14.1 The reliable operation of the supplied FDA system has to be demonstrated after testing and commissioning by conducting a test run of the entire system for one week (24x7), during which no failure of the system shall occur.
- 14.2 The final acceptance of the system will be based on on-field testing of the devices as well as the complete system. Code conformances shall be demonstrated in the acceptance tests. The service check of the system shall be done for 15 days. The equipment will be considered as commissioned after 15 days of uninterrupted successful operation.

15 PRICE BID FORMAT

- 15.1 Price bid format is enclosed as Annexure-C, bidder to furnish the offer in line with the same.
- 15.2 All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications, if any. Responsibility of ensuring correctness & completeness of Scope of Supply & Services as per this specification requirement solely lies with bidder.
- 15.3 Prices quoted by the bidder shall remain firm till the successful handing over of the FDA system to end customer/User.
- 15.4 Bidder to quote only base rates for all the items, Applicable taxes and duties shall be indicated separately.
- 15.5 The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing "Price Bid –Do not Open". This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

16 VENDOR LIST

- 16.1 Project specific vendor list shall be as per "Annexure-[G] of this specification". Bidder to follow the same.
- 16.2 Further the supplied model shall be under regular manufacturing range and have Proven Track Record (PTR).
- 16.3 Bidder to comply with sub-vendor list enclosed with the specification. The sub-vendors for any item that is not appearing in the sub-vendor list (annexure-G) shall be proposed for BHEL's approval.
- Non-acceptance of any proposed sub-vendor by bidder shall not have any commercial implication. While submitting sub-vendors for approval of BHEL, bidder shall furnish following documents:
- ISO certificate of Sub-vendors
 - Proven track record (references for makes and models supplied in the last 3 years along with supporting documents like unpriced PO, customer approved datasheets, proof of supply).

