



**Boiler Auxiliary Plant , Bharat Heavy Electricals
Limited , Ranipet Tamilnadu- 632406**

Purchase Department

Enquiry No: 4290045E dt.13.04.2019
Due on: 06.05.2019

Item : 3D Acoustic Level Scanner

Synopsis :

- (i) **Annexure-I** (a) Description of item , Quantity details and Relevant specification
- (ii) **Annexure-II:** General terms and conditions of tender
- (iii) **Annexure-III:** Commercial terms and conditions Annexure

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Annexure-I To Enquiry: 4290045E dt.13.04.2019**Item Description and Qty Details****Project: NTPC Patratu TPS (R839, R840 & R841)**

SI No	Description of Item	Quantity	Unit	Delivery Destination
01	R79843470001 3D Acoustic Level Scanner As Per Specification :TECI:TDLS:GEN:REV 00 dt.02.12.2017	36	NO	BHEL/STORE/RANIPET
02	R79843470002 Field Junction ABS (Make: Hensel/ Sumip /Pustron/Suchitra) With SMPS & Local Display Indicator	36	NO	
03	R79843470003 MS Mounting Arrangement For The 3D Level Scanner in Hopper.	36	Set	
04	R79843470004 4 Pair x 1.00 SQ MM Shielded Armoured Cable From 3D Level Scanner To The JB (Make: Cords /Kei/Elkay/Polycab/Friends/Parasheild)	1080	MR	
05	R79843470005 Desktop PC Complete Set As Per Annexure Specification.	3	NO	
06	R79843470006 3D Multivision Software With License For Viewing All Hoppers On a Single Screen With Level & 3D Profile.	3	NO	
07	R79843470007 Un-interrupted Power Supply As Per Specification	3	NO	

PRODUCT STANDARD
ELECTRICAL,C & I
BAP / BHEL / RANIPET 632 406

TECI: TDLS: GEN: REV 00
Page 1 of 8
EFFECTIVE DATE: 02.12.2017

TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS FOR ESP
ITEM : 3D ACOUSTIC LEVEL SCANNER SYSTEM
PROJECT : REFER PROJECT SPECIFIC DATA SHEET(Annexure-A)

NAME		DESIGNATION	SIGNATURE	DATE
PREPARED	SRAVAN KUMAR A	ASST. ENGINEER I		02.12.2017
CHECKED	SMITH BABU K K	MANAGER		02.12.2017
APPROVED	GOURI SHANKAR NAIK	DGM		02.12.2017

ISSUED BY EDC – E, C&I

REVISION HISTORY:

REVISION: 00

INITIAL RELEASE DT: 02.12.2017

1.0.0 INTRODUCTION:

- 1.1.0 This technical specification is meant for 3D Acoustic Level Scanner and its Accessories to be supplied and commissioned at project site, mentioned in Project Specific Data Sheet. (Annexure-A of specification)
- 1.2.0 The 3D Acoustic Level Scanner supplied shall be mounted inside the ESP ash hopper (at the hopper top portion) and used for continuous monitoring of the Ash level in the ESP hoppers of thermal power plants
- 1.3.0 The 3D Acoustic Level Scanner shall be used IN-SITU for non-contact type measurement device based on Acoustics frequency waves
- 1.4.0 The 3D Acoustic Level Scanner & its accessories offered by the bidder shall be field proven type. Vendor shall provide sufficient back-up documents and shall be reviewed & approved by BHEL / BAP / RANIPET.
- 1.5.0 The bidder shall submit all the documents required as per this specification, along with their offer for review by BHEL.
- 1.6.0 The offers without enclosing any of the required documents will be considered as non-responsive & incomplete offers. Such offers are liable for rejection.
- 1.7.0 The bidders may note that deviation if any to this technical specification is not acceptable. The offers with technical deviations, is liable for rejection.

2.0.0 SCOPE OF SUPPLY & WORKS:

- 2.1.0 The scope of supply shall include Design, manufacture, testing, inspection, packing and delivery of 3D Acoustic Level Scanner and accessories (which includes local JB's, PC for the visualizing the hopper ash level, software for 3D level visualization, any special cables, any special supports required for fixing inside the ESP Hopper, mounting flanges and tubes) as per this technical specification.
- 2.2.0 The scope of the bidder shall also include the following.
 - a) Erection supervision of the items supplied.
 - b) Commissioning assistance , as required by site, for all the items supplied by the vendor to the satisfaction of BHEL / Customer.
 - c) O&M Manual inputs

3.0.0 PROJECT INFORMATION:

As per Project Specific data sheet (Annexure-A of the specification)

4.0.0 SITE CONDITION & SITE DATA:

4.1.0	Ambient temp outside the hopper	5 to 50°C
4.2.0	Relative humidity (maximum) at 45°C outside the hopper	95 %
4.3.0	Location	Mounted Inside the ESP Hoppers at the hopper top. Surrounding atmosphere is dust laden, polluted and corrosive. The equipment will be subject to negative pressure.
4.4.0	Measurement Media	Fly ash in ESP hoppers
4.5.0	Level measurement type	Continuous
4.6.0	Hopper dimensions applicable	As per project specific data sheet
4.7.0	Hopper material	Mild steel
4.8.0	Type of hopper (Pyramidal / Conical)	As per project specific data sheet
4.9.0	Flue gas flow	Horizontal to upper surface of the hopper
4.10.0	Flue gas pressure (inside ESP)	-350 mm WC (Typical)
4.11.0	Flue gas temperature (i)Normal (ii)Exceptional	160 to 200 Degrees Celcius 300 Degrees for 30 minutes
4.12.0	Source of dust emission	Coal fired boiler
4.13.0	Type of dust collector	ESP.

4.14.0 All the items supplied by the vendor shall be suitable and perform satisfactorily under the site condition as mentioned above and in the project specific data sheet.

5.0.0 Major Components of 3D Acoustic Level Scanner & Its Accessories

5.1.0 All the items and accessories shall be supplied through the principal vendor only. The principal vendor shall be responsible for satisfactory working of complete system of 3D Acoustic Level Scanner.

5.2.0 One set of 3D Acoustic Level Scanner system & its accessories shall consist of the following:

- 3D Acoustic Level Scanner measuring sensor including the housing- One no. per hopper
- Local Display Unit - One no. per hopper
- Interconnecting cables/prefabricated cable as applicable for the 3D Acoustic Level Scanner – One set per hopper

- d) Mounting flanges and supports along with fasteners for installation of the system in the ESP Hoppers.- - One set per hopper
- e) Field Termination box/ Junction Box (IP-65 protection) provided with DC power supply (details as in Section.6) and Interconnection cables, TBs, MCBs.-
- One set per hopper
- f) One set (Details/Specification as per Annexure-A) of PC based operator work station for viewing the 3D ash level of the hoppers.- One set per boiler
- g) One set of software (for visualizing the 3D level of the ESP hoppers), installed in the PC based operator workstation - - One no. per boiler
- h) In case licensing is applicable for the software, the software shall be provided with a perpetual license. The dongle / key required for the software and the Pendrive/DVD/CD containing the software for installation shall also be supplied.

5.3.0 In addition, if any other items required to make the system complete, including plates/flanges etc shall be identified & supplied.

5.4.0 Make of component details

Supplier shall furnish along with offer, the make / model no. for the various components of the 3D level monitoring system (as part of the BOM). The supplier shall also ensure that the make of the components is suitable for the performance of the entire system in totality

6.0.0 Technical Features of the 3D level monitoring system & accessories:

- 6.1.0 The 3D Acoustic Level Scanner is a monitoring device intended to be used for measuring the level of fly ash in the hoppers of ESP.
- 6.2.0 The principle of operation of 3D Acoustic Level Scanner shall be non-contact type based on acoustic frequency waves
- 6.3.0 The 3D Acoustic Level Scanner and its accessories, mounted at the duct, shall be designed for weather & dust proof as per IP 67 degree of protection, as per relevant standard.
- 6.4.0 The model of the 3D level scanner offered shall be suitable for high temperature environment. Details are provided in Annexure-A of the specification.
- 6.5.0 The 3D Acoustic Level Scanner shall measure the hopper ash level and produce 4 – 20mA instantaneous signal corresponding to the hopper ash level. The 4-20 mA DC signals shall be hardwired to DCS for displaying the average ash level in the hopper at DCS. The vendor shall terminate the 4-20 mA at the local Junction Box terminals. (for further connection to DCS)

6.6.0 The 3D Acoustic Level Scanner shall also provide details over serial communication (such as RS-485) to the operator PC for displaying the following values of each hopper in the PC using the 3D visualization software

- a) Average level
- b) Maximum level
- c) Minimum level
- d) Volume
- e) Mass
- f) Real time 3D profile

6.7.0 The 3D Acoustic Level Scanner shall meet the following.

- a. Accuracy : 1 % or better
- b. Housing and Antenna : Die Cast Aluminum, Min. 3 Antennas/ Scanner
- c. Protection class : IP-67
- d. Measurement range : Empty to Full of ESP hopper

6.8.0 Power supply details

AC power supply shall be provided by BHEL at the local Junction box of the 3D Acoustic Level Scanner as follows at site

- a) Voltage: 240V AC/110V AC, Single phase, (Confirmation at PO stage)
- b) Frequency: 50 Hz.

Separate DC power supply unit shall be provided in the Field JB by the supplier, suitable for the input AC supply as above. The DC power supply shall take care of the DC power requirements of the 3D Acoustic Level Scanner equipment with sufficient capacity to avoid heating during continuous operation

6.9.0 Six copies of Erection, commissioning, operation & maintenance manual shall be provided and shall be in ENGLISH only. Accordingly, any displays, instruction etc. shall be furnished in English only.

6.10.0 The scope for the vendor shall include the Local display unit along with the 3D level scanner. The Local display unit shall be separately mounted outside the hopper. The applicable cables, fasteners etc required for interconnection of the display unit with the sensor of the 3D level measurement system shall also be supplied by the vendor.

6. 11. 0 MOUNTING FLANGE WITH TUBE

6.11.1 The Mounting flange/ studs/brackets with flange along with fasteners shall be provided for mounting the 3D level scanner system in the ESP Hoppers.

6.11.2 The length and type of mounting arrangement shall be suitable with respect to the hopper dimensions and hopper geometry for the project

6.11.3 Suitable sealing gaskets shall be supplied, as required and applicable, so as to prevent dust, air and water entry through the point of connection of Flange/stud with the hopper.

6.11.4 All mounting hardware (bolt, nut & washers or any other items not specified but required for the system) for fixing the system and all applicable equipment / accessories shall be supplied by the vendor. The bolts shall have adequate length for fixing the equipment / accessories.

6.12.0 INTERCONNECTING CABLES and FIELD JBs:

6.12.1 Inter connecting cables of sufficient length, screened type, from 3D level Sensors to the Local Termination box / Junction box shall be supplied along with the 3D acoustic level sensor.

6.12.2 Field JBs shall be provided terminals to terminate the 4-20 mA output from each 3D level scanner. The cable from the local JB to DCS shall not be in vendor scope.

6.12.3 Field JBs shall be provided with 20% spare terminals and two earthing terminals on the external body of the JB

6.12.4 Double compression , brass Cable glands of suitable size shall be provided in the JB

7.1.0 DOCUMENTS /DETAILS TO BE SUBMITTED ALONG WITH THE OFFER

- a) Schedule of technical confirmations, and deviations / Remarks , if applicable (As per Annexure- B of the specification)
- b) Bill of materials including scanner, cables, flanges, operator work station, JBs, special tools if any
- c) Scope of work / Scope of supply
- d) Block / Schematic diagrams identifying various items quoted / required and also indicating the scope division

8.1.0 THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED TO BHEL IN THE EVENT OF AN ORDER ON THE BIDDER.

Following documents / drawings shall be submitted to BHEL (For Approval) within 2 weeks from the date of purchase order.

8.2.0 Detailed Bill of material (as per purchase order including special tools if any) indicating item description, part no. rating, quantity make etc.

8.3.0 Details of dimension and weight for various loose items.

- 8.4.0 Mounting arrangement drawing indicating the location of mounting in the hopper.
- 8.5.0 Electrical interconnection diagram indicating terminal details of various signals.
- 8.6.0 Internal wiring diagram of the Local Junction Box / Field Termination Box.
- 8.7.0 Termination details of various items
- 8.8.0 The bidder shall furnish test certificates/ reports and calibration reports.
- 8.9.0 The details of the cable being supplied.
- 8.10.0 The bidder shall furnish detailed interconnection between various equipment / Instrument.
- 8.11.0 Erection instruction.
- 8.12.0 Pre commissioning checks.
- 8.13.0 Commissioning procedure.

9.1.0 O & M INSTRUCTION MANUAL :

- 9.2.0 Six Hard copies of operation & maintenance instruction manual shall be supplied along with the 3D acoustic level scanner. The number of copies shall be as per Enquiry / Purchase order. In addition, the O & M manual shall also be submitted in CD/ pen drive.
- 9.3.0 The O & M instruction manual shall include all the items supplied by the bidder / vendor.
- 9.4.0 The O&M manual shall include the following:
 - a)Detailed technical write up on working principal, technical data & specification for various items.
 - b)Detailed erection procedures
 - c)Detailed commissioning procedure, trouble shooting, maintenance schedule etc.
 - d)Detailed operating instructions
 - e)Detailed maintenance instructions
 - f)List of spare parts along with ordering details
 - g) All inter connection drawings including terminal / pin details
 - h) DO's & DON'Ts

10.1.0 PACKING:

The 3D acoustic level scanner and its accessories shall be covered with polythene and packed in carton boxes. The carton boxes shall be packed in wooden boxes / Equivalent strength card board pallets. Lining with plastic sheet shall be provided inside the packing to avoid water entry during transit / storage.

11.1.0 INSPECTION

11.2.0 Vendor shall submit their Manufacturing Quality Plan along with test procedure for our review and approval. The test procedure shall cover 3D acoustic scanner along with the local display unit, interconnecting cable, Operator PC. The make of components shall be part of MQP

11.3.0 The 3D acoustic level scanner and its accessories shall be inspected based on the following documents.

- a) BHEL Purchase Order
- b) BHEL Technical Specification.
- c) BHEL / CUSTOMER Approved Vendor Drawing.
- d) BHEL approved Quality plan along with Test procedures

12.1.0 COMMISSIONING:

12.2.0 The vendor shall furnish necessary documents to BHEL for erecting the 3D Acoustic level scanner and its associated items supplied by the vendor.

12.3.0 The vendor shall commission all the 3D acoustic scanner and its associated items supplied by the vendor to the satisfaction of BHEL/ Customer.

12.4.0 The vendor shall carry out the necessary configuration of each 3D acoustic scanner and the 3D visualization software at site.

12.5.0 List of recommended spares to be quoted along with the offer. The spares list shall Include the following:

- a. 3D Scanner module
- b. Interconnecting cables
- c. Power supply module (230/110 V AC to 24 V DC)
- d. PC based system for visualization
- e. Software for 3D visualization

12.6.0 The scope includes two days of training to be provided to Site engineers at site.

Annexure-A (NTPC Patratu Data Sheet)

Sl No	Description	Remarks / Value/ Details
	Item - Type	Non-Contact Acoustic Frequency Waves Based 3D Level Scanner for ESP Hoppers.
1	Project Name and Details	NTPC Patratu
	Project location	Patratu
2	Flue gas moisture content	6% to 8 % (by weight) – Typical values
3	Flue gas sulphur content	Later
4	Type of hopper (Pyramidal / conical)	Conical
5	Size of hopper (Height and diameter for conical hopper)	Later
6	No of ESP hoppers per boiler with 3D level scanners	12 passes
7	No of boiler units for the project	03
8	<ul style="list-style-type: none"> 3D Scanner IP rating Field Junction Box IP rating 	IP-65 or Better IP-65 or Better
9	Communication cable length from local JB to the ESP Control room	Around 100metres
10	Cable size for selection of gland to be provided in the local Field JB provided by the vendor	a) Power cable(incoming 240 or 110 V AC) – b) 4-20 mA Screened cable(cable from JB to DCS) – c) Incoming cables from the scanner to JB – (Vendor to decide on the cable gland size) d) Signal Cable from JB to ESP CR –
11	Special requirements if any (including variation in the number of PCs or variation in input power supply, variation in process temperature etc)	N.A.
12	No of hard copies- O&M Manual	06
13	No of CDs/DVDs/Pendrives for the O&M Manual	01
14	Minimum Requirements for the PC (used for 3D visualization)	<ul style="list-style-type: none"> CPU: Latest generation CPU Removable bulk storage drive (MOD /DVD / DAT):6 GB (minimum) Removable Bulk Storage Media for above:10 nos.

		<ul style="list-style-type: none">• Monitor: Minimum 19" Full Flat TFT Resolution 1600 x 1280, refresh rate min 85 Hz.• UPS 1 no. on-line Interactive UPS with 30 mins. battery backup on machine load (for PC & its printer)• Software: General MS Windows latest version, MS-Office, Microsoft Visual Studio, Adobe Acrobat, anti-virus McAfee or equivalent, etc. Application software - to suit project specific requirement (PCs shall display Average Level, Maximum Level, Minimum Level, Volume, Mass and Real Time Complete 3D Profile of each ESP Hopper.)
15	Signal information	4-20 mA signal shall be hardwired to corresponding DDCMIS for displaying Average Level of each ESP Hopper in the First Field of ESP. In addition to the information available in LMS PC, the vendor shall provide all required hardware and software to display the respective information on OWS located at ESP CR.

Annexure-B (NTPC Patratu Technical specification Confirmation Sheet)

(Note: The salient technical points are brought out in the annexure for confirmation by the vendor. In addition to the confirmation mentioned herein, the vendor shall meet all the requirements of the technical specification)

Sl No	Description	Confirmation by the supplier	Remarks if any
1	3D acoustic level scanner offered meets the technical requirements including IP requirements as per 6.7.0		
2	3D acoustic level scanner offered is suitable for temperature requirements as per 4.11.0		
3	Suitable for the hopper geometry as specified in Annexure-A, # 6&7		
4	4–20mA instantaneous signal corresponding to the hopper ash level should be available (made available at the local field JB) for hardwiring to DCS for displaying the average ash level in the hopper at DCS.		
5	The 3D Acoustic Level Scanner shall also provide details over serial communication (such as RS-485) to the operator PC(at ESP Control room) for displaying the following values of each hopper in the PC using the 3D visualization software <ul style="list-style-type: none"> • Average level • Maximum level • Minimum level • Volume • Mass • Real time 3 D profile 		
6	Local display unit along with the 3D level scanner. Since the local display unit is separately mounted outside the hopper, the applicable conduits, cables, fasteners etc required for interconnection of the display unit with the sensor of the 3D level measurement system shall also be supplied		
7	Max Length permitted between the antenna sensor and the local display unit (in mm)		

8	Field Termination box/ Junction Box (IP-65 protection) provided with DC power supply (details as per technical specification) and Interconnection cables, TBs, MCBs, suitable cable glands.		
9	PC for visualization of Hopper ash levels as per specification provided in Annexure-A		
10	Erection supervision and commissioning shall be provided.		
11	Hard copies of O&M Manual and CD/Pendrive as per Annexure-A		