ANNEXURE-A

ITEM: CONTINUOUS AMBIENT AIR QUALITY MONITORING SYSTEM (CAAQMS) FOR PANKI PROJECT

Pre- Qualifying Requirement (PQR):

1. The bidder shall offer the analyzers "i.e. SO_2, NOx, CO, CO_2, O_3, PM10 & PM2.5" which have been supplied, erected and commissioned in a power plant with unit rating 500 MW or above and this system should be working satisfactorily for a minimum period of one year as on 05 November 2015. The bidder shall submit copy of "PO placed/ Dispatch documents/Commissioning Report/End User certificate with details of end user concerned official for supply, satisfactory operation of the commissioned equipment" in support of above.
2. Offered CO_2 analyzer, which are not meeting PQR point no. 1, is also acceptable if measurement principle is same as CO analyzer. In such case, PQR of equivalent CO analyzer, as per point 1 above, would be acceptable against offered CO_2 analyzer.
3. The bidder shall offer "Hg analyzer" which have been commissioned in a power plant with unit rating 200 MW or above and this system should be working satisfactorily for a minimum period of one year as on BHEL bid opening date. The bidder shall submit copy of "PO placed/ Dispatch documents/Commissioning Report/End User certificate with details of end user concerned official" in support of above.
4. For Bidders offering upgraded / latest models of analyzer in point 1,2 or 3 above, PQR of equivalent previous models is acceptable. For offered analyzers, OEM shall certify that offered model is upgraded version of earlier model meeting PQR in point 1,2 or 3 above. The bidder shall submit Reference List of Projects wherein offered analyzers are supplied & commissioned.
5. The bidder shall have experience for installation, execution & commissioning of similar type of system in last 5 years in 2 nos. thermal power stations of capacity of 250 MW or above. The bidder shall submit copy of "PO placed on bidder, Dispatch documents, Commissioning Report with details of end user concerned official".
6. In case the bidder is sourcing analyzers from an OEM, Tender specific authorization letter is required from the manufacturer, clearly indicating contact details like Name, Email and address of manufacturer.
7. The bidder shall furnish an agreement with OEM for providing services and supply of spare parts for 5 years from the date of commissioning of items. In case OEM is bidding, he shall provide a certificate for providing services and supply of spare parts for 5 years from the date of commissioning of items.
8. The bidder shall furnish "OEM Technical literature/Manuals of offered Analyzers/ Accessories and all major items forming part of BOM".
9. Bidder's Registered address of India office and Name of representative for technical support for E&C and after sales service at project site.
10. The firm of Bidder should have in existence in past 3 years as on date of bid opening. Bidder Average Annual Turnover (Last 3 Years): 2 Crore. Supporting documents certified by CA to be provided.

CONTINOUS AMBIENT AIR QUALITY MONITORING SYSTEM

1.01.00 CAAQMS Stations – 04 Sets

Broad break up of items under CAAQMS is as below:

S. No.	Description	Quantity
1.	Sulphur dioxide (SO_2) Analyzer	04 No.
2.	Oxides of nitrogen (NOx) Analyzer	04 No.
3.	Carbon monoxide (CO) Analyzer	04 No.
4.	Carbon dioxide (CO_2) Analyzer	04 No.
5.	Ozone (O_3) Analyzer	04 No.
6.	Suspended Particulate Monitors (PM10, PM2.5 Analysers)	08 No. (02 at each AAQMS)
7.	Sampling Inlet Heads (PM10, PM2.5 and TSP – 01 Set)	04 Set (12 No.)
8.	Mercury (Hg) Analyser	01 No.
9.	Meteorological Monitoring System	01 Set
10.	Multi Gas Calibrator	04 Set
11.	Calibration Gas Cylinders for analysers (01 Set for each AAQMS)	04 Set
12.	Zero Air Generator	04 No.
13.	Hydrogen Generator	04 No.
14.	Sample Handling System Including Compressed Air For Purging	04 Set
15.	Analyzer Shelter with 19" Rack Cabinet, Furniture (01 Cupboard, 01 Table & 02 Revolving Chairs), Air Conditioners (2T, 2 No. for each AAQMS)	04 Set
16.	UPS for each shelter (1 Working & 1 Standby – 1 Set)	04 Set
17.	Local DAS with Work Station(PC)	04 Set
18.	Central DAS with Work Station (PC), Laser Jet Printer & UPS	01 Set
19.	Exclusive Work Station for uploading data on CPCB server	01 Set
20.	Electronic Display with wireless connectivity along with Platform and Mounting structure	01 No.
21.	RF Wireless Communication. License & Renewal for use of wireless communication for 3years	1 Set
22.	Mandatory Spares	01 Set
23.	Any additional item not covered above but required as per technical specifications for completeness of system.	-

1.01.01 AAQMS will be provided to check upon the ambient air quality inside and around the power plant and capable of generating required reports for submission to relevant central & state regulatory agencies by owner.

1.01.02 Ambient air quality will be monitored for concentration levels of selected gaseous pollutants at different locations within the power station boundary and adjoining areas as per the ambient air quality monitoring guidelines of central and state regulatory agencies like MOEF, central and state pollution control boards (PCBs) prevailing during contract execution phase.

1.01.03AAQMS system including the analyzers being supplied will meet all applicable requirements/ guidelines of relevant central & state regulatory agencies like MOEF, central and state pollution control boards (PCBs) etc or of US EPA in the absence of the same. It is the sole responsibility of the Bidder to obtain the necessary approval. Owner has no liability towards the same. A proof of approvals and certificates of the above compliance along with copy of the Test report (in English) from internationally reputed agencies such as US EPA, TUV /UAB of Germany, Envt. Canada, Envt. Japan, EEC etc will be furnished.

1.01.04 AAQMS will include monitoring of the following pollutant gases/parameters. Method of measurements & standards will be as per CPCB and state pollution control boards (PCBs) norms.

a) Sulphur dioxide (SO2)
b) Oxides of nitrogen (NOx)
c) Carbon monoxide (CO)
d) Carbon Di-oxide (CO2)
e) Suspended particulate matter (PM10 & TSP)
f) Suspended particulate matter (PM2.5)-respiratory
g) Ozone (O3)
h) Mercury Analyser - at one location only

1.01.05 AAQMS for each plant location will be fixed type, self contained 'station'. Total four (4) nos. such stations will be provided at the min. one (1) no 'station' will be located at the "Up wind" direction path. Balance three (3) no. 'stations' will be located at different plant locations considering the factors like downwind direction, sensitive receptor, population etc. the exact location of the monitoring stations will be decided in consultation with owner and regulatory agencies during project implementation phase.

1.01.06 Ambient air quality monitoring for each plant location will be suitable for continuous on line monitoring of different pollutant gases. AAQMS will allow on line monitoring, on line logging of parameters values, on line archiving and on line report generation for environmental monitoring authorities (CPCB & SPCB) and plant management personnel. All required software & hardware will be provided by bidder.

1.01.07 The Analysers / Monitors should be 19" Rack Mounted with the ON / OFF Switch and display of all important status signals including Lamps, etc. should be preferably on the front panel.

1.01.08 The system must function properly in the weather and atmospheric conditions as below:

Ambient Temperature Outside cabinets	**Pressure**	**Relative Humidity**	**Atmosphere**	**Required Protection class of panels/ cabinets/desks to be provided by bidder**
Outdoor Location				
55 degree C max	Atmosphere	100%	Dusty area $	IP 65
55 degree C max	Atmosphere	100%	Air (dirty)	IP 65
4 degree C min	Atmosphere	5% min	Air (dirty)	IP 65
Indoor Location				

55 degree C max	Atmosphere	95% max	Air	IP 54**
4 degree C min	Atmosphere	5% min	Air	IP 54**
Air Conditioned Areas				
24 +/- 5 degree C normal	Atmosphere	95% max	Air	IP 32***
50 degree C max*	Atmosphere	5% min	Air	IP 32***

* During air conditioning failure (for certain period)
** For non-ventilated enclosures. For ventilated enclosures, protection class will be IP 42.
*** With a suitable canopy at the top to prevent ingress of dripping water.
$ Dusty area like Conveyor galleries, Transfer points, bunker area, Track hopper area, Crusher house, ash silo, bottom ash area etc.

1.01.09 The system will be supplied with all ancillaries and consumables necessary for trouble free operation during the Warranty period. In case the. Shelf life of any consumable is shorter, and then supplies to be done in suitable phases. Bidder will give details of shelf-life, quantity of consumables required etc. to last the warranty period.

1.01.10 A Sampling System compatible with the Analysers / Monitors for Total Suspended Particulates (TSP), PM10, PH2.5, CO, O3, Mercury, NOx and SO2, CO2 will be provided. The system, wherever applicable, will also be compatible with Analysers for Pb (which the Owner may procure in future). The system, wherever applicable, will have the facility for moisture removal.

1.01.11 Minimum requirements like input power, space, approach and any other associated facilities required for installation and commissioning of the AAQMS will be specified by the bidder in the offer. Installation and commissioning of the AAQMS will be done by the bidder at the site provided by UPRVUNL. Bidder will obtain statutory and other clearances for commissioning, operation & maintenance of the AAQMS.

1.01.12 Bidder will furnish, along with the bid documents, the details of calibration system provided with each Analyzer / Monitor.

1.01.13 AAQMS system will include the following: (a) AAQMS stations - 4 nos; (b) Centralised AAQMS data acquisition system.

1.01.14 Each AAQMS station will include the following including analyzer, accessories, calibration facility, mounting racks/cabinets, furniture, and housing shelter, data acquisition system etc. but not limited to the same:
a) Individual gas analyzers for the parameters specified.
b) Necessary sampling systems for AAQMS analysers
c) Multi gas calibration system
d) Zero air generators.
e) Hydrogen generator.
f) Calibration gas cylinders.
g) Mounting cabinet / rack for analyzers and accessories
h) Housing shelter for AAQMS equipment – environmentally conditioned, walk-in Type Shelter complete with lighting and convenience receptacles.
i) UPS & lighting power supply complete with distribution facility.
j) WORK STATIONS based data acquisition system for AAQMS station.
k) Furniture like work station tables, industrial grade chairs, working tables etc.

l) Interfacing the AAQMS analysers signals to the AAQMS work stations either by serial communication link or hardwired signals including suitable cables with accessories at both ends and cable carrier etc.

1.01.15 SPECIFICATIONS OF CONTINUOUS MONITORING AMBIENT AIR ANALYSERS

Description	**NO-NO_2-NOx Analyser**	**SO_2 Analyser**	**CO Analyser**	**Ozone Analyser**	**Mercury Analyser**
Principle	Chemiluminescence	UV Fluorescence	NDIR Spectroscopy	UV Photometric/ chemiluminescence	Atomic Absorption /Atomic Fluorence
Measurement	NO, NO_2, NOx in Ambient Air	Sulphur Dioxide In Ambient Air	CO	O_3	Hg
Display	LCD	LCD	LCD	LCD	LCD
Ranges	0-1000 PPB in Multi ranges (minimum four selectable ranges) preferably as below: 0-100 PPB 0-200 PPB, 0-500 PPB, And 0-1000 PPB	0-1000 PPB in Multi Ranges (minimum four selectable ranges) preferably as below: 0-100 PPB 0-200 PPB, 0-500 PPB, And 0-1000 PPB	0-1 PPM to 0-100 PPM selectable	0-100 ppb to 0-10 PPM	0.5 – 2000 ng/m3, 5-1000 ng/m3 selectable
Minimum detectable Limit	1 PPB	1 PPB	0.05 ppm	0.6 ppb (RMS)	-
Noise Level	0.5 PPB or less	0.5 PPB or less	-	-	-
Zero Drift Lowest Range	<1PPB in 24 Hours	<1 PPB in 24 Hours With automatic zero compensation	<0.1 ppm/day	<1.0 ppb	-
Span Drift at Lowest Range	+2% in 7 days of full scale	+2% in 7 days of full scale	<1% of reading per day	+ 1% of measured value/week	-
Response time at Lowest range	<=100 sec	<=60 sec	<60 sec	20 Seconds	-
Linearity	+1% of full scale	+1% of full	+1% of full	+1% of full	

Calibration	Built – in calibration Facility	Built – in calibration Facility	Built – in calibration Facility	Built – in calibration Facility	Built – in calibration Facility
Consumables and spares	Recommended requirements of 3 Years of continuous operation	Recommended requirements of 3 Years of continuous operation	Recommended requirements of 3 Years of continuous operation	Recommended requirements of 3 Years of continuous operation	Recommended requirements of 3 Years of continuous operation
Digital Signal Transmission	RS 232 link. Analyser will be capable to transfer all the data through RS 232/485 link to a PC/OWS based data logger.	RS 232 link. Analyser will be capable to transfer all the data through RS232/485 link to a PC/OWS based data logger.	RS 232 link. Analyser will be capable to transfer all the data through RS 232/485 link to a PC/OWS Based data logger.	RS 232 link. Analyser will be capable to transfer all the data through RS232/485 link to a PC/OWS based data logger.	RS 232 link. Analyser will be capable to transfer all the data through RS232/485 link to a PC/OWS based data logger.

1.01.16 Continuous ambient air measurement of TSP, PM10 & PM 2.5

Principle: Beta attenuation by particulates sampled through the instrument and collected on movable filter tape. Before and after sampling, beta radiation will be measured by appropriate counter. An internal microprocessor will handle all sequences and automatically calculate the concentration of the particulate matter being measured. Each analyser will be freely configurable at site for either TSP, PM 10 & PM 2.5. These analysers will be provided with sampling heads suitable for continuous measuring of PM2.5 and PM10. Additional sampling arrangement for TSP will also be provided and it will be possible to easily connect it to the Analyser normally measuring PM2.5.

1	Measurement	Continuous ambient air measurement of TSP, PM10 & PM 2.5
2	Sampling System	System for sampling of particulates of following sizes
		(a) Total Suspended Particulates (TSP) (b) 10 microns or less. (c) 2.5 microns or less.
3	Measurement Range	0-1000 microgram per cubic meter (ug/m^3)
4	Display	LCD
5	Resolution	1% of the concentration
6	Minimum Detectable Limit	2 micrograms/m^3
7	Filter material	glass fiber filter
8	Roll length	Approximately 30 meters
9	Measurement result	1 hour average of shorter
10	Digital Signal Transmission	RS 232 link. Analyser will be capable to transfer all the data through RS 232 link to a PC based data logger.

1.01.17 CO_2 analyser

a) Principle - IR type with gas filter correction
b) Range - 0 to 1000 ppm (fully selectable)
c) Minimum detectable limits - 0.2 ppm
d) Zero drift (24 hr. basis) - <0.1 ppm per day
e) Span drift (24 hr. basis) - + 1% per week
f) Response time - 60 sec.
g) Accuracy - (±) 0.1 ppm
h) Linearity - (±) 1% of full scale reading
i) Operating temperature - 20-30°c
j) Signal output - 4-20 mA DC, RS 232 or RS 485 link
k) Power supply - 230V AC(UPS)
l) Mounting - rack mounted
m) Digital Signal Transmission - RS 232 link. Analyser will be capable to transfer all the data through RS 232/485link to a PC/OWS based data logger.

1.01.18 Multi-point calibration System

To cross check the built-in-calibration facility of the Analysers/Monitors, a Multi-Gas Calibration System for each AAQMS station with fast response time will be offered by the Bidder which can be used as manual or remote multi-point generation of gas concentrations from one to several high concentration Span Gas Cylinders. The Multi-Gas Calibration System will meet the US EPA or TUV/4AB of Germany, Envt. Canada, Envt. Japan, EEC etc. requirements.

a) Flow measurement accuracy - (±) 1% of set point or (±) 1% of full scale reading (ln 20-100%) whichever is less.
b) Repeatability of flow control - (±) 0.2 % of full scale reading
c) Linearity of mass flow - (±) 0.5 % of full scale reading Measurement
d) Calibration gas input ports - 6 nos.
e) Response time - <60 sec. for 0-99 %
f) Temperature range - 0-40°c
g) Power supply - 230V AC (UPS)

1.01.19 Analyser gas sampling system will be complete with sampling hood arrangement with SS hood, SS 316 manifold, moisture trap, air compressor of requisite capacity (minimum 10 LPM) and heat less type air dryer.

1.01.20 Zero air generators will be with inbuilt catalytic converter.

1.01.21 The analysers should be complete with calibration system. Calibration gas cylinders (as applicable) for NO_X, SO_2, CO, CO_2, O_3, Mercury Analyser, TSP, SPM-PM10 & PM2.5 analysers as required of appropriate capacity suitable for minimum 6 months calibration with SS 316 regulator. Empty cylinders would be supplied initially. Gas filling of cylinders would be provided during commissioning of AAAQMS at site. All the calibration gases provided along with the system must be NIST traceable. The analyser must have zero point internal calibration system. The calibration procedure will be integrated into the software system for automatic calibration.

1.01.22 Hydrogen generator complete with fluid tank and all accessories –hydrogen purity of >99.99%.

1.01.23 All the Analyser will be provided with dual range & auto ranging facility.

1.01.24 All consumables like Chemical reagents, filters, markers, papers etc. will be provided by bidder.

1.01.25 The analysers must function properly in Indian conditions without any defect between 0 to 50 deg C ambient temperature, 0 to 100% relative humidity and in high ambient dust level.

1.01.26 All Analysers, Monitors and Sensors will be fully integrated in the Rack Cabinet which is installed in shelter and fully calibrated and tested before call for inspection. Total integrated analyser system along with shelter will be functionally inspected by Owner at Bidder's place prior to dispatch to site.

1.02.00 AAQMS analyser shelter

1.02.01 General requirement

The analyser shelter will be a completely assembled unit suitable for installation on a concrete pad or as a stand-alone unit. All internal piping and tubing will terminate in bulkhead connections. Internal wiring will terminate in external junction boxes. All equipment including tubing, conduit fittings, junction boxes etc. will be installed so as not to interface with the removal of analysers, sample handling systems and related equipment, accessibility for maintenance will be the prime consideration. The minimum size of shelter will be 4 (Length) x 3 (Width) x 2.5 (Height) meters. To accommodate the panels, work stations, tables, revolving tilting chairs, cupboard, UPS, battery etc.

1.02.02 Construction features

i. The analyser shelter will consist of a self-framing exterior skin assembled on a rigid primed and painted steel superstructure. All materials used in the construction will be non-combustible.

ii. Wall panels design to be completely weather resistant. The design will allow for thermal expansion/contraction of the structure over the complete range of ambient temp. Applicable for the location without causing harmful buckling or opening of joints etc. materials of construction will be 2 mm thick SS sheets for external walls and 18 gauge galvanized steel for internal walls with ribbed interlocking. The ribbed interlocking will provide a strong column for the sheets on the side valves, where the "u" profile created at the edges, when interlocked with the second sheet, increases the section modules of ribbing.

iii. The wall panels of the shelter will be insulated and designed for the given ambient conditions by glass rock wool approx. 100 mm insulation thickness.

iv. Roof panels design and construction to be completely weather resistant. The design will allow for thermal expansion/contraction of the structure over the complete range of ambient temp. Applicable for the location without causing harmful buckling or opening of joints etc.

v. The base structure of the shelter will be constructed using ISMC (1501125) ISMB (100) welded property and adequately sized to ensure structural rigidity to prevent deformation during dragging, lifting, loading and unloading of the shelter.
vi. The roof panels will be provided with 80mm thick rock wool insulation.
vii. All insulation materials are to be fire retarding.
viii. The analyzer house will have two doors, one as the main entrance and the other as the emergency of the shelter.
ix. The doors are to be mounted on special hinges to ensure gas tight construction of the shelter.
x. Doors will be sturdy, double walled, insulated with rock wool and open to the outside. Each door will have a window with transparent toughened safety glass.
xi. The main entrance will carry a plate indicating the plane area number and the tag-list of all the analyzers inside the shelter.
xii. Analyzer shelters met the standards of the unknown building code with the following design loads:
i) Roof - 20 lb / sq ft live load
ii) Wind - 35 lb /sq ft at 0-30 ft above grade elevation
iii) Seismic zone - as applicable for project location (Panki, Kanpur, Uttar Pradesh)
xiii. All tubes and cable entries to the shelter will be through multi-cable transit blocks – to ensure gas tightness of the shelter.
xiv. The floor is to be fabricated with anti-slip sheet and sealed continuously to ensure no loss of pressure.
xv. Each shelter will be provided with lightening protection system.

1.02.03 Painting

a) Preliminary cleaning involving removing of grease, oil, paint and dirt, which prevent pickling acid from coming in contact with the scale or mist.
b) Structural painting will include scraping, chemical cleaning, one coat of each primer, one coat of epoxy zinc chromate red oxide primer and two coats of epoxy finish paint. The surface coating will take sufficient care of removing all the containment thus ensuring against premature and complete coating failure. Precautions to be taken to avoid air bubbles and uneven coat thickness.
c) Internal sheet metal: the internal walls will be powder coated.
d) Painting for the shelter is completed in every respect before dispatch. No painting will be done at site except touch up of scratches made during site erection.

1.02.04 Environmental conditioning

Analyzer shelters will be environmentally conditioned to keep the inside atmosphere of the shelter at a constant temperature of 24°c (±) 3 °C to obtain repeatability and reliability of the analyzers and also a comfortable working environment for workmen. For this purpose, either a skid mounted type air conditioning unit or 'split type' industrial grade air conditioner (1 working & 1 standby) to be provided. Air conditioner will be able to work continuously under ambient worst conditions. A 300 mm single phase (230/240 V AC) exhaust fan with safety grills & flap type louver will be provided in the shelter. Hygrometer will be provided to measure & display the humidity inside the shelter. Similarly, thermostat will be provided to measure & display the Temperature inside the shelter. All Air conditioner will be 5 star rated.

1.02.05 Lighting

a) Illumination level in the shelters will be at a minimum of 300 lux at 750mm elevation inside the shelter. Maintenance factor will be 0.65
b) External dome type lighting will be under the overhangs to provide sufficient illumination for maintenance work.
c) Power switches for internal and external lighting will be provided near to the main entrance on the outside of the shelter.

1.02.05 Fire detection & protection:
Necessary fire & smoke detection devices, 2 nos. Fire Extinguishers, fire detection & protection measures for each analyzer shelter will be provided as per regulatory requirement. Fire & smoke detection devices will be provided with pot. Free contact/suitable interfacing to connect with local work station for alarm purpose.

1.02.06 Platform for AAQMS Shelter:

Platform of suitable size and Height is required to be constructed by the Bidder. Shelters is required to be installed at platform at site of each AAQMS Station as a part of scope of supply.

1.02.07 Earth Pit for AAQMS.

The Supplier will provide earth pit for AAQMS.

1.02.08 Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) will be provided for the CAAQMS shelters, CAAQMS rooms. These will be designed for sitting for long duration such that these are comfortable for the back. Chair pedestal will be made of 5mm thick MS plate covered with polypropylene cladding. Arm-rests in one piece will be of poly-urethane and twin wheel castor of glass filled nylon. The exact details will be finalized & approved during detailed engineering.

1.02.09 UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM
UPS of suitable capacity with all accessories like battery and battery charger will be provided. UPS at each shelter would be required for AAQMS components and Work Station. UPS would not be required for Air Conditioner. Specification for UPS & battery will be as below:

UPS system for AAQMS will consist of following:

a. 1 x 100% charger and inverter,
b. 1 x 100% Ni Cd Battery Bank for 1 hour,
c. Bypass Line Transformers and Voltage Stabilizer,
d. static switch,
e. manual bypass switch,
f. 2 x 100% ACDB
g. Other necessary protective devices and accessories.

The UPS will be designed at a load factor of 0.8 lagging at 50 deg C keeping a 10% design margin over the actual load requirement. UPS load rating will be submitted by bidder for approval considering full load operation. The UPS System will meet the following

requirements as a minimum. If UPS KVA rating is applicable at a lower ambient temperature than specified 50 deg. C, the Bidder will consider a derating factor of at least 1.5%/deg. C for arriving at the specified UPS capacity at 50 deg. C ambient. The UPS will have an overload capacity of 125 % rated capacity for 10 minutes, 150 % rated capacity for 60 seconds, 200% for 10 seconds and 300% for 4 milli-seconds. The inverter will have sufficient capability to clear fault in the maximum rated branch circuit, limited to 8 percent of finally selected UPS Capacity.
Acoustic noise at rated linear load will be < 75 dBA at 1meter distance from UPS as per ISO-3746. The industrial grade UPS system will include the following equipment:

S.N.	Descriptions	Configuration for UPS
1	100% capacity of IGBT based PWM Inverter with output Voltage, current, frequency, KVA & KW digital display/meter.	2 No. (1 Working & 1 Standby)
2	100% capacity static switches with input Voltage, current, frequency digital display/meter at bypass line.	(As required) 2 no.(Min)
3	Manual by-pass switch	1 No.
4	100% capacity floats-cum-boast full wave Chargers	2 No.
5	Battery Set with accessories each	2 set for 1 hour back-up at 100% of selected UPS rating.
6	Step-down transformer (415 V, three phase , to 230V, single phase) of required capacity)	1 No.
7	Static Voltage Stabilizer with input & output ON Red indication and input & output Voltage, current, frequency digital display/meter.	1 Set
8	Input isolation transformer with input & output ON red indication and input Voltage, current, frequency digital display/meter. Output isolation transformer.	1 No. each
9	A.C. Power Distribution Panels (including 20 % spare feeders on each panel with 2 nos. minimum spare feeder of each rating) and digital type Ammeter, Voltmeter, Frequency meter, PF meter, Watt meter & VA meter	2 sets (Quantities of feeders will be as on required basis)
10	Interconnecting Armored FRLS ST2, PVC type C insulated Copper conductor Cable between UPS equipment & battery, UPS & ACDB, ACDB & loads.	As required
11	MCCB (At input, output, battery side, bypass & ACDB side etc) with ON, OFF & Trip indication.	1 no each
12	Battery Junction Boxes with MCCB, Voltmeter & Current meter.	1 set each
13	Any other equipment necessary for completion of the system will be provided by bidder.	

All equipment, enclosures and accessories for UPS system will be designed, arranged assembled and connected in accordance with the requirements of this specification.

1.02.09.01 Chargers

The chargers will be self-regulating, solid state silicon controlled, full-wave rectifier type designed for single and parallel operation with battery and will have automatic voltage regulators for close voltage stability even when AC supply voltage fluctuates, effective current limiting features, filters to minimize harmonics. The charger should be capable to fully charge the required batteries as well as supply the full rated load through inverter. Furthermore, the charger should be able to re-charge the fully discharged battery within 8

hours automatically. The charger output regulation will be ± 1% from no load to full load with an input power supply variation of ± 10% in voltage and ± 5% in frequency. In addition to indications/display on charger panel, alarms along with relevant analog measurements will also be provided by employing RS 485 Port Modbus Protocol /Ethernet TCP/IP protocol for use in DDCMIS. The list of alarm output & 4-20 mA signals will be as approved by Owner during detailed engineering.
The charger will be current limited for charger circuit protection and protection of battery from overcharge will also be provided. The current limit will be continuously adjustable. The chargers will have a slow walk-in circuit which will prevent application of full load DC current in less than 10 seconds after AC power is energised.
The chargers will be fed from 415V AC, 50 HZ, 3 phase, 3 wire system. Charger design will ensure that there is no component failure due to fluctuations of input supply or loss of supply and restoration.
The minimum full load efficiency at nominal input and output will be 90%. The ripple content will be limited to +/- 2 % without battery and +/-1% with battery of Charger output voltage.
The UPS battery will have sufficient amp-hour capacity to supply the steady state KVA rating of the UPS specified for 60 minute, irrespective of the actual load on UPS.
The UPS system will be capable of operating without D.C. battery in circuit under all conditions of load and the performance of various components of UPS like inverter, charger, static switch etc. will be guaranteed without the battery in circuit.
The UPS system design will ensure that in case of failure of mains input power supply to one of the chargers, the other charger whose mains input power supply is healthy, will feed to one or both the inverters as the case may be as per manufacturer's standard practice & continue to charge the D.C. battery at all load conditions. The Bidder should note that this situation should not in any way lead to the discharge of the D.C. Battery.
Voltage control will be step less smooth and continuous. Float & equalizing control will have an adjustable range of ±5%.

1.02.09.02 Static Inverters

The static inverter will be of continuous duty, solid state IGBT type using proven Pulse Width Modulation (PWM)/Quasi square wave/step wave technique consisting of static filters, integrated control modules including necessary oscillators, voltage regulators, current limiting and surge suppression. Ferro resonant types Inverters are not acceptable.
The nominal voltage output will be 230 Volts, Single phase, 50 Hz.
The inverter equipment will include all necessary circuitry and devices to conform to requirements like voltage regulation, current limiting, wave shaping, transient recovery, automatic synchronization etc.
The steady state voltage regulation will be +/-1.5% and transient voltage regulation (on application/removal of 100% load) will be +/-10%. Time to recover from transient to normal voltage will not be more than 50 msec. Frequency regulation for all conditions of input supplies, loads and temperature occurring simultaneously or in any combination will be better than ± 0.5% (automatically controlled).
The total harmonic content will be 5% maximum and content of any single harmonic will be 3% maximum. The inverter efficiency will be at least 90% on full load and 80% on 50% load. The synchronisation limit for maintenance of synchronisation between the inverter and stand by AC source will be 48-52Hz, field adjustable in steps of 1 Hz.
On occurrence of a fault in branch circuit, the inverter will be capable of clearing the highest rated branch circuit fuse in 4 milli-seconds or less.

The inverter will be protected against overload, short circuit, 100% loss of load, as well as excursions, loss or restoration of D.C. input voltage and synchronizing voltage
The D.C. input current will never exceed twice the full load current except for a short circuit within the inverter.
For any value of the load and load power factor drawn by the equipment served, the inverter will not impose on D.C. source any voltage oscillations in excess of 5 volts (RMS total all frequencies) or any current oscillations in excess of 3 percent (RMS total all frequencies) of the D.C. current at full load.
The inverter will be self-protecting against A.C. and D.C. Transients, voltage surges and steady state abnormal voltage and currents likely to be encountered in the plant.

1.02.09.03 Static Switch and Manual Bypass Switch

The static switch will be solid-state type using SCR for performing the function of transferring UPS loads automatically without any break from (i) faulty inverter to healthy inverter in case of failure of one of the two inverters and (ii) from faulty inverter to standby AC source in case of failure of both the inverters. The transfer time will be ¼ cycle maximum in synchronous mode.
Static transfer switch will be furnished with contact to alarm failure of the alternate source or opening of any fuse protecting the static switch.
The UPS bus will be monitored by two voltage detectors. One fast acting circuit will be used for detecting a complete and instantaneous voltage loss while the other slower acting averaging circuit with adjustable trip level will be employed to detect voltage deviation beyond selected limits. Both voltage detector circuits will automatically initiate operation of transfer switch.
Transfer Inhibit - Automatic or manual transfer from inverter to stand-by A.C. source vice versa will be inhibited when the inverter frequency is not synchronized to the alternate source.
i)Retransfer to Normal
ii) The return to inverter mode will be manual in all cases.
iii) Manual transfer will be initiated by push button actuation.
Manual bypass switch will be employed for isolating the UPS during maintenance. The switch has also the facility of by-passing both the static transfer switches during start-up at the option of the operator.
The UPS bus will be monitored by two voltage detectors. One fast acting circuit will be used for detecting a complete and instantaneous voltage loss while the other slower acting averaging circuit with adjustable trip level will be employed to detect voltage deviation beyond selected limits. Both voltage detector circuits will automatically initiate operation of transfer switch. The Manual bypass switch and required disconnect devices will be furnished duly mounted and wired in enclosure, furnished by the Bidder. Continuous and overload capacity of the switches will be equal to 100% of the continuous and overload rating of each inverter. Peak Capacity will be 1000% of continuous rating for 5 cycles.

1.02.09.04 Step Down Transformer and Voltage Stabiliser

One 415V three phase to 230V, single phase transformer along with associated voltage stabilizer will be furnished with each UPS system source.
The overload capacity of the transformer and voltage stabilizer will not be less than 300% for 200 millisecond duration. The voltage stabilizer will employ servo-controlled circuitry and will maintain the specified output voltage for 0-100% load with maximum input voltage variations as indicated above. The efficiency of the stabiliser will be 95% or better.

Class of insulation of wound components like transformers etc will be class H with temp rating up to class B. The type and other details will be subject to Owner's approval.

1.02.09.05 AC Distribution Board (ACDB)

The distribution boards will be fixed type, of modular design in freestanding gasketted sheet steel enclosure conforming to IP-54. Sheet steel thickness will be 2 mm minimum. Each module will be housed in a separate compartment complete with individual front access door. Working height will be limited to 1800 mm from floor level. A full height vertical cable alley will be provided in each panel to facilitate module wiring. The alley will be liberally sized and will the back of the panels.

The details of the AC distribution board, i.e. exact, rating and number of feeders etc. of the 2x100% ACDB will be as approved during detailed engineering. Each feeder will have fast acting semi conductor fuse, MCB & LED indication for ON status. ACDB will be designed to cater to the requirements of all the loads. The number of feeders (including 20 % spare feeders on each panel with 2 nos. minimum spare feeder of each rating) and rating of each feeder will be to suit the individual load keeping in view the fuse clearance capability of UPS system already stipulated and will be as finalised during engineering. No price implication is admissible for the number ratings of feeders as decided during engineering and owner's decision in this will be final.

1.02.09.06 Batteries

The batteries will be heavy duty valve regulated Nickel-cadmium type and will be sized for one hour of full load operation at 100% of selected UPS rating irrespective of the actual load on UPS and 24 VDC Charger system during non-availability of AC supply / chargers. The Ni-Cd batteries will conform to IS: 10918. For sizing calculation, design margin, an aging factor of 0.8 and a temperature correction factor as per manufacturer's standard at 4 deg. C electrolyte temperature (Based on temperature characteristics curve to be submitted by the Bidder at a temperature of 4 deg. C), Capacity factor, float correction (if applicable) will be taken into consideration. The sizing of the battery will be as approved by Owner during detailed engineering. The Bidder will consider a voltage drop of 2.5V from battery room to DCDB and DCDB to load, while sizing the battery for 24 V DC Charger System and 4V from battery room to the inverter input while sizing the battery for UPS System.

Nickel coated copper connectors will be used for connecting up adjacent cells and rows. Bolts, nuts and washers will be effectively Nickel coated to prevent corrosion.

All the terminals and cells inter-connectors will be fully insulated or have insulation shrouds.

1.03.00 Power distribution board

Power distribution board with external surge protection devices for distribution of UPS & 240/230 V AC power for all individual consumers as individual analyzers, auxiliary equipment inside and around the shelter, lighting receptacles will be provided. Each of the main systems will have an individual isolation circuit breaker 2 pole type mounted next to the individual power users.

1.03.01 Telephone connection with telephone set and walki talkie set will be provided for each AAQMS stations.

1.03.02 Air conditioner (condenser unit) and any other equipments installed outside the shelter will be placed under proper sun/rain protection shade/canopy. Folding Aluminum ladder (height 180 cm) for roof access and mounting bracket for ladder will be provided by bidder.

1.03.03 Analyser panels & furniture will be provided with all features.

1.04.00 Work Stations based data acquisition system (CDAS & LDAS)/Data Logger System

The WORK STATIONS based DAS system for each AAQMS station will collect, store and analyze real time air quality data from all instruments of the station through user friendly software and operate on the latest windows software system. Data from each local DAS would be transmitted to CDAS. Diagnostic features should be clearly indicated by the system and any unauthorized access should be protected by a password. PPB to microgram per cubic meter (ug/m3) conversion factors should be part of system. WORK STATIONS specification will be as below:

The Workstations (PCs) to be provided by the Bidder should be latest available in the market at the time of supply to prevent early obsolescence and will be subject to approval. The software packages to be included with the Work Station (PCs) will be the latest version available at the time of supply.

However, for operating work station (PC), the hardware will conform to the following minimum requirements:

S.N.	**Features**	**Configuration for workstations**
1	Processor	64 bit/32 bit - On board Intel – Xeon quad core, 3.46 GHz processor with 1066 MHz bus with Hyper threading or higher.
2	Memory	8 GB DDR3 RAM
3	Drives	1 x 1000 GB IDE Hard Disc Drive of 7200 RPM or higher. 2048 MB Graphic Accelerator.
4	Monitor (colour)	LED based 24" sized Monitors. with non-interfaced refresh rate min 75 Hz. Full HD resolution 1920 X 1080, 256 colours with MRPII compliant, viewing angle 178° vertical & Horizontal and fastest response time.
5	DVD R/W	16x or higher
6	Intelligent UPS (on line) with all accessories and software for remote monitoring for each workstation	1 no. each with 30 mins. Battery backup on machine load and 10% design margin at full load.
7	Keyboard	ASCII
8	Pointing Device	Optical Mouse
9	Accessories	**Industrial grade furniture (Table & Chair for work Station)**
10	Software	Latest & proven version of Windows OS with Multimedia. Third party operating system, graphical users interface and software, if required. General MS Windows latest, MS-Office Professional, Adobe- Acrobat, anti-virus software with IPS, AutoCAD etc. Application engineering & HMI software - to suit project Specific requirement.
11	Misc. Requirements	System chipset: Intel Express. 2 x RS – 232 ports.

		1 x parallel port. 4 nos. USB 3.0/2.0 ports. (2 nos. on front side). 1 x 16 X or better DVD R/W Drive. 2 x Ethernet (10 / 100 / 1000MB) cards (Industrial Grade). 2 nos. graphic output cards minimum. Sound card & Internal speakers. Wireless internet & Blue tooth Interface. Redundant power supply (Inbuilt).
12	The mouse/keyboard/monitor will have extra length of cable depending on the location of CPU rack (normally placed behind LVS panel). Individual Monitors will be supplied for all stations.	

All instruments will be interfaced with local DAS system suitably either through a redundant serial link or by hardware. The application software will have the following features:

a) Calculation of arithmetic mean values, average values at different fixed intervals and user defined time periods like hourly/weekly/monthly/yearly etc.
b) Calculation of pollution load and wind roses (by interfacing meteorological data wherever provided).
c) Generation of reports for at different fixed intervals like daily, weekly, annual etc. and for user defined periods.
d) Generation of reports in the form of line/column charts/tables/curves/graphics etc.
e) Generation of reports for pollution load, wind rose, station etc.
f) Comparison of data of various parameters for the same monitoring station.
g) Generation of reports for real time data and based on archived data.
h) Display of real time (on line momentary values) and archived values in tabular texts and graphic formats.
i) Facility for calibration windows for analyser calibration.
j) Real time monitoring of status of all analyses and sensors with diagnostics for maintenance personnel.
k) Alarm annunciation of analyser/sensor abnormal conditions.
l) Data reports, calibration reports and status reports for user selectable time period (instantaneous or averaged over a period of ½ hr, 1 hr, 4 hrs, 8 hrs, 24 hrs, weekly, monthly or yearly). Diurnal variation, standard deviation, regression and other statistical parameter reporting possibilities with various available models.
m) Control panel window for controls of each Analyser, including calibration.
n) Real time multi-curves/graphs, historic multi-curves/graphs, tabular data over user selectable time period.
o) Real time status and diagnostics for maintenance people.
p) Possibility to export the data files in other formats.

1.04.01 Data Communication System

Industrial grade UHF RF based redundant two-way wireless communication link between individual AAQMS station and centralized AAQMS station will be provided for each AAQMS station for data communication with centralized AAQMS station.
Bidder will determine the optimal antenna type required to achieve data transfer rate between all wireless access points. Bidder will use for this purpose, approved and standard equipment like antenna and/or amplification devices etc. required to achieve the above and will provide agreement of technical support and support availability. Bidder will

obtain necessary approval for Licenses authorizing the use of communication equipment specified frequencies.

1.05.00 Central AAQMS monitoring

1.05.01 Monitoring and report generation of AAQMS for the whole power station will be carried out through a centralised WORK STATION based data acquisition system. For this purpose, all individual analyzer data from each AAQMS stations will be collected in WORK STATIONS based centralized AAQMS DAS monitoring system with B&W A4 sized LJP.

Printer Specification

S.N.	Features	Laser Printer (B&W)
1	Paper Size	A4
2	Printing speed (min) in normal mode for A4 size	16 ppm (B&W)
3	Type	Heavy duty, at least 30000 pages/month
4	Resolution (black) (min.)	600 dpi
5	First page out time (with full graphic display)	<45 sec
6	Paper input capacity (min.)	500 sheets
7	Paper sheets with printer	20 reams (A4) (1 ream = 500 sheets)
8	Additional Cartridge/toner of each type as used in printer	1
9	Additionally, two sets of print cartridges and Five ream of papers will also be provided with printer.	

WORK STATIONS specification will be same as given in specification. Central AAQMS will also be connected to Plant DDCMIS & MIS server for monitoring thru Station LAN for transfer of data. Necessary Software for the Purpose will be loaded into DDCMIS.

1.05.02 Central AAQMS DAS system will perform following functions:
a) To collect all the data from individual AAQMS stations at prescribed time or on request.
b) Ability to manage multiple remote AAQMS stations.
c) Monitoring, analyze, report generation and archiving of data.
d) To transmit the data to plant DDCMIS
e) To transmit the data to Digital Display Board

1.05.03 Central AAQMS DAS system software will have following features

Data backup facilities should be available. Minimum, median, percentile, maximum, standard deviation frequency analysis and cumulative frequency analysis should be possible.
a) Calculation of arithmetic mean values, average values at different fixed intervals and user defined time periods like hourly/weekly/monthly/yearly etc. for each remote station.
b) Calculation of pollution load and wind roses (by interfacing meteorological data)
c) Generation of reports for at different fixed intervals like daily, weekly, annual etc. and for user defined periods.
d) Generation of reports in the form of line/column charts/tables/curves/graphics etc.
e) Calculation of reports for pollution load, wind roses, station etc.

f) Comparison of data of various parameters for the same monitoring station.
g) Inter comparison of data between different monitoring stations.
h) Generation of reports for real time data and based on archived data.
i) Facility for calibration windows for analyzer calibration.
j) Real time monitoring of status of all analysers and sensors with diagnostics for maintenance personnel.
k) Alarm annunciation of analyser/sensor abnormal conditions.
l) Should have the facilities of the following chart types: like Line & column chart, Simple 3 D, line & column chart, Polar diagram and 3 D perspective column chart.
m) Should have the remote control facilities for calibrations (Zero & Span) and Measuring Range.

1.06.00 Design, Functional & Performance Requirements

1.06.01 AAQMS offered will ensure operability, maintainability and reliability. This system offered will be consistent with modern practices and will be compliance with all applicable codes, standard guides, statutory regulations and safety requirements.

1.06.02 Bidder will consider wireless link or hardwired link for remote operation of the AAQMS.

1.06.03 CAAQMS package software to be loaded on MIS users work station for viewing the process mimics, trends, logs, data, details etc.

1.07.00 Meteorological Monitoring System (MMS)

1.07.01 A meteorological monitoring system (MMS) will be provided in line with the recommendation of the regulatory authority. Meteorological data will be monitored with in the Plant Premises at One (1) Location. The Exact Location of the Monitoring Station will Be decided during Project Implementation Phase Based On The Central & State PCB Guidelines. The Following parameters will Be monitored:
a) Wind Direction
b) Wind Speed
c) Ambient Temperature
d) Ambient Pressure
e) Solar Radiation
f) Relative Humidity
g) Rainfall

1.07.02 MMS will Be Continuous On-Line Type. MMS will allow monitoring, logging of parameter Values, Archiving and Report Generation for Environmental Monitoring Authorities and Plant Management Personnel.

The Meteorological data acquisition system / Data Logger will be provided with at least 8 Analog and 24 Digital Inputs and internal memory for all collected parameters. The Data loggers will have capability of connecting to all Analysers/ Monitors including any future optional Analysers and Sensors for meteorological parameters.
Functional Requirement of Data Logger

1. Calculate vector mean of wind direction and wind speed, generate reports of wind roses, pollution roses, alarm for all parameters.
2. Data reports, calibration reports and status reports for user selectable time period (instantaneous or averaged over a period of ½ hr, 1 hr, 4 hrs, 8 hrs, 24 hrs, weekly, monthly or yearly). Diurnal variation, standard deviation, regression and other statistical parameter reporting possibilities with various available models.
3. Control panel window for controls of each Analyser, including calibration.
4. Real time multi-curves/graphs, historic multi-curves/graphs, tabular data o v e r user selectable time period.
5. Real time status and diagnostics for maintenance people.
6. Possibility to export the data files in other formats.

1.07.03 MMS will be complete with all the Necessary Measuring Equipment and Accessories. For this purpose, MMS data logger can be housed in one AAQMS Station Shelter.

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1.07.04 Output Signal of All Meteorological Monitoring Analysers will be connected to the Central AAQMS monitoring station either through serial link or by hardwire signals for Monitoring, Archiving and Report Generation for Environmental Monitoring Authorities. Necessary Software for the purpose will be loaded onto the Central AAQMS monitoring station.

1.07.05 SPECIFICATIONS OF METEOROLOGICAL SENSORS

	Wind Speed Sensor	Wind Direction Sensor	Air Temperature Sensor	Relative Humidity (RH) Sensor	Solar Radiation Sensor (Solarimeter)
Principle	Frequency proportional to wind speed	Potentiometric type Sensor (Resistance proportional to Wind direction)	RTD (Platinum) Resistance proportional to temperature	Thin film capacitance type sensor	Thermopile/ Thermo-couple Based withAppropriate Wind Shield
Range	0-60 m/sec	0-360 deg	0-50 deg C	0-100% RH	0.3 to 60 microns Measurement range:-0-1500
Accuracy	2 % of full scale	2 % of full scale	+ 0.2 deg C	3 % for range 10% to 90%	+ 3.5 %
Threshold	0.3 m/sec	0.3 m/ sec		Sensitivity: 0.2% RH	
Operating Temperature	0 to 50deg C	0 to 50 deg C	0 to 50°C	0 to 50°C	0 to 50 deg C
Radiation shield			Nonaspirated Radiation Shield	Nonaspirated Radiation Shield	

1.07.06 Specifications of Rain Gauge

Rain Gauge will be of Self Recording Type and of reputed make & recording facility will be provided in Electronics. The Gauge will be rugged having material of construction resistant to atmospheric corrosion. The Instrument will have automatic functions for computing rainfall for pre set time periods.

1	Accuracy	+ 1 % to + 5% for rainfall rates. Ranging from the lowest to 125 mm/hr or more
2	Sensitivity	0.5 mm
3	Operating Temperature	0 to 50 deg C

1.07.07 Meteorological Mast

One Meteorological Mast of telescopic type and of 10-meter height to be placed adjacent to one AAQMS Station. The Mast is required for mounting the Meteorological Sensors. Necessary Hangers and Holders along with electrical Grounding Set will be provided for installation of the Sensors. Material of Construction of the Mast will be metallic i.e. heavy grade aluminum and robust and will be resistant to atmospheric corrosion. Wind load limit will be more than 8.5 sq. ft at 50 mph.

1.08.00 Additional Work Station

CPCB is now insisting that all the Power plants should upload the environment parameters to CPCB's web server. One number of work station (Specification as per clause 1.04.00) with necessary software (as recommended by CPCB) with modem & dedicated internet connection and necessary I/O cards to access the mA output from various analyzers, will

be supplied by bidder for uploading the parameters of CAAQMS. (Minimum of 40 parameters are to be uploaded).

1.09.00 Specification for Digital Display Board

1. Size of the display – 4 Feet (H) X 8 Feet (L) minimum.
2. Visibility Range - 80-100 mtr (Size of display will be suitable to achieve the visibility range).
3. No of Display lines - 7 as following:
   a. Name of company
   b. Date and Day
   c. Provision for additional line for stack parameters
   d. Ambient air quality parameters with units
   e. Meteorological parameters
   f. Provision for additional line
   g. Provision for additional line
4. Display of colour elements - Colour (RGY)
5. Minimum life span - 5 years
6. Ambient Temperature - Maximum 50^{o}C
7. Humidity Range – 0 - 99%
8. Language - English only
9. Colour gradient - Cluster LED based
10. Display casing - Weather proof casing IP 65 with Canopy.
11. Type - Microcontroller/Microprocessor driven
12. LED matrix - 2X64X128 for above display size.
13. LED pitch - 0.6”
14. Signal input to the display board - (i) Data communication through RS 232/485 /Ethernet or suitable protocol from CAAQMS station for all parameters of CAAQMS and Meteorological parameters.
    (ii) Provision for 10-Analog signals from stack monitoring Device/DDCMIS.
15. Power Supply - 230V AC from UPS.
16. Platform and Mounting structure - 01

1.10.00 TRAINING REQUIREMENT

Bidder will provide training to end user for Theory & design features, Trouble shooting and fault analysis for AAQMS (Min. 5 Man days).

1.11.00 Only Single Point power supply would be provided at each AAQMS & display board location by BHEL. All other works/items related to installation, commissioning, demonstration and handing over upto the satisfaction of end user as per technical specification requirement will be in Bidder’s scope.

2.00.00 MANDATORY SPARES AGAISNT MAIN PACKAGE SUPPLY OF AAQMS

S.N.	Analyzer	Quantity
1.0	**SO_2 analyser**	
1.1	SO_2 analyser instrument	1 no complete Instrument.
1.2	Electronic Card Assemblies of each type	10%
1.3	Sets of Gaskets/"O" rings	2 sets
1.4	Heater Assembly / Thermister	20%
1.5	Air flow meter	1 no
1.6	Consumables like filter elements light sources etc.	100%
1.7	Calibration gases of all types and ranges	One year supply
2.0	**NO-NO_2-NOx analyser**	
2.1	NO-NO_2-NOx analyser instrument	1 no complete Instrument of each Type.
2.2	Electronic Card Assemblies of each type	10%
2.3	Sets of Gaskets/"O" rings	2 sets
2.4	Heater Assembly / Thermister	20%
2.5	Air flow meter	1 no
2.6	Consumables like filter elements light sources etc.	100%
2.7	Calibration gases of all types and ranges	One year supply
3.0	**CO analyser**	
3.1	CO analyser instrument	1 no. complete Instrument.
3.2	Electronic card Assemblies of each type	10%
3.3	Sets of Gaskets /"O" rings	2 sets
3.4	Heater assembly/thermister	20%
3.5	Consumable like filter elements light sources etc.	100%
3.6	Calibration gases of all types and ranges	One year supply

4.0	**Dust monitor/Analyser**	
4.1	Dust monitor analyser instrument	1 no. complete Instrument.
4.2	Electronic Card Assemblies of each type	10%
4.3	Sets of Gaskets /"O" rings	2 sets
4.4	Air flow meter	1 no.
4.5	Consumable like filter elements light sources etc.	100%
5.0	**Mercury Analyser**	
5.1	Mercury analyser instrument	1 no. complete Instrument.
5.2	Electronic Card Assemblies of each type	10%
5.3	Sets of Gaskets /"O" rings	2 sets
5.4	Air flow meter	1 no.
5.5	Consumable like filter elements light sources etc.	100%
6.0	**Ozone Analyser**	
6.1	Ozone analyser instrument	1 no. complete Instrument.
6.2	Electronic Card Assemblies of each type	10%
6.3	Sets of Gaskets /"O" rings	2 sets
6.4	Consumable like filter elements light sources etc.	100%
6.5	Calibration gases of all types and ranges	One year supply
7.0	**Wireless equipment**	
7.1	Electronic modules including power supply unit	10% of each type
7.2	Modem	1 no. of each type
7.3	Connectors/Patch Cord	2 nos. of each type and length

1. Wherever quantity has been specified percentage (%) the quantity of mandatory spares to be provided by the bidder will be distributed into various ranges/size/rating/type (as the case may be) in the same proportion of the main population. **4 sets of AAQMS is to be considered while calculating specified percentage (%)**. In case the quantity so calculated happens to be fraction, the same should be rounded off to next higher whole number.
2. Wherever the quantities have been indicated for each type, size, range etc., these will cover all items supplied and installed and the breakup for these will be furnished in the bid.
3. In case spares indicated in the list are not applicable to the particular design offer by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list. Equivalent quantities will be provided in case of unavailable spares in above list.

4. Interchangeability and Packings:
   All spares supplied under this contract will be strictly interchangeable with parts for which they are intended for replacements. These spares will include all mounted accessories like components, boards, add or items, fittings, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require additional item. All electronic modules should be pre set and/or pre-programmed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/ROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre-setting/ re programming before putting them in to service. The spare will be treated and properly packed for long term storage.
5. Identification:
   Each spare will be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents will be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.

Buyer Specific ATC document for Ambient Air Quality Monitoring System (AAQMS) & Mandatory Spares of AAQMS of 1X660 MW Panki project site

<table>
<tr><td>1.</td><td>MDCC (Material dispatch clearance certificate) Clause:

Please note that material shall be dispatched only after issue of Material dispatch clearance certificate (MDCC) by BHEL. For issue of MDCC, you are required to submit the set of documents (i.e. Packing list, Warrantee certificate, Complete test / inspection reports, Calibration certificates, copy of inspection call etc).

BHEL will release MDCC within 07 days from the date of receipt of complete documents as detailed above.

The delivery period of 150 days is inclusive of 07 days taken by BHEL to issue MDCC.</td></tr>
<tr><td>2.</td><td>Quality Requirement:

(i) Joint inspection will be witnessed by M/s BHEL and M/s NTPC at works of successful bidder.

(ii) Successful bidder to submit quality plan in line with technical specification in prescribed format for approval of customer / BHEL within 30 days of Purchase Order. BHEL will provide approval of quality plan within 30 days from the date of submission. Any delay in submission / approval will be in respective account.

The delivery period of 150 days is inclusive of time for quality plan submission and approval.</td></tr>
<tr><td>3.</td><td>Customer Approval:

At present, following bidders are conditionally approved by customer i.e. offering specific make of analysers, multipoint calibrators & metrological sensors. In the event of non-compliance of these approval conditions w.r.t. this bid, customer approval would also be required of below listed conditionally approved bidders.

<table>
<tr><th>Item Description</th><th>Customer approved Bidders (conditionally as above)</th></tr>
<tr><td>Ambient Air Quality Monitoring System (AAQMS)</td><td>1. M/s Chemtrol Engineering Ltd.
2. M/s Environment SA India Pvt. Ltd.
3. M/s Thermo Fisher Scientific India Pvt. Ltd.</td></tr>
</table>

Offers from bidders other than the above list are also acceptable subject to approval by End Customer. Final acceptance of all participated bidders shall be subject to approval by End Customer.

BHEL will open the Price Bids of only those bidders who are finally approved by the end customer.</td></tr>
</table>

4.	**Pre-Qualification Requirement (PQR):** The Pre-Qualification Requirements have been made part of bid as **Annexure-A**. All the bidders should ensure submission of complete details and documents as called for in the same. The offers submitted by the bidders would be scrutinized with respect to Pre-Qualification Requirements first. **Techno-Commercial offer of only those bidders shall be evaluated who meet the Pre-Qualification Requirements.**
5.	**Technical Specification Requirement:** 1. Please quote your valuable offer as per BHEL Specification enclosed with bid documents as follows: **Annexure-B:** Specification for AAQMS (Main Package) and, **Annexure-C:** Specification for AAQMS (Mandatory Spares of Main Package) 2. Bidders are requested to upload point-wise compliance of BHEL Specifications along with the offer as token of acceptance.
6.	**Payment Terms:** • 90% payment after receipt of material at site against submission of PBG @ 10% of Order value valid till entire Guarantee / Warranty period. The PBG will be in BHEL format and from one of the BHEL consortium banks. For name of BHEL consortium bank, please visit our website hwr.bhel.com. • Balance 10% payment after installation and commissioning at site. • Payment will be released by BHEL within: - 45 days for Micro and Small enterprises - 60 days for Medium enterprises - 90 days for Non MSME enterprises
7	**Delivery Period:** The material should be supplied within 150 days of purchase order. This period includes following: • 30 days from the date of PO for supplier to submit the documents (drawings / datasheet & Quality Plan) for approval. • 30 days for documents approval by BHEL/ End User • 07 days for raising inspection call and witness of joint inspection by M/s BHEL and M/s NTPC

	• 07 days for issuing dispatch clearance from the date of receipt of documents mentioned in Clause No. 1 of this document. • 07 days for arranging dispatch of material from the date of providing MDCC by BHEL. Any delay in document submission / approval / Inspection will be in respective account.
8.	**Post Order Document approval:** Drawings/Data sheets/Quality Plan (QP) will be submitted to BHEL for BHEL/customer approval within 30 days of purchase order. The documents shall be complete in all respects. To ensure completeness of documents (as per specifications) BHEL would have in person meeting/ video-conference within first 15 days of PO (if requested by supplier well in advance). However, delay in documents approval due to vague / in-complete submission of documents shall be on supplier's account. BHEL will arrange the approval of the drawings/data sheets/QP within 30 days of their receipt. In case of delay on account of BHEL, delivery shall be re-scheduled accordingly.
9.	**Installation, Commissioning & Training:** The supplier will supply, erect & commission all the items covered under scope of **Annexure-B & Annexure-C** at Panki site to integrate the system, demonstrate the performance of the Equipment and all its accessories to ensure compliance with complete specifications & parameters of the specification to the satisfaction of BHEL/End User. Only Single Point power supply would be provided at each AAQMS & display board location by BHEL. All other works/items related to installation, commissioning, demonstration and handing over up to the satisfaction of end user as per technical specification requirement will be in Bidder's scope. Bidder will provide training to end user for Theory & design features, Trouble shooting and fault analysis for AAQMS (Min. 5 Man days). ***Cost of Installation, Commissioning and Training should be inclusive in the quoted prices.*** Installation, Commissioning and Training will be done at following address: CHIEF ENGINEER (PROJECTS) 1X660 MW UPRVUNL PANKI TPS EXT., PANKI, KANPUR UP-208020 ***Failing to comply to the Installation, Commissioning and Training clause, the offer will be rejected straightaway.***

<table>
<tr><td>10.</td><td>Validity:

Offer will be valid for 180 days from bid end date and extensions thereof.

BHEL will reserve the right to reject any or all quotations, quoting validity less than 180 days.</td></tr>
<tr><td>11.</td><td>Evaluation criteria:

Evaluation will be done on the basis of Total Landed cost up to Panki project site considering all items together for supply of complete scope of bid (Total value wise evaluation).</td></tr>
<tr><td>12.</td><td>Document:

2 hard copies of O&M manual, 05 CD ROM copies of O&M manual and 05 soft copy of O&M manual in English language giving complete technical information for operation and maintenance of the items to be supplied with the equipment.</td></tr>
<tr><td>13.</td><td>Price Basis:

Please confirm that prices have been quoted on F.O.R. Panki site basis.</td></tr>
<tr><td>14.</td><td>Packing & Dispatch:

All the items in the enquiry will be packed separately in a suitable water proof vibration packing box capable of bearing air, water and road transit hazards. “PCRI HWR” should be written in bold letters on all four sides of the boxes. Packing boxes will be properly identified and marked with BHEL’s (India) Purchase Order Number.</td></tr>
<tr><td>15.</td><td>Guarantee:

The equipment will be guaranteed for a period of 36 months from the date of dispatch or 24 months from the date of Installation & Commissioning, whichever is earlier.

Failing to comply to the Warranty clause, the offer will be rejected straightaway.</td></tr>
<tr><td>16.</td><td>EARNEST MONEY DEPOSITE (EMD)

13.1 Interested vendors must submit their offer along with the following Earnest Money Deposit (EMD) in a separate sealed envelope:

<table>
<tr><th>Details</th><th>Amount In INR</th><th>Amount in Foreign Currency</th><th>Type</th></tr>
<tr><td>EMD</td><td>INR 2,00,000/-
(INR Two Lacs Only)</td><td>Equivalent Foreign currency</td><td>Refundable</td></tr>
</table>

13.2 EMD shall not carry any interest.</td></tr>
</table>

13.3 Modes of deposits will be as per General Terms and Conditions (GTC) GeM_GTC_4.0 v1.10_02May23.

The demand draft shall be in favor of "BHEL Haridwar". E-Payment is also acceptable. For e-payment, RTGS details are as mentioned below:

Bank Details	**SWIFT Details of bank**	**Contact Details of Banker**
STATE BANK OF INDIA RANIPUR BRANCH, OPP: BHEL MAIN GATE, SECTOR-5, RANIPUR, HARIDWAR, UTTRAKHAND, INDIA PIN CODE : 249403	SWIFT NO : SBININBB225 CC ACCOUNT NO : 10667995458 IFSC CODE : SBIN0000586	Chief Manager (IBD) Contact No. +91 1334 224201 +91 1334 226125 Fax: +91 1334 226512

13.4 MSE Suppliers, who are the manufacturer of offered items as per specification are exempted from submission of the EMD.

13.5 EMD exemption will be allowed as per criteria laid down in General Terms and Conditions (GTC) GeM_GTC_4.0 v1.10_02May23.

13.6 Bids not accompanied with requisite EMD or bids accompanied with EMD of inadequate value shall be liable for rejection, wherever exemption is not allowed.

13.7 The bidder whose bid is technically not accepted will be informed & EMD wherever submitted shall be refunded after the finalization of the contract. EMD shall be forfeited in the event of bidder opting out after tender opening (PART-I).

13.8 Earnest money of successful bidder shall be returned only after receipt of Performance Bank Guarantee (PBG).

17. **General Clause:**

All other commercial terms and conditions will be governed by General Terms and Conditions (GTC) GeM_GTC_4.0 v1.10_02May23.

18. **Conflict of Interest among Bidders/ Agents:**

"A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. **The bidder,: found to have a conflict of interest shall be disqualified**. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:

a) they have controlling partner (s) in common; **or**

	b) they receive or have received any direct or indirect subsidy/ financial stake from any of them; **or** c) they have the same legal representative/agent for purposes of this bid; **or** d) they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder,· **or** e) Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/Assemblies from. one bidding manufacturer in more than one bid; **or** f) In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following: 1. The principal manufacturer directly or through one Indian agent on his behalf; and 2. Indian/foreign agent on behalf of only one principal, **or** g) A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid,· **or** h) In case of a holding company having more **than** one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "
19.	**E-invoicing:** E-invoicing under GST has been implemented w.e.f. 01.10.2022 for all the taxable persons having turnover more than Rs. 10 cr. it has been specified by the govt that it is mandatory to mention a valid unique invoice reference no. (IRN) and QR code as generated from govt. portal on a tax invoice. Based on such information, GST ITC as claimed by BHEL in GST returns shall be matched with the corresponding details uploaded by supplier in E-invoicing system. In case the vendor / contractor delays or fails to provide all the documents as per the purchase order / work order at the time of submitting tax invoice to BHEL, any subsequent financial loss to BHEL on account of vendor/contractor shall be to vendor's / contractor's account. BHEL has further right to take necessary steps to protect its interest at the time of release of payment. this further requires inclusion of IRN and QR code on tax invoice as announced by govt. of india w.e.f. 01.10.2022.
20.	**Integrity Pact:** (a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following

Independent External Monitors OEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl.	IEM	Email
1.	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2.	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s)-

Mr. Vinay Kumar Gupta Designation: Addnl. Engr. (PCRI-BOI) Pollution Control Research Institute HEEP, BHEL, Haridwar- 249403 Uttarakhand, India Email ID: vinaykumar.gupta@bhel.in Tel: +91 1334 28 1187	Mr. Deshraj Yadav Designation: Dy. Manager (PCRI-BOI) Pollution Control Research Institute HEEP, BHEL, Haridwar- 249403 Uttarakhand, India Email ID: deshraj@bhel.in Tel: +91 1334 28 1187

21. **Arbitration Clause:**

In case of any dispute arising out of as in connection with this contract, the same shall be referred to arbitration under Arbitration & Conciliation Act 1996 of a sole arbitrator who shall be appointed by mutual consent of the parties. The seat & venue of arbitration shall be Haridwar.

The proceedings shall be conducted in English. The Governing law of contract shall be the substantive law of India.

22. **Risk Purchase:**

	In case of abnormal delays (beyond the maximum late delivery period as per LD clause) in supplies / defective supplies or non-fulfillment of any other terms and conditions given in Purchase Order, BHEL may cancel the Purchase Order in full or part thereof, and may also make the purchase of such material from elsewhere / alternative source at the risk and cost of the supplier. BHEL will take all reasonable steps to get the material from alternate source at optimum cost. If bidder does not agree to the above Risk Purchase Clause, BHEL reserves the right to reject the offer. In case for compelling reasons BHEL accepts the offer without acceptance of this clause by the bidder and in the eventuality of Risk Purchase, appropriate action will be taken as per BHEL extant rules. This will be without prejudice to any other right of BHEL under the contract or under General Law. **Action against Bidders / vendor / supplier / contractor in case of default:** In order to protect the commercial interests of BHEL, BHEL shall take action against supplies / contractors by way of suspension of business dealings, who either fail to perform or are in default without any reasonable cause, cause loss of business/ money/ reputation, indulge in malpractices, cheating, bribery, fraud or any other misconduct or formation of cartels so as to influence the bidding process or influence the price etc. Suspension of Business Dealings could be in the form of "Hold" or "Banning" a supplier/ contractor or a bidder and shall be as per "Guidelines for Suspension of Business Dealings with Suppliers/ Contractors" available at BHEL's website "https://www.bhel.com/guidelines-suspension-business-dealings-supplierscontractors".
23.	**Acceptance of offers from country Sharing Land Border with India:** I. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turkey projects) only if the bidder is registered with the Competent Authority. Further, any bidder (including bidder from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, shall also require to be registered with the same competent authority. II. "Bidder" means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process. III. "Bidder (or entity) from a country which shares a land border with India" for the purpose of this Order means: - a. An entity incorporated, established or registered in such a country; or b. A subsidiary of an entity incorporated, established or registered in such a country; or c. An entity substantially controlled through entities incorporated, established or registered in such a country; or d. An entity whose beneficial owner is situated in such a country; or

e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

IV. The beneficial owner for the purpose of (iii) above will be as under:
1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.
Explanation:
a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company;
b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
5. In case of a trust, the identification of beneficial owners) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

VI. The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

VII. The registration shall be valid at the time of submission of bid and at the time of acceptance of bid.

VIII. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution.

Note: Following declarations would be required from bidders (if applicable):
(A) "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that

	this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]" (B) "I have read the clause regarding restrictions on procurement from a bidder having Transfer of Technology (ToT) arrangement. I certify that this bidder does not have any ToT arrangement requiring registration with the competent authority. **OR** * have read the clause regarding restrictions on procurement from a bidder having Transfer of Technology (ToT) arrangement. I certify that this bidder has valid registration to participate in this procurement."