

Note to prospective bidders –

BHEL is regularly procuring different variants of Online Dissolved Gas Analyzer (Online DGA) based on their ultimate customer technical specification requirement. For reduction in procurement cycle and to avoid formal enquiries and communication for individual variant/ customer, BHEL intend to enter into framework agreement for supply of different variants of Online DGA for 2 years.

It shall be worth to note that these items are generally based on customer technical requirements, approval of make and ordered quantities; hence only tentative quantities of individual items are indicated against different items. BHEL reserve the right to suitably place the order on L1 vendor based on customer approval, customer technical requirements, approval of make and ordered quantities. Hence, BHEL doesn't fully assure the placement of order for quantity indicated.

Quantity Distribution -

1. For item 1 & 3 of Annexure A, Quantity distribution shall be in the ratio of 65:35 amongst L1 and L2 vendors, where the number of techno-commercially qualified bidders is more than 2 and L2 vendor accept the price of L1 vendor. Otherwise 100% quantity shall be awarded to L1 vendor.
2. For item 2 & 4 of Annexure A, 100% quantity shall be awarded to L1 vendor.
3. Quantity variation shall be $\pm 30\%$ on each item and sub-items of Annexure A, over the quantities indicated in the tables.

Method of evaluation -

1. The bid shall be in two parts.
2. Framework agreement shall be valid for 2 years from date of finalization of RC and quantities mentioned in Annexure A will be for 2 years requirement.
3. Rates of instruments shall remain firm till execution of Framework Agreement.
4. Bidder can quote for any individual item i.e. Item 1 or 2 or 3 or 4 of Annexure A. Evaluation shall be on individual L1 basis for each item of Annexure A.
5. Bidder having lowest price for 1 set of Item of Annexure A shall be considered as L1 vendor.
6. Any individual sub-item (logically) can be ordered by BHEL as per requirement during order placement.
7. 95% payment shall be on supply and 5% on successful erection and commissioning of items.
8. Bidder to attach duly signed copy of this annexure along with their bid as acceptance of the bid conditions. No other documents/ brochures shall be considered for technical evaluation, except deviation if any.

I accept the above,

(Seal & signature of bidder)

Framework agreement of Online DGA Equipment**Item 1**

	Items Description	Quantity (Set)	Unit Price
a.	Online Dissolved Gas Analyzer as per Annexure-B, Section 1 & 2 of technical annexure	60	
b.	Installation item required for above	60	
c.	Erection & commissioning charges	60	
d.	Armoured multimode FO Cable with suitable ST connectors (1 set = 500m)	30	
e.	Laptop as per Annexure-B, Section-6 with suitable analysis software	30	
f.	Charges for 3 year extra warranty	30	
	Total price for 1 set (1 nos. quantity of each of the above)		

Item 2

	Items Description	Quantity (Set)	Unit Price
a.	Online Dissolved Gas Analyzer as per Annexure-B, Section 1 & 3 of technical annexure	20	
b.	Installation item required for above	20	
c.	Erection & commissioning charges #	20	
d.	Armoured multimode FO Cable with suitable ST connectors (1 set = 500m)	10	
e.	Laptop as per Annexure-B, Section-6 with suitable analysis software	10	
f.	Charges for 3 year extra warranty	10	
	Total price for 1 set (1 nos. quantity of each of the above)		

Item 3

	Items Description	Quantity (Set)	Unit Price
a.	Online Dissolved Gas Analyzer as per Annexure-B, Section 1 & 4 of technical annexure	60	
b.	Installation item required for above	60	
c.	Erection & commissioning charges	60	
d.	Laptop as per Annexure-B, Section-6 with suitable analysis software	30	
e.	Charges for 3 year extra warranty	30	
	Total price for 1 set (1 nos. quantity of each of the above)		

Item 4

	Items Description	Quantity (Set)	Unit Price
a.	Online Dissolved Gas Analyzer as per Annexure-B, Section 1 & 5 of technical annexure	10	
b.	Installation item required for above	10	
c.	Erection & commissioning charges	10	
d.	Charges for 3 year extra warranty	06	
	Total price for 1 set (1 nos. quantity of each of the above)		

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4.	INSTALLATION AND COMMISSIONING	
4.1	Installation & commissioning of the system is also in the scope of supply. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative and also provide training for operation and maintenance to our ultimate customer at site on intimation of BHEL and obtain certificate from the customer for the same. Supplier should quote the charges for the same, if any, in the offer separately.	
4.2	Vendor shall make all required arrangements for mounting/installation of equipment on tank/ ground from the stored location to the installation site. All associated accessories as supplied by the vendor for commissioning of equipment shall be properly commissioned at site.	
4.3	In case the equipment integrated with SAS, whatever input of the instrument required shall be given to SAS/Powergrid engineer for SAS integration. If any problem arises related to signal transmission, then supplier to give solution or they have to visit site.	
5.	INSPECTION & DESPATCH	
5.1	Three sets of inspection, routine, acceptance and calibration test reports, operation and maintenance manual, descriptive catalogue/ leaflets shall be sent along with dispatch document. One set shall be supplied along with the equipment.	
5.2	The supplier shall furnish a list of all fittings and components in the dispatch details giving description and quantity of each item (Quantity of each item shall be mentioned). All items shall be properly packed in wooden boxes so as to avoid scratches/damage in transit.	
5.3	All the items of each DGA equipment to be kept in set of box only i.e. one box for main equipment, 1 box for commissioning & accessories items. In any condition item required for 2 different sets not to be mixed in 1 box.	
5.4	The equipment shall be supplied with all necessary accessories required for carrying out DGA of oil sample complete in all respect as per the technical specification. The following shall be also form a part of supply:- • Software • Operation Manual (2 set for every unit), • Software Manual • Compact disc giving operation procedures of Maintenance Manual & Trouble shooting instructions	
6.	WARRANTY	
6.1	The equipment must carry manufacturer's warranty for 24 Months from date of commissioning or 30 months from date of delivery to BHEL whichever is earlier. The date of commissioning shall be reckoned from submission of certificate received from customer to BHEL.	

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SECTION 2**Technical requirement of Online DGA - ITEM 1**

	Technical requirements			Yes/ No
1.	Measurement range	H2 CH4 C2H6 C2H4 C2H2 CO CO2 O2 N2 H2O	5 to 5000 ppm 5 to 5000 ppm 5 to 5000 ppm 3 to 5000 ppm 1 to 3000 ppm 10 to 10000 ppm 20 to 30000 ppm 500 to 25000 ppm 10000 to 100000 2 to 100% RS (Given in ppm)	
2.	Operating principal	Photo acoustic spectroscopy (PAS) or Gas chromatography (GC) with thermal conductivity detector (TCD)/ Flame ionization detector (FID)		
3.	Complying standard	IEC 61326-1 for EMI/EMC Standards IEC 60255-21-1/ IS 9000 for Basic Environmental Testing Procedures covering Shock, bump and vibration tests. IEC 364-4-41 for Protection against electric shock IEC 61010 for Safety requirements for electrical equipment for measurement & control use. IEC 60529, IP 55 for Weather Proof Standards.		
4.	Sensitivity Accuracy Repeatability	100% for each gas $\pm 10\%$ $\pm 3\%$ to 10% depending upon gases		
5.	Operating condition	Power supply Voltage Power supply Frequency Ambient Temperature Range Operating Oil Temperature Range Operating Humidity Pressure Withstand (Oil side) Exterior enclosure Environment protection EMI & EMC Compatibility	200 to 300 V, 1-phase AC 45 to 55 Hz 20 to + 55°C 20 to + 120°C 10 to 95% RH Full Vacuum to 10 psi Stainless steel IP 55 Yes	
6.	Alarms/Indication	The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment.		

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7.	Display / Memory	The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment.	
		The equipment shall display all the individual gas and moisture concentration on its display unit and shall have facility to download all the stored the data from the unit for further analysis.	
8.	Sampling & Memory	The sampling rate shall be selectable as 2 or 4 or 6 or 12 hours etc. The equipment shall have inbuilt memory to store these results for complete 3 year even if sampling is done at the lowest interval.	
9.	Communications	USB & IEC 61850 compliant	
		Modem/ Eathernet or RS 232 & RS 485 and analogue 4-20mA Isolated output	
		Equipment shall have facility to give SMS alert to at least three users whenever any fault gas violates the predefined limit.	
		The equipment shall be capable of transferring data to sub-station automation system confirming to IEC 61850. Necessary interface arrangement shall be provided by the supplier for integration with automation system. The necessary type test report for such confirmation shall be submitted.	
		Bidder to quote armoured multimode fiber optic cable in multiple of 25m with suitable ST connector at both end alongwith suitable converter/ adopter (if required) to communicate between DGA equipment and substation PC / Laptop. Necessary FO port / suitable adopter at equipment end shall also be part of main DGA equipment.	
10.	Calibration (If applicable)	The carrier and calibration gas shall have minimum capacity to work for at least three years without replacement. All the consumable (if any) up-to warrantee period shall be included in the scope of supply. The equipment must have an automatic Calibration facility at fixed intervals. For calibration if anything required including cylinder must be mounted with the equipment.	
11.	Mounting	Equipment shall be mounted separately on ground. Suitable arrangement shall be provided to support and protect the inlet and outlet piping arrangement. Inlet and outlet piping shall be of stainless steel.	

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12.	Other technical features	The monitor shall be equipped with an inbuilt oil circulation system to ensure that the oil being sampled is the true representative sample of the oil from the transformer tank/ in continuous touch with the sensor of the equipment for online continuous monitoring of the oil from the transformer tank.	
		The monitor must have facility for collecting an oil sample for external oil tests, such as an external quick connect port plus sampling accessories.	
13.	Software	Software for fault indication and fault diagnostics shall include following: Fault Indication:- i. IEEE, IEC or user configurable levels of dissolved gases ii. Rate of change trending Fault Diagnosis:- i. Key gases ii. Ratios (Rogers, IEC etc.) iii. Duval's Triangle	

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SECTION 3

Technical requirement of Online DGA - ITEM 2

	Technical requirements			Yes/ No
1.	Measurement range	H2 CH4 C2H6 C2H4 C2H2 CO CO2 O2 N2 H2O	5 to 5000 ppm 5 to 5000 ppm 5 to 5000 ppm 3 to 5000 ppm 1 to 3000 ppm 10 to 10000 ppm 20 to 30000 ppm 500 to 25000 ppm 10000 to 100000 2 to 100% RS (Given in ppm)	
2.	Operating principal	Intelligent Transmitter with no moving parts or pumps to detect and continuously monitor the evaluation of the values of gases through a gas permeable membrane		
3.	Sensitivity Accuracy Repeatability	100% for each gas $\pm 5\%$ or $\pm$ LDL (whichever is greater) $\pm 2\%$ to ± 2 ppm (whichever is greater)		
4.	Operating condition	Power supply Voltage Power supply Frequency Ambient Temperature Range Operating Oil Temperature Range Operating Humidity Pressure Withstand (Oil side) Exterior enclosure Environment protection EMI & EMC Compatibility	90 to 270 V, 1-phase AC 45 to 55 Hz -40 to + 55°C -40 to + 120°C 10 to 95% RH Full Vacuum to 10 psi Stainless steel IP 55 Yes	
5.	Alarms/Indication	The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment.		
6.	Display / Memory	The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment.		
7.	Sampling & Memory	The sampling rate shall be selectable as 2 or 4 or 6 or 12 hours etc. The equipment shall have inbuilt memory to store these results for 1 year even if sampling is done at the lowest interval.		

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8.	Communications	USB & IEC 61850 compliant	
		Modem/ Ethernet, RS 232 & RS 485, FO, RJ45 with Modbus, GSM and analogue 4-20mA Isolated output	
		The equipment shall be capable of transferring data to sub-station automation system confirming to IEC 61850. Necessary interface arrangement shall be provided by the supplier for integration with automation system. The necessary type test report for such confirmation shall be submitted.	
		Bidder to quote armoured multimode fiber optic cable in multiple of 25m with suitable ST connector at both end alongwith suitable converter/ adopter (if required) to communicate between DGA equipment and substation PC / Laptop. Necessary FO port / suitable adopter at equipment end shall also be part of main DGA equipment.	
9.	Calibration (If applicable)	The equipment must have an automatic Calibration facility at fixed intervals. For calibration if anything required including cylinder must be mounted with the equipment.	
10.	Other technical features	DGA should have dual level visual alarm indicators, continuous display, and a heat dissipater, which shall be mounted between the valve and the transmitter.	
		The monitor must have facility to allow result to be analyzed along with loading of the Transformer. It should also evaluate gases as per load i.e. load compensation facility	
11.	Software	Software for fault indication and fault diagnostics shall include following: Fault Indication:- i. IEEE, IEC or user configurable levels of dissolved gases ii. Rate of change trending Fault Diagnosis:- i. Key gases ii. Ratios (Rogers, IEC etc.) iii. Duval's Triangle iv. Church Monogram v. Cellulose degradation	

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SECTION 4**Technical requirement of Online DGA - ITEM 3**

Technical requirements					Yes/ No
		Gas	Range	Accuracy (Whichever is greater)	
1.	Measurement range	H2 CO C2H4 C2H2	5 to 2000 ppm 5 to 5000 ppm 1 to 2000 ppm 1 to 2000 ppm	±10% or ±5 ppm ±10% or ±10 ppm ±10% or ±3 ppm ±10% or ±1 ppm	
2.	Sensitivity	100% for H2 and C2H2 Minimum detection sensitivity to C2H2 – 2ppm			
3.	Operating condition	Power supply Voltage Power supply Frequency Operating Ambient Temperature Operating Oil Temperature Range Operating Humidity Pressure Withstand (Oil side) Environment protection			230V ±20%, 1-phase AC 45 to 55 Hz 50°C 0 to +100°C 10 to 85% RH 40 psi IP 55
4.	Alarms/Indication	4 alarm contacts with dual stage variable alarm setting provision in increment of 10ppm approx. Power failure alarm relay shall be supplied as a standard fitting.			
5.	Display	LCD Display of atleast 4 ½ digit			
6.	Sampling & Memory	Data including gas concentration , date and time of measurement shall be stored in memory at a specified frequency. The last gas concentration stored in device database shall be displayed on a high quality LCD display. The device shall be driven by a minimum 8-bit microprocessor and operating parameters and data retrieval shall be managed using a PC based control software to be provided with the unit.			
7.	Communications	Modbus TCP/IP Protocol, RS 232 / RS 485 and analogue 4-20mA Isolated output			
		The output for DAS/ recorder shall be 4-20 mA isolated.			
		Potential free alarm contacts for high gas concentration (user programmable) of each gas shall be wired upto transformer M. Box/CMB/CMS. These will be used by owner for facia alarm in control room and DDCMIS/ SCADA. Also real time data for concentration of each gas shall be provided at owner's control room (DDCMIS/SCADA) through CMS with required format & communication. All software/ hardware/ cables & its conduit covering/ laptop computer for monitoring from control room (within a distance of 500 m) shall be in the scope of the bidder.			

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8.	Calibration (If applicable)	A suitable calibrating arrangement for each online DGA shall also be provided.	
9.	Mounting	Sufficient length of stainless steel tubes (min . 30 meters), connectors etc. shall be in scope of supply of supplier.	
10.	Other technical features	The equipment shall have suitable sensing device to accurately detect and measure various gases in transformer oil as mentioned above. The sensor assembly should be robust in design and shall be suitable for operation in tropical site condition and complete in all respects. The sensor assembly shall be suitable for connection to any transformer in service.	
		The attachment shall be provided with oil sampling port to facilitate oil collection for manual off-line DGA.	

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SECTION 5

Technical requirement of Online DGA - ITEM 4

	Technical requirements		Yes/ No
1.	Measurement range	H2 – 0 to 2000 ppm H2O – 0 to 95% RS (Given in ppm)	
2.	Alarms/Indication	Hydrogen and water –Programmable Alarm/Indication levels, with corresponding NO/NC solid state relays for (High/Very High)	
3.	Environment	Exterior enclosure and components all made of corrosion proof material to IP 55 Operating Ambient Temperature Range : – 20 to + 55°C. Operating Oil Temperature Range. : – 20 to + 105°C Pressure Withstand (Oil side) : Full Vacuum to 10 psi.	
4.	Communications	RS-232 ports and Analog 4 – 20 mA isolated outputs. RS-232 ports and suitable for Ethernet connectivity.	

SECTION 6

Technical requirement of Laptop

Screen size : 14 inch (min.)

Processor : Intel Core i5 or higher, 64bit or higher

Operating System : Window 8.1 professional (single language) or higher

RAM : 4 GB or higher

HDD : 500GB or higher

Accessories : Carry bag & charger to be supplied along with Laptop.