

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
TRANSFORMER ENGINEERING DEPARTMENT

DOC. REF. TRE/NIFPES/RC (PI NO – 340694018)

ANNEXURE - B

SECTION 1

**GENERAL TECHNICAL SPECIFICATIONS FOR NITROGEN INJECTION FIRE PREVENTION
AND EXTINGUISHING SYSTEM FOR OIL FILLED TRANSFORMER / REACTOR**

1.0	SCOPE:
	The scope of this specification covers Design, Engineering, Supply, Testing at works before dispatch, Erection, Testing and Commissioning and performance demonstration of "fire protection and extinguishing system by nitrogen injection method". The necessary Civil Work which will be required for construction of oil soak pit for the storage of oil coming out from the transformer / reactor, plinth for Fire extinguishing cubicle (FE cubicle) , MS Tank, laying of oil pipe, nitrogen pipe, electrical cables, control boxes, extinguishing cubicle, nitrogen cylinder, necessary valves, fire detectors and other equipment & accessories required for erection, testing, commissioning and performance demonstration of the complete fire protection system is in the scope of the tenderer. The full details of the same are required to be submitted to BHEL for approval, when first unit is implemented on a transformer/ reactor of specific make & rating.
2.0	General Description
	This standard lays down the specification for Nitrogen Injection Explosion prevention and Fire Extinguishing System for oil cooled transformer/ reactor. Dedicated Nitrogen injection system is used to:
a.	Prevent transformer/ reactor tank explosion and possible fire, in the event of internal fault and as such it acts as fire preventer.
b.	Also act as firefighting system
c.	System comprises of Cubicle (installed near the transformer/ reactor), Control Box (installed in control room), Conservator isolation valve (installed in conservator pipeline), piping & valves for draining oil from transformer/ reactor, equipment & piping for nitrogen injection, fire detectors (on transformer/ reactor top cover), copper cables etc.
3.0	Reference standards/Codes/Design, erection and commissioning norms
a.	Central Electricity Authority, the Gazette of India, Extraordinary 2010
b.	Technical standards for constructions of substations and switchyards
c.	Technical standards for construction of Thermal Generating Stations
d.	Safety provisions for electrical installations and apparatus of voltage exceeding 650V
e.	CBIP Manual on Transformers-Publication No.317
f.	Relevant British/IEC Codes where Indian Standards are not available.
g.	Approval Certificate should be obtained from the Loss Prevention Association (LPA)
h.	National Fire Codes 1993 of National Fire Protection Association (NFPA) USA
i.	The Entire NIFPES system shall be designed, erected and commissioned in accordance with the regulation of the Tariff Advisory Committee (TAC). In the absence of TAC regulations NFPA regulation shall be adhered.

REV	DATE	ALT CKD	REV	DATE	ALT CKD	REV-00	NAME	SIGN	DATE
						PREP	For TRE		05.11.19
						CKD	For TRE		08.11.19
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4.0	Principle of Operation
	Depressurization process commences through oil drain and simultaneously nitrogen is injected at a predetermined flow rate to create stirring action and to bring down temperature of top oil below ignition point, evacuates gases formed thereby preventing explosion of tank and in case of fire, it extinguishes fire within maximum 30 seconds. During fault condition, system operates and conservator isolation valve blocks oil flow to isolate conservator tank oil. Also in case of fire, it prevents escalation of fire. The system comes in to operation automatically/ remotely/ manually under following conditions: -
	Auto mode
a.	For Prevention of Fire, signals in series: ▪ Differential Relay Operation ▪ Buchholz Relay paralleled with Pressure Relief Valve or Rapid Pressure Release Relay ▪ Tripping of all connected breakers (HV & LV side) is a pre-requisite for initiation of system activation.
b.	For extinguishing fire, signals in series: ▪ Fire Detector, ▪ Buchholz Relay paralleled with Pressure Relief Valve or Rapid Pressure Release Relay ▪ Tripping of all connected breakers (HV & LV side) is a pre-requisite for initiation of system activation.
	Manual Mode (Remote) Tripping of all connected breakers (HV & LV side) is a pre-requisite for initiation of system activation.
	Manual Mode (Mechanical) Tripping of all connected breakers (HV & LV side) is a pre-requisite for initiation of system activation.
5.0	System features
	▪ System shall have interlock to ensure operation of system only after transformer / reactor electrical isolation to avoid nitrogen injection in energized transformer/ reactor. ▪ Pressure monitoring switch for back-up protection for nitrogen release as redundancy to first signal of oil draining commencement for Nitrogen release shall be provided. ▪ Nitrogen release scheme shall be designed in such a way that the nitrogen gas shall not enter the energized transformer/ reactor tank even in case of passing/ leakage of valve. ▪ System shall have provision of testing during commissioning, during annual maintenance and on live transformer/ reactor to ensure healthiness at all times. ▪ System shall be complied to IEC:61850 and suitable to be hooked on to the station SCADA and fire alarm.

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6.0 Data Sheet / System components

SI No	Description	Specifications/Requirement	Tick appropriate answer.
1.	Type and Model	Nitrogen Injection Explosion Prevention and Extinguishing System for transformer / reactor rating a) ITEM 1 : NIFPES suitable for the transformer / reactor of oil capacity up to of 55KL- Scope as per Section-2 b) ITEM 2 : NIFPES suitable for the transformer / reactor of oil capacity more than 55KL - Scope as per Section-3	Offered/ Not Offered Offered/ Not Offered
2.	Details of documents enclosed with technical bid.	a) Design Calculations for the number of fire detectors, pipe sizing of drain pipe and nitrogen injection pipe, Nitrogen cylinder capacity, Number of nitrogen points etc. OGA of Fire Extinguishing Cubicle with BOM b) Logic Diagram of Control box c) Dimensioned Drawing of Conservator Isolation Valve d) Logic Diagram of Signal Box e) Technical specification of Fire Detectors/ LHD	Yes/No Yes/No Yes/No Yes/No Yes/No
3.	Fire Extinguishing (FE) Cubicle	Split door	Yes/No
3.1.	Dimensions (LXBXH)	Vendors to specify in mm a) ITEM 1 : b) ITEM 2 :	
3.2.	Weight	Vendors to specify in kg a) ITEM 1 : b) ITEM 2 :	
3.3.	Material and thickness	CRCA Sheet, 3 mm	Accepted/Not Accepted
3.4.	Protection Class	IP56	Accepted/Not Accepted
3.5.	Nitrogen cylinder		
3.5.1.	Capacity and quantity of Nitrogen cylinder	a) For ITEM 1 , minimum 1 No./ more than 1 Cylinder if required as per the design calculation, with 68 Liter water Capacity and shall hold Minimum 10 cu-m gas at pressure of 150-200 kg/sq. cm b) For ITEM 2 , Minimum 2 No./ more than 2 Cylinder if required as per the design calculation, with 68 Liter water Capacity and shall hold Minimum 10 cu-m gas at pressure of 150-200 kg/sq. cm	Accepted/Not Accepted Accepted/Not Accepted

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3.5.2.	Nitrogen gas purity	99.99%. for all Types of NIFPES Models	Accepted/Not Accepted
3.6.	Pressure of Nitrogen filling	Maximum 200 kg/sq. cm	Accepted/Not Accepted
3.7.	Minimum distance of Fire Extinguishing cubicle from the transformer/ reactor	5-10 Meters or beside fire safety wall	Accepted/Not Accepted
3.8.	Method of mounting	Plinth mounted	Accepted/Not Accepted
3.9.	Items to be provided in the Fire Extinguishing cubicle		
3.9.1.	Contact manometer, which will	a) Show nitrogen cylinder pressure b) Show Falling pressure c) Have Electrical contact & dual indicator for actual pressure as well as level for low pressure signal	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted
3.9.2.	Pressure Regulator with safety relief valve to increased temperature variation compensation	a) Inlet pressure: 150-200 kg/cm ² (+/-10%) b) Outlet pressure range: 8 to 12 kg/cm ²	Accepted/Not Accepted Accepted/Not Accepted
3.9.3.	Pressure gauge	For showing nitrogen injection pressure.	Accepted/Not Accepted
3.9.4.	Oil Release Unit and suitable to operate without power	a) Electro mechanical type, operating on substation DC supply as well with provision for operation using manual lever in case of DC supply loss. b) It shall have mechanical locking arrangement to ease in maintenance and avoid unnecessary operation during maintenance test.	Accepted/Not Accepted Accepted/Not Accepted
3.9.5.	Gas release unit and suitable to operate without power	a) Electro mechanical type, operating on substation DC supply as well with provision for operation using manual lever in case of DC supply loss. b) It shall have mechanical locking arrangement to ease in maintenance and avoid unnecessary operation during maintenance test.	Accepted/Not Accepted Accepted/Not Accepted
3.9.6.	Oil drain assembly	Electro mechanical type, operating on substation DC supply as well with provision for operation using manual lever in case of DC supply loss.	Accepted/Not Accepted
3.9.7.	Pressure monitoring switch as backup in addition to signal from limit switch to initiate nitrogen release simultaneously with oil drain commencement	Provision of limit switch with Pressure Switch (Back up)	Accepted/Not Accepted

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3.9.8.	Limit switches with No of contacts & spare contacts (NO & NC)	1. Oil drain valve closed. 2NO 2. Oil drain valve open. 2NO 3. Gas inlet valve closed. 1NO+1NC 4. Gas injection started. 1NO+1NC 5. Oil drain unit locked mechanically. 2NO/ 1NC+1NO 6. Nitrogen release unit locked mechanically 2NO/ 1NC+1NO	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted
3.9.9.	Oil leak detector chamber		Accepted/Not Accepted
3.9.10.	Panel lightning	LED type	Accepted/Not Accepted
3.10.	System is suitable for oil drain gate valve of size 125/150NB fitted in transformer / reactor tank & provided by BHEL		Accepted/Not Accepted
3.11.	System is suitable for the gate valves of size 25NB provided by BHEL for the nitrogen injections fitted in transformer / reactor tank.		Accepted/Not Accepted
3.12.	Oil drain pipe size	Vendors to specify in mm a) For the transformer / reactor of oil capacity up to 55KL oil b) For the transformer / reactor of oil capacity more than 55KL	
3.12.1.	Length and Number of openings in the transformer/ reactor tank	a) To be provided by Vendor as per site location, from transformer/ reactor to Fire Extinguishing cubicle & from Fire Extinguishing cubicle to oil pit/MS Tank b) 1 No. opening in tank will be given for oil draining	Accepted/Not Accepted Accepted/Not Accepted
3.12.2.	Material	a) MS ERW, Heavy duty for Trfr to fire extinguishing cubicle b) GI Class C Pipe, Medium for fire extinguishing cubicle to oil pit	Accepted/Not Accepted Accepted/Not Accepted
4.	Control Box		
4.1.	Dimensions (LXBXH)	Vendors to specify in mm a) ITEM 1 b) ITEM 2	
4.2.	Weight	Vendors to specify in kg a) ITEM 1 b) ITEM 2	
4.3.	Type & thickness of sheet steel	CRCA, 16/14 SWG	Accepted/Not Accepted
4.4.	Make of components provided in the control box	Vendor to specify make of a) MCB b) Relays c) Hooters d) Contactors e) indicating lamps f) Operating switches	

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4.5.	Control voltage	a) 110/220 V DC/ substation voltage. b) AC-DC/ DC-DC converter, timer shall not be used for reliable operation	Accepted/Not Accepted Accepted/Not Accepted
4.6.	Method of mounting	Wall / Frame	Accepted/Not Accepted
4.7.	Audio and visual alarms	To be provided with different volume (dB) levels	Accepted/Not Accepted
4.8.	Degree of protection	IP 42	Accepted/Not Accepted
4.9.	Following indications/Alarms indications to be incorporated in the control box (* Marked shall be in the topmost row of control box panel)		Accepted/Not Accepted
4.9.1.	System on*		Accepted/Not Accepted
4.9.2.	PNRV/TCIV open*		Accepted/Not Accepted
4.9.3.	Oil drain valve closed*		Accepted/Not Accepted
4.9.4.	Gas inlet valve closed*		Accepted/Not Accepted
4.9.5.	PNRV/TCIV closed		Accepted/Not Accepted
4.9.6.	Fire Detector Trip		Accepted/Not Accepted
4.9.7.	Buchholz Relay Trip		Accepted/Not Accepted
4.9.8.	Oil drain valve open		Accepted/Not Accepted
4.9.9.	Extinction in process		Accepted/Not Accepted
4.9.10.	Cylinder pressure low/ Low N2 pressure		Accepted/Not Accepted
4.9.11.	Differential relay trip		Accepted/Not Accepted
4.9.12.	PRV/RPRR trip		Accepted/Not Accepted
4.9.13.	Transformer / Reactor Trip		Accepted/Not Accepted
4.9.14.	System out of service		Accepted/Not Accepted
4.9.15.	Line fault fire detector		Accepted/Not Accepted
4.9.16.	Line fault differential relay		Accepted/Not Accepted
4.9.17.	Line fault buchholz relay		Accepted/Not Accepted
4.9.18.	Line fault (PNRV/TCIV)/RPRR		Accepted/Not Accepted
4.9.19.	Line fault transformer/reactor trip		Accepted/Not Accepted
4.9.20.	Line fault (PNRV/TCIV)		Accepted/Not Accepted
4.9.21.	Auto/Manual/Off		Accepted/Not Accepted
4.9.22.	Extinction release on		Accepted/Not Accepted
4.9.23.	Extinction release off		Accepted/Not Accepted
4.9.24.	Lamp test		Accepted/Not Accepted
4.9.25.	Visual / Audio Alarm		Accepted/Not Accepted
4.9.26.	Visual / Audio alarm for DC supply fail		Accepted/Not Accepted

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4.9.27.	Oil Temperature		Accepted/Not Accepted
4.9.28.	Tank Pressure		Accepted/Not Accepted
4.9.29.	Healthiness of all sensors		Accepted/Not Accepted
4.9.30.	Increase in temperature of oil/tank pressure beyond the set limit.		Accepted/Not Accepted
4.9.31.	Automatic operation failed.		Accepted/Not Accepted
4.9.32.	Detection of fire due to external causes.		Accepted/Not Accepted
4.9.33.	Monitoring of N2 Injection Pressure & Cylinder Pressure		Accepted/Not Accepted
4.9.34.	Pressure Monitoring switch for back up protection of Nitrogen release		Accepted/Not Accepted
4.9.35.	Leakage from the Drain pipe		Accepted/Not Accepted
5.	Conservator Isolation Valve/ Shutter		
5.1.	Type	Operating mechanically on transformer / reactor oil flow rate with visual position indicator	Accepted/Not Accepted
5.2.	Location	Horizontally in the conservator pipe line between Conservator and Buchholz relay	Accepted/Not Accepted
5.3.	Conservator pipe	Suitable for conservator pipe size 80 NB	Accepted/Not Accepted
5.4.	No of contacts	1 NO	Yes/No
5.5.	Padlocking provision for service, filtration/ refilling / filling	To be provided	Accepted/Not Accepted
5.6.	Visual position indicator similar to Buchholz relay for inspection	For physical close indication to be provided	Accepted/Not Accepted
5.7.	Transformer / Reactor Conservator Isolation valve setting for normal operation (Valve should not close) to ensure no obstacle for transformer/ reactor breathing	40 ltr / minute for 80 mm conservator pipe	Accepted/Not Accepted
5.8.	Transformer / Reactor conservator Isolation valve setting for operation during abnormal flow of oil due to rupture/ explosion of tank or bushing/ oil drain during system operation	60 ltr/ minute (minimum) for 80 mm conservator pipe	Accepted/Not Accepted

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6.	Fire Detectors or Linear Heat Detectors (LHD)		
6.1.	Type	Quartz bulb, Heat sensing / Linear Heat Detector type required - Vendor to specify type offered	
6.2.	Quantity Required	Depending upon transformer/ reactor top cover area – to ensure full coverage	Accepted/Not Accepted
6.3.	Method of Fixing	a) Bolting on Fire Detector bracket on transformer/ reactor top cover. b) Using fire survival, copper cables (capable to withstand 750 deg C)	Accepted/Not Accepted Accepted/Not Accepted
6.4.	Temperature for heat sensing	141 Deg C	Accepted/Not Accepted
6.5.	Heat sensing area	800 mm radius	Accepted/Not Accepted
6.6.	Number of contacts	2 NO	Accepted/Not Accepted
6.7.	Necessity and condition of refilling/replacing	After operation	Yes/No
7.	Signal Box	It shall be fitted as per the customer desired location (on/ away from the transformer or reactor, preferably near the marshalling box), for terminating cable connection from PNRV/ TCIV, detectors & for further connection to the control box.	Accepted/Not Accepted
7.1.	Protection class of signal box	IP55	Accepted/Not Accepted
8.	Power Supply		
8.1.	For Control Box	a) For operation: 110/220 V DC / Substation DC voltage (As per the customer requirement) b) For DC fail alarm: 230 V AC	Accepted/Not Accepted Accepted/Not Accepted
8.2.	For Cubicle	For illumination and heating : 230 V AC	Accepted/Not Accepted
9.	Extinction period		
9.1.	On commencement of Nitrogen injection	Maximum 30 seconds	Accepted/Not Accepted
9.2.	On system activation	Maximum 3 minutes	Accepted/Not Accepted
10.	Provision to be given for	a) On line supervision of operating signals b) DC supply monitoring c) Test facility (excluding CIV, FD) on live transformer / reactor d) Anti-condensation heater for Cubicle e) Manual operation in DC supply fail f) Separate oil drain and Nitrogen release mechanisms.	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted

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11.	Details of Tank Openings/Fittings to be provided by Vendor for items in BHEL scope after placement of Purchase Order. (transformer/ reactor OGA Drg will be given by BHEL to Vendor)	a) For Oil drain opening location on tank wall b) For nitrogen injection – location of all openings on tank wall c) Flange sizes with dummy piece (length) in conservator pipe between Buchholz relay and conservator tank for fixing of PNRV/TCIV d) Brackets on transformer/ reactor top cover for sensing equipment – location & dimensional drawing e) Spare potential free contacts for system activating signals i.e. differential relay, buchholz relay, pressure relief valve, transformer / reactor isolation (master trip relay)-type and nos f) Foundation required for the FE cubicle. g) Foundation required for the oil tank. h) Fixing Bracket/Foundation required for the signal box.	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted
12.	CABLING		
12.1.	Fire survival cables for THE connection of fire detectors in parallel to signal box/ marshalling box.	Fire survival cables, able to withstand 750 °C, Standard: BS 7629-1, BS 8434-1, BS 7629-1 and BS EN 50267-2-1/ Relevant Indian standard.	Accepted/Not Accepted
12.1.1.	Length of Fire survival cable	In multiple of 50 meter (No joint shall be acceptable in any length ordered i.e in multiple of 50 meter.)	Accepted/Not Accepted
12.2.	Fire retardant low smoke (FRLS) copper cable for the connection of signal box/ marshalling box near transformer / reactor and FEC mounted near transformer / reactor with control box mounted in the control room	Fire retardant low smoke (FRLS) copper cable 12 core X 2.5 square-mm along with accessories shall be used	Accepted/Not Accepted
12.2.1.	Length of FRLS 12 core x 2.5 square-mm cable	In multiple of 300 meter (No joint shall be acceptable in any length ordered i.e. in multiple of 300 meter.)	Accepted/Not Accepted

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12.3.	Fire retardant low smoke (FRLS) copper for the connection between control box to DC & AC supply source, FEC to AC supply source, signal box / marshalling box to transformer / reactor conservator isolation valve connection on transformer / reactor. Separate cable for the AC supply and DC supply shall be used.	Fire retardant low smoke (FRLS) copper cable 4 core x 2.5 mm ² along with accessories	Accepted/Not Accepted
12.3.1.	Length of FRLS 4 Core x 2.5 square-mm cable	In multiple of 100 meter (No joint shall be acceptable in any length ordered i.e. in multiple of 100 meter.)	Accepted/Not Accepted
12.4.	Test certificates for all the above cables shall be submitted.	--	Accepted/Not Accepted
13.	System shall be suitable to be hooked on to the station Fire alarm.	--	Accepted/Not Accepted
14.	System shall be suitable to be hooked on to the station SCADA	--	Accepted/Not Accepted
15.	System shall be complied to IEC:61850 Protocol and suitable to be hooked into the substation network system with IEC:61850 Protocol.	--	Accepted/Not Accepted
16.	Plinth	Civil work for plinth for Fire Extinguishing Cubicle at any customer site in India	Accepted/Not Accepted
17.	MS tank	MS tank as required by BHEL with capacity as 10KL / 20 KL shall be supplied by the vendor.	Accepted/Not Accepted
17.1.	OIL Container / Underground tank Specification	- Capacity of tank shall be of 10KL / 20KL. (As per the BHEL requirement). 5/6mm (as per the BHEL requirement) thick MS sheet. - Cylinder shall be placed with horizontal axis below ground level with adequate supporting frame of angles and channels at bottom and clamp on sides. The bottom frame shall be fixed firmly with bolts grouted in ground with cement concrete 1:2:4 (1cement: 2coarse sand: 4 graded stone aggregate). - Tank shall have 700 mm dia air tight manhole cover with gasket. - Drainage/suction valve.	Accepted/Not Accepted

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		c) Lifting hooks of suitable strength. d) Air vent pipe with through silica gel breather. e) One no. drain/suction pipe DN 50 NB on topmost circular surface of tank. f) One no. drain pipe DN 150 NB on vertical flat surface of tank and g) All other accessories for functional requirement of tank. 5. Outside surface of tank shall be painted with black anti corrosive bitumastic paint (Two or more coats on new work) and also oil resistive paint as per requirement.	
18.	Oil pit / Oil chamber	Oil pit (civil construction) as required by customer suitable for the underground MS tank OF 10KL / 20KL	Accepted/Not Accepted
18.1.	Oil pit / Oil chamber specification	Chamber for OIL tank below GL 1. Chamber shall be of rectangular in size having minimum 50 cm clearance on sides and top of the MS tank. 2. Bottom slab of the tank shall be of minimum 125 mm thick RCC 1:1.5:3 (1 cement :1.5 coarse sand: 3 grade stone aggregate of 20 mm of nominal size) having reinforcement 12mm dia @ 175 center to center both ways (TMT bars conforming to relevant IS codes). 3. Cement shall conform to OPC 43 grade. 4. Water proofing compound @ 1 kg./bag cement as per CPWD specifications shall be mixed with the cement in RCC and plaster work.. 5. Side walls of the chamber shall be brick masonry in cement mortar (1 cement: 4 Coarse sand) with bricks conforming to class designation 75 thickness of wall shall be given below. (a) From GL to 500 mm below GL - 230 mm (b) From 500 mm below GL to 1250 mm below GL - 345 mm. (c) From 1250 mm below GL to 2000 mm below GL -460mm 6. Complete inside surface and outer surface up to 300 mm	Accepted/Not Accepted

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		below of GL of wall shall be plastered with 15mm thick cement mortar 1:4 (1 cement: 4 fine sand) having neat cement punning on top of the plaster. 7. Top of brick wall shall have 100 mm thick coping in cement concrete 1:2:4 (1 cement: 2 Coarse sand: 4 graded stone aggregate 20 mm nominal size). 8. Space between wall and MS tank including bottom gap and top of tank shall be filled with dry Jamuna sand after fixing of tank in chamber and on top of Jamuna sand gap shall be plugged with cement concrete 1:2:4 (1 cement: 2Coarse sand: 4 graded stone aggregate) having minimum 125mm thickness. 9. All material and items shall conform to CPWD specifications. 10. For 700mm dia. of manhole of tank, round MS sheet of 700mm dia., 5mm thick and length as per requirement to be provided as attachment with tank	
19.	PAINTING SCHEME	Painting scheme and shade of signal box, FE Cubicle, Control box, pipes, other accessories etc. shall be in line with the customer requirement.	Accepted/Not Accepted
20.	FACTORY TEST	Tests will be carried out on following in the supplier's workshop in presence of purchaser's representative. a) Supplier has to carry out Type tests as per IS/IEC. Specially IP 56 on FEC. b) Reports of all routine tests conducted as per the relevant IS/IEC standards in respect of brought out items including test reports test reports for degree of protection of FEC/control box/signal box shall be submitted by the supplier. c) The supplier shall demonstrate functional test on complete system associated with the following:- ▪ FEC Cubicle, showing oil drain and nitrogen injection etc. ▪ Operation of Conservator isolation valve	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted

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		▪ Operation of Control box d) simulation and verification of the response the complete system without actual draining of the oil and injection of the nitrogen gas. e) The performance test of the complete system shall be possible to be carried out after erection of the system with transformer / reactor at site.	Accepted/Not Accepted Accepted/Not Accepted
21.	PERFORMANCE TEST	a) Performance test of the complete system shall be carried out after complete erection at site by the supplier's representative. These tests shall include simulation and verification of the response of the complete system without actual draining of the oil and injection of the nitrogen gas. In addition to above, additional tests as required necessary shall be conducted b) It shall be demonstrated at site that during cooling pump ON/ OFF the Conservator isolation valve does not trip.	Accepted/Not Accepted Accepted/Not Accepted
22.	DRAWINGS, DESIGN CALCULATION AND MANUALS	Following is to be submitted to BHEL along with offer: a) Design Calculations for the number of fire detectors, pipe sizing of drain pipe and nitrogen injection pipe, Nitrogen cylinder capacity, Number of nitrogen points etc. b) Detailed layout drawing along with the equipment drawing to be given along with techno commercial bid indicating complete bill of materials. c) After awarding of contract, detailed dimensional drawing of the system complete bill of materials including location and size of plinth for cubicle and recommended capacity of oil soak- pit shall be submitted for purchaser's approval. d) After approval 10 (ten) sets of all above drawings and 5 (five) sets of operation and maintenance instruction manual (bound) along with soft copies (In CDs) shall be submitted for purchaser's use.	Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted Accepted/Not Accepted

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23.	Spares	Required nos. of the following Spare items shall be supplied as per requirement: - (a) Nitrogen Cylinder (b) Fire detector/ Heat sensor (c) 1 set of Hose pipes (d) N2 Gas Regulator Assembly (e) Fire detectors (f) limit switch for the fire detector (g) Thermostat (h) Heating Element	Accepted/Not Accepted
24.	No modification on the transformer / reactor	No modification on the transformer / reactor shall be allowed which affects its performance (i.e. efficiency, losses, heat dissipation ability etc.) safety, life etc. or it's any other useful parameter. This requirement shall be paramount importance and shall form the essence of the contract. However, in any case of any modification, performance of transformer / reactor should not be affected in any manner by having Nitrogen Injection Fire Prevention Cum Extinguishing System (NIFPES) and the Contractor / Sub-Contractor shall give an undertaking to this effect. All pipes should be washed / rinsed with transformer / reactor oil. If any damage is done to the transformer / reactor and / or any connected equipment during installation & commissioning full recovery therefore shall be effected from the Contractor / Sub-Contractor of NIFPS system	Accepted/Not Accepted
25.	Guarantee terms	a) The system shall be guaranteed for satisfactory operation and against defects in design, materials and workmanship for a period of at least 24 months from the date of received and 18 months from commissioning whichever is earlier. b) Bidder shall also quote separate charges towards incremental warranty for every six month.	Accepted/Not Accepted Accepted/Not Accepted

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EVALUATION CRITERIA:

1. NIFPES for the transformer/ reactor of oil capacity up to of 55KL-Item 1 - Scope as per section 2
2. NIFPES for the transformer/ reactor of oil capacity more than 55KL-Item 2 -Scope as per section 3
3. Price to be indicated in section 2 & 3 shall be on FOR BHEL Bhopal Basis, except site related items/ activities.
4. The bid shall be in two parts.
5. Bidder can quote for any individual item 1 or 2. Evaluation shall be on individual L1 basis for item 1 or 2.
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.
9. Bidder having lowest total price for 1 set of each individual sub-items of item 1 or 2 (Total sum of last column of section 2 & 3), shall be considered for arriving L1 for the Item 1 & Item 2 respectively.

QUANTITY: (For 2 years period)

- a. **ITEM 1- NIFPES for the transformer / reactor of oil capacity up to of 55KL: Qty: 12±4 Nos.**
- b. **ITEM 2-NIFPES for the transformer / reactor of oil capacity > 55KL: Qty: 50±15 Nos.**
- c. For item 1 & 2, Quantity distribution shall be 65% & 35% of each item between L1 & L2 bidder, where the number of techno-commercially qualified bidders shall be more than 2 and L2 vendor accept the price of L1 vendor. Otherwise 100% quantity shall be awarded to L1 vendor.

INSTRUCTIONS TO BIDDERS (ITB):-

1. BHEL is regularly procuring Nitrogen injection fire prevention and extinguishing system (NIFPES) for different ratings of transformer/reactor based on their ultimate customer technical specification requirement. For reduction in procurement cycle and to avoid formal enquiries and communication for individual variant/ customer. 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 (as per above 9.c) based on customer approval, customer technical requirements, approval of make and ordered quantities and hence BHEL doesn't fully assure the placement of order for quantity indicated.**
2. Any other accessories, which is not listed in all above clauses but may be required for satisfactory operation of the system shall be deemed to be included in scope and also such item shall be clearly bring out in the bid.
3. Bidders should note that they are required to submit the techno-commercial offer for all the item and fill the blank price bid as per Section 2 & 3. In case, any bidder is not quoting for any sub item of Item 1 or 2, bid may be rejected.
4. Bidders are required to submit Data sheet as per clause 6.0 given in this specification. It is expected that answer to all the points of questionnaire shall be "YES/ACCEPTED". **In the case if any answer is "NO", the same should be substantiated with suitable justification/reason etc. for BHEL review.** Also details may be filled where vendor to specify.
5. Bidder shall submit the undertaking that they have clearly understood the specification and there is no deviation from their side. NO deviation/ alteration of any kind in scope or equipment or specification shall be entertained once technical bid/contract is finalized.
6. The above specification is issued without any prejudice to BHEL's standard terms & Conditions. The specification doesn't absolve the bidder from his basic responsibility of supplying a quality material to BHEL and service to nation.
7. Prices shall remain firm during whole period of framework agreement.

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
TRANSFORMER ENGINEERING DEPARTMENT

DOC. REF. TRE/NIFPES/RC

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SECTION 2 : Scope for evaluation of price bid of NIFPES suitable for the transformer / reactor of oil capacity up to of 55KL- ITEM 1

It.	Item Description	Qty.	Unit Price
1.	NIFPES System the power transformer / reactor of oil capacity up to of 55KL along with Fire Extinguisher Cubical, Control box & conservator isolation valve	1 Set	
2.	4 Nos. Heat Sensor or Fire detector or 12.5Mtr. LHD (3 nos. 2-way and 1 nos. 3-way box)	2 Set	
3.	25m Fire survival cable	2 Set	
4.	150m FRLS Armoured cable along with accessories for connection between Trs.- CB – FEC	2 Set	
5.	50m FRLS Armoured cable along with accessories for connection between Relay panels to control box, DC source etc.	2 Set	
6.	6m ERW Class 'C' pipes with support and fittings etc. for connections between Trs. and FEC	1 Set	
7.	10m pipes with fittings for connection between FEC and Oil pit	1 Set	
8.	NIFPES system shall be complied to IEC:61850 protocol and compatible to be hooked on to the station SCADA system substation network system with IEC:61850 Protocol	1 No.	
9.	MS oil tank of capacity of 10 KL & 5 mm thick sheet	1 No.	
10.	MS oil tank of capacity of 10 KL & 6 mm thick sheet	1 No.	1.2 times of item 9
11.	MS oil tank of capacity of 20 KL & 5 mm thick sheet	1 No.	1.8 times of item 9
12.	MS oil tank of capacity of 20 KL & 6 mm thick sheet	1 No.	2.16 times of item 9
13.	Incremental cost for every six month for additional warranty above the guarantee period	1 No.	
14.	Nitrogen Cylinder (Spare)	1 No.	
15.	1 set of Hose pipe (Spare)	1 set	
16.	Nitrogen Gas Regulator Assembly (Spare)	1 No.	
17.	Limit switch for the fire detector (Spare)	1 No.	
18.	Fire detector / Heat sensor / 5m LHD (Spare)	1 No.	
19.	Thermostat (Spare)	1 No.	
20.	Heating Element (Spare)	1 No.	
21.	Installation & comm. at any Customer site in India	1 No.	
22.	Civil work for plinth for Fire Extinguishing Cubicle at any Customer site in India	1 No.	
23.	Civil work for oil pit at any Customer site in India	1 No.	
24.	Civil work for Safety Wall at any Customer site in India (between Transformer and FEC) (250mm thick x1500mm wide x 2500 mm height =0.9375 m ³)	1 set	
25.	Provisions in the control box for following – 1) Monitoring of N2 Injection Pressure & Cylinder Pressure 2) Pressure Monitoring switch for back up protection of N2 release 3) Leakage from the drain pipe	1 set	
GRAND TOTAL			

Note - Rate of item 10, 11 & 12 shall be calculated on factor basis and not to quote/ added.

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SECTION 3 : Scope for evaluation of price bid of NIFPES suitable for the transformer / reactor of oil capacity more than 55KL: ITEM 2

It.	Item Description	Qty.	Unit Price
1.	NIFPES System the power transformer / reactor of oil capacity more than 55KL along with Fire Extinguisher Cubical, Control box & conservator isolation valve	1 Set	
2.	4 Nos. Heat Sensor or Fire detector or 12.5Mtr. LHD (3 nos. 2-way and 1 nos. 3-way box)	2 Set	
3.	25m Fire survival cable	2 Set	
4.	150m FRLS Armoured cable along with accessories for connection between Trs.- CB – FEC	2 Set	
5.	50m FRLS Armoured cable along with accessories for connection between Relay panels to control box, DC source etc.	2 Set	
6.	6m ERW Class 'C' pipes with support and fittings etc. for connections between Trs. and FEC	1 Set	
7.	10m pipes with fittings for connection between FEC and Oil pit	1 Set	
8.	NIFPES system shall be complied to IEC:61850 protocol and compatible to be hooked on to the station SCADA system substation network system with IEC:61850 Protocol	1 No.	
9.	MS oil tank of capacity of 10 KL & 5 mm thick sheet	1 No.	
10.	MS oil tank of capacity of 10 KL & 6 mm thick sheet	1 No.	1.2 times of item 9
11.	MS oil tank of capacity of 20 KL & 5 mm thick sheet	1 No.	1.8 times of item 9
12.	MS oil tank of capacity of 20 KL & 6 mm thick sheet	1 No.	2.16 times of item 9
13.	Incremental cost for every six month for additional warranty above the guarantee period	1 No.	
14.	Nitrogen Cylinder (Spare)	1 No.	
15.	1 set of Hose pipe (Spare)	1 set	
16.	Nitrogen Gas Regulator Assembly (Spare)	1 No.	
17.	Limit switch for the fire detector (Spare)	1 No.	
18.	Fire detector / Heat sensor / 5m LHD (Spare)	1 No.	
19.	Thermostat (Spare)	1 No.	
20.	Heating Element (Spare)	1 No.	
21.	Installation & comm. at any Customer site in India	1 No.	
22.	Civil work for plinth for Fire Extinguishing Cubicle at any Customer site in India	1 No.	
23.	Civil work for oil pit at any Customer site in India	1 No.	
24.	Civil work for Safety Wall at any Customer site in India (between Transformer and FEC) (250mm thick x1500mm wide x 2500 mm height =0.9375 m ³)	1 set	
25.	Provisions in the control box for following – 1) Monitoring of N2 Injection Pressure & Cylinder Pressure 2) Pressure Monitoring switch for back up protection of N2 release 3) Leakage from the drain pipe	1 set	
GRAND TOTAL			

Note - Rate of item 10, 11 & 12 shall be calculated on factor basis and not to quote/ added.