

1563151/2023/HFP-SW/540900
~~PQR REV 00~~

**PQR FOR 11/33 KV OUTDOOR LIVE TANK CURRENT TRANSFORMER AS PER
 ANNEXURE-A PI NO.-380930004**

S. No	Description of requirement	Document to be attached
1	Bidder should OEM	Self-Declaration or any other supporting document
2	Bidder should have supplied Outdoor Live Tank CTs or similar items in any one of the last five financial years to BHEL or any Central / State Govt Organization / Electricity distribution/transmission/generation utility	Purchase Order copy(s)/Invoice(s) / Any other document certifying the supplies)
3	Average annual turnover of FY2019-20, FY2020-21 and FY2021-22 should not less than Rs.3 Cr.	Single CA Certificate for average annual turnover details for relevant period. Document must have UDIN number.

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TECHNICAL SPECIFICATION FOR OUTDOOR CTS (APPLICABLE STANDARD IS:2705)

TABLE : 1

CL. NO.	DESCRIPTION	11kV CT IT-01,02,03	33kV CT IT-04 & 05	BIDDER'S CONFIRMATION
1.0	TECHNICAL PARAMETERS			
1.1	System Voltage (3Phase, 50 Hz) kV	11	33	
1.2	Insulation level			
1.2.1	System highest voltage kV	12	36	
1.2.2	Power freq. withstand voltage (primary) kV Power freq. withstand voltage (secondary) kV	28 3	70 3	
1.2.3	Lightening Impulse withstand voltage kVp	75	170	
1.3	Insulation class kV/kVrms/kVp	12/28/75	36/70/170	
1.4	STC Rating / duration kA/sec	25kA /3 sec		
1.5	The short time thermal current should suit the breaker rupturing capacity and duration to suit the maximum tripping time.			
1.6	Instrument safety factor for all metering cores shall be as low as practicable and should be less than 5 for all the cores.			
1.7	Accuracy Limit Factor	10 for Protective Core		
1.8	Continuous Overloading Capacity	120%		
1.9	Neutral Earthing	Solidly earthed system		
1.10	Insulation class of CTs	As per IS/IEC		
1.11	Limit of Temperature Rise	60°C as per latest IS/IEC		
1.12	Secondary. Term. & Rating Plate on P1/P2 Side	P2 side		
2.0	Application	Outdoor, Live Tank, Vacuum Impregnated type, Mounted on Steel Structure		
2.1	Porcelain Housing	It shall be single piece of homogeneous, vitreous porcelain of high mechanical & dielectric strength. It will be glazed with uniform Brown or Dark brown colour with smooth surface finish.		
2.1	Creepage Distance of porcelain/bushing	Min. 300mm and shall suit to 12kV system(For It-01,02 and 03)	Min. 900mm and shall suit to 36kV system (For It-04.)	
2.2	Mounting Dimensions	1. Mounting Dimensions shall be as per 2.2.1 and 2.2.2 2. Vendor to submit drawing along with offer.		
2.2.1	Mounting centers	280 x 280 mm		
2.2.2	Mounting hole	16 dia. hole		
2.3	2 nos. Terminal connectors suitable for horizontal/vertical take-off (i.e. universal connection). Drill dia. as per Panther/Zebra.	Suitable for Panther/Zebra Conductor		
2.4	Terminal Connectors shall be properly fitted on the primary terminals.	To be Confirmed.		
2.5	1 no. Cable gland per CT suitable for the following: (i) 4 Core for Item-03 (ii) 6 Core for Item-01,02 and 04 (iii) 10 Core for Item-05	To Be Confirmed.		
2.6	ACSR Conductor (Panther/Zebra shall be communicated later).	1 metre conductor piece shall be provided with each CT		

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2.7	Class of insulation	Immersed in new insulating oil	
2.8	Constructional Feature		
2.8.1	Type	Oil filled (oil conforming to IS: 335-1983 transformer oil with low viscosity type).First filling of oil shall be in vendor's scope. The Insulating oil must be new and unused as per IS and weight of oil in the CT should be 30 lts to 35 lts as per gauge level invariably.	
2.8.2	Core	The core shall be high grade non-ageing electrical silicon-laminated steel of low hysteresis loss and high permeability to ensure high accuracy, at both normal and over current/voltage.	
2.8.3	Mounting	The current transformers shall be suitable for mounting on steel structures or concrete pedestals. The necessary flanges, bolts, etc, for the base of the Current Transformer shall be supplied and these shall be galvanized. The current transformer tank and other metal parts shall be galvanized.	
2.9	Insulation	All windings of Current Transformers shall be made of high grade electrolytic copper wire double paper covering insulation and the manufacturing of the units shall be done in completely closed and air-conditioned room.	
2.9.1	Secondary winding	<ol style="list-style-type: none"> 1. Shall be made of copper wire of high electrolytic grade. 2. Tape insulated or cast resin 3. For multi ratio design, the multi ratio will be achieved by reconnection of the secondary winding. The excitation current of the CT shall be as low as possible. 4. Vendor shall furnish the magnetization curves for all the cores. 	
2.9.2	Primary winding	<ol style="list-style-type: none"> 1. It shall be made of high conductivity rigid copper wire. The primary winding current density shall not exceed the limit of 1.6 Amp per sq. mm for normal rating. 2. The design current density for short circuit current as well as conductivity of metal used for primary winding shall be as per IS 2705. The calculation for the selection of winding cross section shall be furnished by contractor. 3. Double paper covered vacuum impregnated oil immersed. 4. Fibre glass insulation sleeves are to be provided for primary winding. Details of winding and core shall be furnished. 	

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2.10	Tank		
2.10.1	Type	Live tank, hermetically sealed suitable for pressure of approx. 1.2kg/sqcm to 2 kg/sqcm. for 8 hrs.	
2.10.2	Pressure relief device	Spring loaded.	
2.10.3	Construction	<ol style="list-style-type: none"> The tank shall be fabricated of MS steel sheet. The tank thickness should be not less than 10 SWG(3.25mm) and top/bottom cover should be 5 SWG(5.38mm). Dome shape top cover shall be provided and should be designed to avoid the stagnation of rain water. Vendor to ensure proper sealing to avoid oil leakage in service condition. Vendor to mark oil leakage points in OGA drawings of CT. Any nut & bolt and screw used for fixation of the interfacing porcelain bushing for taking out the terminals shall be provided on flanges cemented to bushings and not on porcelain. If gasket joints are used, Nitrite Butyl Rubber gasket shall be used. The grooves shall be machined with adequate space for accommodating gasket under pressure. The sealing methods/arrangement shall be part of CT OGA drawing to be approved by BHEL before manufacturing. EXTERNAL FINISH: The tank shall be hot dip galvanized INTERNAL FINISH: The inner surface shall be painted with oil resistance white enamel paint. All external H/w and all ferrous parts exposed to atmosphere except tank (For Tank Refer. Pt. 6 & 7 above) must be properly hot dip galvanized. 	
2.10.4	Sealing	Provision for sealing secondary terminal compartment, primary ratio change strips (if any) and tank effectively shall be made such that no fraud etc. such as tampering of the ratio or circuit (current) is possible. The holes provided for the above sealing provision shall be of adequate size and pass the sealing wire of about 14 SWG.	
2.10.5	Drain plug(with label)	Required	
2.10.6	Oil level indicator	<ol style="list-style-type: none"> The CT shall be fitted with prismatic type oil sight window at suitable location so that the oil level is clearly visible with naked eye to an observer standing at ground level. Marking for maximum and minimum 	

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		<p>level shall be clearly given.</p> <p>3. To compensate oil volume variation due to temperature variation, Nitrogen cushion or the stainless steel bellows shall be used. Rubber diaphragms are not permitted for this purpose.</p> <p>4. The units shall be vacuum filled with oil, after processing and thereafter hermetically sealed to eliminate air and moisture from entering the tank.</p>	
2.10.7	Oil filling valve with label	Required	
2.11	Secondary terminals		
2.11.1	Type	<p>1. Stud Type</p> <p>2. The secondary terminals studs shall be provided with at least 3 nuts and 2 plain washers. The min. stud length 15 mm. The min spacing between the centres of the adjacent studs shall be 1.5 times the outer dia. of the stud.</p> <p>3. The secondary terminals shall be brought out into suitable compartment which shall have a removable cover. The terminal box with the cover closed and tightened and the cable/conduit in position when supplied shall have a degree of protection co forming to IP 54 of IS:2147.</p> <p>4. The secondary taps shall be adequately reinforced to withstand normal handling, without damage.</p> <p>5. Hole suitable for control cable as per Cl. 2.5 to be provided on bottom side of secondary terminal box.</p> <p>Dimension location to be clearly shown in CT OGA drawing.</p>	
2.11.2	Size	M6	
2.11.3	Material	Brass duly nickel plated	
2.11.4	Short circuit link	Required	
2.12	Primary terminals	Dimensions of Primary terminals shall confirm to IS:10601:1983 and the primary terminal shall be of standard size of 30 mm dia x 80 mm length of heavily tinned (min. thickness 15 micron) electrolytic copper of 99.9 % conductivity.	
2.12.1	Type	Stem	
2.12.2	Size	To suit temperature rise limits of 45deg considering 20% continuous over load as per IS/IEC.	
2.12.3	Polarity	<p>1) The polarity shall be marked on each CT at the primary and secondary terminals.</p> <p>2) CT's should have primary terminal connectors with stud in both sides suitable for Panther/Zebra conductor(Exact requirement</p>	

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		shall be communicated at the time of PO Placement).	
2.13	Earthing terminals	The assembly comprising of the chassis, frame work and the fixed parts of the metal casing of the CT, shall be provided with 2 separate earthing terminals.	
2.13.1	Size	The earthing terminals shall be of size M16X30 mm each with 1 plain washer and 1 nut for connection to the station earth mat. Terminals shall protected against corrosion and metallicly clean and identified by means of the sign marked in a legible and indelible manner on or adjacent to the terminals.	
2.13.2	Material	Brass with tin plating	
2.13.3	Earthing Connectors	Suitable earth connectors for earthing connections shall also be supplied. Thickness of the clamp must be minimum of 12 mm and the stud clamp will be bimetallic. Length of connection shall be 250mm (min.) longer than the earth terminal height from base (if base is not flat).	
2.13.4	Lifting arrangement	<ol style="list-style-type: none"> 1. The CT shall be provided with two lifting eyes to lift the CT. This shall be so positioned so as to avoid any damage to the CT during lifting for instillation or transportation purpose. This shall be detailed in General Arrangement drawing. Arrangement shall be provided such that CT can be lifted after packing and also the strength of such arrangement shall be suitable to lift CT weight. 2. Also a mark should put at Primary terminal mentioning "DO NOT LIFT FROM HERE" 	
The top cover and terminal box cover should be such that rain water does not enter even through the gaskets.			
Vendor shall not be permitted to change above mentioned requirement in lieu of any GA Drawing approval after order placement during contract execution stage.			

TABLE: 2

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11/ 33 kV CT, 3 Phase, 50 Hz.

Item No.	Description	Core-1	Core-2	Core-3	Vendor Confirmation
1.	11 kV CT 400-200-100/1-1 A	15VA, 5P10	5VA, 0.2S	-	Yes/No
2.	11 kV CT 600-300/1-1-0.5775A	15VA, 5P10	5VA, 0.2S	Cl.PS, $V_k \geq 40I(R_{ct} + R_L)$ at lower tap/ratio, $I_e \leq 30mA$ at $V_k/4$, $I = \text{Rated Current of CT.}$ $R_L = 0.5\Omega$	Yes/No
3.	11 kV 600-300/1-1A	15VA, 5P10	5VA, 0.2S	-	Yes/No
4.	33 kV 400-200-100/1-1 A	15VA, 5P10	5VA, 0.2S	-	Yes/No
5.	33 kV 400-200-100/1-1-1 A	15VA, 5P10	5VA, 0.2S	Cl.PS, $V_k \geq 40I(R_{ct} + R_L)$ at lower tap/ratio, $I_e \leq 30mA$ at $V_k/4$, $I = \text{Rated Current of CT.}$ $R_L = 0.5\Omega$	Yes/No

TABLE : 3

3.0	CLIMATIC CONDITIONS	BIDDER'S CONFIRMATION
3.1	Ambient Air Temp. - -5°C (min) & 50°C (max.)	
3.2	Relative humidity - 10%(min) & 95%(max)	
3.3	Height above MSL - ≤ 1000 meters (consider suitable Altitude correction factor in Impulse withstand for height more than 1000 mtrs)	
3.4	Pollution Severity - Heavily polluted (with coal dust & Fly ash) & Highly corrosive environment.	
3.5	Seismic Coefficient - 0.3g	
3.6	Design Ambient Temp.- 50°C	

TABLE : 4

4.0 NAME / RATING PLATE :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
4.1	As per relevant IS(Rating Plate shall be on anodized plate)	
4.2	(i) Identification mark on CT's - "PO NO." , "IT NO." (ii) Manufacturer's Name, Sl. No. and/or Type of designation: (iii)Manufacturer's Name:	
4.3	CT Rated Transformation Ratio with Core details	
4.4	Rated Voltage Class, Frequency and Insulation Level	
4.5	Insulation Class	
4.6	STC,HSV	
4.7	Rated short time thermal current with the associated rate time and rated dynamic current.	
4.8	Customer P.O. No., Year of Supply and Customer name to be etched on rating plate.	

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5.0 PERMORMANCE GURANTEEE :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
5.1	The bidder shall guarantee for satisfactory performance of the equipment for a minimum period of 60 months from the date of commissioning or 66 months from the receipt of last consignment, whichever is earlier. In the event of any defect in the equipment / material arising out of faulty design, inferior quality of raw material used or bad workmanship within the guarantee period, vendor to guarantee to replace/repair to the satisfaction of the purchaser/customer, the defective equipment, free of cost.	

6.0 PACKING :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
6.1	For identification marking on CT's Project Name : Customer P.O. No.(Shall be provided at P.O. Placement stage) Item No.	
6.2	Vendor to confirm packing in wooden case (as per drg no. 35210055605 attached) with base suitable to hold weight of CT. Wood used for packing shall be of good quality and shall have adequate thickness. Vendor to confirm that packing is done in such a way that it can be sent as it is from BHEL to customer, without any extra packing at BHEL end.	
6.3	CTs shall be wrapped in good quality plastic cover before wooden packing.	
6.4	Porcelain Insulator shall be packed with good quality foam material.	

7.0 DOCUMENTS TO BE SUBMITTED ALONGWITH THE OFFER :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
7.1	Following drawings:- 7.1.1 Cross section view showing material of important components 7.1.2 Porcelain/Bushing Insulator 7.1.3 Pressure release device (clearly indicating release pressure). 7.1.4 OGA showing front elevation, site elevation and plan view clearly, marking terminal, thickness of tank, oil quantity, creepage distance, lifting lugs etc. 7.1.5 Quality plan of manufacturer.	
7.2	One copy of the following documents 7.2.1 All Type test certificates including the ones mentioned below (ALL TYPE TEST REPORTS SHALL BE AS PER RELEVANT IS/IEC AND SHALL NOT BE MORE THAN 5 YRS OLD. REPEAT TYPE TEST DUE TO THIS SHALL NOT ATTRACT ANY SEPARATE CHARGE) (i) STC (ii) Temperature Rise (iii) Lightning Impulse Test (iv) High Voltage Power Frequency wet withstand voltage test. (v) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class. (vi) Type test of Bushing Insulator Note: Satisfactory Valid type test certificates from central Govt. /NABL lab is to be furnished for the tests mentioned above as per the specification. Type tests applicable as per IS. Without required Type Test certificates, the offer shall be rejected. Provisional/in house non-NABL type testing reports are not acceptable.	

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8.0 ACCEPTANCE AND ROUTINE TESTS :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
8.1	Verification of terminal marking and polarity	
8.2	Power frequency dry withstand Test on primary & secondary windings.	
8.3	Over Voltage Interturn test.	
8.4	Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.	

9.0 ACCEPTANCE CRITERIA :

Sl. No.	DESCRIPTION
9.1	Availability of inspection report (of BHEL authorized representative/customer representative)
9.2	Availability of 2 Nos. terminal connectors & 1no. Cable gland per CT. Terminal Connectors shall be properly fitted on the CT.
9.3	Test report for porcelain insulator.
9.4	Test report for pressure release device.
9.5	Verification of terminal marking and polarity as per approved drawing.
9.6	Test Report for Over Voltage Interturn test.
9.7	Test Report for Power frequency dry withstand tests on primary windings.
9.8	Test Report for Power frequency dry withstand tests on secondary windings.
9.9	Test Report of Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.
9.10	Visual checks for cracks & surface finish.

10.0 INSPECTION :

Sl. No.	DESCRIPTION	BIDDER'S CONFIRMATION
10.1	By BHEL authorized representative/end customer representative as per approved drawing. Two weeks advanced information to be given.	

11.0 LABELS/MARKINGS/ENGRAVINGS REQUIRED FOR THE FOLLOWING:

Sl.No.	Description	BIDDER'S CONFIRMATION
11.1	Secondary Terminal	
11.2	Safety Valve and PRV (Shall be marked on the CT top cover also)	
11.3	Oil Level Indicator(Min and Max Levels)	
11.4	Earthing Terminal	
11.5	Oil Drain Plug	
11.6	Oil filling plug	

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Delivery address will as per table below:

F.O.R. AP stores: (Details of stores listed below).

Sl. NO.	APCPDCL	APSPDCL	APEPDCL
1	Dy. Executive Engineer/District Stores, APCPDCL, Gunadana, Vijayawada-524004, Cell-9440812092	Assistant Divisional Engineer, District Stores, APSPDCL, Nellatur, Gudur-524101, Cell:9440812012 Ph:08624-222523	Dy. Executive Engineer/District Stores, APEPDCL, Srikakulam, Near Arts College Road, Srikakulam-532001
2	Dy. Executive Engineer/District Stores, CRDA, APCPDCL, Gujjanagundla, Guntur-522006, Cell-9440812264	Assistant Divisional Engineer, District Stores, APSPDCL, Greamspeta, Old Collector Office Road, Chittoor-517001, Cell:9440811853, Ph:08572-241517	Dy. Executive Stores/District Stores, Simhachalam, APEPDCL, R.R.V. Puram, Visakhapatnam-530029
3	Dy. Executive Engineer/District Stores, APCPDCL, Gujjanagundla, Guntur-522006, Cell-9440812264	Assistant Divisional Engineer, District Stores, APSPDCL, Industrial Estate, Arts college Road, Kadapa-516004, and Cell: 9440811917, Ph: 08562-244106.	Dy. Executive Stores/District Stores, APEPDCL, Nellimerla, Vizianagram-535217
4	Dy. Executive Engineer/District Stores, APCPDCL, Power office, Kurnool Road, Ongole-523001, Cell-9440812199	Assistant Divisional Engineer, District Stores, APSPDCL, JNTU Engineering College Road, O/o Superintending Engineer, Operation, Anantapur-515001. Cell: 9440813219, Ph: 0854-297046.	Dy. Executive Stores/District Stores, APEPDCL, Vatluru, Eluru, West Godavari dist-534007
5	-	Assistant Divisional Engineer, District Stores, APSPDCL, O/o Superintending Engineer, Operation, Kurnool, Opposite to RTC Bus Stand, Kurnool-518004, Ph:08518-256345, Cell:9440813326.	Dy. Executive Stores/District Stores, APEPDCL, Near 220KV sub-station compound, Bommuru, Rajahmundry-533124, East Godawari distt.

Note: - 1) Unloading will be done by customer during first receipt of material at stores.

2) Quantity-wise delivery (in multiple of 3) for different AP-Stores will be informed later.

Prepared By:
Date:

Approved By:
Date: