SPECIFICATIONS FOR
132 KV CAPACITOR VOLTAGE TRANSFORMER

❖ REQUIREMENT:

The equipment offered shall be highly reliable suitable to operate satisfactorily in hot humid and polluted climate. The equipments offered shall work satisfactorily within temperature range of 0°C to 50°C and relative humidity of 95% non-condensing. It shall be suitable for satisfactory working in normally polluted atmosphere.

❖ SPECIFICATION:

The equipment is required for 132 KV system. The system data is given as under:

SYSTEM PARTICULARS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Voltage</td>
<td>132 kV</td>
</tr>
<tr>
<td>Max. System Voltage</td>
<td>145 kV</td>
</tr>
<tr>
<td>Rated Power Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Rated system continuous circuit</td>
<td>630 A</td>
</tr>
<tr>
<td>Maximum Thermal short circuit Current for 1 Sec.</td>
<td>31.5 kA</td>
</tr>
<tr>
<td>Dynamic Limiting Current</td>
<td>38.5 kA</td>
</tr>
</tbody>
</table>

STANDARDS:

The equipment shall meet the following ISS and IEC standards with latest amendment:

IS : 2099 - Specification for bushings for alternating Voltage above 1000V.
IS : 3156 - Specification for voltage transformer.
IS : 5621 - Specification for hollow insulators for Use in Electrical equipments.
IS : 335 - Insulation Oil for transformers and switch Gears.
IEC : 186 & - Specification for voltage transformers.
IEC : 186 A
IEC : 270 - Partial Discharge Measurement
IEC : 358 - Coupling capacitors and capacitor Dividers.
Unless otherwise stated elsewhere in the specification, the rating as well as performance & testing of the instrument transformer shall confirm but not limited to the latest revision and amendments available at the time placement of order of all relevant standards listed above.

The design, manufacture and performance of the equipment shall comply with all currently applicable standards, regulation and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the supplier of his responsibility.

**G E N E R A L:**

The 132 KV CVTs are required for PLCC, station metering, synchronisation and protection of 132 KV Transmission Lines. The equipment is required for connecting high frequency equipment to high voltage line. It shall be suitable for operating from 40 KHz to 500 KHz. It shall have high frequency capacitance of 4400pF. HF terminal shall be provided for connecting PLCC equipment.

**CONSTRUCTION:**

CVT shall comprise of a capacitor divider unit and an electromagnetic unit so designed and interconnected that the secondary voltage of electromagnetic unit is substantially proportional to and in phase with the primary voltage applied to the capacitor divider units. If a carrier frequency coupling device is introduced into the earth lead of intermediate voltage capacitor the error introduced by this device shall be negligible at rated frequency in relation to the errors of CVT. The material and construction and assembly of CVT shall be such that capacitance does not change with time and the effect of temperature is minimum.

The live metal surface, nuts and bolts used for the connection of two capacitor stacks shall be either of brass or tinned copper to provide good electrical connection. Corona shield and high voltage terminal studs shall be of copper.

The intermediate electromagnetic circuit of CVT shall be provided with necessary device like, series choke coil or reactance unit to minimise the draining of carrier signal through the electromagnetic unit. It will be provided with an over voltage suppressor to protect the electromagnetic unit. Earthing terminal of CVT shall be brought out through a bushing rated for 11 kV-class minimum.
The internal insulation level of CVT shall be higher compared to external insulation to prevent damage to internal insulation. Material used in the insulation and assembly of the winding shall be insoluble, noncatalytic, and chemically inactive in hot transformer oil and shall not be subjected to a shrinking and seasoning process to avoid further shrinking during service.

The capacitor stacks and windings shall be suitably supported and permanently secured at frequent intervals so that no shifting occurs due to dynamic forces developed by short circuit and that during transportation. All the winding shall be of electrolytic copper.

CVTs shall be hermetically sealed with non-breathing type of bellows arrangement with first filling insulating oil confirming to latest IS: 335. Suitable arrangements shall be provided for expansion and contraction of oil due to operating temperature variations, without affecting property of insulating materials, oil etc. In case, inert gas sealing is used, pressure relief device shall be provided. The arrangement provided shall be described in details.

All exposed ferrous parts like tank, expansion chamber, terminal box etc., shall be of high quality steel, and shall be hot dip galvanised confirming to IS : 2633. Steel surface coming in contact with oil shall be coated with oil resisting varnish. All fasteners shall be hot dip galvanised. The construction of the tank including fitting of capacitor unit shall be such that there shall not be any Oil leakage. In case of any leakage, it should be possible to attend it on site.

The hollow porcelain insulators for CVTs shall confirm to IS: 5621. Porcelain shall be homogeneous, vitreous, the glazing of which shall be uniform brown or dark brown colour. The terminals for external connections shall be so mounted as to enable easy connection and disconnection.

CVTs including hollow insulators shall be sufficiently strong to withstand external stresses due to wind pressure up to 150 Kg/m$^2$, earthquake, short-circuit and conductor pull at the terminals. The minimum creepage distance for insulator housing shall be as per IEC: 358 for normally polluted atmosphere. CVTs shall be suitable for hotline washing.

Secondary terminals of CVTs shall be brought out in a weather proof outdoor terminal box having enclosure protection of minimum IP55 as per IS : 2147. The terminal box shall be provided with blank gland plates of adequate size. The secondary terminal box of CVT shall include necessary HRC fuses for protection of secondary circuits. For purpose of fuse supervision, both the sides of the fuse shall be terminated on terminal block. The terminals for metering core shall be brought out in separate sealable compartment/Box.
Each CVT winding shall be provided auxiliary terminals on terminal block complete with necessary incoming connections.

HF Auxiliary bushing shall be provided suitably so that HF connection can be made without affecting main bushing. The arrangement for taking HF connection shall be described.

CVTs shall be provided with two secondary windings i.e. one for metering and one for protection, each having following particulars:

<table>
<thead>
<tr>
<th>Winding</th>
<th>Purpose</th>
<th>Burden</th>
<th>Accuracy</th>
<th>Primary Voltage</th>
<th>Secondary Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>Metering</td>
<td>10 VA*</td>
<td>0.2</td>
<td>132 kV</td>
<td>110 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. 2</td>
<td>Protection</td>
<td>50 VA*</td>
<td>3P</td>
<td>132 kV</td>
<td>110 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

* Simultaneously.

The voltage factor shall be 1.2 for continuous and 1.5 for 30 seconds rating.

CVTs shall be provided with necessary clamps/connectors complete in all respect for Panther conductor for connecting to high voltage line.

CVT shall be fully protected against high voltage oscillations and lightening surges. The bidder shall provide complete write up for protection provided.

Steel pedestal for mounting the CVT if ask to supply for the Quantity shown in the Schedule, then the same shall be offered as per the technical specification of the structure and the drawing for given details of Base Plan, Top View & Foundation bolt. The pedestal shall have facility to mount Coupling Devices and Protective Device. The detailed drawing shall be furnished.

- **LIST OF TYPE TEST REPORTS FOR 132KV, 4400PF CVT:**
  1. Temperature rise test on EMU
  2. Lightning impulse voltage withstand test
  3. Switching impulse withstand voltage test (Wet)
  4. Partial discharge test
  5. Ferro resonance test
  6. Short circuit withstand capability test
  7. Transient response test
  8. High frequency capacitance & equivalent series resistance
9. Temperature coefficient test
10. RIV
11. Visual corona
12. Power frequency withstand voltage test
13. Discharge test
14. Measurement of stray capacitance & stray conductance
15. IP55 test on secondary terminal Box.

The equipment offered must have been type tested after manufacture in India. Equipment shall be again type tested if required by the purchaser in presence of purchaser or/and any third party. Measurement of HF capacitance and equivalent series resistance within the frequency range 40 to 500 kHz should have been carried out and it should meet IEC No. 358 Clause: 10. If required this test will be carried out again. This test report for high frequency measurement shall be enclosed with technical bid.

- **ROUTINE TEST:**

  All the tests shall be carried out in presence of purchaser’s representative and/or any third party as decided by the purchaser as mentioned under above standards.

- **OIL LEAKAGE AND OIL FILLING:**

  The bidder shall indicate clearly whether oil leakage problem can be attended at site and topping of oil carried out.

  In case of oil leakage during guarantee period, supplier shall attend the same free of cost. If CVT is required to be taken to works, supplier shall do so at his cost and arrange for replacement CVT if required by the user.

- **PACKING:**

  The CVTs shall be dispatched properly packed so that there is no damage during transportation. All warning and instruction shall be in Red Bold letters on outside of packing for handling the CVT during transportation. The rest of warning and instruction etc., shall be on CVT tank in Red Colour.
SPECIFICATIONS FOR
132 KV CAPACITOR VOLTAGE TRANSFORMER

INSTRUCTION MANUAL:

One Erection and Commissioning Manual shall be provided for each CVT and shall be dispatched together with CVT. Two copies of instruction Manual with CD for soft copy shall be provided with the tender bid.

DRAWINGS:

The following drawings indicating all the dimensions and weight etc. with complete technical details shall be enclosed together with technical bid:

1. General Arrangement Drawing
2. Rating & Diagram Plate for 145KV CVT
3. Secondary terminal Box having separate sealable compartment with locking arrangement for metering core having class of accuracy 0.2
4. Sectional view for 145KV CVT
5. Terminal connector suitable for single ACSR conductor

The offer without the above drawings and insufficient technical data to evaluate the bid technically, will not be considered.

SCHEDULE OF DEVIATION:

Bidder shall bring out all the deviation from specification in separate schedule of deviation.

SCOPE OF SUPPLY:

The following items are included in the scope.

(i) CVT complete in all respect.
(ii) Clamps & connectors
(iii) Pedestal structures for mounting CVT (if required)

The manufacturer's scope of supply covers design, manufacture, assembly, stage inspection, testing at supplier's works, packing for shipment and delivery of equipment to the store in safe condition in accordance with this specification. The Bidder shall have to provide all the ‘Guaranteed Technical Particulars’ as per Schedule-A (GTP) & details of ‘Technical documents /Type test reports submitted’ as per Schedule-B.
The GTP submitted by the bidder in the offer if found to be not provided as per the Schedule-A & if any of the type test reports from the list given above found to be more than 5 Years old on the date of opening of the tender, then offer will be rejected without any prior confirmation. Also if any of the type test reports from the list given above not submitted then it shall be indicated clearly by the bidder in the schedule of deviation.
SPECIFICATIONS FOR
132 KV CAPACITOR VOLTAGE TRANSFORMER

SCHEDULE - A
GUARANTEED TECHNICAL PARTICULARS
( To be submitted by bidder with the tender)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GENERAL</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Manufacturer’s name &amp; address</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Model No.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Mounting</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Suitable system Frequency</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Applicable standards</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Rated Primary voltage kV (rms)</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Highest voltage kV (rms)</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Maximum temperature rise above: ambient temperature of 50 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAPACITOR DIVIDER</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Capacitance values at rated frequency And at rated temperature for:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ High voltage capacitor ‘C₁’ pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Intermediate voltage capacitor ‘C₂’ pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Total Equivalent capacitance pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Rated temperature at which above Values are indicated °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Capacitance temperature coefficient</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>1.2x50 micro sec. Lightning impulse Withstand test voltage for capacitor Unit kVp</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>1 minute power frequency withstand voltage kV (rms)</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Radio interference voltage (max) at 156 kV (rms) volts</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Visual corona extinction voltage kV</td>
<td></td>
</tr>
</tbody>
</table>
### SPECIFICATIONS FOR 132 KV CAPACITOR VOLTAGE TRANSFORMER

6. Variation in capacitance of total rated capacitance over entire range of carrier frequency

7. Tan delta value of capacitor unit

8. Total creepage distance of insulator mm.

9. Rated intermediate voltage kV

10. Equivalent series resistance over entire range of carrier frequency ohms

11. Partial discharge level at rated voltage pico col.

### ELECTROMAGNETIC UNIT

1. Rated primary voltage kV

2. Rated secondary voltages

   - First winding volts
   - Second winding volts

3. Rated voltage factor

   - continuous
   - short time

   Duration sec.

4. Rated burden of secondary winding

   - First winding VA
   - Second winding VA
   - Simultaneous VA
   - Rated power factor of burden

5. Accuracy class of secondary

   - First winding
   - Second winding
   - Phase angle error

6. Insulation withstand test voltages

   - Rated voltage class of primary kV
   - Capacitor divider unit kV
   - Earth terminal of capacitor voltage device kV
   - Primary winding of electromagnetic unit kV
SPECIFICATIONS FOR
132 KV CAPACITOR VOLTAGE TRANSFORMER

7. Whether the earth terminal of the
   □ voltage divider provided Yes/No
   □ If yes, the rated voltage
   □ 1 minute power frequency withstand voltage kV

8. Whether series reactance/choke/ frequency ng coil provided Yes/No
   If yes, Rated voltage kV
   1 minute power frequency test voltage kV

9. Terminal box details
   @ Degree of protection as per IS: 2147
   @ Whether cable glands provided Yes/No

10. Rated secondary winding Voltages:
    10.1 First winding Volts
    10.2 Second winding Volts

11. Method of connections:
    11.1 Primary
    11.2 Secondary windings
    11.3 First winding
    11.4 Second winding

12. Rated voltage factor:
    12.1 Continuous
    12.2 Short time
    12.3 Duration Sec.

13. Rated burden of secondary Windings:
    13.1 First winding VA
    13.2 Second winding VA
    13.3 Total burden VA

14. Rated power factor of the burden

15. Accuracy class of secondaries
    15.1 First winding
    15.2 Secondary winding
    15.3 Phase angle error
<table>
<thead>
<tr>
<th></th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>Class of insulation.</td>
</tr>
<tr>
<td>17.</td>
<td>Rated intermediate voltage ( kV )</td>
</tr>
<tr>
<td>18.</td>
<td>Rated primary voltage of Electro-Magnetic unit. ( kV )</td>
</tr>
<tr>
<td>19.</td>
<td>Insulation withstand test voltages</td>
</tr>
</tbody>
</table>
**SPECIFICATIONS FOR**

**132 KV CAPACITOR VOLTAGE TRANSFORMER**

**SCHEDULE-B**

‘Technical documents /Type test reports submitted’

(To Be filled up by Bidder & to be submitted with tender)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>YES</th>
<th>NO</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Certificate of OEM attached</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Fresh certificate of chartered Engineer indicating manufacturing capacity submitted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>List of order with details of Qty, value of the Order and Order No. Compulsory with date (Executed during last 5 years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) For same rated equipment supplied to GETCO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) For higher rated equipment than offered to GETCO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Same rated equipment supplied to other utility with performance certificate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>All 15 Nos. of Type Test reports submitted are as per list given in TS &amp; not more than 5 years old.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>List of performance certificate along with copy of performance certificate submitted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Set of drawings as per the list given in TS along with the CD of Soft copy submitted.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SPECIFICATIONS FOR 132 KV CAPACITOR VOLTAGE TRANSFORMER

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>YES</th>
<th>NO</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Copy of the technical specification submitted with the seal of OEM &amp; sign of CE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>QAP Submitted for Offered equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GTP Provided as per Schedule-A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>In case of oil leakage during guarantee period supplier shall attend the same free of cost &amp; if require supplier shall have to take the CVT to works at his cost. (To be confirmed by bidder)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Your offer fully complies to meet all the requirements as per TS &amp; documents to be submitted as above.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I __________________________, the authorized signatory here by confirmed that the details pertain to Sr. No. 1 to 11 of Schedule-B submitted herewith the tender is correct in all respect and as per corporation’s requirements. If any detail there in found incorrect or inadequate/insufficient by corporation then decision of corporation will be acceptable to us without any further clarification.

Signature of Authorized representative of Company

NAME: __________________________

STATUS: __________________________
SPECIFICATIONS FOR
132 KV CAPACITOR VOLTAGE TRANSFORMER

SCHEDULE OF REQUIREMENTS

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>132kV CVT with CC = 4400 PF &amp; with two windings having VA burden 50 &amp; 10 and having accuracy of 3P &amp; 0.2 class for protection &amp; metering core respectively having separate sealable compartment arrangement with locking facility and with HF terminal for PLCC connectivity and along with Clamps/Connectors.</td>
<td></td>
</tr>
</tbody>
</table>