SPECIFICATIONS FOR
220KV 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 220KV system. The system data is given as under:

➤ SYSTEM PARTICULARS

Line Voltage .................................................. 220 kV
Max. System Voltage ................................. 245 kV
Rated Power Frequency ......................... 50 Hz
Rated system continuous current ........ 1250 A
Maximum Thermal short
Current for 1 Sec. ................................. 31.5 kA
Dynamic Limiting Current .......... 38.5 kA

➤ STANDARDS :

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

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 : 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.

**GENERAL:**

The 220KV CVTs are required for PLCC, station metering, synchronisation and protection of 220KV Transmission Lines. The equipment is required for connecting high frequency equipment to high voltage line. It shall be suitable for operating from 40KHz to 500KHz. 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 dielectric material shall be mixed type i.e. paper and polypropylene material. 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. The HF 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, non-catalytic, 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 bellow arrangement with first filling insulating oil confirming to latest IS: 335 or better quality of oil. 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/m², 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 IP-55 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.

CVT s 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>50 VA</td>
<td>0.2</td>
<td>220 kV (\sqrt{3})</td>
<td>110 V (\sqrt{3})</td>
</tr>
<tr>
<td>No. 2</td>
<td>Protection</td>
<td>50 VA</td>
<td>3 P</td>
<td>220 kV (\sqrt{3})</td>
<td>110 V (\sqrt{3})</td>
</tr>
</tbody>
</table>

The Simultaneous burden shall be 100VA at 0.2/3P class of accuracy.

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

**CVTs shall be provided with necessary clamps complete in all respect for Single ACSR Moose 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.

Sign & Seal of Bidder
GETCO/E/TS-220KV CVT 0802/R2, Dt:31.08.2009
PREQUALIFICATION REQUIREMENTS:

1. The bidder shall be **Original Equipment Manufacturer** of the Capacitor Voltage Transformer offered. The offered equipments should have been designed, manufactured and tested as per relevant IS/IEC Standards with latest amendments.

2. The bidder should indicate manufacturing capacity by submitting fresh certificate of a Chartered Engineer (CE).

3. The bidder should clearly indicate the quantity and single value contract executed during last FIVE (5) years, for the offered equipment.
   - The details of past supplies should cover,
     (i) Same rated equipment as Offered supplied to GETCO (Erstwhile known as GEB).
     (ii) Higher rated equipment than Offered supplied to GETCO (Erstwhile known as GEB).
     (iii) Same rated equipment as Offered supplied to other Power Utilities during last FIVE years & with Performance Certificate for last three years.

4. The bidder shall furnish the copies of type test reports for the CVT offered. Equipment Offered shall have all Valid Type Test Certificate of not later than 5 Years from NABL accredited Laboratory for the offered equipment type tested in India.

5. The bidder shall furnish the full technical details & drawings for the Capacitor Voltage Transformer offered.

6. The bidder shall have the experience of at least 10 years of manufacture & supply of similar type of Capacitor Voltage Transformer.

7. The bidder shall furnish the full details of the orders executed.

8. **Any deviation shall be clearly indicated separately.**

9. The GETCO reserves right to increase or decrease the quantity at the time of placing the order.

10. The GETCO reserve right either to accept or reject any of the offers Without assigning the reason.

   Along with Manufacturing Quality Plan, the Bidder shall have to submit following Type test reports (Not more than 5 years old on the date of opening of tender) with the tender bid.

   - **LIST OF TYPE TEST REPORTS FOR 220KV, 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 will require 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.

- **INSTRUCTION MANUAL**:
  One Erection and Commissioning Manual shall be provided for each CVT and shall be dispatched together with CVT. Two copies of
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)
(iv) O&M Manual along with drawings

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 not found 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
220KV CAPACITOR VOLTAGE TRANSFORMER

### SCHEDULE – A
GUARANTEED TECHNICAL PARTICULARS
(*To be submitted with the tender*)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL</td>
<td></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>11.</td>
<td>Type of dielectric material</td>
<td></td>
</tr>
</tbody>
</table>

### CAPACITOR DIVIDEER
1. Capacitance values at rated frequency
   And at rated temperature for:
   - High voltage capacitor 'C₁' pF
   - Intermediate voltage capacitor 'C₂' pF
   - Total Equivalent capacitance pF
   - Rated temperature at which above values are indicated °C
   - Capacitance temperature coefficient

2. 1.2x50 micro sec. Lightning impulse withstand test voltage for capacitor unit kVp

3. 1 minute power frequency withstand voltage kV (rms)

4. Radio interference voltage (max) at 156 kV (rms) volts

5. Visual corona extinction voltage kV
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
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/compensating 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. Class of insulation.

11. Rated intermediate voltage kV

12. Rated primary voltage of Electro-Magnetic unit. kV

13. Insulation withstand test voltages
### 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>
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<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>
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<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>
### 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>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: ________________________
## SCHEDULE OF REQUIREMENTS

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>220kV CVT with CC = 4400 PF &amp; with two windings having VA burden 50 &amp; 50 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>
<tr>
<td>2.</td>
<td>Steel Pedestal structure for mounting arrangement of CVT as per the technical specification of the structure and the drawing for given details of Base Plan, Top View &amp; Foundation bolt</td>
<td></td>
</tr>
</tbody>
</table>