

**Scope of work for Major Overhauling of 31.5/24 MVA, 132/11KV Power Transformer (MT-1) installed at CPP**

Overhauling/servicing of all parts including replacement of all gaskets, onsite dry out of winding/insulation, complete oil replacement for conformity of oil test result as per IS-1866 ,testing and final commissioning of the 31.5/24 MVA, 132/11KV Power Transformer MT-1 Installed at Captive Power Plant . Detailed scope of work as given below:

1. Oil sampling and complete oil testing (All transformer oil tests including DGA and Furan analysis) before and after completion of job as per through NABL accredited lab.
2. Pre-overhauling check for defect items, condition of transformer and its accessories.
3. Initial test such as winding resistance, Turn ratio, magnetizing current, short circuit at low voltage, magnetic balance, vector group ,IR,PI & capacitance and tan delta of bushing and winding to ascertain the health of transformer winding and OLTC. Party shall analyze the test values and provide recommendation.
4. Removal of HV and LV connections/Cable duct from transformer.
5. Removal of LAs along with its structures if required for proper positioning of hydro/crane for overhauling activities.
6. Disconnection of all control cables of buchholz relay, oil-surge relay, oil-winding temperature indicator and CT's. Before disconnection suitable marking and tagging of cables shall be done and noted.
7. Dismantling of HV, LV Bushings, conservator tank, all pipelines, buchholz relay, explosion vent, MOLG, Breather pipelines, radiators, cooling fans.
8. HV & LV Bushings shall be carefully handled and stored with necessary cushions/packing to avoid damage to bushings.
9. Lifting of top cover of transformer tank.
10. Internal Inspection of core coil assembly HV/LV connections/leads, all insulations like press board, parmali wood cleats and clamps, Core tightness, checking of core earthing integrity.
11. Complete cleaning and desludging to be done from top cover and inspection covers with hot transformer oil jet to flush out sludge deposit from yoke, oil ducts and base channels. Open the drain plug to drain out sludge collected at the bottom of the tank. This procedure shall continue, till clean oil gets collected at the drain plug.
12. Dry out process will comprise 4-6 cycle of vacuum pulling along with hot oil circulation, followed by nitrogen purging in order to achieve required dryness of active part. Party shall make all arrangement for external heating with suitable heater and induction heating arrangement if required.  
Dryness of the active part (core coil assembly) will be identified by indirect method as mentioned in point no. 2 Party shall compare the values of the test done before and after dry out.
13. The daily records of IR values, condensate collected and host of other parameters like core temperature, ambient temperature, average vacuum etc. shall be maintained. The IR values shall be plotted on time scale.
14. Dry out process shall be continued till steady state value of IR is improved from the existing values. Party shall achieve significant improvement in IR values and considerable reduction in tan delta values with the dry out process followed by them.

15. The main tank then filled with hot oil under vacuum with the temperature of oil maintained around 60-70 deg C. When filling a transformer with oil, it is preferable to pump in the oil from the bottom while drawing vacuum from top, using a streamline filter machine. New Oil shall be provided by M/s NFL.
16. **Overhauling of OLTC** .Hot oil washing of diverter & selector chamber after untanking Diverter switches.(ii) Untanking diverter switches.(iii) Cleaning of fixed & moving contact(iv) Tightening of all the clamping hardware(v) Replacing all the oil sealing gaskets/O-rings(vi) Greasing of gears in driving mechanism. Overhauling of OLTC will be carried out, however supply of spares if required shall be against separate order.
17. Supply / preparation & replacement of all the oil sealing gaskets made from rubberized cork sheet confirming to grade RC 80c of IS 4253(Part-II) for whole transformer. Certificate of supplied gasket shall be provided by the Party.
18. On completion of all schedule activities, all the accessories & fittings that were dismantled will be fitted back after necessary maintenance. Due care shall be taken while termination of ACSR conductor with HV bushings conductor. Bimetallic Terminal connectors shall be provided for connection between aluminium and copper conductor.
19. Testing after Transformer Overhauling/Serviceing:
  - Winding resistance.
  - Turn ratio.
  - Magnetizing current.
  - Short Circuit Test.
  - Magnetic Balance Test
  - Vector Group Test
  - Measurement of IR value.
  - Capacitance & tan delta of bushings & windings.
  - SFRA
  - Simulation of all protective device of transformers
20. Charge the transformer on no-load, allow it to settle for nearly 24 hours after which air release from all possible venting points shall be carried out.
21. Party shall ensure that no seepage /oil leakage shall occurred form any point from the transformer, buckhoz, bushings, radiator valves/flanges etc. If any such discrepancies observed later on after commissioning of transformer within defect liability period ( i.e 12 months) will be attended by the Party on emergent basis.
22. Painting of Complete transformer, Marshalling Box including its NGR with 01 coat of primer and 02 coats of Epoxy based Paint shade 631 of IS-5. Paint shade shall be get approved from M/S NFL before application. Painting job includes surface preparation such as degreasing, de-rusting and thorough cleaning of all the external surfaces of tank, fittings. Cleaning should be done either by hand brush /emery paper/water/detergent cleaning or combination of all the above to remove all rust/loose paint/peeled-off paint, grease, oil etc. as per standard procedures and directions of Engineer-In-charge (EIC). No sharp scratches or cuts shall be made from cleaning operation. Supply of paints, Primer (Berger/Asian make only),Brushes,Spary painting machine and other accessories as required for painting shall be in the scope of contractor
23. All Electrical Testing equipment's ,lifting tools & tackles,slings,chain pulley, D-Sackles,Scaffolding arrangement , Filter machine of required capacity, empty drums/storage tank

of required capacity, all gaskets ,paint and thinner ,Nitrogen cylinder, safety PPE's, External heaters, induction heater coils etc. shall be in the scope of Party. Any nut bolts found damaged/corroded during transformer dismantling or box-up shall be replaced with new nut bolts and supply of the same shall be in party scope. Calibration report of all testing equipment's & testing report of all lifting tools/tackles shall be submitted by the Party when reported on site.

24. Qualified, experienced and efficient engineer should supervise the various activities such as dismantling & assembling of various costly accessories viz. bushings, OLTC, top plate, core-coil assembly (if required), Dry out , testing at site etc. Date-wise record of various activities should be maintained by you. List of qualified engineers with their experience should be furnished with the offer.
25. The Party shall be responsible for the equipment or material handed over to them for installation/replacement and in case any mishandling or missing of the same shall be replaced or repaired at party's cost. Replacement of any material required at any stage of overhauling shall be in party scope.
26. Nitrogen bottles with 99% purity will have to be provided by the contractor with necessary certificates.
27. Complete maintenance/overhauling report three set shall be submitted by the Party both in the hard and soft format.
28. Maintenance of following accessories & fittings shall be carried out by the Party.

**Cooling Radiators:** Clean the radiators, header pipes and associated pipe work and fittings, using clean dry oil. Each individual radiator shall repeatedly flushed with clean hot oil to remove deposits of sludge from inside of the radiator fins. Check the external surface thoroughly for rust & oil leaks. The leaking joints if found any shall be repaired using inert gas welding while rusts shall be removed. Welding machine and operator shall be provided by NFL.

**LV Bushings:** Bushings shall be checked for any cracks & chirpings. The stems shall be cleaned and re-fitted with the bushings.

**HV Bushings:** OIP condenser bushings are used for connections to HV windings Bushing surface shall be checked for cracks & chirps and tested for DDF and IR.

**Buchholz Relay:** The relay shall be checked for correct operation of mercury switches by injecting air through the test petcock when full of oil. After mounting, the angle of inclination shall be maintained between 5-7 degrees.

**Conservator:** The conservator inside surface should thoroughly cleaned.

**Temperature Indicators:** Temperature Indicators should be cleaned by blow cleaning. The capillary bulbs should be cleaned by buffing. Both Oil and Winding temperature indicators should be calibrated afresh with standard thermometers immersed in hot oil bath.

**Magnetic Oil Gauges:** The float levels shall be checked for smooth up-down movement between the end positions. Making of mercury contact in 'Low Oil Level' condition was checked before fitting onto conservator.

**Valves & Drain Plugs:** The valves were checked for smooth operation after replacement of the oil seals of the spindle. The oil seals of the drain plugs were replaced by fresh ones. Critical valves shall be painted with red color.

29. **MATERIALS/TOOLS IN THE SCOPE OF CONTRACTOR:**

All Electrical Testing equipment's ,lifting tools and tackles,slings,chain pulley, D shackles Scaffolding arrangement , Filter machine of required capacity, empty drums/storage tank of required capacity, all gaskets ,Diverter switch diaphragm ,primer, paint and thinner ,Nitrogen cylinder, inert gas, safety PPE's, External heaters, induction heater coils ,Nut Bolts etc. shall be in the scope of Party. Calibration report of all testing equipment's & testing report of all lifting tools/tackles shall be submitted by the Party when reported on site and before start of work.

30. **ASSISTANCE/MATERIAL IN SCOPE OF M/S NFL:**

- Lifting device Hydra / Crane.
- Power supply for overhauling work.
- New fresh oil for transformer
- Arrangement of any other spare/accessories as per requirement against any found defective.
- Accommodation on chargeable basis shall be provided depending on the availability

31. **TIME SCHEDULE & PENALTY**

1. Party should be able to mobilize Man Power and material at our site within 07 days after receiving information from NFL through E mail.
2. Entire job of overhauling as defined in scope of work Annexure-1 must be completed in 35 days. Party to mobilize Manpower well in advance for overhauling work and job will be carried out on round the clock basis. Completion time period as given above shall be from handing over of the safety work permit and site clearance till successful commissioning of transformer. In case of delay of job, penalty as per clause no. 33 of GTC

32. **PERFORMANCE GUARANTEE**

Job shall be treated as complete when there is improvement in IR, PI and winding tan delta values and no seepage/leakage from any parts of transformer is achieved and subject to conformity of oil test values as per IS 1866 .Achieved values shall be guaranteed for one years from the date of commissioning Any defects observed during Guarantee period due to bad / poor workmanship, it is the duty of the contractor to rectify / replace the same at his own cost. It includes,

1. Leakage from gaskets& radiator
2. Decrease in IR value& oil BDV
3. Painting
4. Any other work carried by contractor during overhauling

33. **NAME PLATE DATA OF POWER TRANSFORMER-MT- 1:**

Make: GEC, Sr No. B26398, supplied against P.O No SPS/PV/006/874 dated 21.10.86  
MVA: 31.5/24, Type of cooling: ONAF/ONAN, Temperature Rise: 40/50,  
Voltage Ratio  
HV: 132Kv, Connection: Star  
LV: 11 Kv, Connection: Star  
TV: 6.6 kV, Connection Closed delta

Normal Amps (ONAF/ONAN)  
HV: 137.8/105Amp  
LV 1653.3 /1259.7Amp  
Impédance volt (At Principal tap 9) :(ONAF/ONAN) :12.25/9.333%  
Vector Group: YNyn0d1  
Core and coil weight: 29875 Kg  
Tank & fittings weight: 20625 Kg  
Mass of Oil: 14800 Kg  
Total Mass: 65300 Kg  
Quantity of oil: 17000 litre  
Year of Manufacturing: 1987  
Class: HV: 650Kvp, LV: 75kvp,HV Neutral 95kvp  
OLTC : Make- MR, OLTC type: D III 200 Y 45/60 18.17.0 Sr No- 3292 No of Tap: 17 at HV Side.

34. **SUBMISSION OF MAINTENANCE REPORT:**

Party shall submit the detail maintenance report both in soft and Hard format in spiral binding three set with colored photographs, Test values( winding and oil) and comparison statement of test values before and after overhauling and recommendation report.