



SECTION – 2.33

Comprehensive Operation & Maintenance (O&M)

General

- A. The Contractor shall carry out comprehensive Operation & Maintenance (O&M) of the complete electrical system and associated equipment for a period mentioned in the tender document.
- B. The scope shall include routine operation support, preventive maintenance, predictive maintenance, breakdown maintenance, testing, statutory compliance, liaisoning with statutory authorities, supply of consumables (SF6 Gas, Nitrogen Cylinders, Transformer Oil, Lubrication, cleaning material, sundry material etc.) , spares, tools & tackles, manpower, supervision, documentation, software, testing equipment, material handling equipment's and all activities required for reliable and safe operation of the system.
- C. All testing agencies shall be NABL accredited, and all testing equipment/instruments used for the works shall possess valid calibration certificates traceable to national/international standards.
- D. GIPCL may, at its discretion, provide available spares, if any, for use by the Bidder. However, all such spares utilized shall be replaced by the Bidder with new, unused items of the same make and specifications, with confirmation of full interchangeability. The replenishment of such spares shall be completed within the stipulated time mutually agreed at the time of issuance.
- E. In case the Bidder fails to comply with the O&M requirements stipulated in the Tender within the prescribed/reasonable time frame and specified maintenance frequency, GIPCL shall have the right, at its sole discretion, to get the work executed through an alternate agency and/or procure the required materials independently.

In such cases, the entire cost incurred by GIPCL towards execution of the work/material procurement shall be recovered from the Bidder along with:

- Supervision charges @ 15%, and
- Agency/service charges @ 10%.

Accordingly, a total loading of 26.5% on the actual expenditure incurred by GIPCL shall be recoverable from the Bidder's running bills and/or any other dues payable under the contract.

- F. 132 kV Transmission Lines (Including OPGW) and Remote End Grid Substation shall be excluded from the Bidder's scope. However, transmission line droppers, connectors, OPGW termination and all associated equipment at the GIPCL end shall be within the scope of the Bidder.
- G. Major failures of 70 MVA, 132 kV Power Transformers pertaining to transformer windings, OLTC, and HV bushings shall be excluded from the Bidder's scope. However, the Diverter Switch Assembly and Drive Mechanism of the OLTC shall remain within the Bidder's scope. Detailed scope of Power Transformers shall be referred from the Tender Document.



H. The scope described in this section is indicative in nature and shall not be construed as limiting the Bidders responsibilities. The bidders shall be fully responsible for ensuring safe, reliable, efficient, and trouble-free operation and maintenance of the complete plant/system in accordance with applicable standards, statutory regulations, OEM recommendations, and good engineering practices.

The indicative list of major equipment covered under the scope is provided below. However, omission of any equipment, device, component, accessory, subsystem, or service from the scope shall not absolve the Bidder of its responsibility for comprehensive Operation & Maintenance (O&M) of the complete plant/system.

Any equipment, device, component, accessory, consumable, tool, service, or activity not specifically mentioned herein, but required for safe, reliable, efficient, and continuous operation and maintenance of the plant/system, shall be deemed to be included within the Bidder's scope of work, in line with the specifications, standards, and services applicable to similar equipment covered under the Contract, without any cost implication to GIPCL.

Scope

1.0.0 Statutory Compliance and Liaisoning

The following activities shall be in the Contractor's scope:

- 1.1.0 Annual inspection of the electrical installation from the concerned office of the Electrical Inspector and other statutory authorities as applicable.
- 1.2.0 Complete liaisoning and coordination with Electrical Inspectorate and other statutory authorities.
- 1.3.0 Submission of all required documentation, drawings, test certificates, calibration certificates, forms, and compliance reports.
- 1.4.0 Filing and processing of online/offline applications, permissions, approvals, renewals, and statutory submissions.
- 1.5.0 Coordination of inspection visits to the project site.
- 1.6.0 Attending observations raised by statutory authorities and ensuring compliance closure.
- 1.7.0 Arranging shutdowns, testing support, manpower, and equipment required during inspections.
- 1.8.0 Maintenance of statutory records, logbooks, test reports, calibration reports, and inspection registers.
- 1.9.0 Ensuring compliance with all applicable statutory rules, CEA regulations, electrical safety requirements, and applicable standards.

Statutory charges, government fees, and inspection fees, if any, shall be reimbursed by GIPCL against submission of original receipts and supporting documents.



2.0.0 Hotline Washing of Complete Switchyard (Except Surge Arresters)

- 2.1.0 Hotline washing of complete 132 kV switchyard equipment and structures, excluding surge arresters, shall be carried out through an experienced and authorized agency.
- 2.2.0 The agency shall possess valid statutory clearances, trained personnel, safety certifications, and authorization for carrying out hotline washing activities in 145 kV class switchyards.
- 2.3.0 Hotline washing shall be carried out using approved methods, equipment, insulated tools, and demineralized water as applicable.
- 2.4.0 All safety precautions, work permits, barricading, PPEs, and operational coordination shall be in Contractor's scope.
- 2.5.0 Required water for washing shall be provided by GIPCL free of cost at one point.
- 2.6.0 Hotline washing shall be carried out minimum twice in a year:
- Once before monsoon season.
 - Once during/after winter season or at the end of the calendar year.
- 2.7.0 Additional hotline washing, if required due to excessive contamination, environmental conditions, or operational requirements, shall also be carried out as instructed by GIPCL.

3.0.0 SF6 Circuit Breakers

The Contractor shall carry out complete O&M activities for all SF6 Circuit Breakers including preventive maintenance, condition monitoring, annual testing, troubleshooting, repairs, attending breakdowns, gas handling, and associated control systems.

3.1.0 Annual Testing and Measurements

The following tests and measurements shall be carried out annually or as recommended by OEM/standards:

- a. Contact Resistance Measurement (CRM)
- b. Timing Test
- c. Insulation Resistance (IR) Test
- d. Dynamic Resistance Measurement (if required)
- e. Functional checks of trip/close circuits
- f. Operation counter verification
- g. SF6 gas pressure and density checks
- h. Dew point/moisture measurement of SF6 gas (where applicable)
- i. Calibration of all pressure switches of air and gas systems
- j. Calibration of all gauges and pressure monitoring devices
- k. Verification of anti-pumping and interlocking schemes



- I. Checking of annunciation, alarms, indications, and supervisory circuits

All test reports shall be submitted to GIPCL in approved format.

3.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning, tightening, servicing, and health check-up of breaker control cubicles.
- b. Inspection and servicing of all electrical components including relays, contactors, MCBs, terminal blocks, heaters, switches, wiring, etc.
- c. Maintenance of operating mechanisms including spring charging mechanism, pneumatic system, hydraulic system, motors, linkages, and bearings etc.
- d. Maintenance of air compressor systems including filters, piping, valves, pressure switches, NRVs, and accessories.
- e. Cleaning and tightening of complete power circuits and control wiring.
- f. Lubrication of moving parts as per OEM recommendations.
- g. Attending all breakdown maintenance and emergency restoration works.
- h. Detection and rectification of SF6 gas leakages and air leakages.
- i. Topping-up/replacement of SF6 gas as required.
- j. Replacement/repair of defective components including coils, contacts, motors, compressors, relays, pressure switches, gauges, valves, heaters, and auxiliary switches.
- k. Coordination with OEMs for major overhauling/repair activities wherever required.
- l. Disposal/handling of SF6 gas and waste material as per applicable environmental and safety regulations.
- m. Replacement/repair/restoration equipment or associated accessories shall be carried out in case of major failure or where test results are found beyond acceptable / permissible limits as per applicable standards or OEM recommendations.
- n. Carry out root cause analysis for major failures

Frequency of preventive maintenance activities shall be minimum once in a year or more frequently as required based on OEM recommendations, equipment condition, operational requirements, statutory requirements etc.

All test reports shall be submitted to GIPCL in approved format.

4.0.0 Current Transformers (CT's – 132 kV)

The Contractor shall carry out complete testing, inspection, preventive maintenance, condition monitoring, troubleshooting, and breakdown maintenance of all Current Transformers.

4.1.0 Annual Testing and Measurements

The following tests shall be carried out annually or as recommended by applicable standards/OEM:



- a. Tan Delta Test
- b. Capacitance Measurement
- c. Ratio Test
- d. Polarity Check
- e. Accuracy Test
- f. Insulation Resistance (IR) Test
- g. Oil level inspection and oil leakage checks
- h. Visual inspection of bushings, terminal connectors, marshalling boxes, and earthing connections

The Contractor shall arrange all required permissions, shutdown coordination, and liaisoning with statutory authorities for testing of tariff metering CTs. Statutory charges, if any, shall be reimbursed by GIPCL against submission of original receipts.

All test reports and observations shall be submitted to GIPCL in approved format.

4.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning, tightening, inspection, and servicing of terminal boxes and marshalling kiosks.
- b. Cleaning and tightening of power terminals, jumpers, connectors, and earthing connections.
- c. Inspection of porcelain/composite insulators for cracks, contamination, and damages.
- d. Attending breakdown maintenance and emergency restoration activities.
- e. Detection and rectification of oil leakages.
- f. Replacement/repair/restoration equipment or associated accessories shall be carried out in case of major failure or where test results are found beyond acceptable / permissible limits as per applicable standards or OEM recommendations.
- g. Carry out root cause analysis for major failures.

5.0.0 Potential Transformers (PTs – 132 kV)

The Contractor shall carry out complete testing, inspection, preventive maintenance, condition monitoring, troubleshooting, and breakdown maintenance of all Potential Transformers (PT / VT's).

5.1.0 Annual Testing and Measurements

The following tests shall be carried out annually or as recommended by applicable standards/OEM:

- a. Tan Delta Test
- b. Capacitance Measurement
- c. Ratio Test
- d. Polarity Check



- e. Accuracy Test
- f. Insulation Resistance (IR) Test
- g. Oil level inspection and oil leakage checks
- h. Visual inspection of bushings, terminal connectors, marshalling boxes, and earthing connections

The Contractor shall arrange all required permissions, shutdown coordination, and liaisoning with statutory authorities for testing of tariff metering PT's. Statutory charges, if any, shall be reimbursed by GIPCL against submission of original receipts.

All test reports and observations shall be submitted to GIPCL in approved format.

5.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning, tightening, inspection, and servicing of terminal boxes and marshalling kiosks.
- b. Cleaning and tightening of power terminals, jumpers, connectors, and earthing connections.
- c. Inspection of porcelain/composite insulators for cracks, contamination, and damages.
- d. Attending breakdown maintenance and emergency restoration activities.
- e. Detection and rectification of oil leakages.
- f. Replacement/repair/restoration equipment or associated accessories shall be carried out in case of major failure or where test results are found beyond acceptable / permissible limits as per applicable standards or OEM recommendations,
- g. Carry out root cause analysis for major failures.

6.0.0 Isolators / Disconnectors (132 kV) with / without earth switches.

The Contractor shall carry out complete preventive, predictive, routine, and breakdown maintenance of all 132 kV isolators/disconnectors including motor operated mechanisms, earth switches, auxiliary circuits, interlocks, operating structures, and associated accessories.

6.1.0 Annual Testing and Inspection

The following tests, inspections, and checks shall be carried out annually or as recommended by OEM/standards:

- a. Contact resistance measurement of all poles
- b. Insulation Resistance (IR) Test
- c. Functional checks of local/remote operation
- d. Verification of electrical and mechanical interlocks
- e. Verification of proper alignment and contact engagement
- f. Inspection of arcing horns, contacts, blades, fixed contacts, and moving assemblies



- g. Checking of earth switch operation and interlocking
- h. Inspection of insulators for cracks, contamination, and damages

All observations and test reports shall be submitted to GIPCL in approved format.

6.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning of insulators, operating mechanisms, structures, and terminal connectors
- b. Tightening of all power and control connections
- c. Lubrication of bearings, gears, moving parts, hinges, and linkages as per OEM recommendations
- d. Servicing of motor operated mechanism (MOC) including motors, gear assemblies, limit switches, contactors, relays, torque switches, and control wiring
- e. Adjustment and alignment of moving/fixed contacts and operating linkages
- f. Attending operational abnormalities, jamming, improper closing/opening, and synchronization issues
- g. Maintenance of earth switches including alignment, interlocking, and contact pressure adjustment
- h. Attending all breakdown maintenance and emergency restoration works
- i. Thermographic scanning and rectification of hot spots
- j. Replacement/repair of defective components including motors, auxiliary switches, contacts, bearings, operating rods, insulators, wiring, and hardware
- k. Replacement/repair/restoration equipment or associated accessories shall be carried out in case of major failure or where test results are found beyond acceptable / permissible limits as per applicable standards or OEM recommendations

Frequency of preventive maintenance activities shall be minimum once in a year or more frequently as required based on OEM recommendations, equipment condition, operational requirements, statutory requirements etc.

7.0.0 Surge Arrestors (132 kV)

The Contractor shall carry out complete preventive maintenance, testing, inspection, monitoring, and breakdown maintenance of all 132 kV surge arresters and associated accessories.

7.1.0 Annual Testing and Inspection

The following inspections and tests shall be carried out annually or as recommended by OEM/standards:

- a. Insulation Resistance (IR) Test
- b. Leakage current measurement



- c. Thermographic inspection
- d. Visual inspection for cracks, damage, contamination, flash marks, and deterioration
- e. Inspection of surge counter operation and readings
- f. Verification of earthing continuity and connections
- g. Inspection of terminal connectors and mounting arrangements
- h. Verification of grading rings and corona shields (where applicable)

All test reports and observations shall be submitted to GIPCL.

7.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning of surge arresters, insulators, structures, and terminal connectors
- b. Tightening of all terminal and earthing connections
- c. Servicing/replacement of surge counters and associated wiring / earthing.
- d. Attending breakdown maintenance and emergency restoration works
- e. Replacement/repair of defective arresters or associated accessories in case of abnormal leakage current, flashover, puncture, or failure.
- f. Carry out root cause analysis for major failures.
- g. Coordination with OEMs/testing agencies wherever required.

8.0.0 Bus Post Insulators (132 kV)

The Contractor shall carry out complete inspection, preventive maintenance, testing, and breakdown maintenance of all 132 kV bus post insulators and associated hardware.

8.1.0 Annual Inspection and Testing

The following inspections/tests shall be carried out annually:

- a. Visual inspection for cracks, chippings, contamination, discoloration, and mechanical damages
- b. Inspection of busbar joints and terminal connections
- c. Verification of alignment and mechanical integrity
- d. Inspection support structures
- e. Insulation Resistance (IR) Test, if applicable

All findings and corrective actions shall be documented and submitted to GIPCL.

8.2.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning of insulators, busbars, and supporting structures
- b. Tightening of busbar joints, clamps, connectors, and hardware



- c. Rectification of loose connections and overheating points
- d. Replacement of damaged clamps, connectors, fasteners, and hardware
- e. Attending breakdown maintenance and emergency restoration works
- f. Replacement/repair/restoration equipment or associated accessories shall be carried out in case of major failure or where test results are found beyond acceptable / permissible limits as per applicable standards or OEM recommendations.

9.0.0 Oil Filled Transformer

The Contractor shall carry out complete operation support, preventive maintenance, predictive maintenance, testing, condition monitoring, oil management, and breakdown maintenance of the Transformers including all accessories, control systems, cooling systems, OLTC / OCTC system, protection interfaces, marshalling box, and associated equipment.

The scope shall include, but not be limited to, the following transformers:

- a. 70 MVA , 132/11 kV Transformer.
- b. All 11 kV Auxiliary Transformers.
- c. All Inverter duty Transformers.
- d. Any other oil Filled Transformers.

9.1.0 Annual Testing and Measurements

The following tests and measurements shall be carried out annually and as recommended by OEM/standards:

9.1.1 Electrical Tests

- a. Insulation Resistance (IR) Test
- b. Polarization Index (PI)
- c. Winding Resistance Measurement
- d. Transformer Turns Ratio (TTR) Test
- e. Capacitance and Tan Delta Test of all windings and all bushings
- f. Dynamic Resistance Measurement of OLTC (applicable to 70 MVA transformer).

9.1.2 Oil Tests

- a. Breakdown Voltage (BDV) Test
- b. Moisture Content Analysis
- c. Acidity
- d. Interfacial Tension
- e. Resistivity
- f. Dielectric Dissipation factor
- g. Flash Point



- h. Sediment and Sludge
- i. Dissolved Gas Analysis (DGA)
- j. Furan Analysis (for transformer above and including 10 MVA)

9.1.3 Functional Checks

- a. Buchholz relay operation check
- b. PRV operation check
- c. OTI/WTI calibration and functional checks
- d. Verification of annunciation, alarms, and trip circuits
- e. Calibration of temperature indicators and associated switches.
- f. Cooling system functional checks including fans.
- g. OLTC / OCTC operation and interlock verification

9.1.4 Other Inspections

- a. Inspection of bushings for cracks, oil leakage, and contamination
- b. Inspection of marshalling box, terminal connections, and earthing
- c. Inspection of silica gel, breather and oil levels and periodic replacement as and when required.

9.1.5 Instrument Transformers (Installed as an integral part of Transformer)

- a. Ratio Test
- b. Polarity Check
- c. Accuracy Test
- d. Insulation Resistance (IR) Test
- e. Visual inspection of bushings, terminal connectors, marshalling boxes, and earthing connections

All test reports, observations, trends, and recommendations shall be submitted to GIPCL.

9.2.0 Major overhaul of OLTC (Wherever installed).

- a. Complete overhauling of OLTC, including the Drive Mechanism Box, shall be carried out once in every four (4) years or earlier, if required, based on equipment condition, operational performance and OEM recommendations.
- b. The work shall include complete inspection, servicing, overhauling, testing, and recommissioning of the OLTC system in line with OEM recommendations.
- c. All activities shall be carried out under the supervision of experienced and competent personnel
- d. Opening of OLTC diverter switch and selector switch compartments.



- e. Dismantling of diverter switch assembly, selector switch, and associated mechanisms.
- f. Inspection of:
 - i. Main contacts, arcing contacts, transition resistors
 - ii. Springs, shafts, bearings, and mechanical linkages
 - iii. Insulating components (barriers, cylinders, supports)
 - iv. Carbon deposits, pitting, erosion, and alignment
- g. Cleaning of all components using approved methods.
- h. Replacement of:
 - i. Worn-out contacts (fixed and moving)
 - ii. Arcing contacts and transition resistors (if required)
 - iii. Gaskets, seals, and O-rings
 - iv. Bearings, springs, and hardware as required
- i. All dismantled reusable parts shall be properly cleaned and reused after inspection.
- j. Drive Mechanism Overhaul
 - i. Inspection and servicing of OLTC drive mechanism (motor drive unit - MDU).
 - ii. Checking and lubrication of gear trains, shafts, and moving parts.
 - iii. Inspection and calibration of:
 - Limit switches
 - Tap position indicators and Mechanical interlocks
 - iv. Functional checking of manual and electrical operation.
- k. Reassembly
 - i. Proper reassembly of OLTC components as per OEM tolerances.
 - ii. Alignment and tightening using recommended torque values.
 - iii. Replacement of all gaskets and sealing elements.
- l. Oil Filling and Filtration
 - i. Filling of new OLTC oil (Supply of New Oil is in scope of Bidder)
 - ii. Oil filtration to achieve required BDV, moisture, and other limits.
 - iii. Ensuring leak-proof sealing of OLTC compartment.
- m. Testing & Checks
 - i. Mechanical operation test of OLTC for full tap range (local & remote).
 - ii. Contact timing and sequence verification (if applicable).
 - iii. Insulation resistance (IR) and winding resistance measurement for each tap.
 - iv. Functional testing of protection, interlocks, and annunciation.
 - v. Checking of tap position indication at local and control room.
- n. Final Checks & Commissioning



- i. Ensuring smooth and noiseless operation of OLTC.
- ii. Checking for oil leakage, abnormal vibration, or heating.
- iii. Restoration of all connections and systems.
- iv. Trial operation under no-load and load conditions.

9.3.0 Preventative and breakdown maintenance of OLTC & OCTC.

- a. Servicing and maintenance of OLTC or OCTC (as applicable) mechanism including inspection, lubrication, contact replacement, filtration, and servicing once in a year or earlier, if required, based on equipment condition, operational performance and OEM recommendations.
- b. OLTC Oil Replacement once in two (2) years or earlier, if required, based on equipment condition, operational performance and OEM recommendations.
- c. Routine inspection and health assessment of OCTC systems.
- d. Cleaning of OCTC compartments, tap selector assemblies, and associated components.
- e. Checking and tightening of all power and terminal connections.
- f. Inspection of tap selector contacts, fixed and moving contacts, contact pressure arrangements, springs, operating shafts, and mechanical linkages.
- g. Inspection and servicing of manual operating mechanisms including handles, gear arrangements, locking arrangements, indicators, and associated hardware.
- h. Lubrication of moving parts as per OEM recommendations.
- i. Inspection of gaskets, seals, and oil leakages in the OCTC compartment, if applicable.
- j. Verification of tap position indication and locking arrangements.
- k. Functional checks of tap position indicators and locking mechanisms
- l. Attending operational abnormalities, improper tap changing, overheating, loose contacts, and mechanical jamming.
- m. Rectification of oil leakages and replacement of defective gaskets/seals.
- n. Repair/replacement of defective contacts, springs, shafts, handles, indicators, locking mechanisms, and associated accessories.
- o. Attending emergency breakdown maintenance and restoration works.
- p. Carry out root cause analysis for major failures.

9.4.0 Preventive and Breakdown Maintenance

The maintenance scope shall include, but not be limited to, the following:

- a. Cleaning of transformer body, radiators, bushings, marshalling boxes, Cooling Control Panel and associated accessories
- b. Tightening of all power, control, and earthing connections



- c. Maintenance of cooling system including fans, motors, valves, piping, and associated controls
- d. Oil filtration, oil top-up, and leak rectification.
- e. Replacement of gaskets, seals, breather silica gel, valves, gauges, and accessories. Servicing of Buchholz relay, PRV, conservator system, and associated piping
- f. Attending transformer tripping, alarms, abnormal temperature rise, and operational abnormalities
- g. Attending emergency breakdown maintenance and restoration works
- h. Coordination with OEMs for major repairs/overhauling wherever required
- i. Replacement/repair/restoration of components in case of major failure
- j. Maintaining transformer oil records, test reports, and maintenance history.
- k. Carry out root cause analysis for major failures.

The Contractor shall ensure safe handling, storage, filtration, and disposal of transformer oil and waste material in accordance with applicable safety and environmental regulations.

10.0.0 Nitrogen Injection Fire Protection System (Wherever installed)

10.1.0 Testing and Functional Checks and preventative Maintenance

The Contractor shall carry out periodic testing and functional verification of the complete system including, but not limited to, the following:

- a. Functional testing of complete Nitrogen Injection Fire Protection System
- b. Simulation tests for fire initiation logic
- c. Verification of alarm and trip logic, operation of solenoid valves and release mechanisms , auto/manual operation, event/alarm history and fault logs.
- d. Leak testing of piping and cylinder connections .
- e. Inspection and Cleaning of control panels (Fire Extinguishing Cubicle , Control Panel at MCR) , detectors, nitrogen cylinders, piping systems, valves, and associated equipment's.
- f. Inspection of piping network, fittings, isolation valves, nozzles, and flexible hoses for leakage, blockage, corrosion, or damages.
- g. Checking and tightening of all electrical connections, terminals, and control wiring.
- h. Verification of cylinder mounting arrangements and supports.
- i. Inspection and servicing of marshalling boxes, junction boxes, and field devices.
- j. Verification of cylinder mounting arrangements, supports and weight.

Testing shall be done once in a quarter or earlier, if required, based on equipment condition, operational performance OEM recommendations and statutory requirements.

All testing shall be carried out without compromising system safety and reliability.

All test reports and observations shall be submitted to GIPCL in approved format.



10.2.0 Refilling / Recharging / Consumables

The scope shall include:

- a. Refilling/recharging of nitrogen cylinders after operation, leakage, pressure drop, expiry, or as required.
- b. Replacement/refilling of consumables required for healthy operation of the system.
- c. Replacement of defective hoses, seals, gaskets, valves, fittings, pressure gauges, switches, and accessories as required.
- d. Replacement of detectors, relays, actuators, solenoid coils, indication lamps, and electronic modules in case of malfunction/failure.
- e. Periodic hydro testing/certification of cylinders as per statutory requirements.
- f. Transportation, handling, and safe storage of cylinders.

10.3.0 Breakdown Maintenance and Restoration

The Contractor shall attend all emergency complaints, alarms, mal-operations, leakages, and breakdowns related to the NIFPS.

The scope shall include, but not be limited to:

- a. Attending emergency breakdown maintenance on 24x7 basis.
- b. Repair/replacement/restoration of defective control panels and associated components.
- c. Coordination with OEM/service agencies for major repairs or specialized maintenance activities wherever required.

The Contractor shall ensure minimum downtime and earliest restoration of the complete system.

10.4.0 Statutory Compliance and Documentation

- a. Maintain all maintenance records, inspection reports, testing records, calibration reports, and history sheets.
- b. Maintain cylinder validity/testing records and statutory certifications.
- c. Ensure compliance with applicable statutory regulations, TAC requirements, CEA regulations, and safety standards.
- d. Submit periodic maintenance reports and recommendations to GIPCL.
- e. Arrange liaisoning and coordination with statutory authorities wherever required.

11.0.0 HV / MV Cables

Operation, routine inspection, preventive maintenance, condition monitoring, testing, fault identification, repair and replacement of cable system including all associated cables, its accessories like Indoor & outdoor terminations, straight through joints, Link boxes, Earthing connections, Cable glands, lugs and clamps . Cable trays/trenches.



11.1.0 Annual Testing and Measurements

- a. Tan Delta
- b. Capacitance measurement.
- c. VLF / Hi-pot test as applicable
- d. Insulation Resistance (IR) test
- e. Sheath integrity test
- f. Earth continuity verification

All test reports and observations shall be submitted to GIPCL in approved format.

11.2.0 Preventive Maintenance Activities

- a. Checking for physical damage, overheating, corrosion, water ingress, vermin attack etc.
- b. Inspection and tightening of cable terminations and gland connections.
- c. Inspection of cable routes, trenches, trays and supports.
- d. Checking for partial discharge marks, tracking, cracking, discoloration and overheating.
- e. Cleaning and dewatering of cable trenches.
- f. Removal of vegetation, debris and combustible materials.
- g. Maintenance of trench covers and cable support systems.

11.3.0 Breakdown Maintenance

- a. Attending all cable faults/breakdowns on 24x7 basis.
- b. Fault location using suitable fault locating equipment.
- c. Excavation, jointing, termination repair /replacement and restoration of cable system.
- d. Emergency restoration to minimize outage duration.

12.0.0 HV / MV / LV Switchgears and associated panels.

Complete Switchgear Panels including but not limited to Breakers, Motorised MCCB's, Current Transformers (CTs), Potential Transformers (PTs), Surge Arresters (SAs), Protection Relays, Auxiliary Relays , Metering System and associated auxiliaries.

12.1.0 Annual Testing and Measurements

12.1.1 Breaker / MCCB's

- a. Hi-POT test (applicable to MV System)
- b. IR measurement Pole to Pole and Pole to Earth.
- c. CRM and Timing (applicable to MV System)
- d. Measurement of Trip and Coils resistance.



12.1.2 Protective Relays

- a. Secondary injection testing
- b. Verification of protection settings
- c. Communication system verification
- d. Trip circuit supervision checks.
- e. Master Trip and Auxiliary relay testing.

12.1.3 Metering System (Other than Tariff Meters)

- a. Secondary Injection test and Calibration Check
- b. Communication verification
- c. Verification of meter healthiness
- d. Inspection of metering circuits and terminals.

12.2.0 Preventive Maintenance Activities

- a. Cleaning, tightening, sealing and checking of complete panel including but not limited to Busbar Chamber, Cable box, LV compartment , Breaker / MCCB Compartment etc.
- b. Checking insulation barriers and shutters
- c. Inspection for signs of overheating, tracking, abnormal sound, smell, or flash marks
- d. Indications, mimic and annunciation
- e. Earthing connections
- f. Space heaters and anti-condensation arrangements
- g. Mechanical Operation test (Manual Close / Open, Electrical Close/ Open in Local and Remote, Anti pumping, Spring Charging).
- h. Verification of Interlocks
- i. Inspection of interrupter condition
- j. Lubrication of Breaker moving parts
- k. Checking spring charging mechanism
- l. Instrument Transformers: inspection, terminal tightening and secondary wiring inspection.
- m. Instrument Transformers: IR measurement (as required), Ratio and polarity verification (as required)
- n. Surge Arrestors (SA's): Visual inspection for cracks / damage , Cleaning of insulators, Leakage current monitoring (as required) and Earthing continuity verification.
- o. Functional Checking, tightening of Control switches, indication lamps, annunciators. Semaphore Mimics and any other devices which is part of the panel.

12.3.0 Breakdown Maintenance

- a. Attend breakdowns on 24x7 basis
- b. Diagnose and rectify faults.



- c. Replace / Repair Defective equipment and components.
- d. Restore equipment in minimum possible time
- e. Carry out root cause analysis for major failures.

13.0.0 Control and Relay Panels (Including RTCC Panels)

13.1.0 Annual Testing and Measurements.

- a. Secondary injection testing of all IED including all meters , MFM, PMU, PQM, Relays, BCU, BCP, BPU etc.
- b. Functional testing of protection schemes.
- c. Verification of Service Settings and scheme configuration.
- d. Master trip and auxiliary relay testing
- e. Trip and close command verification
- f. Alarm and annunciation testing
- g. Interlock verification
- h. Auto-reclose scheme testing
- i. Synchronizing scheme testing

13.2.0 Preventive and routine Maintenance Activities.

- a. Firmware review / update as recommended by OEM.
- b. Firmware/configuration backup management
- c. Communication healthiness verification.
- d. DC supply, Trip Circuit Supervision, Control and sector switches, annunciation and hooter system checking and verification.
- e. Routine inspection of protection and control system
- f. Relay healthiness monitoring
- g. Fault analysis and troubleshooting
- h. Cleaning, tightening of terminal, wiring and sealing of Panels.
- i. Healthiness of relays and communication modules
- j. Verification of earthing connections
- k. Inspection for dust, moisture or vermin ingress.
- l. Analyse tripping events and submit fault analysis reports.

13.3.0 Event Analysis & System Coordination.

- a. Download and analyse disturbance records and event logs after faults / trappings
- b. Identify root cause of abnormal operation/maloperation
- c. Coordinate protection settings with system requirements
- d. Provide recommendations for corrective actions



- e. Retrieval, analysis and submission of Disturbance Records (DR), Event Records (ER), Fault Records, relay indications, SOE logs and other relevant data/reports to GETCO/STU/SLDC as and when required.
- f. Coordination with GETCO/STU/SLDC for protection system operation, outage management and fault restoration activities.
- g. Coordination for relay operation analysis, grid disturbances, tripping events and compliance with grid code/statutory requirements.
- h. Ensuring healthy communication interface between protection system, SCADA, SAS and SLDC/GETCO systems.

13.4.0 Documentation and Reporting

- a. Relay testing and calibration reports
- b. Relay setting records
- c. Preventive maintenance reports
- d. Disturbance analysis reports
- e. Event log records
- f. History sheets for all relays and IED

13.5.0 Breakdown Maintenance.

- a. Attend breakdowns on 24x7 basis
- b. Diagnose relay/protection/control circuit faults
- c. Restore faulty protection schemes in minimum time
- d. Replace / Repair defective components, IED's, relays etc.

14.0.0 DC System

The Contractor shall carry out complete preventive, predictive, routine, and breakdown maintenance of complete DC System comprising Battery Banks, Battery Chargers, DC Distribution Boards (DCDBs), associated cabling and discharge resistance panel etc.

14.1.0 Annual Testing and Measurements.

14.1.1 Battery Banks (Other than VFRB)

- a. Dismantling of all type of connections (intercell, interbank, interrow, terminal cables etc.) through cleaning and tightening after installation.
- b. Replacement of connectors, re-termination of connection as required.
- c. Specific Gravity measurement and topping up of electrolyte.
- d. Battery capacity test/discharge test as per OEM recommendations.
- e. Replacement / Repair of Cells based on capacity test results.



14.1.2 Charges (FC, BC & FCBC)

- a. Functional testing of motorised MCCB's alarms, annunciation and SCADA / SAS communication for each parameter.
- b. Charger performance test.
- c. DC ripple measurement.
- d. Testing of indicating instruments (Meters)

14.1.3 DCDB's & Discharge resistance Panel / Box.

- a. Functional testing of motorised MCCB's alarms, annunciation and SCADA / SAS communication for each parameter.
- b. Verification of fuse/MCB/MCCB healthiness
- c. Inspection, cleaning, and Tightness checking of busbars and terminals.
- d. Testing of indicating instruments (Meters)

14.2.0 Preventive, Predictive and Routine Maintenance Activities.

14.2.1 Battery Banks (Other than VFRB)

- a. Checking of electrolyte level and Topping of Electrolytes at least once in month or earlier if required.
- b. Cleaning, tightening of intercell, interbank, inter row and terminal connection once in quarter or earlier, if required, based on equipment condition, operational performance and OEM recommendations.
- c. Earth leakage monitoring and rectification in case of any fault.
- d. Visual inspection of battery cells for leakage, bulging, crack, corrosion, battery racks and its support etc. once in quarter or earlier, if required.
- e. Verification of battery room ventilation and illumination once in a quarter.
- f. Individual cell voltage measurement and specific gravity measurement.
- g. Float voltage and boost voltage and charge / discharge current measurement and verification

14.2.2 Battery Charges

- a. Functional checking of alarms and indications and SAS / SCADA communication of all parameters.
- b. Inspection of charger modules/components
- c. Verification of float and boost charging operation
- d. Measurement of charger output voltage/current
- e. Verification of ripple content
- f. Inspection of cooling fans and ventilation
- g. Tightening of power and control connections



- h. Cleaning of internal components and filters

Once in six months or earlier, if required, based on equipment condition, operational performance and OEM recommendations

14.3.0 Breakdown Maintenance.

- a. Attend all DC system faults on 24x7 basis
- b. Diagnose and rectify faults in battery chargers, battery banks and DCDBs
- c. Replace defective components, parts, Battery Cells, Meters, MCCB's etc.
- d. Restore DC supply system in minimum possible time.
- e. Submit root cause analysis report for major failures.

15.0.0 UPS System

The Contractor shall carry out complete preventive, predictive, routine, and breakdown maintenance of complete UPS System UPSDB, SVC, Static Bypass System, measuring instruments and associated cabling etc.

In case of dedicated UPS battery bank, O&M shall be carried out as stipulated in "DC System"

15.1.0 Annual Testing and Measurements.

- a. UPS functional testing including Static bypass , manual and automatic changeover, alarm , annunciation and SAS /SCADA communication.
- b. Output voltage and frequency verification
- c. Harmonic/ripple verification
- d. Verification of synchronization circuits and control logic.

15.2.0 Preventive and Routine Maintenance.

- a. Inspection, cleaning, Tightness checking of power and control system.
- b. Cleaning of internal components shall be as per OEM approved methods
- c. Inspection of MCCBs/MCBs, contactors and switches
- d. Functional checking of indications and alarms
- e. Verification of feeder healthiness
- f. Thermographic inspection of busbars and terminations
- g. Inspection and replacement recommendation for cooling fans and filters as required
- h. Verification of earthing continuity

15.3.0 Breakdown Maintenance

- a. Attend all UPS system faults on 24x7 basis
- b. Diagnose and rectify UPS, SVC, UPS DB faults
- c. Restore UPS supply in minimum possible time
- d. Replace defective components / equipment devices.
- e. Coordinate with OEM for major failures, if required



- f. Submit root cause analysis report for major breakdowns.

16.0.0 FOTE (Fibre Optic Terminal Equipment).

Complete FOTE system including optical transmission equipment, communication interfaces, power supply units and associated accessories.

The Bidder shall ensure reliable and uninterrupted operation of the FOTE system for protection, signalling, SCADA, telemetry, voice and data communication applications.

Bidder shall be in close coordination and consultation for O&M of FOTE with GETCO / STU / SLDC for the practices followed.

The scope shall include, but not be limited to, the following

16.1.0 Annual Testing and Measurements

- a. Measurement of optical power levels (Tx/Rx).
- b. Optical attenuation/loss measurement of fibre links.
- c. Verification of communication channel performance and signal integrity.
- d. BER (Bit Error Rate) testing and analysis.
- e. Verification of alarm and event logging functions.
- f. Functional testing of communication interfaces and ports.
- g. Testing of Ethernet, E1, RS-232/RS-485 and other communication channels, wherever applicable.
- h. Verification of synchronization and timing signals.
- i. Testing of redundant communication paths and auto changeover functions.
- j. Inspection and testing of power supply modules and DC input supply.
- k. Verification of SCADA/RTU/Protection communication interfaces.
- l. Healthiness check of SFP modules/transceivers.

16.2.0 Preventive and Routine Maintenance

- a. Firmware/software health verification and updates as recommended by OEM.
- b. Visual inspection and cleaning of FOTE panels and equipment.
- c. Inspection of optical patch panels, LIUs and cable routing.
- d. Verification of proper earthing and bonding.
- e. Checking healthiness of LEDs, alarms and indications.
- f. Tightness checking of power and communication terminals.
- g. Verification of proper operation of cooling fans and ventilation arrangements.
- h. Inspection of redundant modules and communication cards.
- i. Backup of configuration files and system settings.
- j. Verification of communication with SCADA, protection panels and remote stations.
- k. Monitoring of alarm logs, event records and communication failures.



Once in three (03) months or earlier, if required, based on equipment condition, operational performance, OEM recommendations and GETCO/STU/SLDC practices.

16.3.0 Breakdown Maintenance

- a. Attending communication failures, alarms and equipment faults.
- b. Diagnosis and rectification of faults in FOTE equipment and associated communication system.
- c. Restoration of communication channels in minimum possible time.
- d. Replacement of defective components/modules/accessories.
- e. Coordination with SLDC/STU/GETCO and other agencies during communication failures and restoration activities.
- f. Analysis of communication interruptions and submission of root cause analysis reports.
- g. Restoration and reconfiguration of communication links after outages/failures.
- h. Support during grid disturbances, relay event analysis and SCADA communication issues.
- i. Maintenance of fault history and restoration records.

17.0.0 Dry type Transformer.

The scope shall include operation support, inspection, testing, preventive maintenance, breakdown maintenance and condition monitoring of complete Dry Type Transformer system including associated terminations, cooling arrangements, protection devices and auxiliaries.

17.1.0 Annual Testing and Measurements

- a. Insulation Resistance (IR) measurement of HV and LV windings.
- b. Core insulation resistance measurement.
- c. Functional testing of temperature indicators, alarms and trip circuits.
- d. Verification of operation of cooling fans (as applicable)
- e. Inspection and testing of associated protection system.
- f. Noise and vibration observation.

17.2.0 Preventive and Routine Maintenance

- a. Visual inspection of transformer and associated equipment.
- b. Cleaning of transformer windings, enclosure, ventilation ducts and panels using approved methods.
- c. Inspection for dust accumulation, moisture ingress, cracks, discoloration or overheating marks.
- d. Tightness checking of HV/LV cable terminations, busbar joints and earthing connections.



- e. Inspection and cleaning of cooling fans, blowers and air filters.
- f. Verification of proper ventilation and room temperature conditions.
- g. Checking operation of temperature monitoring devices, alarms and trips.
- h. Inspection of transformer enclosure, gaskets and support structure.
- i. Verification of healthy condition of surge protection devices and associated components.

Once in Six (06) months or earlier, if required, based on equipment condition, operational performance.

17.3.0 Breakdown Maintenance

- a. Attending transformer faults, alarms and abnormal operating conditions.
- b. Diagnosis and rectification of faults in transformer and associated auxiliaries.
- c. Restoration of transformer in minimum possible time.
- d. Replacement of defective components ,accessories and transformer.
- e. Rectification of loose connections, overheating and insulation-related issues.

18.0.0 Neutral Grounding Transformer and associated system.

The scope shall include operation support, inspection, testing, preventive maintenance, breakdown maintenance and condition monitoring of complete NGT system including Neutral Grounding Resistor (NGR), associated protection devices, terminations auxiliaries.

18.1.0 Annual Testing and Measurements

- a. Insulation Resistance (IR) measurement of transformer windings.
- b. Winding resistance measurement.
- c. Transformer Turns Ratio.
- d. Double Frequency Test as per applicable standards whenever required.
- e. Polarity
- f. Vector group verification, wherever applicable.
- g. Measurement of Neutral Grounding Resistor (NGR) resistance value.
- h. Verification of earth continuity and grounding connections.
- i. Functional testing of protection relays, alarms and trip circuits associated with NGT/NGR system.
- j. Verification of neutral current monitoring system.
- k. Inspection and testing of CTs associated with NGT protection.
- l. Inspection of marshalling box, terminal blocks and control wiring.

All test results shall be recorded and compared with previous records and OEM permissible limits for trend analysis.

18.2.0 Preventive and Routine Maintenance



- a. Visual inspection of NGT, NGR and associated equipment.
- b. Cleaning of transformer enclosure, insulators, resistor banks and terminal compartments.
- c. Inspection for overheating, discoloration, corrosion, or cracks.
- d. Tightness checking of power, neutral and earthing connections.
- e. Inspection and cleaning of cooling arrangement and ventilation openings.
- f. Verification of healthy condition of resistor elements and support insulators.
- g. Inspection of marshalling box, control wiring and cable terminations.

18.3.0 Breakdown Maintenance

- a. Attending faults, alarms and abnormal operating conditions related to NGT/NGR system.
- b. Diagnosis and rectification of faults in transformer, resistor bank and associated circuits.
- c. Restoration of system in minimum possible time.
- d. Replacement of defective minor components/accessories.
- e. Rectification of loose connections, overheating and insulation-related issues.
- f. Coordination for shutdowns and restoration activities.
- g. Analysis of faults/tripping associated with grounding system and submission of root cause analysis reports.
- h. Emergency support during earth fault conditions and system disturbances.
- i. Maintenance of breakdown history and corrective action records.

Once in Six (06) months or earlier, if required, based on equipment condition, operational performance.

19.0.0 LT Cables.

The scope shall include operation support, inspection, testing, preventive maintenance, breakdown maintenance and condition monitoring of LT power and control cables along with associated joints, terminations, glands, cable trays, trenches and accessories

19.1.0 Annual Testing and Measurements

- a. Insulation Resistance (IR) measurement of LT power and control cables.
- b. Continuity testing of cables and cores.
- c. Earth continuity verification.
- d. Inspection and testing of control cable circuits associated with protection and control systems.
- e. Verification of healthy condition of cable glands, lugs and ferruling.

19.2.0 Preventive and Routine Maintenance



- a. Visual inspection of LT cables, cable trays, trenches and routing.
- b. Inspection for physical damage, overheating, insulation deterioration, moisture ingress and corrosion.
- c. Tightness checking of cable terminations and gland connections.
- d. Inspection of cable joints and terminations for overheating, tracking and discoloration.
- e. Cleaning of cable trays, trenches and cable routes.
- f. Removal of dust, debris, water accumulation and unwanted vegetation from cable routes.
- g. Inspection and maintenance of cable identification tags
- h. Verification of proper clamping and support arrangements.
- i. Verification of earthing and bonding connections.

Once in Six (06) months or earlier, if required, based on equipment condition, operational performance.

19.3.0 Breakdown Maintenance

- a. Attending LT cable faults, failures and abnormal operating conditions.
- b. Fault identification and fault location using suitable equipment.
- c. Excavation, jointing, termination repair/replacement and restoration of cable system.
- d. Replacement / repair of defective cable accessories and damaged cable portions, wherever required.
- e. Emergency restoration of power supply in minimum possible time.
- f. Rectification of loose connections, overheating and insulation-related issues.

The Contractor shall ensure safe, reliable and uninterrupted operation of LT cable system throughout the contract period in accordance with OEM recommendations, applicable IS/IEC standards and approved maintenance procedures.

20.0.0 Illumination and HVAC System

The scope shall include operation support, inspection, testing, preventive maintenance, and breakdown maintenance of indoor and outdoor lighting systems, HVAC equipment and associated LT panels, cabling, controls and auxiliaries

20.1.0 Annual Testing and Measurements

- a. Insulation Resistance (IR) measurement of lighting circuits and associated cabling.
- b. Measurement of illumination levels at designated locations.
- c. Functional testing of lighting control circuits, timers and photocells (as applicable).
- d. Verification of emergency lighting system and emergency lamps.
- e. Inspection and testing of outdoor lighting poles and earthing connections.
- f. Verification of operating voltage, current and power parameters of HVAC equipment.



- g. Measurement of ambient and conditioned room temperature.
- h. Verification of air flow and ventilation performance.

20.2.0 Preventive and Routine Maintenance

- a. Visual inspection of indoor and outdoor lighting fixtures.
- b. Cleaning of luminaires, fittings and control panels.
- c. Replacement of defective lamps, LEDs, drivers, chokes and accessories.
- d. Tightness checking of lighting panels, switches and cable terminations.
- e. Inspection of lighting poles, supports and mounting arrangements.
- f. Verification of proper operation of emergency lighting systems.
- g. Maintenance of lighting DBs and associated wiring.
- h. Cleaning and maintenance of air filters, blower assemblies, cooling coils, ventilation ducts indoor and outdoor units.
- i. Verification of refrigerant levels and identification of leakage, wherever applicable.
- j. Tightness checking of electrical and control connections.
- k. Verification of drainage system and condensate lines.
- l. Maintenance of proper ventilation and air circulation in electrical/control rooms.

Once in three (03) months or earlier, if required, based on equipment condition, operational performance.

20.3.0 Breakdown Maintenance

- a. Attending failures of lighting circuits, fixtures and associated panels.
- b. Rectification/replacement of defective lighting fixtures, control gears, switches and wiring.
- c. Restoration of illumination system in minimum possible time.
- d. Rectification of cable faults and loose connections.
- e. Emergency restoration of critical lighting systems.
- f. Attending faults and abnormal operating conditions of HVAC equipment.
- g. Diagnosis and rectification of electrical, mechanical and control system faults.
- h. Replacement of defective components/accessories/equipment.

21.0.0 Earthing & Lightning System

21.1.0 Annual Testing and Measurements

- a. Measurement of earth resistance of all earth pits using calibrated earth resistance tester.
- b. Continuity testing of earthing network, risers and earth conductors.
- c. Verification of equipment earthing and body earthing continuity.
- d. Measurement of grid continuity and bonding resistance.



- e. Inspection and testing of neutral earthing system and associated connections.
- f. Verification of earthing connections of transformers, switchgear panels, cable trays, structures, surge arrestors and equipment.
- g. Thermographic inspection of accessible earth connections and joints, wherever applicable.
- h. Recording and trend analysis of earth resistance values.
- i. Inspection and testing of lightning arrestors / air terminals and down conductors.
- j. Continuity testing of lightning protection conductors.
- k. Verification of bonding between lightning protection system and earthing network.
- l. Inspection of surge counters, wherever installed.
- m. Verification of integrity of lightning protection system for buildings, structures and equipment.

All test reports and observations shall be submitted to GIPCL in approved format.

21.2.0 Preventive and Routine Maintenance

- a. Visual inspection of earth pits, earth strips and earthing conductors.
- b. Inspection for corrosion, loose joints, damage or discontinuity.
- c. Tightness checking of all accessible earthing connections.
- d. Watering/refilling/chemical treatment of earth pits, wherever required.
- e. Cleaning and maintenance of earth pit chambers and covers.
- f. Rectification of damaged or corroded earthing strips and connections.
- g. Verification of proper identification and numbering of earth pits.
- h. Maintenance of earthing drawings and records.
- i. Inspection of air terminals, lightning masts and down conductors.
- j. Verification of mechanical integrity and proper fastening.
- k. Cleaning and maintenance of lightning protection components.
- l. Inspection for corrosion, damage or loose connections.
- m. Verification of proper bonding with equipment and structures.
- n. Maintenance of surge protection devices and associated earthing connections.

21.3.0 Breakdown Maintenance

- a. Attending faults and abnormalities in earthing system.
- b. Rectification/replacement of damaged earthing strips, risers and earth connections.
- c. Rectification of high earth resistance values.
- d. Emergency restoration of critical equipment earthing.

22.0.0 Scope of Comprehensive Thermography Services



The Bidder shall carry out comprehensive Infrared Thermography inspection and condition monitoring of all electrical and associated equipment covered under the O&M contract using calibrated thermal imaging instruments.

The scope shall include detection, analysis, reporting and rectification recommendations for abnormal temperature rise, loose connections, overloading, insulation deterioration and developing faults.

The scope shall include, but not be limited to, the following:

22.1.0 Equipment Covered under Thermography

Thermographic inspection shall be carried out for, but not limited to, the following equipment:

- a. All equipment of BESS system.
- b. PCS (Inverters)
- c. 132 kV Switchyard Equipment
- d. Circuit Breakers (SF6/VCB)
- e. Isolators and Earth Switches
- f. CTs, PTs/CVTs and Surge Arresters
- g. Busbars, Jumpers and Clamps
- h. Power Transformers, IDT, Auxiliary and Dry Type Transformers
- i. Neutral Grounding Transformers (NGT)
- j. 11 kV Switchgear Panels
- k. LT Panels, PCCs, MCCs and DBs
- l. Battery Chargers, DCDBs and UPS Systems
- m. UPS DBs and ACDBs
- n. HT and LT Cable Terminations & Joints
- o. Control & Relay Panels
- p. Earthing Connections and Grounding Joints
- q. Lighting Panels and associated electrical connections.
- r. Any other equipment not listed above but part of the project.

22.2.0 Scope of Thermographic Inspection

- a. Infrared scanning of all accessible live electrical connections and equipment.
- b. Identification of hotspots, abnormal heating and temperature imbalance.
- c. Detection of loose connections, overload conditions and contact deterioration.
- d. Identification of insulation deterioration and phase imbalance.
- e. Comparative temperature analysis between phases and similar equipment.
- f. Verification of loading conditions during scanning.



- g. Periodic scanning during normal operating conditions and peak loading conditions, wherever feasible.
- h. Follow-up thermographic inspection after rectification of abnormalities.

22.3.0 Frequency of Thermography

- a. Comprehensive thermographic inspection at least once every year.
- b. Additional thermography after major shutdowns, modifications, faults or abnormal observations.
- c. Emergency thermographic inspection whenever required.

22.4.0 Thermography Reporting

The Bidder shall submit detailed thermography reports containing:

- a. Equipment identification and location.
- b. Thermal images and corresponding visual images.
- c. Measured temperature values.
- d. Ambient temperature and load conditions.
- e. Temperature differential analysis.
- f. Severity classification of hotspots.
- g. Probable cause of abnormalities.
- h. Corrective action recommendations.
- i. Priority for rectification.
- j. Comparative trend analysis with previous reports.

Reports shall be submitted in hard and soft copies.

22.5.0 Rectification Support

- a. Inform Owner immediately in case of critical hotspots.
- b. Assist in identifying root cause of abnormalities.
- c. Carry out tightening, cleaning and minor rectification works wherever included in scope.
- d. Re-scan equipment after rectification to verify normal condition.

22.6.0 Instruments & Personnel

- a. Use calibrated infrared thermal imaging camera of suitable resolution and accuracy.
- b. Deploy trained and experienced thermography personnel.
- c. Maintain valid calibration certificates for all thermographic instruments.

23.0.0 Power Conditioning Units (Inverters)



23.1.0 Annual Testing and Measurements

- a. Functional testing of all protection features including over/under voltage, overcurrent, earth fault, anti-islanding, Fault Ride Through , over temperature, and surge protection.
- b. Inspection and testing of cooling systems, fans, filters, heat sinks, and ventilation arrangements.
- c. Measurement and recording, harmonics, insulation resistance, and earth continuity.
- d. Verification of inverter performance parameters, synchronization, protections, alarms, indications, and communication signals.
- e. Verification and calibration of meters, sensors, transducers, and monitoring systems.
- f. Any other testing and measurements as recommended by OEM and relevant standards.
- g. Verification of firmware/software health, communication systems, SCADA integration, and data logging functions.
- h. Breaker / Power Contactors / MCCB's testing as per scope mentioned at HV / MV / LV Switchgears and associated panels.

All test reports and observations shall be submitted to GIPCL in approved format.

23.2.0 Preventive and Routine Maintenance

- a. Routine inspection, cleaning, tightening, servicing, and maintenance of complete PCU systems and associated auxiliaries.
- b. Cleaning of dust, moisture, carbon deposits, and foreign particles from panels, PCBs, cooling paths, and ventilation systems.
- c. Checking and tightening of all electrical connections, terminals, busbars, glands, and earthing connections.
- d. Inspection and servicing of cooling fans, air filters, heat sinks, capacitors, relays, contactors, fuses, SPDs, and control circuits.
- e. Replacement/top-up of consumables and components required for reliable operation.
- f. Recording and analysis of inverter trip history, fault logs, efficiency trends, and operational performance.
- g. Coordination with OEM/service agencies for troubleshooting, software support, firmware updates, and major repairs wherever required.
- h. Compliance with OEM recommendations and approved maintenance schedules.
- i. Retrieval, analysis and submission of Disturbance Records (DR), Event Records (ER), Fault Records, SOE logs and other relevant data/reports to GIPCL/GETCO/STU/SLDC as and when required.
- j. Coordination for protection operation analysis, grid disturbances, tripping events and compliance with grid code/statutory requirements.



Once in three (03) months or earlier, if required, based on equipment condition, operational performance.

23.3.0 Breakdown Maintenance

- a. Attending and rectification of inverter / PCU faults, failures, trips, alarms, communication issues, and performance abnormalities.
- b. Identification and replacement/repair of defective components, modules, cards, power electronics, auxiliaries, and associated accessories.
- c. Restoration of inverter operation within the stipulated response and restoration time.
- d. Submission of fault analysis report indicating root cause, corrective action, and preventive measures.

23.4.0 Major overhaul and upgradation.

Scope includes major overhaul and upgradation of the Power Conditioning Units (PCUs) / Inverters as per OEM recommendations, applicable standards, and approved maintenance practices.

24.0.0 Fire Protection and Alarm System

24.1.0 Annual Testing and Measurements

- a. Functional testing and verification of complete fire detection, alarm, annunciation, suppression, and monitoring systems.
- b. Testing of smoke detectors, heat detectors, flame detectors, any other type of detectors / Sensors, manual call points, hooters, sounders, beacons, and fire alarm panels.
- c. Testing and calibration of sensors, detectors, relays, switches, modules, and associated control circuits.
- d. Verification of operation of fire extinguishing/suppression systems including cylinders, actuators, solenoid valves, release mechanisms, and interlocks.
- e. Measurement and recording of insulation resistance, loop resistance, battery health, charger performance, and earthing continuity.
- f. Functional testing of annunciation, trip commands, shutdown interlocks, SCADA/BMS integration, and communication signals.
- g. Checking of pressure, leakage, expiry status, and health condition of extinguishers, cylinders, hoses, nozzles, and accessories.
- h. Any other testing and measurements as recommended by OEM and applicable standards/statutory requirements.

24.2.0 Preventive and Routine Maintenance

- a. Routine inspection, cleaning, servicing, testing, and maintenance of complete fire protection, detection, alarm, and suppression systems.



- b. Cleaning and checking of detectors, panels, annunciators, hooters, MCPs, relays, wiring and associated accessories.
- c. Tightening of electrical connections, earthing points, terminals, glands, and control wiring.
- d. Compliance with OEM recommendations, statutory norms, and approved maintenance schedules.

Once in three (03) months or earlier, if required, based on equipment condition, operational performance, statutory requirements.

24.3.0 Breakdown Maintenance

- a. Attending and rectification of faults, failures, alarms, communication issues, leakage, malfunctioning, and operational abnormalities in the fire protection and alarm systems.
- b. Identification, repair, replacement, or restoration of defective detectors, panels, modules, relays, valves, cylinders, cables, piping, and associated accessories.
- c. Restoration of the complete fire protection and alarm system within the stipulated response and restoration time.

25.0.0 Substation Automation System (SAS) , Supervisory Control and Data Acquisition (SCADA) and Energy Management System (EMS)

Scope of comprehensive operation support and maintenance of the complete Substation Automation System (SAS), Supervisory Control and Data Acquisition (SCADA) system and Energy Management System (EMS) including all hardware, software, communication systems, networking equipment, interfaces, servers, workstations, Remote Terminal Units (RTUs), Human Machine Interfaces (HMIs), gateways, cybersecurity systems, auxiliary systems and associated accessories installed at the plant/substation. The scope shall include ensuring reliable, secure and uninterrupted operation of all monitoring, control, protection interfacing, telemetry, data acquisition, event logging, alarm management and reporting functions in accordance with OEM recommendations, applicable standards and statutory requirements

25.1.0 Annual Testing and Measurements

- a. Functional testing and health check of SAS, SCADA and EMS servers, workstations, gateways, HMIs, RTUs, PLCs, networking equipment and associated peripherals.
- b. Verification and testing of all communication protocols including IEC 61850, IEC 60870-5-101/104, Modbus, OPC and other applicable protocols.
- c. Testing and calibration of meters, transducers, annunciation systems, event loggers and sequence of events (SOE) functions.
- d. Verification of data acquisition, telemetry, remote control, interlocking, alarm and trip indications from all field devices and bays.



- e. Testing of redundancy features for servers, communication networks, switches, firewalls, GPS clock synchronization and power supplies.
- f. Cybersecurity assessment including antivirus updates, firewall health checks, user access verification and backup restoration testing.
- g. Verification of EMS functions including load monitoring, energy accounting, reporting, trend analysis and historical data storage.

Preparation and submission of test reports, calibration certificates and system health assessment reports as per approved formats.

25.2.0 Preventive and Routine Maintenance

- a. Routine inspection, cleaning and servicing of SAS, SCADA and EMS hardware, panels, servers, workstations, RTUs, networking equipment and communication interfaces.
- b. Periodic backup of system databases, configuration files, event logs, historical data and application software.
- c. Updating and maintenance of operating systems, firmware, antivirus software, patches and application software in coordination with OEM recommendations.
- d. Maintenance of time synchronization systems including GPS clocks and NTP / SNTP synchronization across all devices.
- e. Verification and upkeep of cybersecurity measures including password management, access control and firewall configurations.
- f. Preventive maintenance, cooling/ventilation systems and auxiliary power supplies associated with SAS/SCADA/EMS equipment.
- g. Labelling and maintenance of documentation, drawings, configuration records and software licenses.
- h. Coordination with Load Dispatch Centre (LDC), SLDC/RLDC/GETCO and other agencies for telemetry and communication availability.

Once in Six (06) months or earlier, if required, based on equipment condition, operational performance, statutory requirements.

25.3.0 Breakdown Maintenance

- a. Attending and rectification of failures in SAS, SCADA and EMS systems including servers, RTUs, HMIs, networking equipment, communication gateways and field interfaces.
- b. Diagnosis and restoration of communication failures, telemetry interruptions, alarm failures and remote operation issues.
- c. Replacement/repair of defective hardware modules, power supplies, network switches, communication cards, I/O modules and associated components.



- d. Restoration of databases, application software and configuration files in case of corruption or system failure.
- e. Rectification of synchronization, data mismatch, event logging and historical data storage issues.
- f. Coordination with OEMs, communication service providers and system integrators for troubleshooting and resolution of critical faults.
- g. Emergency support for restoration of SAS/SCADA/EMS operation to ensure uninterrupted monitoring and control of the substation/power system.
- h. Submission of breakdown reports including root cause analysis, corrective actions taken and recommendations for preventing recurrence.

26.0.0 Surveillance System & CCTV

Scope included but not limited to carry out comprehensive operation support and maintenance of the complete Surveillance System and Closed-Circuit Television (CCTV) system including cameras, Network Video Recorders (NVRs), Digital Video Recorders (DVRs), video management systems, monitors, control stations, storage devices, networking equipment, communication systems, power supplies, UPS systems, cabling, accessories and all associated hardware and software installed at the plant/substation. The scope shall include ensuring reliable and continuous surveillance coverage, recording, monitoring, playback, storage, remote access and integration with security systems in accordance with OEM recommendations, applicable standards and statutory requirements.

26.1.0 Annual Testing and Measurements

- a. Functional testing and health check of all CCTV cameras, PTZ cameras, any other type of cameras, NVRs/DVRs, monitors, video walls and control stations.
- b. Verification of video recording, playback, storage retention, remote monitoring and retrieval functions.
- c. Testing of camera positioning, zoom, focus, infrared/night vision, motion detection and alarm integration features.
- d. Verification of communication networks, optical fibre links, switches, routers and associated connectivity systems.
- e. Testing of redundant storage systems, servers, power supplies and UPS systems associated with the surveillance system.
- f. Verification of cybersecurity features, user access controls, passwords and network security configurations.
- g. Testing of integration with access control systems, fire alarm systems, intrusion detection systems and other security systems wherever applicable.



- h. Measurement and verification of camera coverage, image quality, recording resolution and frame rates.
- i. Preparation and submission of testing reports, system health reports and recommendations for corrective actions.

26.2.0 Preventive and Routine Maintenance

- a. Routine inspection, cleaning and servicing of CCTV cameras, housings, lenses, PTZ mechanisms, control panels and associated accessories.
- b. Maintenance of NVRs/DVRs, storage devices, servers, monitors, workstations and video management software.
- c. Inspection and maintenance of communication systems including Ethernet switches, routers, optical fibre cables, patch panels and connectors.
- d. Periodic backup of video data, system configurations and software databases.
- e. Updating of firmware, operating systems, antivirus software and application software as per OEM recommendations.
- f. Verification of camera alignment, focus, viewing angles and illumination levels for effective monitoring.
- g. Monitoring and rectification of video loss, recording interruptions, storage utilization and network communication issues.
- h. Labelling and maintenance of drawings, layouts, configuration records and maintenance logs.
- i. Ensuring continuous availability and reliable operation of the complete surveillance and monitoring system.

Once in three (06) months or earlier, if required, based on equipment condition, operational performance, statutory requirements.

26.3.0 Breakdown Maintenance

- a. Attending and rectification of failures in CCTV cameras, PTZ systems, NVRs/DVRs, servers, monitors, storage devices and associated equipment.
- b. Diagnosis and restoration of video loss, recording failures, playback issues, communication failures and remote access problems.
- c. Replacement/repair of defective cameras, hard disks, network switches, power supplies, communication modules, connectors and associated components.
- d. Restoration of software applications, video management systems and configuration files in case of system corruption or failure.
- e. Rectification of faults related to image quality, camera movement, infrared operation, synchronization and storage systems.



- f. Coordination with OEMs, service providers and system integrators for troubleshooting and resolution of critical faults.

27.0.0 Instrumentation and Communication Cables.

The Contractor shall carry out comprehensive operation support and maintenance of all instrumentation, control, communication and optical fiber cables including associated terminations, junction boxes, patch panels, cable trays, conduits, connectors and accessories to ensure reliable transmission of control, protection, monitoring and communication signals in accordance with applicable standards and OEM recommendations.

27.1.0 Annual Testing and Measurements

- a. Insulation resistance, continuity and signal integrity testing of instrumentation and communication cables.
- b. OTDR and attenuation testing of optical fibre cables.
- c. Verification of cable terminations, glands, connectors, patch cords, LiU and junction boxes.
- d. Testing of communication links, earthing and shielding continuity.
- e. Preparation and submission of testing and health assessment reports.

27.2.0 Preventive and Routine Maintenance.

- a. Routine inspection, cleaning and maintenance of cables, terminations, trays, conduits and associated accessories.
- b. Checking for insulation deterioration, loose connections, moisture ingress, overheating and physical damages.
- c. Maintenance of optical fibre systems, splice joints, LIUs and communication terminations.
- d. Rectification of signal disturbances, communication interruptions and grounding/shielding issues.
- e. Upkeep of cable identification tags, route markers, cable layouts and maintenance records.

27.3.0 Breakdown Maintenance

- a. Identification and rectification of cable faults including open circuit, short circuit, earth fault and communication failures.
- b. Fault localization using suitable test equipment including OTDR for fibre optic cables.
- c. Repair/replacement of damaged cables, connectors, splice joints, terminations and associated accessories.
- d. Restoration of faulty communication links, signal transmission and network connectivity.



- e. Emergency restoration of critical control, protection and communication circuits.
- f. Submission of breakdown reports including fault analysis and corrective actions taken.

28.0.0 BESS System Specific - Scope

Bidder shall refer DTS VFRB, Vol-I Section 5 SCC_VFRB_EPC_120MWH, and Section-1 GTS.

29.0.0 Civil and General, Minimum Staffing, Insurance and Key O&M Deliverables – Scope

Bidder shall refer DTS VFRB, Vol-I Section 5 SCC_VFRB_EPC_120MWH, and Section-1 GTS.

30.0.0 Operation – Scope

The Contractor shall provide complete operation services for the Battery Energy Storage System (BESS) and associated systems on round-the-clock basis in accordance with OEM recommendations, Grid Code, SLDC/GETCO / STU instructions and applicable statutory regulations.

The scope shall include, but not be limited to, the following:

30.1.0 BESS Operation & Grid Coordination

- a. Charging and discharging operation of BESS as per SLDC/STU instructions, approved schedules and plant operational strategy.
- b. Continuous monitoring of actual injection/import vis-à-vis approved schedule.
- c. Monitoring of Special Energy Meters (ABT Meter) data and real-time operational parameters.
- d. Monitoring of frequency-linked operation and grid support requirements.
- e. Operation of BESS for peak shaving, load shifting, ancillary services and frequency regulation as instructed by SLDC/GETCO/STU.
- f. Black start support and grid restoration operation, wherever applicable.
- g. Ensuring operation of BESS within OEM recommended operating limits and grid code requirements.
- h. Preparation , submission and Coordination with SLDC/GETCO/STU for:
 - i. Scheduling and schedule revisions
 - ii. Line shutdown permits
 - iii. Switching operations
 - iv. Synchronization activities
 - v. Grid restoration
 - vi. Emergency handling

30.2.0 DSM Monitoring & Energy Management



- a. Analysis of DSM (Deviation Settlement Mechanism) and identification of deviation causes with supporting documents for each incidence.
- b. Taking corrective operational actions to minimize DSM penalties.
- c. Coordination with SLDC/ GETCO / STU for revision of schedules.
- d. Preparation and submission of:
 - i. DSM reports
 - ii. Deviation analysis reports
 - iii. Energy accounting reports
- e. Monitoring BESS efficiency, charge/discharge cycles and degradation (if any) trends.
- f. Maintaining operational records and cycle history of battery system.

30.3.0 Monitoring & Control of BESS Equipment

Continuous monitoring and operation of:

- a. Battery Racks/Modules
- b. Battery Management System (BMS)
- c. Power Conversion System (PCS)
- d. Energy Management System (EMS)
- e. SCADA System
- f. HVAC System
- g. Fire Detection & Fire Fighting System
- h. Auxiliary Power System
- i. DC System and UPS
- j. Communication System
- k. Associated HT/LT Electrical Systems

The Contractor shall ensure:

- l. Healthy communication between all subsystems.
- m. Continuous availability of SCADA and operational data.
- n. Monitoring of alarms, trips and abnormal operating conditions.
- o. Timely reporting and corrective actions for abnormalities.

30.4.0 Safety Management

- a. Issuance, control and monitoring of Permit to Work (PTW) system for all maintenance activities.
- b. Implementation of Lock Out Tag Out (LOTO) procedures during shutdown and maintenance activities.
- c. Compliance with all electrical safety procedures and statutory regulations.
- d. Conducting safety toolbox talks and safety awareness programs.



- e. Conducting periodic safety inspections and audits.
 - i. Emergency response coordination for:
 - ii. Fire incidents
 - iii. Battery thermal runaway
 - iv. Electrical faults
 - v. Gas leakage and emergency conditions
- f. Ensuring proper use of PPE and site safety compliance.

30.5.0 Housekeeping & Site Maintenance

The Contractor shall maintain proper housekeeping of:

- a. BESS containers/buildings
- b. Control room
- c. Switchyard
- d. Auxiliary rooms
- e. Cable trenches
- f. Internal roads and surrounding areas

The scope shall include:

- g. Preparation and implementation of housekeeping schedules.
- h. Dust control and cleanliness around equipment.
- i. Removal of waste material and scrap disposal as per environmental norms.
- j. Maintenance of safe access and emergency routes.

30.6.0 Communication, SCADA & Data Management

- a. Submission of operational data, event details and reports to SLDC/GETCO/STU.
- b. Timely submission of SEM data to SLDC/GETCO/STU as per regulatory requirements.
- c. Ensuring uninterrupted communication and data transfer to SLDC/REMC/GETCO.
- d. Monitoring SCADA, communication network and data availability.
- e. Coordination for communication failures and restoration activities.
- f. Maintenance of operational databases, logs and data backups.
- g. Support during audits, inspections and compliance verification.

30.7.0 Reporting & Documentation

The Contractor shall prepare and submit:

- a. Daily BESS operational reports
- b. Daily energy accounting reports
- c. DSM reports and deviation analysis



- d. Incident and tripping reports
- e. Availability and performance reports
- f. Monthly operational reports
- g. Grid disturbance analysis reports
- h. Shutdown and restoration reports
- i. Root Cause Analysis (RCA) reports for major events/failures

The Contractor shall maintain:

- j. Operational logbooks
- k. Event records
- l. PTW and LOTO records
- m. Shutdown and restoration records
- n. Alarm and fault history
- o. Battery cycle and performance records.

30.8.0 Regulatory & Statutory Compliance

The Contractor shall coordinate and provide operational/generation data and reports to:

- a. SLDC
- b. GETCO
- c. GEDA
- d. STU
- e. GUVNL
- f. CEA
- g. MNRE
- h. GERC
- i. REMC
- j. Any other statutory authority as required

The Contractor shall ensure timely compliance with:

- k. Grid code requirements
- l. SLDC operational directives
- m. Regulatory reporting requirements
- n. Applicable statutory regulations and standards.