SECTION-VI

TECHNICAL AND GENERAL SPECIFICATIONS

1) CURRENT SCOPE & ENHANCED SCOPE:

a) CURRENT SCOPE:
The current scope indicates the scope of equipment as detailed in **Part A** in this section. This scope will begin from the effective date of the contract.

b) ENHANCED SCOPE:
The enhanced scope will be in two phases – the equipment details are provided in Part B in this section. The enhanced scope shall be added to the ongoing contract as and when they are available. The tentative date of these additions will be intimated in advance; at least 2 months if not earlier.

Kindly note that it is not binding on the Institute to add the enhanced scope to the contract on the tentative dates indicated in Part B. It is also the sole discretion of the Institute to NOT add any enhancement of scope.

The indicative drawings – layout plan and SLDs - for the above scope is included separately in the Section VII.

2) DEPLOYMENT OF PERSONS :

a) OPERATION STAFF:

The contractor shall deploy the following persons as detailed in Section III.

Station In Charge: An Engineer with Degree in Electrical Engineering and having at least 5 years experience of operation and maintenance of similar kind of sub stations. He shall be over all In- charge for Sub Station. He shall be posted in **General / Day shift (9AM -5:30PM, 6 days per week)** and responsible for functioning of sub station, arranging shut downs, programming for maintenance, coordination between Owner and other agencies involved etc. Working knowledge in Hindi English language is essential. Computer literate with knowledge of MS Word, Excel & MS Project

Shifts In Charge: An Engineer with Degree/Diploma of Electrical Engineering and having adequate experience of shift duties of similar kind of sub station. He shall be posted in shift of 8 hours. There will be three Engineers per day and one as a Reliever. He shall be responsible for operation of sub station. He shall be shift In-charge responsible for reporting to the Station In-charge. Working knowledge in Hindi English language is essential. He should be computer literate with knowledge of MS Word, Excel & MS Project.

Operators: The Operator is having Diploma of Electrical Engineering or ITI and adequate experience of shift duties of similar kind of sub station. One operator shall be posted in each shift of 8 hours. There will be six operators per day and two

relievers. He shall be responsible for maintaining log books, operations during his shift. Working knowledge in Hindi English language is essential. The operator staff shall have general literacy of computer with knowledge of MS Word, MS Excel, etc.

For enhanced scope, that is proposed to be added, additional operators shall be provided as described in Section III.

3) MAINTENANCE CREW :

The maintenance crew would consist of:

Maintenance Engineer: Engineer having Degree or Diploma of Electrical Engineering and having adequate experience of Maintenance of similar kind of substation. He shall be posted as and when required and responsible for routine and breakdown maintenance of substation.

Additional Staff: The additional staff comprising of skilled, unskilled workers headed by Engineer shall be posted for routine, yearly, half yearly maintenance during break downs and shut downs as per requirement and quantum of work. Apart from above the Testing engineers along with skilled staff shall visit substation for annual relay testing and in event of emergency whenever their services required for smooth functioning of substation.

Operation staff shall be exclusive and not utilized for regular, periodic and breakdown maintenance works.

For enhanced scope, additional maintenance staff shall be considered as necessary.

4) TOOLS & TACKLES:

All tools and tackles required for the safe and satisfactory operation and maintenance including preventive and break down maintenance of the substation and related equipment covered under this tender shall be provided by the contractor.

The tools and tackles, apart from other things, must comprise of

a) Set of Discharge rods (Minimum six nos.)
b) Complete set of all sizes of Double-ended, Ring, Tubular & box spanners – 2 sets.
c) Complete set of all sizes of screw drivers -2 sets
d) Complete Tool Box -2 nos.
e) 1 No. Blower & Vacuum Cleaner.
f) One derrick capable of handling highest equipment of the sub station
g) Guy ropes suitable for hoisting above derrick.
h) Minimum two sets of Electrical safety heavy duty hand gloves of highest voltage rating available in the market.
i) 6 nos Safety Helmets, 6 nos. safety belts & Safety shoes.
j) 2 nos of heavy duty dry cell or rechargeable (without acid) torches.
k) Rain coats and gum boots as required.
l) First aid box

m) 1 No. Insulation tester 5 kV capacity, Motorised Type
n) 1 No. Insulation tester 1 kV capacity
o) 1 No. Earth tester
p) 2 nos. Multi meter - Analog & Digital
q) Clamp meter for measuring AC/DC current
r) Temperature sensor adaptor for multi meter
s) Cable crimping tools of adequate capacity etc.
t) Metal-clad extension Power supply boards with MCB & surge protection
u) Phase Sequence meter
v) Other general purpose test instruments
w) PC with printer

All the above Equipment shall be produced to the Engineer In-charge for verification every six month basis.

5) CONSUMABLES:

a) Petroleum jelly as required
b) Carbon Tetra Chloride (CTC) solution as required
c) Contact Cleaner Spray (STANVAC chemical or equivalent) as required
d) M-Seal epoxy compound, sealing compound, emery paper, paint, red oxide, etc. as required.
e) Insulation tapes, HT tapes, etc. as required.
f) Silica gel, gasket (neoprene cork & neoprene rubber), cotton tape, Teflon tape, etc. as required.
g) Cotton waste, muslin cloth, waste cloth, cleaning agents, etc. as required.

Other major consumables like transformer oil, SF6 gas with filling kit, indicating lamps, control and power cables/wires, etc. shall be provided by the Institute.

6) SPARES:

a) All spares recommended by manufacturers of equipment installed in the sub-station. (To be provided by IPR but a comprehensive list should be prepared by the contractor at the time of starting the contract.)
b) Nuts, bolts, washers of sizes used in substation and other systems.
c) Fuse holders and HRC fuses, terminal links, control wires and lugs of rating used in the substation and other systems.
d) The contractor shall keep ready stock of all items/consumables for day to day maintenance/ repairing works.

7) OPERATIONS:

a) Hourly:

i) Taking readings of all meters installed at control panel. ACDB, DCDB, Battery Charger etc.
ii) Air and Gas pressures of Gas circuit breakers.
iii) Oil & Winding temperatures of Transformers.
iv) Taking the reading of surge arrestor counters of Lightning Arrestors,
v) Checking any sparking or flash over / hot spots in the substation.

b) Daily :

i) Checking the operation of compressors of Circuit breaker.
ii) Visual Checking contacts of Isolators are in proper position or not.
iii) Checking oil levels of all bushings, Main & OLTC Conservator, CTs and PTs, etc.
iv) Checking oil leakages if any for Transformers, CTs & PTs & taking appropriate action for its timely repair
v) Checking air / gas/ oil leakages if any for Circuit Breakers.
vi) Checking condition of Silica gel.
vii) Checking DC voltage.
viii) Cleaning of premises, Control relay panels etc.
ix) Maintaining log books and daily check list.
x) Checking Deposition of dust and dirt on Insulators.
xi) Checking Locks and doors of substation are in good condition.
xii) Checking no leaks have developed in the roof. Ventilating systems.
xiii) Checking the heating systems are working normally.
xiv) Checking the prescribed safety aids are in place and in good order.
xv) Checking the earth connections is unbroken.
xvi) Checking the packing of cables entering and leaving the trenches or tunnels with in the premises are intact.
xvii) Checking the ventilating louvers are not damaged.
xviii) Checking the access roads to the oil filled devices is not obstructed.
xix) Draining the air/moisture from air conservators of circuit breakers.
xx) Trouble shooting and minor repair of electrical circuits components in case of any abnormal conditions.

c) Weekly:

i) Checking Yard and control room lighting.

d) Monthly:

i) Checking Auto/ Manual operations of OLTC.
ii) Checking earth connections and their contact, tighten wherever required.
iii) Preparation of monthly checklist and events log for the month.

e) Events:

i) Logging auto / manual operations of OLTC.
ii) Logging the breakdown events with relay indications etc.
iii) Logging shut down events, log of operations during shut down period.
iv) Logging of on /off of feeders in the 22 kV & 11 kV and 415V distribution system.
v) Maintaining visitors registers along with their comments and details of their visits.

8) MAINTENANCE:

a) Maintenance scope include both preventive and breakdown maintenance. Preventive maintenance shall be routinely carried as per details provided herein below.

b) Breakdown maintenance shall be provided as and when situation warrants with a failure/fault in the system. The breakdown maintenance shall be attended at the highest priority so to make good the faulted system and putting into operation. For breakdown maintenance the contractor shall coordinate/liaison with Engineer In-charge and the original equipment manufacturer for replacement parts and services as necessary. Infrastructure, tools and tackles and site support shall be provided by the contractor for such jobs with priority and without unnecessary delays. OEM parts and services, if any, required for the completion of breakdown services shall be approved and cleared for execution by appropriate authorities.

c) During the preventive (routine) maintenance the contractor shall carry out the following as listed for various system components:

d) Though the list contains several individual jobs they could be executed in a combined scope as in servicing or overhauling of the component.

e) The maintenance jobs which are specifically underlined in the following list shall be carried out by OEM supplier or their authorized service provider only. The contractor shall be required to provide proof for the same before executing the job. These jobs must be carried out during the month mentioned alongside the job. Detailed service reports should be submitted after the completion of the job.

f) All the maintenance activities shall be carried out by following all the safery measures using required PPE equipment. The contractor will be soly responsible for any mishap due to unsafe act / practice.

LIST OF MAINTENANCE ACTIVITIES IN THE SCOPE INCLUDE THE FOLLOWING:

1) Power Transformers: (for Distribution Transformers the following will be adopted as applicable)

a) Hourly:

i) Check oil & winding temperatures, check for abnormalities & recording them.
ii) Observe and record Load (amperes) and Voltage. Check against rated figure.
iii) Visual check for overheating if any at terminal connections (Red hots) and observation for any unusual internal noises. This check must be done in each shift.

b) Daily:

i) Observation of oil levels in (a) main conservator tank (b) OLTC conservator (c) bushings and examining for oil leaks if any from the transformer.
ii) Checking the Color of silica gel in the breather and also oil level of the oil seal. If silica gel colour changes from blue to pink by 50% the silica gel is to be reconditioned or replaced.
iii) Visual check of explosion vent diaphragm for any cracks.

c) Monthly:

i) Physical examination of diaphragm of vent pipe for any cracks.
ii) Cleaning of bushings, inspect for any cracks or chippings of the porcelain and checking of tightness of clamps and jumpers.
iii) Measurement of IR values of transformer with suitable megger according to the rating of the transformer. Recording of the values specifying the temperature which measurements are taken.
iv) Cleaning of Silica gel breather.
v) Checking of temperature alarms by shorting contacts by operating the knob.

d) **Quarterly:**

i) Testing of Bucholz surge relays & low oil level trips for correct operation.
ii) Checking of all connections on the transformer for tightness such as bushings, tank earth connection.
iii) Lubricating / greasing all moving parts of OLTC mechanism.

e) Half Yearly:

i) Bushing testing for tan delta.
ii) Testing of main tank oil for BDV and moisture content.
iii) Testing OLTC oil for BDV & moisture content.

a) Yearly:

i) Testing of oil for dissolved gas analysis, acidity, tan delta, interface tension specific resisitivity.
ii) Calibration & testing of oil & winding temperature indicators.
iii) Measurement of magnetizing current at normal tap and extreme taps.
iv) Measurement of DC winding resistance.
v) Turns ratio test at all taps.
vi) Overhaul of tap changer and mechanism. **(Feb)**
vii) Calibration of tap position indicator.
viii) Filtration of oil or replacement of oil in main tank as well as OLTC
ix) Changing the gaskets at all locations as when leakage is found or the gasket is damaged or else yearly.
x) Replacing of Buchholz relay, OTI, WTI, breather etc. if found malfunctioning (material to be provided by IPR)
xi) Replacement of bushing when required.
xii) Sweep Frequency response Analysis test.(**As and when required)**

ii. 145 kV SF6 Circuit Breakers (Spring Charge Mechanism)

a) Hourly:

i) Check SF_6 Gas pressure.

b) Daily:

i) Check the operation of spring charging motors. Check timing and sound.
ii) Check gas density in each shift.

c) **Monthly:**

i) Air cleaning with blower.
ii) Cleaning of circuit breaker body and bushings.

iii) Auxiliary contacts cleaning.
iv) Tightening of nuts and bolts.
v) Checking breaker Operation (Local/Remote operation).
vi) Check anti-condensation protection.
vii) Check of motor control
viii) Use of anti-corrosion spray where required.

d) **Quarterly:**
i) Check for SF6 leaks.(Gas leakage test)
ii) Oiling and greasing of all moving parts.
iii) Functional check of trip circuit.
iv) Checking the settings of air and gas pressure switches.

e) **Half-yearly:**
i) Checking ON/OFF Timings of Circuit breaker poles.
ii) Complete servicing, oiling and greasing of all moving parts. Replacement of any defective part.**(Dec, Jun)**
iii) Operation and control of Auxiliary circuits. **(Dec,Jun)**
iv) Recharge time of operating mechanism after specified sequence.
v) Checks on specific operations.
vi) Control Circuit Insulation Checking.
vii) Measurement of Humidity

f) **Yearly:**
i) Touch up painting wherever required. Porcelain insulator.
ii) Checking contact resistance of Breaker main contact.
iii) Checking of circuit breaker level with spirit level.
iv) Mechanism checking and lubrication to all moving parts.**(Mar)**
v) IR values of Power and Control Circuits.
vi) Operating circuits power consumption during operations.
vii) Verification of correct rated operating sequence. **(Mar)**
viii) Checking and adjustment of Track alignment and Interlocking mechanism. **(Mar)**

g) Repairs:
i) Filling the breaker with SF6 – The CB may be filled only by or under the supervision of qualified personnel and in accordance with the SF6 filling curve. *SF6 filling kit and SF6 gas cylinder to be provided by IPR.*

iii. Lightning Arrestors:

a) Hourly:
i) Checking the readings of surge arrestor counters.

b) Monthly:
i) Cleaning of porcelains Insulators.

c) Quarterly:
i) Removing of bird nests, if any.
ii) Monitor the total leakage current (capacitive and resistive current) and resistive current.

iii) Records of the number of operations of the Arrester should be maintained and if more number of operations are seen then the same should be informed to the concerned authority.

d) Yearly:

i) Testing of counters

e) Repairs:

i) Replacement of Lightening Arrestor pole.(LA to be provided by IPR)

iv. <u>Isolators</u>

a) Daily:

i) Visual Inspection

b) Monthly:

i) Clean the porcelain insulators and inspect for cracks and chip off.
ii) Check for tightness of nuts and bolts. Drive tube locknuts. Drive lever and phase coupling plan, bolts etc.

c) Quarterly:

i) Open the disconnector and earthing switch and inspect the contacts. (wipe the contact surface with solvent).
ii) Check for contact surface soundness.
iii) After maintenance and inspection, smear contact surface lightly with contact lubricant.
iv) Check for split pins in clevis, if damaged, to replace the same.
v) Lubricate all clevis pins.
vi) Check contact gap 34-36 mm. if found inadequate replace contact spring.

d) Half Yearly:

i) <u>Maintenance of Drive Mechanism:</u> **(Sept & Mar)**
ii) Apply grease on the teeth of the spur gear and GEAR box/ Lead screw and guide nut and incase of lead screw type.
iii) Oil auxiliary switch linkage and pivot on the guard aperture for manual operation.
iv) Cleaning of auxiliary switch contact & greasing with silicon grease.
v) Check that all the electrical components are firmly fixed and let the contactors operate freely.
vi) Check all electrical connections for tightness.
vii) Check all mounting bolts for tightness.
viii) Apply grease to mechanical interlock-cam groove, if the disconnector is with earth switch.
ix) Check interlocks.
x) Adjustment of limit switch if it is required.
xi) Main Contacts
xii) Cleaning and lubrication of main controls
xiii) Check Alignment.
xiv) Main contact resistance measurement
xv) Tightness of nuts bolts and pins etc.
xvi) Cleaning of support insulators and checking of insulator cracks, if any.

xvii) Earth Switch
xviii) Checking and Alignment of earthing blades
xix) Cleaning of contacts
xx) Checking of Contact resistance.
xxi) Operation of earthing switch.
xxii) Checking of aluminum Copper flexible conductor.
xxiii) Checking of earth connections of structures and marshalling box.
xxiv) Marshalling Box
xxv) Visual check of auxiliary contacts.
xxvi) Cleaning and terminal tightness.
xxvii) Checking of space heaters and illumination.
xxviii) Checking of healthiness of gaskets else replace the gaskets.

e) Lubricants recommended:

i) For Contact Surface - Clean contact surface with plain cloth and apply contact Grease.
ii) For External drive linkage - Shell Alvania grease

v. <u>Current Transformers</u>

a) Daily:

i) Visual Check
ii) Check for Oil leakage

b) Monthly:

i) Clean the porcelain insulators and inspect for cracks and chip off.
ii) Secondary connection of the CT should be intact.

c) Half yearly:

i) Check the I.R. value of each Current Transformer and keep record.
ii) Check the Pressure Diaphragm. If pressure diaphragm is defective, replace it with new one as per the procedure explained in the instruction manual.
iii) If the insulation resistance of the current transformer is low it can be improved by oil filtration under vacuum.
iv) Attending to oil leakage in the CT. If it due to failure of gaskets, the gaskets need to be replaced. (Gaskets should be provided be the contractor)
v) Tan-delta and Capacitance measurement

vi. <u>Voltage Transformers</u>

a) Daily:

i) Check Oil level and check for any leakage
ii) Chattering sounds

b) Monthly:

i) Cleaning of Bushing
ii) Checking for Oil level & topping up of oil if, required

c) Half yearly:

i) Check the I.R. value of each Voltage Transformer and keep record.
ii) Check the Pressure Diaphragm. If pressure diaphragm is defective, replace it with new one as per the procedure explained in the instruction manual.

iii) If the insulation resistance of the Voltage transformer is low it can be improved by oil filtration under vacuum.
iv) Attending to oil leakage in the VT. If it due to failure of gaskets, the gaskets need to be replaced. (Gaskets should be provided be the contractor)

vii. <u>Switch Yard (all equipment including structural that are not covered elsewhere)</u>

a) Checking the yard at periodic intervals and attend to any unusual observations, defects, sparks, loose contacts, red hot spots and loose bolts and nuts etc., and informing the concerned authority. The records of operational persons shall also be consulted for this purpose.
b) Checking the earth resistance of all earthing pits **<u>half-yearly</u>**.
c) Checking the Protection and control circuit of each equipment monthly.
d) Checking of operation and interlock of all equipment monthly.
e) The premises should be kept neat and clean.

viii. <u>HT/LT/Control & Relay Panels:</u>

a) Daily:

i) Check for any tripping chattering in the electrical parts, abnormal noise, overheating in the panels.
ii) Check whether indication lamps, enunciator lights, bell, buzzers and hooter are working.
iii) Check all terminal cubicles for healthy contacts, minor repairs/services/cleaning etc.
iv) Observe the annunciation window, and there is any alarm then consults the concerned authority.
v) Check whether the panel is ingress protected.
vi) Cleaning of relay cases of dirt etc.
vii) Cleaning the panels, relay covers, blowing dust from inner side of panels.
viii) Polarity of DC supply.
ix) Physical checks of all wiring & connections.

b) Monthly:

i) Check for the proper working of all ammeters, voltmeters, relays, contactors malfunction etc. and if found faulty/not working replace it with new corresponding spare meters (All spares are to be provided by IPR).
ii) Clean the panels from inside with the help of the blower/ vacuum cleaners.
iii) Check all the cables for overheating, tightness of the glands, lugs & crimping.
iv) Check the fuse-link & fuse holders.
v) Check the control wiring of the panel along with the controls for the proper functioning and tripping at the preset parameters.
vi) Tightening of all earthing connections.

c) Yearly:

i) Check the operation of MCB, relays, TNC.
ii) <u>Testing and calibration of relays</u>.**(Apr)**

d) Repairs:

i) The following items can be replaced and made functional if they are found not repairable, then need to be replaced MCB, Contactors, Cable termination with glands, relays, TNC, selector switch, indicating lamps, voltmeter, ammeter, fuse holders etc. (All spares to be provided by IPR).

ix. <u>22 kV & 11 kV Switch Boards:</u>

a) Daily:

i) Visual inspection
ii) Check whether indication lamps, selector switch, TNC, ammeter, Enercon meters (MFM) are working.
iii) Check whether all relays, are functioning properly.

b) Quarterly:

i) Visual inspection of panels.
ii) Checking of control scheme for healthiness.
iii) Visual Checking of Panel Meters.
iv) Checking of heater circuit & rectification of required.
v) Checking handles and doors & rectification if required.
vi) Checking and ensuring the closing of all the panels/panel doors etc
vii) Checking and sealing of cable entry holes.
viii) Tightening of all earth connections.

c) Yearly:

i) Measurement and recording of IR values for Main Bus bar.
ii) Checking of all terminations for tightness.
iii) Checking of CT, PT and Relays connections for tightness.
iv) <u>Testing of all panel Relays and Meters CT & PT.</u> **(Apr)**
v) Measurement of insulation resistance value of circuit breaker.
vi) <u>Measurement of breaker closing and tripping time.</u> **(Apr)**
vii) <u>Vacuum test</u> **(Apr)**
viii) <u>Measurement of contact resistance.</u> **(Apr)**
ix) Checking of control circuit
x) Visual inspection of earth connections and checking of tightness
xi) <u>Checking of mechanical and electrical interlocks, interlocks within the switch board to ensure proper functioning of the same.</u> **(Apr)**
xii) Checking and sealing of cable entry holes

d) Repairs:

i) <u>During the time of operation any of the items mentioned above are found malfunctioning then they must be replaced.(All Spares/materials will be supplied by IPR and tools should be provided by the party)</u>

x. <u>LT Panel:</u>

a) Daily:

i) Visual inspection
ii) Check whether indication lamps, selector switch, TNC & all meters are working.
iii) Check whether all relays, are functioning properly.

b) Quarterly:

i) Visual inspection of panels.
ii) Checking and sealing of cable entry holes.
iii) Checking of D.C. supply & control switchgear.
iv) Checking of Indication lamps, replacement if required.
v) Checking of Indication Meter and rectification/replacement if, required.
vi) Checking/replacement of fuses if required.
vii) Checking of Bus bar connection, Tightening of nut bolts, cleaning of bus bar if, required.
viii) Cleaning and Tightening of bus bar in the bus bar chamber.
ix) Tightening of all earth connections.
x) Cleaning of the inside and outside panels using blowers and vacuum cleaner.
xi) Cleaning and Tightening of cable Incoming and outgoing terminations.

c) Yearly:

i) Checking of D.C. supply & control switchgear.
ii) Checking & ensuring the closing all panels/panel doors including the supply of necessary material if required
iii) Cleaning of circuit breakers, lubricating the moving parts as per maintenance procedure
iv) Checking of alignment in racking mechanism of breakers for free and smooth movement of circuit breakers. **(Nov)**
v) Checking of contact erosion of circuit breakers. **(Nov')**
vi) Checking of mechanical/ electrical interlocks, interlocks within the switchboard to ensure proper functioning of same. **(Nov)**
vii) Functional operations check of limit switches, auxiliary contacts. **(Nov)**
viii) Visual inspection of earth connections and checking of tightness
ix) Measurement of insulation resistance value of circuit breakers
x) Measurement of contact resistance of circuit breaker poles. **(Nov)**
xi) Measurement of circuit breaker closing and tripping time. **(Nov)**
xii) Functional operations check of circuit breaker
xiii) During operation, any of the items found malfunctioning must be replaced. All material will be provided by IPR. **(Nov)**
xiv) Measurement and recording of IR values for Main Bus bar.
xv) Checking of all terminations for tightness.
xvi) Checking of CT, PT and Relays connections for tightness.
xvii) Testing of all panel Relays and Meters, CTs & PTs. **(Nov)**

xi. 415V Distribution System (MCCBs,MDBs and DBs):

a) Daily:

i) Visual inspection
ii) Check whether indication lamps, selector switch, ammeter, MCBs etc. are working.

b) Quarterly:

i) Check if all the panels are ingress protected.
ii) Routing of cables for new loads if required.

iii) At the time of adding new cable proper tags and ferruling must be done.
iv) Cleaning of the panel.
v) Tightening of all earth connections.
vi) Checking and sealing of cable entry holes.
vii) Checking of D.C. supply & control switchgear.
viii) Checking of Indication lamps, replacement if required.
ix) Checking of Indication Meter and rectification/replacement if, required.
x) Checking/replacement of fuses if required.
xi) Checking of Bus bar connection, Tightening of nut bolts, cleaning of bus bar if, required.
xii) Cleaning and Tightening of bus bar in the bus bar chamber.
xiii) Cleaning of the inside and outside panels using blowers and vacuum cleaner.
xiv) Cleaning and Tightening of cable Incoming and outgoing terminations.

c) Repairs:

i) If any component is found malfunctioning it has to be replaced. Material will be provided by IPR.

XII. CABLE NETWORK:

a) Monthly:

b) Visual inspection of cables.
c) Checking all cable terminals & joints for overhauling /loose connections and tightening, terminating, rejoining, if required.
d) Checking and recording or IR values of all cables with megger of suitable range if the concerned feeder cable is idle for more than one month.

Fault Diagnosis:

Wherever there is fault in any cable network, the contractor has to diagnose the fault in the pertinent cable and identify the type and location of faults if any.

EARTHING SYSTEM:

e) Quarterly:

i) Checking of all earth connections, joints and cleaning and tightening thereof.
ii) Putting adequate quality of water in earth pits.
iii) Checking and recording of earth resistance of all points, pits and taking corrective action to improve it, if required.

xiii. METERS:

a) Daily:

i) Visual inspection.
ii) Checking of each meter (Analog/Digital) for its correct operation, if found faulty/not working replace it with new spare.

xiv. PROTECTIVE RELAYS

a) Quarterly:

i) Visual inspection and cleaning from outside.

b) Yearly:

i) Checking of each relay for its correct operation by secondary injection. **(Apr)**
ii) Cleaning of relay contacts by CRC-2-26. **(Apr)**
iii) Calibration of relay. **(Apr)**
iv) Checking of current/voltage setting as per recommended setting. **(Apr)**
v) Checking of time characteristic as per recommended setting. **(Apr)**

xv. PARTIAL DISCHARGE DETECTION:

a) Yearly:

i) Partial Discharge Detection Test shall be carried for the entire zone of the 132 kV sub-station with appropriate standard procedures. Comparative assessment of the detection and measurements shall be done with previous year's records.

xvi. THERMAL IMAGING:

a) Yearly:

i) Comprehensive thermal imaging for the all the equipment in the entire scope shall be carried out and detailed diagnostic and assessment report shall be provided with suggestive measurements for troubleshooting and preventive measures.

GENERAL TERMS AND CONDITIONS

It is to be noted that **any damage occurs due to faulty operation or maintenance of the contractor** in the sub-station, the contractor has to carry out necessary repair with the supply of parts, consumables within minimum possible downtime and make the same functional. If they are found not repairable, then the same needs to be replaced **with new one without any extra cost.** This will be applicable to all equipment, instruments and controls covered in the scope of contractor as well as those equipment, instruments and controls which are part of the plant but not covered in the scope of contractor.

Notwithstanding as to what is specifically stated under SUB-STATION MAINTENACE SCHEDULE, it shall be responsibility of the contractor to attend to all the preventive & routine maintenance and repairs and breakdown services including replacement of necessary parts and components.

ANNEXURE – I

PART-A: List of Major Equipment and their Main Specifications

Sr. No.	Name of Equipment	Quantity	Make/ Manufacturer	Specifications
1.	Lightening Arrestor	18 Nos.	ELPRO,CGL, W.S. Industries	Voltage Rating-120KV Current Rating-10 KA HSV-145 KV
2.	Voltage Transformer	3 Nos.	AE,CGL	Voltage Ratio-132 KV/110V HSV-145 KV
3.	Current Transformer	21 Nos.	CGL	HSV-145 KV **CT #1A** Ratio-40-80/1 **CT#1B** Ratio-150-300/1 **CT#2** Ratio-150-300/1 **CT#3** Ratio-150-300/1 **CT#4,5,6** Ratio-150-300/1
4.	Circuit Breaker	6 Nos.	SIEMENS	Current Rating-3150 Amp. Type-Spring Charge Mechanism HSV-145 KV
5.	Isolator/Earth Switches	7 Nos.	S&S, SIEMENS	Rating-800 Amp HSV-145 KV (Incoming unit with Earth Switch)
6.	Power Transformers	5 Nos.	TR#1-AYL	Rating-31.5 MVA Percentage Impedence-9.24 Vector Group-DYn11 BIL:-650 KV,Ratio-132 /11.2 KV Cooling-ONAN Insulating Oil volume- 16,990 ltr On load tap changer – XRSD 15/200/19(18) with MA-E, 200A,

			TR#2- NGEF	132KV Rating-37.5MVA (Cont.) 75.0MVA(Peak) Pecentage Impedence-11.4 Vector Group-DYn 11 Ratio-132 /11.5 KV Cooling-ONAN Insulating Oil volume- 27,400ltr OLTC present
			TR#3&TR#4- TRIL	Rating-15 MVA Percentage Impedence-7.5 Vector Group-DYn 11 Ratio-132 /11.5 KV Cooling-ONAN Insulating Oil Volume-17, 350ltr OLTC present
			TR#5- TOSHIBA	Rating-31.5 MVA Percentage Impedence-8.75 Vector Group-DYn 11 Ratio-132 /22 KV Cooling-ONAN Insulating Oil Volume-25,000ltr OLTC present
7.	Control Relay Panels	6 Nos.	MAKTEL	Each panel consists of Annuncia-tion Window, Multi function meter, analog meters, Relays, indication lamps, hooter,TNC etc. Relays (numeric & electromagnetic) Mainly consists of • Overcurrent relay • Differential prot. Relay • REF relays • Master trip relays • Auxiliary relays for WTI, OTI, and bucholz relay • Trip ckt. Supervision relays
	RTCC Panel	5 Nos.	TRIL,NGEF, TOSHIBA	

8.	HT Panels 11 kV Switchgear 22 kV Switchgear	 52 Nos. 10 Nos. 20 nos.	 SIEMENS MEGAWIN SIEMENS	There are 7 HT Panels consists mainly of VCBs, digital meters for current, volatage and frequency, TNC , Selector switch, indicating lamps, analog ammeters & relays VCBs consists of : 2500A – 2 set 1250A - 11 sets 800A – 39 sets Relays (numeric & electromagnetic Mainly consists of : Over current relays(numerical) Under voltage relays(numerical) Mater trip & Auxiliary relays There are 4 nos. 22 kV HT Panels consisting mainly of VCBs, digital meters for current, voltage and frequency, TNC , Selector switch, indicating lamps, analog ammeters & relays 22 kV VCBs consists of: 1250A – 1 set; 800A – 19 sets
7.	Distribution Transformers	11 Nos.	DANKE ELECT. DT#1 - DT#6 DT#7 DT#8 –DT#11 (TRIL Make)	Ratio-11000/433V Cooling-ONAN Vector Group-DYn11 Rating-2 MVA Oil Quantity-1150 ltr Percentage Impedance – 7.37 Ratio-11000/433V Rating-1 MVA Oil Quantity-700 ltr Percentage Impedance – 6.92 Ratio-11000/415V Cooling-ONAN Vector Group-DYn11 Rating-2.5 MVA Percentage Impedance – 7.5
9.	LT Panels	9 Nos.	GEPC,Schneider	Each panel consists of I/C ACB, O/G ACBs/MCCBs, CTs,PTs, analog meters, protection releases and accessories like lamps, space heaters etc.. ACBs are GE make Spectronic breakers with microprocessor

		4 nos	M/s Swati S/G (ABB make CBs & MCCBs)	based releases- RMS 7 having adjustable current time settings for Overload, Short circuit and Earth Fault with Fault indication module and CT's of standard rating Rating of various ACBs- • 3200A-13 sets • 2500 A- 3 sets • 1250A – 3 sets • 800A - 21 sets • 630A - 1 set • 400A - 1 set MCCBs (GE make) of ratings: 400A, 250A, 200A, 125A, 100A Relays mainly consists of: • Under voltage relay • Auxiliary relay • Master trip relay • Earth fault relay • RMS 7 relay Each panel consists of I/C ACBs, B/C ACBs, O/G ACBs and MCCBs, CTs, PTs, analog meters, protection releases and accessories like lamps, space heaters etc.. ACBs will be with microprocessor releases having adjustable current time settings for Overload, Short circuit and Earth Fault with Fault indication module and CT's of standard rating Rating of various ACBs- • 4000 A – 8 sets • 3200A - 4 sets • 2500A - 1 set • 1600 A- 5 sets • 1250A - 2 sets • 800A – 9 sets MCCBs of ratings: 400A, 250A, 200A, 125A, 100A Relays mainly consists of: • Under voltage relay • Auxiliary relay • Master trip relay • Earth fault relay RMS 7 relay

10	415 V MDBs 1) ACDB 2) DCDB	 19 02	 GEPC -	Each panel consists of I/C MCCB, O/G MCBs, CTs, analog meters, protection releases and accessories like lamps etc.. **MDB#1** **Incomer :** **1 No. - 250 A, 35 kA, TPN, MCCB** **Outgoing :** 12 Nos. – 6A, 10 kA, TPN, MCB 2 Nos. – 32 A, 10 kA, TPN, MCB 2 Nos. – 63 A, 10 kA, TPN, MCB (DB # 1 & 2) **MDB#2** **Incomer :** **1 No. - 100 A, 25 kA, 4P, MCCB** **Outgoing :** 6 Nos. – 32 A, 10 kA, TPN, MCB 1 Nos. – 63 A, 10 kA, TPN, MCB **MDB#3** **Incomer :** **1 No. - 200 A, 35 kA, TPN, MCCB** **Outgoing :** 6 Nos. – 32 A, 10 kA, TPN, MCB 2 Nos. – 63 A, 10 kA, TPN, MCB (DB # 3 & 4) **MDB#4** **Incomer :** **1 No. - 400 A, 35 kA, TPN, MCCB** **Outgoing :** 8 Nos. – 32 A, 10 kA, TPN, MCB 3 Nos. – 63 A, 10 kA, TPN, MCB(DB # 5,6 &7) **MDB#5** **Incomer :** **1 No. - 100 A, 25 kA, 4P, MCCB** **Outgoing :** 6 Nos. – 6A, 10 kA, TPN, MCB 1 No. – 16 A, 10 kA, TPN, MCB 2 Nos. – 32 A, 10 kA, TPN, MCB 1 No. – 63 A, 10 kA, TPN, MCB **MDB#6,7,8,9,10 & 11** **Incomer:** 1 No. – 200A, 35 kA, TPN, MCCB **Outgoing:** 3 Nos – 32 A, 10 kA, TPN, MCB 3 Nos. – 40 A, 10 kA, TPN, MCB(DB#8 – 25) **MDB # 12,13,14,15,16 &17**

	Wall DBs	31	MISC	**Incomer:** 1 No. – 100A, 35 kA, TPN, MCCB **Outgoing:** 5 Nos – 32 A, 10 kA, TPN, MCB 1 No. – 63 A, 10 kA, TPN, MCB(DB#26 -31) **MDB # 18** **Incomer:** 1 No. – 250A, 35 kA, TPN, MCCB **Outgoing:** 15 Nos – 20 A, 10 kA, TPN, MCB **MDB # 19** **Incomer:** 1 No. –100A, 35 kA, TPN, MCCB **Outgoing:** 03 Nos – 32 A, 10 kA, TPN, MCB 05 Nos – 32 A, 10 kA, SP, MCB **DC DB # 1** **Incomer :** **1 No. - 250 A, 25 kA, DP, DC MCCB** **Outgoing :** 30 Nos. – 6A, 10 kA, DC, SP, MCB 15 Nos. – 20 A, 10 kA, DC, SP, MCB **DCDB # 2** **Incomer :** **1 No. - 200 A, 25 kA, DP, DC MCCB** **Outgoing :** 10 Nos. – 6A, 10 kA, DC, SP, MCB 10 Nos. – 20 A, 10 kA, DC, SP, MCB **DB # 1:** 12 Ways DB 1 No. - 63 A, 10 kA, TPN MCB with provision for 63 A, 100 mA, DP ELCB as incomer and 12 nos. - 6 A, 10 kA, SP MCBs as outgoing per phase with wire set and separate neutral bars. **DB # 2 :** 6 Ways DB 1 No. - 63 A, 10 kA, TPN MCB with provision for 63 A, 100 mA, DP ELCB as incomer and 6 nos. - 20 A, 10 kA, SP MCBs as outgoing per phase with wire set and separate neutral bars.

				DB # 3 & 4 : 12 Ways DB 1 No. - 63 A, 10 kA, TPN MCB with provision for 63 A, 100 mA, DP ELCB as incomer and 8 nos. - 6 A, and 4 nos. – 16 A, 10 kA, SP MCBs as out-going per phase with wire set and separate neutral bars. **DB # 5, 6, & 7 :** 8 Ways DB 1 no. – 63 A, 10 kA, TPN MCB with provision for 63 A, 100 mA, DP ELCB as incomer and 5 nos. - 6 A, and 3 nos. – 16 A, 10 kA, SP MCBs as out-going per phase with wire set and separate neutral bars. **DB # 8 – 25** 1 no. – 40 A, 10 kA, TPN MCB with provision for 40A, 100mA, DP ELCB as Incomer and 1 nos. 6 A, 10kA, SP, MCB/ phase3nos. 16 A, 10kA, SP, MCB/phase with wire set and separate neutral bars. **DB #26 – 31** 1 no. – 63 A, 10 kA, TPN MCB with provision for 63A, 100mA, DP ELCB as Incomer and 4nos. 20 A, 10kA, SP, MCB/phase with wire set and separate neutral bars.
	DB's @ITER-India Building	10Nos.	Misc.	**DB#1** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 20A, SP MCB **DB#2** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 8 Nos. – 20A, 4P MCB **DB#3** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 32A, SP MCB

				DB#4 **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 8 Nos. – 40A, 4P MCB **DB#5** **Incomer :** **1 No. - 100A, 4P, MCB** **Outgoing :** 12 Nos. – 40A, SP MCB **DB#6** **Incomer :** **1 No. - 125A, 4P, MCB** **Outgoing :** 8 Nos. – 40A, 4P MCB **DB#7** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 20A, 4P MCB **DB#8** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 20A, DP, MCB **DB#9** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 20A, DP, MCB **DB#10** **Incomer :** **1 No. - 63A, 4P, MCB** **Outgoing :** 12 Nos. – 40A, DP, MCB
	415V MCCBs	8Nos. @LTP# 2	GEPC	**1 No.100A, 1No. 200A, 1No. 200A,2 Nos. 400A,1No 600A**
		5Nos. @LTP# 3	GEPC	9Nos. @LTP#10
		6Nos. @LTP# 6	GEPC	**5 Nos. 200A, 1No 250A**

		7Nos. @LTP# 8	GEPC	**4 Nos.100A, 1No. 200A, 2Nos. 250A**
		4Nos. @LTP# 9	GEPC	**4 Nos.100A**
		9Nos. @LTP# 10	GEPC	**7 Nos.100A, 2Nos. 250A**
		18Nos. @LTP# 12	CGL	**3 Nos. 250A, 5Nos. 125A,8Nos. 63A,2 Nos. 400A**
		8Nos. @LTP# 13	CGL	**2 Nos. 250A, 6Nos. 63A**
		8Nos. @SST-1Tok. Hall (VHDP)	Schneider	**3 Nos. 200A, 5Nos. 125A**

PART-B: List of Major Equipment and their Main Specifications
(To be included towards the end of 2017)

Sr. No.	Name of Equipment	Qty	Specifications
1.	HT Panels (11 kV Switch-gear)	8 nos.	There is 2 no. 11 kV HT Panel consisting mainly of VCBs, digital meters for current, voltage and frequency, TNC , Selector switch, indicating lamps, analog ammeters & relays 11 kV VCBs consists of: I/C: 2000 A – 1 set; 800A – 1 set O/G: 800A/1250A – 6 sets Relays (numeric & electromagnetic Mainly consists of : Over current relays(numerical) Under voltage relays(numerical) Master trip relays Auxiliary relays
2.	Distribution Transformers (Dry Type)	2 nos.	Ratio-11000/415V Cooling-ONAN Vector Group-DYn11 Rating-2.5 MVA Percentage Impedance – 7.5
3.	LT Panels	8 nos.	Each panel consists of I/C ACBs, B/C ACBs, O/G ACBs and MCCBs, CTs, PTs, analog meters, protection releases and accessories like lamps, space heaters etc.. ACBs will be with microprocessor releases having adjustable current time settings for Overload, Short circuit and Earth Fault with Fault indication module and CT's of standard rating Rating of various ACBs- •4000A – 11 sets (4P) •3200A – 2 sets (3P) •2500A - 2 sets(3P) •2000A – 1 set(3P) •1600A – 3 sets (3P) •1250A – 4 sets (3P) •800A – 19 sets(3P) •MCCBs of ratings: 630A,400A, 250A, 200A, 125A, 100A Relays mainly consists of: • Under voltage relay • Auxiliary relay • Master trip relay • Earth fault relay
4.	415 V MDBs & 230 V DBs		Details to be provided later.