Appendix-I.

Maintenance Schedule of various electrical equipments :

1. 33 KV double feeder junction point

1.1 Lightning arrestors:

Maintenance schedule shall be as under:

S. No.	Activity	Periodicity	Remarks
1.	Outside visual check	Daily	The maintenance of the 33 KV double feeder junction point mainly depends up on the planned shut downs of the both 33 KV feeders by MPPKVVKLtd . Contractor shall work in coordination with MPPKVVKLtd.
2.	Cleaning and tightening, touch up painting etc.	Yearly	
3.	Checking earth connection and tightening of nuts & bolts.	Yearly	
4.	Replace faulty parts, if required.	as and when required	
5.	Thorough Checking of lightening arrestors and replacement of components, if required (preferably once before monsoon).	Yearly	

1.2 33 KV air break switches:

Maintenance schedule shall be as under:

S. No.	Activity	Periodicity	Remarks
1.	Outside visual check	Daily	The maintenance of the 33 KV double feeder junction point mainly depends up on the planned shut downs of the both 33 KV feeders. by
2.	Clean the porcelain insulators and inspection for cracks and chip off.	Yearly	
3.	Check for tightness of nuts and bolts, drive tube locknuts, drive lever and phase coupling plan bolts etc.,	Yearly	
4.	Check for contact surface coating/wearing. After maintenance and inspection, smear	Yearly	

	the contact surface lightly coated with contact lubricant (petroleum jelly).		MPPKVVKLtd . Contractor shall work in coordination with MPPKVVKLtd.
5.	Check contact gap, if found inadequate replace contact.	Yearly	
6.	Check that all the insulators, electrical components are firmly fixed and let the contacts operate freely. Check all electrical connections for tightness. Check all mounting bolts for tightness. checking of insulator cracks, if any	Yearly	
7.	Cleaning of support insulators and checking of insulator cracks, if any	Yearly	
8.	Checking earth connection and tightening of nuts & bolts .	Yearly	

1.3 33/0.433KV, 750 KVA substations

S. No.	Item	Periodicity
1.	logging of 33 KV metering electrical parameters like KWH , KVAH , calculation of power factor on daily & monthly basis etc.	In general shift (Daily)

1.3.1 Lightning arrestors:

Maintenance schedule shall be as under:

S. No.	Activity	Periodicity	Remarks
1.	Outside visual check	Daily	The maintenance of the 33 KV double feeder junction point mainly depends up on the planned shut downs of the both 33 KV feeders by
2.	Cleaning and tightening, touch up painting etc.	Yearly	
3.	Checking earth connection and tightening of nuts & bolts .	Yearly	
4.	Replace faulty parts, if required.	as and when required	
5.	Thorough Checking of lightening	Yearly	

	arrestors and replacement of components, if required (preferably once before monsoon).		MPPKVVKLtd . Contractor shall work in coordination with MPPKVVKLtd.

1.3.2 33 KV air break switches:

Maintenance schedule shall be as under:

S. No.	Activity	Periodicity	Remarks
1.	Outside visual check	Daily	The maintenance of the 33 KV double feeder junction point mainly depends up on the planned shut downs of the both 33 KV feeders by MPPKVVKLtd . Contractor shall work in coordination with MPPKVVKLtd.
2.	Clean the porcelain insulators and inspection for cracks and chip off.	Yearly	
3.	Check for tightness of nuts and bolts, drive tube locknuts, drive lever and phase coupling plan bolts etc.,	Yearly	
4.	Check for contact surface coating/wearing. After maintenance and inspection, smear the contact surface lightly coated with contact lubricant (petroleum jelly).	Yearly	
5.	Check contact gap, if found inadequate replace contact.	Yearly	
6.	Check that all the insulators, electrical components are firmly fixed and let the contacts operate freely. Check all electrical connections for tightness. Check all mounting bolts for tightness. checking of insulator cracks, if any	Yearly	
7.	Cleaning of support insulators and checking of insulator cracks, if any		
8.	Checking earth connection and tightening of nuts & bolts.	Yearly	

1.3.3 Distribution transformers: 33/0.433KV, 750 KVA Transformers installed to feed the various loads of Institute. This work includes watering of all earth pits installed for of 33 KV substations, ONAN transformers shall be maintained as per the schedule given below,

S. No.	Items of maintenance	Periodicity	Remarks
1.	Logging oil temperature	Daily	
2.	Outside visual inspection including breather, oil level, oil leaks etc.	Daily	
3.	Position of tap changer	Daily	
4.	Check/verify temperature indicators	Daily	
5.	Checks for unusual sound	Daily	
6.	Check for oil Level	Daily	
7.	Checking of breather	Weekly	
8.	Oil filtration as per IS 1866 and IS 10593/9434.	Yearly`	(Oil filtration machine & Testing kit shall be provided by Institute free of cost) .
9.	Record neutral current	Monthly	
10.	Measurement of earth resistance, checking of earthing system continuity, healthiness and rectification if required.	Half yearly.	
11.	Measurement of IR values.	Yearly.	
12.	Cleaning of bushing and external surface of tank and radiators.	Yearly	
13.	Checking of terminal loose connections if any and tightening the same, foundation health etc.	Yearly	
15.	Replace/clean oil gauge glasses, check oil level indicators	As and when required.	
16.	Checking of neutral earth and body earth connections and tightening the same,	Half yearly	

17.	Servicing of tap changer equipment including drive etc.	As and when required	
18.	Reactivation of breather silica gel, oil leak arresting, tightness of bushings, replacement of oil seals etc.	As & when required	

2.1 Main LT Panel : These LV panel is being fed by 750 KVA, 33/.433 KV transformer and distributing power to various loads in all the buildings of the of Institute. Mains change over & Auto mains failure panel comprise of incoming & outgoing Air Circuit Breakers (ACBs), control and protection devices, control transformers, control wiring, Bus bars and measuring instruments (including multifunctional meters), and instrument transformers etc. The periodic maintenance activities of mains change over & Auto mains failure panel shall be as given below:

	Item of maintenance	Periodicity	Remarks
1.	Outside visual inspection	Daily	
2.	Outside cleaning of panels	Daily	
3.	Checking healthiness of contacts (auxiliary & main) surface of ACBs, mounting of contacts spring.	Weekly	
4.	Checking healthiness and proper functioning of control relays, contactors, wiring, fuses and isolating contacts/jaws, meters etc	Yearly/as and when required	
5.	Servicing and testing of ACBs including checking of mechanism for operation (electrical/manual), rack in/out adjustment, alignment. This shall also include thorough cleaning, removal of old grease, dirt, required lubrication and measurement of switching time.	Yearly/as and when required	**(OEM service team and Testing kit shall be provided by Institute free of cost)**
6.	ACBs shunt trip device – checks for operation coil health, terminals & mounting etc. as applicable	Yearly	

7.	Auxiliary switch unit – checks for operation, contacts health, terminals & mounting screws.	Yearly	
8.	ACBs overload device and protective release testing & calibration. Checks for correct setting of releases and prepare record.	Yearly	
9.	Panel inside visual inspection, all compartments cleaning, tightening of bus bars, control wiring etc.	Yearly	
10.	Bus bar testing for IR value	Yearly	

3.1 Distribution panel I and II **:** This LV panel is being fed by Auto mains failure panel (AMF) feeding power to various labs and loads installed at various locations in the three buildings of the Institute. The Distribution panel comprise of incoming motorized 1000 - 4 pole Air Circuit Breaker. The outgoing with eight nos MCCBs of various capacity varying from 250 A to 800 A, out of eight MCCBs four numbers of GE make and four numbers of L&T make. MCCBs are being installed at the Distribution panel for AC distribution, Metering devices & selector switches connected with control wirings, Multi metering devices cum control and protection device, control wiring, bus bars are the part of this panel.

Distribution panel II: LV panel is fed with 400 A MCCB of Distribution panel - I and is installed at the LT room. The incoming of new LV Panel is connected with 400 A MCCB and outgoing with four numbers 160 A MCCBs and 100 A six numbers of MCCBs.

S. No.	Item of maintenance	Periodicity	Remark
1.	logging of electrical parameters like Voltage, currents, etc.	In general shift	
2.	Outside visual inspection	Daily	
3.	Outside cleaning of panels	Weekly	
4.	Checking healthiness of contacts (auxiliary & main) surface of ACBs, mounting of contacts spring.	Yearly/as and when required	
5.	Checking healthiness and proper functioning of control relays, contactors, wiring, fuses and isolating contacts/jaws, meters etc	Yearly	

6.	Servicing of ACBs, including checking of mechanism for operation (electrical/manual), rack in/out adjustment, alignment. This shall also include thorough cleaning, removal of old grease, dirt, required lubrication and measurement of switching time.	Yearly	**(OEM service team and testing kit shall be provided by Institute free of cost)**
7.	ACBs shunt trip device – checks for operation coil health, terminals & mounting etc. as applicable	Yearly	
8.	Auxiliary switch unit – checks for operation, contacts health, terminals & mounting screws.	Yearly	
9.	ACBs overload device and protective release testing & calibration. Checks for correct setting of releases and prepare record	Yearly	
10.	Arc chutes- inspection & cleaning for dust, dirt, foreign material, flow or cracks and take remedial action, if required.	Yearly/as and when required	
11.	Perform MCCBs operational checks & trip tests. Remedial action shall be taken if required.	Yearly	
12.	Panel inside visual inspection, all compartments cleaning, tightening of bus bars, control wiring etc.	Yearly	
13.	Bus bar testing for IR value	Yearly	

4.1 Automatic Power Factor Correction Panel (APFC): APFC panel of rating 200 KVAR (units of 50/25/12.5 KVAR) having MCCB and contactor control for power factor improvement. The schedule of maintenance activities is as given below:

	Item maintenance	Periodicity	
1.	Outside visual inspection	Daily	
2	Outside cleaning	Weekly	
3.	Operational checks of switch gears	yearly	

4.	Healthiness of capacitors & capacitor current measurement	yearly	
5.	Thorough Cleaning, tightness, etc.	Yearly	
6.	MCCBs trip test	Yearly	**(OEM service team and testing kit shall be provided by Institute free of cost)**

4.1 Other equipments:

Watering of earth pits, cleaning, and picking/cutting of grass and vegetation growth in switch yard should be carried out from time to time. Regular cleaning of Switchyard shall be taken up by the contractor and no grass/vegetation growth shall be allowed throughout the contract period. Cable trenches at substation shall be cleaned annually**.**

5.1 LV panels Distribution System (Main DBs and DBs):

This LV panels are being fed by Distribution panel feeding power to various labs / loads installed at various labs/ locations inside the three buildings of the Institute. PDBs and LDBs of labs and Common areas at Institute and CSR Housing Complex are charged by these various LV panels. *The contractor shall provide preventive and maintenance services for the following* LV panels and DBs.

- 400 A Change over switch & Old building Panel –I
- Old building distribution panel –II
- Cryogenic building Panel
- Cryogenic Plant Panel
- He Plant Panel I
- He plant panel II
- Work shop and Dilution Panels
- UHV –STM lab
- New building panel
- New building various labs panels
- PDBs and LDBs of labs and Common areas
- Guest house building panel I & II,

- Old staff quarters panel
- A type staff quarters panel
- B & C Block distribution panel

LV panels:

Daily: a) Visual inspection,

b) Check whether indication lamps, selector switch & all meters are working.

c) Checking and ensuring the closing of all the panel doors etc.,

d) Check whether all relays, are functioning properly.

Weekly:

Cleaning of the LV panels.

Quarterly:

a) Visual inspection of panels.

b) Checking and sealing of cable entry holes.

c) Checking of control switchgear.

d) Checking of Indication lamps, replacement if required.

e) Checking of Indication meter and rectification/replacement if, required.

f) Checking/replacement of fuses if required.

g) Checking of Bus bar connection, Tightening of nut bolts, cleaning of bus bar if, required.

h) Cleaning and tightening of bus bar in the bus bar chamber.

i) Tightening of all earthing connections.

j) Checking and sealing of cable entry holes.

k) Cleaning of the inside and outside panels using blowers and vacuum cleaner.

Yearly:

a) Checking of control switchgear.

b) Checking & ensuring the closing of the wall panels/panel doors including the supply of necessary material if required.

c) Cleaning of circuit breakers, lubricating the moving parts as per maintenance procedure

d) Checking of mechanical/ electrical interlocks, interlocks within the switchboard to ensure proper functioning of same

e) Functional operations check of limit switches, auxiliary contacts Etc.,

f) Visual inspection of earth connections and checking of tightness

g) Measurement of insulation resistance value of circuit breakers

h) Measurement of contact resistance of circuit breaker poles

i) Measurement of circuit breaker closing and tripping time

j) Functional operations check of circuit breaker

k) During operation, any of the items found malfunctioning must be replaced. All materials will be provided by Institute.

l) Measurement and recording of IR values for Main Bus bar.

m) Checking of all terminations for tightness

n) Checking of CT and control relays connections for tightness

Main DBs, PDBs and LDBs: Installed at the Institute and the CSR, Housing Complex,

Daily:

A)Visual inspection & proper doors closing.

b) Check whether indication lamps, selector switch, ammeter, MCBs etc are working.

Quarterly:

a) Check if all the panels are ingress protected.

b) Checking of termination of incoming and outgoing cables

c) Routing of cables for new loads if required (only flexible cables and indoor).

d) At the time of adding new cable proper tags and ferruling must be done.

e) Cleaning of the panel.

f) Checking and sealing of cable entry holes.

g) Tightening of all earthing connections.

Repairs:

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