

नॉर्थ ईस्टर्न इलेक्ट्रिक पावर कॉर्पोरेशन लिमिटेड

NORTH EASTERN ELECTRIC POWER CORPORATION LIMITED



भारत सरकार का उद्यम: A Govt. of India Enterprise

मिनीरत्न : श्रेणी-I: Miniratna : Category-I

एनटीपीसी लिमिटेड की पूर्ण स्वामित्व वाली सहायक कंपनी

A Wholly owned subsidiary of NTPC Ltd



OFFICE OF THE EXECUTIVE DIRECTOR (CONTRACTS & PROCUREMENT)

Corrigendum No. 05 Dated 26. 05. 2026

To

NIB No.490 Dated: 19.03.2026

For

220KV GIS and Pothead yard of 240 MW Heo Hydro Electric Project, Arunachal Pradesh.

Corrigenda to the Bid Document are hereby issued as below:

Sl. No	Bid Stipulation	Amendment
1	Vol-II, Sec-I, Technical Speciation, Sub Sec 1: 220KV GIS with GIB. Clause No.1: Scope Clause No.14: Earthing of the GIS Clause No.25: Online Portable Monitoring System for Partial Discharge Detection	Vol-II, Sec-I, Technical Speciation, Sub Sec 1: 220KV GIS with GIB: Clause No.1: Scope Clause No.14: Earthing of the GIS Clause No.25: Partial Discharge Monitoring System. is amended and replaced by the revised Clauses and attached as Annexure-I of this Corrigendum.
2	Vol-II, Sec-I, Technical Speciation, Sub Sec 2: Pothead Yard Equipment: Clause No.1: Pothead Yard Equipment, Sub Clause 1.1: Scope Clause No.1.6.8: Technical Parameters for Line Trap Clause No.1.14: Direct Stroke Lighting Protection (Additional Clause)	Vol-II, Sec-I, Technical Speciation, Sub Sec 2: Pothead Yard Equipment: Clause No.1: Pothead Yard Equipment, Sub Clause 1.1: Scope Clause No.1.6.7: Terminal Connectors Clause No.1.6.8: Technical Parameters for Line Trap Clause No.1.7.3: Spacers, Corona bells etc. (if required) Clause No.1.7.5: Busbar Conductor Clause No.1.8.3: Steel Structures Additional Clause Clause No.1.14: Direct Stroke Lighting Protection Clause No.1, 1.6.7, 1.6.8, 1.7.3, 1.7.5 and 1.8.3 is amended and Clause No.1.14 is added and attached as Annexure-II of this Corrigendum.

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3	Vol-II, Sec-II, Schedule of Requirement (SOR).	Vol-II, Sec-II, Schedule of Requirement is amended and attached with this corrigendum as revised SOR.
4	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.1.07: 245kV, a set of 3 single phase (Isolated) Gas Insulated metal enclosed 3150A Busbars (GIB) each enclosed in bus enclosures and connecting the line bay module to respective SF6 to AIS bushing as per layout drawing attached with the tender document.SF6 to AIS Bushing also forms part of this item. Each set of Gas Insulated Bus bars (GIB) shall be complete with required gas monitoring system, safety grounding, bends/elbows, non-magnetic support structures, flexible bellows/ expansion joints (if required)	Price for Item at SI.No.2(Earthing Material for connection from over ground riser to equipment, ground bus etc.) under the heading "A (220KV GAS INSULATED SWITCHYARD(GIS))" of revised SOR shall be quoted along with the Item at SI.No.1.07 of the published Price Schedule (BOQ) FOR Supply, F&I and ETC and price break-up shall be submitted after opening of price bid.
5	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.2.02: 212kV,216kV MCOV, Class 4, 20kA rated discharge, single phase station class, ZnO surge arrester complete with surge counter/ leakage meter, terminal connector, mounting structure etc.	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.2.02 shall be read as "216kV, Class 4, 20kA rated discharge, single phase station class, ZnO surge arrester complete with surge counter/ leakage meter, terminal connector, mounting structure etc.
6	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.2.05: 245kV, 1200A, 0.625mH, single phase Line Traps complete with pedestal, support insulators and mounting structure etc.	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.2.05 shall be read as "245kV, 2500A, single phase Line Traps complete with pedestal, support insulators and mounting structure etc.
7	Price Schedule (BOQ) FOR Supply, F&I and ETC SI.No.2.07: GI Structure for the termination gantries, lightening protection, earthing, busbar/al tube etc. as required	Price for Item at SI.No.4,5,6,7 and 8 under the heading "B (POTHEAD YARD EQUIPMENT)" of revised SOR shall be quoted along with the Item at SI.No.2.07 of the published Price Schedule (BOQ) FOR Supply, F&I and ETC and Price Break up shall be submitted after opening of Price Bid.

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8	Price Schedule (BOQ) FOR Supply and F&I Sl.No.4.01: Special Erection/Maintenance Tools and Tackles	Price for Item at Sl. No. a, b, c and d under the heading "OTHER" of revised SOR shall be quoted along with the Item at Sl.No.4.01 of the published Price Schedule (BOQ) FOR Supply and F&I and Price Break up shall be submitted after opening of Price Bid.
9	Price Schedule (BOQ) FOR ETC Sl.No.4.01: Grounding conductor/Cable/wire along with associated accessories for grounding of all non-current carrying items of equipment, transformer neutrals, Gen neutrals etc.	Price for Item at Sl. No. a under the heading "OTHER" of revised SOR shall be quoted along with the Item at Sl.No.4.01 of the published Price Schedule (BOQ) FOR ETC and Price Break up shall be submitted after opening of Price Bid.

26/05/26

CGM(Tech)

Contract & Procurement
NEEPCO, Shillong.

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OFFICE OF THE EXECUTIVE DIRECTOR (CONTRACTS & PROCUREMENT)

Not in Original

Memo No. QP/C&P/F/E/Heo HEP(GIS)/ 2142/ VOL-1/2025-26/ 404-413 Dated: 26.05.2026

1. The Chairman and Managing Director, NEEPCO, Shillong for favour of kind information please.
2. The Director (Finance), NEEPCO, Shillong, for favour of kind information please.
3. The CTO, NEEPCO, Shillong, for favour of kind information please.
4. The ED Projects (Hydro), NEEPCO, Guwahati, for kind information please.
5. The ED, D&E, NEEPCO, Guwahati, for kind information please.
6. The ED, CPMG, NEEPCO Ltd., Guwahati, for kind information please.
7. The ED(Finance), NEEPCO, Shillong for kind information please.
8. The Head of Project, Heo HEP, NEEPCO, Dist- Shi Yomi, Arunachal Pradesh, for information please.
9. The CGM (IT), NEEPCO, Shillong for information with a request to arrange for uploading the Corrigendum at NEEPCO Website.
10. The Assistant Hindi Officer, Hindi Section, NEEPCO, Shillong, for translating the Corrigendum to Hindi. It is also requested to forward the Hindi Version of the Corrigendum to IT Wing, Shillong for uploading in NEEPCO Website.

[Handwritten Signature]
26/05/26

CGM(Tech)
Contracts & Procurement
NEEPCO, Shillong.

220 kV GIS and Pothead yard of Heo Hydro Electric Project (240 MW) Arunachal Pradesh		Technical Specification Volume II Section-I Sub Sec. 1 220kV GIS with GIB
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220 kV GAS INSULATED SWITCHGEAR (GIS) with GAS INSULATED BUS DUCT (GIB)**1. Scope**

This section covers the criteria for design, manufacture, supply and transportation up to site, handling and storage at site, erection, testing and commissioning of one (1) 220 kV Gas Insulated Switchgear (GIS) & required Gas Insulated Bus Duct (GIB), spare parts for five (5) years trouble free operation, special tools and tackles and as described in the specification. The 220 kV Gas Insulated Switchgear GIS & GIB will be installed in the powerhouse of the Heo HEP, the latter erected on the left bank of Yarjep (Shi) river located in District Shi Yomi, Arunachal Pradesh.

The layout shall be generally as shown on the drawings however, subject to the provisions of this specification and approval of the Engineer, these may be adjusted as necessary to suit the manufacturer's standard design.

The Gas Insulated Switchgear (GIS) will be the 220 kV Substation, installed in the GIS Hall (EL more than 1000m) located above transformer hall, in the GIS Building.

The Gas Insulated Switchgear (GIS) Bays shall be connected directly to respective generator transformers (GTs) and SST located in transformer hall and to respective SF6 to Air Bushings located in pot head yard, through Gas Insulated Bus (GIB).

Design of Earth mat of the GIS hall shall be prepared by the by the bidder.

Earthing connection from the over ground riser located at GIS hall to GIS equipment and panels shall be in the scope of the bid.

The switchyard layout shall be designed to accommodate future extension, including space provision, for one reactor bay and two future outgoing feeder bays.

Exclusion:

- I. All kind of civil works like construction of foundations, cable trenches etc. are excluded from the scope of the Contract. However, supply of foundation bolts & other embedded parts, foundation details and other specification for the finalization of civil drawing where ever required shall be under the scope of contract.
- II. Laying of earth mat is excluded from this scope of contract. However, earthing design of the GIS hall and over ground earth connection from riser to GIS equipment and panels shall be included in the scope of this contract.
- III. Supply of cable tray is excluded from the scope of contract. However, the contractor shall coordinate with the Powerhouse contractor for their requirement during detailed



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engineering.

14. Earthing of the GIS

- The grounding system shall be designed and provided as per IEEE-80-2013 and CIGRE-44 to protect operating staff against any hazardous touch voltages and electro-magnetic interferences. Design of Earth mat of the GIS hall shall be prepared by the bidder considering all the factors including "Very fast transient over voltage", 'Transient enclosure voltage' etc. and shall be submitted by the successful bidder.
- The GIS supplier shall define clearly what constitutes the main grounding bus of the GIS. The contractor shall supply the entire material for grounding bus of GIS viz conductor, clamps, joints, operating and safety platforms etc. The contractor is also required to supply all the earthing conductors and associated hardware material for connecting all GIS equipment, bus ducts, enclosures, control cabinets, supporting structure, GIS surge arrestor etc. to the ground bus of GIS.
- The enclosure of the GIS may be grounded at several points so that there shall be grounded cage around all the live parts. A minimum of two nos. of grounding connections should be provided for each of circuit breaker, current transformers, voltage transformers, cable terminals, surge arrestors, earth switches and at each end of the bus bars. The grounding continuity between each enclosure shall be effectively interconnected either internally or externally with Copper bonds of suitable size to bridge the flanges. Subassembly to subassembly bonding shall be provided to bridge the gap & safe voltage gradients between all intentionally grounded parts of the GIS assembly & between those parts and the main grounding bus of the GIS.
- The enclosure grounding system shall be designed to minimize circulating currents and to ensure that the potential rise during an external or internal fault is kept to an acceptable level. The guidelines of IEEE Std. 80-2000 on GIS grounding, especially the transient ground potential rise caused by high frequency phenomena, shall be taken into consideration while designing the grounding system for GIS. The manufacturer shall furnish readily accessible connectors of sufficient mechanical strength to withstand electromagnetic forces as well as capable of carrying the anticipated maximum fault current without overheating by at least from two paths to ground from the main ground bus. The contractor shall provide suitable measure to mitigate transient enclosure voltage caused by high frequency currents due to by lightning strikes, operation of surge arrestor, phase to earth fault and discharges between contacts during switching operation. The grounding system shall ensure safe touch & step voltages in all the enclosures. The manufacturer shall provide suitable barrier of non-linear resistor/counter discontinued SF6/Air termination SF6/HV cable bushing etc. to mitigate





transient enclosure voltage.

- The grounding arrangement of GIS shall ensure that touch and step voltages are limited to safe values. The enclosures of the GIS shall be grounded at several points and connected to ground bus such that there shall be a grounded cage around all live parts;
- The three (3) enclosures of the single-phase GIS shall be bonded to each other at the ends of the GIB to ensure and localize flow of circulating currents;
- Substantial earthing terminals / pads suitable for connecting 75 x 8 mm mild steel flat capable of carrying the maximum possible earth-fault current shall be provided at positions to be determined by the GIS manufacturer. The terminals shall be designed to carry this current without damage for a duration at least equal to the short circuit period of the main busbars. These grounding terminals shall be suitable for bolted connection;
- The Contractor shall provide the material and labor to bond each earthing terminal to the main grounding grid located within the GIS hall and GIB in Transformer enclosures / hall. Earthing conductors shall be capable of withstanding 50 kA for 1 second;
- Where operating mechanism cabinets are mounted on the GIB enclosures, the grounding shall be made by separate conductor. Local control cabinets and marshalling boxes shall be grounded through a separate conductor;
- All conduits and control cable sheaths shall be connected to the control cabinet or marshalling box grounding bus. All steel structures shall be grounded. All wirings of GIS shall be shielded and grounded. Sub-assembly to sub-assembly ground conductors should be provided to ensure safe voltage gradients;
- Provisions of IEC 62271-203 and IEC 60694 regarding safeguards in earthing of connected cables, testing during maintenance and other safety measures shall be ensured.

EQUIPOTENTIAL EARTH MAT: (BELOW THE GIS)

- When a fault current flows through the earthing connections into the soil, the enclosures, linked to the earthing circuits, are carried at the same potential as the earthing mat conductors but this potential is generally different from that on the soil surface.
- In order to ensure the security of personnel, it is necessary to install an equipotential mat linked to the general earthing mat in the zones where metal enclosures and fixed accessories are accessible from the floor.
- It is also necessary to provide an equipotential earthing mat in the zones where an emergency mechanical operation or a locking system is accessible from the floor. It is therefore possible to extend the equipotential mat to allow the operator to carry out his manoeuvres.
- In order to ensure a good equipotential surface, each element of the equipotential mat must be

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connected to the general earthing network by the manufacturer.

- This mat will be placed on the floor, all around the switch gears. It is not required in front of the control cubicles. If it is an oxidizing material, it should be hot dip galvanized.
- The manufacturer must provide and specify this equipotential earthing mat. The location of the equipotential mat should be defined by the supplier for all the GIS and at places where:
 - The enclosures are accessible for the floor.
 - Manual operation of apparatus or locking system is located.
- Three copies of final equipotential earth mat drawings along with design calculations may be submitted for approval by the successful Tenderer.

25. Partial Discharge Monitoring System

25.1 Continuous Online Monitoring System for Partial Discharge Detection

- The GIS shall be provided with a continuous monitoring system for partial discharge measurement using Ultra High Frequency (UHF) method. For the purpose adequate numbers of UHF sensors (on each phase) at strategic locations covering the entire installation shall be provided. The Partial Discharge Monitoring system shall be used to monitor any kind of partial discharges occurring inside the insulation of EHV equipment. The system should be usable during the HV testing (whilst installation and commissioning) as well as during maintenance of GIS (and transformers).
- The system shall be self-sufficient to sense, acquire and analyse the UHF signals emitted by partial discharge in GIS. It should be able to identify and classify even the smallest of partial discharge. The system should be able to take inputs from internal and external couplers and optimise the number of inspections required to cover the full GIS. It should be easy to carry in between bays and designed to withstand under difficult environmental condition allowing PD recording of 1 hour to 12 months.
- The analysis system should be a Windows based software platform that allows easy configuration of substation and locations. It should allow importing / exporting and storing the configurations and easily retrieving them later. System should also provide facility to connect remotely using remote client.
- System should be able to take inputs from any UHF coupler fitted in the GIS. A sampling resolution of 256 samples per cycle shall be provided to ensure accurate PD detection. The sensitivity of the offered system shall be in accordance with CIGRE document for UHF detection TF 15 / 33.03.05 that will be verified as part of site sensitivity tests. System should





eliminate all external noise automatically. It should also distinguish between noise and coincidence of PD event among different phases. System should be able to identify and analyse the PD quickly in real time similar to the online PD monitoring system. The contractor / bidder shall furnish the details of offered system with the bid for information / review of employer. Reputed manufacturer like Megger/ Omicron/ Qualitrol PD monitoring system shall be preferred.

- The system shall capture high frequency transient phenomenon, generated by partial discharges, characterized by measuring signals in the UHF range (Ultra High Frequency, 100MHz-2000 MHz).
- The online PDMS shall be tested according to the following standards.
- EN55011:11/2009 – IEC61326-1:5/2006, IEC61000-3-2:9/2005, IEC61000-3-3:9/2008, IEC61000-4-3:5/2006 – IEC61326-1:5/2006, IEC61000-4-4:12/2004 – IEC61326-1:5/2006, IEC61000-4-5:11/2006 – IEC61326-1:5/2006, IEC61000-4-6:5/2003 – IEC61326-1:5/2006, IEC61000-4-11:8/2004 – IEC61326-1:5/2006, IEC61000-4-2:03/2009 – IEC61326-1:5/2006, IEC60255-5, IEC61180, IEC61000-4-8, IEC61000-4-9, IEC61000-4-10, IEC60068-2-1/2, IEC60068-2-6, IEC60068-2-27, IEC60529
- The Monitoring of the PDMS system must be Continuous and real time via simultaneous channels. No Multiplexer device or system shall be allowed.
- The PDMS System should be display partial discharge amplitudes in dB μ V and dBm and the user should have the access to select the amplitude as per the requirements.
- The PDMS system should be capable to measure and store the data of time period of measurement is minimum of 5 years.
- The PDMS shall be extendable up to minimum of 1000 measurement channels and the data acquisition unit should have minimum 60 numbers of channels in 1 rack to avoid multiple devices and further handling.
- Also the PDMS system should have 2 different types of data monitoring system for indoor IP54 and for outdoor it should be IP65 rated.
- All the PD sensors should have protection or PDMS system OEM should provide the protection device to avoid electrification to avoid damage to the equipment as well as humans.
- The UHF PD signals should convert to lower frequencies (<2MHz) directly at the output of the UHF Sensor and transmitted from UHF sensor to Acquisition unit to avoid external interference in the measurement and it can transmit the PD signal up to 80-meter distance.
- Each Racks must be equipped with built in UPS system for backup during supply interruption the backup time is a minimum of 20 minutes duration.
- Control Cabinet of the PDMS is installed with:

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- Latest version of Industrial type PC (IPC) with MS Windows 10 or Newer.
 - The server must have Two RAID controlled hard disk for redundancy.
 - IPC is installed with optional CD drive, a Keyboard & Mouse drawer.
 - The system must have 21" touch screen display for easy operation (Normal monitor display not allowed)
 - The system should have laser colour printer for reporting.
 - The system should be capable for LAN interface for Time synchronisation via NTP and shall be configured for establishing a Windows Remote Access Connection
 - The Cabinet Must be lockable type to avoid unauthorized access.
 - The cabinets should have dedicated UPS.
- PDMS Control Software:
- The software should have Measurement data's as PRPD (Phase Resolved Partial Discharge) Pulse diagram, Trend measurement, PDIV & PDEV etc.
 - Overview of the GIS (Gas Schematic Diagram or Single Line Diagram) with the indication of Position and Labelling of each sensor.
 - Trending of Upp and Upavg for each sensor
 - Provide 3D view (Time, Phase Angle & Amplitude)
 - Live scope view of measurement
 - Monitored by Watchdog to ensure that the software runs all time
 - PDMS control software shall provide analysis panel for analysing the historic and the life measurement data for multiple sensors in parallel
 - Control Panel shall provide Upp and Upavg trending for an adjustable time period
 - The Time Period shall be adjustable though start and end or selecting hourly/daily/weekly/monthly plot
 - Possible to view the historical data over the lifetime of the system
 - Measurements of different phases of one sensor position shall be beneath each other to ease the comparison of signals.
 - PDMS control software can be switchable to a manual operation mode for investigative measurements, commissioning, and for HV Test modes.
 - During the Manual operation mode operator can display the live (Update period below 0.5s) scope view of up to 24 sensors in parallel to get instant feedback about PD activity in the GIS.
 - Manually start the recording of PRPD s for further analysis
 - Measurements gain is adjustable
 - Dedicated HV mode will record all measurements during the HV test along the HV voltage values to check the PD inception & extinction voltage and the same will be replayed later.





- Control software has dedicated Maintenance mode to Suppress/Pause the event and alarm generation in case the owner wants to perform any maintenance activities in the system.
- Control software provides a dedicated mode for the sensitivity verification procedure according to CIGRE TBA654 (former CIGRE 15/33.03.05).
- Dedicated mode should guide the user through the verification procedure, store the measurement data and provide a detailed report in MS Word or PDF format.
- PDMS control software shall generate logs:
 - High level PD Events & Low-level PD Events
 - System Fault Events
 - Maintenance Request Events
 - Switching Operations
 - Communication Errors
 - PD events shall be indicated to ease the review of significant data
- Alarm Criteria:
 - Allows to set thresholds along a count rate that need to exceed this threshold in an adjustable period of time.
 - Shall be adjustable to avoid short term interruptions from external disturbances
 - Shall be adjustable for individual sensor or group of sensors
- PRPD Measurement & Synchronization condition:
 - To guarantee a phase resolved PD measurement, the PDMS shall be synchronized to the HV supply of the GIS through AC signals from the VT's
 - There should be a minimum of 4 sync-inputs to connect VT signals from each section of each busbar, for the proper synchronization at all time
 - PDMS shall provide a facility to automatically select one active synchronization signal
- PDMS Features:
 - PDMS shall provide an extensive self-monitoring facility
 - System shall monitor the status of MCBs, overvoltage protections, the redundant fiber optic ring network, the connection to each acquisition unit, the connection to each frequency converter unit and the status of heating and cooling devices.
 - Each change of the status of the monitored equipment shall lead to event that logged in the control software event list
 - PDMS use gating antennas to pick up the external noise signals and eliminate.
- IEC61850 Integration:
 - Integration to the Substation SCADA/SAS shall be through an IEC61850 interface
 - The current Measurement data and PD alarm indication for each sensor shall be available

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- The system shall communicate any system fault or maintenance requests over IEC61850
- Alternatively, potential free contacts should be available to forwards events and alarm situations via hardware
- Calibration:
 - UHF couplers must be first calibrated as per CIGRE procedure TBA654 as part of factory acceptance tests to guarantee detection sensitivity of 5pC
 - GIS of same design shall be used as test specimen during the coupler calibration. The Pulse injection level determined through above the factory calibration tests shall only be used as reference for site sensitivity checks during commissioning of the PDMS system. The data sheet/ frequency response characteristics shall be submitted for reference.
 - Pulse generator for UHF sensor sensitivity test shall also be supplied as a standard accessory.

● PD Fault Identification & Location/Pattern Recognition/Predictive Maintenance Diagnostic Software:

To interpret various types of PD defects, intelligent diagnostics software (expert system) shall be built- in as part of the PDM software capability. This is mainly to reduce the dependence on PD specialist. The bidder shall also make available typical point-on-wave patters as library pictures to train the user.

ADDITIONAL REQUIREMENT

- The bidder shall provide a reference list of PD monitoring system, which is supplied by them and is in successful operation in a power utility.
- The bidder/OEM should have supplied system in 200kV GIS and above.
- The bidder/OEM of PDMS should be in the business of supply of PDMS for Generator for at least 10 years. Please submit customer reference list.
- OEM of equipment should have manufacturing facility and service center in India to support the product throughout its life cycle and documentary evidence should be submitted along with bid.



220 kV GIS and Pothead yard of Heo Hydro Electric Project (240 MW) Arunachal Pradesh		Technical Specification
		Volume II Section-I
		Sub Sec. 2 Pothead Yard Equipment

1. POTHEAD YARD EQUIPMENTS

1.1. Scope

This specification covers the design, manufacturing or manufacture co-ordination, testing at manufacturer's works, ex-works supply, loading at manufacturer's works, insurance, transportation, and destination store delivery, erection testing & commissioning of following equipment along with their accessories for 220 kV pothead yard near Power House. All the required accessories, documents & equipment whether specified herein or not shall be in the scope of the bidder.

The scope shall also include supply of special tools & plants required for the erection, testing and commissioning of 220 kV pothead yard equipment and also supply of mandatory spares required for maintenance of supplied equipment for five years trouble free operation. The manufacturer shall also recommend the additional spares required for efficient and trouble-free operation of the pothead yard:

The pothead yard is planned to include two-line bays: one outgoing line to Tato-1 HEP, one outgoing line to Kaying PS and two future bays.

Lay out plan drawing of the Pothead Yard shall be prepared by the bidder and submit for approval.

Design of Earth mat of the Pothead yard floor shall be prepared by the bidder.

Earthing connection from the over ground riser located at Pothead yard floor to equipment and structures shall be in the scope of the bid.

Pothead Yard Equipment (for each bay):

- i) Disconnecter with Earth Switches;
- ii) Capacitive voltage Transformers;
- iii) Surge Arresters;
- iv) Line Trap;
- v) Bus Post Insulators;





- vi) Pothead yard Structures;
- vii) Conductor;
- viii) Bay Marshalling Kiosk
- ix) Fencing.

All equipment/ components shall be suitable for operation at an altitude above 1000 m above MSL.

Exclusion:

- I. All kind of civil works like construction of foundations, cable trenches etc. are excluded from the scope of the Contract. However, interface with the civil contractor and supply of foundation bolts & other embedded parts, foundation details and other specification for the finalization of civil drawing where ever required shall be under the scope of contract.
- II. Laying of earth mat is excluded from this scope of contract. However, earthing design of the Pot head yard floor and over ground earth connection from riser to equipment and structures shall be included in the scope of this contract.
- III. Supply of cable tray is excluded from the scope of contract. However, the contractor shall coordinate with the Powerhouse contractor for their requirement during detailed engineering.
- IV. Stringing from transmission line dead-end tower to Pothead yard gantry structure is excluded from the scope. However, conductor droppings for pothead yard equipment connection shall be in the scope of this contract.

1.6.7 Terminal Connectors

The line traps shall be suitable for connection to ACSR Moose Quad conductor. Necessary connector shall be supplied by the Bidder.

Line traps shall be supplied with the necessary terminals and connectors, as required by the ultimate design for the particular installation. The clamps and connectors shall meet the requirements as given in General Technical



Requirements.

Bird barriers: The bird barrier design shall be such that no entrance to the line trap shall admit a sphere having a diameter of 16 mm.

1.6.8 Technical Parameters for Line Trap

Wave Trap shall be outdoor pedestal mounting type suitable for erection on top of the CVTs.

Wave Trap shall conform to IEC 353 fulfilling the following technical particulars:

- Temperature range -10°C to $+50^{\circ}\text{C}$;
- Elevation $> 1000\text{ m}$;
- Rated power frequency 50Hz ;
- Rated system voltage 220Kv ;
- Highest system voltage 245kV ;
- Rated continuous current at 40°C ambient 2500 Amp ;
- Rated short time current for 1 sec. 50kA ;
- Rated system frequency 50Hz ;
- Asymmetric peak value of the first half wave of rated Short time current 127.5 kA ;
- Carrier frequency blocking range 30kHz to 500kHz ;
- Nominal discharge current of protective device at $8/20\mu\text{ Sec}$ 10kA ;
- Minimum blocking resistance 570 Ohm ;
- Type of tuning Broad Band;
- Inductance 1.0 mH or 0.5 mH ;
- Tapping Loss $<2.6\text{ dB}$.

The Bidder shall indicate continuous current rating of the Wave Trap at 65°C ambient.



1.7.3. Spacers, Corona Bells etc. (If Required)

Spacers shall conform to IS: 10162. The spacers are to be located at a suitable spacing to limit the short circuit forces and also to avoid snapping of sub conductors during short circuit conditions. Necessary spacers span calculation shall be provided by the Bidder during detailed engineering for the approval of Employer.

Specifications of ACSR Moose quad conductor for which these spacers are required are described separately.

1.7.5. Busbar Conductor

The Conductor shall conform to IS: 398 (part V) - 1992 except where otherwise specified herein.

The details of the conductor are tabulated below:

ACSR Moose quad conductor

- The details of aluminium strand are as follows:

Minimum breaking load of strand before stranding	1.57 kN
Minimum breaking load of strand after stranding	1.49 kN
Maximum D.C. resistance of strand at 20°C	2.921 Ohms/km

- The details of steel strand are as follows:

Minimum breaking load of strand before stranding	12.86 kN
Minimum breaking load of strand after stranding	12.22 kN

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Minimum number of twist to be withstood in torsion test when tested on a gauge length of 100 times diameter of wire	18 - before stranding 16 - after stranding
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1.8.3. Steel Structures

For design of steel structures loads such as dead loads, live loads, wind loads etc. shall be based on IS: 875-1987. Wind on wire & structure shall be considered as per IS: 802 Part 1)-1977.

Wind pressure on conductor & ground wire shall be considered as 45 Kg. /sq. m on full projected area of conductor & ground wire under full wind condition & 30 Kg/sq. m under 2/3 of full wind condition respectively.

Wind on structure shall be considered as 195 Kg. /sq. mtr & 130 Kg. /sq. mtr. on 1.5 times the projected area of windward face under full wind condition & 2/3 full wind condition respectively. Wind on projections of members on longitudinal face should be taken as 1.0 times of the projected area.

Wind on structure should be applied on each panel of the column.

Wind on insulator shall be calculated as per IS: 802 (Part 1)-1977.

Seismic forces as per IS: 1893 (Latest) shall be taken into consideration for seismic zone V.

For materials and permissible stresses IS: 802, Part-1, Section-2, 1992 shall be followed in general however additional requirements given in following paragraphs shall be considered.

Steel Sections for the members to be used for various parts of steel sections shall conform to IS: 2062 grade A. Only equal angles shall be used. Properties of the steel sections shall be as per IS: 808.

Minimum thickness of galvanized structural member shall be as follows:






Members	Minimum thickness (mm)
Leg members, Ground wire Peak members/ Main members	5
Other members	4
Redundant members	4
Gussets	5

The gussets which are transferring load to other members should have thickness of 2 mm. more than the member from which load is to be transferred.

Maximum slenderness ratios (KL / r):

- Leg members & peak members 120
- Lattice & other design members 200
- Secondary members 250

As per IS-802 Part-1, Section-2, 1992.

Minimum distance from hole center to edge shall be 1.5 x bolt diameter. Minimum distance between center to center of holes shall be 2.5 x bolt diameter.

In order to facilitate inspection and maintenance, the structures shall be provided with climbing devices. Each gantry shall be provided with step bolts not less than 16 mm diameter & 175mm long spaced-not more than 450 mm apart, staggered on faces on one leg extending from about 0.5 meters above ground level to the top of the Structure. The step bolt shall conform to IS: 10238.

All structures shall be designed for the worst combination of dead loads, live loads, wind loads, loads due to deviation of conductor & ground wire, load due to unbalanced tension in conductor & ground wire, torsional load due to unbalanced vertical and horizontal forces, erection loads, short circuit forces including "snatch" in the case of bundled conductor etc. Short circuit forces shall be calculated considering a fault level of 50 kA.



The conductor used shall be ACSR Moose quad conductor as indicated in the drawings enclosed herewith. The GSS Ground wire used shall be 7/3.15 mm. CIGRE Guide No. 7.0 and IEC 865 may be followed for evaluation of the short circuit forces.

Pothead yard gantry structures shall be designed for the two conditions i.e. normal conditions and short circuit condition. In both conditions the design of all structures shall be based on the condition where stringing is done only on one side i.e. all the three (phase) conductors broken on the other side. Factor of safety of 2.0 under normal conditions and 1.5 under short circuit/broken wire conditions shall be considered.

In case of transverse loads due to wind on wires of actual wind span, no shielding effect of conductors shall be considered.

Vertical load of half the span of conductor / string and the earth wires on either side of the beam shall be taken into account for the purpose of design. Weight of man with tools shall be considered as 150 kgs. for the design of structures. For beam design 150 kg/phase (Total=450kg). Insulator string consists of 25 discs of 120 kN/string (Double Tension String). Weight of insulator shall be calculated accordingly.

Unbalanced longitudinal load as tabled below should be considered:

Case	Wind Pressure kg/ m ²	Unbalanced/Longitudinal Load / Sub conductor	Unbalanced/Longitudinal Load / Ground wire
1	45	820 kg.	435 kg.
2	30	1000 kg.	440 kg.

Terminal take off gantries shall be designed for a minimum conductor & ground wire tension of 1 metric tonnes per sub conductor & 440 Kg respectively. The maximum distance between terminal gantry and dead-end Structure shall be taken as 100meters.

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The design of these terminal gantries shall also be checked considering +/- 30 deg. deviation of conductor & ground wire in both vertical and horizontal planes.

The girders shall be connected with lattice columns by bolted joints.

Foundation loads shall be calculated as per above mentioned loads & anchor bolts shall be designed accordingly.

The bidder shall submit the loads on each structure along with the bid.

1.14. Direct Stroke Lightning Protection (Additional Clause)

The bidder shall provide adequate overhead shielding to effectively prevent direct lightning strikes to any equipment within the Pothead yard areas and Powerhouse building. The system shall also be designed to provide "effective shielding" to ensure that no insulation flashover can result from atmospheric discharges striking the overhead shielding. The screens shall be of aluminium clad steel wires, and connected to provide low impedance paths to earth.

The lightning protection scheme shall be designed by the bidder using the latest version of the electro geometric model (EGM) or Razevig method. Detailed calculations demonstrating the adequacy of the proposed shielding shall be submitted to the Purchaser for approval prior to the overhead shielding design being finalized. The Detailed calculations shall accompany the layout with section drawing of the proposed system.

The bidder may propose a lightning mast and/or shield wire system. Overhead shield wires shall not make use of "X" patterns & shall not lead to a fault, if broken. Conductor sag shall be considered when designing the overhead shielding system; however, conductor swing need not be considered.

The layout of the earth wires shall be such that equipment to be protected generally lies within areas bounded by two or more conductors, in which case the





protected angle shall not exceed 45° . Where equipment is protected by a single earth wire, the protective angle shall not exceed 35° to the vertical.

The overhead earth wire shall be suitable for extension to protect the substation equipment to be installed in future stages of development.

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1. INTRODUCTION

Broad schedule of requirements is furnished herewith for price schedule as mentioned in Section IX, Vol-I of the Bid Documents. The schedule of requirements is indicative of requirements of GIS & GIB, Pothead yard & PLCC equipment and essential services. The scope of supplies and services shall be as per various clauses in the different volumes of this Package and the tenderer shall be responsible to ensure completeness of supplies and services even though these are not fully covered in this volume. The switchyard layout shall be designed to accommodate future extension, including space provision, for one reactor bay and two future outgoing feeder bays.

Any item of supply not explicitly listed but otherwise either evident by the contents of the specifications or essential for smooth operation of the equipment shall be construed as forming part of the supply and no additional charges shall be payable for the same.

If any particular items which were not explicitly listed are found to be essential, the tenderer / contractor shall affirm the inclusion of the same in the scope of supply without any extra charge on the contrary if any items reflected in this Schedule of Requirement is not required; the tenderer shall exclude such items. However, such inclusion / exclusion shall be brought out in the Schedule of Deviation with justification for consideration of the purchaser.

Tenderer shall have to quote as per list of items / equipment detailed in this section as well as taking Technical Specifications & drawings into consideration.

The schedule of requirement given below may under-go a change during detail engineering.

Mandatory special tools, tackles & slings etc. if in two different sections, the same shall be considered only once for procurement and it shall be brought-out in the schedule of deviation.

Tenderers have liberty to include / delete the items suiting to their plants & equipment but such inclusion / deletion shall be clearly reflected in schedule of deviation with proper justification subject to acceptance of the purchaser. The spare parts shall be interchangeable with and shall be of the same or higher quality than the original component.

Tenderers shall have to quote for each individual mandatory spare.



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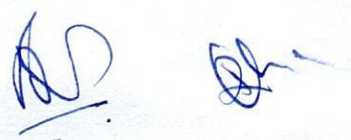
2. SWITCHYARD EQUIPMENT

Sl.No.	Brief Description	Quantity
A.	220kV GAS INSULATED SWITCHGEAR (GIS)	
1.	245 kV, 3150A, 50kA, 3 Ph, 50Hz, Gas Insulated metal enclosed Switchgear (GIS) having double bus and with the following arrangement of bays and other details as per technical specification and enclosed SLD & Layout drawings.	
1.1	245kV, 3 Ph units, SF6 gas insulated, metal enclosed 3150A bus bars running along the length of the switchgear to interconnect the envisaged circuit breaker bay modules. Each bus bar set shall be complete with voltage transformers, safety grounding switch, bay marshalling box, support structure, SF6 gas monitoring system LCC etc. and suitable for future extension (if any) at both ends.	2 Nos.
1.2	245kV, 3150A Generator Transformer bay module complete with bus isolators & Earth switch, CB, 6 core CTs, Earth switch, Line side isolator, high speed earth switch, surge arrestor with surge counter, marshalling box, SF6 gas monitoring system for complete bay, LCC etc as required.	3 Sets
1.3	245kV, 3150A Station Service Transformer (SST) bay module complete with bus isolators & Earth switch, CB, 6 core CTs, Earth switch, Line side isolator, high speed earth switch, surge arrestor	1 Set




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	with surge counter, marshalling box, SF6 gas monitoring system for complete bay, LCC etc as required.	
1.4	A set of GIB connections between GIS module and associated three numbers single-phase step-up transformers for each Generator Transformer bay, SST, each GIB is rated for 245kV 3150A as per Layout Drawings attached with the tender document. Each set of Gas Insulated Busbars (GIB) shall be complete with required gas monitoring system, safety grounding, flexible bellows/expansion joints, bends/elbows, non-magnetic support structures etc. as required to complete the installation and for its safe working.	4 Sets
1.5	245kV, 3150A Bus coupler bay module complete with Bus isolators and earthing switches, CB, 6 core CTs, SF6 gas monitoring system, marshalling box, LCC etc. in line with Technical specification.	1 Set
1.6	245kV, 3150A Line Bay modules complete with Bus Isolators & Earthing switch, CB, 6 core CTs, earthing switch, line side isolator with high speed E/S, marshalling box, SF6 gas monitoring system, LCC etc. for complete bay.	2 Sets
1.7	245kV, a set of 3 single phase (Isolated) Gas Insulated metal enclosed 3150A Busbars (GIB) each enclosed in bus enclosures and connecting the line bay module to respective SF6 to AIS bushing as per layout drawing attached with the tender document. SF6 to AIS Bushing also forms part of this item. Each set of Gas Insulated Bus bars (GIB) shall be complete with required gas monitoring system,	2 Sets



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	safety grounding, bends/elbows, non-magnetic support structures, flexible bellows/ expansion joints (if required).	
2.	Earthing Material for connection from over ground riser to equipment, ground bus etc.	1 Lot
B.	POTHEAD YARD EQUIPMENT	
3.	245 kV Pothead yard consisting of the following equipment	
3.1	216 kV, Class 4, 20kA rated discharge, single phase station class, ZnO surge arrestor complete with surge counter/ leakage meter, terminal connector, mounting structure etc.	6 Nos.
3.2	245 kV, 3150A, 3 phase gang operated, Disconnecter along with live side Earth switch, support insulators, terminal connectors, support structure & operating mechanism as per technical specifications	2 Sets
3.3	245kV, Bus Post Insulator with Al pipe holding clamp, mounting structure etc.	As per requirement
3.4	245kV, 2500A single phase Line Traps complete with pedestal, support insulators and mounting structure etc.	4 Sets
3.5	245kV, 4400pF, 3 core single phase line capacitive voltage transformers, ratio $220/\sqrt{3}\text{kV}-110/\sqrt{3}\text{V}-110/\sqrt{3}\text{V}-110/\sqrt{3}\text{V}$ complete with mounting structures, marshalling box, terminal box etc. as per tender specification. Insulator shall be rated for 1050kVp BIL as per IEC.	6 Sets



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3.6	GI Structure for the termination gantries, lightening protection, earthing, busbar/al tube etc. as required	1 Lot
4.	Earthing Material for connection from over ground riser to equipment, ground bus, etc.	1 Lot
5.	ACSR Moose Quad Conductor for 2-line bays, and drop-down conductors etc. as per detailed specification	1 Lot
6.	Insulator strings, Disc insulators, Hardware fittings, clamps, connectors, vibration dampers, spacers and all other accessories	1 Lot
7.	Earth wire and accessories	1 Lot
8.	Bay Marshalling Kiosk	2 nos
C.	PLCC SYSTEM	
5.1	PLCC equipment for both ends inclusive of the following	
5.2	PLCC Boards consisting of line coupling filters, Redundant PLCC system, Tele protection device, Digital Multiplexer, Data Modem, 75-ohm HF cable, space heaters, exchange, telephones etc.	1 Set

3. OTHER

a.	Online continuous PD monitoring system	1 No
b.	Gas Recovery System	1 No
c.	SF ₆ Measuring Device (DILO)	1 No
d.	SF ₆ Handling device (DILO)	1 No
e.	Special Erection/Maintenance Tools and Tackles	As required



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f.	Mandatory Spare Parts – Switchyard Equipment (as per Technical Specifications);	As specified
g.	Any Additional Spares required for 5-year trouble free operation period as recommended by Bidder over and above Mandatory Spares. List to be furnished along with price for consideration of the Employer. <i>(Shall not be considered for bid evaluation)</i>	As recommended <i>(Optional)</i>
h.	Storage, Transportation to place of erection, Erection, Testing and Commissioning of all equipment;	As specified
i.	Grounding conductor/Cable/wire along with associated accessories for grounding of all non-current carrying items of equipment, transformer neutrals, Gen neutrals etc.	As specified

4. NOTES

- 1) The specifications and accompanying drawings are intended to describe and provide a finished piece of work. It is to be understood and agreed by Contractor, that the work desired shall be complete in detail, even though every item involved is not particularly mentioned. Contractor shall be required to provide all materials, equipment, labour, etc. necessary for the entire completion of the work described and shall not avail himself of any manifesting unintentional error, omission or inconsistency that may exist. The contractor shall carry out and complete the work in every respect to the satisfaction of Employer. The work shall meet the requirements laid down by the Employer/Engineer, latest local regulations of state, safety codes, fire and general insurance regulations and all other standards accepted practices.
- 2) This specification calls for execution of the Work in the most expeditious manner to ensure successful and timely commercial operation of the equipment installed. It is essential that Contractor has adequate experience for supply/erection/commissioning of similar equipment under his direct responsibility and supervision. It must have in its possession, adequate quantity of precision tools and erection/installation aids and must have on its direct roll, adequately qualified and experienced supervisory staff and craftsmen.
- 3) The contractor shall supply the equipment from reputed and experienced manufacturers.




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- 4) The Bidder shall furnish the main offer as per details, for the purpose of evaluation. However, the Bidder can make an alternative, if desired, for consideration of owner along with all the required information.

[Handwritten signatures]