

Amendment-I dated 26.05.2025 to the RFP Documents for selection of bidder as Transmission Service Provider to establish intra-state transmission system for “Establishing 400kV Sub-station at Mekhali along with associated transmission lines (Belagavi District)” through tariff based competitive bidding process.

XSI. No.	Clause No.	Existing Provisions	New / Revised Provisions
1.	SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION in RFP	-	Technical requirements for communication system are enclosed as Annexure-A .
2.	SPECIFIC TECHNICAL REQUIREMENTS FOR SUBSTATION in RFP & TSA	<p>The proposed 400/220kV Substation at Mekhali Substation at Raibag Taluk, Belagavi District shall be conventional AIS type generally conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.</p> <p>Other CEA Regulations/guidelines as amended up to date and MoP guidelines, as applicable, shall also be followed.</p>	<p>The proposed 400/220kV Substation at Mekhali Substation at Raibag Taluk, Belagavi District shall be conventional AIS type generally conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.</p> <p><u>The proposed extension of 400/220 kV Yalwar, 400/220 kV Dhoni, 220/110 kV Kudachi, 220/110 kV Mahalingpur, and 220/110 kV Hathargi shall be conventional AIS type conforming to the requirements of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, as amended from time to time.</u></p> <p>Other CEA Regulations/guidelines as amended up to date and MoP guidelines, as applicable, shall also be followed.</p>
3.	RFP, TSA & SPA	Name of the Project Specific SPV	All the reference to the name of the SPV may be read as <u>“MEKHALI POWER TRANSMISSION LIMITED”</u> .

SPECIFIC TECHNICAL REQUIREMENTS FOR COMMUNICATION

The communication requirement shall be in accordance to CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020, CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, CERC (Communication System for inter-State transmission of electricity) Regulations, 2017, CEA (Cyber Security in Power Sector) Guidelines, 2021, and CERC Guidelines on “Interface Requirements” 2024, all above documents as amended from time to time.

The complete InSTS communication system commissioned by TSP under the RFP shall be the asset of InSTS and shall be available for usage of InSTS requirements as suggested by STU from time to time.

The communication services viz. SCADA, VoIP, PMU, AGC & AMR (wherever applicable) have been identified as critical services and therefore shall be provisioned with 2+2 redundancy i.e. 2 channels for Main Control Centre (SLDC) and 2 channels for Backup Control Centre (SLDC). In order to meet this requirement, suitable redundancy at port and card level need to be ensured by the TSP to avoid any single point of failure which may lead to interruption in real-time grid operation.

PMU to PDC communication (wherever required) shall be through 2 channels to the PDC (main) as there is no backup PDC at present.

Accordingly, all the hardware for communication services of station as stated above shall support dual redundancy for data transmission of station to respective main and backup SLDC.

In order to meet the requirement for grid management and operation of substations, Transmission Service Provider (TSP) shall provide the following:

1.0 400kV DC Quad moose line from proposed 400kV Yalwar Substation to proposed 400kV Mekhali Substation (Quad ACSR/ AAAC/ AL59 Moose equivalent).

In 400 kV D/C line from 400kV Mekhali to 400kV Yalwara, TSP shall supply, install & commission One (1) No. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak.

The TSP shall install this OPGW from gantry of Mekhali up to the gantry of Yalwara with all associated hardware including Vibration Dampers, mid-way & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is 135kms (approx.).

Maintenance of OPGW Cable, OPGW Hardware & shall be the responsibility of TSP.

2.0 400kV DC Quad moose line from existing 400kV Doni Substation to proposed 400kV Mekhali Substation (Quad ACSR/ AAAC/ AL59 Moose equivalent).

In 400 kV D/C line from 400kV Mekhali to 400kV Dhoni, TSP shall supply, install & commission One (1) No. OPGW cable containing 48 Fibres (48F) on one E/W peak and conventional earth wire on other E/W peak.

The TSP shall install this OPGW from gantry of Mekhali up to the gantry of Dhoni with all associated hardware including Vibration Dampers, mid-way & gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at end Substations. The transmission line length is 164kms (approx.).

Maintenance of OPGW Cable, OPGW Hardware & shall be the responsibility of TSP.

3.0 LILO of 220kV Chikkodi-Mugalkhod with Drake conductor to proposed 400/220 kV Mekhali sub-station

On LILO of both ckt of 220kV Chikkodi-Mugalkhod line to 400kV line at Mekhali sub-station, TSP shall supply, install and commission OPGW and earthwire as per Tower Configurations:

- (I) Loop-In and Loop out Ckt on Single Towers: Two (2) no. OPGW cable containing 48Fibres (48F) to be installed and commissioned by the TSP on both the Earthwire peaks.
- (II) Loop-In and Loop out Ckt on Two separate Towers: One (1) no. OPGW cable containing 48Fibres (48F) on one earthwire peak and conventional earthwire on other E/W peak for both Loop In and Loop Out Lines.

The TSP shall install OPGW cables from gantry of Mekhali sub-station up to the LILO tower with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Mekhali sub-station. The transmission LILO line length is 10 kms (approx.).

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Chikkodi and 220kV Mugalkhod S/s as per link budget requirement after change of fiber length due to LILO at Mekhali sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

4.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Kudachi Sub-station along with 2Nos of 220kV TB's at Kudachi

In 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Kudachi Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I) DC line on Single Towers: One (1) no. OPGW cable containing 48Fibres (48F) to be installed and commissioned by the TSP.

The TSP shall install OPGW cables from gantry of Mekhali sub-station up to gantry of Kudachi with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Mekhali sub-station and 220kV Kudachi sub-station. The transmission line length is 24 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Kudachi as per link budget due to new 220kV line at 220kV Kudachi sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

5.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Mahalingpur Sub-station along with 2Nos of 220kV TB's at Mahalingpur.

On 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Kudachi Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I) DC line on Single Towers: One (1) no. OPGW cable containing 48Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of Mekhali sub-station up to gantry of Mahalingpur with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at Mekhali sub-station and 220kV Mahalingpur sub-station. The transmission line length is 43 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Mahalingpur as per link budget due to new 220kV line at 220kV Mahalingpur sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

6.0 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Aequs Sub-station along with 2Nos of 220kV TB's at Aequs(Hathargi).

In 220kV DC line with Twin Zebra conductor from proposed 400/220kV Mekhali to 220/66kV Aequs Sub-station, TSP shall supply, install and commission OPGW as per Tower Configurations:

- (I) DC line on Single Towers: One (1) no. OPGW cable containing 48Fibres (48F) to be installed and commissioned by the TSP

The TSP shall install OPGW cables from gantry of 400kV Mekhali sub-station up to gantry of 220kV Aequs with all associated hardware including Vibration Dampers, mid-way and gantry Joint Boxes (called OPGW Hardware hereafter) and finally terminate in Joint Boxes at 400kV Mekhali sub-station and 220kV Aequs sub-station. The transmission line length is 40 kms (approx.).

Further TSP shall comply to the requirements mentioned as per **Appendix-F.1-VOID**

Further necessary optical interfaces shall also be provided by the TSP in the FOTE of 220kV Aequs as per link budget due to new 220kV line at 220kV Aequs sub-station.

Maintenance of OPGW Cable and OPGW Hardware shall be responsibility of TSP.

7.0 4Nos. of 400 kV line bays line bays at 400/220kV Mekhali for termination of 400kV Yalwar and 400 kV Dhoni DC lines.

- I. TSP shall supply, install & commission one or more no. FODP (336F or higher) alongwith panel and required Approach Cables (48F/24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.
- II. TSP shall supply, install & commission One or more STM-16 (FOTE) equipment alongwith panel/s supporting minimum Nine (9) directions with Multiplex Section Protection – 1+1 (MSP) with necessary interfaces to meet the voice and data communication requirement among proposed 400kV Yalwar and 400kV Doni. These directions shall exclude protected (1+1) local patching among equipment (if any). The suitable DC Power Supply and backup to be provided for communication equipment. The 8command Digital Tele Protection Coupler (DTPC) with 220V DC source on E1 for each 400kV line at both ends to be provided.
- III. FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTE under present scope shall be integrated by TSP with the existing FOTE at remote end Sub-stations ie., 400kV Doni and 400kV Yalwar which shall be communicating with respective control center. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing

FOTE/FODP panels for integration with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE the TSP shall coordinate with station owner to reconfigure the directions in existing FOTE at control room. Alternatively, The TSP may integrate the FOTE under the present scope with existing FOTE in the nearby Kiosk connected to the control room FOTE (if available with spare direction). For this purpose, TSP shall provide necessary FODP sub rack / Splice trays/ Patch cords etc. and suitable optical interfaces/ equipment in the existing FOTE/FODP panels in another Kiosk (SPR).

- IV. FOTE & FODP can be accommodated in same panel to optimize space.
- V. The new communication equipment under the present scope shall be compatible for integration with existing KPTCL NMS of OPGW. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by KPTCL Team, however all the necessary support in this regard shall be ensured by TSP.

The maintenance of all the communication equipment and software thereof including FOTE, PMU, FODP, approach cable, DCPS along with Battery Bank shall be the responsibility of TSP.

8.0 8Nos. of 220kV line bays at 400/220kV Mekhali for termination of proposed 220 kV DC lines.

- I. TSP shall supply, install & commission one or more no. FODP (432F or higher) along with panel and required Approach Cables (48F/24F) with all associated hardware fittings from gantry tower to Bay Kiosk and from the Bay Kiosk to Control room.
- II. TSP shall supply, install & commission One or more STM-16 (FOTE) equipment alongwith panel/s supporting minimum Nine (9) directions with Multiplex Section Protection – 1+1 (MSP)with necessary interfaces to meet the voice and data communication requirement among 220kV Chikkodi, 220kV Mughalkod, 220kV Kudachi, 220kV Mahalingpura and 220kV Aequs S/s. These directions shall exclude protected (1+1) local patching among equipment (if any). The suitable DC Power Supply and backup to be provided for communication equipment. The 8command Digital Tele Protection Coupler (DTPC) with 220V DC source on E1 for each 400kV line at both ends to be provided.

- III. FOTE/FODP panel shall be installed in the new Bay Kiosk/ Switchyard Panel Room (SPR). The FOTE under present scope shall be integrated by TSP with the existing FOTE at remote end Sub-stations ie., 220kV Chikkodi, 220kV Mughalkod, 220kV Kudachi, 220kV Mahalingpura and 220kV Aequs S/s which shall be communicating with respective control center. TSP to provide necessary FODP sub rack / Splice trays/ Patch cords etc. and optical interfaces/equipment in the existing FOTE/FODP panels for integration with the existing FOTE for onwards data transmission.

In case spare optical direction is not available in the existing FOTE the TSP shall coordinate with station owner to reconfigure the directions in existing FOTE at control room. Alternatively, The TSP may integrate the FOTE under the present scope with existing FOTE in the nearby Kiosk connected to the control room FOTE (if available with spare direction). For this purpose, TSP shall provide necessary FODP sub rack / Splice trays/ Patch cords etc. and suitable optical interfaces/ equipment in the existing FOTE/FODP panels in another Kiosk (SPR).

- IV. FOTE & FODP can be accommodated in same panel to optimize space.
- V. The new communication equipment under the present scope shall be compatible for integration with existing KPTCL NMS of OPGW. The local configuration of the new communication equipment shall be the responsibility of TSP. The configuration work in the existing centralized NMS for integration of new Communication equipment shall be done by KPTCL Team, however all the necessary support in this regard shall be ensured by TSP.

The maintenance of all the communication equipment and software thereof including FOTE, PMU, FODP, approach cable, DCPS along with Battery Bank shall be the responsibility of TSP.

9.0 Specific Requirement for Phasor Measurement Units (PMUs)

TSP shall supply, install & commission required No. of Phasor Measurement Units (PMUs) PMUs at all the locations under the scope of TSP under this RFP as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 (along with all amendments if any), and all the applicable Regulations, Standards, Guidelines issued time to time. The signal list shall be as per the Annexure-I Part-B of CERC Guidelines on "Interface Requirements" 2024. These PMUs shall be provided with GPS clock and LAN switch and shall connect with LAN switch of control room of respective substations/ generating stations with Fibre Optic cable. These PMUs shall be connected with the FOTE at Substation/ generating stations for onwards data transmission to the PDC (Phasor Data Concentrator) located at respective SLDC&RLDC. Configuration work in existing PDC at SLDC/RLDC for new PMU integration shall be done by respective TSP in co-

ordination with SLDC/RLDC. The maintenance of all the PMUs and associated equipment shall be the responsibility of TSP.

Note: Existing Station owner/s to provide necessary support to integrate different equipment & applications of new extended bays with the existing substation e.g. Communication (through FOTE), Voice etc. for smooth operation and monitoring of new added grid elements.

Repeater Requirements -VOID

- If the repeater location is finalized in the Control Room of a nearby substation, TSP shall provide 1 No. OPGW (96F/48F) as per OPGW in main line to accommodate all OPGW fibers of main line, on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 no. Approach Cable (96F/48F) as per OPGW laid to accommodate all OPGW fibers of main line, with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the repeater equipment in substation control room. TSP shall co-ordinate for Space and DC power supply sharing for repeater equipment.

TSP shall provide required FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link.

OR

- If the repeater location is finalized in the nearby substation premises, the TSP shall identify the Space for repeater shelter in consultation with station owner. Further TSP shall provide 1 No. OPGW (96F/48F) as per OPGW in main line to accommodate all OPGW fibers of main line, on a single Earthwire peak with OPGW Hardware & mid-way Joint Boxes etc. of the line crossing the main line and 1 No. Approach Cable (96F/48F) as per OPGW laid to accommodate all OPGW fibers of main line, with all associated hardware fittings, to establish connectivity between crossing point of main transmission line up to the substation where the repeater shelter is to be housed.

TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems.

OR

- If the repeater location is finalized on land near the transmission tower. TSP shall make the provisions for Land at nearby tower for repeater shelter. Further TSP shall provide required. Approach Cable (96F/48F) as per OPGW laid in main line to accommodate all OPGW fibers of main line with all associated hardware fittings to establish connectivity up to the location of repeater shelter.

TSP shall provide repeater shelter along with FODP, FOTE (with STM-16 capacity) with suitable interfaces require for link budget of respective link, reliable power supply provisioning for AC and DC supply, battery bank, Air Conditioner and other associated systems.

Maintenance of OPGW Cable and OPGW Hardware, repeater equipment & items associated with repeater shelter shall be responsibility of TSP.

Next Generation Firewall (NGFW)

TSP shall provide 2 NGFW one in Main & another in Standby mode having electrical ethernet interfaces/ports and placed between FOTE & SAS gateway/s at the substation. All ethernet based applications shall be terminated in the firewall ports directly (e.g. PMU, AMR, VOIP, SAS/SCADA etc.). Each port of firewall shall work as a separate zone. Firewall shall be hardware based with features of Block/Allow/drop and IPSec VPN (network encryption).

The number of ports/interfaces in each firewall (i.e. Main & Standby) shall be minimum 16 nos. TSP shall provide either single firewall or multiple firewalls to meet this interfaces requirement, each for main as well as standby firewall. Minimum throughput of firewall shall be 300 Mbps.

The Firewall shall be managed/ configured as standalone at present and shall also have compatibility to manage/configure through Centralized Management Console (CMC) remotely in future.

Firewall shall be tested and certified for ISO15408 Common Criteria for least EAL4+. Further, the OEM must certify that it conforms to Secure Product Development Life Cycle requirements as per IEC62443-4-1. The firewall shall generate reports for NERC-CIP Compliance.

The specifications for the firewalls are given at **Annexure F.2** and schematic diagram showing firewall placement given at **Figure F.2**.

Specifications of Next Generation Firewall (NGFW)

1. NGFW shall have following features including but not limited to:

Encryption through IPsec VPN (Virtual Private Network), Deep Packet Inspection (DPI), Denial of service (DoS) and Distributed Denial of Service (DDoS) prevention, Port Block/ Allow, rules/ policies for block/allow, IP (Internet Protocol) & Media Access Control (MAC) spoofing protection, threat detection, Intrusion Prevention System (IPS), Anti-Virus, Anti-Spyware, Man InThe Middle (MITM) attack prevention.

2. The proposed firewall shall be able to handle (alert, block or allow) unknown /unidentified applications e.g. unknown TCP & UDP packets. It shall have the provision to define application control list based on application group and/or list.
3. Firewall shall have feature and also have capability to update the definition/ Signatures of Anti-Virus online as well as offline. Firewall shall also be compatible to update the definitions/signatures through CMC. There shall be a defined process for security patching and firmware up-gradation. There shall be a feature to field validate firmware checksum. The same shall also be validated before using the OEM provided file/binary in the process of firmware up-gradation and security patching
4. Firewall shall have Management Console port to configure remotely.
5. Firewall shall be EMI/EMC compliant in Substation environment as per IEC 61850-3.
6. Firewall shall be rack mounted in existing standard equipment cabinets.
7. Firewall shall have support of SCADA applications (IEC-60870-5-104), ICCP, PMU (IEEE C37.118), Sub-Station Automation System (IEC 61850), Ethernet and other substation environment protocols.
8. Client based Encryption/ VPN must support different Operating System platforms e.g. Windows, Linux & Mac.
9. The solution must have content and comprehensive file detection policies, blocking the files as function of their types, protocols and directions.
10. Firewall shall have logging facility as per standard logs/events format. Firewall shall have features to export the generated/stored logs/events in csv (Comma Separated Value) and also any other standard formats for offline usage, analysis and compliance. Firewall shall have suitable memory architecture and solution to store and be enable to export all logs/events for a period of last 90 days at any given time.

11. Firewall shall have features and be compatible with local as well as central authentication system (RADIUS, LDAP, or TACACS+) for user account and access right management. It shall also have Role Based User management feature.
12. Firewall shall have the capability to configure sufficient number of VLANs.
13. Firewall shall have the capability to support sufficient number of sessions.
14. Firewall shall have provision to configure multiple IP Sec VPNs, at least 100 nos., (one-to-many or many-to-one). Shall support redundant operation with a similar router after creation of all the IP Sec VPN. IPSec VPN shall support encryption protocols as AES128, AES256 and hashing algorithms as MD5 and SHA1. IPSec VPN throughput shall support at least 300 Mbps
15. Firewall shall be capable of SNMP v3 for monitoring from Network Management system. It shall also have SNMPv3 encrypted authentication and access security
16. Firewall shall support in Active/Passive or Active-Active mode with High Availability features like load balancing, failover for firewall and IPsec VPN without losing the session connectivity.
17. Firewall should have integrated traffic shaping (bandwidth, allocation, prioritisation, etc.) functionality
18. Shall support simultaneous operation with both IPv4 and IPv6 traffic
19. Firewall shall be compatible with SNTP/NTP or any other standards for clock synchronization
20. Firewall shall have the features of port as well as MAC based security
21. Firewall shall support exporting of logs to a centralized log management system (e.g. syslog) for security event and information management.
22. Firewall time shall be kept synchronised to official Indian Timekeeping agency, time.nplindia.org.
23. Firewall product shall be provided with all applicable updates at least until 36 months since the applicable date of product shipping to the concerned utility.

Firewall Placement Diagram

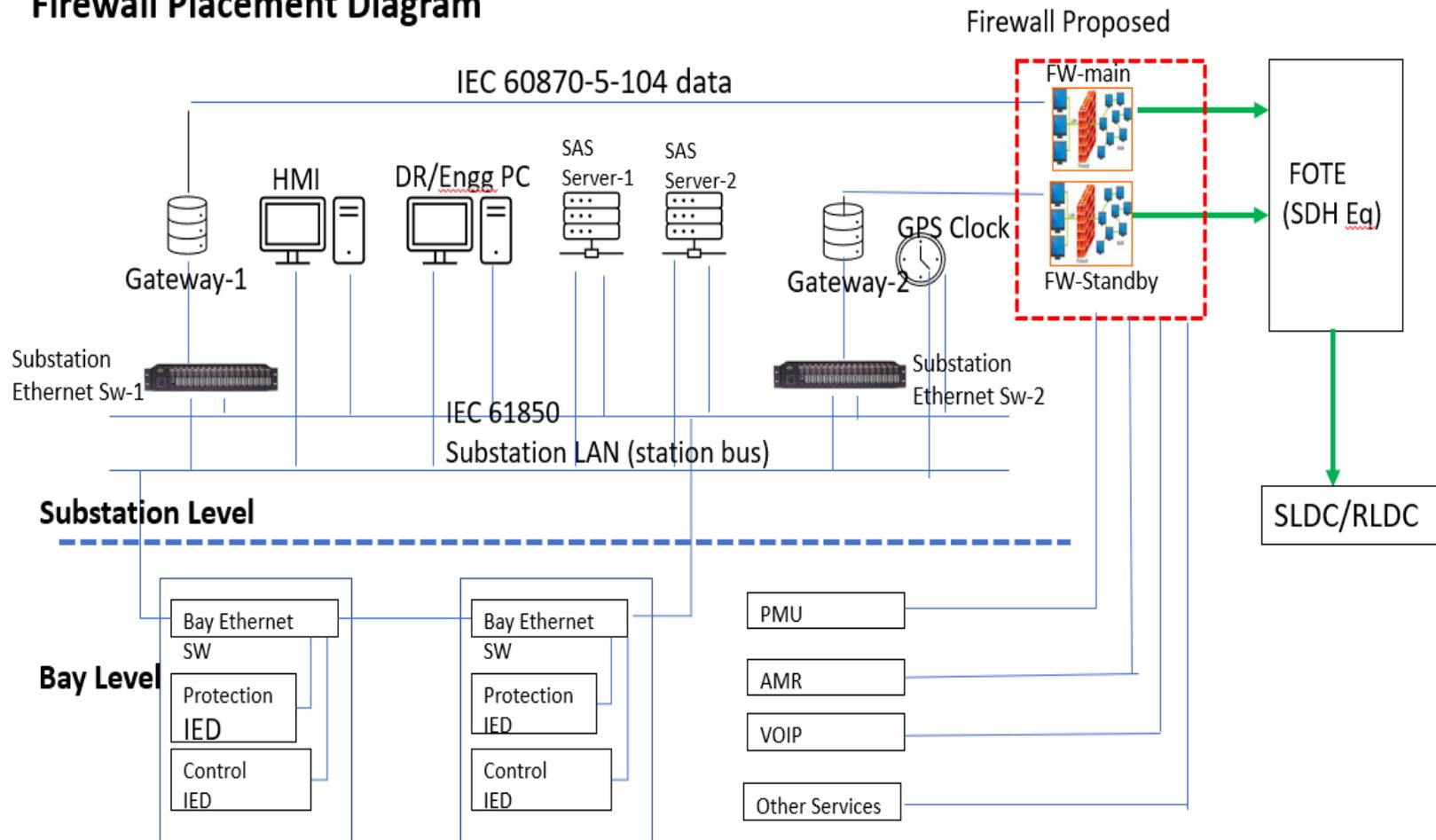


Figure F.2

10.0 PLCC and PABX:

Power line carrier communication (PLCC) equipment completes for speech, tele-protection commands and data channels shall be provided on each transmission line. The PLCC equipment shall in brief include the following: -

- Coupling device, Coupling filters line traps, carrier terminals, protection couplers, HF cables, PABX (if applicable) and maintenance and testing instruments.
- At new substation, a telephone exchange (PABX) of 24 lines shall be provided at as means of effective communication among various buildings of the substation, remote end substations and with control centres (RLDC/ SLDC) etc.
- Coupling devices shall be suitable for 400kV and 220kV voltage class. The pass band of coupling devices shall have sufficient margin for adding communication channel in future if required. Necessary protection devices for safety of personnel and low voltage part against power frequency voltages and transient over voltage shall also be provided.
- The line traps shall be broad band tuned suitable for blocking the complete range of carrier frequencies. Line Trap shall have necessary protective devices such as lightning arresters for the protection of tuning device.
- The carrier terminals shall be of single side-band (SSB) amplitude modulation (AM) type and shall have 4 kHz band width. PLCC Carrier terminals and Protection couplers shall be considered for both ends of the line.
- PLCC equipment for all the transmission lines covered under the scheme shall be provided by TSP. PLCC to be provided for following lines are under present scope:

Sl. No	Line name	PLCC configuration
1	400kV Mekhali-Yalwara-1	Phase-Phase Coupling
2	400kV Mekhali-Yalwara-2	Phase-Phase Coupling
3	400kV Mekhali-Doni-1	Phase-Phase Coupling
4	400kV Mekhali-Doni-2	Phase-Phase Coupling
5	220kV Mekhali-Kudahi-1	Phase-Phase Coupling
6	220kV Mekhali-Kudahi-2	Phase-Phase Coupling
7	220kV Mekhali-Mahalingpura-1	Phase-Phase Coupling
8	220kV Mekhali-Mahalingpura-2	Phase-Phase Coupling
9	220kV Mekhali-Aequs-1	Phase-Phase Coupling

10	220kV Mekhali-Aequis-2	Phase-Phase Coupling
11	220kV Mekhali-Chikkodi-1	Phase-Phase Coupling
12	220kV Mekhali--Chikkodi-2	Phase-Phase Coupling
13	220kV Mekhali-Mughalkod-1	Phase-Phase Coupling
14	220kV Mekhali--Mugalkhod-2	Phase-Phase Coupling

- Further, CVT and Wave trap for all 400 kV and 220 kV line bays under present scope shall be provided by TSP.
- All other associated equipment like cabling, coupling device and HF cable shall also be provided by the TSP.
- The PLCC Equipment to be provided at both ends of Sub-station for 400kV and 220kV lines. (except for 220kV Chikkodi-Mughalkod line)
- The PLCC Equipment to be provided only at 400kV Mekhali for 220kV Mekali-Chikkodi DC line and 220kV Mekhali-Mughalkod DC line as the line is getting LILoed at 400kV Mekhali Sub-station.
- Two (2) sets of 48 V battery banks for PLCC and communication equipment shall be provided at each new Substation with at least 10-hour battery backup and extended backup, if required.

11.0: Communication through VSAT:

KPTCL is having captive VSAT communication network for all Sub-stations. The VSAT equipment will be provided by KPTCL and the estimated cost of equipment will be intimated.

In addition, License fee, Annual bandwidth charges, AMC cost and other statutory charges pertaining to VSAT on quarterly basis needs to be paid. The demand note will be issued from KPTCL to pay the charges. An undertaking agreement on a stamp paper towards payment of VSAT charges has to be submitted to KPTCL (as a back-up communication)

SPECIFIC TECHNICAL REQUIREMENTS FOR INTEGRATION OF COMMUNICATION EQUIPMENT WITH STATE LEVEL NMS & REGIONAL UNMS:

The new communication equipment/ system for all the substations under the present scope shall be compatible for integration with existing regional level NMS system/ Centralized Supervision and Monitoring System (CSMS) i.e. Regional UNMS. The local configuration of the new communication equipment at the station end shall be the responsibility of TSP as per **Annexure E.1**. The configuration work in the existing centralized NMS/ CSMS at Control center end, for integration of new Communication equipment/ system shall be done by Regional ULDC Team/ NMT, however all the necessary support in this regard shall be ensured by TSP.

Annexure E.1

Requirement for integration of Communication Equipment with Regional UNMS:

1. TSP shall ensure that NMS/EMS/NE supplied by them is NBI compliant and all FCAPS functionality is supported in the NBI such as NE Inventory, Hardware Inventory – Shelf/Slot/Card/SFP/Port, Topology, Protections, Alarms, Performance- real time and periodic, Performance KPI parameters (E-1, STM, Ethernet) , Remote Configuration, Cross Connects, Trails and Circuits, Services Provisioning (NE), E-1 , STM, Ethernet , TX and RS Trace, loop back and details are published in the NBI guide for the configuration parameters.
2. TSP shall be obliged to provide/share all necessary documentations such as NBI Guide/MIB/IDL/WSDL/API files/ etc. for onward integration of their NMS/EMS/NE with regional UNMS.
3. The following support shall be provided by TSP for integration of their supplied equipment with regional UNMS:
 - Enabling and activating NBI license in their EMS/NMS and providing NBI login access along with User credentials
 - Assist in verifying NBI Connectivity with UNMS vendor for the successful communication and retrieval of data.
 - Assist in troubleshooting (if required) for NBI connectivity along with UNMS vendor for the communication and retrieval of data.
4. For standalone NE which is not integrated with any EMS/NMS, TSP shall provide modality of complete FCAPS data acquisition as above through industry standard programmatic methods and provide the CLI command manual.