AGENDA

FOR

16th TeST MEETING

Date: 22.01.2025

Eastern Regional Power Committee

14, Golf Club Road, Tollygunge

Kolkata: 700033

Contents

EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 16th TeST MEETING TO BE HELD ON 22.01.2025(WEDNESDAY) AT 10:30 HRS

1. PART-A: CONFIRMATION OF MINUTES

1.1. Confirmation of Minutes of 15th TeST Meeting held on 2nd August 2024 physically at ERPC Conference Hall, Kolkata

The minutes of 15th TeST Sub-Committee meeting held on 02.08.2024 was circulated vide letter dated 09.08.2024.

Members may confirm the minutes of 15th TeST meeting.

2. PART-B: ITEMS FOR DISCUSSION/UPDATE

2.1 Usage and sharing of OPGW for power systems applications: CEA

- The first meeting of Committee for usage and sharing of OPGW was held on **09.08.2024 (**MoM attached as **Annexure B.2.1.2).** The Committee issued a draft report for the usage and sharing of OPGW for usage and sharing of Optical Ground Wire (OPGW) fibers for power system applications (attached as **Annexure B.2.1.2**).
- The report is in alignment with the Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020, and the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022. Various aspects of OPGW usage and sharing has been discussed below:-

➢ OPGW fibre core Allocation:

Type of Transmission Line	**Application**	**Fiber Cores Alloted**
Double circuit (D/c) Or Single Circuit (S/c) transmission line with length greater than 30 km, thus not requiring Line differential Protection.	Grid Applications	6 Fibers
	Spare Fibers for alternate communication path for STUs /Radially connected feeders from GSS/Future needs etc	10 Fibers
	Spare Fibers for new technology migration	4 Fibers
	Commercial Use	Remaining fibers
Transmission line is Double circuit (D/c) with length less than 30 km, requiring Line	Grid Applications	6 Fibers
	Teleprotection Applications	8 Fibers
	Spare Fibers for alternate communication path for STUs /Radially	6 Fibers

Differential Protection as per Request for Proposal (RfP) documents/as per Regional Power Committee's (RPC's) protection philosophy.	connected feeders from GSS/Future needs	
	Spare Fibers for new technology migration	4 Fibers
	Commercial Use	Remaining fibers
Transmission line is S/c with length less than 30 km, requiring Line differential Protection, as per RfP documents/as per RPC's protection philosophy.	Grid Applications	6 Fibers
	Teleprotection Applications	4 Fibers
	Spare Fibers for alternate communication path for STUs /Radially connected feeders from GSS/Future needs	6 Fibers
	Spare Fibers for new technology migration	4 Fibers
	Commercial Use	Remaining Fibers

- Sharing of OPGW between various entities

Scenario	**Owned/Maintained by**	**Fibres Shared**	**Commercialization Policy**
OPGW laid under ULDC scheme for ISTS and InSTS Lines	POWERGRID, for ISTS allocation by CTU and for InSTS allocation by STU	Upto 10	Excess fibre commercialization for 2 years with CERC NoC. Renewable every 2 years
OPGW laid by STU on InSTS Lines	Allocation by STU	Upto 10	Excess fibre commercialization for 2 years with SERC/SLDC NoC. Renewable every 2 years
OPGW laid by CTU/Powergrid on InSTS Lines	Allocation by CTU with STU Coordination	50% for both InSTS and ISTS	commercialization for 2 years with SERC/SLDC NoC. Renewable every 2 years
OPGW laid by TSPs on ISTS Lines under TBCB/RTM Projects	TSP, allocation by CTU	Upto 10	commercialization for 2 years with SERC/SLDC NoC. Renewable every 2 years

Number of fibres shared is subject to approval of RPC. the Regional Power Committee (RPC) must ensure prior consultation with the Power System Communication and Development (PSCD) Division, Central Electricity Authority (CEA).

- Integration of FOTE for Differential Protection

- Differential teleprotection is a vital component of power system protection, ensuring rapid and selective fault clearance.
- The communication medium is over a shared fiber or separate optical fibers using **IEEE C37.94** (herein after referred as C 37.94) protocol.
- For **High-Criticality and High-Voltage Lines (220 kV and above)** requiring line differential protection preference is given to dedicated or separate fiber cores for line differential protection rather than shared fibers. If dedicated fibres are not available then an interim setup with shared fibres can be done. However it should meet the IEC 60834 provisions.
- For **Lower-Criticality and Lines below 220kV** differential protection may be allowed on shared fibres via FOTE using C37.94 protocol.

- Routing of OPGW and adjustments for LILO:

- At Transmission Lines:
    - For Main D/C lines with S/C LILO - Splice the required number of fibers for the LILO section at the appropriate point and ensure fiber continuity for main line traffic. Only single tower required (either M/C or D/C) with 2 earth wire peaks.
    - For main D/C lines with D/C LILO - Route all fibers of OPGW from the main line through the new substation and Splice the required number of fibers for the LILO line at the new substation, if the new Substation is of different entity. Either 2 separate D/C towers with one earthwire peak each may be used or M/C tower may be used.
- In both cases OPGW used may use 24 Fibre Cores.
- LILO adjustments at substation:
    - Fiber Optic Terminal Equipment (FOTE) - Signal reconfiguration, routing modifications, capacity upgrades, synchronization, integration with new FOTE and Ensure compatibility with new LILO traffic.
    - Relays - Reconfiguration of protection schemes, distance zone, adjustments, differential protection tuning.
    - SCADA and Telemetry - Data routing, alarm configuration, SCADA system updates.
    - Amplifiers/Signal Boosters – may require installation.
    - Protection Redundancy - Ensure redundancy, perform testing and commissioning and Verify that no single point of failure exists
- Commercial utilization of OPGW Fibres.

- Any commercial use must receive prior approval (NoC) from CERC/SERCs in line with CERC (Sharing of Revenue Derived from Utilization of Transmission Assets for Other Business) Regulations, 2020
- Any entity intending to lease fiber cores for commercial purposes shall provide prior intimation to the relevant Regional Power Committees (RPCs).
- Commercialization of fiber cores may be permitted for a duration of two years, subject to renewal thereafter at the end of each period. Additionally, the right to intervene, seek withdrawal, or cease utilization of spare fibers must be reserved to address any emerging grid requirements.

➢ OPGW Implementation in New Transmission Projects and Upgradation Schemes

In the new transmission projects and upgradation schemes, the Planning agency should ensure that any decision regarding deployment of fiber cores considers both present needs and future expansions

- Planning of OPGW with a minimum of 48 fiber cores in wideband nodes to be done, as per feasibility and requirement. For installations within city limits, OPGW may be equipped with 96 fiber cores.
- In remotely located areas where the demand for extensive fiber optic communication does not justify the installation of 48 fiber cores, a flexible approach is recommended.

Deliberation as per **219th OCC**

❖ All constituents were apprised that a committee chaired by Member (Power System), CEA has been constituted to develop guidelines on the usage and sharing of Optical Ground Wire (OPGW) for power system applications. In this regard, valuable inputs have been sought from all concerned stakeholders.
❖ Inputs received from ER constituents on OPGW fibre sharing summarized below:
- WBSETCL informed: Aprroximately 50% fibres used for own purpose.
- DVC informed: Around one-third of the total fibres used for own purpose.
- Jharkhand submitted : Only two pairs of fibres are used for communication purpose.
- Bihar intimated that major portion of the fibres is leased out for commercial use.
- OPTCL apprised: Four fibres used for own purpose, 4 fibres are kept reserved while rest are having commercial utilization.
- Powergrid ER-II informed: Three pairs of fibres are for own use while rest 9 pairs are in commercial use.

219th OCC Decision

- OCC observed that OPGW has been laid under various schemes like ULDC and various mode by STUs and Central Sector transmission licensees.To accommodate new generation capacity and to cater to increasing power demand there is frequent change in network configuration like LILO of existing transmission lines or addition of new lines.This has necessitated the sharing of existing fibres among different utilities for establishing reliable communication.
- OCC acknowledged the necessity of optimal utilization of existing OPGW fibres amongst power sector utilities.
- OCC opined that in view of implementation of line differential protectionin short lines and emerging technologies like MPLS,etc , maximum portion of the OPGW fibres(including spare fibres) should be kept for power sector applications.
- OCC further opined that usually 24 fibre OPGW is used while 48 fibre OPGW deployed in LILO portions of the transmission line. This existing practice may be kept unchanged.

Members may discuss.

2.2 Firewall Installation for Existing ISTS Substations: CEA

- Firewalls are not installed at existing substations of POWERGRID and some of the other Private TSPs substations to ensure perimeter security.

- In 2021, Nodal agency for cyber security in Power Sector i.e. (Cyber Security Division of CEA/ CISO-MoP) has issued guidelines for cyber security viz. CEA (Cyber Security Guidelines for Power Sector), 2021. As per guidelines, following points are to be taken care by the responsible entities:

  I. "The Responsible Entity shall ensure that every Critical System resides within an Electronic Security Perimeter".

  II. "Has deployed an Intrusion Detection System and Intrusion Prevention System capable of identifying behavioural anomaly in both IT as well as OT Systems".

- To ensure above requirement, CTU has prepared specification for Firewall after discussion with CERT-Trans (POWERGRID) and CEA. After finalization of the same with CEA, CTU started to include in the inputs to RFP documents from Nov'21 wherever applicable.

- For the existing substations (under RTM & TBCB) also Firewall needs to be installed for providing the cyber security at the ISTS integrated communication system level.

- POWERGRID has submitted a list of 273 no. of existing substations for all five regions which is attached at **Annexure-B.2.2.1**. Where the firewall needs to be installed. POWERGRID has told that installation of firewall at their stations (RTM & TBCB) has a huge cost implication which cannot be covered through O&M expenses specified by CERC.

- As per meeting held on 28.11.2023 among CTU, POWERGRID, CEA, NRPC & Grid-India, a PoC was also proposed for testing of Power System application behaviour by installation of Firewall (MoM of meeting attached at **Annexure-B.2.2.2**). As agreed during the said meeting POWERGRID shall carry out the POC in parallel with this proposal.

- Further, a committee was formed under the Chairmanship of CE (Cyber Security Division), CEA in line with the minutes of meeting dtd. 12.04.24 convened by CEA and chaired by Member, Power System (committee formation letter is attached at **Annexure-B.2.2.3**). Later CEA vide letter dtd. 25.06.2024 (attached at **Annexure-B.2.2.4)** communicated that all utilities (POWERGRID & Pvt. TBCB) are required to comply with the CEA (Cyber Security Guidelines), 2021 and deploy Intrusion Prevention and Intrusion Detection System. In addition, the letter stated that, as Cyber Security Regulations of CEA are in advanced stage so there is no necessity for constitution of aforesaid committee. It is to mention that the draft cyber security regulations are under circulation by CEA.

- This agenda was deliberated in the 48th COM SR meeting held on 29.07.24 (abstract of minutes are attached at **Annexure-B.2.2.5**), where MS, SRPC suggested that agenda can be put up in the upcoming NPC meeting for deliberations. This agenda was also deliberated in the 15th ER TeST meeting held on 02.08.2024 (abstract of attached at **Annexure-B.2.2.6**), where it was suggested to put up the agenda in the upcoming NPC meeting.

- The issue need to be deliberated regarding POWERGRID and private TSPs, concerning the booking of expenditure on the installation of firewalls and compliance with other requirements under the CEA Cyber Security Guidelines for the Power Sector, 2021, as well as the upcoming CEA cyber security regulations. This includes consideration of

additional capitalization for RTM substations and treatment as "Change in Law" under the TSA for TBCB substations, in line with the CERC order in Petition No. 94/MP/2021 **Annexure-B.2.2.7**).

Breakup of **RTM/ TBCB** substations of Powergrid in ER for Firewall requirement is given below:

Region	POWERGRID RTM S/S	POWERGRID TBCB S/S
ER	**44**	**05**
Total: 49		

- For the **RTM** substations, expenditure of firewall installation can be booked in **Add CAP** or a new scheme may be prepared. For the **TBCB** substations, expenses can be booked under change in law as **CERC order on petition no. 94/MP/2021.**

As per deliberation in **15th TeST meeting**:

CTU apprised:

- Basic architecture and tentative modalities for supply & installation of Firewall at POWERGRID sub-stations
- In recent 48th COM-SR meeting, SRPC has opined to place this agenda in NPC.

POWERGRID also suggested that this agenda may be taken up in NPC forum for discussion.

15th TeST decision:

TeST committee opined that detailed methodology of the scheme for supply and installation of firewall at the existing substations of Powergrid may be devised in line with yet to be finalized CEA regulations on cyber security.

TeST committee referred the issue to NPC forum for further deliberation.

During the 15th NPC meeting held on 14.11.2024, Chairperson, NPC/CEA, advised that the proposal of recovery of costs for firewall installation at existing ISTS substations (RTM & TBCB) may be examined by the Power System Wing of CEA in consultation with Cyber Security Division, CEA, F&CA Division, CEA, PSPA-I & II Division, CEA, PCD Division, CEA, GRID-India, RPCs, CTU and POWERGRID at the earliest.

- In the meeting, it was also suggested that the number of firewalls included in the proposal should also be reviewed to ensure alignment with actual requirements.
- As per the direction from 15th NPC meeting, a meeting was convened under chairmanship of **Member (PS), CEA.**
- **The Key Points for Deliberation:**
    - **i.** The cost of firewall installation and associated cybersecurity measures may be managed under the **TSP's O&M expenses**.

ii. The proposal for the installations of number of firewalls may be reviewed to ensure alignment with actual operational and security requirements.

iii. The status of proposal for installation of firewall for STUs/Gencos/IPPs/Bulk Consumers etc. along with integration and updation, patch management and status of working of existing firewall system if any will be reviewed.

Members may discuss.

2.3 Guidelines on Availability for Communications Systems: ERPC

- As per **Regulation 7.3** of the Central Electricity Regulatory Commission (Communication System for inter-State transmission of Electricity), Regulations, 2017, National Power Committee (NPC) has been entrusted to prepare Guidelines on Availability of Communication System in consultation with RPCs, RLDCs, CTU and other stakeholders. (Guidelines Report attached as **Annex B.2.3**)
- Accordingly, NPC prepared Guidelines on "Availability of Communication System" in consultation with the stakeholders and submitted the same for approval of the Commission. The said Guidelines was approved in **January 2024** and published in public domain as "Guidelines on Availability of Communication System" Regulations.
- Availability of Communication System adhere to *Regulation 6(3) of the CEA (Technical Standards for Connectivity to the Grid), Regulation 5(1) of the CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020 and Regulation 11 of the Indian Electricity Grid Code (IEGC) 2023.*

As per clause 3.4 Responsibility of CTU and STU:

a) CTU (or STU as the case may be) shall be responsible for submission of the details of communication channels including the redundant channels configured for use of voice / data / video exchange, protection, Tele-protection / SPS to respective RLDC (SLDC as the case may be) on monthly basis incorporating the details of new channels configured during previous month. The total number of communication channels (N) is based on the requirement of RLDCs/NLDC and the same would be decided in consultation with respective RPCs/NPC.

b) CTU (or STU as the case may be) shall be responsible for submission of theperformance/availability of configured channels of the previous month to respective RLDCs for verification by RLDCs and onward submission to respective RPC for computation of availability of the communication system for previous month.

➢ Applicability of Guidelines:

- Applicable to CTU for the Communication System Infrastructure of inter-State Transmission System.
- Applicable to STU for the Communication System Infrastructure of intra-State Transmission System, till appropriate regulation on Communication is framed by the respective State Electricity Regulatory Commission.

➢ Roles and Responsibility of CTU and STU:

- CTU (or STU as the case may be) shall be responsible for submission of the details of communication channels on monthly basis incorporating the details of new channels configured during previous month.

- CTU (or STU as the case may be) shall be responsible for submission of the performance/availability of configured channels of the previous month to respective RLDCs for verification by RLDCs and onward submission to respective RPC for computation of availability.
- CTU (or STU as the case may be) shall submit availability reports of configured channel including the redundant channels in format prescribed by RLDC/RPC.

➢ Communication System outages:

- Outage time of communication system elements (i.e. channels) due to acts of God and force majeure events beyond the control of the communication provider shall be considered as deemed available.
- Any outage of duration more than one (01) minute in a time-block shall be considered as not available for the whole time-block.
- Any outage of duration less than or equal to one (01) minute in a time-block shall be treated as deemed available provided such outages are not more than ten (10) times in a day.
- Since presently **UNMS** system is under control of the POWERGRID and it was commissioned in **December 2023** and more over said availability calculation is to be generated from system hence it is proposed that said calculations are to be generated and submitted by the POWERGRID to ERPC/ERLDC for further necessary action.

CTU may explain.Members may discuss.

2.4 Laying of OPGW on Transmission lines in Eastern Region: CTU

OPGW on below mentioned lines have been installed & commissioned by POWERGRID during the period 2004- 2005. The links were commissioned by POWERGRID telecom dept (PDT). These links mentioned at (a) to (e) are catering to ULDC operation.

(a) 400kV Prayagraj(Allahabad)–Sasaram(Length: 214.42 km)

(b) 400kV Farakka –Jeerat (Length: 219.45 km)

(c) 400kV Indravati-Rengali (Length: 377.31 km)

(d) 400kV Malda-Binaguri (Length: 217.69 km)

(e) 400kV Binagauri-Bongaigaon (Length: 103.75 km OPGW +6.75 km UGFO)

(i) The above links are part of ISTS assets as per CERC order with conditions stipulated at para 26(ii) vide order date 17.05.2023 i.r.o. Petition no. 287/MP/2022 as brought out below:

"The ownership, control and management including operation and maintenance of the transmission system including all cores of OPGW cables, transmission towers, substations shall continue to be vested with and controlled by the Petitioner at all time."

POWERGRID was the petitioner.

(ii) It may be mentioned here that Useful life of these links of 15 years is completed as per CERC norms. The link condition is deteriorating now and condition is declining. Optical Attenuation has increased beyond the design limits.

(iii) As per discussion held with POWERGRID on dtd. 18.12.2024 and revised agenda received from POWERGRID through email, OPGW details is modified and revised OPGW list for laying of OPGW on these links is tabulated below:

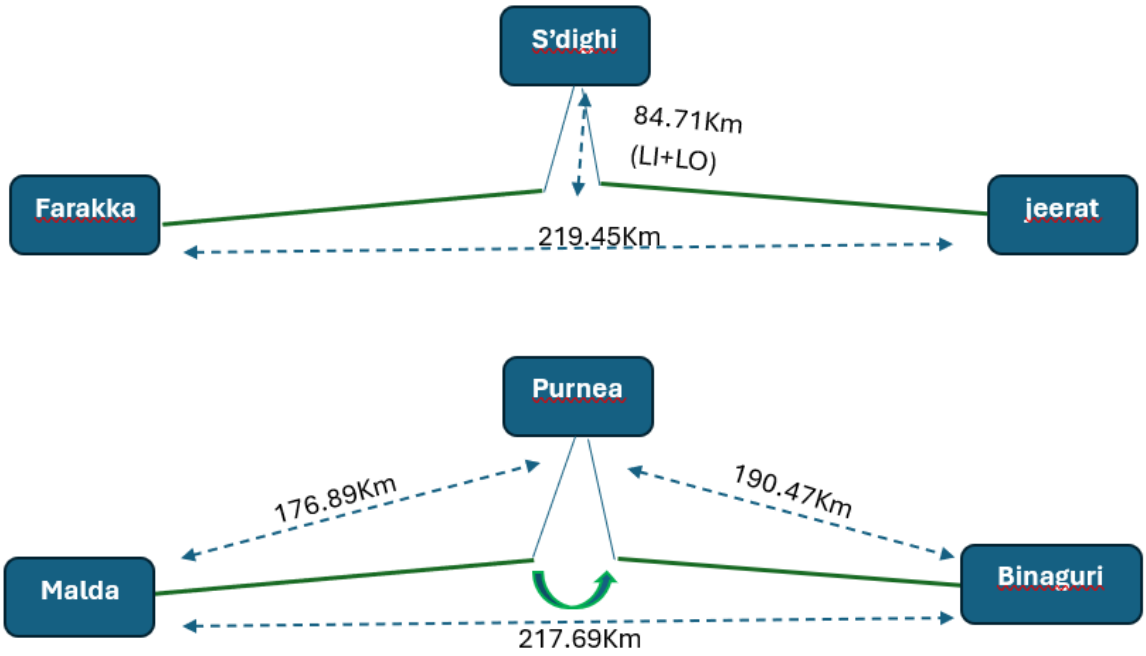
S.No.	Description	Link Length approx. (km)	Design Attenuation(dB)	Actual Attenuation (dB)	Year of Commissioning	FOTE Requirement
1	400kV Prayagraj (Allahabad) –Sasaram	214.42	53.61	71.82 ↑ (+18.21)	2004	Covered in Congestion Scheme
2	400kV Farakka – Sagardighi II -Jeerat	(84.71+ 219.45)304	59.21	73.43 ↑ (+14.62)	2004	1 no STM-64 for Sagardighi. (Farakka, Jeerat covered in Congestion Scheme)
3	400kV Indravati-Rengali-Talcher	377.31	94.33	122.22↑ (+27.89)	2005	2 nos. STM-16 One each at Indravati, Rengali. (Talcher covered in AGC scheme.)
4	400kV Malda -Purnea & 400kV Purnea - Binaguri	367.34 (176.89+190.47)	52.73	75.10↑ (+22.37)	2004	1 no. STM-64 for Malda. (Binagudi, Purnea covered in Congestion Scheme)
5	400kV Binagauri-Bongaigaon	239.81	25.94	78.94↑ (+53)	2004	No requirement at Bongaigaon as per POWERGRID input.
	Total=	**Approx. 1503 km**				**2 nos.- STM 16 2 nos. STM 64**

(iv) These links are being utilised for sensitive and critical grid management data to RLDC/NLDC from sub-stations and SLDCs. In view of above, there is need fornew OPGW laying on above mentioned lines.

(v) POWERGRID is making regular efforts to maintain availability of these links. Any outage will most likely have an immense impact on grid management capabilities as these links are very important and backbone original ULDC network established for grid operation.

(vi) As per POWERGRID there is no OPGW in LILO portion link of Farakka-Sagardihi-Jeerat link and also need to be laid in this scheme for system reliability. For Malda-Purnea-Binaguri link, in LILO portion 24F OPGW was laid in 2014 as informed by

POWERGRID. However, 48F OPGW was suggested by CEA as per letter dtd.22.11.2024 attached as **Annex – B.2.4**.



Accordingly, it is proposed that 48F OPGW may be laid on above lines along with required FOTEs (2 no STM-64, 2 No STM-16) as mentioned above. The cost of laying OPGW on above links approx. 1503 km is approx. Rs 84.74 Crores. It is proposed to lay OPGW as a new scheme i.e. Eastern Region OPGW Strengthening Scheme (ERSS).

Powergrid and ERLDC may explain. Members may discuss.

2.5 Dual reporting (2+2) of ISTS stations to Main RLDC and Backup RLDC: CTU

- Presently SCADA data channels are reporting in main and backup mode (1+1) with 1 main channel to RLDC and 1 backup channel to Backup RLDC. To increase the redundancy in the system Grid-India requested that both main and backup channels should report to RLDCs as well as back up RLDCs (in dual mode). In this regard meetings were held among POWERGRID, Grid-India, CTU and CEA dated 09.05.2023 and 27.06.2023 (MoM attached at **Annexure-B.2.5.1**) where dual reporting of SCADA Chanels to main RLDC & Backup RLDC were deliberated.

- Further, CERC has issued Guidelines on "Interface Requirements" under the CERC (Communication System for inter-State transmission of Electricity) Regulations, 2017 (Attached at **Annexure-B.2.5.2**) in Jan'24. Which also mandated that users shall provide communication interfaces with multiple ports, cards, gateways etc. to avoid failure of single hardware element.

- To meet this requirement for new ISTS stations, CTU has started to include this requirement in the RFP inputs for the TBCB projects from Aug'23 onwards. For the existing substations CEA-PCD vide letter dtd.22.07.2024 (attached at **Annexure-B.2.5.3**) also confirms these requirement of 2+2 channels to main and backup RLDC.

- For existing ISTS sub stations, CTU has requested all the TSPs e.g. POWERGRID, Adani, Sterlite, Indigrid, Aparaava, Renew Power etc. to provide status for readiness of 2+2 channels upto RLDC. As per inputs received POWERGRID, Indigrid, Sterlite existing SAS gateway / RTUs needs upgradation or replacement. Further TSPs stated that this requirement has cost implications, and they require a separate scheme to upgrade their existing substations.
- As per discussions held within CTU (Engg & Communication departments), the Engg team suggested that as SAS upgradation comes under substation related work, this type of work can be carried out under O&M /AddCap as no separate transmission schemes are generally required at element level.
- Agenda in this regard was also sent by CTU to NPC for deliberation and seeking their views and issuing guidelines, however NPC is of the view, that this agenda first needs to be put up in RPC level for consensus of all stakeholders. Thereafter CTU has forwarded the same to all the RPCs vide letter dtd. 11.09.2024 (attached at **Annexure-B.2.5.4**)
- Further, as per decision of 14th and 15th ERTeST meeting, POWERGRID has completed the PoC test for Jamshedpur S/s and has submitted the draft test report. The draft PoC report is attached as **Annexure-B.2.5.5**.The proposed architecture is attached in **Annexure-2.5.6.**
- For this purpose, four channels are to be configured - one channel for RTU-1/gateway-1 reporting to ERLDC Main-1, second for RTU-1/gateway-1 to ERLDC Main-2, third for RTU-2/gateway-2 to ERLDC Main-1 and the fourth for RTU-2/gateway-2 to ERLDC Main-2 The aspect of dual channel reporting has been discussed in 14th and 15th Test Meeting, CTUIL communication planning meeting.
- These four channels are in addition to the two existing channels reporting to the present SCADA system at ERLDC MCC and ERLDC BCC. The existing channel will remain in service till taken over by New SCADA implementation in Eastern region which is expected to be completed by March 2026.

Key points for deliberation:

- Forum is requested to deliberate this requirement of SAS/RTU Upgradation/ Replacement for existing substations in **Additional Capitalization for RTM substations** and **under Change in Law of TSA** for the **TBCB substations** in line with CERC order on petition no. 94/MP/2021. This Agenda was discussed in 26th TeST meeting of NR also, where NRPC stated that this requirement may be taken up in similar manner as the finalized implementation mode of Firewall scheme by CEA NPC committee.
- ERLDC and POWERGRID may explain the result of PoC to members.
- All **ISGS/IPPs/private transmission licensees** are requested to check feasibility for dual channel provisions at respective ends to ensure that the requirements for dual reporting of RTUs/SAS gateways can be achieved before commissioning of the upcoming SCADA/EMS upgradation project. An email communication to all utilities have been shared from ERLDC. List of dual reporting feasibility is attached as **Annexure B.2.5.7**

CTU and ERLDC may explain. ISGS, IPPs and Private licensees may update. Members may discuss.

2.6 Findings from communication audit in ER at Subhasgram Substation: ERLDC

As per regulations and NPC procedure for communication system audit , a committee comprising of ERPC, ERLDC , WBSETCL has conducted the audit of communication system at 400 KV Subhasgram , POWERGRID.

Key Findings are as follows:

1. Separation of approach cable and FODP for operation and commercial purpose.
2. Isolation of Control & Communication room.
3. Integration Battery Charger alarms /measurements shall be made available to SAS (if available) or alarms shall be alarmed in common substation annunciator.
4. Third party cybersecurity audit.

Hence it is requested to POWERGRID and SLDC to comply with the above in the up-coming communication nodes.

It is also requested to schedule the next ISTS / Critical Substation for next node of communication audit from the following nodes as discussed in earlier meeting.

a. Durgapur, PG
b. Maithoton , PG & Maithon , DVC,
c. Rourkela, PG and Rourkela OPTCL
d. Bhubaneswar, SLDC , OPTCL

Detailed Communication Audit report of 400 KV Subhasgram station along with compliance reply from Powergrid ER-II is attached in **Annexure-B.2.6.**

ERLDC may explain. Members may discuss.

2.7 Workshop on adoption of MPLS technology in ISTS network by CTU/POWERGRID: ERLDC

NPC vide letter ref. CEA-GO-15-14/1/2021-NPC Division/256-277 dtd. 14.09.2023, constituted a Joint-Committee to assess Feasibility, Integration & Roll-out of MPLS in ISTS Communication System. CEA has nominated personnel for the Joint-Committee from CEA, all RPCs, CTU, GRID-INDIA, POWERGRID, CSPTCL-Chhattisgarh, KSEB-Kerala, RVPNL-Rajasthan and WBSETCL-West Bengal. The previous Joint Committee Meetings have discussed the following points:

- 1st JC meeting (19 Sep. 2023) - SDH getting obsolete and Compatibility with UNMS.
- 2nd JC meeting (17 Oct. 2023) - Presentations by MPLS-IP/TP vendors.
- 3rd JC meeting (5 Dec. 2023) - Presentation on alternate technologies. Assessment of POC done.
- 4th JC meeting (23 Jan. 2024) - MPLS-IP POC agreed by CISCO. N/w to be finalized for POC.
- 5th JC meeting (11 Mar. 2024) - MPLS/OEMs/Vendor issues, Field visit of RRVPNL & TANTRANSCO.
- 6th JC meeting (8 Aug. 2024) - Test setup shared. Locations finalized.

In the last 7th MPLS Joint Committee Meeting held on 20.12.2024 on Virtual Mode, **Draft Report on Introduction of MPLS technology in ISTS Communication System** was

deliberated by CTU for information and discussion with all members. (MoM of 7th MPLS Joint Committee attached as **Annexure-B.2.7**)

- In view of above, it is to intimate that adaptation of MPLS technology for ISTS communication system is in verge of finalization and expected to be finalized in the Month of February 2025.
- Since all the SLDCs, IPPs, ISGS real time data and voice is to be integrated with respective RLDC, a workshop is proposed to be conveyed by the POWERGRID/CTU on said technology with emphasis on integrating constituents' data and voice with the ISTS communication network.

CTU may update. Members may discuss.

2.8 Strengthening of last mile connectivity of Sikkim SLDC: ERLDC

It is observed that Sikkim SLDC last mile connectivity (Aerial link /UGFO link) fails very frequently there by ICCP links are down and non-availability of data and voice to ERLDC as well as SLDC, it was found that 03 times there is fiber cut between Gangtok and Sikkim SLDC (link length app. 5 Km) in last one to two months.

Moreover, as per guidelines from the technical manual for communication system, same is to be strengthened with redundant communication links.

Hence, it is proposed to CTU to take up said issue on priority for providing alternate link (viz. aerial cable /UGFO / MW point to point link with proper cyber security) to said link.

ERLDC may explain. Members may discuss.

2.9 Utilizing the Asset in the Deployment of the OPGW Network: Powerlinks

Powerlinks Transmission Limited carries out O&M of EHV transmission line (220kV and 400kV) having towers spread across 3 states from West Bengal to Uttar Pradesh. In existing transmission infrastructure, of Powerlinks in Eastern Region, is hereby requested for installation of OPGW, which can be utilized for:

- System Integration - OPGW facilitates the integration of Supervisory Control and Data Acquisition (SCADA) systems, which are essential for real-time monitoring, automation and control of the electrical grid.
- High Speed communication/ Data Transmission - The optical fibers within the OPGW are used for high-speed data transmission, which supports a range of communication needs.
- Lightning Protection - OPGW is installed at the top of the transmission tower, where it can intercept lightning and safely divert it to the ground.

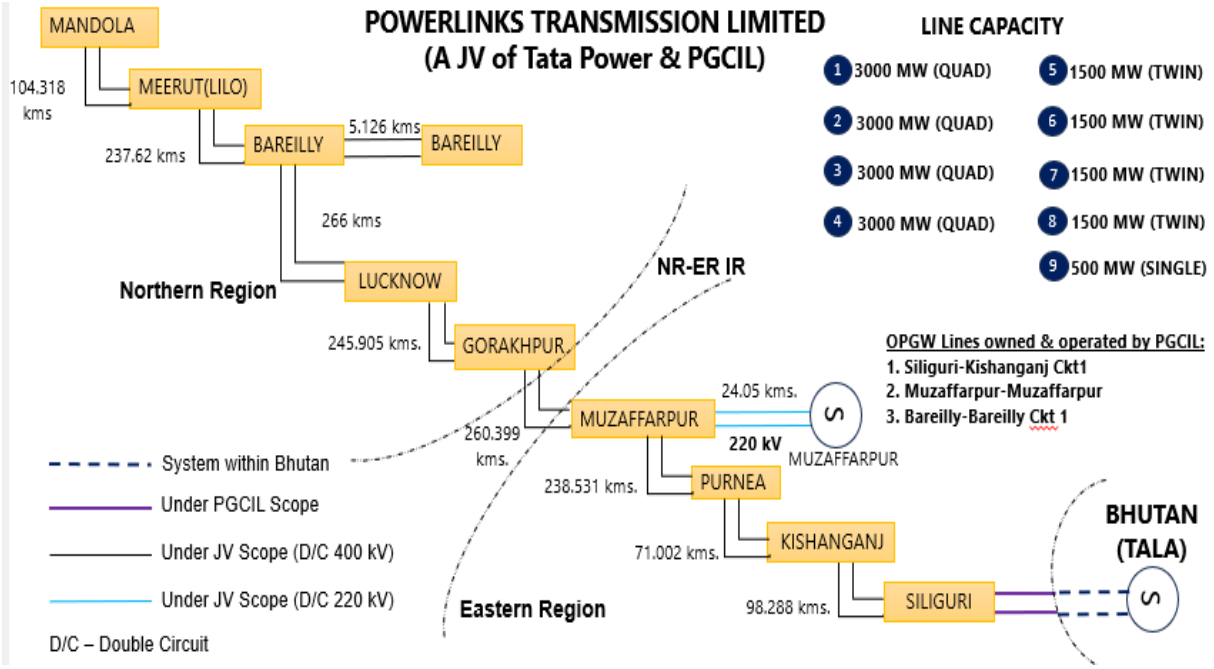
- **Also, as per the advisory by Central Electricity Authority dated 22.05.24 (reference attached), Central and State Sector utilities must prioritize the implementation of the OPGW laying across its transmission network to ensure compliance with regulatory requirements.**
- **Hence, to optimally utilize the existing transmission assets covering three states with a significant line length and adhere to the compliance with regulatory**

requirements, we propose to set up OPGW network in entire line length of Powerlinks Transmission Limited.

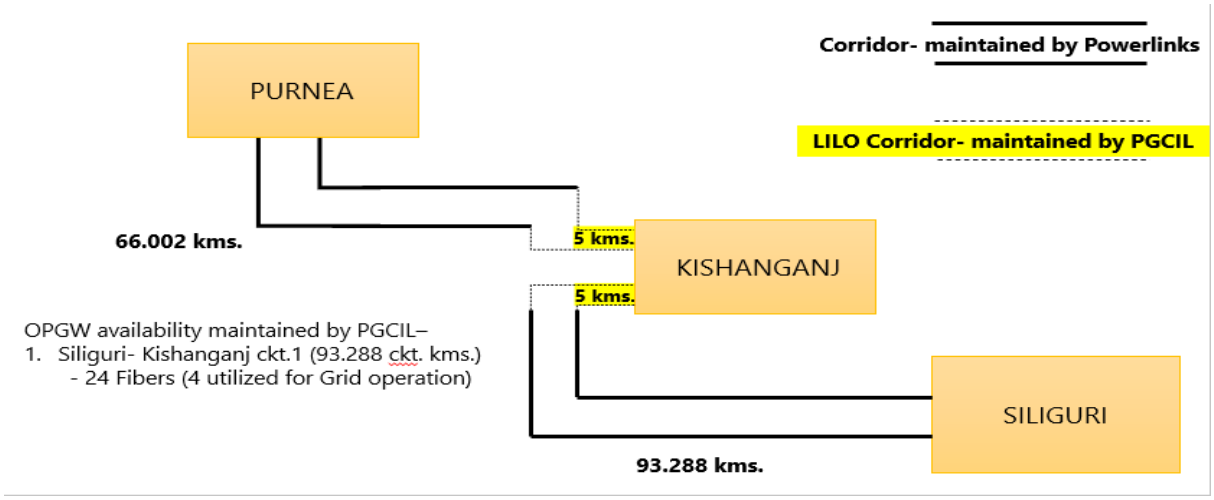
Details of transmission lines owned and maintained by Powerlinks

S.N.	Line name	Line Length (In KM)
1	Siliguri-Kishanganj Circuit-2	98.288
2	Kishanganj-Purnea Circuit 1	71.002
3	Purnea-Muzaffarpur Circuit 1	238.531
4	Muzaffarpur-Gorakhpur Circuit 1	260.399
	Total Length in ER region	**668.22 Km**

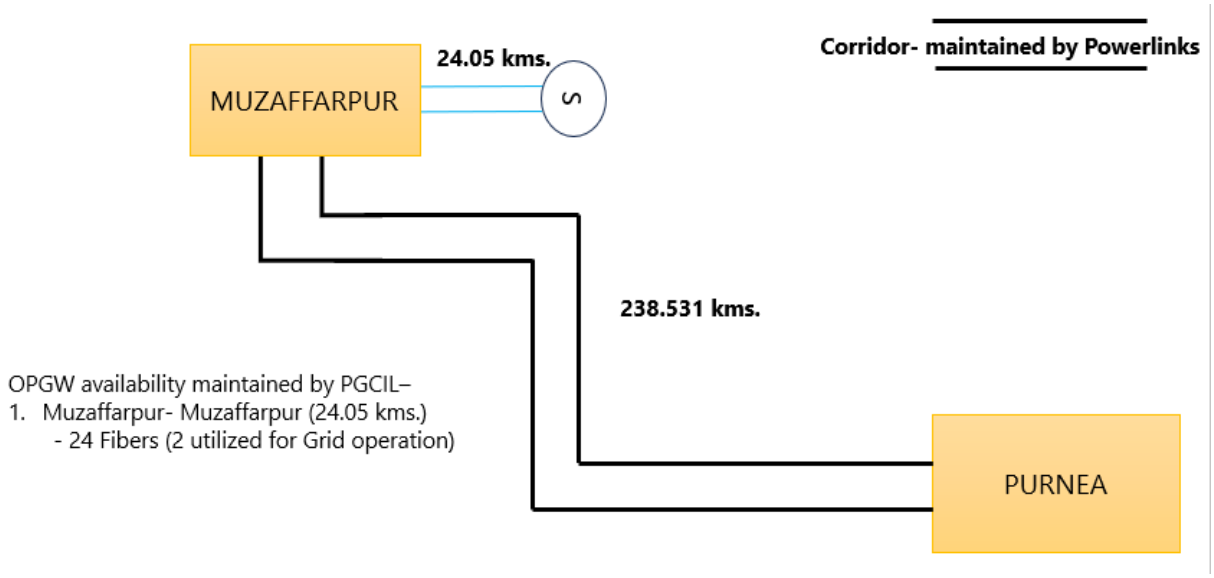
OVERVIEW



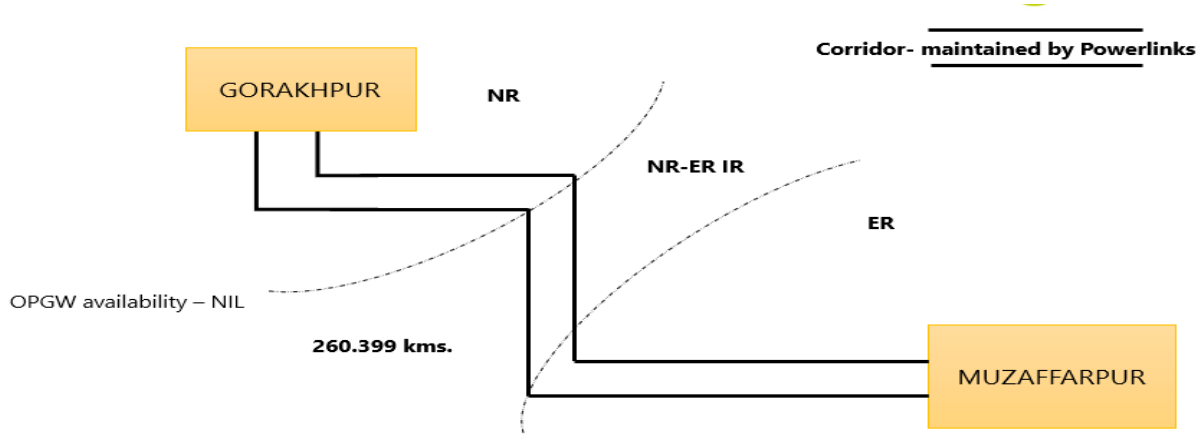
SECTION 1 (SILIGURI-PURNEA)



SECTION 2 (PURNEA-MUZAFFARPUR)



SECTION 3 (MUZAFFARPUR-GORAKHPUR)



Deliberation as per **221st OCC:**

Powerlinks briefly explained the proposal of OPGW laying on 04 no.s of 400 kV lines in line with CEA guidelines.Presently there exists OPGW only on 400 kV Binaguri-Kishanganj line in the vicinity and OPGW needs to be laid on all other lines as mentioned above.

221st OCC Decision

- Since the proposed laying of OPGW shall be carried out in RTM mode, technical requirement of the OPGW links for reliable communication needs to be ascertained.

Powerlinks may explain. Members may discuss.

2.10 Status of Eastern Region Communication Schemes awarded to TSPs.: CTU

Following communication projects have been awarded to various TSPs after approval in NCT.

Sl No.	Project Name	Award Date	Implementing Agency	Implementation Time	Status update by TSP
1.	Scheme for OPGW laying in 400kV BokaroA- Kodarma line.	11.03. 2024	POWERGRID	18 months	Installation Completion by March 2025
2.	Scheme for Requirement of Additional FOTE for redundancy at AGC locations in ER.	11.03. 2024	POWERGRID	06 months	Done
3.	Requirement of Additional FOTE at various ISTS nodes in ER due to exhaustion of existing capacity	22.11.2024	POWERGRID	12 months	Under tendering
4.	Deployment of FOTE (SDH Equipment) and amplifier solutions at Alipurduar S/s end for OPGW based communication and Teleprotection for 400kV lines from PHEP-II, PHEP-I and Jigmeling of Bhutan to Alipurduar, India	22.11.2024	POWERGRID	06 months	Under Tendering

5.	Eastern Region Expansion Scheme-44: Supply and installation of OPGW along with terminal equipment at both ends of Siliguri (POWERGRID) – Kishanganj (POWERGRID) 220 kV D/c (HTLS) line (108 km).	22.11.2024	POWERGRID	18 months	Under Process of Supply

Members may update.

2.11 Status of ongoing projects in POWERGRID ER-II: POWERGRID

Following is the status of ongoing works in ULDC,ER-II under various approved projects:

A. Fiber Optic Expansion Project (Additional Requirement):

Link Name	Length (Km)	Status	Remarks
Teesta III-Kishanganj	242.062	Commissioned on 28.02.2024	Work was delayed due to severe ROW issues at various location and non-availability of A/R in non-auto mode due to high hydro scenario.
Rangpo-Chuzachen	20.727	Commissioned on 21.12.2024	Work was delayed for more than 3 years due to severe ROW issues in section T34-T37. Matter was taken up repeatedly with owner of TL, Sikkim Energy & Power Dept as well as Administration for resolution of the issue. There was very low ground clearance of conductor which was the main reason of ROW by local villagers. However, Joint Site visit was done by POWERGRID and Sikkim E&PD official on 18.11.2024 to find feasible solution to the problem. After lot of efforts, feasible solution of low conductor clearance was worked out and meeting conducted with local villagers on 09.12.2024 where they has given consent for carrying out the pending opgw work. Accordingly, work re-commenced and completed on 20.12.2024.
TLDP-NJP	82	Deleted from Scope of the Project	Consent rejected by WBSETCL,Owner of the TL, for

			carrying out OPGW laying on their line.

B. Upgradation of SCADA/RTU/SAS and Strengthening of OPGW In Eastern Region

Link Name	Length (Km)	Status	Remarks
Durgapur-Jamshedpur	183.635	Commissioned on 15.12.2023	
Durgapur-Farakka	157.745	Commissioned on 22.06.2024	Delay due to ROW issue at sites, non-availability of shutdown and entry issue in Farakka NTPC.
Rangpo-Dikchu	32.176	Commissioned on 11.09.2024	Delay due to flash flood in Sikkim in 4th Oct-2023. OPGW installation and equipment installation and commissioning was hampered. Majority of the sites are not reachable. DCPS & Battery Bank washed out at Dikchu HEP. Re-supply done. There was flood scenario again on June-2024 and major landslide occurred on August-2024. However, after reachability of site on September-2024, re-supply was done and pending work completed and link finally commissioned on 11.09.2024.

Site Name	SAS/RTU	Status	Remarks
Birpara	SAS	Commissioned	
NewMelli	SAS	Commissioned	
Gangtok	RTU	Commissioned	
Binaguri	RTU	Commissioned	
Subhasgram	RTU	Work in Progress	Delay due to non-availability of shutdown. Shutdown was issued by ERLDC in December-2024 & January-2025 for CT-PT integration and work of majority of the bays has been completed. Only 2 bays remaining. Expected commissioning by Jan-2025.
Maithon	RTU	Work in Progress	Delay due to non-availability of shutdown. Shutdown was issued by ERLDC in December-2024 & January-2025 for CT-

			PT integration and work of majority of the bays has been completed. Only 2 bays remaining. Expected commissioning by Jan-2025.
Berhampore	SAS	Commissioned	Delay due to non-availability of shutdown. Shutdown was received in December-2024, work has been completed. SAS commissioned on 01.01.2025.
Durgapur	SAS	Considered for keeping at SAS Lab at Rajarhat S/s	

C. Strengthening of OPGW in Eastern Region and Inter-regional Links

Link Name	**Length (Km)**	**Status**	**Remarks**
Jamuria-Ramkanali	51.995	Commissioned on 05.06.2023	
Ramkanali-CTPS	72.074	Commissioned on 23.03.2023	
Purulia-Jamshedpur	87.08	Commissioned on 12.04.2023	
CTPS-Gola	67.639	Commissioned on 22.03.2023	
KTPS-Giridih	105.298	Commissioned on 12.01.2024	
Howrah(DVC)-Howrah(WB)	1.022	Commissioned on 22.05.2024	
Maithon-Durgapur	74.125	Commissioned on 24.01.2024	
Durgapur-Sagardighi	133.572	Commissioned on 24.06.2024	
Farakka-Purnea	179.643	Commissioned on 24.06.2024	
Farakka-Sagardighi-Subhasgram	331.096	Commissioned on 18.12.2024	Delay due to non-receipt of permission from Railways and signing of way leave agreement with Railways for carrying out opgw work in 02 nos. railway crossing span. After repeated communication and followup with Railways (Howrah DRM, Eastern Railways), wayleave agreement signed on 12.09.2024. Several request was made for traffic & power block through official

			correspondence. Work finally completed and link commissioned on 18.12.2024.

Members may discuss.

2.12 Proposal for deletion of FOTE in Teesta-V under redundant FOTE scheme for AGC in ER: POWERGRID ER – II

Scheme for redundant FOTE in AGC locations in Eastern Region was approved in 18th NCT. Following is the status:

S/n	Location	Region	Status	Remarks
1	Rangit	ER-II	Commissioned	
2	Teesta-V	ER-II	Pending	Proposed for deletion from scope of project.
3	NTPC Barh	ER-I	Commissioned	
4	MTPS Kanti	ER-I	Commissioned	
5	NPGC Nabinagar	ER-I	Commissioned	
6	NorthKarnpura	ER-I	Commissioned	
7	Talcher NTPC	Odisha Projects	Commissioning In Progress	
8	Darliparli NTPC	Odisha Projects	Commissioning In Progress	

Teesta-V NHPC vide email (copy attached in **Annex B.2.12**) confirmed that plant is under shutdown and installation of FOTE is not possible and it is expected to come in operation in 2026. Hence, it is proposed for deletion of the redundant FOTE in Teesta-V from scope of this project.

Powergrid may explain. Members may discuss.

2.13 Ensuring Accurate data and Telemetry for the Proper functioning of State Estimator in ERLDC: ERLDC

Present SCADA/EMS in SLDCs and ERLDC has State Estimator (SE) and Real-Time Contingency Analysis (RTCA) which are important for real time decision support for providing any planned outage or accessing impact of any forced outage on the grid. Presently SE and RTCA is functioning only at ERLDC and are not properly functional in SLDCs. At ERLDC it's truncated at 220 kV levels due to poor reliability of data at 132 kV levels. Major reasons for non-working of SE and RTCA at SLDCs and truncation at ERLDC at 220 kV level are non-availability of reliable data and telemetry of 132 kV substations specially breaker/isolator status. However, ERLDC is supporting states so that these can be made functional to some extent.

Now new SCADA/EMS system implementation under ULDC Phase III has already commenced in Eastern Region. The new SCADA/EMS system includes several additional

decision-support tools apart from SE/RTCA for real-time operations, of which some of prominent ones are listed below:

- Automatic Demand Management System (ADMS)
- Load Forecasting
- Transmission Loss Sensitivity Factors (TLSF)
- Network Sensitivity Applications (LODF, GSDF, LSDF)
- Optimal Power Flow (OPF)
- Short Circuit Analysis (SCA)
- Transmission Line/Corridor Capability Monitor (TCM) for Real time ATC/TTC calculation
- Dynamic Security Assessment (DSA)

Successful integration of these tools at SLDCs as well as ERLDC hinges on accurate data and telemetry from 132 kV and above substations in the Eastern region.

Performance status of running RTCA for Real time outage is provided in below figure from 1st Dec 2024 till 15th Jan 2025 at ERLDC.

During this, out of 13 results major three outages where times SE and RTCA function at ERLDC did not provide satisfactory results due to data availability issues as quoted below. It can be seen that, how analog as well digital status input can impact decision support tools non-availability during real time grid operation. In coordination with SLDCs and Utilities, these observed issues have been rectified bilaterally.

Date	Description of SCADA/EMS Data Issue	Impact on SE/RTCA Performance at ERLDC	Remarks/Corrective Action

03-12-2024	Non-update of correct Status data of 400 kV Meramundali Station	Non-Satisfactory Result in RTCA	Corrected in coordination with SLDC Orissa
07-12-2024	Data Quality issue from Farakka NTPC for Analog and Status Points	Non-Satisfactory Result in RTCA	Corrected in coordination with NTPC Farakka
02-01-2025	Partial Data availability from Maithon and Subhasgram	Non-Satisfactory Result in RTCA	Corrected in coordination with POWERGRID

In view of the above, following points may be discussed:

- SLDCs should utilize existing SCADA SE/RTCA tools for real time contingency analysis and outage processing.
- SCADA data telemetry monitoring and compliance status for all 132 kV and above substations in OCC and TEsT meeting of Eastern region.
- All SLDCs to share the complete substation based RTU wise list and its communication availability, integration and reporting in SLDC SCADA, protocol (101/104), RTU/SAS upgradation plan, Communication system under planning, timeline for completion of activities and any other relevant details
- All SLDCs at present should ensure station wise checking of all analog and status point, checking of suspected isolator/breaker status and its correction at field levels.
- Ensuring integration of all required digital and analog data during new SAS/RTU upgradation work to ensure function of these tools at SLDC level.

- **221st OCC Decision**
  OCC advised all ER constituents to ensure reliable telemetry from all 132 kV and above stations to ERLDC for proper functioning of essential SCADA tools Real-Time Contingency Analysis (RTCA), State Estimator (SE),etc at both ERLDC and respective SLDCs.

ERLDC may explain. Members may discuss.

2.14 Ensuring Real-Time Data Telemetry for Newly added/Modified Transmission and Generation Elements with ERLDC for Real time operation and SCADA/EMS Decision support tools functioning: ERLDC

- In the fiscal year 2024-25, numerous requests have been received at ERLDC from ISTS-connected users and users under SLDC jurisdiction for the integration of newly added or modified transmission and generation elements. However, these requests often lack ensured real-time data telemetry prior to first-time charging.
- Users are then providing undertakings from their management stating that real-time data telemetry will be made available within a time-bound manner. Based on the undertaking, though ERLDC has allowed charging of such elements for overall improvement of power supply position in respective control area, but the commitment made in such undertaking are not fulfilled.

- This is resulting in violation of data availability commitment for reliable and secure grid operation, affecting state estimation accuracy, and the effectiveness of the real-time contingency analysis tool within the SCADA/EMS system at the ERLDC level.

A list of applications received in year 2024-25 where charging has been allowed based on undertaking for data and telemetry are listed below where undertaking timelines have not been adhered to.

Applicant	FTC Application	Substation Name/Element Name	Date mentioned for compliance in Undertaking	Compliance Status
Indian Railway	Main Bays of Pusauli(PG)to Durgawati(DFCCIL)	220 kV Durgawati	SCADA (30-10-2023)	No
SLDC Bihar	Charging of 132 kV DMTCL (Motihari)-Motihari D/C tr. line after restoration of fallen and damaged towers at loc 122,123,124.	132 kV Motihari (BSPTCL)	SCADA (18.06.2024)	No
SLDC Ranchi	FTC of LILO 132KV Sonenagar-Nabinagar-Nagaruntari TL at GSS Nabinagar	132 kV Nagaruntari (JUSNL)	SCADA (02.07.2024) and VOIP (04.12.2024)	No

It has been informed to all users that as per the below mentioned regulations, all users, including generating plants and transmission licensees under the control areas of RLDC and SLDCs, must ensure the integration of SCADA and telemetry for real-time data for grid operations at SLDC and RLDC levels as required.

- IEGC Clauses 8.2.3, 8.2.4, 11.1, 11.3
- CERC (Communication System for Inter-State Transmission of Electricity) Regulations 2017, Clause 7.8.i
- CEA (Technical Standards for Connectivity to the Grid) Regulations 2007, Clauses 6.3 and 6.5
- CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations 2022, Clauses 10.1.b, 40.1.c.i & ii, 43.4
- IEGC Clause 33.2, which mandates reliable and accurate real-time data for successful state estimation and real-time contingency analysis through the SCADA/EMS system at RLDC and SLDC levels.

In view of the above, following actions points are envisaged by all users within ERLDC and SLDCs control areas

- All users within the ERLDC control areas and Eastern Region State Control areas must prioritize the successful installation and integration of all communication systems,

channels, and interfaces with the ERLDC/SLDC SCADA system before applying for charging any new elements.

- Significant lead time should be provided for integration and checking of real time data availability at ERLDC level.

Further, practice of allowing charging based on undertakings should be discouraged and to be communicated to all users within the State control areas so that they can take up the same during project implementation phase.

Members may discuss these issues and the necessary steps to ensure compliance and improve real-time operations.

ERLDC may explain. Above constituents may update. Members may discuss

2.15 Non availability of SCADA telemetry in Eastern region: ERLDC

- SCADA/EMS system has been installed at SLDC and RLDC and real time operators are performing grid management activities based on real time SCADA data. Further, State Estimation (SE) application and real time contingency analysis (RTCA) application in SCADA/EMS system also utilize these data for decision making. It may kindly be noted that as per **clause 33.2 of IEGC 2023,**
- *"SLDCs, RLDCs and NLDC shall utilize network estimation tool integrated in their EMS and SCADA systems for the real time operational planning study.* ***All users shall make available at all times real time error-free operational data for the successful execution of network analysis using EMS/SCADA. Failure to make available such data shall be immediately reported to the concerned SLDC, the concerned RLDC and NLDC along with a firm timeline for restoration.*** *The performance of online network estimation tools at SLDC and RLDC shall be reviewed in the monthly operational meeting of RPC. Any telemetry related issues impacting the online network estimation tool shall be monitored by RPC for their early resolution."*
- However, it is observed that several important stations under SLDC jurisdiction in Eastern Region are not reporting to respective SLDCs (as shown in table below) and hence ERLDC is also not getting data through ICCP. SLDC wise list of substations is tabulated below. Substations with voltage level 220 kV and above along with 132 kV stations (**in Annexure-B.2.15**) are listed below.

Table: Area wise no of station without data telemetry as on 08-01-2025 for 220 KV and above level.

SLDC Responsible for data integration	No of SS/GS without data Telemetry
BSPTCL	07
JUSNL	09
OPTCL	05
WBSETCL	04

Table: Area wise no of station without data telemetry as on 08-01-2025 for 132 KV level.

Constituent Responsible for data integration	No of SS/GS Integrated with ERLDC	No of SS/GS NOT reporting to ERLDC
BSPTCL	92	71
JUSNL	26	20
OPTCL	68	23
WBSETCL	91	31
DVC	29	2
SIKKIM	3	2
CS	5	2

Detailed list of 132 kV Substation is provided in Annexure B.2.15.

Details of stations, which are not reporting or yet to be integrated at SLDC for 220 KV and above level stations is provided below as per SLDC bifurcation:

Table: Non availability of SCADA Data Telemetry of Bihar Substations

SL No.	BSPTCL	Last Reported	15th TEsT Meeting Status
1	FATUHA_220	27-02-2024, Bus and Feeder Data are not reporting	Not reporting due to Node issue of RTU
2	BEGUSARAI_220	16-05-2024, Bus and Feeder Data are not reporting	Analog data partially reporting. Issue of communication cable which is rectifying at the field end
3	SONENAGAR_NEW_220	27-09-2024, Bus and Status Points are not reporting	Bus and Status Points are now reporting at Bihar SLDC
4	MUSAHARI_220	Reporting intermittently	Partial data were being reported at Bihar SLDC
5	LAUKAHI_220	12-09-2024	Partial data were being reported at Bihar SLDC
6	JAMALPUR_BGCL_220	Reporting intermittently	Partial data were being reported at Bihar SLDC
7	GARAUL_220	08-07-2024	Partial data were being reported at Bihar SLDC

Table: Non availability of SCADA Data Telemetry of Jharkhand Substations

SL No.	JUSNL	Last Reported	15th TEsT Meeting Status
1	BURMU_220	INTEGRATION ISSUE	Burmu will be reporting in next 2 months
2	CHATRA_220	16-01-2024	Additional Time required
3	GIRIDIH_220	INTEGRATION ISSUE	Additional Time required
4	GODDA_220	11-01-2023	Additional Time required
5	JASIDIH_220	01-06-2023	Additional Time required
6	GARHWANEW_220	28-02-2022	Additional Time required
7	SMARTCITY_220	27-02-2023	Additional Time required
8	DUMKA_220	22-05-2023	Additional Time required
9	CHAIBASA_220	25-10-2022	Additional Time required

Table: Non availability of SCADA Data Telemetry of Odisha Substations

SL No.	OPTCL	Last Reported	15th TEsT Meeting Status
1	NALCO_220	21-04-2023	Earlier it was reporting in 101 protocol. NALCO is in the process of data transmission over IEC 104 protocol . 11 KM of OPGW link is already established. It will be completed within 3 months
2	PARADEEP_ESSAR_220	10-11-2021	RTU upgradation for data transmission over IEC 104 is under process. This matter has been already taken up with M/s Essar.
3	EMAMI_220	01-11-2021	Letter from CGM (Tel), OPTCL & SLDC has already been issued to EMAMI for rectification of data link to SLDC. EMAMI yet to respond.
4	PARADEEP_IOCL_220	01-11-2021	Because of obsoletion of PLCC equipment, IOCL has already been given

			BOQ to migrate to 104 communication. Their response is awaited
5	TELKO_220	INTEGRATION ISSUE	220KV Telkoi SAS has been failed since dt 17.06.2023 due to GE SAS gateway issue. This matter has-been already taken up with M/s-GE

Table: Non availability of SCADA Data Telemetry of West Bengal Substations

SL No.	WBSETCL	Last Reported	15th TEsT Meeting Status
1	TLDP4_220	28-08-2023	To be restored within 3 months
2	TLDP3_220	18-05-2024	Reporting at SLDC level
3	KLC_Bantala_220	16-07-2022	Reporting at SLDC level
4	HALDIA TPP_400	Bus-1 and few Status Points are not reporting	

Looking at above aspects, SLDCs may kindly provide a firm timeline for restoration of data from these 220 kV and above level Substations. SLDC may kindly share the RTUs wise data availability to ERLDC so that all substations up to 132 kV level can be integrated at ERLDC level for New SCADA system.

ERLDC may explain.BSPTCL, JUSNL, OPTCL, WBSETCL may update. Members may discuss.

2.16 Non-reporting stations for AMR: ERLDC

Below mentioned list of stations are not reporting to ERLDC via AMR due to certain reasons like LAN or Communication related issue. Matter needs to be resolved at the earliest.

Sr. No.	Utility	SUBSTATION_NAME	Issue	Remarks
1	WBSETCL	New PPSP	Data Not reporting since long	Communication/AMR issue
2	WBSETCL	Bidhannagar 400KV		
3	WBSETCL	Subhasgram		
4	WBSETCL	New Town		
5	WBSETCL	Bidhannagar 220KV		
6	WBSETCL	Jeerat		
7	WBSETCL	Santaldihi		
8	WBSETCL	Sagardighi		

9	WBSETCL	KLC Bantala	Port not configured	No card available
10	Bihar	KISHANGANJ	LAN DOWN	Network Issue
11	Bihar	DARBHANGA	LAN DOWN	Network Issue
12	Bihar	SIPARA	Panel Shifted	Network Issue
13	Bihar	Khagul	LAN DOWN	Network Issue
14	Bihar	SONNAGAR NEW(BH)	LAN DOWN	Lan need to restore
15	Bihar	132 KV Baisi	Port not Configured	New Meter integration in-progress
16	Bihar	132 KV Raxaul	Port not Configured	
17	Bihar	132 KV Kataiya	Port not Configured	
18	Bihar	132 KV BalmikiNagar	Port not Configured	
19	Bihar	400 KV Bakhtiyarpur New	Port not Configured	
20	Bihar	132 KV RAMNAGAR	Port not Configured	
21	GRIDCO	132 KV JALESWAR(GRIDCO)	Port not Configured	Entry Permission
22	GRIDCO	JODA(GRIDCO)	LAN DOWN	-
23	GRIDCO	Dhulunga CMP	Port not Configured	No panel
24	GRIDCO	132 KV BHOGRAl(GRIDCO)	Port not Configured	No panel
25	SIKKIM	220 KV LEGSHIP POOl(SIKKIM)	Port Configured, Pin not available	-
26	JUSNL	LALMATIA(JH)	LAN DOWN	Network Issue

ERLDC may explain. Members may update.

2.17 Deviation in SCADA Vs SEM data: ERLDC

ERLDC publishes deviation in tie-lines data of SCADA system while comparing with SEM meter data every week and shares it with all associated utilities and SLDCs. This is for improvement of SCADA data accuracy and to minimize error. This helps in real time decision support tool for deviation management and ensuring grid reliability.

Three key feeders from the shared list is being explained where SCADA data telemetry at field level is required to be checked on urgent basis and actions are envisaged.

- Based on 02 December 2024 to 08 December 2024 data analysis for **400KV Biharsharif - Balia circuit 1** is provided below in tabular form where the analysis of SEM Vs SCADA revealed that Biharsharif end SCADA data need to be checked as showing high % error. Associated plots for the same is attached.

Comparison	Error %	Remarks
SEM VS SCADA at Biharsharif End	28.7	Based on the analysis of error, Biharsharif end SCADA data need to be checked as it is showing high percentage of error.
SEM VS SCADA at Balia End	3.83	
SCADA(Biharsharif) VS SCADA (Balia)	32.98	
SEM(Biharsharif) VS SEM(Balia)	8.75	

- Based on 09 December 2024 to 15 December 2024 data analysis for **400KV Biharsharif - Balia circuit 2** is provided below in tabular form where the analysis of SEM Vs SCADA revealed that Biharsharif end SCADA data need to be checked as showing high % error. Associated plots for the same is attached in the annexure.

Comparison	Error %	Remarks
SEM VS SCADA at Biharsharif End	28.4	Based on the analysis of error, Biharsharif end SCADA data need to be checked as it is showing high percentage of error.
SEM VS SCADA at Balia End	3.57	
SCADA(Biharsharif) VS SCADA (Balia)	32.71	
SEM(Biharsharif) VS SEM(Balia)	1.29	

- Based on 09 December 2024 to 15 December 2024 data analysis for **400KV Talcher - Meramundali 1** is provided below in tabular form where the analysis of SEM Vs SCADA revealed that Talcher end SCADA data need to be checked as showing high % error. Associated plots for the same is attached in the annexure.

Comparison	Error %	Remarks
SEM VS SCADA at Talcher End	9.42	Based on the analysis of error, Talcher end SCADA data need to be checked as it is showing high percentage of error.
SEM VS SCADA at Meramundali End	1.06	
SCADA(Talcher) VS SCADA (Meramundali)	9.45	
SEM(Talcher) VS SEM(Meramundali)	5.51	

Plots available in **Annexure-B.2.17**

ERLDC may explain. Members may discuss.

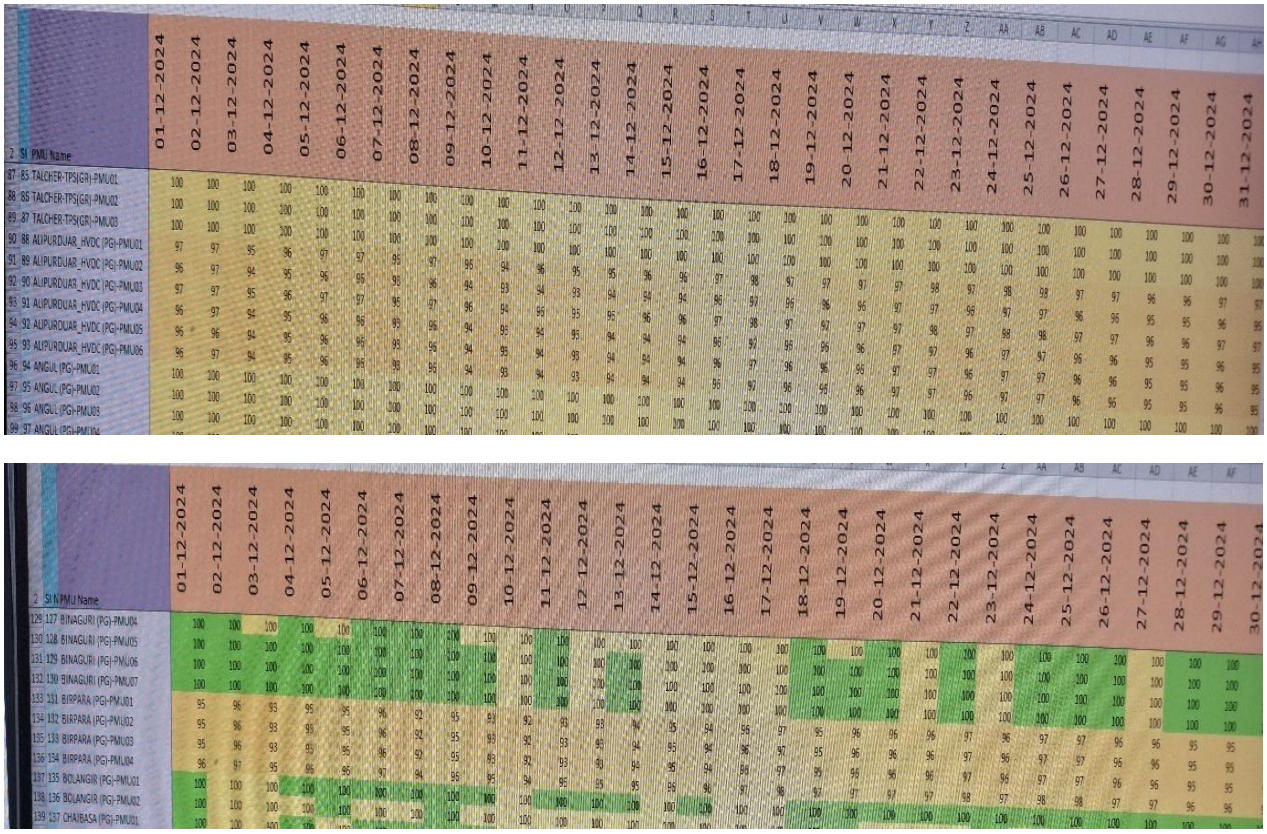
2.18 Non-reporting of PMUs: ERLDC

PMU data are used at ERLDC for real-time monitoring as well as post-facto analysis of faults and other events. At present, 7 number of physical PMUs from multiple central sector stations are not reporting to ERLDC. Respective Utilities has been informed over mail and other communication about these issues.

List of non-reporting Central Sector PMUs are tabulated below:-

PMU ID	PMU Address	Station	Station ID	Feeder(s)	Issue	Last reported on
5675-5676	ER1KISHN_PG PM05	Kishan ganj	KISHN_ PG	400DARBH_PG 1	Waiting for configuration frame	23-02-2024
5678-5679	ER1KISHN_PG PM06	Kishan ganj	KISHN_ PG	400DARBH_PG 2	Waiting for configuration frame	23-02-2024
5762-5763	ER1DARBH_PGPM01	Darbhanga	DARBH _PG	400SITAM_PG2	Waiting for configuration frame	16-05-2024
5765-5766	ER1DARBH_PGPM02	Darbhanga	DARBH _PG	400SITAM_PG1	Waiting for configuration frame	16-05-2024
5226-5228	ER1KAHAL_NTPM01	Kahalgaon	KAHAL_ NT	400LAKHI_PG1 and 2	GPS lock and time-stamp issue	>1 year
5229-5231	ER1KAHAL_NTPM02	Kahalgaon	KAHAL_ NT	400BANKA_PG 1 and 2	GPS lock and time-stamp issue	>1 year
5232-5234	ER1KAHAL_NTPM03	Kahalgaon	KAHAL_ NT	400FARAK_PG 3 and 4	GPS lock and time-stamp issue	>1 year

Further, PMUs at Alipurduar and Birpara are dropping significant numbers of frames:



ERLDC may explain. POWERGRID, NTPC and DMTCL may update. Members may discuss

2.19 SCADA Integration & Reporting Status of Transnational Tie Lines with Nepal: ERLDC

SCADA data reporting in respect of 132 KV Kataiya-Duhabi Feeder ,132 KV Ramnagar-Valmikinagar Surajpura Feeder is not available at ERLDC.

As per the deliberation in **14th TesT :**

BSPTCL representative apprised:

SCADA data reporting in respect of 132 KV Kataiya-Duhabi Feeder is hampered owing to RTU malfunctioning while there is issue with PLCC i.r.o 132 KV Ramnagar-Valmikinagar Surajpura Feeder.

14th TeST Decision:

TeST committee advised BSPTCL to resolve the persistent issues at the earliest (within 15 days) to ensure reliable reporting of important Trans-national tie lines with Nepal in SCADA.

Further **IEGC 2023, Clause 11.3** states that

"All users, STU and participating entities in case of **cross-border trade shall provide,** in coordination with CTU, the required facilities at their respective ends as specified in the connectivity agreement. The communication system along with data links provided for speech and real time data communication shall be monitored in real time by all users, CTU, STU, SLDC and RLDC to ensure high reliability of the communication links."

However, real time monitoring cross border power exchange is affected due to non reporting of SCADA data of the cited stations. BSPTCL and Bihar SLDC may share the present status/progress regarding corrective action for the data availability at ERLDC.

ERLDC may explain.BSPTCL may update. Members may discuss.

2.20 Submission of MAC/IP address of all end user communication equipment's: ERLDC

TeST committee in 15th TeST Meeting opined that remaining utilities may submit the details to ERLDC in prescribed format. Status of Constituents wise list is attached at **Annexure B.2.20.**

ERLDC may explain. Members may discuss.

2.21 Information on Trial Operation Certificate issued for various OPGW links and AGC FOTE in ER: ERLDC

ERLDC issues trial operation certificates for the OPGW links in line with the length and other parameters as approved in ERPC forum. A brief overview of the OPGW links with their commercial operation dates provided below:

Summary of OPGW Links with DOCO.

Sl.No.	Name of link (Rating)	Date of Certificate	DOCO	Link length
1	400 KV D/C Patna-Balia Line-1 OPGW Link (24 F DWSM)	31/01/2024	17.11.2023	180.45 km
2	LILO portion of Biharsharif-Balia at Ara OPGW Link (48 F DWSM)	29/01/2024	30.12.2023	10.192 km
3	400 KV BRBCL Nabinagar- Sasaram OPGW Link (24 F DWSM)	02/02/2024	30.12.2023	81.394 km
4	400 KV Biharsharif- Sasaram OPGW Link (24 F DWSM)	02/02/2024	25.11.2023	199.750 km

5	400 KV Biharsharif- Kahalgaon OPGW Link (24 F DWSM)	02/02/2024	25.11.2023	233.234 km
6	LILO portion of 400kV Angul- GMR OPGW Link (24 F DWSM)	26/03/2024	15.02.2024	30 km
7	765 KV Gaya-Varanasi OPGW Link (24 & 48 F DWSM)	04/03/2024	22.01.2024	310.186 km
8	400 KV DURGAPUR - JAMSHEDPUR OPGW Link (24 F DWSM)	28/05/2024	15.12.2023	183.635 km
9	400 KV DURGAPUR - MAITHAN OPGW Link (24 F DWSM)	28/05/2024	24.01.2024	74.125 km
10	400 KV TEESTA III - KISHANGANJ OPGW Link (24 F DWSM)	28/05/2024	29.02.2024	242.062 km
11	400 KV Durgapur - Farakka OPGW Link (24 F DWSM)	25/07/2024	22.06.2024	157.745 km
12	400 KV Durgapur - Sagardighi OPGW Link (24 F DWSM)	25/07/2024	22.06.2024	133.572 km
13	400 KV Farakka - Purnea OPGW Link (24 F DWSM)	25/07/2024	24.06.2024	179.643 km
14	400KV Rangpo - Dikchu OPGW Link (24 F DWSM)	18/11/2024	11.09.2024	32.176 km
15	765 KV Jharsuguda - Dharamjaygarh OPGW Link (24 F DWSM)	08/10/2024	30.08.2024	148.603 km
16	400 KV Rourkela-Raigarh OPGW Link	ERLDC has given consent to WR.		
17	400KV Rangpo - Chuzachen OPGW Link (24 F DWSM)	16/01/2025	21.12.2024	20.727 km

Details of AGC FOTE enclosed at **Annex-B.2.21.**This is for information to the TeST committee.

ERLDC may elaborate. Members may note.

****

Annexure B.2.1.2

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत संचार विकास प्रभाग
Power System Communication Development Division
****

To,
As per list enclosed

Subject: Committee to formulate comprehensive guidelines for the usage and sharing of optical fibers of Optical Ground Wire (OPGW) for power system applications – reg

महोदय / Sir,

The first meeting of the Committee to formulate comprehensive guidelines for the usage and sharing of optical fibers of OPGW for power system applications was held via VC (MS Teams) on 09.08.2024 (Friday).

The Minutes of the meeting are enclosed herewith.

PCD Division, CEA acknowledges the prompt furnishing of written inputs by SRPC, NERPC and CTU. The same has been examined and will be incorporated in the Draft report.

Encl: As above

भवदीय/Yours' faithfully,

(S K Maharana)
Chief Engineer (PCD)

To,

1. Member (PS), CEA, New Delhi
2. Chief Engineer , NPC, CEA, New Delhi
3. Chief Engineer, ET&I, CEA, New Delhi
4. Member Secretary, NRPC, New Delhi
5. Member Secretary, WRPC, Mumbai
6. Member Secretary, SRPC, Bengaluru
7. Member Secretary, ERPC, Kolkata
8. Member Secretary, NERPC, Shillong
9. Chairman & Managing Director, POWERGRID
10. Chairman & Managing Director, GRID INDIA
11. Chief Operating Officer. CTUIL
12. Chairman, UPPTCL, Uttar Pradesh
13. Managing Director, RVPNL
14. Chairman-cum-Managing Director, OPTCL, Odisha
15. Chairman & Managing Director, WBSETCL, West Bengal
16. Managing Director, GETCO, Gujarat
17. Managing Director, MPPTCL, Madhya Pradesh
18. Chairman & Managing Director, KSEBL, Kerala
19. Chairman & Managing Director, TANTRANSCO, Tamil Nadu
20. Chairman, AEGCL, Assam
21. Director General, EPTA, New Delhi

Minutes of the first meeting of the Committee to formulate comprehensive guidelines for the usage and sharing of optical fibers of OPGW for power system applications held on 09.08.2024

List of participants is attached at Annexure-A

1.1. Member (Power Systems), CEA welcomed the Committee members and highlighted that on account of absence of any uniform framework regarding usage and sharing of OPGW fiber cores laid on transmission lines, several issues have been raised. This Committee has been constituted to develop comprehensive guidelines for the usage and sharing of optical fibers in power system applications. In this first meeting, the focus will be on reviewing current practices followed across various STUs to optimize fiber usage for power system operations. The Committee's Terms of Reference are to resolve discrepancies in fiber routing, usage, and sharing.

1.2. Deliberations held:

1.2.1. Need of Guidelines, Allocation Requirements and Sharing Scenarios

CTU made a detailed presentation on the recent issues pertaining to sharing of fibers that necessitates the formulation of uniform guidelines. It stated that arriving at a uniform decision for similar issues pertaining to usage of fibers and sharing in different regions and with different stakeholders becomes difficult on account of absence of any uniform framework. The following issues that have been dealt in recent times were presented by CTU:

(1) Issues in sharing of requisite number of OPGW fibers by the main line owner after the reconfiguration of main line on account of LILO (Line In Line Out) by the different Licensees.
(2) Non uniformity in fiber sharing among different TBCB licensees.
(3) Inconsistency in fiber sharing between ISTS licensee and STUs for data communication and line protection purposes.
(4) Conflicts in sharing of OPGW fibers laid under Unified Load Dispatch and Communication (ULDC) scheme on Intra-State lines and ownership issues post expiration of useful life of fiber.
(5) Non availability of spare fibers post damage of fiber core being used for ULDC purposes.
(6) Sharing of fibers of distribution licensee for ISTS and STU data communication purpose.

Key points that emerged:

(1) The issues are being temporary mediated, as of now, at Regional Power Committee (RPC level. However, in the absence of uniform guidelines, arriving at a decision in different cases becomes difficult.

(2) Central Electricity Regulatory Commission (Sharing of Revenue Derived from Utilization of Transmission Assets for Other Business) Regulations, with prior intimation, permits the transmission licensee to utilize its transmission assets for other businesses. However, there is a caveat that transmission assets utilised for other businesses shall not, in any manner, adversely affect inter-State transmission of electricity.

(3) Crucial aspect of Inter State Transmission of electricity is the real time operation and monitoring of grid for which backbone communication network comprising of OPGW fibers is a pre-requisite.

(4) As far as utilization of fibers of OPGW is concerned, grid operation and reliability are the top most priority and needs to override all other business uses.

(5) CERC, while approving the use of transmission systems, including OPGW, for commercial purposes, mandates that the safety and security of substations and transmission lines must be maintained. Any security breach is unacceptable and must be reported to the Commission immediately. This underscores the critical need for robust security measures when commercializing or sharing ISTS assets among different entities.

(6) The issues arising out of inconsistencies in usage of OPGW fibers and sharing needs a streamlined approach. The technical aspect regarding how many fibers need to be kept reserved for grid monitoring, operation and protection purposes (hereafter referred to as power system application) and how many may be allowed for commercial business uses will be covered in Committee's Report and Guidelines. If still the issue arises, resolution needs to be mediated initially on mutual basis followed by escalating it at RPC level. If still unresolved, CEA needs to be approached. Any difference in interpretation of CERC Regulations and commercial grievances arising out of it, can be taken up at CERC level.

(7) Uniform principle and approach for catering to sharing of OPGW fibers amongst Powergrid (ULDC scheme fibers), TBCB licensees and STU's can be finalized by the Committee. However, sharing of Underground Cable of DISCOMs for grid operation purposes needs separate discussion, with the participation of representatives of DISCOM.

(8) STUs vary in their practices and opinions on the number of fibers to be reserved for power system applications while ensuring network redundancy. Generally, most of the STUs reserve six fiber cores—two for primary use, two for standby, and two as spares—to meet grid operation needs, excluding differential teleprotection requirements.

(9) While planning the transmission scheme itself or while going for upgradation of OPGW fibers, enhanced number of cores can be planned, based on the opportunities of commercialization in that region.

(10) The entity leasing out the OPGW fiber core on commercial basis, while formalizing the commercial arrangement needs to reserve the right to intervene, seek withdrawal or cease utilisation of spare fibers. if the utilization of the same for other commercial purposes adversely affects the grid operation in any manner.

Decision taken:

(1) All the members to submit in written the current practice being followed vis-a-vis their view on the following:

a) Number of fibers to be reserved for power system applications, clearly stating number of fiber cores required for speech, data communication and for catering to teleprotection application including the spare fibers to be kept in case of any damage; future reconfiguration or sharing of OPGW infrastructure among ISTS and STU as required.
While stating the current practice and requirements, members to specify the current OPGW network configuration (whether Multiplex Section Protection (MSP) or Sub-Network Connection Protection (SNCP) protocol is being used)

b) Number of OPGW fiber core to be planned while planning the new transmission scheme or carrying out existing communication infrastructure upgradation.

c) Principle of sharing of fiber cores of OPGW among Powergrid (owner of ULDC fibers), STU's and ISTS licensees (Powergrid as well as other TSPs).

(2) CTU , Powergrid and GridIndia to submit their inputs in respect of need of utilization of underground fiber optic cable (UGFO) of DISCOMs for grid operation purposes. A separate meeting to be convened with the DISCOMs to deliberate upon principle of sharing of underground fiber optic cable (UGFO) laid by DISCOMs. CTU, Powergrid and GRID INDIA to mobilise their resources to compile the cases requiring the DISCOM's cooperation and coordinate with DISCOMs for the above meeting.

1.2.2. Integration of Fiber Optic Terminal Equipment (FOTE) for differential protection in accordance with the C37.94 protocol

Key points that emerged:

(1) Need for differential protection arises for transmission lines of short length , primarily at 220 kV level and below . However, sometimes, after reconfiguration on account of LILO of long lines, the need for differential protection on one of the sections arises.

(2) While STU's like GETCO have implemented Fiber Optic Terminal Equipment (FOTE) based Differential protection utilizing the bandwidth itself; however utilities and licensees like TANTRANSCO, KSEBL and Powergrid carry out the same using separate fiber cores. For differential protection of a single feeder, 2 pair of fibers are utilized for differential protection after accounting for redundancy.

(3) Powergrid highlighted one of the use cases wherein M/s Kallam Transmission Limited (KTL) after LILOing of Pugalur (HVDC) – Pugalur (HVAC) line of Powergrid at Kallam Pooling Station (PS) initially implemented differential protection on 400 kV D/C Pugalur (HVDC) - Karur PS section (less than 30 km) using 6 separate fibers. However, subsequently, they followed-up with OEM(s) for carrying out suitable modifications in relay and FOTE to enable differential protection through FOTE over C37.94 protocol.

Decision taken:

(1) Powergrid to submit a report based on use case of LILO of Pugalur (HVDC) – Pugalur (HVAC) line of Powergrid at Kallam PS pertaining to operational nuances and efficiency of carrying out Fiber Optic Terminal Equipment (FOTE) based differential protection in accordance with C37.94 protocol.

(2) The Committee while finalizing the number of fibers to be reserved for power system applications will take into account the length of the line and the feedback from the operational experience of the above used case.

1.2.3. Uniform mechanism of routing of OPGW fibers in case of LILO/reconfiguration of the transmission line.

Key points that emerged:

(1) As per current practice, STU's like GETCO follows the practice of routing all the fiber cores of OPGW through the LILO node instead of partially splicing the same. However, in cases when few fiber cores of OPGW on the main line are leased out on commercial basis, those commercialized cores are not spliced and are left intact.

(2) ISTS Licensees like Powergrid carry out routing of all the fiber cores through the LILO node in case of LILO of D/c line as it involves dismantling of few towers as well. However for S/c line, they opt for partial splicing.

(3) While carrying out routing of fibers through the LILO node, it needs to be ensured that FOTE installed at all the nodes are compatible.

(4) In case of LILO of the main line at a new node, there are two approaches that can be followed for communication of data and speech signals of new node. Firstly, either the same fibers carrying the communication data of the main line be provisioned to carry the communication data of the new node as well. Second approach is to allocate the separate fiber pairs to the licensee/party implementing the new S/stn and LILO.

(5) With the implementation of Unified Network Management System (UNMS), the necessity to opt for FOTE of same make may be done away with. However, interoperability of FOTE of different makes and their compatibility to integrate with UNMS will be required.

(6) While routing the fibers through LILO node, link budget requirement needs to be maintained. TSP implementing the new node needs to provide new suitable optical interfaces/cards in the FOTE at existing nodes as well, in case the link budget requirement is not met with the existing Optical interfaces.

Decision taken:

(1) All the members to submit their views regarding the mechanism of routing of OPGW fibers in case of LILO/rerouting is taken up on any existing transmission line. The suggestion needs to be made in light of the fact that routing philosophy will also impact the number of fibers to be kept reserved for future LILOs.

1.3. With the above key points and corresponding decisions, the meeting concluded with a note that all the members will actively contribute in providing the inputs. Based on the inputs received, CEA will circulate a draft Report which will be deliberated in the next meeting.

The meeting ended with thanks to the chair.

****

Annexure A

List of Participants

S.no	Members	Name	Organisation/Association
1.	Member (Power Systems) (Chair)	Shri A K Rajput	CEA
2.	Chief Engineer, PCD	Shri S K Maharana	CEA
3.	Chief Engineer, NPC	Smt. Rishika Saran	CEA
4.	Chief Engineer, ET & I	Not present	CEA
5.	Member Secretary, RPCs	Shri V K Singh,	NRPC
		Shri Asit Singh	SRPC
		Shri Deepak Kumar	WRPC
		Shri N S Mondal	ERPC
		Shri K B Jagtap	NERPC
	Other Representatives from RPCs	Shri D N Gawali	WRPC
		Shri Sandeep	WRPC
		Shri Praveen Jangra	NRPC
		Shri Dilip Khuntia	ERPC
6.	Executive Director, CTU	Shri Shiv Kumar Gupta on behalf of ED, CTU	CTU
7.	Executive Director, Grid India	Shri Ankur Gulati and Shri Paritosh on behalf of ED, GridIndia	GridIndia
8.	Executive Director, Powergrid	Shri Vishal Singh on behalf of Shri Doman Yadav	Powergrid
9.	Representative of Electric Power Transmission Association – 2 TSPs	Shri Sanjay Johari	Adani Energy Solutions
		Shri Vivek Kartikeyan	Sterlite Power
10.	Representative from STUs (at the level of Chief Engineer or equivalent)	Shri B K Mallick	OPTCL
		Shri Prabodh Biswal	OPTCL
		Shri S Kanika Parameswari	TANTRANSCO
		Shri R K Gupta	MPPTCL
		Smt Kshama Shukla	MPPTCL
		Shri Arup Sarmah	AEGCL
		Smt Punam Biswakarma	AEGCL
		Shri Viju Rajan John	KSEBL
		Shri K P Rafeeque	KSEBL
		Shri N K Patel	GETCO
11	Special Invitee from PSETD Division, CEA	Shri Bhanwar Singh Meena	PSETD, CEA
12	PCD Division Officers	Miss Priyam Srivastava	PCD,CEA
		Shri Akshay Dubey	PCD, CEA
		Shri Arjun Agarwal	PCD, CEA

Annexure B.2.1.2

Draft Report of the Committee to formulate comprehensive guidelines for the usage and sharing of optical fibers (OPGW) for power system applications

Table of Contents

Abbreviations and Full Forms:

1. AGC - Automatic Generation Control
2. CERC - Central Electricity Regulatory Commission
3. CTU - Central Transmission Utility
4. FOTE - Fiber Optic Terminal Equipment
5. GSS - Grid Substation
6. IEEE - Institute of Electrical and Electronics Engineers
7. IEC - International Electrotechnical Commission
8. InSTS - Intra-State Transmission System
9. IPPs - Independent Power Producers
10. ISGS - Inter-State Generating Station
11. ISTS - Inter-State Transmission System
12. LILO - Loop-In-Loop-Out
13. NLDC - National Load Dispatch Center
14. NoC - No Objection Certificate
15. OPGW - Optical Ground Wire
16. PMU - Phasor Measurement Unit
17. PSCD - Power System Communication and Development
18. RLDC - Regional Load Dispatch Center
19. ROW - Right of Way
20. SCADA - Supervisory Control and Data Acquisition
21. SERC - State Electricity Regulatory Commission
22. SLDC - State Load Dispatch Center
23. STU - State Transmission Utility
24. TSP - Transmission Service Provider
25. VoIP - Voice over Internet Protocol

Draft Report of the Committee to formulate comprehensive guidelines for the usage and sharing of optical fibers (OPGW) for power system applications

1. Introduction

1.1. This report provides a comprehensive framework for the usage and sharing of Optical Ground Wire (OPGW) fibers across power system applications, with the goal of creating a unified approach for fiber allocation that meets the diverse needs of grid operations, system protection, and authorized commercial use. It establishes principles for effective resource allocation, maintaining sufficient redundancy to support future requirements, such as Loop-In-Loop-Out (LILO) expansions, network reconfiguration and scalability to accommodate evolving operational demands.

1.2. In alignment with the *Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020*, and the *Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022*, this report provides uniform guidelines to ensure a secure and resilient communication infrastructure. These guidelines are designed to support seamless communication across wide-band nodes, extending to Load Dispatch Centers (LDCs). By fostering a consistent approach to fiber sharing and allocation, this report intends to promote interoperability and efficiency across multiple entities and users within the power system, ensuring reliable and uninterrupted communication which is critical for grid stability and operations.

2. Allocation Requirements

OPGW fiber cores must be allocated in a way that ensures grid security, future scalability, and opportunities for commercial use, while maintaining redundancy.

Case 1: Double circuit (D/c) Or Single Circuit (S/c) transmission line with length greater than 30 km, thus not requiring Line differential Protection.

Category	**Fiber Allocation**	**Remarks**
Grid Applications	6 Fibers	For communication applications essential for real-time grid management and operation (such as SCADA data, VoIP, PMU, AGC etc). This includes 2 Main, 2 Standby and 2 spare fiber cores
Spare Fibers for alternate communication path for STUs /Radially connected feeders from GSS/Future needs etc	10 Fibers	Reserved in case of Intra-State / Inter-State Utilities/TSPs/ISGS/IPPs require main/alternate OPGW based communication path OR reconfiguration/LILO requirement whicharises alongwith differential protection requirement.

Category	Fiber Allocation	Remarks
Spare Fibers for new technology migration	4 Fibers	Reserved for simultaneous migration to new technology such as Packet based communication network. This includes 2 Main and 2 Standby fibers.
Commercial Use	Remaining fibers	Excess fibers that can be leased that too with the right reserved to intervene, seek withdrawal or cease utilisation of spare fibers in case the grid requirement arises.

Total Allocation: Minimum of 20 fibers for grid applications per OPGW installation.

This allocation ensures that the highest priority is given to grid stability and protection of system aspect, with adequate spare fibers to ensure system resilience and future scalability.

Case 2: Transmission line is Double circuit (D/c) with length less than 30 km, requiring Line Differential Protection as per Request for Proposal (RfP) documents/as per Regional Power Committee's (RPC's) protection philosophy.

Category	Fiber Allocation	Remarks
Grid Applications	6 Fibers	For communication applications essential for real-time grid management and operation (such as SCADA data, VoIP, PMU, AGC etc). This includes 2 Main, 2 Standby and 2 spare fiber cores
Teleprotection Applications	8 Fibers	For Differential Teleprotection, 4 Fibers are required for a single feeder. Accordingly, 8 Fibers for a D/c line.
Spare Fibers for alternate communication path for STUs /Radially connected feeders from GSS/Future needs	6 Fibers	Reserved in case of Intra-State / Inter-State Utilities/TSPs/ISGS/IPPs require main/alternate OPGW based communication. As the transmission line is short, no future LILO/reconfigurations envisaged.
Spare Fibers for new technology migration	4 Fibers	Reserved for simultaneous migration to new technology such as Packet based communication network. This includes 2 Main and 2 Standby
Commercial Use	Remaining fibers	Excess fibers that can be leased that too with the right reserved to intervene, seek withdrawal or cease utilisation of spare fibers in case the grid requirement arises.

Total Allocation: Minimum of 24 fibers for grid applications per OPGW installation. No scope of leasing out the fiber core if the OPGW is 24 Fiber core. Leasing out of fibers, in above case, is possible if OPGW with more than 24 fiber cores is provided.

Case 3: Transmission line is S/c with length less than 30 km, requiring Line differential Protection, as per RfP documents/as per RPC's protection philosophy.

Category	Fiber Allocation	Remarks
Grid Applications	6 Fibers	For communication applications essential for real-time grid management and operation (such as SCADA data, VoIP, PMU, AGC etc). This includes 2 Main, 2 Standby and 2 spare fiber cores
Teleprotection Applications	4 Fibers	For Differential Teleprotection, 4 Fibers are required for a single feeder.
Spare Fibers for alternate communication path for STUs /Radially connected feeders from GSS/Future needs	6 Fibers	Reserved in case Intra State / Inter State Utilities/TSPs/ISGS/IPPs require main/alternate OPGW based communication. As line is short, no future LILO/reconfigurations envisaged.
Spare Fibers for new technology migration	4 Fibers	Reserved for simultaneous migration to new technology such as Packet based communication network. This includes 2 Main and 2 Standby fibers.
Commercial Use	4 Fibers	Excess fibers that can be leased that too with the rights reserved to intervene, seek withdrawal or cease utilisation of spare fibers in case grid requirement arises.

Total Allocation: Minimum of 20 fibers for grid applications per OPGW installation.

---

3. Sharing Scenarios

The table below outlines how fibers will be shared between entities for different transmission lines, ensuring that fibers are allocated equitably and securely across CTU, STUs, and other private transmission licensees.

Scenario	Management Entity	Fiber Sharing	Commercialization Policy
i) OPGW Laid Under ULDC Scheme on ISTS Lines	Presently owned and maintained by POWERGRID.	Upto 10 Fibers, based on requirement, to be shared with STU's/TSPs free of	Excess fiber cores can be commercialized for up to 2 years with CERC NoC.

Scenario	Management Entity	Fiber Sharing	Commercialization Policy
	Allocation to be managed by CTU.	cost, subject to approval of RPC*.	Can be renewed after 2 years.
ii) OPGW Laid Under ULDC Scheme on Intra-State Lines (InSTS)	Presently owned and maintained by POWERGRID. Allocation to be managed by STU.	Upto 10 Fibers, based on requirement to be shared with ISTS licensees/other STU's/TSPs free of cost, subject to approval of RPC*.	Excess fiber cores can be commercialized for up to 2 years with NoC from CERC/SERC/SLDC#, as applicable. Can be renewed after 2 years.
iii) OPGW Laid by STUs on Intra-State Lines	Allocation to be managed by STU.	Upto 10 fibers, based on requirement, to be shared with ISTS Licensee for seamless ISTS communication free of cost, subject to approval of RPC*.	Excess fibers can be commercialized for 2 years with NoC from SERC/SLDC#. Can be renewed after two years.
iv) OPGW Laid by CTU/Powergrid on Intra-State Lines	Allocation to be managed by CTU with STU coordination.	50% fibers reserved for ISTS operations and 50% for Intra-state Operation. In case, requirement of ISTS/Intra State entails more than 50 % quota, the same to be shared free of cost subject to approval of RPC*.	Commercialization for 2 years with NoC from SERC/SLDC#, renewable every 2 years.
v) OPGW Laid by TSPs on ISTS Lines under TBCB/RTM Projects	Owned and maintained by TSPs. Allocation to be managed by CTU	Upto 10 Fibers, based on requirement, to be shared with other ISTS licensees/ STU's free of cost, subject to approval of RPC*.	Commercialization of excess fibers NoC from CERC, renewable every 2 years.

*While approving fiber-sharing proposals, the **Regional Power Committee (RPC)** must ensure prior consultation with the **Power System Communication and Development (PSCD) Division, Central Electricity Authority (CEA)**.

NoC from SERC's will be applicable for such Intra-state lines wherein SERCs have established regulations for sharing revenue from the utilization of transmission assets for other businesses. If such Regulations do not exist and STUs adopt alternative methods to commercialize their fiber optic infrastructure such as leasing agreements, in such cases, NoC from SLDC will be required

4. Integration of FOTE for Differential Protection

4.1. Differential teleprotection is a vital component of power system protection, ensuring rapid and selective fault clearance. The choice of communication medium, whether IEEE C37.94 (herein after referred as C 37.94) protocol over a shared fiber or separate optical fibers, significantly impacts the reliability and performance of this protection scheme.

4.2. The choice between C37.94 compliant FOTE and separate fiber cores for differential teleprotection depends on a variety of factors, including line length, voltage level, criticality, and network conditions. While C37.94 can be a cost-effective solution for certain applications, separate fibers offer superior reliability and faster fault clearance, making them the preferred choice for critical transmission lines, especially at higher voltage levels.

4.3. The Regional Power Committees (RPCs) generally prioritize a **reliable and dedicated communication link for line differential protection** to ensure the integrity and security of protection signals, especially given the criticality of fast and accurate fault detection for power system stability.

4.4. While specific practices may vary depending on the line's voltage level, length, and criticality, however, in order to guarantee reliable communication for line differential protection systems, the Committee recommends the following provisions:

Condition	**Recommendation**	**Reason**
High-Criticality and High-Voltage Lines (220 kV and above) requiring line differential protection	Preference to dedicated or separate fiber cores for line differential protection rather than shared fibers.	As per IEC 60834, which governs teleprotection equipment, the RPCs lean towards using communication setups that meet high reliability and availability standards, favoring separate fibers to reduce signal attenuation and improve reliability for critical protection.
Lower-Criticality or lines with Voltage below 220 kV requiring line differential protection	Line differential protection may be allowed on shared fibers via Fiber Optic Terminal Equipment (FOTE) using the C37.94 protocol	Multiplexing protection signals over a shared fiber can be a cost-effective solution, particularly when the risk of latency and interference is lower due to shorter transmission distances and moderate fault current levels.
High-Criticality and High-Voltage Lines (220 kV and Above) requiring line differential protection. However, constraint in	Line differential Protection using C37.94-compliant FOTE over shared fiber may be	By ensuring reliable and timely communication, C37.94-compliant FOTEs can contribute to meeting the requirements of IEC 60834.

Condition	Recommendation	Reason
availability of separate Optical fibers.	allowed with the following condition: • The setup must meet the provisions of IEC 60834 regarding speed, security, and dependability standards under real-time conditions.	

5. Routing of OPGW Fibers during LILO

5.1. In case of Loop-In-Loop-Out (LILO) of transmission lines, routing OPGW fibers must be done in a way that preserves the operational integrity of the grid's communication infrastructure. Key recommendations are elucidated in table below:

Main Line and LILO Configuration	LILO Tower Type	OPGW Installation Requirement	Fiber Routing/Splicing in New Substation	Configuration Adjustments in Existing Substations	Remarks
Main Line: D/c, 24-Fiber OPGW; S/C LILO	M/c OR D/c Tower (Single Tower for Loop In and Out) with two Earth wire peaks	Install 24 F OPGW on both earthwire peaks i.e same Nos. of OPGW as that of main line on both earth wire peaks.	-Route required No. of fibers only through the new substation. -Splice the required number of fibers for the LILO section at the appropriate point.	- Configure protection schemes and data transfer systems to accommodate the new line and substation -Ensure fiber continuity for main line traffic	Independent OPGWs for each line for enhanced separation and reliability.
Main Line: D/C, 24-Fiber OPGW; D/C LILO	Two Separate D/C Towers (Separate Loop In and Out)	Install 24F OPGW i.e same Nos. of fiber cores as that of main line on one	-Route all fibers of OPGW from the main line through the new substation.	- Configure protection schemes and data transfer systems to accommodate	Dual OPGW ensures redundancy and protection with selective routing and splicing.

Main Line and LILO Configuration	LILO Tower Type	OPGW Installation Requirement	Fiber Routing/Splicing in New Substation	Configuration Adjustments in Existing Substations	Remarks
		earthwire peak per tower.	-Splice the required number of fibers for the LILO line at the new substation, if the new S/stn is of different entity.	the new line and substation	
Main Line: D/C, 24-Fiber OPGW; D/C LILO	Multi-Circuit Tower	Install 24 F OPGW on both earthwire peaks i.e same Nos. of OPGW as that of main line on both earth wire peaks.	-Route all fibers of OPGW from the main line through the new substation. -Splice the required number of fibers for the LILO line at the new substation, if the new S/stn is of different entity.	Adjust relay protocols and FOTE configurations to account for additional nodes.	Ensures dual-path redundancy for high-voltage applications with critical data and protection need

5.2. Whenever a Transmission Licensee implements a Loop-In-Loop-Out (LILO) arrangement on an existing transmission line, adjustments must be made in the **existing Substations**, including **Fiber Optic Terminal Equipment (FOTE)**, **relays**, and **other protection equipment** to ensure seamless integration and reliable protection.

Table summarizing LILO adjustments in existing Substations

Equipment	Adjustments Required	Details
Fiber Optic Terminal Equipment (FOTE)	Signal reconfiguration, routing modifications, capacity upgrades, synchronization, integration with new FOTE, supply of necessary optical interfaces to meet link budget requirement.	Ensure compatibility with new LILO traffic, enhance capacity if required, and synchronization with relays.
Relays	Reconfiguration of protection schemes, distance zone	Modify relay settings for fault detection across LILO, adjust

Equipment	Adjustments Required	Details
	adjustments, differential protection tuning.	impedance settings, and back-up coordination.
SCADA and Telemetry	Data routing, alarm configuration, SCADA system updates.	Integrate new LILO substation data into SCADA, configure additional alarms for LILO events.
Amplifiers/Signal Boosters	Installation if required, signal quality testing.	Ensure strong signal levels across LILO paths, perform attenuation checks.
Protection Redundancy	Ensure redundancy, perform testing and commissioning.	Verify that no single point of failure exists, conduct fault simulations, and document updated settings.

5.3. The entity undertaking the LILO installation and commissioning of the new substation shall ensure that all necessary adjustments, interfaces, and configuration support are implemented to maintain seamless data communication and reliable operation of protection schemes without signal degradation or loss. It is incumbent upon this entity to provide comprehensive support to the owner of the existing substation, facilitating integration and ensuring that all configuration and interoperability requirements are met to uphold continuous, high-integrity signal transmission and effective protection functionality across the network.

6. Commercial Utilization of OPGW Fibers

6.1. OPGW fibers not required for grid operations purpose can be leased for commercial purposes, provided the grid security is maintained. The following conditions govern commercial use:

6.1.1. **Regulatory Oversight**: Any commercial use must receive prior approval (NoC) from CERC/SERCs in line with CERC (Sharing of Revenue Derived from Utilization of Transmission Assets for Other Business) Regulations, 2020.

6.1.2. **Prior communication:** Any entity intending to lease fiber cores for commercial purposes shall provide prior intimation to the relevant Regional Power Committees (RPCs). This will enable the RPCs to get assessed and confirmed that there are no anticipated requirements or expansion needs for grid operation within the next five years. This measure will ensure that critical resources remain available for system reliability and operational demands.

6.1.3. **Fiber Allocation for Commercial Use**: 4 fibers out of 24 fiber core OPGW, as the case permits, based on Allocation requirements detailed at Para 2 above, may be allocated for commercial purposes, with a focus on ensuring that these fibers do not interfere with grid operations. Commercialization of fiber cores may be permitted for a duration of two years,

subject to renewal thereafter at the end of each period. Additionally, the right to intervene, seek withdrawal, or cease utilization of spare fibers must be reserved to address any emerging grid requirements. This ensures that critical infrastructure needs are prioritized and met effectively.

Should an entity identify significant potential for commercialization of fiber in a specific area or seek to maximize revenue generation, it may consider deploying 48-core OPGW. However, it is mandatory that the entity provides prior intimation and adheres strictly to the CERC Revenue Sharing Regulations to ensure compliance and alignment with regulatory requirements.

6.1.4. **Monitoring**: Continuous monitoring of system will be implemented to ensure that commercial usage of fibers does not compromise the grid's operations.

---

7. OPGW Implementation in New Transmission Projects and Upgradation Schemes

7.1. In the new transmission projects and upgradation schemes, the Planning agency should ensure that any decision regarding deployment of fiber cores considers both present needs and future expansions, balancing the infrastructure's capability with associated costs.

7.2. Planning of OPGW with a minimum of 48 fiber cores in wideband nodes to be done, as per feasibility and requirement. For installations within city limits, OPGW may be equipped with 96 fiber cores to facilitate usage by DISCOMs, SLDCs, RLDCs, and NLDC for last-mile connectivity, contingent upon the load-bearing capacity of the line. This approach will accommodate any additional future requirements, including Loop-In-Loop-Out (LILO) configurations or increased capacity utilizing the same Right of Way (ROW).

7.3. In contrast, in remotely located areas where the demand for extensive fiber optic communication does not justify the installation of 48 fiber cores, a flexible approach is recommended. In such instances, a reduced number of fiber cores tailored to the specific needs and anticipated communication requirements may be installed.

7.4. This strategy will facilitate the establishment of a robust, scalable communication network while maintaining efficiency and responsiveness to evolving operational needs across all areas.

---

8. Conclusion

8.1. These guidelines aim to establish a standardized approach to the allocation and sharing of Optical Ground Wire (OPGW) fibers across power system applications, ensuring secure, reliable, and scalable communication infrastructure that meets both present and future grid requirements. By implementing uniform principles for fiber allocation and usage, entities

across the power sector—including CTU, STU, DISCOMs, SLDCs, RLDCs, and NLDCs—can achieve consistent and efficient communication system for grid operations, protection, and commercial applications. These guidelines provide a clear and standardized framework for the allocation and sharing of Optical Ground Wire (OPGW) fibers, balancing the commercial prospects of fiber usage with the imperative of maintaining secure, reliable, and scalable grid operations.

---

9. Brief of Recommendations for Adoption

9.1. Uniform Fiber Allocation

Entities should adhere to this fiber allocation guidelines/framework for grid operations, ensuring designated fibers for essential communication and protection. Excess fibers may be designated for commercial use, subject to periodic review and regulatory oversight, thereby maximizing resource utilization without compromising the grid stability.

9.2. Compliance with CEA Regulations

All implementations should align with the 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 Interface Requirements and CEA Cyber Security Guidelines, to promote standardized, high-quality communication infrastructures across the power transmission networks.

9.3. Scalability for Future Needs

In areas with high potential for future growth or within city limits, entities are encouraged to install OPGW with 48/96 fiber cores to provide sufficient capacity for last-mile connectivity, future expansions, and LILO requirements, leveraging the Right of Way (ROW) effectively.

9.4. Commercial Usage Protocol

Fiber cores available for commercial use should be limited to two-year leasing terms and further, as the case may be. Any commercial usage should have the necessary NoC from CERC or SERC, and the rights to cease utilization should remain with the grid-operating authority to prioritize emerging grid needs.

9.5. Coordination and Monitoring

For LILO implementations and OPGW installations in new and upgraded transmission schemes, the entity responsible for installation of the same must provide continuous support to existing substations, facilitating configuration adjustments and ensuring reliable data transfer. Continuous monitoring is recommended to assess the impact of commercial use and maintain high standards of operational reliability.

These recommendations will ensure that all stakeholders in power system communication can operate within a unified framework, promoting efficiency, compliance, and grid security.

----------x----------

Annexure-B.2.2.1

S.No.	Substation	Region	Voltage leve	State	RTM/TBCB
1	HYDERABAD	SR-I	400/220kV	Telangana	RTM
2	NAGARJUNSAGAR	SR-I	400/220kV	Andhra Pradesh	RTM
3	KADAPA **(765 GIS ext)**	SR-I	765/400/220kV	Andhra Pradesh	RTM
4	MUNIRABAD	SR-I	400/220kV	Karnataka	RTM
5	GOOTY	SR-I	400/220kV	Andhra Pradesh	RTM
6	GAZUWAKA	SR-I	400/220kV	Andhra Pradesh	RTM
7	KHAMMAM	SR-I	400/220kV	Telangana	RTM
8	VIJAYAWADA	SR-I	400/220kV	Andhra Pradesh	RTM
9	VIZAG **HVDC**	SR-I	HVDC B2B	Andhra Pradesh	RTM
10	NELLORE	SR-I	400kV	Andhra Pradesh	RTM
11	WARRANGAL	SR-I	400/220kV	Telangana	RTM
12	NELLORE PS **(765 kV)**	SR-I	765/400kV	Andhra Pradesh	RTM
13	RAICHUR **(765 kV)**	SR-I	765/400kV	Karnataka	RTM
14	KURNOOL **(765 kV)**	SR-I	765/400kV	Andhra Pradesh	RTM
15	NP KUNTA	SR-I	400/220kV	Andhra Pradesh	RTM
16	SRIKAKULAM **(765 kV GIS)**	SR-I	765/400kV	Andhra Pradesh	RTM
17	VEMAGIRI **(765 kV GIS)**	SR-I	765/400kV	Andhra Pradesh	RTM
18	NIZAMABAD **(765 kV) GIS**	SR-I	765/400kV	Telangana	RTM
19	MAHESHWARAM **(765 GIS)**	SR-I	765/400kV	Telangana	RTM
20	C'peta(765 KV)-**TBCB**	SR-I	765/400kV	Andhra Pradesh	TBCB
21	BANGALORE	SR-II	400/220kV	Karnataka	RTM
22	MADRAS (Sriperumabdur)	SR-II	400kV	Tamil Nadu	RTM
23	SALEM	SR-II	400kV	Tamil Nadu	RTM
24	UDUMALPET	SR-II	400/220kV	Tamil Nadu	RTM
25	TRICHUR	SR-II	400kV	Kerala	RTM
26	MADURAI	SR-II	400/220kV	Tamil Nadu	RTM
27	TRICHY	SR-II	400/230 kV	Tamil Nadu	RTM
28	KOLAR AC	SR-II	400/220kV	Karnataka	RTM
29	KOLAR **HVDC**	SR-II	HVDC	Karnataka	RTM
30	HOSUR	SR-II	400/220kV	Tamil Nadu	RTM
31	HIRIYUR	SR-II	400/220kV	Karnataka	RTM
32	THIRUVANAN-THAPURAM	SR-II	400/220kV	Kerala	RTM
33	NARENDRA	SR-II	400/220kV	Karnataka	RTM
34	MYSORE	SR-II	400/220kV	Karnataka	RTM
35	THIRUNELVELI	SR-II	400/230 kV	Tamil Nadu	RTM
36	KALIBANDHAPATU	SR-II	400/230 kV	Tamil Nadu	RTM
37	KARAIKUDI	SR-II	400/230 kV	Tamil Nadu	RTM

38	PUGALUR (Karur)	SR-II	400/230 kV	Tamil Nadu	RTM
39	HASSAN	SR-II	400/220kV	Karnataka	RTM
40	PUDUCHERRY	SR-II	400/220kV	Pondicherry	RTM
41	ARASUR	SR-II	400/230 kV	Tamil Nadu	RTM
42	KOCHI	SR-II	400/220kV	Kerala	RTM
43	PALLAKAD	SR-II	400/220kV	Kerala	RTM
44	BIDADI	SR-II	400/220kV	Karnataka	RTM
45	TIRUVALEM	SR-II	765/400kV	Tamil Nadu	RTM
46	TUTICORIN PS	SR-II	400kV	Tamil Nadu	RTM
47	NAGAPATTINAM	SR-II	400kV	Tamil Nadu	RTM
48	KOZHIKODE	SR-II	400/220kV	Kerala	RTM
49	MADHUGIRI (TUMKUR)	SR-II	400/220kV	Karnataka	RTM
50	KUDGI	SR-II	400kV	Karnataka	RTM
51	DHARMAPURI (SALEM PS)	SR-II	400kV	Tamil Nadu	RTM
52	PAVAGADA	SR-II	400/220kV	Karnataka	RTM
53	YELAHANKA	SR-II	400/220kV	Karnataka	RTM
54	THIRUNELVELI	SR-II	400/230 kV	Tamil Nadu	RTM
55	Pugalur HVDC	SR-II	HVDC	Tamil Nadu	RTM
56	Pugalur GIS	SR-II	400kV	Tamil Nadu	RTM
57	TRISSUR HVDC	SR-II	HVDC	Kerala	RTM
58	TRISSUR GIS	SR-II	400kV	Kerala	RTM
59	PURNEA **(220)**	ER-I	220/132 kV	Bihar	RTM
60	BIHARSHRIFF	ER-I	400/220kV	Bihar	RTM
61	JAMSHEDPUR	ER-I	400/220kV	Jharkhand	RTM
62	SASARAM **(765 kV)**	ER-I	765/400/220/132	Bihar	RTM
63	SASARAM **HVDC**	ER-I	HVDC B2B	Bihar	RTM
64	NEW PURNEA	ER-I	400/220kV	Bihar	RTM
65	ARA **(220)**	ER-I	220/132 kV	Bihar	RTM
66	MUZAFFARPUR	ER-I	400/220kV	Bihar	RTM
67	PATNA	ER-I	400/220kV	Bihar	RTM
68	RANCHI	ER-I	400/220kV	Jharkhand	RTM
69	GAYA **(765 kV)**	ER-I	765/400/220 kV	Bihar	RTM
70	BANKA	ER-I	400/132 kV	Bihar	RTM
71	RANCHI (NEW) **(765 kV)**	ER-I	765/400 kV	Jharkhand	RTM
72	LAKHISARAI	ER-I	400/132 kV	Bihar	RTM
73	CHAIBASA	ER-I	400/220kV	Jharkhand	RTM
74	KISHANGANJ **(GIS)**	ER-I	400/220kV	Bihar	RTM
75	CHANDWA **(GIS)**	ER-I	400kV	Jharkhand	RTM
76	DALTONGANJ	ER-I	400/220/132 kV	Jharkhand	RTM
77	Chandauti	ER-I	400/220/132 kV	Bihar	TBCB
78	Sitamarhi	ER-I	400/220/132 kV	Bihar	TBCB

79	BIRPARA	ER-II	220/132 kV	West Bengal	RTM
80	SILIGURI **(220)**	ER-II	220/132 kV	West Bengal	RTM
81	MALDA	ER-II	400/220/132 kV	West Bengal	RTM
82	DALKHOLA **(220)**	ER-II	220kV	West Bengal	RTM
83	DURGAPUR	ER-II	400/220kV	West Bengal	RTM
84	MAITHON	ER-II	400/220kV	West Bengal	RTM
85	NEW SILIGURI	ER-II	400/220kV	West Bengal	RTM
86	GANGTOK **(132)**	ER-II	132/66 kV	sikkim	RTM
87	SUBHASHGRAM	ER-II	400/220kV	West Bengal	RTM
88	BERHAMPUR	ER-II	400/220kV	West Bengal	RTM
89	RANGPO **(GIS)**	ER-II	400/220kV	sikkim	RTM
90	NEW MELLI **(220 kV GIS)**	ER-II	220kV	sikkim	RTM
91	ALIPURDUAR **HVDC**	ER-II	HVDC	West Bengal	RTM
92	ALIPURDUAR	ER-II	400/220kV	West Bengal	RTM
93	RAJARHAT	ER-II	400/220kV	West Bengal	RTM
94	Medinipur	ER-II	765/400 kV	West Bengal	TBCB
95	INDRAVATI	ODISHA	400kV	ODISHA	RTM
96	RENGALI	ODISHA	400/220kV	ODISHA	RTM
97	JEYPORE	ODISHA	400/220kV	ODISHA	RTM
98	ROURKELA	ODISHA	400/220kV	ODISHA	RTM
99	BARIPADA	ODISHA	400/220/132 kV	ODISHA	RTM
100	BOLANGIR	ODISHA	400/220kV	ODISHA	RTM
101	KEONJHAR	ODISHA	400/220kV	ODISHA	RTM
102	TALCHER **HVDC**	ODISHA	HVDC	ODISHA	RTM
103	JHARSUGUDA **(765 kV)**	ODISHA	765/400kV	ODISHA	RTM
104	ANGUL **(765 kV)**	ODISHA	765/400kV	ODISHA	RTM
105	PANDIABILI **(GIS)**	ODISHA	400/220kV	ODISHA	RTM
106	HAFLONG **(132)**	NER	132kV	Assam	RTM
107	SALAKATI **(220)**	NER	220/132kV	Assam	RTM
108	AIZWAL **(132)**	NER	132kV	Mizoram	RTM
109	JIRIBAM **(132)**	NER	132kV	Manipur	RTM
110	KUMARGHAT **(132)**	NER	132/33kV	Tripura	RTM
111	NIRJULI **(132)**	NER	132/33kV	Arunachal Pradesh	RTM
112	IMPHAL **(132)**	NER	400/132 kV	Manipur	RTM
113	MISA(400)	NER	400/220kV	Assam	RTM
114	DIMAPUR **(220 GIS)**	NER	220/132kV	Nagaland	RTM
115	BALIPARA(400)	NER	400/220/132 kV	Assam	RTM
116	BADARPUR **(132)**	NER	132kV	Assam	RTM
117	KHLERIHAT **(132)**	NER	132kV	Meghalaya	RTM
118	BONGAIGAON	NER	400/220kV	Assam	RTM
119	ZIRO **(132)**	NER	132/33kV	Arunachal Pradesh	RTM
120	SILCHAR (400)	NER	400/132 kV	Assam	RTM

121	MARIANI	NER	400/220kV	Assam	RTM
122	MOKOKCHUNG	NER	220/132kV	Nagaland	RTM
123	BISHWANATH CHARIALI	NER	400/132 kV	Assam	RTM
124	BISHWANATH CHARIALI **(HVDC)**	NER	HVDC	Assam	RTM
125	ROING **(132)**	NER	132/33kV	Arunachal Pradesh	RTM
126	TEZU **(132)**	NER	132/33kV	Arunachal Pradesh	RTM
127	NAMSAI **(132)**	NER	132/33kV	Arunachal Pradesh	RTM
128	Mleriat (**132 kV GIS**)	NER	132kV	mizoram	RTM
129	BASSI	NR-I	400/220kV	Rajasthan	RTM
130	BALLABHGARH	NR-I	400/220kV	haryana	RTM
131	MANDOLA	NR-I	400/220kV	utter pradesh	RTM
132	DADRI **HVDC**	NR-I	HVDC	utter pradesh	RTM
133	HISSAR	NR-I	400/220kV	haryana	RTM
134	BHIWADI	NR-I	400/220kV	Rajasthan	RTM
135	MEERUT **(765 kV)**	NR-I	765/400/220kV	utter pradesh	RTM
136	BAHADURGARH	NR-I	400/220kV	haryana	RTM
137	MAHARANIBAGH **(GIS)**	NR-I	400/220kV	delhi	RTM
138	KANKROLI	NR-I	400/220kV	Rajasthan	RTM
139	KOTA	NR-I	400/220kV	Rajasthan	RTM
140	ROORKEE	NR-I	400/220kV	Uttarakhand	RTM
141	BHINMAL	NR-I	400/220kV	Rajasthan	RTM
142	GURGAON **(GIS)**	NR-I	400/220kV	haryana	RTM
143	BHIWADI **HVDC**	NR-I	HVDC	Rajasthan	RTM
144	SONEPAT	NR-I	400/220kV	haryana	RTM
145	KOTESHWAR **(GIS)**	NR-I	765/400kV	Uttarakhand	RTM
146	NEEMARANA	NR-I	400/220kV	Rajasthan	RTM
147	SIKAR	NR-I	400/220kV	Rajasthan	RTM
148	JAIPUR SOUTH	NR-I	400/220kV	Rajasthan	RTM
149	MANESAR **(GIS)**	NR-I	400/220kV	haryana	RTM
150	BHIWANI **(765 kV)**	NR-I	765/400/220kV	haryana	RTM
151	JHATIKARA **(765 kV)**	NR-I	765/400kV	delhi	RTM
152	JIND	NR-I	400/220kV	haryana	RTM
153	KOTPUTLI	NR-I	400/220kV	Rajasthan	RTM
154	BAGPAT **(GIS)**	NR-I	400/220kV	utter pradesh	RTM
155	SAHARANPUR	NR-I	400/220kV	utter pradesh	RTM
156	DEHRADUN	NR-I	400/220kV	Uttarakhand	RTM
157	AJMER (765 kV)	NR-I	765/400kV	Rajasthan	RTM
158	CHITTORGARH (765 kV)	NR-I	765/400kV	Rajasthan	RTM
159	TUGLAKABAD **(GIS)**	NR-I	400/220kV	delhi	RTM
160	765/400 KV Badla (S/s)	NR-I	765/400/220kV	Rajasthan	RTM

161	765/400 KV Bikaner	NR-I	765/400kV	Rajasthan	RTM
162	KISHENPUR	NR-II	400/220kV	Jammu & Kashmir	RTM
163	MALERKOTLA	NR-II	400/220kV	Punjab	RTM
164	MOGA	NR-II	765/400/220kV	Punjab	RTM
165	WAGOORA	NR-II	400/220kV	Jammu & Kashmir	RTM
166	ABDULLAPUR	NR-II	400/220kV	haryana	RTM
167	NALLAGARH	NR-II	400/220kV	Himachal Pradesh	RTM
168	JALANDHAR	NR-II	400/220kV	Punjab	RTM
169	PATIALA	NR-II	400/220kV	Punjab	RTM
170	KAITHAL	NR-II	400/220kV	haryana	RTM
171	AMRITSAR	NR-II	400/220kV	Punjab	RTM
172	FATEHABAD	NR-II	400/220kV	haryana	RTM
173	LUDHIANA	NR-II	400/220kV	Punjab	RTM
174	CHAMBA	NR-II	400/220kV	Himachal Pradesh	RTM
175	PANCHKULA	NR-II	400/220kV	haryana	RTM
176	SAMBHA	NR-II	400/220kV	Jammu & Kashmir	RTM
177	PARBATI PS / BANALA	NR-II	400/220kV	Punjab	RTM
178	NEW WANPOH	NR-II	400/220kV	Jammu & Kashmir	RTM
179	HAMIRPUR	NR-II	400/220kV	Himachal Pradesh	RTM
180	KURUKSHETRA	NR-I	400/220kV	haryana	RTM
181	KURUKSHETRA **(HVDC)**	NR-I	HVDC	haryana	RTM
182	KALA Amb 400 KV GIS (TBCB)	NR-II	400/220kV	Himachal Pradesh	TBCB- InvIT
183	DRASS GIS	NR-II	220/66 kV	J&K	SLTS
184	KARGIL	NR-II	220/66 kV	J&K	SLTS
185	KHALSTI	NR-II	220/66 kV		SLTS
186	KEH	NR-II	220/66 kV	Laddakh	SLTS
187	AGRA **(765 kV)**	NR-III	765/400/220kV	utter pradesh	RTM
188	KANPUR	NR-III	400/220kV	utter pradesh	RTM
189	VINDHYACHAL **HVDC**	NR-III	HVDC B2B	Madhya Pradesh	RTM
190	RIHAND **HVDC**	NR-III	HVDC	utter pradesh	RTM
191	ALLAHABAD	NR-III	400/220kV	utter pradesh	RTM
192	MAINPURI	NR-III	400/220kV	utter pradesh	RTM
193	GORAKHPUR	NR-III	400/220kV	utter pradesh	RTM
194	LUCKNOW	NR-III	400/220kV	utter pradesh	RTM
195	BALIA	NR-III	765/400kV	utter pradesh	RTM
196	RAEBAREILLY	NR-III	220/132kV	utter pradesh	RTM
197	BAREILLY	NR-III	400kV	utter pradesh	RTM
198	SITARGANJ	NR-III	220/132kV	Uttarakhand	RTM
199	PITHORAGARH	NR-III	220/132kV	Uttarakhand	RTM
200	BALIA **HVDC**	NR-III	HVDC	utter pradesh	RTM

201	FATEHPUR	NR-III	765/400/220kV	utter pradesh	RTM
202	LUCKNOW New	NR-III	765/400kV	utter pradesh	RTM
203	SOHAWAL	NR-III	400/220kV	utter pradesh	RTM
204	SHAHJAHANPUR	NR-III	400/220kV	utter pradesh	RTM
205	BAREILLY New	NR-III	765/400kV	utter pradesh	RTM
206	AGRA **(HVDC)**	NR-III	HVDC	utter pradesh	RTM
207	VARANASI	NR-III	765/400kV	utter pradesh	RTM
208	KANPUR New	NR-III	765/400kV	utter pradesh	RTM
209	ALIGARH	NR-III	765/400kV	utter pradesh	RTM
210	ORAI	NR-III	765/400kV	utter pradesh	RTM
211	BHADRAWATI	WR-I	400/220kV	Maharastra	RTM
212	CHANDRAPUR **HVDC**	WR-I	HVDC B2B	Maharastra	RTM
213	RAIPUR	WR-I	400/220kV	Chattishgarh	RTM
214	MAPUSA	WR-I	400/220kV	Goa	RTM
215	BHATAPARA	WR-I	400/220kV	Chattishgarh	RTM
216	RAIGARH	WR-I	400/220kV	Chattishgarh	RTM
217	WARDHA	WR-I	765/400/220kV	Maharastra	RTM
218	SEONI	WR-I	765/400/220kV	Madhya Pradesh	RTM
219	SOLAPUR	WR-I	765/400/220kV	Maharastra	RTM
220	PUNE (TALEGAON)	WR-I	400/220kV	Maharastra	RTM
221	PARLI	WR-I	400/220kV	Maharastra	RTM
222	BILASPUR	WR-I	765/400kV	Chattishgarh	RTM
223	RAIPUR (DURG) PS	WR-I	765/400kV	Chattishgarh	RTM
224	RAIGARH (KOTRA) PS	WR-I	765/400kV	Chattishgarh	RTM
225	RAIGARH (TAMNAR) PS	WR-I	765/400kV	Chattishgarh	RTM
226	AURANGABAD	WR-I	765/400/220kV	Maharastra	RTM
227	DHARAMJAYGARH	WR-I	765/400kV	Chattishgarh	RTM
228	PUNE New	WR-I	765/400kV	Maharastra	RTM
229	CHAMPA PS	WR-I	765/400kV	Chattishgarh	RTM
230	KOLHAPUR	WR-I	400kV	Maharastra	RTM
231	CHAMPA **(HVDC)**	WR-I	HVDC	Chattishgarh	RTM
232	PADGHE	WR-I	765/400kV	Maharastra	RTM
233	***WARORA***	WR-I	765/400kV	Maharastra	TBCB- InvIT
234	***PARLE TBCB***	WR-I	765/400kV	Maharastra	TBCB- InvIT
235	***Raigarh HVDC***	WR-I	HVDC	Chattishgarh	RTM
236	ITARSI	WR-II	400/220kV	Madhya Pradesh	RTM
237	JABALPUR	WR-II	400/220kV	Madhya Pradesh	RTM
238	DEHGAM	WR-II	400/220kV	Gujarat	RTM
239	SATNA	WR-II	765/400/220kV	Madhya Pradesh	RTM
240	KHANDWA	WR-II	400/220kV	Madhya Pradesh	RTM
241	BOISOR	WR-II	400/220kV	Maharastra	RTM
242	VAPI	WR-II	400/220kV	Gujarat	RTM
243	GWALIOR	WR-II	765/400/220kV	Madhya Pradesh	RTM

244	BINA	WR-II	765kV	Madhya Pradesh	RTM
245	RAJGARH	WR-II	400/220kV	Madhya Pradesh	RTM
246	DAMOH	WR-II	400/220kV	Madhya Pradesh	RTM
247	PIRANA	WR-II	400/220kV	Gujarat	RTM
248	SHUJALPUR	WR-II	400/220kV	Madhya Pradesh	RTM
249	BHACHAU	WR-II	400/220kV	Gujarat	RTM
250	NAVSARI	WR-II	400/220kV	Gujarat	RTM
251	INDORE	WR-II	765/400/220kV	Madhya Pradesh	RTM
252	JABALPUR PS	WR-II	765/400kV	Madhya Pradesh	RTM
253	KALA	WR-II	400/220kV	Gujarat	RTM
254	MAGARWADA	WR-II	400/220kV	UT of Daman & Diu	RTM
255	VINDHYACHAL PS	WR-II	765/400kV	Madhya Pradesh	RTM
256	VADODARA	WR-II	765/400/220kV	Gujarat	RTM
257	BETUL	WR-II	400/220kV	Madhya Pradesh	RTM
258	REWA	WR-II	400/220kV	Madhya Pradesh	RTM
259	Bhuj	WR-II	765/400/220kV	Gujarat	RTM
260	Banaskantha	WR-II	765/400kV	Gujarat	RTM
261	Radhanesda (Vav)	WR-II	400/220kV	Gujarat	RTM
262	765/400/220 kV Fatehgarh-II	NR-I	765/400/220	Rajasthan	RTM
263	765/400/220 kV Bhadla-II	NR-I	765/400/220	Rajasthan	RTM
264	765/400 kV Jeerut	ER-II	765/400	West Bengal	TBCB
265	765/400 kV Khetri	NR-I	765/400	Rajasthan	TBCB
266	400/220132 kV Saharsa	ER-I	400/220/132 kV	Bihar	TBCB
267	400/220 kV Dwarka	NR-I	400/220kV	Delhi	RTM
268	Sambhal	NR-III	400/220/132 kV	Uttar Pradesh	TBCB
269	Bhuj-II	WR-II	765/400/220	Gujrat	TBCB
270	Guna	WR-II	400/220kV	Madhya Pradesh	TBCB
271	Bhind	WR-II	220/132	Madhya Pradesh	TBCB
272	Jauljivi	NR-III	400/220kV	Uttarakhand	RTM
273	Chandigarh	NR-II	220/66	Chandigarh	RTM

Minutes of the Meeting held on 28.11.2023 among CTU, POWERGRID, Grid-India, CEA, NRPC to discuss Firewall requirement at POWERGRID Substations and Firewall architecture proposed by POWERGRID

1. A meeting was held among CTU, POWERGRID, Grid-India, CEA, NRPC on 28.11.2023 on virtual mode to discuss Firewall requirement at POWERGRID Substations and Firewall architecture proposed by POWERGRID. List of Participants is attached at **Annexure-I.**

2. At the outset, Sr. GM (CTU) welcomed all the participants in the meeting and started the meeting. Sr. GM (CTU) asked CM (CTU) to give a brief on the meeting agenda and background.

3. CM (CTU) gave a brief presentation on the meeting agenda and background, same is attached at **Annexure-II.** He explained that at present around 271 nos. of existing stations of POWERGRID does not have firewall installed for the protection of ISTS communication system. To protect ISTS communication system, firewall in High Availability (HA) mode may be installed at these substations. For installation of these firewalls a scheme shall be prepared by CTU based on the inputs provided by POWERGRID, Grid-India and CEA. The same shall be put up to the RPC for their review as per MoP guidelines and finally shall be put up for approval in NCT. The scheme shall be planned and implemented on regional basis.

4. Further a Centralized Management Console (CMC) is also proposed region wise with main and backup architecture to manage these firewalls, defining updates for Intrusion Prevention System and Intrusion Detection System.

   CTU further stated that for all the new substations in TBCB they are proposing and providing firewall specifications in the RFPs. This is also being done for generators/ bulk consumer while providing connectivity to the ISTS system.

5. CTU stated that this issue was being discussed from a long time as CEA cybersecurity guidelines mention that the utilities shall provide the desired cyber security measures of their own. However, POWERGRID stated that since they have ISTS assets, these security measures need to be discussed with all stakeholders and RPCs. CTU requested POWERGRID to present their proposed firewall architecture.

6. POWERGRID presented the architecture which is attached at **Annexure-III**. It was deliberated that changes in existing IP addresses and network may take huge investment and many other issues may arise due to this and result in an unstable system. POWERGRID stated that the proposed Firewall architecture is in bridge mode so that there is no need to change the present IP addressing scheme and network changes due to involvement of these firewalls. Further along with firewall L2 switches are proposed to keep L2 VLANs also operated in the present system.

There are type 5 type of application that has been reported, and these are being terminated on the Ethernet port of SDH so applications have been configured with IP address. However, the Gateway for these applications shall be provided at RLDC end.

POWERGRID further stated that firewall will have minimum 8x1G port and 4x10G ports shall be sufficient to fulfil the current and the future requirements with dedicated separate management port based on the input interface requirement. L2 layered switches shall be provided with 24 nos. of ethernet ports. POWERGRID also stated that if number of ports increase the cost of firewall increases abruptly despite of same through put.

7. CTU asked RLDC to provide their inputs as they are the users for all the applications e.g. SCADA, VOIP, AMR, PMU. Grid-India stated that AGC is not applicable at POWERGRID stations, POWERGRID stated that this is a generalized architecture which is showing all applications that needs to be terminated through Firewall like AGC and AMR. CTU enquired POWERGRID whether NTPC, NHPC, NPCIL etc the central sector stations, shall install firewall at their locations or POWERGRID to provide on their behalf, as communication system in these stations is installed and maintained by POWERGRID.

8. POWERGRID said that they can implement the project for POWERGID stations for ISGS stations provided review & approval by RPC/NCT. Further he stated that at new generating stations NTPC is installing FOTE at their own cost. Grid-India stated that in NTPC stations FOTE is being installed by POWERGRID under ULDC scheme.

9. CTU stated that if SW1 fails, all the services shall get disrupted, Grid-India also suggested that Switch 1 and 2 should be on Criss cross architecture so that there is no interruptions of services if one switch goes down. POWERGRID said that they will update the architecture before final proposal. Grid-India also stated that as per new 2+2 channels architecture in the diagram shall be shown as one channel to main RLDC and another channel to backup RLDC.

10. ERLDC stated that there is no need of firewall as there is no IT system involved, POWERGRID replied that if Firewall is not provided than opening a single port is equivalent to opening of 65000 ports which may become vulnerable.

11. Grid-India stated that protecting only POWERGRID stations is not the holistic solution we should involve all the STU and utilities at RPC level, CTU stated that they are mandated for planning for ISTS system however for STU deliberations may be done in the upcoming RPC meetings.

12. WRLDC stated that let the proposal may be put up for another aspect of holistic way, in a single meeting this cannot be concluded.

13. All members agreed that a POC can be done before final formulation of the scheme. POWERGRID stated that they shall take up the POC parallel. Grid- India stated that the POC can be done in all the regions for better results. POWERGRID stated that this has financial implications as in one Region OEM may do POC at their cost but five regions

this has to be discussed with OEMs. Members suggested that POC proposal may be put up in RPC forums so that decision may be taken.

14. CTU enquired about various firewall which are procured under TBCB projects of POWERGRID can be configured in the single CMC provided by POWERGRID. POWERGRID stated it is not possible to integrate other make firewall on the same CMC. Moreover, firewall of different regions and utilities are not possible to be integrated due to OEM restrictions.

15. CTU enquired about encryption possibility and MPLS suitability, POWERGRID stated that using open-source encryption protocol encryption can be done without changing anything at RLDC end, further same firewalls are suitable for MPLS also.

16. CEA stated that they don't have any additional observation but before finalization of architecture they should be communicated. CTU/POWERGRID agreed for the same.

17. Following was concluded in the meeting:
    (i) POWERGRID shall revise the architecture and switch layout.
    (ii) Main & Backup RLDC channel shall also be shown in the architecture.
    (iii) A pilot project (POC) to be done before formulation of the scheme. CTU shall put the same for RPC review.
    (iv) Funding modalities of the scheme for all ISTS/ISGS stations etc. also need to be deliberated at RPC.
    (v) Deliberation of a similar scheme is also required at RPC for STUs and other Private ISTS licensees.

Meeting ended with vote of thanks.

Annexure-I

List of participants

CTUIL		
1.	Sh. H.S. Kaushal	Sr. GM
2.	Sh. S. K. Gupta	Sr. DGM
3.	Sh. T. P. Verma	Ch. Manager
4.	Sh. Kaushal Suman	Manager
Power-CSIRTs, CEA		
1.	Mukesh Kumar	
2.	L K S Rathour	
POWERGRID		
1.	D. Murali Krishna	Sr. DGM
2.	Dr. Sajal Sarkar	Chief Manager
3.	Gaurav Awal	Chief manager
Grid-India/ERLDC		
1.	L. Murali Krishna	Sr. DGM
2.	Ayush Raj	
3.	Biswajit Mondal	Chief Manager
4.	Rishav Kumar	
Grid-India/WRLDC		
1.	Sh. S.K. Saha	G.M. , WRLDC
Grid-India/NRLDC		
1.	Sh. Ankur Gulati	DGM, NRLDC
Grid-India		
1	Harish Rathour	GM
2	Rajkumar	
3	Abdullah Siddique	
NRPC		
1.	Priyanka Patel	Manager
AEGCL		
1.	Arup Sarmah	

Annexure-II

Firewall for existing POWERGRID S/s

1. At present no firewall are installed at 271 existing S/s of POWERGRID (including 12 nos. S/s of SPV) for ISTS communication. Firewall are only installed for NTAMC network at substations. Present Substation architecture attached at Fig-1.
2. For the new ISTS S/s CTU is providing Firewall requirement & specifications in the RFP of TBCB projects
3. For RE Generators and Bulk consumer those connectivity is given through ISTS network, CTU is also providing Firewall requirement
4. To protect existing substations and ISTS communication system from any cyber attack/ threat it is proposed that firewall may be installed in HA mode (dual redundancy) at these 271 nos. substations
5. Firewall placement is given in the proposed diagram at Fig-2, where firewall is to be placed between SAS gateway and FOTE of ISTS network.
6. A Centralized Management Console (CMC) is also proposed to manage these firewalls at regional level
7. There will be Main and Backup CMC and remote console at every Region to manage the firewalls

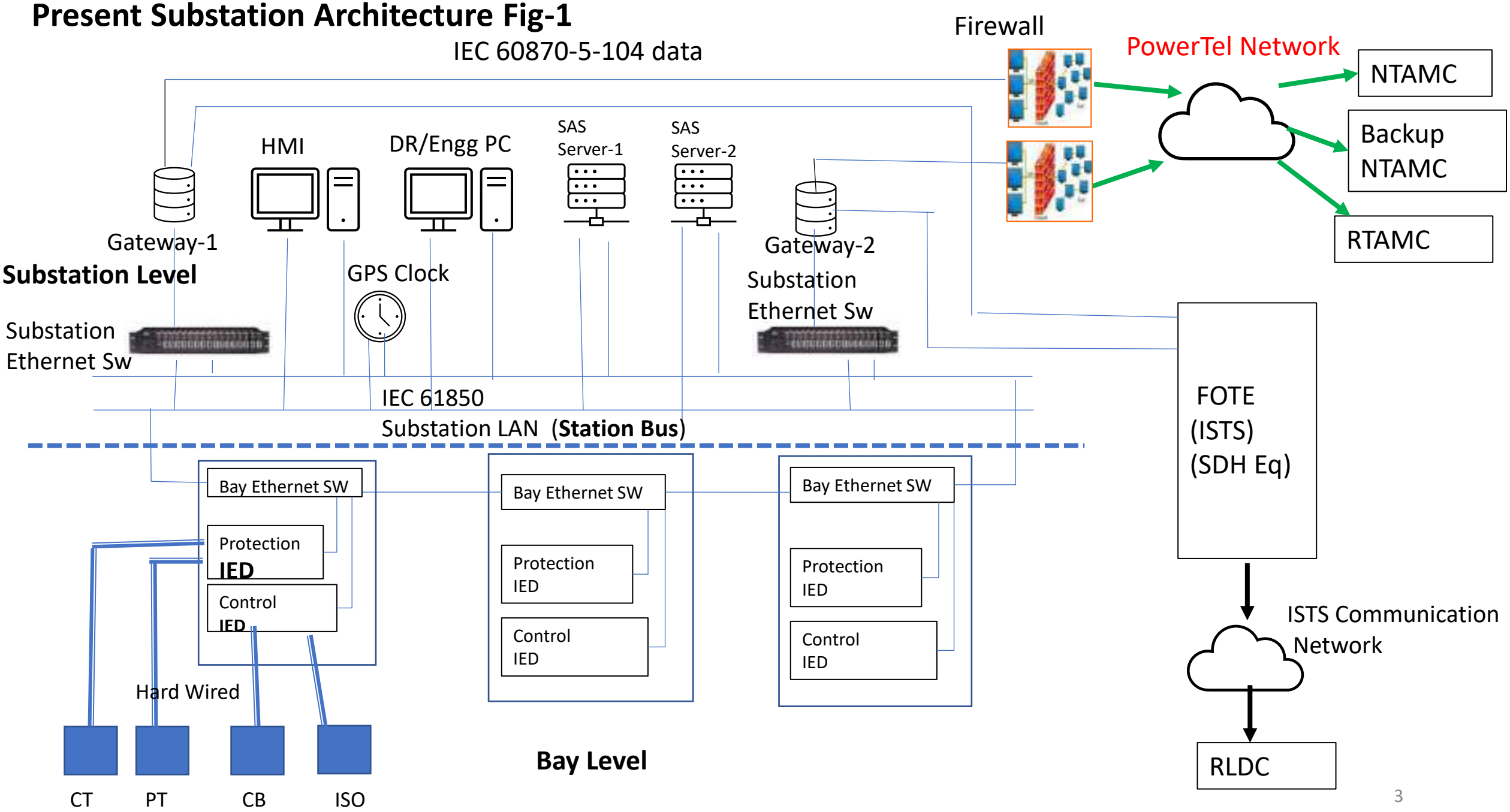
Region-wise Breakup of Firewall

NR	WR	ER	SR	NER
89	52	49	58	23

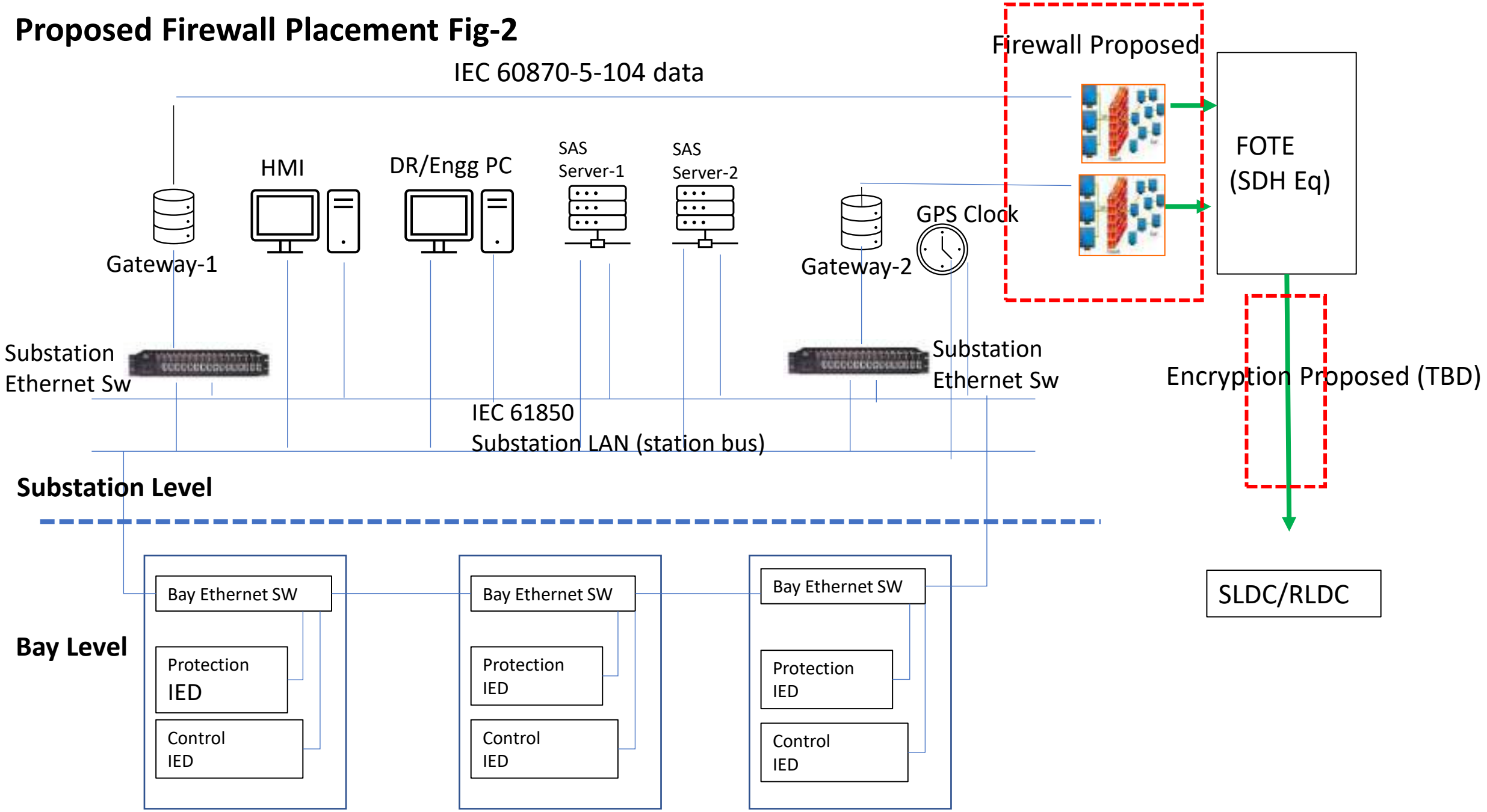
In line with the MoP Guideline of **Planning of Communication System for Inter-State Transmission System (ISTS) of dated 09.03.2022, Category-B** includes standalone project such as Cyber Security.

Under Category-B Firewall scheme can be prepared and put up for approval from NCT

Present Substation Architecture Fig-1



Proposed Firewall Placement Fig-2



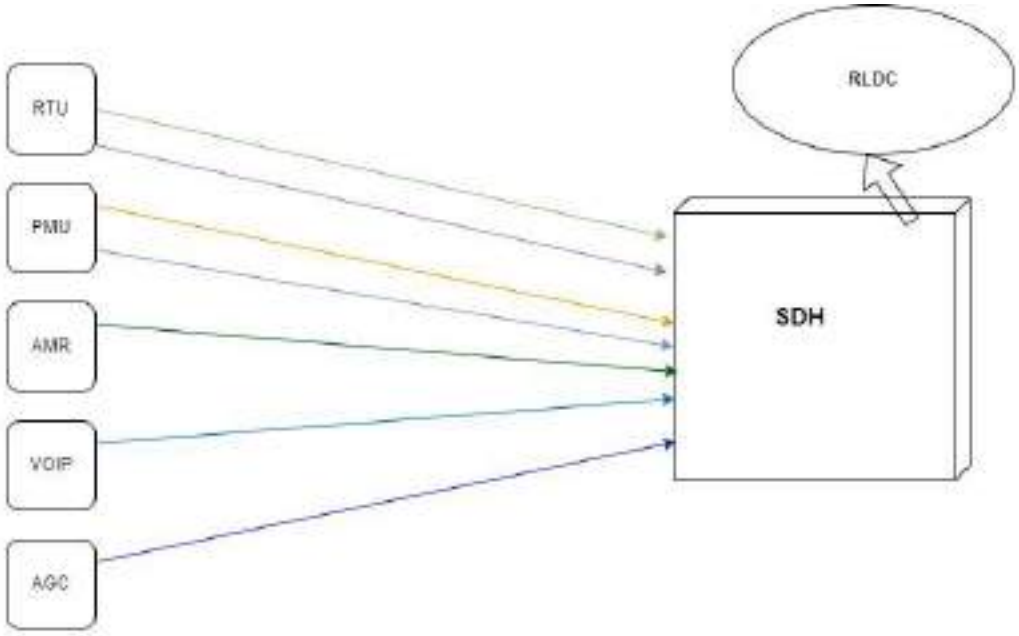
Points to be discussed

1. Proposed draft Firewall Architecture by POWERGRID
2. Firewall Placement at existing POWERGRID Sub-Stations
3. Methodology of procurement and installation
4. Requirement of any modifications / changes at RLDC end
5. Requirement of CMC (Centralized Management Console)
6. Any Other Point

Annexure-III

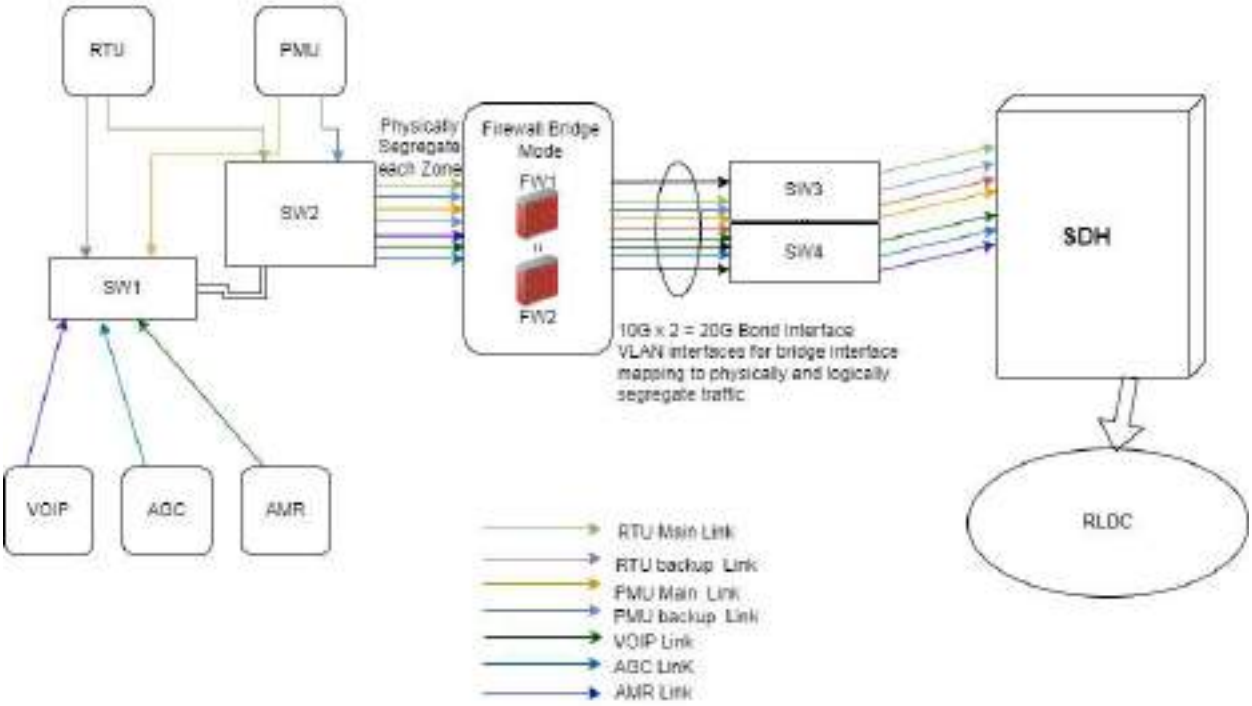
Architecture for Firewall at POWERGRID Substation

Current Network Architecture



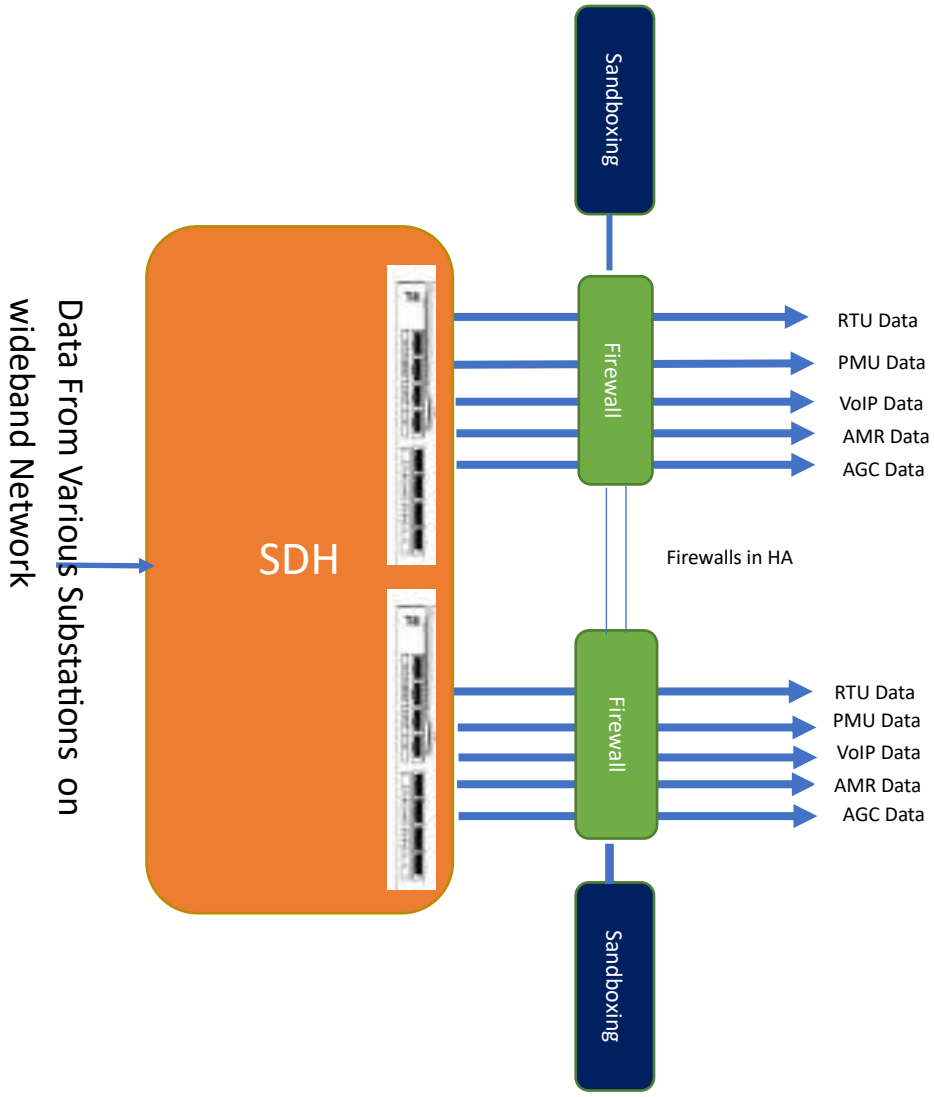
- There are total five services with seven connections terminated with SDH
- The connectivity in between services and SDH are on layer 2 of TCP/IP.
- Services are configured with IP addresses however the gateways of each services are defined at RLDC end.
- The firewalls are hosted at RLDC end, for RTU traffic only, to filter out the traffic
- There is no firewall in between at RLDC for PMU, AMR, VOIP and AGC traiffic
- The services devices are multiple and similar setup is hosted across multiple sites hence requirement is to have access control protection via firewall with minimum impact.

Proposed Network Architecture



- Firewall will be deployed in HA with bridge mode with all NGTP functionalities.
- Following network zones will be created on firewall - RTU Main, RTU Backup, PMU Main, PMU backup, VOIP, AGC, AMR and one dedicated zone for Management of firewalls.
- Each Zone will be physical/logically segregated w.r.t to connectivity and data processing.
- Access control policy with IPS will be enabled to restrict and inspect the traffic.
- Dedicated Management server and Log server will be implemented at core sites and all the firewalls will be managed centrally.
- This approach may not require to change any IP address of the device.
- WAN interface of firewall will be having link aggregation to handle minimum 7 LAN interfaces.
- WAN interface Link aggregation will be created based on 10G ports to have optimal performance.
- Firewall with minimum 8 x 1G ethernet and 4 x 10G interfaces will be factored to fulfil current and future requirements with dedicated, separately management port.
- Based on interface requirement, minimum 1.5 Gbps of Next Generation Threat prevention firewall is required
- Layer-2 Managed switch with 24 ports shall be required.

AT RLDC End


Sandboxing
Data From Various Substations on wideband Network
SDH
Firewall
RTU Data
PMU Data
VoIP Data
AMR Data
AGC Data
Firewalls in HA
Firewall
RTU Data
PMU Data
VoIP Data
AMR Data
AGC Data
Sandboxing

Annexure-XIII 15th NPC

Annexure-B.2.2.3

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग-II
Power System Planning & Appraisal Division-II

विषय/Subject: Constitution of committee for examination and recommendation on requirement of firewall/ any cyber security elements in the existing ISTS system – reg.

A meeting was held on 12th April, 2024 under chairmanship of Member (Power Systems), CEA to discuss the issue of provision of Next Generation Firewall (NGFW) in respect of installation where such a provision does not exist in the Transmission service agreement (TSAs). In the meeting, it was decided that a committee shall be formed for examination and recommendation on requirement of Firewall/ Any cyber security elements in the existing ISTS system as well as under implementation substations.

Accordingly, a committee is hereby constituted with following composition:

1	Chief Engineer (Cyber Security Division, CEA)	Chairman
2	Representative from PGCIL	Member
3	Representative from GRID-INDIA	Member
4	Representative from CTUIL	Member
6	Representative from EPTA	Member
7	Deputy Director (PCD division, CEA)	Convener

The Terms of Reference (ToR) of the Committee are:

1. The Committee shall examine d recommend the requirement of firewall/ cyber security elements required in the existing/under implementation Inter-state transmission system.
2. The Committee shall also recommend mode of implementation of firewall/ cyber security elements.
3. The Committee shall submit its recommendations to Member (Power System), CEA within one month.

This issues with the approval of competent authority.

भवदीय/Yours faithfully,

For 7/5/24

(बी.एस.बैरवा / B.S. Bairwa)
मुख्य अभियन्ता (इंचार्ज)/Chief Engineer I/C

To

a) All the members of committee
b) Chief Engineer (I/C) (PSPA-II, CEA)
c) Chief Engineer (PCD, CEA)

सेवा भवन, आर. के पुरम-I, नई दिल्ली-110066 **टेलीफोन**: 011-26732347 **ईमेल**: cea-pspa2@gov.in वेबसाइट: www.cea.nic.in
Sewa Bhawan, R.K Puram-I, New Delhi-110066 **Telephone**: 011-26732347 **Email**: cea-pspa2@gov.in **Website**: www.cea.nic.in

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
साइबर सुरक्षा प्रभाग
Cyber Security Division

Dated: 25-06-2024

विषय : Constitution of committee for examination and recommendation on requirement of firewall/any cyber security elements in the existing ISTS systems - reg.

This has reference to the meeting held on 12th April, 2024 under the chairmanship of Member (Power System), CEA to discuss the issue of provisioning of Next Generation Firewall in respect of those installations where such a provision does not exist already, in Transmission Service Agreements. Finally, it was decided to constitute a committee which would examine and recommend requirement of firewall/cyber security elements in the existing ISTS system.

In this regard, it is mentioned that, all the utilities in power sector are required to follow the "CEA (Cyber Security in Power Sector) Guidelines, 2021" in order to ensure cyber security for the system. The Guidelines do not specifically mention the provision of Next Generation Firewall. However, utilities are required to ensure the deployment of Intrusion Detection System and Intrusion Prevention System capable of identifying behavioural anomaly in both IT as well as their OT Systems.

Also, formulation of Cyber Security Regulations in Power Sector, is at an advanced stage. It deals exhaustively with Intrusion Detection System and Intrusion Prevention System deployment in order to ensure cyber security.

Against the aforesaid background, it is felt that there is no necessity for constitution of aforesaid committee at this stage.

(RP Pradhan)
Chief Engineer
Cyber Security Division

To,

1. Chief Engineer, PSPA-II, CEA

E-mail/Website

भारत सरकार केंद्रीय विद्युत प्राधिकरण **दक्षिण क्षेत्रीय विद्युत समिति** 29, रेस कोर्स क्रास रोड बेंगलूरु -560009	सत्यमेव जयते	Government of India Central Electricity Authority **Southern Regional Power Committee** 29, Race Course Cross Road Bengaluru-560 009
Email: **seprotnsrpc-ka@nic.in**	Web site: www.srpc.kar.nic.in	Ph: 080-22259343
सं/No. SRPC/SE(P,C&SS)/ COMSR/48/2024/		दिनांक /Date **7th August 2024**

To
As per the mailing list

विषय/Sub: Minutes of the 48th Meeting of the communication equipment outage coordination [COM SR - Outage August 2024], held on 29.07.2024 - Reg.

महोदय / Sir,

दिनांक **29.07.2024** को एस आर पी सी बेंगलूरू में आयोजित हुआ , संचार उपकरणों की आउटेज समन्वय की बैठक के कार्यवृत, आपके अवलोकन केलिए हमारे वेबसाइट https://srpc.kar.nic.in में अपलोड किया गया है ।

Enclosed please find the minutes of the 48th Meeting of the Communication equipment outage coordination meeting [**COMSR – Outage August 2024]**, held on 29.07.2024 at SRPC, Bengaluru. The same has been uploaded in SRPC website https://srpc.kar.nic.in.

भवदीय/ Yours faithfully,

M. Ramakrishna 7/8/2024

(मेका रामकृष्ण/ Meka Ramakrishna)
अधीक्षणअभियंता (पी,सी&एस एस) /Superintending Engineer (P,C&SS)

डाक सूची / Mailing List

1. मुख्य अभियंता (एसएलडीसी), एपी ट्रांस्को / Chief Engineer (SLDC), APTRANSCO, Vijayawada.
2. मुख्य अभियंता (एसएलडीसी), बेंगलूरु / Chief Engineer (SLDC), KPTCL, Bangalore
3. मुख्य अभियंता (एसओ), केएसईबीएल / Chief Engineer (SO), KSEBL, Kalamassery
4. मुख्यi अभियंता (प्र), टैनट्रांस्को / Chief Engineer (Opn.), TANTRANSCO, Chennai
5. मुख्य अभियंता (ग्रि.प्र.), टी.एस.ट्रानस्को / Chief Engineer (SLDC), TSTRANSCO, Hyderabad
6. अधीक्षक अभियंता-I, विद्युत विभाग, पुदुचेरी / S.E - I, Electricity Department, Puducherry
7. ई.डी, आरएसटीपीएस, एनटीपीसी, रामगुंडम / E.D, RSTPS, Jyothinagar, Ramagundam, Telangana
8. महाप्रबंध, तालचेर स्टेज-II, एनटीपीसी / G.M, STPP Stg - II, NTPC, Talcher, Odisha
9. समूह महाप्रबंधक, सिंहाद्री एस.टी.पी.एस, एन.टी.पी.सी. / G.G.M, Simhadri STPS, Visakhapatnam, AP.

Deliberation:

a) SRLDC informed that the CERC Communication Regulations 2017 & the Procedure for Centralized Supervision, Monitoring, and Fault Reporting of Communication Systems mandates that the operational feedback on ISTS communication systems shall be furnished to CTUIL on quarterly basis. Accordingly, SRLDC has provided feedback to CTUIL for the quarter April-June 2024.

b) CTUIL stated that the RTU/SAS gateway is part of the Substation SAS and should not be considered as a communication system as per the definition in the Communication Regulations 2017. Only the associated communication system from the wideband location is planned by CTUIL. The respective users are responsible for the RTU/SAS gateway and channel up to the nearest wideband. Thereafter, CTUIL will assess the need for augmentation or upgradation of communication equipment or paths to the appropriate control centre.

c) SRLDC mentioned that the operational feedback is based on the performance of RTUs and ICCP channels as observed through the diagnostic features of the SCADA systems at SRLDC.

d) CTUIL noted that providing an alternate path up to the wideband node for the radial fibre connectivity of RE stations may not be feasible, as these RE generators are connected by a single line. RE stations might face challenges in complying with Clause 4.12 of the CEA Manual of Communication Planning in Power System Operation, which mandates route-diversified paths for each communication channel.

e) It was suggested that while RE stations up to the CTU wideband node are connected through a single line, dual channels for control centres should be ensured via a single OPGW path. After handover at the CTUIL FOTE, the channels should have route diversity, ensuring a working path and protection path with resource disjoint.

12. CTUIL Agenda

CTUIL vide email dated 22.07.2024 (**Annexure-12**) had furnished the following agenda:

12.1 Supply & Installation of Firewall for POWERGRID (RTM & TBCB) sub-stations.

CTUIL vide email dated 22.07.2024 has furnished the following:

(i) POWERGRID has informed that in the existing 273 nos. of Substations of POWERGRID, Firewall is not available for electronic security perimeter as per CEA (Cyber Security Guidelines), 2021.

(ii) A meeting was conducted on 28.11.2023 among CTU, POWERGRID, CEA, NRPC & Grid-India to finalize the firewall architecture. Finalized architecture is given at Annexures of CTUIL agenda.

(iii) Later on, a committee was formed under the Chairmanship of CE (Cyber Security Division), CEA in line with the minutes of meeting dated 12.04.2024 convened by CEA and chaired by Member, Power System Later CEA vide letter dated 25.06.2024 had communicated that utilities are required to comply the CEA (Cyber Security Guidelines), 2021 and deploy Intrusion Prevention and Intrusion Detection System. Further, as Cyber Security Regulations of CEA are in advanced stage so there is no necessity for constitution of aforesaid committee.

(iv) POWERGRID has communicated to CTU that Firewall installation at existing substations involved a huge amount which cannot be covered through O&M expenses, therefore a scheme / Project may be prepared for supply and installation of Firewalls at the existing substations of POWERGRID. They further informed that, the Firewall shall be having electrical ethernet interfaces/ports and placed between FOTE & Communication Gateways. All ethernet based applications shall be terminated in the firewall ports directly (e.g. PMU, AMR, VOIP, SAS/SCADA etc.) before mapping into communication equipment for further optical transmission. There shall also be Main and Backup Centralized Management Console (CMC) required along with remote console at Regional level to manage these firewalls. The CMC will seamlessly integrate existing firewall (if any) and upcoming firewalls of different makes.

(v) POWERGRID has provided a list of substations where Firewall needs to be installed for southern region. There are 57 no. of PGCIL RTM Substations and 1 no. of PGCIL TBCB substation. For the RTM substations, expenditure of firewall installation can be booked in Add CAP or a new scheme may be prepared. For the TBCB substations, expenses can be booked under change in law as CERC order on petition no. 94/MP/2021.

Deliberations:

a) PGCIL (G&C)/ULDC stated that as per the CEA (Cyber Security Guidelines) 2021, it is mentioned to deploy Intrusion Prevention and Intrusion Detection Systems. For compliance with these guidelines, it

is necessary to procure the next-generation firewall and only in these typed the above specifications will be met. Basic Firewall does not have the above functionalities as stated in the Guidelines.

b) MS, SRPC enquired whether the next-generation firewall is required to comply with the regulations. PGCIL/ULDC clarified that Intrusion Prevention and Intrusion Detection Systems are provided by many OEMs within the next-generation firewall itself.

c) TGTRANSCO informed that all SCADA data is secured and it is nowhere being connected to internet so the data is protected. PGCIL added that one station data can be seen by other station data while using the IP address, hence the Firewall is required to avoid the interruption.

d) PGCIL (G&C) informed that in the existing 273 substations of Powergrid, firewalls are not available for the electronic security perimeter as per the CEA (Cyber Security Guidelines), 2021. PGCIL/ULDC stated that under these guidelines, it is necessary to provide firewalls for 57 RTM stations and one TBCB station in SR region.

e) SE (P, C & SS), SRPC enquired whether this issue has been discussed in other regions. PGCIL (G&C)/ULDC replied that this discussion was initially proposed in SR region and is planned to be subsequently discussed in other regions. PGCIL (G&C)/ULDC highlighted that it was thought to include under O&M expenses but this implementation cannot be done under this head due to the high cost.

f) PGCIL (G&C)/ULDC requested the forum to suggest CTUIL should formulate a scheme for procurement of firewall.

g) After deliberation, forum requested CTUIL to put up this agenda item in the NPC forum, as it pertains to all regions and obtain the conceptual approval to proceed further by RPCs. Commercial implications may also be deliberated during NPC meeting. CTUIL agreed the same.

12.2 Communication Issues at SEPL & MEPL

CTUIL vide email dated 22.07.2024 has furnished the following:

In the 47th COM SR meeting CTUIL was requested to convene a meeting to resolve SEPL & MEPL communication issues. In this regard CTUIL has called a meeting among SRPC, Grid India, POWERGRID, CTU, SEPL, & MEPL in Virtual Mode on 17.07.2024.

Following points were concluded in the meeting:

1. SEPL & MEPL to install 1 no. FOTE each at SEPL and MEPL stations.
2. POWERGRID to provide the required no. of ports at 765kV Nellore PS and at 400kV Nellore PG.

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
पूर्वी क्षेत्रीय विद्युत समिति
Eastern Regional Power Committee
14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता-700033
14 Golf Club Road, Tollygunj, Kolkata-700033
Tel. No.:033-24239651,24239658 FAX No.:033-24239652, 24239653 Web: **www.erpc.gov.in**

सं. /NO. ERPC/Op/SCADA/2024/ 811 **दिनांक/DATE: 09.08.2024**

सेवा में/To,

संलग्न सूची के अनुसार/As per list enclosed.

विषय: 02.08.2024 (शुक्रवार) को आयोजित ईआरपीसी की 15वीं TeST (Telecommunication, SCADA & Telemetry) उप-समिति की बैठक का कार्यवृत्त
Sub: Minutes of 15th TeST (Telecommunication, SCADA & Telemetry)Sub-Committee Meeting of ERPC held on 02.08.2024 (Friday)

Please find enclosed **Minutes of 15th Telecommunication, SCADA & Telemetry (TeST) sub-committee meeting of ERPC** held on **02.08.2024 (Friday) physically** at **ERPC Conference Hall, Kolkata** at 10:30 hrs for your kind information and necessary action. The same is also available at ERPC website (www.erpc.gov.in).

कृपया अपनी जानकारी और आवश्यक कार्रवाई के लिए **02.08.2024 (शुक्रवार)** को **ईआरपीसी कॉन्फ्रेंस हॉल, कोलकाता** में 10:30 बजे आयोजित ईआरपीसी की **15वीं Telecommunication, SCADA & Telemetry (TeST) उप-समिति** की **बैठक** के संलग्न **कार्यवृत्त** देखें। यह ईआरपीसी वेबसाइट (www.erpc.gov.in) पर भी उपलब्ध है।

टिप्पणियाँ, यदि कोई हों, कृपया यथाशीघ्र इस कार्यालय को अग्रेषित करें।
Observations, if any, may please be forwarded to this office at the earliest.

इसे सदस्य सचिव के अनुमोदन से जारी किया जाता है।
This issues with the approval of Member Secretary.

09/08/2024

(S.Kejriwal)
SE(Operation)
एसई (ऑपरेशन)

EASTERN REGIONAL POWER COMMITTEE

MINUTES OF 15th TeST MEETING HELD ON 02.08.2024(FRIDAY) AT 10:30 HRS

- *Member Secretary , ERPC chaired the 15th TeST meeting. At the outset, all participants were cordially welcomed and enquired of their specific roles in Communication system of Eastern region.*
- *CTU apprised:*
- ✓ *Role of CTU and RPC in communication planning at regional level.*
- ✓ *Resource disjoint and redundancy of communication network for route diversity in line with CERC and CEA guidelines.*
- ✓ *Comprehensive studies(POC) on interoperability between SDH technology and MPLS as well as among different OEMs of various versions of MPLS(i.e MPLS –TP and MPLS-IP) is currently being carried out before adoption of new technology in ISTS network.*
- *ERLDC underlined the following:*
- ✓ *Apart from network visualization, system study related features are also getting incorporated in upcoming SCADA/EMS system to be implemented shortly.*
- ✓ *Requirement of dedicated manpower at each SLDC for optimal utilization of new SCADA features.*
- ✓ *Significance of root cause analysis in event of major communication outages to evade frequent recurrence.*
- *TeST sub-committee suggested nomination of one regional coordinator on behalf of NTPC to seamlessly deal with all communication related issues of NTPC generating stations.(**Action:**NTPC)*
- *TeST sub-committee advised CTU to carry out the studies on applicability of MPLS technology in a time bound manner.(**Action:** CTU)*

1. PART-A: CONFIRMATION OF MINUTES

1.1. Confirmation of Minutes of 14th TeST Meeting held on 24th April 2024 physically at ERPC Conference Hall, Kolkata

The minutes of 14th TeST Sub-Committee meeting held on 24.04.2024 was circulated vide letter dated 15.05.2024.

Members may confirm the minutes of 14th TeST meeting.

Deliberation in the meeting

Members confirmed the Minutes of 14th TeST sub-committee meeting.

2. PART-B: ITEMS FOR DISCUSSION/UPDATE

2.1 Supply & Installation of Firewall for POWERGRID sub-stations (RTM & TBCB).: CTU

- POWERGRID has informed that in the existing **273** nos. of Substations of POWERGRID, Firewall is not available for electronic security perimeter as per **CEA (Cyber Security Guidelines), 2021.**

- A meeting was conducted on 28.11.2023 (MoM attached as **Annexure B.2.1.1**) among CTU, POWERGRID, CEA, NRPC & Grid-India to finalize the firewall architecture. Finalized architecture is given at **Annexure-B.2.1.2**.
- Later on, a committee was formed under the Chairmanship of **CE (Cyber Security Division), CEA** in line with the minutes of meeting dtd. 12.04.24 convened by CEA and chaired by **Member, Power System**.
- Later,**CEA** vide letter dtd. 25.06.2024 (attached at **Annexure-B.2.1.3**) communicated that utilities are required to comply the CEA (Cyber Security Guidelines), 2021 and deploy Intrusion Prevention and Intrusion Detection System. **Further, as Cyber Security Regulations of CEA are in advanced stage so there is no necessity for constitution of aforesaid committee.**
- POWERGRID has communicated to CTU that Firewall installation at existing substations involved a huge amount which cannot be covered through O&M expenses, therefore a scheme / Project may be prepared for supply and installation of Firewalls at the existing substations of POWERGRID.
- They further informed that, the Firewall shall be having electrical ethernet interfaces/ports and placed between FOTE & Communication Gateways. All ethernet based applications shall be terminated in the firewall ports directly (e.g. PMU, AMR, VOIP, SAS/SCADA etc.) before mapping into communication equipment for further optical transmission. There shall also be Main and Backup Centralized Management Console (CMC) required along with remote console at Regional level to manage these firewalls. The CMC will seamlessly integrate existing firewall (if any) and upcoming firewalls of different makes.
- POWERGRID has provided a list of substations where Firewall needs to be installed for Eastern region which is at **Annexure-B.2.1.4**. Breakup of **RTM/ TBCB** substation is given below:

Region	**POWERGRID RTM S/S**	**POWERGRID TBCB S/S**
ER	**44**	**05**
Total: 49		

- For the **RTM** substations, expenditure of firewall installation can be booked in **Add CAP** or a new scheme may be prepared. For the **TBCB** substations, expenses can be booked under change in law as **CERC order on petition no. 94/MP/2021.**
- Deliberation in this regard is required from the Forum for methodology and preparation of scheme for supply and installation of firewall at the existing substation of POWERGRID in view of **CEA Cyber Security Guidelines 2021** & upcoming CEA regulations on cyber security.

CTU may update. Members may discuss.

Deliberation in the meeting

CTU apprised:

- ✓ *Basic architecture and tentative modalities for supply & installation of Firewall at POWERGRID sub-stations*
- ✓ *In recent 48th COM-SR meeting, SRPC has opined to place this agenda in NPC.*

POWERGRID also suggested that this agenda may be taken up in NPC forum for discussion.

TeST decision:

- *TeST committee opined that detailed methodology of the scheme for supply and installation of firewall at the existing substations of Powergrid may be devised in line with yet to be finalized CEA regulations on cyber security.*
- *TeST committee referred the issue to NPC forum for further deliberation.*

2.2 Dual reporting of RTU, PMU, VOIP, AGC etc applications on dual channel to RLDC and Back up RLDC: CTU

- Presently, all the data channels and voice channels are reporting in main and backup mode with a main channel to RLDC and protection channel to Backup RLDC. It is suggested by ERLDC & WRLDC that for increase of redundancy in the system both main and protection channels should report to RLDCs as well as back up to RLDCs in dual mode considering the criticality of real grid operations by the ERLDC.
- For discussing the same meetings were held among POWERGRID, Grid-India, CTU and CEA on dated 09/05/23 and 27/06/23. Now as per discussion in meeting, POWERGRID had to provide the region wise data of additional requirement for equipment/card/port etc in respective FOTE/Gateway/RTU for the implementation of dual redundancy.
- POWERGRID CC AM dept. and POWERGRID GA & C dept. have provided the required data pertaining to SAS/RTU and FOTE respectively as per attached **Annexure B.2.2.1 and B.2.2.2**

Based on the data provided by POWERGRID AM and GA & C, requirement in ER is as follows:

Sr. No.	**Region**	**RTU reqd. (in no.)**	**SAS reqd. (in no.)**	**FOTE reqd. (in no.)**	**Ethernet card reqd. (in no.)**
1	ER-1	0	01	Nil	20 Nos. including main and back up RLDC
2	ER-2	0	03		
3	Odisha	0	00		
Total qty reqd.		0	04		

Cost estimate for the scheme as provided by POWERGRID is as follows:

a)Cost of one new SAS: 1.5 cr

b)Cost of total four new SAS required: 4x1.5 cr = 6 cr

c)Cost of one ethernet card:1.25 lacs

d)Cost of required 20 Nos. ethernet card:20x 1.25lacs=25 lacs

Total cost estimate for the scheme(b+d):**6.25 cr**

Deliberation in 5th CPM:

- CTU asked if there is any requirement pertaining to new FOTE and FOTE ethernet card at New Jeerat and Mednipur S/S.
- POWERGRID informed that at New Jeerat and Mednipur S/s there is no requirement pertaining to new FOTE and FOTE ethernet card.

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 94/MP/2021

Coram:

Shri Jishnu Barua, Chairperson
Shri I. S. Jha, Member
Shri Arun Goyal, Member
Shri P. K. Singh, Member

Date of Order: 27.12.2023

In the matter of:

Petition under Section 79(1)(f) of the Electricity Act, 2003 read with Regulation 111 of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999 seeking directions for installation of optical ground wire for the 400kV Kurukshetra – Malerkotla transmission line established under the Northern Region System Strengthening Scheme XXXI(B).

And

In the matter of:

Central Transmission Utility, **……..Petitioner**
(Power Grid Corporation of India Ltd).
B-9, Qutab Industrial Area,
Katwaria Sarai, New Delhi-110016

Versus

1. Sekura NRSS XXXI(B) Transmission Ltd.,
   503, Windsor, off CST Road, Kalina, Santacruz (E), Mumbai-400098 (Maharashtra)
2. Northern Regional Power Committee
   18-A, Shaheed Jeet Singh Marg, Qutab Institutional Area, New Delhi-110016
3. Central Electricity Authority,
   Sewa Bhawan, Rama Krishna Puram, Sector -1, New Delhi-110066
4. National Load Despatch Centre,
   B-9, First Floor, Qutab Institutional Area, Katwaria Sarai, New Delhi-110016
5. Northern Regional Load Despatch Centre,
   18-A, Shaheed JEET Singh, Sansanwal Marg, Katwaria Sarai, New Delhi-110016
6. Khargone Transmission Ltd.,
   F1, The Mira Corporate Suite, Plot No.1 &2, C-Block, 2nd Floor, Ishwar Nagar,

Mathura Road, New Delhi-110065

7. NER-II Transmission Ltd.
   F1, The Mira Corporate Suite, Plot No.1 &2, C-Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
8. East North Interconnection Company Ltd.,
   The Mira Corporate Suite, Plot No.1 &2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
9. Bhopal Dhule Transmission Company Ltd.,
   The Mira Corporate Suite, Plot No.1 &2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
10. Jabalpur Transmission Company Ltd.,
    The Mira Corporate Suite, Plot No.1 &2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
11. NRSS XXIV Transmission Ltd.,
    The Mira Corporate Suite, Plot No.1 &2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
12. Purulia & Kharagpur Transmission Co. Ltd.,
    The Mira Corporate Suite, Plot No.1 &2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
13. RAPP Transmission Company Ltd.,
    The Mira Corporate Suite, Plot No. 1&2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
14. Maheshwaram Transmission Ltd.,
    The Mira Corporate Suite, Plot No. 1&2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
15. Gurgaon Palwal Transmission Ltd.,
    The Mira Corporate Suite, Plot No. 1&2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
16. Odisha Generation Phase-II Transmission Ltd.,
    The Mira Corporate Suite, Plot No. 1&2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
17. Patran Transmission Company Ltd.,
    The Mira Corporate Suite, Plot No. 1&2, C Block, 2nd Floor, Ishwar Nagar, Mathura Road, New Delhi-110065
18. Western Transco Power Ltd.(WTPL)
    Achalraj, Opp.Mayor Bunglow, Law Garden, Ahmedabad-380006
19. Western Transmission (Gujarat) Ltd., (WTGL)
    Achalraj, Opp. Mayor Bunglow, Law Garden, Ahmedabad-380006
20. Chhattisgarh WR Transmission Ltd.,
    Achalraj, Opp. Mayor Bunglow, Law Garden, Ahmedabad-380006
21. Raipur Rajnandgaon Warora Transmission Ltd.,
    Achalraj, Opp. Mayor Bunglow, Law Garden, Ahmedabad-380006
22. Sipat Transmission Limited
    Achalraj, Opp. Mayor Bunglow, Law Garden, Ahmedabad-380006

23. Raichur Sholapur Transmission Co. Ltd.,
    Patel Estate, S. V. Road, Jogeshwari (West), Mumbai-400102
24. POWERGRID Vizag Transmission Ltd.,
    POWERGRID, SR HQ, 6th Floor, D. No. 6-6-8/32 &39/E, Kavadiguda,
    Secunderabad-500080, Telangana
25. POWERGRID Unchahar Transmission Ltd.,
    765/400/220 KV POWERGRID S/S, Fatehpur-Lalganj-Lucknow Road,
    Village- Chauferva, Post & Distt-Fatehpur-212601(Uttar Pradesh)
26. Kudgi Transmission Ltd.,
    Mount Poonamallee Road, Manapakkam, P.B. No.979, Chennai-600089
27. Darbhanga Motihari Transmission Co. Ltd.,
    503, Windsor, Off CST Road, Kalina, Santacruz (E), Mumbai -40009 (Maharashtra)
28. NRSS XXXVI Transmission Ltd.,
    Plot No. 19, Film City, Sec-16 A, Gautam Buddha Nagar, Noida, UP-201301
29. Warora Kurnool Transmission Ltd.,
    Achalraj, Opp. Mayor Binglow, Law Garden Ahmedabad-380006
30. POWERGRID Southern Inter Connector Transmission System Ltd (PSITSL),
    POWERGRID, SR1 HQ, D.No.6-6-8/32&395/E, Kavadiguda,
    Secunderabad-500080, Telangana
31. POWERGRID Parli Transmission Ltd (PPTL),
    Sampriti Nagar, Nari Ring Road, Uppalwadi, Nagpur-440026
32. POWERGRID Kala Amb Transmission Ltd.
    (PKATL) 400/220KV Barwala Sub-station, Vill-Naggal, NH-73,
    Barwala Panchkula, Haryana-134118
33. POWERGRID Warora Transmission Ltd, (PWTL)
    WR-1 RHQ, Sampriti Nagar, Nari Ring Road,
    PO: Uppalwadi, Nagpur-440026(Maharashtra)
34. Powergrid NM Transmission Limited Southern
    Region Transmission system –II, RHQ, Near Driving Test Track,
    Singanayakanhalli, Yelahanka Hobli, Bangalore-560064
35. Powergrid Jabalpur Transmission Limited, POWERGID,
    Plot No. 54, Jay Ambe School, Sama-Savli Road, Vadodara-390018, Gujarat
36. Alipurduar Transmission Ltd.(ATL)
    Achalraj, Opp. Mayar Binglow, Law Garden Ahmedabad-380006
37. KOHIMA-MARIANI Transmission Ltd.,
    B-5,Tower-3, 3rd Floor, Okaya Business Centre,
    Sector-62, Noida, (Uttar Pradesh) 201306, India
38. POWERGRID Medinipur Jeerat Transmission Ltd.
    POWERGRID, Eastern Region II Headquarters, CF-17,
    Action Area 1C, New Town, Rajarhat, Kolkata-700156
39. POWERGRID Mithilanchal Transmission Ltd.
    POWERGRID, ERTS-I Regional Haed Quarter, Near Transformer Repair Works,
    Board Colony, Shastri Nagar, Patna-800023 (Bihar)
40. POWERGRID Ajmer Phagi Transmission Ltd. SCO bay 5 to 10,

SECTOR-16A, FARIDABAD, HARYANA- 121002

41. Power Grid Corporation of India Ltd.
Load Dispatch & Communication (LD&C), B-9,
Qutab Institutional Area, Katwaria Sarai, New Delhi-110016 **…..Respondents**

Parties Present:

Shri Samar Chandra De, NERLDC
Shri M. G. Ramachandran, Senior Advocate, STL
Ms. Suparana Srivastava, Advocate, CTUIL
Shri Tushar Mathur, Advocate, CTUIL
Ms. Astha Jain, Advocate, CTUIL
Shri Shubham Arya, Advocate, STL
Ms. Shikha Sood Advocate, STL
Ms. Reeha Singh, Advocate, STL
Ms. Pallavi Maitra, Advocate R-7 to 12
Shri Venkatesh, Advocate, NRSS XXXVI
Shri Anand Singh Ubeja, Advocate, NRSS XXXVI
Shri Mohit Mansharamani, Advocate, NRXX XXXVI
Shri Hemant Singh, Advocate, WTPL
Shri Chetan Garg, Advocate, WTPL
Shri Swapnil Verma, CTUIL
Shri Ranjeet S. Rajput, CTUIL
Shri Priyansi Jadiya, CTUIL

ORDER

Central Transmission Utility (CTU) has filed the present Petition under Section 79(1)(f) of the Electricity Act, 2003, read with Regulation 111 of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999, seeking directions for installation of optical ground wire for the 400kV Kurukshetra – Malerkotla transmission line established under the Northern Region System Strengthening Scheme XXXI(B).

2. The Petitioner has made the following prayers:

i. Issue appropriate directions to Respondent No.1 for allowing OPGW installation on the 400kV Kurukshetra-Malerkotla D/c line under the Reliable Communication Project approved for the Northern Region by Northern Region Power Committee to ensure early completion of the link.

ii. Issue further appropriate directions to Respondent No.1 for facilitating and allowing OPGW installation in the transmission elements implemented by transmission licensees in line with the mandate of Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020; any other applicable Regulations/Procedure in this regard, orders and directions of this Hon'ble Commission and

the decision of coordinated meetings between entities such as Regional Power Committees (RPC), Central Electricity Authority (CEA), Central Transmission Utility (CTU), National/Regional Load Despatch Centres (NLDC/RLDC) and other statutory/regulatory stakeholders.

iii. Pass such further and other order(s) as this Hon'ble Commission may deem fit and proper in the facts and circumstances of the present case.

Submission of Petitioner

3. Petitioner has made the following submissions:

(a) Communication systems are essential to facilitate the secure, reliable and economic operation of the grid and are an important pre-requisite for the efficient monitoring, operation and control of the power system. The provisions relating to communication systems for the power sector have been initially spelt out in the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 (hereinafter "Grid Code, 2010") and the Central Electricity Authority (Technical Standard for Connectivity to the Grid) Regulation, 2013 (hereinafter "Grid Standard for Connectivity") whereunder, all requesters, users, Central/State Transmission Utilities are obligated to provide systems to telemeter power system parameters. Thereafter, on 15.5.2016, this Commission notified the Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017 (hereinafter "Communication System Regulations, 2017"), which lay down the rules, guidelines, and standards to be followed by various persons and participants in the system for the continuous availability of data for system operation and control including market operations.

(b) Petitioner has been entrusted with the responsibility for the development of an efficient and coordinated communication system on a regional basis, which is to be connected to provide a backbone communication system spread across India as per the Manual of Communication Planning Criteria of the Central Electricity Authority, 2019. CEA has further notified the Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020 (hereinafter "Communication Standards Regulations, 2020"), laying down the requirements for planning, implementation, operation and maintenance and up-gradation of a reliable communication system for all communication requirements including exchange of data for power system at the national level, regional level,

inter-State level and intra-State level. The Regulations envisage planning of backbone regional and national communication network using ISTS transmission lines by the Petitioner as per requirement.

(c) The Communication Standards Regulations, 2020, envisage planning of backbone regional and national communication network using ISTS transmission lines by the Petitioner as per requirement. Regulation 26 of the said Regulations necessitates the construction of wideband communications using fibre optic communication.

(d) Optical Ground Wire (OPGW) is an optical fibre embedded in the earth wire, which is used in overhead power lines. In furtherance of the regulatory mandate, the Petitioner has established the backbone communication network in the Northern Region as part of various projects such as the Unified Load Despatch & Communication (ULDC) Project, Microwave Replacement Project and Fiber Optic Expansion Projects, apart from other transmission projects.

The Reliable Communication Scheme under the Central Sector for Northern Region was proposed by the Petitioner in the 35th Technical Coordination Committee (TCC) Meeting held on 1.5.2017, which was approved in the 39th Meeting of the Northern Regional Power Committee held on 2.5.2017.

In this manner, the scheme for the installation of OPGW based reliable communication system with a network size of 7248kms (including OPGW replacement of ULDC Phase –I) by the Petitioner in the Northern Region was approved for its implementation. In accordance with the above approval, which was reiterated in the 40th Meeting, the Petitioner proceeded with the installation of around 7248 km of OPGW along with the communication equipment under the central sector in the Northern Region.

(e) The implementation of an additional network with the Reliable Communication Scheme under the Central Sector for the Northern Region was approved in the 47th Meeting of the Northern Regional Power Committee held on 11.12.2019 and in the 44th Meeting of the Technical Coordination Committee held on 10.12.2019. Accordingly, the revised network size of the Reliable Communication Project will become 7398 Km. As a part of the above scheme, OPGW was also agreed to be installed on the 400kV Kurukshetra-Malerkotla line (180km) by replacing the existing earth wire.

(f) The Petitioner has taken up implementation of the project wherein OPGW is to be installed on ISTS transmission lines by replacing existing earth wire. For that purpose, the Petitioner has entered into a contract dated 31.1.2019 with M/s Apar Industries Ltd. (APAR) after the selection of the same based on an open tender.

(g) The 400kV ISTS transmission line connecting Kurukshetra-Malerkotla had been implemented by Respondent No.1 as part of the transmission scheme in the name of "Northern Region System Strengthening Scheme XXXI (B)" through the TBCB route as follows:

i. 400 kV Kurukshetra-Malerkotla D/c line

ii. 400 kV Malerkotla-Amritsar D/c line

(h) In view of the regulatory mandate for implementing the national backbone communication system, including for the Northern Region, the Petitioner approached Respondent No.1 for the installation of OPGW on the 400kV D/c Kurukshetra- Malerkotla line built by the Respondent. Further, vide email dated 15.9.2020, the Petitioner clarified certain queries raised by Respondent No.1

(i) Respondent No.1 vide letter dated 5.10.2020 raised issues with respect to the installation of OPGW on the 400kV Kurukshetra-Malerkotla transmission line and stated that it was unable to understand the regulatory provision which allowed that part of TBCB asset could be removed/dismantled and adjusted against the capital cost of other cost-plus assets in order to achieve tariff optimization in cost plus project. As such, Respondent No.1 declined to grant its consent "to take away NTL earth wire including hardware & fittings by M/s. APAR Industries Ltd. after dismantling for executing OPGW Work". Respondent No.1 also sought clarifications from the Petitioner with respect to the following:

i. The available regulatory provisions and contractual provisions under the TSA under which implementation of OPGW ULDC scheme through its asset would not entail any impact on the revenue of the asset.

ii. Petitioner to hand over the verified quantity of earth wire, including accessories to Respondent No.1 after proper re-rolling on drums at its Patiala store.

iii. Whether any damage to the assets of Respondent No.1 during the installation of OPGW by the Petitioner would be rectified by the Petitioner at its own to the level of satisfaction of Respondent No.1.

iv. Petitioner to provide schedule of work execution, planning, details of executing agency etc., to Respondent No.1 prior to mobilizing the work at the site for joint discussion purposes.

v. Whether the Petitioner would indemnify Respondent No.1 towards:

a. Outage/tripping of line implemented by Respondent No.1, which might reduce transmission line service availability.

b. Any perspective dispute, litigation or (RoW/crop) compensation claims raised by any of the landowners.

vi. From the lifetime operation and maintenance perspective after the completion, commissioning and capitalization of the OPGW work, clarification with respect to:

a. Ownership of the transmission line, particularly in view of the substitution of earth wire by the Petitioner and if the asset was to be handed over to Respondent No.1 for ease of its operation and maintenance in future.

b. Whether the Petitioner intended to utilize the transmission line commercially in any manner.

(j) Petitioner vide letter dated 12.10.2020 informed Respondent No.1 that live-line installation of OPGW was field proven and more than 70,000 kms of installation had been completed by the Petitioner. As regards the return of earth-wire and other issues raised by Respondent No.1, the Petitioner stated that the same could be dealt with in line with the decision taken during the Meeting chaired by the Member Secretary, Northern Region Power Committee on 5.3.2019 on similar issues raised by M/s Parbati Koldam Transmission Company Limited (PKTCL) for OPGW installation on their lines. Petitioner's prayers are liable to be seen in the context and perspective of the obligations of Respondent No.1 in terms of the Transmission Service Agreement dated 02.01.2014.

(k) Respondent No.1 is also obligated in terms of the provisions of the CERC (Procedure, Terms and Conditions for grant of Transmission License and other

related matters) Regulations, 2009, to maintain the project in accordance with the prudent utility practices and applicable directions passed by competent authorities.

(l) The OPGW requirement on the said line under the Reliable Communication Project is vital for providing reliable and redundant communication of Malerkotla 400kV ISTS sub-station to the Northern Region Load Despatch Center and the Malerkotla 400 kV ISTS sub-station is important for evacuation of bulk power to Punjab through the downstream of 800 kV Champa-Kurukshetra HVDC line.

(m) Respondent No.1 or any similarly placed transmission licensee may have inter alia the following concerns or issues, on which the Commission may be pleased to issue appropriate guidance and directions:

i. Change in value (if any) of their assets upon replacement of existing earth-wire with OPGW (optical ground-wire) when such installation is being carried out at the behest of CTU/POWERGRID.

ii. Impact of this change in assets on the tariff (if any).

iii. Impact of tripping and shutdowns on their system availability (if any)

iv. Ownership of OPGW.

v. Permission for the licensee to use OPGW for any commercial purpose.

(n) The Commission may issue directions and guidance in general governing the installation of OPGW wherever so required in accordance with the mandate of Communication Standards Regulations, 2020, Communication System Regulations, 2017 or any other applicable Regulations/Procedure in this regard; orders and directions of this Commission and the decision of coordinated meetings between entities such as Regional Power Committees (RPC), Central Electricity Authority (CEA), Central Transmission Utility (CTU), National/Regional Load Despatch Centres (NLDC/RLDC) and other statutory/regulatory stakeholders.

Hearing on 25.06.2021

4. Petition was admitted on 25.06.2021, and the Commission observed that the issues raised by CTUIL in the instant matter may arise in the case of other TBCB projects. Therefore, the Commission directed CTUIL to implead all the transmission

licensees implementing transmission projects under the TBCB route as respondents so that all of them may be heard and suitable directions could be issued in one order instead of deciding the issues in multiple petitions. The Commission further directed the Petitioner to implead PGCIL as a party to the proceedings. The Commission also directed STL to discuss with CTUIL and firm up the issues that may arise in the installation of OPGW in place of earth wire in various TBCB projects for smooth and proper adjudication of the issues involved.

Submission of Petitioner

5. Petitioner vide affidavit dated 30.11.2021 and dated 08.03.2022 has filed an "Amended Memo of parties" impleading other transmission licensees.

6. Petitioner vide affidavit dated 08.03.2022 submitted the Minutes of Meeting dated 14.07.2021 between CTU, NRSS XXXI(B) Transmission Ltd (NTL) & Powergrid and Minutes of the Meeting held on 13.08.2021 with ISTS licensees to discuss issues related to OPGW installation on Malerkotla - Kurukshetra line & LILO of Fatehgarh – Bhadla line at Fatehgarh-II. There were divergent opinions with respect to the implementation, ownership, maintenance and operation of OPGW and no consensus was arrived at in these meetings.

Hearing on 10.03.2022

7. The Commission directed CTUIL to hold a further meeting(s) with the transmission licensees and come out with a suitable proposal for smooth and proper adjudication of the issues involved.

8. The Commission directed the Petitioner to submit the list of transmission assets along with the transmission licensee's name wherein this replacement of earth wire/ old OPGW is planned and any other issues being faced by CTUIL related to modifications required to be carried out in TBCB assets keeping in view the integrated nature of ISTS.

Submission of Petitioner

9. Petitioner vide affidavit dated 29.03.2022 has submitted as follows:

(a) The list of the transmission assets along with the transmission licensee's name wherein the replacement of earthwire/old OPGW is planned (as on 29/03/2022) has been submitted comprising of majority assets of Powergrid and one line Western Transmission Power Ltd (Adani).

(b) In case the replacement of earth wire/old OPGW is planned in additional transmission assets in future, the same would be informed to the Commission by the Petitioner.

(c) The issues (including issues other than replacement of earth wire/old OPGW) being faced by the Petitioner related to modifications required to be carried out in TBCB assets is tabulated as below:

Sr. No.	Name of Owner Utility (TBCB/JV/ IPTC)	Name of lines	Issues raised by owner Utilities/likely to arise	Comments
1.	M/s. NTL (NRSS XXXI(B) Transmission Limited) M/s Sekura Ltd.	400kV Kurukshetra – Malerkotla TL (139Km)	a. Impact on tariff and revenue after replacement of Earthwire with OPGW (POWERGRID ownership). b. Handing over the Earthwire. c. Rectification of any damaged asset in the process of OPGW installation. d. Prior intimation of any work and responsible contractor. e. Indemnification of any outage or claimed compensation by any landowner. f. Ownership of OPGW and its O&M. g. Any commercial use of OPGW.	POWERGRID has communicated that it has no objection if the implementation of the laying of OPGW is undertaken by M/s Sekura NRSS XXXI(B) Transmission Ltd (STL)
2.	M/s. PKTCL (M/s. IndiGrid) (**JV with POWERGRID**)	i. 400kV S/C Parbati III(HEP) – Parbati Pooling (7Km) ii. 400kV S/C Parbati II(HEP) – Parbati III (12Km) iii. 400kV Parbati Pooling – Koldam (65Km)	a. Rectification of any damaged asset in the process of OPGW installation. b. Return of earthwire c. Any commercial use of OPGW.	POWERGRID has communicated that M/s PKTCL may do the installation of OPGW on their own, as discussed during the meeting with Licensees on 13.08.21.
3.	Torrent Power Limited	(i) LILO of Pirana (PG) – Pirana (T) 400kV D/c line at Ahmedabad S/s with twin HTLS along	a. Long shutdown is required for the execution of reconductoring and bay upgradation work. This may	As such no issue has been raised by owner/implementer. However, the implementation work through TBCB for bay

	(**TBCB)**	with reconductoring of Pirana (PG) – Pirana(T) line with twin HTLS conductor (ii) **Bay upgradation work at Pirana (PG) & Pirana (T)**	affect the availability of other bays intermittently. b. Commercial issues may be raised by the owner for the modification.	upgradation works and reconductoring in the existing line of Torrent Power will require dismantling, breakage, and removal of existing infrastructure in the premises of Torrent Power by the new TSP.

(d) The Ministry of Power vide its Order No. 15/3/2017-Trans-Pt(1) dated 09.03.2022 has issued the "Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS)". The Guidelines define the categories of Communication System Schemes for ISTS as Category (A) and Category (B) and provide their corresponding approval procedure. The categories A and B have been defined under the Guidelines as follows: -

- **Category (A)**: Communication system directly associated with new ISTS as well as incidental due to implementation of new ISTS elements (e.g. LILO of existing line on new/existing S/s where OPGW/terminal equipment are not available on the existing mainline/substations etc.)
- **Category (B)**: Upgradation/modification of existing ISTS Communication system pertaining to the following:
  - Missing Links Redundancy/ System Strengthening
  - Capacity upgradation (Terminal equipment)
  - Completion of life of existing communication system elements
  - Other standalone project e.g. Cyber Security, Unified Network Management System (UNMS)
  - Adoption of New Communication Technologies

(e) Under the Guidelines, the requirement for a communication system linked with the new ISTS, shall be included in the new ISTS package and the combined proposal shall be approved as per the directions contained in MoP's Office Order dated 28.10.2021 regarding the Re-constitution of the "National Committee on Transmission" (NCT). In the case of Category (B), Communication Schemes/Packages proposed by CTUIL for the upgradation/modification of the existing ISTS Communication System, standalone projects, and adoption of new technologies shall be put up to RPC for their views, and RPC has to provide their views on the Schemes/Packages proposed by CTUIL within 45 days of receipt of

the proposal from CTUIL. The Schemes/Packages, along with the views of RPC shall be approved by NCT. Subsequent to communication received from POWERGRID that it has no objection if the implementation of laying of OPGW is undertaken by M/s Sekura NRSS XXXI(B) Transmission Ltd (STL), the installation of OPGW on 400kV Kurukshetra-Malerkotla Transmission Line in the instant petition may be undertaken as per the procedure prescribed for category (B) communication systems under the Guidelines.

(f) The Guidelines formulated by the Ministry of Power settle the divergent opinions with respect to implementation, ownership, maintenance and operation of OPGW between the transmission licensee and CTUIL and therefore, difficulty/disputes which are under consideration in the present Petition are not likely to recur in near future.

Submission of Respondent Western Transco Power Limited (WTPL)

10. Respondent No.18 **Western Transco Power Limited (WTPL)** vide affidavit dated 29.04.2022 has mainly submitted as under:

(a) Respondent No. 18, Western Transco Power Limited, is a Transmission Licensee and the 765/400kV Pune (PG) (GIS) – 400kV Parli (PG) was constructed by Respondent No. 18, which was commissioned on 01.12.2013.

(b) If the Commission allows some other party to lay OPGW on the transmission asset owned and operated by another licensee, the same would necessarily entail the following issues, which need to be considered by this Commission:

i. The ownership of the OPGW shall remain uncertain as the transmission asset will belong to one entity, and the OPGW shall be owned by another entity.

ii. The OPGW which shall be installed may be utilized for commercial purposes such as communication etc., which cannot be allowed to an entity which is not the owner of the transmission asset, and the said entity cannot be permitted to make undue monetary gains by using the said asset.

iii. During installation of the OPGW, there may be damage to the existing asset of the Applicant.

iv. The suitability of OPGW to the existing transmission asset is an important factor, which also requires consideration by this Commission.

v. Issues as regards the Right of Way ("RoW") during the extraction of the existing wire.

vi. The Applicant will be liable to be compensated in case of any damage caused by the licensee during the installation of OPGW.

vii. Deemed availability/ compensation of financial loss in case of tripping, breakdown, maintenance etc., due to the reason not attributable to the transmission licensee which owns the transmission line in question.

viii. Whether O&M will be carried out by the transmission licensee which owns the transmission line in question.

11. The Commission is precluded from granting a license or permission to any other party qua a transmission asset which is owned by t Respondent No. 18.

Submission of other Respondents

12. The other Respondents NER-II Transmission LTD. (NERII), Parbati Koldam Transmission Co. LTD. (PKTCL), Gurgaon Palwal Transmission Co. LTD. (GPTL), Jabalpur Transmission Co. LTD. (JTCL), Maheshwar Transmission Co. LTD. (MTL), RAPP Transmission Co. LTD. (RTCL), Bhopal Dhule Transmission Co. LTD. (BDTCL), Odisha Generator Phase-II Transmission Co. LTD. (OGPTL), East North Interconnection Transmission Co. LTD. (ENICL), Patran Transmission Co. LTD (PTCL) and Purulia & Kharagpur Transmission Co. LTD (PKTCL), vide their individual affidavit dated 29.05.2022 have submitted the similar submission, which are as under:

(a) The present Petitioner is obligated to comply with the provisions of Communication System Regulations, 2017, which requires the Petitioner to undertake only the planning of the communication system and not undertake installation of OPGW and communication system on the assets of the other transmission licensees.

(b) Section 17 of the 2003 Act has a bar on the Petitioner to acquire the transmission assets of any other licensee by any arrangement. The prayers made by the Petitioner are tantamount to the Petitioner acquiring the transmission assets of the

Respondent Licensee for installing OPGW. This is clearly stated in negative language in clause 1(a) of section 17 of the 2003 Act.

(c) The "Guidelines on Planning and Communication System for Inter State Transmission System" do not mandate the CTUIL or PGCIL to install OPGW on the transmission lines/transmission projects owned by other transmission licensees. The said Guidelines state that the proposal made by the Petitioner for the upgradation/modification of the existing ISTS communication system, etc., shall be put up to RPCs for their views.

(d) The following substantial issues arise in the present matter:

(A) Proposal may entail modification of license conditions:

i. In the event that the Petitioner is to replace the earth wires of other transmission licensees, there may be an issue attracting license amendment, which *inter alia* requires prior permission of the Lenders. Moreover, if the ownership of OPGW is to remain with the Petitioner, then two different transmission licensees will have ownership over one TBCB asset, which will lead to complexities in terms of operation and maintenance of the asset, leveraging of the assets for another business, RoW/crop compensation, outage and availability related claims, etc.

(B) The issue of Deemed Availability.

(C) The issue of CTUIL engaging in "Other Business" under section 41 of the 2003 Act:

i. The proposal of the Petitioner to install OPGW on the transmission assets of another Transmission Licensee entails the Petitioner to recover capital expenditure and other expenditure on installing the OPGW from the point of connection, transmission charges from the base of customers of the Petitioner.

ii. Section 41 only allows the transmission licensee to engage in any business for "Optimum Utilization of its assets." Therefore, under section 41 of the 2003 Act, one transmission licensee cannot engage in another business for utilization of another transmission licensee's assets.

iii. There is no basis in fact or in law based on which the Respondent No.1 transmission licensee or any other transmission licensee would permit the

Petitioner or PGCIL to utilize their own transmission assets for CTUIL/PGCIL to derive revenue from installing the OPGW.

iv. Under section 41, the Second Proviso thereto prohibits the Respondent No.1 licensee or other transmission licensees from providing their own transmission assets to CTUIL/PGCIL because that would be tantamount to encumbering its transmission assets for the loans/financial assistance that CTUIL/PGCIL would incur for the expenditure on OPGW installation.

v. Respondent No.1 licensee/other transmission licensees cannot be deprived of return on investment on their own transmission assets by depriving them of installing the OPGW on their own assets.

(D) The issue of Indemnification: The transmission licensees will be exposed to disputes on account of right-of-way issues with locals, outages, decrease in availability of transmission system, loss of revenue, etc., if the OPGW is installed by CTUIL/PGCIL and hence transmission licensees should be indemnified by CTUIL and/or PGCIL, as the case may be.

(e) The dismantled earth wires will have to earn scrap value which will be amenable to treatment under the sharing of non-tariff income between the beneficiaries and LTTCs and transmission licensees. Can CTUIL nor PGCIL be permitted to replace the existing earth wires of the transmission assets of the Answering Respondent/other transmission licensees?

Submission of Petitioner

13. Petitioner vide affidavit dated 12.05.2023 has submitted that in compliance with the directions of the Commission, a meeting was held between CTUIL & ISTS Transmission Licensees on 08.05.2023, and the minutes of the same have been submitted.

Hearing on 15.05.2023

14. During the hearing on 15.05.2023, following has been recorded:

"3. Learned counsel for CTUIL informed that pursuant to the direction of the Commission given in the instant petition vide Record of Proceedings dated 10.3.2022, a meeting was held between CTUIL and ISTS transmission licensees on 8.5.2023, wherein it was recorded that in the earlier meeting held on 13.8.2021, between CTUIL and the transmission licensees, it was agreed by general consensus that unless otherwise requested, the work

regarding installation of OPGW shall be awarded to the asset owner. She further informed that a meeting was also held on 13.3.2023, amongst CTUIL, Powergrid and Sekura pursuant to the directions of the Commission vide RoP dated 10.3.2022 to discuss OPGW installation on 400 kV D/C Malerkotla- Kurukshetra line owned and operated by Sekura wherein Sekura suggested that OPGW work should be awarded to them as additional work being change in the original transmission line scope and cost of the same shall be recovered by revision in their existing TBCB tariff. Learned counsel for the CTUIL submitted that the work shall be awarded in RTM mode and tariff of the same shall be determined by the Commission as per the applicable regulations.

4. Learned counsel for Respondent No.18/WTPL submitted that while passing order in present petition, the Commission may bear in mind that the matter in issue is of Communication System and to what extent the powers under the Electricity Act, 2003 can be used in allowing revenue or in approving or determining tariff of Communication System which is not part of the transmission. In response, learned counsel for the CTUIL submitted that the Communication System is part of the transmission system CTUIL submitted that the work should be awarded in RTM mode and tariff of the same shall be determined by the Commission as per the applicable regulations."

15. After hearing the Petitioner and Respondents, the Commission reserved the order in the matter on 15.05.2023.

Written Submission of Respondent No. 1, SEKURA NRSS XXXI(B) Transmission Ltd

16. Respondent No.1, **SEKURA NRSS XXXI(B) Transmission Ltd** has made written submissions dated 05.06.2023 as under:

(a) CTUIL has proposed the following in view of MoP "Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS)" dated 09.03.2022 and recent approvals of OPGW on existing lines:

(i) OPGW installation work under ISTS Communication requirement shall be awarded to the transmission line asset owner.

(ii) Terminal equipment associated with OPGW cable shall be awarded to bay owner/s of the transmission line on which OPGW is proposed for installation.

(b) A consensus has emerged that Respondent No. 1 can undertake the implementation of OPGW in the transmission assets owned by it and further that such OPGW cables will form part of its transmission assets, which ownership would also lie with Respondent No 1.

(c) The NRSS project has been developed and operated by Respondent No. 1 as a Tariff based Competitive Bidding licensee. All transmission assets forming part of the NRSS XXXI B Project are subject to the tariff that has been arrived at pursuant to competitive bidding in accordance with the guidelines issued by the Ministry of

Power (“MOP”). Accordingly, the regime that governs the tariff of the NRSS XXXI B project falls under Section 63 of the EA 2003.

(d) OPGW cables do not constitute a standalone asset. It is only a part of the transmission assets of a transmission licensee. The NRSS XXXI B Project is regulated under Section 63 of the EA 2003, it may not be appropriate to apply a separate regulated tariff mechanism for the upcoming OPGW cables of the NRSS XXXI B Project.

(e) In view of the above, the OPGW cables forming part of the communication system would form an integral part of the transmission lines owned and operated by Respondent No. 1.

(f) In the context of factoring in the implementation of the Reliable Communications Scheme in the tariff of the TBCB licensee, implementation of the Communication System as part of the NRSS XXXI B project by replacing the earth-wire with OPGW cables is an additional requirement under the mandate of law. Considering that the said requirement has cropped up after the bid deadline, the implications of the above should be considered under the Change in Law provision of the Transmission Service Agreement (TSA).

(g) The consequences of the Change in Law and, in particular, the computation of the impact thereof upon the tariff have been set out in detail under the TSA. Considering that the TSA governs the tariff for the entire transmission assets in the NRSS project, any change in such tariff would fall within the purview of the TSA.

(h) There is precedent for allowing additional expenditure incurred on account of a Change in Law to be passed through in the tariff. Reliance is placed on Talwandi Sabo Power Limited vs Punjab State Electricity Regulatory Commission [MANU/ET/0054/2020], wherein the Tribunal held that the MoEF and CC Notification constituted a Change in Law event and any additional expenditure incurred on account of the installation of flue-gas desuphurisation system was to be included as Additional Capital Cost. Reliance is also placed on the judgment of the Tribunal in NRSS XXXI (B) Transmission Limited vs Central Electricity Regulatory Commission [MANU/ET/0071/2021]. In this case, the Appellant has claimed compensation on account of the increase in the length of the transmission lines due to a change in the Gantry Coordinates from the one indicated in the Survey Report.

(i) Further, vide its Final Order dated 13.05.2022 in remand proceedings in Petition no. 195MP2017, it was decided as follows:

"16. Accordingly, NTL shall recover from LTTCs the IDC and IEDC incurred for the extended period of SCOD and compensation for the actual change in the length of the Transmission lines as against the length of the Transmission lines in case the Gantry Coordinates would have been same as indicated in the Survey Report in accordance with Article 12.2.1 of the TSA i.e. increase in non-escalable transmission charges at the rate of 0.313% for a cumulative increase of capital cost of Rs.1.158 crore incurred up to the extended SCOD of the project."

(j) Procedurally and administratively, it would be quite difficult and challenging for the TSP, CTUIL & other stakeholders involved actively in the ISTS transmission charges billing, collection & disbursement (BCD) process from a viewpoint that parts of the same transmission asset owned & operated by same Transmission Licensee would be treated under two different tariff regimes i.e. part asset under TBCB Tariff and part asset under RTM mode. The commission may please consider the single tariff regime under the available provision of the TSA for all such similar cases of OPGW laying in the existing transmission TBCB assets.

Analysis and Decision

17. We have considered the submissions of the Petitioner, and Respondents and perused all relevant documents on record. The following issues arise for our consideration:

Issue No. 1: Who shall be responsible for implementing the installation of optical ground wire (OPGW) to strengthen the communication network by replacing the earth wire on the existing transmission line owned by a transmission licensee?

Issue No. 2: What other factors need to be considered while such replacement is carried out, such as the impact on discovered tariff, availability, loss due to damage, etc. for the transmission licensee?

The above issues have been dealt with in succeeding paragraphs.

Issue No. 1: Who shall be responsible for implementing the installation of optical ground wire (OPGW), to strengthen the communication network by replacing the earth wire on the existing Transmission Line owned by a transmission licensee?

18. Petitioner has submitted that the Reliable Communication Scheme under Central Sector for Northern Region for installation of OPGW based reliable communication system with a network size of 7248 kms (including OPGW replacement of ULDC Phase–I), by the Petitioner, was approved in the 39th Meeting of the Northern Regional Power Committee held on 2.5.2017, which was revised to 7398 Km in the 47th Meeting of the Northern Regional Power Committee held on 11.12.2019.

19. Petitioner has taken up the implementation of the project wherein OPGW is to be installed on ISTS transmission lines by replacing existing earth wire for which it has entered into a contract dated 31.1.2019 with M/s Apar Industries Ltd. (APAR) as per which dismantled earth wire shall be taken away by the contractor.

20. Petitioner has approached Respondent No.1 for installation of OPGW on the 400kV D/c Kurukshetra-Malerkotla line, which was opposed by Respondent No. 1 seeking clarifications on the regulations under which Petitioner has proposed to take away part of its asset and the ownership of new OPGW among other queries.

21. Respondent Western Transco Power Limited (WTPL) has submitted that the OPGW which shall be installed may be utilized for commercial purposes such as communication etc., which cannot be allowed to an entity which is not the owner of the transmission asset, and that the said entity cannot be permitted to make undue monetary gains by using the said asset. Further, during the installation of the OPGW, there may be damage to the existing assets of the Applicant. WTPL. Further, the concerns on Deemed availability/ compensation of financial loss in case of tripping, breakdown, maintenance, etc., due to the reason not attributable to the transmission licensee which owns the transmission line in question need to be handled besides who will carry out O&M of such OPGW.

22. The Respondents NER-II Transmission LTD. (NERII), Parbati Koldam Transmission Co. LTD. (PKTCL), Gurgaon Palwal Transmission Co. LTD. (GPTL), Jabalpur Transmission Co. LTD. (JTCL), Maheshwar Transmission Co. LTD. (MTL), RAPP Transmission Co. LTD. (RTCL), Bhopal Dhule Transmission Co. LTD. (BDTCL), Odisha Generator Phase-II Transmission Co. LTD. (OGPTL), East North

Interconnection Transmission Co. LTD. (ENICL), Patran Transmission Co. LTD (PTCL) and Purulia & Kharagpur Transmission Co. LTD (PKTCL) have opposed the replacement of earth wire by any other licensee such as Petitioner.

23. Subsequent to the filing of the instant Petition, several rounds of meetings were undertaken by CTUIL with transmission licensees wherein consensus emerged during the meetings held on 13.3.2023 and 8.5.2023 regarding modalities for implementation of OPGW raised in the instant Petition.

24. We have considered the submissions of the Petitioner and Respondents and have also perused the facts on record.

25. The relevant extracts of the 39th Meeting of the NRPC held on 2.5.2017, and 47th Meeting of the NRPC held on 11.12.2019 are as under:

39th Meeting of the NRPC held on 2.5.2017

"NRPC Deliberations

B.6 Reliable Communication Scheme under Central Sector for Northern Region

B.6.7NRPC approved the proposal by POWERGRID for installation of 5474 kms. of OPGW based communication scheme, at an estimated cost of Rs.137 Crs."

"B.17 Replacement of OPGW installed under ULDC Phase-I

B.17.6 POWERGRID informed that 24-F OPGW would be considered as per the existing philosophy and along with communication equipment for which the estimated cost would be Rs.59 Crs. The scheme would become part of existing Commercial Agreement signed for ULDC Project and would be implemented as part of Reliable Communication Scheme under Central Sector for Northern Region.

B.17.7 After detailed deliberations NRPC approved the proposal of replacement of old OPGW installed under ULDC phase-I…"

47th Meeting of the NRPC held on 11.12.2019

"*B.6.4 After detailed deliberations, the following links were agreed upon:*

Sl. No.	*Name of Link*	*Route Length (km)*	*Purpose*
1	*400kV Panchkula-Patiala*	*65.494*	*Physical Path Redundancy & route diversity for Panchkula S/s*
2	*400kV Jallandhar Moga*	*85.15*	*Physical Path Redundancy & route diversity for Jallandhar (PG) through Central Sector links.*
3	*400kV Parbati PS - Amritsar*	*250.53*	*Path Redundancy & route diversity of Parbati PS (Banala) & Hamirpur 4 through Central sector network.*
4	*LILO of Parbati – Amritsar at Hamirpur*	*6.7*	

5	***400kV Kurukshetra-Malerkotla PG***	***180***	***Path Redundancy of Malerkotla (PG) through central sector network.***
6	*765kV Meerut - Moga*	*337.15*	*Route diversity of Moga S/S & creation of reliable ICCP link between Punjab, Rajasthan (through upcoming 765kV Bikaner Moga under GEC Part D & NRLDC.*
7	*400kV Dehradun-Bagpat*	*165*	*Physical path Redundancy & for route diversity of Bagpat S/S*
8	*400kV RAPP B -Jaipur South with LILO at Kota*	*226*	*Redundancy of Kota & RAPP through Central Sector network*
9	*400kV Allahabad-Singrauli*	*200*	*Redundancy of Singrauli*
10	*400kV Allahabad-Fatehpur 765*	*130*	*Strengthening of Inter Regional Connectivity (WR-NR). (400kV Fatehpur – Mainpuri is under implementation under Reliable Communication scheme)*
11	*400kV Kanpur - Ballabhgarh*	*370*	*Redundancy of old Agra-Kanpur link which has reached the end of its useful life of 15 years.*
12	*Chittorgarh 400kV RVPN to Chittorgarh 220kV RVPN*	*07*	*Redundancy of Chittorgarh 220/132 through Central Sector network*
13	*400kV Lucknow – Kanpur*	*156*	*Redundancy of Network and avoiding multiple sub-stations*
	TOTAL	*2179.024*	

B.6.5 POWERGRID further informed that in accordance with 39th & 40th NRPC meeting, implementation of 7248 Km OPGW is under execution. POWERGRID also informed that around 2031 km OPGW network is not coming up in the original reliable scheme (as approved in 39th NRPC) as some of the IPPs are not coming up and also connectivity for some were covered in different schemes. Considering the same and additional requirement of 2180 km as proposed for taking care of contingencies as per Communication Planning Criteria, the overall network size approved in 39th & 40th NRPC will increase by only 150 km considering new requirement of 2180 km in lieu of 2031km network not coming up as brought out above.

B.6.6 Accordingly, TeST sub-committee members have agreed for the implementation of 2180 Km of OPGW network under on-going Reliable Communication Project (7248 km) so that the same can be implemented within the same time period. The revised network size of Reliable Communication Project will become 7398 Km.

B.6.7 TCC recommended for the approval of the modified scheme as agreed by TeST subcommittee.

NRPC Deliberations

B.6.8 NRPC concurred with TCC deliberations."

As per the above, the proposal of the petitioner for the installation of OPGW based communication network for Reliable Communication Scheme under the Central Sector for Northern Region was approved in 39th Meeting of NRPC held on 02.05.2017 and 47th Meeting of NRPC held on 11.12.2019, wherein the installation of OPGW on 400kV Kurukshetra - Malerkotla line (180km) by replacing the earth wire was agreed in 47th meeting of the NRPC.

26. Clauses 7.1.1 and 7.1.2 of the Transmission Service Agreement dated 02.01.2014 of Respondent No.1, as submitted by the Petitioner, provide as under:

"7. OPERATION AND MAINTENANCE OF THE PROJECT

7.1.1 The TSP shall be responsible for ensuring that the Project is operated and maintained in accordance with the Indian Electricity Grid Code (IEGC)/State Grid Code (as applicable), Transmission License, directions of National Load Despatch Centre/RLDC/SLDC (as applicable), Prudent Utility Practices, other legal requirements including the terms of Consents, Clearances and Permits and is made available for use by the Transmission Customers as per the provisions of applicable regulations including but not limited to the Central Electricity Regulatory Commission (Open Access in Inter-state Transmission) Regulations, 2004, Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, and the Central Electricity Authority Grid Standards of Operation and Maintenance of Transmission Lines (as and when it comes into force) as amended from time to time and provisions of this Agreement.

7.1.2 The TSP shall operate and maintain the Project in an efficient, coordinated and economical manner and comply with the directions issued by the National Load Despatch Centre, RLDC or the SLDC, as the case may be, in line with the provisions of the Electricity Act 2003 and Rule 5 of the Electricity Rules, 2005, and as amended from time to time."

As per the above, the TSP (i.e. Transmission licensee) is responsible for ensuring the operation and maintenance of the project in an efficient, coordinated and economical manner and in compliance with the Indian Electricity Grid Code (IEGC)/State Grid Code (as applicable), Transmission License, directions of National Load Despatch Centre/RLDC/SLDC (as applicable), Prudent Utility Practices, other legal requirements.

Further, the "Prudent Utility Practices" defined in the TSA are as under:

"**"Prudent Utility Practices"** shall mean the *practices, methods and standards that are generally accepted internationally from time to time by electric transmission utilities for the purpose of ensuring the safe, efficient and economic design, construction, commissioning, operation, repair and maintenance of the Project and which practices, methods and standards shall be adjusted as necessary, to take account of:*

(i) operation, repair and maintenance guidelines given by the manufacturers to be incorporated in the Project,
(ii) the requirements of Law, and
(iii) the physical conditions at the Site
……"

As per the above, the TSP (i.e. Transmission licensee) is obligated to adopt the practices, methods and standards that are generally accepted internationally from time to time by electric transmission utilities for the purpose of ensuring the safe, efficient and economic design, construction, commissioning, operation, repair and maintenance of the Project and to take into account the guidelines given by the manufacturers, requirements of law and physical conditions at the site.

27. Regulation 7.2 of the Communication System Regulations, 2017, provides as under:

"7.2 Role of CTU (i) The CTU shall in due consideration of the planning criteria and guidelines formulated by CEA, be responsible for planning and coordination for development of reliable National communication backbone Communication System among National Load despatch Centre, Regional Load Despatch Centre(s) and State Load Despatch Centre(s) and REMCs along with Central Generating Stations, ISTS Sub - Stations, UMPPs, inter-State generating stations, IPPs, renewable energy sources connected to the ISTS, Intra-State entities, STU, State distribution companies, Centralised Coordination or Control Centres for generation and transmission. While carrying out planning process from time to time, CTU shall in addition to the data collected from and in consultation with the users consider operational feedback from NLDC, RLDCs and SLDCs.

(ii) The CTU shall plan the communication system comprehensively and prospectively for users considering the requirement of the expected nodes in consultation with Standing Committee to be constituted by CEA."

As per the above, CTUIL shall be responsible for planning and coordination for the development of a reliable National communication backbone Communication System among the National Load despatch Centre, Regional Load Despatch Centre(s) and State Load Despatch Centre(s) and REMCs along with Central Generating Stations, ISTS Sub -Stations, UMPPs, inter-State generating stations, IPPs, renewable energy sources connected to the ISTS, Intra-State entities, STU, State distribution companies, Centralized Coordination or Control Centres for generation and transmission.

28. Clause (aa) of Regulation 2(i) and Regulation 7.8 of the Communication System Regulations, 2017, provide as under:

"2(i) aa) "User" means a person such as a Generating Company including Captive Generating Plant, RE Generator, Transmission Licensee [other than the Central Transmission Utility (CTU) and State Transmission Utility (STU)], Distribution Licensee, a Bulk Consumer, whose electrical system is connected to the ISTS or the intra-State transmission system.

……..

7.8 Role of Users:

(i) The Users including renewable energy generators shall be responsible for provision of compatible equipment along with appropriate interface for uninterrupted communication with the concerned control centres and shall be responsible for successful integration with the communication system provided by CTU or STU for data communication as per guidelines issued by NLDC.

(ii) Users may utilize the available transmission infrastructure for establishing communication up to nearest wideband node for meeting communication requirements from their stations to concerned control centres.

(iii) The Users shall also be responsible for expansion /up-gradation as well as operation and maintenance of communication equipment owned by them."

As per the above, Users, inter-alia including transmission licensee, may utilize the available transmission infrastructure for establishing communication up to the nearest wideband node for meeting communication requirements and shall also be responsible for expansion /up-gradation as well as operation and maintenance of communication equipment owned by them.

29. Regulation 26(1) of the Communication Standards Regulations, 2020 provides as under:

*"**26. Requirements of fibre optic communication.** (1) All wideband communications shall be established using fibre optic communication consisting of underground fibre optic cable, optical ground wire (OPGW) or underground fiber optic cable (UGFO) and all dielectric self supporting (ADSS)."*

As per the above, all wideband communications shall be established using fibre optic communication.

30. The Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS) issued by MoP on 09.03.2022 provides as under:

*"**Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS)***

1. Introduction

In order to achieve safe, secure, stable and reliable operation of the grid as well as its economical and integrated operation, communication system plays a critical role. The communication system may be treated as an integral part of the transmission system. Therefore, it is imperative to carry out the planning for Communication System in Power Sector.

For planning, and coordination for development of communication system for inter-State transmission system, Central Transmission Utility is designated as the nodal agency.

Ministry of Power has formulated this guidelines named as "Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS)". This guidelines defines the categories of Communication System Schemes for ISTS and their corresponding approval procedure.

2. Objective

Considering the critical role of Communication System in ISTS, a separate guidelines for its planning is essential. This guideline on Planning of Communication System for Inter-State Transmission System (ISTS) is being formulated with the objective to help in efficient, coordinated, smooth, economical and uniform planning of Communication System for ISTS.

3. Applicability

i. This guideline shall come into force from the date of its issuance by the Ministry of Power.

ii. The guidelines shall be applicable for communication system for ISTS only.

4. ***Categorization of Communication Schemes/Packages***

Communication Schemes/Packages under this policy are categorized as Category (A) and Category (B). The description of categories is as under:-

Category (A): *Communication system directly associated with new ISTS as well as incidental due to implementation of new ISTS elements (e.g. LILO of existing line on new/existing S/s where OPGW/terminal equipment are not available on the existing main line/substations etc.)*

Category (B): *Upgradation/modification of existing ISTS Communication system pertaining to following:*

- *Missing Links*
- *Redundancy/ System Strengthening*
- *Capacity upgradation (Terminal equipment)*
- *Completion of life of existing communication system elements*
- *Other standalone project e.g. Cyber Security, Unified Network Management System (UNMS)*
- *Adoption of New Communication Technologies*

5. Procedure for approval of Communication Schemes/Packages

Category (A): *As planning of ISTS Communication System is an integral part of planning of new Inter-State Transmission System, the requirement for communication system linked with new ISTS shall be included in new ISTS package and combined proposal shall be approved as per the directions contained in MoP office order dated 28.10.2021 regarding Re-constitution of the "National Committee on Transmission" (NCT).*

Further, Communication requirements which are incidental due to implementation of new ISTS elements (e.g. LILO of existing line on new/existing S/s where OPGW/Terminal Equipment are not available on the existing main line/substations etc.) are also to be approved alongwith that of respective transmission system package.

Category (B):

Communication Schemes/Packages proposed by CTUIL for upgradation/modification of existing ISTS Communication System, standalone projects, adoption of new technologies shall be put up to RPC for their views. RPC to provide their views on the Schemes/Packages proposed by CTUIL within 45 days of receipt of the proposal from CTUIL.

The Schemes/Packages alongwith the views of RPC shall be approved by NCT.

6. Communication system shall be planned in accordance with Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, Manual of Communication System Planning in Power System Operation published by Central Electricity Authority and other relevant regulations/guidelines/orders/policies issued by Government of India for development of reliable communication system for the power system."

As per the above, Communication Schemes shall be proposed by CTUIL for the upgradation/modification of the existing ISTS Communication System, standalone projects, and adoption of new technologies, respectively.

31. We observe that the modalities of implementation of the said OPGW by the existing transmission licensee or POWERGRID are not covered specifically in the MOP

Communication Guidelines. However, on the direction of the Commission, Petitioner has convened meetings on 14.07.2021,13.08.2021,13.03.2023 and 8.05.2023 with the ISTS licensees to come out with a suitable proposal for smooth and proper adjudication of the issues involved. Consensus for the installation of OPGW by replacing the existing earth wire has been reached in the meetings held on 13.03.2023 and 08.05.2023. The relevant extracts of the same are as follows :

Minutes of the Meeting held on 13.03.2023 between CTU, POWERGRID &NRSS XXXI (B) Transmission Ltd./ Sekura

"*…..……...*

3. *CTU added that a compliance affidavit was submitted before CERC after receiving communication from POWERGRID that it has no objection if the implementation of laying of OPGW is undertaken by M/s NRSS XXXI (B) Transmission Ltd. / Sekura on its 400kV D/C Malerkotla - Kurukshetra line. Subsequently M/s NRSS XXXI (B) Transmission Ltd. / Sekura submitted a proposal to CTU via letter dtd. 23.01.2023 for OPGW installation on its 400kV Malerkotla - Kurukshetra line as well as on 400kV Malerkotla – Amritsar line of 48F OPGW on both the lines.*
4. *CTU further informed that after reviewing the proposal of M/s NRSS XXXI (B) Transmission Ltd. / Sekura, the 400kV D/C Malerkotla – Amritsar line was not found to be required at present for OPGW installation. Moreover, the OPGW fibre capacity of 24F is sufficient at present. In view of this CTU has put up an agenda in 63rd NRPC for OPGW installation on the 400kV D/C Malerkotla - Kurukshetra line with 24F OPGW. NRPC after deliberations, was of the view that Hon'ble CERC should be apprised about the proposal before reviewing in RPC and getting approved in NCT. If M/s NRSS XXXI (B) Transmission Ltd. / Sekura wants to install OPGW on its 400kV D/C Malerkotla – Amritsar line and 48F in place of 24F in both 400kV D/C Malerkotla - Kurukshetra line & 400kV D/C Malerkotla – Amritsar line, the cost of the OPGW with 48F on 400kV Malerkotla – Amritsar line and additional fibers of 400kV D/C Malerkotla - Kurukshetra line shall be borne by the M/s NRSS XXXI (B) Transmission Ltd. / Sekura.*
5. *CTU further stated that the various issues raised earlier by M/s NRSS XXXI (B) Transmission Ltd. / Sekura viz., impact on tariff and revenue after replacement of earthwire with OPGW (POWERGRID Ownership), handing over the earth wire to POWERGRID, rectification of any damaged asset in the process of OPGW installation, prior intimation & work planning of OPGW laying work and; details of responsible contractor, indemnification on of any outage or claimed compensation by any landowner, issue related to the ownership of the OPGW and its O&M, and issue related to any commercial use of OPGW etc. shall get resolved as the OPGW laying work shall be awarded to NRSS XXXI (B) Transmission Ltd. / M/s Sekura after NCT approval under RTM mode, and M/s Sekura being the Owner of this ISTS transmission line the ownership of this OPGW would also remain with them.*
6. *NRSS XXXI (B) Transmission Ltd. / M/s Sekura suggested that this OPGW work shall be awarded to them as additional work by change in the original transmission line scope and cost of the same shall be recovered by revision in their existing TBCB tariff. However, CTU stated that as the TBCB asset has already lived its prominent life so this work shall be awarded in RTM mode and tariff of the same shall be determined by the applicable RTM regulations of CERC.*
7. *CTU stated that deliberations of this meeting shall be communicated to CERC as part of Petition no. 94/MP/2021.*

……..”

As per the above, NRSS XXXI(B) Transmission Ltd / M/s Sekura suggested installing 48 F OPGW in place of 24 Fibre suggested by CTUIL. Further, Sekura suggested that OPGW work may be awarded to them as additional work by a change in the original transmission line scope, and the cost of the same may be recovered by a revision in their existing TBCB tariff. However, CTU stated that this work shall be awarded in RTM mode, and the tariff of the same may be determined as per RTM regulations of CERC. Further, CTU also stated that various issues raised earlier by M/s NRSS XXXI (B) Transmission Ltd. / M/s Sekura shall also be resolved by awarding the OPGW work to them.

Minutes of the Meeting held between CTU & ISTS Transmission Licensees on 08.05.2023

“7. With reference to above ROP and MOP guidelines, CTU proposed below mentioned methodology for deliberation during the meeting:

Sr. No.	*CTUIL proposal for deliberations*
(i)	*In view of MoP “Guidelines on Planning of Communication System for Inter-State Transmission System (ISTS)” dtd. 09.03.2022 and recent approvals of OPGW on existing lines, following is proposed:* ***(i) OPGW installation work under ISTS Communication requirement shall be awarded to the transmission line asset owner.*** ***(ii) Terminal equipment associated with OPGW cable shall be awarded to bay owner/s of the transmission line on which OPGW is proposed for installation.*** *If the Asset owners refuses the work same shall be deliberated in the NCT and awarded to other party with consent of existing asset owner/s.*
(ii)	*Other views of Transmission licensees on the above*

8. Sekura agreed for the methodology put up by CTU, however they raised the concern of provision of Fibre Optic Terminal equipment (FOTE) at bays level for their line, 400kV Kurukshetra- Malerkotla. POWERGRID confirmed they shall provide FOTE as the bays are owned by them as suggested by CTU.

9. Indigrid enquired about the modalities of using OPGW for ISTS communication which is provided by the TSP which was not originally in the scope of RFP of a transmission line. CTU informed that such issues shall be dealt on case-to-case basis in the RPC forum, in view of ISTS system requirement.

10. Other licenses also agreed to the CTU proposal.

……..”

As per the above, it was agreed that OPGW installation work under ISTS Communication requirement might be awarded to the transmission line asset

owner, and if the asset owners refuse the work, same may be deliberated in the NCT and awarded to another party with the consent of existing asset owner(s).

32. We observe that Communication systems are essential to facilitate secure, reliable and economic operation of the grid and are an important pre-requisite for the efficient monitoring, operation and control of the power system CTU, has been entrusted with the responsibility of planning and coordination for the development of an efficient and coordinated communication system on a regional basis to provide a backbone communication system for the ISTS under various Regulations of CEA and CERC and Guidelines of MOP.

33. We observe that during the meetings held on 13.03.2023 and 8.5.2023, Petitioner CTUIL and Respondent No.1Sekura have agreed on the modalities of implementation of OPGW on instant transmission asset of Malerkotla-Kurukshetra line. Further, during the hearing on 15.05.2023, CTUIL based on the meeting held on 08.05.2023 between CTU and various transmission licensees, submitted that the OPGW work may be awarded to the transmission line asset owner. Accordingly, the work of replacement of earth wire under instant case may be allowed to be executed by the transmission licensee owning such earth wire following the required procedure with the approval of the competent authority.

Issue No. 2: What other factors need to be considered while such replacement is carried out, such as impact on discovered tariff, availability, loss due to damage etc, for the Transmission licensee?

34. During the Meeting held on 13.03.2023 and during a hearing on 15.05.2023, CTU has submitted that the work may be awarded in RTM mode and the tariff of the same may be determined by the Commission as per the applicable regulations.

35. Respondent No.1 has submitted that the implementation of the Communication System by replacing the earth-wire with OPGW cables is an additional requirement under the mandate of law, and the same may be considered under the Change in Law provision of the Transmission Service Agreement (TSA). Further, the consequences of Change in Law and, in particular, the computation of the impact thereof upon the tariff have been set out in detail under the TSA, and any change in tariff would fall within the purview of the TSA.

36. We observe that installation of OPGW is a requirement which has emerged at a stage after the TBCB project has been declared commercial. Further, we observe that the tariff of the TBCB Project is governed in terms of TSA and are of the view that appropriate compensation needs to be provided for recovery of additional expenditure towards OPGW installation and its maintenance by the licensee.

37. We have perused the TSA signed on 02.01.2014 between NRSS XXXI (B) Transmission Limited and LTTCs, submitted in another Petition No. 89/TT/2014, which provides the treatment of Change in Law as under:

"12 CHANGE IN LAW

12.1 Change in law

12.1.1 Change in law means the occurrence of any of the following after the date, which is seven (7) days prior to the Bid Deadline resulting into any additional recurring/ non – recurring expenditure by the TSP or any income to the TSP:

- *The enactment, coming into effect, adoption, promulgation, amendment, modification or repeal (without re-enactment or consolidation) in India, of any Law, including rules and regulations framed pursuant to such Law;*
- *a change in the interpretation or application of any Law by any Indian Governmental Instrumentality having the legal power to interpret or apply such Law, or any Competent Court of Law:*
- *the imposition of a requirement for obtaining any Consents, Clearances and Permits which was not required earlier;*
- *a change in the terms and conditions prescribed for obtaining any Consents, Clearances and Permits or the inclusion of any new terms or conditions for obtaining such Consents, Clearances and Permits;*
- *any change in the licensing regulations of the Appropriate Commission, under which the Transmission License for the Project was granted if made applicable by such Appropriate Commission to the TSP;*
- *any change in the Acquisition Price; or*
- *any change in tax or introduction of any tax made applicable for providing Transmission Service by the TSP as per the terms of this Agreement*

……

12.2 Relief for Change in Law

12.2.1 During Construction Period

During the Constriction Period, the impact of increase/decrease in the cost of the Project in the Transmission Charges shall be governed by the formula given below:

- For every cumulative increase/decrease of each Rupees One Crore Fifteen Lakhs Eighty Thousand Only (Rs. 1.158 Cr) in the cost of the Project up to the Scheduled COD of the Project, the increase/decrease in Non-Escalable Transmission Charges shall be an amount equal to Zero Point Three One Three percent (0.313%) of the Non-Escalable Transmission Charges.

12.2.2 During the Operation Period:

During the Operation Period, the compensation for any increase/decrease in revenues shall be determined and effective from such date, as decided by the Appropriate Commission whose decision shall be final and binding on both the Parties, subject to rights of appeal provided under applicable Law.

Provided that the above mentioned compensation shall be payable only if the increase/decrease in revenues or cost to the TSP is in excess of an amount equivalent to one percent (1%) of Transmission Charges in aggregate for a Contract Year.

12.2.3 For any claims made under Articles 12.2.1 and 12.2.2 above, the TSP shall provide to the Long Term Transmission Customers and the Appropriate Commission documentary proof of such increase/decrease in cost of the Project/ revenue for establishing the impact of such Change in Law.
12.2.4 The decision of the Appropriate Commission, with regards to the determination of the compensation mentioned above in Articles 12.2.1 and 12.2.2, and the date from which such compensation shall become effective, shall be final and binding on both the Parties subject to rights of appeal provided under applicable Law."

We observe that the instant case of replacement of earth wire with OPGW is a work which was not part of the original scope of TSA. Since the OPGW has not been provided with a separate transmission licence, we are not inclined to consider the suggestion of CTU to consider the instant work of replacement under RTM. We observe that TSA provides for treatment of additional expenditure under "Change in Law". We are of the considered view that additional expenditure on account of the replacement of earth wire after adjusting the buy-back or the scrap value of that earth-wire shall be treated in the manner as expenditure under Change in Law so that its recovery is simplified. The transmission licensee is directed to follow a transparent process of competitive bidding while implementing such work. After implementation of the work, the transmission licensee is required to approach the Commission for approval of such expenditure along with audited data of the expenditure and details of competitive bidding carried out by it. The transmission licence shall not be required to be amended to include OPGW since the transmission licence issued to Respondent No.1 does not specifically provide the specification of earth wire, and OPGW shall be considered within the same transmission licence.

38. Further regarding the treatment of deemed availability for the period when such replacement is carried out, we have perused the TSA signed on 02.01.2014 between NRSS XXXI (B) Transmission Limited and LTTCs, submitted in another Petition No. 89/TT/2014, which provides the provision for availability of the project as under:

"8 AVAILABILITY OF THE PROJECT
8.1 Calculation of Availability of the Project:
Calculation of Availability for the Elements and for the Project, as the case may be, shall be as per Appendix IV of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009, as applicable seven (7) days prior to the Bid Deadline and as appended in Schedule 9.
……..

Schedule 9

Appendix IV of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009

Procedure for Calculation of Transmission System Availability Factor for a Month

"

…….

5. The transmission elements under outage due to following reasons shall be deemed to be available:

i. Shut down availed for maintenance or construction of elements of another transmission scheme. If the other transmission scheme belongs to the transmission licensee, the Member-Secretary, RPC may restrict the deemed availability period to that considered reasonable by him for the work involved.

ii. Switching off of a transmission line to restrict over voltage and manual tripping of switched reactors as per the directions of RLDC.

……."

As per the above, the transmission elements under outage due to shutdown availed for maintenance or construction of elements of another transmission scheme, which may be of the same transmission licensee also, shall be deemed to be available. Hence the issue of deemed availability shall be handled accordingly.

39. Considering the above we are of view that the treatment of deemed availability during the period of OPGW installation work by replacing the exiting earth wire, shall be treated in terms of the provisions under TSA.

40. CTUIL is directed to follow similar principles for facilitating and allowing OPGW installation by other transmission licensees.

41. The Petition No. 94/MP/2021 is disposed of in terms of the above.

Sd/	Sd/	Sd/	Sd/
(P. K. Singh)	**(Arun Goyal)**	**(I. S. Jha)**	**(Jishnu Barua)**
Member	**Member**	**Member**	**Chairperson**

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

No.- L-1/210/2016/CERC

CORAM:

Shri Jishnu Barua, Chairperson
Shri I. S. Jha, Member
Shri Arun Goyal, Member
Shri P. K. Singh, Member

Date of Order: 19th January, 2024

In the matter of:

Approval of "Guidelines on Availability of Communication System" under the Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017.

Order

The Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017 (hereinafter referred to as the 'Communication Regulations') were published on 29.05.2017 in the Gazette of India Extraordinary (Part-III, Section-4, No. 218).

2. Regulation 7.3 of the Communication Regulations requires NPC to prepare Guidelines on "Availability of Communication System" in consultation with the stakeholders and submit the same for approval of the Commission.

3. Accordingly, NPC has submitted the "Guidelines on Availability of Communication System", after stakeholder consultation, for approval of the Commission.

4. The Commission has examined the Guidelines submitted by NPC, and after incorporating suitable changes, the Commission hereby approves the “Guidelines on Availability of Communication System” which are enclosed as an Annexure to this Order.

Sd/-	**Sd/-**	**Sd/-**	**Sd/-**
(P. K. Singh)	**(Arun Goyal)**	**(I. S. Jha)**	**(Jishnu Barua)**
Member	**Member**	**Member**	**Chairperson**

Annexure

GUIDELINES

ON

AVAILABILITY OF COMMUNICATION SYSTEMS

Prepared in Compliance

To

Central Electricity Regulatory Commission

(Communication System for inter-State transmission of electricity)
Regulations, 2017

January 2024

Annex B.2.3

GUIDELINES ON AVAILABILITY OF COMMUNICATION SYSTEM

1. INTRODUCTION:

1.1 As per Regulation 7.3 of the Central Electricity Regulatory Commission (Communication System for inter-State transmission of Electricity), Regulations, 2017, National Power Committee (NPC) has been entrusted to prepare Guidelines on Availability of Communication System in consultation with RPCs, RLDCs, CTU and other stakeholders. Accordingly, these Guidelines have been prepared for determining Availability of Communication System.

1.2 The relevant provisions in the Central Electricity Authority (Technical Standards for Connectivity to the Grid), Regulations, 2007, CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020 and CERC (Indian Electricity Grid Code) Regulations, 2023 in respect of Communication System are as follows:

1.2.1 **Regulation 6(3) of the CEA (Technical Standards for Connectivity to the Grid)** stipulates that *'the requester and user shall provide necessary facilities for voice and data communication and transfer of online operational data, such as voltage, frequency, line flows and status of breaker and isolator position and other parameters as prescribed by the appropriate load dispatch centre.'*

1.2.2 **Regulation 5(1) of the CEA (Technical Standards for Communication System in Power System Operations) Regulations, 2020** stipulates that user shall be capable of transmitting all operational data as required by appropriate control centre.

1.2.3 **Regulation 11 of the Indian Electricity Grid Code (IEGC) 2023 stipulates as follows:**

"11. DATA AND COMMUNICATION FACILITIES (1) Reliable speech and data communication systems shall be provided to facilitate necessary communication, data exchange, supervision and control of the grid by the NLDC, RLDC and SLDC in accordance with the CERC (Communication System for inter-State Transmission of Electricity) Regulations, 2017 and the CEA Technical Standards for Communication.

(2) The associated communication system to facilitate data flow up to appropriate data collection point on CTU system including inter-operability requirements shall also be established by the concerned user as specified by CTU in the Connectivity Agreement.

(3) All users, STU and participating entities in case of cross-border trade shall provide, in coordination with CTU, the required facilities at their respective ends as specified in the connectivity agreement. The communication system along with data links provided for speech and real time data communication shall be monitored in real time by all users, CTU, STU, SLDC and RLDC to ensure high reliability of the communication links."

2. DEFINITION:

2.1 Words and expressions used in these guidelines shall have the same meaning assigned in the Electricity Act, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulation ,2007, CEA (Technical Standards for Communication System in Power System Operation) Regulations, 2020, CERC (Communication System for Inter-State transmission of Electricity), Regulations, 2017 and Indian Electricity Grid Code Regulations, 2023 and amendments thereof.

2.2 Other words have been explained as per the context in these Guidelines.

3. SCOPE AND APPLICABILITY:

3.1 As per Regulation 5 (i) of the CERC (Communication System for inter-State transmission of Electricity), Regulations, 2017, "*These regulations shall apply to the communication infrastructure to be used for data communication and tele -protection for the power system at National, Regional and inter-State level and shall also include the power system at the State level till appropriate regulation on Communication is framed by the respective StateElectricity Regulatory Commissions.*"

3.2 Accordingly, these guidelines shall be applicable to the CTU for the Communication System Infrastructure of inter-State Transmission System. The guidelines shall also be applicable to STU for the Communication System Infrastructure of intra-State Transmission System, till appropriate regulation on Communication is framed by the respective State Electricity Regulatory Commission.

3.3 The CTU (or STU as the case may be) shall have back to back co-ordination/agreement with transmission licensees, generators, dedicated transmission line owners, bulk consumers and concerned entities for providing power system communication on their network.

3.4 **Responsibility of CTU and STU:**

a) CTU (or STU as the case may be) shall be responsible for submission of the details of communication channels including the redundant channels configured for use of voice / data / video exchange, protection, Tele-protection / SPS to respective RLDC (SLDC as the case may be) on monthly basis incorporating the details of new channels configured during previous month. The total number of communication channels (N) is based on the requirement of RLDCs/NLDC and the same would be decided in consultation with respective RPCs/NPC.

b) CTU (or STU as the case may be) shall be responsible for submission of the performance/availability of configured channels of the previous month to respective RLDCs for verification by RLDCs and onward submission to respective RPC for computation of availability of the communication system for previous month.

c) CTU (or STU as the case may be) shall submit availability reports of configured channel including the redundant channels in format prescribed by RLDC/RPC, generated from the centralized NMS. The availability report of the call logging facility (with time stamp) may be provided till commissioning of centralized NMS for availability computation.

4. TREATMENT OF COMMUNICATION SYSTEM OUTAGES:

4.1 Outage time of communication system elements (i.e. channels) due to acts of God and force majeure events beyond the control of the communication provider shall be considered as deemed available. However, onus of satisfying the Member Secretary, RPC that element outage was due to aforesaid events shall rest with the communication provider.

4.2 Any outage of duration more than one (01) minute in a time-block shall be considered as not available for the whole time-block. Any outage of duration less than or equal to one (01) minute in a time-block shall be treated as deemed available provided such outages are not more than ten (10) times in a day.

Illustration: If a channel is out for a duration less than or equal to one (01) minute in a time-block, and such outages are more than ten (10) times in a day, all the time-blocks with such outages shall be treated as not available.

4.3 All other outages not covered under 4.1 and 4.2 shall be considered as not available during the whole block for the computation of channel availability.

5. METHODOLOGY FOR COMPUTATION OF AVAILABILITY OF COMMUNICATION SYSTEM:

5.1 Availability of Communication System **(A_{CS})** shall be calculated as under:

$$A_{CS} = \frac{\sum_{i=1}^{N} A_i}{N}$$

Where - N is total number of communication channels as specified in 3.4(a) above.

- A_i is Availability of i^{th} Channel which shall be calculated as given in 5.2 below.

5.2 Availability of i^{th} Channel (A_i) shall be arrived as under:

$$A_i = \frac{B_T - B_{Ni}}{B_T} \times 100$$

Where B_T is Total number of time-blocks in a month

B_{Ni} is the total number of time-blocks, in which i^{th} *channel was not available after considering deemed availability status of 4.1 & 4.2 above.*

$B_{Ni} = B_{ANi} - B_{Gi} - B_{LTTi}$,

Where-B_{ANi} is absolute number of time-blocks in which the i^{th} channel was 'not available' on account of any reason.

-B_{Gi} is Number of time-blocks out of B_{ANi}, in which i^{th} *channel was 'not available' on account of act of God as specified in 4.1 above.*

-B_{LTTi} is Number of time-blocks out of B_{ANi}, in which i^{th} *channel was 'not available' for a duration less than or equal to one (01) minute in a time-block and not more than ten (10) times in a day as specified in 4.2 above.*

Illustrations:

Case1: If there are 2880 time-blocks (B_T) in a month, and a particular channel is not available for a total of 70 time-blocks; and out of this, the above mentioned channel was not available for 20 (B_{Gi}) time-blocks due to act of God, six (06) time-blocks for less than one (01) minute (B_{LTTi}), then B_{ANi}=70, B_{LTTi} =06, B_{Ni} =70-20-06 = 44, and A_i = (2880-44)/2880 = 98.47%

Case 2: If there are 2880 time-blocks (B_T) in a month, and a particular channel is not available for a total of 70 time-blocks; and out of this, the above mentioned channel was not

available for 20 (B_{Gi}) time-blocks due to act of God, 11 time-blocks for less than 1 minute, then B_{ANi}=70, B_{LTTi} = 0, B_{Ni}=70-20-0=50, and A_i = (2880-50)/2880 = 98.26%.

6. Revision of these Guidelines

6.1 As and when required, these Guidelines shall be reviewed and revised by NPC with the approval of the Commission.

***

Annex – B.2.4

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत संचार विकास प्रभाग
Power Communication Development Division
****

CEA-PS-17-24/1/2024-PCD Division/ **Date: 22-11-2024**

To,

(As per the attached list)

Subject: Facilitating Broadband expansion by allowing leasing of fiber on OPGW - regd.

This has reference to the DO letter dated 11th November 2024(No. 5-5/NBM-2024/PGCIL-OPGW) addressed to Secretary (MoP) from Department of Telecommunications, Ministry of Communications. Wherein MoP has been requested to consider laying at least 48F (48 Fibres) OPGW (Optical Ground Wire) in future transmission projects making provision for leasing of additional fibers for the use of telecom licensees i.e TSP (Telecom Service Provider)/ ISP (Internet Service Provider)/ IP (Internet Protocol)-1 etc.

During a review meeting of NER (North Eastern Region) Telecom projects, Hon'ble Minister for Communication had directed to facilitate broadband expansion by allowing leasing of fibers on OPGW of POWERGRID in place of leasing of bandwidth, so that rural areas and hinterlands can get good and reliable telecom connectivity.

In view of this, CTU (Central Transmission Utility), POWERGRID, STUs (State Transmission Utilities) and all the TSPs (Transmission Service Providers) are requested to incorporate the necessary provisions in the technical specifications of their future transmission schemes supporting the laying of at least 48F OPGW instead of 24F OPGW for the upcoming TBCB (Tariff based Competitive Bidding)/RTM (Regulated Tariff Mechanism) schemes. It is further advised that the schemes which are presently in bidding stage may also be modified accordingly by the BPCs (Bid Process Coordinators) wherever applicable.

This issues with the approval of Chairperson, CEA.

22/11/24

Chief Engineer (PCD)

(Addressed to the list below :)

S.No.	Designation	Address	E-mail
1.	COO, CTUIL	Plot No. 2, Sector – 29 Near IFFCO chowk Metro station, Gurugram – 122001	df@powergrid.in, do@powergrid.in, pcgarg@powergrid.in
2.	CMD, PGCIL	Powergrid, Saudamini, Plot No – 02, Sector – 29, Gurugram, Haryana 122001	cmd@powergridindia.com
3.	Chairman & Managing Director, PGCIL	Saudamini, Plot No. 2, Sector-29 Gurgaon-122001 (Haryana)	cmd@powergrid.in
4.	Chairman & Managing Director, APTRANSCO	Gunadala, Eluru Rd, Vijayawada, Andhra Pradesh 520004	cmd@aptransco.gov.in
5.	Chairman, APPGCL, Andhra Pradesh	Vidyut Soudha, Gunadala Eluru Road, Vijaywada Andhra Pradesh – 520 004	chairman@apgenco.gov.in
6.	Chairman & Managing Director, TCTL	Vidyut Soudha, Khairatabad, Hyderabad – 500082	cmd@tgtransco.com
7.	Chairman & Managing Director, TSPGCL	Vidyut Soudha, 'A' Block, Khairatabad, Hyderabad – 500 082 (Telangana)	cmd@tsgenco.co.in cmdtransco@telangana.gov.in
8.	Managing Director, TANTRANSCO	10th Floor/NPKRR Malikai, No. 144 Anna Salai, Chennai-600002	mdtantransco@tnebnet.org
9.	Chairman & Managing Director, KSEBL Kerala	Board Secretariat, Vidyuthi Bhavanam Pattom, Thiruvananthapuram – 695004	cmdkseb@kseb.in
10.	Managing Director, KPTCL	1st floor, Kaveri Bhawan, K. G. Road, Bangalore-560009	md@kpclgmail.com

11.	Director (Operations), MSETCL	C-19, E-Block Prakashganga, Bandra-Kurla Complex Bandra(E), Mumbai 400 051.	dirop@mahatransco.in, sealdc8100@mahatransco.in
12.	Managing Director, MSPGCL Maharashtra	Prakashgad, Plot No. G-9, 4th Floor Bandra (E), Mumbai-400051	md@mahagenco.in
13.	Chief Engineer (Elect.), Goa Electricity	Department Vidyut Bhawan, Panji, Goa - 403001	cee-elec.goa@nic.in, elec.goa@nic.in
14.	Chairman, GUVNL Gujarat	Sardar Patel Vidyut Bhawan, Race Course, Vadodara- 390 007	md.guvnl@gebmail.com
15.	Chairman, Gujarat Urja Vikas Nigam Ltd.	Sardar Patel Vidyut Bhawan, Race Course, Vadodara- 390007	md.guvnl@gebmail.com
16.	Managing Director, GETCO	Sardar Patel Vidyut Bhawan, Race Course, Vadodara- 390 007	md.getco@gebmail.com
17.	Secretary, Dadra & Nagar Haveli Electricity Department	Dadar Nagar Secretariat, Silvassa- 396230	tapasyaraghav@gmail.com
18.	Director (Operations) , RRVPNL	Vidyut Bhawan, Jyoti Nagar Jaipur, Rajasthan	dir.oper@rvpn.co.in cmd.rvpn@gmail.com
19.	Chairman, HVPNL	Shakti Bhawan, C4, Sector No. 6 Panchkula – 134109, Haryana	chairmanpu@gmail.com
20.	Managing Director, J&KPTCL	JKPTCK ,Power complex , bemina Srinagar (J&K) janipur jammu	mdjkptcl1@gmail.com
21.	Managing Director, HPPTCL	Himfed Building, BCS, New Shimla - 171009 (H.P.)	md@hppcl@gmail.com
22.	Managing Director, HPGCL Haryana	Room No.411,3rd Floor, Urja Bhawan,C-7, Sector-6, HPGCL Panchkula	md@hpgcl.org.in

23.	Managing Director, PTCL of Uttarakhand	Vidyut Bhawan, Saharnpur Road, Near I.S.B.T. Crossing, Dehradun,Uttarakhand – 248002	md.ptcul@rediffmail.com
24.	Managing Director, UJVNL (Uttarakhand)	Maharani Bagh, G M S Road, Dehradun	mdujvnl@ujvnl.com, md@ujvnl.com
25.	Chairman& Managing Director, BSPTCL	Vidyut Bhawan, Bailey Road Patna – 800021	mdcellbsptcl@gmail.com, cmd.bsphcl@gmail.com
26.	Managing Director, BSPGCL Bihar	5th Floor, Vidyut Bhawan, Bailey Road, Patna	md.bspgcl@gmail.com
27.	Chairman & Managing Director, PSTCL Punjab	The Mall, Mall Road, Patiala – 147001	cmd@pstcl.org
28.	Chairman & Managing Director, UPPTCL	7th Floor Shakti Bhawan, 14-Ashok Marg Lucknow Lucknow- 226001	cmd@upptcl.org, chairman@upptcl.org
29.	CMD, UPRVUNL	Shakti Bhawan,14- Ashok Marg, Lucknow226001	chairmanuppcl@gmail.co m md@uprvunl.org
30.	Managing Director, MPPTCL	Shakti Bhawan, Rampur, Jabalpur(MP) - 482 008	md@mptransco.nic.in, ce.pnd@mptransco.nic.in
31.	Managing Director, MPPGCL	Shakti Bhawan, Vidyutnagar, P.O. Jabalpur- 482 008	mppgcl@mp.nic.in
32.	Chairman, Jharkhand Urja Utpadan Nigam Ltd.	Engineering Building, HEC Dhurwa, Ranchi- 834004	mdjuunl2018@gmail.com
33.	Managing Director, JUSNL Jharkhand	Engineering Buliding, HEC, Dhurwa, Ranchi – 834004	mdjusnl@gmail.com, md@jusnl.in
34.	Chairman & Managing Director, CSPHCL, Chhattisagarh	Vidyut Seva Bhawan,P.O. Sunder Nagar, Danganiya,	mdtransco@cspc.co.in, chairman@cspc.co.in

		Raipur- 492 013	
35.	Chairman & Managing Director, WBSETCL	Bidhan Nagar, Kolkata-700 091.	md@wbsetcl.in
36.	Chairman & Managing Director, WBPDCL	Bidyut Unnayan Bhaban, plot 3/C, LABlock, Sector-III Salt Lake City, Kolkata - 700	wbpdcl@wbpdcl.co.in
37.	Chairman & Managing Director, OPTCL	Janpath, Bhubaneswar-751022.	ele.bpmohapatra@optcl.co.in, ele.ssahu@optcl.co.in, dir.operation@optcl.co.in, cmd@optcl.co.in
38.	Chairman, OPGCL Odisha	Zone-A,7th Floor, Fortune Towers, Chandrasekharpur, Bhubaneswar - 751023 Odisha	energy@nic.in
39.	Managing Director, CSPGCL	Vidyut Seva Bhawan P.O. Sunder Nagar, Danganiya, Raipur- 492 013 Chhattisgarh	mdgenco@cspc.co.in
40.	Chairman, Jharkhand Urja Utpadan Nigam Ltd.	Engineering Building, HEC Dhurwa, Ranchi-834004	mdjuunl2018@gmail.com
41.	Managing Director, SPDCL Sikkim	NH– 10, Near UD&HD Dept. Gangtok East Sikkim 737101	spdcskm@gmail.com
42.	Chairman, APGCL, Assam	Bijulee Bhawan, Paltan Bazar, Guwahati,Assam.	cgm.ppd@aegcl.co.in, anjanjc.aegcl@gmail.com, gm.mpr@aegcl.co.in, rakesh.kumar@apgcl.org
43.	Managing Director, AEGCL (Assam)	Bijulee Bhawan, Paltan Bazar, Guwahati- 781 001	managing.director@aegcl.co.in, md_aegcl@yahoo.co.in

44.	The Engineer-in-Chief, Power and Electricity Dept, Govt of Mizoram	Kawlphetha Building New Secretariat Complex, Khatla, Aizawl Mizoram 796001	eincpower@gmail.com
45.	Chief Engineer (P), Manipur Electricity Dept.	South Block, Imphal, Manipur- 795 001.	md.mspcl@gmail.com, snandei@gmail.com, ed.tech.mspcl@gmail.com , ce-power@man.nic.in
46.	Chief Engineer, Nagaland Dept. of Power	Chief Engineer (D&R) Electricity House. A.G. Colony, Kohima – 797001	miaziekho77kehie@gmail .com
47.	Chairman & Managing Director, Meghalaya	Lumjingshai Short Round Road Shillong- 793001	ewnong@yahoo.com, directormeptcl@gmail.co m, cetranzemeptcl@gmail.co m
48.	Chairman, TSECL Tripura	Bidyut Bhaban, Banamalipur, Agartala, Tripura - 799001	managing.director@tsecl.i n
49.	Chief Engineer (P) Dept. of Power , Govt of Arunachal Pradesh	Itanagar, Arunachal Pradesh – 791 111	setrans26@gmail.com, tktara@hotmail.com, vidyutarunachal@rediffm ail.com, vidyutarunachal@gmail.c om, setrans26@gmail.com, tktara@hotmail.com, ee.ced@hotmail.com
50.	Commissioner-cum-Secretary(P), ANED (Andaman)	Secretariat , Andaman and Nicobar Islands, Port Blair- 744101	secyit.and@nic.in
51.	Secretary, Lakshadweep Electricity Dept.	Lakshadweep Electricity Dept. Kavaratti - 682555	lk-ktelect@nic.in
52.	Secretary, Puducherry Electricity	Department Secretariat, Puducherry- 605001	secycs.pon@nic.in, secytran@py.gov.in
53.	Chairman & Managing Director, DTL Delhi	Shakti Sadan, Kotla Marg, New Delhi – 110002	gmom1.dtl@gmail.com, dgmtoperation1.dtl@gmai l.com, md@dtl.gov.in

54.	Chairman & Managing Director, NTPC Ltd	NTPC Bhawan, Core 7, Scope Complex 7, Institutional Area Lodhi Road, New Delhi-110003	cmd@ntpc.co.in, amanna@ntpc.co.in, kamalverma@ntpc.co.in shipratyagi@ntpc.co.in
55.	Chairman & Managing Director, NHPC Ltd	Corporate Office, NHPC Office Complex, Sector 33 Faridabad- 121003, Haryana	cmd@nhpc.nic.in
56.	Chairman & Managing Director, NLC Ltd	Cuddalore District Block - 1, Neyveli Tamilnadu- 607 801	cmd@nlcindia.in
57.	Chairman & Managing Director, THDC Ltd	Pragatipuram, By Pass Road, Rishikesh 249 201	cmd@thdc.co.in
58.	Chairman & Managing Director, NPCIL	Nabhikiya Urja Bhavan, Anushaktinagar, Mumbai-400094	npciltecrectt@npcil.co.in, cmdsecretariat@npcil.co.in
59.	Chairman & Managing Director, NEEPCO Ltd.	NEEPCO Ltd., Lower New Colony, Shillong-793003	cmdneepco@neepco.co.in
60.	Chairman, BBMB (Bhakhra)	Sector -19B, Madhya Marg, Chandigarh – 160019	cman@bbmb.nic.in
61.	Chairman & Managing Director, Damodar Valley Corp.	Head Quarter DVC Towers, VIP Road Kolkata-700054	chairman@dvc.gov.in
62.	Director General, EPTA	First Floor, 6 Basant Lok, Vasant Vihar, New Delhi - 110070	Dg.epta@epta.in, epta.dg@gmail.com
63.	Chairman & Managing Director, TATA Power	NDPL House, Hudson Lines, Kingsway Camp Delhi-110 009	vrshrikhande@tatapower.com, BD@tatapower.com, nitin.kumar@tatapower.com, neeraj.srivastava@tatapower.com, piyushkumar@tatapower.com

64.	MD & CEO, Adani Transmission Ltd	3rd Floor, South Wing, Adani Corporate House, Shantigram, S. G. Highway, Ahmedabad - 382421	sameer.ganju@adani.com, Narendran.Ojha@adani.com, atlbd@adani.com, ishwar.dubey@adani.com, sunnykumar.singh@adani.com, sanjay.johari@adani.com
65.	Managing Director, Adani Power Limited	Shantigram, Near Vaishnodevi Circle, S.G. Highway, Ahmedabad-382421 Gujarat	manish.karna@adani.com
66.	Manager, AESL	Adani Power Limited, 7th Floor, Sambhav Building, Judges Bunglow Road, Bodakdev, Ahmedabad, Gujarat-380015	Praveen.tamak@adani.com
67.	Managing Director, L&T IDPL	L&T Campus, TCTC Building, First Floor, Mount Poonamallee Road, Manapakkam, Chennai – 600089.	csr@lntecc.com
68.	Chairman & Managing Director, Reliance Power	Reliance Centre, Ground Floor 19, Walchand Hirachand Marg, Ballard Estate, Mumbai 400 001	
69.	Director, Darbhanga – Motihari Transmission Co. Ltd.	6th Floor, Plot No. 19 & 20, Film City, Sector 16 –A, Noida, Uttar Pradesh – 201301	Nimish.Sheth@SEKURA.IN, Neeraj.Verma@SEKURA.IN, Vijayanand.Semletty@Sekura.in
70.	Chairman & Managing Director, SJVN Ltd	SJVN Corporate Head Quarters, Shanan Shimla-06. SHIMLA – 171006 HP	sectt.cmd@sjvn.nic.in, nandlal.sharma@sjvn.nic.in
71.	Director, G R Infra Project Ltd	2nd Floor, Novus Tower, Plot No. 18, Sector 18, Gurugram, Haryana - 122015,	modassar.a@grinfra.com, ashwin@grinfra.com, transmission@grinfra.com, akul.s@grinfra.com

72.	Dy GM, G R Infra Project Ltd	Rajgarh Transmission Limited, C/O: G R INFRAPROJECTS LIMITED, 2nd Floor, Novus Tower, Plot No. 18, Sector 18, Gurugram State - Haryana Pin Code – 122015	rajgarhtransmission@grinfra.com
73.	CMD, Megha Engineering & Infrastructures Ltd	S-2 Technocrat Industrial Estate Balanagar Hyderabad - 500 037	jsrinivaskumar@meilgroup.in
74.	Chairman & Managing Director, PPCL	Himadri, Rajghat Power House Complex, New Delhi – 110002	md.ipgpp@nic.in
75.	Director & CEO, Indian Transmission Business Sterlite Power Transmission Ltd	DLF Cyber Park, Tower B, 9th Floor, Udyog Vihar Phase -III, Sector-20 Gurugram- 122008 Ph – 0124-4562000	balaji.sivan@sterlite.com, fahim.alam@sterlitepower.in, Sterlite.bd@sterlitepower.com, chandan.dutt@sterlite.com
76.	Dy. President Kalpataru Power Transmission Ltd	101, Kalpataru Synergy, Opp. Grand Hyatt, Vakola , Santacruz (E), Mumbai 400055. India.	milind.nene@kalptarupower.com, kaushal.thakkar@kalpatarupower.com, thakkarkaushal86@yahoo.com, ajay.tripathi@kalpatarupower.com
77.	Director, Torrent Power Ltd	Electricity House, Lal Darwaja, Ahmedabad – 380001	NAMANSHAH@torrentpower.com, kaushal.thakkar@kalpatarupower.com, kashyapdesai@torrentpower.com, MAYANKGUPTA@torrentpower.com, VATSALPATEL@torrentpower.com
78.	Associate Director, Commercial & Regulatory, Sekura	503A, Windsor, Off CST Road, Kalina Mumbai-400098	Vijayanand.Semletty@Sekura.in

79.	CMD, KEC International Limited	RPG House, 463, Dr. Annie Besant Road,Worli, Mumbai – 400030	kecindia@kecrpg.com
80.	CMD, Juniper Green Transmission Private Limited	F-9 First Floor, Manish Plaza-1, Plot No. 7, MLU, Sector 10, Dwarka South West Delhi 110075	rohit.gera@junipergreenenergy.com, rohit.gera91@gmail.com
81.	CMD, ReNew Transmission Ventures Private Limited	ReNew , Commercial Block-1, Zone 6, Golf Course Road DLF City Phase-V, Gurugram-122009	mohit.jain@renewpower.in, anuj.jain@renewpower.in, amit.kumar1@renewpower.in
82.	CMD, Apraava Energy Private Limited	7th Floor, FULCRUM, Sahar Road, Andheri (East) Mumbai 400 099	sumit.sinha@apraava.com, naveen.munjal@apraava.com, roshni.shah@apraava.com
83.	Head & VP, Regulatory & Contracts	Unit No. 101, First Floor, Windsor, Village KoleKalyan, off CST Road, Vidyanagari Marg, Kalina, Santacruz (East), Mumbai – 400 098	venkatraman.inumula@indigrid.com
84.	Senior Manager (Bidding & Business Development), IndiGrid Ltd	Unit No. 101, First Floor, Windsor, Village KoleKalyan, off CST Road, Vidyanagari Marg, Kalina, Santacruz (East), Mumbai – 400 098 Maharashtra	wasim.alam1@indigrid.com
85.	Managing Director, L&T IDPL	L&T campus TCTC building , First Floor, Mount Poonamalle Road, Manapakkam, Chennai-600089, Tamil Nadu	contactus@lntidpl.com csr@lntecc.com
86.	Chief Engineer, Electric M &RE Division	Electric M &RE Division, Choglamsar, Leh-Ladakh-194101	cepladakh@gmail.com

87.	Director (BD & Commercial), Apraava Energy	Apraava Energy Private Limited (FULCRUM 7th Floor, Next to Hyatt Regency, Sahar Road, Andheri (East), Mumbai – 400 099. India.	sumit.sinha@apraava.com
88.	Manager, Megha Engineering & Infrastructures Ltd	-	**shivaprasad@meilgroup.com**
89.	Manager ReNew Transmission Ventures Pvt Ltd	Renew.Hub, Commercial Block-1, Zone-6, Golf Course Road, DLF City Phase V, Gurugram, Haryana – 122009	mohit.jain@renew.com
90.	Asst. Vice President, Sterlite Power	DLF Cyber Park, 9th Floor, B Block, Udyog Vihar Phase III, Sector 20, Gurugram – 122008, Haryana, India	yash.tandon@sterlite.com
91.	Head Environment & Corporate Affairs, Resergent Power (TATA)	NRSS - XXXVI,Tata Power B-12 & 13 Shatabdi Bhawan, Sector-4, Noida State - Uttar Pradesh - 201301	rajnishmehrotra@tatapower.com

Minutes of the Meeting(Virtual mode) held on 09.05.2023 (Tuesday)regarding dual reporting of RTU, PMU, VOIP, AGC etc. applications

A meeting on the subject was held on 09.05.23 at 11:00 AM with participants from CEA, RLDCs, CTUIL, Grid-India, and POWERGRID. List of the participants is enclosed at Annexure-I. 2. At the outset Sr. .DGM (CTU) welcomed the participants and explained the agenda to all the participants. He requested all the participants to contribute their valuable suggestion for agenda to reach at some conclusion.

Agenda: Dual reporting of RTU, PMU, VOIP, AGC etc. applications on 2+2 channel to main RLDC and Backup RLDC

Presently, one data channel and one voice channel are routed for reporting to main RLDC and similarly one data & one Voice channel is reporting at backup RLDC.

It is proposed by GRID INDIA that to increase of the redundancy in the system at least two data channels and two voice channels shall be routed for reporting to main RLDC and another two data & two Voice channels shall report at backup RLDC.

A detailed deliberation in meeting dated 05/04/23 was done among RLDCs, POWERGRID, CEA for evolving a common planning philosophy for all regions.

In the meeting GRID INDIA stated that as per communication regulation 2017/IEGC dual channel reporting for all communication applications from each ISTS station is required for both main and back up RLDCs. This requirement has also been conveyed by ED, NLDC to ED, GA & C vide letter dtd.16.03.2020

It was stated in the meeting that present channel configuration operational at different RLDCs for main and back up CC respectively is as follows:

a) NRLDC:1+1 & 2+1(for few stations)

b) SRLDC:1+1

c) WRLDC:2+1

d) ERLDC:1+1

e) NERLDC:1+1

POWERGRID stated that they are designing the ISTS Communication system with 1+1 channel configuration i.e. one channel for main RLDC and one channel for back up RLDC.

However, CEA recommended as follows: Manual of Communication Planning in Power System Operation clause 4.1.2 states:- “To ensure redundancy with route diversity, each communication channel (working path) planned for the Users shall be provided with alternate channel (protection path) in different routes, i.e., the working path and protection path should be resource disjoint. For last mile connectivity to load dispatch center(s), additional redundancy in different route may be considered. In case of failure of the working path, the protection path shall be available for the required communication services.”

Therefore, dual redundancy may be planned for both main and back-up load dispatch centers.

At present following services are working on ISTS communication network:

- **i.** SCADA
- **ii.** PMU
- **iii.** Tele protection
- **iv.** Telecontrol
- **v.** AGC
- **vi.** Voice
- **vii.** Automated Metering Application
- **viii.** Telemetering
- **ix.** Video conferencing
- **x.** ICCP (between control canters)
- **xi.** PDC
- **xii.** PDC to PDC
- **xiii.** Supervision of communications System
- **xiv.** Video Surveillance
- **xv.** Data Sync between MCC & BCC

The above applications need to be deliberated for dual redundancy requirement.

POWERGRID shall implement this redundancy for both main and backup Regional load dispatch center(s) in all the regions wherever possible with the existing resources in coordination with GRID INDIA.

In case of any additional requirement for implementation of redundancy POWERGRID may update the details region wise i.e. availability of SAS gateway ports, spare ethernet ports in existing FOTE, new FOTE if any etc. . POWERGRID shall quantify these requirements along with tentative costs on Regional basis.

The action to be taken up by TSPs, IPPs, ISTS, ISGS besides POWERGRID also needs to be discussed.

Deliberations: CGM(SRLDC) explained that Main and Backup control centre is old terminology and now Main-I &Main-II control centre terminology is being used and at each control centre one main & one backup channel is required. Grid India(NRLDC) explained that at present data is being transmitted to respective main & Backup RLDCs using 101 protocol through terminal server/DCPC for old RTUs and by using 104 protocol for SAS. Grid India agreed to share this detail in a week time. Further, POWERGRID informed that RTUs are being replaced with SAS (104 PROTOCOL) as soon as their life is completed. POWERGRID shall share the plan for replacement of RTUs communicating on 101 Protocol.

POWERGRID queried that in CEA planning manual, only route redundancy is mentioned and no where port redundancy is stated. Hence it needs to be clarified whether port level redundancy is also required. CEA clarified that path should be resource disjoint and so both path and ports should be resource disjoint. POWERGRID (NR-ULDC), stated that there is constraint of ports for dual redundancy of SCADA data in the RTUs procured under sub-station package and agreed for upgradation of same subject to approval. POWERGRID further clarified that RTUs with sufficient ports for dual redundancy are being planned recently as requested by ED(NLDC) -GRID INDIA vide letter dated 16.03.2020.

At present PMU data is reporting to single location i.e. Main RLDC as per current planning under URTDSM project. Grid India further stated that PMU data is transmitted on dual channel through switch to main RLDC. Grid India require multi ports at PMU for dual redundancy. Further redundant communication between SLDC PDC to RLDC PDC, RLDC PDC to Main/backup NLDC PDC shall also be required.

Tele protection & Telecontrol are operated by TSPs and should be in dual redundancy.

For AGC services dual redundancy is already considered & being implemented by TSPs . Dual channels to Main and Backup NLDC are required for AGC.

For Voice dual redundancy is also required. For the same, exchange to exchange dual redundancy shall be planned. Exchanges are placed at all SLDCs &RLDCs. At present Substation to Exchange link level protection is already available.

For AMR dual redundancy is also required. At present single channel is reporting to RLDC. For video conferencing Grid India is requested to justify the requirement of dual redundancy as per industry practice as mentioned in ‘Manual For Communication Planning’ as suggested by CEA.

For ICCP dual redundancy is required for main RLDC to Backup RLDC, Main RLDC to main SLDC, Main RLDC to backup SLDC, Backup RLDC to Main SLDC, Backup RLDC to backup SLDC as planned under new SCADA system.

For PDC to PDC dual redundancy is also required. CTU requested Grid India to share the architecture of new SCADA,PDC communication, ICCP.

Supervision of communication channels & Video Surveillance are not used by Grid India. However, TSPs/ CTU may plan as per their requirement.

For data sync dual redundancy between MCC and BCC is also required.

ERLDC, Grid India suggested that planning for terminal equipment(SDH/PDH)at dual redundancy is also required. However, it is suggested that dual redundancy of terminal equipment may be planned for critical locations such as AGC, SPOFs(Single point of failures).

As per discussion, following applications are summarised below for dual redundancy up to existing and upcoming control centres of Grid India.

i. SCADA
ii. PMU
iii. AGC
iv. Voice
v. Automated Metering Application
vi. ICCP (between control canters)
vii. PDC to PDC
viii. Data Sync between MCC & BCC

Conclusion

1. Grid India shall share the data for all the RTUs/SAS , their connectivity type(single or dual redundancy) & all other relevant data for all the TSPs(IPPs, ISGS, TBCB,RTM etc.) within a week time.
2. POWERGRID shall analyse the existing system for dual redundancy and implement the dual redundancy with existing resources wherever possible.
3. POWERGRID shall further state the additional requirements of ports/cards/equipment etc. along with cost for implementation of dual redundancy to above mentioned services on priority where dual redundancy cannot be implemented because of resource constraints. Same shall be discussed at respective RPC forum and shall be finally approved in NCT.

Annexure-I

List of participants of the meeting

- **CEA**

1. Sh. Prateek Srivastava, Assistant Director, PCD
2. Sh. Akshay Dubey,
3. Ms. Priyam, Dy. Director, PSPA-I

- **CTUIL**

1. Sh. Shiv Kumar Gupta, Sr.DGM, CTUIL
2. Sh. Tej Prakash Verma, Ch.Mgr., CTUIL
3. Kalpana Shukla,DGM, CTUIL
4. Kaushal Suman, Manager, CTUIL

- **Powergrid**

1. Sh. Ajaya Kumar P, Sr.GM, ULDC
2. Sh. Satish Kr Sahare, GM, ULDC
3. Smt. Shyama Kumari, DGM, GA&C
4. Sh. Kapil Gupta, DGM, GA&C
5. Sh. Mahesh M, Ch. Mgr, ULDC
6. Sh. Narendra Kumar Meena, Ch. Mgr. ULDC
7. Sh. Santanu Rudrapal, Ch. Mgr, ULDC
8. Sh. Vishal Badlas, Mgr, GA&C
9. Sh. Kashif Bakht Muhammad Nabi, Dy. Mgr, ULDC
10. Sh. Ashish Kumar Das, Asst Mgr, ULDC

- **GRID- India**

1. Sh. MK Ramesh, CGM, SRLDC
2. Sh. Harish Kumar Rathour, GM, NLDC
3. Sh. Sanjeev, GM, WRLDC
4. Sh. L. Murlikrishna, Sr. DGM
5. Sh. Ankur Gulati, DGM, NRLDC
6. Sh. Sakal Deep, Engineer, NERLDC
7. Sh. Koti Naveen
8. Sh. Ananthakrishnan
9. Sh. Rakesh
10. Sh. Sudeep M
11. Bijender Singh Chhoer
12. P Doungel

RNOD (Recoded Notes of the discussion) of the virtual meeting held on 27.06.2023 (Tuesday) regarding dual redundancy of RTU, PMU, VOIP, AGC etc.

A meeting on cited subject was held on 27.06.2023 at 10:30 A.M. with the participants from CEA, RLDCs, CTUIL, GRID-India and POWERGRID. The list of the participants is enclosed at Annexure-I. At the outset Sr. GM (CTUIL) welcomed the participants and stated the requirement of two channels each at main and backup control centres, already discussed in the meeting held on 09.05.2023 and confirmed by PCD(CEA) subsequently. In view of this CTU requested the participants to provide their valuable views/suggestions for each application for the said redundancy.

Deliberation:

CTU stated that at present one data channel and one voice channel are routed for reporting to main RLDC and similarly one data & one voice channel is reporting at backup RLDC. However, during the meeting held on 09.05.2023, GRID-India requested for at least two data channels and two voice channels for reporting to each RLDC i.e. main RLDC and backup RLDC, to increase the redundancy in the system.

Further CTU stated to deliberate on all the data and voice applications being used from stations to control centres (CC) and among CCs viz SCADA,PMU, AGC,VOIP etc.. CEA suggested that the redundancy shall be developed in a phased manner and the constraints on the existing communication network shall be explicitly reviewed and taken up accordingly.

Detailed deliberations were held among GRID-INDIA-RLDCs, POWERGRID, CEA, CTU for the same and ISTS communication system was proposed for different services with redundancy:

1. SCADA

2. PMU

3. AGC

4. VOIP

5. Automated Metering Application(AMR)

6. ICCP (Between control centers)

7. PDC to PDC

8. Data sync between MCC & BCC

GRID-INDIA has submitted the data regarding present status of redundancy of these services which is enclosed as Annexure-I. POWERGRID has also submitted the data of utilization of optical fiber network for some links of Eastern region which is enclosed as Annexure-II. CTU again requested POWERGRID to provide requisite data for the implementation of said redundancy scheme.

It was also felt to analyze the enhancement required for the above mentioned 8 services on 2+2 redundancy as discussed below:

1. **SCADA :-** Currently SCADA is reporting through 1+1/2+1/2+2/1+0 (radial) channel in different regions. For 2+2 redundancy of SCADA data, it requires extra ethernet ports at RTU, SAS Gateway & FOTE along with suitable bandwidth in optical fiber network. CTU stated that POWERGRID shall provide data of utilized and spare ethernet ports for existing RTUs, SAS Gateways and FOTE and shall also asses the data for additional requirement of the said redundancy. POWERGRID agreed the same.
2. **PMU :-** POWERGRID stated that presently one port of central sector PMUs is split into two channels at MUX (SDH) level from where onwards one channel reports to NTAMC (PG) and other reports to PDC (RLDC). GRID-India stated that as at present there is no plan of backup PDC, hence PMU data may be sent to PDC at RLDC in 1+1 mode only. Accordingly, one additional channel is required from PMUs to RLDCs. POWERGRID is requested to check availability of additional port on PMU and FOTE along with bandwidth requirement for configuration of additional backup channel to RLDC. POWERGRID agreed the same.
3. **AGC :-** GRID-India-NLDC stated that **c**urrently 2 channels are reporting from generators up to HMI of the station and there after through fibre optic network to NLDC Main Control Centre (MCC). GRID-India explained that a separate RTU is provided to integrate the generator data and route it further through the existing FOTE. This is in addition to existing RTU/SAS Gateway reporting to RLDCs.. As per redundancy requirements of control centre, 2 additional channels for AGC from generator station (in addition to the SCADA data) are required for data reporting to Backup Control Centre (BCC). GRID-INDIA also

stated that AGC signal to generator is being planned from RLDC in future. POWERGRID is requested to check availability of ports on RTU (both SCADA and Generation), SAS Gateway of AGC system and FOTE for implementation of same. POWERGRID agreed the same.

4. **VOIP :-** POWERGRID stated that currently VOIP is communicating through single channel only. GRID-India stated that they require redundancy on Port level and additional port shall be required at VOIP phone, exchange & FOTE. As present VOIP exchange has completed its life, it is suggested that requisite features for VOIP phones & exchange shall be included during system upgradation/ replacement. POWERGRID agreed to provide relevant data for the same.
5. **AMR :-** GRID-India stated that new AMR architecture is in planning phase and they will provide required inputs after looking in architecture.
6. **ICCP :-** GRID-India stated that currently ICCP (Between NLDC, RLDC and SLDC) is working on 2 communication channels for main-to-main control center and 2 communication channels for backup to backup control center only. For redundancy, GRID-India requires 4 extra channels, 2 channels for main RLDC to backup SLDC communication and 2 channels for backup RLDC to main SLDC communication. POWERGRID is requested to provide additional requirements (if any) for implementation of same. POWERGRID agreed the same.
7. **PDC to PDC :-** GRID-India stated that at present '1' channel is provided between PDC(SLDCs) to PDC (RLDC), for redundancy in PDC(SLDCs) to PDC(RLDC) communication additional 1 channel is required as discussed in PMU above.
8. **Data Sync between MCC & BCC :-** GRID-India stated that presently 1 channel is working for data sync between Main Control Center and Backup Control Center i.e. main SLDC to backup SLDC, main RLDC to backup RLDC, main NLDC to backup NLDC, further it is required to provide 1 additional channel for redundancy.

As per above discussion POWERGRID is requested to provide the requisite data for implementation of redundancy of services as discussed above within 21 days. POWERGRID agreed for the same. Meeting ended after vote of thanks by SR.GM(CTU).

List of participants of the meeting

- **CEA**

1. Sh. Prateek Srivastava, Assistant Director, PCD
2. Ms. Priyam, Dy. Director, PSPA-I

- **CTUIL**

1. Sh. H.S. Kaushal, CGM, CTUIL
2. Sh. Shiv Kumar Gupta, Sr.DGM, CTUIL
3. Sh. Tej Prakash Verma, Ch.Mgr., CTUIL
4. Sh. Divesh Kamdar, AET, CTUIL

- **POWERGRID**

1. Sh. Satish Kr Sahare, GM, ULDC
2. Smt. Shyama Kumari, DGM, GA&C
3. Sh. Kapil Gupta, DGM, GA&C
4. Sh. Mangesh Shriram Bansod, DGM, IT
5. Sh. Sundeep Kumar Gupta, Ch. Mgr, GA&C
6. Sh. Narendra Kumar Meena, Ch. Mgr. ULDC
7. Sh. Santanu Rudrapal, Ch. Mgr, ULDC
8. Sh. Vishal Badlas, Mgr, GA&C
9. Sh. Hemanth Kumar, Asst. Mgr, ULDC

- **GRID- India**

1. Sh. Harish Kumar Rathour, GM, NLDC
2. Sh. Aukur Gulati, Ch. Mgr, NRLDC
3. Sh. Sakal Deep, Engineer, NERLDC
4. Sh. Akhil Singhal, NERLDC
5. Sh. P. Doungel, NERLDC
6. Sh. Amba Prasad Tiwari, NERLDC
7. Sh. Mohneesh Rastogi, NLDC
8. Sh. Ganesh, SRLDC
9. Sh. Rakesh, SRLDC
10. Sh. Ashutosh Pagare
11. Sh. Koti Naveen, WRLDC

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

No.- L-1/210/2016/CERC

CORAM:

Shri Jishnu Barua, Chairperson
Shri I. S. Jha, Member
Shri Arun Goyal, Member
Shri P. K. Singh, Member

Date of Order: 19th January, 2024

In the matter of:

Approval of Guidelines on "Interface Requirements" under the Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017.

Order

The Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017 (hereinafter referred to as the 'Communication Regulations') were published on 29.05.2017 in the Gazette of India Extraordinary (Part-III, Section-4, No. 218).

2. Regulation 7.4, read with Regulation 14.2 of the Communication Regulations requires NLDC to prepare Guidelines on "Interfacing Requirements" in consultation with the stakeholders and submit the same for approval of the Commission.

3. Accordingly, NLDC has submitted the Guidelines on "Interfacing Requirements" after stakeholder consultation for approval of the Commission.

3.4. The communication media being used for data transfer and data rate shall be in accordance with the Central Electricity Authority(Technical Standards for Communication System in Power System Operations) Regulations, 2020.

4. Communication Interface

The Users shall support at least the following facilities and plan for communication interfaces accordingly at the time of implementation:

1. Real time data exchange including AGC/Control signal with Control Centre (Main & Backup).
2. Phasor data exchange
3. Meter data exchange
4. Protection signal transmission (SPS, Direct Tripping and Permissive Tripping Carrier Signal etc.)
5. Voice communication
6. Video Communication

Other requirements, if any, users may include while designing the local communication interface requirement.

The required communication interfaces shall be provided for both sending and receiving ends based upon jurisdiction/ownership. All the interfaces shall be provided with audio-visual status indication to indicate its normal operation as per relevant standards.

Users shall have functionality to support any of the interfaces given below based on requirement of data flow as per CEA/CERC guidelines from their respective end to control centres.

Interfaces are classified as following: -

1. Remote Station Interfaces
2. Control Centre Interfaces
3. Terminal Equipment Interfaces

4.1. Remote Station

"Interfacing Requirements" in respect of terminal equipment, Remote Terminal Unit (RTUs)/ Substation Automation System (SAS), Supervisory Control and Data Acquisition System (SCADA), Phasor Measurement Unit (PMU) /Phasor Data Concentrators (PDC), Automatic Generation Control

(AGC), Station Protection / System Protection Schemes (SPS), Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), etc. and for data communication is decided based on communication protocol used for transfer of data between user and respective control centres through dedicated and redundant communication channel with route diversity.

Remote end equipment like RTUs, PMUs, SAS, Metering Gateways, Meter Data Collection Unit, PLCs for AGC etc. shall report through communication protocol which is supported at the reporting Control Centre.

While designing the interface requirement of the remote locations, all the interfaces required for data (power system parameter, meter data, AGC/Control Signal), voice, video, protection signal shall be considered and shall be compatible with respective control centre as well as intervening Communication System equipment.

A typical General Arrangement drawing for a Remote Station is enclosed as ***Annexure-III***.

The interfaces shall be designed to operate under single contingency failure condition. Equipment should support interfaces with multiple ports, cards, gateways etc. and configured in redundant mode so that failure of single hardware element, i.e. communication port, card, gateway etc. of the users shall not lead to failure of data communication. Communication system shall be designed as per planning criterion to be notified by CEA.

Availability of communication links shall be maintained as per the CERC Communication Regulations, 2017. Further, the communication channel provided/configured for the real time data communication shall be made error free and shall not lead to intermittency in real time data at respective Control Centre.

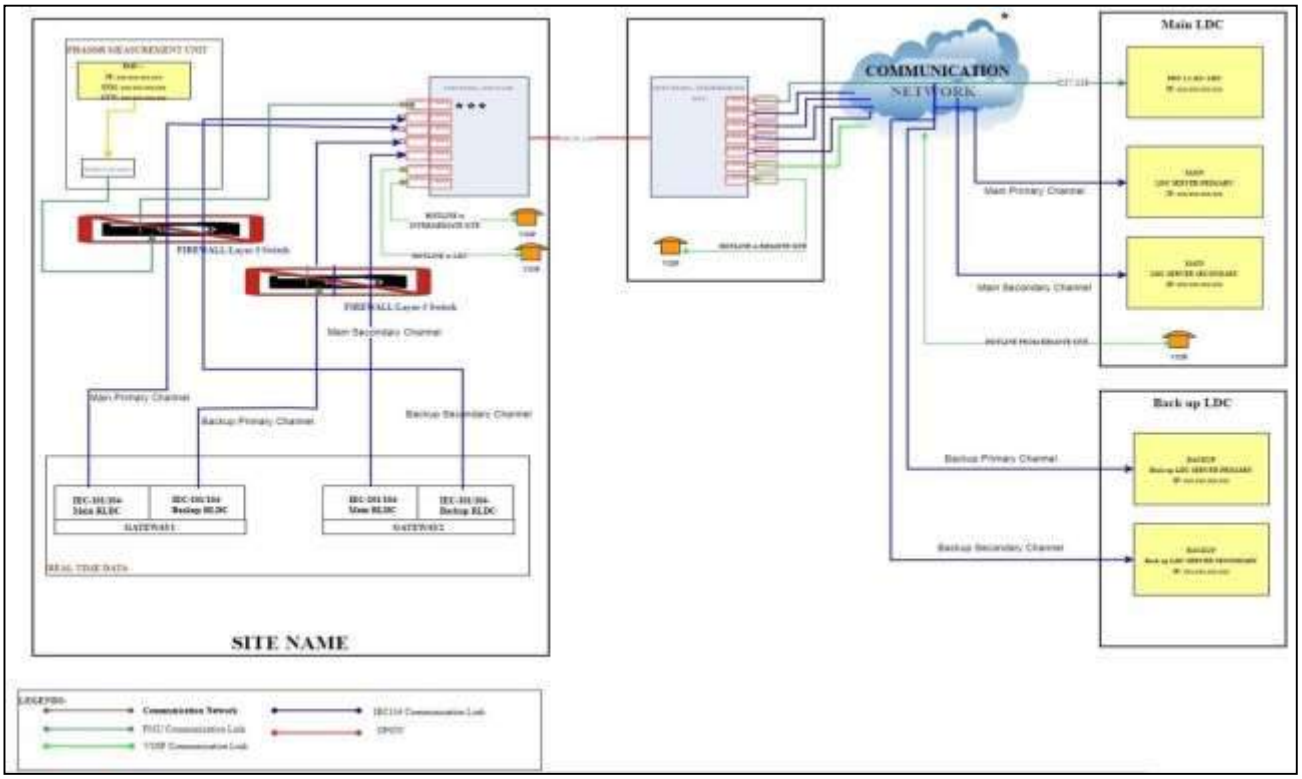
4.1.1. Remote Terminal Unit (RTU)/Substation Automation System (SAS)/PLCs

"Remote Terminal Units" (RTU) / Substation Automation System (SAS) is the device suitable for measuring, recording and storing the consumption of electricity or any other quantity related with electrical system and status of the equipment in real time basis and exchanging such information with the data acquisition system for display and control.

The RTU/SAS System /device should communicate with Control Centre front end system in either

ANNEXURE-III

Typical Remote Station General Arrangement Diagram having IEC-101/104 RTU



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली संचार विकास प्रभाग
Power System Communication Development Division

सेवा में / To,

Chief Operating Officer, CTUIL,
Saudamini Plot, Gurgaon

Subject: **Requirement of Dual redundancy of communication services – regd**

Reference: CTU email dated 07.06.2024

CTU vide above mentioned reference has forwarded SRPC's email seeking clarifications in respect of requirement of dual redundancy of communication services for the existing stations (TBCB/RTM).

1.1. In this regard, it may be noted that ensuring redundancy with route diversity is the requirement stipulated in CEA's Manual of Communication Planning in Power System Operation. Further, it was proposed by GRID INDIA that to ensure redundancy with route diversity, at least two data channels and two voice channels shall be routed for reporting to main RLDC and another two data & two Voice channels shall report at backup RLDC.

1.2. Also, with issuance of Guidelines on "Interface Requirements" under the CERC (Communication System for inter-State transmission of Electricity) Regulations, 2017, it has been made amply clear that suitable redundancy at port, card and gateway level needs to be ensured to avoid any single point of failure which may lead to interruption in real-time grid operation.

1.3. CTUIL has already convened meetings amongst POWERGRID, POSOCO, CTUIL and CEA (PCD) on 09.05.2023 and 27.06.2023, for examining the availability of two channels each from the ISTS stations to Main & Back-up Control Centers and to deliberate on the need for the same. Various applications of data, phasor and voice were deliberated during these meetings and requirement of the dual redundancy for different communication services used for ISTS was agreed as below:

i. SCADA
ii. PMU
iii. AGC

iv. Voice
v. Automated Metering Application
vi. ICCP (between control canters)
vii. PDC to PDC
viii. Data Sync between MCC & BCC

1.4. This called for modifications in the existing ISTS infrastructure, besides inclusion of the same in the scope of the upcoming TBCB/ RTM schemes.

1.5. The technical inputs for RfP of the upcoming TBCB/RTM schemes have been updated based on decision taken in meeting convened by PCD, CEA on 28.06.2023, to ensure the compliance of dual redundancy.

1.6. For the existing system, CTUIL, Powergrid and Grid India were requested to coordinate in identifying the immediate measures/upgradations to be undertaken to ensure the dual channel reporting, for the identified communication applications, from each ISTS station to main and back up RLDCs.

भवदीय
Signed by Suman Kumar Maharana
Date: 22-07-2024 14:20:59

(एस.के.महाराणा / **S. K. Maharana**)
मुख्य अभियन्ता /**Chief Engineer (PSCD)**

Copy to:

1. Member Secretary, SRPC

सेंट्रल ट्रांसमिशन यूटिलिटी ऑफ इंडिया लिमिटेड
(पावर ग्रिड कारपोरेशन ऑफ इण्डिया लिमिटेड के स्वामित्व में)
(भारत सरकार का उद्यम)
CENTRAL TRANSMISSION UTILITY OF INDIA LTD.
(A wholly Owned Subsidiary of Power Grid Corporation of India Limited)
(A Government of India Enterprise)

Ref: C/CTU/COMM **Date:** 11/09/2024

To,
As per distribution list

Sub: Regarding RPCs view on the agenda to be put up in upcoming 15th NPC meeting.

Dear Sir/Madam,

This is with reference to the agenda sent by CTUIL for the upcoming 15th NPC meeting (Agenda attached at ***Annexure-I***). NPC after reviewing the agenda suggested CTU to seek the views of RPCs on the following two agenda:

A.3. Methodology for replacement of old ISTS communication elements e.g. OPGW and FOTE who have lived their useful life as per CERC tariff regulation.

A.4. Dual reporting of ISGS/RE Remote stations to RLDC Main and Backup Control centers.

In view of the above, RPCs are requested to give their valuable views/comments/suggestions within fortnight in order to take up the same for the deliberation in the subject NPC meeting.

Thanking you,

Yours faithfully,

(H.S. Kaushal)
Sr. GM (CTUIL)

List of Addresses:

1.	Member Secretary, Northern Regional Power Committee 18-A, Qutab Institutional Area, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110 016	2.	Member Secretary, Southern Regional Power Committee 29, Race Course Cross Road Bangalore – 560 009
3.	Member Secretary, Western Regional Power Committee MIDC area, Marol, Andheri East , Mumbai -400093	4.	Member Secretary, Eastern Regional Power Committee 14, Golf Club Road, Tollygunge Kolkata-700033
5.	Member Secretary, North Eastern Regional Power Committee (NERPC) Meghalaya State Housing Finance Co-operative Society Ltd. Building Nongrim Hills, Shillong, Meghalaya – 793003		

Annexure-B.2.5.5

Proof of Concept (PoC) of Dual Channel Redundancy for SCADA Data reporting to ERLDC SCADA\EMS system

Contents

1. Background

As per MoM of 14th Test Sub-Committee meeting of ERPC held on 24.04.2024 the following decision was made:

"TeST committee advised PowerGrid to carry out POC on pilot basis for dual reporting via SCADA to ERLDC (main and backup). PowerGrid agreed to carry out the POC at Berhampur station."

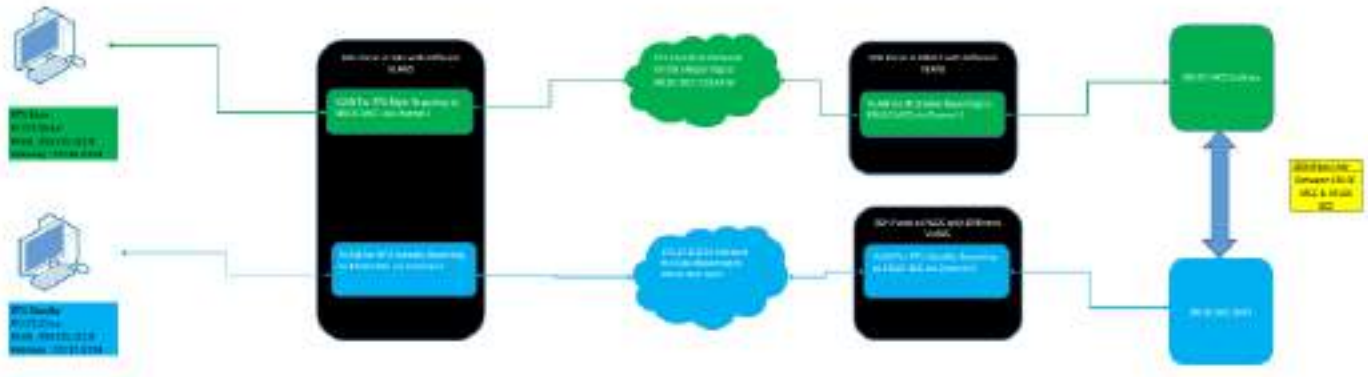
Based on this, POC for dual channel reporting to ERLDC SCADA\EMS system was conducted during RTU upgradation and migration from IEC 101 to IEC 104 protocol work of Jamshedpur_PG station as RTU team was present there during testing time.

2. Network Architecture

A. **Present Network architecture** for Data reporting to ERLDC SCADA\EMS system via

i. Main Channel to ERLDC MCC Kolkata (IP Series: 172.16.0.0; Subnet Mask: 255.255.252.0)

ii. Backup Channel to ERLDC BCC New Delhi (IP Series: 172.17.0.0; Subnet Mask: 255.255.252.0)



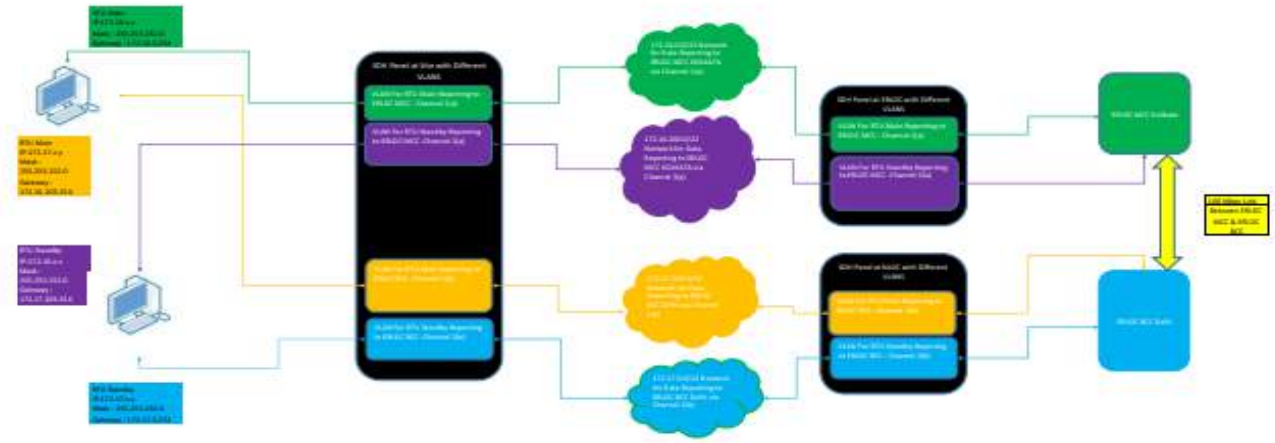
B. **Proposed Network architecture** for Dual Channel reporting to ERLDC MCC & BCC SCADA\EMS system. IP series for Dual channel reporting of Data to ERLDC SCADA\EMS system is detailed below: -

i. **Main Channel "1(a)"** for Data reporting by **RTU Main** to ERLDC MCC Kolkata *(IP Series: 172.16.0.0; Subnet Mask: 255.255.252.0)* (Already Existing for all Central Sector RTUs)

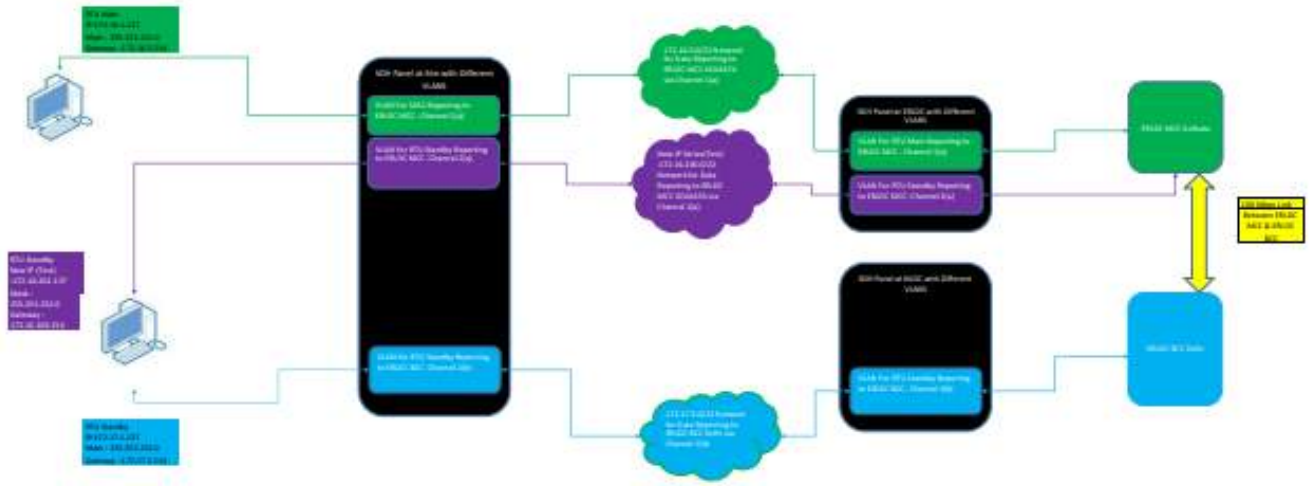
ii. **Main Channel "1(b)"** for Data reporting by **RTU Main** to ERLDC BCC New Delhi *(IP Series: 172.17.200.0; Subnet Mask: 255.255.252.0)* (Newly Proposed)

iii. **Standby Channel "2(a)"** for Data reporting by **RTU Standby** to ERLDC MCC Kolkata *(IP Series: 172.16.200.0; Subnet Mask: 255.255.252.0)* (Newly Proposed)

iv. **Standby Channel "2(b)"** for Data reporting by **RTU Standby** to ERLDC BCC Kolkata *(IP Series: 172.17.0.0; Subnet Mask: 255.255.252.0)* (Already Existing for all Central Sector RTUs)



C. **Test Setup for Proof of Concept** as per Proposed Network architecture in 2.1.(a) for Data reporting to ERLDC.

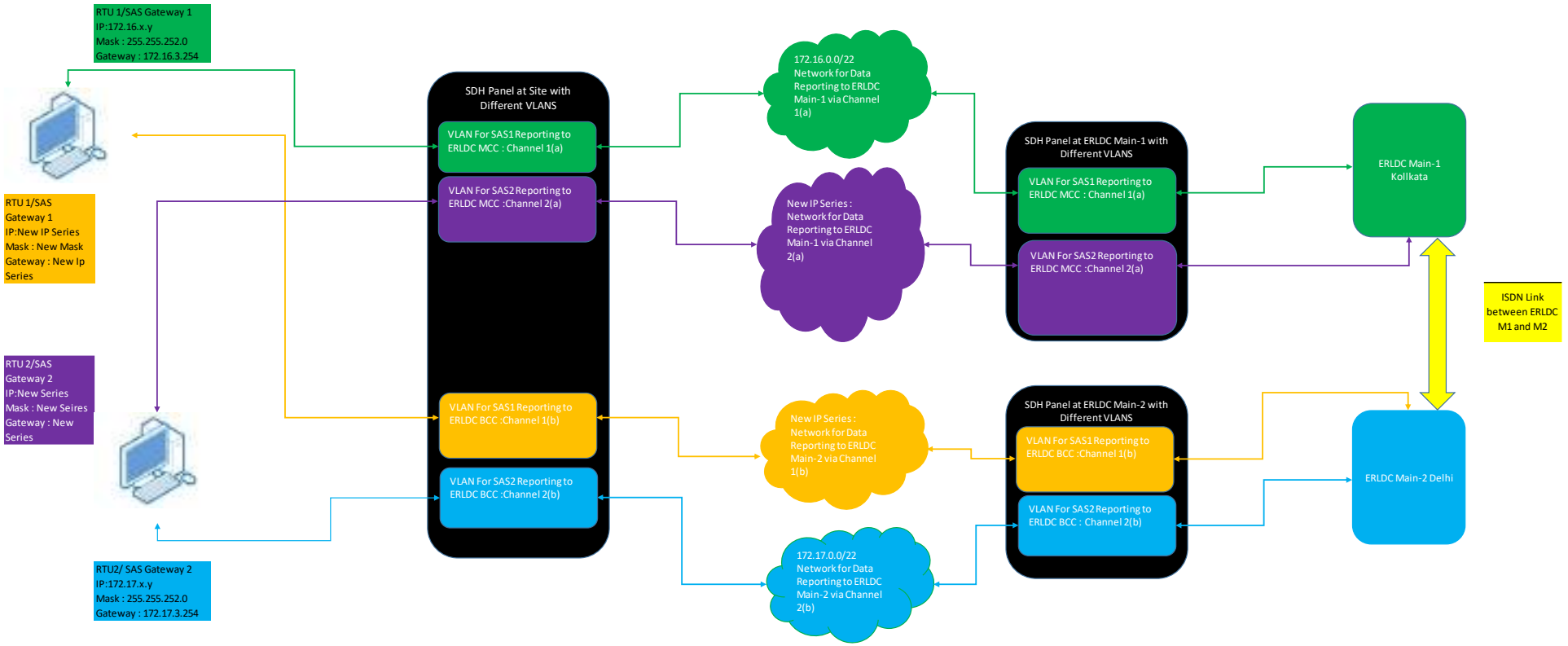


3.Conclusion

a. Proof of Concept of Dual Channel Redundancy was completed successfully for Jamshedpur_PG station on 29.08.2024 on joint effort by POWERGRID ULDC and ERLDC SCADA Team.

b. Testing of Data reporting redundancy was done by 3 of the 4 channels configured in RTU: -
    1) 172.16.1.137: - Main Channel 1(a) for Data reporting to MCC ERLDC by RTU Main.
    2) 172.17.1.137: - Standby Channel 2(b) for Data reporting to BCC ERLDC by RTU Standby.
    3) 172.16.201.137: - Standby Channel 2(a) for Data reporting to MCC ERLDC by RTU Standby.
    4) 172.17.201.137: - Since the PoC is done successfully for Standby Channel 2(a); There will not be any issue in Data reporting by RTU Main via Channel 1(b) to ERLDC BCC after configuration in: -
        i. Configuration in ERLDC BCC SCADA for Main Channel 1(b) (i.e., reporting by RTU Main to ERLDC BCC) (which is envisaged in Upcoming SCADA).
        ii. Configuration at SDH Level by PowerGrid ULDC Team for Channel 1(b) to BCC ERLDC (which is up to NLDC in present scenario and will be up to NERLDC Guwahati in Upcoming SCADA)

Annexure-2.5.6



Annexure B.2.5.7

Substation/Power Plant	Utility	Update on Dual Channel reporting feasibility
NTPC Farakka	NTPC	
NTPC Kahalgaon	NTPC	
NTPC Barh	NTPC	
NTPC BRBCL	NTPC	
NTPC KBUNL	NTPC	
NTPC NPGC	NTPC	
NTPC North Karanpura	NTPC	
NTPC Darlipalli	NTPC	
NTPC Talcher Stage I	NTPC	
NTPC Talcher Stage II	NTPC	
NHPC Rangit	NHPC	
NHPC Teesta V	NHPC	
MPL	Tata Power	
APNRL	Adhunik	
Chujachen HPS	IPP	
Rongnichu HPS	IPP	
Dikchu HP	IPP	
Jorethang HPS	IPP	
Tashiding HP	IPP	
Teesta III	IPP	
EUL	IPP	
GMR	IPP	
JITPL	IPP	
Motihari and Darbhanga	DMTCL	
Dhanbad	NKTL	
Any other ISTS/IPP/ISGS		

Annexure-B.2.6

सत्यमेव जयते
भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
पूर्वी क्षेत्रीय विद्युत समिति
Eastern Regional Power Committee
14, गोल्फ क्लब रोड, टॉलीगंज, कोलकाता-700033
14 Golf Club Road, Tollygunj, Kolkata-700033
Tel. No.:033-24239651,24239658 FAX No.:033-24239652, 24239653 Web: **www.erpc.gov.in**

सं./NO. ERPC/Op/SCADA/2024/ 1073 **दिनांक/DATE: 25.09.2024**

सेवा में/To
Substation I/C
400 kV Subhasgram (PG)
Subhasgram ,South Garia , West Bengal 712306

विषय: 400 kV सुभाषग्राम (PG) सबस्टेशनके संचार अंकेक्षण पर रिपोर्ट
Sub: Report on Communication Audit of 400 kV Subhasgram (PG) S/S

As per clause 10 of the Central Electricity Regulatory Commission Regulations on "Communication System for inter-State transmission of Electricity" (2017) *RPC shall conduct annual audit of the communication system annually as per the procedure finalized in the forum of the concerned RPC.*

Accordingly, in line with SOP finalized by NPC Communication Audit was carried out at Subhasgram (PG) S/S on 16.08.2024 by designated audit team.

The detailed report of the audit carried out is enclosed herewith for perusal and necessary compliance of the audit observations.
Update on the compliance to relevant observations may please be reverted at earliest convenience.

This is for your kind information and necessary action.

भवदीय / Yours faithfully

Mondal 25.9.2024

(N.S.Mondal)
Member Secretary,ERPC
सदस्य सचिव, ईआरपीसी

Copy to:

(1) EXECUTIVE DIRECTOR, POWERGRID, ER-II, KOLKATA
(2) GENERAL MANAGER, ULDC, POWERGRID

REGIONAL COMMUNICATION AUDIT REPORT (ER)

BACKGROUND

- Eastern Region is 2nd to commence Communication Audit of Substations after SR and 400 KV Subhasgram(PG) is **1st ISTS Substation** in ER to undergo communication audit.
- In line with **Clause 10** of Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations that mandates conduct of performance audit of ISTS communication system in their respective region by concerned RPC Secretariat, **400 KV Subhasgram (PG)** was selected for Communication Audit vide mail dated **12.08.2024** from **ERPC.** The audit was carried out in line with the SOP finalized by NPC.
- **Eastern Region Communication Audit Team** consisting of members from ERPC, ERLDC & WBSETCL visited **400 KV Subhasgram(PG)** Station on **16th August 2024.**

General Information		
1.	Station name	Subhasgram
2.	S/S voltage level	400 kV
3.	Date of Commissioning	March, 2007
4.	Region and state	Eastern region/ West Bengal
5.	Audit date	**16.08.2024**
6.	Auditee Entity	Powergrid ER-II

Communication Audit Team Members			
Sl. No.	**Name**	**Designation**	**Organisation**
1.	Shri A . Chatterjee	Assistant Director	ERPC
2.	Shri L . Muralikrishna	Sr. DGM (Communication)	ERLDC
3.	Shri R . Jaiswal	Engineer (Communication)	ERLDC
4.	Shri Abu Tahir	Assistant Engineer (Communication)	WBSETCL

Auditee Team Members			
Sl. No.	**Name**	**Designation**	**Organisation**
1.	Shri Santanu Rudrapal	Chief Manager	Powergrid
2.	Shri Anurag Nayak	Manager	Powergrid

Signature of Audit Team:

Attached Documents		
Sl. No.	Name of the Document	Annexure
1.	Communication Audit checklist	Annex-A
2.	Audit Data submitted by Powergrid during scrutiny.	Annex-B
3.	SAT report of 20 kW, 48 V DCPS	Annex-C
	SAT report of 450 AH battery bank	Annex-D
4.	SAT report of SDH (Tejas)	Annex-E
5.	Maintenance report of Communication equipment (including DCPS and Battery bank)	Annex-F
6.	OTDR test report of FO cable n/w Subhasgram and Jeerat, New Jeerat Along with OTDR calibration report.	Annex-G
7.	AMC site visit report of PMU	Annex-H
8.	220 kV and 400 kV SLD of Subhasgram(PG)	Annex-I

Scope of Audit:

The Audit broadly included following activities but not strictly limited to the following aspects:

- ☐ Available communication Network for its redundancy.
- ☐ Availability of channel redundancy for all the functions for which it is configured.
- ☐ Communication equipment (hardware and software configuration) of all the nodes including repeater stations for its recommended performance. Documentation of the configuration of the respective site and its updation.
- ☐ Fibre layout/usage of fibre / Availability of dark fibre and its healthiness.
- ☐ Cable Schedule and identification/tagging.
- ☐ Healthiness of Auxiliary supply including the healthiness of Battery backup.
- ☐ Healthiness of Earthing / Earth protection for communication system.
- ☐ Availability of sufficient cooling equipment at the User's premises to maintain the stipulated temperature for the communication equipment.
- ☐ Optical power level.
- ☐ Alternate modes of communication for speech. Scope of Communication Audit included Checking Healthiness and working condition of Communication Links, Equipment and Auxiliary Power supply and checking of various communication network related parameters.
- ☐ Audit Team also visited 400/220 KV switchyard in addition to Control room, Communication room, Battery room and ACDB Panel room in Subhasgram(PG) Substation.

Signature of Audit Team:

- The following observations have been found and discussed with Sh. Shantanu Rudrapal, CM (ULDC – POWERGROD ER-II) & Sh. Anurag Naik, Manager at 400 KV Subhasgram(PG).

List of Observations during Communication audit at 400 KV Subhasgram Substation (POWERGRID) on 16th August 2024.	
Sl. No.	**Observation**
1	The display of auxiliary power data at the charger / DCPS panel is not visible for monitoring.
2	Approach cable is common for Communication, protection & Commercial application.
3	Non-availability of third-party Cyber Security audit reports.
4	Communication room & Control room is not separated.
5	Preventive maintenance of Auxiliary power is not done at regular intervals.
6	OTDR Results of OPGW Cable for Jeerat is on higher side (0.26 dB/Km) vs prescribed limit of 0.21dB/ Km.

Signature of Audit Team:

Annex-A

Communication Audit Checklist

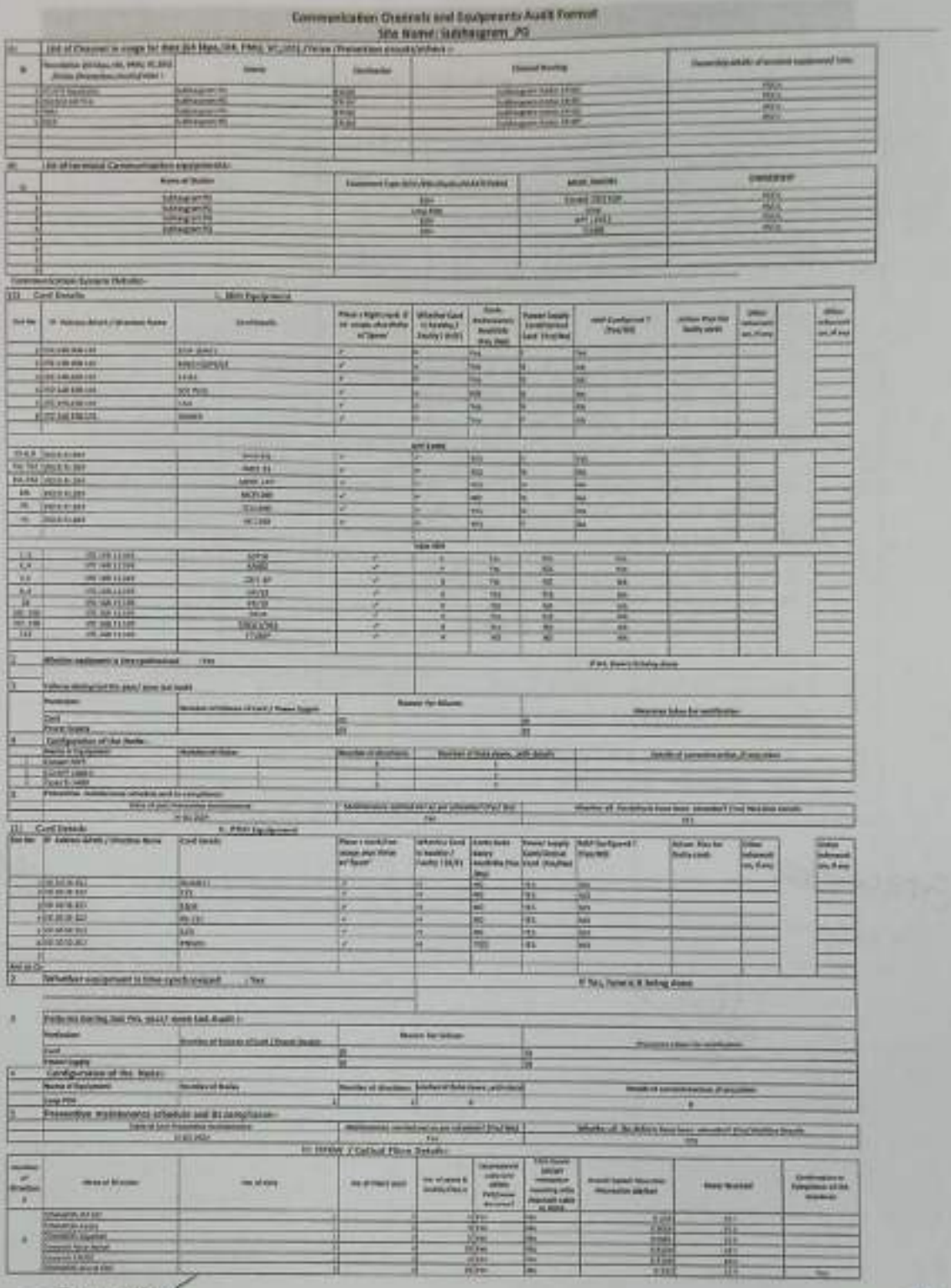
S.No	Check list points	Expected	Actual	Remarks
1	Whether OPGW is terminated properly. Down lead shall be fixed property in sufficient locations. Metallic part shall be connected to earth mat riser.	Yes	Yes	Found Ok
2	Distinct approach cable shall be laid 1 Protection & Communication 2 Fibers for commercial applications. Item no 1 cable shall be terminated in communication room FODP. One number FODP panel shall be available in the communication room.	Yes	Partially Ok.	Approach cable for Protection & Communication 3 Fibers for commercial applications are not separate.
3	Fiber Identification shall be done in FODP properly.	Yes	Yes	Found Ok
4	Whether End to end tests were carried out during installation and records are available. (Both Optical Power Source/receiver Test and OTDR Test results)	Yes	Yes	Found Ok
5	Whether patch chords 1 Cross labelled (source/ receive) 2 Tx Rx Marking 3 Mechanical protection is provided for patch chords laid between panels.	Yes	Yes	Found Ok
6	Whether separate room for communication is available with following:- 1. Air conditioning with standby A/C Unit. 2. AC Distribution board with ELCB. 3. Single point earthing bar which shall be connected to substationEarth mat.	Yes	Partially Ok.	Separate room for communication is not available. Rest is found Ok.
7	Two sets of 48 V (Positive Earthed) DC Systems hall be available with 1. Common DC Distribution board/ Panels with incoming MCB, coupler MCB , out doing MCBs etc. 2. Minimum 200 Ah (2 sets of battery) VRLA batteries are preferred to keep chargers and battery in communication room. 3. Battery Charger shall be Thryristorised/SMPS.	Yes	Yes	Found Ok

BPR Gurgaon

Communication Audit Checklist

8	Battery Charger alarms /Measurements shall be made availableto SAS (if available). It can be achieved through MOD bus or connecting analogue/ digital signals to Common BCU of SAS. If such system is not available major alarms shall be alarmed in common substation annunciator.	Yes	Yes	Local annunciator is available.
9	2 nos. of substation Data (From RTU or SAS Gateway) shall route in different roots to Main and Standby Load Dispatch centres.	Yes	No	RTU Upgradation work is in progress.
10	Kindly assure proper protection is available for AC Distribution (ELCB, MCB, Backup fuse).	Yes	Yes	Found Ok
11	Aux Transformer neutral Earthing shall be connected to Stations earth mat (Aux Transformers shall be installed in yard earth mat area only)	Yes	Yes	Found Ok
12	Whether DG sets with AMF panels are provided for Aux AC Supply	Yes	Yes	Found Ok
13	Whether 2 nos 11 kV (or 33kV) supplies are available for Each station aux Transformer	Yes	Yes	Found Ok

Annex-B



Communication Channels and Equipments Audit Format

Site Name : Subhagram_PG

Annex-C

पावरग्रिड
POWERGRID

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

संदर्भ/Ref : CC-ENGG-LD201803-1000980-LD0019-SAT DCPS

Date : 08/09/2023

From : Shyama Kumari
DGM

To : STERLITE POWER TRANSMISSION LTD
2222 P NH 2 Gurgaon 121102
121102

Cc : 1) CGM, ER1, RHQ, PATNA 2) CGM, ER2, RHQ, KOLKATA 3) Sr GM, ODISHA, RHQ, BUBHANESWAR

Subject : Package - Z: Communication System Package for Upgradation of SCADA/RTUs/SAS in central sector stations and strengthening of OPGW network in Eastern Region.

LOA Ref : CC-CS/987-ER1/OPGW-4226/3/G4/NoA-I/ER1-250001 Dated 17/11/2021

Please find enclosed following drawings/ documents for necessary action at your end.

Vendor Drg. No.	:	Z-SAT Procedure
Orgn. Drg. No.	:	LD201803-1000980-LD0019-SAT DCPS
Revision No.	:	00
Drg. Title	:	SAT procedure of DCPS
App. Category	:	CAT-I
Release Date	:	08/09/2023

Scan to verify

Comments : Approved

अनुमोदित श्रेणी/App. Category:

I. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु जारी।
Approved/released for fabrication/construction.

II. फेब्रिकेशन/निर्माण/टाइप टेस्टिंग हेतु अनुमोदित/जारी करते समय दिए गए टिप्पणियों एवं मार्गदर्शनों को सम्मिलित किया जाये। कृपया विधिवत दस्तावेज अनुमोदनार्थ प्रस्तुत करें।
Approved/released for fabrication/ construction subject to incorporation of comments and modification as noted. Revised drawing required for approval.

III. टिप्पणियाँ सम्मिलित करने के उपरांत दस्तावेज को अनुमोदनार्थ प्रस्तुत करें।
To be resubmitted for approval after incorporating the comments.

IV. सूचनार्थ एवं रिकार्ड हेतु।
For information and record.

REL-CON निर्माण हेतु जारी।
Released for construction.

नोट/Note:

1. Approval/Comments conveyed herein neither relieve the contractor of his contractual obligations and his responsibilities, weights, quantities, design details assemble fits, performance particulars and conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limits the purchaser's right under the contract.
2. The approval conveyed vide this letter does not cover the approval of make for sub-vendor items.

Sterlite Power Transmission Limited, DLP Cyberpark, 9th floor, Tower B
Udyog Vihar phase III, sector 20, Gurugram

Sterlite Power

Ref No: SPTL/MSI/ PGCIL ER-1 PKG-Z/ 52

Dated: 08-09-2023

To,
DGM, LD & C Dept.
Power Grid Corporation of India Limited
Plot No- 42, Sector- 44, Gurugram,
Haryana-122001

Kind Attention: Mrs. Shyama Kumari (DGM, LD & C)

Sub: Submission of SAT procedure for DCPS.

Package Description: Communication system package for Strengthening of OPGW network in Eastern regions. Upgradation of Scada RTU/SAS in central sector station.

Ref No:
Supply Contract Agreement No: CC-CS/987-ERI/OPGW-4226/3/G4/NOA-I/ER-I-250001 dated 17/11/2021
Service Contract Agreement No: CC-CS/987-ERI/OPGW-4226/3/G4/NOA-II/ER-I-250002 dated 17/11/2021

Dear Madam,

This is in reference to the above-mentioned subject and Project; we are hereby submitting the below mentioned documents for approval under Package-Z.

1. Submission of SAT procedure for DCPS>

Thanking You.

Your Sincerely
For Sterlite Power Transmission Limited

	Eastern Region Fibre Optic Expansion Project (Additional Requirement) SITE ACCEPTANCE TEST PROCEDURE	Sterlite Power

Package II : Strengthening of OPGW Network in ER

SITE ACCEPETANCE TEST (SAT) FOR DCPS SYSTEM

Customer : Power Grid Corporation of India Ltd.

Contractor : M/s Sterlite Power Transmission Ltd.

Sub-Contractor:

Manufacturer: M/s Delta Electronics Pvt. Ltd.

Constituent / Site location : Subhasgram

DCPS Rating : 48V ; 35A (4k 20kW)

No. of Modules : 4

Equipment Serial No. : 23R2309020048 12436

IP : 198.168.100.100

Username : Admin ; Password : Osian

SAT Results: **Test Pass / Fail**

Observations, if any:

STPL / DELTA	POWERGRID
Signature with date : Name: Amit Kr. Pandey Designation:	Signature with date : K.B.M Nabi Name: काशिफ नबी Kashif Nabi Designation Dy. Manager (E.L.D.C) पावरग्रिड, ईआर-II, क्षेत्रीय मुख्यालय, कोलकाता POWERGRID, ER-II, REGIONAL HQ, KOLKATA

DELTA ELECTRONICS INDIA PVT. LTD.

SUMMARY OF TESTS ON DCPS SYSTEM			
SL No	**TEST**	**PASS/ FAIL**	**REMARKS**
	Tests on DCPS System	Pass	
01	Mechanical & Visual Check Tests	Pass	
02	DCPS Switch ON test	Pass	
03	DCPS Low Voltage & High Voltage limits Checks	Pass	
04	Pre alarm test for Battery Low Voltage	Pass	
05	Battery Low Voltage Disconnect Level Test	Pass	
06	Rectifier Fail Alarm Test	Pass	
07	Total Output Power Tests	Pass	
08	Hot Plug in Test	Pass	
09	Calibration & Parameter settings Test	Pass	
10	Automatic Float cum Boost Charge Mode Change Over Test	Pass	
11	Battery Path Current Limiting Test	Pass	
12	Full Load Current Test	Pass	

K.B.H Nabi

काशिफ नबी
Kashif Nabi
By. Manager (U.L. O.C)
POWERGRID, ER II, HQ, KOLKATA

DELTA ELECTRONICS INDIA PVT. LTD.

DCPS TESTS PROCEDURE

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
1	**MECHANICAL & VISUAL CHECK TEST**			
1.1	Visual Inspection of Rack Mechanical, Rack should have good finish all Nut & Bolts Must be secured.	Good Finish & Secured	OK	
1.2	Ensure all PCBs in the rack are secured properly in cabinet.	Good workmanship	OK	
1..3	All electrical/ electronic components are secured properly in cabinet.	Good workmanship	OK	
1.4	Ensure all cabling is neat and secured tightened. Proper lugs with heat shrinkable sleeves have been used. Ensure Controller Cables are properly Inserted. Check screening and labeling.	Good workmanship	OK	
2	**Switch On Test**			
2.1	Make all external connections to the system including, Input mains Supply, Dummy Load,		OK	
2.2	Connect the Site Battery Bank to DCPS.		OK.	
2.3	Check Input AC supply at DCPS Input MCB with Multimeter &.turn on the system's main MCB		238V, 237.8V, 237.3V	
2.4	System shall turn on Alarm Module shall also turn ON. Controller Display shall read the System O/P voltage.	System should turn ON & display DC o/p voltage 54V+/-1% V	54.5V	

K.B.M

Kashif Nabi
Dy. Manager (T.L.D.C)
POWERGRID, ER-II, KOLKATA

DELTA ELECTRONICS (INDIA) PVT. LTD.

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
3	**DCPS Low Voltage & High voltage limit test**		ok	
	(a)DC Low Voltage Limit Test		ok	
3.1	Verify the Low battery Minor & Major set value at 45.0 in controller.	~45 +/- .5V	ok	
3.2	Set External Power Supply nominal output at 54.5 & switch off the external power supply Input.		OK	
3.3	Connect External power supply output Terminals to DCPS Output terminals. Ensure to connect in correct Polarity.		ok	
3.4	Switch On External Power Supply & verify the DC Output at DCPS output terminals.	54.5Volts	ok	
3.5	Switch Off DCPS Battery MCB & DCPS Input Mains MCB.		ok	
3.6	Decrease the External Power Supply nominal Output Voltage up to 44.0Volts through voltage adjustment option	~45.0 +/- .5V	ok	
3.7	Check Battery Major & Battery Minor Alarm on DCPS Controller display & also check the PFC on respective terminal (13 & 14) on PFC terminals.		ok	
3.8	Switch On DCPS Input/Battery MCB & verify output voltage (54.5Volts) . Observe that Low battery Alarm will get reset.		ok	

DELTA ELECTRONICS INDIA PVT. LTD.

काशिफ नबी
Kashif Nabi
Dy. Manager (O.C.)
POWERGRID, ER-II, HQ, KOLKATA

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
	(a)DC High Voltage Test			
3.9	Verify the High battery Minor & Major set value at 58.0V & 58.5V in controller.	~58.0 +/- .5V ~58.5 +/- .5V	ok	
3.10	Reset Battery Major High setting at 57.0Volts & Battery Minor High at 56.8 Volt in controller.		ok	
3.11	Set External Power Supply nominal output at 54.5 Volts.		ok	
3.12	Connect External power supply output Terminals to DCPS Output terminals. Ensure to connect in correct Polarity.		ok	
3.13	Switch On External Power Supply & verify the DC Output at DCPS output terminals.	54.5Volts	ok	
3.14	Switch Off DCPS Battery MCB.		ok	
3.15	Increase the External Power Supply nominal Output Voltage up to 56.9Volts through voltage adjustment option. Observe battery high voltage minor alarm at 56.8 +/- .5v & further increase up to 57.2 Volts & verify major at 57.0 +/- 0.5Volts.	(Battery Minor High) 56.8 +/- .5V (Battery Major High) ~57.0 +/- .5V	ok	
3.16	Check High Battery Alarm on DCPS Controller display & also check the PFC on respective terminal (13 & 14) on PFC terminals.	(There are four DC high value setting starting from 56.8Volts in Controller. It can be verified through Power suit software in Factory only)	ok	
3.17	Decrease External Power Supply Output voltage to Nominal DCPS output Voltage @ 54.5Volts. Verify that Alarms will get reset. Switch on DCPS Battery MCB.		ok	
3.18	Disconnect External Power Supply output Terminals from DCPS. Restore the Original Battery High Minor & Major Alarm settings.		ok	

DELTA ELECTRONICS INDIA PVT. LTD.

Kashif Nabi
Dy Manager
POWERGRID, ER-II, KOLKATA

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
4	**Battery Pre Alarm test for Low Voltage (Battery Discharge)**		ok	
4.1	Verify the Low battery Minor & Major set value at 45.0 in controller.	~45 +/- .5V	ok	
4.2	Set External Power Supply nominal output at 54.5 & switch off the external power supply input.		ok	
4.3	Switch Off DCPS Battery MCB.			
4.4	Connect External power supply output (-Ve) Terminals to DCPS Battery MCB Power Plant side. Ensure to connect in correct Polarity.		ok	
4.5	Switch On External Power Supply & verify the DC Output at DCPS output terminals.	54.5Volts	ok	
4.6	Switch Off Mains Input MCB.			
4.7	Decrease the External Power Supply nominal Output Voltage to slightly lower than 45.0Volts through voltage adjustment option	~45 +/- .5V	ok	
4.8	Check Battery low Voltage Minor & Major Alarm on DCPS Controller display & also check the PFC on respective terminal (13 & 14) on PFC terminals.		ok	
4.9	Switch On DCPS Input Supply MCB & verify output voltage (54.5Volts). Observe that Low battery Alarm will get reset.		ok	
4.10	Disconnect External Power Supply output Terminals from DCPS. Connect the DCPS Battery by Switching ON battery MCB.		ok	
5.0	**Battery & Load Low Voltage Disconnect Level Test**			
5.1	Verify Low Voltage Battery Disconnect (LVBD = 42.0 V) & Low Voltage Load Disconnect (LVLD = 44.0V) in controller setting.	~44 +/- .5V (LVLD) ~42.0 +/- .5V (LVBD)	OK	
5.2	Set Nominal Voltage 54.5 in External Power Supply & Switch off External Power supply input switch.		OK	
5.3	Connect External power supply output Terminals to DCPS Battery MCB Power Plant side. Ensure to connect in correct Polarity.		ok	
5.4	Switch Off Battery MCCB			

K.B.M Nabi
काशिफ नबी
Kashif Nabi
Dy. Manager (U.L.D.C)
POWERGRID, ERLD-II, RHQ, KOLKATA

DELTA ELECTRONICS INDIA PVT. LTD.

	Eastern Region Fibre Optic Expansion Project (Additional Requirement) SITE ACCEPTANCE TEST PROCEDURE	Sterlite Power

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
5.5	Slowly reduce External Power Supply Nominal O/P voltage Up to 43.5 Volts and check LVLD operation (Disconnect)		ok	
5.6	Further reduce External Power Supply Nominal O/P voltage Up to 41.5 Volts and check LVBD operation (Disconnect)		ok	
5.7	Verify that Alarm Controller will switch off.		ok	
5.8	Switch On DCPS Mains Input MCB		ok	
5.9	Verify that LVBD & LVLD contactors will reconnect.		ok	
5.10	Switch ON Battery MCCB		ok	
5.11	Disconnect External Power Supply		ok	
6	**Rectifier Fail Alarm Test**			
6.1	Switch Off Input MCB of one Rectifier & Verify that Rectifier fail Alarm will Appear on respective PFC Terminal (4&5) & Controller Display.	Rectifier Fail LED shall glow	ok	
6.2	Switch On Rectifier MCB & Verify that Alarm will get reset.		ok	
7	**Total output Power Test**			
7.1	Insert all the modules and turn on all Input AC MCBs of SMPS Modules.		ok	
7.2	Put External Load on DC bus so as equipment is loaded at its 50% capacity		ok	
7.3	Adjust float voltage to 54.5 Volts		ok	
7.4	Increase the load to 100% capacity and note down the DC voltage & Current	Based on DCPS Output Current rating	ok	
7.5	Note Down the Total Current (Load +Battery) & Verify that O/P Voltage of PP shall be Constant.	System output power will be based on system Module Rating i.e. n X (3.1KW/1.4KW	R_1 - OFF R_2 - 25.1A R_3 - 24.6A R_4 - 24.8A	74.2A
7.6	Disconnect the external Load Bank			

KBM Nabi

Kashif Nabi
Dy. Manager (U.L.D.C)
POWERGRID, ER-II, RHQ, KOLKATA

DELTA ELECTRONICS INDIA PVT. LTD.

	Eastern Region Fibre Optic Expansion Project (Additional Requirement) SITE ACCEPTANCE TEST PROCEDURE	Sterlite Power

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARKS
	HOT PLUG IN TEST		ok	
8.1	Switch on all rectifier module and pull out one rectifier module in live condition from PR Rack.		ok	
8.2	Reinsert Rectifier Module inside PR Rack & verify that module will get switch on.		ok	
8.3	No Damage/Drift shall occur.	No Drift/Damage	ok	
(9)	**Calibration Test**		ok	
9.1	DC Voltage: Note the DC voltage displayed on Controller Display, Measure DC output Voltage with a standard Digital multimeter & compare results	Better than +/- 1.5%	ok	
9.2	Rectifier Current: Put 50% load on the Load terminals, Note the Rectifier current displayed on Controller, Measure current through DC Clamp meter & compare results.	Better than +/- 1.5%	R_1 - 18.5 R_2 - 18.5 R_3 - 13.9 R_4 - 18.3	Total: 73.5A
9.3	Battery Current: Switch off the Power Plant Input AC Power MCB. Measure the battery current reading on Controller & measure the battery shunt mv & compare the results	Better than +/- 1.5%	ok	
10	**Automatic Mode change over Float to charge (Boost) mode**		ok	
10.1	Connect External Load bank to DCPS Output.		ok	
10.2	Switch Off the SMPS AC Input MCB & Switch on Load.		ok	
10.3	Reset the Automatic Boost Change over threshold setting at 5AH		ok	
10.4	Discharge the Battery for sufficient time, based of Battery Capacity & threshold setting level.		ok	
10.5	Switch On SMPS Input MCB & Verify the all the modules are working fine.		ok	
10.6	Observe the Charging mode.	Should be the Boost Mode	ok	
10.7	Boost mode shall change to float mode subsequently		ok	

DELTA ELECTRONICS INDIA PVT. LTD.

K.B.M Nab.
Kashif Habi
Dy. Manager (ULDC)
POWERGRID, ER-II, KOLKATA

Sr. No.	TEST & PROCEDURE	SPECIFICATION	OBSERVATION	REMARK
11	**Battery path Current Limiting Test**		OK	
11.1	Verify the Battery Path Current Limit (Charge Current limit in Controller) & reset it at 20Amps through Controller Keypad Note down the Power Plant O/P Voltage.	set value will be 10% of battery rating , shall not exceed the set value	OK	
11.2	Connect the External load (According to DCPS rated output capacity/Module availability) on DCPS Load terminals		OK	
11.3	Switch off DCPS Input Mains MCB & switch on Load MCB.		OK	
11.4	Discharge DCPS Batteries through External Load for 30 Minutes.(Discharge Time may vary based on available load at site.)		OK	
11.5	Switch On the DCPS Input Mains MCB & Measure the battery path current. Observe that Power Plant battery path current will be constant. Note current at this point.	Maximum Current at Battery Path should not cross 20A (set Value)	OK	
11.6	Restore the Original Battery Path Current Limit through Controller Keypad.		OK	
11.7	Disconnect External Load from DCPS.			
12	**Full Load Current Test & Battery Charging**		OK	
12.1	Put Maximum specified load (External Load Bank) current on the load terminal / Bus bar.	Individual Module Overload Testing will be done.	OK	
12.2	Now slightly increase the load & simulate overload condition.	System overload alarm shall glow at >100% of system capacity	OK	
12.3	Disconnect External Load Bank.		OK	

K. & M. Nath.

Kashit Nath

DELTA ELECTRONICS INDIA PVT. LTD.

	Eastern Region Fibre Optic Expansion Project (Additional Requirement) SITE ACCEPTANCE TEST PROCEDURE	///SterlitePower

SITE ACCEPETANCE TEST (SAT) FOR BATTERY SYSTEM

Customer : Power Grid Corporation of India Ltd.

Contractor : M/s Sterlite Power Transmission Ltd.

Sub-Contractor:

Manufacturer: HBL Power Systems

Constituent / Site location : Subhasgram

DCPS Rating : 35A ,48V

Battery Bank Rating : 450 A-h , 48V

SAT Results: **Test Pass / Fail**

Observations, if any :

SPTL / DELTA /HBL	POWERGRID
Signature with date : Name: Amit Kr Pandey Designation:	Signature with date : K.B.N Nabi Name: Kashif Nabi Designation Dy Manager (ULDC) POWERGRID, ER-II, KOLKATA

Annex-D

Battery

The purpose of test is to confirm the requirements of the supplied VRLA Battery for 48V DCPS /Charger at site in accordance to technical specifications & approved DRS /drawings.

The following tests are carried out at site for the purpose of verifying the acceptability of the supplied VRLA batteries.

S. No.	Test	Requirement	Procedure
01.	Visual Observation	a) No damages, scratches on battery container and cover b) Terminals c) Presence of venting device.	Visual inspection for the parameters mentioned in the requirement.
02.	Dimensional Observation/Inspection	Following information shall be indelibly and durably marked on each Cell / Battery Stack. a) Serial Number b) Ah capacity at 10-hour rate. c) Manufacturer type and trade name. d) Month and year of manufacture.	Visual inspection for the parameters mentioned in the requirement.
.03.	Capacity Test @ 10 hr Rate.	The Cell/Battery shall meet/exceed the rated capacity requirements declared by Manufacturer / Specifications	After full charge of battery bank, the cell shall be discharged at a constant current of 0.1C_{10} by using artificial load. The discharge shall be stopped when the closed-circuit voltage of the cell reaches to 1.75V/cell. The time in hours elapsing between beginning and end of discharge shall be taken as period of discharge. The capacity obtained from the cell should not be less than 100%.

K-B-M

Kashif Nabi

DELTA ELECTRONICS INDIA PVT. LTD.

Check list:

1.1 Cable:

A. Check Neatness of Cable.

Conformity	
✓ OK	NOT OK

B. Check Tightness of Cable.

Conformity	
✓ OK	NOT OK

C. Check Continuity of Cable.

Conformity	
✓ OK	NOT OK

1.2 Batteries:

A. Check Terminal Tightness.

Conformity	
✓ OK	NOT OK

B. Check Battery cells for cracks, damage and finish.

Conformity	
✓ OK	NOT OK

C. Check Polarity of cell:

Sr. No	Test	Requirement
3.1	Polarity Marking test	Polarity indications: Red for positive terminal and black for negative terminal

Conformity	
✓ OK	NOT OK

D. Check all cells physically installed and interconnected as per General Arrangement Drawing.

Conformity

K.B.M Nab.

Kaushik Nabi

OK	NOT OK

E. Check covers Installed Properly

Conformity	
OK	NOT OK

F. Check Narking of cells

Conformity	
OK	NOT OK

G. Check capacity of batteries @ C10 rate

Sr. No	Description	Requirement/Specification	Observation
1	a) After 6 Min	≥1.98V	
2	b) After 6 Hrs	≥1.92V	
3	c) After 8 Hrs	≥1.85V	
4	d) After 10 Hrs	≥1.75V	

Discharge test enclosed

Conformity	
OK	NOT OK

K.B.M Rao

DELTA ELECTRONICS INDIA PVT. LTD.

DELTA ELECTRONICS INDIA PVT. LTD.

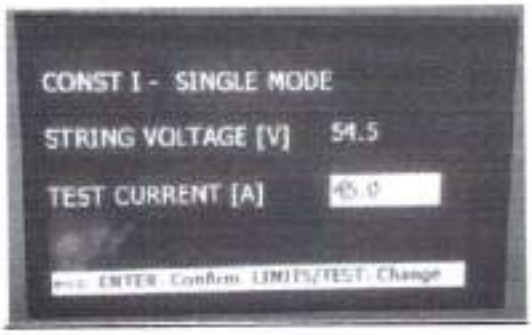
K.B. Nabi

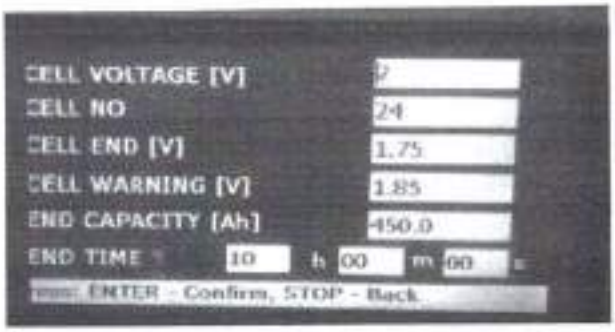
Kashif Nabi

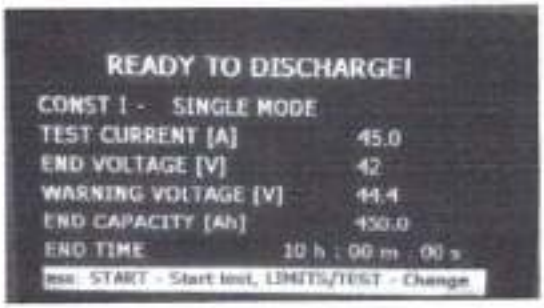
Dy. Manager (O & M)

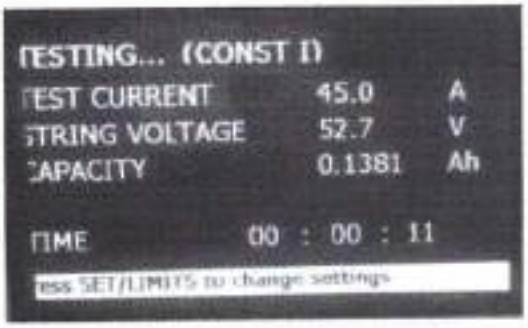
POWERGRID

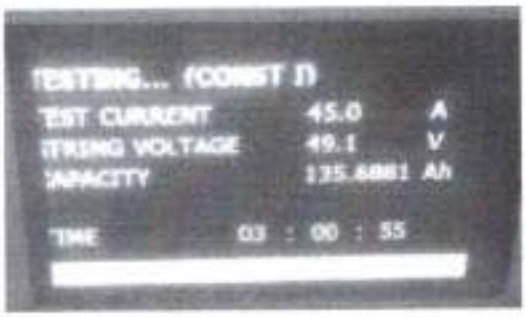
Discharging

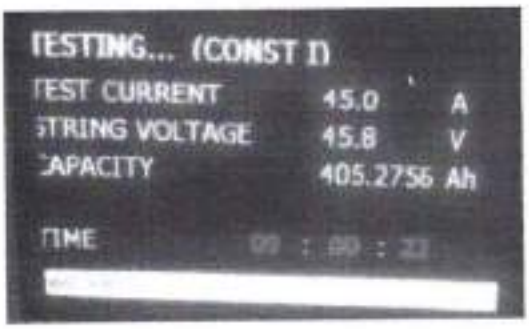










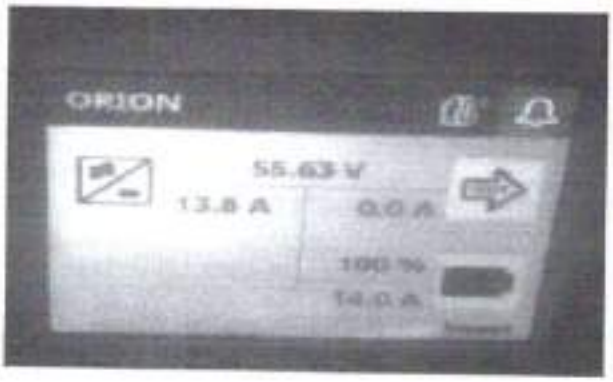


K.B.N Nabi

Kashif Nabi

DELTA ELECTRONICS INDIA PVT. LTD.

Recharging



K.B.M Nabi

कौशल नबी
Kashif Nabi

DELTA ELECTRONICS INDIA PVT. LTD.

Charging / Discharging Log Sheet

Customer Name & Address	PGCIL (Subhasgram)			
Battery Details	Voltage 48V	Capacity 450AH	G.A.D. No	Date 1/12/2023
Load Current (Max)	Charged on Date	Charged Due on Date		Set/Batch No

Sl No	Cell Serial No	Float Volts	PM → 12:53	1:53	2:53	3:53	4:50	5:53	6:53	7:53	8:55	9:55	Recharging Voltage
			Charging / Discharging Voltage Vs Time (Min.)										
1	022303603	2.280	2.093	2.082	2.065	2.040	2.029	2.010	1.965	1.945	1.924	1.845	
2	022303604	2.282	2.095	2.085	2.060	2.045	2.026	2.016	1.984	1.962	1.940	1.901	
3	022303602	2.289	2.085	2.084	2.068	2.046	2.035	2.015	1.984	1.968	1.942	1.905	
4	022303601	2.282	2.095	2.083	2.064	2.043	2.032	2.012	1.998	1.960	1.930	1.886	
5	022303621	2.284	2.097	2.086	2.070	2.045	2.036	2.014	1.993	1.963	1.936	1.894	
6	022303622	2.282	2.094	2.082	2.064	2.042	2.032	2.019	1.990	1.960	1.932	1.887	
7	022303620	2.286	2.095	2.085	2.069	2.045	2.035	2.017	1.984	1.967	1.940	1.902	
8	022303624	2.286	2.096	2.084	2.070	2.047	2.036	2.018	1.987	1.968	1.940	1.902	
9	022303617	2.285	2.093	2.086	2.066	2.043	2.033	2.012	1.982	1.955	1.933	1.870	
10	022303618	2.285	2.094	2.084	2.068	2.044	2.035	2.016	1.966	1.945	1.928	1.879	
11	022303619	2.288	2.087	2.086	2.067	2.043	2.031	2.011	1.989	1.962	1.925	1.878	
12	022303620	2.287	2.090	2.087	2.060	2.044	2.032	2.012	1.986	1.955	1.921	1.871	
13	022303614	2.286	2.083	2.082	2.064	2.041	2.032	2.012	1.987	1.956	1.929	1.877	
14	022303613	2.285	2.084	2.082	2.066	2.041	2.034	2.011	1.985	1.959	1.929	1.883	
15	022303616	2.285	2.097	2.080	2.065	2.040	2.029	2.010	1.984	1.962	1.934	1.881	
16	022303615	2.286	2.095	2.085	2.070	2.045	2.036	2.018	1.993	1.967	1.940	1.901	
17	022303609	2.287	2.096	2.084	2.068	2.045	2.035	2.016	1.986	1.964	1.936	1.895	
18	022303610	2.282	2.095	2.082	2.065	2.041	2.036	2.010	1.980	1.956	1.924	1.880	
19	022303611	2.283	2.093	2.085	2.067	2.042	2.036	2.014	1.984	1.962	1.933	1.887	
20	022303612	2.282	2.094	2.086	2.071	2.042	2.031	2.014	1.987	1.970	1.944	1.909	
21	022303605	2.283	2.085	2.083	2.066	2.042	2.024	2.011	1.984	1.956	1.926	1.878	
22	022303606	2.282	2.083	2.080	2.064	2.039	2.036	2.006	1.981	1.958	1.916	1.859	
23	022303607	2.288	2.098	2.085	2.070	2.045	2.035	2.016	1.980	1.962	1.934	1.895	
24	022303608	2.283	2.097	2.086	2.071	2.046	2.035	2.017	1.982	1.965	1.934	1.896	
Terminal Voltage		54.55	50.30	50.20	49.63	49.10	48.60	48.23	47.75	47.05	46.35	45.25	
Display Voltage		–	49.70	49.50	49.68	49.01	48.80	48.00	47.20	46.80	46.80	44.60	
Battery Current (A)		–	45A	45A	45A	45A	45A	45A	45A	45A	45A	45A	

K.B.M Nabi

काशिफ नबी
Kashif Nabi
Dy. Manager
POWERGRID, ER-II, KOLKATA

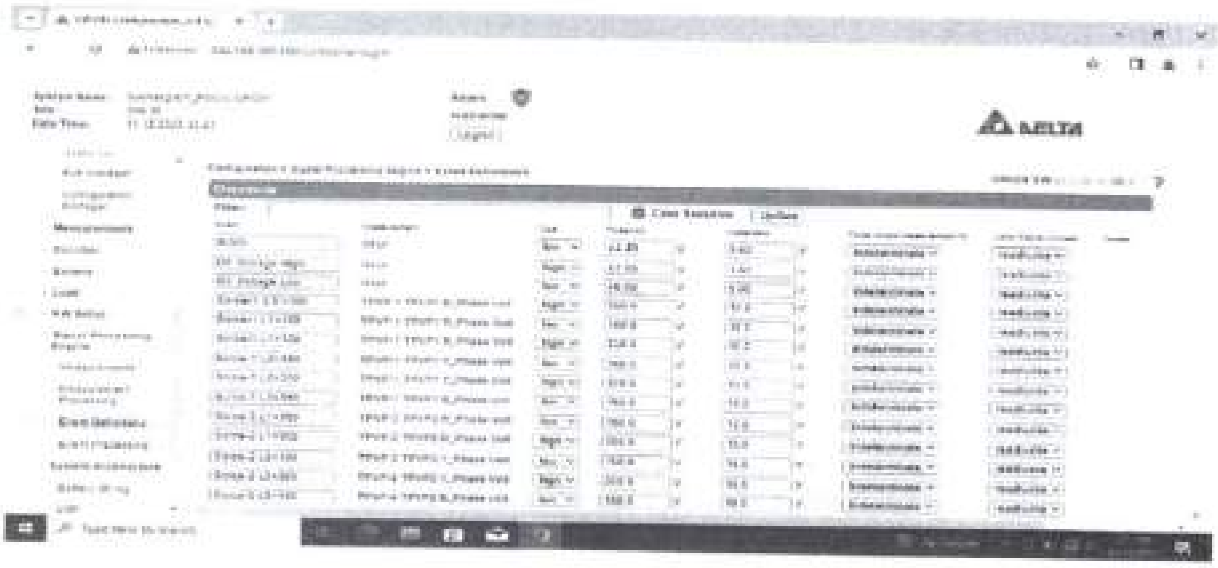
Customer

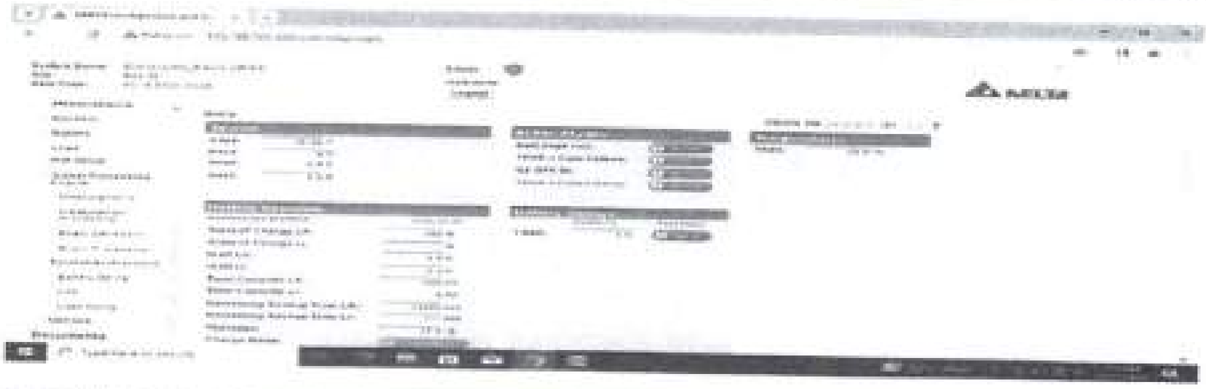
8461756594
Service Engineer

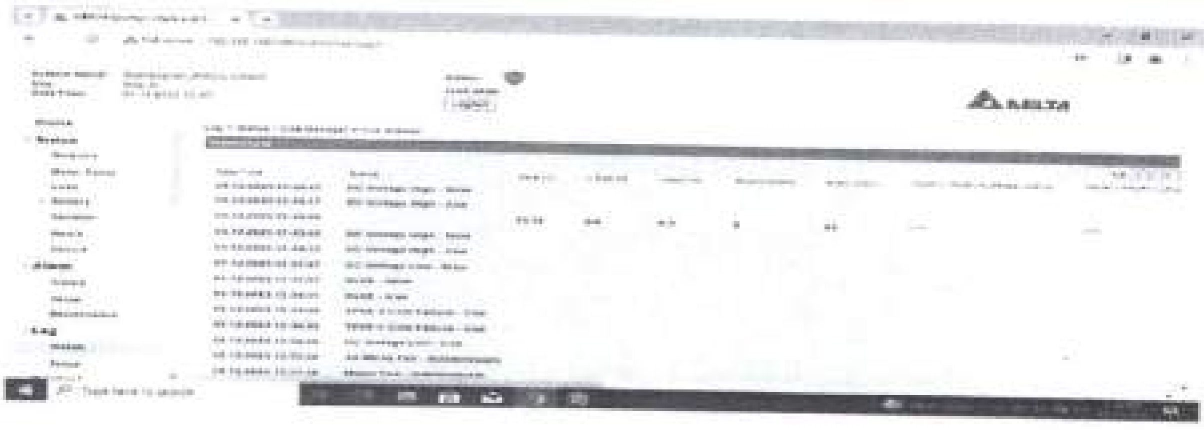
DELTA ELECTRONICS PVT LTD

Subhasgram SAT

DCPS Setting







DELTA ELECTRONICS INDIA PVT. LTD.

K.B.M Nabi

Dy. Manager (U.L.D.C)

POWERGRID, ER-II, RHQ KOLKATA

797

Annex-E

SITE ACCEPTANCE TEST PROCEDURE

(FO Transmission system, Termination Equipment sub-system & associated NMS System)

TABLE OF CONTENTS

Contents

800

1. SCOPE OF TESTING

All equipment shall be tested on site under the conditions in which it will normally operate. The tests shall be exhaustive and shall demonstrate that the overall performance of the contract works satisfies every requirement specified.

Phases of Site Acceptance Testing

1.1 Installation Testing

Site Installation Test

The field installation test will be performed for all equipment at each site.

The purpose of installation test is to ensure that all the equipments and cables conform to the BOQ; the installation of equipment and cabling conform to drawings, rack elevations; the appearance of equipment meets the requirements.

(1) **Installation tests on FO Transmission system (SDH Equipments)** :

The installation tests on FO Transmission system (SDH Equipments) mainly include:

1.	Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling
2.	Station power supply input and equipment power supply (DC-DC converter) output voltage measurements
3.	Terminal transceiver performance testing (Tx power, Tx spectrum, receive signal strength, connector losses etc.)
4.	Service channel performance
5.	Craftsperson interface, alarm , control functional performance
6.	Rack and local alarms: No alarms shall be present and all alarms shall be demonstrated to be functional
7.	Network management interface and supervision performance
8.	Correct configuration, level setting & adjustments and termination of Input/ output interfaces
9.	Proper establishment of Safety and signalling earthing system and resistance to ground to be checked.
10.	Simulation of failure conditions and failover of protected components.

(2) **Installation tests on Termination Equipment sub-system (PDH Equipments –Drop-Insert Mux & DACS)**

The installation tests on Termination Equipment sub-system mainly includes:

1.	Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling
2.	Power supply/converter voltage measurements
3.	Muldem performance testing
4.	Craftsperson interface, alarm and control functional performance
5.	Rack and Local alarms
6.	Network management interface and supervision performance
7.	Channel performance
8.	Safety and signalling earthing system
9.	Simulation of failure conditions and failover of protected components.

(3) **Installation Test on NMS system.**

The installation tests on NMS system mainly includes:

1.	Physical inspection for conformance to drawings, rack elevations and appearance of equipment and cabling.
2.	Workstation (Remote & Local) hardware inventory, configuration and characteristics.
3.	Demonstration of proper operation of all hardware, including workstations (Remote & Local) peripherals.

1.2 Link Commissioning Testing

The link commissioning tests shall verify that communication can be performed over the fiber optic link under test. Delay measurement, Bit Error measurements & service channel performance monitoring shall be made on the fibre optic links to verify compliance with designed link performance.

For Ethernet interface: At a minimum the following test requirements shall be demonstrated as per RFC 2544:

a) Ping test

b) Throughput test

c) Latency test

d) Packet Loss

10% of the total links (as chosen by PGCIL/Constituent, generally to cover links from all configurations

used) shall be tested for duration of 12 Hours.

Rest of the links shall be tested for 1 Hour. In case a link does not meet the performance requirements during 1 hour, then the duration of the test shall be increased to 12 hours.

In case any link does not meet the performance requirements during 12 hour, then the cause of failure shall be investigated and the test shall be repeated after rectifying the defects.

This phase of testing shall be conducted by the Contractor and witnessed by the Employer. Field adjustments shall be made to meet established standard, however if the field adjustments fail to correct the defects the equipments may be returned to the Contractor for replacement at his own expense. In case any adjustments are required to be made during the interval of the test then the test shall be repeated.

1.3 Integrated Testing

Prior to commencement of integrated testing the overall system shall be configured as required to provide all the data and voice channel required to interconnect the various control centres and RTU. The integrated testing shall include end-to-end testing of back-bone network. Integrated testing for last batch shall include testing of the entire

back-bone network. The intent of integrated testing is to demonstrate that the equipment is operational end to end under actual conditions, that all variances identified during factory and field installation and communications testing have been corrected, and that the communication equipment is compatible with other equipment at all locations. The Integrated System Test shall include all fibre optic transmission equipment, termination equipment, the network management subsystem and other components.

At a minimum the following tests shall be included in the integrated testing:

1.3.1 Installation testing for NMS as per table given below

1.3.2 Equipment configuration shall be checked to establish that it supports the channel routing.

1.3.3 End to end testing of all individual voice circuits originating from PLCC, PABX or Phones and to establish proper interfacing with PLCC\PABX\Phones and to demonstrate proper operation of channels over wideband systems. Operation shall be checked in terms of quality of voice, call initiation and call termination processes.

1.3.4 End-to-end testing of all individual Data Circuits originating from PLCC, RTU and SCADA Front Ends and to establish proper interfacing with PLCC\RTU\Front End and to demonstrate proper operation of channels over wideband systems. Operation shall be checked in terms of monitoring of BER/packet loss.

1.3.5 Testing of NMS to demonstrate proper operation of all functions: Configuration Management, Performance Management, Fault, Management and Security management. All the standard features of the NMS shall be demonstrated for proper functioning.

1.3.6 Demonstration of Protection switching including ring network whereas applicable and synchronization of equipment as per synchronization plan.

2. TEST PROCEDURES

2.1 Installation Testing

Following is the list of Installation and Link Commissioning tests to be conducted on the selected equipment during the Site acceptance testing: -

Sr. No	Test Description	Test Procedure No.
1	Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling	TPS-01
2	Station power supply input and equipment power supply (DC-DC converter) output voltage measurements	TPS-02
3	Terminal transceiver performance testing (Tx power, Tx spectrum, receive signal strength, connector losses etc)	TPS-03
4	Services channel performance Test	TPS-04
5	Craftsperson interface, alarm and control functional performance	TPS-05
6	Rack and local alarms	TPS-06
7	Network management interface and supervision performance	TPS-07
8	Correct configuration, level setting & adjustments and termination of input/ output interfaces	TPS-08
9	Proper establishment of Safety and signalling earthing system and resistance to ground to be checked.	TPS-09
10	Simulation of failure conditions and failover of protected components.	TPS-10
11	Craftsperson interface, alarm and control functional performance (PDH)	TPS-11
12	Simulation of failure conditions and failover of protected components (PDH)	TPS-12
13	Channel performance tests (PDH)	TPS-13
14	Network management interface and supervision performance (PDH)	TPS-14
15	Muldem performance testing (PDH)	TPS-15

Sr. No	Test Description	Test Procedure No.
16	Simulation of failure conditions and failover of protected components (DACS)	TPS-16
17	Channel Performance Tests (DACS)	TPS-17
18	Physical inspection for conformance to drawings, rack elevations and appearance of equipment and cabling of NMS System Workstation hardware inventory, configuration and characteristics of NMS System	TPS-18
19	Demonstration of proper operation of all hardware, including workstations peripherals of NMS System	TPS-19

2.2 Link Commissioning Testing

The commissioning tests shall verify that communication can be performed over the fiber optic link under test. Delay measurement, Bit Error measurements & service channel performance monitoring shall be made on the fibre optic links to verify compliance with designed link performance.

For Ethernet interface: At a minimum the following test requirements shall be demonstrated as per RFC 2544:

2.2.1 Ping test

2.2.2 Throughput test

2.2.3 Latency test

2.2.4 Packet Loss

10% of the total links (Chosen by PGCIL, generally to cover links from all configurations used) shall be tested for duration of 12 Hours.

Rest of the links shall be tested for 1 Hour. In case a link does not meet the performance requirements during 1 hour, then the duration of the test shall be increased to 12 hours.

In case any link does not meet the performance requirements during 12 hour, then the cause of failure shall be investigated and the test shall be repeated after rectifying the defects.

This phase of testing shall be conducted by the Contractor and witnessed by the Employer. Field adjustments shall be made to meet established standard, however if the field adjustments fail to correct the defects the equipments may be returned to the Contractor for replacement at his own expense. In case any adjustments are required to be made during the interval of the test then the test shall be repeated.

Sr. No	Test Description	Test Procedure No.
1	Ethernet Channel Testing	TPS-20
2	Measurement of BER For SDH Link	TPS-21
3	Delay measurement	TPS-22

896

2.3 Integrated Testing

Following is the list of Integrated testing tests to be conducted on the selected equipment during the Site acceptance testing: -

Sr. No	Test Description	Test Procedure No.
1	End to End testing of Voice circuits	TPS-23
2	Testing of NMS Functionality	TPS-24
3	Protection Switching and Synchronization of Equipment	TPS-25
4	End to End Data Channel testing	TPS-26
5	Interfacing with Existing Communication System	TPS-27

3. Test equipment

Prior to start of testing a consolidated list of all test equipment used for the Site Acceptance Testing shall be provided along with Make/Model numbers and valid Calibration Certificates.

Test Equipments/Instruments to be used during SAT :

1) E1 BER Tester
2) Ethernet Tester
3) Optical Power meter
4) Digital Multi meter
5) VF Tester
6) Earth Tester
7) Any other as per testing requirements

4. SAT Procedure

4.1 SAT-I

TPS-01 : Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling

Equipment Under Test : FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM

Test Parameter : Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling

1. Test Descriptions

To identify correctly given equipment and verify the hardware configuration, and make the equipment ready for software configuration and commissioning.

2. Test Procedure

- Check the hardware configuration as per the configuration drawing.
- Check the installation whether it is as per the site layout drawing.
- Check the workmanship and accuracy of the installation and cabling.
- Check for physical damage
- Check the quantity as per approved BOQ.

3. Test Results Records

Test Parameters	Test Criteria	Test Results
Hardware configuration	Complies with the approved BOQ	Ok / Not Ok
Equipment layout	Equipment layout complies with the approved site layout drawing	Ok / Not Ok
Installation of Rack	• Location should conform to layout drawing • Fixed on floor by bolts	Ok / Not Ok
Installation of subrack and card	• Subrack should be firmly fixed • Cards should be inserted into the slots and locked	Ok / Not Ok
Cabling and terminator	• DC Power cable colour	Ok / Not Ok

processing	to distinguish the polarity • Cable lays smoothly, straight and tidily, without obvious twist and cross. • Cable buffer ares are consistent. • Well colligated. • Stripped length of cable should be consistent. • Good connection. Soldering point should be smooth and tight	
Physical damage	• Any physical damage in equipment	Ok / Not Ok

Make the sketch drawing of actual telecom room layout if any variance.

4. Test Remarks

OK

Rack is not installed, SDH equipment is installed in existing Commtel ... rack as per PGCIL instruction

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 12:15 PM

Site Name: Subhasgram PGCIL

Tested By : Kingshuk Pal (Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By : (POWERGRID/Constituent)

Date :

POWER GRID CORPORATION OF INDIA LTD.

Ethernet IP - 192.168.111.103

Router ID - 192.168.11.103

TPS-02 : Station power supply input and equipment power supply(DC-DC converter) output voltage measurements

Equipment Under Test : FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM

Test Parameter : Station power supply input and equipment power supply (DC-DC converter) output voltage measurements

1. Test Descriptions

To check the station Power Supply Voltage and the PDP output Voltage is with in the given range.

2. Test Procedure

- Check the i/p voltage at PDP
- Check the o/p voltage at PDP.

3. Test Equipments Required

- Digital Multimeter

4. Test Results Records

Test Parameters	Test Criteria	Test Results
i/p Voltage at PDP	i/p voltage should be in the range of -42V to -55V	Ok / Not Ok
o/p Voltage at PDP	o/p voltage should be in the range of -42V to -55V	Ok / Not Ok

5. Test Remarks

Equipment Under Test: Tejas TJ-1400
Test Date and Time: 31-07-2024 12:30 PM
Site Name: Subhasgram PGCIL

Tested By	: Kingshuk Pal (Manufacturer/Contractor)	Witnessed By	: (POWERGRID/Constituent)
Date	: 31.07.2024	Date	:

Biplob Sarkar
Sr. Dy. General Manager (ULDC)
POWERGRID, ER-II, KOLKATA

POWER GRID CORPORATION OF INDIA LTD.

TPS-03: Terminal transceiver performance testing (Tx power, Receive signal strength)

Equipment Under Test : FO EQUIPENTS (SDH)

Test Parameter : Terminal transceiver performance testing (Tx power, Receive signal strength)

1. **Test Descriptions**

   To check the Tx Power, Receiving Signal Strength is within the given range.

2. **Test Procedure**

   Tx Power Measurement

   - Connect the output port (Tx) of the tested optical interface card to the optical power meter.
   - Turning the optical power meter to the specified wavelength.
   - Measure the Tx output power level in dBm.
   - Record the result showing on the optical power meter.

   Receiving Signal Strength

   - Connect the output port (Rx) of the tested optical interface card to the optical power meter.
   - Turning the optical power meter to the specified wavelength.
   - Measure the Rx input power level in dBm.
   - Record the result showing on the optical power meter.

3. **Test Equipments Required**

   - Digital Optical Power Meter

4. **Test Results Records**

   Tx Power Measurement:

Sr. No.	Node / Station	Sr.No.	Optical Inteface Type (As per Approved BoQ)	Minimum (dBm)*	Maximum (dBm)*	Actual (dBm)
1	Slot-1, Port-1	APAP2144 CCC1C33	S16.1 1310 nm	-5	0	-2.20
	Slot-3, Port-1	APAP2844 CCC1C34		-5	0	-2.15
2	Slot-2, Port-1	DP34KPF CCC1443	L16.3 1550.12 nm	+3	+7	+5.10
	Slot-4, Port-1	DP34KPF CCC1444		+3	+7	+5.23

813

3	Slot-2, Port-2	APAP2224 CCC3956	L16·2 1550nm	-2	+3	+0·47
	Slot-4, Port-2	APAP2224 CCC3955		-2	+3	+0·52
4	Slot-2, Port-3	DP34KPF C2CC117	L16·3 1550·12nm	+3	+7	+5·39
	Slot-4, Port-3	DP34KPF C2CC112		+3	+7	+5·03

*As per Approved DRS

The measured optical output power should be within the limits as expressed in the table given above.

Receiving Signal Strength:

Sr. No.	Node / Station	Sr.No.	Module Type (As per Approved BoQ)	Receiver Signal Strength (dBm)*	Actual (dBm)
1	Slot-1, Port-1	APAP2244 CCC10353	S16·1 1310nm	≤-18	-24·35
	Slot-3, Port-1	APAP2244 CCC1036		≤-18	-23·95
2	Slot-2, Port-1	DP34KPF C2CC143	L16·3 1550·12nm	≤-28	-33·45
	Slot-4, Port-1	DP34KPF C2CC144		≤-28	-34·03
3	Slot-2, Port-2	APAP2224 CCC3956	L16·2 1550nm	≤-28	-32·35
	Slot-4, Port-2	APAP2224 CCC3955		≤-28	-32·42
4	Slot-2, Port-3	DP34KPF C2CC117	L16·3 1550·12nm	≤-28	-33·91
	Slot-4, Port-3	DP34KPF C2CC112		≤-28	-33·27

The measured receiver power should be within the limits as expressed in the table given above.

* As per Approved DRS

POWER GRID CORPORATION OF INDIA LTD.

814

5. Test Remarks OK

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 1:15 PM

Site Name: Subhagram PGCIL

Tested By : Kangsuk Pal
(Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By :
(POWERGRID/Constituent)

Date :

Biplob Sarkar
Sr. By. General Manager (ULDC)
POWERGRID, ER-II, KOLKATA

TPS-04: Services Channel performance Test

Equipment Under Test : FO EQUIPENTS (SDH)

Test Parameter : Services Channel performance Test

1. **Test Descriptions**

   To identify correct operation of the services channels used for the EOW phones.

2. **Test Procedure**

   - Connect the EOW phone to services channel.
   - Make a call from EOW phone to any station at other end (as per EOW numbering plan)
   - Check the quality of voice
   - Make a Omnibus call to different sites and check

3. **Test Results Records**

   EOW telephone works well conversation quality is satisfactory.
   Selective calling Ok / Nok
   Omnibus calling Ok / Nok

4. **Test Remarks**

   Ok

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 12:25PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal (Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By : Biplob Sarkar (POWERGRID/Constituent)

Date :

POWER GRID CORPORATION OF INDIA LTD.

TPS-05: Craftsperson interface, alarm and control functional performance

Equipment Under Test : FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM

Test Parameter : Craftsperson interface, alarm and control functional performance

1. Test Descriptions

Functions of LCT:
Change configuration
Get alarm of any fault
Get performance information
To simulate defects by using the measurement equipment and LCT
Performance monitoring
Loopback

2. Test Equipments Required

- LCT
- BER Tester

3. Test Procedure

Connect the LCT to equipment under test through management port

- Ensure the equipment under test is working.
- Login the LCT.
- Change some configurations of the equipment.
- Get the fault information from the equipment.
- Get and browse the performance data of the equipment.
- Change configurations of another station indirectly, get its fault information and performance data

Loop back test

- Apply a software loop on remote end E1 channel through LCT.
- Test the loop back with E1 tester on local end.
- Record the result there should be no error during this period.

817

4. Test Results Records

Test item	Ok / Not Ok
LCT is able to change the configuration of the connected NE.	OK
LCT can get fault information from the connected NE.	OK
LCT can get performance data from the connected NE.	OK
LCT is able to change the configuration of any NE in the network.	OK
LCT can get fault/alarm information from the unconnected NE.	OK
LCT can get performance data from the unconnected NE.	OK
Check for connection of NMS and LCT on the network at the same time	OK
Check for remote loopback, local loopback	OK
Check for cross connection	OK
Test the loop back with E1 tester on local end	OK
Record the result there should be no error during this period	OK

Alarms should be indicated on LCT and equipment when there is some failure. Equipment can be configured by LCT.
Performance data can be monitored on LCT.

5. Test Remarks

OK

Equipment Under Test: Tejas TJ-1400
Test Date and Time: 31.07.2024 1:40PM
Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal
(Manufacturer/Contractor)
Date : 31.07.2024

Witnessed By :
(POWERGRID/Constituent)
Date :

POWER GRID CORPORATION OF INDIA

TPS-06: Rack and local alarms

Equipment Under Test : FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM

Test Parameter : Rack and local alarms: No alarms shall be present and all alarms shall be demonstrated to be functional

1. Test Descriptions

To check the Rack alarm and Local alarms are correctly reflects on Equipment and LCT.

Rack Alarm

- Urgent Alarm's
- Non Urgent alarm's
- No Alarm

Local Alarms on LCT

FO System

- LOS on optical port
- LOS on 2Mbit/s Port
- Card failure by pulling out some cards

Termination Equipments

- AIS (RDI)
- E1_LOF
- E1_LOS

2. Test Equipments Required

- LCT

3. Test Procedure

Rack Alarm

1) Disconnect one of the optical Rx port. There should be Urgent alarm of SDH Sub-Rack.
2) Restore the optical RX port. then there should be no alarm on SDH Sub-Rack
3) Remove the 2Mbps cable from the DDF (Should be working 2M), there should be Urgent alarm on SDH Sub-Rack.
4) Connect the 2Mbps cable on DDF, the Urgent alarm should be cleared.

Local alarm on LCT

For LOS/LOF on SDH System

- Connect the LCT to the SDH and PDH equipment one by one
- Pull out the optical card of SDH Equipment, check the alarm display.
- Pull out the Tributary card of SDH and PDH equipment, check the alarm display.
- Pull out the E1 link from SDH and PDH equipments, check the alarm display.
- Verify the SDH and PDH equipment is configurable by LCT.
- Verify the performance monitoring on LCT.

4. Test Results Records

Rack alarm

S.No.	Test item (SDH)	Test result
1	Urgent Alarm appearing in fault conditions	Ok / Not Ok
2	Non Urgent Alarm appearing in fault conditions	Ok / Not Ok
3	No alarms (during Normal operation)	Ok / Not Ok

Local alarm on LCT

Alarms should be indicated on LCT and equipment when there is fault condition.

5. Test Remarks

OK

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 1:55 PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal
(Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By :
(POWERGRID/Constituent)

Date :

POWER GRID CORPORATION OF INDIA LTD.

TPS-07: Network management interface and supervision performance

Equipment Under Test	:	FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM
Test Parameter	:	Network management interface and supervision performance

1. Test Descriptions

To check the Communication between NMS and Gateway NE through management interface.

Test will be carried out to check the following parameters

- Configuration
- Loopback Testing
- Laser Testing
- Alarm reporting
- Performance monitoring

2. Test Equipments Required

- NMS System
- BER Tester

3. Test Procedure

- Login to the equipment through management port.
- STM-4 /16 Line loop back in software
- E1 Loop back in software and check on BER tester
- Laser switch off/on through software
- Monitor optical power
- Display of alarms
- Performance event collection like ES, SES, BBE for 15Min

4. Test Results Records

Verify all the above listed test procedures is working ok:		Ok / Not Ok
NMS can configure and supervise the whole network	:	Ok / Not Ok
Diagnostics is possible on NMS	:	Ok / Not Ok
Alarms should be displayed if there is any failure	:	Ok / Not Ok

5. Test Remarks

821

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 2:06PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal
(Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By :
(POWERGRID/Constituent)

Date :

Biplob Sarkar
Sr. Dy. General Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-I, कोलकाता
POWERGRID, ER-II, KOLKATA

POWER GRID CORPORATION OF INDIA

TPS-08: Correct configuration, level setting & adjustments and termination of Input/ output interfaces

Equipment Under Test : FO EQUIPMENTS (SDH)

Test Parameter : Correct configuration, level setting & adjustments and termination of Input/ output interfaces

1. **Test Descriptions**

   To check the Equipment configuration is according to approved Configuration plan. To check the Input/output termination of Optical and Electrical cables are according to approved scheme

2. **Test Equipments Required**

   - LCT
   - Approved Optical and 2Mbps distribution Diagrams

3. **Test Procedure**

   - Connect the LCT to the SDH equipment through f interface.
   - Ensure the SDH equipment is working.
   - Login the LCT.
   - Check the equipment configuration
   - Check the Termination of Input and Output cables.
   - Check different level settings in the SDH Equipment.

4. **Test Results Records**

   Configuration, level setting adjustment and termination should comply with the approved documents : Ok / Not Ok ✓

5. **Test Remarks**

   Ok

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 2:20PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal (Manufacturer/Contractor)

Witnessed By : (POWERGRID/Consultant)

Date : 31.07.2024

Date :

Page 26 of 62

TPS-09: Proper establishment of Safety and signalling earthing system and resistance to ground to be checked.

Equipment Under Test	:	FO EQUIPMENTS (SDH) & TERMINATION EQUIPMENT SUB-SYSTEM
Test Parameter	:	Proper establishment of Safety and signalling earthing system and resistance to ground to be checked

1. **Test Descriptions**

   To check the Earthing cable Terminations To check the Earth resistance.

2. **Test Equipments Required**

   - Clamp Earth Tester

3. **Test Procedure**

   - Check that all the earthing connection are terminated on the earth bus bar are tightened
   - All equipments are connected with Earth bus bar
   - Colour of the Earth cable is yellow-green or green
   - Measure the Earth resistance Clamp Earth Tester
   - Check the wrist strap is available at each station

4. **Test Results Records**

Earthing connections are properly done	:	✓ Ok / Not Ok
Earth resistance measured is less than 10 Ω	:	Ok/ Not Ok

5. **Test Remarks**

OK
Value = 0.006 Ω

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 2:25PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal
(Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By :
(POWERGRID/Constituent)

Date :

POWER GRID CORPORATION OF INDIA LTD.

TPS-10: Simulation of failure conditions and failover of protected components

Equipment Under Test : FO EQUIPENTS (SDH)

Test Parameter : Simulation of failure conditions and failover of protected components.

1. Test Descriptions

To check the Failure conditions and protection components for following cards :
- Control Cards
- Optical Cards

2. Test Equipments Required

- BER Tester

3. Test Procedure

Control Card

- Control cards work on 1+1 protection. 1 protection card for 1 working card.
- Make the equipment work on normal status.
- Pull out the working Control card.
- The protection Control card should take over, and traffic should be restored.

Optical Card

- Optical cards work on 1+1 protection. 1 protection card for 1 working card.
- Make the equipment work on normal status.
- Pull out the working Optical card.
- The protection STM-4 /16 card should take over, and traffic should be restored.

For both the cards make software loop on any E1 and put in the BER testing mode. Check that during both the test the traffic is restored automatically.

4. Test Results Records

Traffic restored automatically even if one Control card and Optical card terms Faulty : Ok / Not Ok

5. Test Remarks

ok

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 3:20PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal (Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By : (POWERGRID/Constituent)

Date :

विनोद सरकार
VINOD SARKAR
Sr. Dy. General Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-II, कोलकाता
POWERGRID, ER-II, KOLKATA

POWER GRID CORPORATION OF INDIA LTD.

TPS-11: Craftsperson interface, alarm and control functional performance

Equipment Under Test	:	TERMINATION EQUIPMENT SUB-SYSTEM
Test Parameter	:	Craftsperson interface, alarm and control functional performance (MUX and DACS)

1. Test Descriptions

Functions of LCT:
Change configuration
Get alarm of any fault
Get performance information
To simulate defects by using the measurement equipment and LCT
Performance monitoring
Loopback

2. Test Equipments Required

- LCT
- BER Tester

3. Test Procedure

Connect the PDH Equipment with LCT.

- Connect the LCT to the PDH equipment
- Ensure the PDH equipment is working.
- Login the LCT.
- Change some configurations of the equipment.
- Get the fault information from the PDH equipment.
- Get and browse the performance data of the equipment.
- Change configurations of another station indirectly, get its fault information and performance data.

Loop back test

- Apply a software loop on any E1 channel thro LCT
- Test the loop back with E1 tester

4. **Test Results Records**

Test item	Ok / Not Ok
LCT is able to change the configuration of the connected NE.	
LCT can get fault information from the connected NE.	
LCT can get performance data from the connected NE.	
LCT is able to change the configuration of any NE in the network.	
Check for remote loopback, local loopback	
Check for branching connection	

Alarms should be indicated on LCT and equipment when there is some failure.
Equipment can be configured by LCT.
Performance data can be monitored on LCT

5. **Test Remarks**

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ **Witnessed By** : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ **Date** : _____

TPS-12: Simulation of failure conditions and failover of protected components

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Simulation of failure conditions and failover of protected components (MUX)

1. **Test Descriptions**

   To check the Failure conditions and protection components for following cards Power supply card

2. **Test Equipments Required**

   - BER Tester

3. **Test Procedure**

   - Power Cards work on 1+1 protection. 1 protection card for 1 working card.
   - Make the equipment work on normal status.
   - Pull out the working power card.
   - The protection power card should take over, and traffic should be restored.

   For this test make software loop on any data channel and put in the BER testing mode. Check that during test the traffic is restored automatically.

4. **Test Results Records**

   Traffic restored automatically even if one Power card terms Faulty : Ok / Not Ok

5. **Test Remarks**

   _____
   _____
   _____
   _____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ (Manufacturer/Contractor) **Witnessed By** : _____ (POWERGRID/Constituent)

Date : _____ **Date** : _____

TPS-13: Channel performance tests(PDH)

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Channel Performance Test (MUX)

1. Test Descriptions

To check the channel performance of interface cards as below :
- FXO/FXS voice cards
- VF E&M 4w Cards
- Async. Data card

2. Test Equipments Required

- BER Tester
- Telephone Instrument
- VF Tester

3. Test Procedure

For FXO/FXS Voice cards

- Connect the Telephone Instrument at station under test and any remote station
- Make a telephone call to remote station
- Check the quality of Voice.

For 4 w VF E&M cards

- Connect the VF Tester to channel under test
- Give the loop back at remote station
- Send the frequency of 1 Khz, Level 4 db thro VF Tester
- Measure the return frequency and level
- Results should be same with ±5% variation
- Perform the test on 30% of all channels

For Async. Data channel card

- Connect the BER tester to channel under test
- Give the loop back at remote end of the channel
- Measure the BER for 5 min.
- There should be no error during this period.
- Perform the test on 30% of all channels

4. Test Results Records

For FXO/FXS cards

Card Serial No. :_____

Call can be established between two stations : Ok / Not Ok
Voice Quality is Good : Ok / Not Ok

For 4w VF E&M Cards

Card Serial No. :_____

Channel No	Tx Frequency (KHz) / Level (db)	Rx Frequency (KHz) / Level (db)	Test Status
1	1 Khz / 4 db		Ok / Not Ok
2	1 Khz / 4 db		Ok / Not OK
3	1 Khz / 4 db		Ok / Not OK
4	1 Khz / 4 db		Ok / Not OK

Card Serial No. :_____

Channel No	Tx Frequency (KHz) / Level (db)	Rx Frequency (KHz) / Level (db)	Test Status
1	1 Khz / 4 db		Ok / Not OK
2	1 Khz / 4 db		Ok / Not OK
3	1 Khz / 4 db		Ok / Not OK
4	1 Khz / 4 db		Ok / Not OK

For Async. data channel card

Card Serial No. :_____

Channel No.	BER	Test Status
1		Ok / Not Ok
2		Ok / Not Ok
3		Ok / Not Ok
4		Ok / Not Ok

Card Serial No. :_____

Channel No.	BER	Test Status
1		Ok / Not Ok
2		Ok / Not Ok
3		Ok / Not Ok
4		Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-14: Network management interface and supervision performance

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Network management interface and supervision performance (MUX and DACS)

1. Test Descriptions

To check the Communication between NMS and Gateway NE through Management interface.

Test will be carried out to check the following parameters

- Configuration
- Loopback Testing
- Alarm reporting
- Performance monitoring

2. Test Equipments Required

- NMS system
- BER Tester

3. Test Procedure

- Login to the equipment through management interface
- E1 Loop back in software and check on BER tester
- Display of alarms
- Check the MUX board Configuration
- Perform the operation of branching the Timeslots
- Performance event collection

4. Test Results Records

Verify all the above listed test procedures is working ok;		Ok / Not Ok
NMS can configure and supervise the whole network	:	Ok/ Not Ok
Diagnostics is possible on NMS	:	Ok / Not Ok
Alarms should be displayed if there is any failure	:	Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-15: Muldem performance testing (MUX)

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Muldem performance testing (MUX)

1. Test Descriptions

To check the multiplexing and de-multiplexing is properly happening in MUX Equipment.

2. Test Equipments Required

- BER Tester
- VF Tester

3. Test Procedure

Loop back the main 2mbps transmission Signal of E1 card.
Connect the BER Tester to any data channel of same MUX Check the loop back

Follow the following procedure for different data channels

For 4w VF E&M cards

- Connect the VF Tester to channel under test
- Send the frequency of 1 Khz, Level 4 db thro VF Tester
- Measure the return frequency and level
- Results should be same with ±5% variation

For Async. Data channel card

- Connect the BER tester to channel under test
- Measure the BER for 5 min.
- There should be no error during this period.

4. Test Results Records

Multiplexing and Demultiplexing is happening properly in MUX equipment : Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-16: Simulation of failure conditions and failover of protected components (DACS)

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Simulation of failure conditions and failover of protected components (DACS)

1. Test Descriptions

To check the Failure conditions and protection components for following cards

Power supply card
Control card

2. Test Equipments Required

- BER Tester

3. Test Procedure

- Power Card and Control Card work on 1+1 protection. 1 protection card for 1 working card.
- Make the equipment work on normal status.
- Pull out the working power card.
- The protection power card should take over, and traffic should be restored.
- Pull out the working Control card
- The protection Control card should take over, and traffic should be restored.

For this test make software loop on any E1 channel on and put in the BER testing mode. Check that during test the traffic is restored automatically.

4. Test Results Records

Traffic restored automatically even if one Power card terms Faulty	:	Ok / Not Ok
Control card terms Faulty	:	Ok / Not Ok

5. Test Remarks

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By	: _____	Witnessed By	: _____
	(Manufacturer/Contractor)		(POWERGRID/Constituent)
Date	: _____	Date	: _____

TPS17: Channel Performance Tests (DACS)

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : Channel Performance Test (DACS)

1. Test Descriptions

To check the channel performance of interface cards as below

- Tributary Card
- Cross connect card

2. Test Equipments Required

- BER Tester

3. Test Procedure

For Tributary Card

- Connect the BER tester to E1 channel under test
- Give the local software loop back to the channel
- Measure the BER for 5 min.
- There should be no error during this period
- Perform the test for 30% of total E1 channels

For Cross connect card

- Connect the BER tester to any 64kbps data channel configured between any remote station and station under test.
- Give the Remote Loop back.
- Check the cross connection is properly done in DACS using LCT
- Check the BER
- In case of 64K VF channel
- Send the frequency of 1 Khz, Level 4 db thro VF Tester
- Measure the return frequency and level
- Results should be same with ±5% variation

4. Test Results Records

For Tributary Card

Card Serial No. : _____

Channel No.	BER	Test Status
1		Ok / Not Ok
2		Ok / Not Ok
3		Ok / Not Ok
4		Ok / Not Ok
5		Ok / Not Ok

For Cross connect card

Card Serial No. :_____

Channel Performance of Cross Connect Card : Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-18: Physical inspection for conformance to drawings, rack elevations and appearance of equipment and cabling of NMS System Workstation hardware inventory, configuration and characteristics of NMS System

Equipment Under Test	:	NMS System (incl. all associated HW & SW supplied with the complete system)
Test Parameter	:	Physical Inspection for conformance to drawings, rack elevations and appearance of equipment and cabling Hardware & Software Inventory, Configuration and characteristic

1. Test Descriptions

To identify correctly given equipment and verify the hardware configuration, and make the equipment ready for software configuration and commissioning.

2. Test Procedure

- Check the hardware configuration as per the configuration drawing.
- Check the installation whether it is as per the site layout drawing.
- Check the workmanship and accuracy of the installation and cabling.
- Check for physical damage
- Check the Hardware & software inventory as per approved DRS & BOQ documents.

3. Test Results Records

Make the sketch drawing of actual NMS room layout if any variance.

No Physical Damage	: Ok / Not Ok
Hardware & Software Inventory as per approved DRS & BOQ	: Ok / Not Ok
Hardware Configuration as per approved DRS & BoQ	: Ok / Not Ok

4. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-19: Demonstration of proper operation of all hardware, including workstations peripherals of NMS System

Equipment Under Test : NMS System

Test Parameter : Demonstration of proper operation of all hardware, including workstations peripherals of NMS System

1. **Test Descriptions**

   To identify all the hardware including Workstations and its peripheral devices operates correctly.

2. **Test Procedure**

   2.1. Check the Workstations are connected with all the peripheral devices as per the BOQ
   2.2. Power On the Workstation and devices.
   2.3. Check the operation of all devices

3. **Test Results Records**

   All hardware associated with NMS are working properly : Ok / Not Ok

4. **Test Remarks**

   _____
   _____
   _____
   _____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ **Witnessed By** : _____
(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ **Date** : _____

POWERGRID CORPORATION OF INDIA LTD.

4.2 SAT-II

TPS-20: Ethernet Channel Testing (SDH)

Equipment Under Test	:	SDH Equipment along with Ethernet Interface Unit
Test Parameter	:	Throughput, Latency, Packet Loss Measurement and Ping test of Ethernet Interface

1.0 TEST DESCRIPTION

To verify that Ethernet card is in compliance with the specifications of IEEE 802.3/RFC-2544 standards.

2.0 TEST EQUIPMENT

1. Ethernet Analyser
2. Local Craft Terminal (LCT)
3. Low loss optical patch cord & LAN cable

3.0 TEST PROCEDURE

1. Connect the SDH nodes Node-A & B with LCT.
2. At Node-A and B, Configure WAN bandwidth of the Ethernet interface as per channel plan.
3. Connect the Ethernet Analyser to LAN port of SDH equipment with UTP cable. Set the LAN port to Auto Negotiate mode.
4. At Node-B, set the Ethernet Analyser in Layer-2 loop back mode.
5. At Node-A, start the RFC 2544 test in the Ethernet analyser, set the test parameters for throughput, latency and packet loss test, set the frame length to 1518 bytes.
6. Measure the throughput, latency & packet loss.
7. All links will be tested for 1 min.

POWER GRID CORPORATION OF INDIA LTD.

4.0 **Test Result Record**

A. **Throughput**

Anticipated result		Actual result
Bandwidth	Throughput	
2Mbps	As per applicable RFC-2544 Standard	2·000
6 Mbps	As per applicable RFC-2544 Standard	6·000
10 Mbps	As per applicable RFC-2544 Standard	10·000

The throughput of the Ethernet card should not be less than the bandwidth configured.

B. **Latency**

Anticipated result		Actual result
Bandwidth	Latency	
2 Mbps	As per applicable RFC-2544 Standard	4·904
6 Mbps	As per applicable RFC-2544 Standard	4·908
10 Mbps	As per applicable RFC-2544 Standard	5·106

The actual latency should be less than the value tolerated in the worst case.

C. **Packet Loss**

Anticipated result		Actual result
Bandwidth	Packet loss ratio	
2 Mbps	As per applicable RFC-2544Standard	0·000
6 Mbps	As per applicable RFC-2544 Standard	0·000
10 Mbps	As per applicable RFC-2544 Standard	0·000

The actual frame loss ratio should be less than the value tolerated in the worst case.

845

D. Ping Test

Connect the laptop to Ethernet port under test at both the nodes. Run the ping test

Test Result:
Both laptops ping each other thro Ethernet Channel : Ok / Not Ok

There should be No Packet Loss : Ok / Not Ok

5.1 Test Remarks

OK

Equipment Under Test: Tejas TJ-1400
Test Date and Time: 31.07.2024 3:40PM
Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal (Manufacturer/Contractor)
Date : 31.07.2024

Witnessed By : (POWERGRID/Constituent)
Date :

Dipak Sarkar
Dy. General Manager (SCADA)
POWERGRID, ER-II, KOLKATA

POWER GRID CORPORATION OF INDIA LTD.

TPS-21: Measurement of BER For SDH Link

Equipment Under Test : FO EQUIPENTS (SDH)

Test Parameter : Bit Error measurements

1. **Test Descriptions**

   To check the BER Measurements for End to End links for SDH Equipment.

2. **Test Equipments Required**

   - LCT
   - BER Tester

3. **Test Procedure**

   - Configure an E1 channel from remote end to local end.
   - Apply a software loop on remote end E1 channel through LCT.
   - Test the loop back with E1 tester on local end for 1 hours/12 hours as required @10% of the link will be test for 12 hours.

   Note: - 1. All BER have to be done for only 1 hour except for 10% of the link (12 hours).

4. **Test Results Records**

Test item	Ok / Not Ok
The test results recorded there should be no error during this period as per ITU-T recommendation G.821	Ok

5. **Test Remarks**

Ok

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 3:05 PM

Site Name: Subhasgram PGCIL

Tested By : Kingsuk Pal
(Manufacturer/Contractor)

Witnessed By :
(POWERGRID/Constituent)

Date : 31.07.2024

Date :

उप महाप्रबंधक (यू.एल.डी.सी.)
Dy. General Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-II, कोलकाता
POWERGRID, ER-II, KOLKATA

POWER GRID CORPORATION OF INDIA

TPS-22: Delay measurement

Equipment Under Test : FO EQUIPENTS (SDH)

Test Parameter : Delay measurements

1. **Test Descriptions**

To Measure the transmission delay in the path of the network for SDH Equipment.

2. **Test Equipments Required**

- LCT
- BER Tester

3. **Test Procedure**

- Configure an E1 channel from remote end to local end.
- Apply a software loop on remote end E1 channel through LCT.
- Test the loop back with E1 tester on local end.
- Once there is no alarm in tester, open the delay measurement and simulate test.
- Total delay in the path is measured and displayed.

4. **Test Results Records**

Test item	Measured value	Ok / Not Ok
Delay measurement should not be more than 50 msec	1.36 ms	Ok

5. **Test Remarks**

Ok

Equipment Under Test: Tejas TJ-1400

Test Date and Time: 31.07.2024 3:08 PM

Site Name: Subhangram PGCIL

Tested By : Kingsuk Pal (Manufacturer/Contractor)

Date : 31.07.2024

Witnessed By : Biplob Sarkar (POWERGRID/Constituent)

Date :

POWERGRID, ER-II, KOLKATA

4.3 SAT-III

TPS-23: End to End testing of Voice circuits

Equipment Under Test	:	FO EQUIPMENTS (SDH) & TERMINATION EQUIPMENT SUB-SYSTEM
Test Parameter	:	End to End testing of Voice circuits

1. **Test Descriptions**

   To check the individual voice circuits originating from PLCC, PABX or phones are working properly.

2. **Test Procedure**

   - Make a phone call to all configured voice circuits from the station under test.
   - Check the call initiation, Quality of Voice and Call termination is happening properly.

3. **Test Results Records**

Call initiation is proper	: Ok / Not Ok
Quality of Voice is good	: Ok / Not Ok
Call Termination is proper	: Ok / Not Ok

4. **Test Remarks**

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By	: _____ (Manufacturer/Contractor)	**Witnessed By**	: _____ (POWERGRID/Constituent)
Date	: _____	**Date**	: _____

TPS-24: Testing of NMS Functionality

Equipment Under Test	:	FO EQUIPMENTS (SDH) and Existing TERMINATION EQUIPMENT SUB-SYSTEM (PDH & DACS)
Test Parameter	:	End to End testing of Voice and Data circuits of Existing System

1. **Test Descriptions**

   To check all Data and Voice circuits originating from RTU, PLCC, PABX or phones are working properly.

2. **Test Procedure**

   - Make a phone call to Existing configured voice circuits from the station under test.
   - Check the call initiation, Quality of Voice and Call termination is happening properly.
   - Check the Existing Data are reporting to corresponding Sub-LDC and SLDC.

3. **Test Results Records**

Call initiation is proper	: Ok / Not Ok
Quality of Voice is good	: Ok / Not Ok
Call Termination is proper	: Ok / Not Ok
Data reporting is proper	: Ok / Not Ok

4. **Test Remarks**

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ **Witnessed By** : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ **Date** : _____

TPS-25: Protection Switching and Synchronization of Equipment

Equipment Under Test : NMS System

Test Parameter : Demonstration of the standard features of the NMS System

1. Test Descriptions

To verify that the entire standard features of NMS System are working properly as per technical specifications requirements.

2. Test Parameters

- Configuration Management
- Performance Management
- Fault Management
- Security Management

3. Test Procedure

CONFIGURATION MANAGEMENT

- Connect the TNMS system with the management interface of SDH equipment by using Ethernet cable.
- Ensure the SDH equipment is working.
- Login NMS as user of advanced level.
- Check the NMS whether it can establish and maintain the network topology.
- Check the NMS whether it provides the tools for planning, establishing and changing the static equipment configuration, this item can be conducted by changing some parameters & cross connection of the SDH equipment.
- Check the NMS whether it provide verification testing to support new equipment installation, this can be tested by adding a new NE.
- For creating the cross connection, establish the cross connection between any of the two ports in the same or different card.

FAULT MANAGEMENT

- Display Equipment Status, Display graphical, topological & Map type and Display the use of colour on links and Nodes.
- Connect the TNMS system with the management interface of SDH equipment by using

Ethernet cable.

- Ensure the SDH equipment is working.
- Login NMS as user of advanced level.
- Generate the various alarms; check the NMS for relevant alarm status.
- For example, pull out one card from SDH sub-rack; check the NMS for alarm of that fault.
- Insert the card, and then the alarm disappears.
- Check the alarm history, which includes all alarm events.
- Check the capability of alarm retrieval filter. Change the setting and retrieve.
- Check the colors for different level alarm events.
- Print alarm report.

SECURITY MANAGEMENT

- Connect the TNMS system with the management interface of SDH equipment by using Ethernet cable.
- Ensure the SDH equipment is working.
- Login as Administrator
- Add a user and define the user profile.
- Login as user and verify that user is able to perform various tasks as per profile.

PERFORMANCE MANAGEMENT

- Connect the TNMS system with the management interface of SDH equipment by using Ethernet cable.
- Ensure the SDH equipment is working.
- Configure a E1 interface and run performance management for specified interval.
- Monitor events & thresholds.
- Generate reports on daily, weekly, monthly and yearly basis containing system statistics.

LCT FUNCTIONALITY TEST

- Connect the LCT to the SDH equipment through LCT interface.
- Ensure the SDH equipment is working.
- Login the LCT.

- Change some configurations of the equipment.
- Get the fault information from the SDH equipment.

4. Test Results Records

Sr. No.	Test Description	Results (OK / Not OK)
1.0	**CONFIGURATION MANAGEMENT**	
1.1	Capability to establish and maintain the backbone topology.	
1.2	Capability to provide graphical maps depicting the sub-rack configurations.	
1.3	Capability to plan, establish and change the static equipment configuration.	
1.4	Verification testing to support new equipment installation.	
1.5	Cross-connect capability between any of the two ports in same or different card.	
2.0	**FAULT MANAGEMENT**	
2.1	After generating an alarm, it is automatically displayed.	
2.2	Alarm has been shown automatically when there is card failure.	
2.3	NMS can maintain an alarm summary of unacknowledged current alarm.	
2.4	NMS can maintain an alarm history.	
2.5	Operator can acknowledge and clear alarms.	
2.6	Alarm retrieval filter is available.	
2.7	Alarms can be classified and configured as critical alarms, major alarms and minor alarms, in different colors.	
2.8	Alarm reports can be extracted.	
3.0	**SECURITY MANAGEMENT**	
3.1	Security Management functionality allows user addition and user profile definition.	
4.0	**PERFORMANCE MANAGEMENT**	
4.1	Performance Management can be enabled for specific interface.	
4.2	The Measurement interval can be selected.	

4.3	Monitor events & thresholds.	
4.4	Generate reports on daily, weekly, monthly and yearly basis containing system statistics.	
5.0	LCT Functionality Test	
5.1	LCT can get fault information from the connected SDH node.	
5.2	LCT is able to change the configuration of the connected SDH node.	
5.3	LCT is able to change the configuration of connected SDH node.	

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ **Witnessed By** : _____

(Manufacturer/Contractor) **(POWERGRID/Constituent)**

Date : _____ **Date** : _____

TPS-26: End to End Data Channel testing

Equipment Under Test : TERMINATION EQUIPMENT SUB-SYSTEM

Test Parameter : End to End Data Channel testing

1. Test Descriptions

To check the channel performance of interface cards as below :
- FXO/FXS voice cards
- VF E&M 4w Cards
- Async. Data card

2. Test Equipments Required

- BER Tester
- Telephone Instrument
- VF Tester

3. Test Procedure

For FXO/FXS Voice cards

- Connect the Telephone Instrument at station under test and any remote station
- Make a telephone call to remote station.
- Check the quality of Voice.

For 4 w VF E&M cards

- Connect the VF Tester to channel under test
- Give the loop back at remote station
- Send the frequency of 1 Khz, Level 4 db thro VF Tester
- Measure the return frequency and level
- Results should be same with ±5% variation
- Perform the test on 30% of all channels

For Async. Data channel card

- Connect the BER tester to channel under test
- Give the loop back at remote end of the channel
- Measure the BER for 5 min.
- There should be no error during this period.
- Perform the test on 30% of all channels

4. Test Results Records

For FXO/FXS cards

Card Serial No. :_____

Call can be established between two stations : Ok / Not Ok
Voice Quality is Good : Ok / Not Ok

For 4w VF E&M Cards

Card Serial No. :_____

Channel No	Tx Frequency (KHz) / Level (db)	Rx Frequency (KHz) / Level (db)	Test Status
1	1 Khz / 4 db		Ok / Not Ok
2	1 Khz / 4 db		Ok / Not OK
3	1 Khz / 4 db		Ok / Not OK
4	1 Khz / 4 db		Ok / Not OK

Card Serial No. :_____

Channel No	Tx Frequency (KHz) / Level (db)	Rx Frequency (KHz) / Level (db)	Test Status
1	1 Khz / 4 db		Ok / Not OK
2	1 Khz / 4 db		Ok / Not OK
3	1 Khz / 4 db		Ok / Not OK
4	1 Khz / 4 db		Ok / Not OK

For Async. data channel card

Card Serial No. :_____

Channel No.	BER	Test Status
1		Ok / Not Ok
2		Ok / Not Ok
3		Ok / Not Ok
4		Ok / Not Ok

Card Serial No. :_____

Channel No.	BER	Test Status
1		Ok / Not Ok
2		Ok / Not Ok
3		Ok / Not Ok
4		Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

TPS-27: Interfacing with Existing Communication System

Equipment Under Test : FO EQUIPENTS (SDH) & TERMINATION EQUIPMENT SUB- SYSTEM

Test Parameter : Protection Switching and Synchronization of Equipment

Pre-requisite : All the synchronization clock & associated items installed as per approved Synchronization plan

1. Test Descriptions

a) To check the Failure conditions and protection switching is working properly for all protections on Control cards, Optical Cards (protection switching for ring network wherever applicable).

b) To check the Failure conditions and protection switching is working properly for protections of Optical Cards/interfaces in ring network wherever applicable.

c) To check the Synchronization of the Equipment is as per the approved Sync. Plan.

2. Test Equipments Required

- BER Tester

3. Test Procedure

Control Card

- Control cards work on 1+1 protection, 1 protection card for 1 working card.
- Make the equipment work on normal status.
- Pull out the working Control card.
- The protection Control card should take over, and traffic should be restored.

Optical Card

- Optical cards work on 1+1 protection, 1 protection card for 1 working card.
- Make the equipment work on normal status.
- Pull out the working Optical card.
- The protection Optical card should take over, and traffic should be restored.

For both the cards make software loop on any data/E1 channel at remote end and put in the BER testing mode. Check that during both the test the traffic is restored automatically.

Synchronization

- Check the Synchronization Cabling/connection is as per approved Sync. Plan.
- Check the sync. Priority switching on protected path through LCT/NMS.

4. Test Results Records

a) Traffic restored automatically even if one Control and Optical card terms Faulty : Ok / Not Ok

b) No Clock failure alarm during the protection switching : Ok / Not Ok

c) Check Synchronization cabling/connection/Configuration is as per the approved Synchronization Plan : Ok / Not Ok

d) Check the sync. Priority switching on protected Path through LCT/NMS : Ok / Not Ok

5. Test Remarks

_____

_____

_____

_____

Equipment Under Test: _____

Test Date and Time: _____

Site Name: _____

Tested By : _____ Witnessed By : _____

(Manufacturer/Contractor) (POWERGRID/Constituent)

Date : _____ Date : _____

Annex-F

MAINTENANCE PLAN

Annual Maintenance Contract of Communication Equipment supplied under " Establishment of Fibre Optic Communication System and stand alone equipments supplied under various Substation Packages in Eastern Region "

Annexure-III

FORMAT TO BE FILLED DURING SEMI ANNUAL SITE VISIT

1. **SITE INFORMATION**:

Site name : Subhasgram PG

Address : Subhasgram

Contact Person :

Telephone & Fax :

2. **GENERAL CLEANLINESS**

Communication room air conditioner

- Is air conditioner on? Yes/No
- Are filters clean? Yes/No
- Is air conditioner cooling O.K? OK/NOT OK
- Action Required by POWEGRID/Constituent---------- Not Required

Communication room cleanliness

- Check if communication room is in good condition (Over all)
  Yes
- Check if regular cleaning of telecom room done.
  Yes
- Check if room is manned.
  Yes
- Check if AC/DC supply has been tapped for other uses.
  No
- Is the room having any damp wall.
  No
- Action required by POWERGRID/CONSTITUENT'S.
  Not required

Gautam Mann
14/08/19
CONTRACTOR'S s representative

POWERGRID/CONSTITUENT'S representative

Biplob Sarkar
Sr. Dy. General Manager (U.D.C)
POWERGRID, ER-II, KOLKATA

MAINTENANCE PLAN

Annual Maintenance Contract of Communication Equipment supplied under " Establishment of Fibre Optic Communication System and stand alone equipments supplied under various Substation Packages in Eastern Region "

Annexure-III contd/-

EQUIPMENT RACK CLEANLINESS:

- **Check if cabinets are closed and key available with room in charge.**

Key available ✓ Not Available Cabinet Closed Open

- Clean the equipment with vacuum cleaner. Cleaned

Actions required by POWERGRID/CONSTITUENT'S/Constituent:

____

Action required by CONTRACTOR'S: ________________

3.0 TEMPERATURE MEASUREMENT:

Room temperature

- Check the room temperature (25°C is recommended) 25.3°C
- Temperature very near equipment cabinet 24.6°C

Action Required by POWERGRID/CONSTITUENT'S/Constituents :

____

4.0 POWER SUPPLY MEASUREMENT

- Input DC Voltage at MCB 54.3
- Input DC Voltage at Cabinet TB 54.2
- AC Voltage at the time of station visit (Primary source): 238V
- Availability of AC Supply in 24 hours Yes
- Charger Voltage 55.5V
- Battery Voltage (Charger AC Supply off) 55.1V

Actions required by POWERGRID/CONSTITUENT'S Not required

Santanu Manna 14/03/24
CONTRACTOR'S's representative

POWERGRID/CONSTITUENT'S representative

विप्लव सरकार
Biplob Sarkar
उप महाप्रबंधक (यू एल डी सी)
Dy. General Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-II, कोलकाता
POWERGRID, ER-II, KOLKATA

MAINTENANCE PLAN

Annual Maintenance Contract of Communication Equipment supplied under " Establishment of Fibre Optic Communication System and stand alone equipments supplied under various Substation Packages in Eastern Region "

Action required by CONTRACTOR'S _____

5.0 MULTIPLEXER & SDH EQUIPMENT ALARM CHECK

Visual check for the alarm on Mux & SDH equipment, in case of any alarm present further investigation and corrective action.

Action required by CONTRACTOR'S:_____

6.0 CABLE CHECK

- Check the cable terminations at all MDFs visually. Recrone if any loose wires.
- Check cable route for any abnormality.
- Are cable trenches covered properly?

7.0 DOCUMENTS AND TEST INSTRUMENTS

- Check the documents at site. ✓ Available Not available
- Check the availability of test instrument/tool kit at site. (Multi meter, Screwdriver, plier etc.) Yes available

8.0 EARTHING CHECK

- All the cables are connected properly with the ground point.
- Clean the end points if required while removing the earth cable first put temporary earth cable. After correction place the original cable and remove loop cable.
- Clean star point with sand paper and put petroleum jelly.
- Measurement of earth resistance: 0.021 Ω

Sankar Mane 12/03/29

CONTRACTOR'S's representative

POWERGRID/CONSTITUENT'S representative

बिप्लब सरकार
Biplob Sarkar
Chief Manager (S/S & C)
Dy. General Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-II, कोलकाता
POWERGRID, ER-II, KOLKATA

MAINTENANCE PLAN

Annual Maintenance Contract of Communication Equipment supplied under " Establishment of Fibre Optic Communication System and stand alone equipments supplied under various Substation Packages in Eastern Region "

Annexure –IV

DC POWER SUPPLY EQUIPMENT MAINTENANCE FORMAT TO BE FILLED AT SITE

SITE INFORMATION

SITE NAME : Subhasgram PG

ADRESS : Subhasgram

TELEPHONE AND FAX NO

	DESCRIPTION	VALUE, IF ANY	REMARKS
1	Cleaning done		Yes
2	Power connection checked for lightening & Over heating		Yes
3	Control Connections are all tight	Ok	
4	All indications / Meters / Display on the panel are working	Ok	
5	Input frequency		
6	Rectifer LEDs	Ok	
7	Normal Operation on each module	Ok	
8	Float Voltage		
9	Checking for AC voltage L-L, L-M		
A	R – Y	412 V	
B	Y – B	410 V	
C	R – B	411 V	
10	Checking AC current		
11	Checking of DC Voltage	55.6 V	
12	Checking Of earthing	0.219	
13	Battery Voltage / resistance measurement done & enclosed	55.2 V	
14	Check functioning of hooter/ buzzer (Alarm Annunciation)	Ok	
16	Parameters checked in SCADA System	Ok	
17	Proper guidance given for normal day to day operation	Ok	

SUGGESSIONS FROM CONTRACTOR'S :

REMARKS FROM CUSTOMER :

CONSTITUENT / POWERGRID REPRESENTATIVE :

MAINTENANCE PLAN

Annual Maintenance Contract of Communication Equipment supplied under " Establishment of Fibre Optic Communication System and stand alone equipments supplied under various Substation Packages in Eastern Region "

Annexure –VI

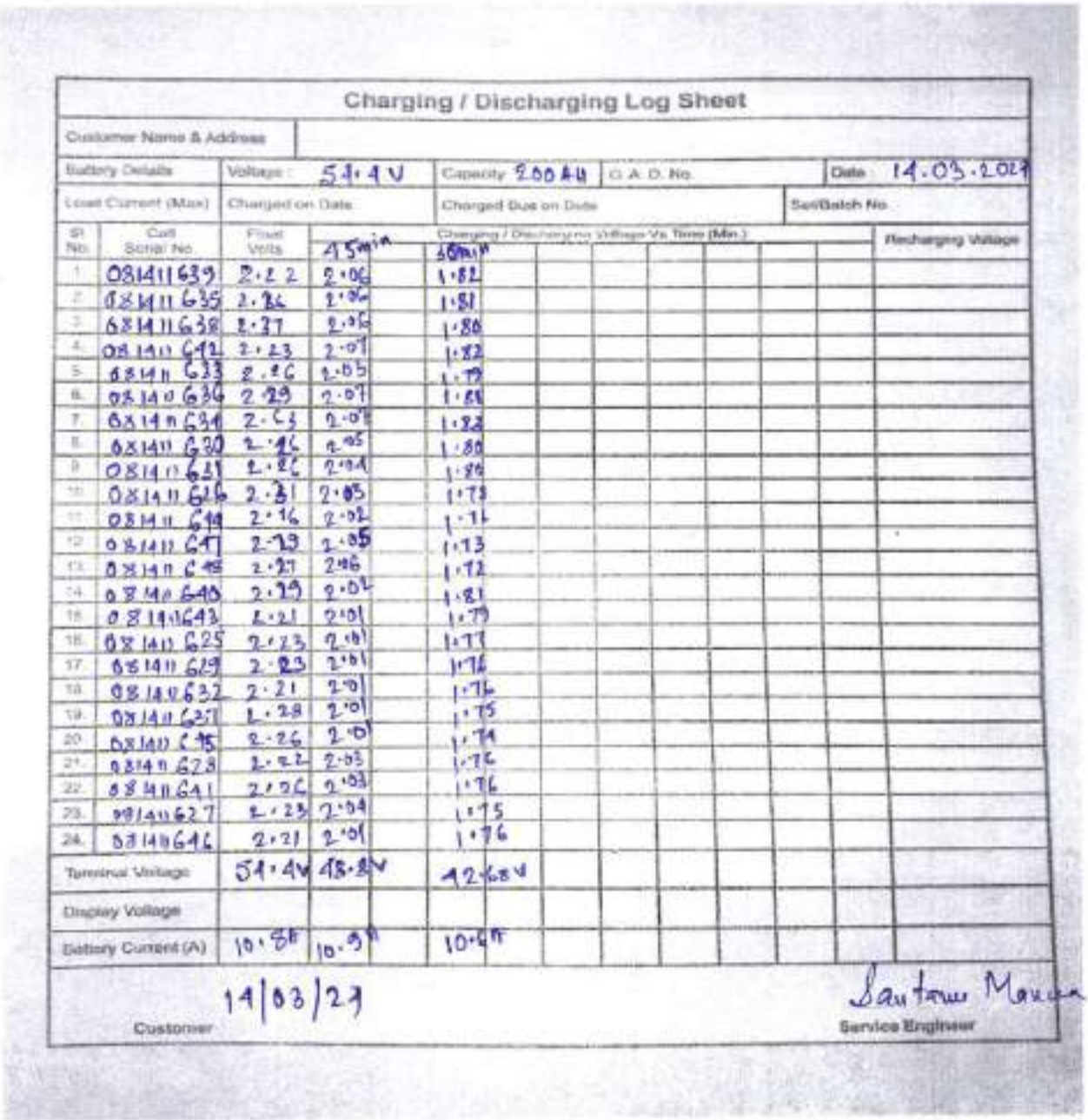
BATTERY BANK MAINTENANCE FORMAT TO BE FILLED AT SITE

SITE INFORMATION

SITE NAME : Subhasgram PG

ADRESS : Subhasgram, WB

TELEPHONE AND FAX NO _____



Charging / Discharging Log Sheet

Customer Name & Address

Battery Details | Voltage : 54.4 V | Capacity 200 AH | C.A.D. No. | Date 14.03.2027

Load Current (Max) | Charged on Date | Charged Bus on Date | Set/Batch No

Sl No.	Cell Serial No.	Float Volts	45 min	60 min							Recharging Voltage
			Charging / Discharging Voltage Vs Time (Min.)								
1	08141639	2.22	2.06	1.82							
2	08141635	2.26	2.06	1.81							
3	08141638	2.27	2.06	1.80							
4	08141632	2.23	2.07	1.82							
5	08141633	2.26	2.05	1.79							
6	08140636	2.29	2.07	1.81							
7	08141631	2.23	2.08	1.82							
8	08141630	2.26	2.05	1.80							
9	08141629	2.26	2.04	1.80							
10	08141626	2.31	2.05	1.79							
11	08141619	2.16	2.02	1.74							
12	08141647	2.23	2.05	1.73							
13	08141645	2.27	2.06	1.72							
14	08140640	2.29	2.02	1.81							
15	08141643	2.21	2.01	1.79							
16	08141625	2.23	2.01	1.77							
17	08141629	2.23	2.01	1.76							
18	08140632	2.21	2.01	1.76							
19	08141627	2.28	2.01	1.75							
20	08141645	2.26	2.01	1.79							
21	08141628	2.22	2.03	1.76							
22	08141641	2.26	2.03	1.76							
23	08141627	2.23	2.04	1.75							
24	08140646	2.21	2.01	1.76							
Terminal Voltage		54.4V	48.8V	42.68V							
Display Voltage											
Battery Current (A)		10.8A	10.9A	10.6A							

14/03/27

Customer

Service Engineer

(April,24 to June,24)

FORMAT TO BE FILLED DURING SEMI ANNUAL SITE VISIT

1. SITE INFORMATION:

Site name : 400/220 kV. Subhangram S/s.
Address : Subhangram.
Contact Person :
Telephone & FAX :

2. General Cleanliness of RTU Room: — Done/ Not done

RTU Room

- Check if RTU room is in good condition Or any physical damage to RTU (Over all)

  Good Condition

- Check if regular cleaning of RTU room is done.

  Done

- Check if AC/DC supply has been tapped for other uses.

  Not Tapped

- Is the room having any damp wall?

  No

- Check, whether rat droppings, lizard or other vermin in RTU /SIC panel and take corrective actions as required by DJSCPL.

  Not Required.

- **Action required by Constituent** Not Required.

EQUIPMENT — Done /Not done

- Check if cabinets are closed and key available with room in charge.
- Blowing & cleaning of RTU/SIC panel.

Action required by Contractor/Constituent

Not Required

3.0 TEMPERATURE MEASUREMENT:

Room temperature: 24°c

Action required by Contractor/Constituent

Not Required.

4.0 POWER SUPPLY MEASUREMENT

- Input DC Voltage at MCB 50.4 V
- Input DC Voltage at Cabinet TB 50.4 V

Signature of DJSCPL Representative

Signature of Constituent Representative.

- AC Voltage at the time of station visit (Primary source) Ph – N.....234.....V
- Charger Voltage.....50.5/47.7.....V

Action required by Contractor/Constituent

Not Required.

5.0 A) RTU/SIC CHECK — Done/ Not done

- **Visual check for LEDs on**

			Rack-1	Rack-2
i)	CPU	→		
ii)	SAU	→	AIU - 06 NOS	AIU - 03 NOS
iii)	AAU Cards	→	DIU - 09 NOS	DIU - 06 NOS
iv)	DAU Cards	→	CPU - 01 NOS	CPU - 01 NOS
v)	ACU Cards	→	PSU - 01 NOS	PSU - 01 NOS
vi)	DOU Cards	→		
vii)	PCU Cards	→		
viii)	Modems	→	MDS08 (Not in Service)	

Action required by Contractor/Constituent Not Required

B) Update & Maintained the record of cards, modem & transducers available in RTU panel.

All record of cards, modem & transducers are available in RTU Panel.

6.0 Loop Back check on modem for main/stand by path on which data communications is not healthy — Done/ Not done

i) Checking of Modem parameters.

ii) Checking of loop back test from Modem to Communication equipment termination point.

iii) Remote loop back test from modem to modem if any noise is observed.

iv) Check the modem to modem loop for communication link in which data is reporting to control centre, if any noise is observed to be intimated constuents.

Action required by Contractor/Constituent Not Required

Done/ Not done

7.0 A) Checking of Reporting Parameters: Check all the parameters by connecting laptop on local RTU and match the parameters with actual value at local site for any discrepancy.

i) Parameter: V/P/Q/F/CB Status/Isolator Status

ii) Name of the line/bus/Xer/Generator

iii) Value/status at RTU on console port

Signature of DJSCPL Representative

Signature of Constituent Representative.

iv) Actual Status at site

v) Is there any discrepancy between RTU value and field value?

If yes then reason for the same

Action taken by Contractor Not Required

Action to be taken by Constituent Not Required.

Separate sheet to be attached for all the above parameters

B) Checking of transducer output at SIC panel & CMR's output in control panel for any suspected/bad input values intimated by Control Centre. Change the Transducer/CMR if faulty.

Any Action required to be performed by Contractor/Constituent to correctness of telemetry value.

Not Required.

8.0 CABLE CHECK

Done/ Not done

- Check the cable termination at all Termination Point visually. Tighten if any loose wires in SIC panel.
- Visually Check cable route for any abnormality observed to intimate to constituent.
- Are cable trenches covered properly? yes.

Any Action required to be performed by Contractor/Constituent to correctness of above.

Not Required.

9.0 DOCUMENTS AND TEST INSTRUMENTS

Done/ Not done

- Check the documents at site 400/220 kV Sub... S/S. Documents Available/Not available

10.0 EARTHING CHECK

Done/ Not done

- Check if the earthings are connected properly with the ground point.
- If earthing is not not found proper then Clean the end points if required while removing the earth cable first put temporary earth cable. After correction place the original cable and remove loop cable.

Any recommendation if required to constituents to improve the earthing.

Not Required

Signature of DJSCPL Representative

Signature of Constituent Representative.

Note:

- DJSCPL would submit the 10 day advance schedule to visit so S/S & accordingly constituents/ POWERGRID also depute their representative for verifications / signing of the aforesaid activities.
- To work in control panel, the permission from respective Constituents with authorized representatives from constituents must be present alongwith DJSCPL.
- The field sheet to be submitted to respective SLDC & ULDC, Kolkata office for further reference & record.

Signature of DJSCPL Representative

Signature of Constituent Representative.

Annex-G

FO CABLE END TO END TEST USING OTDR (1550 nm)

Project: - "Annual Maintenance Contract towards OPGW Cable and Associated Hardware Accessories in ER-II under ULDC and Powertel."

Client: - Power Grid Corporation of India Limited			**Contractor: TEN DOT INFRA PVT. LTD.**		
Report No:				Date : 06-08-2024	
Sector :					
Line link : SUBHASGRAM TO NEW JEERAT					
Loc. Form: SUBHASGRAM			**Loc. To: NEW JEERAT**		

Type of OTDR	Testing Date	Wavelength
	06-08-2024	**1550nm**

Tube Color	Fibre No.	Fibre Color	Length (m)	Attenuation (dB)	
			Direction - A	Total Loss	Remarks
BLUE	1	Blue	LIVE	LIVE	
	2	Orange	LIVE	LIVE	
	3	Green	104.510	23.250	
	4	Brown	94.969	21.109	
	5	Gray	LIVE	LIVE	
	6	White	LIVE	LIVE	
	7	Red	32.372	6.415	
	8	Black	112.859	24.513	
	9	Yellow	107.337	22.374	
	10	Violet	93.646	19.834	
	11	Pink	85.935	18.496	
	12	Aqua	113.56	23.479	
ORANGE	13	Blue	98.196	25.291	
	14	Orange	113.64	23.521	
	15	Green	LIVE	LIVE	
	16	Brown	LIVE	LIVE	
	17	Gray	113.594	23.622	
	18	White	113.602	23.796	
	19	Red	113.618	23.226	
	20	Black	113.635	23.635	
	21	Yellow	104.339	24.574	
	22	Violet	113.512	23.307	
	23	Pink	113.627	23.369	
	24	Aqua	113.602	23.202	

OTDR Trace results attached for all Fiber (Yes/No)

Tested By
Ten Dot Infra Pvt. Ltd.

Approved By
POWER GRID

FO CABLE END TO END TEST USING OTDR (1550 nm)

Project: - "Annual Maintenance Contract towards OPGW Cable and Associated Hardware Accessories in ER-II under ULDC and Powertel."

Client: - Power Grid Corporation of India Limited		**Contractor: TEN DOT INFRA PVT. LTD.**	
Report No:			Date : 06-08-2024
Sector : ULDC			
Line link : SUBHASGRAM TO NEW JEERAT (Starlite)			
Loc. From: SUBHASGRAM		**Loc. To: JEERAT (Starlite)**	

Type of OTDR	Testing Date	Wavelength
	06-08-2024	**1550nm**

Tube Color	Fibre No.	Fibre Color	Length (Km)	Attenuation (dB)	Remarks
			Direction - A	Total Loss	
BLUE	1	Blue	LIVE	LIVE	
	2	Orange	LIVE	LIVE	
	3	Green	LIVE	LIVE	
	4	Brown	LIVE	LIVE	
	5	Gray	67.653	15.906	
	6	White	67.653	15.737	
	7	Red	67.645	15.363	
	8	Black	67.645	15.558	
	9	Yellow	67.628	15.691	
	10	Violet	67.645	16.474	
	11	Pink	67.653	16.183	
	12	Aqua	67.637	15.912	
ORANGE	13	Blue	67.637	15.741	
	14	Orange	67.65	16.064	
	15	Green	67.645	15.698	
	16	Brown	67.628	15.817	
	17	Gray	67.555	21.657	
	18	White	67.596	20.543	
	19	Red	67.645	15.609	
	20	Black	67.653	15.665	
	21	Yellow	67.653	15.928	
	22	Violet	67.653	15.523	
	23	Pink	67.628	15.639	
	24	Aqua	67.653	15.714	

OTDR Trace results attached for all Fiber (Yes/No)

Tested By
Ten Dot Infra Pvt. Ltd.

TEN DOT INFRA PVT. LTD.

Approved By
POWER GRID

FO CABLE END TO END TEST USING OTDR (1550 nm)

Project: - "Annual Maintenance Contract towards OPGW Cable and Associated Hardware Accessories in ER-II under ULDC and Powertel."

Client: - Power Grid Corporation of India Limited			**Contractor: TEN DOT INFRA PVT. LTD.**		
Report No:				Date : 06-08-2024	
Sector :					
Line link : SUBHASGRAM TO PGCIL JEERAT 3NO. TRY & PGCIL JEERAT 4NO. TRY					
Loc. Form: SUBHASGRAM			**Loc. To: PGCIL JEERAT**		
Type of OTDR			Testing Date	Wavelength	
			05-08-2024	**1550nm**	

Tube Color	Fibre No.	Fibre Color	Length (m)	Attenuation (dB)	Remarks
			Direction - A	Total Loss	
Loc. Form: SUBHASGRAM		**Loc. To: PGCIL JEERAT 3NO. TRY**			
BLUE	1	Blue	LIVE	LIVE	
	2	Orange	35868.90	8.735	
	3	Green	LIVE	LIVE	
	4	Brown	LIVE	LIVE	
	5	Gray	35868.90	10.444	
	6	White	LIVE	LIVE	
	7	Red	LIVE	LIVE	
	8	Black	35860.73	11.932	
	9	Yellow	LIVE	LIVE	
	10	Violet	35860.73	9.839	
	11	Pink	LIVE	LIVE	
	12	Aqua	LIVE	LIVE	
Loc. Form: SUBHASGRAM		**Loc. To: PGCIL JEERAT 4NO. TRY**			
ORANGE	1	Blue	69352.53	19.389	
	2	Orange	69360.70	20.537	
	3	Green	69319.86	21.431	
	4	Brown	LIVE	LIVE	
	5	Gray	LIVE	LIVE	
	6	White	69336.20	21.303	
	7	Red	LIVE	LIVE	
	8	Black	LIVE	LIVE	
	9	Yellow	LIVE	LIVE	
	10	Violet	LIVE	LIVE	
	11	Pink	LIVE	LIVE	
	12	Aqua	LIVE	LIVE	

OTDR Trace results attached for all Fiber (Yes/No)

Tested By
Ten Dot Infra Pvt. Ltd.

Approved By
POWER GRID

Yokogawa India Limited

Regd. Office :
Plot No. 96, 3rd Cross
Electronic City Complex, Hosur Road
Bangalore – 560 100. India

Tel : 0091-80-41596000
Fax : 0091-80-28528656

YOKOGAWA

To whom so ever it may concern

LETTER OF CALIBRATION – AQ1000-ASC

Ref.No: 19/11/MLK/AQ1000/CAL certi/051
Date: 09.01.2024

We, M/s. Yokogawa India Limited (herein after referred as Yokogawa), a company duly organized and existing under the laws of India, having its registered office at Plot No.96, Electronics city complex, Hosur Road, Bangalore – 560100, India do hereby confirm that we are the manufacturer of Optical Time Domain Reflectometer (OTDR).

We, Yokogawa, do hereby confirm that following serial no. of OTDR (AQ1000-ASC) is calibrated in the month of JAN 2024 and the calibration of this instrument is valid till 08 JAN 2025.

AQ 1000 OTDR, S. No. : C3YH29018F

For Yokogawa India Limited

KUMARASWAMY.M.L.
Deputy General Manager
Head – Optical Communication Products BHQ,
Mobile : +91 9448041968
E Mail :ML.Kumaraswamy@in.yokogawa.com

Annex-H

AMC – SITE VISIT MOM

s

Name of the Site: SUBHASH GRAM POWERGRID.

Customer: POWERGRID.

Substation: SUBHASHGRAM

Project: WAMS System under Unified Real Time Dynamic State Measurement (URTDSM) Project – Package- I

M/s. GE T&D India Limited,	Site :- SUBHASHGRAM
Gaurab Das.	अनुराग नायक
Name: Gaurab Das (ENG)	Name : Anurag Nayek.
Dated :- 20/03/24	

AMC – SITE VISIT MOM

M/S GE representative **GAURAB DAS** reached SUBHASHGRAM POWERGRID Substation on 20/03/24 and carried out the following work.

Verification of Supplied Material

Sr.no	Equipment Description	Installed Quantity
1	PMU	02
2	GPS Receiver	02
3	Ethernet switch -4 Port	01
4	Antenna Dome	02

Activity Carried Out: -

Sr.no	Activity	Yes	No	Remark
1	CT/PI/DI connection checked	YES		
2	All Measurement Values of PMU verified from Control Center	YES		
3	DI status verified from Control Centre	YES		
4	Connectors of Dome & Receiver side tightened	YES		

Additional Activity:

Equipment Operational status after Troubleshooting.

Sr.no	Equipment Description	Status	Alarm Status
1	PMU	Working fine	No Alarm
2	GPS Receiver **Firmware Version-08A06**	Working Fine	No Alarm
3	Ethernet switch -4 Port	Working Fine	No Alarm
4	Antenna Dome	Working Fine	No Alarm

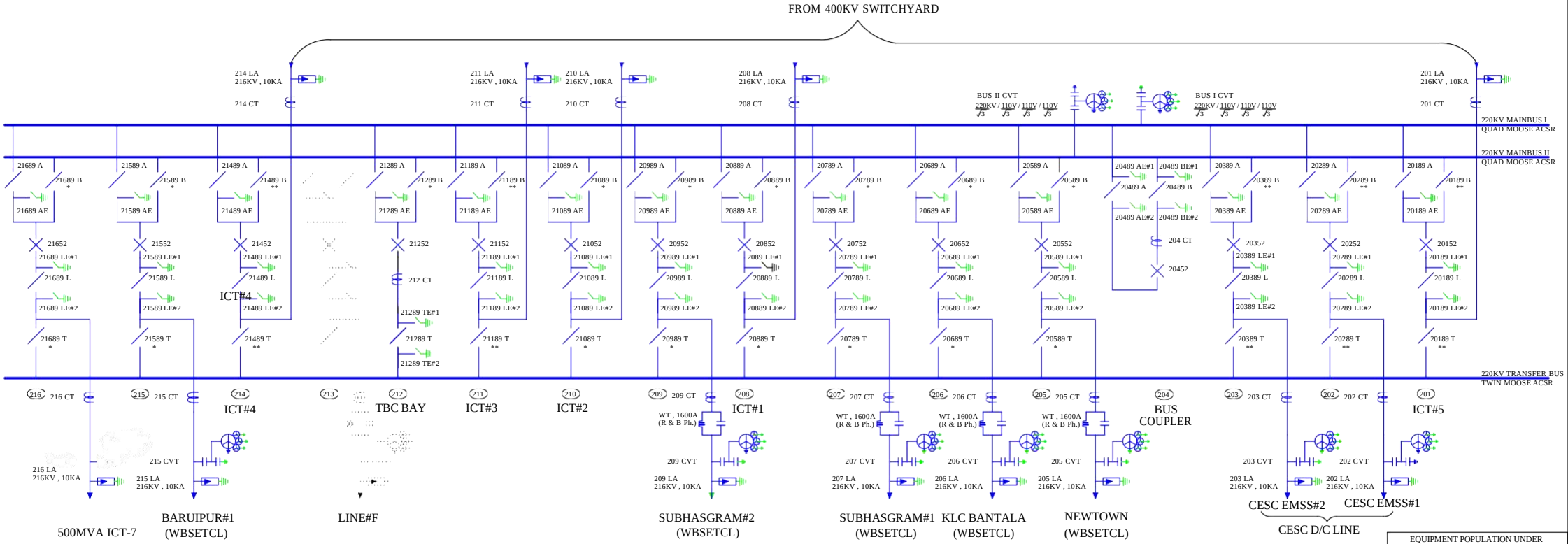
M/s. GE T&D India Limited,	Site :- SUBHASHGRAM
Gaurab Das.	अनुराग नायक
Name: Gaurab Das (ENG)	Name : Anurag Nayek.
Dated :- 20/03/24	

Annex-I

POWER GRID CORPORATION OF INDIA LTD.

400/220KV SUBHASGRAM SUBSTATION

SINGLE LINE DIAGRAM FOR 220KV SWITCHYARD



———	PRESENT
. . . . .	FUTURE
209	BAY NUMBER

Note :- Bay Nos. - 201, 204 , 205 , 206 , 207 , 208 , 209 , 210, 212, 215 & 216 UNDER O&M
Bay Nos. - 202 , 203 , 211 & 214 UNDER CESC CONSULTANCY
Bay Nos. -213 is Future Bay

EQUIPMENT POPULATION UNDER O&M AND CONSTRUCTION			
SYMBOL	DESCRIPTION		QTY.
	CVT	4400 pF	30
	CB	1600A	14
		2500A	1
	D.B. ISO. WITH 1 E/S	1600A	14
	D.B. ISO. WITH 2 E/S	1600A	14
		2500A	2
*	TANDEM ISO.	1600A	17
**	TANDEM ISO. ELECTRICALLY GANGED	1600A	10
	C.T.	1600A	45
	SURGE ARRESTER	216 KV 10 KA	39
	WAVE TRAP	1600A , 0.5 mH	8

POWER GRID CORPORATION OF INDIA LTD.

400/220KV SUBHASGRAM SUBSTATION

SINGLE LINE DIAGRAM FOR 400KV SWITCHYARD

———	PRESENT
(401)	BAY NUMBER

EQUIPMENT POPULATION UNDER O&M AND CONSTRUCTION			
SYMBOL	DESCRIPTION		QTY.
	AUTO TRF.	315 MVA 500 MVA	4 1
	REACTOR	50 MVAR 125MVAR	1 1
	CB WITH C.R.	2000A (3 PH)	6
	CB WITHOUT C.R.	2000A (3 PH)	13
	D.B. ISO. WITH 1 E/S	2000A	47
	D.B. ISO. WITH 2 E/S	2000A	2
	C.T.	2000A 3000A	42 9
	SURGE ARRESTER	336 KV	36
	WAVE TRAP	2000A , 1.0 mH	4
	CVT	8800 & 4400 pF	24

Note :- Bay Nos. - 401 to 406 AND 415 UNDER O&M
Bay Nos. - 408 , 409 , 411 , 412 , 413 , 414 , 416 & 417 UNDER CESC CONSULTANCY
Bay Nos. - 407 & 410 UNDER CONSTRUCTION (ERSS-XVIII) & 418 UNDER CONSTRUCTION (ERSS-XX)

Status/Compliance of Observations during Communication audit at 400KV Subhasgram Substation (POWERGRID)

S/n	Observation	Status/Compliance
1	The display of auxiliary power data at the charger/DCPS panel is not visible for monitoring.	Matter is being taken up with the AMC vendor for resolution of the issue.
2	Approach cable is common for Communication, protection & Commercial application.	As per present design, single approach cable is connected with the OPGW at Gantry upto FODP at control room /Communication room as FODP is the common point for distributing the fibers for communication, protection and commercial applications.
3	Non-availability of third-party Cyber Security audit reports.	SDH at Subhasgram Substation is a part of communication system of central sector of Eastern Region and reporting to NMS and UNMS at Kolkata. Cyber security of UNMS System which is the centralized system for all the communication equipments including Subhasgram was carried out on 08.07.2024. Audit report is traceable.
4	Communication room and Control room are not separated.	In Subhasgram Substation, Communication panels are placed inside Control room which is the most secured placed in the substation as per original plan during substation construction in the year 2005.
5	Preventive maintenance of Auxiliary power is not done at regular intervals.	There are 02 nos. DCPS System at Subhasgram S/s for ULDC network. 1. Delta Make DCPS system is newly supplied and commissioned on May-2024. 2. Eltek make DCPS System: Maintenance is being done regularly on semi-annual basis as per terms of AMC. Last 02 maintenance carried out on May-2024 and December-2023. Report is traceable.
6	OTDR Results of OPGW Cable for Jeerat is on higher side (0.26 dB/Km) vs prescribed limit of 0.21 dB/Km.	OTDR test was carried out on 06.08.2024 for Jeerat line where in one fiber loss seem more than 0.26 db/Km. However, OTDR test reconducted on 20.12.2024 and in the testing it is found that losses are within 0.21 db/Km. Reports is traceable.

30/12/2024

संतनु रुद्रपाल
Santanu Rudrapal
मुख्य प्रबंधक (य. एल. डी. सी.)
Chief Manager (ULDC)
पावरग्रिड, पूर्वी क्षेत्र-II, कोलकाता
POWERGRID, ER-II, KOLKATA

Annexure-B.2.7

Minutes of the 7th MPLS Joint Committee Meeting held in virtual mode on 20.12.2024

The 7th Meeting of Joint Committee (JC) constituted by NPC was held on 20.12.2024 through virtual mode to discuss and recommend the "Introduction of MPLS technology in ISTS Communication System".

The list of participants is attached at ***Annexure-I.***

Sr. General Manager (CTU) welcomed all the participants at the meeting and proceeded with the agenda items. The summary of discussions is mentioned below:

CTU explained briefly about the agenda points for the 7th meeting to the JC as under:

- Proposed recommendation for migration methodology for new/upcoming ISTS nodes into MPLS TP/IP.
- Discussion on the Draft Report circulated by CTU.

Presentation shared by CTU is attached at ***Annexure-II***.

CTU explained that as proposed in the draft report MPLS TP/IP network can be integrated with legacy SDH network with hybrid or any intermediate interface supporting SDH technology. CTU proposed a MPLS TP isolated network connecting all the control centres that runs on separate fiber pairs alongside with the existing SDH network for connecting the backup channels initially. Every upcoming node to be connected to the ISTS network shall have to connect the main channel to the SDH ring and backup channel with the MPLS TP ring. The traffic migration on regional basis from SDH to MPLS shall be done gradually by shifting the main channels of the connected nodes to the MPLS TP ring as and when they are required to be replaced.

CTU further gave a presentation for the various scenarios that may arise when a new ISTS node with either MPLS TP or MPLS IP is to be connected with the existing network. The scenarios are mentioned as under:

New ISTS Node type	Existing Node/CC for integration	Comment
MPLS IP	SDH	New MPLS to legacy network link
MPLS TP	SDH	New MPLS to legacy network link
MPLS IP	MPLS TP	New MPLS to MPLS network link
MPLS TP	MPLS IP	New MPLS to MPLS network link
MPLS IP	Control Centre (CC)	Radial connectivity
MPLS TP	Control Centre (CC)	Radial connectivity

Deliberation

1. TANTRANSCO stated that the methodology shown by CTU is not 1+1 protection configuration and it is independent parallel communication instead. To bring MPLS ring in function, we shall require 4 fibres because within MPLS we must enable 1+1 protection channel. CTU replied that the ISTS communication network is already designed in 2+2 channel philosophy i.e. all nodes are reporting to their control centres 2 main and 2 backup channels. In view of this the further redundancy shall not be required.

2. ERLDC expressed their concerns regarding cyber security requirement with NCIIPC consent. CTU explained that security for both MPLS TP and MPLS IP shall be ensured as per CEA Cyber Security Guidelines 2021. CTU also explained that equipment like MPLS TP and MPLS IP are communication equipment and Cyber Security regulations for communication equipment already exist. Moreover, draft cyber security regulations are also shared by CEA which shall be complied by the MPLS IP/TP vendors.

   CTU requested CEA to explain their Cyber Security regulations. CEA stated that their Cyber Security regulations draft is already published. At present the draft has stakeholders comments which are being deliberated and after deliberation the draft shall be notified to the JC. CEA also stated that the roles are very clearly defined in the draft and there is no equipment wise differentiation, and it is technology agnostic. CTU further stated that whatever equipment shall be used it must comply the CEA cyber security guidelines.

   CEA asked CTU/implementing agency to ensure that OEMs have their equipment complied with certification specified in CEA cyber security regulations. In case the OEMs are not able to comply the requirement fully, they may approach the CEA Cyber Security division.

   TANTRANSCO also stated that various provisions are available for the OEMs in IEC 62443 standard.

3. CSPTCL raised their concern for the lack of competition for MPLS tender bidding. CEA asked CSPTCL to write to PCD division or to R&D division of CEA as they are the nodal agencies responsible to ensure that there is sufficient competition in bidding. CEA also asked CSPTCL to make a representation and mail the specifications of tenders and their participation to CEA and seek necessary directions.

4. POWERGRID stated that at present they have only 6 useable fibres for ULDC purposes and only 2 of them are spare for contingency situations. So the formation of backup MPLS ring with separate fibers may not be feasible. CEA stated that in the ongoing committee of the fiber sharing policy provision is already there for the spare fiber for the purpose of technology migration. CTU requested CEA to assign 6 fibres as spare for MPLS in their policy and stated that there is no need to approach CERC as this is for technology upgradation work. CTU explained that the number of fibres is now increased to 48 fiber against present 24 fiber requirement and same is also

communicated by CEA to all the utilities by letter dated 22.11.2024. Therefore, in the upcoming lines there shall be no issue for sparing additional fibers for MPLS technology migration.

5. NRLDC asked for detailed explanation regarding migration from SDH to MPLS e.g. how many nodes to be covered at first, where will the implementation happen and how the data will transfer from SDH to MPLS after the implementation of MPLS ring. NRLDC also mentioned that their system is made up of small regional links and even in those regional links they have small SLDCs connected, they have a cluster of networks in contrast to the singular ring network shown by CTU. CEA also added that the present methodology shown by CTU is very broad and asked for a node specific migration plan.

   CTU clarified that the methodology presented is just a representation of migration on a broader level for the discussion of JC and their suggestions. Planning at node level shall require significant time. CTU also requested Grid India and POWERGRID to provide their comments/views on proposed migration plan to CTU. CEA suggested that proposed migration shall be done in phased manner starting from a smaller/regional network.

6. NRLDC stated that a seamless network is not possible when combining both MPLS TP and IP and enquired whether single technology can be selected to have a seamless network. CTU agreed with NRLDC and added concerns regarding implementing a mixed MPLS TP and IP network with problems like extraction of MPLS TP/IP channels from the main payload while going from MPLS TP to IP and vice-versa.

   CEA requested KSEBL and TANTRANSCO to share their inputs in respect of the migration with MPLS as they already have gone ahead with state specific MPLS networks/tenders.

   KSEBL stated that MPLS TP and MPLS IP has already been implemented in some European countries. KSEBL further stated that both the technology has their limitations and in some cases even for TP-TP and IP-IP ethernet shall be needed for cross vendor compatibility. KSEBL gave their view, that MPLS TP and MPLS IP both technologies are suitable provided it satisfies the functional requirements of the users. KSEBL suggested in a broader sense that we should not restrict our self with any specific technology, we should be open to both MPLS TP and MPLS IP and wherever there are technical constraints based on the issues we can give some preference to some technology otherwise it should be open to both IP and TP.

   ERLDC shared their concerns regarding having a mix of MPLS TP and MPLS IP and stated that how conversion at every node will be done within ISTS network. With a test scenario CTU explained, if the main ring is MPLS TP and the new node has IP technology, then the new node implanter must bear the cost of an additional node to convert its IP payload to TP payload and then connect that TP node to the main TP ring.

Same methodology can be applied if the main network happens to be MPLS IP and the new ISTS node is TP.

CTU further stated that the draft report prepared by them suggests an information highway on MPLS TP as it is more deterministic compared to MPLS IP, however the new nodes on IP/TP can be connected to this highway suitably. CTU requested the JC members to give their suggestions in this regard.

7. CEA NPC suggested that the report shall be equipped with broad technical specifications for the proposed MPLS system. CTU replied that MPLS system on the whole shall be considered for migration, however the broad specifications shall constitute and conform to the functional requirements for the applications being run on the legacy network.

Conclusion:

1. POWERGRID and Grid India to provide their comments/views/suggestions as discussed.
2. In the next meeting report shall be reviewed in view of the above comments/views/suggestions.

Annexure-I

List of Participants

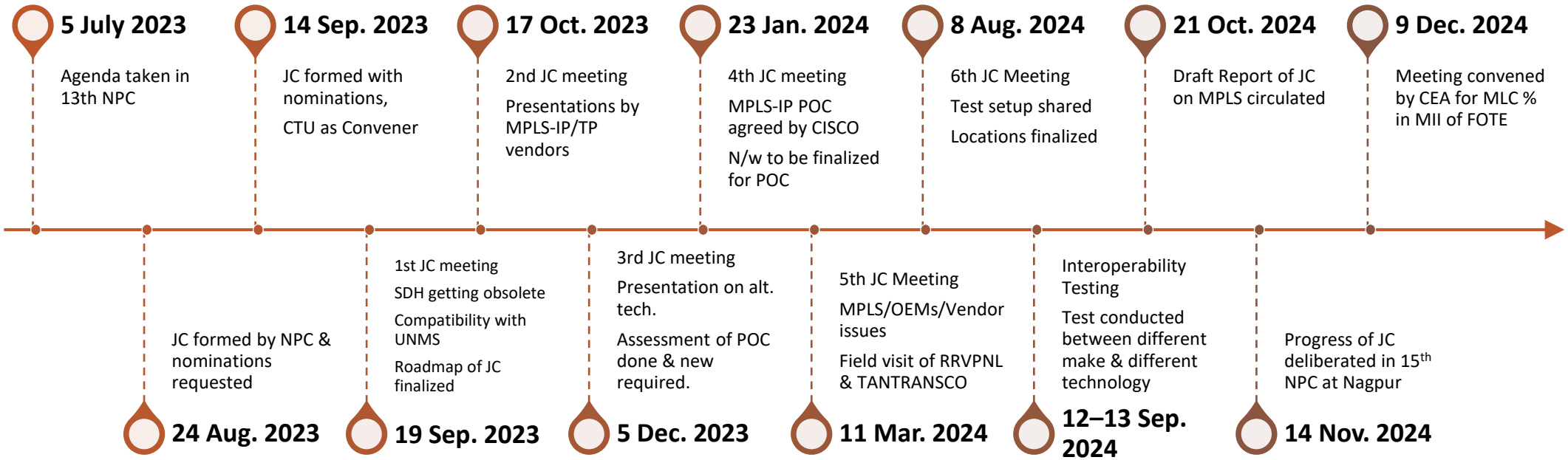
Sr. No.	Name	Designation
CEA NPC		
1	Sh. Satyendra Kumar Dotan	Director
CEA PCD		
2	Ms. Priyam Srivastava	Dy Director
NRLDC		
3	Sh. Ankur Gulati	DGM
ERLDC		
4	Sh. L Muralikrishna	DGM
KSEBL		
5	Sh. K P Rafeeque	
TANTRANSCO		
6	Sh. K N Srinivasan	EE
POWERGRID		
7	Sh. Gaurav Awal	Ch Manager
WBSETCL		
8	Sh. Biswajit Madhu	Add. CE
CSPTCL		
9	Sh. Jitendra Jha	
CTUIL		
10	Sh. H S Kaushal	Sr GM
11	Sh. S K Gupta	Sr DGM
12	Sh. T P Verma	DGM
13	Ms.Kalpana Shukla	DGM
14	Sh. Kaushal Suman	Ch Manager
15	Sh. Prakhar Pathak	Engineer
16	Sh. Anshul Mahawar	Engineer (T)

Annexure-II

Agenda for 7th JC Meeting

20.12.2024

Chronology


5 July 2023
Agenda taken in 13th NPC
24 Aug. 2023
JC formed by NPC & nominations requested
14 Sep. 2023
JC formed with nominations,
CTU as Convener
19 Sep. 2023
1st JC meeting
SDH getting obsolete
Compatibility with UNMS
Roadmap of JC finalized
17 Oct. 2023
2nd JC meeting
Presentations by MPLS-IP/TP vendors
5 Dec. 2023
3rd JC meeting
Presentation on alt. tech.
Assessment of POC done & new required.
23 Jan. 2024
4th JC meeting
MPLS-IP POC agreed by CISCO
N/w to be finalized for POC
11 Mar. 2024
5th JC Meeting
MPLS/OEMs/Vendor issues
Field visit of RRVPNL & TANTRANSCO
8 Aug. 2024
6th JC Meeting
Test setup shared
Locations finalized
12–13 Sep. 2024
Interoperability Testing
Test conducted between different make & different technology
21 Oct. 2024
Draft Report of JC on MPLS circulated
14 Nov. 2024
Progress of JC deliberated in 15th NPC at Nagpur
9 Dec. 2024
Meeting convened by CEA for MLC % in MII of FOTE

Grid Application	Cross OEMs (OEMs of same technology IP or TP) On MPLS	Cross Technology (TP & IP)	Same OEM & Same Technology IP/TP On MPLS
SCADA	✓	On ethernet only ✓	✓
VOIP	✓	On ethernet only ✓	✓
AMR	✓	On ethernet only ✓	✓
*Tele Protection (Distance over Ethernet)	✓	✓	✓
Tele Protection (Distance over E1)	✗	✗	✓
Tele Protection (Differential C37.94)	✗	✗	✓ Tested only for MPLS TP

*This was tested for DTPC with TP (GE)/(BELDEN) to TP (HITACHI). Remaining test were done by pinging on Laptop

Proposed Recommendations (under Draft Report)

MPLS TP/IP network can be integrated with legacy SDH networks with hybrid or any intermediate interfaces supporting SDH technology.

By adopting a hybrid approach, the transition to packet based MPLS technology can be achieved without disrupting existing services while maintaining compatibility with existing infrastructure.

The integration of MPLS with SDH legacy system should also provide full feature support for adding and dropping SDH tributaries (STM, E1, Ethernet service) on the node.

Focus on OEM Collaboration to resolve the remaining interoperability issues

Proposed Recommendations (under Draft Report)

Training and Skill Gap	Personnel Training, Knowledge Transfer, Training and Expertise
OAM Integration	UNMS shall be used to integrate the legacy SDH and MPLS TP/IP environments efficiently.
Redundancy Measures	New channels shall be configured in the legacy network to mitigate the disruption in channel redundancies while migrating from SDH to MPLS environment.
Repeaters optimization	An optimization for repeaters is also required to collocate the repeaterless distances of MPLS environment with the legacy network.
Security	Protect both MPLS-TP and MPLS-IP traffic in line with the CEA cyber security Guidelines 2021

For existing ISTS Nodes

Proposed Recommendations (under Draft Report)

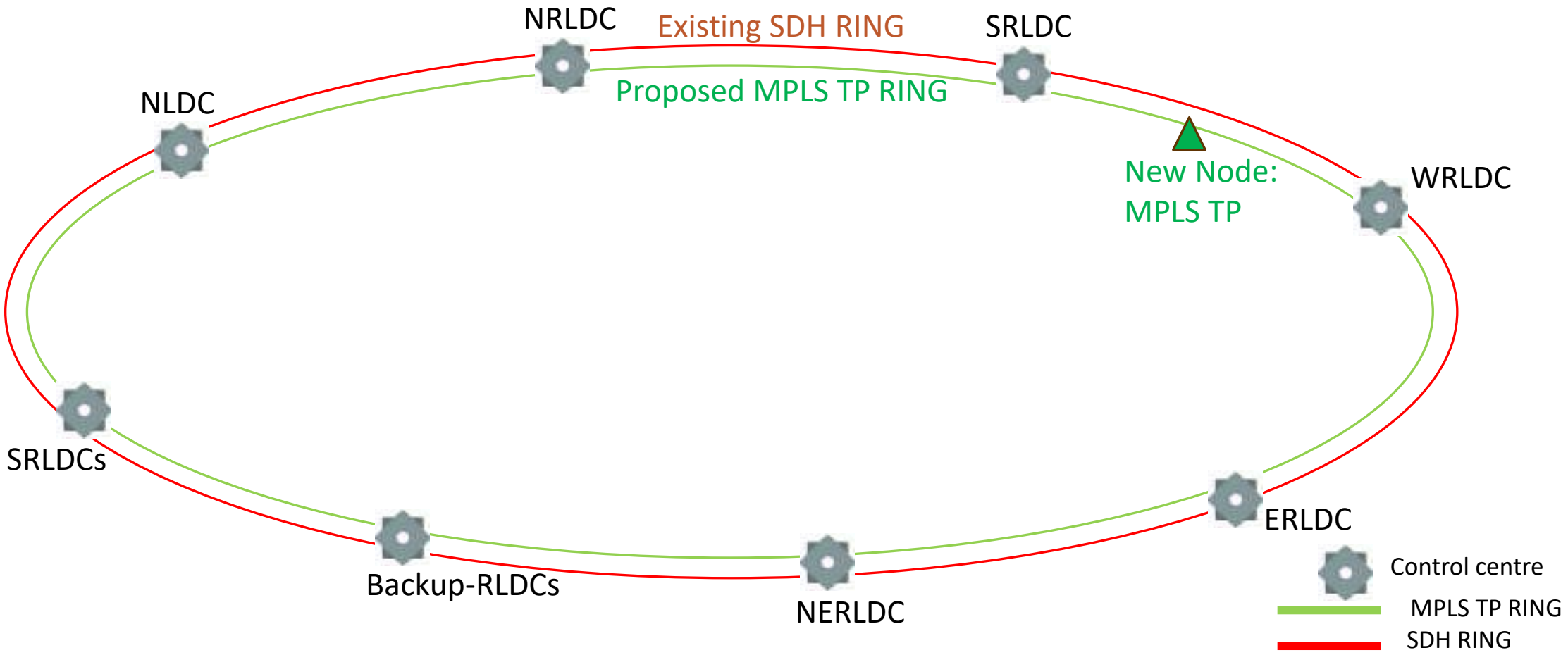
- It is proposed to have a connectivity of all the Control Centers in ring topology with the more deterministic MPLS TP network alongwith the existing SDH network.
- Link budget requirements to route the existing data efficiently.
- MPLS equipment deployment:
  - To substitute the SDH equipment if it has lived the depreciated life (eg 7 years).
  - At SDH nodes which are not to be replaced, for add/drop of channels MPLS TP equipment may be required.
  - At all new nodes.

For upcoming ISTS nodes

Proposed Recommendations (under Draft Report)

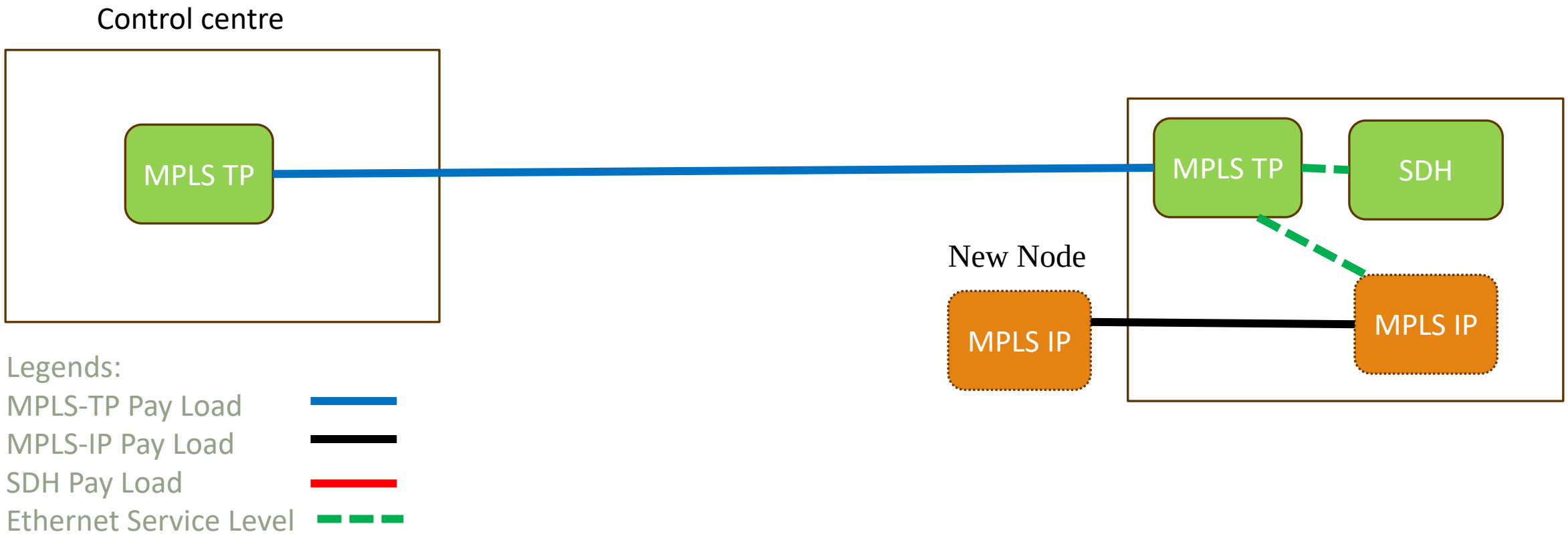
- Besides nodes covered above, all the existing and new SDH nodes is proposed to be reviewed and engineered for either MPLS IP or MPLS TP equipment.
- New node with MPLS IP getting terminated to an intermediate MPLS TP node to reach the control center. In this case MPLS IP traffic shall be fed in the MPLS TP node via ethernet and further transmitted.
- New node with MPLS IP getting terminated directly to control center. In this case an MPLS IP equipment needs to be provided at the control center.

Migration Methodology for Existing ISTS nodes



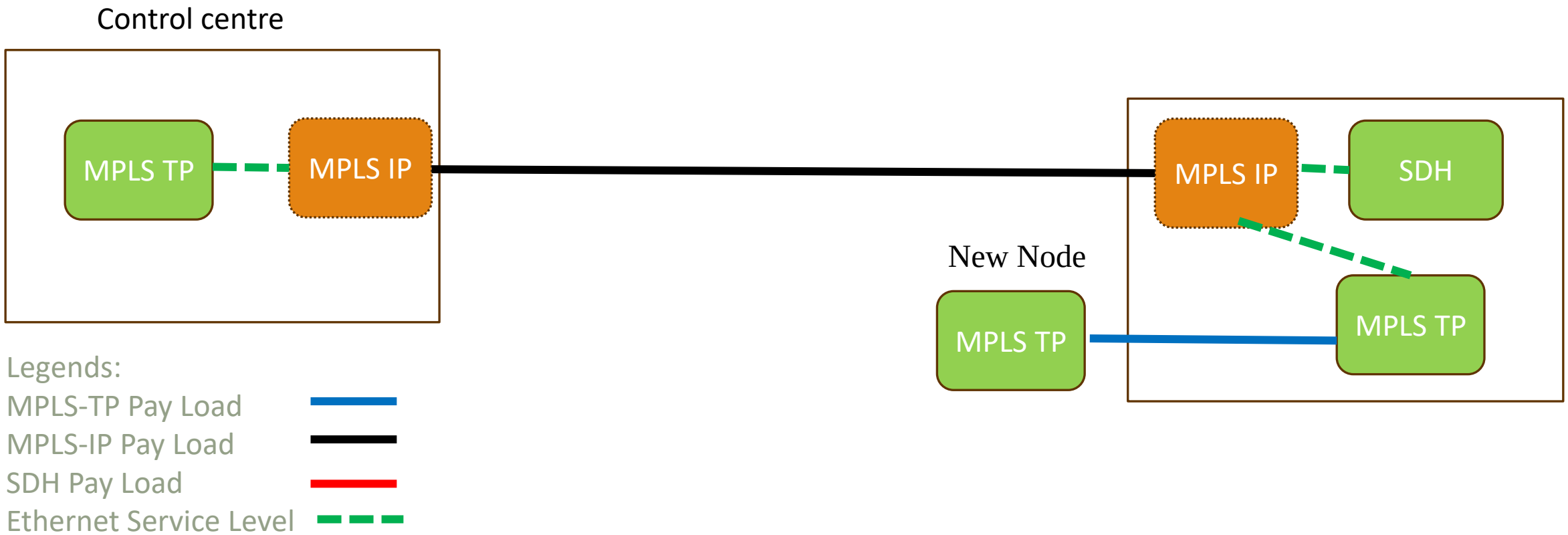
Migration Methodology for new/upcoming ISTS nodes

New node with MPLS IP getting terminated to an intermediate SDH node to reach the control centre



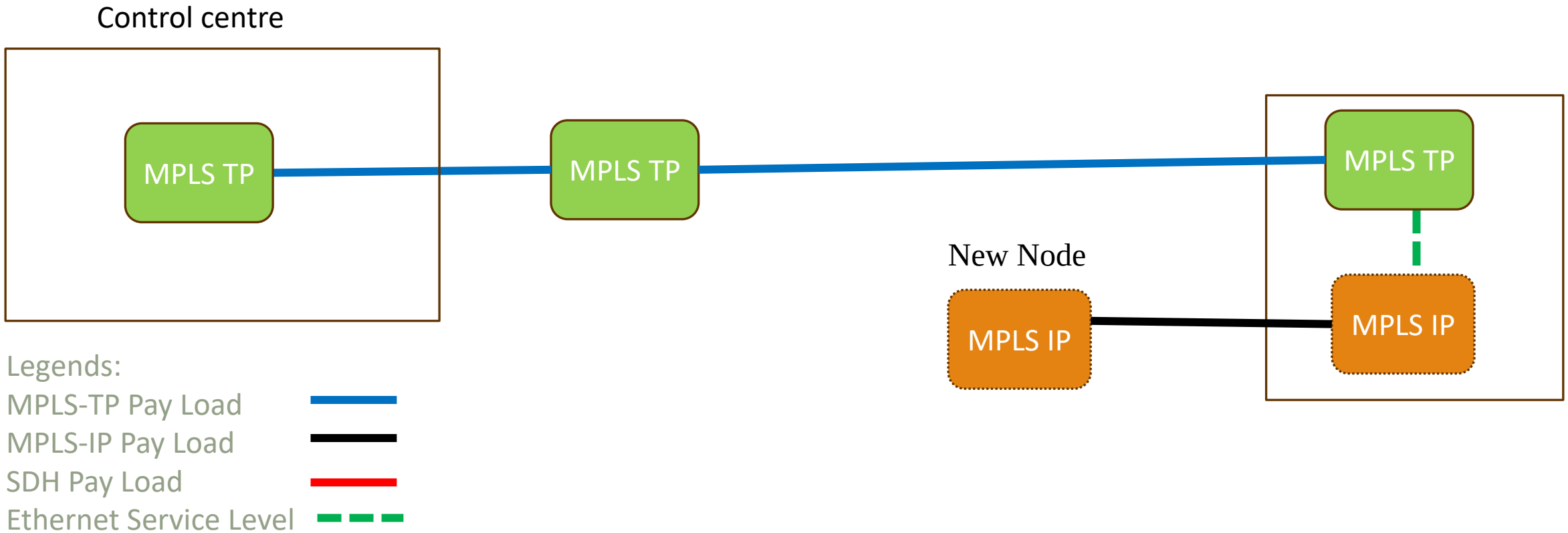
Migration Methodology for new/upcoming ISTS nodes

New node with MPLS TP getting terminated to an intermediate SDH node to reach the control centre



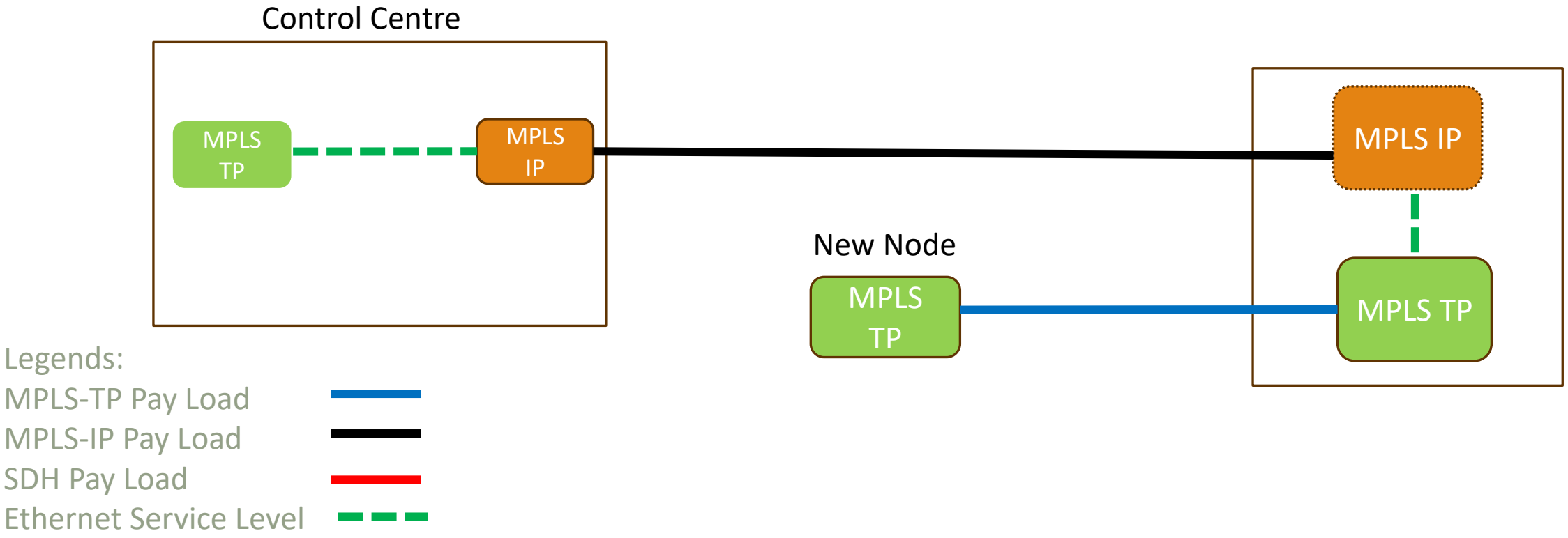
Migration Methodology for new/upcoming ISTS nodes

New node with MPLS IP getting terminated to an intermediate MPLS TP node to reach the control centre



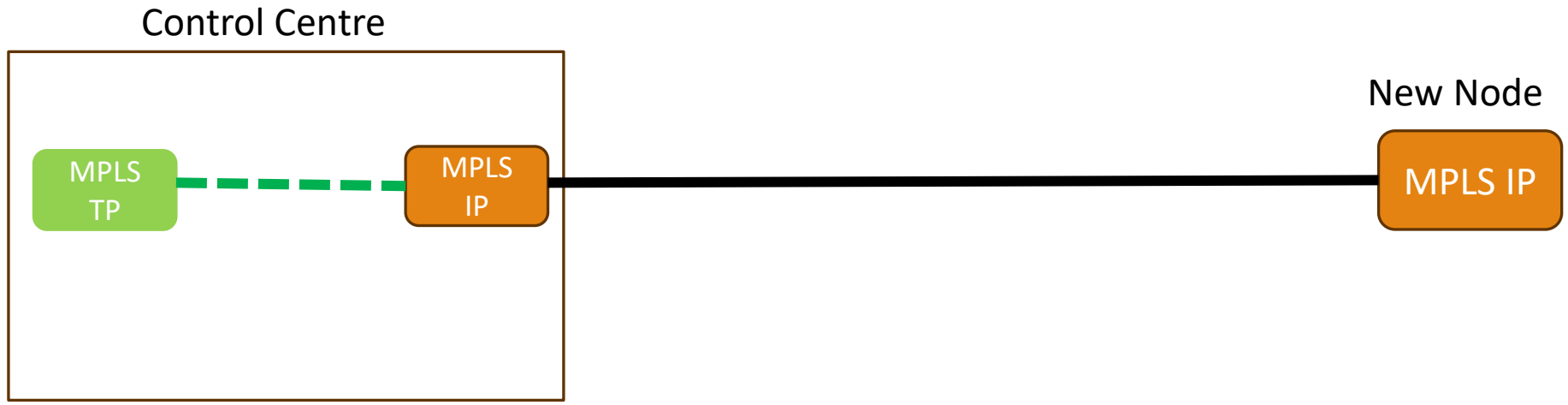
Migration Methodology for new/upcoming ISTS nodes

New node with MPLS TP getting terminated to an intermediate MPLS IP node to reach the control centre



Migration Methodology for new/upcoming ISTS nodes

New node with MPLS IP getting terminated radially to control centre



Legends:

MPLS-TP Pay Load

MPLS-IP Pay Load

SDH Pay Load

Ethernet Service Level

Migration Methodology for new/upcoming ISTS nodes

New node with MPLS TP getting terminated radially to control centre

Legends:

MPLS-TP Pay Load

MPLS-IP Pay Load

SDH Pay Load

Ethernet Service Level

Deliberation in 15th NPC at Nagpur held on 14.11.2024

OEM/Vendor shall plan based on the required market volume to increase the Local Content.

CEA shall also take up with MoP to optimize the LC/MII year on year basis to make a wider participation of OEMs.

Thank you

Annex B.2.12

Outlook

Re: Redundant FOTE at Teesta-V for AGC communication

From teesta-v-phem . <teesta-v-phem@nhpc.nic.in>
Date Sat 11/30/2024 5:33 AM
To Santanu Rudrapal {सान्तनू रूद्रपाल} <santanu.rudrapal@powergrid.in>
Cc ERPC TeST <erpcscada@gmail.com>; Siddhartha Jyoti Lahiri {एस.जे. लाहिड़ी} <sjlahiri@powergrid.in>; Bedashruti Das {वेदश्रुति दास} <bedashrutidas@powergrid.in>

Sir,
It is intimated that Teesta V Power Station is under shutdown and expected to be operational in January 2026. In this situation installation of redundant FOTE is not possible.
This is for your kind information please.

Thanks and Regards

Sanjay Kumar Sharma, MIE

Senior Manager (E)

Teesta V Power Station

East Sikkim-737134

Mob:9800016796

Email:sanjaynhpc@nhpc.nic.in

:teesta-v-phem@nhpc.nic.in

nhpc masthead as navratna

> **From:** Santanu <santanu.rudrapal@powergrid.in>
> **To:** teesta-v-phem <teesta-v-phem@nhpc.nic.in>
> **Cc:** ERPC <erpcscada@gmail.com>; Siddhartha <sjlahiri@powergrid.in>; Bedashruti <bedashrutidas@powergrid.in>
> **Date:** Friday, 29 November 2024 8:30 PM IST
> **Subject:** Re: Redundant FOTE at Teesta-V for AGC communication
>
> Dear Sir,
> Kindly confirm regarding readiness of Teesta-V station so that redundant FOTE may be installed.

सादर धन्यवाद/ Best Regards
सांतनु रुद्रपाल / Santanu Rudrapal
मुख्य प्रबंधक / Chief Manager
एकीकृत भार प्रेषण और संचार / Unified Load Despatch & Communication (ULDC)
पूर्वी क्षेत्र-II, क्षेत्रीय मुख्यालय, कोलकाता/ERTS-II, RHQ-Kolkata,
पावर ग्रिड कारपोरेशन ऑफ इंडिया लिमिटेड/Power Grid Corporation of India Ltd.
Address: CF-17, Action Area-1C, New Town, Kolkata-700156 (WB)
Mobile: 9434735848
Email: santanu.rudrapal@powergrid.in

From: Santanu Rudrapal {सान्तनू रूद्रपाल}
Sent: Tuesday, September 10, 2024 8:43 PM
To: teesta-v-phem@nhpc.nic.in <teesta-v-phem@nhpc.nic.in>
Cc: L Murali Krishna (एल मुरली कृष्णा) <lmuralikrishna@grid-india.in>; ERPC TeST <erpcscada@gmail.com>; S J Lahiri {एस.जे. लाहिड़ी} <sjlahiri@powergrid.in>; Biplob Sarkar {बिपलब सरकार} <biplob@powergrid.in>
Subject: Redundant FOTE at Teesta-V for AGC communication

Dear Sir,
Implementation of redundant FOTE at various power plants in ER for reliable AGC communication with NLDC by POWERGRID was approved in 18th NCT. Copy of approval attached for your reference. Accordingly, POWERGRID is executing the scheme. 01 no. In this scheme, FOTE is to be commissioned at Teesta-V NHPC. It is gathered that presently the existing equipments at Teesta-V is non-operational due to flood in Sikkim. It is kindly requested to confirm regarding the present condition for installation of the FOTE and establishment of AGC communication.

Regards
Santanu Rudrapal
CM(ULDC)

Annexure B.2.15

Annexure 3: List of 132 KV stations whose data is either not reporting or not integrated at ERLDC or the station has gone significant rearrangement.

1. Bihar SLDC

SL. NO.	Station Name	Remarks
1	Banjari	data not reporting, KCL feeder missing, Dehri feeder LILOed Kerpa
2	Kcl	station missing
3	Kerpa	station missing
4	Imamganj	Sherghati feeder missing
5	Sherghati	Swakala solar plant feeder missing
6	Swakala Solar Plant	station missing
7	Karwandiya	station missing
8	Dumraon New	data not reporting
9	Dumraon	data not reporting, Dumraon New feeder missing
10	Bikramganj	Pairo & Bikramganj Tss feeder missing
11	Bikramganj Tss	station missing
12	Pairo	station missing
13	Arrah (B)	data not reporting, Dumraon New feeder missing
14	Arrah TSS	station missing
15	Jagadishpur	station missing
16	Tehta	Chandauti feeder LILOed at Belaganj
17	Masauri	Naubatpur feeder missing
18	Jahanabad	data not reporting, Khizirsarai feeder missing
19	Jahanabad TSS	station missing
20	Ataula	Rafiganj feeder LILOed at Chandauti
21	Rafiganj	data not reporting, Bahupura Solar plans
22	Rafiganj TSS	station missing
23	Bahupura Solar Plant	station missing
24	Kerpa	station missing
25	Sasaram	Nadolkhar feeder missing
26	Sonenagar	data not reporting, Tss station missing
27	Sonenagar New	data not reporting, Aurangabad feeder missing
28	Aurangabad	station missing
29	Nabinagar	data not reporting
30	Sasaram PG 132	Dehri feeder LILOed at N_khudra
31	N_Khudra	station missing

SL. NO.	Station Name	Remarks
32	Kochas	Named Dinara, data not reporting
33	Nadolkhar	Bhabua feeder missing, Kochas feeder missing
34	Khudra TSS	karmanasa feeder missing
35	Bhabua	data not reporting
36	Karmanasa	data not reporting
37	Mohania	data not reporting, pasaoli feeder LILed at Ramgarh
38	Ramgarh	station missing
39	Paliganj	station missing
40	Bihta	data not reporting, Bihta new feeder missing
41	Belaganj	data not reporting
42	Tarapur	data not reporting
43	Jamui	data not reporting , jamui new & Jhajha TSS feeder missing,
44	Jhajha TSS	Station missing
45	Jamui New	station missing
46	Balia	Station missing
47	Rajgir	data not reporting, Bhore, Asthawan feeder missing
48	Bhore,	station missing
49	Wazirganj	data not reporting, bodh gaya feeder LILOed at Khizisarai
50	Nawada	Warisliganj. B'Sariff Nawada New feeder missing
51	Warisaliganj	station missing
52	Pupri	station missing
53	Siraha	Station missing
54	Chapra	data not reporting, Amnour feeder missing
55	Chapra TSS	station missing
56	Vaishali	data not reporting , Goraid, Amnour feeder mising
57	Bela Rail Factory	station missing
58	Ekma	data not reporting
59	Mashrakh	data not reporting, Maharajganj, Rajpatti TSS feeder missing
60	Maharajganj	data not reporting
61	Rajpatti TSS	station missing
62	Siwan	data not reporting
63	Skmch	data not reporting, mushahari & Belsand feeder missing
64	Belsand	station missing
65	Bazpatti Tss	station missing
66	Sitamarhi	data not reporting

SL. NO.	Station Name	Remarks
67	Samastipur	Jandaha, MTPS feeder missing
68	Samastipur New	Shahpur Patori feeder missing
69	Shahpur	station missing
70	Samastipur TSS	station missing
71	Turki Tss	station missing
72	Hazipur	Hazipur TSS, Sheetalpur, Chapra feeder missing
73	Hazipur Tss	station missing
74	Jandaha	data not reporting
75	Manhar	station missing
76	Dalsinghsarai	Kusheshwarsthan, Bachwara Tss feeder missing
77	Bachwara Tss	station missing
78	Kusheshwarsthan	dalsinghsarai, Sonebarsha, Benipur, Rosera feeder missing, data not reporting
79	Rosera	station missing
80	Harsanpur	station missing
81	Benipur	station missing
82	Sonebarsa	Udakishanganj, Simri Bakhtiarpur, Simri Bakhtiarpur Tss feeder missing , data not reporting
83	Simri Bakhtiarpur	data not reporting
84	Simri Bakhtiarpur Tss	station missing
85	Udakishanganj	data not reporting
86	Saharsa	Purnea feeder LILOed at Banmankhi
87	Banmankhi	data not reporting
88	Dhamdaha	data not reporting
89	Purnea	Forbesganj feeder LILOed at Triveniganj , Manihari feeder missing
90	Naugachia	Naugachia Tss feeder missing
91	Naugachia Tss	station missing
92	Katihar	Manihari feeder missing, data not reporting
93	Katihar Tss	station missing
94	Manihari	data not reporting
95	Begusarai	Balia, Manjhaul feeder missing
96	Manjhaul	data not reporting
97	Bakhri	data not reporting
98	Teghra	station missing
99	Darbhanga	data not reporting, Pandaul feeder LILOed at gangaura,

SL. NO.	Station Name	Remarks
100	Darbhanga New	station missing
101	Gangaura	data not reporting, Shiso TSS feeder missing
102	Shiso TSS	station missing
103	Pandaul	Phulparas feeder missing
104	Sakari TSS	station missing
105	Madhubani	Benipatti feeder missing
106	Benipatti	data not reporting, Pupri feeder missing
107	Jainagar	Benipatti feeder missing
108	Phulpasar	data not reporting, Supaul feeder LILOed at nimali, Laukahi feeder missing
109	Jhanjharpur	station missing
110	Supaul	data not reporting, laukahi & nimali feeder missing
111	Nimali	station missing
112	Forbesganj	Palassi, Araria & triveniganj feeder missing
113	Triveniganj	data not reporting
114	Palassi	station missing
115	Araria	station missing
116	Kishanganj	data not reporting, Araria & Barsoi feeder missing
117	Barsoi	Manihari feeder missing, data not reporting
118	Baisi	data not reporting
119	Narkatiaganj	station missing
120	Ramnagar	data not reporting, Narkatiaganj feeder missing
121	Motihari	Jivdhara TSS, Sugauli Sug Mill, Motipur feeder missing,data not reporting, Dhaka feeder LILOed at Motrihari,
122	Sheohar	station missing
123	Harinagar TSS	station missing
124	Narkatiaganj Sugar Mill	station missing
125	HPCL Lauriya	station missing
126	Bettiah	Areraj, Bettah TSS, Majhaulia TSS, Narkatiaganj feeder missing
127	Raxaul	data not reporting
128	Dhaka	Bairgania TSS, Pakridayal feeder missing
129	Pakridayal	data not reporting
130	Bairgania TSS	station missing
131	Sugauli Sugar Mill	station missing
132	Gopalganj	Sindhwalia sugar mill, Hathua feeder missing

SL. NO.	Station Name	Remarks
133	Mashrakh	data not reporting
134	Siwan	siwan new / Raghunathpur, pachkuri Tss, Amnour feeder missing
135	Sheetalpur	data not reporting
136	Goraid	station missing
137	Amnour	station missing
138	Muzaffarpur	Pamdayalu TSS feeder missing
139	Motipur	Muzaffarpur feeder LILOed at MTPS
140	Mahal TSS	station missing
141	Chakia	station missing
142	Sheikhpura	Sheikhpura TSS , Sheikhpura New feeder missing
143	Sheikhpura TSS	Station missing
144	Hathidah	data not reporting, Mokama feeder missing
145	Lakhisarai	Sultanganj feeder LILOed at Jamalpur New , Lakhisarai TSS feeder missing
146	Lakhisarai TSS	station missing
147	Sultanganj	data not reporting, Garodi station missing, Banka feeder missing
148	Sabour	data not reporting, jagadishpur feeder missing
149	Banka	Banka New feeder missing
150	Banka New	data not reporting, ACSEPL feeder missing
151	Acsepl	station missing
152	Board Colony	station missing
153	Digha New	station missing
154	Digha	data not reporting, Digha new feeder missing
155	Jakkanpur	data not reporting
156	Karbighaia	data not reporting
157	Mithapur	Karbighaia feeder missing
158	Gaighat	data not reporting
159	Fatuha	Sipara feeder LILOed at Jakkanpur New
160	Ultratech	station missing
161	Harnaut	Fatuha feeder LILOed at Ultratech
162	Biharsariff	Bakhtiyarpur feeder missing
163	Bakhtiyarpur	station missing
164	Mokama TSS	station missing
165	Ekangarsarai	data not reporting, Ekangarsarai TSS feeder missing

SL. NO.	Station Name	Remarks
166	Ekangarsarai TSS	Station missing
167	Khizirsarai	chandauti feeder missing
168	Hulasganj	B'sariff, khizirsarai feeder missing
169	Nalanda	data not reporting
170	Nalanda Tss	station missing

2. Jharkhand SLDC

SL. NO.	Station Name	Remarks
1	Dumka Old 132/66	2 deoghar feeders LILOed at jharmundi, 2 pakur feeders LILOed at dumka new, not reporting
2	Tolra 132	station missing
3	Latehar 132	feeder mismatch
4	Gumla 132	station missing
5	Simdega 132	station missing
6	Manoharpur 132	station missing
7	Lodhna 132	station missing
8	Hec 132	station missing
9	Hatia Old 132	feeder mismatch
10	Namkum 132	feeder mismatch,hatia and subarnarekha feeder mismatch
11	Khunti 132	feeder mismatch, not reporting
12	Tamar 132	station missing
13	Chandil 132	1 golmuri feeder LILOed at MANGO
14	Mango 132	station missing
15	Golmuri 132	1 chandil feeder LILOed at MANGO, not reporting
16	Rajkharaswan 132	chakradharpur feeder missing, not reporting
17	Goelkera 132	1 manoharpur feeder missing, not reporting
18	Jadugoda 132	multiple feeder mismatch, not reporting
19	Bahragora 132	station missing
20	Jamtara 132	multiple feeder mismatch, not reporting
21	Chitra 132	station missing
22	Sariya 132	station missing
23	Jamua 132	station missing
24	Deoghar 132	multiple feeder mismatch, not reporting
25	Pakur 132	multiple feeder mismatch
26	Barhait 132	station missing
27	Rajmahal 132	station missing
28	Sahebgunj 132	multiple feeder mismatch, not reporting
29	Madhupur 132	station missing
30	Shankarpur 132	station missing
31	Jharmundi 132	station missing

SL. NO.	Station Name	Remarks
32	Chandrakyari 132	station missing
33	Jainamore 132	station missing
34	Lohardaga Old 132	station missing
35	Naomundi 132	station missing
36	Kanke 132	2 Ratu 132kv feeders missing, not reporting
37	Usha Martin 132 Tps	station missing
38	Sikidri Hps 132	station missing
39	Inland Power Tps 132	station missing
40	Chaibasa Rungta 132	station missing
41	Tata Sponge Tps 132	station missing
42	Adityapur 132	2 tata sponge feeders missing, not reporting
43	APPL Jamshedpur Tps	station missing
44	Shree Cement 132	station missing
45	Dalbhumgarh 132	feeder count mismatch, not reporting
46	Nagaruntari 132	data not reporting
47	Garhwa 132	data not reporting
48	Kendposhi 132	data not reporting
49	Chakradharpur 132	data not reporting
50	Japla 132	data not reporting
51	Kamdara 132	data not reporting
52	Manikui 132	data not reporting
53	Noamundi 132	data not reporting

3. DVC SLDC

SL. NO.	Station Name	Remarks
1	Nimiaghat 132	data not reporting
2	Sindhri 132	Station missing
3	P. Kanta 132	Station missing
4	Balihari 132	Station missing
5	Ramkanali 132	1 feeder to jamuria missing
6	Belmuri 132	1 feeder to adisaptgram(wb) missing
7	Howrah 132	1 kolaghat feeder has been LILOED at foodpark(wb)
8	Kolaghat 132	1 howrah feeder has been LILOED at foodpark(wb)
9	Sermuri 132	Station missing
10	Ray 132	Station missing
11	Jspl 132	Station missing
12	Jamuria 132	multiple feeders missing
13	Rajbera 132	station missing
14	Konar 132	hazaribag rd feeder missing
15	Hazaribag Rd 132	Station missing
16	Giridih	data not reporting

4. Odisha SLDC

SL. NO.	Station Name	Remarks
1	Nuagaon Tr	station missing
2	Sri Ganesh	station missing
3	Rourkella	Rajgangpur feeder missing, Tarkera feeder should be 3 instead of 2
4	Bhalulata	station missing
5	Nalda Tr.	station missing
6	RML Rungta	data not reporting, feeder mismatch
7	Arya	data not reporting
8	Barbil	feeder mismatch
9	P.Ponga	Tr. , Patnaik Stl, & a thermal PS feeder missing
10	MSP	data not reporting
11	Karanjia	data not reporting
12	Bangiriposi	RTSS 2 feeders missing
13	Jaleswar	Kuchei feeder instead of Baripada PG
14	Birla Tyre	data not reporting
15	Soro	Soro feeder LILOed at Chandipur
16	Chandipur	station missing
17	Balasorel Alloy	station missing
18	Traction	station missing

SL. NO.	Station Name	Remarks
19	Somnathpur	station missing
20	TSL ferro Alloys(SF previously)	station missing
21	Udala	station missing
22	Betanati	station missing
23	Facor	data not reporting
24	Dharma Port	station missing
25	Dharma Tr	station missing
26	Pattamundai	Olavar & Rajnagar feeder missing
27	Rajnagar	1 Pattamundai feeder missing
28	Olavar	station missing
29	Chandbali	station missing
30	Marhaghai	Jajpur Rd feeder LILOed at Kendrapara & Data not Reporting
31	Kendapara TTS	station missing
32	Jajpur Rd	data not reporting
33	Anandpur	Bhadrak feeder LILOed at Agarpada
34	Agarpada	station missing
35	Kalarangi	data not reporting
36	Jabamayee	Jabamayee feeder LILOed at Gondia & Data not reporting
37	Gondia	station missing
38	MESCO	feeder mismatch
39	J. pura	station missing
40	Sukinda Rtss	station missing
41	Kamakhyanagar	data not reporting
42	BC Mohanty	Bamnipal feeder LILOed at daitari data not reporting
43	Daitary	station missing
44	Baminipal	data not repor
45	Chaipal	Global, Talcher Heavy Wtr ltd Talcher Rd feeder missing
46	FCI Talcher fertilizer ltd	station missing
47	Global	station missing
48	Talcher Heavy Wtr ltd	station missing
49	Banki	Data not reporting , Arati & Nuapatna
50	Arati Steels	Data not reporting, BSIL Khuntuni feeder missing
51	BSIL Khuntuni	station missing
52	Iltratech Cement	station missing
53	TS Alloy	station missing
54	Chowduar	Charbatia Tr, Nuapatna feeder missing
55	Chowduar Tr.	station missing
56	Charbatia Tr	station missing
57	Grid steel	station missing

SL. NO.	Station Name	Remarks
58	ICCL	Mania & Bahugram feeder misiing
59	Bahugram	station missing
60	Mania	station missing
61	Dalmia Cement (OCL)	station missing
62	Salipur	Bahugram, Dalmia Cement (OCL) feeder missing
63	Bamra Tr	station missing
64	Kutra	station missing
65	Dalmiyacement Solar	station missing
66	Shiva Cement	station missing
67	Kalugaon	station missing
68	Rajgangpur	Data not Reporting,Traction,Kutra,Dalmiyacement Solar,Bamra, Tarkera feeder missing
69	Traction	station missing
70	OISL	station missing
71	Aryan Viraj	Aryan feeder missing
72	Aryan	station missing
73	Viraj	station missing
74	Shyam Dry	data not reporting
75	SMC	data not reporting
76	Kuchinda	station missing
77	Jharsuguda	Data not reporting
78	Action Ispat	station missing
79	L&T	station missing
80	Hirakud	station missing
81	Dhutra Tr	station missing
82	Gorposh Tr	station missing
83	MSP	station missing
84	Brajarajnagar	Lakhanpur, Belphar, MCL, Kechhbahal rtss, feeder missing
85	Lakhanpur	station missing
86	Belphar	station missing
87	MCL	station missing
88	Kechhbahal rtss	station missing
89	Angul	data not
90	Nandira	Burla feeder LILOed at Sambalpur
91	Sambalpur	Rajkhjole feeder LILOed at Maneswar
92	Maneswar	station missing
93	Maneswar RTSS	station missing
94	Hindalco	1 Hirakund/Burla Feeder missing
95	Chiplama	Bargarh feeder LILOed at Thuapalli & data not reporting
96	Bargarh	data not

SL. NO.	Station Name	Remarks
97	Thuapalli	station missing
98	Godbhaga RTSS	station missing
99	Ghens	station missing
100	Bolangir	Saintala old feeder LILOed at Tusura & ACME
101	Sonepur	Birmaharajpur feeder missing
102	Birmaharajpur	station missing
103	Muchkund	station missing
104	Padwa	station missing
105	Manabar	station missing
106	Maliguda	station missing
107	Jeypore	station missing
108	Ch Kusumi Tr	station missing
109	HAL	station missing
110	Patangi	station missing
111	Podagoda	station missing
112	Raygoda	Jeynagar feeder LILOed at Podagoda & Raygoda Tr feeder missing
113	VBC Ferro Alloy	station missing
114	Raygoda Tr.	station missing
115	Akhusirgha	Gunupur feeder missing
116	P.Khemundi	R. Udaygiri, Palasingi RTSS feeder missing
117	palasingi RTSS	station missing
118	Mohana	R. Udaygiri feeder missing
119	R. Udaygiri	station missing
120	Digahandi	Chikiti, New Aska feeder missing
121	chikiti	station missing
122	Behrampur	New Aska feeder LILOed at Hinjili & data not reporting
123	IMFA	No feeder for ICCL & data not reporting
124	J K Paper	station missing
125	Bhulamaska Tr	station missing
126	Hinjili	station missing
127	Narendrapur	Jagganathpur feeder missing
128	Jagganathpur	station missing
129	Boudh	2 Phulbani feeder missing
130	Phulbani	Bhanjnagar feeder LILOed at G Udaygiri
131	G Udaygiri	station missing
132	Ganjam	station missing
133	Ramba Tr.	station missing
134	Chhatrapur	Aska feeder LILOed at purushotampur
135	purushotampur	data not reporting
136	IRE	station missing

SL. NO.	Station Name	Remarks
137	Balugaon	Solari Tr., feeder missing
138	Solari Tr	station missing
139	Chandpur	Chandka feeder LILOed at Atri, Khurda, & Medhasal / Samukha Feeder LILOed at Atri / Khaipadar Tr. LILOed at Atri
140	Khaipadar	station missing
141	Khurda	data not reporting
142	Argul	Data not reporting
143	Samukha	Khurda Feeder LILOed at Atri
144	Satasankha	station missing
145	Puri	data not reporting
146	Nimapara	Kesura feeder LILOed at Pratapsasan
147	Ranasinghpur/Sijua	Nimapada feeder LILOed at Kesura
148	Unit 8	station missing
149	Mancheswar B	station missing
150	BPPL	station missing
151	Bidanasi	BPPL feeder LILOed at Brajabiharipur
152	Brajabiharipur	station missing
153	IFFCO	data not showing
154	PPL	data not reporting
155	sijju tr	station missing
156	PPT	data not reporting
157	Tritol	station missing
158	Jagatsingpur	paradeep feeder LILOed at Tritol & Gorakhnath feeder missing also data not reporting
159	Gorakhnath	station missing
160	Phulnakhara	Pratapsasan feeder missing
161	Bhubaneswar	Patia & Mancheswar B feeder missing Also Data not reporting
162	Patia	station missing
163	RML Rungta	data not reporting
164	Khejuraikata	data not reporting
165	BRG	station missing
166	kharagprasad	station missing
167	Samal	station missing
168	Traction	station missing
169	Shalivahana	station missing
170	Dhenkanal	ICCL feeder Liloed at Khuntuni, Narbheram Feeder missing
171	Narbheram	station missing
172	Joranda	station missing
173	khuntuni	station missing
174	shree cement ltd	station missing
175	Sunabedi	HAL, Patangi feeder missing & data not reporting
176	Tusura	station missing

SL. NO.	Station Name	Remarks
177	ACME	station missing
178	Patnagarh	Padmapur feeder missing
179	Padmapur	Naupada feeder missing
180	Kesinga	Kantabanji, Powmax,Lanjigarh TSS, feeder missing
181	Powmax	station missing
182	Bhawanipatna	Lanjigarh TSS, Bhawanipatna RTSS feeder missing
183	naupada	station missing
184	Khariar	kantabaji feeder missing
185	junagarh	bhawanipatna feeder mising
186	lanjigarh TSS	station missing, data not reporting
187	Bisamcuttack Tr	station missing
188	Umerkote	station missing
189	Munigada	station missing
190	Debugaon	Jaypatna, Umerkote feeder missing
191	Tetulikhunti	Vento solar, Nabarangpur feeder missing
192	Nabarangpur	Jeynagar feeder LILOed at Boriguma
193	Boriguma	station missing

5. West Bengal SLDC

SL. NO.	STATION	Remarks
1	Coochbehar	Feeder mismatch
2	Dinhata	Data not reporting
3	Kamakhyaguri	Station missing
4	Rangapani	Station missing
5	Mathabhanga	Feeder mismatch
6	Moinaguri	Data not reporting. LILO of NJP at Mohitnagar missing
7	Birpara	Data not reporting. 1 additional feeder to Alipurduar and Coochbehar each on SLD.
8	Chalsa	Data not reporting. Feeder to Mohitnagar missing.
9	Mohitnagar	Data not reporting.
10	Siliguri	Data not reporting. LILO of NBU at Ujanoo missing.
11	Ujanoo	Station missing
12	Lebong	Data not reporting
13	TCF-1	Rangapani feeder missing
14	TCF-3	LILO of 2 Dalkhola feeders at Islampur missing
15	Islampur	Station missing
16	Raiganj	Feeder mismatch
17	harischandrapur	Station missing
18	Kushmundi	Station missing
19	Balurghat	Feeder mismatch
20	Malda	Feeder mismatch
21	Khejuria	Data not reporting
22	farakka	Station missing
23	Dhulian	Feeder mismatch
24	Ambuja	Station missing
25	Raghunathganj	Data not reporting. Feeder mismatch.
26	Lalgola	Feeder mismatch
27	Sonar Bangla	Station missing
28	Amtala	LILO of 2 Debgram feeders at Rejinagar missing
29	Nazirpur	2 Domkal feeders missing
30	Domkal	Station missing
31	Bhadrapur	Data not reporting

SL. NO.	STATION	Remarks
32	Rampurhat	2 Bhadrapur feeders missing
33	Salar	Station missing
34	Katwa	Data not reporting. LILO of 2 Gokarna feeders at Salar missing.
35	Debagram	Data not reporting. LILO of 2 Amtala feeders at Rejinagar missing.
36	Lavpur	Station missing
37	Kalna	Data not reporting
38	Bolpur	2 Lavpur feeders missing
39	Ukhra	Data not reporting
40	Bagula	Station missing
41	Bongaon	LILO of Krishnanagar feeders at Bagula missing
42	Kalyani	Only 1 feeder each to BTPS and Dharampur in SLD, 2 each on map.
43	BTPS	Data not reporting. LILO of 1 Dharampur feeder at Kalyani missing. 2 Liluah feeders on map, 1 each to Liluah and Chanditala in SLD.
44	Burdwan	Station missing
45	Dhatrigram	Station missing
46	Mahachanda	Station missing
47	Mankar	Data not reporting. 2 Panagarh feeders missing.
48	Tarakeshwar	Data not reporting. 2 Jangipara feeders missing.
49	Jangipara	Station missing
50	Chanditala	Feeder mismatch
51	Minakhan	Station missing
52	Sonakhali	Station missing
53	Kakdweep	Ramganga feeders missing
54	Ramganga	Station missing
55	Falta	LILO of 1 Joka feeder at Sirakol missing
56	Sirakol	2 Baruipur and 1 Falta feeders missing
57	Joka	Feeder mismatch
58	Renia	Station missing
59	Sonarpur	Feeder mismatch
60	Ramnagar	Station missing

SL. NO.	STATION	Remarks
61	Contai	Feeder mismatch
62	Bajkul	Station missing
63	Haldia	HFC feeder missing
64	BEL	Station missing
65	Keshiary	Station missing
66	Hizlee	Station missing
67	Pingla	2 Keshiary feeders missing
68	WBIDC	Feeder mismatch
69	Jhargram	Data not reporting
70	Debra	Station missing
71	Chandrakona Road	2 Goaltore feeders missing
72	Goaltore	Station missing
73	Bishnupur	2 khatra feeders in place of Bankura
74	Indus	data not reporting
75	Manbazar	Station missing
76	Jhalda	Station missing
77	Bagmundi	Jhalda feeder missing
78	Purulia	Jhalda feeder missing
79	Bankura	2 New Bishnupur feeders in place of Bishnupur
80	Panpur	Station missing
81	Hindmotor	LILO of Liluah feeder at Dankuni missing
82	Dankuni	Station missing
83	Kona	Station missing
84	Liluah	feeder mismatch
85	Foodpark	feeder mismatch
86	Uluberia	LILO of Kolaghat feeder at Bagnan missing
87	Bagnan	feeder mismatch
88	Kolaghat	feeder mismatch
89	Majerhat	Princep street feeder missing
90	Jadavpur	Patuli feeder missing
91	Belur	feeder mismatch

SL. NO.	STATION	Remarks
92	Titagarh	feeder mismatch
93	East Calcutta	Feeders missing
94	Chitpur	Station missing
95	BBD Bag	data not reporting
96	Park circus	Station missing
97	Park lane	feeder mismatch

6. Sikkim SLDC (132 and 66 kV)

SL. NO.	Station Name	Remarks
1	MELLI 132	analog data reporting for feeders only
2	sagbari 132	station missing
3	samardong 132/66	data not reporting, dikchu feeders mismatch
4	geyzing 132/66	data not reporting,66kv feeder mismatch
5	Peling 66	station missing
6	Soreng 66	station missing
7	Sombaria 66	station missing
8	Rothak 66	station missing
9	Jorethang 66	station missing
10	Melli 66	feeder count mismatch
11	Mamring 66	data not reporting
12	Topakhani 66	station missing
13	Urhp 66	station missing
14	Marchak 66	station missing
15	Macleoids 66	station missing
16	Llhp Hps 66	Feeder mismatch
17	Pakyong 66	station missing
18	Tadong 66	Gangtok_PG feeder mismatch
19	Sichey 66	Tadong feeder mismatch
20	Phudong 66	data not reporting
21	Mangan 66	data not reporting
22	Meyong 66	station missing
23	Rabomgchu 66	station missing
24	Maltin 66	station missing
25	Lachung 66	station missing
28	Bulbuley 66	data not reporting
29	Sherathang 66	station missing
30	Rhenock 66	station missing
31	Rongli 66 Hps	station missing

7. Central Sector

SL. NO.	Station Name	Remarks
1	Rangit	not reporting
2	Durgawati	not reporting

Annexure 4: SEM vs SCADA Plots

SEM VS SCADA Comparison (Biharsharif-Balia Ckt-1)

Fig- Plot for SCADA(Biharsharif) Vs SCADA(Balia) data

Fig- Plot for SEM(Biharsharif) Vs SEM(Balia) data

Fig- Plot for SCADA(Biharsharif) Vs SEM(Biharsharif) data

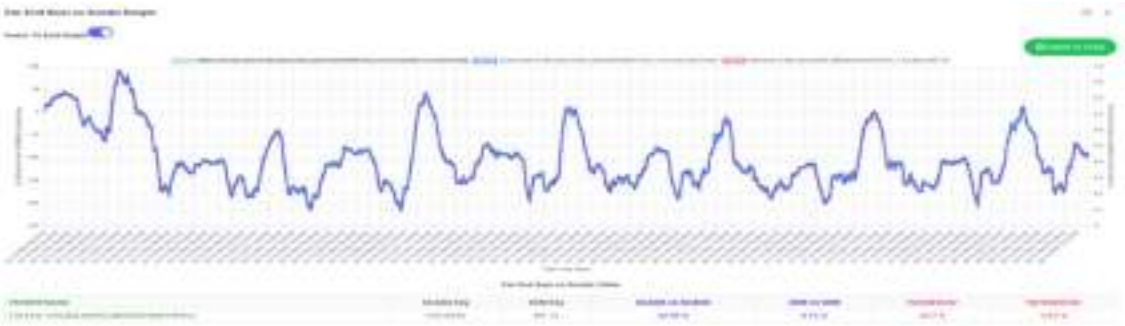


Fig- Plot for SCADA(Balia) Vs SEM(Balia) data

SEM VS SCADA Comparison (Biharsharif-Balia Ckt-2)

Fig- Plot for SCADA(Biharsharif) Vs SCADA(Balia) data

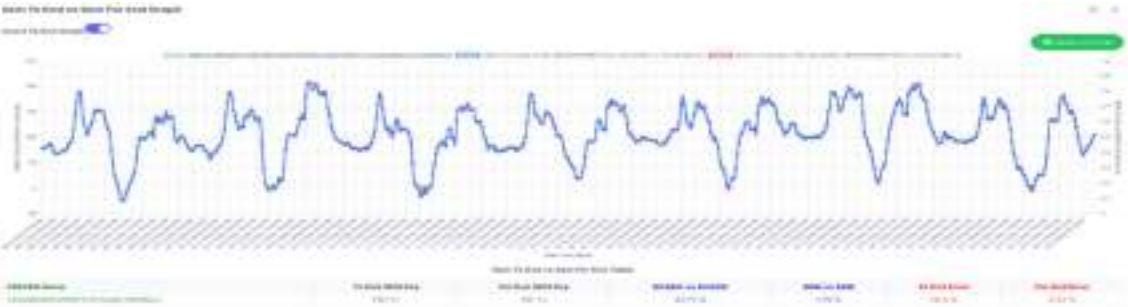


Fig- Plot for SEM(Biharsharif) Vs SEM(Balia) data

Fig- Plot for SCADA(Biharsharif) Vs SEM(Biharsharif) data

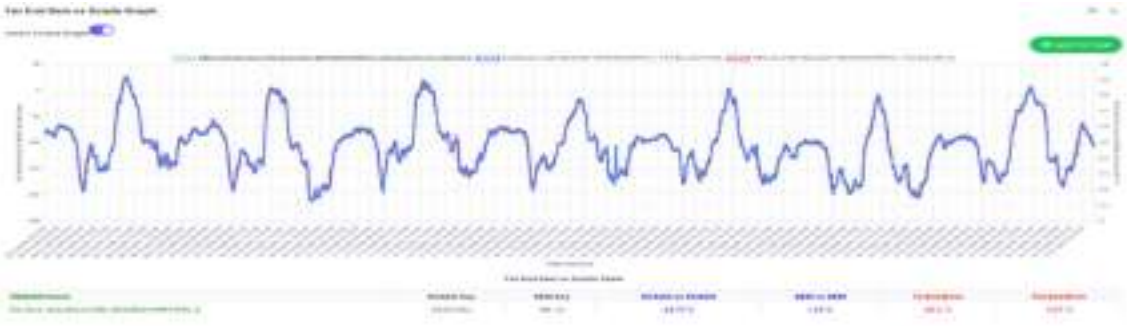


Fig- Plot for SCADA(Balia) Vs SEM(Balia) data

SEM VS SCADA Comparison (Talcher-Meramundali Ckt-1)

Fig- Plot for SCADA(Talcher) Vs SCADA(Meramundali) data

Fig- Plot for SEM(Talcher) Vs SEM(Meramundali) data

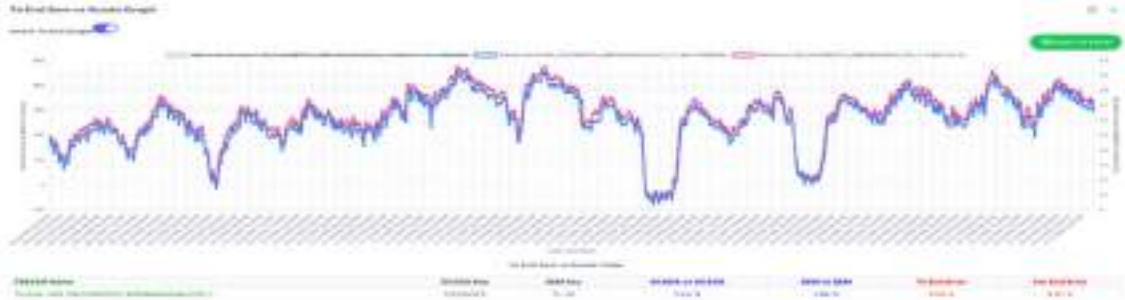


Fig- Plot for SCADA(Talcher) Vs SEM(Talcher) data

Fig- Plot for SCADA(Meramundali) Vs SEM(Meramundali) data

Annexure B.2.20.

Summary of IP & MAC addresses of the end user equipment connected in Data & voice Network.								
S.N.	**Constituents**	**RTU/SAS/GATEWAY DEVICE**	**ROUTER / FIREWALL**	**VOIP**	**AMR/DCU**	**URTDSM**	**SWITCH**	**Any Other device.**
1	POWERGRID ER-I	MAC & IP	Not Submitted	Not Submitted	MAC & IP (56)	Submitted but not in format	Not Submitted	No Details is reccived.
2	POWERGRID ER-II	MAC & IP (18 No. Stations)	Not Submitted	Not Submitted	MAC & IP(48)	Submitted but not in format	Not Submitted	No Details is reccived.
3	POWERGRID ODISHA PROJECT	MAC & IP (10 No. Stations)	Not Submitted	Not Submitted	MAC & IP(18)	Submitted but not in format	Not Submitted	No Details is reccived.
4	BIHAR	Not Submitted	Not Submitted	Not Submitted	MAC & IP (Submitted by POWERGRID)	Not Submitted	Not Submitted	No Details is reccived.
5	JHARKHAND	Not Submitted	Not Submitted	Not Submitted	MAC & IP (Submitted by POWERGRID)	Not Submitted	Not Submitted	No Details is reccived.
6	ODISHA	MAC & IP	Not Submitted	MAC & IP	MAC & IP (Submitted by POWERGRID)	MAC & IP	Not Submitted	No Details is reccived.
7	WEST BENGAL	Not Submitted	Not Submitted	Not Submitted	MAC & IP (Submitted by POWERGRID)	Not Submitted	Not Submitted	No Details is reccived.
8	SIKKIM	Not Submitted	Not Submitted	Not Submitted	MAC & IP (Submitted by POWERGRID)	Not Submitted	Not Submitted	No Details is reccived.
9	DVC	IP	IP	IP	MAC & IP (Submitted by POWERGRID)	IP	IP	No Details is reccived.
10	RONGNICHU	MAC & IP	MAC & IP	MAC & IP	IP	Not Submitted	Not Submitted	No Details is reccived.
11	JORETHANG	MAC & IP	MAC	MAC	Not Submitted	Not Submitted	Not Submitted	Ethernet adapter MAC & IP
12	TASHIDING	MAC & IP	MAC & IP	MAC & IP	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.

13	ADHUNIK	IP	Not Submitted	Not Submitted	MAC & IP (Submitted by POWERGRID)	Not Submitted	Not Submitted	(DAC & BDAC) IP
14	BARH	MAC & IP	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
15	GMR	IP	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
16	NKTL DHANBAD	MAC & IP	Not Submitted	MAC & IP	Not Submitted	MAC & IP	Not Submitted	No Details is reccived.
17	MPL	IP	Not Submitted	Not Submitted	Not Submitted	Not Submitted	IP	(DC/DR PC & SUX) IP
18	DARLIPALI	MAC	Not Submitted	MAC	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
19	FARAKKA	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
20	KAHALGAON NTPC	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
21	NABINAGAR	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
22	NORTH KARANPURA	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
23	KBUNL	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
24	BRBCL	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
25	RANGIT	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
26	TEESTA V	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
27	DIKCHU	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
28	DMTCL	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
29	CHUJACHEN	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
30	IBEUL	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
31	BTPP	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
32	CHUJACHEN	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.
33	TEESTA III	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.

34	PMJTL	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	Not Submitted	No Details is reccived.

Note: DCU of ISTS substations of Bihar, Jharkhand, West Bengal,Odisha, Sikkim and DVC are included in

Annex-B.2.21

Summary of OPGW Links with DOCO and other details.				
Sl.No.	**Name of link (Rating)**	**Date of Certificate**	**DOCO**	**Link length**
1	400 KV D/C Patna-Balia Line-1 OPGW Link (24 F DWSM)	31/01/2024	17.11.2023	180.45 km
2	LILO portion of Biharsharif-Balia at Ara OPGW Link (48 F DWSM)	29/01/2024	30.12.2023	10.192 km
3	400 KV BRBCL Nabinagar- Sasaram OPGW Link (24 F DWSM)	02/02/2024	30.12.2023	81.394 km
4	400 KV Biharsharif- Sasaram OPGW Link (24 F DWSM)	02/02/2024	25.11.2023	199.750 km
5	400 KV Biharsharif- Kahalgaon OPGW Link (24 F DWSM)	02/02/2024	25.11.2023	233.234 km
6	LILO portion of 400kV Angul- GMR OPGW Link (24 F DWSM)	26/03/2024	15.02.2024	30 km
7	765 KV Gaya-Varanasi OPGW Link (24 & 48 F DWSM)	04/03/2024	22.01.2024	310.186 km
8	400 KV DURGAPUR - JAMSHEDPUR OPGW Link (24 F DWSM)	28/05/2024	15.12.2023	183.635 km
9	400 KV DURGAPUR - MAITHAN OPGW Link (24 F DWSM)	28/05/2024	24.01.2024	74.125 km
10	400 KV TEESTA III - KISHANGANJ OPGW Link (24 F DWSM)	28/05/2024	29.02.2024	242.062 km
11	400 KV Durgapur - Farakka OPGW Link (24 F DWSM)	25/07/2024	22.06.2024	157.745 km
12	400 KV Durgapur - Sagardighi OPGW Link (24 F DWSM)	25/07/2024	22.06.2024	133.572 km
13	400 KV Farakka - Purnea OPGW Link (24 F DWSM)	25/07/2024	24.06.2024	179.643 km
14	400KV Rangpo - Dikchu OPGW Link (24 F DWSM)	18/11/2024	11.09.2024	32.176 km
15	765 KV Jharsuguda - Dharamjaygarh OPGW Link (24 F DWSM)	08/10/2024	30.08.2024	148.603 km
16	400 KV Rourkela-Raigarh OPGW Link	ERLDC has given consent to WR.		
17	400KV Rangpo - Chuzachen OPGW Link (24 F DWSM)	16/01/2025	21.12.2024	20.727 km

Location	Requirements	Total ports	FOTE Requirements	Status
FARAKKA STPS II	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	3	Not Required
FARAKKA STPS III	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4		
KAHALGAON STPS II	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	Not Required
TALCHER STPS I	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
TALCHER STPS II	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4		
BARH STPS I	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
BARH STPS II	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4		
KBUNL Stage II	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
NPGC Stage I	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
DARLIPALI	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
NORTHKARANPURA	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
TEESTA V	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
RANGIT	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	1	01 Nos. SDH
MPL	1+1 Ethernet ports for Main NLDC & Back up NLDC.	4	2	Not Required
Total Location - 11, Requirements is at 08.			**14**	**08**

Sl.No.	Name of FOTE	Date of Certificate	DOCO	SDH Capacity	SDH Location
1	Additional FOTE at Rangit NHPC	16/01/2025	10-09-2024	STM-16	Rangit NHPC
2	Additional FOTE at Karanpura NTPC	16/01/2025	09-09-2024	STM-16	North Karanpura