



भारत सरकार  
Government of India  
विद्युत मंत्रालय  
Ministry of Power  
केन्द्रीय विद्युत प्राधिकरण  
Central Electricity Authority  
विद्युत संचार विकास प्रभाग  
Power Communication Development Division  
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**Subject: - Standing Committee on Communication System Planning in Power Sector (SCCSPPS) – Minutes of 1<sup>st</sup> Meeting and Recommendations of the Committee.**

The minutes of first meeting of the ‘Standing Committee on Communication System Planning in Power Sector’ conducted by the Central Electricity Authority on 9<sup>th</sup> March, 2021 were circulated on 25<sup>th</sup> March, 2021 for comments. Minutes were modified by incorporating received comments suitably. The Minutes as approved by the Chairman of the Committee and the Recommendations of the Committee thereupon, duly approved by the Chairperson, CEA, are enclosed herewith for kind information and necessary action by all concerned. The minutes of the meeting and recommendations of the Committee may also be downloaded from <https://cea.nic.in/SCCSPPS/?lang=en>.

Signature Not Verified  
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KUMAR  
Date: 2021.07.14 18:32:10 IST

Chief Engineer &  
Member Secretary of the Committee

To,

1. Members of the ‘*Standing Committee on Communication System Planning in Power Sector*’ [List enclosed]
2. Chief Engineer (PSE&TD), CEA
3. Chief Engineer (IT), CEA

Copy to:-

1. Chairperson, CEA
  2. Principal Chief Engineer, CEA
  3. Deputy Director (IT), CEA – *With a request to upload the minutes of the subject meeting on the CEA website.*
- For kind information please.

Standing Committee on Communication System Planning in Power Sector (SCCSPPS)

Minutes of Meeting

and

Recommendations of the Committee

<b>Meeting Number:</b>	1 <sup>st</sup> Meeting
<b>Meeting date &amp; time:</b>	09 <sup>th</sup> March, 2021 at 11:00 Hrs
<b>Mode:</b>	Online through Webex
<b>Chief Guest:</b>	Shri P S Mhaske, Chairperson, CEA
<b>Committee Chair:</b>	Shri P C Kureel, Principal Chief Engineer, CEA
<b>Member Secretary:</b>	Shri Upendra Kumar, Chief Engineer, PCD Division, CEA
<b>List of participants:</b>	Enclosed at Annexure - I

Chief Engineer, PCD Division, CEA & Member Secretary of the Standing Committee on Communication System Planning in Power Sector extended a cordial welcome to all the participants and expressed his honour to introduce Shri PC Kureel, Principal Chief Engineer, CEA, & Chairman of the Committee with the participants. He then welcomed Sh P S Mhaske, Chairperson, CEA, and expressed his gratitude for readily accepting the invitation to be present with us as Chief Guest during the inaugural session of the meeting. He then invited Sh Faraz, Deputy Director to felicitate the utility wise introduction process of the participants.

After introduction of the participants, he then invited the Chairman of the Standing Committee for his opening remark and share his aspiration from the Committee based on his vast experience in the power sector.

Shri Kureel greeted the members and welcomed Shri PS Mhaske, Chairperson, CEA & the Chief Guest at the inaugural session of the meeting and stated that his vast experience and valuable direction to the Standing Committee would go a long way in framing up and meeting the aspirations of the committee. He also expressed his gratitude while welcoming the Chief Engineers from CEA, Member Secretaries from RPCs and the imminent experts from the power sector. He then thanked his own team from PCD Division headed by Shri Upendra Kumar, CE for organizing the meeting. While talking about the prevalent Covid pandemic situation and the limitations it has imposed, he stated that the charm of physical meeting, where everyone can meet each other in person, is definitely missing. He hoped that if situation gets better, the next meeting can be organized physically. He also praised the human spirit that we all have shown during this past one year and adapted to the situation as a way of life. He apprised the members of Section 73A of Electricity Act, 2003 which mandates CEA to formulate short term and perspective plan for development of electricity system. He emphasized that an efficient electricity system depends on a safe, reliable and stable grid which in turn depends upon a healthy and secure communication system. He told the participants that while CEA, in cognizance of 73A of the Act, has already taken initiative in other fields like Hydro, Thermal, Transmission, Distribution and Safety, this is the first meeting of Standing Committee on Communication System Planning in Power Sector. This committee comprises of a little over 40 Members and this itself speaks about the sincerity and effort that we are going to take in future to develop a robust communication system in power sector. He expressed his confidence in the expertise of the Members of the committee and hoped that the meeting will end with

some good and fruitful suggestions for achieving goals of the power sector. He once again welcomed the participants and handed over the platform to Shri Upendra Kumar, CE, PCD Division, CEA for further proceedings.

Chief Engineer, PCD Division, CEA & Member Secretary of the Standing Committee then invited Sh P S Mhaske, Chairperson, CEA, to endure the participants with his words and inaugurate the meeting.

Sh P S Mhaske, Chairperson, CEA, expressed his sincere appreciation for the honour given to him by the Chairman of the Committee Sh. P.C. Kureel for officiating the inaugural session of the 1<sup>st</sup> meeting of the Standing Committee on Communication System Planning in Power Sector and welcomed the participants. While addressing the participants he said that Power system operation, monitoring and control requires cost effective communication services with high reliability, availability, accuracy and rapid response time which are higher than those provided by public telecom carriers. During emergency situations like cyclone, flood, earthquake etc. power utilities cannot rely on communication systems shared with other services and utilities which may themselves be overloaded by the same emergency conditions. Due to these reasons, power utilities develop and use their own communication networks which continue to expand in the future with increased automation in the transmission and distribution grids services. He further said that at times, absence of standard guidelines or criteria and regulation for development of the communication system for the power sector leads to protocol conflicts, upgradation and integration problems between new and existing systems. Therefore, a need was felt to frame regulations and lay down standard guidelines for adopting a uniform approach to communication planning for development of flexible, efficient, cost effective and reliable communication system for the power sector.

He further informed the Committee that for coordinated development of the reliable communication system, CEA has taken various steps, like; formulation of “Technical Standards for Communication System in Power System Operations Regulations, 2020” which were published in the official Gazette 2nd of March last year, formulation of draft on “Manual of Communication Planning in Power System Operation”. He further informed that formulation of Cybersecurity Regulations has also been taken up in the CEA and formation of the “Standing Committee for Communication System in the Power Sector” is another step taken by the CEA of flexible, efficient, cost effective and reliable communication system for the power sector.

He further said that main role of the Standing Committee which is meeting 1<sup>st</sup> time today is to prepare short-term plan and perspective plan for communication system in line with the transmission plan prepared by CEA and take its periodic review, coordinate the activities of the CTU/STUs for communication purposes for the optimal utilization of transmission assets and formulate norms for operation and maintenance of communication network among other things.

In view of these advancements, he then expressed his aspiration from the Committee to contribute for the development of reliable communication system would be paramount in the power sector. With this, he then wished that the Members will deliberate on every agenda item, resolve issues brought out in the agenda note and take decisions which would be very useful for the development of flexible, efficient, cost effective and reliable Communication System for the Indian Power Sector and expressed his pleasure to formally open the meeting and wished successful deliberations on the items brought out in the Agenda Note.

Then Chief Engineer, PCD Division, CEA & Member Secretary of the Standing Committee invited Deputy Director, PCD Division, CEA to take up the agenda items.

Here, it is mentioned that at the outset of the agenda, Member Secretary, ERPC suggested that Damodar Valley Corporation (DVC) may also be included as a Committee Member, which was agreed by the Chairman of the Standing Committee.

Then Deputy Director, PCD Division, CEA took the agenda items as follows:

**B.1.1 Formulation of *Conduct of Business Rules* for functioning of this Committee.**

During formulation of the Committee, the Competent Authority agreed to the proposal for framing of Conduct of Business Rules (CBR) for functioning of the Committee after its 1<sup>st</sup> meeting. Accordingly, a draft CBR was prepared by the CEA and shared with the Committee Members along with the Agenda note for their inputs so as to deliberate and finalize the same.

No inputs on the CBR were received from the Members for deliberations in the meeting, however, during the meeting Member Secretary (SRPC) suggested to specify the time frame for short term and perspective plans in the CBR.

Specific numbers for time frame for short term and perspective plans each, could not be converged due to different time frames suggested by the Members. Finally, Chairman, SCCSPPS, after listening to deliberations from the Members summarized that short term and perspective planning for the upcoming Communication System should be done in line with planning for transmission system rather than mentioning specific time frames in the CBR. However, in case where Communication System upgradation is uncorrelated with transmission system planning, a time frame may be decided to monitor progress of such schemes/projects e.g. OPGW laying as mandated by MoP order dated 16 Sept 2015 or upgradation of equipment/media to cater the bandwidth requirement of additional services for existing users.

**Recommendations:**

1. Short term and perspective planning for the upcoming Communication System should be done in line with planning for transmission system.
2. Members were requested to furnish suitable time frame for Short term and Perspective plan for the Communication System upgradation which is uncorrelated with upcoming Transmission System planning.
3. Committee recommended two weeks' time for furnishing inputs, if any, on draft CBR in writing by Members from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

**B.1.2 Finalization of draft Manual of Communication Planning in Power System Operation**

During the meeting, CE, PCD Division, CEA apprised the Committee that draft Manual of Communication Planning in Power System Operation was shared with the Committee Members along with the Agenda note on 26.02.2021 for furnishing comments by 05.03.2021. However, inputs from Chief Engineer (IT), CEA & CISO (MoP), CTU and HVPNL were received. He requested other Members for providing the inputs on the draft

at the earliest to CEA so that the same could be finalized and placed before the Authority for approval.

In this regard, Chairman, SCCSPPS, suggested that every utility should provide their inputs on the draft Manual. The inputs may be submitted within two weeks from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

**Recommendations:**

Committee recommended two weeks' time for furnishing inputs on the draft Manual on communication system planning by the utilities from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com) so that the same could be finalized and placed before the Authority for approval.

**B.1.3 Wideband network of the communication infrastructure**

CE, PCD Division, CEA stated that communication system should be planned in a way as to ensure smooth, coordinated and reliable grid operation while taking care of optimal utilization of national resource. To achieve this, a nation-wide compilation of wideband communication system map is essential. In view of this, CEA vide its letter dated 30.07.2020 requested transmission utilities to furnish a complete map of their existing as well as proposed wideband network of the communication infrastructure. However, the requisite information from Uttar Pradesh, Rajasthan, J&K, Ladakh, Goa, DNH, Daman & Diu, Arunachal Pradesh, Assam, Manipur, Nagaland, Tripura, Andaman & Nicobar Island, Lakshadweep is still pending. He requested the Committee Members from these utilities to kindly expedite furnishing of the information.

**Recommendations:**

Committee recommended that the above utilities shall submit Wideband network of their communication infrastructure at the earliest to CEA at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

**B.1.4 Furnishing of information to CEA**

Section 73(i) of the Electricity Act, 2003 states that the function & duty of CEA is to collect and record the data concerning the generation, transmission, trading, distribution and utilization of electricity and carry out studies relating to cost, efficiency, competitiveness and such like matters.

CE, PCD Division, CEA requested the Members to take note of the same and furnish the data to the CEA, as may be required, in the prescribed time and format.

**Recommendations:**

Committee recommended that utilities shall submit various data as sought by CEA within prescribed time limit and format.

**B.1.5 Communication system database**

In order to carry out planning of new communication system/ replacement of existing element(s), a nationwide database of the wideband communication system deployed for power system operation needs to be created and maintained. The database may contain information on (i) substation and communication service details, total BW capacity

required for the substation, OPGW and associated FOTE details, NMS details etc. For this purpose, formats for database prepared by the CTU were shared with the Committee Members along with the Agenda note for providing their inputs on the same.

Various suggestions for improvements in the draft formats were given by Members. CE, PCD Division, CEA requested the Members to provide their inputs in writing to CEA. He also apprised that as the information sought is dynamic in nature, therefore, needs to be updated periodically.

Chairman, SCCSPPS, instructed that inputs on the draft format(s) may be provided within two weeks from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

### **Recommendations:**

Committee recommended two weeks' time for furnishing inputs on the draft format(s) by the Members from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

### **B.2.1 OPGW for Existing System**

Vide MoP Minutes of Meeting dated 16.09.2015, it has been conveyed that OPGW shall be installed on all upcoming lines of 132 kV and above and on identified existing lines to provide reliable communication and data acquisition system for 132 kV and above substations. Consequently, DPRs were prepared by POWERGRID for Reliable Communication Scheme in NR, SR, ER, WR & NER Regions comprising 1,09,313 km of OPGW. MoP Vide letter 03.10.2016, advised POWERGRID to implement the Centre Sector portion of 5,660 km.

Now, CTU vide its agenda requested the Central and State Sector utilities to provide status of implementation of the above OPGW and to identify additional requirement of OPGW subsequent to preparation of the said DPRs.

For Central Sector, POWERGRID updated that around 18,000 km OPGW is under implementation against proposed 5,660 km. Further, around 9,000 km OPGW is under tendering which is approved in various RPC meetings.

Member Secretary, NPC, CEA stated that OPGW installation of 94,137 km is sanctioned for State Sector portion under PSDF scheme and proposals from 4 states viz. Arunachal Pradesh, Meghalaya, Uttar Pradesh and Odisha are under consideration for OPGW installation. She suggested that status of installation of the OPGW can be obtained from RPCs within a month. She further informed that total OPGW installation for the State Sector would be 1.18 lakh km in place of 103,653 km considered in the DPRs. All State Sector 132 kV and above OPGW link status may be furnished within one month considering revised proposals, if any.

CE, PCD Division, CEA requested POWERGRID and State Transmission Utilities to provide OPGW installation data, namely; name of the line, voltage level (kV), whether S/C, D/C or M/C, No. of earthwire/OPGW, length of the line (km), fibre count in the OPGW and scheme under which implementation is done/being carried out, to CEA within three weeks from the date of issue of Minutes of Meeting.

**Recommendations:**

1. Committee recommended that Central and State Sector utilities should provide the status of implementation of the OPGW laying for the data given in Para-1/4 above through RPCs and should identify additional requirement of OPGW, if any.
2. Committee recommended that Transmission utilities should provide OPGW installation data, namely; name of the line, voltage level (kV), whether S/C, D/C or M/C, No. of earthwire/OPGW, length of the line (km), fibre count in the OPGW and scheme under which implementation is done/being carried out, to CEA within **three weeks** from the date of issue of Minutes of Meeting at [celdntcea@gmail.com](mailto:celdntcea@gmail.com).

**B.2.2 Upgradation of Equipment capacity**

CTU has proposed that lower capacity links need to be upgraded/replaced with higher capacity links. Details of STM-1/4 ISTS and STU links, lying between STM-16 links, identified for upgradation with STM-16 links are given at **Annexure B2(2)**. Estimated cost for upgradation/replacement of such links are:

- NR: 5.0 Cr
  - SR: 3.0 Cr
  - WR: 4.0 Cr
  - NER: 4.0 Cr
  - ER: 4.0 Cr
- TOTAL: 20 Cr**

In the meeting, Director, PCD Division, CEA suggested that for better utilization of resources, details of link BW and its utilization should be known before considering the upgradation of equipment capacity. CEA has already sought information from POWERGRID in this regard. Other utilities are also requested to provide the similar information to the CEA so as to facilitate the Committee to identify congested links for upgradation.

CE, PCD Division, CEA suggested that utilities may also consider other communication technology options while proposing for the replacement.

**Recommendations:**

1. Committee recommended that transmission utilities should furnish details of link bandwidth and its utilization to identify the congested links for communication equipment upgradation and better utilization of resources within three weeks from the date of issue of the minutes of meeting at [celdnt@gmail.com](mailto:celdnt@gmail.com).
2. Committee recommended that transmission utilities may also consider other communication technology options while proposing for the replacement.

**B.2.3 OPGW links in intervening lines**

To provide 100% redundancy with route diversity for communication, it is required to plan for OPGW on some intervening lines.

CTU in its agenda item proposed that in order to achieve 100% redundancy for the substation data upto RLDC, lines of ISTS/STU/Other utilities, such as that described in the

agenda item, need to be identified in a coordinated manner and installation of OPGW on such lines shall be taken on priority by the concerned utilities.

After detailed deliberation, CE, PCD Division, CEA while summarizing the views of members suggested that intervening lines which provide 100% redundancy with route diversity should be identified within three weeks from the date of issue of minutes. CEA would also collect details of such lines through RPCs. He also added that such lines shall be monitored on priority basis for early completion of OPGW links. Concerned Construction Monitoring Division of CEA would be requested to closely monitor progress of such lines.

The issue regarding scope and ownership of laying of OPGW on existing main lines having no OPGW (for example, in case of LILO line) was also brought up. CTU informed that they have modified RfP and there would not be any such issues for the upcoming lines. However, for already commissioned lines it was decided that:

1. States, POWERGRID and CTU shall identify such links and forward the list to CEA.
2. POSOCO & RPC shall provide information available with them for such links.
3. A joint exercise shall be carried out by CEA and CTU for identification of such links by reviewing ISTS along with state sector FO networks. Agenda will be discussed in the next meeting based on the findings.

**Recommendations:**

1. Committee recommended that intervening lines which provide 100% redundancy with route diversity should be identified within 3 weeks from the date of issue of minutes in coordination with CTU/STUs/RPCs.
2. Committee recommended that such links should be monitored on priority basis by concerned Construction Monitoring Division of CEA for early completion.
3. Regarding scope and ownership of laying of OPGW on existing main lines having no OPGW (for example, in case of LILO line) Committee recommended following-
  - a. States, POWERGRID and CTU shall identify such links and forward the list to CEA.
  - b. POSOCO & RPC shall provide information available with them for such links.
  - c. Joint exercise shall be carried out by CEA and CTU for identification of such links by reviewing ISTS along with state sector FO networks. Based on this, agenda will be put up in the next meeting of the Standing Committee for deliberations.

**B.2.4 Dual path for Radial Nodes**

At present in the existing ISTS networks, dual path has been implemented for most of the nodes/links which are non-radial in nature. However, there are many generating stations and ISTS nodes on radial connectivity which are not possible to be connected on OPGW links with alternate path. The dual path is also critical for the generating stations to be monitored and controlled for AGC. Besides, some of the stations connected to the ISTS communication networks using public network via GPRS / leased line connectivity and hence are vulnerable to cyber-attacks, are less reliable and have poor availability.

Followings are proposed by the CTU in its agenda item:

1. Nodes with radial connectivity should be identified to provide dual path.



2. Links which are running at present over public network such as GPRS/ Leased line needs to be identified and replaced with dedicated networks on OPGW or with another media like ADSS/UGFO, VSAT, Wimax.
3. The above proposals may also be included in the draft Manual of Communication Planning in Power System Operation.

In the meeting, provision for dual path for radial links, where OPGW links are not feasible to provide as alternate path, was discussed and adaption of various technologies for dual path like private network on OPGW or with another media like ADSS/UGFO, VSAT, Wimax and use PLCC as an alternate channel in place of GPRS/Leased line were considered. After detailed deliberation, CE, PCD Division, CEA suggested that a list of such radial node should be provided by concerned LDCs/RPCs before reaching any conclusion. Regarding usage of public networks such as GPRS, as mentioned in Central Electricity Authority (Technical Standards for Communication System in Power System Operation) Regulations, 2020, he proposed that the same can be reviewed appropriately.

The LDCs/RPCs are requested to provide details of Central Sector and State Sector nodes with radial connectivity within three weeks from the issue of Minutes of Meeting. Considering various factors, communication media/technology may be decided and relevant orders may be issued.

### **Recommendations:**

Committee recommended that LDCs/RPCs shall provide details of Central Sector and State Sector nodes with radial connectivity within three weeks from the issue of Minutes of Meeting. Considering various factors, communication media/technology may be decided and relevant orders may be issued

### **B.2.5 Review of Criteria for PMU Placement**

As per the minutes of Joint Meeting of the standing committees on Power System planning held on 05.03.2012; following locations were proposed for PMU installation:

1. All 400 kV stations in State and ISTS grid
2. All generating stations at 220 kV and above
3. HVDC terminals and all inter-regional and inter-national tie lines
4. Both ends of all the transmission lines at 400 kV and above: State and ISTS sector

CTU in its agenda item suggested that the above criteria need to be reviewed in respect of NER & Sikkim as most of the transmission lines in NER & Sikkim are at 132 kV/ 220 kV level. The CTU proposed that following locations may also be included for PMU placement:

1. All 132 kV and above ISTS lines in NER & Sikkim
2. All 132 kV and above ISGS in NER & Sikkim

Tentative quantity of PMUs in NER - 120 nos. and in Sikkim- 22 nos. Details of links for PMU placements in NER & Sikkim are attached at **Annexure B2(3)** and **Annexure B2(4)** respectively. This requirement of PMUs in NER and Sikkim may be included in the upcoming URTDSM Phase-II project.

Member Secretary, NPC, informed that the review of the PMU placement criteria is under consideration in NPC. CE, PCD Division, CEA requested her to include the CTU proposal of PMU placement under URTDSM Phase-II for deliberation and comments of PCD Division may be sought. Accordingly, the agenda will be forwarded to the NPC Division for consideration.

### **Recommendation**

Committee recommended to forward the agenda item to NPC for including the CTU proposal of PMU placement under URTDSM Phase-II for deliberation in NPC meeting.

### **B.2.6 Cyber security policy for the ISTS communication network**

The CTU in its agenda item informed that at present there are no firewall installed at substation level for protection of the ULDC network and following is proposed to address Cybersecurity aspects for Power System communication:

1. Firewalls to be installed at all existing ISTS/ISGS Substation between the path of SAS Gateways and FOTE for protecting data to RLDC with centralized management system with Server etc. Schematic diagram shown at **Annexure B2(5)**.
2. Similar approach for protection/ security may also be adopted at STU, IPP nodes. This approach will not be effective unless all the users connected with the ISTS communication network shall adopt the same safety measure.

During discussion, CE, IT Division, CEA informed that substation communication protocols do not include cybersecurity features in their original standard. Simultaneous, cyber intrusions into multiple substations is a scenario that cannot be ruled out and can lead to catastrophic outages. To mitigate cyber-attacks, firewalls are widely adopted as an access control method against hackers, however, they do not guarantee cybersecurity. Instances of firewalls being mis-configured and even if the configuration of firewalls are correct, it has vulnerabilities because they are not able to detect insider attacks and connections from the trusted sites. Hence, solutions based solely on firewalls can be inadequate. Further, IEC-62351 for information security of power system control operations does not cover all cyber intrusions. Therefore, he suggested that a sub-committee be formed within three weeks from date of issue of Minutes in this regard to deliberate on the matter comprehensively. The sub-committee may also examine the feasibility of installation of Firewall/ Cyber Security Protection for the substations with IEC- 60870-5-101 and its report may be submitted to CEA within 60 days from date of its formation.

After detailed deliberation, Chairman, SCCSPPS, agreed with proposal of CE, IT Division, CEA regarding formation of sub-committee to discuss this matter in detail. Member may be asked to volunteer for the sub-committee.

### **Recommendation**

Committee recommended for the formation of sub-committee to discuss **Cyber security policy for the ISTS communication network** in detail and submit its report to CEA within 60 days from date of its formation.

### **B.2.7 Unified Network Management System (UNMS)**

CTU in its agenda item submitted following status of UNMS project in different Regions and requested to expedite the approval in WR, SR & ER:

1. NR – NIT done, OBD scheduled on 22.02.2021
2. NER- NIT done, OBD scheduled on 24.02.2021
3. WR – Scheme to be approved in WRPC.
4. ER- Scheme deliberated in subcommittee, approval in ERPC is to be done.
5. SR- Scheme to be approved in SRPC, funding to be decided.

In the meeting CE, PCD Division, CEA apprised that UNMS being a regulatory requirement, its implementation needs to be expedited and utilities are requested to ensure its smooth integration. If any issue arises regarding integration with centralized NMS, the matter should be referred to CEA.

### **Recommendation**

Committee recommended that every utility shall ensure implementation of centralized NMS. If any issue arises regarding integration with centralized NMS, the matter should be referred to CEA.

### **B.3.1 Communication modality at new and existing lines with CTU**

GETCO in its agenda item informed that there are about 30 nos. of 400 kV/220 kV lines through which GETCO-STU is connected with PGCIL-CTU. In these lines point to point PLCC system is established. Similarly, many lines from CPP/IPP/wind farm/solar are also connected with STU through PLCC. For such cases GETCO requested for modalities/clarification for

- Modalities for replacement of PLCC system with OPGW+FOTE wideband system in these lines are required - who will bear the expense for replacement; and
- whether OPGW+FOTE system is to be provide in new lines.

Director, PCD Division, CEA clarified that OPGW + FOTE may be employed without replacing existing PLCC system citing MoP order dated 16.09.2015 which states that one existing earth wire may be replaced with OPGW to provide reliable communication and data acquisition system for 132 kV and above substations.

Further, he informed that as per draft Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Amendment Regulations, 2021, OPGW may be used with same functionality as PLCC for 132 kV and above lines. However, in order to provide redundancy, PLCC system may be used along with OPGW till the life of PLCC system is over or until another alternate path with OPGW is made available.

It was also suggested that utilities may go for assistance from PSDF to install OPGW for the identified lines under reliable communication scheme without replacing existing PLCC system. Regarding lines not covered under PSDF funding, utilities may reach out to RPCs to get approval and build the OPGW+FOTE system.

### **Recommendation:**

Committee recommended that utilities may go for the assistance from PSDF to install OPGW for the identified lines under reliable communication scheme without replacing existing PLCC system (in order to provide redundancy till its life or until another alternate path with OPGW is made available) and for the lines which are not covered under

PSDF funding, utilities may reach out to RPCs to get approval and build the OPGW+FOTE system.

**B.3.2 Operation & maintenance modality of Communication link of OPGW + FOTE with CTU lines.**

GETCO in its agenda item requested for modalities/clarification for O&M of Communication link of OPGW + FOTE with CTU lines.

During discussion, committee informed that responsibility for O&M of the communication system lies with owner of the communication infrastructure.

**Recommendation:**

Committee recommended that responsibility for O&M of the communication system shall lie with owner of the communication infrastructure.

**B.4 TSTRANSCO in its agenda item requested for modalities/clarification for:**

1. Use of MPLS technology in power sector in place of existing SDH/PDH equipment
2. Leasing of spare dark fibers of OPGW cable laid on EHT towers to telecom operators
3. Standardization of earthing practices for communication system in EHT substations

**1. Use of MPLS technology in power sector in place of existing SDH/PDH equipment:** TSTRANSCO proposal regarding adoption of MPLS technology in lieu of SDH/PDH was discussed. In this regard, CEA informed that some states like KSEB, TANTRANSCO and JUSNL have earlier proposed to adopt MPLS technology in place of SDH/PDH. As per their proposal, CEA advised them to consider MPLS technology as proposed by them subject to the compliance of relevant provisions of the Central Electricity Authority (Technical Standards for Communication System in Power System Operations) Regulations, 2020. CEA suggested that performance/working of MPLS technology employed by RRVPNL may be studied in detail before going ahead with its wider adoption.

**Recommendation:**

Committee recommended that for wider adoption of the MPLS technology, the performance/working of MPLS technology employed in RRVPNL may be studied in detail and a sub- committee may be constituted for this purpose.

**2. Leasing of spare dark fibers of OPGW cable laid on EHT towers to telecom operators:** CEA suggested that before leasing of dark fibers, TSTRANSCO may seek input/experience from POWERTEL and accordingly modalities may be framed.

**Recommendation:**

Committee recommended that utilities may seek input/experience from POWERTEL and accordingly modalities may be framed.

**3. Standardization of earthing practices for communication system in EHT substations:** In this regard, TSTRANSCO was suggested to follow relevant provisions of Central Electricity Authority (Technical Standard for Communication System in Power

System Operations) Regulations, 2020. During further deliberations, CTU/POWERGRID informed that it is adopting both common and separate earthing for communication equipment and electrical equipment on basis of EPR values. Committee decided that POWERGRID will share its experience and industry best practices with the Committee within three weeks from date of issue of minutes of meeting.

**Recommendation:**

Committee recommended that POWERGRID will share its experience and industry best practices with the forum within three weeks from date of issue of minutes of meeting.

**B.5.1 Replacement of GI Earth Wire by OPGW**

In its agenda item, MPPTCL suggested that guidelines may be issued to all STUs to replace GI Earth Wire by OPGW on account of the marginal difference between cost of the two. Further, since AC shall be provided for FOTE, therefore VRLA Battery Set may be considered instead of conventional lead acid battery. This will overcome problem of space constraints in the sub-stations.

During discussion, Committee informed that vide MoP order dated 16.09.2015 utilities were requested to install OPGW to provide reliable communication and data acquisition system for 132 kV and above substations. CE, PCD Division, CEA informed that provision has been made in the draft Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Amendment Regulations, 2021 for installation of OPGW along with necessary terminal equipment on transmission lines of voltage rating of 110 kV and above for speech transmission, line protection, and data channels. The draft amendment is under the process of notification. Regarding usage of VRLA battery set, he informed that Clause-8(11) of Central Electricity Authority (Technical Standard for Communication System in Power System Operations) Regulations, 2020 mandates that communication equipment at all nodes shall be provided with at least ten hours backup and extended backup wherever required. The choice between use of VRLA and conventional battery set is left to the owner. So, there is no specific need for the guidelines to be issued in this respect.

**Recommendation:**

1. Regarding replacement of GI earth wire by OPGW Committee recommended that utilities shall follow the MoP order dated 16.09.2015 until the amendments in the above Regulations are notified in this regard.
2. Committee recommended that Clause-8(11) of Central Electricity Authority (Technical Standard for Communication System in Power System Operations) Regulations, 2020 shall be followed and the choice between use of VRLA and conventional battery set is left to the owner.

**B.6.1 Upgradation of Equipment capacity**

TANTRANSCO in its agenda item has proposed some existing links enclosed at **Annexure B6(1)** for upgradation of equipment capacity in the first phase for ISTS Communication.

During deliberations, TANTRANSCO was advised to follow the decision made under item B.2.2 in this regard.

**Recommendations:**

Recommendations made by committee for the agenda item No. B.2.2 shall be applicable for Agenda item No. B.6.1 also.

**B.6.2 OPGW links in intervening lines**

TANTRANSCO in its agenda item has proposed some existing links enclosed at **Annexure B6(2)** for replacement of OPGW links and has also proposed routes for redundancy.

During deliberations, TANTRANSCO was advised to follow the decision made under item B.2.3 in this regard.

**Recommendations:**

Recommendations made by committee for the agenda item No. B.2.3 shall be applicable for Agenda item No. B.6.2 also.

**B.6.3 Protection for N-1 Redundancy**

This item in the agenda note was only for information of the Committee Members.

**B.6.4 UNMS System**

TANTRANSCO in its agenda item has informed that it is already equipped with NMS for state communication system and if it is to be integrated in the UNMS Project, TANTRANSCO requests 100% Grant through PSDF funding (or) otherwise TANTRANSCO may kindly be excluded from UNMS Project. The same has also been deliberated in SRPC TCC meeting held on 23.12.2020 and thereafter also.

During deliberations, TANTRANSCO was advised to follow the decision made under item B.2.7 in this regard.

**Recommendations:**

Recommendations made by committee for the agenda item No. B.2.7 shall be applicable for Agenda item No. B.6.4 also.

**B.7.1 Review of current Communication Systems used in each STUs and CTU - KSEB agenda**

1. Protection Policies adopted with the aid of Communication Channels – Necessity of maintaining PLCC at 220kV level and below.
2. As optical fiber connectivity will be available up to 110 kV substations in all Utilities after the completion of the Reliable Communication Project, policy on migration from Feeder Distance Protection to Differential Protection need to be formulated – Techno-economic analysis.

During deliberations, CE, PCD, CEA informed that draft Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Amendment

Regulations, 2021 provides that (i) OPGW along with necessary terminal equipment shall be provided on transmission lines of voltage rating of 110 kV and above for speech transmission, line protection, and data channels and (ii) primary path for tele-protection shall be on point-to-point OPGW and alternative path shall be either on PLCC or predefined physically diversified OPGW paths OPGW and PLCC are optional as having the same functionality. Existing PLCC system to ensure redundancy as discussed in item B.3.1.

**Recommendations:**

Committee recommended that utilities may continue with existing PLCC system (in order to provide redundancy till its life or until another alternate path with OPGW is made available).

**B.7.2 Reviewing technological innovations and proven technologies in telemetering and tele protection areas and formulating an implementation strategy on a long-term perspective in a uniform phased manner among various STUs – KSEB agenda**

1. Modern communication techniques that can be adopted in the power sector with the optimum utilization of resources and the Techno-economic consideration in adopting new technology.
2. Migration from SDH to MPLS Technology.
3. Draft guidelines on Communication Interface equipment dated 23.04.2020 - Requirement of Approved document.

Point no. 1 and 2 above regarding migration of technology are already covered in agenda item B.4. Regarding point no. 3 above, POSOCO informed the Committee that draft in under finalization in CERC and will be available shortly.

**Recommendations:**

Recommendations made by committee for the agenda item No. B.4.1 shall be applicable for points 1 and 2 of Agenda item No. B.7.2 also.

**B.7.3 Remote controlling of transmission lines/Generators from LDCs through communication channels and its applications in maintaining Grid stability – KSEB agenda**

KSEB in its agenda item suggested for framing of Methods and Policies that can be adopted for the remote control of transmission lines/Generators from LDCs through communication channels.

After detailed deliberation, it was decided to form a sub-committee to deliberate on the matter with members from CEA, RPCs, POSOCO, CTU and STUs within three weeks from the date of issue of Minutes and report may be submitted to CEA within 60 days from date of formation of sub-committee.

**B.7.4 Methods and policies to be incorporated to ensure cyber security in the communication networks of STUs /CTU – KSEB agenda**

During deliberations, KSEB. was advised to follow the decision made under item B.2.6 in this regard.

**B.7.5 Policies to be adopted in the interlinking of communication channels of different STUs/CTU – KSEB agenda**

During discussion it was informed by CE, PCD Division, CEA that this will be considered in Manual on Communication System Planning in Power System Operations.

**B.7.6 Policies to be adopted in the sharing of real time data about transmission lines/generators/grid conditions between STUs/CTUs through their communication networks – KSEB agenda**

After detailed deliberation, it was decided to form a sub-committee to deliberate on the matter with members from CEA, RPCs, POSOCO, CTU and STUs within three weeks from the date of issue of Minutes and report may be submitted to CEA within 60 days from date of formation of sub-committee.

**B.7.7 Policies to be adopted in the visibility and accessibility to the real time Grid operations/Grid conditions of other Utilities through the interlinked communication channels – KSEB agenda**

After detailed deliberation, it was decided to form a sub-committee to deliberate on the matter with members from CEA, RPCs, POSOCO, CTU and STUs within three weeks from the date of issue of Minutes and report may be submitted to CEA within 60 days from date of formation of sub-committee.

Finally, it was decided that the same sub-committee shall address the agenda points B.7.3, B.7.6 and B.7.7

**Recommendations:**

Committee recommended constitution of a sub-committee with members from CEA, RPCs, POSOCO, CTU and STUs within three weeks from the issue of minutes of meeting to deliberate on matters of item B.7.3, B.7.6 and B.7.7. The sub-committee shall submit its report to CEA within 60 days from the date of its formation.

**B.8.1 Upgradation of STM-1 network (OEM – Fiberhome) established under Microwave replacement package**

PSTCL in its agenda item informed that it is in the process of upgrading its communication network to either higher capacity or migrate it to other advanced technologies available in the market such as MPLS-TP as the support of current network by the OEM (Fiberhome) is not available. Apart from this, limited bandwidth of the network has obstructed integration/ augmentation of expansion projects.

During deliberations, CTU advised that PSTCL may continue with the existing system till exhaustion of its lifetime while planning for redundancy by installing higher capacity equipment or migrating to other advanced technologies such as MPLS-TP simultaneously. The system can be migrated later.

**Recommendations:**

Committee recommended that PSTCL may continue with the existing system till exhaustion of its lifetime while planning for redundancy by installing higher capacity



equipment or migrating to other advanced technologies such as MPLS-TP simultaneously. The system can be migrated later.

**B.9.1. Extension of existing fiber network through next phase PSDF grant to further extend the fiber connectivity**

RRVPNL in its agenda informed that CEA earlier has decided for establishing of communication facility through fiber upto all 132 kV & above level substations for which 50% grant from PSDF was given. This initiative has allowed RVPN to establish 14368 km of OPGW network with connectivity upto 552 nos. of 132 kV & above level substations. At present 14235 km of OPGW network has already been established and 358 nos. of substations are already connected on fiber and reporting to Command & Control Center. Remaining are also likely to be connected by April 2021.

Now, 81 nos of 132 kV & above voltage level substations are also added to the system. Also, few of the OPGW links are required to enhance the reliability on fiber network in the ring system. Therefore, there is a requirement to further extend the fiber network for connecting remaining substations along with OPGW connectivity of existing lines/ links.

In view of the above, RRVPNL proposed that extension of the existing fiber network may be considered and allowed under PSDF grant next phase, to further extend the fiber connectivity.

Member Secretary, NPC, suggested that the proposal may be submitted to the NPC for consideration for PSDF funding. The Committee agreed with the same.

**Recommendations:**

The committee recommended that RRVPNL may submit its proposal regarding PSDF grant for extension of fiber network to NPC.

**B.9.2. Discontinuance of PLCC for speech at 132 kV level substations**

RRVNL informed that due to establishment of fiber network upto 132 kV level, the speech facility is feasible with VoIP communication. RVPN has already established it upto 220 kV level substations and have facility in the deployed system to add 132 kV substations also with the addition of VoIP phones. Therefore, now the speech facility at 132 kV level can also be achieved with fiber connectivity on VoIP. In view of this, RRVNL needs a policy decision on discontinuing PLCC for speech at 132 kV level substations. This would spare pool of frequency band and help in relieving frequency congestion.

During the deliberations, representative of NLDC informed that they are using VoIP facilities since 2012 and is working fine. Therefore, RRVNL may go ahead as per requirement. Members agreed with the proposal.

**Recommendations:**

The committee recommended that RRVPNL may go ahead with its proposal for usage of VoIP and discontinuance of PLCC for speech at 132 kV level substations as per its requirement.

**B.9.3. Fiber connectivity for all traction substation of 132 kV and above voltage level being established by Railways/ DFCCIL**

RRVPNL in its agenda item informed that with large electrification of railway tracks and dedicated link for DFCCIL, Railway/ DFCCIL are also establishing large number of 220 kV & 132 kV TSS. In future, these substations will be substantial in numbers and substantial load will flow through it. The real time data of these TSS would also be required for grid management/ operation purposes. At present, in absence of definite policy, Railways/ DFCCIL denies establishment of communication through PLCC and fiber optics, and insist that the energy data shall be transferred by them on GPRS.

RRVPNL suggests for making a policy decision for making the fiber connectivity essential for all traction substation of 132 kV and above voltage level being established by Railways/ DFCCIL for real time data transfer as per future grid operation/ management requirements.

As representation from Railways/DFCCIL are not in the Committee, CE, PCD Division, CEA suggested that the RRVPNL will provide detailed station-wise proposal and then CEA would take up the matter with Railways/DFCCIL. Member agreed with the same.

**Recommendations:**

The committee recommended that regarding fiber connectivity for all traction substations (132 kV and above) being established by Railways/DFCCIL, RRVPNL shall provide detailed station-wise proposal to CEA for taking up the matter with Railways/DFCCIL.

**B.10. Goa Electricity Department in its agenda item submitted the following:**

- (i) Tele-protection Scheme for the all the elements of the ISTS carrying bulk power to Goa and integration of the same with SLDC's SCADA.
- (ii) Providing 100% redundancy to the communication system across all the Transmission substations in Goa and providing last mile connectivity for necessitating data reporting to SLDC and RLDC's.
- (iii) Establishing OPGW connectivity between MSETCL's 220 kV Mahalaxami & Tillari Substations with Goa's 220 kV Amona Substation, so as to provide voice, data, video and tele-protection between these three nodes.

Based on the discussions among Goa, MSETCL and CTU, the Chairman of the Committee directed the Member Secretary to put up Goa's points in the WRPC meeting.

**Recommendations:**

The committee recommended that agenda of Goa Electricity Department be taken up in WRPC meeting.

**B.11.** Agenda items from OPTCL could not be discussed as representative from OPTCL was not online while taking up the agenda. Therefore, the same has been deferred for the next meeting.

Annexure - IList of Participants

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## List of links to be upgraded to STM-4 to STM-16

## Northern Region

Sr. No.	Name of Link		Remarks
	From	To	
1	Bhilwara	Beawar	For WR Redundancy
2	Beawar	Merta	
3	Merta	Ratangarh	
4	Ratangarh	Sikar	
5	Ajmer (PG)	Ajmer (RVPNL)	
6	Kota	Rapp-C	For WR Redundancy
7	Hisar	Bhiwani BBMB	
8	Kurukshetra (PG)	Jind	
9	Jind	Bhiwani (PG)	
10	Baghpat	Dehradun	STM-16 ring and path redundancy
11	Dehradun	Abdullapur	
12	Abdullapur	Panchkula 400	
13	Patiala (PG)	Rajpura	
14	Rajpura	Mohali	
15	Mohali	Chandigarh SLDC	

## Eastern Region

Sr. No.	Name of Link		Remarks
	From	To	
1	Barh	Kahalgaon	
2	Patna 400	Arah220	
3	Patna	Balia	
4	Jepore	Bolangir	Jeypore -> Gajuawaka (SR)
5	Bolangir	Angul	
6	Angul	Srikakulam (SR)	ER-SR
7	Angul	Jharsuguda	
8	Jharsuguda	Rourkela	
9	Alipurduar	Birpara	Alipurduar-> Bongaigaon (NER)
10	Birpara	Siliguri	
11	Siliguri	Purnea 400	

## Southern Region

Sr. No.	Name of Link		Remarks
	From	To	
1	Kurnool New	Gooty	
2	Gooty	Gooty (AP)	

3	Kalivanthapattu	Sriperambudur	
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**Western Region**

Sr. No.	Name of link		Remarks
	From	To	
1	Raigarh	Raigarh PS	
2	Korba STPP	Birsinghpur	
3	Birsinghpur	Damoh	
4	Damoh	Bhopal	
5	Dehgam	Ranchhodpura	WR-NR redundant path via Banaskantha - Chhitorgarh
6	Ranchhodpura	Bachau	
7	Bachau	Mundra-CGPL	

**North Eastern Region**

Sr. No.	Name of link		Remarks
	From	To	
1	Bongaigaon	Salakati	
2	Badarpur	Kolasib	
3	Kolasib	Aizawl	
4	Passighat	Along	
5	Along	Daparijo	
6	Daparijo	Ziro	
7	Ranganadi	Balipara	
8	Namsai	Miao	Arunachal Links under NERPSIP
9	Miao	Jairampur	
10	Jairampur	Changlang	
11	Changlang	Khonsa	
12	Khonsa	Deomali	
13	Deomali	Kathalguri	



**List of lines for PMU installation in NER**

Sl. No.	Region	Name of the Line	Length in ckt km	Charged at	Voltage Level in kV
1	NER	Tezu -Namsai S/c	95	132	132
2	NER	Pasighat - Roing	108	132	132
3	NER	Roing - Tezu	72	132	132
4	NER	Bongaigaon - salkati-II D/C line (Lenth is for Bongaigaon - salkati-II only)	1	220	220
5	NER	Balipara - Tezpur	9	220	220
6	NER	Misa - Kopili-III	76	220	220
7	NER	Salakati - BTPS-I	3	220	220
8	NER	Salakati - BTPS-II	3	220	220
9	NER	Misa - Kopili-I	73	220	220
10	NER	Misa - Kopili-II	73	220	220
11	NER	Misa - Dimapur-I	124	220	220
12	NER	Misa - Dimapur-II	124	220	220
13	NER	Misa - Samaguri-I	34	220	220
14	NER	Misa - Samaguri-II	34	220	220
15	NER	Mariani - Mokokchung I	49	220	220
16	NER	Mariani - Mokokchung II	49	220	220
17	NER	Aizwal - Kolasib	66	132	132
18	NER	Kolasib - Badarpur	107	132	132
19	NER	Agartala - Agartala-I	8	132	132
20	NER	Agartala - Agartala-II	8	132	132
21	NER	Aizwal - Kumarghat	133	132	132

**List of lines for PMU installation in NER**

Sl. No.	Region	Name of the Line	Length in ckt km	Charged at	Voltage Level in kV
22	NER	Aizwal -Melriat- Zemabawk(LILO	10	132	132
23	NER	Aizwal -Melriat- Zemabawk	7	132	132
24	NER	Badarpur - Badarpur	1	132	132
25	NER	Badarpur - Jiribam	67	132	132
26	NER	Badarpur - Khliehriat	77	132	132
27	NER	Badarpur - Kumarghat	119	132	132
28	NER	Dimapur - Imphal	169	132	132
29	NER	Doyang - Dimapur-I	93	132	132
30	NER	Doyang - Dimapur-II	93	132	132
31	NER	Gohpur - Nirjuli (Itanagar)	43	132	132
32	NER	Imphal - Imphal	2	132	132
33	NER	Jiribam - Aizwal	172	132	132
34	NER	Jiribam - Haflong	101	132	132
35	NER	Jiribam - Loktak-II	82	132	132
36	NER	Salakati - Gaylemphug	49	132	132
37	NER	Khandong - Haflong	63	132	132
38	NER	Khandong - Khliehriat-I	42	132	132
39	NER	Khandong - Khliehriat-II	41	132	132
40	NER	Khandong - Kopili I	11	132	132
41	NER	Khliehriat - Khliehriat	8	132	132
42	NER	Kumarghat - R.C.Nagar (Agarthala)	104	132	132

**List of lines for PMU installation in NER**

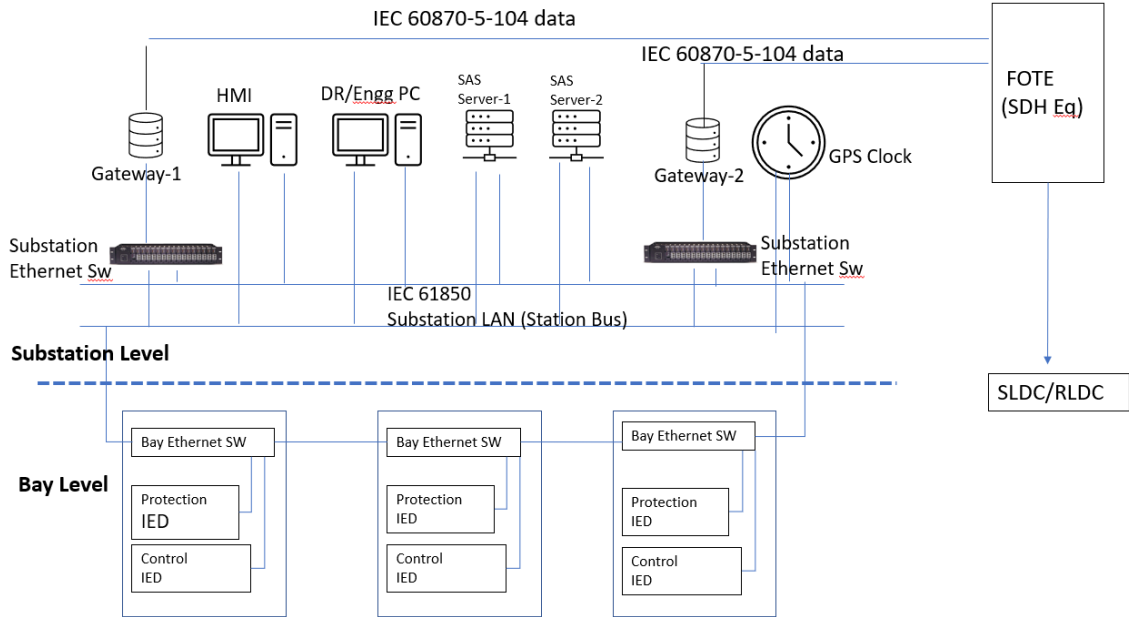
Sl. No.	Region	Name of the Line	Length in ckt km	Charged at	Voltage Level in kV
43	NER	Loktak - Imphal-II	35	132	132
44	NER	Nirjuli - Ranganadi	22	132	132
45	NER	Kopili - Khandong II	12	132	132
46	NER	Dimapur - Dimapur (PG) (LILO portion)	0	132	132
47	NER	Dimapur (PG) - Kohima (LILO portion)	0	132	132
48	NER	Silchar - Srikona I	1	132	132
49	NER	Silchar - Srikona II	1	132	132
50	NER	Silchar - Badarpur I	19	132	132
51	NER	Silchar - Badarpur II	19	132	132
52	NER	Part of Silchar - Hailakandi I	30	132	132
53	NER	Part of Silchar - Hailakandi II	30	132	132
54	NER	Imphal (state) - Ningthoukong	0	132	132
55	NER	Imphal (state) - Imphal	0	132	132
56	NER	Ranganadi - Ziro	45	132	132
57	NER	Bishwanath Chariali - Bishwanath Chariali (Pavoi) I	13	132	132
58	NER	Bishwanath Chariali - Bishwanath Chariali (Pavoi) II	13	132	132
59	NER	Mokokchung - Mokokchung I	1	132	132
60	NER	Mokokchung - Mokokchung II	1	132	132

**List of lines for PMU installation in Sikkim**

Sl. No.	Region	Name of the Line	Length in ckt km	Charged at	Voltage Level in kV
1	ER-II	Rangpo - New Melli I	26	220	220
2	ER-II	Rangpo - New Melli II	26	220	220
3	ER-II	Rangit - Karseong (upto LILO point)	61	132	132
4	ER-II	Karseong - Siliguri (upto LILO point)	31	132	132
5	ER-II	Siliguri - Meli	92	132	132
6	ER-II	Meli - Chuzachen	21	132	132
7	ER-II	Rangpo - Chuzacheng I (upto LILO)	1	132	132
8	ER-II	Rangpo - Gangtok	17	132	132
9	ER-II	Gangtok - Rangpo	73	132	132
10	ER-II	Rangpo - Rangit	3	132	132
11	ER-II	Rangit - Rammam	27	132	132

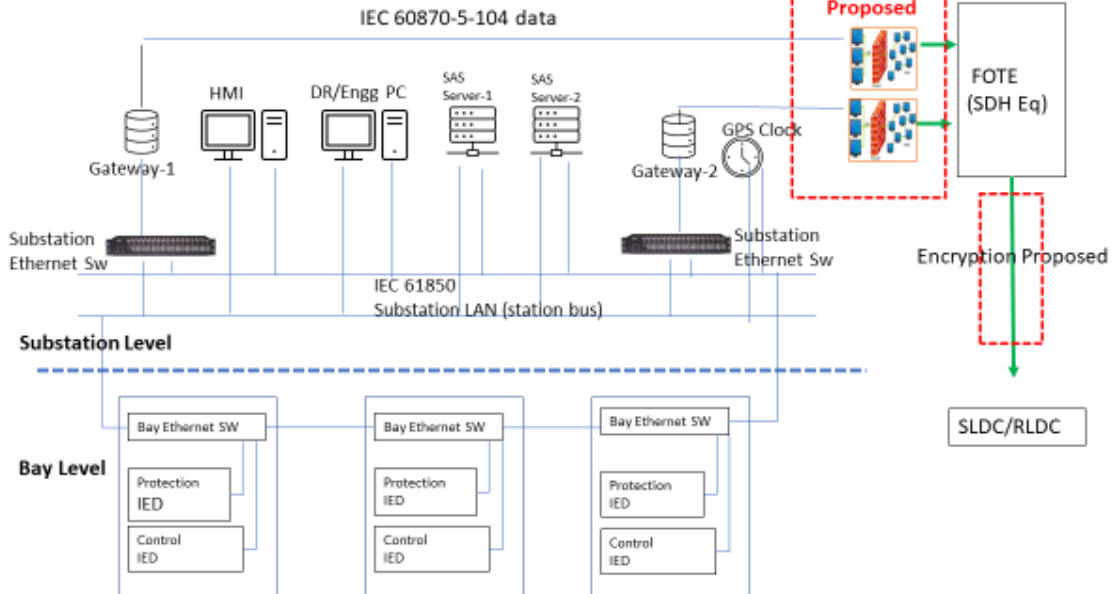
**Existing Network architecture at S/s**

**Typical Substation Automation Architecture**



Proposed Firewall:

**Proposed solution for Communication Security**



**TANTRANSCO: Agenda B.6.1 - Upgradation of Equipment capacity**Chennai Circle:

The existing links as listed below are needed to be upgraded in FIRST PHASE for ISTS Communication:

Sl No	Link Detail	Link upgradation required		Equipment Upgradation / SFPs Required at
		From	To	
1	Chennai - Sriperumbudur	STM-4	STM-16	Chennai and Sriperumbudur covered under P&C/P.O. 1009 and SFPs to be allocated.
2	Chennai - Kalivanthapattu	STM-4	STM-16	Tejas SFP at Chennai and KVPT required.
3	Sriperumbudur - Kalivanthapattu	STM-4	STM-16	Sriperumbudur end covered in P&C/P.O. 1009 and SFPs to be allocated. Kalivanthapattu end SFP for Tejas OLTE to be arranged.
4	Sriperumbudur – Trichy (PGCIL – Telecom Bandwidth enhancement to be addressed)	STM-1	STM-16	Sriperumbudur end covered in P&C/P.O. 1009 and Trichy end SFP for Tejas OLTE to be arranged.
5	Trichy-Madurai	STM-4	STM-16	Trichy Tejas SFPs to be arranged. Madurai end covered in P&C/P.O. 1009 and SFPs to be allocated.
6	KVPT to Pugalur Via Alagapuram	STM-4	STM-16	SFPs for Tejas at Kalivanthapattu, Pugalur and at Alagapuram required.
7	Alamathy - Manali	STM-4	STM-16	ABB 615 Equipments to be upgraded at both ends.
8	Alamathy-NCTPS	STM-4	STM-16	ABB 615 SFPs and Samo2 required, at NCTPS end and Firmware revision required.
9	Alamathy-SVC	STM-4	STM-16	ABB 615 SFPs and Samo2 cards required for SVC end and Firmware revision required.

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10	SVC-SRPDR	STM-4	STM-16	ABB 615 SFPs and Samo2 cards required for SVC end and Firmware revision required.
11	Basin Bridge – Manali	STM-1	STM-16	ABB 615 SFPs and Samo2 cards required for Basin Bridge end and Firmware revision required.
12	MLDC/Chn – Basin Bridge Upcoming		STM-16	ABB 615 SFPs and Samo2 cards required for Basin Bridge end and Firmware revision required.
13	Alamathy-Thiruvalam	STM-4	STM-16	ABB615 SFPs required for TVLM end and Firmware revision required.

Note:Sl.No.1 to 6 links are covering ISTS, ICCP, REMC traffic.

Madurai Circle

The following OPGW Links as listed below are needed to be upgraded in the first phase for ISTS Communication.

SL No	Link Detail	Link Up-gradation Required		Equipment Up-gradation / SFPs Required at	Remarks
		From	To		
1	Madurai-Trichy	STM-4	STM-16	1) <b>Madurai end</b> - Upgradation of FOTE by Hybrid FOTE vide P&C Spec 1022 Dt 08.10.2020 is in progress.  2) <b>Trichy end</b> – The available M/s.Tejas FOTE support STM-16 capacity and hence only STM16 SFPs are to be arranged.	
2	Madurai 230 – Checkkanoorani 230	STM-4	STM-16	M/s.Tejas SFPs are required in the existing FOTE for both ends.	M/s.Tejas OLTE under PGCIL SR2 Scope and SFP requirement may be addressed to PGCIL SR2
3	Madurai 230 – Kayathar 400 KV	STM-1	STM-16	1) <b>Kayathar end</b> - Enhancement of M/s.ABB FOTE for STM16 capacity is required.	
4	Kayathar 400 KV – Karaikudi PG	STM-4	STM-16	1) <b>Both ends</b> – Replacement of Ms/.Tejas FOTE for STM16 is required since existing backplane (XA14OT5) does not support STM-16	



Coimbatore Circle:

Sl. No.	Name of PH/SS	Existing OFC Direction	Existing Capacity	To be upgraded as	New OFC link to be provided in the Existing feeder for redundancy	Requirement
1	SUB-LDC/Erode	Salem230 kV SS	STM4	STM16		XA60G cards required (TEJAS OLTE )
		Pugalur230 kV SS	STM4	STM16		
		Trichy 230 kV SS	STM4	STM16		
		Salem 400 kV SS	STM4	STM16		
		Ingur230 kV SS	STM4	STM16		
		LMHEP-4	–	STM4	110 kV SWTP#	
2	Ingur 230 kV SS	SUB-LDC/Erode	STM4	STM16		
		Karamadai230 kV SS	–	STM16	Karamadai 230 kV #	
		Kurukathy 230 kV SS	–	STM4	110 kV Kurukkathy 230 kV SS#	
		MTPS S-1	–	STM4	230 kV MTPS S-1#	
		Thingalore230 kV SS	–	STM4	Thingalore230 kV#	
3	Kurukkathy 230 kV SS	Pugalur400 kV SS	STM4	–		
		Myvadi230 kV SS	STM4	STM16		
		Palladam230 kV SS	STM4	–		
		Rasipalayam400 kV SS	–	STM4	110 kV Rasipalayam110 kV#	
		Ingur230 kV SS	–	STM4	110 kV Ingur 230 kV SS #	
4	Pugalur 230 kV SS	Pugalur400 kV SS	STM4	STM16		
		SUB-LDC/Erode	STM4	STM16		

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		Pudansandai230 kV SS	–	STM4	Pudansandai230 kV#	
5	Pugalur 400 kV SS	Pugalur230 kV SS	STM4	STM16		
		Kalivanthapattu400 kV SS	STM4	STM16		
		Karaikudi400 kV SS	STM4	–		
6	Pudansandai 230 kV SS	Pugalur230 kV SS	–	STM4	Pugalur230 kV #	
		Unjanai 230 kV SS	–	STM4	Unjanai 230 kV#	
		Deviyakurichi 230 kV SS	STM4	–		
		Valayapatty 230 kV SS	STM4	–		
7	Unjanai 230 kV SS	Pudansandai 230 kV SS	–	STM4	Pudansandai230 kV#	OLTE to be provided
		Salem400 kV SS	–	STM4	230 kV Salem400 kV SS#	
8	Thingalore 230 kV SS	Ingur230 kV SS	–	STM4	Ingur 230 kV #	
		Gobi 230 kV SS	–	STM4	110 kV Gobi230 kV SS#	
		Salem400 kV SS	–	STM4	230 kV Salem400 kV SS#	
		MTPS S-2	–	STM4	230 kV MTPS S-2#	
9	Pallakapalayam 230 kV SS	Gobi 230 kV SS	–	STM4	Gobi230 kV#	OLTE to be provided
		LMHEP-4	–	STM4	110 kV LMHEP-4#	
		Salem400 kV SS	–	STM4	230 kV Salem400 kV SS#	
10	Gobi 230 kV SS	Thingalore230 kV SS	–	STM4	110 kV Thingalore230 kV SS#	OLTE to be upgraded (COMTEL

## Annexure B6(1)

		Pallakapalayam 230 kV SS	–	STM4	Pallakapalayam230 kV#	OLTE)
		Anthiyur230 kV SS	–	STM4	Anthiyur230 kV#	
		MTPS stage-2	–	STM16	230 kV MTPS S-2#	
		Arasur 230 kV SS	STM4	STM16		
		Arasur 400 kV SS	STM4			
		Karuvalur230 kV SS	–	STM4		
		Karamadai400 kV SS	–	STM16		
11	Anthiyur 230 kV SS	MTPS stage-1	–	STM4	230 kV MTPS stage-1#	OLTE to be provided
		LMHEP-3	–	STM4	110 kV LMHEP-3#	
		Gobi 230 kV SS	–	STM4	Gobi 230 kV#	
12	Myvadi230 kV SS	Kurukathy 230 kV SS	STM4	STM16		XA60G cards required (TEJAS OLTE )
		Udumalpet230 kV SS	STM4	–		
		Arasur400 kV SS	STM4	STM16		
		Arasur230 kV SS	STM4	STM16		
		Madurai400 kV SS	STM4	STM16		
		Salem230 kV SS	STM4	STM16		
		Ottakalmandabam230 kV SS	–	STM16	OKMBAM 230 kV#	
		Anaikadavu400 kV SS	–	STM16	230 kV Anaikadavu 400 kV SS#	
		Kadamparai PH	–	STM4	230 kV Kadamparai PH#	
13	Udumalpet230 kV SS	Myvadi230 kV SS	STM4	–		

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		Aliyar230 kV SS	–	STM4		
14	Aliyar 230 kV SS	Udumalpet 230 kV SS	–	STM4		
		Kadamparai PH	–	STM4		
		Sarkarpathy PH	–	STM4	No alternate route available. VSAT link may be considered for alternate route	Laid ADSS cable
		Sholayar PH-1	–	STM4	No alternate route available. VSAT link may be considered for alternate route	
15	Palladam230 kV SS	Ottakalmandabam230 kV SS	–	STM4	OKMBAM230 kV#	
		Kurukathy 230 kV SS	STM4	–		
		Tirupur230 kV SS	–	STM4	Tirupur230 kV#	
16	Kadamparai PH	Aliyar 230 kV SS	–	STM4		
		Myvadi230 kV SS	–	STM4	Myvadi230 kV#	
17	Sholayar PH-1	Aliyar230 kV SS	–	STM4		
		Sholayar PH-2	–	STM4		
18	Sholayar PH-2	Sholayar PH-1	–	STM4	No alternate route available. VSAT link may be considered for alternate route	
19	Sarkarpathy PH	Aliyar 230 kV SS	–	STM4		
20	Anaikadavu400 kV SS	Rasipalayam400 kV SS	STM4	STM16		XA60G cards required (TEJAS OLTE )
		Thappagundu	STM4	STM16		
		Ottakalmandabam2	–	STM4	OKMBAM 230	

## Annexure B6(1)

		30 kV SS			kV#	
		Myvadi230 kV SS	–	STM16	Myvadi230 kV#	
21	Rasipalayam400 kV SS	Kurukkathy 230 kV SS	–	STM4	110 kV Kurukkathy 230 kV SS#	
		Palavadi 400 kV SS	STM4	STM16		XA60G cards required (TEJAS OLTE )
		Anaikadavu 400 kV SS	STM4	STM16		
22	Coimbatore 230 kV SS	Thudialur 230 kV SS	STM4	STM16	Own fiber to be provided	OLTE to be upgraded (COMTEL OLTE)
		Ottakalmandabam2 30 kV SS	–	STM16	OKMBAM230 kV#	
23	Ottakalmandabam230 kV SS	Coimbatore 230 kV SS	–	STM16	Coimbatore 230 kV#	OLTE to be provided
		Myvadi230 kV SS	–	STM16	Myvadi230 kV#	
		Thudialur 230 kV SS	–	STM16	Thudialur230 kV#	
		Palladam230 kV SS	–	STM4	Palladam230 kV#	
24	Thudialur 230 kV SS	Arasur 230 kV SS	STM4	STM16		PG fibre OLTE to be upgraded (COMTEL OLTE)
		Coimbatore 230 kV SS	STM4	–		PG fibre
		Kundha PH-4	–	STM4	230 kV Kundha PH-4#	
		Ottakalmandabam2 30 kV SS				
		Karamadai400 kV SS				

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					Own fiber to be provided	PG fibre
	Arasur230 kV SS	Thudialur 230 kV SS	STM4	STM16		
25		Arasur400 kV SS	STM4	-		PG fibre
26	Arasur400 kV SS	Arasur230 kV SS	STM4	-		SAMO2 card required(ABB FOX615)
		Gobi 230 kV SS	STM4	-		
		MTPS S-2	STM4	STM16		
		Myvadi230 kV SS	STM4	STM16		PG fibre
		Karamadai230 kV SS	STM4	-		
		Karuvalur230 kV SS	-	STM4		
27	Karuvalur230 kV SS	Gobi 230 kV SS	-	STM4	Gobi230 kV#	OLTE required
		Arasur400 kV SS	-	STM4	Arasur PG#	
28	Salem400 kV SS	SUB-LDC/Erode	STM4	STM16		SAMO2 card required(ABB FOX615)
		Salem230 kV SS	STM4	STM16		
		MTPS S-1	-	STM4		
		Thingalore230 kV SS	-	STM4	Thingalore230 kV#	
		Unjanai 230 kV SS	-	STM4	Unjanai 230 kV#	
		Pallakapalayam 230 kV SS	-	STM4	Pallakapalayam230 kV#	
		Singapuram230 kV SS	-	STM4	Singapuram230 kV#	
		MTPS S-2	STM4	STM16		
29	Salem230 kV SS	SUB-LDC/Erode	STM4	STM16		1)OLTE to be upgraded (COMTEL OLTE) 2) MUX(ALCATE
		Salem400 kV SS(PG)	STM4	-		
		Salem400 kV	STM4	STM16		

## Annexure B6(1)

		SS(TNEB)				L) was defect
		Myvadi230 kV SS	STM4	STM16		
30	Kariyamanagalam230 kV SS	Palavadi 400 kV SS	STM1	STM4		OLTE to be upgraded (COMTEL OLTE)
		Udanapalli 230 kV SS	STM4	–		
31	MTPS S-2	Palavadi 400 kV SS	STM1	STM16		SAMO2 card required(ABB FOX615)
		Salem400 kV SS	STM4	STM16		
		Karamadai400 kV SS	STM4	STM16		
		Arasur400 kV SS	STM4	STM16		
		MTPS-1	STM4	–		
		Gobi 230 kV SS	–	STM16	Gobi 230 kV#	
		Thingalore230 kV SS	–	STM4	Thingalore230 kV#	
		Anthiyur230 kV SS	–	STM4	Anthiyur230 kV#	
		Mettur230 kV SS	–	STM4	Mettur230 kV#	
32	Udanapalli 230 kV SS	Kariyamanagalam230 kV SS	STM4	–		XA60G cards required (TEJAS OLTE )
		Shoolagiri	STM4	STM16		
		Palavadi 400 kV SS	STM1	STM4		
33	Gurubarapalli 230 kV SS	Palavadi 400 kV SS	STM4	–	230 kV Palavadi 400 kV SS#(Straight Fibre required)	
		Singarapet230 kV SS	STM1	STM4		
34	Palavadi 400 kV SS	Pochampalli	STM1	STM16		XA60G cards required (TEJAS OLTE )
		MTPS S-2	STM1	STM16		
		Rasipalayam400 kV	STM4	STM16		

## Annexure B6(1)

		SS				
		Mettur230 kV SS	STM1	STM4		
		Udanapalli 230 kV SS	STM1	STM4		
		Kariyamanagalam230 kV SS	STM1	STM4		
		Gurubarapalli 230 kV SS	STM1	STM4	Gurubarapalli 230 kV#(Straight Fibre required)	
35	Pochampalli	Palavadi 400 kV SS	STM1	STM16		SAMO2 card required
		Thiruvalam400 kV SS	STM1	STM16		
36	Mettur230 kV SS	Palavadi 400 kV SS	STM1	STM4		OLTE to be upgraded (COMTEL OLTE)
		Shoolagiri	–	STM4		
		MTPS S-2	–	STM4	230 kV MTPS S-2#	
		Mettur Tunnel PH	–	STM4	230 kV Mettur Tunnel PH#	
		Mettur Dam PH	–	STM4	110 kV Mettur Dam PH#	
37	Mettur Tunnel PH	Mettur230 kV SS	–	STM4	230 kV Mettur230 kV SS #	OLTE to be provided
		MTPS S-1	–	STM4	230 kV MTPS S-1#	
38	Mettur Dam PH	Mettur230 kV SS	–	STM4	110 kV Mettur230 kV SS #	OLTE to be provided
		LMHEP-1	–	STM4	110 kV LMHEP-1#	
39	MTPS S-1	Mettur Tunnel PH	–	STM4	230 kV Mettur Tunnel PH#	XA20G cards required (TEJAS OLTE )
		Anthiyur230 kV SS	–	STM4	Anthiyur230 kV#	
		Singarapet230 kV SS	–	STM4	Singarapet230 kV#	



## Annexure B6(1)

		Salem400 kV SS	–	STM4		
		Ingur230 kV SS	–	STM4	Ingur 230 kV #	
		Salem230 kV SS	–	STM4	Salem230 kV#	
		MTPS S-2	STM4	–		
40	Singarapet230 kV SS	Salem230 kV SS	–	STM4		SAMO card required
		Gurubarapalli 230 kV SS	STM1	STM4	Gurubarapalli 230 kV#	
		Vinnamangalam230 kV SS	–	STM4	Vinnamangalam230 kV#	
		Thiruvalam400 kV SS	–	STM4	230 kV Thiruvalam400 kV SS#	
		Thiruvanamalai 230 kV SS	–	STM4	Thiruvalam230 kV#	
		MTPS S-1	–	STM4	230 kV MTPS S-1#	
		Arani230 kV SS	–	STM4	Arani 230 kV#	
		Shoolagiri400 kV SS	–	STM4	230 kV Shoolagiri400#	
41	Valayapatty230 kV SS	Pudansandai230 kV SS	STM4	–		
		Deviyakurichi 230 kV SS	STM4	–		
42	Deviyakurichi 230 kV SS	Pudansandai230 kV SS	STM4	–		
		Valayapatty230 kV SS	STM4	–		
		Singapuram230 kV SS	–	STM4	Singapuram230 kV#	
43	Singapuram230 kV SS	Salem400 kV SS	–	STM4	230 kV Salem400K SS#	OLTE to be provided

## Annexure B6(1)

		Deviyakurichi 230 kV SS	-	STM4	Deviyakurichi230 kV#	
44	LMHEP-1	Mettur Dam PH	-	STM4	110 kV Mettur Dam PH#	OLTE to be provided
		LMHEP-2	-	STM4	110 kV LMHEP-2#	
45	LMHEP-2	LMHEP-1	-	STM4	110 kV LMHEP-1#	OLTE to be provided
		LMHEP-3	-	STM4	110 kV LMHEP-3#	
46	LMHEP-3	LMHEP-2	-	STM4	110 kV LMHEP-2#	OLTE to be provided
		LMHEP-4	-	STM4	110 kV LMHEP-4#	
		Anthiyur230 kV SS	-	STM4	110 kV Anthiyur230 kV SS#	
47	LMHEP-4	LMHEP-3	-	STM4	110 kV LMHEP-3#	OLTE to be provided
		SUB-LDC/Erode	-	STM4	110 kV SWTP#	
		Pallakapalayam 230 kV SS	-	STM4	110 kV Pallakapalayam230 kV SS#	

**TANTRANSCO: Agenda B.6.2 - OPGW in intervening links**

Chennai Circle:

- 1) Certain vital Links such as Tiruvalam 400 to Tiruvalam 230, Kanchi 230 to Kanchi 110 have been charted for execution in Reliable Communication project shortly.
- 2) Fibre Optic UG cable laying works from Basin Bridge to TNEB HQ SS is in progress.
- 3) Redundancy in Communication path would be strengthened if following OPGW Fibre cuts are arranged to be rectified at the earliest.
  - a) NCTPS Stg – II to Vallur.
  - b) Tondiarpet to NCTPS Stg – I.
  - c) Korattur – Manali.

Madurai Circle:

Redundancy in Communication path can be strengthened if following OPGW links are replaced for providing Reliable & Seamless Communication network in the Southern Region of TANTRANSCO.

SL No	NAME OF THE OPGW LINK	NAME OF LILO FIBRE IN THE LINK	FIBRE DETAILS			REQUIREMENT / REPLACEMENT OF FIBRE	Remarks
			OWNERSHIP	NO OF FIBRES / DISTANCE [Km]	STATUS OF FIBRES		
1	<b>MADURAI 230 KV- Trichy 230 KV</b> OPGW Link	Madurai- Checkkanoorani 230 - Samayanallur 230- Alagarkoil 230- Mundipatty 230- Alundur 230- Trichy 230	TANTRANSCO	24 F / 130 Km	3 Fibres Defective and frequent cut observed in section between Alundur - Trichy	Replacement of 24F by 48F – 130 km	Replacement by 48 F will provide the reliable backbone network for TANTRANSCO and also solves the congestion due to many LILO SS in this link.
2	<b>Madurai-Kayathar 400 KV</b> OPGW Link	Madurai 230 - Anuppankulam 230 - Kayathar 400 – Kayathar 230	TANTRANSCO	12 F / 140 Km	3 Fibres Defective and frequent cut observed in this link.	Replacement of 12F by 48F – 140 km	Replacement will provide the reliable Fibre network since entire Solar, Wind data of Southern Region are reporting via this link to Control Centres

Trichy Circle:

The following OPGW routes are proposed for redundancy

1. Trichy – Sriperumpudur link (STM link of PGCIL)

If OPGW provided From Perambalur to TAQA and TAQA to Neyveli TS II physical fiber connectivity can be obtained from Trichy – Sriperumpudhur as follows:

Trichy 230kV SS ----- Perambalur 230 kV SS ===== M/s TAQA (Gen)

=====Neyveli TS II ----- Villuppuram 110 -----S.P.Koil -----

Sriperumpudur.

Note: ----- Existing OPGW ===== Proposed OPGW

2. Trichy – Erode OPGW link (Very Old OPGW link, served more than 20 years)

If OPGW proposed from Trichy 110 kV SS – Mondipatty - Erode Express feeder, redundant fiber path can be obtained from Trichy – Erode with minimum loss.