



भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
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सं./MTGS/SG/NPC/CEA/2023/208

दिनांक: 08.07.2024

सेवा में/ To

(As per distribution list)

विषय: Revised Standard Operating Procedures (SOPs) for Third Party Protection System Audit, Grid Disturbances/Grid Incidents/Tripping's, and Communication audit for Substations, and Communication System Outage Planning- reg.

Madam/Sir,

As per the 14th NPC meeting held on 03.02.2024, the following Standard Operating Procedures (SOPs) are revised and attached herewith for your kind information and necessary action, please:

1. Third Party Protection System Audit.
2. Grid Disturbances/Grid Incidents/Tripping's.
3. Communication audit for Substations.
4. Communication System Outage Planning.

Encl: As above


08.07.24

Yours faithfully,
(सत्येंद्र कु. दोतान / Satyendra Kr. Dotan)
Director, NPC

Distribution List

1. SE/EE from RPCs of concerned subgroup of NPC (Protection/ Communication)

Copy to

1. Chief Engineer, NPC Secretariat, CEA
2. Member Secretary, NRPC
3. Member Secretary, WRPC
4. Member Secretary, SRPC
5. Member Secretary, ERPC
6. Member Secretary, NERPC

3.

Revised Final Standard Operating Procedure (SOP) for Communication audit of Substations

1. This procedure has been prepared in compliance to Central Electricity Regulatory Commission (Communication System for inter-State transmission of electricity) Regulations, 2017. As per clause 10 of the Regulation, RPC shall conduct annual audit of the communication system annually as per the procedure finalized in the forum of the concerned RPC. However, this SOP for communication audit of substations is finalized to maintain uniformity at the national level. It also mandates that RPC Secretariat shall issue necessary instructions to all stakeholders to comply with the audit requirements within the time stipulated by the RPC Secretariat based on the audit report. An Annual Report on the audit carried out by respective RPC is to be submitted to the Commission within one month of closing of the financial year.
2. The Audit would be conducted in two phases. In first phase scrutiny of the reports, documents etc. In the second phase physical verification shall be carried out.
3. Each User/entity, using inter-state transmission or the intra-state transmission incidental to inter-state, shall submit the detailed report to RPC Secretariat and RLDC, as per prescribed format on yearly basis. The detailed report shall be submitted by the April end of the respective year. This report shall be considered as self-certificate regarding availability and healthiness of the Communication system of respective user/entity.
4. In respect of intra-state users/entities, SLDC shall submit detailed reports yearly by the April end of the respective year, to RPC Secretariat and RLDC.
5. Outage report of all the channels (including Network Management System, PLCC etc) report for a month shall be submitted by the Users/entities to RLDC and respective SLDCs, on monthly basis, by 7th day of the next month. RLDC and SLDCs after verifying the NMS data shall submit report to RPC Secretariat by 15th day.
6. All users/entities and Control Centers shall get the third-party cyber security audits done from a Cert-in certified vendor in compliance of CEA (Cyber Security in Power Sector) Guidelines, 2021. The detailed report of the Cyber Security Audit shall be submitted by 15th April for the previous financial Year.
7. RPC Secretariat may ask any other information required for Audit of the communication system in addition to these periodic reports.

Phase-I Audit: Scrutiny of the Information

8. A Communication System Audit Sub-Group comprising one member each from RPC, RLDC, PowerGrid and One of the respective Region SLDCs shall be constituted by RPC Secretariat with the approval of Member Secretary, RPC. The sub-group may co-opt any other member from any organization for facilitating the activities of the sub-group. Further, consultation from CEA may be taken, if required. The Audit team shall be formed excluding the member for the Organization/Utility whose system is to be audited.
9. The Communication System Audit Sub-group shall scrutinize the information received in RPC Secretariat. The Sub-group may also ask any additional information necessary for its activities. All the users/entities, RLDC, SLDCs shall provide the information to the subgroup on priority within the stipulated time period.
10. The sub-group shall also identify the nodes for physical inspection based on the criticality of the node in view of performance of the communication network or based on the deficiencies observed in the communication system.
11. The Audit would include but not limited to following aspects:
 - a. Availability of communication channels. The outage reason needs to be clearly specified whether it is on account of the concerned entity or on account of any other entity, force majeure etc. The list of communication channels would be finalized by Communication System Sub Group in consultation with other stakeholders.
 - b. Availability of terminal equipment. The outage reason needs to be clearly specified whether it is on account of the concerned entity or on account of any other entity, force majeure etc. The list of terminal equipment would be finalized by Communication System Sub Group. Part outage like failure of specific cards etc. would also be furnished along-with reasons.
 - c. Availability of Auxiliary System e.g. Battery Charger, Battery bank, sufficient cooling equipment etc.
 - d. Compliance of CERC and CEA Regulations and the procedures under these Regulations.
 - e. Completion of periodic testing of the communication system in accordance with procedure for maintenance and testing prepared by CTU.
 - f. Audit of all newly commissioned communication equipment within six months of its commissioning.
 - g. Completion of 3rd party Cyber Security Audits.
 - h. Network traffic w.r.t capacity.
 - i. Spare availability, replenishment etc.

- j. Any other parameters as agreed by the Communication Sub Group.

Phase-II Audit: Physical Verification

12. Based on the Recommendations of the Communication System Audit Sub-group, Audit team shall be constituted and the physical inspection Audit plan shall be prepared by RPC Secretariat.
13. Audit team shall be formed on regional basis.
14. Audit shall be carried out in a planned manner as included in this document by a team of three members. The audit team shall comprise of one representative from the RPC Secretariat, one representative from RLDC and one representative from any of the Utilities or SLDCs of respective Region. The Audit team shall be formed excluding the member for the Organization/Utility whose system is to be audited. The Audit team may co-opt any other member from any organization for facilitating the activities of the committee.
15. Once the plan is finalized, minimum 3 days advance notice shall be served to the concerned Auditee entity intimating the detailed plan so that availability of required testing equipment and the required documents is ensured by Auditee entity and is made available to the Audit team during the site visit.
16. Member Secretary, RPC in consultation with the Communication System Audit Subgroup may decide on any additional nodes/locations for physical inspection if a location is very critical in view of performance of the communication network at any time of the year.
17. The Scope of the physical verification shall include but not limited to the following:
 - a. Available communication Network for its redundancy
 - b. Availability of channel redundancy for all the functions for which it is configured.
 - c. Communication equipment (hardware and software configuration) of all the nodes including repeater stations for its recommended performance.
 - d. Documentation of the configuration of the respective site and its updation.
 - e. Fibre layout / usage of fibre / Availability of dark fibre and its healthiness.
 - f. Cable Schedule and identification / tagging.
 - g. Healthiness of Auxiliary supply including the healthiness of Battery backup.
 - h. Healthiness of Earthing / Earth protection for communication system.
 - i. Availability of sufficient cooling equipment at the User's premises to maintain the stipulated temperature for the communication equipment.
 - j. Optical power level
 - k. Alternate modes of communication for speech
18. The format for collecting the details of Communication channels/links and Equipment is at **Annexure-I** and the same shall be furnished by the Auditee entity.

19. Communication Audit Checklist points are given in **Annexure-II** and the same are to be thoroughly verified by the Audit team.
20. Expenses towards Lodging, Boarding & Transportation (Excluding Air/Train Fair) between various places within the jurisdiction of Auditee entity shall be borne by respective Auditee entity. The Coordinating Officer(s) from the Auditee Utilities identified for each Team is (are) responsible for facilitating them to all the Members of respective Team.
21. Audit team shall submit report including recommendations for action on deficiencies, if any, found during the inspection, within 15 days from the date of inspection to Member Secretary, RPC. After approval of MS, RPC, the report would be communicated to the Auditee entity for compliance.

Audit Compliance Monitoring

22. Communication System Audit Sub-group would monitor the compliance of audit observations as applicable. Non-compliance of Audit Recommendations, if any, shall be put up to TCC and RPC.
23. The Annual Audit Report would be reviewed by a Communication System Sub Group at RPCs level. After considering the observations of Sub Group, RPC Secretariat shall issue necessary instructions to all stakeholders to comply with the audit requirements within the time stipulated by the RPC Secretariat based on the audit report. An Annual Report on the audit carried out by RPC would be submitted to the Commission within one month of closing of the financial year.

Audit Format (Annexure-I)

REGIONAL COMMUNICATION AUDIT REPORT			
General Information:			
1	Substation Name		
2	SS Voltage level		
3	Date of commissioning of the substation	XX.XX.XXXX	
4	Region & State / Auditee	/	
5	Audit Date		
6	Name of the Utility which owns the SS		
Details of Audit Team Members :			
SL	Name	Designation	Organization
1			
2			
3			
4			
Attached Documents, if any			
SL	Name of the document	Original / Signed / Copy	
1			
2			

3		
4		
5		
6		
7		

Audit Format (Annexure-I)

8		
9		
10		
11		
12		
13		
14		
15		
16		
17		

Communication Channels and Equipments Audit Format

(A) List of channels in usage for data (64 kbps, 104, PMU, VC, 101) / Voice / Protection circuits / others:

Sl	Description (64 kbps, 104, PMU, VC, 101) / Voice / Protection circuits / Others)	Source	Destination	Channel Routing	Ownership details of terminal equipment / Links
1					
2					
3					
4					
5					
6					
7					
8					

(B) List of terminal communication equipments:

Sl	Name of Station	Equipment Type (SDH / PDH / Radio / VSAT / EPABX)	Make / Model	Ownership
1				
2				
3				
4				
5				
6				

7				
8				

(C) Communication System Details:

I. SDH Equipment

(1) Card Details:

Slot No	IP Address & Path / Direction Name	Card Details	Place a ✓ mark if on usage, else Write as "Spare"	Whether Card is healthy / Faulty ? (H / F)	Cards Redundancy available Yes / No	Power Supply Card / Optical Card Yes / No	MSP configured? Yes / No	Action Plan for faulty cards	Other Information, if any
1									
2									
3									
And so on									

(2) Whether equipment is time synchronized : Yes / No

If Yes, how is it being done?

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(3) Failures during last Fin. year / since last Audit :

Particulars	Number of failures of Card / Power Supply	Reason for failures	Measures taken for rectification
Card		(i) (ii) (iii)	(i) (ii) (iii)
Power Supply		(i) (ii) (iii)	(i) (ii) (iii)

(4) Configuration of the Node:

Audit Format (Annexure-I)

Name of Equipment	Number of Nodes	Number of directions	Name of Directions	Number of links down, with details	Details of corrective action, if any, taken

(5) Preventive maintenance schedule and its compliance:

Date of Last Preventive maintenance	Maintenance carried out as per schedule? (Yes / No)	Whether all the defects have been attended? (Yes / No) Give details

II. PDH Equipment

(1) Card Details :

Slot No	IP Address	Card Details	Place a ✓ mark if on usage, else Write as "Spare"	Whether Card is healthy / Faulty ? (H / F)	Cards Redundancy available Yes / No	Power Supply Card / Optical Card Yes / No	MSP configured? Yes / No	Action Plan for faulty cards	Other Information, if any
1									
2									
3									
And so on									

(2) Whether equipment is time synchronized : Yes / No

If Yes, how is it being done?

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(3) Failures during last Fin. year / since last Audit :

Audit Format (Annexure-I)

Particulars	Number of failures of Card / Power Supply	Reason for failures	Measures taken for rectification
Card		(i) (ii)	(i) (ii)
		(iii)	(iii)
Power Supply		(i) (ii) (iii)	(i) (ii) (iii)

(4) Configuration of the Node:

Name of Equipment	Number of Nodes	Number of directions	Name of Directions	Number of links down, with details	Details of corrective action, if any, taken

(5) Preventive maintenance schedule and its compliance:

Date of Last Preventive maintenance	Maintenance carried out as per schedule? (Yes / No)	Whether all the defects have been attended? (Yes / No) Give details

III. OPGW / Optical Fibre Details

[illegible]

IV. Healthiness of Auxiliary System:

(1) Details of 2 independent Power Sources :

[illegible]

(2) Conformation to Compliance of CEA Standards :

V. Healthiness of Earthing of each equipment:

Sl	Equipment	Status on Healthiness of Earthing

VI. Details of Voice communication available between Sub-station and Control Centre:

Sl	Voice communication (Sub-station - Control Centre)	Status on Healthiness of Voice communication	Healthiness of air-conditioning of communication room as per OEM recommendation

VII. PLCC Details:

Number of Panels	Make and Model	Direction	Frequency (Tx & Rx)	Status on Healthiness	Last preventive maintenance		Details of defects, if any, attended	Status of Availability of Spares	Conformation to Compliance of CEA Standards
					Schedule	Actual			

			KHz						

VIII. Radio Communication Details:

Number of Equipments	Make and Model	Status on Healthiness	Last preventive maintenance		Details of defects, if any, attended	Status of Availability of Spares	Conformation to Compliance of CEA Standards
			Schedule	Actual			

- IX. Data Retention :**
- (i) Earliest Date of availability of data : _____
 - (ii) Historical data availability : _____ days.
- X. Control Command Delay :**
- (i) Time delay in seconds from Control Centre : _____ Seconds
for SCADA
 - (ii) Time delay in seconds from Control Centre : _____ Seconds
for WAMS
- XI. Wide Band Network :**
- (i) Absolute channel delay in protection applications : _____ ms
 - (ii) Channel delay asymmetry in protection applications : _____ ms
 - (iii) Switching Time delay to alternate path/route during failure of one path : _____ ms
- XII. Status of integration with U-NMS or state NMS:**
- XIII. Any other information :**

**Audit Team Member
SRPC**

**Audit Team Member
Co-Ordinator**

**Audit Team Member
PGCIL (Internal / External)**

**Audit Team Member
State (Internal / External)**

Communication Audit Checklist (Annexure-II)

S.No	Check list points	Expected	Actual	Reference
1	Whether OPGW is terminated properly. Down lead shall be fixed properly in sufficient locations. Metallic part shall be connected to earth mat riser.	Yes		
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 communication room			
3	Fiber Identification shall be done in FODP properly			
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)			
5	Whether patch chords 1 Cross labelled (source/ receive) 2 Tx – Rx Marking 3 Mechanical protection is provided for patch chords laid between panels			
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 substation Earth mat			
7	Two sets of 48 V (Positive Earthed) DC System shall 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 Thyristorised/ SMPS			

8	Battery Charger alarms /measurements shall be made available to 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			
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Communication Audit Checklist (Annexure-II)

	alarms shall b alarmed in common substation annunciator			
9	2 nos of substation Data (From RTU or SAS Gateway)shall route in different roots to Main and Standby Load Dispatch centres			
10	Kindly assure proper protection is available for AC Distribution (ELCB, MCB, Backup fuse),			
11	Aux Transformer neutral Earthing shall be connected to Stations earth mat (Aux Transformers shall be installed in yard earth mat area only)			
12	Whether DG sets with AMF panels are provided for Aux AC Supply			
13	Whether 2 nos 11 kV (or 33kV) supplies are available for Each station aux Transformer			