

**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 Procedure on “Centralized supervision for quick fault detection and restoration” 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 7.2 of the Communication Regulations requires CTU to prepare a Procedure on “Centralized supervision for quick fault detection and restoration” in consultation with the stakeholders and submit the same for approval of the Commission.

3. Accordingly, CTU, vide its letters dated 1.9.2017, 28.10.2021 and 18.5.2023, submitted the Procedure on “Centralized supervision for quick fault detection and restoration” after stakeholder consultation for approval of the Commission.

4. The Commission has examined the Procedure submitted by CTU, and after incorporating suitable changes, the Commission hereby approves the Procedure on “Centralized supervision for quick fault detection and restoration”, which is 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

PROCEDURE ON CENTRALIZED SUPERVISION
FOR
QUICK FAULT DETECTION
AND
RESTORATION OF
COMMUNICATION SYSTEM

Prepared in Compliance

To

Central Electricity Regulatory Commission

(Communication System for inter-State transmission of electricity)

Regulations, 2017

January, 2024

Abbreviation

ASON	Automatically Switched Optical Network
CMC	Centralized Management Console
DCPS	DC Power Supply
DER	Daily Exception Report
EMS	Element Monitoring System
FSP	Forecasting Service Provider
MPLS	Multi-Protocol Label Switching
NE	Network Element
NMT	Network Monitoring Team
OTN	Optical Transport Network
PDH	Plesiochronous Digital Hierarchy
PIU	Power Interface Unit
PTN	Packet Transport Network
RCA	Root Cause Analysis
SDH	Synchronous Digital Hierarchy
CNMS	Centralized Network Management System
VSAT	Very Small Aperture Terminal

1. Background

This Procedure is issued in compliance to the Regulation 7.2 of the Central Electricity Regulatory Commission (Communication System for inter-State Transmission of electricity) Regulations, 2017 (hereinafter referred to as “the Communication Regulations”).

2. Objective

- 2.1 To lay down Procedure on “Centralized supervision for quick fault detection and restoration” and coordinated operation amongst the concerned users of the interconnected communication systems.

3. Applicability

- 3.1 This Procedure shall be applicable to the following:
 - (i) The Communication System Infrastructure of Inter-State transmission system and Intra-State transmission system, till appropriate regulation on Communication is framed by the respective State Electricity Regulatory Commission, being used for communication purpose for Power System Operation at National, Regional, Inter-State & Intra-State level.
 - (ii) All Users as defined under Regulation 2(i)(aa) of the Communication Regulations (such as Generating Company including Captive Generating Plants, RE Generator, ISTS & Intra-State Transmission Licensee, Distribution Licensee, Bulk consumer whose electrical system is connected to the ISTS or the Intra-State Transmission system), SLDCs, RLDCs, NLDC, CTU, STUs, RPCs, REMCs, FSP and Power Exchanges shall abide by the principles and procedure as applicable to them in accordance with this Procedure.

4. Communication System

The definition of the communication system shall be as per the Communication Regulations.

In order to implement this Procedure, the Communication System has been categorized as following:

- (i) Communication System of Inter-State Transmission System.
- (ii) Communication System of Intra-State Transmission System.
- (iii) Communication System of Cross Border Interconnections.

5. State of The Art System for Centralized Supervision & Monitoring System (CSMS):

In line with the Communication Regulations, for Centralized Supervision for Quick Fault Detection and Restoration, a Centralized Network Management System (CNMS) consisting of necessary Hardware and Software, shall be implemented on National and Regional level by CTU. The CNMS shall be integrated with the existing network management system (NMS) of other users in power system and standalone network elements, which are not being monitored on network management system within its jurisdiction on national and regional basis.

All Users/Owners shall provide necessary support to interface their network management system or network element with CNMS to fully comply the functionalities as mentioned below (in para 5.1) in accordance with the CEA (Technical Standards for Communication System in Power System Operations) Regulations 2020 (hereinafter referred to as “CEA Technical Standards for Communication System”).

5.1 Broad Features of the Centralized Supervision and Monitoring System (CSMS):

5.1.1 The CSMS shall provide centralized supervision and monitoring of the communication networks in accordance with the CEA Technical Standards for Communication System.

5.1.2 The CSMS shall be in main and back-up control centre architecture with centralised database and twenty-four hours operations & maintenance on all days.

5.1.3 The Network Management System shall have displays for audio-visual alarm generation and logging facility to facilitate the operator for quick fault detection.

5.1.4 The NMS shall facilitate access to the communication equipment for configuration and fault restoration as well as to facilitate monitoring the performance and alarms of

the communication system element.

5.1.5 The CSMS shall have capability of integration with technologies in line with the CEA Technical Standards for Communication System. The communication equipment installed shall be interoperable, so as to allow seamless integration between different vendors.

5.1.6 The NMS shall have features to store necessary information and facility to generate report on communication system availability of major equipments as well as the data channels on daily /weekly /monthly /annual basis, as applicable.

5.1.7 For very small aperture terminal communication, network management system (NMS) shall have facility of maintaining link availability status along with signal strength of the nodes.

5.1.8 For very small aperture terminal communication, redundant configuration shall be enabled in network management system

5.2 Cyber Security

5.2.1 The Communication infrastructure shall be planned and designed to address the network security needs as per Grid Code Regulations, CEA Technical Standards for Communication System, CEA (Cyber Security in Power Sector) Guidelines 2021 and any such regulations issued from time to time, by an appropriate authority.

5.2.2 NLDC, shall monitor case of cyber security incidences and discuss them at RPC level and take necessary action as deemed fit.

5.2.3 RPC shall ensure that third party cyber security audits shall be conducted periodically (period to be decided at RPC) and appropriate measures shall be implemented to comply with the findings of the audits. The audits shall be conducted by CERT-In certified third-party auditors.

5.2.4 All users and control centres connected to the communication system shall have robust programs in place to adequately and continuously manage cyber security risks that could have adversely impact power system communications infrastructure in compliance to the CEA Technical Standards for Communication System. The cyber security program shall address the following, namely:

- (a) compliance with provisions of the Information Technology Act, 2000 (21 of 2000) and National Cyber Security Policy, 2013 as amended from time to time;
 - (b) implementation of the National Critical Information Infrastructure Protection Centre (NCIIPC) Guidelines;
 - (c) implementation of guidelines and advisories issued by Computer Emergency Response Team (CERT India) and applicable Sectoral Computer Emergency Response Team (CERT); and
 - (d) compliance to the Central Electricity Authority (Cyber Security) Regulations, as and when they come into force.
- 5.3 Till the time, the CSMS system is not in place, the functions for Centralized Supervision including for quick fault detection and restoration shall be carried out as per the existing Procedure enclosed as **Appendix-I** and all the users/ owners shall facilitate CTU/STU to coordinate for the same with all requisite details on periodic manner as brought out in this procedure, as applicable.
- 6. Process for Implementation of Centralized Supervision and Monitoring System of Communication System:**
- 6.1 CTU and STU shall be the nodal agency for implementation of Centralized Supervision and Monitoring System of communication system for Inter-State transmission system and Intra -State transmission system respectively.
 - 6.2 Network Management System shall be implemented in compliance with the CEA Technical Standards for Communication System.
 - 6.3 Control Centre shall have Centralized Supervision and Monitoring System by integrating its network management system with Network Management System of other users/ owners and standalone network elements, which are not being monitored on network management system within its jurisdiction on national and regional basis.
 - 6.4 Users/ owners shall provide all necessary support to interface their network

management system or network element with Centralized Supervision and Monitoring System.

- 6.5 Centralized Supervision and Monitoring System shall be in main and back-up control centre architecture with centralized database and twenty-four hours operations & maintenance on all days.
- 6.6 The Users/ Owners of communication system (ISTS and Intra State) shall cooperate in exchanging information, holding review meetings during integration (as and when required), joint testing and commissioning of their communication system with Centralized Supervision and Monitoring System including Cyber Security Protection, with nodal agencies.

7. Procedure for Resource Deployment by Communication System User/Owner:

- 7.1 The user/owner shall be responsible for the Operation and Maintenance (O&M) of their respective Communication system and to maintain the availability of the communication system as per the Communication Regulations.
- 7.2 Operation and Maintenance (O&M) Personnel shall be deployed by user/owner for Operation, Monitoring and Quick Fault Restoration of communication system or any other assistance as may be required for maintaining a seamless network with desired availability. Such O&M Personnel shall be skilled/ trained in maintenance of the communication system Equipment / Optical Fibre, DCPS, Battery & PIU (Power Interface Unit) and NMS. Crew provisioning for physical restoration of FOTE & FODP etc. shall be done by the owner/ user. They should be equipped with necessary test equipment, vehicle, tool kits, laptop, mobile phones etc.
- 7.3 Specialized training shall be provided to the persons manning the centralized monitoring centre and to the field support staff as well as O&M Personnel deployed for maintenance of the communication system in accordance with the CEA Technical Standards for Communication.

8. Procedure for Centralized Supervision, Monitoring and Fault Reporting of Communication System

- 8.1 CTU shall deploy a Network Monitoring Team (NMT) at Main & Backup control centres for centralized supervision and monitoring of the communication network and shall coordinate with ISTS communication system Owner, Users, RLDC, SLDCs etc. for quick fault detection and restoration.
- 8.2 NLDC, RLDC & SLDC in coordination with NMT of CTU shall integrate & supervise the communication systems of ISTS, ISGS, IPP, STU, etc. for monitoring, supervision & control of Power System and adequate data availability in real time. Further RLDCs shall collect and furnish data related to communication system of various users, ISTS, ISGS, IPP, STU, SLDC, RLDC to RPCs for certifying availability of ISTS Communication System on monthly basis. RLDCs & SLDCs shall provide operational feedback to CTU & STU on quarterly basis or as applicable.
- 8.3 NMT of CTU shall monitor the communication network and logs of fault/ event reporting as raised by the Communication System Owner/ Users and Nodal Agencies in the following manner:
- i) Through raised trouble tickets in Centralized Network Management System
 - ii) Lodged complaint through web portal.
 - iii) System generated alarms (including standalone NEs)
 - iv) Through any other communication media (mail,phone etc)
- 8.4 Whenever any fault/abnormality is observed in the communication system by the Network Management System, it shall automatically notify to the concerned user/ owner for rectification of faults/trouble tickets within agreed time frames, which will subsequently be taken up with maintenance personnel of the concerned faulty communication system at site to take corrective action(s) for rectification of faults/trouble tickets within agreed time frames.
- 8.5 NMT of CTU shall inform communication system owner/ user in case of critical

alarms/ faults as per escalation matrix provided as **Annexure-I**.

- 8.6 NLDC, RLDC, SLDC and REMC in case of outage of telemetered data, or communication failure shall register an event through Centralized Management System, the respective owner/user shall be alarmed so that the owner /user shall ensure healthiness of its communication system. In case, outage pertains to fault in communication system of other owner, the owner/ user shall either lodge complaints through Centralized Management System or add response regarding healthiness of its network in the already raised ticket/ event rather than raising a new ticket, as applicable.

9. Procedure for Fault Restoration of Communication System

Restoration activities of the communication system are to be carried out by the owner/ user, as and when, any system related problem is reported primarily by Communication system user/ owner (and reported by NMT of CTU in different scenario), to facilitate rectification of fault and quick restoration. This shall include fault detection, repair or replacement of defective parts, restoration of services and final functional checking by the User/ Owner.

The Communication system owner/user shall identify Nodal officer (s) for their respective area/ system. Nodal officer shall be single point coordinator, responsible for co-ordination with NMT of CTU. Details of Nodal Officer (name, designation, company name, address, contact details email, mobile no. etc.) shall be provided to CTU.

- 9.1 Following actions shall be taken by Communication System Owner/User after receiving the fault alarm/reporting:
1. Acknowledge faults/ alarms and prioritize them for immediate corrective actions.
 2. Take corrective action by remote diagnostics & troubleshooting through their respective NMS, wherever possible.
 3. Inform maintenance Personnel for detection/ attending the faults for rectification and restoration of the fault ensuring inventory availability.
 4. Maintenance Personnel shall update status of maintenance/restoration work to the concerned nodal officer of communication system user/ Owner.

5. The nodal officer shall communicate NMT of CTU through Centralized Network Management System for closing the Trouble Ticket / reported fault event and details of the fault restored.
6. For fault restoration, nodal officer may also co-ordinate with NMT of CTU/ other communication owner in respect of spare inventory availability if required, for an integrated/ unified approach.

The communication network is designed with redundancy and automatic take-over of available redundant paths. However, in case the fault restoration is prolonged, the communication owner shall explore the possibility for route diversion/ re-configuration on the existing communication network in close co-ordination with NMT of CTU and concerned nodal officer. No separate charges shall be paid for such route diversion or channel re-allocation. However, such rerouting shall be discontinued once the original channel is restored.

10. Roles & Responsibilities of Communication System Owner/User and CTU

10.1 Communication_System Owner/ User Responsibilities:

1. Communication System Owner/ User shall follow the Communication Regulations and Standards as well as follow the guidelines issued by CEA, CTU and NLDC.
2. Users/ owners shall take necessary action for operation and maintenance of their respective interfaces and ensure their communication system availability in line with the Communication Regulations and the CEA Technical Standards for Communication System.
3. Ensure and maintain proper environment for operation of the equipment by providing power supply, Proper Earthing system and dust & rodent free environment with air-conditioned applicable to electronic system and server computers (with proper surge and short circuit protection).
4. Raise trouble ticket/ complaint to Network Monitoring Team (NMT) of CTU for unavailability of Services/ Bandwidth through Centralized Network Management

System in case fault is not located in its communication network or user/owner shall add response in the already raised ticket/ registered complaint regarding healthiness of their respective networks.

5. Provide access to the faulty site/equipment to the designated power system users as the need may be.
6. Associate & Co-ordinate with maintenance Personnel for rectification of the problem.
7. Update Network Monitoring Team (NMT) of CTU for availability of Services/Bandwidth after fault rectification through Centralized Supervision System with all fault rectification details needed for Root Cause Analysis.
8. Communication user/owner shall update status information of alarm/trouble ticket/ fault reported and maintenance work under progress in Centralized Network Management System, record all faults in the fault record sheet and summary of action taken for fault rectifications and share the detailed report as and when required by NMT of CTU.
9. Communication System Owner/ User shall provide inputs to the CTU/ STU in the prescribed formats enclosed as **Annexure-II** with this Procedure.

10.2 Responsibilities of CTU:

CTU through NMT shall discharge all functions in co-ordination with ISTS Owners/ Users, IPPs, ISGS, RLDCs, SLDCs as per followings, for Supervising & Monitoring of the communication system:

1. Supervise and coordinate for Network discovery where route diversion/ re-configuration is needed, the communication system owner/ user shall explore the possibility for route diversion on the existing facility in close co-ordination with other concerned owner(s) in case the fault restoration is prolonged. However, such rerouting shall be discontinued once the original channel is restored.

2. Supervise for Troubleshooting on a network element and its interfaces (eg. where more than one communication system owners/ users network terminates) as and when required and in coordination with Communication system owner/ user, based on the diagnostics on interfaces to locate problems in network elements.
3. Informing the communication system owner for maintenance team deployment for critical cases.
4. Supervise and coordinate for the End-to-end Communication Channel verification with the communication system owner/ user upon receipt of information regarding outage of telemetered data or communication failure (in case end to end communication channel involves multiple owner/user), the respective user shall initiate testing/checking of the communication channel in co-ordination with NLDC/RLDC/SLDC/REMCs as per the procedure in line with the diagnostic features available in the SCADA system. This is to identify the fault whether the failure is due to faulty communication channel or problem with the end equipment.

Illustration:

In case outage pertains to fault in communication system, the users shall examine their NMS for trouble shooting of the failure. If fault pertains to communication system of other user/ owner, the user/ owner shall lodge fresh complaints or shall add response regarding healthiness of its own network in the already raised ticket/ complaint and would alert the other communication system owner(s) for quick fault restoration. In case fault does not pertain to communication system, the NMT of CTU in coordination with user(s) shall take up with the relevant stakeholder/utility.

5. CTU through NMT shall view end to end network or system of the affected section in Centralized Supervision System and supervise & monitor the same for quick restoration of the communication system.
6. CTU through NMT shall escalate the critical alarms/ events etc. as per agreed escalation matrix in case of critical scenario involving more than one

communication system owner/ user. Typical Escalation Matrix shall be submitted by Communication System Owner/ Users in the specified format enclosed as **Annexure-I**.

7. CTU through NMT shall undertake the routine maintenance activities of Centralized NMS and create data backup of the Centralized NMS on daily basis.
8. CTU through NMT shall prepare and publish the report (as given below) on its website;

	Activity	Frequency
1	Communication Network operations (Daily Exception Report etc) / Fault status	Daily
2	Communication Network utilization reports	Quarterly
3	MIS report	Monthly
4	Analytics/Predictive Report	Quarterly
5	Availability Report	Monthly

11. Revision of Procedure

11.1 As and when required, this Procedure shall be reviewed and revised by CTU with the approval of the Commission.

Annexure-I

Typical Escalation Matrix

Technical Support Desk Owner/User Name:

Email:

TELEPHONE:

Complaint /Trouble Ticket send email: abc@xyz.com

Escalation Level	Personnel Detail	Remarks
Level A	<u>XEN/</u> <u>Alternate Executive</u> ABC Office: Contact:Email:	To open trouble ticket send email to: abc@xyz.com
Level B	<u>SE</u> Xxxxxxxx Office: Contact: Email:	
Level C	<u>CE</u> Xxxxxxxx Office: Contact: Email:	
Level D	<u>Director/MD</u> Xxxxxxxx Office: Contact: Email:	

Escalation Procedure

The escalation level shall be guided based on the severity level (I, II, III, IV) and specified timeline with respect to initial call as specified in the prevailing AMC contract.

Annexure-II

Table-I: Data to be furnished by ISTS Users

Sl. No	Data/ Information to be submitted	Periodicity of Data submission	Submitted by Entity (as applicable from para 10.1)
1	System Availability Report <ul style="list-style-type: none"> • Downtime Report of Link • Downtime Report of Communication System Components 	Monthly (7 th day of each billing month)	Communication System Owner/ User
2	Channel Availability Report <ul style="list-style-type: none"> • Downtime Report of Link • Downtime Report of Communication System Components 	Monthly (7 th day of each billing month)	Communication System Owner/ User
3	Bandwidth Utilization Report vis-à-vis Services	Monthly (7 th day of each billing month)	Communication System Owner/ User
4	Non-Reporting/ Intermittency of DATA	Monthly (7 th day of each billing month)	NLDC/ RLDC/ SLDC
5	Cyber Security Incident	(within 24 hrs/ as per Cyber Security Guidelines of CEA)	Communication System Owner/ User/REMC/ SLDC/RLDC/ NLDC
6	New Element (Communication System Component) Integration/ Replacement Report/ New Service Provisioning	Monthly (7 th day of each month) & within 24 hrs	Communication System Owner/ User/NLDC/RLDC/SLDC/ RE MCs

7	Maintenance Compliance Report	Quarterly	Communication System Owner/ User
8	Performance Audit Report	Annually	Communication System Owner/ User
9	Cyber Security Audit Report	Annually (As per CEA approved guidelines)	Communication System Owner/ User

Formats for DATA Input by ISTS User/Owner/ISTS Communication System

Communication System Owner/ User/ Company Name:

System Availability Report

Format-1A

Sl. No.	Link Name	Link Id	Date Downtime	Date Uptime	Total down Hrs.	Remarks
1						
2						
3						

Link Downtime Report

Format-1B

Sl. No.	Link Name	Link Id	Date Downtime	Date & Uptime	Total down Hrs.	Remarks
1						
2						
3						

Communication System Component Downtime Report

Format-1C

No.	Communication System Component Name	Communication System Component Id	Date & Downtime	Date & Uptime	Total down	Remarks
1						
2						
3						

Channel Availability Report

Format-2A

No.	User (Stn) Node Name	User (Stn/ Control Centre) Node Name	Date Downtime	Date Uptime	Total down Hrs.	Remarks
1						
2						
3						

Channel vs. Link Availability Report

Format-2B

No.	Channel Id	Details of links				
		Link Name	Date Downtime	Date Uptime	Total down Hrs.	Remarks
1						
2						
3						

Cyber Security Incident Report

Format-3

Sl. No.	Cyber Security Incident detail	Component Id where Cyber Security breach happened	Time of Security Breach/ Isolation of system	Time of correction/ take back of Comm. System	Total downtime Hrs.
1					
2					
3					

Maintenance Compliance Report

Format-4

Sl. No.	Communication System Component Name	Component Id	Date of Maintenance	Details of Maintenance Performed	Remark
1					
2					
3					

Designed and Approved Service vs Bandwidth Utilization report Format-5

	Services	Application			Bandwidth Utilization	Remark
			From	To		
1	Ethernet	RTU Data			10 Mbps	
		PMU Data			40 Mbps	
		Meter Data				
2	VLAN	ICCP data			100 Mbps	
		PDC to PDC Data				
		Video Conferencing				
3	P to P	PDC to PDC Data				
4	EI	Protection Links				
		RTU Data				

**Existing Procedure for Supervision & Fault Restoration of ISTS
Communication System**

(Manual entry of event/fault & It's restoration time- noted down from NMSsystem-
into Log Book/ Register entry at Regional/ State level)

At present, different makes of communication equipment are deployed in various regions. These communication equipments are based on standard SDH technology, however the Network Monitoring System (NMS) software (hosted on a PC with limited feature & computational efficiency) of these equipment is proprietary and is different for different OEMs. Accordingly, we have multiple NMSs, each NMS corresponding to a set of communication equipment of specific make. In general, the NMS provided by all OEMs have five functional areas of network management mentioned as under:

1. **Fault Management:** Fault management is the process to identify and fix any errors in the system. There is provision of many alarms that can be distinguished based on faults. Alarms can be classified as Critical, Major & Minor. When any event / fault happens, alarm flashes and is acknowledged and the timing is noted in the register/ log book and subsequently NMT team is informed over phone/message, subsequently they go to site, restores the fault and then informs the up time, same is also shown in NMS system, and that restoration time is noted in log book/ register again. Thus report for link downtime summation & calculations for that particular NMS & its managed nodes/ NEs/ FOTE are calculated.
2. **Configuration Management:** This is the process to monitor and maintain devices and network configurations. NMT (Network Monitoring Team) can create new channels as per requirement. Addition of New NE (Network Equipment), deletion of NE can be done with NMS.
3. **Performance Management:** In this process various data channel (E1, Ethernet, 64 Kbps) performance is measured with defined parameters.
4. **Security Management:** A user can access NMS only if he/she is having user id & password. Administrator has privilege to give certain permissions to any users.
5. **Accounting Management:** Administrator can create multiples user accounts based on requirement. Administrator has privilege to add/delete accounts.

The multiple NMSs in various regions are monitored by placing all the NMSs in a region at one place, which is generally at RLDC. The region wise NMSs (typically)details are as under:

Region	Sl. No.	NMS Make	Model
NR	1	Fujitsu (SDH)	SUN Altra 60
	2	Nokia (PDH)	Netviewer Version 10.1 EP2
	3	Fibrehome (SDH, PDH & DACS)	OTNM 2000-V2.0R5
	4	TEJAS (SDH)	TJ5100 version 4.4, TJ5100 version 7.5
	5	Valiant (PDH)	VCL-MX version 5.7,

			VCL-MX version 6
	6	ECI (SDH, PDH)	EMS-APT version 4.0.20
	7	FIBCOM (SDH)	FIBCOM 6300NM
	8	ABB (SDH)	FOX515H FOXVIEW
ER	1	Coriant (SDH)	Coriant 14.1 12.45.0
	2	Loop (PDH)	Loop Version: V2.08.00.07
	3	ECI (SDH) s	EMS-APT version 4.0.20
	4	FIBCOM (SDH)	FIBCOM 6300NM
SR	1	Tejas (SDH)	TJ1500 Ver 6.1
	2	Valiant(PDH)	VCL-MX version 5.7
WR	1	Tejas (SDH)	TJ1500 Ver 6.1
	2	Valiant(PDH)	VCL-MX version 5.7
	3	ECI (SDH)	EMS-APT version 4.0.20
		FIBCOM (SDH)	FIBCOM 6300NM
	4	Loop (PDH)	Loop Version: V2.08.00.07
NER	1	ECI (SDH & PDH)	EMS-APT Version 4.0.20
	2	FIBCOM (SDH)	FIBCOM 6300NM 3.6.08
	3	Valiant (PDH)	VCL MX Version 6
	4	Siemens (SDH)	ENMS V4.50.014
	5	ABB (PDH)	UCST-FOX 515
	6	Loop (PDH)	Loop Version: V2.08.00.07
	7	TEJAS (SDH)	TJ1500 Ver 6.1

From the above table it is evident that there are multiple make NMSs , in Northern, Eastern, Southern, Western, and North Eastern regions respectively. Event/ Faults timing are manually noted from NMS systems and are written down in register/ Log book for report/log generation and this is being followed as present practice for calculating Link/ Channel downtime, communication system availability & its performance. These log books / Registers are maintained by the vendor/ owners at Regional/ State Level Control Centers (typically at RLDCs/ SLDCs) where multiple NMSs are hosted.

These NMSs for ISTS systems are centrally located at the respective RLDC/Regional Headquarter of POWERGRID and are being monitored by POWERGRID/ OEM teams called as Network Monitoring Team (NMT). These teams are monitoring their respective NMSs at the central location physically during office hours only.

On occurrence of a fault depicted on NMS, the NMT teams first try to diagnose and troubleshoot the fault remotely through NMS. In case the fault is still persistent, then NMT calls their maintenance team deployed in the field to attend and rectify the fault. Once the fault is rectified, the alarm s or flag at the NMS is reset and the NMT confirms their maintenance team.

Besides above, there are communication equipment which are of different make other than the available NMSs in the region and are not being captured by the NMS. Faults occurring at such equipment nodes are being attended locally by maintenance

team with the help of local craft terminal (LCT). The LCTs are connected with the communication equipment and the fault is diagnosed and resolved with the help of proprietary software.

Flow chart of Existing Procedure for Supervision & Fault Restoration

