North Eastern Regional Power Committee

Agenda for

60th Protection Coordination Sub-Committee Meeting

Date : 31/10/2023 (Tuesday)

Time : 10:00 hrs

Venue : NERPC Conference Hall, Shillong

C O N F I R M A T I O N O F M I N U T E S

1. CONFIRMATION OF MINUTES OF THE 59th PROTECTION SUB-COMMITTEE MEETING OF NERPC.

Minutes of the 59th PCC Meeting held on 29th August, 2023 (Tuesday) at NERPC Conference Hall, Shillong was circulated vide no. No.: NERPC/SE (O)/PCC/2023/2083-2124 dated 29th September, 2023.

No comment(s)/observation(s) were received from the constituents.

The Sub-committee may confirm the minutes of 59th PCCM of NERPC

B. ITEMS FOR DISCUSSION

B.1 Protection Audit of NER:

First phase of Third-Party protection Audit (2013-14) was completed in 2015 and in Second Stage of Protection Audit (2017-18) numerous stations were covered. However, few stations are yet to be audited. Status for second phase of Protection Audit:

Name of the state/utility	Name of the station(s)/Status
Arunachal Pradesh	132/33kV Along, 132/33kV Pasighat, 220/132/33kV Deomali, 132/33kV Daporizo, 132/33kV Lekhi, 132/33kV Tippi, 132/33kV Chimpu, 132/33kV Khupi.
Assam	Completed in Nov'21.
Manipur	Yet to be intimated, i.r.o some Substations
Meghalaya	400/220/132kV Byrnihat,132kV Mawphlang, 132KV Mustem, 132kV Umiam
Mizoram	Yet to be intimated, i.r.o some Substations
Nagaland	132kV Wokha, 132kV Sanis,132kV Kiphire
Tripura	Yet to be intimated, i.r.o some Substations

In 58th PCCM, the sub-committee agreed to complete the audit of the remaining substations at the earliest. The sub-committee agreed that the audit of the substations could be done by the utilities themselves via any expert third party or by the third party as nominated by the sub-committee. If the audit had been done by the utility itself via any expert third party, then the report should be sent to NERPC and NERLDC. The forum decided to maintain a yearly record of the substations that had been audited.

In 59th PCCM following decision were taken -

(a) The audit formats will be circulated to the nodal officers 2 weeks prior to the date of audit and the nodal officers of respective State/power utilities have to fill the format and submit to the NERPC secretariat within 1 week.

(b) The final audit report will be completed within 2 weeks after the completion of Audit.

(c) The forum decided that the SOP as issued by NPC, CEA will be followed for the third-party protection audit to be carried out by NERPC

NPC division of CEA has finalized S.O.P for third party protection Audit. (**Annexure-B.1.1**)

NERPC has prepared revised calendar for third party protection audit for reference of the constituents. (**Annexure-B.1.2**)

Forum may deliberate

B.2 Protection audit and protection performance indices as per IEGC 2023

As per the protection code of IEGC 2023 following roles and responsibilities, related to the subject mentioned, of constituents have been defined–

Description		**Constituent**	**Responsibility**	**Timeline**
Audit	Internal Audit	All users (132kV and above)	Shall conduct internal audit of protection system	Annually
			Audit report to be shared with RPC	Not specified
			Action plan for rectification of deficiencies to be shared with RPC	Not specified
	Third party Audit	All users (132kV and above)	Shall conduct audit for each SS	Once in five years
			Shall conduct audit on advice of RPC	Within three months of advice of RPC
			Audit report* to be submitted to RPC and NERLDC/SLDC	Within a month of submission of third-party audit report
			Action plan for rectification of deficiencies	Same as above
		RPC	Compliance to audit reports to be followed up regularly	Not specified
		RPC	After analysis of any event, shall identify substations where audit is required to be carried out	Conditional responsibility

	Annual audit plan	All users	Annual audit plan to be submitted to RPC by ***31st October***	Annual
Performance indices **	1.Dependibility index (D) 2.Security index (S) 3.Reliability index (R	All users (132kV and above)	Shall submit the indices for previous month to RPC and RLDC	monthly
		All users	Shall submit he reason for indices less than unity (element wise) and action plan for corrective measures	Not specified
		RPC	Action plan to be regularly followed up in RPC	

*Audit report shall contain information sought in the format enclosed as **Annexure – B.2**

**definition of indices

(a) The Dependability Index defined as $D = \frac{Nc}{Nc+Nf}$

where,

N_c is the number of correct operations at internal power system faults and

N_f is the number of failures to operate at internal power system faults.

(b) The Security Index defined as $S = \frac{Nc}{Nc+Nu}$

Where,

N_c is the number of correct operations at internal power system faults

N_u is the number of unwanted operations.

(c) The Reliability Index defined as $R = \frac{Nc}{Nc+Ni}$

Where,

N_c is the number of correct operations at internal power system faults

N_i is the number of incorrect operations and is the sum of N_f and N_u

B.3 Standard Operating Procedure for addressing GD/GI/tripping

NPC, CEA has finalized the SOP to address Grid disturbance/Grid Incidents/other tripping in consultation with all RPCs. The same is attached as **Annexure B.3** and put up for deliberation of the sub-committee.

B.4 Protection protocol and protection philosophy of NER

In compliance with clause 12(2) and clause 13 of IEGC 2023, NERPC has prepared draft protection protocol for NER. The same is attached as **Annexures B.4** and put up for deliberation of the sub-committee.

B.5 df/dt scheme

df/dt scheme is not available in NER. The necessity of the scheme for NER may be deliberated in the forum.

In 59th PCCM, the forum agreed on the necessity of implementing the df/dt scheme in NER, considering the growing presence of renewable energy sources in the country and consequently reducing inertia of the grid.

Member Secretary, NERPC directed NERLDC to prepare a plan for the implementation of the df/dt scheme in NER.

B.6 Analysis and Discussion on Major Grid Disturbances which occurred in NER grid w.e.f. August 2023 to September 2023:

August 2023

Events related to Assam

SN	Event	Discussion points	Deliberation of the sub-committee
1.	220 kV Samaguri-Jawaharnagar line tripped at 09:32 Hrs on 07.08.2023. (B/G: - Due to tripping of this element, Jawaharnagar area of Assam Power System got separated from the rest of NER Grid 220 kV Sarusajai-Jawaharnagar line was under planned shutdown)	**Samaguri end** As per DR no fault observed Mal operation of relay DT signal tripping CB operated in 45ms AR not attempted R=0.1kA, Y=0.099kA, B=0.1kA, **JAWAHARNAGAR END** **DR not available**	
2.	132 kV North Lakhimpur - Dhemaji line tripped at 08:39 Hrs on 08.08.2023.	**DR not available**	

	(B/G: - Due to tripping of this element, Dhemaji & Silapathar areas of Assam Power System got separated from the rest of NER Grid)		
3.	220 kV Agia - Boko and 220 kV Azara - Boko lines tripped at 09:32 Hrs on 18.08.2023. (B/G: - Due to tripping of these elements, Boko area and Boko Solar Power Plant of Assam Power System were separated from the rest of NER Grid)	**Agia end** **Suspected Vegetation fault** DT received and CB operated in 1192ms, AR not attempted Fault Current B=1.17 kA, N=0.92 kA, Angle -20 Degree Z2, Z3 Started after 1161ms Tripped on DT signal **Boko end** B-N fault EF relay picked up and CB Operated in 974ms, AR not Attempted Fault Current B=1.09 kA, N=1.23kA Angle -17 Degree **Azara end** Suspected operation due to over reach TEF trip operated in 1032ms AR not attempted Fault Current B=0.83 kA, N=0.72 kA Angle -27 degrees	

4.	132 kV Rupai - Chapakhowa line tripped at 18:03 Hrs on 26.08.2023. (B/G: - Due to tripping of this element, Chapakhowa area of Assam Power System and Pasighat, Roing, Tezu, Namsai areas of Arunachal Pradesh Power System got separated from the rest of NER Grid 132 kV Along- Pasighat line was under emergency shutdown since 16:19 Hrs on 26.08.2023 due to tower collapse)	**Rupai End** **DR available not as per standard only one signal visible L1 86B OPTD** **Chapakhowa End** B-N Fault Earth Fault (In>1) activated and operated in 50ms AR not attempted Current signal is not proper in DR so we cannot extract the value of current and Angle	
5.	132 kV Rupai - Chapakhowa line tripped at 09:14 Hrs on 29.08.2023. (B/G: - Due to tripping of this element, Chapakhowa area of Assam Power System and Basar, Along, Pasighat, Roing, Tezu, Namsai areas of Arunachal Pradesh Power System got separated from the rest of NER Grid 132 kV Daporijo - Basar line was declared faulty since 05:13 Hrs on 27.08.2023)	**DR available not submitted**	

Events related to Arunachal Pradesh

SN	Event	Discussion points	Deliberation of the sub-committee
1.	132 kV Balipara - Tenga line tripped at 21:52 Hrs on 02.08.2023. (B/G: - Due to tripping of this element, Tenga, Khupi areas and Dikshi HEP of Arunachal Pradesh Power System got separated from the rest of NER Grid)	**Balipara end** **Y-N Fault** **Suspected Lightening Fault** Z1 activated and CB Operated in 57ms AR not attempted Fault Y=3.9kA, N=3.6 kA Angle -69 Degree **Tenga END** Z1 activated and CB Operated in 90ms AR not attempted Fault Current Y=0.54kA, N=0.78kA Angle -57 degree	
2.	132 kV Daporijo -Ziro and 132 kV Along - Pasighat lines tripped at 23:02 Hrs on 04.08.2023. (B/G: - Due to tripping of these elements, Daporizo, Basar & Along areas of Arunachal Pradesh Power System got separated from the rest of NER Grid)	**Zero End** **B-N fault** **Suspected solid ground fault** Earth Fault (In>1) activated and CB Operated in 65ms AR not Attempted Fault Current Y=0.3 kA, N=0.25 kA Angle -3 degree DR before fault not standard **DAPORIZO END DR NOT AVAILABLE**	

3.	132 kV Along-Pasighat, 132 kV Along-Basar and 132 kV Basar - Daporijo lines tripped at 13:18 Hrs on 08.08.2023. (B/G: - Due to tripping of these elements, Basar and Along areas of Arunachal Pradesh Power System were separated from the rest of NER Grid)	**132 kV Along- Daporizo** **Along END** **B-N Fault** Z1 operated in 55ms AR operated successfully after 1050ms Fault Current B=0.35kA, N=0.34kA **Daporizo End DR not Available** **132 kV Along-Pasighat** **Along** Z1 operated in 63ms Fault Current B=0.34 kA, N=0.37 kA Angle 129 degree **Pasighat End DR not Available**	
4.	132 kV Balipara - Tenga line tripped at 20:59 Hrs on 08.08.2023. (B/G: - Due to tripping of this element, Tenga, Khupi areas and Dikshi HEP of Arunachal Pradesh Power System got separated from the rest of NER Grid)	**Balipara end** **Likely Vegetation Fault** **R-B-N fault** Z1 Operated in 61ms AR not Attempted Fault Current R=1.97kA, B=2.38kA, N=1.24kA **Tenga end** CB operated in 41ms (relay not mentioned in DR) Fault Current R=0.62kA, B=0.86kA	

5.	132 kV Balipara - Tenga line tripped at 19:27 Hrs on 21.08.2023. (B/G: - Due to tripping of this element, Tenga, Khupi areas and Dikshi HEP of Arunachal Pradesh Power System got separated from the rest of NER Grid)	**DR not submitted in wave form only .dat file submitted**	

Events related to Meghalaya

SN	Event	Discussion points	Deliberation of the sub-committee
1.	132 kV EPIP II - New Umtru & 132 kV Umtru - New Umtru lines tripped at 16:47 Hrs on 03.08.2023. (b/g: - Due to tripping of these elements, New Umtru Generating Station of Meghalaya Power System got separated from the rest of NER Grid)	Already discussed in 59th PCCM.	

Events related to Mizoram

SN	Event	Discussion points	Deliberation of the sub-committee
1.	132 kV Zuangtui -Serchip line tripped at 12:25 Hrs on 01.08.2023. (B/G: - Due to tripping of this element, Serchip, Lunglei, Melriat(MI) and Lungmual areas of Mizoram Power System got separated from the rest of NER Grid	**Zuangtui End** **Likely a Vegetation fault** **R- N Fault** Earth fault relay operated in 59ms AR not Attempted Fault Current R=0.55kA,N=0.32kA Angle -7.8 degree	

	132 kV Aizawl-Lungmual line was under planned shutdown from 07:54 Hrs on 01.08.2023)	**Serchip end DR not Available**	
2.	132 kV Melriat(PG) - Zuangtui line tripped At 11:49 Hrs on 29.08.2023. (B/G :- Due to tripping of this element, Zuangtui, Saitual, Vankal, Serchhip, Lunglei and Khawzawl areas and Vankal Solar Power Plant of Mizoram Power System got separated from the rest of NER Grid 132 kV Melriat-Lunglei line was under shutdown to control overloading of 132kV Aizawl-Lungmual line).	**Melriat END** **R-N Fault** Earth Fault relay operated in 113 ms AR not attempted Fault Current R=1.07kA, N=0.8kA Angle -22 degree **Zuangtui end** **No tripping**	

Events related to Nagaland

SN	Event	Discussion points	Deliberation of the sub-committee
1.	132 kV Kohima-Meluri line tripped At 19:14 Hrs on 01.08.2023. (B/G: - Due to tripping of this element, Meluri, Kiphire areas and Likimro HEP of Nagaland Power System got separated from the rest of NER Grid)	**No DR submitted**	
2.	132 kV Kohima-Meluri line tripped At 12:30 Hrs on 02.08.2023. (B/G: - Due to tripping of this element, Meluri, Kiphire areas and Likimro HEP of	**No DR submitted**	

	Nagaland Power System got separated from the rest of NER Grid)		
3.	132 kV Dimapur (PG) - Dimapur (DoP, Nagaland) D/C lines tripped At 16:35 Hrs on 02.08.2023. (B/G: - Due to tripping of this element, Dimapur (NL) area of Nagaland Power System got separated from the rest of NER Grid)	**No DR submitted for CKT 1** **CKT 2** **Dimapur (PG) end** **Likely a solid fault** Z1 activated and operated in 72ms AR Operated successfully after 1676ms Fault Current Y=10.17kA, N=9.73kA, Angle -18 degree **Dimapur (DoP, Nagaland) END** Over current (I>1) operated in 39ms DR is not standard so Angle and fault current cannot be extracted from DR.	
4.	132 kV Kohima-Meluri line tripped At 18:51 Hrs on 18.08.2023. (B/G: - Due to tripping of this element, Meluri, Kiphire areas and Likimro HEP of Nagaland Power System got separated from the rest of NER Grid)	**Kohima END** **Suspected vegetation fault** **B-N Fault** Z1 operated in 78 ms AR not attempted Fault Current B=0.99kA, N=0.95kA Angle -55 degree **Meluri end DR not standardised**	

Agenda items from NERLDC

B.7 Submission of Flash Report and Detailed Report by User/SLDC as per 37.2 of IEGC-2023:

As per IEGC-2023, Event reporting by User as per 37.2

Event reporting shall make available adequate data to facilitate event analysis.

(a) Immediately following an event (grid disturbance or grid incidence as defined in the CEA Grid Standards) in the system, the concerned user or SLDC shall inform the RLDC through voice message.

(b) Written flash report shall be submitted to RLDC and SLDC by the concerned user within the time line specified in Table 8 below.

(c) Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 Hrs specified in Table 8 below.

(d) RLDC shall report the event (grid disturbance or grid incidence) to CEA, RPC and all regional entities within twenty-four (24) hours of receipt of the flash report.

(e) After a complete analysis of the event, the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.

(f) RLDCs and NLDC (for events involving more than one region) shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis which shall be discussed and finalized at the Protection subcommittee of RPC.

TABLE 8 : REPORT SUBMISSION TIMELINE

Sr. No.	Grid Event^ (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss **event**	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

^*The classification of Grid Disturbance (GD)/Grid Incident (GI) shall be as per the* CEA Grid Standards.

All User/SLDCs are requested to prepare and share **Flash Report** and **Detailed Report** with NERLDC and NERPC following any Grid Events. (Format attached).

B.8 Submission of Protection Performance indices by Transmission Utilities:

As per Regulation No. 15(6), Protection Code - Users shall submit the following protection performance indices of previous month to their respective RPC and RLDC on monthly basis for 220 kV and above (132 kV and above in NER) system, which shall be reviewed by the RPC:

- The Dependability Index defined as $D = Nc/\ Nc+N$f
- The Security Index defined as $S = Nc\ /Nc+N$u
- The Reliability Index defined as $R = Nc\ Nc+Ni$

Where,

Nc: number of correct operations at internal power system faults

Nf: Number of failures to operate at internal power system faults.

Nu: Number of unwanted operations.

Ni: Number of incorrect operations and is the sum of Nf and Nu

As per Regulation No. 15(7), each user shall also submit the reasons for performance indices **less than unity** of individual element wise protection system to the respective RPC and action plan for corrective measures. The action plan will be followed up regularly in the respective RPC.

As per the above quoted regulations, **all the Users** are requested to furnish performance indices with regards to the tripping and analysis of their respective elements during the previous month to **NERLDC and NERPC by 10th of every month** such that it can be verified by NERLDC.

B.9 Status of submission of FIR and DR & EL outputs for the Grid Events as on dated 19.10.2023

In line with regulation 12 (1) of CEA Grid Standards Regulations and IEGC-23 provision under clause 37.2 (c), FIR and DR & EL Outputs for each grid events are required to be submitted by concerned utilities to NERLDC for detailed investigation and analysis.

Name of Utility	Total FIR/ DR/EL	Total FIR, DR & EL submitted			Total FIR, DR & EL not submitted			% Submission of		
		FIR	DR	EL	FIR	DR	EL	FIR	DR	EL
DoP, Arunachal Pradesh	47	31	18	24	16	23	21	66	48	54
DEPL	9	0	0	0	9	9	9	0	0	0
AEGCL	105	82	86	82	23	11	13	78	89	87
APGCL	8	0	0	0	8	8	8	0	0	0
MSPCL	39	27	3	4	12	33	34	69	15	13
MePTCL	17	14	16	16	3	1	1	82	94	94
MePGCL	16	0	2	0	16	10	16	0	29	0
P&ED, Mizoram	1	0	0	0	1	0	0	0	100	100
DoP, Nagaland	25	20	14	14	5	5	5	80	80	80
TSECL	38	20	26	29	18	7	7	53	81	82
TPGCL	8	0	0	0	8	8	8	0	0	0
POWERGRID	84	83	70	74	1	2	4	99	97	95
NEEPCO	80	39	36	28	41	40	49	49	47	36
NHPC	8	0	0	0	8	8	8	0	0	0
NTPC	2	0	0	0	2	2	2	0	0	0
ERTS	1	0	0	0	1	1	1	0	0	0
BHUTAN	1	0	0	0	1	1	1	0	0	0
OTPC	4	3	3	1	1	0	2	75	100	50
IndiGrid	16	15	15	15	1	1	1	94	94	94

Status of uploading of FIR and DR & EL outputs in Tripping Monitoring Portal for events from 30-08-2023 to 19-10-2023 is given below:

Concerned Utilities are requested to upload Disturbance Recorder (DR), Event Logger (EL) outputs for grid events along with a First Information Report (FIR) in Tripping Monitoring Portal (https://tripping.nerldc.in/Default.aspx) for analysis purpose. In light of the cybersecurity measures implemented by Grid India to safeguard sensitive information, NERLDC has created the email address nerldcso3@gmail.com . This new account has been specifically set up to facilitate the secure exchange of DR and EL files that have previously faced blockage when sent to nerldcprotection@grid-india.in.

In 59th OCCM following points were discussed –

Concerned utilities updated as follow-

1. Assam- due to shifting related works at Boko and Mariani there have been shortcomings in submitting the required data.

2. Tripura- Non-availability of Laptops at substations and connectivity issues hampering the submission of DR/EL in timely manner.

3. Nagaland – some DRs are missing at the substations. SLDC will coordinate with substation to address the issue.

4. MePTCL – at some substations, relays are of Siemens make and some issues are being faced in downloading from the relays. Matter has been taken up with the OEM.

5. Mizoram- informed that they will upload DR/EL for intra-state lines also.

Member Secretary stated that all States/Utilities to take a step to resolve above shortcomings and send the DR/ER data (which is mandatory) as per IEGC regulation.

B.10 Non-Operation of A/R at Doyang HEP for 132 kV Dimapur- Doyang 1&2 line:

Sl. No.	Element Name	Time	Relay End1	Relay End2	Remarks
1	132 kV Dimapur - Doyang 1	19-09-2023 14:53	DP, ZI, R-Y-E, FD: 86.192 Kms, AR Successful	DP, ZI, R-Y-E, AR Not Operated	Lightning
2	132 kV Dimapur - Doyang 2	07-08-2023 19:35	DP, ZI, B-E, FD:23.84 kms, AR Successful	DP, ZI, B-E, AR Not Operated	Lightning
3	132 kV Dimapur - Doyang 2	19-08-2023 02:19	DP, ZII, Y-E, FD: 91.14 Kms; carrier aided, AR Successful	DP, ZI, Y-E, AR Not Operated	Lightning

Numerous instances of tripping have been noted, primarily attributed to the transient nature of the fault. The Autorecloser at the Dimapur (PG) end has consistently performed successfully. Nevertheless, it is apparent that no Autorecloser operation was recorded in the submitted Disturbance Recorder (DR) from the Doyang end, indicating that there is need of checking of Autorecloser function at Doyang HEP.

NEEPCO is requested to update the root cause and remedial measures taken so that line can be reclosed for transient fault.

B.11 Non-operation of auto recloser in Important Grid Elements for transient faults w.e.f. September 2023:

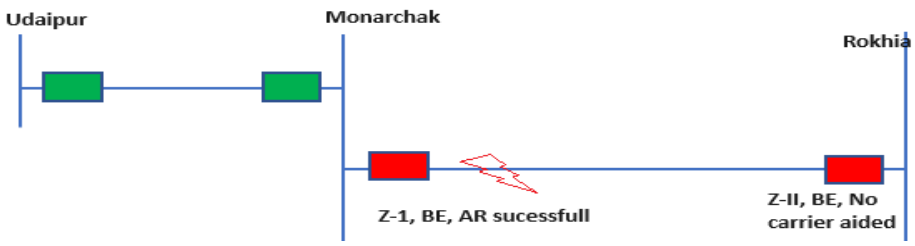
Sl No	Element Name	Time	Relay End1	Relay End2	A/R not Operated	Remarks from Utility
1	132 kV Haflong - Umranshu Line	01-09-2023 01:21	DP, ZI, B-E, FD: 30.73 Kms AR successful	DP, ZI, B-E, FD: 17.1 kms	Umranshu	
2	400 kV Bongaigaon - Byrnihat Line	02-09-2023 11:36	DP, ZII, R-E, FD: 156.8 kms, AR successful	DP, ZI, R-E	Byrnihat	
3	400 kV Byrnihat - Silchar Line	10-09-2023 22:49	DP, ZI, Y-E, FD: 171.7Km, AR successful	DP, ZI, Y-E, FD: 152.23 Km	Silchar	
4	220 kV AGBPP - Mariani (AEGCL) Line	11-09-2023 17:17	DP, ZI, Y-E	DP, ZI, Y-E, FD: 108.9 km (DR window – 1 second)	Both ends	
5	220 kV Agia - Boko Line	14-09-2023 12:46	DP, ZI, B-E, FD: 44.7 Km	DP, ZII, B-E, FD: 36.5 Kms	Agia	
6	220 kV Agia - Boko Line	14-09-2023 13:16	DP, ZI, B-E, FD: 44.7 kms	DP, ZII, B-E, FD: 15 km	Agia	

7	132 kV Badarpur - Karimganj Line	16-09-2023 11:34	DP, ZI, R-Y, FD: 22.447kms	DP, ZI, R-Y, FD: 6.941 kms	Both ends	
8	220 kV Dimapur - Misa 2 Line	18-09-2023 02:42	DP,ZI,R-E,FD: 1.45 km, AR successful	DP,ZII, R-E,FD:23kkm, Carrier Aided Tripping	Misa	
9	220 kV Agia - Azara Line	18-09-2023 11:29	DP, ZII, B-E, Carrier Received, AR successful	DP, ZI, B-E	Azara	
10	132 kV BTPS - Dhaligaon 1 Line	18-09-2023 16:43	DP, ZI, Y-B-E, FD: 20.6 kms	DP, ZI, Y-B-E	Both ends	
11	132 kV Bokajan - Dimapur Line	22-09-2023 13:47	DP, ZI, B-E	DP, ZI, B-E, FD: 7.45 Kms, AR successful	Bokajan	
12	220 kV Agia - Boko Line	23-09-2023 13:26	DP, ZI, B-E, FD: 27.8km AR not ready	DP, ZI, B-E, FD: 45.6km, operated	Agia	
13	220 kV Mariani (AEGCL) - Samaguri Line	29-09-2023 16:46	DP, ZI, B-E	DP, ZI, B-E, FD: 55.2 Kms	Both ends	
14	220 kV Mariani (AEGCL) - Samaguri Line	30-09-2023 10:24	DP, ZI, B-E, FD:127Kms	DP, ZI, B-E, FD: 29.8 Kms	Both ends	

15	132 kV Aizawl - Kolasib Line	01-10-2023 17:27	DP, ZI, B-E, FD: 33.9Km	DP, ZI, B-E, FD: 35.02 Kms	Aizawl	
16	132 kV Gohpur - North Lakhimpur 1	02-10-2023 10:59	DP, ZI, B-E,FD:7.7 KM	DP, ZI, B-E,FD:78.8 KM	Both ends	
17	220 kV Mariani (AEGCL) - Samaguri Line	13-10-2023 01:02	R-ph, 118.4 KM	DP, ZI, R-E, 29.8 km	Both ends	

B.12 <u>Non operation SPS at Monarchak on 15-09-2023:</u>

Monarchak and Rabindranagar area of Tripura power system is connected with rest of the NER grid through 132 kV Monarchak – Udaipur and 132 kV Monarchak – Rokhia line.



At 13:08 Hrs on 15-Sept-2023, 132 kV Monarchak - Rokhia Line tripped on DP with following relay indications- **Monarchak:** B-Ph, ZI, FD: 07.86 km, AR Successful, **Rokhia:** B-Ph, ZII, FD: 28.95 km.

Non- operation of SPS at Monarchak is observed due to Successful autorecloser at Monarchak.

In the above event, Monarchak survived N-1 contingency as actual generation was 94 MW only otherwise blackout of Moanrchak is unavoidable.

Followings actions are requested from **TPGCL** and **NEEPCO**:-

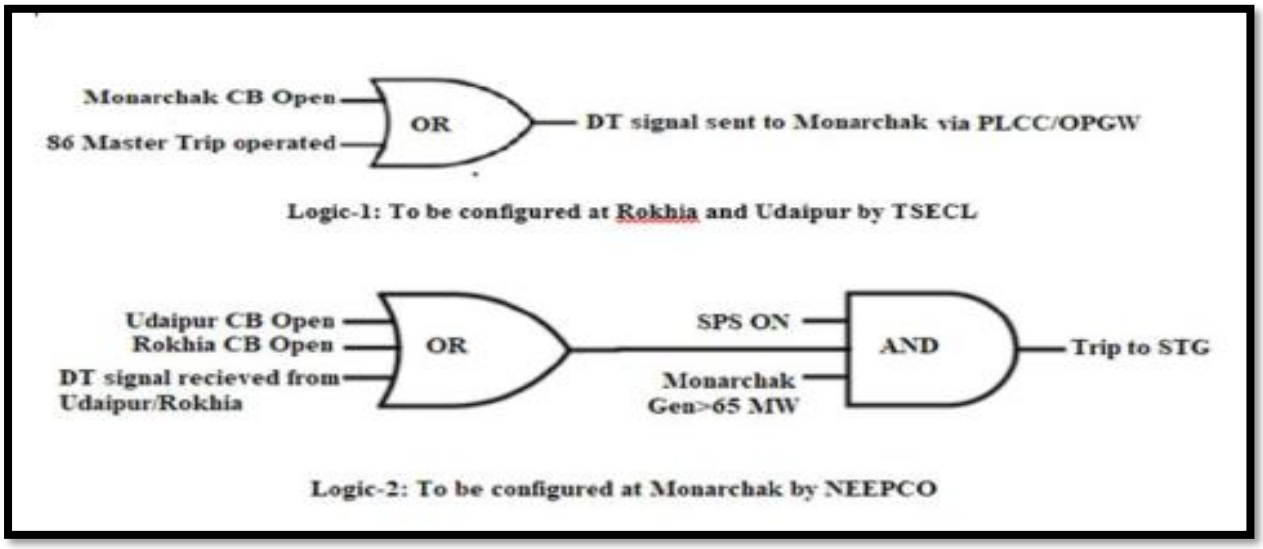
- **NEEPCO** is requested to disable A/R operation at Monarchak for Udaipur and Rokhia line as a short-term measure to avoid blackout of Monarchak power station until implementation of PLCC/OPGW link by TSECL.

- **TPGCL & TSECL** is requested for early implementation/commissioning of PLCC link for successful operation of A/R scheme during transient fault at Rokhia and Udaipur. This will allow the changes in SPS at Monarchak :

a) Any one CB of either 132 kV Udaipur and Rokhia tripped at Monarchak Station and Gen>65 MW

b) A/R successful at Monarchak but CB tripped at Rokhia/Udaipur and Gen>65 MW

Following new revised scheme proposed for review and further implementation.



B.13 Details of tripping of lines due to spurious DT signal transmission:

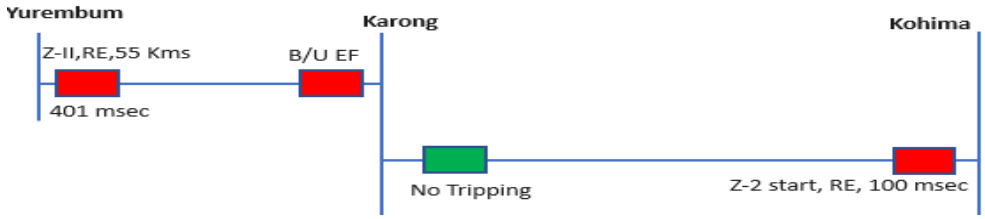
Sl. No	Element Name	Outage Date and Time	DT Sent from	Root cause and remedial measures
1	400 kV Balipara - Kameng 1 Line	18-09-2023 15:46	Kameng HEP	DT sent from Kameng: DC circuit fault
2	132 kV Agartala - Bodhjannagar	28-09-2023 09:11	Agartala (TSECL)	
3	132 kV Haflong - Jiribam Line	07-10-2023 22:25	Jiribam (PGCIL)	
4	132 kV AGTCCPP - PK Bari (TSECL) 1 Line	11-10-2023 18:03	PK Bari(TSECL)	

5	132 kV AGTCCPP - PK Bari (TSECL) 2 Line	11-10-2023 18:03	PK Bari(TSECL)	

Utilities are requested to share the **root cause and remedial measures** taken.

B.14 Blackout of Karong S/S of Manipur on 10-10-2023:

Blackout of Karong S/S occurred due to tripping of 132 kV Imphal – Karong Line & 132 kV Karong – Kohima Line at 12:21 Hrs of 10-10-2023.



As per analysis from Yurembum & Kohima DR: Following were observed-

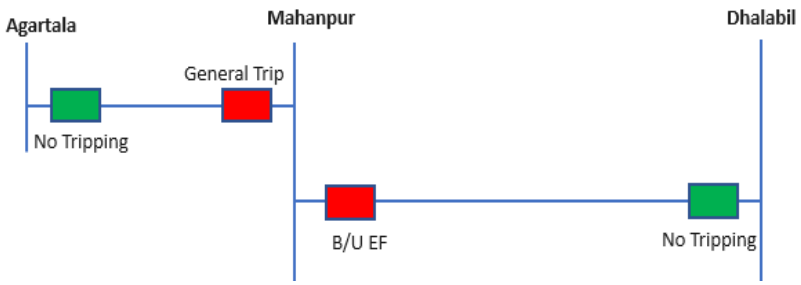
1. RE fault detected from Yurembum at a distance of 55.09 Kms from Yurembum and it was cleared within 401 msec.
2. Z-II, RE fault detected from Kohima at a distance of 42 Kms from Kohima. No tripping was observed from DR signature. Fault current disappear within 100 msec.
3. **Proper analysis** could not be done due to non submission of DR/EL from Karong by MSPCL.

MSPCL is requested to intimate the root cause for the event.

DoP, Nagaland is requested to intimate the reason of tripping from Kohima within in 100 msecs.

B.15 Grid Disturbance at Mohanpur on 29-Sept-2023:

Mahanpur area of Tripura system was connected with rest of NER grid through 132 kV Mahanpur-Dhalabil and 132 kV mahanpur-Agartala Line.

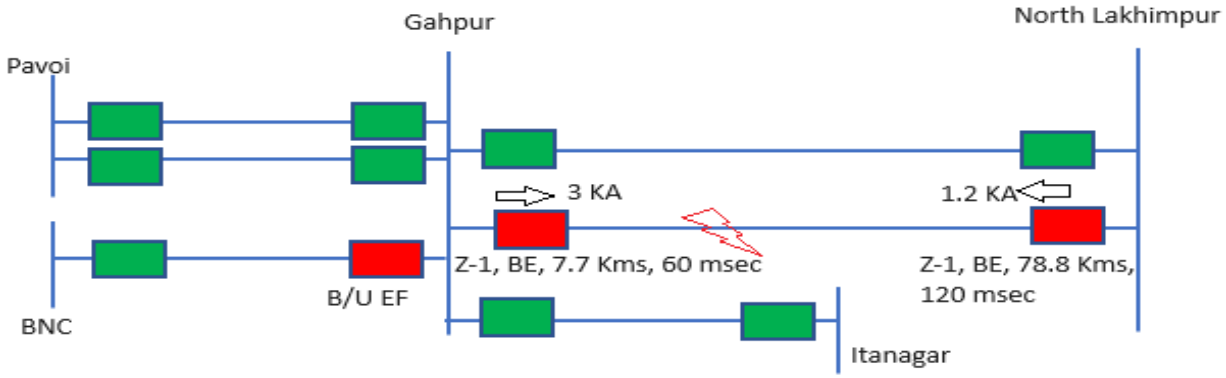


At 02:33 Hrs on 29-Sept-2023 both 132 kV Agartala- Monahpur Line & 132 kV Dhalabil - Mohanpur line tripped from the **Mohanpur end** on operation **Earth Fault** and **General Trip which led to blackout of Mahanpur Substation**. No tripping was observed from the other end such as Agartala & Dhalabil.

Root cause cannot be concluded due to non-submission of DR and EL by TPTL.

TPTL is requested to share the root cause of tripping and remedial measures taken.

B.16 <u>Tripping of 132 kV Biswanath Chariali (PG) - Gohpur Line on 02-10-2023:</u>



At 10:59 Hrs on 02-10-2023, Phase to E fault occurred in 132 kV Gohpur - North Lakhimpur 1 and cleared from Gohpur within 60 msec and from N Lakhimpur within 120 msec.

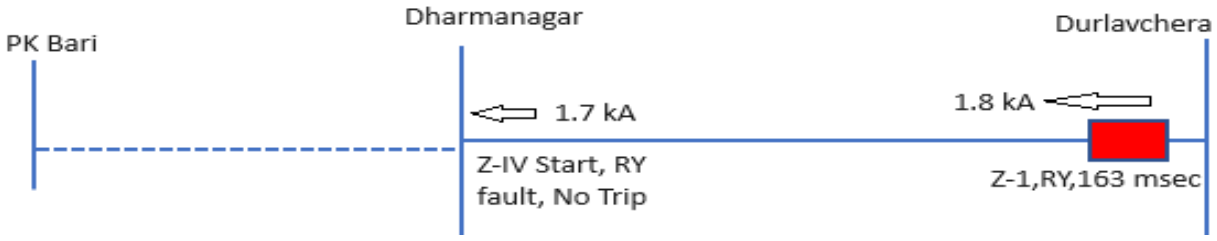
At the same time 132 kV BNC line tripped from Gohpur on dir B/U EF (421 A) within **40 msec** which inferred to be **UNWANTED**

AEGCL is requested to intimate the root cause and remedial measures taken after the event.

B.17 <u>Blackout of Dharmanagar area of Tripura power system:</u>

Event 1(15-09-2023):

Dharmanagar area was radially connected with rest of NER grid through 132 kV Dharmanagar - Dullavchera line.



At 11:43 Hrs on **15-09-2023**, 132 kV Dharmanagar – Dullavchera Line tripped from Durlavchera on Z-1 operation within 163 msec. No tripping recorded from Dharmanagar end as it detects fault in Z-IV. It seems that Phase-to-Phase fault was in downstream side of Dharamanagar.

Following needs to be intimated-

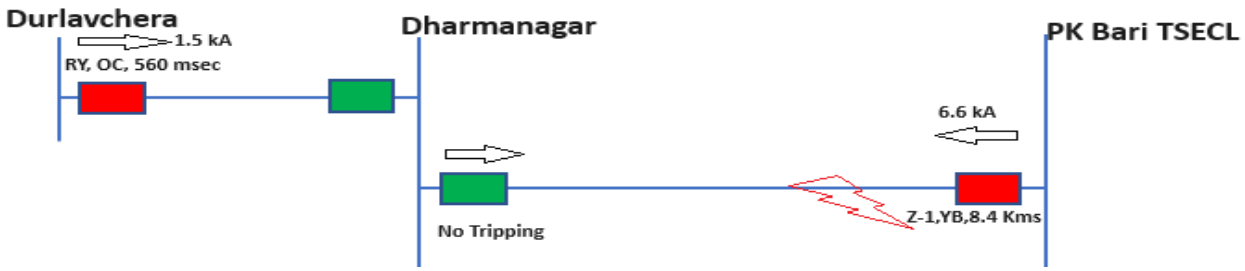
Exact location of fault and its action taken by **TPTL**.

Reason of Tripping on Zone I by **AEGCL** (***if there is any over-reaching***) and actions taken.

Event-2(19-10-2023):

Dharmanagar area was connected with rest of NER grid through 132 kV Dharmanagar - Dullavchera line and 132 kV Dharmanagar-PK Bari Line.

At 01:47 Hrs, 132 kV P K Bari -Dharmanagar Line and 132 kV Dharmanagar – Dullavchera Line tripped which led to blackout of Dharamanagar area of Tripura Power system. Load loss of **22 MW** recorded at Dharmanagar area of Tripura power system, which is the matter of concern.



Phase to Phase fault was in 132 kV PK bari-Dharmanagar Line and fault was cleared from PK Bari within 60 msec. Protection system at Dharmanagar **fails to isolate** the fault, due to which fault was feeding continuously from adjacent healthy Line 132 kV Durlavchera-Dharmanagar from Durlavcherra end and finally clear the fault within 560 msec on B/U O/C protection.

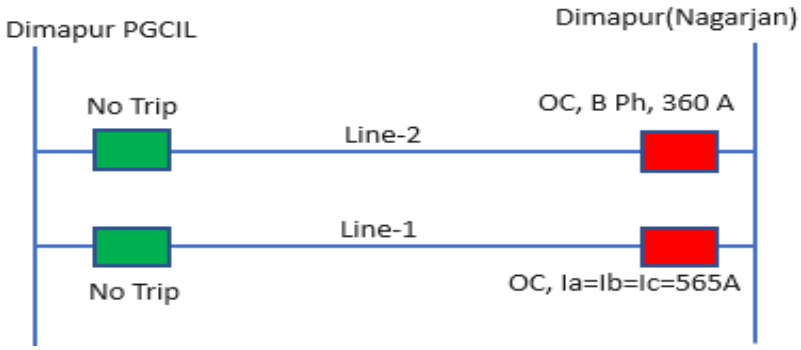
TPTL is requested to intimate the following-

1. The reason of non-clearing of fault from Dharmanagar and its remedial measures.
2. Reason of non-Submission of DR and EL from Dharmanagar S/S

B.18 <u>Blackout of Dimapur area of Nagaland power system on 15th and 16th September 2023:</u>

Dimapur (Nagarjan) area of Nagaland power system was connected with rest of NER grid Via. 132 kV Dimapur (PG)-Dimapur (Nagarjan) D/C.
At 18:30 hrs of 15-09-2023 and 17:38 Hrs of 16-09-2023, 132 kV Dimapur (PG)-Dimapur (Nagarjan) D/C tripped leading to blackout of Dimapur (Nagarjan) area of Nagaland Power System, which is the matter of concern.

Due to the above, load loss of around **110 MW and 96 MW** recorded.



Sequence of Events -

1. 132 kV Dimapur – Dimapur 2 tripped at Nagaland end on operation of OC with Ia= 308 A, Ib=320 A and **Ic=360 A**) within 28.6 sec(**OC pickup:360A**)
2. Subsequently after tripping of line II, whole load shifted to 132 kV Dimapur – Dimapur 1 led to tripping of Line-I on OC within 5.7 sec(**Phase current Ia= Ib=Ic=565 A**)

Key Observations-

1. There is no fault in the system as per DR/PMU signal.
2. About **40A -50 A** less current observed in B-phase as compared to other R & Y phase in Line-1. This 50 A current is added to B-phase of parallel line-2 which led to tripping of Line-2 on over current. It seems that there is some issue with primary side connection, which may be due to loose jumper joints/isolator etc that creates high impedance path in B-phase of Line-1.

In order to identify the issue, NERLDC requested DoP Nagaland to do the following-

- Line impedance parameter test of Line-1
- Thermovision scanning of Line-1 & 2 during peak hours to locate the loose joints/hot spots etc.

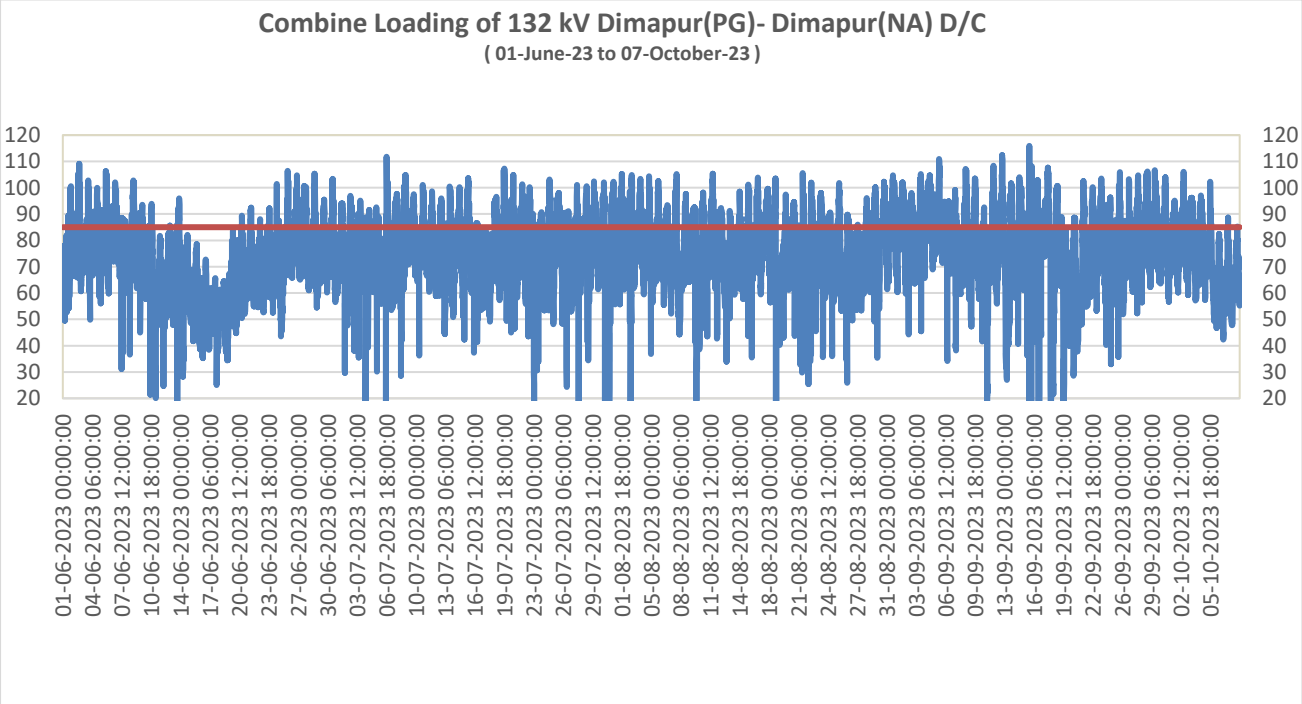
- CRM test of CB and isolator

As reported by DoP Nagaland, all parameters are within limit after testing of CRM (CB/ISO) and thermal scan (bay/Line).

NERLDC suggested

1. **DoP Nagaland** to carry out thermal scanning during loading condition.
2. **PGCIL** to carry out line impedance measurement test so that imbalance current issue may be known.
3. DoP Nagaland to increase the Overcurrent relay setting to 420A (**91 MW**) or 70% of CT ratio as discussed in the 206th OCCM.

B.19 <u>Requirement of SPS implementation at Dimapur to for ensuring reliable power in Dimapur area of Nagaland:</u>



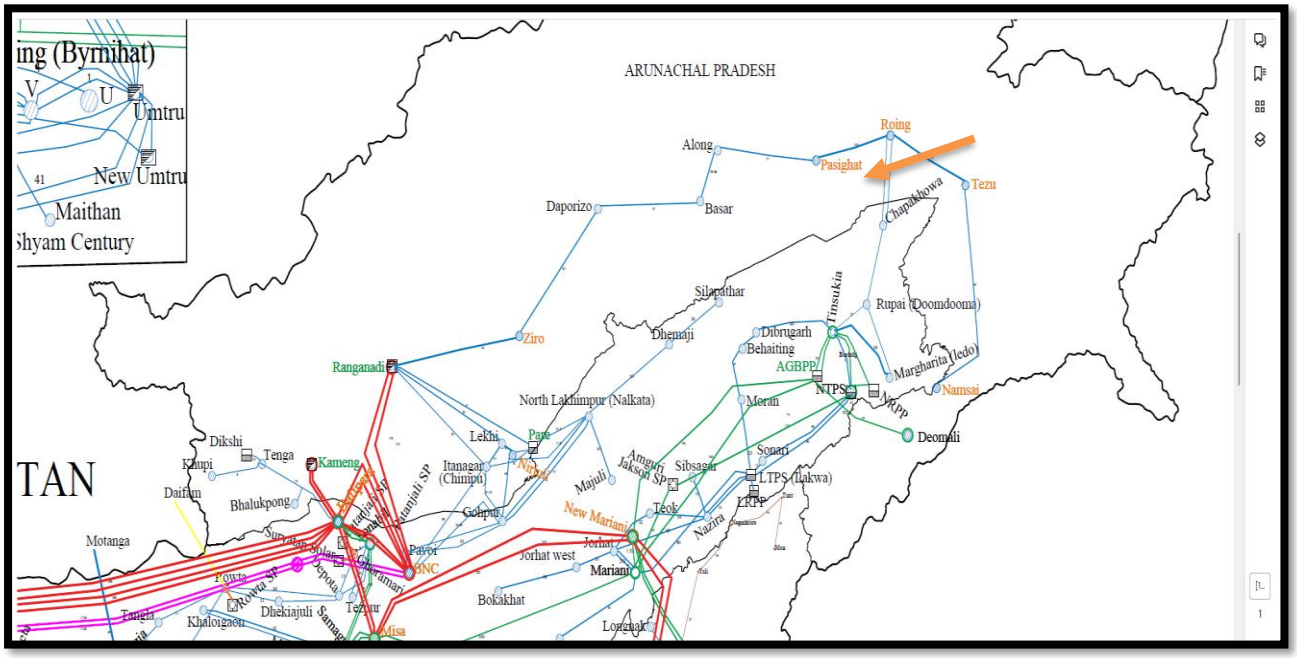
Loading profile of Dimapur shows N-1 contingency of any one circuit not satisfied most of the time as the combine loading was above 85 MW for 35% of times and above 80 MW for 22% of times.

Hence, to satisfy the N-1 contingency at Dimapur (NL) and to avoid load loss in the Dimapur area, DoP, Nagaland is requested to implement suitable System Protection Scheme (SPS) with following criteria-

If the loading of any one circuit current exceeds more than 415A, the SPS will trigger and it will shed 25-30 MW load at Nagarjan area, which will increase the reliability of Nagarjan area of Nagaland system.

B.20 <u>SPS for tripping of 132 kV Panyor-Ziro line:</u>

The reliability of Ziro, Daporijo, Along, Pasighat, Roing, Tezu, Namsai, Chapakhowa, Ledo and Rupai area has been increased after commissioning of 132 kV Roing-Chapakhuwa DC in the month of July 2023.



Since its integration into the grid on 4th July 2023, the 132kV Chapakhowa-Roing D/C line has successfully prevented multiple number grid disturbance in Arunachal Pradesh. The details are given below.

Sl. No	Elements Tripping	Tripping count
1	132 kV Daporijo – Basar- Along Line	6 Times
2	132 kV Along - Pasighat Line	30 Times
3	132 kV Daporijo - Ziro Line	9 Times

Study suggests that a severe low voltage issue may arise on tripping of 132 kV Panyor-Ziro line and may lead to cascading tripping in Arunachal Pradesh powers system. In such case, SPS may be designed to isolate the downstream load of Ziro substation on tripping of 132 kV Panyor-Ziro line.

Agenda form NERTS

B.21 Frequent faults in 33kV system of Ziro:

Frequent faults observed in 33kV feeders at Ziro substation. Same maybe looked into for rectification by DoP Arunachal as otherwise ICT at Ziro is getting stressed. List of faults is as given under: -

Sr. No.	Name of Feeder	Month / No. of tripping	Total
1	Old Ziro	April - 11 May - 11 June - 9 July - 10 August - 18 September - 12	70
2	Kimin	April - 28 May - 36 June - 21 July - 39 August - 46 September - 34	204
3	Kurung - Kumey	April - 44 May - 61 June - 51 July - 46 August - 61 September – 57	320

B.22 Providing PLCC in State owned lines /bays :

a. 132kV Dimapur Kohima line (Length – 58 km) - 132kV Dimapur - Kohima bay at Dimapur end is maintained and owned by PGCIL. Of this line, 350mtr is owned by POWERGRID whereas balance is owned by DOP – Nagaland. Presently, there is no PLCC available in this state owned line. Due to this, Carrier aided tripping is not possible which shall lead to higher fault feeding in case of Zone 2 fault from each end. The same may cause disturbance also.

Further, bay at POWERGRID end is GIS. On SF6 gas pressure low, isolation from remote end is utmost important looking at the safety of the equipment and grid. Without PLCC, DT implementation cannot be achieved. This matter needs to be

taken up for rectification at the earliest.

b. 132kV Melriat Zemabwk (Length – 10.12 km) – PLCC link is not established for 132kV Melriat – Zemabwk line owned by POWERGRID. Spare PLCC panels alongwith wave trap is available at Melriat substation. However, due to non-availability of 48V dc supply at Zemabwk end, the PLCC link cannot be commissioned. DoP Mizoram is requested to arrange the 48V dc supply to commission the PLCC link.

c. 132kV Nirjuli Lekhi (Length is 11kms) – 132kV Nirujli Lekhi line is maintained jointly by DoP AP & POWERGRID (5 km DoP, 6 km POWERGRID). PLCC link is not available for this feeder. Earlier this line was netween Ranganadi and Nirjuli where PLCC was provided. However, after LILO at Lekhi by DOP-AP, PLCC was shifted to Lekhi – Ranganadi Section and PLCC was not provided in Nirjuli – Lekhi section. As per standard protection practice, PLCC needs to be available for 132kV lines. Therefore, DoP AP is requested to look into the installation & commissioning of PLCC at both ends.

B.23 <u>PLCC issues:</u>

a. 400kV Mariani Kohima Ckt #2 - For 400kV Mariani-Kohima Ckt-2, ABB make PLCC Model no-ETL41 is installed at both ends. PLCC panels at both ends are owned by KMTL. At Mariani end, for PLCC Ch#1, alarm is persisting in P4LA card. KMTL had previously deputed service engineer for rectification of the issue in Oct 2022.The issue was resolved in Oct 2022. However, the same issue had resurfaced again from 24th August 2023. Repeated communication has been sent to KMTL to resolve the issue. However, rectification action is still pending.

b. 132 kV Roing - Pasighat – PLCC panels for 132kV Roing -Pasighat feeder are installed at both ends. Panels are in healthy condition at both ends. However, due to non-availability of healthy 48V dc supply at Pasighat end, PLCC panels at Pasighat are in OFF state. DoPAP is requested to arrange healthy 48V dc supply at Pasighat end.

c. 132kV Dimapur - Bokajan – For safe and rapid isolation DT scheme is required as per standard practice. However, 132kV Dimapur-Bokajan feeder, DT send scheme is not implemented at Bokajan end (AEGCL). AEGCL is requested to implement the same.

d. As per latest practice of POWERGRID, to prevent unwanted DT send due to DC flickering earth fault, a standard time delay of 10 msec is being added in all Protection Couplers (DTPC / PLCC) having provision for the same. Same maybe allowed in all lines having DTPCs (owned by other utilities) connected to POWERGRID substations:

Sr. No.	Name of Line	Owner of DTPC / PLCC
1	132kV BNC-Gohpur	Indigrid
2	132kV BNC-Itanagar	Indigrid
3	132kV Badarpur-Karimganj	AEGCL
4	220kV Balipara – Sonabil Ckt 2	AEGCL

B.24 Auto reclose related issues:

A. Auto Reclose is a standard requirement which is not functional for the following feeders:

a. **132kV Dimapur-Doyang 1&2** – At Doyang end, AR is not functional. NEEPCO maykindly look into it to enable it.
b. **132kV Dimapur-Bokajan** - Auto reclose for this line is not functional at Bokajan end. AEGCL is requested to enable it at the earliest.
c. **132kV Dimapur-Dimapur 1 & 2** - Auto reclose for these lines are not functional at stateend. DoP Nagaland is requested to enable the AR feature.

B. As per standard practice of POWERGRID, 3-ph AR is enabled for all 132kV lines. For 132kVBNC-Gohpur & 132kV BNC-Itanagar ckt, only 1-ph AR is enabled. As line belongs to Indigrid, consent maybe accorded to enable 3-ph AR at both ends. Enabling of 3-ph ensures that for all types of faults (1-ph, ph-ph, 3-ph faults), AR shall be initiated which will increasesystem availability.

B.25 Non reporting of bays to RLDC

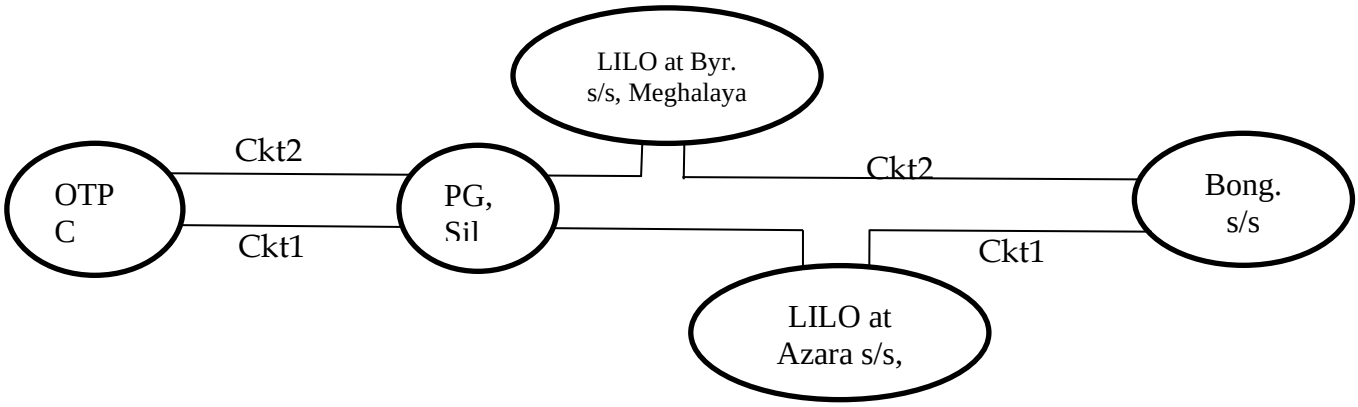
During commissioning of SAS & CRP at AEGCL Srikona, Gohpur, Pavoi, RTU was dismantled. Therefore, data of POWERGRID owned bays are not reporting to RLDC. AEGCL may restore theRTUs and set up the communication link upto SLDC/RLDC at Srikona & Pavoi. Thereafter, wiringof equipment status upto RTU shall be done by POWERGRID.

Agenda form NETC

B.26 <u>Correction of the settings of the relays associated with NETC transmission line elements and installation of TWFL in connected S/S.</u>

North East Transmission Company Limited (NETC) is currently operating the 400 kV D/C Palatana-Silchar and Silchar-Bongaigaon T/L with connectivity through LILO line at Byrnihat (Meghalaya) and at Azara (Assam) for evacuation of power from OTPC power plant located at Palatana, Tripura to NER States.

A Single line diagram showing the connectivity of the 400 kV Palatana-Bongaigaon Transmission system is as follows:



During the last financial year (FY 2022-23), there were instances of tripping in the 400 kV D/C Palatana-Bongaigaon Transmission System. Due to inaccurate fault calculations of the relays, difficulties were faced in detection of fault location. In normal scenarios, we expect to locate the faults within a range of +/- 5 km from the relay distance measurement. However, during post-fault patrolling, we discovered fault locations approximately 10-15 km away from the relay's calculated distance. The same issue persisted for the tripping instances during the current Financial Year (2023-24) as well. Here is a brief overview of such tripping instances:

SL. No.	Name of line element	No. of tripping occurred during		Remarks
		FY 2022-23.	FY 2023-24 till Sept 2023	
1	Palatana-Silchar line 1	12	2	During the all these tripping(s), the distance indications
2	Palatana-Silchar line 2	4	4	

3	Silchar-Azara	7	2	of the relay were wrong.
4	Silchar-Byrnihat	10	8	
5	Byrnihat-Bongaigaon	2	1	
6	Azara-Bongaigaon	0	0	

In view of above, we propose the following for detail deliberation by the forum:

i) A comprehensive review of the relay setting arrangements and implementation of the modified setting in conformity with the actual line parameters at all the connecting substations.

ii) Installation of the travelling Wave-Based Fault Locators (TWFL) at all the aforementioned connecting substations to ensure smooth and effective operation of the lines by precisely locating faults in cases of the line tripping.

Submitted for detail deliberation please.

Agenda form MePTCL

B.27 <u>Requirement of SPS for 132 KV Khliehriat (PG)-Khliehriat D/C line</u>

With expected availability of at least two machines of Kopili and one machine of Khandong during peak hours of the coming winter months of 2023-24 and considering the anticipated increase in demand, it is expected that total power flow along 132 KV Khliehriat (PG)-Khliehriat D/C line would be between 90-110 MW under different conditions. Load flow studies had been carried out by SLDC and shared with NERLDC. The matter had also been discussed with DGM, NERTS since 132 KV Khliehriat (PG)-Khliehriat line 1 is under POWERGRID. The scheme envisages shedding of 20-25 MW load at 132 KV Mustem substation in the event of tripping of any circuit of 132 KV Khliehriat (PG)-Khliehriat D/C line.

The above requirement was agreed in principle during the 205th OCC meeting and NERLDC and MePTCL were requested to develop the tripping logic and to present it in the next PCC meeting. The schematics of the SPS is attached for reference.

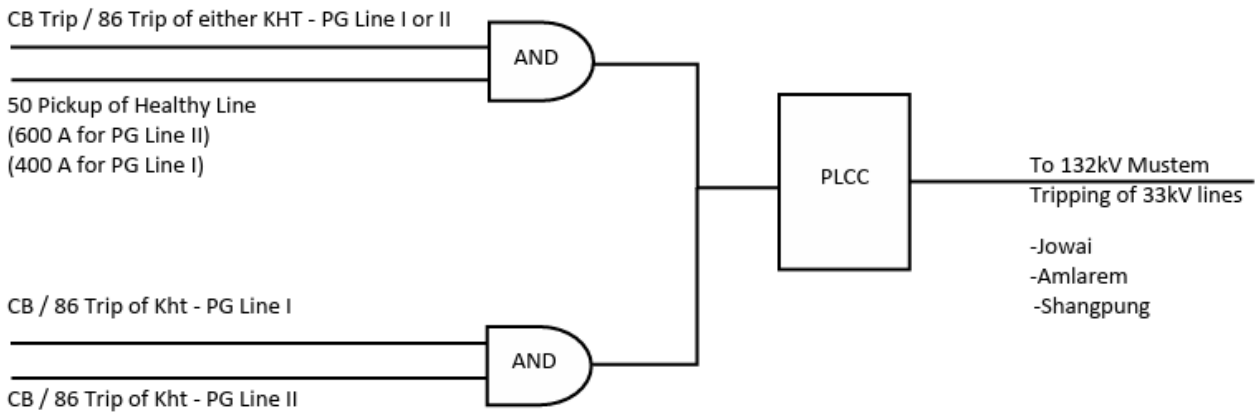
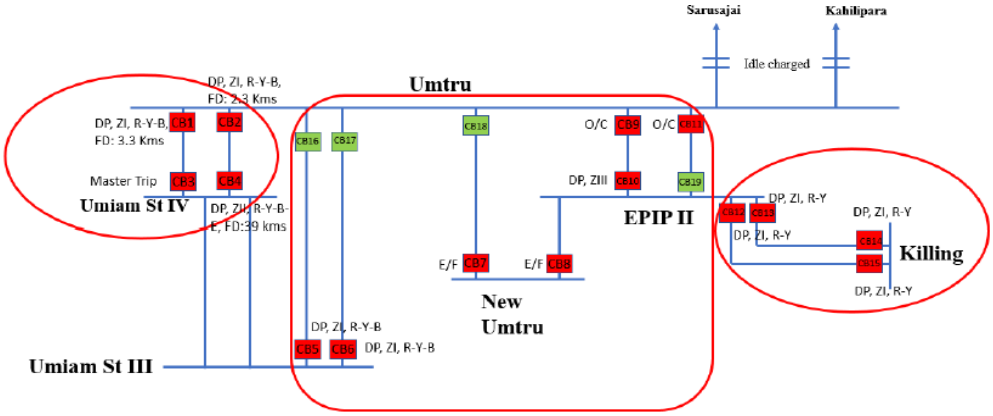


Fig: SPS Schematics at 132kV Khliehriat S/S for 132kV PG Line I & II

Forum may deliberate

C. Follow-up Agenda items

C.1 Grid disturbance in Umtru & New Umtru areas of Meghalaya Power System on 23th July'23 (59th PCCM)



Deliberation of the 59th PCCM

i) Regarding non-operation of protection at Umtru for Umiam stg III lines, MePGCL updated that relays have been checked and found to be ok. The forum requested MePGCL to recheck the protection system and intimate NERPC and NERLDC about the root cause.

ii) MePGCL assured the forum to send the relay settings of lines at Umtru and new Umtru to NERPC/NERLDC.

iii) The forum strongly requested MePGCL to disable the High Set definite time Back up O/C and E/F settings as per the NER protection philosophy.

MePGCL may update the latest status

C.2 Tripping of 132 kV Khlieriat-Khlieriat-2 Line along with 132 kV Khlieriat-Lumshnong Line (59th PCCM)

At 15:24 Hrs on 8th June'23, three phase fault was in 132 kV Khlieriat-Lumshnong Line and it was cleared within 70 msec from Khlieriat on Z-1. At the same time, 132 kV Khlieriat-Khlieriat-2 Line tripped from Khleiriat(PG) on Z-1 which is unwanted. Similar kind of event also occurred at 23:35 Hrs on 15/05/22.

As per NERLDC record, LDP (Line Differential Protection) has been implemented on the 132 kV Khlieriat-Khlieriat-2 Line as line length is less than 10 Km.

Observation-

With LDP in place, distance protection should not come into operation except in case of failure in the optical fiber link or a failure in the LDP relay.

MePTCL is requested to intimate the root cause of tripping of 132 kV Khlieriat-Khlieriat-2 Line and remedial actions taken.

In **59th PCCM**, the forum decided that on short lines with differential protection as primary protection, there should be a delay of 100 msec in Zone 1 of the backup distance protection.

C.3 Implementation of Bus Bar protection scheme at Kahilipara (57th PCCM)

Sl No	Description of Event	Action Already Taken	Recommended actions in last sub- group	Discussion Points	Deliberation of the Subgroup
35.	Tripping of 132 kV Kahilipara - Sarusajai 1, 2 and 3 line, 132 kV Kahilipara Main Bus I, 132 kV Kahilipara Transfer Bus I and 132 kV Kahilipara - Kamalpur Line on 02.08.21			->R-Y phase bus fault at Kahilipara. ->Z2 protection operated at Sarusajai end for line 1,2 and 3. ->Z5 picked the fault at Kahilipara for all the feeders.	->BB protection to be implemented at Kahilipara With procurement of 5 core CTs

AEGCL may update

C.4 Blackout of Zuangtui area of Mizoram System on 25.07.23

Grid disturbance of category GD-1 (Load loss: 20 MW) occurred at Zuangtui and Saitual substations of Mizoram state at 13:13 Hrs of 25/07/2023 due to tripping of 132 kV Melriat(PG) – Zuangtui & 132 kV Serchip-Zuangtui lines which is the cause of concern.

As per DR analysis, highly resistive B ph fault was in 132 kV Zuangtui – Serchip line and it was cleared within 431 msec from Zuangtui on In>1 (396 A). At the same time, Melriat – Zunagtui line tripped from Melriat on In>1 (331 A)

Observation:

i. P&ED Mizoram is requested to intimate the root cause of tripping of 132 kV Zuangtui – Serchip line.

ii. ROT of EF settings at Melriat for Zunagtui line and Zuangtui for Serchip line seems low and is overlapping. So, proper coordination is to be done by POWERGRID and P&ED Mizoram to prevent unwanted tripping.

In 59th PCCM, it was decided that NERPC, Mizoram and PGCIL will coordinate to revise the current pick up and TMS values of backup E/F and O/C relays for Melriat-Zuangtui and Zuangtui-Serchip lines so that overlapping in relay operation may be avoided.

C.5 <u>Ensuring Reliable Power Supply at Dimapur (Nagarjan) area:</u>

On 02-08-2023 at 16:35 Hrs, 132 kV Dimapur(PG)- Dimapur(NL) II line tripped on Zone I due to snapping of Y-Phase jumper. This led to shifting of entire load to 132 kV Dimapur(PG)- Dimapur(NL) I Line which resulted in tripping of the line on Overcurrent. Due to the GD, load loss of 85 MW observed in the Dimapur area of Nagaland power system which is the cause of concern.

The present CT ratio of 132 kV Dimapur(PG) – Dimapur (NL) D/C is 600/1 and the present overcurrent setting of 360 A at Dimapur(NL) end with each circuit carrying capacity of 82 MVA, thus not complying with N-1 criteria.

To satisfy the N-1 contingency at Dimapur(NL), following measures may be taken by DoP, Nagaland:

i. Increase the Over current settings from 360 A to 450 A at Dimapur(NL) to cater to a maximum load of 102 MVA.

ii. Implement an SPS scheme

Suggested Logic: When current in either of the circuit crosses 360 A with time delay of 1.1 sec, load shedding of around 35 MW to be done.

In 59th PCCM, the forum requested Nagaland to increase the overcurrent setting for 132kV Dimapur (PG)-Dimapur (NL) from present 60% to 70% at Nagaland end so that cascade tripping may be avoided in case of tripping of one line. DoP Nagaland assured that the suggested setting will be implemented shortly.

C.6 <u>Zone I overreaching of 132 kV Agartala- AGTCCPP -2 on 12-July-2023:</u>

At 12:58 Hrs on 12-July-2023, fault was in 132 kV AGTCCPP - PK Bari (TSECL) 2 Line and fault was cleared from AGTCCPP on Zone I and PK Bari on ZII. At the same time, healthy 132 kV Agartala - AGTCCPP 2 Line tripped from Agartala on ZI which is unwanted.

NERTS is requested to:

i. Intimate the root cause of the tripping and remedial measures taken

ii. Review the Distance Protection Zone settings at Agartala.

In 59th PCCM NERTS intimated that the distance protection zone settings are in order. However, during the fault the relay initially picked the fault in Zone 2 but then the fault impedance locus entered Zone 1. Further, he stated that distance relay will be checked and tested at the earliest.

D. Items for Status Update

D.1. Status of auto-reclosure on *z*-1 operation for important lines:

In the discussions of the Sub-group on 12-04-2021 the following points were noted:

a. Auto-Reclosure is very much required for maintaining system stability, reliability and uninterrupted power supply.

b. Presently it will take some time for the state utilities to implement the PLCC and establish carrier communication between stations.

c. The operation of Auto-Reclosure on Z-I operation at the local end independent of carrier healthiness is required.

In the 57th and 56th PCC meeting the forum approved the implementation of Auto-Reclosure on Z-1 without carrier check for all lines except the lines with generating stations at both the ends and requested the utilities to implement the AR scheme at the earliest.

In 58th PCC meeting, the forum enumerated the lines where AR is to be enabled at the earliest.

Nagaland: 132kV Dimapur-Kohima line (from Kohima end)

Mizoram: 132kV Turial-Kolasib line

Manipur: 132kV Imphal-Ningthoukong

Tripura: 132kV Agartala-S M Nagar (TSECL), 132kV Agartal-Rokhia DC, 132kV Agartala-R C Nagar DC, 132kV Agartala-Budhjungnagar

Arunachal Pradesh: 132kV Balipra-Tenga, 132kV Ziro-Daporijo-Along-Pashighat link

AEGCL has updated in 58th PCCM that two 220KV substations (Jawaharnagar and Sonapur) and the 220 KV bay at Kathalguri has no auto reclosure but is expected to come up soon. Almost 60% of 132 KV substations has auto reclosure scheme and by June'23 the coverage will increase up to 90%.

Meghalaya stated in the same meeting that the petition to implement auto reclosure in all lines has been placed at MERC as the lines are very old and may snap on auto reclosing mechanism if persistent fault occurs. They stated that AR scheme has been put in place for 5 lines, but approval is required. **(Annexure D.1)**

Latest status -

Sl no	State	Important Transmission lines where AR has to be enabled at the earliest	Lates status
1.	Arunachal Pradesh	132kV Balipara-Tenga, 132kV Ziro-Daporijo-Along-Pashighat link	No representative
2.	Assam	All 220kV and 132kV lines	For 220kV sub stations- At Sonapur, GIS work underway, support of OEM required At Kathalguri, procurement of relays underway At Jawaharnagar, WIP All works at threes substations to be completed by Nov'23 For 132kV substations- 80% work completed, by Nov'23 90% to be completed
3.	Manipur	132kV Imphal-Ningthounkong	-
4.	Meghalaya	**Annexure (D.1)**	AR put in place for 5 lines but approval of MERC is still awaited. The forum suggested MePTCL to do double jumpering at critical locations to ensure integrity of the old lines Meghalaya requested MS, NERPC to write a letter to higher authorities to expedite the commissioning of the AR in the intra-state lines
5.	Mizoram	132kV Turial-Kolasib line	AR implemented (TPAR). Moreover, AR implemented in – i.132kV Zuangtui-Serchip line (both sides) ii. 132kV Zuangtui-Saitual line (Zuangtui side only)

			iii.132kV Lungmual-Melrita line (Melriat side) iv.132kV Kolasib-Bairabi line (Kolasib side only)
6.	Nagaland	132kV Dimapur-Kohima line (from Kohima end)	Procurement done. AR to be enabled shortly
7.	Tripura	132kV Agartala-S M Nagar (TSECL), 132kV Agartal-Rokhia DC, 132kV, 132kV Agartala-Budhjungnagar	WIP, to be completed by 15th September, 2023

D.2. <u>Installation of line differential protection for short lines:</u>

As per sub-regulation3 of Regulation 48 of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022-

"For short line (less than 10 km) or cable or combination of overhead line and cable, line differential protection shall be used with built-in backup distance protection."

As per discussion in 59th PCC meeting and subsequent OCC/Sub-group meetings the status for different STUs/ISTS licensees are as follows:

Name of utility	**Last updated status**	**Latest status**
AEGCL	DPR submitted to PSDF secretariat	DPR sent back by PSDF secretariat. Third party protection audit reports have to attached with the DPR
MSPCL	Revised DPR for 132kV Imphal-Imphal-III to be submitted.	To be submitted soon
MePTCL	Work completed Aug'21, but not commissioned yet. Meghalaya to provide line-wise status on progress of LDP commissioning work to NERPC and NERLDC.	Report on line-wise status on progress of LDP commissioning work submitted to NERPC and NERLDC
P&ED Mizoram	Lines identified viz. 132kV Aizawl - Luangmual and 132kV Khamzawl - Khawiva. DPR submitted. PSDF approval awaited.	Will take up with SLDC whether DPR has been submitted.

DoP Nagaland	Lines identified under DPR preparation stage. Three lines were identified, viz; (i)132kV Dimapur-Dimapur-1 & 2 ((ii) 132kV Doyang-Sanis.	LDP on Dimapur-Dimpaur lines completed. Regarding Doyang-Sanis line, NEEPCO to install LDR at Sanis end.
TSECL	132kV 79 Tilla-Budhjungnagar. DPR to be prepared	Cost estimate submitted to TIDC to arrange for ADB funding.

Regarding the 132kV Doyang-Sanis line, NEEPCO to procure and install the LDP relays and associated accessories at both the ends. DoP Nagaland will bear the cost corresponding to Sanis end.

NERTS and MePTCL have provided the status on LDP installation on lines in **Annexure D.2.**

Sub-committee may deliberate

D.3. Status for SPS

	Name of SPS	SPS Trigger/Action	Utility	Latest Status/Discussion points
1.	SPS related to secure & reliable operation of Leshka HEP	Upon tripping of one circuit of 132kV Leshka-Khliehriat D/C, Leshka generation to be reduced	MePGCL	Logic and scheme has been finalized. Modification in Protection scheme of units and extending the SPS signal to the UCB by M/S Hitachi is pending. M/S Hitachi yet to communicate with MEPGCL and provide the price offer

Concerned utilities may please update the status.

D.4. Status against remedial actions for important grid events:

Sl No	Details of the events(outage)	Remedial action suggested	Name of the utility	Latest status (59th PCCM)
1.	132 kV Balipara-Tenga line in May and June	Carrier aided inter-tripping to be implemented for 132kV Balipara-Tenga-Khupi at the earliest (PLCC has to be installed on the link.	DoP, Arunachal Pradesh. As per previous updates, Work covered under PSDF. In progress	Same status

		Under consideration of the higher authorities)		
2.	132 kV DoyangMokokchung line 132 kV Mokokchung - Mokochung (DoP, Nagaland) D/C lines on 30th July	Carrier inter-trip for 132kV DHEP-Mokokchung to be implemented by DoP Nagaland (NO PLCC on the line. Matter under consideration of Higher authorities)	DoP Nagaland (Work under progress. Will be completed soon.)	
3.	Leshka-Khleihriat DC multiple tripping in April to September	TLSA installation along the line to be done by MePTCL	MePTCL (DPR submitted, Approval pending.)	
4.	132 kV Loktak-Jiribam line, 132 kV Loktak-Imphalline,132 kV Loktak-Ningthoukhong line, 132 kV Loktak-Rengpang line &Loktak Units 1,2 and 3 on 3rdAug	> 5MVA TRAFO (Aux. Transformer) to be repaired ->5MVA Auxiliary TRAFO panel to be repaired by NHPC	NHPC (Order to be placed soon. Will take 6months after placing the order)	
5.	Grid disturbance of category GD-1 (Load loss: 13MW) occurred at Karong areas of Manipur Power System at 07:41 Hrs on 4th August'22	MSPCL to check the following1. Protection setting at Karong along with circuit wirings from DPR to CB mechanism 2. Z-III setting at Imphal and its healthiness of correct operation by relay testing.	MSPCL	
6.	PLCC & protection related issues at 132kV Tipaimukh S/S	MSPCL to ensure uninterrupted service of PLCC system at 132kV Tipaimukh S/S.	MSPCL	
7.	Grid Disturbance at Loktak HEP on 03rd Aug'22	NHPC-Loktak informed that LBB has been included under R&U scheme and the same shall be commissioned by Mar'23	NHPC (LBB to be commissioned under R&U project and by the end of Nov'23)	
8.	Multiple tripping occurred at PK Bari-PK Bari and PK Bari-	-> Healthiness of Carrier aided POTT	TSECL, NTL	

	Kumarghat Line on 4th July 2022.	scheme needs to be ensured by TSECL -> LDP needs to be implemented in 132 kV PK Bari-Kumarghat Transmission line. TSECL is requested to update the status of installation of LDP to this end -> After installation of DTPC at PK Bari end and Kumaraghat end by PGCIL, Inter-trip will now be enabled between Kumaraghat and P K Bari after TSECL assists in connection of Relay to DTPC panel at P K Bari end.	(->LDP to implemented by September'23 ->Inter trip at PK Bari to be configured. Will be completed by August.)	
9.	At 19:36 Hrs of 18-04-23, Grid Disturbance of category GD-1(Load Loss:120 MW) occurred at Ghoramari, Depota, Rowta and Dhekiajuli areas of Assam system due to tripping of 132 kV Sonabil-Ghoramari and 132 kV Sonabil-Depota Line	an SPS has to be devised for preventing overloading of the lines till the lines reconductored with HTLS conductors	AEGCL, NERLDC	
10.	Review of SPS at Monarchak (item 2.22 of the sub-group held on4th May 23)	NERLDC requested NEEPCO and Tripura to implement the revised logic at Monarchak (as provided by NERLDC) and Udaipur Rokhia ends respectively	NEEPCO, TSECL (SLDC TSECL intimated that logic 1(to be configured at Udaipur and Rokhia to send DT to Monarchak) could not be implemented as there is no PLCC/OPGW	

			connectivity in the LILO portion of Monarchak. NERLDC requested TSECL to explore installation of PLCC/FO for smooth functioning of SPS scheme for the reliability of Monarchak system)	
11.	Blackout of 220kV Salakati GSS on 18th of November, 2022	commissioning of the Bus Bar protection at 220 kV BTPS(Assam) S/S	AEGCL. Offline testing done. To be enabled in few days	
12.	Bus Bar Protection at 220 kV Mariani (Assam) Substation	Commissioning of Bus Bar Protection at 220 kV Mariani (Assam) Substation	AEGCL To commissioned by September end	
13.	132 kV Aizawl - Tipaimukh Line tripped at Aizawl end only on received of spurious DT signal on 16th and 26th Feb'23	rectification of PLCC issues at Tipaimukh end by MSPCL	MSPCL	
14.	Outage of 220 KV Bus Bar Protection Scheme at 400/220/132 KV Killing SS	Bus-Bar protection of 220kV bus at Killing SS	MePTCL M/S ABB has given offer. Board's approval awaited. To be completed in 3-4 months	
15.	Retrip configuration in LBB scheme in AEGCL Hailakandi station:	In previous sub group meeting The forum opined that the retrip scheme in the LBB protection will increase reliability of the protection system and will help in preventing mal operations in	AEGCL Logic finalized, need to be tested. Whole work may be completed within one month	

		connecting feeders. AEGCL agreed to the suggestion and assured that the Retrip scheme, with time delay of 100msec will be configured in the LBB scheme in Silchar-Hailakandi Ckt 1 & 2 at Hailakandi end.		
16	Non-operation of AR for various lines at Byrnihaat end on 25th and 26th June'23	Rectification of PLCC issues by MePTCL Consultation with OEM underway for resolution	MePTCL	
17	Non-operation of AR for various lines at Sonapur end in July and August	GIS related issues, coordination with OEM required	AEGCL	
18	Grid disturbance in Umtru & New Umtru areas of Meghalaya Power System on 23th July'23	O/C and E/F high set settings for Umtru and EPIP-II lines at New Umtru to be disabled	MePGCL	

DATE AND VENUE OF NEXT PROTECTION SUB- COMMITTEE MEETING

The next Protection Sub-Committee meeting will be held in the month of December, 2023. The date and venue will be intimated separately.

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Annexure B.1.1

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
एन.पी.सी. प्रभाग/National Power Committee Division
Ist Floor, Wing-5 ,West Block-II, RK Puram, New Delhi-66

No.4/MTGS/SG/NPC/CEA/2023/ 353 Date: 18.09.2023

Subject: Standard Operating Procedure for Protection System Audit- reg.

Standard Operating Procedure (S.O.P) for Protection System Audit is enclosed herewith for your kind information and necessary action.

Enclosure: As above

Yours faithfully,

सत्येंद्र 18.09.23

(सत्येंद्र कु. दोतान / Satyendra Kr. Dotan)
Director, NPC & Member Convener (Sub-group)

Standard Operating Procedure for Protection System Audit

A protection system audit is a review and evaluation of the protection systems of a substation with an objective to verify whether required protection systems have been put in place at station by the concerned utility, and to recommend suitable measures to provide for the same.

Ministry of Power, had constituted a Committee under the Chairmanship of Chairperson CEA to examine the grid disturbances on the 30th and the 31st July 2012. One of important recommendation of the committee was conducting of extensive audit of protection system. List of sub-stations where protection audit is to be undertaken on priority basis was prepared and audited across the country. This was the beginning of protection audit across the country and large number of important 400 and 220kV substations were audited.

Keeping in view the importance of Protection System Audit, Standard Operating Procedure has been prepared for the reference purpose. It will provides a step-by-step guide for RPCs to follow during the audit process.

1. All users shall conduct third party protection audit of each sub-station at 220 kV and above (132 kV and above in NER) once in five years or earlier as advised by the respective RPC.
2. After analysis of any event, each RPC shall identify a list of substations / and generating stations where third-party protection audit is required to be carried out and accordingly advise the respective users to complete third party audit within three months.
3. The third-party protection audit report shall contain information sought in the format as per IEGC 2023 and its further amendments.
4. Annual audit plan for the next financial year shall be submitted by the users to their respective RPC by 31st October. The users shall adhere to the annual audit plan and report compliance of the same to their respective RPC.

5. Criteria for choosing substations for third party protection audit:

The following criteria are generally applied during choosing a substation for protection audit.

i. Substations/ Generating (SS/ GS) stations with frequent grid incidences or frequent maloperations or any grid occurrence in any substation which affected supply to large number of substations and caused significant load loss. In this case, third-party protection audit may be carried out within three months or as decided in the Protection sub-Committee Meeting of the RPC.

ii. Based on request received from utilities for arranging protection audit in certain stations (e.g. for availing PSDF funding for Renovation and Upgradation of Protection system). In this case, preferably third-party protection audit may be carried out within three months.

iii. Important 400kV and 765kV substations (SS) / Generating stations (GS) including newly commissioned SS/ GS. In this case, third-party protection audit may be carried out at a frequency decided in the Protection sub-Committee Meetings of respective RPCs.

6. Protection audit Procedure:

i. After identification of stations for protection audit, the same is communicated to the owner utility seeking nomination of one nodal officer for each Station.
ii. The nodal officer shall provide the details of substation for preparation of protection audit format (in line with IEGC and subsequent amendments).
iii. Meanwhile nominations shall be sought from all utilities to form regional teams for audit. Regional teams comprising of engineers from various utilities /utility (other than the team of host State) of the region shall be formed based on the no. of SS to be audited. (Each team may consists of 3 or 4 engineers from utilities other than the host utility and at the maximum a team will be able to audit 3 to 4 stations in 7-9 days or so)
iv. Once the team details and list of stations to be audited is finalised the details of nodal officers, team members , list of stations to be audited by each team is shared to all for further coordination regarding planning and conduction of audit.
v. Based on the inputs received from nodal officer regarding the list of elements in the substation to be audited, protection audit formats shall be prepared by RPC (in line with IEGC) and circulated to nodal officer. The nodal officer along-with the substation engineers shall fill the audit format and furnish the same along-with various attachments sought as part of the audit format within a week or so. List of attachments shall be given in the covering page of audit format.
vi. The filled in audit format along-with the received annexures shall then forwarded to the audit team by the nodal officer and any further clarification regarding the format or attachments shall be taken up by the audit team with the nodal officer under intimation to RPC.
vii. The SS/ GS shall be audited based on the data filled in audit format checking for compliance of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022, Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 & CEA (Measures relating to Safety and Electric Supply) Regulations, 2010, CERC regulations and amendments to the same, approved guidelines of RPC, best practices in industry, report of the Task Force on Power System Analysis Under Contingencies and as per the "Model Setting Calculations For Typical IEDs Line Protection Setting Guide Lines Protection System Audit Check List Recommendations For Protection Management Sub-Committee on Relay/Protection Under Task Force For Power System Analysis Under Contingencies" etc.
viii. After conduct of audit, the shortcomings observed in the audit shall be discussed in detail with the nodal officer and substation engineers and recommendations are finalised.
ix. The filled in audit format along-with the recommendations and attachments shall be finalised and final protection audit report RPC (in line with IEGC) shall be compiled.
x. Final protection audit report shall be discussed in Protection Coordination Committee and recommendations may be accepted/deleted/modified as per the scope of audit and compliance of various regulations/guidelines etc.
xi. The recommendations of all SS audited shall be inserted into audit recommendations database and update regarding recommendations shall be sought from respective utilities.
xii. Action plan for rectification of deficiencies detected, if any, shall be submitted to the respective RPC and RLDC and monthly progress will be submitted.

xiii. The travel expense from place of duty to Substation/Generating Station to be audited shall be borne by respective Auditor (Parent Organisation). The expense for boarding, lodging any travel of the team during the audit period shall be borne by the organisation owning the Substation/Generating Station.

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Protection and UFR Audit Calendar (November'23 – May'24) - NER

Sl. no	State	Protection Audit Station	Planned Audit date (Protection + UFR)	UFR stations
1.	Arunachal Pradesh	Daporizo (132/33kV)	13th - 17th February'24	132kV Lekhi
		Along (132/33kV)		132k/11kV Tippi
		Pashighat (132/33kV)		33kVBandardawa
		Roing (132/33kV)		132/33kV Chimpu
		Chimpu (132/33kV)		33kV Yupia
				132/33kV Daporijo
		Khuppi (132/33kV)		33kV Dumporizo
		Tenga (132/33kV)		
2.	Assam	Sonabil (220/132kV)	15-19th April'24	Samaguri (220/132/33)
		Agia (220/132/33kV)		Sankardev (132/33)
		Sarusajai (220/132/33kV)		Azara (132/33)
		Samaguri (220/132/33)		Tinsukia (220/132/33)
		BTPS (220/132/33)		Panisokua (132/33)
		Other stations already covered in protection Audit carried out in 2021		CTPS (132/33)
				Nalkata (132/33)
				Garmur (132/33)
				Dhaligaon (132/33)
				Bilasipara (132/33)
3.	Manipur	Karong (132/33kV)	12-16th May'24	KHUMAN LAMPAK (33/11kV)
		Imphal (132/33kV)		YAINGANGPOKPI (132/33kV)
		Jiribam (132/33kV)		SANGAIPROU (33/11kV)
		Rengpang (132/33kV)		WANGJING (33/11kV)
		N. Thoubal (400/132kV)		
		Churchandpur (132/33kV)		
		Kakching (132/33kV)		
		Tipaimukh (132/33kV)		
4.	Meghalaya	Byrnihaat (400/220/132kV)	16-20th January'24	Ampati (132/33)
		Mawphlang (132/33kV)		Nangalbibra (132/33)
		Mustem (132/33kV)		Mendipathar (132/33)
		Umiam stg I (132/33kV)		Mawphlang (132/33)
		Umiam stg III (132/33kV)		Rongkhon (132/33)
		Umiam (132/33kV)		Nongstoin (132/33)
		EPIP I (132/33kV)		Mawlyndep (132/33)
		EPIP II (132/33kV)		Mustem (132/33)
5.	Mizoram	Kolasib (132/33kV)	11-15th March'24	Luangmual (132/33kV)
		Zuangtui (132/33kV)		Shimui (132/33kV)
		Luangmual (132/33kV)		Zuangtui (132/33kV)
		Serchip (132/33kV)		
6.		Kohima (132/33kV)		Dimapur (132/66/33 kV)
		Wokha (132/33kV)		Mokokchung (132/33)

	Nagaland	Sanis (132/33kV)	11-15th November'23	Kohima (132/33kV)
		Chepouzou (132/33kV)		
		Mokokchung (132/33kV)		
		Dimapur (132/33kV)		
7.	Tripura	Rokhia (132/33kV)	21st-24th December'23	Ambassa (132/33kV)
		Agartala (132/33kV)		Dhalabil(132/33kV)
		SM Nagar(132/33kV)		Udaipur (132/33kV)
		P K bari (132/33kV)		Rokhia (132/33kV)
		Udaipur (132/33kV)		
		Kumaraghat (132/33kV)		
		Ambassa (132/33kV)		
		Dharmangar (132/33kV)		
		Budhjungnagar (132/33kV)		
		Dhalabil (132/33kV)		

ANNEXURE - 1

THIRD PARTY PROTECTION SYSTEM CHECKING & VALIDATION TEMPLATE FOR A SUBSTATION

1. INTRODUCTION

(1) The audit reports, along with action plan for rectification of deficiencies found, if any, shall be submitted to RPC or RLDC within a month of submission of report by auditor.

(2) The third-party protection system checking shall be carried at site by the designated agency. The agency shall furnish two reports:

(a) Preliminary Report: This report shall be prepared on the site and shall be signed by all the parties present.

(b) Detailed Report: This report shall be furnished by agency within one month after carrying out detailed analysis.

2. CHECKLIST

(1) The protection system checklist shall contain information as per this Regulation.

(a) General Information (to be provided prior to the checking as well as to be included in final report):

(i) Substation name

(ii) Name of Owner Utility

(iii) Voltage Level (s) or highest voltage level?

(iv) Short circuit current rating of all equipment (for all voltage level)

(v) Date of commissioning of the substation

(vi) Checking and validation date

(vii) Record of previous tripping's (in last one year) and details of protection operation

(viii) Previous Relay Test Reports

(ix) Overall single line diagram (SLD)

(x) AC aux SLD

(xi) DC aux SLD

(xii) SAS architecture diagram

(xiii) SPS scheme implemented (if any)

(b) The preliminary report shall inter-alia contain the following:

TABLE A: FORMAT OF PRELIMINARY REPORT

S. No.	Issues	Remarks
1	Recommendation of last protection checking and validation	Status of works and pending issues if any
2	Review of existing settings at substation	Recommended Action
3	Disturbance Recorder out available for last 6 tripping's (Y/N)	Recommended Action
4	Chronic reason of tripping, if any	Recommended Action
5	Major non-conformity/deficiency observed	Recommended Action

(c) The relay configuration checklist for available power system elements at station:

(i) Transmission Line

(ii) Bus Reactor/Line Reactor

(iii) Inter-connecting Transformer

(iv) Busbar Protection Relay

(v) AC auxiliary system

(vi) DC auxiliary system

(vii) Communication system

(viii) Circuit Breaker Details

(ix) Current Transformer Details

(x) Capacitive Voltage Transformers Details

(xi) Any other equipment/system relevant for protection system operation

(d) The minimum set of points on which checking and validation shall be carried out is covered in this clause. The detailed list shall be prepared by checking and validation team in consultation with concerned entity, RLDC and RPC.

(i) Transmission Line Distance Protection/Differential Protection

a. Name and Length of Line

b. Whether series compensated or not

c. Mode of communication used (PLCC/OPGW)

d. Relay Make and Model for Main-I and Main-II

e. List of all active protections & settings

f. Carrier aided scheme if any

g. Status of Power Swing/Out of Step/SOTF/Breaker Failure/Broken Conductor/STUB/Fault Locator/DR/VT fuse fail/Overvoltage Protection/Trip Circuit supervision/Auto-reclose/Load encroachment etc.

h. Relay connected to Trip Coil-1 or 2 or both

i. CT ratio and PT ratio

j. Feed from DC supply-1 or 2

k. Connected to dedicated CT core (mention name)

l. Other requirements for protection checking and validation

(ii) Shunt Reactor & Inter-connecting Transformer Protection

a. Whether two groups of protections used (Group A and Group B)

b. Do the groups have separate DC sources

c. Relay Make and Model

d. List of all active protections along with settings

e. Status of Differential Protection/Restricted Earth Fault Protection/Back-up Directional Overcurrent/Backup Earth fault/ Breaker Failure

f. Status of Oil Temperature Indicator/Winding Temperature Indicator/Bucholz/Pressure Release Device etc.

g. Relay connected to Trip Coil-1 or 2 or both

h. CT ratio and PT ratio

i. Feed from DC supply-1 or 2

j. Connected to dedicated CT core (mention name)

k. Other requirements for protection checking and validation

(iii) Busbar Protection Relay

a. Busbar and redundant relay make and model

b. Type of Busbar arrangement

c. Zones

d. Dedicated CT core for each busbar protection (Yes/No)

e. Breaker Failure relay included (Yes/No), if additional then furnish make and model

f. Trip issued to both Busbar protection in case of enabling

g. Isolator indication and check relays

h. Other requirements for protection checking and validation

(iv) AC auxiliary system

a. Source of AC auxiliary system

b. Supply changeover between sources (Auto/Manual)

c. Diesel generator (DG) details

d. Maintenance plan and supply changeover periodicity in DG

e. Single Line Diagram

f. Other requirements for protection checking and validation

(v) DC auxiliary system

a. Type of Batteries (Make, vintage, model)

b. Status of battery Charger

c. Measured voltage (positive to earth and negative to earth)

d. Availability of ground fault detectors

e. Protection relays and trip circuits with independent DC sources

f. Other requirements for protection checking and validation

g. Communication system

i. Mode of communication for Main-1 and Main-2 protection

ii. Mode of communication for data and speech communication

iii. Status of PLCC channels

iv. Time synchronization equipment details

v. 7OPGW on geographically diversified paths for Main-1 and main-2 relay

vi. Other requirements for protection checking and validation

(vi) Circuit Breaker Details

a. Details and Status

b. Healthiness of Tripping Coil and Trip circuit supervision relay

c. Single Pole/Multi pole operation

d. Pole Discrepancy Relay available(Y/N)

e. Monitoring Devices for checking the dielectric medium

f. Other requirements for protection checking and validation

(vii) Current Transformer (CT)/Capacitive Voltage Transformer (CVT) Details

a. CT/CVT ID name and voltage level

b. CT/CVT core connection details

c. Accuracy Class

d. Whether Protection/Metering

e. CT/CVT ratio available and ratio adopted

f. Details of last checking and validation of CT/CVT healthiness

g. Other requirements for protection checking and validation

h. Other protections: Direction earth fault, negative sequence, over current, over voltage, over frequency, under voltage, under frequency, forward power, reverse power, out of step/power swing, HVDC protection etc.

3. SUMMARY OF CHECKING:

The summary shall specifically mention minimum following points:

(1) The settings and scheme adopted are in line with agreed protection philosophy or any accepted guidelines (e.g. Ramakrishna guidelines or CBIP manual based).

(2) The deviations from the RPC protection philosophy, if any and reasons for taking the deviations shall be recorded.

(3) All the major general deficiency shall be listed in detail along with remedial recommendations.

(4) The relay settings to be adopted shall be validated with simulation based or EMTP studies and details shall be enclosed in report.

(5) The cases of protection maloperation shall be analysed from protection indices report furnished by concerned utility, the causes of failure along with corrective actions and recommendations based on the findings shall be noted in the report.

Final Standard Operating Procedure (SOP) to address the Grid Disturbances (GDs)/Grid Incidents (GIs)/any other Protection Trippings

1. Immediately following an event (grid disturbance/incidence as defined in the CEA (Grid Standards) Regulations 2010 and subsequent amendment in the system, the concerned user/entity or SLDC shall inform to the RLDC through voice message.
2. Written flash report shall be submitted to RLDC and SLDC by the concerned user/entity within the time line specified in **Table 8** below, as per the IEGC, 2023.
3. In compliance of IEGC, 2023, All the Users, STU/SLDC are required to furnish the following information in respect of Grid Occurrences(GD/GI) within the time line specified in **Table 8** below, to RLDC/ RPC:
   (i) First Information Report (FIR)
   (ii) Event Logger (EL) output
   (iii)Disturbance Recorder (DR) output
   (iv)Trip event analysis report-TR (with pre and post fault system conditions)
   (v) Data Acquisition System (DAS)
4. RLDC shall report the event (grid disturbance or grid incidence) to CEA, RPC and all regional entities within twenty-four (24) hours of receipt of the flash report.
5. After a complete analysis of the event, the user/entity shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.
6. Based on the above detailed report submitted to RLDC by the entities, RLDC shall Categorize Grid Occurrences into grid incidents (GIs) and grid disturbance (GDs) based on criteria as per the CEA (Grid Standards) Regulations 2010 and subsequent amendment. RLDC shall also submit the Auto Reclosure (A/R) failure events, PLCC related events, any other protection related events to RPCs on monthly basis.
7. RLDCs and NLDC (for events involving more than one region) shall prepare a draft report of each grid disturbance or grid incidence including simulation results and analysis along with associated PMU plots of appropriate resolution, which shall be discussed and finalized at the Protection sub-committee/sub-group of RPC as per the timeline specified in **Table-8** below.

TABLE 8 : REPORT SUBMISSION TIMELINE

Sr. No.	Grid Event^ (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+7 days	+60 days
2	Near miss **event**	8 hours	24 hours	+7 days	+7 days	+60 days
3	GD-1	8 hours	24 hours	+7 days	+7 days	+60 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+60 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+60 days

^*The classification of Grid Disturbance (GD)/Grid Incident (GI) shall be as per the* CEA Grid Standards.

(**The above table is as per the IEGC 2023**)

8. RPCs shall circulate all the GDs, GIs, near miss events, A/R events, PLCC mal-operation events, any other protection related event etc. along with the Agenda for Protection Co-Ordination Sub-Committee (PCSC) of RPCs. PCSC meetings are to be held in every month.
9. The implementation of the recommendations of the final report shall be monitored by the protection sub-committee of the RPC. Tripping portals deployed for reporting of the GDs & GIs on RLDCs portal, shall also have compliances reporting of PCSC recommendations on this portal. NLDC shall disseminate the lessons learnt from each event to all the RPCs for necessary action in the respective regions.
10. Constituents/entities shall furnish the following details to RPCs/RLDCs in respect of all the grid occurrences for analysis:

    a) Detailed analysis of the events
    b) SLD or equivalent pictorial representation clearly showing:
        i. Location of fault with distance
        ii. Fault details with type & relay indications
        iii. CT/PT/CVT rating details with location
        iv. Bus-bar arrangement/ Configuration of feeders and other information related to the ratings of the information required for analysis of the disturbance.
        v. CB positions (OPEN/ CLOSE) before and after fault
        vi. Isolator & Earth-switch positions (OPEN/CLOSE)
        vii. Voltage, frequency & power flows with direction at the time of fault
    c) Output of Event logger & Disturbance recorder
    d) Remedial Action(s) taken
    e) Relay setting details

    HVDC Station Disturbance : Any additional data such as HVDC transient fault

record, switchyard equipment and any other relevant station data required for carrying out analysis of an event by RPC, NLDC, RLDC and SLDC shall be furnished by the users including RLDC and SLDC, as the case may be, within forty- eight (48) hours of the request. All users shall also furnish high-resolution analog data from various instruments including power electronic devices like HVDC, FACTS, renewable generation (inverter level or WTG level) on the request of RPCs, NLDC, RLDCs or SLDCs.

Generating Station Disturbance: Generating Station shall furnish high-resolution analog data from various instruments including AVR response, PSS response required for analysis of disturbance.

11. The respective entities (for which the Grid occurrence is placed in the PCSC agenda) shall present the Grid Occurrence which shall cover all related aspects such as:

    a) Antecedent conditions,
    b) Bus-configuration,
    c) Reasons of GD/ GI occurrence,
    d) Relevant Diagrams showing location of the fault,
    e) Bus bar arrangement/configuration of feeders and other connected equipment with proper CB positions (OPEN/ CLOSE) at the time of occurrence of the fault,
    f) Type of protections operated,
    g) Substantiation of the protections operated by relevant DRs & ELs,
    h) Reasons for protection systems mal-operation/non-operation,
    i) Remedial measures taken/ proposed, etc.

12. In respect of failure or Non-operation of A/R events, PLCC mal-operation events, any other protection related event as given in the PCSC agenda the concerned entities, shall furnish the reasons along with remedial action taken to RPCs/RLDCs. The same would be analyzed by the PCSC.
13. In the PCSC meetings, all the GDs, GIs, A/R non-operation/mal-operation, PLCC mal-operations, other protection related trippings/events as circulated in the agenda shall be analyzed in detail by the PCSC forum and conclude the suitable recommendations to avoid the recurrence of such incidents in the future.
14. The action plan by the entities shall be furnished to RPC for implementation of the PCSC recommendations along with the timelines.
15. The implementation of the PCSC recommendations shall be followed up in the monthly PCSC meetings of RPC.
16. When grid disturbances or grid incidents occurred at major/critical substations and at substations that affected critical/essential/strategic loads, a ***Protection System Analysis Group (PSAG)*** shall be constituted consisting of the members from RPC, NLDC, RLDC, PGCIL, a Protection Expert from the region along with the Entity under whose jurisdiction GD/GI occurred to analyze the GD/GI in detail by visiting the respective substation/substations physically and conducting the meetings. PSAG would finalize the remedial actions and recommendations after deliberations and detailed analysis. The progress of implementation of the PSAG shall be followed up in the monthly PCSC Meetings.
17. In case any user/entity fails to undertake remedial action identified by the RPC within the specified timelines as decided by PCSC of RPC, the concerned RPC may approach the Commission with all relevant details for suitable directions.

18. A date depository of the event as maintained by the RLDC shall be accessible to every entity and the entity shall upload all the relevant documents on the RLDC portal of trippings.

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Annexure C.1

Name of the line	Status as updated in 56/57th PCC meeting	Latest Status
132 kV Agia - Mendipathar	PLCC works completed. AR operation configuration to commence from March'22. Latest Status to be intimated.	
132 kV EPIP II - Byrnihat D/C		
132 kV EPIP II - Umtru D/C		
132 kV Kahilipara - Umtru D/C		
132 kV Khliehriat – Mustem		
132 kV Mustem - NEHU line		
132 kV Khliehriat (MePTCL) - Khliehriat (PG) Ckt#II		
132 kV Khliehriat- NEIGRIHMS		
132 kV NEHU – Mawlai		
132 kV Mawlai - Umiam Stage I		
132 kV Mawphlang - Nongstoin		
132 kV Mawphlang - Umiam Stg I D/C		
132 kV Mawphlang- Mawlai		
132 kV Mendipathar – Nangalbibra		
132 kV Myntdu Leshka - Khleihriat D/C		
132 kV Nangalbibra – Nongstoin		
132 kV NEHU – NEIGRIHMS		
132 kV NEHU – Umiam		
132 kV Sarusajai - Umtru D/C		
132 kV Umiam - Umiam St I	By March'22	
132 kV Umiam St I - Umiam St II		
132 kV Umiam St I - Umiam St III D/C		
132 kV Umiam St III -Umiam St IV D/C		
132 kV Umiam St III - Umtru D/C		
132 kV Umtru - Umiam St IV D/C		

NERTS

Status of installation of Line Differential Protection is as given below: -

Sl. No.	Line details	Length (in kM)	No. of dark fibre pairs required	Status
1	132 kV RC Nagar-Agartala-I	8.384	01	Commissioned
2	132 kV RC Nagar-Agartala-II	8.384	01	
3	132 kV Aizawl-Melriat	6.7	01	By Aug'23
4	132 kV Badarpur-Badarpur	1.023	01	Commissioned
5	132 kV Kumarghat-PK Bari	1.5	01	By Nov'23
6	132 kV Khliehriat-Khliehriat-I	7.801	01	Commissioned
7	132 kV Dimapur-Dimapur I	0.347	01	
8	132 kV Dimapur-Dimapur II	0.95	01	By Aug'23
9	132 kV Imphal-Imphal-I	1.5	01	Commissioned
10	132 kV Imphal-Imphal-II	0.339	01	
11	132 kV B'Chariali - Pavoi - I	12.931	01	
12	132 kV B'Chariali - Pavoi - II	12.931	01	
13	220KV Balipara-Sonabil-I	11	01	By Aug'23
14	220KV Salakati-BTPS-I	4	01	By Nov'23
15	220KV Salakati-BTPS-II	4	01	
16	220kV Mariani (PG)-Mariani (AEGCL)	1.5	01	Commissioned
17	132kV Badarpur - Kolasib	107	01	
18	132kV Badarpur - Khliehriat	76.54	01	By Nov'23
19	132kV Badarpur -Silchar - I	19.2	01	Commissioned
20	132kV Badarpur - Silchar- II	19.2	01	
21	132kV Silchar - Hailakandi I	30	01	By Nov'23
22	132kV Silchar - Hailakandi II	30	01	
23	132kV Khliehriat-Khandong - II	40.92	01	Commissioned
24	132kV Khandong-Kopili-II	11	01	
25	132kV Melriat- Zemabawk	10.12	01	
26	132kV Nirjuli - Lekhi	8.301	01	By Jul'23
27	132kV Namsai - Tezu	99.5	01	By Aug'23
28	132kV Roing - Tezu	73	01	
29	132kV Roing - Pasighat	102.85	01	
30	132kV Mokokchung - Mokokchung I	1.44	01	Commissioned
31	132kV Mokokchung - Mokokchung II	1.44	01	
32	132kVSilchar - Srikona I	1.2	01	Commissioned
33	132kVSilchar - Srikona II	1.2	01	
34	132kV Jiribam - Badarpur	67.21	01	By Sep'23
35	132kV Jiribam- Haflong	100.6	01	
36	132kV Aizawl - Kolasib	67	01	By Aug'23
37	132kV Aizawl - Luangmal	0.8	01	
38	132kV Kumarghat - Karimganj	94.94	01	By Nov'23
39	132kV Haflong- Haflong (State)	1.2	01	By Sep'23

Further, for end-to-end communication, SDH has also been utilised for Line Differential Protection as pilot project in following lines: -

1. 132kV Silchar Melriat#1&2
2. 132kV Aizawl Kumarghat

MePTCL

STATUS OF LINE DIFFERENTIAL PROTECTION PROJECT UNDER PSDF

Sl. No	Feeder Name	Installation		Commissioning	Remarks
		End A	End B		
1	EPIP-I - EPIP II Line I	Completed	Completed	Completed	
2	EPIP-I - EPIP II Line II	Completed	Completed	Completed	
3	EPIP -I - Killing Line I	Completed	Completed	Not Completed	Fiber Network Not Available
4	EPIP -I - Killing Line II	Completed	Completed	Not Completed	
5	EPIP -I - M/S Maithan Alloy	Completed	Completed	Not Completed	
6	EPIP -I - Shyam Century	Completed	Completed	Not Completed	
7	EPIP-II - Umtru Line I	Completed	Completed	Completed	
8	EPIP-II - Umtru Line II	Completed	Completed	Completed	
9	EPIP II - New Umtru	Completed	Completed	Completed	
10	EPIP II - Killing Line I	Completed	Completed	Not Completed	Fiber Network Not Available
11	EPIP II - Killing Line II	Completed	Completed	Not Completed	
12	Umtru- New Umtru	Completed	Completed	Completed	
13	LUMSHNONG- M/S MCL	Completed	Completed	Not Completed	Fiber Network Not Available
14	LumSHNONG- M/S ACL	Completed	Completed	Not Completed	
15	Lumshnong - M/S MPL	Completed	Completed	Not Completed	
16	UMIAM - Stage I	Completed	Completed	Not Completed	
17	Umiam - NEHU	Completed	Completed	Completed	
18	UMIAM STAGE-I - Umiam Stage II	Completed	Completed	Not Completed	Fiber Network Not Available
19	NEHU - NEIGHRIMS	Completed	Completed	Not Completed	Awaiting for Commissioning of fiber under NERFO
20	NEHU - MAWLAI	Completed	Completed	Completed	
21	KHLIEHRIAT (MePTCL)-KHLIEHRIAT(PG) line-II	Completed	Completed	Completed	
22	Stage-III - Stage IV Line I	Completed	Completed	Not Completed	Fiber Network Not Available
23	Stage-III - Stage IV Line II	Completed	Completed	Not Completed	