

North Eastern Regional Power Committee

Agenda For

42nd PCC Sub-Committee Meeting

Time of meeting : 10:00 Hrs.

Date of meeting : 06th May, 2016 (Friday)

Venue : "Hotel Nandan", Guwahati.

A. CONFIRMATION OF MINUTES

CONFIRMATION OF MINUTES OF 41st MEETING OF PROTECTION SUB-COMMITTEE OF NERPC.

The minutes of 41st meeting of Protection Sub-committee held on 7th January, 2016 at Guwahati were circulated vide letter No. NERPC/SE (O)/PCC/2015/4520-4555 dated 15th January, 2016.

No comments/observations were received from the constituents, the Sub-committee may kindly confirm the minutes of 41st PCCM of NERPC.

ITEMS FOR DISCUSSION

A.1 Implementation of 3-Phase Auto Reclosure Scheme of Radially fed 132kV Lines connected to Ranganadi HEP:

At present, the power flows to Nirjuli, Gohpur and Ziro radially from Ranganadi HEP and any transient fault in line causes undesirable outages. Hence, to avoid outages during transient fault it is essential to implement 3- Phase Dead Line charging of following 132kV Lines.

- a) 132kV Ranganadi – Nirjuli Line (Dead Line Charging at RHEP)
- b) 132kV Nirjuli – Gohpur Line (Dead Line Charging at Nirjuli)
- c) 132kV Ranganadi – Ziro Line (Dead Line Charging at RHEP)

During 41st PCC meeting, it was agreed that shutdown of 132 kV Ranganadi – Lekhi Line and 132 kV Ranganadi - Ziro Line would be accorded on suitable date(s) as decided by 117th OCC with the consent of DoP, AP. Further Assam will support to meet the loads of Arunachal Pradesh during Shut Down through 132kV Gohpur – Nirjuli Line.

NEEPCO/Ar. Pradesh/NERTS may kindly intimate the status.

A.2 Implementation of 3-phase Auto Reclosure Scheme in all lines associated with Khandong and Kopili HEP:

For reliable operation of Power system it is required to implement 3-Phase Auto Reclosure Scheme in all the 132kV lines associated with Kopili and Khandong HEP of NEEPCO. The lists of such lines are:

- a) 132kV Khandong – Umrangso - Halflong
- b) 132kV Kopili – Khandong #1

During 41st PCC meeting, AEGCL informed the forum that PLCC panel is already available at Umrangso, ABB ETL41 (Speech & data) panel will be shifted from Khandong to Umrangso within 15/01/2016. However panel would be commissioned after joint visit with POWERGRID. Further, for 132kV Kopili – Khandong Line NEEPCO informed the forum that Kopili end bay belongs to POWERGRID and Khandong end bay belongs to NEEPCO. Accordingly, job is to be taken up jointly by NEEPCO and POWERGRID.

NEEPCO, NERTS & Assam may kindly intimate the status.

A.3 Implementation of the recommendations of the Protection Audit:

As per Sl. no 9.1.1 & 9.1.4 of Report on Enquiry Committee on Grid Disturbance in Northern Region on 30th July 2012 and in Northern, Eastern & North-Eastern Region on 31st July 2012, thorough Third Party protection audit needs to be carried out periodically along with independent audit of Fault Recording Instruments.

The status as intimated by NERLDC during 41st PCC meeting is given below:

<i>Status of submission of data related to Third Party Protection Audit</i>			
<i>Name of Constituent</i>	<i>As per format of Task Force</i>	<i>As per format of NERPC</i>	<i>Remarks</i>
<i>DoP, Ar. Pradesh</i>	<i>Not submitted</i>	<i>Submitted</i>	<i>Data as per format of Task Force to be submitted by 31.01.2016</i>
<i>AEGCL</i>	<i>Yes (only checklist submitted)</i>	<i>Details of submission as per Annexure</i>	<i>Balance data to be submitted by 31.01.2016</i>
<i>TSECL</i>	<i>Not submitted</i>	<i>Submitted</i>	<i>Data as per format of NERPC for</i>

			<i>Surajmaninagar & Rabindranagar and Data as per Task Force Format for all sub-stations by 31.01.2016</i>
<i>NEEPCO</i>	<i>AGTPP Not submitted as per format</i>	<i>AGTPP Not submitted as per format</i>	<i>Data for AGTPP as per Task Force format & for AGTPP & AGBPP NERPC format to be By 31.01.2016</i>

Constituents/NERLDC may kindly intimate the status.

A.4 Status of R&M Implementation of NER from PSDF:

The Sub-committee requested all constituents to complete the proactive actions like taking Board's approval, floating of NITs, selection of bidders etc., as directed by the Hon'ble CERC.

During the meeting held on 11.12.2015 at Delhi under the Chairmanship CEA, the forum expressed concerned about delay in disbursement of fund and execution of R&M works.

In 41st PCC meeting, AEGCL informed the forum that once Tri-partite Agreement is signed LOA would be issued.

Constituents may kindly intimate the status.

A.5 Root cause analysis of tripping in Southern Part of NER on 08.08.2015 and 24.09.2015 & Remedial Measures:

Remedial Measures suggested by sub group members at the meeting held at NERPC on 29.09.15

The islanding scheme of AGTPP with Tripura system is to be reviewed so as to ensure successful islanding in such cases of isolation in NER Grid.

During 38th PCC meeting, the Sub-Committee decided that in addition to the recommendations of the sub-group the following should be implemented ASAP:

1. Modification to SPS-1 at Palatana: Unit-I and II to be put in AND logic so that SPS-1 would operate.

During 40th PCC meeting, OTPC informed that the work has already been completed.

DGM (SO-II), NERLDC stated that on 15.12.2015, SPS 1 was triggered when only one module is in operation which is not correct. The SPS 1 should be triggered when both the modules are in service. He requested OTPC to check the scheme and do the necessary logic correction at the earliest.

In 41st PCC meeting, DGM(O&M), OTPC suggested that SPS-1 be disabled when one module is not running, meanwhile OTPC would review the scheme and revert back to the forum with suggestions for further modification(if possible). The forum agreed to the proposal. DGM, OTPC also proposed for modification to SPS-3 since now both units are running. It was decided to refer the matter to System Studies sub-group.

NERTS, NERLDC & OTPC may kindly intimate the status.

Root Cause Analysis & Remedial Measures by sub group members at the meeting held at NERPC on 18.11.15 regarding Non-Tripping of Azara-Bongaigaon as raised by AEGCL:

Cause: As per information given by POWERGRID, the incidences above are due to high arcing faults.

Remedial Measures:

- a. Explore to increase the resistive reach of Z-2 and Z-3.
- b. DEF characteristics should be IDMT in place of definite time with 1100msec opening time at maximum fault level
- c. Further, Z-3 setting should be 1000msec and necessary co-ordination is required for associated lines.
- d. NERPC Secretariat may extend help wherever necessary Administrative coordination is required for clearance of faults.

During 40th PCC meeting, POWERGRID requested AEGCL to implement Zone 3 setting as per the recommendation of task force. Also DEF delay setting should be 100 ms more than Zone 3 setting with IDMT characteristics. AEGCL proposed for review of Zone 3 setting as recommended by task force. However, POWERGRID opined that there is no scope for review as it is the matter for implementation.

AEGCL insisted for joint meeting for which POWERGRID sought agenda from AEGCL.

The Sub-committee requested NERPC to invite AEGCL during the monthly Sub-committee meeting to discuss about various grid incidences being held every month by NERPC along with above issues of Assam.

During 41st PCC meeting SE(O) informed the forum that the monthly Sub-Committee meeting could not be held in January, 2016, and the same will be conducted before the next PCC meeting and he also requested Assam to give some specific agenda/topic to be discussed so that meeting would be fruitful.

NERPC may kindly intimate the status.

A.6 Grid Incidences and Grid Disturbances from January, 2016 to March, 2016:

The following numbers of Grid Disturbances (GD) & Grid Incidents (GI) occurred during the period w.e.f 1st January, 2016 to 31st March, 2016 :-

SI No	Control Area	Grid Incidents	Grid Disturbance	Grid Incidents	Grid Disturbance
		Jan'16 to Mar'16	Jan'16 to Mar'16	Jan'16 to Mar'16	Jan'16 to Mar'16
1	Palatana	3	0	3	0
2	AGBPP	7	1	7	1
3	AGTPP	11	0	11	0
4	Ranganadi	0	0	0	0
5	Kopili	0	0	0	0
6	Khandong	0	0	0	0
7	Doyang	0	0	0	0
8	Loktak	2	0	2	0
9	BgTPP	0	1	0	1
10	Arunachal Pradesh	0	7	0	7
11	Assam	0	12	0	12
12	Manipur	0	20	0	20
13	Meghalaya	0	12	0	12
14	Mizoram	0	5	0	5
15	Nagaland	0	15	0	15
16	Tripura	0	0	0	0

SI. No.	Category of GD/GI	Grid Disturbance in nos	
		Jan'16 to Mar'16	Jan'16 to Mar'16
1	GI-I	13	13
2	GI-II	10	10

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3	GD I	63	63
4	GD II	3	3
5	GD III	0	0
6	GD IV	0	0
7	GD V	0	0
8	Total GI	23	23
9	Total GD	66	66

This is for information to the members. Remedial actions are to taken by the concerned power utilities of NER

A.7 Root cause analysis of Major Grid Disturbance on 16th April 2016:

A major disturbance of category GD-V occurred in NER Grid on 16.04.16 at 1203 Hrs. Concerned persons of all constituents of NER are requested to participate in the meeting alongwith available data for fruitful discussion of the following disturbance.

NER Grid was in synchronism with ER Grid through 220 kV Birpara - Salakati I & II, 400kV Bongaigaon - New Siliguri I, II, III & IV lines and was connected with NR Grid through +/- 800 kV HVDC Biswanath Chariali - Agra Pole-I.

At around 12:00:35.739 Hrs, 400 kV Bongaigaon - BgTPP line I tripped from Bongaigaon end on DP, B-phase, Zone II.

At 12:01:03.001 Hrs, 400 kV Bongaigaon - Balipara line IV tripped on DP, B-phase, Zone II and fault cleared from Balipara end in 325 msec (as per DR data).

Around 12:03:07.272 Hrs, 400 kV Bongaigaon - New Siliguri line III tripped on Zone IV at Bongaigaon. 400 kV Bongaigaon - BgTPP line II tripped from both ends at 12:03:30.091 Hrs and 400 kV Bongaigaon - Azara line tripped at 12:03:30.464 Hrs on DP, B-phase, Zone II at Azara end.

After that, 400/220kV 315 MVA ICT at Bongaigaon tripped on Back Up Over Current Protection on HV Side at around 12:03:36.784 Hrs. 400 kV Bongaigaon - New Siliguri line I tripped at 12:03:36.827 Hrs, 400 kV Bongaigaon - New Siliguri line II tripped at 12:03:37.964 Hrs from Bongaigaon end on over voltage. 400 kV Bongaigaon- New Siliguri line IV also tripped.

Due to these trippings, NER grid desynchronized from rest of India grid and at 12:03:40.960 Hrs. AGTPP along with part of Tripura system separated from isolated NER Grid (from PMU). Sarusajai bus blacked out at 12:03:43.360 Hrs and at 12:03:45 Hrs, +/- HVDC BNC - Agra Pole I blocked. Subsequently major part NER grid collapsed due to load generation mismatch. 220 kV Salakati S/S remained connected with Birpara and Gelephu S/S. AGBPP, LTPS and NTPS stations survived with generation of 150 MW, 90 MW and 60 MW respectively with upper Assam load due to successful operation of islanding scheme at around

12:05 Hrs (information taken from SLDC). The island was synchronized with main grid at Misa at 1406 Hrs. Tripura system initially survived along with AGTPP generation with demand of around 60 MW. Subsequently this island collapsed at due to load generation mismatch.

Details of Restoration attached at **Annexure-1**

Load Loss: 973 MW

Generation Loss: 1125 MW

Category as per CEA Standards: GD-V

Root Cause Analysis:

Remedial Measures:

All utilities of NER are requested to furnish the details for fruitful discussion as mentioned below:

- a. Disturbance Recorders (In COMTRADE format), Relay Flags, Pickup distance of DP relays, Event Loggers, and SOE from all 400 kV and 220 kV Substations for all feeders
- b. Details of Operation of SPS during the disturbance on 16th April 2016
- c. Details of Operation of UFR during the disturbance on 16th April 2016 along with feeder-wise quantum of load relief.
- d. Detailed bus schemes indicating feeders connected in Main I and Main II at 400 kV Bongaigaon, 400 kV BgTPP (NTPC), 400 kV Balipara, 400 kV Silchar, 400 kV Azara, prior to the disturbance
- e. Observations from your end regarding the disturbance.
- f. Reason for pick-up of Backup O/C relays at HV side of ICT at Bongaigaon, even though fault was on HV side
- g. Relay flags for all Units and Lines tripping along with time of tripping and restoration.
- h. Loktak, AGBPP, AGTPP and Palatana may provide the bus frequency data at the time of disturbance (from 1200 Hrs to 1300 Hrs, on 16-04-2016).
- i. Time of formation of AGBPP island along with details of tripping of lines.
- j. Review of Relay Setting
- k. Operation of HVDC Frequency controller during the disturbance.
- l. Time synchronisation of DR & EL
- m. Issues with timely submission of data
- n. Dynamic response of Machines.
- o. Second infeed point of NER.

Members may please deliberate. Further NERLDC may be permitted to approach CERC to mitigate the deficiencies in the system

A.8 Root cause analysis of Grid Disturbances w.e.f. 01.01.2016 to 31.03.2016:

A. Disturbances in Assam system:

- a. **At 1020 Hrs 25.02.16, 220 kV Misa (PG) - Mariani(AS) (Misa (PG) – Not Furnished and Mariani(AS) – Auto Reclose Lockout) line, 220 kV Samaguri – Mariani(AS) (Samaguri (AS) – DP, ZI, R-E and Mariani(AS) –**

DP, ZI, R-E) line and 220 kV AGBPP - Mariani(PG) (AGBPP (NEEPCO) - Direct Trip received and Mariani(PG) - Over Voltage (O/V)) line tripped.

Upper Assam area and AGBPP system were connected with rest of NER Grid through 220 kV Samaguri - Mariani(AS), 220 kV Misa - Mariani(AS), 132 kV Bokajan - Golaghat and 220 kV AGBPP - Mariani(PG) lines (220 kV Misa -Mariani(PG) was under planned Shut Down from 0650 Hrs on 25.02.16 and 132 kV Mariani - Mokokchung line was under long outage). At 1020 Hrs on 25.02.16, 220 kV Samaguri - Mariani (AS), 220 Misa - Mariani(AS), 132 kV Bokajan - Golaghat lines tripped. 220 kV AGBPP - Mariani (PG) line tripped on O/V subsequently at 1022 Hrs. Due to the tripping these elements, Upper Assam area and AGBPP system got isolated from rest of NER Grid. The isolated grid frequency shoots up to 51.99 Hz and AGBPP Unit 3, Unit 4 and Unit 8 tripped on high frequency.

Generation loss: 124 MW in Assam & AGBPP

Category as per CEA Standards: GD-II

Root Cause Analysis :

Remedial Measures :

AEGCL, NEEPCO & NERTS, POWERGRID may elaborate.

- b. **At 1817 Hrs 16.03.16, 400/220/33 kV, 315 MVA ICT at Bongaigaon (PG) (Bongaogaon(PG) - R-Ph, Over Current), 220 Agia (AEGCL)- Azara (AEGCL) (Agia (AEGCL) - Over Current and Azara (AEGCL) - No Tripping) and 220 kV Boko(AEGCL) – Azara (AEGCL) (Boko (AEGCL) - Over Current & Azara (AEGCL) - No Tripping) lines tripped.**

Part of NER Grid (Dhaligaon, Agia and Boko areas of Assam and Nangalbibra area of Meghalaya), North Bengal system, Sikkim system and Bhutan Grid (except Motonga load) were connected with rest of Indian Grid through 400/220/33 kV,315 MVA Bongaigaon ICT, 400/220 kV,315 MVA ICT I & II at Binaguri , 220 kV Bus coupler at Dalkhola, 220 kV Azara – Agia line and 220 kV Azara – Boko line (132 kV Nangalbibra - Nongstoin line,132 kV Rangia - Bornagar line & 132 kV Rangia - Nalbari line kept open for system requirement and 400/220 kV, 200 MVA ICT-I at Malbase was taken in shutdown at 16:27 Hrs on 16.03.16 due to problem in R phase LA, 400 kV Binaguri – Bongaigaon – III, 400 kV Balipara – Bongaigaon – III and 400 kV Balipara – Biswanath Chariali – III were open due to over-voltage, 400 kV Patna - Kishanganj I & II lines were under breakdown). At 17:57 hrs, Dakhola Bus coupler was opened to reduce loading of 220 kV Purnea - New Purnea D/C which was around 180 MW per circuit. With the opening of the bus coupler at Dalkhola, 220 kV Dalkhola - Dalkhola(WB) D/C and 220 kV Dakhoila - Siliguri were on one bus while 220 kV Dalkhola - Purnea D/C and Dalkhola - Malda - D/C were on the other bus. Immediately after opening of the ICT at Malbase (Bhutan), flow on Binaguri ICTs increased from around 200 MW to about 300 MW flow (per ICT). The ICT I at Binaguri tripped at 18:09 hrs due to Back-up over current protection in B phase.

At 18:15 Hr Dalkhola bus coupler was again closed to reduce loading of the Binaguri ICT - 2. But Dalkhola bus coupler tripped immediately after closing. ICT II at Binaguri tripped at 18:17 hrs due to the resulting over-load. Due to the tripping of these two ICTs, the load being met by these ICTs shifted to the 400/220 kV ICT at Bongaigaon. The ICT which was already loaded to around 250 MW further **over-loaded and tripped** at 18:09 hrs. At 18:17 Hrs on 16.03.16 , 220 kV Azara – Agia line and 220 kV Azara – Boko line tripped. Due to tripping of these elements, part of NER Grid (Dhaligaon, Agia and Boko areas of Assam and Nangalbibra area of Meghalaya), North Bengal system, Sikkim system and Bhutan Grid(except Motonga load) separated from rest of Indian Grid and subsequently collapsed due to no source in this area.

Load Loss: 259 MW in Assam & Meghalaya

Category as per CEA Standards: GD-II

Root Cause Analysis :

Remedial Measures : 400/220 kV, 2nd 315 MVA ICT at Bongaigaon & 400/220 kV, 2x315 MVA ICT at BgTPP are to be commissioned at the earliest.

AEGCL, NTPC & POWERGRID may elaborate.

B. Disturbances in Manipur system (16 nos)

- a. At **0437 Hrs on 04.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 40 MW in Manipur.

- b. At **1454 Hrs on 05.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Y-Phase Line 2 LA blast and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Y-Phase Line 2 LA blast**), power supply to Capital area of Manipur interrupted.

Load loss: 53 MW in Manipur.

- c. At **0853 Hrs on 12.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 65 MW in Manipur.

- d. At **0739 Hrs on 14.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 54 MW in Manipur.

- e. At **0746 Hrs on 21.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.
Load loss: 64 MW in Manipur.
- f. At **1511 Hrs on 21.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.
Load loss: 65 MW in Manipur.
- g. At **1905 Hrs on 24.01.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.
Load loss: 68 MW in Manipur.
- h. At **1443 Hrs on 01.02.16**, due to tripping of 132 kV Loktak (NHPC)-Imphal (PG) line & 132 kV Loktak (NHPC)- Ningthoukhong (MSPCL) line (**Line 1: Loktak (NHPC) - DP, Z-II, R-E & Imphal (PG)- DP, Z-I, R-E and Line 2: Loktak (NHPC) – No tripping & Ningthoukhong (MSPCL)- Not furnished**), power supply to Ningthoukhong area of Manipur interrupted.
Load loss: 10 MW in Manipur.
- i. At **0410 Hrs on 09.02.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.
Load loss: 41 MW in Manipur.
- j. At **1523 Hrs on 07.03.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.
Load loss: 28 MW in Manipur.
- k. At **1158 Hrs on 14.03.16**, due to tripping of 132 kV Imphal (PG)-Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 24 MW in Manipur.

- I. At **1115 Hrs on 19.03.16**, due to tripping of 132 kV Loktak-Ningthoukhong (MSPCL) (**Loktak- DP, ZI, Y-E and Ningthoukhong (MSPCL)- Earth Fault**) line, (132 kV Kakching- Kongba line & 132 kV Imphal(PG)- Ningthoukhong line kept open for system constraint), power supply to Ningthoukhong area of Manipur interrupted.

Load loss: 26 MW in Manipur.

- m. At **1545 Hrs on 19.03.16**, due to tripping of 132 kV Imphal (PG)- Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 33 MW in Manipur.

- n. At **0546 Hrs on 26.03.16**, due to tripping of 132 kV Imphal (PG)- Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 50 MW in Manipur.

- o. At **1200 Hrs on 26.03.16**, due to tripping of 132 kV Imphal (PG)- Imphal (MSPCL) I & II lines (**Line 1: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not Furnished and Line 2: Imphal (PG)- Earth Fault & Imphal (MSPCL)- Not furnished**), power supply to Capital area of Manipur interrupted.

Load loss: 25 MW in Manipur.

- p. At **1725 Hrs on 31.03.16**, due to tripping of 132 kV Loktak-Ningthoukhong (MSPCL) (**Loktak- Earth Fault and Ningthoukhong (MSPCL)- not Furnished**) line, (132 kV Kakching -Kongba line & 132 kV Imphal(PG)- Ningthoukhong line kept open for system constraint), power supply to Ningthoukhong area of Manipur interrupted.

Load loss: 35 MW in Manipur.

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

MSPCL, NHPC & NERTS, POWERGRID may elaborate.

C. Disturbances in Arunachal Pradesh system (4 nos)

- a. At **2227 Hrs on 19.01.16**, 132 kV Ranganadi - Lekhi (**Ranganadi- No tripping and Lekhi- Earth Fault**) line tripped. Due to tripping of this

element, Lekhi & Capital area of Arunachal Pradesh separated from rest of NER Grid and subsequently collapsed due to loss of infeed.

Load loss: 48 MW in Arunachal Pradesh

- b. **At 2234 Hrs on 21.01.16**, 132 kV Ranganadi - Lekhi (**Ranganadi- DP, Z1, R--E and Lekhi- Not furnished**) line tripped. Due to tripping of this element, Lekhi & Capital area of Arunachal Pradesh separated from rest of NER Grid and subsequently collapsed due to loss of infeed.

Load loss: 41 MW in Arunachal Pradesh

- c. **At 1650 Hrs on 24.02.16**, 132/33 kV 50 MVA ICT-I at Nirjuli (**Nirjuli (PG) – Residual Earth Fault**) tripped. Due to tripping of this element, Nirjuli area of Arunachal Pradesh separated from rest of NER Grid and subsequently collapsed due to loss of infeed.

Load loss: 11 MW in Arunachal Pradesh

- d. **At 1209 Hrs on 16.03.16**, 132 kV Balipara- Khupi (**Balipara – DP, Z1, R-Y-B and Khupi- No Tripping**) tripped. Due to tripping of this element, Khuupi area of Arunachal Pradesh separated from rest of NER Grid and subsequently collapsed due to loss of infeed.

Load loss: 18 MW in Arunachal Pradesh

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

DoP Arunachal Pradesh, NEEPCO & NERTS, POWERGRID may elaborate.

D. Disturbances in Nagaland system (13 nos)

- a. **At 1019 Hrs 11.01.16**, 132 kV Dimapur (PG) – Dimapur (**Line I: Dimapur (PG) - Over Current and Dimapur (DoP,Nagaland) – Not Furnished, Line II: Dimapur (PG) – General Trip and Dimapur (DoP, Nagaland) – No tripping**) I & II lines tripped. Due to tripping of this element, Dimapur area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 21 MW in Nagaland

- b. **At 2255 Hrs 12.01.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur (PG)- Earth Fault and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 26 MW in Nagaland

Generation Loss: 12 MW in Nagaland (Likimro generation)

- c. **At 2320 Hrs 12.01.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur(PG)-Earth Fault and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 21 MW in Nagaland

Generation Loss: 12 MW in Nagaland (Likimro generation)

- d. **At 1243 Hrs 22.01.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur (PG)-General Trip and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 16 MW in Nagaland

- e. **At 2021 Hrs 08.02.16**, 132 kV Doyang – Mokokchung (NA) (**Doyang (NEEPCO) - DP, ZI, B-E and Mokokchung (NA)- Not Furnished**) line tripped (132 kV Mokokchung (NA)- Mokokchung (PG) I & II lines were under planned shutdown, 132 kV Mokokchung (NA)- Marianai (AS) is under long outage & 66 kV Tuengsang - Likimro line kept open for system requirement). Due to tripping of this element, Mokokchung area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 29 MW in Nagaland

- f. **At 1714 Hrs 18.02.16**, 132 kV Doyang – Mokokchung (NA) (**Doyang (NEEPCO) – Over Current and Mokokchung (NA) - Over Current**) line tripped (132 kV Mokokchung (NA)-Mokokchung (PG) I & II lines were under planned shutdown, 132 kV Mokokchung(NA)-Marianai(AS) is under long outage & 66 kV Tuengsang-Likimro line kept open for system requirement). Due to tripping of this element, Mokokchung area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 24 MW in Nagaland

- g. **At 0038 Hrs 21.02.16**, 132 kV Doyang - Mokokchung(NA) (**Doyang (NEEPCO) – Directional Earth Fault and Mokokchung(NA) – Not Furnished**) line tripped (132 kV Mokokchung (NA)-Mokokchung (PG) I & II lines were under planned shutdown, 132 kV Mokokchung(NA)-Marianai(AS) is under long outage & 66 kV Tuengsang-Likimro line kept open for system requirement). Due to tripping of this element, Mokokchung area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 19 MW in Nagaland

- h. **At 0515 Hrs 21.02.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur (PG)- DP, ZI, Y-E and Kohima-Not Furnished**) line tripped. Due to

tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 14 MW in Nagaland

- i. **At 1008 Hrs 21.02.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur(PG)-DP, ZI, B-E and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 22 MW in Nagaland

Generation Loss: 8 MW in Nagaland (Likimro generation)

- j. **At 1120 Hrs 21.02.16**, 132 kV Dimapur (PG) – Dimapur (**Line I: Dimapur (PG) - Over Current and Dimapur (DoP,Nagaland) - Not Furnished Line II: Dimapur(PG) – General Trip and Dimapur (DoP,Nagaland) – Not Furnished**) I & II lines tripped. Due to tripping of this element, Dimapur area of Nagaland separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 36 MW in Nagaland

- k. **At 1710 Hrs 21.02.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur(PG)-Not Furnished and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 20 MW in Nagaland

- l. **At 0537 Hrs 31.03.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur(PG)-General Trip and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 11 MW in Nagaland

- m. **At 0924 Hrs 31.03.16**, 132 kV Dimapur (PG) - Kohima (**Dimapur(PG)-General Trip and Kohima-Not Furnished**) line tripped. Due to tripping of this element, Kohima (Capital) area of Nagaland separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 14 MW in Nagaland

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

DoP, Nagaland, NEEPCO & NERTS, POWERGRID may elaborate

E. Disturbances in Mizoram system (5 nos)

- i. **At 1420 Hrs 09.01.16**, 132 kV Aizwal - Kolasib (**Aizwal (PG) - Earth Fault and Kolasib – No Tripping**) line and 132 kV Badarpur - Kolasib (**Badarpur (PG)- DP, ZIII, R-E and Kolasib - No Tripping**) line tripped. Due to tripping of these elements, Kolasib area of Mizoram separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 10 MW in Mizoram
Generation Loss: 2 MW in Mizoram

- ii. **At 0205 Hrs 24.02.16**, 132 kV Aizwal - Zuangtui (**Aizwal (PG) - General Trip and Zuangtui – No Tripping**) line tripped. Due to tripping of this element, Zuangtui area of Mizoram separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 19 MW in Mizoram

- iii. **At 1226 Hrs 14.03.16**, 132 kV Aizwal - Zuangtui (**Aizwal (PG) – DP, ZII, R-Y-B and Zuangtui – No Tripping**) line tripped. Due to tripping of this element, Zuangtui area of Mizoram separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 30 MW in Mizoram

- iv. **At 1606 Hrs 28.03.16**, 132 kV Aizwal - Zuangtui (**Aizwal (PG) – DP, ZIII, R-E and Zuangtui – Not furnished**) line tripped. Due to tripping of this element, Zuangtui area of Mizoram separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 46 MW in Mizoram

- v. **At 1621 Hrs 31.03.16**, 132 kV Aizwal - Kumarghat (**Aizwal (PG) – Not Furnished and Kumarghat- DP, ZII, Y-E**), 132 kV Aizwal - Kolasib (**Aizwal (PG) – DP, ZI, B-E and Kolasib – Not Furnished**) and 132 kV Aizwal – Jiribam (**Aizwal (PG) – DP, ZII, B-E and Jiribam- Not Furnished**) line tripped. Due to tripping of these elements, Mizoram system separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 40 MW in Mizoram
Category as per CEA Standards: GD-I
Root Cause Analysis :
Remedial Measures :

P&E, Mizoram & NERTS, POWERGRID may elaborate

F. Disturbances in Meghalaya system (11 nos)

- a. **At 1830 Hrs 29.01.16**, 132 kV Agia (AEGCL) – Medipathar (MePTCL) (**Agia (AEGCL) – Not Furnished and Medipathar (MePTCL) -Not Furnished**) line tripped. Due to tripping of this element, Nangalbibra &

Medipathar areas of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 15 MW in Meghalaya

- b. **At 1414 Hrs 27.02.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) -Not Furnished, Line II: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) -Not Furnished) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 51 MW in Meghalaya

- c. **At 1254 Hrs 28.02.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZI, B-E and Khliehriat (ME) -Not Furnished, Line II: Khliehriat (PG) – DP, ZI, B-E and Khliehriat (ME) -Not Furnished) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 31 MW in Meghalaya

- d. **At 1514 Hrs 28.02.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZI, R-Y-B and Khliehriat (ME) - DP, ZII, R-Y-B, Line II: Khliehriat (PG) – DP, ZI, R-Y-B and Khliehriat (ME) - DP, ZII, R-Y-B) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to load generation mismatch.

Load loss: 43 MW in Meghalaya

Generation loss: 5 MW in Meghalaya (Leshka Generation)

- e. **At 1600 Hrs 28.02.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) -Not Furnished, Line II: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) -Not Furnished) lines and 220 kV Agia -Azara (Agia (AEGCL) – DP, ZI, Y-B-E and Azara (AEGCL) - DP, ZI, Y-B-E) line tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 23 MW in Meghalaya

- f. **At 0804 Hrs 04.03.16**, 132 kV Lumshong- Panchgram (Lumshong – Earth Fault and Panchgram- Earth Fault) line tripped. (132 kV Lumshong - Khliehriat line kept open for system requirement) Due to tripping of these elements, Lumshong area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 14 MW in Meghalaya

- g. **At 1149 Hrs 19.03.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) –No tripping, Line II: Khliehriat (PG) – DP, ZIII, Y-E and Khliehriat (ME) –No tripping) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 45 MW in Meghalaya

- h. **At 1229 Hrs 19.03.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZIII, R-Y-B and Khliehriat (ME) –No tripping, Line II: Khliehriat (PG) – DP, ZIII, R-Y-B and Khliehriat (ME) –No tripping) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 13 MW in Meghalaya

- i. **At 0224 Hrs 28.03.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZI, R-Y-E and Khliehriat (ME) –No tripping, Line II: Khliehriat (PG) – DP, ZIII, R-Y-B and Khliehriat (ME) –No tripping) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 18 MW in Meghalaya

- j. **At 2150 Hrs 30.03.16**, 132 kV Nangalbibra (MePTCL) – Medipathar (MePTCL) (Nangalbibra(MePTCL)- DP,ZII, R-Y-B and Medipathar (MePTCL) –No Tripping) line tripped. Due to tripping of this element, Nangalbibra & Medipathar areas of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 57 MW in Meghalaya

- k. **At 0040 Hrs 31.03.16**, 132 kV Khliehriat (PG) - Khliehriat (ME) I&II (Line I: Khliehriat (PG) – DP, ZI, Y-B-E and Khliehriat (ME) –Not Furnished, Line II: Khliehriat (PG) – DP, ZI, Y-B-E and Khliehriat (ME) –Not Furrnished) lines tripped. Due to tripping of these elements, Khliehriat area of Meghalaya separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 12 MW in Meghalaya

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

AEGCL, POWERGRID & MePTCL may elaborate

G. Disturbances in Pavo, Depota, Gohpur, Lekhi and Khupi areas (Associated with Biswanath Charali) – Group of Areas (2 nos)

- a. **At 0213 Hrs 12.01.16**, 400 kV Ranganadi- Biswanath Charali 1 (**Ranganadi (NEEPCO) – Over Voltage and Biswanath Charali (PG) – Direct Trip**) line tripped (400 kV Ranganadi- Biswanath Charali II was under shutdown from 22:01 Hrs on 11.01.2016). Due to tripping of this element, Ziro & Lekhi areas of Arunachal Pradesh area and Gohpur area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 48 MW in Assam and Arunachal Pradesh

- b. **At 1440 Hrs 13.01.16**, 400 kV Ranganadi- Biswanath Charali 1 (**Ranganadi (NEEPCO) – Over Voltage and Biswanath Charali (PG) – Direct Trip**) line tripped (400 kV Ranganadi- Biswanath Charali II was under shutdown from 22:01 Hrs on 11.01.2016). Due to tripping of this element, Ziro & Lekhi areas of Arunachal Pradesh area and Gohpur area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 36 MW in Assam and Arunachal Pradesh

- c. **At 1834 Hrs 25.01.16**, 132 kV Biswanath Charali - Pavo I (**Biswanath Charali (PG) – No Tripping and Pavo (AEGCL) – Not Furnished**) line, 132 kV Biswanath Charali -Pavo II (**Biswanath Charali (PG) – Over Current and Pavo (AEGCL) – Not Furnished**) line, 220/132 kV, 50 MVA ICT I at Balipara (**Balipara – Over Current**) and 50 MVA ICT II at Balipara (**Balipara – Over Current**) tripped. Due to tripping of these elements, Khupi area of Arunachal Pradesh area and Depota & Pavo areas of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 183 MW in Assam and Arunachal Pradesh

- d. **At 2030 Hrs 25.01.16**, 132 kV Biswanath Charali-Pavo I (**Biswanath Charali (PG) – No Tripping and Pavo (AEGCL) – Earth Fault**) line, 132 kV Biswanath Charali-Pavo II (**Biswanath Charali (PG) – Directional Earth Fault and Pavo (AEGCL) – Earth Fault**) line tripped . Due to tripping of these elements, Depota & Pavo areas of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 80 MW in Assam

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

AEGCL & NERTS, POWERGRID may elaborate

H. Disturbances in Assam system (4 nos)

- a. **At 1135 Hrs 19.01.16**, 132 kV Gohpur - Nirjuli (**Gohpur (AEGCL) – Not Furnished and Nirjuli (PG) - DP, ZI, R-Y-E**) line tripped. Due to tripping of this element, Gohpur area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 15 MW in Assam

Category as per CEA Standards: GD-I

- b. **At 0335 Hrs 21.03.16**, 132 kV Silchar- Dullavcherra (**Silchar- DP, ZII, Y-E and Dullavcherra- Earth Fault**) line tripped. (132 kV Dullavcherra-Dharmanagar line kept open for system requirement). Due to tripping of this element, Dullavcherra area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 12 MW in Assam

- c. **At 0821 Hrs 21.03.16**, 132 kV Silchar- Dullavcherra (**Silchar- No Tripping and Dullavcherra- Earth Fault**) line tripped. (132 kV Dullavcherra-Dharmanagar line kept open for system requirement). Due to tripping of this element, Dullavcherra area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 14 MW in Assam

- d. **At 0945 Hrs 28.03.16**, 132 kV Silchar- Dullavcherra (**Silchar- DP, ZIII, R—Y-E and Dullavcherra- No Tripping**) line tripped. (132 kV Dullavcherra-Dharmanagar line kept open for system requirement). Due to tripping of this element, Dullavcherra area of Assam separated from rest of NER Grid and subsequently collapsed due to no source in this area.

Load loss: 20 MW in Assam

Category as per CEA Standards: GD-I

Root Cause Analysis :

Remedial Measures :

AEGCL & NERTS, POWERGRID may elaborate

I. Disturbance in Bongaigaon Thermal Power Plant

- a. **At 1242 Hrs 02.03.16**, 400 kV BgTPP- Bongaigaon I & II (BgTPP- Bus Bar Differential Protection and Bongaigaon- Direct Trip) lines tripped. BgTPP Unit I also tripped due to operation of Busbar differential protection. Due to tripping of these elements Bongaigaon Thermal Power Plant blackout.

Generation Loss: 151 MW in BgTPP
Category as per CEA Standards: GD-II
Root Cause Analysis :
Remedial Measures :

NERTS, POWERGRID & NTPC may elaborate

J. Tripping of Inter-Regional Lines

A. +/- 800 kV HVDC Biswanth Chariali – Agra

- a. **At 1254 Hrs on 02.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to very early Smoke detection from valve hall at Agra.
- b. **At 0948 Hrs on 05.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to very early Smoke detection from valve hall at Agra.
- c. **At 0735 Hrs on 06.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to valve cooling system problem at Agra end.
- d. **At 0733 Hrs on 14.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line hand tripped (De-blocked) due to 765 kV Agra - Gwalior line tripping.
- e. **At 0550 Hrs on 15.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to line fault at Agra End.
- f. **At 0846 Hrs on 15.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to line fault at Agra End.
- g. **At 2149 Hrs on 20.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to VESDA (Smoke Detection) at Agra End.
- h. **At 1307 Hrs on 30.01.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to commutation failure at Agra End.
- i. **At 0207 Hrs on 01.02.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to operation of Converter Transformer Differential protection.
- j. **At 1647 Hrs on 15.03.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to DCDB E/F at Biswanath Chariali end.
- k. **At 1826 Hrs on 31.03.2016**, Pole-I of +/- 800 kV HVDC Biswanth Chariali – Agra line tripped due to DC Line Fault

B. 400 kV Bongaigaon – New Siliguri

- i. **At 2310 Hrs on 17.01.2016**, 400 kV Bongaigaon - New Siliguri II line tripped (**Bongaigaon: Over Voltage & New Siliguri: Not Furnished**).
- ii. **At 2310 Hrs on 17.01.2016**, 400 kV Bongaigaon - New Siliguri IV line tripped (**Bongaigaon: DP, ZII, Y-B-E & New Siliguri: Not Furnished**).
- iii. **At 1629 Hrs on 02.03.2016**, 400 kV Bongaigaon - New Siliguri I line tripped (**Bongaigaon: No tripping & New Siliguri: Direct Trip received**)

- iv. **At 1634 Hrs on 15.03.2016**, 400 kV Bongaigaon - New Siliguri II line tripped (**Bongaigaon: DP, ZII, B-E & New Siliguri: DP, ZI, B-E**)
- v. **At 2052 Hrs on 27.03.2016**, 400 kV Bongaigaon - New Siliguri I line tripped (**Bongaigaon: DP, ZI, R-E & New Siliguri: DP, ZI, R-E**)

C. 220 kV Birpara – Salakati

- i. **At 1817 Hrs on 16.03.2016**, 220 kV Birpara- Salakati I & II line hand tripped during disturbance in ER, NER & Bhutan.
- ii. **At 2354 Hrs on 27.03.2016**, 220 kV Birpara- Salakati I line tripped (**Birpara: DP, ZI, Y-B-E & Salakati: DP, ZI, Y-B-E**).
- iii. **At 0852 Hrs on 28.03.2016**, 220 kV Birpara- Salakati I line tripped (**Birpara: DP, ZI, R-E & Salakati: DP, ZI, R-E**).
- iv. **At 1728 Hrs on 31.03.2016**, 220 kV Birpara- Salakati II line tripped (**Birpara: Not Furnished & Salakati: DP, ZII, B-E**)
- v. **At 1935 Hrs on 31.03.2016**, 220 kV Birpara- Salakati I line tripped (**Birpara: Not Furnished & Salakati: DP, ZI, R-E**)

Root Cause Analysis :

Remedial Measures :

NERTS, POWERGRID may elaborate

K. Tripping of Generating Units

A. AGBPP

- a. **At 1153 Hrs on 06.01.2016**, Units # 2, 5, 9 of AGBPP tripped due to tripping of Gas Compressor-IV (**Generation Loss = 73 MW**)
- b. **At 0434 Hrs on 11.01.2016**, Units # 5 of AGBPP tripped due to tripping of Gas Compressor-II (**Generation Loss = 45 MW**)
- c. **At 0508 Hrs on 12.01.2016**, Units # 2&4 of AGBPP tripped due to tripping of Gas Compressor-II (**Generation Loss = 89 MW**)
- d. **At 0635 Hrs on 13.01.2016**, Units # 2,3,4&8 of AGBPP tripped due to tripping of Gas Compressor-II (**Generation Loss = 144 MW**)
- e. **At 0544 Hrs on 08.02.2016**, Unit # 4 of AGBPP tripped due to tripping of Gas Compressor-II (**Generation Loss = 31 MW**)
- f. **At 1052 Hrs on 11.02.2016**, GTG I & STG I of AGBPP tripped due to Tripping of Gas Booster Compressor (**Generation Loss = 250 MW**)
- g. **At 0155 Hrs on 26.02.2016**, Units # 1,2,3,7&8 of AGBPP tripped due to Tripping of Gas Compressor II (**Generation Loss = 111 MW**)
- h. **At 0050 Hrs on 06.03.2016**, Units # 7&8 of AGBPP tripped due to tripping of Gas Compressor II (**Generation Loss = 33 MW**)

B. AGTPP

- i. **At 0654 Hrs on 10.01.2016**, Units # 3 of AGTPP tripped due to Differential pressure high in inlet air filter (**Generation Loss = 14 MW**)
- ii. **At 0324 Hrs on 11.01.2016**, Units # 2 of AGTPP tripped due to Differential pressure high in inlet air filter (**Generation Loss = 13 MW**)
- iii. **At 1520 Hrs on 05.02.2016**, Unit # 3 of AGTPP tripped due to control system problem (**Generation Loss = 15 MW**)

- iv. **At 1914 Hrs on 05.02.2016**, STG II of AGTPP tripped due to high core temperature (**Generation Loss = 20 MW**)
- v. **At 1128 Hrs on 15.02.2016**, STG I of AGTPP tripped due to tripping of operator console (**Generation Loss = 22 MW**)
- vi. **At 1901 Hrs on 03.03.2016**, STG II of AGTPP tripped due to operation of Rotor earth fault protection (**Generation Loss = 23 MW**)
- vii. **At 2340 Hrs on 03.03.2016**, Unit # 1 and STG-I of AGTPP tripped due to low control oil pressure (**Generation Loss = 34 MW**)
- viii. **At 1042 Hrs on 04.03.2016**, Unit # 1 of AGTPP tripped due to boiler problem (**Generation Loss = 20 MW**)
- ix. **At 2127 Hrs on 27.03.2016**, Unit # 3 of AGTPP tripped (**Generation Loss = 15 MW**)
- x. **At 1031 Hrs on 28.03.2016**, Unit # 3 of AGTPP tripped due to problem in Control System (**Generation Loss = 4 MW**)

C. Loktak

- i. **At 1720 Hrs on 17.01.2016**, Units # 3 of Loktak tripped due to high Air temperature (**Generation Loss = 35 MW**)
- ii. **At 1715 Hrs on 08.03.2016**, Unit # 1 of Loktak tripped due to GBOC pump failue (**Generation Loss = 35 MW**)

D. Palatana

- i. **At 1611 Hrs on 24.02.2016**, GTG I &II and STG I&II of Palatana tripped due to LA puncture at Palatana (**Generation Loss = 491 MW**)
- ii. **At 1702 Hrs on 31.03.2016**, GTG I & II and STG I & II of Palatana tripped due to operation of Generator Protection (**Generation Loss = 534 MW**)

Root Cause Analysis :

Remedial Measures :

NEEPCO, NHPC & OTPC may elaborate

A.9 Tripping of Imphal #2 and Unit # 2 at Loktak Power Station on 01st Feb 2016:

Before Tripping (Date: 01st Feb 2016, Time: 14:30Hrs)

1. 132 kV Loktak -Jiribam # 2 Feeder was already under shut down from 08:21 Hrs (NERLDC Code:5198)
2. Unit # 2 of Loktak Power Station was running as per the schedule of NERLDC with an Ex-Bus transmitted Power of 34 MW.
3. The Power Flow at 14:30 Hrs at other feeders were as follow:
 - I. Loktak – Jiribam # 1 : 1.5 MW
 - II. Loktak – Imphal # 1 : 5.5 MW
 - III. Loktak – Imphal # 2 : 27.0 MW

Details of the events at the time of Tripping

1. At 14:43:46 Hrs, Carrier signal (CR) received in Loktak – Imphal # 2 feeder and on activation of Zone # 2 Fault in Phase A at a distance of

- 32.05 km, tripping command for Phase A was initiated from MICOM 442 Distance Protection Relay. At the same time Auto-enclosure command was also initiated and elapsed of dead time i.e. 1 Sec, Auto-recourse closed Pole-A of Circuit Breaker.
2. Again after some time (Approx 500 msec) Current of Phase-A started rising and once again Carried Signal was received in Loktak – Imphal # 2 feeder. After activation of Zone # 2 fault by MICOM Relay, it initiated 3 Phase tripping of Loktak - Imphal # 2 Feeder (Since the Auto-enclosure is configured for Single Phase Single Shot Only and also reclaim time is 25 sec).
 3. After tripping of Loktak – Imphal # 2 feeder, only Loktak – Imphal - I and Loktak – Jiribam # 1 feeders were available at Loktak Power Station and both the feeders were radially feeding with the load indicated above, it is therefore mismatching of Load and Generation occurred and tripped Unit # 2 at Loktak Power Station on 115% Over speed Protection.
 4. After Tripping of unit and due to dead bus condition, Breaker of Loktak – Imphal- I and Loktak Jiribam - 1 was manually opened at 14:45 Hrs.

Details of Restoration and again Tripping

1. At 15:30 Hrs Voltage was extended from Imphal Substation through Loktak – Imphal # 1 Feeder, accordingly Unit # 2 was synchronized with the grid at 15:31 Hrs and loaded 34 MW as per the schedule.
2. Suddenly at 15:50 Hrs, load was disconnected from Loktak – Imphal # 1 Feeder (As only one feeder was available at that time for power evacuation) and Unit # 2 tripped on 115% overspeed protection due to unavailability of feeder for power evacuation.
3. After tripping of Unit Dead Bus was observed at Loktak Power Station for One minute. After confirmation from Imphal substation, it was confirmed that the same was observed at their end due to tripping of other feeder.
4. Again Unit # 3 was started, synced with the grid at 16:01Hrs and loaded as per the schedule.

Root Cause Analysis:

Remedial Measures:

A.10 Multiple trippings in 400 kV Bongaigaon- Balipara corridor during 400 kV Bus-I shutdown at Balipara on 29.04.16:

During 400 kV Bus-I shutdown at Balipara on 29.04.16 the following trippings took place putting the grid in very vulnerable condition on two occasions. Only 400 kV Bongaigaon – Balipara Ckt-II remained in service. Restoration of these lines also took considerable time.

400 kV Bongaigaon – Balipara- III was under outage due to O/V

400 kV Bongaigaon – Balipara- I tripped at 09:23 Hrs and restored at 11:29 Hrs

400 kV Bongaigaon – Balipara- IV tripped at 09:41 Hrs and restored at 09:51 Hrs

400 kV Bongaigaon – Balipara- I tripped at 11:40 Hrs and could not be charged

400 kV Bongaigaon – Balipara- III taken in service at 1146 Hrs

400 kV Bongaigaon – Balipara- IV tripped at 11:40 Hrs and restored at 12:04 Hrs

Similar situation may happen at any time during major shutdown when system remains in depleted condition. In view of above it is requested to all concerned for taking extra care during critical shutdown and also ensure that Senior Executives remain in control room for managing contingent situations.

Members may please deliberate

A.11 Completion of activities within specified time as per directives of CERC vide order in Petition No. 113/MP/2014

As per order in Petition No. 113/MP/2014 of Hon'ble CERC, CERC directed to power utilities and organizations of NER to complete the activities within specified time/submit monthly reports as per provisions of IEGC & Grid Standards of CEA etc.

List of actions/activities/reports to be completed within specified time as per directives of CERC vide order in Petition No. 113/MP/2014 attached at - **Annexure II.**

During 41st PCC meeting, NERLDC requested all Power utilities and organizations of NER to send monthly status report of activities related to order in Petition No. 113/MP/2014 to NERPC & NERLDC.

No report has been received till date from any Power utilities of NER. Based on the report submitted by you, NERLDC & NERPC will submit report to Hon'ble CERC.

Members may please deliberate

A.12 Standardization of Disturbance Recorder Channels:

Disturbance Recorders on Transmission elements are necessary for post disturbance analysis, and identification & rectification of any protection operation. As per CBIP's manual on Protection of Generators, GT, Transformers and Networks, it is recommended to have minimum 8(eight) analog signals and 16(sixteen) binary signals per bay or circuit. Also, it should have a minimum of 5 sec of total recording time, minimum pre-fault recording time of 100 msec and minimum post-fault recording time of 1000 msec.

POWERGRID had standardized Disturbance Recorder Channels for lines, transformers & reactors.

The Sub-committee requested NERPC/NERLDC to circulate the above standardization to all constituents of NER for giving comments and suggestion by 24.07.15. NERLDC had sent this document to all constituents of NER for giving comments and suggestion by **24.07.15.**

Till date no comments has been received from any constituents. It is requested all constituents of NER to standardize Disturbance Recorder Channels at the earliest.

Concerned utilities may please intimate the status.

A.13 Frequent voltage dips/tripping on 132 kV line to Umrangshu Plant of Calcom Cement :

During the months of Feb-April'2016 frequent voltage dips/tripping (**Annexure - III**) were recorded leading to production losses of client. Such voltage dips/tripping were not recorded until January, 2016.

Members may like to discuss.

A.14 Submission of Grid Disturbance Report on monthly basis:

As per communication from NPC *vide. 5/GDR/NPC/CEA/2016 dtd. 25.01.2016* henceforward GD report in given proforma (**Annexure - IV**) is required to be submitted on a monthly basis. All the constituents are requested to provide necessary data likewise in a timely manner.

This is for information please.

Any other item:

Date and Venue of next PCC

It is proposed to hold the 43rd PCC meeting of NERPC on second week of June, 2016. The exact venue will be intimated in due course.

Annexure - I

Sl. No.	Line Details	Restoration Time	Remarks
1	132kV RC Nagar-Agartala-I	1225	Power extended to Tripura
2	400KV Bongaigaon-New Binaguri-IV	1230	
3	220kV BTPS –Salakati-II	1250	Power extended to Assam
4	400KV Bongaigaon-New Binaguri-I	1251	
5	400 KV D/C Misa-Balipara-I	1300	
6	400 KV D/C Balipara-Bongaigaon-I	1316	
7	132kV S/C Kumarghat-R.C.Nagar	1321	
8	220 KV S/C Balipara-Tezpur	1328	
9	220 KV D/C Misa-Dimapur-II	1333	
10	220kV BTPS –Salakati-I	1335	
11	132kV Dimapur-Dimapur-II	1345	
12	400 KV D/C Balipara-Bongaigaon-II	1333	
13	132 KV Balipara - Depota	1335	
14	132 KV S/C Aizwal-Kumarghat	1337	Power extended to Mizoram
15	132 KV S/C Aizwal - Zemabawk	1337	
16	220 KV D/C Misa-Samaguri-I	1339	
17	132 KV S/C Dimapur - Imphal	1340	
18	220 KV D/C Misa-Kopili - I	1340	
19	220 KV D/C Misa-Samaguri-II	1340	
20	132kV Surajmaninagar-Palatana-I	1342	Power extended to Palatana
21	132 KV S/C Khandong - Kopili -I	1344	
22	132kV Dimapur-Dimapur-II	1345	Power extended to Nagaland
23	132 KV S/C Loktak - Imphal-II	1346	
24	132 KV S/C Imphal - Imphal-I	1348	Power extended to Manipur
25	132 KV S/C Khandong - Kopili - II	1349	
26	132 KV S/C Khandong - Khliehriat-I	1351	
27	132 KV S/C Badarpur - Khliehriat	1353	
28	132KV S/C Badarpur - Badarpur	1355	Power extended to South Assam
29	400 KV D/C Misa-Balipara-II	1358	
30	400 KV D/C Misa- Mariani old	1406	
31	400KV D/C Balipara-BNC-II	1407	
32	132 KV Balipara - khupi	1411	Power extended to AP
33	132 KV S/C Khliehriat-Khliehriat-I	1413	Power extended to Meghalaya
34	400KV Bongaigaon-BTPS-II	1418	Power extended to NTPC
35	132 KV S/C Khandong - Khliehriat-II	1421	
36	132KV S/C Badarpur - Jiribam	1423	
37	132KV S/C Khandong - Haflong	1423	
38	132KV S/C Badarpur-Kolasib	1424	
39	220 KV D/C Misa-Kopili - II	1424	
40	220 KV Misa-Kopili-III.	1424	
41	132KV D/C Doyang - Dimapur-I	1430	
42	132KV BNC-Pavoi-II	1430	
43	132KV S/C Kolasib-Aizwal	1432	
44	132KV Silchar-Badarpur-I	1432	
45	132 KV S/C Jiribam - Aizwal	1433	
46	400KV D/C Balipara-BNC-III	1434	
47	132kV S/C Badarpur-Kumarghat	1441	
48	132KV Silchar-Imphal-I	1441	
49	132KV S/C Jiribam - Loktak-II	1443	
50	132KV Silchar-Srikona-I	1444	
51	400KV D/C BNC-Ranganadi-II	1449	
52	132KV BNC-Pavoi-I	1456	
53	132KV Silchar-P.K.Bari-I	1458	
54	132KV Silchar-Srikona-II	1459	
55	132KV S/C Ranganadi-Ziro	1500	
56	132 KV S/C Khliehriat-Khliehriat-I	1501	
57	132KV Silchar-Badarpur-II	1501	

58	400KV Bongaigaon-BTPS-I	1501	
59	132 KV S/C Imphal - Imphal-II	1502	
60	132KV Silchar-Pachgram	1502	
61	132KV Silchar-Durlavchhera	1504	
62	132KV Silchar-Imphal-II	1507	
63	220 KV D/C Misa-Dimapur-I	1510	
64	132KV Silchar-P.K.Bari-II	1510	
65	132 KV S/C Khliehriat-Khliehriat-II	1511	
66	132KV D/C Doyang - Dimapur-II	1515	
67	132KV S/C Nirjuli-Ranganadi	1517	
68	400KV Bongaigaon-Azara	1518	
69	132KV D/C RC Nagar-Agartala-II	1530	
70	132kV Surajmaninagar-Palatana-II	1532	
71	132KV S/C Gohpur - Nirjuli	1534	
72	400kV Silchar-Azara	1534	
73	132 KV S/C Jiribam-Haflong	1540	
74	400KV Bongaigaon-Bynihat	1545	
75	132KV D/C RC Nagar-Agartala-I	1549	
76	400 KV D/C Misa- Mariani(new)	1606	
77	400 KV D/C Kathalguri-Mariani(new)	1615	
78	400KV Bongaigaon-New Binaguri-III	1640	
79	400kV Silchar-Palltana-I	1700	

A meeting was held at NERLDC between NERPC, NERLDC and constituents of NER as per directive of Hon'ble CERC in response to Petition No. 113/MP/2014 on 29.12.14.

The constituents of NER agreed upon the following:

- a. Testing of all existing relays and schemes within 2 months by all constituents to assess the healthiness of existing protective relays
- b. Review of relay settings based on history of tripping and non-availability of Distance Protection Relays would be done.
- c. Attempts would be made to avoid any tripping on account of vegetation growth, which is frequent in NER
- d. Single Phase / Three phase Auto Reclose Scheme of transmission lines of voltage level 132 kV and above under List of Important Grid Elements of NER are to be adopted, wherever available. The status of implementation will be monitored in monthly OCC/PCC meetings.

It is requested to power utilities of NER to intimate the latest status of the above activities.

Many of tripping of transmission & distribution lines occurred due to vegetation problem. Tripping of transmission & distribution lines can be reduced if bush/jungle cutting done regularly. It was observed that number of tripping of transmission & distribution lines increases during the period of monsoon.

Deliberation in the Meeting:

It was requested to all the constituents to send monthly status report of the activities decided during joint meeting among NERLDC, NERPC & constituents of NER on 29.12.14. It was suggested that proper patrolling are to be done after tripping any elements and patrolling reports are to be submitted by the concerned utility to NERLDC & NERPC. It was requested to all transmission utilities of NER for furnishing monthly report on trimming of trees.

The Sub-committee once again requested all the constituents to carry out the above suggestions as decided earlier for safety of the grid.

Action: All Power Utilities.



ASSAM ELECTRICITY GRID CORPORATION LIMITED

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No. AEGCL/MD/NERPC(TL)/33

28/4/16

To

The Secretary, NERPC,
POCII Building, Lapalangi, Shillong.

From **Chief General Manager**
Assam Electricity Grid Corporation Limited
1st Floor, Bijulee Bhawan, Paltan Bazaar, Ghy-1

Sub: Agenda Proposal for PCC meeting

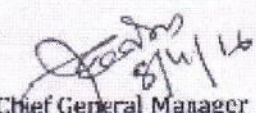
Proposal: 1

There have been frequent voltage dips/tripping on the 132kV line to Umrangshu Plant of Calcom Cement Ltd. during the months of Feb-Apr'2016 as indicated in the enclosed Annexure leading to production losses to the client.

However, such voltage dips/fluctuation was not recorded till Jan'2016.

Requested to take up the matter with the appropriate authority as well as discussion in the next PCC meeting so as to find an early solution to the same.

Encl: As Above

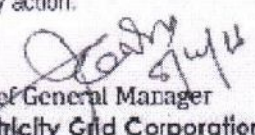

Chief General Manager
Assam Electricity Grid Corporation Limited.

Memo No. AEGCL/MD/NERPC (TL)/33(a)

28/4/16

Copy to:

1. The GM, NERLDC, Lapalangi, Shillong for information and necessary action.


Chief General Manager
Assam Electricity Grid Corporation Limited.

History of Voltage Dip / Power failure in February 2016 and March 2016

S.No	Date	Time of Voltage Dip	Duration in Hrs to restart plant	Production Loss in Rs
1	28.2.2016	3.20 pm	1.05	305640
2	4.3.2016	1.30 pm	1.55	542228
3	8.3.2016	4.50 pm	0.35	164989
4	14.3.2016	9.40 am	0.25	117728
5	15.3.2016	3.55 pm	0.45	212250
6	16.3.2016	10.50 am	0.25	116030
7	28.3.2016	2.35 am	0.55	257530
8	29.3.2016	12.15 am	0.35	164140
9	29.3.2016	1.30 am	1.05	297150
10	31.3.2016	12.20 am	0.25	116030
11	31.3.2016	12.55 am	0.35	164140
12	31.3.2016	1.40 am	0.55	257530
13	31.3.2016	9.40 am	0.50	234890
14	5.4.2016	1.40 pm	1.15	353750
15	Cost of Brick lining failure due to frequent voltage dip & frequent stoppage of Kiln			2250000
Total Production Loss in Rs				5554025

[Handwritten Signature]

