भारत सरकार Government of India
विद्युत मंत्रालय Ministry of Power
उत्तर पूर्वी क्षेत्रीय विद्युत समिति
North Eastern Regional Power Committee
मेघालया स्टेट हाउसिगं फिनांस को- आपरेटिव सोसायटी लि. बिल्डिगं
Meghalaya State Housing Finance Co-Operative Society Ltd. Building
नांग्रिम हिल्स, शिलोंग - ७९३००३
Nongrim Hills, Shillong – 793003.

ISO 9001:2008

Ph. No: 0364 - 2520050
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No. NERPC/SE (O)/OCC/2013/***6178-201*** Dated: November, 27 2013

To,

1. Managing Director, AEGCL, Bijuli Bhawan, Guwahati – 781 001
2. Managing Director, APDCL, Bijuli Bhawan, Guwahati – 781 001
3. Managing Director, APGCL, Bijuli Bhawan, Guwahati – 781 001
4. Director (Generation), Me. PGCL, Lumjingshai, Short Round Road, Shillong – 793 001
5. Director (Distribution), Me. ECL, Lumjingshai, Short Round Road, Shillong – 793 001
6. Director(Transmission), Me. PTCL, Lumjingshai, Short Round Road, Shillong – 793 001
7. CGM, (LDC), SLDC Complex, AEGCL, Kahilipara, Guwahati-781 019
8. Chief Engineer (WE Zone),Department of Power ,Govt. of Arunachal Pradesh, Itanagar- 791 111
9. Chief Engineer (EE Zone),Department of Power, Govt. of Arunachal Pradesh, Itanagar- 791 111
10. Chief Engineer (TP&MZ),Department of Power, Govt. of Arunachal Pradesh, Itanagar- 791 111
11. Engineer-in-Chief (P&E), Department of Power, Govt. of Mizoram, Aizawl – 796 001
12. Chief Engineer (P), Electricity Department, Govt. of Manipur, Keishampat, Imphal – 795 001
13. Chief Engineer (P), Department of Power, Govt. of Nagaland, Kohima – 797 001
14. General Manager, TSECL, Agartala – 799 001
15. Regional ED (East –II), NTPC, 3rd Floor, OLIC Bldg., Pl No- N.17/2, Nayapalli, Bhubaneswar-12
16. ED (O&M), NERTS, PGCIL, Dongtieh-Lower Nongrah, Lapalang, Shillong -793 006
17. ED (O&M), NEEPCO Ltd., Brookland Compound, Lower New Colony, Shillong-793003
18. ED (Commercial), NEEPCO Ltd., Brookland Compound, Lower New Colony, Shillong-793003
19. ED (O&M), NHPC, NHPC Office Complex, Sector-33, Faridabad,Haryana-121003
20. GM (Plant), OTPC, Badarghat Complex, Agartala, Tripura - 799014
21. GM, NERLDC, Dongtieh, Lower Nongrah, Lapalang, Shillong -793 006
22. Member Secretary, ERPC, 14 Golf Club Road, Tollygunge, Kolkata-700033
23. Chief Engineer, GM Division, Central Electricity Authority, New Delhi – 110066

Sir,

Sub: Minutes of the 15th PCC Meeting held on 15th November, 2013 at Itanagar.

The Minutes of the 15th PCC Meeting of NERPC held on 15.11.2013 at "Hotel Donyi Polo Ashok", Itanagar, Arunachal Pradesh is enclosed for favour of kind information and necessary action please**.**

Any comments or observations may kindly be communicated at the earliest.

With warm regards,

Encl: As above

भवदीय / Yours faithfully,

बी. लिंगखोइ

बि. लिंगखोइ / B. Lyngkhoi
अधीक्षण अभियंता / **Superintending Engineer**
प्रचालन / **Operation**

Copy to:

1. CGM, AEGCL, Bijuli Bhavan, Guwahati - 781001
2. CGM, APGCL, Bijuli Bhavan, Guwahati - 781001
3. CGM, DISCOM, Bijuli Bhavan, Guwahati - 781001
4. Head of SLDC, Me.ECL, Lumjingshai, Short Round Road, Umjarain, Shillong – 793 022
5. Head of SLDC, Department of Power, Govt. of Arunachal Pradesh, Itanagar- 791 111
6. Head of SLDC, Department of Power, Dimapur, Nagaland
7. Head of SLDC, Electricity Department, Govt. of Manipur, Keishampat, Imphal – 795 001
8. Head of SLDC, Department of Power, Govt. of Mizoram, Aizawl – 796 001
9. Head of SLDC, TSECL, Agartala – 799 001
10. Chief Engineer(Elect), Loktak HEP,Vidyut Vihar, Kom Keirap, Manipur- 795124
11. DGM (C&M), OTPC, 6th Floor, A-Wing, IFCI Tower -61, Nehru Place, New Delhi – 110019.

वी. निंगशेम्बु

अधीक्षण अभियंता / **Superintending Engineer**

North Eastern Regional Power Committee

MINUTES OF THE 15th PROTECTION COORDINATION SUB-COMMITTEE MEETING OF NERPC

Date: 15.11.2013 (Friday)

Time: **13:30 Hrs.**

Venue: "Hotel Donyi Polo Ashok," Itanagar.

The List of Participants in the 15th PCC Meeting is attached at **Annexure – I**

The meeting was started after the 91st OCC meeting. Member Secretary I/C requested Shri B. Lyngkhoi, SE (O), NERPC to take up the agenda items for discussion.

A. CONFIRMATION OF MINUTES

CONFIRMATION OF MINUTES OF 14th MEETING OF PROTECTION SUB-COMMITTEE OF NERPC.

SE (O), informed that the minutes of the 14th meeting of the PCC held on 4th October, 2013 at Shillong were circulated vide letter NERPC/SE (O)/PCC/2013/5229-58 dated 18th October, 2013.

No comments or observations were received from any of the constituents, the minutes of 14th PCC meeting was confirmed.

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

B. FOLLOW UP ACTION

B.1. Independent third party audit of protection system

During 90th OCC meeting, SE (O) stated that NERPC will help in preparation of the project proposal for funding through NLCPR (Central) for taking up renovation/rectification works. The proposal is to be submitted by each constituent state to Ministry of Power with copy to DoNER. However, a consolidated project proposal for funding through NLCPR (Central) for taking up renovation/rectification works will also be submitted to Ministry of Power with copy to DoNER through Chairman, NERPC & Hon'ble Minister of Power, Govt. of Tripura. The up-gradation/ renovations of substations / generating stations are essential for safety, security and reliable operation of the system. Initiative should be taken for taking up rectification work at the earliest without waiting for funding.

Deliberation of the Committee

SE (O) informed that the estimated cost projected in the DPR for rectification / renovations of substations / generating stations of seven states of the region is about Rs. 816 crores.

In the meantime the draft project proposal prepared by NERPC was sent to constituent states of the region for suggestion/comments / observations and no response was received from any states except Assam. After incorporating the suggestion from Assam, the draft project proposal has already been submitted to Secretary, Ministry of Power (Govt. of Tripura) with request to submit the proposal, on behalf of the region, to Ministry of Power (Govt. of India) through Chairman NERPC & Hon'ble Minster of Power, Govt. of Tripura.

Member Secretary I/C requested all constituent states of the region to take up the issue with their respective Power Ministry for approaching the Ministry of Power, Govt. of India so that funding under NLCPR-Central is approved at the earliest and the schemes is implemented early for smooth operation of the grid for the benefit of the region as well as for the country. He also highlighted that the project funded under NLCRP-Central will be executed by Central Agency as per the guidelines.

CE, Ar. Pradesh expressed reservation on implementation of the scheme by Central Agency. He was of the opinion that funds should be given to the States instead of getting the work done by Central Agency as the state agencies are more familiar with ground reality and can execute the work in a better manner. He requested all other constituent states to look into the matter regarding the funding pattern and executing agency.

DGM, POWERGRID stated that certain works need to be carried out on urgent basis by the NER constituents even if funding is not available from external resources in order to avoid unwarranted tripping / system isolation and smooth operation of the Grid. Accordingly, he suggested that based on the protection audit report, essential rectification work should be taken up at the earliest without waiting for funding.

The Sub-committee requested all the constituent states to take up the matter with their respective Power Ministry so that funding for execution of above work is made available from NLCPR-Central to the constituent states of the region at the earliest and based on the protection audit report, essential rectification work should be taken up at the earliest without waiting for funding. ***.***

B.2. <u>Standardization of Protection Scheme for Generating stations in NER</u>:

During 13th PCC meeting, the Sub-committee had also suggested that Generator protection Philosophy including protection for Generator Transformer (GT), Unit Auxiliary Transformer (UAT), Station Auxiliary Transformer (SAT), Excitation Transformers should also be prepared and requested all the Central sector and State sector Generating companies in NER (NEEPCO, NHPC, NTPC & OTPC; Assam, Meghalaya, Tripura) to furnish their practices at the earliest so that Draft can be prepared for discussion in the next PCC meeting. ***All Central sector and State Sector generating companies agreed to furnish the information.***

<u>Deliberation of the Committee</u>

The Sub-committee reviewed the following Protection Philosophy for Generator [Hydro / Thermal (Coal / Gas based) Generator], Generator Transformer (GT), Unit Auxiliary Transformer (UAT), Station Auxiliary Transformer (SAT) / Station Supply Transformer (SST), Excitation Transformer pertaining to NER as given below:

A: GENERATOR PROTECTION

SN	Protection	Purpose of Protection and Setting
1	Generator Differential Protection (87G1 &87G2)	Generator Differential Protection is provided for internal short circuit fault in generator. Trip
2	95% Stator Earth Fault Protection (64G1) for Unit size less than 100MW	Stator Earth Fault protection is provided for stator phase to earth fault. This protection is limited to approximately 95% of the stator winding. Trip Time delay: 0.3 to 0.5 Secs.
3	100% Stator Earth Fault Protection (64G2) for Unit size 100MW & above	Stator Earth Fault protection is provided for stator phase to earth fault. This protection covers the whole stator winding and the generator neutral. Trip Time delay: 2.0 Secs.
4	Negative Phase Sequence Protection(46G)	Negative Phase Sequence (NPS) protection current can appear due to unbalanced single phase loads or transmission line unsymmetrical faults. This protection safeguards the generator rotor against overheating. The relay should be set to the NPS capability of the generator. Time delay for Alarm at 50% of continuous withstands capability of the machine: 3 sec.
5	Low forward Power (for thermal machines) / Reverse Power Protection (for hydro machines) (32G / 37G) [To be duplicated for large generators]	Low forward Power (for thermal machines) / Reverse Power Protection (for hydro machines) is provided to prevent motor mode of operation. Trip
6	Loss of field Excitation Protection (40G) [To be duplicated for Unit size of 500MW and above]	Loss of Excitation protection is provided to prevent synchronous generator to act as an induction generator. Trip
7	Over Voltage Protection (59G)	Over Voltage provides protection against over voltage on the terminals of the generator, which can damage the insulation. Stage # I: V_{S1}= 1.15 x V_n & T_{S1}= 10 Sec. [**5 Sec. (NTPC)]** Stage # II: V_{S2}= 1.3 x V_n & T_{S2}= 0.5 sec. [**100 ms. (NTPC)]**

8	Generator Over Load Protection (for Hydro machines) (51G)	Generator Over load protection is provided as an additional check of the stator winding temperature. Alarm Time delay: 2.5 to 25 Sec.
9	Generator Over Fluxing Protection (99G) [To be duplicated for Unit size of 500MW and above]	Generator Over Fluxing Protection provides protection against operation at flux densities which may cause accumulative damage to the core. Trip with time delay
10	Generator Under frequency Protection (81G)	Generator Under Fluxing Protection prevents generator from operating for long time at reduced frequency. Alarm Time delay: 2 Sec. Trip
11	Dead machine protection / Accidental back energisation (27G/50G) [Generally recommended for Units of size of 100MW and above]	Dead machine Protection provides protection against inadvertent energisation of generator while at stand still or on turning gear. The generator and rotor may get damaged beyond repair under this condition. Trip
12	Generator Pole slip protection / Out of step protection (98G) [Generally recommended for thermal Units of size of 100MW and above. For hydro machines, utilities can decide the Unit size depending upon machine parameters]	Generator pole slip / out of step detects all pole slips leading to an increase in rotor angular position beyond the generator transient stability limits protection provides protection against inadvertent energisation of generator while at stand still or on turning gear. The generator and rotor may get damaged beyond repair under this condition. Trip
13	Back up impedance protection- 3pole (21G) **Or (This should be treated as separated item – NEEPCO)** Over Current / Under Voltage Protection (51G / 27G)	Backup impedance Protection operates for phase faults. Trip
14	Rotor Earth fault	Rotor Earth fault is provides protection against

	protection (64F1, 64F2)	ground fault of field winding and field short circuit. Alarm (First Rotor Earth fault), Time delay: 1 Sec. Trip (Second Rotor Earth fault), Time delay: 5 Sec. But it is recommended that the machine is taken out of service at the earliest opportunity after the occurrence of first earth fault. **Rotor O/L & O/C protection trip (NTPC)**
15	Generator winding and bearing temperature protection (49G)	Generator winding and bearing temperature protection prevents generator winding / bearing from high temperature operation. Alarm **Trip in place of winding warm gas temp high (NTPC)** The temperature settings shall be as per manufacturer's recommendations.
16	Generator Circuit Breaker Failure Protection(50ZGCB) [To be provided Generators provided with Generator Circuit Breaker (GCB)]	Generator Circuit Breaker Failure operated in case of failure of GCB. Trip
17	Condition Monitoring of Hydro-Turbine generator	Online condition monitoring system shall be provided for monitoring of radial & axial vibration, phasor diagram, air gap and Partial Discharge.
18	Process Control	Process Control is to be provided for sequential operation.
19	Disturbance Recorder (DR), Event Logger (EL) and Fault locator (FL)	To be provided as a standard practice. DR, EL & FL, being inbuilt feature in Numerical Relays, such features should also be used.
20	Time Synchronizing Equipment (TSE)	To be provided as a standard practice.
21	Overall Differential Protection (87OA) for Generator and Generator Transformer	Overall Differential Protection is provided for internal short circuit fault in generator and Generator transformer **& Unit Transformer (NTPC).** Trip
	Grouping	The Protection of Generator could be divided into two groups (Group-A & Group-B) and each group should be

	of Protection	connected to separate DC source. Both Group-A & Group-B protection shall give trip impulse to circuit breaker of Generator bay. The Group-A should include Generator Differential protection (87G), back up Back up impedance protection- 3pole (21G) **[Or** Over Current / Under Voltage Protection (51G / 27G)], overload protection (51G), 100% stator earth fault protection(64G2), Rotor Earth fault protection (64F1/64F2), Low forward Power / Reverse power protection (32G / 37G), and Over voltage protection (59G). The Group-B should include Overall differential protection (87OA), 95% stator earth fault (64G1) protection, loss of excitation protection(40G), pole slip protection (98G), under frequency protection (81G) and over fluxing protection (99G).

(B) Bus bar and LBB Protection

SN	Protection	Setting
1	LBB protection and bus bar protection	Bus bar & LBB protection to be provided at 400kV, 220kV, 132kV/66kV level for Generating stations. LBB current should be in pick up condition always **picking up more than 20%. (NTPC)** LBB Time delay = 200ms.

A: Protection for Generator Transformer (GT)

SN	Protection	Purpose of Protection and Setting
1	Generator Transformer Differential protection (87GT)	Differential Relay is provided for Internal Fault in Transformer Trip
2	Restricted Earth Fault (REF) protection (64GT)	REF to be provided for Internal Earth Fault in Transformer **No REF for 500MW unit, only 87 HV protection in place of REF- (NTPC)**
3	Generator Transformer back up IDMT O/C protection of HV winding (51GT)	Back up protection to be provided for Internal and external Fault. **Trip No O/C protection for GT – (NTPC).**
4	Generator Transformer back up Earth Fault protection	Back up protection to be provided for Internal and external Fault. Trip

	of LV winding (51NGT)	
5	Over Fluxing (OF) protection (99GT)	Over Flux Relay be provided for protection from Over Fluxing (V/f)=1.1 for alarm & (V/f)=1.4 for tripping
6	HV winding cum overhang differential protection (87HV / 87 NT)	HV winding cum overhang differential protection is a unit type protection which operates for earth faults on the generator transformer HV side and also covers a large portion of the HV winding and the HV terminals upto the HV current transformers. **Alarm & Trip contacts both hooked up for TRIP – (NTPC).**
6	Buchholz protection	Buchholz Relay to be provided for detection of incipient internal fault in Transformer Tripping for both stages (The contacts for both stages shall be paralleled so that tripping command goes to CB(s) in both stages.) However, the existing practice of two stage tripping may be reviewed by utilities.
7	Winding Temperature Indicator (WTI)	WTI to be provided for preventing the transformer winding from High Temperature Operation. Cooling, Alarm **Trip with time delay – (NTPC)** The temperature settings shall be as per manufacturer's recommendations.
8	Oil Temperature Indicator (OTI)	OTI to be provided for preventing the transformer oil from High Temperature Operation. Alarm **Trip with time delay – (NTPC)** The temperature settings shall be as per manufacturer's recommendations.
9	Pressure Relief Device (PRD)	PRD to be provided for protection of transformer tank from blasting due to development of high internal pressure during heavy internal fault Trip
10	Magnetic Oil Gauge (MOG)	MOG to be provided for Low oil level Alarm. Alarm
11	Surge Arresters	Gapless Surge Arresters shall be provided on both primary and secondary sides of transformers.
	Grouping of Protection	The Protection of Generator Transformer could be divided into two groups (Group-A & Group-B) and each group should be connected to separate DC source. Both Group-A & Group-B protection shall give trip impulse to circuit breaker of Generator bay. The Group-A should include Transformer Differential protection (87GT) and back up Earth Fault protection of LV winding (51NGT). The Group-B should include REF protection (64GT), back up IDMT O/C protection

		of HV winding (51GT) and HV winding cum overhang differential protection (87HV / 87 NT).

(D) <u>Protection for Unit Auxiliary Transformer (UAT) and Station Auxiliary Transformer (SAT)</u>

SN	Protection	Purpose of Protection and Setting
1	Differential protection (87T)	Differential Relay to be provided for Internal Fault in Transformer Trip
2	Restricted Earth Fault (REF) protection(64)	REF to be provided for Internal Earth Fault in Transformer Trip
3	Back up IDMT O/C protection of HV winding (51)	Back up protection to be provided for Internal and external Fault. Trip
4	Back up Earth Fault protection of LV winding (51N)	Back up protection to be provided for Internal and external Fault. Trip
5	Buchholz protection	Buchholz Relay to be provided for detection of incipient internal fault in Transformer Tripping for both stages (The contacts for both stages shall be paralleled so that tripping command goes to CB(s) in both stages.) However, the existing practice of two stage tripping may be reviewed by utilities.
6	Winding Temperature Indicator (WTI)	WTI to be provided for preventing the transformer winding from High Temperature Operation. Cooling, Alarm **Trip with time delay – (NTPC)** The temperature settings shall be as per manufacturer's recommendations.
7	Oil Temperature Indicator (OTI)	OTI to be provided for preventing the transformer oil from High Temperature Operation. Alarm **Trip with time delay – (NTPC)** The temperature settings shall be as per manufacturer's recommendations.
8	Pressure Relief Device (PRD)	PRD to be provided for protection of transformer tank from blasting due to development of high internal pressure during heavy internal fault

		Trip
9	Magnetic Oil Gauge (MOG)	MOG to be provided for Low oil level Alarm. Alarm
10	Surge Arresters	Gapless Surge Arresters shall be provided on both primary and secondary sides of transformers, located outdoors with overhead connection.
	Grouping of Protection	The Protection of Unit Auxiliary Transformer (UAT) could be divided into two groups (Group-A & Group-B) and each group should be connected to separate DC source. Both Group-A & Group-B protection shall give trip impulse to circuit breaker of Generator bay. The Group-A should include Transformer Differential protection (87T) and back up Earth Fault protection of LV winding (51N). The Group-B should include REF protection (64GT) and back up IDMT O/C protection of HV winding (51).

(E) <u>Protection for Excitation Transformer</u>

SN	Protection	Purpose of Protection and Setting
1	Restricted Earth Fault (REF) protection (64)	REF to be provided for Internal Earth Fault in Transformer Trip. **No REF, Short Circuit Protection provided for excitation transformer – (NTPC).**
2	Instantaneous and IDMT O/C protection of HV winding (51)	Back up protection to be provided for Internal and external Fault. Trip
3	Winding Temperature Indicator (WTI)	WTI to be provided for preventing the transformer winding from High Temperature Operation. Cooling, Alarm Trip The temperature settings shall be as per manufacturer's recommendations.

The Sub-committee requested all the constituents to go through the above protection philosophy and give their observations/comments so that the same can be discussed further and finalized in the next PCC meeting. Suggestions received from NTPC has been incorporated and highlighted in bold letters. The suggestions of NTPC could be discussed as the representative of NTPC was absent. The representative of NTPC has also been requested to attend the next PCC meeting.

B.3 Implementation of islanding scheme in NER

During the 87th OCC meeting, the committee had decided the following islanding scheme and associated frequencies levels for creation of islands in NER:

SN	Islanding Scheme	Lines required to be opened	UFR Location	Implementing Agency
1	**ISLAND AT 48.80 Hz:** Island comprising of generating units of AGBPP (Gas), NTPS (Gas) & LTPS (Gas) and loads of Upper Assam system & Deomali area (Ar. Pradesh) **[Total Generation: 380-400MW and load: 200MW (off peak)-300MW (peak)]**	(a) 220 kV New Mariani (PG) – AGBPP	UFR-1 [At New Mariani (PG)]	**POWERGRID**
		(b) 220 kV New Mariani (PG) – Misa		
		(c) 220 kV Mariani – Misa	UFR-2 [At Mariani, Samaguri of AEGCL]	**AEGCL**
		(d) 220 kV Mariani – Samaguri		
		(e) 132 kV Mokokchung – Mariani		
		(f) 132 kV Dimapur (PG) – Bokajan	UFR-3 [At Dimapur (PG)]	**POWERGRID**
2	**ISLAND AT 48.20 Hz:** Island comprising of generating units of AGTPP (Gas), generating units at Baramura (Gas), Rokhia (Gas) & Gumati (Hydro) and loads of Tripura system & Dullavcherra area (Assam) **[Total Generation: 150-160MW and load: 110MW (off-peak)-150MW (peak)]**	132 kV Palatana – Udaipur	UFR-1 [At Palatana]	**OTPC**
		132 kV Palatana – Surjamani Nagar		
		132 kV Silchar – Dullavcherra	UFR-2 [At Silchar]	**POWERGRID**
		132 kV AGTPP – Kumarghat	UFR-3 [At Kumarghat]	**POWERGRID**
		132 kV P K Bari – Kumarghat		
3	**ISLAND AT 47.90 Hz:** Isolation of NER from NEW grid at ER-NER boundary with rest of the generation and load of NER	To be decided after system study		

During 89th OCC meeting, the Sub-committee had decided to form a sub-group to look into the matter and discuss in detail for implementation of the islanding scheme 1 & 2.

The study group would comprise of representatives from Assam, Tripura, NEEPCO, POWERGRID, NERPC, NERLDC & IIT, Guwahati.

In the 90th OCC meeting, the subcommittee decided to have a meeting of the sub-group at 13:30 PM on 25th October, 2013 at SLDC, Kahilipara to discuss about the Islanding scheme. Assam, Tripura, NEEPCO, POWERGRID, NERPC & NERLDC were requested to depute their concerned persons for discussion so that course of action can be finalized for implementation of the islanding scheme.

For the purpose of system study for Islanding Schemes of NER, the following sets of parameters are required for the generating Units within the proposed island:

a. H : Machine Inertia Constant in p.u. on Machine Base (including turbine inertia)
b. R : Governor Permanent Droop in p.u.
c. D : Turbine Damping Factor/Co-efficient in p.u. on Machine Base
d. Pmax/Qmax : Maximum Generator Active/Reactive Power Output (in MW)
e. Pmin/Qmin : Minimum Generator Active/Reactive Power Output (in MW)

The subcommittee requested Assam (for NTPS, LTPS), NEEPCO (for AGBPP, AGTPP) and Tripura (for Rokhia, Baramura & Gumati Generating plants) to provide above information during the meeting

Deliberation of the Committee

SE(O) informed that the above meeting of Study group could not be held at Kahilipara on 25.10.2013 due to unavoidable circumstances and the same was postponed. He requested the forum to fix the date for next meeting so that NERPC can inform the concern constituents. He also requested all the concerned constituents to furnish the above data at the earliest to NERLDC/NERPC for fruitful outcome of the meeting.

AGM (Protection), AEGCL requested NERPC to include MD, APGCL/APDCL in the mailing list so that data pertaining to generation can be obtained from them. NERPC agreed.

The Sub-committee decided to have the **meeting of the sub-group at 13:30 PM on 29th November, 2013 at SLDC, Kahilipara to discuss about the Islanding scheme**. Assam, Tripura, NEEPCO, POWERGRID, NERPC & NERLDC were requested to depute their concerned persons for discussion so that course of action can be finalized for implementation of the islanding scheme.

The Sub-committee noted as above.

B.4 T- Connection at various points in NER Grid:

Currently following lines are being tapped (i.e. operating with T-connections) to feed radial loads:

i. 220 kV Samaguri – Sarusajai I (Jawharnagar)
ii. 220 kV Sarusajai – Langpi I (Star CemenT)
iii. 132 kV Balipara – Depota (Ghoramara)
iv. 132 kV Samaguri – Depota (Pavoi)
v. 132 kV Srikona - Panchgram
vi. 66 kV Dimapur – Bokajan (Singrijan, Power House & Dairy Farm)

To ensure more reliability and security of these lines, LILO of these lines need to be done at those locations.

In the 13th PCC meeting, CGM (LDC), Assam stated that the matter will be looked into and the status will be intimated in the next PCC meeting.

Deliberation of the Committee

The status as informed by Assam in the meeting is given below:

i. 220 kV Samaguri – Sarusajai I (Jawharnagar) - **Completed**
ii. 220 kV Sarusajai – Langpi I (Star CemenT)
iii. 132 kV Balipara – Depota (Ghoramara)
iv. 132 kV Samaguri – Depota (Pavoi)
v. 132 kV Srikona – Panchgram – **Dec'13**

To be reviewed by Assam

vi. 66 kV Dimapur – Bokajan (Singrijan, Power House & Dairy Farm) – **Representative of Nagaland** stated that they will refer to the case higher Authority.

The sub-Committee noted as above.

B.5 Installation of 2nd Distance Protection Relay (DPR) for 220KV and above System

The status of installation of 2nd DPR in respect of following lines as given in 12th PCC is as follows:

SN	Station	Line	Utility	Status
1	Samaguri SS	220 KV Balipara	AEGCL	**Nov, 2013**
2	BTPS SS	220 KV Salakati # I	AEGCL	Oct, 2013
3	BTPS SS	220 KV Salakati # II	AEGCL	Oct, 2013

During the 11th PCC meeting, the committee advised Assam to install Main –II (Distance protection) at Tinsukia end of Kathalguri-Tinsukia 220kV D/c line.

During 12th PCC meeting Assam had informed that they intend to install the relays, handed over by POWERGRID, at Samaguri Sub Station (for 220kV Balipara – Samaguri line) and Tinsukia Sub Station (for 220kV Kathalguri – Tinsukia line).

POWERGRID informed that they replenished the relays with Micom P442 and requested Assam to install the relays at BTPS (for BTPS - Salakati # 1 & 2 220kV line). Further, POWERGRID stated that the 220kV BTPS - Salakati Line # 1 & 2 is very important so far as NER-ER connectivity is concerned and in case of disturbance, DR data can be exchanged between Salakati and BTPS for analysis and corrective measures.

Deliberation of the Committee

Assam stated that since the BTPS – Salakati 220kV lines are very short (3-4 KM approx); installation of these DPR may not be very effective.

Subcommittee recommended Assam to consider installation of Line Differential relays for above lines and intimate the action plan in next PCC meeting.

The sub-Committee noted as above.

C. NEW ITEMS

C.1 Major Grid Disturbances during October, 2013:

There was no grid disturbance during the month of October, 2013**.**

For kind information only.

Major Events in North-Eastern Regional Grid during the period w.e.f. 30th September, 2013 to 3rd October, 2013

A. Tripping of all units of Ranganadi:

At 1646 Hrs on 02-11-13, 400kV Balipara- Ranganadi II tripped. After this tripping all three units of Ranganadi tripped with following indications:

Unit # 1: Reverse Power protection
Unit # 2: Excitation Failure
Unit # 3: Bus Differential protection.

It was observed that frequency at Ranganadi shot up to 52.79 Hz post tripping of 400kV Balipara- Ranganadi II. System was islanded with a generation of 330 MW (Ranganadi) and loads 90 MW (Ziro, Itanagar and Gohpur).

It is requested to send Governor Response as recorded, excitation limit details, field current at the time of pick-up of excitation failure relay. Please intimate the reason of tripping on Reverse Power protection and Bus Differential protection relays.

Deliberation of the Committee

DGM, NERLDC stated that at 1646 Hrs on 02/11/13, 400kV Balipara-Ranganadi II tripped followed by tripping of all units of Ranganadi HEP and all outgoing feeders from Ranganadi.

It was informed from Ranganadi over phone that the bus configuration of Ranganadi 132kV bus is as follows :Unit I, II & 400/132kV,360MVA ICT-I at Ranganadi is on Bus-A , while Unit III, 132 kV Ranganadi-Nirjuli S/C, 132 KV Ranganadi - Ziro S/C feeders & 400/132kV, 360MVA ICT-II are on Bus-B.

Also it was informed that relay indications of unit trippings were as follows :

1) Unit I - Reverse power protection
2) Unit II - Excitation failure
3) Unit III - Bus differential protection

He requested RHEP to check the details provided for this event and the reasons for relay pick up at their end as there was apparently no fault at Ranganadi end, and 400kV Ranganadi tripped after receiving carrier trip signal from Balipara end. He also requested to provide the Disturbance recorder files and Governor response captured.

Moreover, 132kV Nirjuli - Ranganadi feeder tripped at a delay of approx 18 seconds (16:46:29 Hrs) after 400kV Balipara-Ranganadi II tripping (at 16:46:11 Hrs) which requires proper examination by RHEP authority.

NERLDC requested RHEP to investigate all the above issues and send the details of findings. RHEP agreed for the same

The sub-Committee noted as above.

B. Tripping of 400 kV Silchar- Byrnihat line and STG I of Palatana:

It has been observed that there were 8 nos. of tripping of 400 kV Silchar- Byrnihat line (at 1022 Hrs and 1214 Hrs on 13-10-13, 1926 Hrs on 18-10-13, 1027 Hrs and 1135 Hrs on 20-10-13, 1418 Hrs on 22-10-13, 1015 Hrs on 25-10-13 and 1205 Hrs on 28-10-13) whereas in the last 2 cases STG I of Palatana also tripped on Power Transformer Back-up E/F protection.

As per Standards of Performance of ISTS Regulations of CERC, five or more tripping of a transmission element in a month is to be intimated to CERC. Reasons of these alarming nos., of tripping may be intimated and appropriate action to be taken to minimize number of tripping.

It is requested to inform reasons on STG I of Palatana tripped on earth fault.

In some cases auto reclose was not operated after tripping of 400 kV Silchar-Byrnihat lines. It is requested to inform reasons for non-operation of auto recluse.

Deliberation of the Committee

DGM, POWERGRID stated that the time setting of DEF of DPR at Silchar end of Byrnihat line is made faster than the setting at OTPC end to take care of non-isolation of Machine during similar high resistive fault in 400kV Silchar-Byrnihat Line. He requested OTPC to verify the setting at Silchar and OTPC in consultation with POWERGRID engineer at Silchar.

Representative from OTPC informed that after getting the consent from POWERGRID they have changed their settings as per instruction by POWERGRID.

CE. AP requested that Standard Operating Procedure for setting of relay has to be adopted. He requested all the constituents to co-ordinate with one another before modification of setting to avoid inconveniences.

The sub-Committee noted as above.

C. Activation of Earth Fault Protection of Numerical Relay

It has been observed that lines not getting tripped on high resistive fault as earth fault protection is not activated. Earth Fault of Numerical Relay may be activated or suitable scheme be implemented to protect the system from this type of faults.

Deliberation of the Committee

The Sub-committee requested all the constituents to look into the matter seriously to avoid unnecessary tripping and activate the directional earth fault relay of Numerical distance relay, where two distance protection (Main-I & II) has been provided for protection of line.

The sub-Committee noted as above.

D. Low Frequency Oscillations in NER

Several instances of Low Frequency Oscillations have been observed in NER from PMU plots.

1. On 03rd August 2013 from 22:31:50 Hrs to 22:34:04 Hrs, low frequency oscillations have been observed in all PMUs of NER, a continuous period of around 3 minutes. From FFT analysis of PMU data, major mode oscillation observed was 0.96 Hz which is Inter-plant mode oscillation. 1.91 Hz mode oscillation was also observed which is in general categorized as Intra-plant mode.

2. On 11th August 2013 at 23:35:07 Hrs, after taking 63 MVAR Bus-Reactor II at 400 kV Silchar(PG) into service , low frequency oscillations are observed in PMU data of all stations of NER. The oscillation persisted upto 23:37:47 Hrs, a duration of 2 mins 40 sec. The oscillations persisted in the system from 23:33:09 Hrs itself which got aggravated upon switching of the Bus Reactor at Silchar. The rise in amplitude as observed is sudden which indicate that a system can collapse very fast when their generators' PSS are not tuned properly or their AVRs are in manual control mode.

After observing these oscillations, Manipur manually reduced it's drawal and Loktak also reduced it's generation to prevent overloading of outgoing feeders from Loktak. U#2 of Doyang HEP tripped reportedly on heavy vibration along with 132 kV Doyang – Dimapur II line. From Modal Analysis of Misa Bus Frequency, several instances of negative damping and low damping are found.

3. On 29th September, 2013, 400kV Balipara – Bongaigaon I tripped at 16:25:08:360 Hrs and 400 kV Balipara – Bongaigaon II tripped at 16:25:09:440 Hrs, which led to isolation of NER Grid from rest of NEW Grid (220kV BTPS – Salakati D/C was under shutdown).Following the isolation, Palatana GTG-I tripped while AGTPP generation reduced.

The synchronization at 16:34:48 Hrs was a very rough synchronization where frequency difference between NER Grid and rest of NEW Grid was around 0.344 Hz. Following synchronization all units of AGTPP and STG-I of Palatana tripped. Tripping of generators was also reported in Tripura system and Assam system.

This rough synchronization resulted in 0.53 Hz inter-area oscillations.

Deliberation of the Committee

DGM, NERLDC informed that several Low Frequency Oscillations, as highlited in the above agenda points, have been observed in NER system as per the PMU plots. This is a serious issue and needs to be studied by all the utilities properly for taking corrective actions. He stated that the system should have the inherent capability to absorb such disturbances.

NERLDC informed that as per their observation there is a problem of Intra plant oscillation in AGTPP of NEEPCO due to irregularity of VAR absorption & injection of different units. In addition to this there are cases of Inter plant oscillations between Loktak, Doyang & AGTPP. He requested AGTPP, Loktak & DHEP to look into the matter and take corrective actions.

He apprehended that Governors & AVRs in different generating stations might not be in Auto mode and stressed for Exciter/PSS tuning of generators on regular basis in addition to keeping Governors & AVRs in Auto mode.

NERLDC presented three cases of oscillations in the meeting which are attached herewith at **Annexure – C.1 (D).**

The Sub-committee requested NEEPCO to examine check Synchronization relay, Time Setting of relay etc. Exciter / PSS tuning of generators [more than 100 MW] in NER is required as frequently LFO are being observed.

Sub-committee also requested all power utilities of NER to provide relevant information to NERLDC which will help in detailed investigation and for taking remedial measures.

The sub-Committee noted as above.

C.2 Any other item

i. DGM, POWERGRID informed that on 11.11.2013 fault which occurred on 220 KV Samaguri – Sarusujai and surprisingly, the fault has been extended up to Misa S/S. He requested Assam to look into the matter.

Assam informed that DEF is available but the reason why it extended up to Misa has to be studied and informed to POWERGRID accordingly.

ii. Assam enquired from POWERGRID that Isolators have to be installed by them on 220 KV Samaguri – Misa. DGM, POWERGRID informed that the materials are already delivered and installation will be completed by November, 2013.

Date and Venue of next PCC

It is proposed to hold the 16th PCC meeting of NERPC in first week of December, 2013. The exact date & venue will be intimated in due course.

The meeting ended with thanks to the Chair.

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Annexure-I

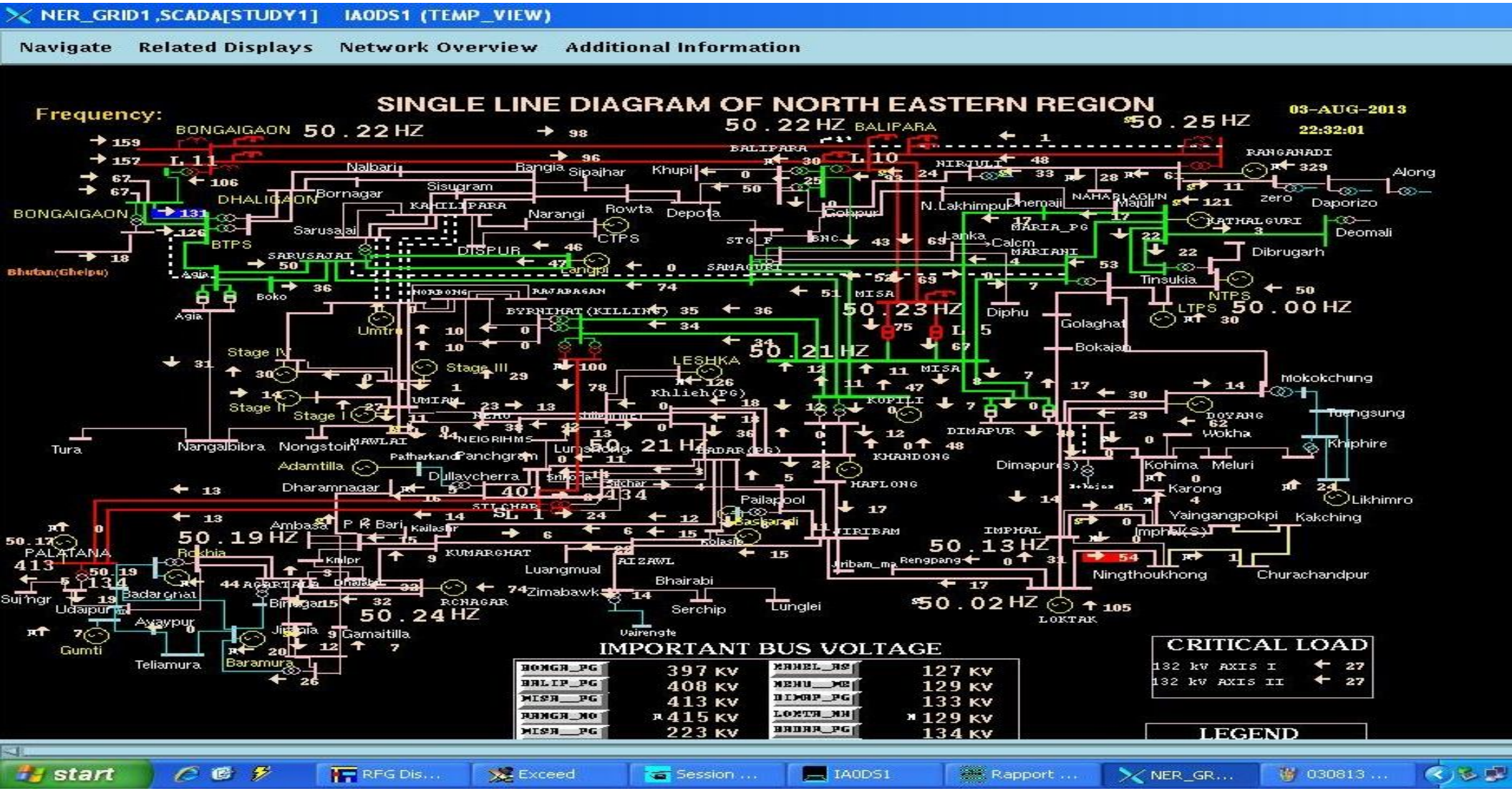
List of Participants in the 15th PCC meeting held on 15/11/2013

SN	Name & Designation	Organization	Contact No.
1.	Sh. A. Perme, CE (P), T, P&M	Ar. Pradesh	09436040297
2.	Sh. Tasso Honda, SE (E), Dirang	Ar. Pradesh	09402698356
3.	Sh. R. Tago, SE (Vig)	Ar. Pradesh	09436044986
4.	Sh. Modan Jin, SE (E)	Ar. Pradesh	09436249596
5.	Sh. Tarik Mize, EE, SLDC	Ar. Pradesh	09436059758
6.	Sh. Dagyom Ango, EE (E), Rumgo	Ar. Pradesh	09436042909
7.	Sh. Zomba Nasho, EE (E), Aato	Ar. Pradesh	09436047021
8.	Sh. D. Taipodia, EE (E), CEZ	Ar. Pradesh	
9.	Sh. Jorona Cohi, EE (E), CEZ	Ar. Pradesh	
10.	Sh. Tano Gango, AE (E), Yeso	Ar. Pradesh	09615514180
11.	Sh. Boku Basur, AE (E), Regd	Ar. Pradesh	09436255244
12.	Ms. Oyi Nasi, AE, SLDC	Ar. Pradesh	08974938678
13.	Sh. H.C. Phukan, CGM, SLDC	Assam	09435559447
14.	Sh. B. C. Bordoloi, DGM, SLDC	Assam	09435045675
15.	Sh. A. K. Saikia, AGM, SLDC	Assam	09864116176
16.	Sh. K. Goswami, AGM, APDCL	Assam	09864020019
17.	Sh. B. M. Saikia, AGM (Com), APDCL	Assam	09435017233
18.	Sh. G.K. Bhuyan, AGM (Protection)	Assam	09854015601
19.	Sh. H. Shanti Kumar Singh, EE(SCD-I)	Manipur	09436022381
20.	Sh. A. Shanti Kishor Sharma, AE	Manipur	09436025924
21.	Sh. A. Kharpan, SE, Me. PTCL	Meghalaya	09436117802
22.	Sh. D.J. Lyngdoh, EE, SLDC	Meghalaya	09863063375
23.	Sh. C.S. Thangkhiew, EE (T&T)	Meghalaya	09436109140
24.	Sh. M. Mawlieh, AEE	Meghalaya	09436108972
25.	**No Representatives**	**Mizoram**	
26.	Sh. Tiameren Walling, EE (T)	Nagaland	09436000098
27.	Sh. Rokobeito Iralu, SDO (T)	Nagaland	09436832020
28.	Sh. B. Debbarma, DGM (SOD)	Tripura	09436450501
29.	Sh. M. Debbarma, Sr. Mgr	Tripura	09436188355
30.	Sh. N. R. Paul, DGM (SO –I)	NERLDC	09436302723
31.	Sh. Kaling Jongkey, Dy. Mgr. (So-I)	NERLDC	09436994401

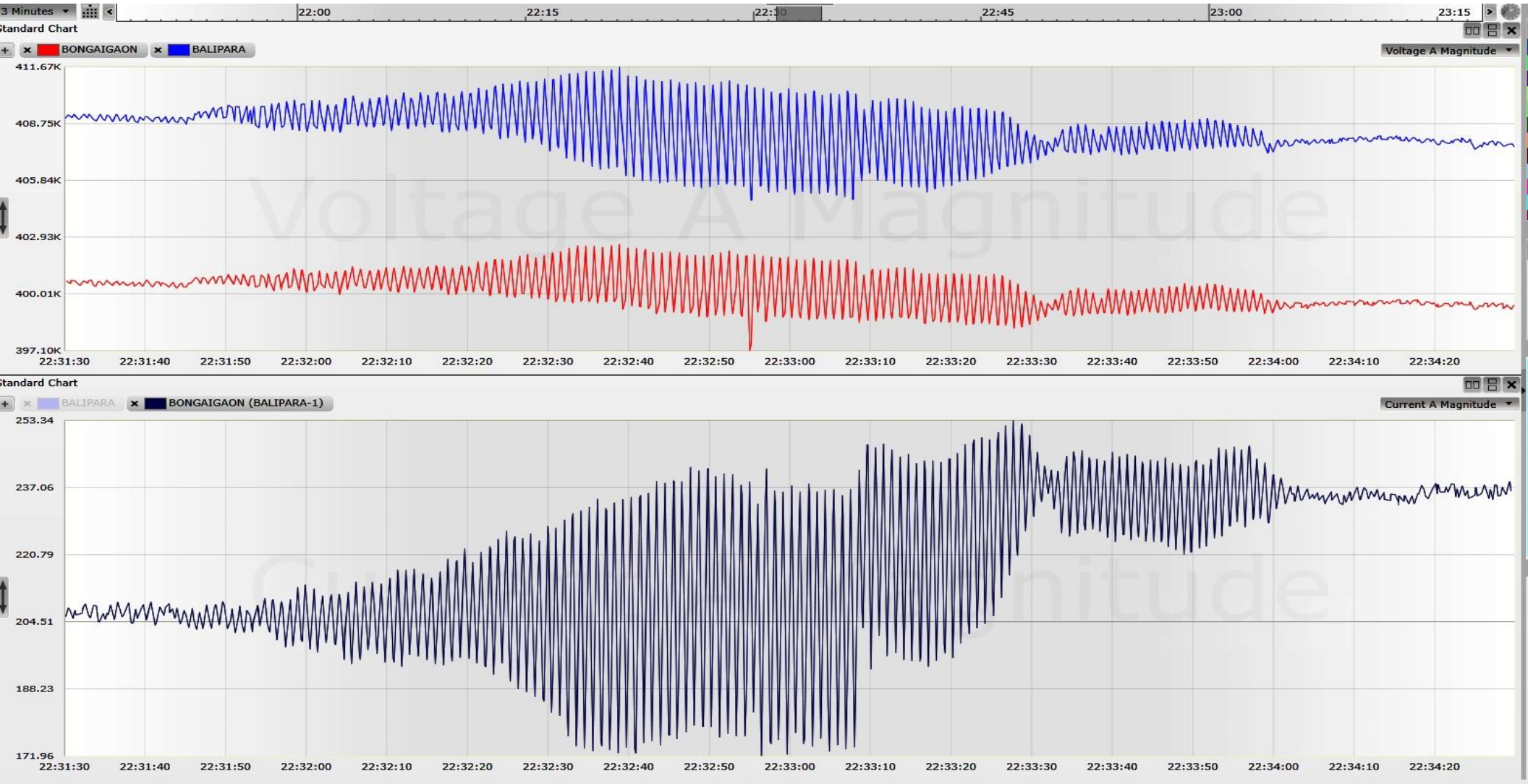
32.	Sh. P. Kanungo, DGM	NERTS	09436302823
33.	Sh. A.K. Das, CM, Nirjuli	NERTS	09402278181
34.	Sh. S. Dutta, Dy. Mgr. Nirjuli	NERTS	09436255251
35.	Sh. B. Pratap, AE, Ziro	NERTS	09856083595
36.	Sh. D.Goswami, Sr.Mgr. (E/M)	NEEPCO	09435577655
37.	Sh. Tanya Taji, Sr.Mgr. (E/M)	NEEPCO	09436042053
38.	Sh. Jayanta Deka, Manager (E)	NEEPCO	09859372294
39.	Sh. Sunder Moni Moha, Dy. Mgr.	NEEPCO	09436898604
40.	Sh. R. C. Singh, Mgr (E)	NHPC	09436894889
41.	Sh. Parshuram Saha, Advisor(O&M)	OTPC	08974728670
42.	Sh. Smruti Ranjan Das, Mgr. (E)	OTPC	09612400784
43.	Sh. S.K. Ray Mohapatra, MS I/C	NERPC	09818527857
44.	Sh.B. Lyngkhoi, SE (O)	NERPC	09436163419
45.	Sh. S. M. Jha, EE (O)	NERPC	09831078162

Low Frequency Oscillations in NER Grid
at
2231 Hrs on 03rd August 2013

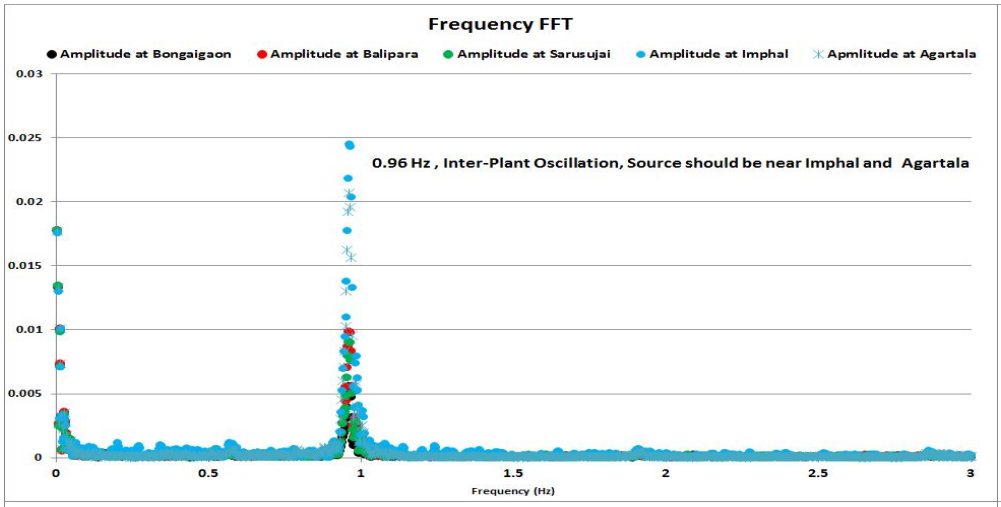
SCADA SLD of NER at time of incident

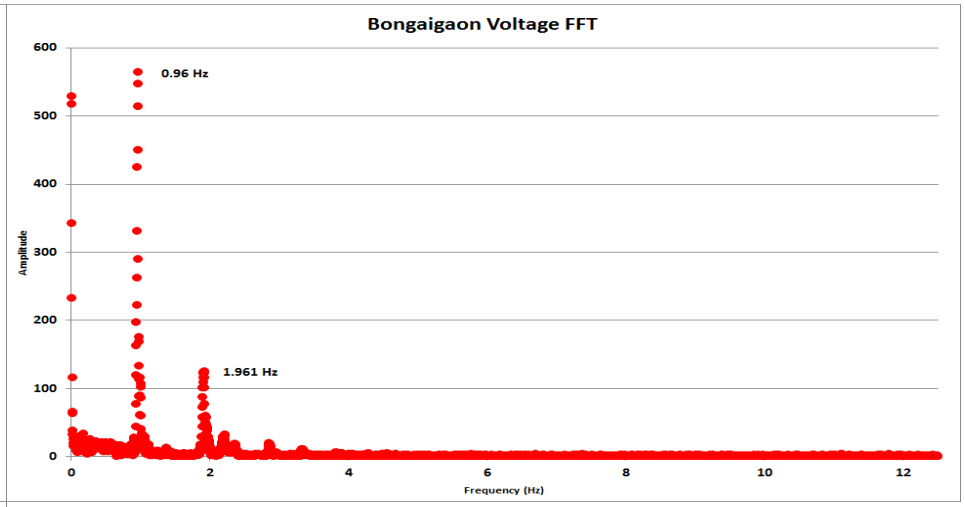


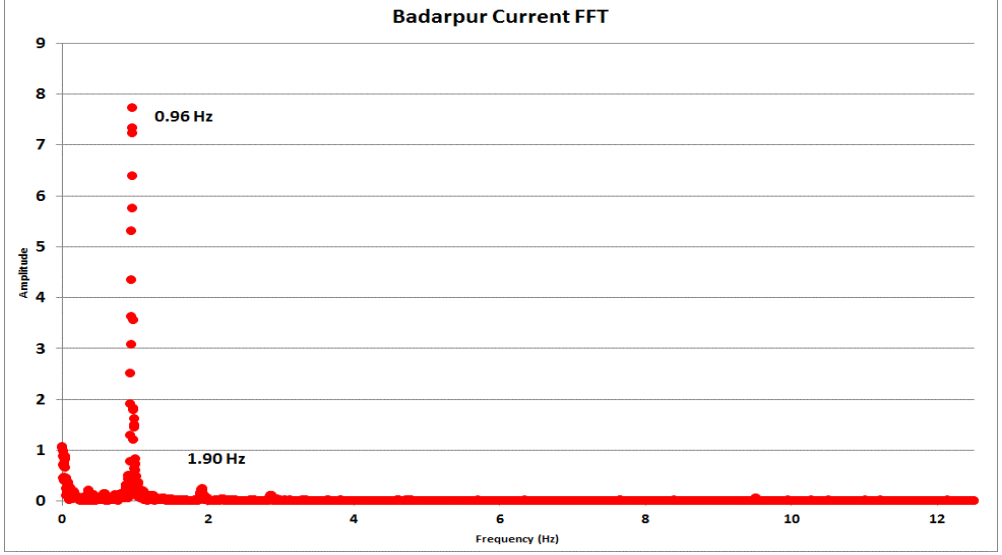
R-phase voltages showing LFO



FFT analysis of Phase Voltages and Currents from PMU data







Observations

- Low Frequency Oscillations were observed in NER Grid on 03rd August 2013 from 22:31:50 Hrs to 22:34:04 Hrs, a continuous period of around 3 minutes. The phenomenon was recorded by all PMUs of NER.
- The PMU data of Phase voltages from all PMUs of NER and line currents of 132kV Badarpur-Khleihriat S/C, 132 kV Badapur-Kumarghat S/C, 132 kV Dimapur – Imphal S/C were analysed to ascertain nature and source of oscillations.
- From FFT analysis Major mode oscillation observed is 0.96 Hz which is Inter-plant mode oscillation.
- Maximum magnitude of oscillation was observed at Agaratala and Imphal which may be nearer to source. Generators in the nearby area (AGTPP, Baramura, Rokhia, Loktak) may have participated in the oscillations. Need to check AVR of generators in those area.
- 1.91 Hz mode oscillation was also observed which is in general categorized as Intra-plant mode.