

North Eastern Regional Power Committee

Agenda

For

123rd OCC Sub-Committee Meeting

Time of meeting : 10:00 Hrs.

Date of meeting : 12th June, 2016 (Tuesday)

Venue : "Hotel Nandan", Guwahati.

A. CONFIRMATION OF MINUTES

CONFIRMATION OF MINUTES OF 122nd MEETING OF OPERATION SUB-COMMITTEE OF NERPC.

The minutes of 122nd meeting of Operation Sub-committee held on 9th June, 2016 at Guwahati were circulated vide letter No. NERPC/SE (O)/OCC/2016/4556-4591 dated 17th June, 2016.

The Sub-committee may confirm the minutes of 122nd OCCM of NERPC as no comments/observations were received from the constituents.

ITEMS FOR DISCUSSION

B. OPERATIONAL PERFORMANCE AND GRID DISCIPLINE DURING JUNE, 2016

As per the data made available by NERLDC, the grid performance parameters for June, 2016 are given below:

NER PERFORMANCE DURING JUNE, 2016

States	Energy Met (MU)		w.r.t. May,16 % inc (+) /dec (-)	Energy Reqr. (MU)		w.r.t. May,16 % inc (+) /dec (-)	% inc (+) /dec (-) of energy reqr vs met. In June, 16
	June-16	May-16		June-16	May-16		
Ar. Pradesh	54.91	52.0	5.60	56.51	54.0	4.65	-2.91
Assam	822.74	689.9	19.25	853.96	733.3	16.45	-3.79
Manipur	57.02	55.3	3.11	58.53	58.3	0.39	-2.65
Meghalaya	141.78	130.1	8.98	141.78	130.1	8.98	0.00
Mizoram	37.75	37.6	0.40	38.58	39.0	-1.08	-2.20
Nagaland	58.23	54.4	7.04	59.36	55.9	6.19	-1.94
Tripura	171.46 (including Bangladesh)	150.15 (including Bangladesh)	14.19	173.16 (including Bangladesh)	156.06 (including Bangladesh)	10.96	-0.99
Region	1172.43	1019	15.06	1208.73	1071	12.86	-3.10

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States	Demand Met (MW)		w.r.t. May,16 % inc (+) /dec (-)	Demand in (MW)		w.r.t. May,16 % inc (+) /dec (-)	% inc (+) /dec (-) of Demand vs met. In June, 16
	June-16	May-16		June-16	May-16		
Ar. Pradesh	130	119.0	9.24	131	118.7	10.36	-0.77
Assam	1458	1423.0	2.46	1511	1496.7	0.96	-3.64
Manipur	151	144.3	4.64	152	144.6	5.12	-0.66
Meghalaya	312	282.2	10.56	311	281.5	10.48	0.32
Mizoram	80	88.0	-9.09	81	88.0	-7.95	-1.25
Nagaland	119	105.0	13.33	119	106.9	11.32	0.00
Tripura	273 (including Bangladesh)	249 (Excluding Bangladesh)	9.64	274.71 (including Bangladesh)	252.2 (Excluding Bangladesh)	8.93	-0.63
Region	2475	2401	3.08	2479	2487	-0.32	-0.16

REGIONAL GENERATION & INTER-REGIONAL EXCHANGE IN MU

AVERAGE FREQUENCY (Hz)

Month---->	June-16	May-16
Total Generation in NER (Gross)	1482.58	1284.80
Total Central Sector Generation (Gross)	1147.12	1011.21
Total State Sector Generation (Gross)	335.46	273.59
Inter-Regional Energy Exchange		
(a) NER-ER	83.71	8.22
(b) ER-NER	124.81	257.38
(c)NER-NR	132.10	313.28
(d)NR-NER	1.82	0.00
© Net Import	-89.18	-64.12

Month---->	June-16	May-16
	% of Time	% of Time
Below 49.9 Hz	7.63	6.11
Between 49.9 to 50.05 Hz	74.09	68.64
Above 50.05 Hz	18.28	25.25
Average	49.99	50.00
Maximum	50.37	50.44
Minimum	49.65	49.56

C. OLD ITEMS

C.1 Status of Generating Units, Transmission Lines in NER:

During 123rd OCC meeting, the statuses as informed by different beneficiaries are as follows:

SN	Items	Status as given in 123 rd OCC Meeting	Status as given in 122 nd OCC Meeting
a. New Projects			
1	Trial operation and CoD of Unit -II of Bongaigoan TPS of NTPC		Trial run and CoD expected by 31.03.2017

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2	400/220kV, 2x315 MVA ICT of NTPC at Bongaigaon		33kV tertiary bushing failure. Replacement order given. Expected date of commissioning 10.07.2016.
3	Trial operation and CoD of Monarchak GBPP of NEEPCO		November, 2016 (subject to gas availability)
4	Kameng HEP of NEEPCO two units (2 x 150 MW) Next two units (2x150 MW)		First two units March 2017.
5	Pare HEP of NEEPCO (2 x 55 MW)		June, 2017
6	400 kV D/C Silchar - Melriat line of PGCIL		Tender Evaluation process is going on. By end June exact status would be given.
7	220kV Rangia - Salakati of AEGCL		December, 2016
8	132kV Monarchak – Surjamaninagar D/C of TSECL		October, 2016
9	400/132 kV, 2nd 125 MVA ICT at Pallatana		July, 2016
10	132kV Pasighat – Aalong of Ar. Pradesh		December, 2016
11	132kV Doyang– Wokha		Line construction completed. However inspection of breaker at NEEPCO bay is required.
12	220 kV, 20 MVAR Bus Reactor& bay at AGBPP		July,2016
13	132kV Surjamaninagar Bay at OTPC		August, 2016
14	400kV D/C Balipara – Kameng of Ar. Pradesh		Delayed to December 2016 to match with Kameng HEP commissioning.
15	RHEP 80 MVAR Bus Reactor		Referred to next SCM of CEA.

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16	SLDCs (Ar. Pradesh, Manipur, Mizoram, Nagaland)		Sept/Oct, 2016 (Building hand over by respective state by June16). For Manipur-July16 & for Meghalaya-June,16
17	400/220 kV 315 MVA ICT-II at Bongaigaon		-
b. Elements under breakdown/ upgradation			
18	63MVAR Reactor at Byrnihat of Me.PTCL		Order placed to M/s CGL. Commissioning by Dec'16
19	Up-gradation of 132 kV Lumshnong-Panchgram line		Line Survey Work(s) going on.
20	Switchable line Reactors at 400kV Balipara & Bongaigoan		Balipara- August 2016 Bongaigaon- September, 2016
21	PLCC Panels at Loktak end of Loktak – Ningthoukhong 132 kV feeder and Loktak - Rengpang 132 kV feeder		July 2016
22	LILO of 132kV Ranganadi – Nirjuli at Pare of NEEPCO by PGCIL		T/L at Loc.87 to be shifted by NEEPCO. Target date of completion July 2016
23	LILO of 132kV Ranganadi – Itanagar (Chimpu) at Pare of Ar. Pradesh		March 2017.

The Sub-Group meeting held on 08/07/2016 while analysing disturbances in NER grid, felt that the re-commissioning of 63 MVAR Reactor at Byrnihat is urgently required and requested MePTCL to kindly expedite.

Concerned constituents may kindly intimate the status.

C.2 CT Ratio of Transmission Lines in NER & Enhancement of Loadability of Lines:

The latest status as informed in 122nd OCC meeting is as follows:

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Sl.No.	Name of the line	CT Ratio at either end (current)		CT Ratio at either end (required)		No. Of CTs required		Current Status
		Stn A	Stn B	Stn A	Stn B	Stn A	Stn B	
1	132KV D/C RC Nagar-Agartala-I**	600/1	400/1	800/1	800/1	3 by PGCIL	4 by PGCIL	Mar'2017
2	132KV D/C RC Nagar-Agartala-II**	600/1	400/1	800/1	800/1	3 by PGCIL	4 by PGCIL	Mar'2017
3	132 KV S/C Jiribam-Aizwal	400/1	400/1	600/1	600/1	3 by PGCIL	4 by PGCIL	Mar'2017
4	132 KV S/C Jiribam-Haflong	400/1	400/1	600/1	600/1	3 by PGCIL	4 by PGCIL	Mar'2017
5	132KV S/C Khandong - Umrangso-Haflong	300/1	400/1	600/1	600/1	3 at Khandong by NEEPCO, 3 at Umrangso by AEGCL	3 at Umrangso by AEGCL, 3 at Haflong by PGCIL	PGCIL - Mar'2017 AEGCL- Mar'2017 NEEPCO- To be informed
6	132 KV S/C Loktak - Imphal-II	400/1	600/1	600/1	600/1	3 by NHPC	0	NHPC- to be informed

Further POWERGRID has proposed that all lines where CT ratio up-gradation is to be done, double jumpering is to be ensured.

Constituents, NERPC/NERLDC may kindly intimate the status and members may deliberate.

C.3 Finalization of Operating Procedures of State Grid of NER:

As per clause no 5.1.g of IEGC, detailed operating procedures for each state grid shall be developed and maintained by the respective SLDC.

Latest status of approval of these documents from OCC forum of NERPC is as follow:-

Sl No	Description	Status of approval from OCC forum of NERPC
1	Operating Procedure of Ar. Pradesh 2015	By 30.06.2016
2	Operating Procedure of Assam 2015	Submitted
3	Operating Procedure of Manipur 2015	By 30.06.2016
4	Operating Procedure of Meghalaya 2015	Submitted
5	Operating Procedure of Mizoram 2015	Submitted
6	Operating Procedure of Nagaland 2015	Submitted
7	Operating Procedure of Tripura 2015	By 30.06.2016

NERLDC/NERPC may kindly update the status.

C.4 Monthly MU requirement & availability of each state of NER as per format:

The following figures of state wise MU requirement and availability were taken from draft LGBR 2016-17 of NERPC. State wise MU requirement and availability for these months are to be checked. Constituents may kindly verify if the above data are correct.

Requirement:

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	67	71	68	73	73	73
Assam	775	791	816	872	872	847
Manipur	82	77	76	80	80	80
Meghalaya	170	175	165	175	175	170
Mizoram	42	42	42	45	45	45
Nagaland	65	68	72	77	77	72
Tripura	112	122	122	122	128	122
NER	1313	1346	1361	1424	1450	1409

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	73	68	68	68	59	74
Assam	816	714	714	714	648	740
Manipur	85	88	95	92	88	90
Meghalaya	185	195	210	220	185	190
Mizoram	46	46	48	48	42	42
Nagaland	74	68	71	69	68	68
Tripura	133	112	122	128	102	128
NER	1412	1291	1328	1339	1192	1332

Availability:

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	46	58	82	92	79	74
Assam	483	544	649	737	703	682
Manipur	58	69	85	108	102	99
Meghalaya	100	149	191	250	258	258
Mizoram	38	44	54	63	59	57
Nagaland	42	51	66	83	79	77
Tripura	185	204	204	222	213	208
NER	950	1119	1330	1557	1493	1455

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	67	52	54	51	45	55
Assam	648	567	580	567	502	564
Manipur	95	81	76	71	61	69
Meghalaya	209	150	138	125	115	123
Mizoram	54	48	44	43	39	45
Nagaland	71	55	54	50	45	50
Tripura	225	211	224	222	190	217
NER	1370	1163	1171	1130	997	1121

In 121st OCC meeting, NERLDC stated that quantum of power against Bangladesh drawal should be reflected in the table either in Tripura drawal figure or separately. Members agreed to that.

Members may please discuss.

C.5 Monthly MW requirement & availability of each state of NER:

The following figures were taken from LGBR 2016-17 of NERPC. These figures are to be reviewed.

A. Peak Demand in MW

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	142	142	137	137	142	147
Assam	1451	1472	1498	1508	1560	1539
Manipur	168	168	168	163	168	163
Meghalaya	405	405	405	405	400	405
Mizoram	90	90	95	90	90	90
Nagaland	125	125	125	140	140	140
Tripura	270	291	296	296	301	291
NER	2651	2693	2724	2739	2801	2775

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	143	132	132	137	137	147
Assam	1513	1508	1518	1456	1352	1466
Manipur	163	179	184	179	179	173
Meghalaya	415	425	430	430	425	420
Mizoram	95	95	101	101	90	95
Nagaland	140	135	135	135	125	125
Tripura	321	275	260	250	250	281
NER	2790	2749	2760	2688	2558	2707

B. Peak Availability in MW

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	127	144	195	165	140	138
Assam	1012	1134	1305	1249	1170	1222
Manipur	131	173	184	196	179	181
Meghalaya	257	304	373	433	455	482
Mizoram	83	100	123	117	108	111
Nagaland	109	129	145	142	134	137
Tripura	324	355	369	365	350	357
NER	2043	2340	2695	2675	2534	2627

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	154	140	129	128	127	179
Assam	1251	1202	1169	1152	1108	1278
Manipur	188	175	147	151	142	188
Meghalaya	442	360	340	312	346	386
Mizoram	117	109	99	98	101	120
Nagaland	142	129	124	122	120	141
Tripura	386	369	373	370	355	392
NER	2681	2484	2381	2331	2298	2682

C. Off Peak Demand in MW (08:00 Hrs)

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	78	78	75	75	78	81
Assam	943	898	944	950	952	939
Manipur	109	109	109	106	109	106
Meghalaya	223	223	223	223	220	223
Mizoram	59	59	62	59	59	59
Nagaland	75	75	75	84	84	84
Tripura	184	198	201	201	205	198
NER	1670	1639	1689	1698	1706	1689

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	79	73	73	75	75	81
Assam	983	935	956	932	852	909
Manipur	106	116	120	116	116	112
Meghalaya	228	234	237	237	234	231
Mizoram	62	62	66	66	59	62
Nagaland	84	81	81	81	75	75
Tripura	218	187	177	170	170	191
NER	1760	1687	1708	1677	1581	1661

D. Off Peak Availability in MW (08:00 Hrs)

Name of State	Apr16	May16	Jun16	Jul16	Aug16	Sep16
Ar. Pradesh	40	50	99	122	102	100
Assam	734	824	1014	1126	1048	1068
Manipur	65	87	119	168	152	148
Meghalaya	198	230	305	416	428	445
Mizoram	50	61	88	102	93	93
Nagaland	72	84	105	123	115	116
Tripura	362	303	326	345	331	335
NER	1420	1640	2054	2402	2269	2304

Name of State	Oct16	Nov16	Dec16	Jan17	Feb17	Mar17
Ar. Pradesh	81	56	59	57	72	69
Assam	982	927	956	935	927	985
Manipur	132	115	92	84	94	102
Meghalaya	377	295	290	261	303	318
Mizoram	86	75	72	69	78	82
Nagaland	103	89	92	89	93	95
Tripura	343	317	335	329	322	339
NER	2104	1875	1896	1824	1888	1989

In 121st OCC meeting, AGM, SLDC, AEGCL opined that 100 MW power supply to Bangladesh should be included in the LGBR of 2016-17. Bangladesh should be treated as internal customer of Tripura for this purpose. The forum agreed.

In 122nd OCC meeting, S.E.(O) informed that CEA has been requested to incorporate 100 MW Bangladesh drawal in LGBR 2016-17.

Members may please discuss.

C.6 Furnishing Reactive Power Absorption Data for last one year:

As per Para no. 9.9.1 of Recommendations of Enquiry Committee on Grid Disturbance, the regulatory provisions regarding absorption of reactive power by generating units needs to be implemented.

It is requested that you may please furnish instances when Reactive Power support was provided by Generators for last one year.

The latest Capability Curve of each generator in Soft Copy may also be provided.

In 122nd OCCM, NERLDC informed the following status of furnishing of reactive power absorption data:

AGBPP, AGTPP, Kopili, Khandong	Furnished on Daily basis
BgTPP	Furnished on Monthly basis
Palatana	Last furnished in Dec'15
Ranganadi	Not furnished
Doyang	Not furnished
Loktak	Not furnished

DGM (SO-I), NERLDC requested all generating utilities to send the requisite information to nerldc@yahoo.co.in.

NEEPCO informed that data for Khandong HEP, Kopili HEP, AGBPP are being generated daily; however they would be resent again. NTPC agreed to submit the data within the stipulated time periodically.

NEEPCO, NHPC & OTPC may kindly intimate the status.

C.7 Implementation of Automatic Demand Management Scheme (ADMS)

Hon'ble CERC directed vide order in Petition No. 113/MP/2014 on 31.12.15 to submit PERT charts & action plans for Implementation of Automatic Demand Management Scheme (ADMS) by SLDCs of NER and to implement ADMS by 30.06.16 . Hon'ble CERC directed RLDCs to submit the report of status of implementation of Automatic Demand Management Scheme (ADMS) by SLDCs of NER by 31.08.16.

SLDCs of NER are requested to furnish monthly report of status of implementation of Automatic Demand Management Scheme (ADMS) by SLDCs of NER.

In 121st OCC meeting, S.E.(O), NERPC informed that the minutes of the ADMS workshop was issued on 07.04.2016. He suggested that the following works are to be carried out by constituents at the earliest as decided in the ADMS workshop.

1. Identifying minimum two substations from each state to enabled ADMS functionalities on pilot basis.
2. Surveying those substations which are identified for ADMS function to understand the actual status of those stations.
3. Preparing the Bill of materials (BOM) and get the cost estimation from suppliers.

Further, he suggested that software development regarding integration of ADMS with existing SCADA system at SLDC level may be included in SLDC Upgradation Project of

POWERGRID. Members agreed to the proposal and confirmed the minutes of the workshop.

In 122nd OCCM, it was decided that SLDCs would inform the status as soon as possible after due consultation with DISCOMs and vendors. It was also decided that NERPC would write to CMDs of all the utilities in the states i.e. TRANSCO and DISCOMs for conducting internal meetings in this regard periodically.

MS, NERPC stated that as per discussions with CERC in matter of implementation of ADMS in NER, CERC representative urged that ADMS be installed in at least one substation of each state. The forum agreed to implement ADMS in one substation of each state, preferably in state capitals. It was also agreed, that implementation on pilot basis may be taken up in Assam/Meghalaya system to begin with. The funding may be obtained from PSDF.

All concerned utilities, POWERGRID, NERLDC/NERPC may kindly intimate the status.

C.8 Rectification of phase notations in NER grid:

It has been found that PMUs are showing different phasors w.r.t different nodes of same grid. It is suspected that there are change in phase notations in NER grid & connectivity.

During 1st NETeST meeting, the forum advised that mixing of Phases (change in phase reference w.r.t. one utility is sometimes different from another) as reflected by PMU data in regional grid is to be corrected. Forum requested that the same may be taken up OCC forum of NERPC.

During 121st OCCM, AGM, AEGCL suggested that physical connections may have to be changed at Azara. DGM (AM), POWERGRID suggested that a joint visit by POWERGRID/AEGCL to Azara would be fruitful. The forum agreed.

In 122nd OCCM, DGM, AEGCL informed that the work would be completed within one week.

NERTS, AEGCL & NERLDC may kindly intimate the status.

C.9 Transformer Tap optimization

System study was conducted by NERLDC considering load, generation and network pattern of May, 2016 during Peak & Off Peak periods. Suggested taps position of important transformers in NER for maintaining bus voltages within permissible limit as well as to minimize system losses are attached at **Annexure – C.9**.

In 121st OCC meeting, NERLDC was requested to write to MeECL regarding changing of tap positions as per voltage profile.

In 122nd OCCM, SE, SLDC, Meghalaya informed the forum that request has been received and he would revert back to the forum after due discussion with MePTCL.

DGM(AM), NERTS informed that since tap changing would be done offline, there should be no danger in the operation, and necessary checks like ratio test and continuity checks may be done after tap changing to check healthiness before putting into service. NERLDC informed that similar tap changing has been done in Northern region and the NR grid had been benefitted. Hence, similar exercise should be done for NER to aid in mitigating high voltage conditions. It was agreed that in case SLDC, Meghalaya does not manage to convince MePTCL to perform tap changing at Byrnihat, NERPC may write to MePTCL on behalf of the forum.

NERLDC may please deliberate.

C.10 Issues related to mismatched figures of installed capacity of NER.

The figures of installed capacity of NER by CEA (As on 31.01.16) is not matching with figures of installed capacity of NER prepared by NERLDC based on data provided by SLDCs of NER. Ministry of Power (MOP) had requested NERLDC to resolve this issue.

The installed capacity of NER prepared by CEA and by NERLDC is attached in **Annexure – C.10.**

During 121st OCCM, Member Secretary, NERPC requested utilities to write to CEA for derating/decommissioning of units at their generating stations. TSECL informed that three units of Baramura GBPP was de-commissioned. DGM(MO), NERLDC informed that NERLDC is raising NERLDC Fees & Charges for AGTTP-Extn based on name-plate rating of 51 MW, however IC is 46 for all purposes. The forum requested NEEPCO to kindly clarify the same.

In 122nd OCCM, NEEPCO representative informed that PG test of STG units of AGTCCPP would be carried out on 15th June 2016 and IC/MCR would be confirmed after that.

NERLDC/NEEPCO/Utilities may please intimate the status.

C.11 Furnishing of Ramp-Up, Ramp-Down, Technical Minimum of Units :

A meeting of the Sub-Committee on 'Review of 12th Plan and Generation Planning' headed by Member (Planning), CEA was held on 7th March, 2016. During the meeting, CEA projected maximum ramping requirement of 30000-36000 MW/hour for about 60 hours (out of 8760 hours) during 2021-22 in view of increase in solar generation.

It is requested to furnish the unit-wise Ramp-Up, Ramp-Down, Technical minimum of Generating Units.etc based on data provided by manufacturer as per the attached format.

Format for submission of these data mailed to all ISGSof NER & SLDCs of NER on 9th March, 2016. OTPC has already submitted the details.

The format is attached as **Annexure-C.11.**

In 122nd OCCM, DGM(SO-I) once again reiterated that the details for hydel stations of ISGSs' and all the state generating stations are not readily available. S.E.(O) requested all the stations to submit the details as early as possible.

NERLDC indicated the following status of furnishing of Ramping details by generators of NER:

Generator	Status
AGBPP, AGTPP	Furnished (as part of Ancillary services)
OTPC	Furnished
Kopili, Khandong	Furnished
BgTPP	Furnished (as part of Ancillary services)
Ranganadi	Not furnished
Doyang	Not furnished
Loktak	Not furnished

NERLDC may please intimate the status.

C.12 High Voltage in Palatana :

During the month of January'16 -50 % of the time, February'16 -96% of the time& March'16 -61 % of the time the voltage of Palatana 400 kV bus was more than 420 kV. The Palatana Bus reactor was charged for the first time at 14:49 Hrs on 14.03.16. The bus reactor tripped at 16:11 hrs on 15.03.16. Bus Reactor at Palatana is under outage since 16:11 hrs of 15.03.16.

OTPC is requested to inform the status of Bus Reactor at Palatana.

In 121st OCCM, OTPC informed that repeated communication to M/s BHEL has been written by them but till date there was no response from BHEL. However, exact status would be informed after detailed analysis by M/s BHEL. The expected date of revival is 15.06.2016.

In 122nd OCCM, DGM, OTPC informed that the matter would be pursued with M/s BHEL if there is no response by 15.06.2016.

DGM (SO-I), NERLDC intimated the forum that the voltage at Palatana remains very high (even beyond IEGC band at some times of the day) during most of the day. The reactor at Palatana has been under outage since long time. The reactor was again charged for 1st time on 14:49 hrs on 14/03/16 for a brief interval, and has been under outage since. Delay in bring the reactor is causing unnecessary deterioration of voltage profile at Palatana and nearby areas. The reactor needs to be brought into service at the earliest.

Members may please discuss.

C.13 Pre monsoon activity of transmission elements:

It was observed that number of tripping of transmission elements in NER increased during monsoon period of last year. For minimization of tripping transmission elements in NER, it is requested to complete all activities (like trimming of trees, vegetation issues etc) of transmission elements before monsoon.

In 121st OCCM, S.E.(O) requested all utilities to expedite vegetation clearance activities. Members agreed.

During 122nd OCCM, S.E.(O) once again highlighted the importance of vegetation clearance. He informed that there has been an alarming rise in number of transient trippings during this pre-monsoon period. All the utilities agreed to undertake activities in this regard and submit report to the forum.

All concerned utilities may please intimate the status.

C.14 Procurement of ERS for NER from PSDF funding:

PSDF Secretariat (NLDC, New Delhi) vide. NLDC-PSDF/NPC-CEA/2016-17/60 dtd. 21st April 2016 has intimated that submission and approval of the schemes is governed in accordance with the guidelines for disbursement of funds from PSDF approved by MoP on 18.9.2014. Guidelines are available on <http://psdfindia.in/>. The schemes have to be submitted as per formats prescribed in guidelines.

In 121st OCCM, POWERGRID agreed to submit the formats/DPR on behalf of NER constituents as soon as possible.

In 122nd OCCM, DGM(AM), NERTS requested NERPC to write to ED,NERTS in this regard, so that DPR may be prepared in earnest. SE(O) informed that letter has already been sent to ED, NERTS for necessary action.

NERTS may please intimate the status.

C.15 Submission of data regarding large scale integration of Renewable Energy:

MoP vide. 23/2/2005-R&R(Vol-XI) dated 22.03.2016 has forwarded communication of MNRE letter No. 11/7/2013-EFM dated 02.03.2016 wherein it was mentioned regarding compilation of data to meet renewable energy targets of 175 GW by 2020. The following data are required for the said purpose:

- a. Data on the technical capacities of power plants such as minimum load, rate of change of generation, start-up time and down time, minimum standstill time, State-wise and region-wise.
- b) Thermal balancing potential of RE rich states today and upto 2020(region-wise also).
- c) Theoretical hydro balancing potential of states today and upto 2020(region-wise also).
- d) Pumped hydro projects capabilities today and upto 2020(region-wise also).
- e) Forecasting and scheduling regulations by States.

In 121st OCCM, all the utilities were requested to kindly submit relevant data listed in (c) & (e) at the earliest.

NERPC may please intimate the status.

D. NEW ITEMS

D.1 Generation Planning (ongoing and planned outages)

NEEPCO & NHPC may kindly intimate the availability for hydro stations:

Generating Station	Units running	MW	MU	Reservoir
Khandong				
Kopili				
Kopili-II				
Ranganadi			Subject to inflow	
Doyang				
Loktak				
AGBPP	-	-	-	-
AGTPP	-	-	-	-

Hydro planning

The outage of other generating stations may be approved considering the outage required for completion of balance restoration activities at KHEP.

The Committee may discuss and approve the proposed shutdown by Generating Stations as given in Annexure – D.2 below.

D.2 Outage Planning Transmission elements

It was agreed in the 99th OCC meeting that shutdown will be availed only after approval is given by the OCC forum. It was also agreed that deferment/revision of outages elements other than already approved in OCC will be henceforth put/displayed in the website of NERPC (**under Operational Activities/OCC Approved shutdown**) as per CERC regulations/ CEA guidelines etc for ensuring smooth & secure grid operation.

Furnishing request of shut down of the element, which was approved by NERPC, by Indenting Agency (ISTS licensees/STUs/Generating Companies) to NERLDC: Planned shutdown approved by NERPC shall be considered for implementation by NERLDC on D-3 basis. If an outage is to be availed on say 10th of the month, the shutdown availing agency would reconfirm to NERLDC on 7th of the month by 10:00 Hr. This practice is necessary to ensure optimal capacity utilization and the time required for associated system study/coordination by/amongst RLDC/NLDC.

The sub-Committee may kindly discuss and approve the transmission line outages proposed by Constituents for July, 2016 - August, 2016 as enclosed at Annexure- D.2.

D.3 Estimated Transmission Availability Certificate (TAC) for the month of April & May, 2016:

NETC and POWERGRID have submitted the outage data for the month of April & May, 2016. So the attributability of outage of the said elements may please be finalized.

Members may please discuss.

D.4 Furnishing of Technical and Commercial data for computation of PoC Charges and Losses for Q3 of 2016-17 (October 2016 – December 2016):

As per provisions of the CERC (Sharing of Inter State Transmission Charges and Losses) Regulations, 2010 as amended from time to time, the following data are required for Computation of PoC Charges & Losses for 3rd Quarter of 2016-17 (October 2016 – December 2016):

- Yearly Transmission Charges (YTC) – As per Format I
- Technical details of new transmission elements & generating units which are expected to commence commercial operation during July 2016 - September 2016 (As per Format-II)
-
- Details of Long term and Medium term contracts (As per Format IIIA)
- Nodewise Forecast maximum withdrawal and injection data (As per Format IIIB)
- Maximum Injection and Withdrawal data for corresponding quarter of last 3 years (As per Format IIIC)

Letter in this regard from NLDC, POSOCO and Approved Formats for furnishing the relevant data (Format I, Format II, Format III) have been emailed to all DICs of NER on 05th April 2016. Formats for data submission are also available on website of NLDC at the following link: http://posoco.in/transmission_pricing/formats.

The requisite data/information may please be forwarded to NLDC at implementingagency@posoco.in with a copy to NERLDC at nerldc@yahoo.co.in latest by **31st July 2016**.

AEGCL, MePTCL and TSECL are requested to indicate the YTC data for October 2016 – December 2016 period of their transmission lines approved by CERC for inclusion in PoC Computations. The YTC data must be submitted as per Format-I only (Approved Format).

Members may please discuss.

D.5 Assessment of Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) by SLDC on respective Inter-State Transmission Corridor

The study results for assessment of Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) for state control areas have only been received from MePTCL.

Updated BaseCases have been mailed to all the SLDCs on 01.07.16. All SLDCs are requested to assess the Total Transfer Capability (TTC), Transmission Reliability

Margin (TRM) and Available Transfer Capability (ATC) using these cases, and furnish the study cases to NERLDC for the month of November'16 by 15th July, 2016. NERLDC assessed study results is attached in Annexure-I.

SLDCs are requested to check the TTC of their control areas as computed by NERLDC and furnish their comments, if any by 15th July'16. If no comments are forthcoming from the States, TTC, ATC & TRM figures of State control area and group of control areas as assessed by NERLDC may be considered as final and uploaded in NLDC website, if required.

It is pertinent to mention here that as per discussions in 122nd OCC meeting of NERPC, all SLDCs of NER may host the assessed TTC / ATC / TRM figures on their website for information dissemination.

NERLDC may kindly deliberate on this issue.

D.6 Detailed operating procedure for Reserve Shut Down(RSD) and Backing down upto technical minimum:

The 4th Amendment of IEGC notified on 6th April, 2016 requires NLDC to formulate a procedure for taking units under Reserve Shut Down (RSD) and identifying units to be Backed down upto technical minimum schedule. Accordingly NLDC has prepared a draft procedure and sent to all RPCs for discussion. All constituents are requested to please go through the procedure and comment, if any, may be sent NLDC so that same can be considered and final procedure can be sent to CERC.

Members may please provide their valuable comments.

D.7 Grid Disturbance (GD-V) in NER on 16.04.16 at 1203 Hrs:

A major disturbance of category GD-V occurred in NER Grid on 16.04.16 at 1203 Hrs. In this connection it was decided in 121st OCC Meeting of NERPC that a Committee is to be formed to analyze the disturbance thoroughly, identify the root causes and suggest corrective measures. It was also proposed in 42nd PCC Meeting of NERPC to constitute an Enquiry Committee for analysis of the above disturbance with independent members.

In 122nd OCCM, after detailed deliberation it was decided that all members of the Enquiry Committee should abide by the decisions of the 42nd PCC forum.

DGM (SO-II), NERLDC had informed SE (NERPC) that the Enquiry Committee for looking into the causes of Grid Disturbance should be formed of independent members. For purpose of the Enquiry committee to start its investigation, NERPC may issue letter to all concerned, stating Terms of Reference, etc.

NERPC may please intimate the status.

D.8 Updated Operating Procedures of NER July 2016:

Draft Operating Procedures of NER, updated to July 2016 has been sent to regional entities of NER, the same is also available in NERLDC website. Power utilities of NER

are requested to furnish their comments and suggestions for this document by 30th June'16 as the same has to be finalized by 10th July'16. The document is password protected; password is available with SOII department of NERLDC.

In 122nd OCCM, DGM(SO-I), NERLDC shared the password of Main document and Annexures to Operating Procedure of NER, and requested all entities of NER Grid to give comments for finalization by 10th July, 2016.

NERLDC may please intimate the status.

D.9 Information of Events of Load crash on account of inclement weather conditions:

As per directives of DPE & MoP, Govt. of India, NERLDC have to prepare reports indicating events in the Grid that occurred on account of inclement weather conditions, particularly events involving load crash. For preparation of these reports, the following inputs are required from affected states:

- a. Date and Time-frame of such incidence
- ii. Affected areas
- b. Reason for load crash
- iv. Tripping of LT feeders (33 kV / 11 kV level). SLDCs may indicate affected areas if detailed information is not available.
- c. Quantum of load crash and generation loss
- v. Details of Restoration
- d. Any corrective measures (presently taken / suggested for future)

A sample format which is being used by NERLDC for event reporting is attached in **Annexure-D.12.**

As and when such events occur, SLDCs are requested to inform about the event to NERLDC immediately after the incident and prepare a report as per the above format and send the same to NERLDC at rtsdnerldc@gmail.com and nerldc@yahoo.co.in. It is pertinent to mention here that AEGCL, MePTCL & TSECL are sending the Load crash reports to NERLDC on regular basis.

In 122nd OCCM, all the utilities agreed to submit the necessary data.

NERLDC may please intimate the status.

D.10 Installation of spare Transformers in NER:

Recently 132/33 kV 10 MVA and 16 MVA Transformers at Nirjuli (PG) have been replaced by 2 nos 50 MVA Transformers. After replacement of the above mentioned transformers, the 10 MVA & 16 MVA Transformers are now Spare Transformers and can be used at other substations. Further in future 220/132 kV 2x50 MVA Transformers at Balipara (PG) will also be replaced by 2x160 MVA Transformers. Members may please deliberate about optimal utilisation of these spare Transformers in NER.

In 122nd OCCM, DGM(AM) suggested that in view of the fact that above stated assets have been replaced, they may now either be de-capitalised or kept as regional spare. Representatives of DoP Ar. Pradesh, AEGCL, DoP Mizoram, TSECL viewed that they should be kept as regional spare. After detailed deliberation it was decided that the

132/33 kV 10MVA transformer is to be stored at Nirjuli(PG) S/Sn for the time being. The 132/33 kV 16 MVA transformer is to be shifted to 132kV Haflong(PG) S/Sn for use by AEGCL for a period not exceeding 18 months. In case of 2x50 MVA transformers at Balipara, it was decided that they would be returned to the owners i.e. NEEPCO & AEGCL. Also the 132kV bay equipments of NEEPCO would be returned and 132 kV bay equipments of AEGCL would be given to DoP Ar.Pradesh (as regional spare) for use at RHEP S/Sn.

Sr. Manager, NEEPCO informed that the concurrence for returning of Balipara ICT and bay equipments would be intimated later.

Members may like to discuss.

D.11 Reasons For Demand - Supply Gap And Its Variation:

It was deliberated in the 4th NPC meeting that monthly power supply position prepared & published by CEA based on the data furnished by the states reflected shortages in almost all the states. However, a number of those states intimated adequate availability of power. This meant that the deficit/shortage in such states was actually not the deficit in true sense but demand-supply gap due to reasons other than shortage of power. The other reasons for the demand-supply gap could be inadequate availability of power, transmission constraint, distribution constraint, financial constraint, etc. The reason for demand-supply gap needed to be clearly mentioned to reflect true picture of power supply position in different states and also to invite attention of various agencies including policy makers to the specific problem areas in the power sector for suitable solution.

After deliberation it was decided in the meeting that all the RPCs would advise the states in their respective regions to intimate broad break-up of demand-supply gap due to various reasons, or at least, the main reason(s) for demand-supply gap in each month.

In 122nd OCCM, DGM(SO-I), NERLDC was of the view that constituents may indicate the load-shedding quantum in their systems under different heads appropriately like inadequate availability of power, transmission constraint, distribution constraint, financial constraint, etc. The forum agreed.

NERPC/NERLDC may please deliberate.

D.12 Reactive Power Planning:

In the 4th meeting of NPC, it had been agreed that states should adopt a proactive approach in the matter of reactive power planning, and that the provisions regarding reactive power planning similar to those mandated in the IEGC for the CTU should be included in the respective State Grid codes.

It was informed in the meeting that Sub-Committee of PSDF had forwarded few schemes of capacitor installation by states to respective RPC for approval of RPCs. It was of the view that RPC might be able to justify the requirement of capacitor installation of state.

After detailed deliberation, it was agreed that the proposal of capacitor installation planning by states/entities would be referred to RPCs and to PSDF Sub-Committee routed through RPCs and the proposal would be vetted by the respective RPC.

In 122nd OCCM, after detailed deliberation it was decided that the SLDCs with due consultation of DISCOMs would revert back to the forum with the requirements.

All the utilities may please inform the status..

D.13 Scheme for Storage and Management of Protection System Data Base:

Ramakrishan Task Force Report on Power System Analysis under Contingencies had recommended for creation of data base for relay settings

Quote:

There is also a need for creating and maintaining data base of relay settings. Data regarding settings of relays in their network should be compiled by the CTU and STUs and furnished to the RLDC and SLDC respectively and a copy should also be submitted to RPC for maintaining the data base.

Unquote

ERPC had prepared scheme for above purpose for funding from PSDF. The scheme had been approved by MoP. SRPC submitted the scheme for similar purpose. Other RPCs were also requested to initiate the preparation of above scheme to implement the recommendations of the Ramakrishna Task Force. It was informed that the Ramakrishna task Force report had been accepted by MoP.

NPC advised RPCs to take necessary action for creating and maintaining database of relay setting. RPCs agreed to initiate preparation of the scheme for implementation recommendation of Ramakrishna Task Force.

In 122nd OCCM, the forum requested NERPC to undertake exercise in this regard on the same lines of ERPC.

NERPC may please inform the status.

D.14 Review of CEA(Technical Standards for Construction of Electrical Plants and Lines) Regulations, 2010:

The stated regulation is to be reviewed every five years. Members may please discuss for modification in Chapter IV, Part-A and Chapter-V, Part-A.

In 122nd OCCM, the members agreed to revert back with their views and any amendments if required.

Members may like to discuss.

AGENDA ITEMS FROM NERLDC:

D.15 Status of RE generation in NER:

NLDC is compiling details of renewable power plants in India. NERLDC has mailed all the power utilities regarding furnishing of details of RE Generation in NER. All the

power utilities are requested to furnish the details of RE Generators currently under operation and also provide information regarding RE Generators expected to be commissioned in future.

The formats are attached in **Annexure-D.15**.

For information & necessary action of members please.

D.16 Verification of Transmission Availability against outage of ISTS Elements:

Monthly Outage verification of ISTS elements is being done by NERLDC. To verify the reasons of outage as claimed by Transmission Licensee, relevant supporting documents namely Disturbance Recorder outputs (in COMTRADE format), Substation Event Logger, Relay indications, Photographs of affected parts of line, Patrolling report, FIR to local district administration, weather report etc. are required. Earlier, NERTS & NETC were also requested to indicate the particular clause of CERC regulations, in case of outages not attributable to respective ISTS Transmission Licensees. In absence of the supporting documents there could be ambiguity in the outage verification process. Accordingly, from next month onwards, NERTS & NETC may furnish the monthly outages for verification, incorporating relevant clause of CERC regulations, in Excel format, with all supporting documents. It is also requested to submit the details within 10th of every month for the previous month.

For deliberation of members please.

D.17 Furnishing of UFR Report and status of Implementation:

As per recommendation of enquiry Committee, the status of installation of UFR in NER is attached in Annexure-III. It is gathered that, 18.5 MW quantum is yet to be implemented in Arunachal Pradesh & Manipur.

DoP, Arunachal Pradesh & MSPCL is requested to provide current status of implementation of UFR in their respective states.

Further NERLDC has already mailed all the states, regarding submission of details of UFR operation on monthly basis as per format- Annexure-IV and the response is summarized as below:

Sl. No.	Name of Utility	Current Status	Remarks
1	DoP, Arunachal Pradesh	Submitted for May'16	
2	AEGCL	Submitted for June'16	Regularly submitting
3	MSPCL	Not submitted	
4	MePTCL	Not submitted	
5	P&E, Mizoram	Submitted for April'16	
6	DoP, Nagaland	Submitted for June'16	Regularly submitting
7	TSECL	Submitted for May'16	

All the states are requested to provide feeder-wise details of UFR operation during Grid Disturbance on 16th April'16 as per the attached format in **Annexure-D.17**.

For information & necessary action of members, please.

D.18 Outage of multiple reactors at Bongaigaon:

420 kV, 80 MVAR Bus Reactor IV at Bongaigaon is under outage since 8th June'16 due to very high hydrogen content on Y-Phase Bushing ; further 420 kV, 80 MVAR Bus Reactor III at Bongaigaon also blasted due to failure of B-Phase bushing on 25.06.16[as reported by NERTS].

After the above blasting incident 420 kV 50 MVAR Bus Reactor II at Bongaigaon, 420 kV 63 MVAR Line Reactor on 400 kV Bongaigaon - New Siliguri line I at Bongaigaon and 400 kV 63 MVAR Line reactor on 400 kV Bongaigaon - Balipara line I at Bongaigaon were taken under emergency shutdown by NERTS, reportedly due to low bushing oil level.

400 kV nodes in NER Grid are experiencing over voltage after commissioning of HVDC Biswanath Chariali. NER Grid is experiencing high voltage at 400 kV Buses due to outage of multiple Bus Reactors. To maintain voltage profile at 400 kV Buses, several 400 kV lines of NER were kept open. Total Loss of reactive power compensation is 323 MVAR due to these outages.

Such multiple outages of reactors are inimical for grid security/operation.

Members may like to discuss.

D.19 Updation of SPS Document of NER Grid:

NERLDC is preparing SPS Document of NER Grid. The draft SPS Document is attached as per **Annexure-D.19**.

All the concerned utilities are requested to give comments on the document and provide the updated Logic Diagram of SPS by 31st July'16.

For information & necessary action of members, please.

D.20 Furnishing of Black Start Time for Power Plants:

All the power utilities having black start facilities are requested to furnish the time required for Black Start of their Power Plants. These data are required by operators for restoration of Grid after disturbance, scheduling of Power plants etc.

The Power Utilities are also requested to provide the time required to start their generators after Grid power is extended upto their bus.

For information & necessary action of members, please.

D.21 Under requisition, Over drawal & DSM outstanding:

It has been observed that some of the constituents are over drawing from the grid on persistent manner whereas at the same time they are surrendering their shares. For instance both Assam and Tripura have overdrawn considerably in last week of June-16[please refer daily reports]. Further no effort is seen to toggle the drawal as per DSM regulation. Report pertaining to over drawal and non-payment to DSM pool is being reported to CERC as per directive. At any time CERC may take suo-motu action in these regard.

For better management of the Grid, it is desired that proper load forecasting is carried out by all the States and requirements met through firm schedule instead of leaning on DSM.

Members may like to discuss.

D.22 Load Forecast Error:

At present day-ahead hourly load forecast data on daily basis is being prepared by NERLDC based on the data sent by SLDCs. It has been observed that there is a huge difference between the forecasted load and the actual demand met.

A comparison between the forecasted load and the actual demand met of all the states of NER is attached in **Annexure-D.22**.

Members may like to discuss.

D.23 Primary Response of generating units:

Primary Response through governor action is expected to be provided by generating units as per section 5.2 (f) to 5.2 (i) of the Indian Electricity Grid Code (IEGC).

NLDC/RLDCs have been evaluating frequency response of all the regional entities due to large contingency in the system leading to load or generation loss. The Median value of FRC of North Eastern Region was of the order of 50 MW/Hz. From the response observed on 9th June'16 for load throw off of 4000 MW, it is apparent that there are scopes for improving of primary response through governor action.

The communication from ED, NLDC is attached at **Annexure-D.23**. The letter was already forwarded to all the concerned utilities by GM, NERLDC.

All the concerned generating utilities are requested to inform the status of implementation of Primary Response at each Generating Units.

As per, CERC approved Procedure for Assessment of Frequency Response Characteristic (FRC) of Control Areas in Indian Power System, all RLDCs are to submit FRC calculation to CERC if loss of load/generation greater than 1000 MW and frequency change of 0.05 Hz occurs in the Grid. Sometimes it has been observed that whatever correction in frequency is required, the same is done within 10secs. Since SCADA data is available after 10secs, these type of incidents are not captured properly. In other words, accurate value of FRC could not be derived from SCADA data due to its inherent design.

Accordingly, all the generating stations are requested to furnish data from DAS (Data Acquisition system) whenever such type of event occurs. If generating stations have not implemented DAS, it is requested to do so at the earliest.

Members may like to discuss.

D.24 Dynamic Data of generating units:

As deliberated in 11th System Study Meeting of NERPC, all the generating Units were requested to furnish dynamic data as per the formats circulated in previous meetings. Some of dynamic simulation data from IGSS are available with NERLDC as of now.

NLDC has prepared the Dynamic Model of All India Grid using legacy data. In order to tune the case for North-Eastern Region for performing Stability studies, it is necessary that all generating utilities to furnish the modelling information available with them. If

these data are not readily available with them, generating utilities of NER are requested to collect these data from manufacture and send these data to NERLDC.

For information & necessary action of members.

D.25 Outage Coordination:

In line with the provisions of the IEGC for outage coordination, a procedure was formulated by NLDC in Feb 2013 for stream lining the shutdown coordination activity.

As per the procedure, the outage indenting agency shall confirm its readiness to avail the outage to NERLDC by 10:00 hrs on D-3 basis i.e. 3 days ahead of the OCC approved date for availing the outage. All the power utilities are requested to inform about the readiness of availing the shutdown through mail to nerldcoutage@gmail.com. Some of the indenting agencies are not informing about the same, making outage co-ordination together with revision in Transfer Capability etc. difficult.

Outage coordinators of all utilities are requested to comply with the procedure.

For information & necessary action of members.

D.26 Impact on Transfer Capability of NER Grid after commissioning of Unit # 1 of BgTPP and 400/220 kV, 315 MVA ICT-II at Balipara:

The Transfer Capability (Import / Export) of NER to ER Grid is impacted by the generation at BgTPP (NTPC). The generation at BgTPP has caused reduction in Import Capability of NER from ER Grid, and increase in Export Capability of NER to ER Grid. This situation of reduction in Import Transfer Capability of NER Grid from ER is expected to further aggravate with commissioning of Unit # 2 and 3 of BgTPP.

After commissioning of 400/220 kV, 315 MVA ICT-II at Balipara (PG), the constraint for import capability of NER from Eastern Region has shifted to 220 kV Balipara – Sonabil – Samaguri link (earlier it was High loading of 400/220 kV, 315 MVA Misa ICT, under N-1 contingency of other ICT at Misa).

After commissioning of 220/132 kV, 2x100 MVA ICTs at Sonabil (AEGCL), the loading on 220 kV Balipara – Sonabil line is expected to increase further due to feeding of downstream loads from 220/132 kV Sonabil (AEGCL) substation. It is thus necessary to expedite commissioning of 2nd circuit of 220 kV Balipara – Sonabil – Samaguri link of AEGCL & kV and award of 400/220 2x500 MVA ICTs at Misa in order to address the constraint in Transfer Capability of NER from ER.

For information & necessary action of members, please.

AGENDA ITEMS FROM NERPC:

D.27 Real-Time Energy Assessment System for effective Grid Management-Software by CDAC

CDAC has submitted a proposal for Real-Time Energy Assessment System for effective Grid Management. The Proposed system has majorly three components namely, real-time data acquisition system, real-time energy assessment system and short term load

forecasting. This would be very useful for the SLDCs for forecasting the load and to plan the scheduling accordingly. This would also be useful for the users to have online information of the schedule and UI charges, this would help them to schedule and reduce their penalty and thereby contributing to the Grid stability. The project would approximately cost around 2 crores which would also require user contribution. The detailed proposal is given at **Annexure. D.27.**

Members may like to discuss.

AGENDA ITEMS FROM AEGCL:

D.28 Delay in Scheduling of power from NTPC ER stations.

It has been notice that in many instances, there is delay in scheduling of Partial or URS requisition of power from NTPC ER .

AEGCL may please deliberate.

D.29 Data mismatch in NERLDC website.

At many instances huge Data mismatch has been found in the Realtime Data “State Schedule vs Actual” of Assam displayed in the NERLDC website.

AEGCL may please deliberate.

AGENDA ITEMS FROM MeECL:

D.29 Certification of Meghalaya state T/L as ISTS line:

Based on initial studies by MeECL the following lines have been found to cater loads of other states in addition to Meghalaya, so they may be declared as ISTS line:

1. 220kV D/C Misa - Killing
2. 132 kV S/C Agia - Nagalbibra
3. LILO of 400kV D/C Pallatana - Bongaigoan at 400/220kV Killing S/S

The matter was discussed in one of the sub-group meetings and it was suggested that NLDC/NERLDC may conduct studies by WebNet software and inform the members of load flow patterns in 123rd OCC.

NERLDC may please intimate the details.

Any other item:

Date and Venue of next OCC

It is proposed to hold the 124th OCC meeting of NERPC on second week of August, 2016. The date & exact venue will be intimated in due course.

1. Summary of System Protection Schemes (SPS)

Normally all the System protection schemes are proposed, discussed and getting approved in RPC meetings such as OCC, PCC, TCC and RPC Board meetings.

The Summary of System Protection Schemes (SPS) both inter/Intra regional which are in service, and no of schemes Approved, no of schemes under discussion stage are detailed below

Sl. No.	Region	No. of Schemes In service	No. of Schemes approved (yet to be operationalized)	No. of schemes under discussion	Remarks
1	North Eastern Region	9			

The System protection schemes for Inter / intra-regional corridor (Region wise) divided in to three categories as stated below.

- i) SPS related to tripping of critical line / corridor
- ii) SPS related to safe evacuation of Generation
- iii) SPS related to overloading of Transformers
- iv) SPS related to maintaining transfer capability

The summary of SPS both inter/intra regional which are in service, and number of schemes yet to be operationalized based on the categories above are detailed below:

Region	Tripping of critical line(s) / corridor			Safe evacuation of generation			Overloading of Transformers / Critical line(s)			TOTAL
	In Service	Approved	Under Discussion	In Service	Approved	Under Discussion	In Service	Approved	Under Discussion	
NER	4	0		2			3			9

Also the system protection schemes for inter/intra-regional corridors (region-wise) can be categorized as stated below:

- i) SPS related to Generation rejection
- ii) SPS related to Load rejection

- iii) SPS related to Generation/Load rejection
- iv) SPS related to HVDC controls
- v) SPS related to others

2. SPS in North Eastern Region

RefNo.	Name of the Scheme	Implementing Agency	Status
SPS/NER/LINE/01	SPS associated with tripping of 400kV Palatana–Silchar D/C lines	CTU, OTPC AEGCL, MePTCL and TSECL	In Service w.e.f. 23.02.2015
SPS/NER/LINE/02	SPS associated with tripping of 400kV Silchar–Azara S/C and 400kV Silchar–Byrnihat S/C lines when there is no generation at Palatana CCGT	CTU, AEGCL, MePTCL and TSECL	In Service w.e.f. 14.09.2013
SPS/NER/LINE/03	SPS associated with overloading of 220kV Salakati – BTPSD/C lines (PG)	CTU, AEGCL	In service w.e.f 23.06.2015
SPS/NER/LINE/04	SPS associated with tripping of 132 kV Umiam Stg-I to Umiam St-III D/C lines	MePTCL	In service w.e.f June 2015
SPS/NER/GEN/01	SPS associated with tripping of 400kV Silchar–Azara S/C and 400kV Silchar–Byrnihat S/C lines during generation of 1st Module of Palatana	CTU, OTPC, AEGCL, MePTCL and TSECL	In Service w.e.f 23.02.2015
SPS/NER/GEN/02	SPS associated with generation evacuation from AGTPP	NEEPCO, CTU	In service w.e.f. 21.07.2015
SPS/NER/TRF/01	SPS associated with tripping of generation of 1st Module of Palatana CCGT (363.3	CTU, OTPC, AEGCL, MePTCL TSECL	In Service w.e.f. 14.09.2013
SPS/NER/TRF/02	SPS associated with tripping of 400/132kV, 2x200MVA ICTs at Silchar (PG)	CTU, AEGCL	In service w.e.f. 29.06.15
SPS/NER/TRF/03	SPS associated with more than 60MW loading from LV to HV side of Azara ICTs	AEGCL	In Service w.e.f August 2014

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RefNo.	Name of the Scheme	Implementing Agency	Status	
SPS related to tripping of critical line / Corridor				
SPS/NER/LINE/01	SPS associated with tripping of 400kV Palatana–Silchar D/C lines	CTU, OTPC AEGCL, MePTCL and TSEC	In Service	
SPS/NER/LINE/02	SPS associated with tripping of 400kV Silchar–Azara S/C and 400kV Silchar–Byrnihat S/C lines when there is no generation at Palatana CCGT	CTU, AEGCL, MePTCL and TSECL	In Service	
SPS/NER/LINE/03	SPS associated with overloading of 220kV Salakati – BTPSD/C lines (PG)	CTU, AEGCL	In Service	
SPS/NER/LINE/04	SPS associated with tripping of 132 kV Umiam Stg-I to Umiam St-III D/C lines	MePTCL	In service	
SPS related to Safe evacuation of generation				
SPS/NER/GEN/01	SPS associated with tripping of 400kV Silchar–Azara S/C and 400kV Silchar–Byrnihat S/C lines during generation of 1st Module of Palatana	CTU, OTPC, AEGCL, MePTCL and TSEC	In Service	
SPS/NER/GEN/02	SPS associated with generation evacuation from AGTPP	NEEPCO, CTU	In Service	
SPS related to overloading of Transformers / Critical Line(s)				
SPS/NER/TRF/01	SPS associated with tripping of generation of 1st Module of Palatana CCGT (363.3	CTU, OTPC, AEGCL, MePTCL	In Service	
SPS/NER/TRF/02	SPS associated with tripping of 400/132kV, 2x200MVA ICTs at Silchar (PG)	CTU, AEGCL	In Service	
SPS/NER/TRF/03	SPS associated with more than 60MW loading from LV to HV side of Azara ICTs	AEGCL	In Service	

SPS related to tripping of critical line / Corridor

RefNo: SPS/NER/LINE/01

SPS for NER Grid Security with Modules (GT+ST) of OTPC Palatana generating station (2 x 363.3 MW)

SPS2- When 400kV Palatana-Silchar (D/C) line strip

Pre-condition:

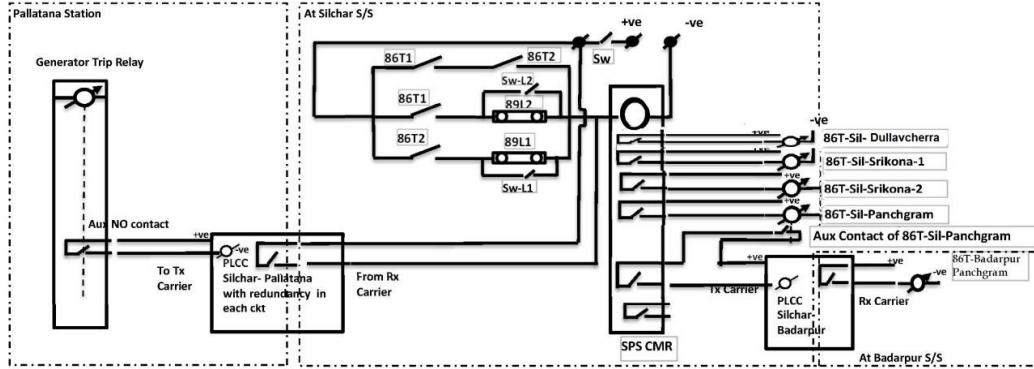
Following lines should be kept in open condition

- 132kV Khliehriat–Lumshnong S/C
- 132kV Pailapool –Jiribam line at Jiribamend
- 132kV PKBari –Dharmangar S/C will be kept open

Scheme:

- i. When both the checks of 400kV Palatana–Silchar line strip, a signal will be generated from trip relays at Silchar
- ii. This signal should trip the HV Circuit Breaker of 400/132 kV, 125 MVA Palatana ICT to maintain safe, secure and reliable operation of Tripura system
- iii. Also this signal should trip CB of 132kV Silchar–Srikona D/C, 132kV Silchar–Panchgram S/C & 132 kV Silchar –Dullavcherra S/C lines at Silchar.
- iv. Subsequent to tripping of 132kV Silchar–Panchgram line, a signal will be generated from trip relay of 132kV Silchar–Panchgram line. This signal should trip the CB of 132kV Badarpur–Panchgram line at Badarpur.
- v. After these trippings a instant load relief of 109MW at Off-peak & 159MW in Peak.
- vi. The signal from tripping of 400kV Silchar – Palatana D/C should also enable reduction of Generation of Module I & II of Palatana, OTPC to around 20MW excluding the auxiliary consumption.
- vi. Then manual demand management/ disconnections should be imposed, if necessary.

Special Protection Scheme for Grid Security of NER- Case1 & 2



86T1 Trip Relay of Silchar-Pallatana ck1 at Silchar End.

86T2 Trip Relay of Silchar-Pallatana ck2 at Silchar End.

89L1 Line Isolator Aux. Contact Silchar-Pallatana ck1 at Silchar End.

89L2 Line Isolator Aux. Contact Silchar-Pallatana ck2 at Silchar End.

SPS CMR High Speed Contact Multiplier relay to be installed & wired at Silchar substation

Sw In Out Switch for SPS scheme,

Sw-L1, Sw-L2 SPS in out switch for Line L1,L2. To be kept ON(through) whenever respective Line is Out & to be kept Off when Line is in service.

Scheme Requirement:

- i. When generator at Palatana trips or both the ckts of 400 kV Palatana – Silchar lines trip, a signal will be generated from trip relays at Silchar
- ii. This signal should trip the CB of 132 kV Silchar – Srikona D/C & 132 kV Silchar – Dullavcherra line & 132 kV Silchar – Panchgram lines at Silchar.
- iii. Subsequently, tripping of 132 kV Silchar – Panchgram line a signal will be generated from trip relay of 132 kV Silchar –Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.

**SPSforNERGridSecuritywithModules(GT+ST)ofOTPCPalatanaq
eneratingstation(2x363.3MW)**

**SPS4- When 400kVSilchar–ByrnihatS/Cand 400kVSilchar–AzaraS/Cline
trips (withoutgenerationatPalatana)**

Pre-condition:

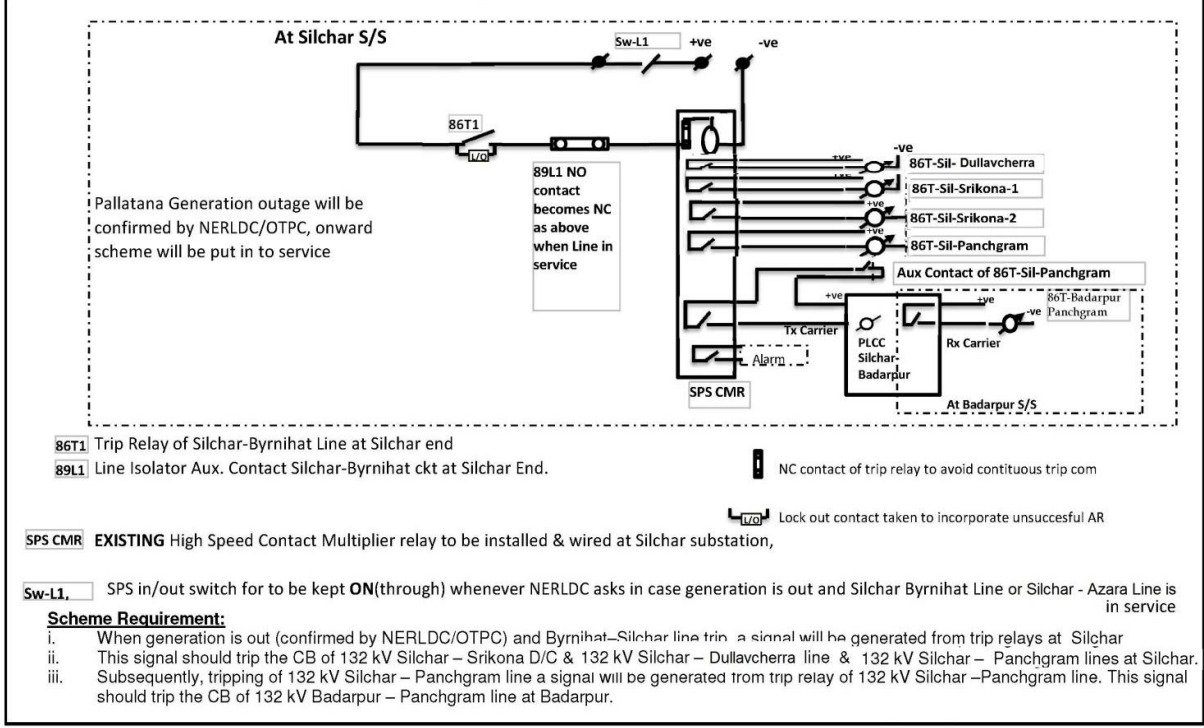
Following lines should be kept in open condition

- 132kVKhliehriat–LumshnongS/C
- 132kVPailapool –Jiribam line at Jiribamend
- 132kVPKBari –Dharmangar S/Cwill be kept open

Scheme:

- i. When 400kVSilchar–Byrnihatlineand 400kVSilchar–Azaralinetrips, a signal will be generated from trip relays at Silchar. Also, in case of outage of either 400kVSilchar–Byrnihatline or 400kVSilchar–Azaraline, if other line trips, signal will be generated from trip relays at Silchar.
- ii. This signal should trip the CB of 132kVSilchar–SrikonaD/C, 132kVSilchar–PanchgramS/C & 132kVSilchar –DullavcherraS/C lines at Silchar.
- iii. Subsequent to tripping of 132kVSilchar–Panchgramline, a signal will be generated from trip relay of 132kVSilchar–Panchgramline. This signal should trip the CB of 132kVBadarpur–Panchgramline at Badarpur.
- iv. After these trippings an instant load relief of around 109MW in Off-Peak and 159MW in Peak Hours will be obtained.
- v. Then manual demand management/ disconnections should be imposed, if necessary.

Special Protection Scheme for Grid Security of NER- Case4



Note :

TheSPSchemes asstatedabovearesubject tochangeswithchanging gridconditions.Theloadsbeing disconnectedwiththeconfiguration as per currentSPSincludeloadsinSouthAssam,partofMeghalayaand partofTripura power systems.

SPS associated with overloading of 220kV Salakati – BTPSD/Clines

Pre-Condition:

The Dhaligaon area load of Assam needs to be kept in radial mode and Bhutan load through 132kV Rangia – Deo thang S/C must not be affected due to operation of this SPS.

Scheme:

- i. To prevent tripping of 220kV Salakati – BTPSD/Clines, radial loads in Dhaligaon area of Assam may be shed as a precautionary measure.
- ii. When 220kV Salakati – BTPSD/Clines get overloaded (more than 600 Ampere current per circuit) in Salakati – BTPS direction, a signal would be generated that will trip radial loads in Dhaligaon area of Assam by tripping of 132 kV BTPS – Dhaligaon I & II lines.
- iii. In case of outage of one circuit of 220kV Salakati – BTPSD/Clines, and overloading of the existing circuit (more than 600 Ampere in Salakati – BTPS direction), a signal would be generated that will trip radial loads in Dhaligaon area of Assam.

SPS associated with tripping of 132 kV Umiam Stg-I – Umiam Stg-

III D/C lines

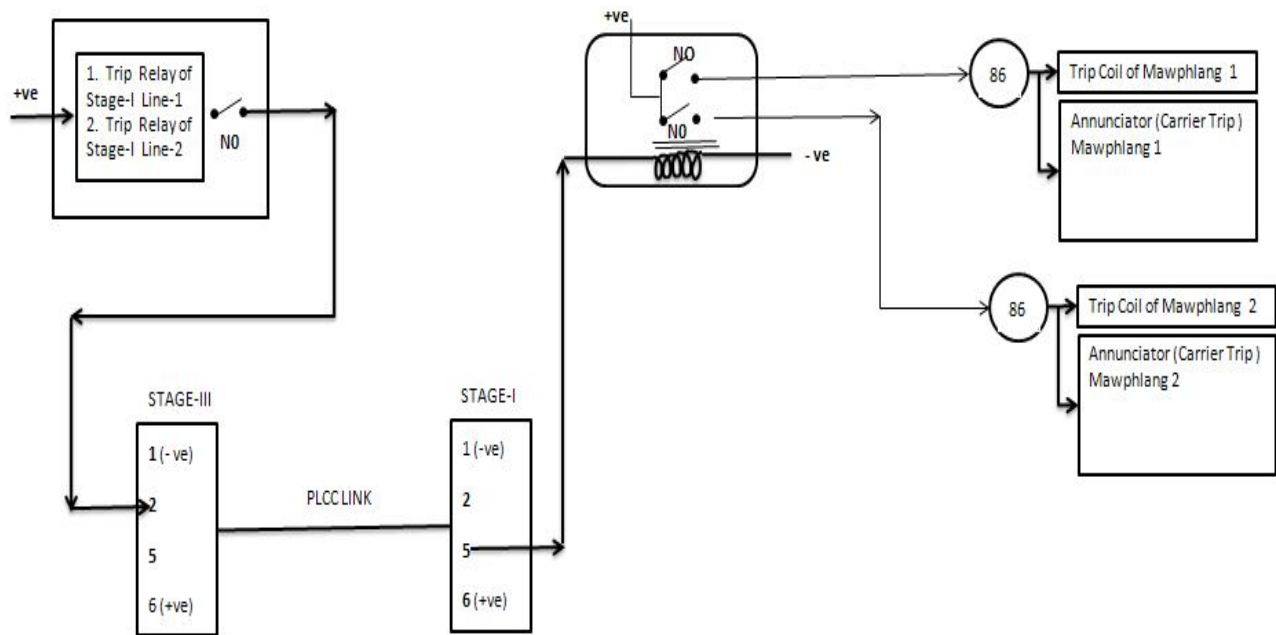
Pre-Condition:

Meghalaya power system shall be segregated into 3 parts by opening of 132 kV Umiam Stg-I – Umiam line & 132 kV Mawlai – Umiam line and 132 kV Nongstoin – Mawphlang line. One part of Meghalaya power system loads shall be fed from Khliehriat (PG) substation, other part connected through 132 kV Agia – Nangalbibra line and the 3rd part through 220/132 kV Killing (Byrnihat) substation.

Scheme:

- iv. To prevent collapse of part of Meghalaya system fed from 220/132 kV Killing (Byrnihat) substation, carrier inter-tripping scheme has been implemented to prevent tripping of 132 kV Umiam St-I – Umiam St-III D/C lines.
- v. In the event of any fault that results in failure or tripping of 132 kV Umiam St-III – Umiam Stg-I D/C lines, a carrier signal would instantaneously be received at the PLCC Protection equipment. The same signal would be transmitted via PLCC link from Stage III to protection equipment at stage I power station. The command is further extended to the tripping circuit at C&R panel resulting in direct trip of two feeders namely, Mawphlang Feeder 1 and Mawphlang Feeder 2 at Stage I power Station shedding a combined load of 25 MW (max) instantaneously.
- vi. If Garo Hills load is provided through 132 kV Nangalbibra – Nongstoin line instead of 132 kV Agia-Nangalbibra line, then the load relief on account of operation of this SPS shall 75 MW (maximum).

Inter-tripping scheme between 132 kV Umiam St-I to Umiam St-III D/C lines



SPSrelatedtoSafeevacuationofGeneration

RefNo: SPS/NER/GEN/01

SPSforNERGridSecuritywithModules(GT+ST)ofOTPCPalatana generatingstation(2x363.3MW)

SPS3- When 400kVSilchar–ByrnihatS/Cand 400kVSilchar–AzaraS/Clinestrip(withgenerationatPalatana)

Pre-condition:

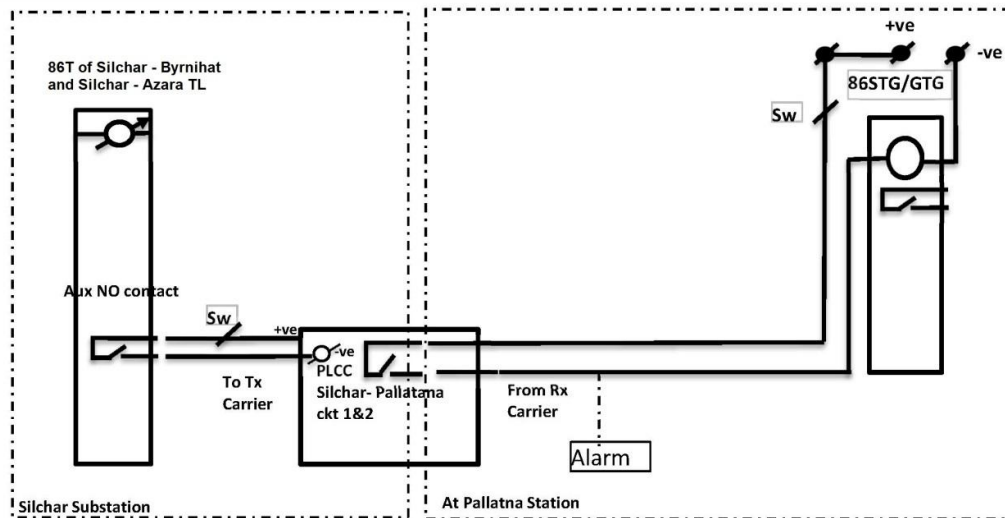
Following lines should be kept in open condition

- 132kVKhliehriat–LumshnongS/C
- 132kVPailapool –Jiribam line at Jiribamend
- 132kVPKBari –Dharmangar S/Cwill be kept open

Scheme:

- i. When 400kV Silchar–Byrnihat S/C and 400kV Silchar–Azara S/C linestrip, signal will be generated from trip relays at Silchar. Also, in case of outage of either 400kV Silchar–Byrnihat line or 400kV Silchar–Azara line, if other line trips, signal will be generated from trip relays at Silchar.
- ii. This signal should trip CBs of GTG/STG of 1st Module of Palatana CCGT (as may be required). But the tripped unit of Palatana will be running in FSNL (Full Speed No Load). The unit of Palatana may be tripped allowing a maximum of 200 MW injection from Palatana.
- iii. Then manual demand management/ disconnection of load should be imposed, if necessary.

Special Protection Scheme for Grid Security of NER- Case:3



86T Trip Relay of Silchar-Pallatana ck1 at Silchar End.

86GTG 86 Trip relay for GTG at Pallatana

Note: At Present spare channel is not available for Silc-Pallatana PLCC links , can be made available on procurement.

Sw In Out Switch for SPS scheme

Scheme:

- i. When 400 kV Byrnihat – Silchar line & 400 kV Silchar - Azara lines trip, signal will be generated from trip relays at Silchar
- ii. This signal should trip CB of GTG/STG of at Palatana. But unit will be running in FSNL
- iii. A instant relief in line loading of 230/130 MW which will avert the system from cascade tripping.
- v. Then manual demand disconnection should be imposed.

SPSfor generation from 6 units of AGTPP – Extension project

When 132 kV AGTPP – Kumarghat S/C line trips (with generation from 4 nos. GT and 2 nos. ST – Extension of AGTPP)

Scheme:

- i. Under N-1 contingency of 132 kV AGTPP – Kumarghat S/C, with generation from 4 nos. GT (Existing) of AGTPP and 2 nos. ST (Extension) of AGTPP, there may be sudden overloading in several lines outgoing from AGTPP or in Tripura power system.
- ii. The tripping of 132 kV AGTPP – Kumarghat line should result in generation reduction of 32 MW at AGTPP (from AGTPP – Extension units) in order to maintain safe line loading on outgoing feeders from AGTPP

(The SPS has been put in service w.e.f. 1300 Hrs of 21-July-2015).

RefNo:SPS/NER/TRF/01

**SPSforNERGridSecuritywithModules(GT+ST)ofOTPCPalatanaq
eneratingstation(2x363.3MW)**

SPS1- WhenPalatanaunittrips

Pre-condition:

Following lines should be kept in open condition

- 132kVKhliehriat(MePTCL) –Lumshnong S/C
- 132kVPailapool –Jiribam line at Jiribamend
- 132kVPKBari –Dharmangar S/C will be kept open

Scheme:

- ii. When both Module of Palatana CCGT trips, a signal will be generated from trip relay of the Modules.
- iii. This signal should then trip the CB of 132kV Silchar – Srikona D/C, 132kV Silchar – Panchgram S/C & 132 kV Silchar – Dullavcherra S/C lines at Silchar.
- iv. Subsequent to tripping of 132kV Silchar – Panchgram line, a signal will be generated from trip relay of 132kV Silchar – Panchgram line. This signal should trip the CB of 132kV Badarpur – Panchgram line at Badarpur.
- v. After these trippings an instant load relief of around 109MW in Off-Peak and 159MW in Peak.
- vi. Then manual demand management/ disconnections should be imposed, if necessary.

RefNo:SPS/NER/TRF/02

SPS for tripping of 400/132 kV, 2x200 MVA transformers at Silchar (P)

G)

Pre-condition:

Following lines should be kept in open condition

- 132 kV Khliehriat–Lumshnong S/C
- 132 kV Pailapool –Jiribam line at Jiribamend
- 132 kV PKBari –Dharmangar S/C will be kept open

Scheme:

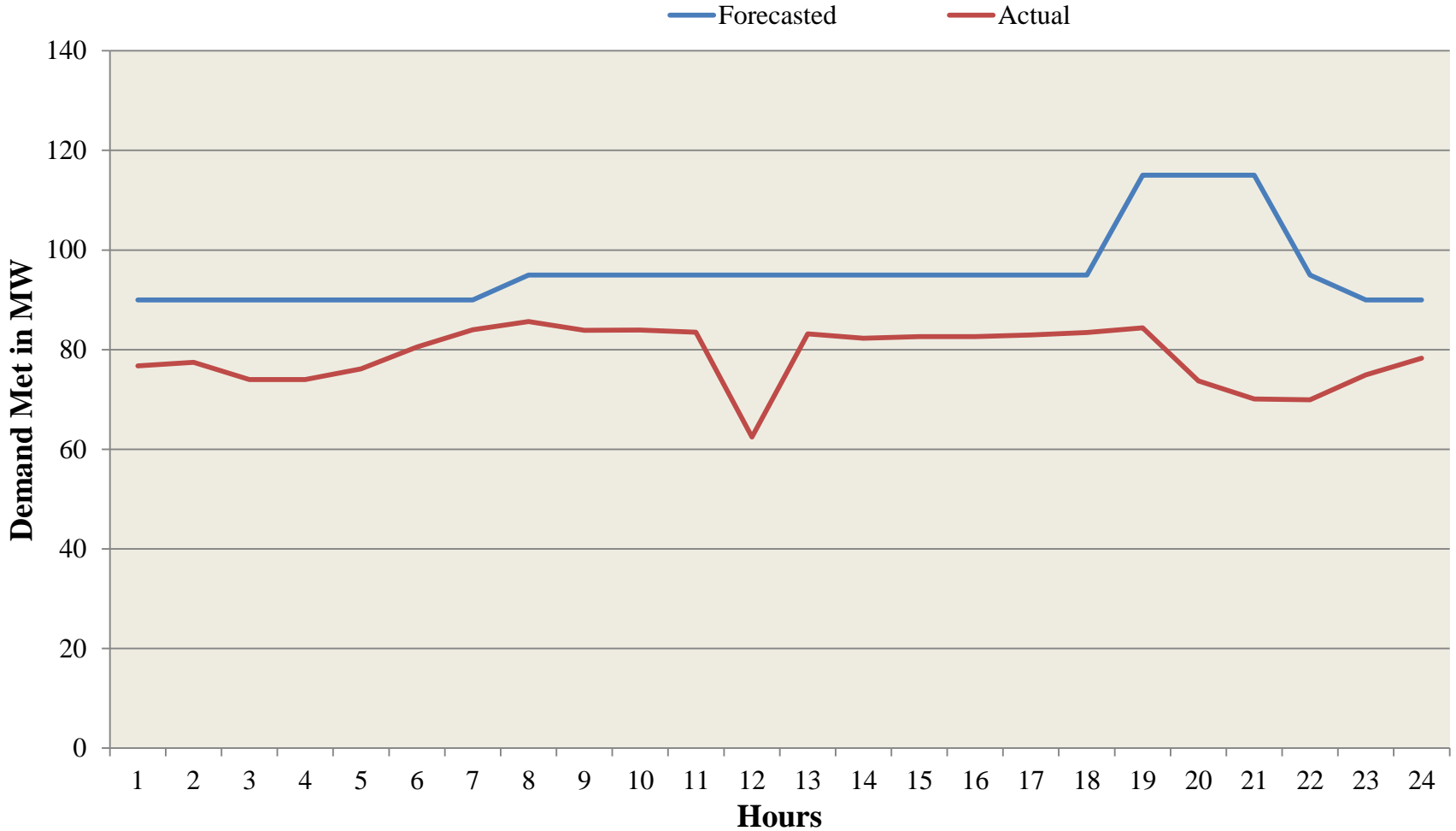
- i. To maintain a safe loading of 400/132 kV, 2x200 MVA transformer at 400/132 kV Silchar (PG) substation, radial loads in Southern part of NER Grid are to be shed.
- ii. Upon tripping of any ICT among 2 x 200 MVA, 400/132 kV ICTs at Silchar, a signal shall be generated.
- iii. This signal should then trip the CB of 132 kV Silchar – Srikona D/C, 132 kV Silchar – Panchgram S/C & 132 kV Silchar –Dullavcherra S/C lines at Silchar.
- iv. Subsequent to tripping of 132 kV Silchar – Panchgram line, a signal will be generated from trip relay of 132 kV Silchar –Panchgram line. This signal should trip the CB of 132 kV Badarpur – Panchgram line at Badarpur.
- v. After these trippings an instant load relief of around 109 MW in Off-Peak and 159 MW in Peak.
- vi. In case one ICT at 400/132 kV Silchar substation is out-of-service, the SPS will still act to disconnect radial loads in Southern part of NER Grid.

SPS associated with more than 60MW loading from LV to HV side of 400/220kV, 2x315MVA Azara ICTs

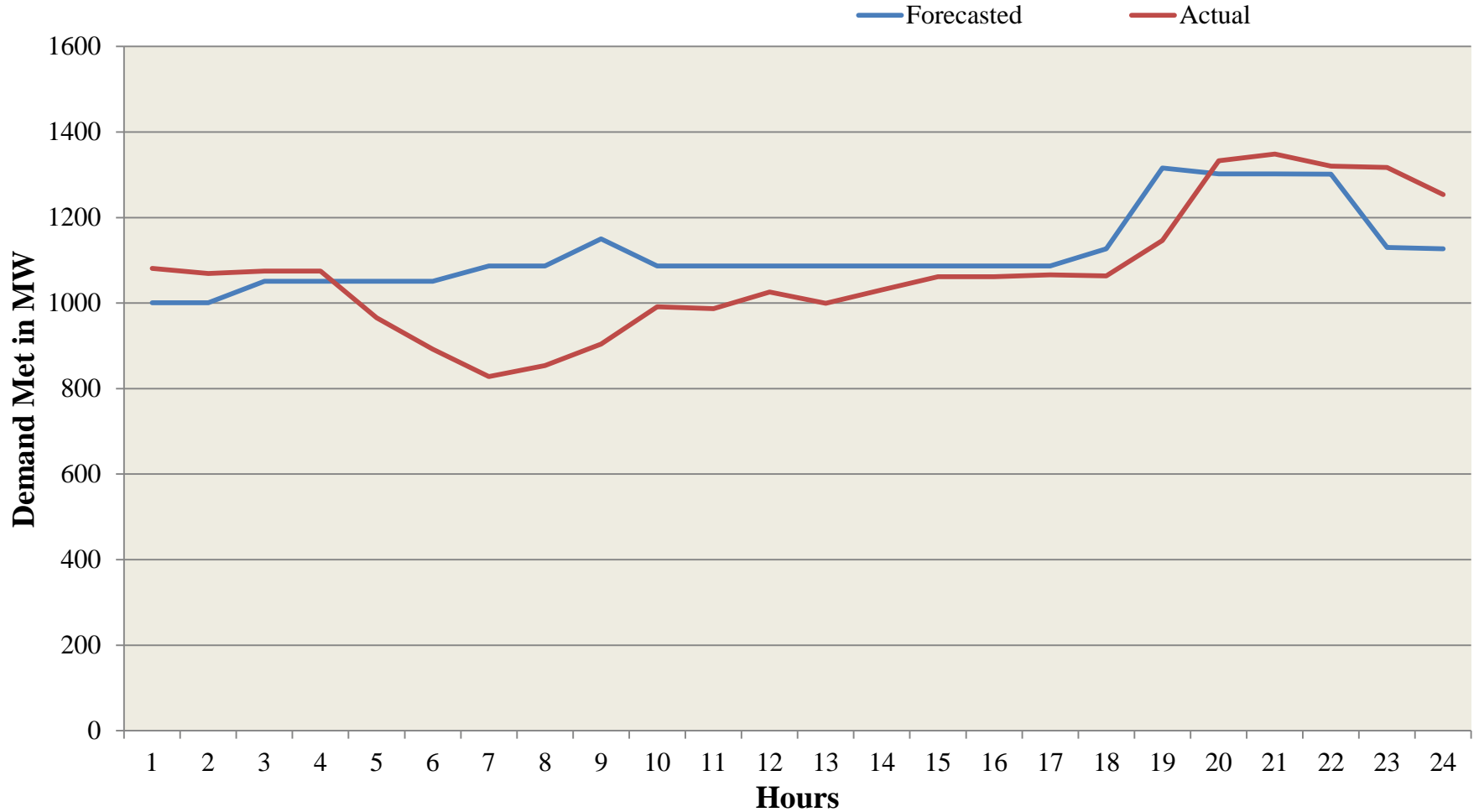
Scheme:

- i. When power flows in 400/220kV, 2x315MVA ICTs at Azara (AEGCL) substation from 220kV to 400kV, it may lead to overloading of 220kV Salakati–BTPSD/Clines.
- ii. When power flow on 400/220kV, 2x315MVA ICTs at Azara (PG) reaches 60MW from 220kV to 400kV side, a relay would pick-up resulting in tripping of 400/220kV, 2x315MVA ICTs at Azara (AEGCL).
- iii. This will prevent flow of power from 220kV Salakati–BTPSD/Cline to Southern part of NER Grid, in absence of sufficient generation in Southern part of NER grid.
- iv. This may affect loads served in Southern part of NER Grid, but will avert tripping of critical corridors in NER Grid.

Comparison Between Forecasted & Actual Demand Met of Arunachal Pradesh for 06-Jul-16

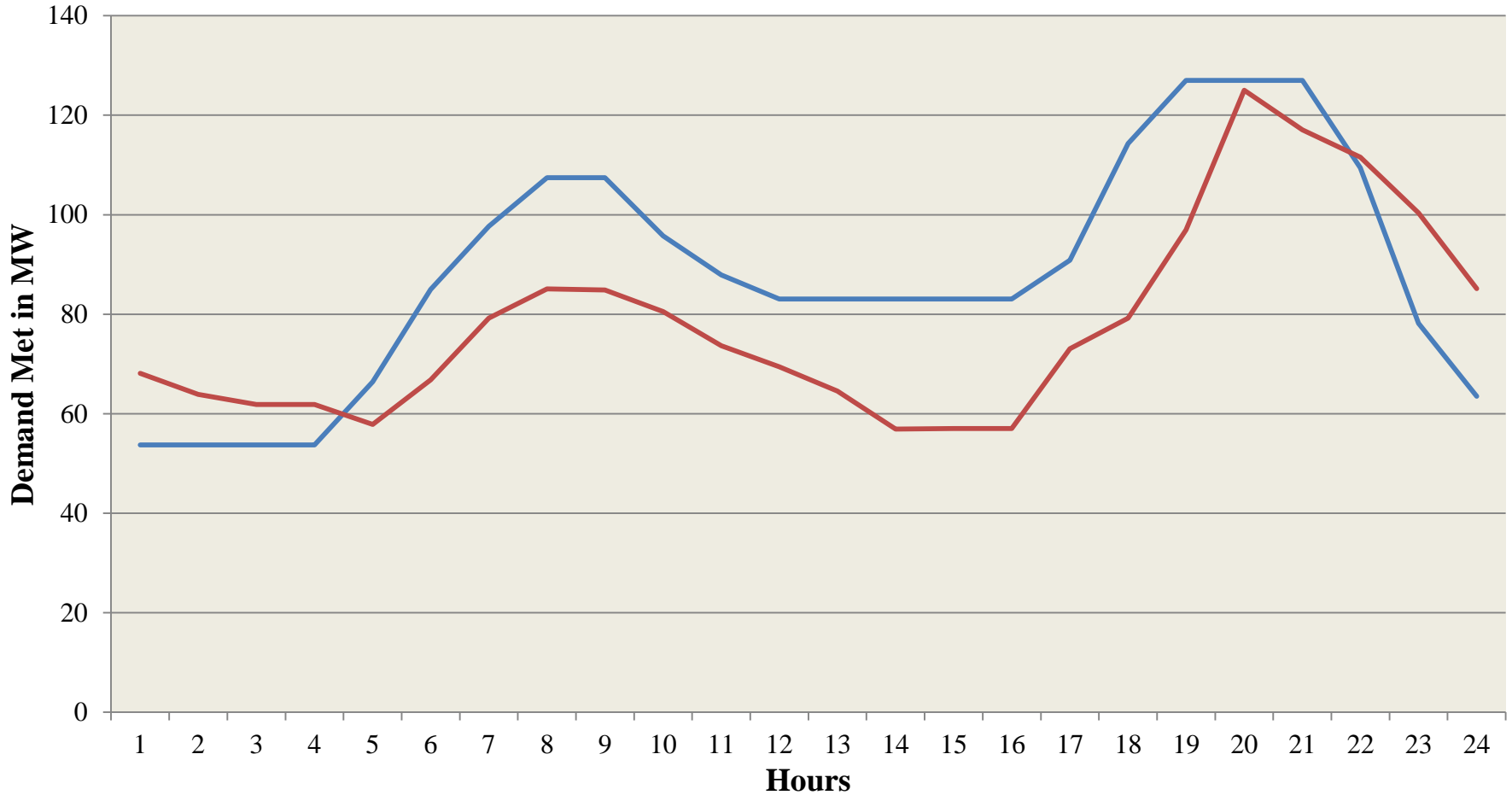


Comparison Between Forecasted & Actual Demand Met of Assam for 06-Jul-16



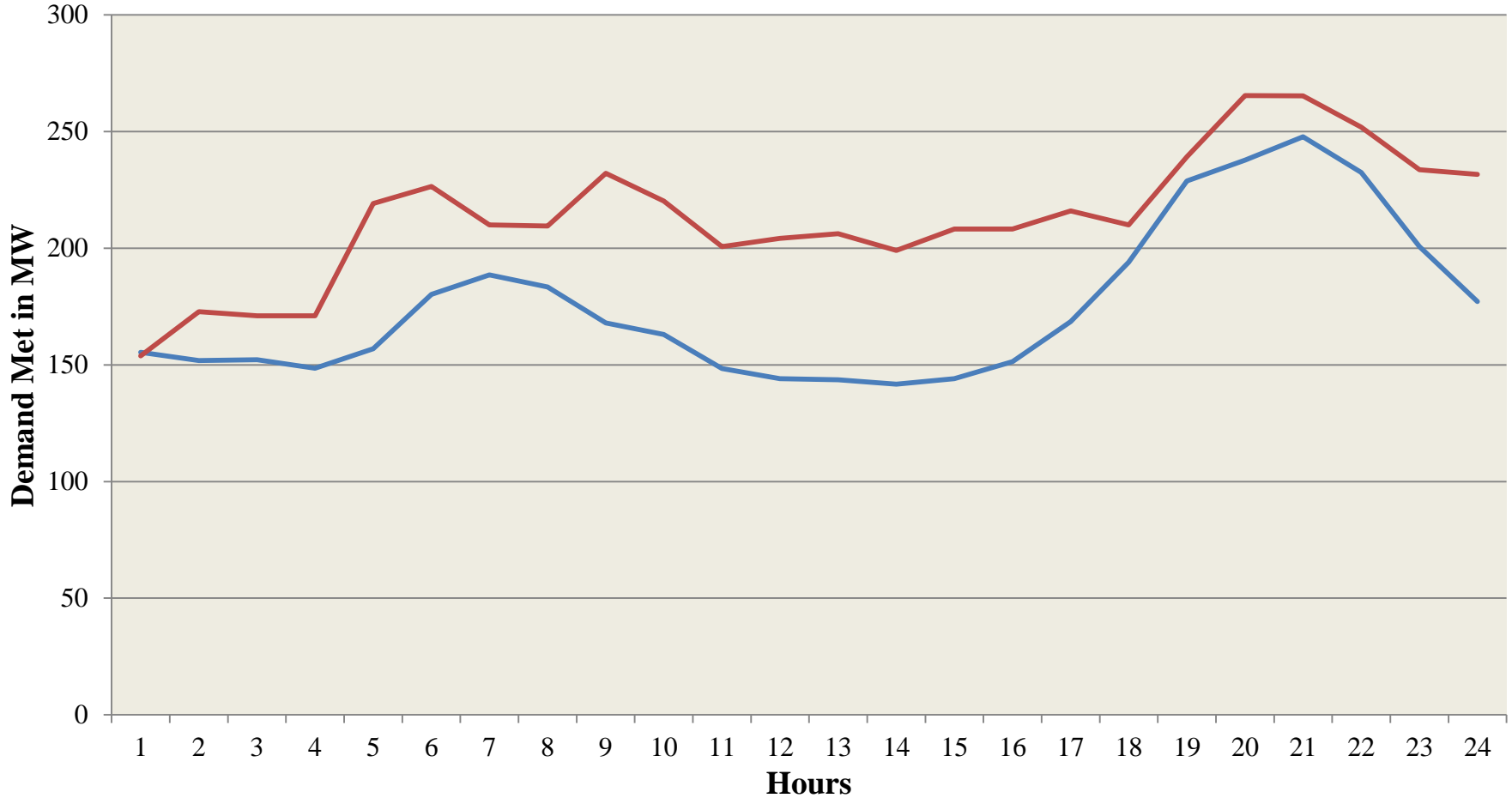
Comparison Between Forecasted & Actual Demand Met of Manipur for 06-Jul-16

— Forecasted — Actual

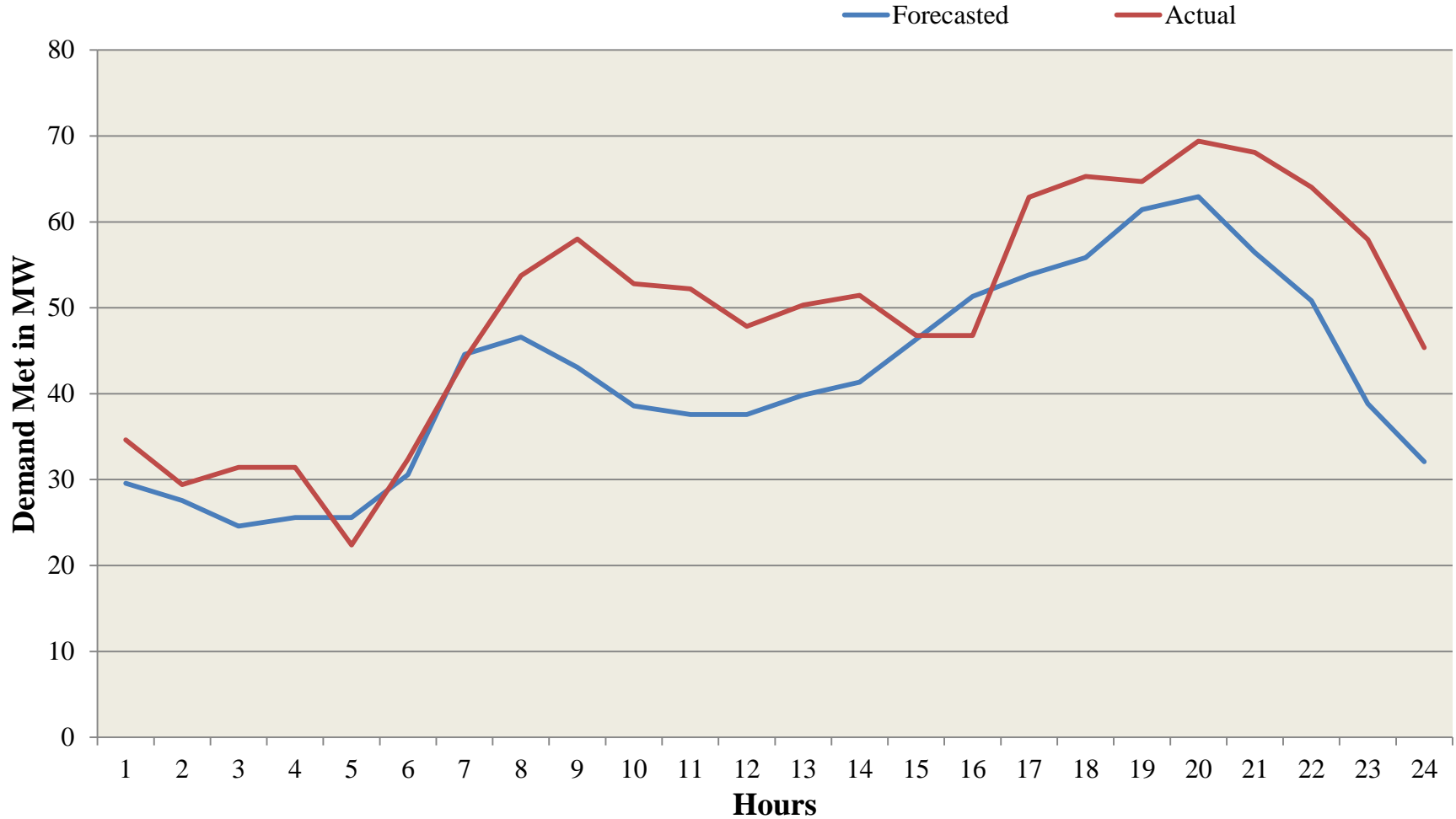


Comparison Between Forecasted & Actual Demand Met of Meghalaya for 06-Jul-16

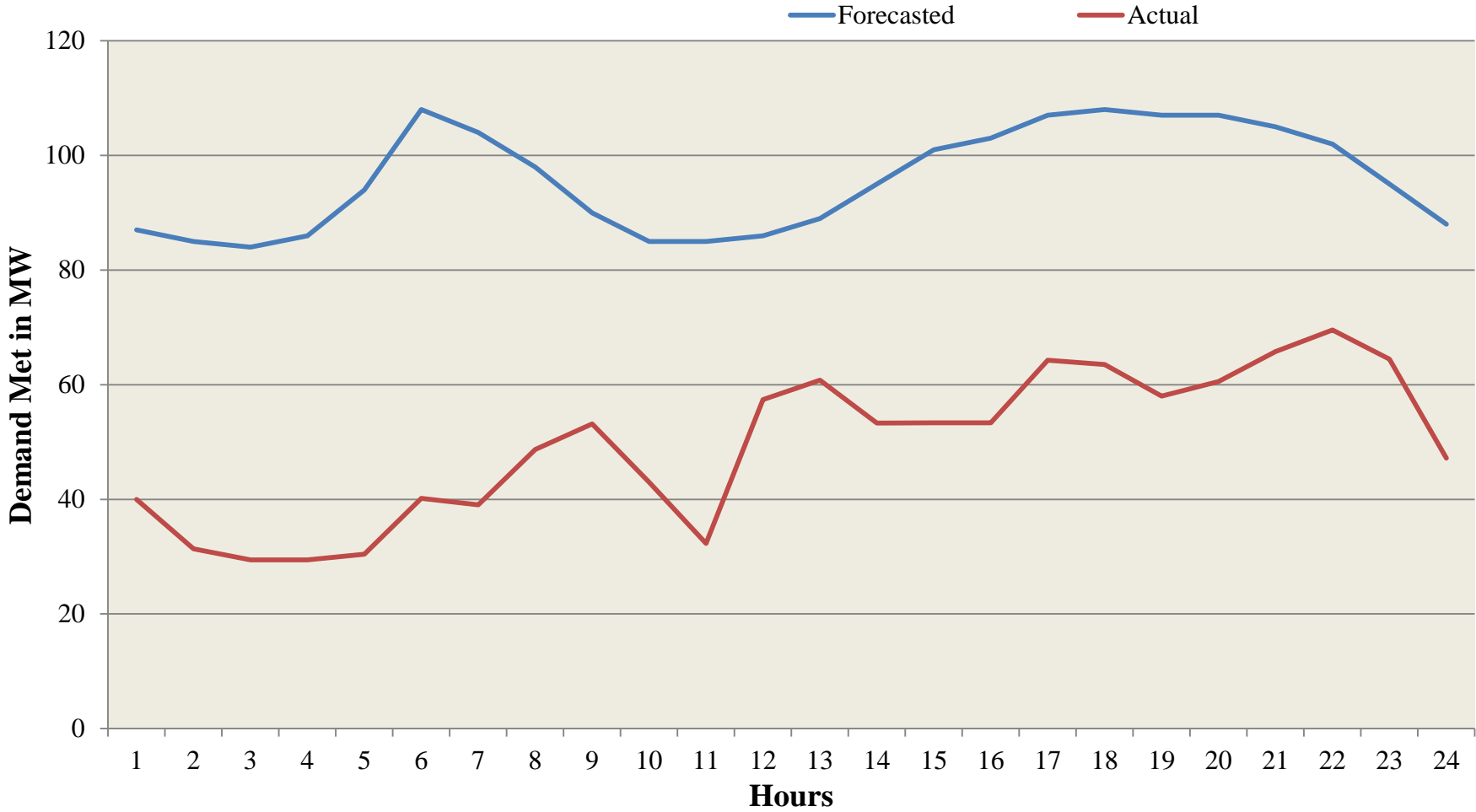
Forecasted Actual



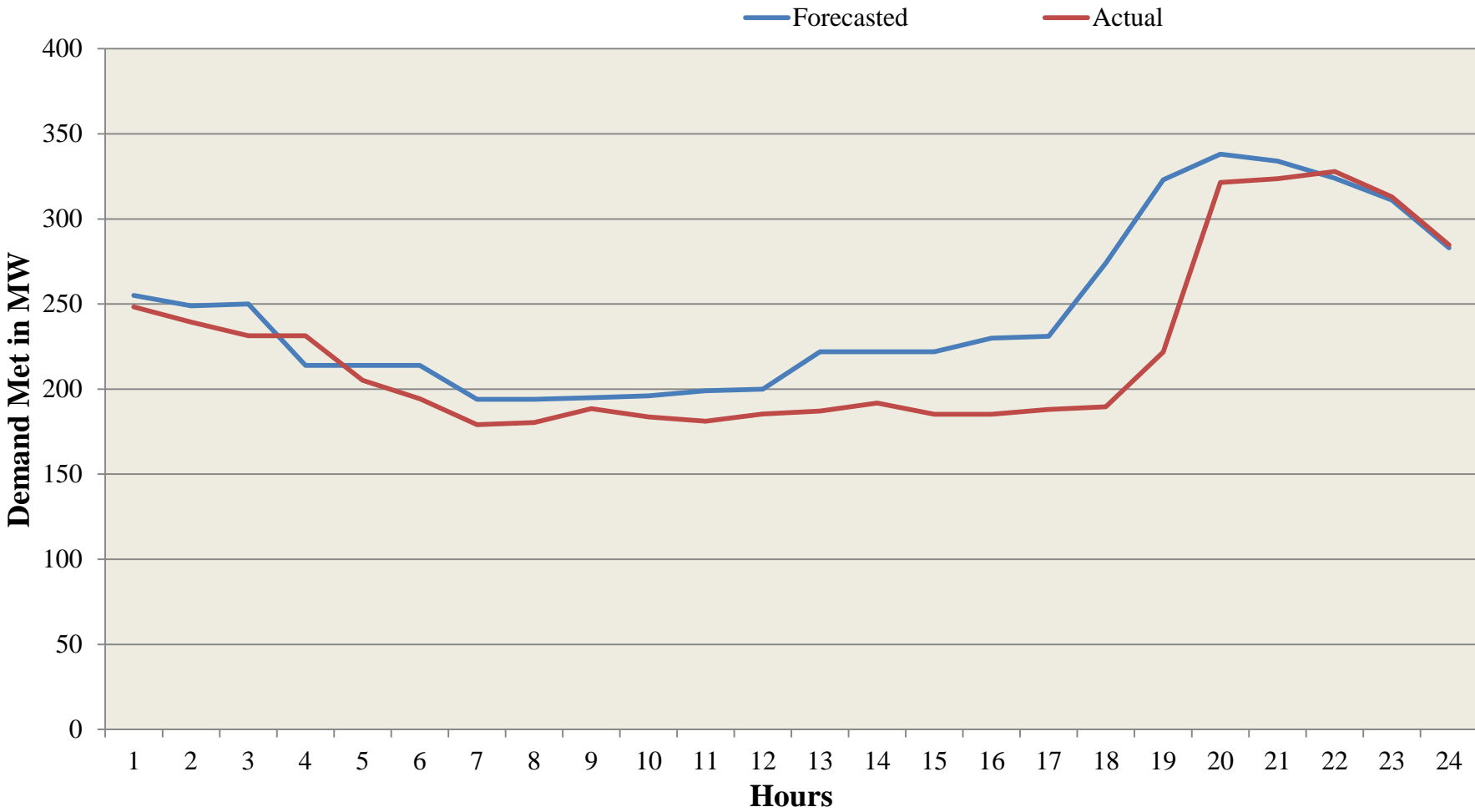
Comparison Between Forecasted & Actual Demand Met of Mizoram for 06-Jul-16



Comparison Between Forecasted & Actual Demand Met of Nagaland for 06-Jul-16



Comparison Between Forecasted & Actual Demand Met of Tripura (with Bangladesh) for 06-Jul-16



पावर सिस्टम ऑपरेशन कॉरपोरेशन लिमिटेड
अंतर कार्यालय ज्ञापन

प्रेषक: कार्यपालक निदेशक(रा.भा.प्रे.के.)

सेवा मे: वितरण सूची के अनुसार

सन्दर्भ: पोसोको/ रा.भा.प्रे.के./ 2016/06

दिनांक: 27.06.16

Subject: Primary response through governor action on generating units

RLDCs/NLDC have been evaluating the frequency response of all regional entities due to a large contingency in the system leading to load or generation loss during the last four years. The tabulation of Frequency Response Characteristics (FRCs) region wise and All India wise since 1st Jan 2015 to 22nd June 2016 is enclosed at **Annexe-I**. It would be observed that the All India median FRC was of the order of 6500 MW/Hz for these 30 events. Median value of FRC was of the order of 1700 MW/Hz for Northern and Western regions and 2550 MW/Hz for Southern region. The FRC for Eastern region was of the order of 600 MW/Hz and 50 MW/Hz for the North east.

Ancillary Services have also been implemented wef 12th April 2016 resulting in better tertiary control for frequency. One of the best daily frequency profile has been achieved on 19th June 2016 with an average frequency of 50.0 Hz and standard deviation of 0.05 Hz. Copy of frequency plot is enclosed at **Annexe-II**.

All this has been achieved mainly with manual controls in the form of scheduling and manual tertiary control through Ancillary Services framework at the inter state level and telephonic advice. For further ramping up this effort, primary and secondary frequency control is also necessary. Actions are being initiated for secondary control through a pilot project initially which could be scaled up quickly to an All India level as per the roadmap identified by the Central Electricity Regulatory Commission (CERC) vide order dated 13th Oct 2015.

Primary response through governor action is already expected to be provided by generating units as per sections 5.2 (f) to 5.2 (i) of the Indian Electricity Grid Code (IEGC). However, the trend of FRCs (Annexe-I) as well as the response from regional entities observed on the 9th June 2016 for load throw off of 4000 MW (placed at **Annexe-III**) suggests that there is

a lot of scope for improving primary response through governor action. On day to day basis, the sharp frequency excursions at hourly boundary (significantly observed at 1800 hrs) are also a cause of concern. Primary response can check this problem which may help in improving the frequency profile.

As a first step, it is requested that all generating units may be encouraged to start providing primary response as per their speed droop. It is observed that the frequency generally comes back to within 50 Hz in less than three (3) minutes after all such events and if all the eligible generators participate, the frequency rise would be contained and the unit output would reduce by only 2-3%. (5% reduction on eligible units in case of 0.125 Hz frequency rise above 50 Hz with 5% speed droop).

RLDCs may kindly advise all the regional entities under their control to follow the above guidelines and confirm at the earliest. A better FRC would clearly indicate that more generators have complied with these guidelines which is in the interest of system security.

This may kindly be implemented wef 1000 hours of 1st July 2016, if not already implemented at the generating stations. A feedback of the same may please be provided.

ब।ब।

(के०वि०एस०बाबा)

संलग्न: उपरोक्तानुसार

वितरण:

- (i) महाप्रबन्धक (उ.क्षे.भा.प्रे.के.)
- (ii) महाप्रबन्धक (पू.क्षे.भा.प्रे.के.)
- (iii) महाप्रबन्धक (प.क्षे.भा.प्रे.के.)
- (iv) महाप्रबन्धक (उ.पू.क्षे.भा.प्रे.के.)
- (v) अपर महाप्रबन्धक (द.क्षे.भा.प्रे.के.)

प्रति:

मुख्य का. अधिकारी, पोसोको - सूचनार्थ

Annexure-I

Regionwise FRC Calculation(MW/Hz) since Jan 2015										
S.No.	Date	Time	Description	Northern Region	Eastern Region	Western Region	North-Eastern Region	Southern Region	All India	
1	14.01.15	19:20	On 14.01.15 at 1920hrs, due to problem in GT Kudankulam Unit-I was tripped. At the time of tripping it was generating 1000MW.	1260	373	1699	86	2243	6023	
2	09.04.15	12:04 hrs	Due to mal operation of Converter transformer R-ph OLTC PRV Limit switch at Kolar end Talcher-Kolar Pole-II tripped. Generation Backing=220MW Load Loss=1303MW	1130	48	1570	86	3972	6223	
3	22.04.15	10:54 hrs	Due to tripping of 400 KV Udumalpet-Palakkad-2, (ckt-1 tripped at 10:52 hrs) Kerala suffered 1575 MW demand loss and 381 MW generation loss	1128	624	2284	74	2986	6490	
4	25.04.15	11:43 hrs	An earthquake with the magnitude of 7.9 on Richter scale occurred with its epicenter in Nepal. The tremors of the same were also felt in Northern, Eastern and North Eastern part of India. Total Load Loss was around 3000MW	1593	801	1829	152	1676	5660	
5	26.04.15	12:40 hrs	An earthquake with the magnitude of 6.9 on Richter scale occurred with its epicenter in Nepal. The tremors of the same were also felt in Northern, Eastern and North Eastern part of India. Total Load Loss was around 2200MW(Approx.)(ER=1500MW,NR=700MW)	1354	1353	1179	45	2109	5000	
6	04.05.15	21:50 hrs	Due to tripping of 400kV Chandrapur(2)-Warora-I&II and 400kV Wardha-Warora-I (Wardha-Warora-II already out under emergency S/D), SPS of Tirora operated resulting tripping of Unit 3 & 5 (generating 1100MW).	3049	1078	286	41	2813	6490	
7	24.05.15	19:19 hrs	Due to tripping of Talcher - Kolar HVDC and consequently tripping of 765 kV Raichur - Sholapur-1&2, NEW & SR grids got separated.	2001	1441	2314	88	10055	6078*	4483*
8	26.05.15	17:55 hrs	Talcher-Kolar HVDC Pole-2 tripped due to DC line fault. Pole 1 survived and went into ground return mode. SPS Action caused generation backing in ER and load shedding in SR.	806	321	2765	66	4305	4230	

Regionwise FRC Calculation(MW/Hz) since Jan 2015									
S.No.	Date	Time	Description	Northern Region	Eastern Region	Western Region	North-Eastern Region	Southern Region	All India
9	27.05.15	11:31 hrs	HVDC Mundra-Mohindergarh Pole-2 tripped due to DC line fault. HVDC Pole-2 was carrying 1100MW before tripping which reduced to 800MW under RVO mode and ultimately tripped.The SPS operated, causing load loss of 1050 MW	2253	353	214	41	2197	5812
10	16.06.15	19:26 hrs	JPNigire - Satna-2 was under planned shutdown. JP Nigire Gen was 1137 MW (as per NLDC SCADA) and was being evacuated through JP Nigire-Satna-1. At 19:26 Hrs JP Nigire-Satna-1 tripped on R-Ph to Earth Fault resulting in outage of JP Nigire due to loss of evacuation	302	566	610	6	2931	4653
11	26.06.15	13:16 hrs	Due to Emergency Switch Off command from Talcher end, Talcher-Kolar HVDC Pole – II tripped and Talcher – Kolar Pole – I went into metallic return mode	1925	1516	344	24	299	4506
12	10.07.15	16:26 hrs	Due to tripping of 765/400KV ICT-2 at Phagi(RRVPNL) (ICT-1 was already in shutdown); Kawai(660MW), Kalisindh (2*500MW) and Chhabara(2*250MW) tripped due to loss of evacuation. Generation Loss of 1800 MW.	5866	210	549	65	2734	8228
13	12.10.15	21:48 hrs	R phase CT of Bus coupler at 220 kV Samaypur BBMB blasted. It resulted into bus fault for both the buses and tripping of all 220 kV feeders from Samaypur will all four ICTs at 400/220 kV Ballabgarh(PG). This resulted in load loss of 930 MW in Haryana and generation loss of 150 MW at Faridabad Gas. Fault clearance time was around 800 msec.	3170	923	920	45	948	6945
14	26.10.15	14:41 hrs	An earthquake of 7.5 magnitude(on Richter scale) hit the North East Afghanistan, the tremors were felt in Northern part of India. There was sudden demand reduction and frequency rise during the incident. There was approx. 1200 MW demand reduction in All India and frequency rise by 0.28 Hz.The state of Jammu and Kashmir was affected badly and there was demand reduction of approx. 1000 MW in J & K.	1137	553	1933	0	1423	4437
15	13.11.15	23:05	Due to tripping of evacuating 400kV Kalisindh - Anta D/C lines from Kalisindh TPP in Northern Region due to Distance Protection, Generation loss of 1120 MW occurred.	1702	887	1054	103	2163	6746
16	30.11.15	17:22	Due to tripping of 400 kV UPCL-Hasan-2 on transient fault both units of UPCL tripped due to SPS operation. This caused an approximate generation loss of 1100 MW.	995	920	1587	115	4192	4506
17	14.12.15	16:54	Fault observed in 400kV Hissar-Bhiwadi ckt2. It resulted into tripping of 400kV Hissar-Bhiwadi ckt-2, Hissar-Fatehabad, Hissar-Bhiwani(PG) ckt2, Hissar-Kaithal ckt2 & at the same time 500kV Mohindergarh-Mundra Pole 2 also tripped due to commutation failure at Mohindergarh end. Load loss observed on behalf of SPS operation in NR	1324	244	1297	230	1921	3247

Regionwise FRC Calculation(MW/Hz) since Jan 2015									
S.No.	Date	Time	Description	Northern Region	Eastern Region	Western Region	North-Eastern Region	Southern Region	All India
18	30.12.15	06:03	TPCIL Generators (2 X 660 MW) tripped due to Loss of evacuation lines , Loss of generation 1069 MW	629	81	2441	57	4071	8108
19	16.01.16	01:29	765kV Antah-Phagi I tripped leading to tripping of all running units of Kawai, Kalisindh & Chabra and lines 400kV Chabra-Kawai, 400kV Chabra-Hindaun, 400kV Bhilwara-Chabra, this incident led to a generation loss of approx. 2100MW. A load loss of approx. 600MW observed in Rajasthan area. The net interchange coming to 1500 MW.	6137	707	1840	70	2874	7500
20	21.02.16	16:46	HVDC Talcher-Kolar Pole-1 tripped due to Valve cooling problem at Kolar end at 16:46 Hrs on 21-02-2016. HVDC pole-2 went into metallic return mode after tripping of HVDC pole-1. SPS signal-1&3 of HVDC Talcher-Kolar operated resulting in 1084MW of load shedding in southern region. In Eastern region, GMR,JITPL and Sterlite generation observed generation backing down of 580 MW in total but since it took place in minutes so the backing down has not been factored in calculations.	542	1140	355	0	5516	6376
21	11.03.16	00:27	Rajasthan wind generation of 1100MW tripped.	1872	771	1274	65	2235	5500
22	14.03.16	01:12	At 01:12hrs, 400KV NTPL-Thootikudi PS tripped on R-N Fault from NTPL end only while synchronizing of this line at 01:36hrs, 400KV NTPL-Thootikudi PS, 400KV NTPL-Coastal, 400KV Thootikudi PS-Coastal and units of NTPL (unit-1 & 2 of 500MW) & Coastal (unit-1 of 600MW) tripped. Total Gen Loss -1350MW.	1833	590	2097	78	3186	8132
23	14.04.16	13:29	On 14.04.16, at 13:29 hrs 400 kV JP Nigrie-Satna-1 tripped on R-E Fault and JP Nigrie-Satna-2 tripped on DT resulting in loss of evacuating lines and generation loss of 1089 MW.	244	17	2930	140	2848	7260
24	30.04.16	15:01	On 30-04-16, at 15:01 Hrs, 400 kV Jabalpur-MB power-1 & 2 tripped on Bus Bar differential protection. This led to black out of MB Power.Frequency drop of 0.14 Hz took place during the event (50.06 Hz to 49.92 Hz).Loss of generation of 1024 MW (Unit 1=496 MW, Unit 2=528 MW) took place.	2418	1597	7998	1	1308	7877
25	01.05.16	12:24	400 kV JP Nigrie-Satna-1 tripped on R-N fault and circuit-2 tripped on DT receipt.At the time of tripping each circuit was carrying 539 MW (approximately).There was generation loss of 1064 MW due to tripping of Unit-I & II at JP Nigrie station.The frequency fall during the event was 0.13 Hz.	111	414	4704	27	3782	8185
26	03.05.16	21:07	400kV JP Nigrie -Satna -1 & 2 tripped on R-N fault resulting in generation loss of 1166 MW due to tripping of units on loss of evacuation paths and frequency dip of 0.13 Hz.	784	849	7469	50	715	8329

Regionwise FRC Calculation(MW/Hz) since Jan 2015									
S.No.	Date	Time	Description	Northern Region	Eastern Region	Western Region	North-Eastern Region	Southern Region	All India
27	18.05.16	17:31	Y&B-phase to phase fault occurred in 400kV Bawana-Mundka ckt-2. At the same time around ~3700MW load loss occurred in Northern Region. Frequency rose from 50.05Hz to 50.42Hz due to load loss into the system. Major contributors in this load loss are Delhi, Haryana, UP & Punjab. Load loss may be due to stalling of induction motors in the system, AC load & tripping of LT feeders. Frequency returned within IEGC band after a period of 5 minutes.	10160	632	3530	44	2608	10000
28	22.05.16	21:11	400 KV Jhakri-Panchkula II tripped and then Jhakri-Rampur II also tripped. This led to SPS operation resulting in tripping of 2 units each at N.Jhakri (500 MW loss) , K.Wangtoo (500 MW loss) and 5 units at Rampur (300 MW loss).	7320	902	791	151	2541	8669
29	09.06.16	14:27	Y-phase CT of 220kV Samaypur-Palwal ckt-1 bursted. It resulted into bus fault at 220kV Samaypur(BBMB) station. At the same 3890MW load loss observed in NR along with generation loss at BTPS (Badarpur), Pragati generation and Faridabad Gas generation.	5226	193	2897	324	2287	9302
30	22.06.16	13:27	400 kV JP Nigree-Satna-1&2 tripped at 13:18 hrs on R-N fault. JP Nigrie U-1 &2 also tripped due to evacuation problem and led to 1200MW gen loss.	2267	432	3190	39	1717	7059
			Median	1647	628	1764	65	2574	6490
			Average	2351	685	2132	77	2822	6603
* NEW and SR FRC as NEW and SR Grid got separated									

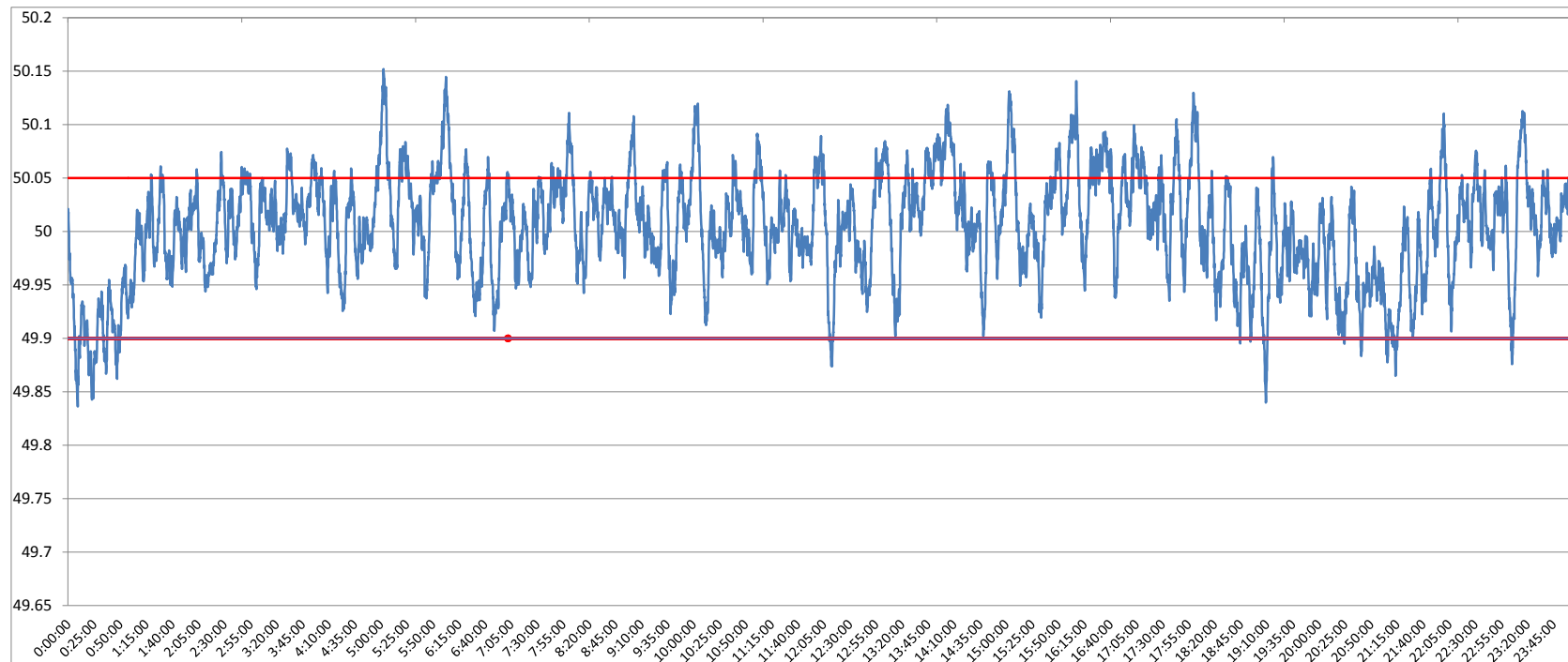


POWER SYSTEM OPERATION CORPORATION LIMITED
NATIONAL LOAD DESPATCH CENTRE NEW DELHI

DURGAPUR:Frequency

National Grid Frequency Profile for

19-Jun-16



<49.2	<49.7	<49.90	<49.97	49.7-49.8	49.8-49.9	49.9-50.0	50.0-50.1	50.1-50.2	49.90-50.05	49.7-50.2	49.97-50.03	50.05-50.1	>50	>50.03	>50.05	>50.2
0	0.00	2.72	23.24	0.00	2.72	41.16	53.91	2.21	79.75	100.00	45.53	15.41	56.04	31.23	17.53	0.00

Average Frequency	50.00	Frequency Variation Index :	0.025	Standard Deviation :	0.050
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Instantaneous Frequency		
Max	50.15	5:02:30
Min	49.84	0:09:10

15 minute average Frequency			
Max	50.069	14:15:00	
Min	49.889	0:30:00	

No. of excursion above 50.03 Hz	160
No. of excursion below 49.97 Hz	122
No. of excursion above 50.00 Hz	173
No. of excursion below 50.00 Hz	174

Average time freq remains below 49.97 per excursion	0:02:45	Average time frequency remains above 50.03 per excursion	0:02:49
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Flash Report on Northern Region Load Loss on 9th June 2016

Date and Time of Incident:

09.06.2016, 14:27 hours

Antecedent Frequency :

49.89 Hz

Due to CT blast of 220 kV Samaypur-Palwal-I at Samaypur(BBMB) all four 400/220 kV ICTs of Ballabgarh(PG) tripped and load loss took place in Delhi, Haryana and Uttar Pradesh. The frequency of Indian Grid shot up to 50.37 Hz from 49.89 Hz due to sudden loss of load of approx. 4000 MW in NR. There was demand reduction of 1500 MW in Haryana, 1400 MW in Delhi and 1000 MW in Uttar Pradesh. The frequency returned to normal within minutes indicating nature of incident similar to that of the stalling of motor loads as observed in previous cases. From PMU plots fault appears to be of three phase to ground fault which got cleared in approx. 1000 msecs.

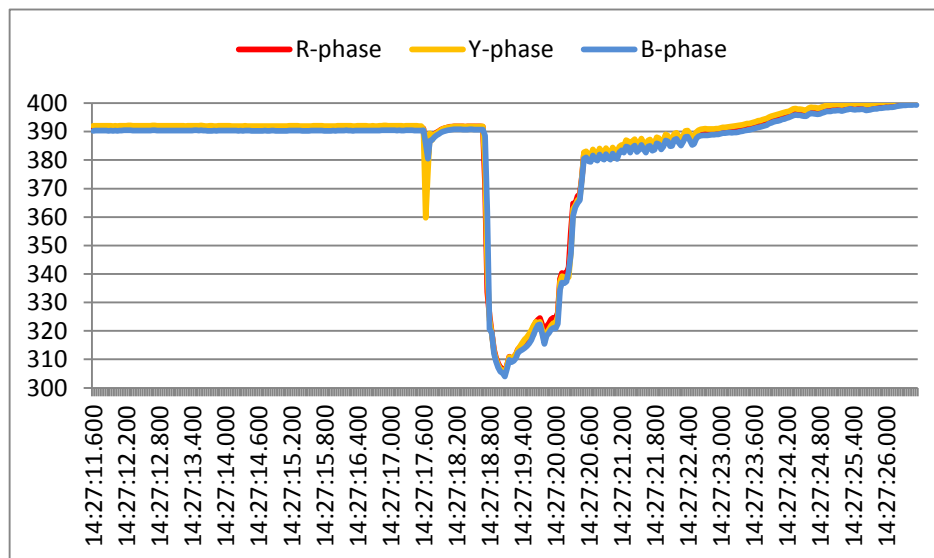
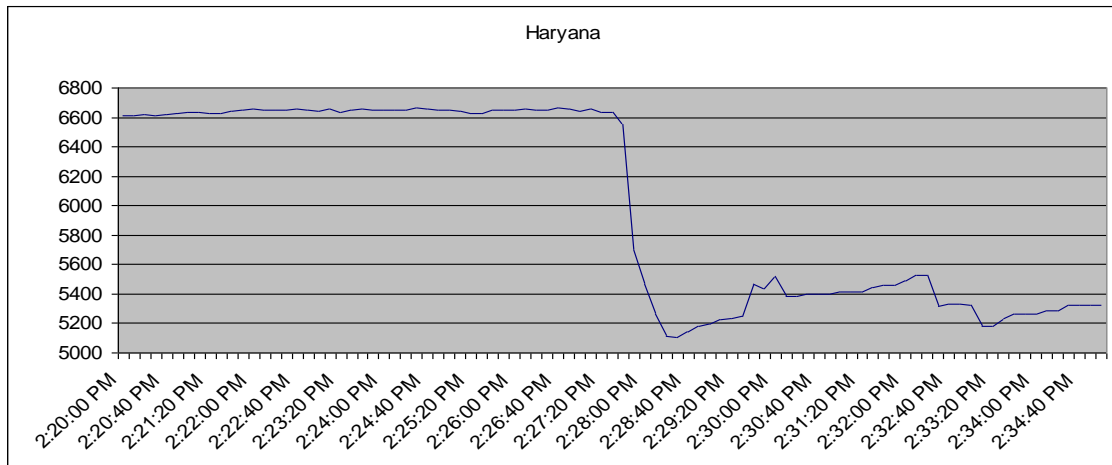
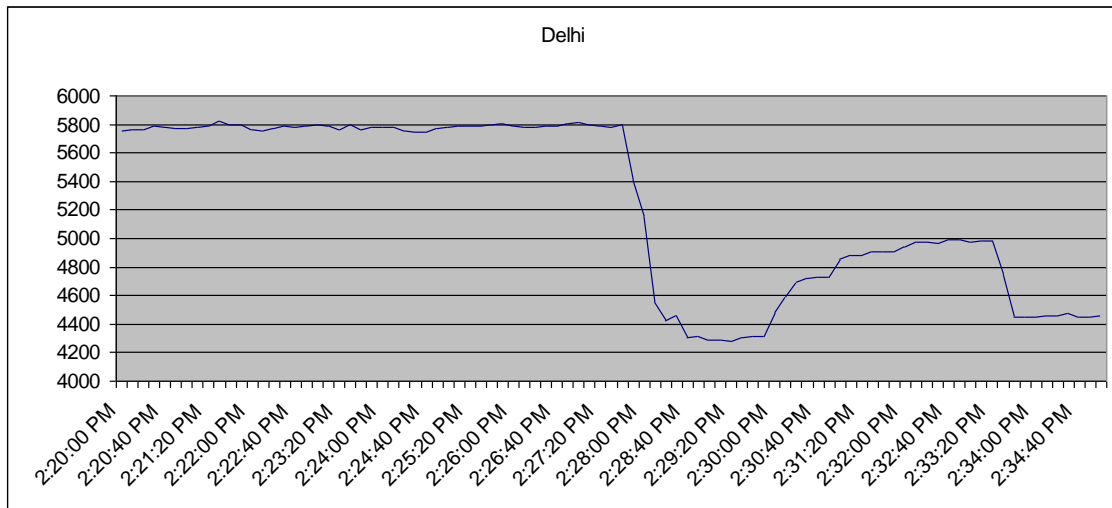


Fig:1 PMU Three Phase Voltage Plot of Dadri station



Fig 2: Frequency Plot where frequency shoot up to 50.37 Hz and revived within six minutes



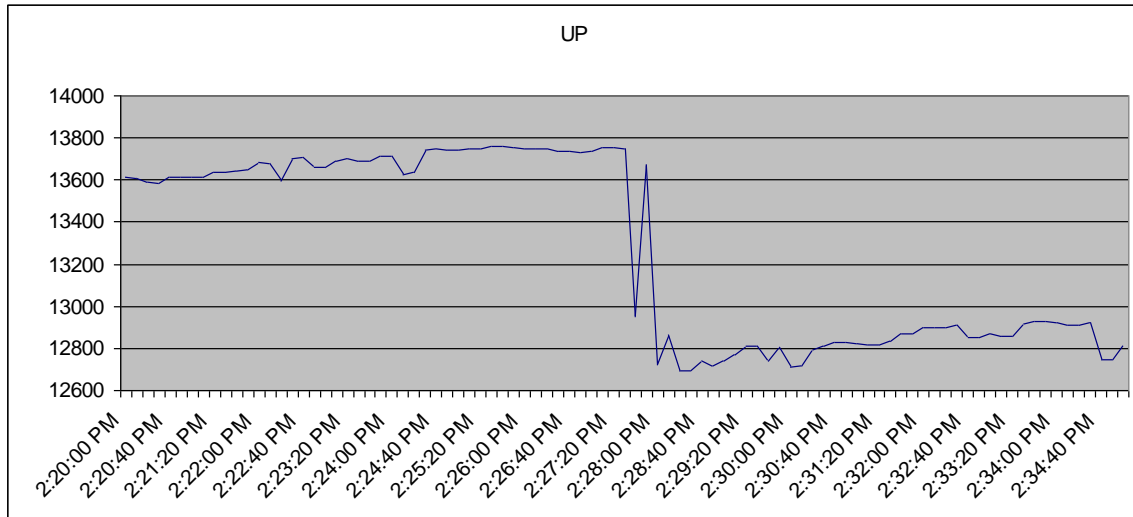


Fig: Demand of NR constituents(in MW)

This heavy loss of demand in Northern region caused reduction in loading of 765 kV Gwalior-Agra-D/c by approx. 1500 MW(total) which led to SPS related to Loss of Import at Agra by 1500 MW in which Generation Backing down of 1000 MW in WR generators is as per design. The generation backing down can be observed in the plot. WR ISGS is on secondary axis and it reduced from 22900 MW to 21900 MW.

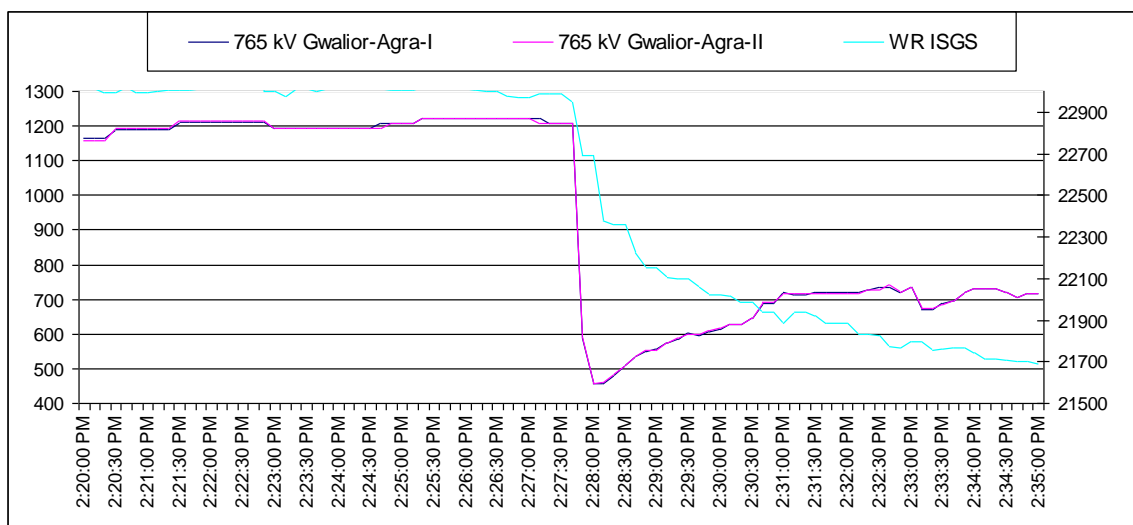


Fig2: 765 kV Gwalior-Agra D/c Power flow and WR ISGS Backing down

Frequency Response for the Load crash incident on 09.06.2016

NR Constituents		
S.No.	Constituent	Percentage of ideal response
1	UTTAR PRADESH	-4%
2	RAJASTHAN	5%
3	HARYANA	10%
4	PUNJAB	10%
5	HIMACHAL PRADESH	11%
6	JAMMU & KASHMIR	12%
7	DELHI	16%
8	UTTARAKHAND	22%
9	CHANDIGARH	91%

WR Constituents		
S.No.	Constituent	Percentage of ideal response
1	Gujarat	13%
2	GOA	0%
3	DNH	0%
4	ESIL	0%
5	Chhattisgarh	3%
6	Maharashtra	7%
7	MP	12%
8	DD	133%

ER Constituents		
S.No.	Constituent	Percentage of ideal response
1	Jharkhand	3%
2	WB	6%
3	DVC	8%
4	OPTCL	10%
5	SIKKIM	105%
6	Bihar	119%

SR Constituents		
S.No.	Constituent	Percentage of ideal response
1	AP	69%
2	KAR	17%
3	KER	50%
4	TN	36%
5	TS	29%
6	PONDY	253%

NER Constituents		
S.No.	Constituent	Percentage of ideal response
1	AP	10%
2	Assam	67%
3	Manipur	92%
4	Meghalaya	-3%
5	Mizoram	165%
6	Nagaland	-101%
7	Tripura	100%

NR Generating Stations

S.No.	State	Percentage of ideal response	S.No.	State	Percentage of ideal response
1	Anta	-5%	17	Rihand-2	5%
2	Suratgarh	-4%	18	Anpara C	5%
3	RAPS-B	-4%	19	RAPS-C	6%
4	Dadri -2	-4%	20	Dadri-Gas	7%
5	ROSA	-1%	21	Unchahar	10%
6	Singrauli	0%	22	Obra	14%
7	Khedar	0%	23	Ropar	21%
8	Paricha	0%	24	Jhajjar#	25%
9	CLP Jhajjar	1%	25	Dadri-1	33%
10	Anpara	1%	26	Auraiya*	NA
11	Tanda	1%	27	Panipat*	NA
12	Rihand-3	2%	28	Yamuna Nagar*	NA
13	Rihand-1	2%	29	Chabra*	NA
14	KTPS	3%	30	Rajwest*	NA
15	Sh. Cement	4%	31	Badarpur	Tripped
16	NAPS	4%	32	Faridabad	Tripped

WR Generating Stations

S.No.	Generator	Percentage of ideal response	S.No.	Generator	Percentage of ideal response
1	SSP	0%	21	APML Tiroda	0%
2	VSTPS-I	0%	22	SIPAT-II	1%
3	VSTPS-III	0%	23	KSK	1%
4	NSPCL	0%	24	KWPCL	3%
5	DB Power	0%	25	APL-I	4%
6	JP NIGRIE	0%	26	EMCO	5%
7	ESSAR MAHAN	0%	27	SASAN	11%
8	MB Power	0%	28	Mouda	16%
9	MCPL	0%	29	VSTPS-IV	24%
10	RKM	0%	30	SIPAT-I	24%
11	Dhariwal	0%	31	KSTPS-I	46%
12	GMR Raipur	0%	32	VSTPS-V	51%
13	JPL Tamnar (Stage II)	0%	33	CGPL	66%
14	JPL	0%	34	VSTPS-II	73%
15	VANDANA	0%	35	KSTPS-II	88%
16	BALCO	0%	36	KSTPS-III	191%
17	LANCO	0%			
18	SKS	0%			
19	APL-II	0%			
20	APL-III	0%			

SR Generating Stations

S.No.	Generator	Percentage of ideal response	S.No.	Generator	Percentage of ideal response
1	KGA 1-2	-6.9%	11	TPCIL	1.4%
2	IL&FS	-4.2%	12	NLY 2	1.6%
3	MAPS	0.0%	13	NLY 1 E	3.4%
4	NLY 2 E	0.0%	14	KGA 3-4	4.6%
5	SIM ST2	0.0%	15	MEPL	9.5%
6	COGEN	0.0%	16	RSTPS	14.8%
7	NTPL	0.0%	17	KKNP	52.0%
8	SEPL	0.0%			
9	LANCO	0.0%			
10	VALLUR	1.4%			

ER Generating Stations

S.No.	Constituent	Percentage of ideal response
1	Chujachen	-77%
2	FSTPP III	-13%
3	Adhunik	-3%
4	TSTPS-I	0%
5	TSTPS-II(SR)	0%
6	MPL	0%
7	JITPL	0%
8	RHEP	1%
9	FSTPP I&II	1%
10	BARH	2%
11	GMR	2%
12	KhSTPP I	3%
13	KhSTPP II	8%
14	TALA	16%
15	CHUKHA	29%
16	Teesta V	60%
17	Sterlite	89%

NER Generating Stations

S.No.	Generator	Percentage of ideal response
1	Kopili	0%
2	RHEP	0%
3	Khandong	1%
4	BTPS	6%
5	Loktak	43%
6	AGTPP	43%
7	AGBPP	50%
8	Palatana	87%

Real-Time Energy Assessment System for effective Grid Management

Proposal

Submitted By

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1. Motivation:

North East India has many industries and it has been a major challenge for these industries to purchase power at lower cost. Introduction to Electricity Act (Open Access) has made possible for these industries to purchase power at lower cost. In India, Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL) follow the collective type open access. Inter-state and intra-state bilateral transactions of open access are handled by Regional LDC and State LDC respectively as per the guidelines. Since the electricity cannot be preserved, economical equity between generation and consumption must be maintained, this is the major challenge faced by the LDCs. In other side, open access users are paying penalties as proper real-time assessment system not available at their end to monitor and the control their schedules. This in turn troubles the grid stability.

In other side, planning of the state load/DISCOM wise load is very import for better management of power grid discipline. One of the most important works of an electric power utility (SLDCs, DISCOMs) is to correctly predict load requirements. Load forecasting is a method of quantitatively determining future load demand. The primary function of a power utility is to supply electrical energy to the consumers economically. Limitations of energy resources in addition to environmental factors, requires that the electrical energy should be used more efficiently.

Power sector is highly capital intensive and entire planning of generation, transmission and distribution follows an axiomatic approach based on load forecasting. For this purpose, the anticipated load demand should be known. The resources available in the country for electrical power generation (thermal, hydro and nuclear power stations) can then be developed easily considering the electrical power and energy requirements and the locations or regions where demand is expected. Load forecasting has many applications including energy purchasing and generation, load switching, contract evaluation and infrastructure development. Short-term load forecasting is used to supply necessary information for the power system management in day-to-day operations and unit commitment. The forecasting time-period or the prediction time for short-term load forecasting can be hour-by-hour, day-by-day, week-by-week. With the recent trend of deregulation of electricity markets, short-term load forecasting has gained more importance and greater challenges.

2. Advantages of real-time energy assessment system

The Proposed system has majorly three components, real-time data acquisition system from special energy meter, real-time energy assessment system and short term load forecasting. Real-time data acquisition system is base for real-time energy basement system. Load forecasting is based on historical load, date, time, weather info etc. parameters.

Benefits of real-time energy assessment system:

- a. Help the better management of power grid and improves the grid stability.
- b. Open access user avoids the penalties and helps to get better incentives by timely actions
- c. It helps the open access user to adhere with given schedules.

Benefits of short-term load forecasting:

- a. Energy purchasing and generation, load switching
- b. Optimum supply schedule, Network planning
- c. Better power system planning, operation and control.
- d. Real-time control and energy management.

3. Background on Open Access and CERC Regulations

A. Open Access

The open access is categorized as intra-state open access and inter-state open access based on Electricity producer and consumer entity location. Inter and intra-state open access is further classified based on duration of contract. Those are long term open access (LTOA), medium term open access (MTOA) and short term open access (STOA). There two different types of open access transactions, one is bilateral and other is collective transaction.

LTOA, MTOA and approved STOA transactions and any other collective transactions will be scheduled by corresponding LDC. Schedules will be made available to open access user on the current day for the next day for all 96 time blocks. Open access user has to adhere the given schedules strictly. Any deviations leads for deviation charges as per CERC regulations based on grid frequency and in turn trouble the grid stability.

Short term like Week-ahead day-head, intra-day forecasting helps for the utilities to purchase any deficit power, planned load-shedding; sell any surplus power, real-time operation and control etc. for better management of power grid. This planned operation helps the grid stability.

B. CERC Regulations for Grid Discipline

The objective of Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) regulations, 2014 is to maintain grid discipline and grid security as envisaged under the Grid Code through the commercial mechanism for Deviation Settlement through drawal and injection of electricity by the users of the grid. These regulations shall be applicable to sellers and buyers involved in the transactions facilitated through short-term open access or medium-term open access or long-term access in inter-State transmission of electricity.

- a) The charges for the Deviations for all the time-blocks shall be payable for over drawal by the buyer and under-injection by the seller and receivable for under-drawal by the buyer and over-injection by the seller and shall be worked out on the average frequency of a time-block at the rates specified in this regulation.
- b) Charges for deviation for each 0.01 Hz step is equivalent to 35.60 Paise/kWh in the frequency range of 50.05-50.00 Hz, and 20.84 Paise/kWh in frequency range 'below 50 Hz' to 'below 49.70 Hz'. These charges are applicable up to 12% of the schedule deviation. More than 12% of schedules deviation charges as per the CERC Regulations, 2014.

The CERC regulation helps for the better grid stability and management. To adhere with the regulations real-time assessment system helps the open access user when to draw more power for cheaper cost and when to draw less power to get better incentives. Assessment system gives various notifications/alarms for needful timely actions; this in turn helps for grid stability.

4. Real-Time Energy assessment system

Decision support system for load forecasting, is vitally important for the electric utility. Accurate model for electric power load forecasting are essential to the operation and planning of DISCOMS/SLDCS. Load forecasting helps the DISCOMS/SLDCS to make decisions on purchasing electric power, load shedding and other infrastructure development. Short term load forecast includes from same-day, day-ahead and week-ahead.

Real Time energy assessment system helps the open access users to adhere the schedules properly. The assessment system gives real-time proactive alarms/notifications like, when to draw more power with cheaper price and when to under draw to get better incentives. This system allows the user to adhere to the schedules and helps the power grid discipline by giving better incentives to open access consumers.

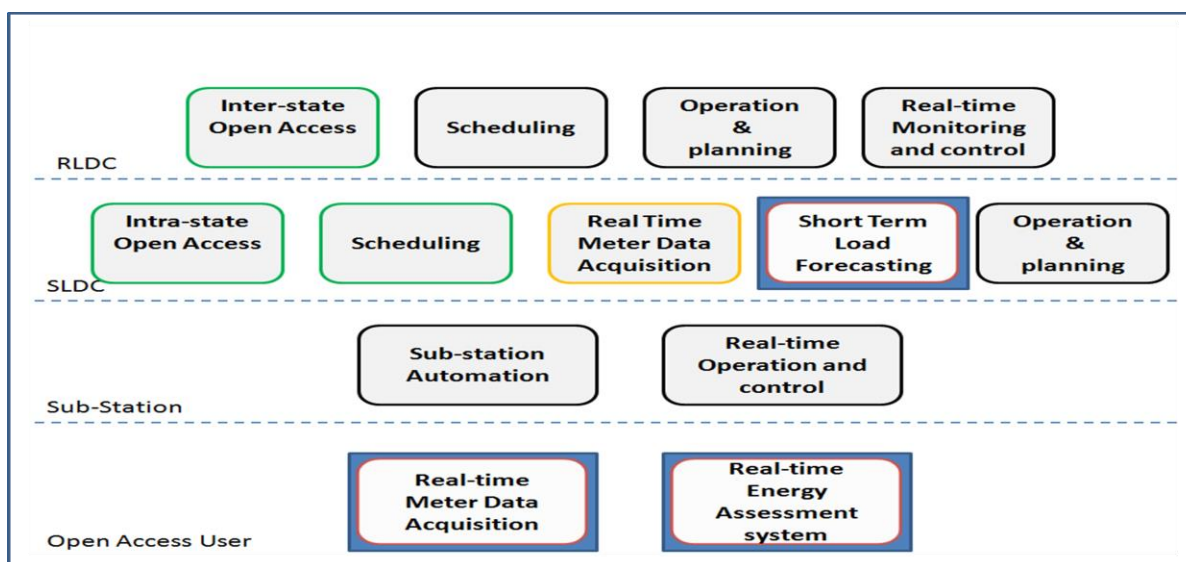


Fig:1-Power System hierarchical Architecture and its responsibilities

The assessment system for grid discipline contains three modules.

- a) Real-time data acquisition system(for open access user)
- b) Real-time Energy Assessment system(for open access user)
- c) Short-term Load forecasting tools(for DISCOMs/SLDC)

3.1 Real-Time Data Acquisition System

Data Acquisition system acquires real-time data like actual power import/export, reactive power, 3-phases voltage & current and frequency from Special Energy meter. The data will be provided in various forms like tabular, gauge, trend and graphical format for better understanding power import/export.

3.2 Real-time Energy Assessment System

Real-Time Energy Assessment System works based on Scheduled import/export, actual import/export, and Grid Frequency and CERC grid discipline regulations. Schedule data will be provided by LDC for all 96 time blocks of the day. Actual import/export, Frequency (f) information collected from Special Energy Meter in real-time basis. CERC Schedule deviations charges will be made available in Database for decision making. Rate of deviation charges (RDC) is as shown below, these charges applicable up to 12% of deviation.

SL.No	RATE FOR DEVIATION CHARGE(RDC)
1	$f \geq 50.05\text{Hz}$, RDC=0
2	$50.05 > f \geq 50.00$, RDC increases by 35.6 p/u for each 0.01Hz step
3	$50.00 > f \geq 49.7$, RDC increases by 20.84 p/u for each 0.01Hz step
4	$F < 49.7$, RDC=824.04p/u

Table.1: Rate for Deviation Charge(RDC) based on frequency

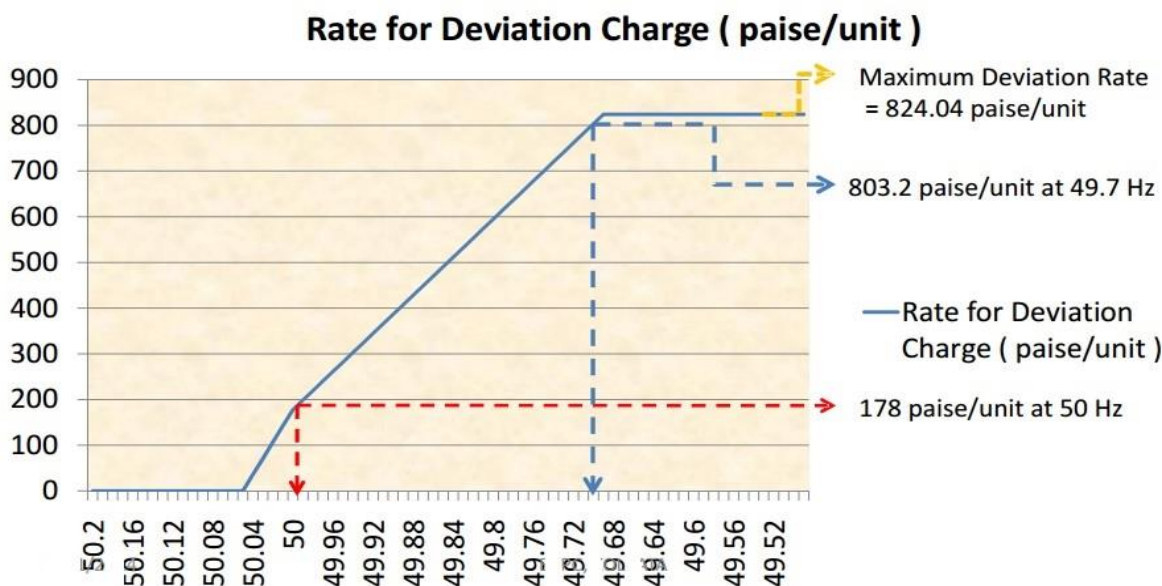


Fig.2: Rate for Deviation Charge(RDC) based on frequency

If grid frequency is more than 50.05Hz, user can overdraw power free of cost and can even ramp down their captive generation. When frequency is 50Hz user can overdraw power at cheaper prices like 178paise/unit. When a frequency is 49.7 and below open access user has to pay with RDC as 824.04 paise/unit. If under draws when frequency is 49.7 and below will get better incentive as 824.04 paise/unit.

Energy assessment system configured with limits based on schedule quantum, drawl quantum, deviation quantum, frequency, rate for deviation charge (RDC). Various alarm/notifications generated by energy assessment system for needful timely actions to avoid penalties and get better incentives. Energy assessment system has provision for customization as per user requirements when they need alarms/notifications. This system helps for grid discipline by avoiding penalties and giving incentives to open access user. This system makes the win-win situation for the both open access users and power grid at every point of time.

3.3 Load Forecasting

Supply and load of electrical demand fluctuates with the changes of weather conditions. An energy price also plays a key factor during peak load conditions. In these situations, load forecasting plays a vital role for power utilities. In general, there are 3 types of forecasting approaches i.e. short term, medium term and long term. Short-term forecasts which are usually from one hour to one week, medium forecasts which are usually from a week to a year, and long-term forecasts which are longer than a year. Short term load forecasting can be used to predict the load and to take decisions to prevent overloading. When these decisions are taken at right time, such decisions can improve network reliability and also reduce the occurrences of equipment failures and blackouts. Various methods for short term load forecasting are similar day approach, regression models, time series, neural networks, statistical learning algorithms, fuzzy logic, and expert systems. End-use and econometric approaches are broadly used for medium forecasting.

Factors considered during medium and short term forecast are historical load, weather data, population of the area, economic and geographic data of that area. One additional factor considered especially considered for short term forecasting is time factor. This time factor include time of the year, day of the week and hour of the day. Time factor is crucial during forecasting due to the differences in load between weekdays and weekends. Load on weekdays also can behave differently. Special days such as holidays, festivals etc is one more critical factor affect the load. Time series for load is a set of data that is based on observed load over a time period. It is the historical record of data taken at equally spaced intervals with consistency. Considering all these factors such as weather conditions of historical data, differentiating type of days such as weekday/weekend, special days for medium or short term forecasting, time series for load is prepared.

Recommended model for short term forecasting Auto Regressive Integrated Moving Average (ARIMA) model based on the Box-Jenkins method. Adopted methodology is a self- projecting time series forecasting method. For forecasting each day, a dynamic set of comparison day selection criteria is created. The criteria takes into consideration day of week, day type including special holidays and several user definable parameters. Comparison days are sorted with very wide search criteria until one

or more days are found. Special days are not used as comparison days except in case of forecasting the load for special day. The special days definitions are editable by the user.

Box-Jenkins modeling involves identifying an appropriate ARIMA process, fitting it to the data, and then using the fitted model for forecasting. One of the attractive features of the Box-Jenkins approach to forecasting is that ARIMA processes are a very rich class of possible models and it is usually possible to find a process which provides an adequate description to the data. Box-Jenkins modeling procedure involved an iterative five-stage process of Data preparation, model selection, parameter estimation, model checking and forecasting. Data preparation involves transformations and differencing. Transformations of the data can help stabilize the variance in a series where the variation changes with the level. Model selection uses various graphs based on the transformed and differenced data to identify ARIMA processes to provide a good fit to the data. Parameter estimation means finding the values of the model coefficients which provide the best fit to the data. Model checking involves testing the assumptions of the model to identify any areas where the model is inadequate. If the model is found to be inadequate, it is necessary to go back to model selection and try to identify a better model. Once the model has been selected, estimated and checked, it is a straightforward task to compute forecasts.

Duration:

2 Years

Budget Outlay:

Rs.2 crore