ANNEXURES

ANNEXURE – A

LIST OF PARTICIPANTS IN THE 37th ERPC MEETING

Date: 17.03.2018 **Venue: Goa**

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
BSPTCL			
1.	H.R.Panday	Director(Project)	7763817709 dir.proj.bsptcl@gmail.com
2.	Bhaskar Sharma	Advisor(Tech.)	9771496900
BSHPCL			
3.	Jayant Kumar Dubey	EEE	7320920591 interstatebsphcl@gmail.com
4.	Anand Suman	AEE (I/S)	7763815059 interstatebsphcl@gmail.com
5.	Himanshu Kumar	Resd. Engr	8987069761 rendbsphcl @gmail.com
NBPDCL			
6.	S.K.P.Singh	Director (Projects)	7763815029 directorprojects.nbpdcl@gmail.com
SBPDCL			
7.	Narendra Kumar	Ch.Engineer(Comml.)	7763814014 narendra060@gmail.com
8.	P.Prasad	EEE(Comml.)	7763814744 purush5676@gmail.com
9.	N.K.P.Sinha	Director(Projects)	7763813949 dirprojectsbpdcl@gmail.com
WBPDCL			
10.	Subhasis Ghosh	Director(O & M)	s.ghosh03@wbpdcl.co.in
WBSETCL			
11.	Partha Pratim Mukherjee	CE(PTP)	7449300215 ceptp.wbsedcl
12.	Sudipto Mukhopadhyay	CE (Regulations)	7449300226 cereg.wbsedcl@gmail.com
CESC			
13.	Sandip Pal	General Manager(System Operation)	9831054651
14.	A Sen Gupta	Dy. GM (System Con)	9831802682 arunava.gupta@rp-sg.in
DPL			
15.	Debasis Sinha	Director (Mining & Regulatory) & CS	9434706516 debasisdl@yahoo.co.in
16.	Parthapratim Roy	General Manager (Corp-Tech),	9434706349 royparp@gmail.com
GRIDCO			
17.	Umakanta Sahoo	DGM (PP)	9437185507 u.sahoo.puri@gmail.com
18.	Mrs. Susmita Mohanty	Asst.GM(E)	9437231456 susmitagridco@gmail.com
19.	M. K. Das	Director (Comml)	7606000337 dir.commercial@yahoo.com
OHPC			
20.	S.K.Tripathy	Director(Operation)	7328840009 sanjib.burla@gmail.com
OPGC			
21.	Krushna Ch. Samantray	DGM	9338715428 krushna.samantray@opgc.co.in
22.	Pradeep Kr Mahapatra	AGM	9338715401 pradeep.mohapatr@opgc.co.in

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
ODISHA/SLDC			
23.	Uttam Kumar Samal	Director(O)	9438907730 dir.operation@optcl.co.in
24.	Chitta Ranjan Mishra	AGM(E)	9438907801 ele.crmishra@optcl.co.in
25.	Lalatendu Nayak	Sr.GM(O &M)	9438907305 ele.lanayak@optcl.co.in
26.	P.K.Mishra	CLD	9438907402 Ele.pkmishra@sldc
JUVNL, JUSNL, JBVNL			
27.	Dr. N.M.Kulkarni	Secretary-cum-CMD	9431121011
28.	Atul Kumar	Director (Project)	9431135532 dir.p.jusnl@gmail.com
29.	Sailesh Prakash	ESE (SLDC)	9470145226 saileshjseb@gmail.com
30.	S.K.Thakur	Chief Engineer (Comml.)	9431908984 sunilthakursp@yahoo.com
31.	C.M.Sharma	Ch.Engineer	9431175416 cmsharma51@gmail.com
TVNL			
32.	Sanatan Singh	Managing Director	9031049921 sanatantvnl@gmail.com gmcumce.ttps@gmail.com
33.	S.K.Choudhary	El. Suptd. Engr	9031049931 sailesh.ttps@yahoo.co.in
TVPTL			
34.	B.S.Jha	Director (Projects)	965049560
DVC			
35.	P.K.Mukhopadhyay	CMD	9831227333 Chairman @dvc.gov.in
36.	A.K.Jain	DCE, Chairman Office	9434676386 anil.jain@dvc.gov.in
37.	A. Debnath	Executive Director (System)	9831954257 achintya.debnath@dvc.gov.in
38.	D.K.Aich	Executive Director (Comml.)	9831954257
39.	B Pan	Chief Engineer-I, (SLDC)	9903247102 bpam.dvc@gmail.com
40.	S .Ghosal	Dy. Chief Engineer (Commercial)	9432677003 subrataghosal64@gmail.com
MPL			
41.	Purusottam Thakur	CEO	9238003939
42.	Sudip Dash	Group Head (Commercial)	9204652869 7004510981 sudip.dash@tatapower.com
NTPC			
43.	M.P.Sinha	ED,ER-I	9431009112 mpsinha@ntpc.co.in
44.	H.S.Sahu	GM(OS),ER-I	9493193251 hssahu@ntpc.co.in
45.	Shailendra Singh	DGM(Comml)	9650990665 shailendrasingh@ntpc.co.in
46.	B.B.Tripathy	GM(OS),ER-2	9437176595 bbtripathy69@hotmail.com
POWERGRID			
47.	Sanjai Gupta	ED	9422211226 sanjai.gupta@powergridindia.com
48.	S.N.Sahay	ED,ER-1	9431815843
49.	Avinash M Pavgi	GM(AM)ER1	9910378086 apavgi@powergridindia.com
50.	P.N.Dixit	ED,CC-AM	9873549062 pndixit@powergridindia.com

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
51.	Rajesh Verma	CM(CTU)	9599192370 rverma@powergridindia.com
52.	R.P.Rath	GM(AM)	9078883604 rprath@powergridindia.com
53.	A.K. Behera	DGM(AM)	9437575638 akbehera@powergridindia.com
54.	S.K. Singh	Dy.GM(AM) / ER-I	8544401030 singhsk@powergridindia.com
55.	N K Ohdar	GM	9434740031 nkohdar@powergridindia.com
56.	SVS Satyanarayan	AGM	9434740037 svs@powergridindia.com
57.	Ms. Manju Gupta	AGM	9910378128 manju@powergridindia.com
58.	M. K. Agarwal	DGM (COMML)	9931815668 mridul@powergridindia.com
NHPC			
59.	Janardan Choudhary	ED(O&M)	9958819003 janardan.choudhury@gmail.com
60.	Chander Mohan	ED(Comml.)	9818039339 cmohan@gmail.com
61.	M.K.Mittal	Director (Finance)	9717636802 mkmittal@nhpc.nic.in
62.	S.K.Mishra	Sr. Manager(O &M)	skm.nhpc@yahoo.com
Sikkim			
63.	N.T.Bhutia	PCE cum Secretary	
64.	S.P.Kazi	Chief Engineer-I	9434169660
GMRKEL			
65.	Arabinda Pani	Head-O&M	7752020444 arabinda.pani@gmrgroup.in
66.	Pradeep Kumar Mohanty	GM	7894450332 pradeep.mohanty@gmrgroup.in
67.	M.D.Pandey	Associate Manager,Power Sales	9821020812 manishdeopandey@gmail.com
PTC			
68.	Harish Saran	ED (Marketing)	9810394429 harishsaran@ptcindia.com
Tata Power Trading			
69.	Prashant Sharma	Head (Comml.)	9910378002 prashantsharma@tatapower.com
Tata Power			
70.	Sanjeev Mehra	MD	9250001771 sanjeev.mehra@tatapower.com
JITPL			
71.	Chandrashekhar Bobade	VP	8130613563 transmission@jindalgroup.com
Teesta Urja Ltd.			
72.	D.P Bhargava	Chief Consultant (O&M	9958833995 dpbhargava@teestaurja.com
CEA			
73.	Vijay Menghani	Chief Engineer(IT)	9999035484 vmenghani@nic.in
74.	B.K.Sharma	Principal Chief Engineer (GO & D Wing)	9968284836 bkscea@gmail.com
75.	Praveen Gupta	Chief Engineer(IRP)	9810692114 pgupta67@nic.in
BHUTAN			
76.	K.Phuntsho	CEO	795-17944708
77.	Sherab	GM	975-17650925
78.	K.Tshewang	Ch. Engineer	975-17775454 ktshewangemoea.gov.bt

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
79.	T.Choden	Dy. Engr	975-17647484 tchoeden@moea.gov.bt
DGPC			
80.	Kuenga Namgay	Director(O &M)	9719693104 director.o&m@drukgreen.com
POSOCO			
81.	G.Chakraborty	DGM(MO)	9433041815 gcharaborty@posoco.in
82.	N.Nallarasan	DGM(SO)	8527077022 nallarasan@posoco.in
83.	P.K.Agarwal	Director (MO)	990064320
ERLDC			
84.	P. Mukhopadhyay	ED	9869438073 pmukhopadhyay@posoco.in
85.	G. Mitra	DGM	9831297392 gopalmitra@posoco.in
86.	S. Banerjee	DGM	9433041823 surajit.banerjee@posoco.in
87.	S. Konar	Chief Manager	9436335370 konar_s@posoco.in
88.	A B Sengupta	Sr.Engr.	9433041872 anwaryasen @ posoco.in
ERPC			
89.	J.Bandyopadhyay	Member Secretary	9432326351 mserpc-power@gov.in
90.	P.K. De	Executive Engineer	9433125844 rpc.erpc@gov.in
91.	P.N.Sarkar	Executive Engineer	9830027523 pn_sarkar@rediffmail.com
92.	D.K. Bauri	Executive Engineer	9883617326 eeop.erpc@gov.in
93.	G. R. Jada	Executive Engineer	9547891353 ereb_cea@yahoo.com
94.	A.De	AEE	9681932906 alik.erpc@gov.in
95.	P.P. Jena	AEE	9776198991 ppjena.erpc@gov.in

ANNEXURE – B

LIST OF PARTICIPANTS IN THE 37th TCC MEETING

Date: 16.03.2018 **Venue: Goa**

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
BSPTCL			
1.	H.R.Panday	Director(Project)	7763817709 dir.proj.bsptcl@gmail.com
2.	Bhaskar Sharma	Advisor(Tech.)	9771496900
BSHPCL			
3.	Jayant Kumar Dubey	EEE	7320920591 interstatebsphcl@gmail.com
4.	Anand Suman	AEE (I/S)	7763815059 interstatebsphcl@gmail.com
5.	Himanshu Kumar	Resd. Engr	8987069761 rendbsphcl @gmail.com
NBPDCL			
6.	S.K.P.Singh	Director (Projects)	7763815029 directorprojects.nbpdcl@gmail.com
SBPDCL			
7.	Narendra Kumar	Ch.Engineer(Comml.)	7763814014 narendra060@gmail.com
8.	P.Prasad	EEE(Comml.)	7763814744 purush5676@gmail.com
9.	N.K.P.Sinha	Director(Projects)	7763813949 dirprojectsbpdcl@gmail.com
WBPDCL			
10.	Subhasis Ghosh	Director(O & M)	s.ghosh03@wbpdcl.co.in
WBSETCL			
11.	Partha Pratim Mukherjee	CE(PTP)	7449300215 ceptp.wbsedcl
12.	Sudipto Mukhopadhyay	CE (Regulations)	7449300226 cereg.wbsedcl@gmail.com
CESC			
13.	Sandip Pal	General Manager(System Operation)	9831054651
14.	A Sen Gupta	Dy. GM (System Con)	9831802682 arunava.gupta@rp-sg.in
DPL			
15.	Debasis Sinha	Director (Mining & Regulatory) & CS	9434706516 debasisdl@yahoo.co.in
16.	Parthapratim Roy	General Manager (Corp-Tech),	9434706349 royparp@gmail.com
GRIDCO			
17.	Umakanta Sahoo	DGM (PP)	9437185507 u.sahoo.puri@gmail.com
18.	Mrs. Susmita Mohanty	Asst.GM(E)	9437231456 susmitagridco@gmail.com
19.	M. K. Das	Director (Comml)	7606000337 dir.commercial@yahoo.com
OHPC			
20.	S.K.Tripathy	Director(Operation)	7328840009 sanjib.burla@gmail.com
OPGC			
21.	Pradeep Kr Mahapatra	AGM	9338715401 pradeep.mohapatr@opgc.co.in
22.	Krushna Ch. Samantray	DGM	9338715428 krushna.samantray@opgc.co.in

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
ODISHA/SLDC			
23.	Uttam Kumar Samal	Director(O)	9438907730 dir.operation@optcl.co.in
24.	Chitta Ranjan Mishra	AGM(E)	9438907801 ele.crmishra@optcl.co.in
25.	Lalatendu Nayak	Sr.GM(O &M)	9438907305 ele.lanayak@optcl.co.in
26.	P.K.Mishra	CLD	9438907402 Ele.pkmishra@sldc
JUVNL, JUSNL, JBVNL			
27.	Dr. N.M.Kulkarni	Secretary-cum-CMD	9431121011
28.	Atul Kumar	Director (Project)	9431135532 dir.p.jusnl@gmail.com
29.	Sailesh Prakash	ESE (SLDC)	9470145226 saileshjseb@gmail.com
30.	S.K.Thakur	Chief Engineer (Comml.)	9431908984 sunilthakursp@yahoo.com
31.	C.M.Sharma	Ch.Engineer	9431175416 cmsharma51@gmail.com
TVNL			
32.	Sanatan Singh	Managing Director	9031049921 sanatantvnl@gmail.com gmcumce.ttps@gmail.com
33.	S.K.Choudhary	El. Suptd. Engr	9031049931 sailesh.ttps@yahoo.co.in
DVC			
34.	P.K.Mukhopadhyay	CMD	9831227333 Chairman @dvc.gov.in
35.	A.K.Jain	DCE, Chairman Office	9434676386 anil.jain@dvc.gov.in
36.	A. Debnath	Executive Director (System)	9831954257 achintya.debnath@dvc.gov.in
37.	D.K.Aich	Executive Director (Comml.)	9831954257
38.	B Pan	Chief Engineer-I, (SLDC)	9903247102 bpam.dvc@gmail.com
39.	S .Ghosal	DY. Chief Engineer (Commercial)	9432677003 subrataghosal64@gmail.com
MPL			
40.	Purusottam Thakur	CEO	9238003939
41.	Sudip Dash	Group Head (Commercial)	9204652869 7004510981 sudip.dash@tatapower.com
NTPC			
42.	M.P.Sinha	ED,ER-I	9431009112 mpsinha@ntpc.co.in
43.	H.S.Sahu	GM(OS),ER-I	9493193251 hssahu@ntpc.co.in
44.	Shailendra Singh	DGM(Comml)	9650990665 shailendrasingh@ntpc.co.in
45.	B.B.Tripathy	GM(OS),ER-2	9437176595 bbtripathy69@hotmail.com
46.	S D Jha	AGM (Comm)ER-1	9471004728 sdjha@ntpc.co.in
POWERGRID			
47.	Sanjai Gupta	ED	9422211226 sanjai.gupta@powergridindia.com
48.	Avinash M Pavgi	GM(AM)ER1	9910378086 apavgi@powergridindia.com
49.	P.N.Dixit	ED,CC-AM	9873549062 pndixit@powergridindia.com
50.	Rajesh Verma	CM(CTU)	9599192370

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
			rverma@powergridindia.com
51.	R.P.Rath	GM(AM)	9078883604 rprath@powergridindia.com
52.	A.K. Behera	DGM(AM)	9437575638 akbehera@powergridindia.com
53.	S.K. Singh	Dy.GM(AM) / ER-I	8544401030 singhsk@powergridindia.com
54.	N K Ohdar	GM	9434740031 nkohdar@powergridindia.com
55.	SVS Satyanarayan	AGM	9434740037 svs@powergridindia.com
56.	Ms. Manju Gupta	AGM	9910378128 manju@powergridindia.com
57.	M. K. Agarwal	DGM (COMML)	9931815668 mridul@powergridindia.com
NHPC			
58.	Janardan Choudhary	ED(O&M)	9958819003 janardan.choudhury@gmail.com
59.	Chander Mohan	ED(Comml.)	9818039339 cmohan@gmail.com
60.	M.K.Mittal	Director (Finance)	9717636802 mkmittal@nhpc.nic.in
61.	S.K.Mishra	Sr. Manager(O &M)	skm.nhpc@yahoo.com
Sikkim			
62.	N.T.Bhutia	PCE cum Secretary	
63.	K.B.Kunwar	PCE -I	8001124511 kunwarkb@gmail.com
64.	S.P.Kazi	Chief Engineer-I	9434169660
GMRKEL			
65.	Arabinda Pani	Head-O&M	7752020444 arabinda.pani@gmrgroup.in
66.	Pradeep Kumar Mohanty	GM	7894450332 pradeep.mohanty@gmrgroup.in
67.	M.D.Pandey	Associate Manager,Power Sales	9821020812 manishdeopandey@gmail.com
PTC			
68.	Harish Saran	ED (Marketing)	9810394429 harishsaran@ptcindia.com
Tata Power Trading			
69.	Prashant Sharma	Head (Comml.)	9910378002 prashantsharma@tatapower.com
Tata Power			
70.	Sanjeev Mehra	MD	9250001771 sanjeev.mehra@tatapower.com
JITPL			
71.	Anand Mohan Misra,	COO	9810553164 anand.misra@jindalgroup.com
72.	Chandrashekhar Bobade	VP	8130613563 transmission@jindalgroup.com
Teesta Urja Ltd.			
73.	D.P Bhargava	Chief Consultant (O&M	9958833995 dpbhargava@teestaurja.com
CEA			
74.	Vijay Menghani	Chief Engineer(IT)	9999035484 vmenghani@nic.in
75.	B.K.Sharma	Principal Chief Engineer (GO & D Wing)	9968284836 bkscea@gmail.com
76.	Praveen Gupta	Chief Engineer(IRP)	9810692114 pgupta67@nic.in
BHUTAN			
77.	K.Phuntsho	CEO	795-17944708

Sl. No.	Name S/Shri	Designation	Contact Number e-mail id
78.	Sherab	GM	975-17650925
79.	K.Tshewang	Ch. Engineer	975-17775454 ktshewangemoea.gov.bt
80.	T.Choden	Dy. Engr	975-17647484 tchoeden@moea.gov.bt
Tala HEP			
81.	Yeshi Tenzin	Chief Engineer,	975-77182008/17161166 ce.thp@drukgreen.com
DGPC			
82.	Kuenga Namgay	Director(O &M)	9719693104 director.o&m@drukgreen.com
POSOCO			
83.	G.Chakraborty	DGM(MO)	9433041815 gcharaborty@posoco.in
84.	N.Nallarasan	DGM(SO)	8527077022 nallarasan@posoco.in
ERLDC			
85.	P. Mukhopadhyay	ED	9869438073 pmukhopadhyay@posoco.in
86.	G. Mitra	DGM	9831297392 gopalmitra@posoco.in
87.	S. Banerjee	DGM	9433041823 surajit.banerjee@posoco.in
88.	S. Konar	Chief Manager	9436335370 konar_s@posoco.in
89.	A B Sengupta	Sr.Engr.	9433041872 anwaryasen @ posoco.in
ERPC			
90.	J.Bandyopadhyay	Member Secretary	9432326351 mserpc-power@gov.in
91.	P.K. De	Executive Engineer	9433125844 rpc.erpc@gov.in
92.	P.N.Sarkar	Executive Engineer	9830027523 pn_sarkar@rediffmail.com
93.	D.K. Bauri	Executive Engineer	9883617326 eeop.erpc@gov.in
94.	G. R. Jada	Executive Engineer	9547891353 ereb_cea@yahoo.com
95.	A.De	AEE	9681932906 alik.erpc@gov.in
96.	P.P. Jena	AEE	9776198991 ppjena.erpc@gov.in

Annexure-2

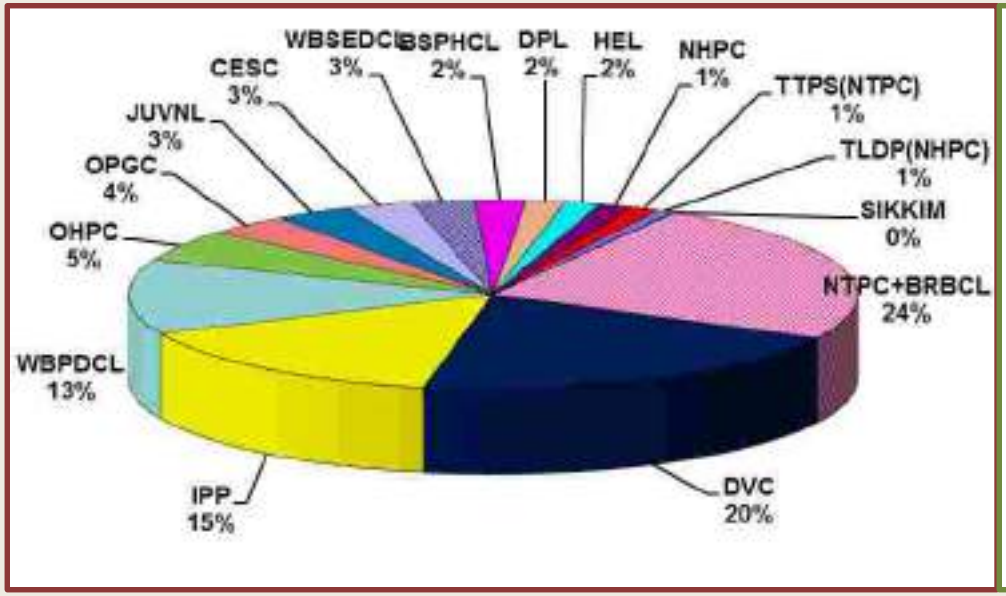
Power System Operation Corporation Ltd.

37th ERPC Meeting

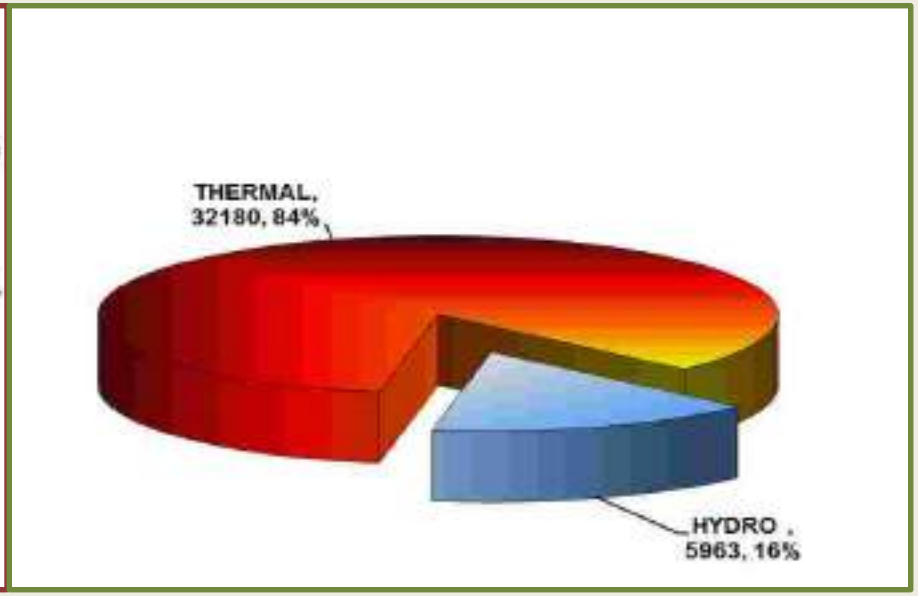
ER Grid Performances

- Overview
- Frequency Profile
- Demand / Energy met
- Generation pattern
- Transnational Exchange
- Eastern-Regional Export Profile
- Overdrawal by E. Region
- Trading in Exchange and Bilateral STOA
- New transmission element / Generation

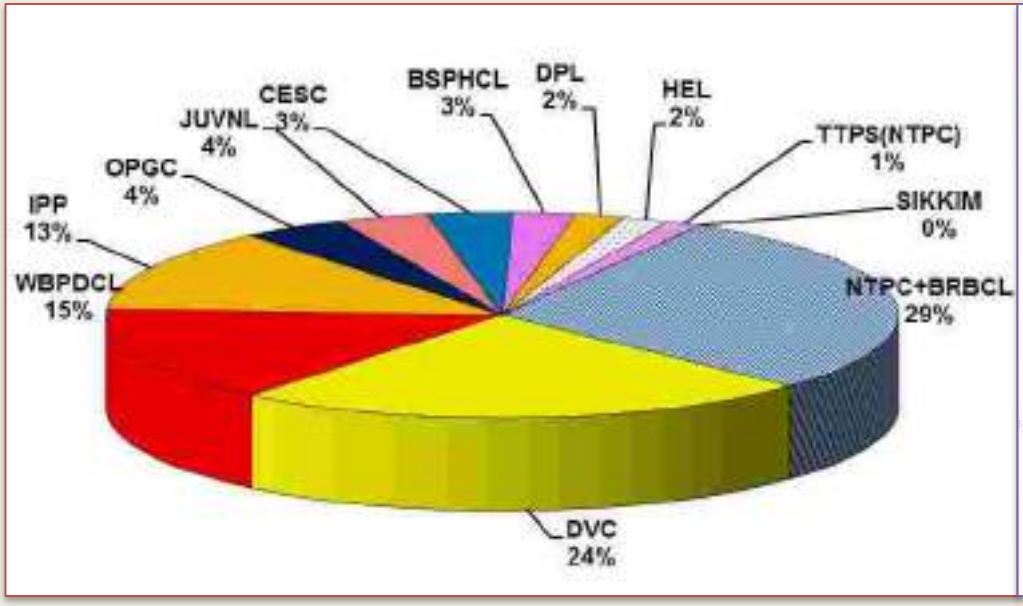
Eastern Region's Effective Capacity=38143 MW



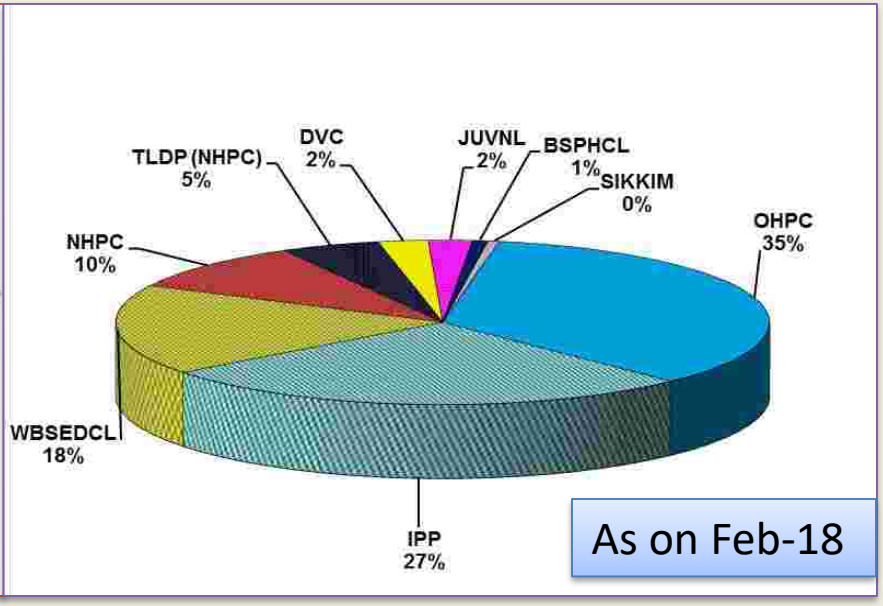
Eastern Region's Thermal Vs Hydro Generation



Thermal Generation (32180 MW) –Owner wise

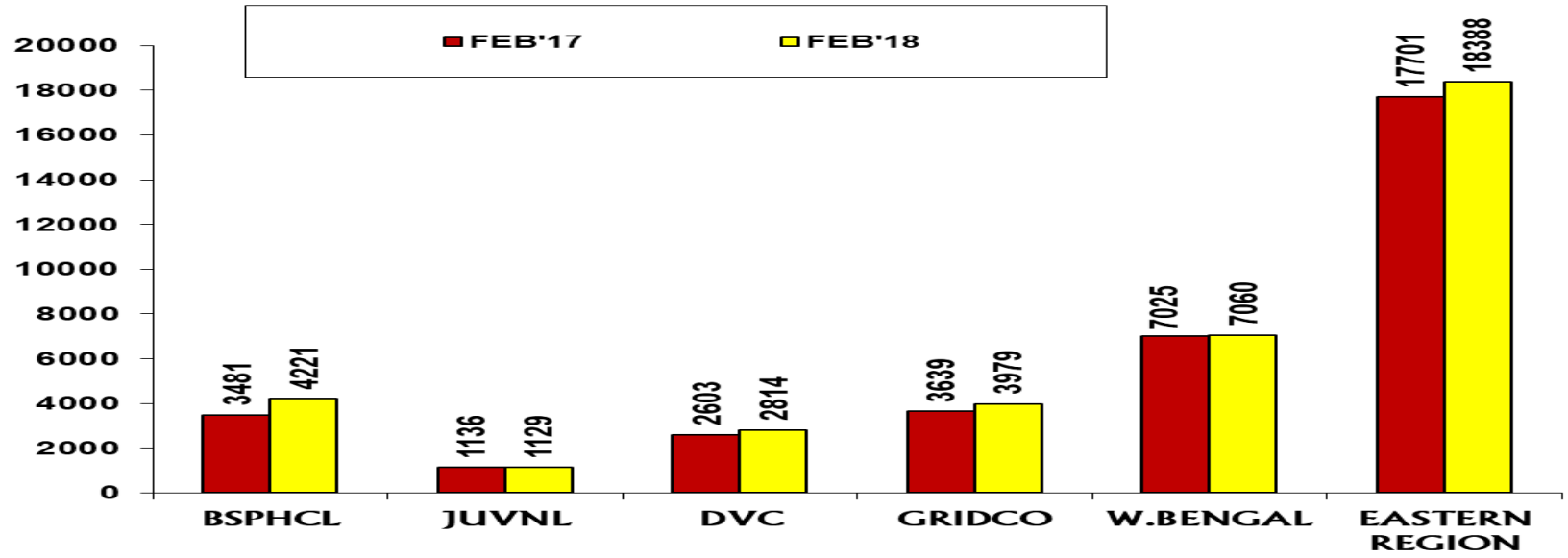


Hydro Generation (5963 MW) – Owner wise

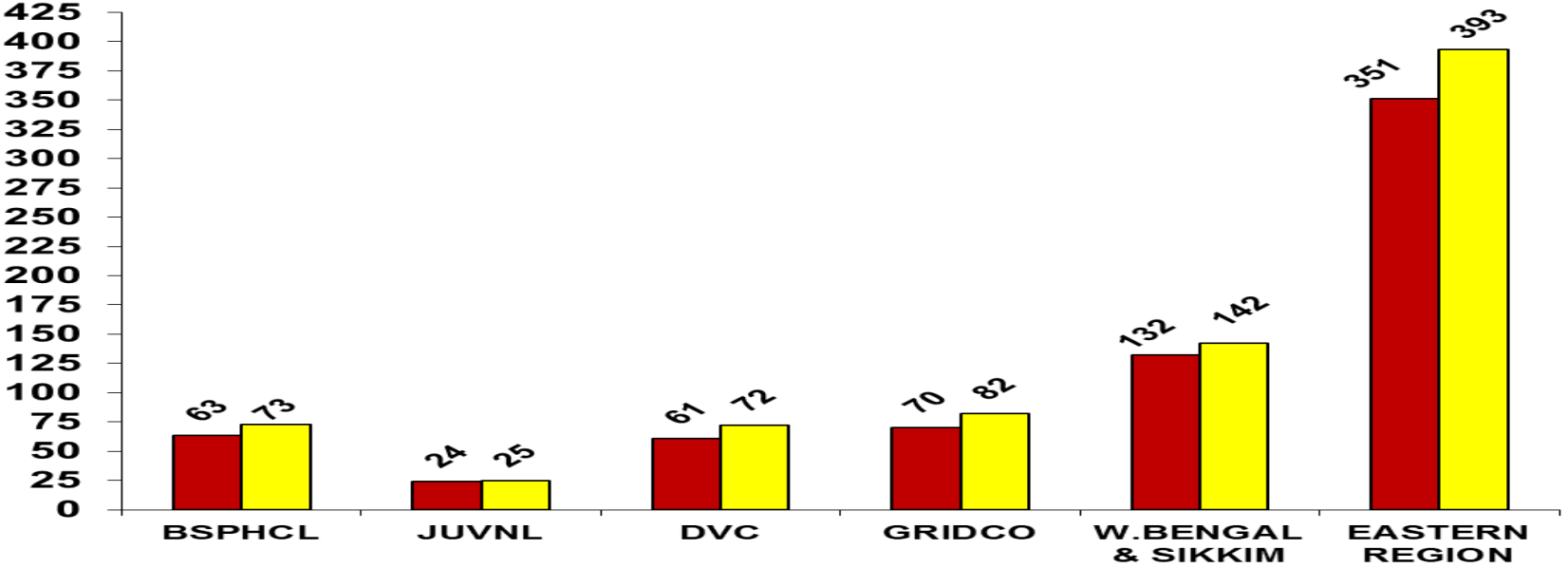


As on Feb-18

AVERAGE DAILY MAXIMUM DEMAND (MW) MET IN FEB- 2018



AVERAGE ENERGY CONSUMPTION IN MU PER DAY IN FEB- 2018



Highlights of Demand / Consumption (Apr-17 to Feb'18)

Maximum Demand Met

ER:	**21116 MW;** ***on 18/10/17 at 19:43 hrs***
BSPHCL :	***4488 MW ; ON 26/09/17***
JUVNL:	***1222 MW; ON 22/04/17***
DVC:	***3202 MW; ON 30/12/17***
GRIDCO:	***4656 MW; ON 10/10/17***
WB:	***8605 MW; ON 12/04/17***
SIKKIM:	***117 MW; ON 28/10/17***

	Avg (MU)	Max (MU)	Date of Max
BSPHCL	74	93	28/09/17
JSEB	24	26	05/09/17
DVC	65	71	24/01/18
GRIDCO	79	93	16/09/17
WBSETCL	145	182	16/09/17
Sikkim	1.29	1.97	01/02/18
ER	387	458	16/09/17

Frequency Profile

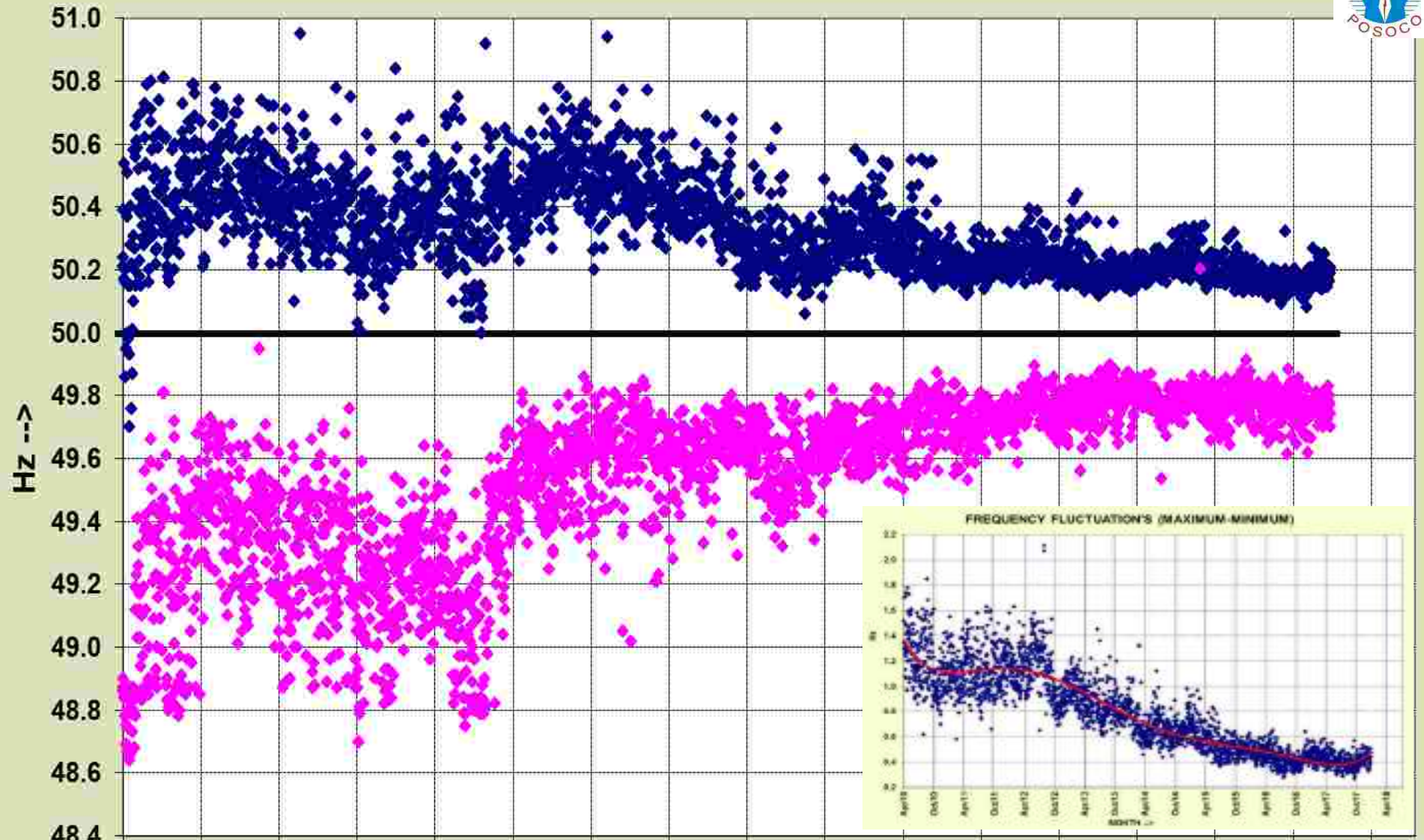
Highlights of Frequency Profile (Apr-17 to Feb'18)

- Maximum Freq - 50.32Hz on 21/05/17, 17/09/17
- Minimum Freq – 49.62 Hz on 23/09/17, 07/11/17, 31/01/18
- Average Freq:- 49.98 Hz
- FVI:- 0.02

% of Frequency

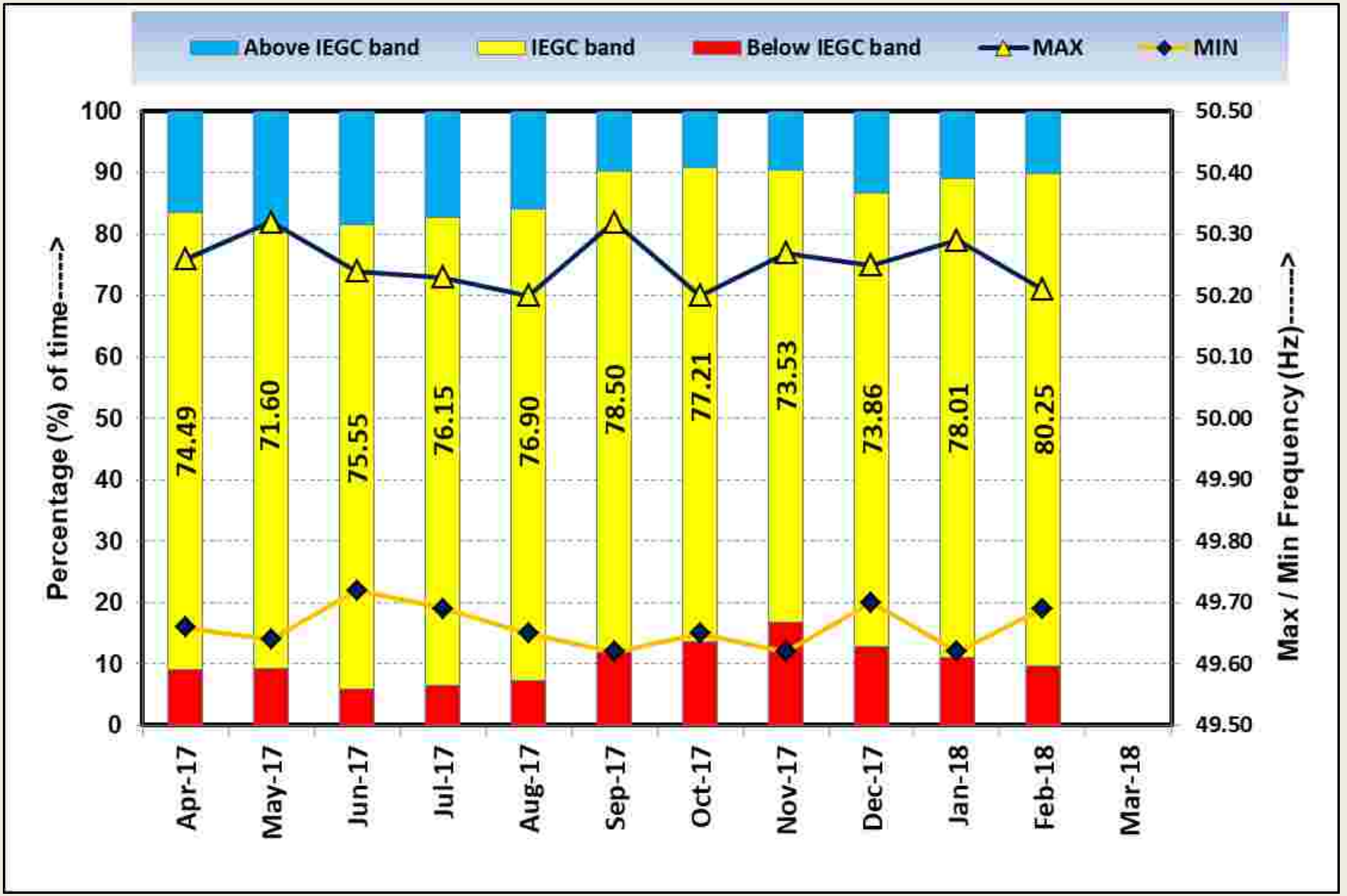
- 76.0% of the time freq was within IEGC Band
- Within IEGC band Max =88.18% on 17/07/17
- Above IEGC band Max =38.12% on 20/08/17
- Below IEGC band Max =50.23% on 03/05/17

MAXIMUM AND MINIMUM FREQUENCY PATTERNS



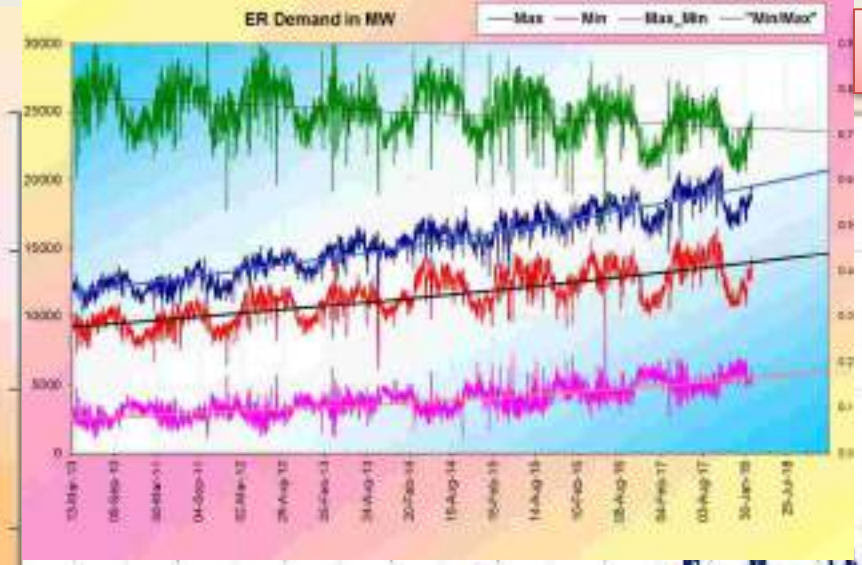
Frequency Profile

Max: 50.32 Hz; Min: 49.62 Hz; Avg: 49.98 Hz;
Average:76% of time within IEGC Band



Demand / Energy Consumption Pattern

Energy Consumption Growth Trend



All India Growth: 5.06% (YoY Avg.)
Max = 3643 mu on 18/08/2017
In 2ndary axis

ER growth: 5.4% (YoY Avg.)
Max = 458 mu on 16/09/2017

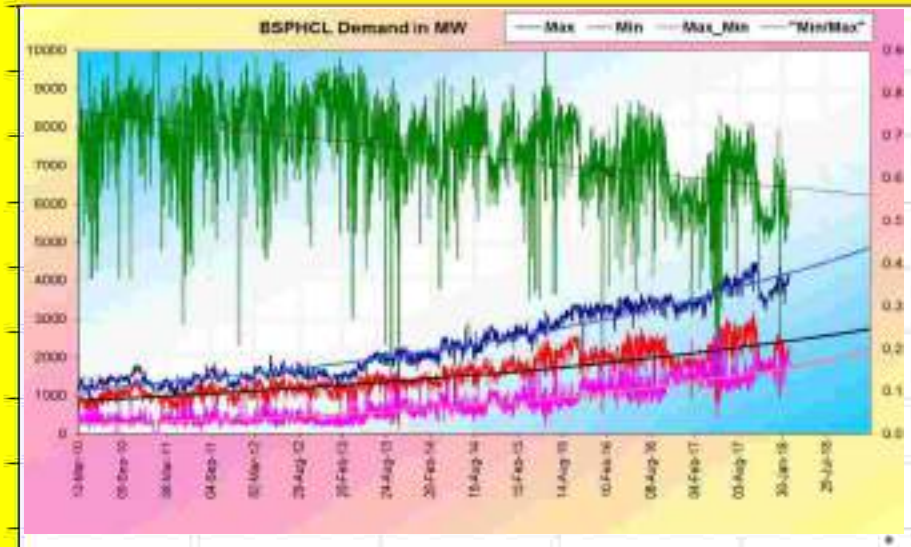
MU

600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00

4000
3500
3000
2500
2000
1500
1000

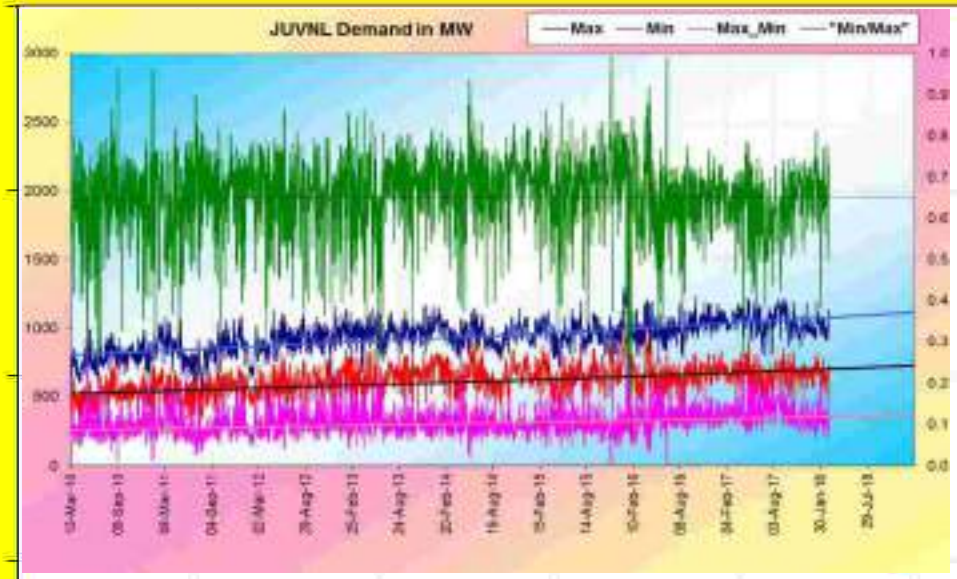
09/Apr/10
06/Oct/10
04/Apr/11
01/Oct/11
29/Mar/12
25/Sep/12
24/Mar/13
20/Sep/13
19/Mar/14
15/Sep/14
14/Mar/15
10/Sep/15
08/Mar/16
04/Sep/16
03/Mar/17
30/Aug/17

BSPHCL Energy met in MU



Avg. Energy Consumption growth:
11.8% (YoY)

JUVNL Energy met in MU

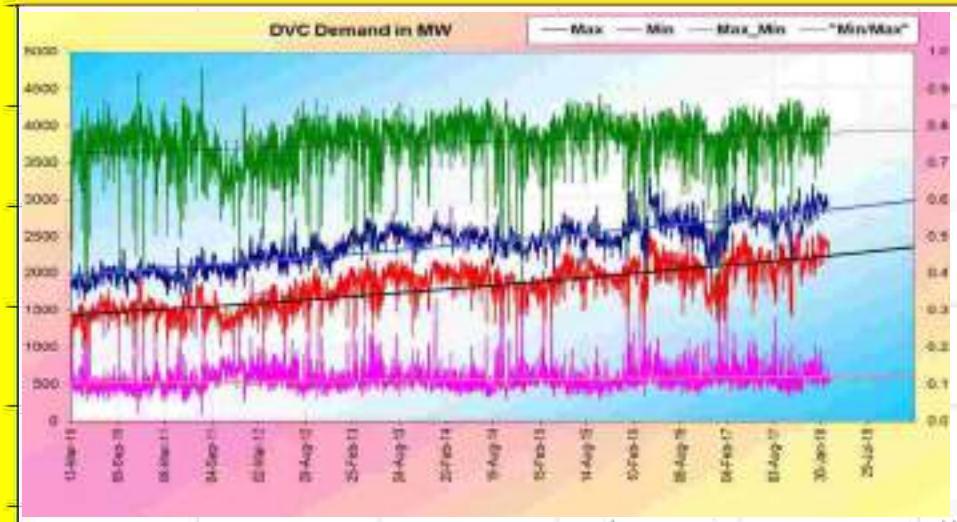


Avg. Energy Consumption growth:
3.4% (YoY)

40
35
30
25
20
15
10

01-Apr-10
01-Apr-11
31-Mar-12
31-Mar-13
31-Mar-14
31-Mar-15
30-Mar-16
30-Mar-17
30-Mar-18
30-Mar-19
29-Mar-20

DVC Energy met in MU

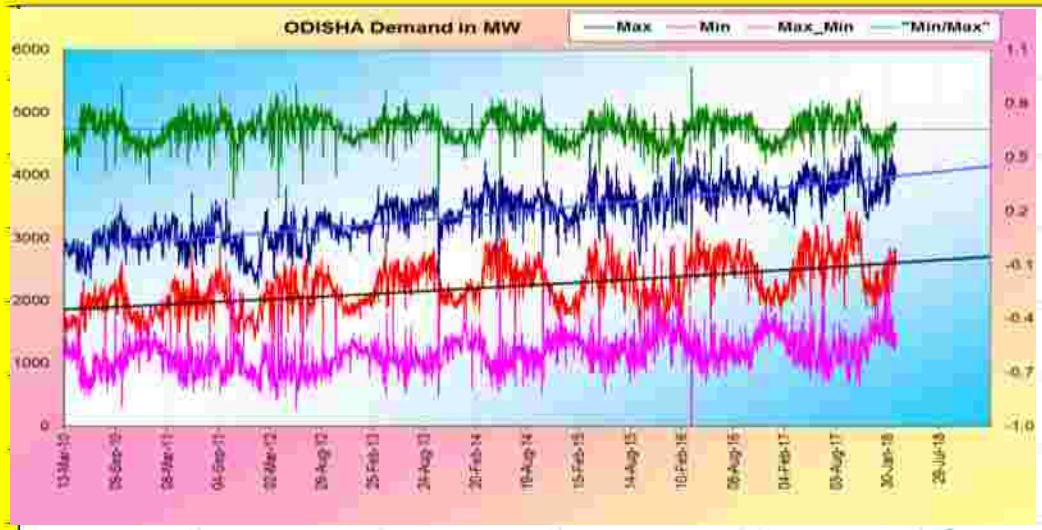


Avg. Energy Consumption growth:
7.1% (YoY)

90
85
80
75
70
65
60
55
50
45
40
35

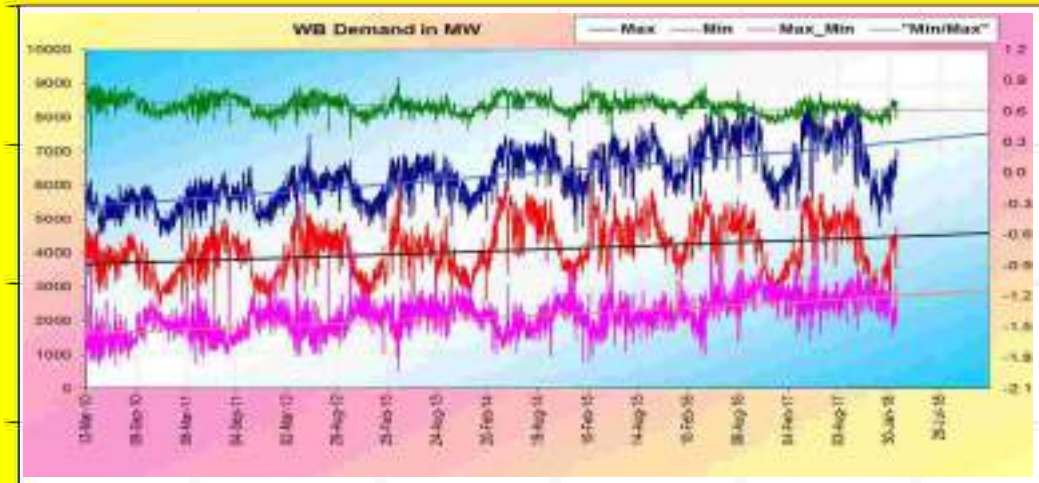
01-Apr-10
01-Apr-11
31-Mar-12
31-Mar-13
31-Mar-14
31-Mar-15
30-Mar-16
30-Mar-17
30-Mar-18
30-Mar-19
29-Mar-20

Odisha Energy met in MU



Avg. Energy Consumption growth:
6.8% (YoY)

WB Energy met in MU

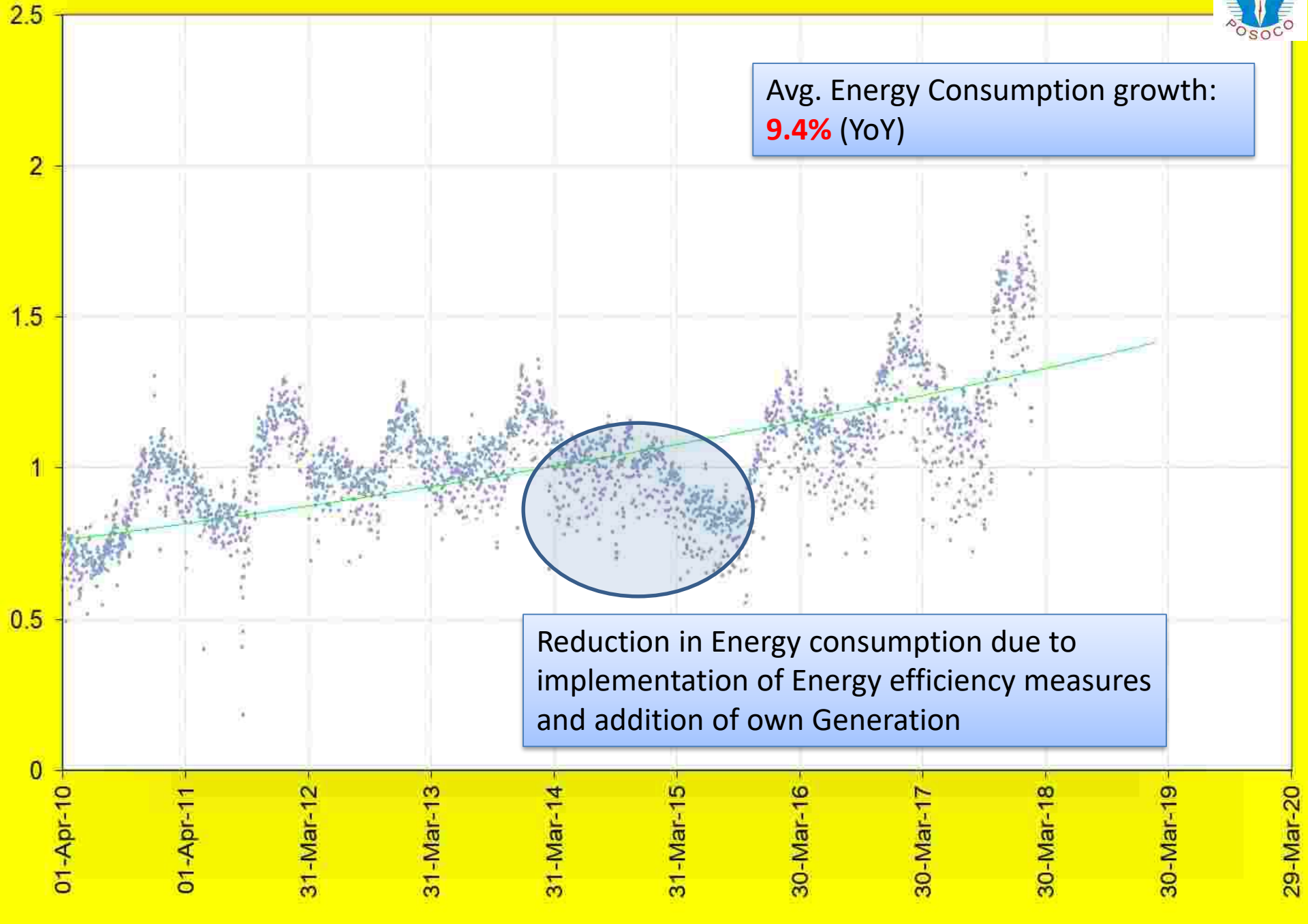


Avg. Energy Consumption growth:
1.3% (YoY)

240
220
200
180
160
140
120
100
80

01-Apr-10
01-Apr-11
31-Mar-12
31-Mar-13
31-Mar-14
31-Mar-15
30-Mar-16
30-Mar-17
30-Mar-18
30-Mar-19
29-Mar-20

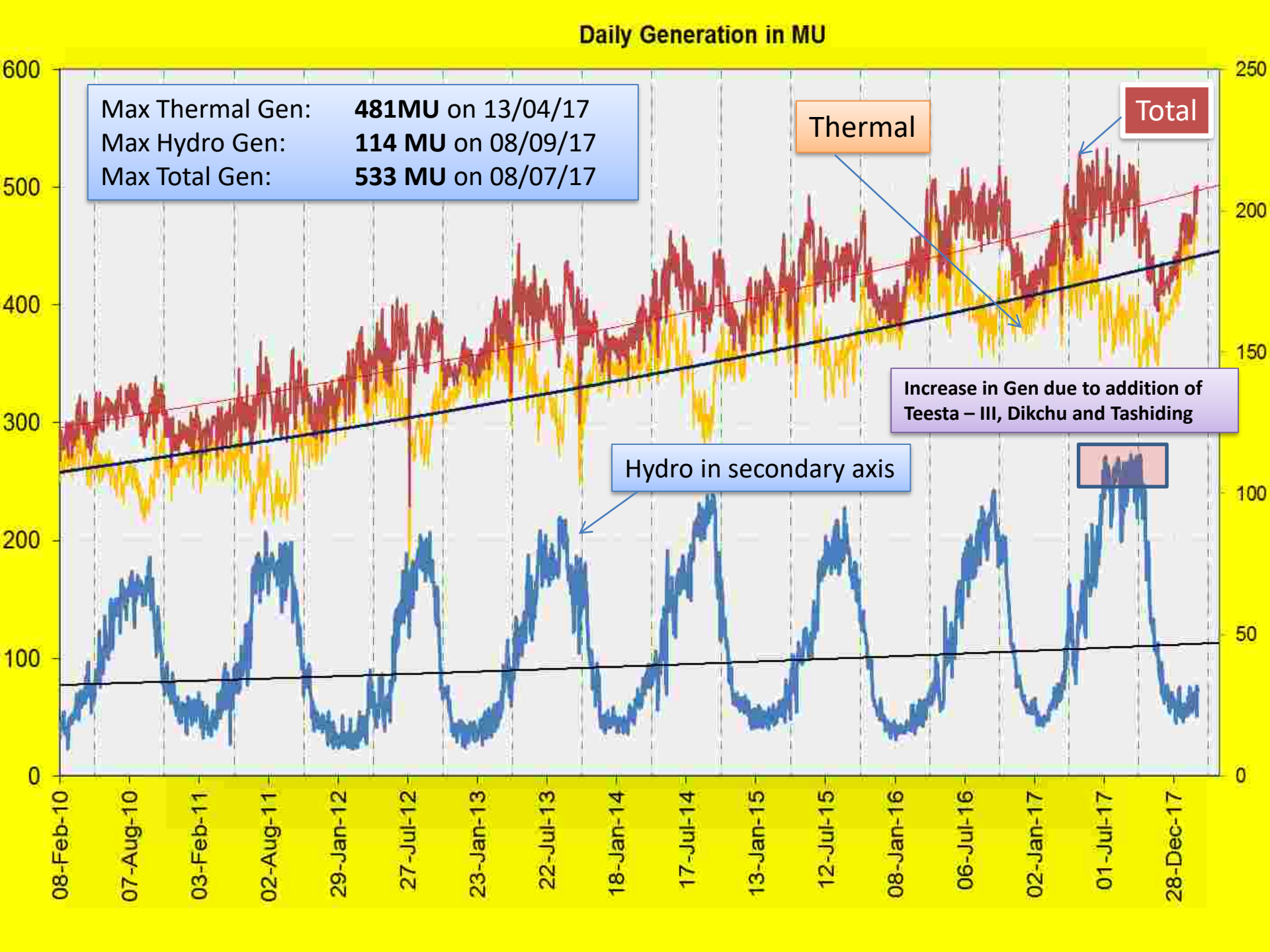
Sikkim Energy met in MU

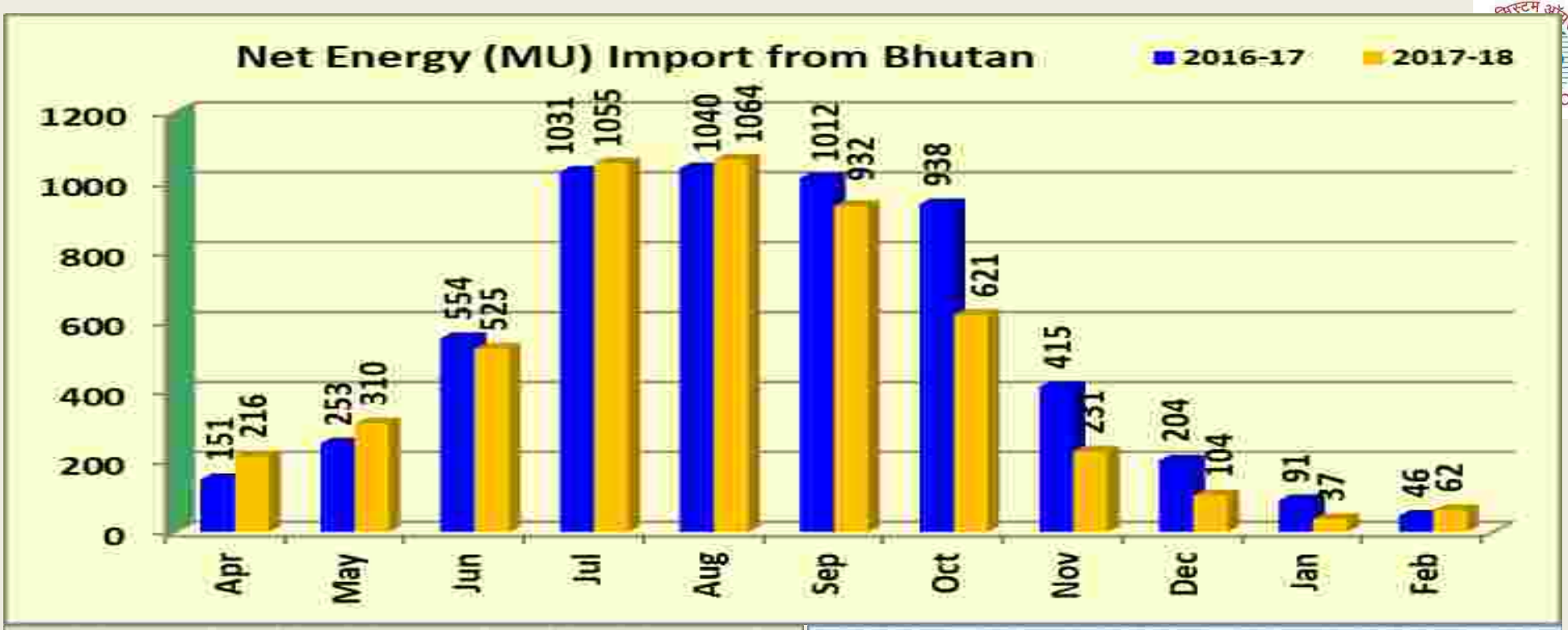


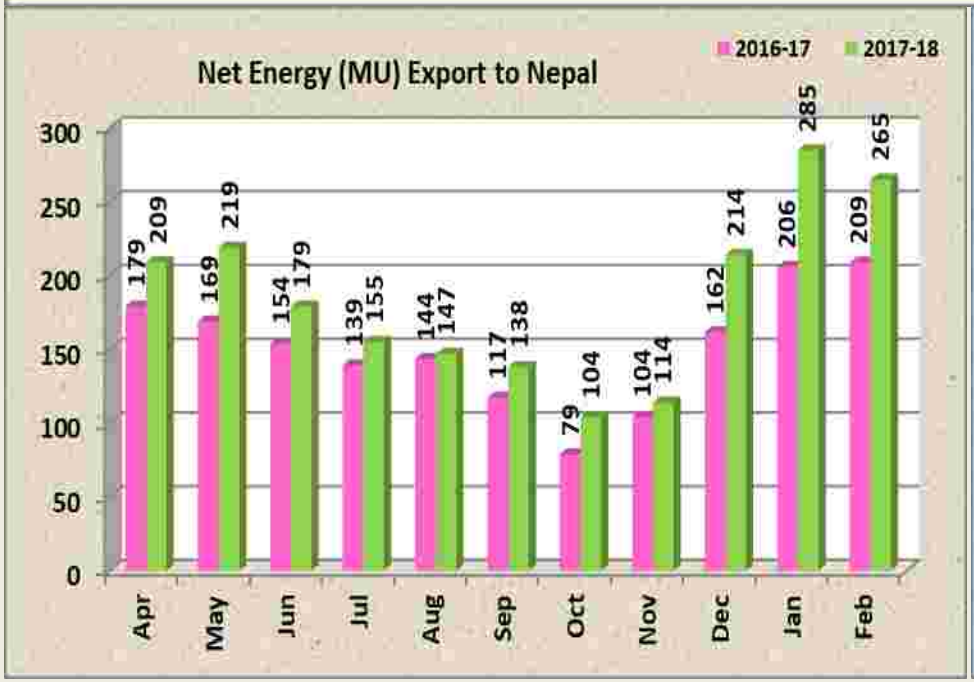
Avg. Energy Consumption growth: **9.4%** (YoY)

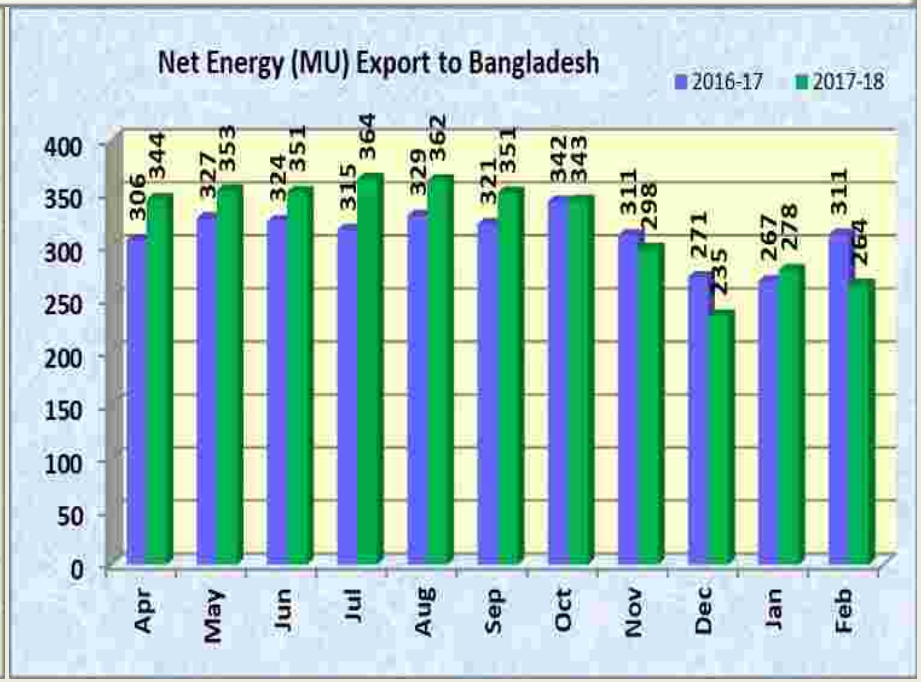
Reduction in Energy consumption due to implementation of Energy efficiency measures and addition of own Generation

Generation pattern


Daily Generation in MU
Max Thermal Gen: 481MU on 13/04/17
Max Hydro Gen: 114 MU on 08/09/17
Max Total Gen: 533 MU on 08/07/17
Thermal
Total
Increase in Gen due to addition of Teesta – III, Dikchu and Tashiding
Hydro in secondary axis
600
500
400
300
200
100
0
250
200
150
100
50
0
08-Feb-10
07-Aug-10
03-Feb-11
02-Aug-11
29-Jan-12
27-Jul-12
23-Jan-13
22-Jul-13
18-Jan-14
17-Jul-14
13-Jan-15
12-Jul-15
08-Jan-16
06-Jul-16
02-Jan-17
01-Jul-17
28-Dec-17

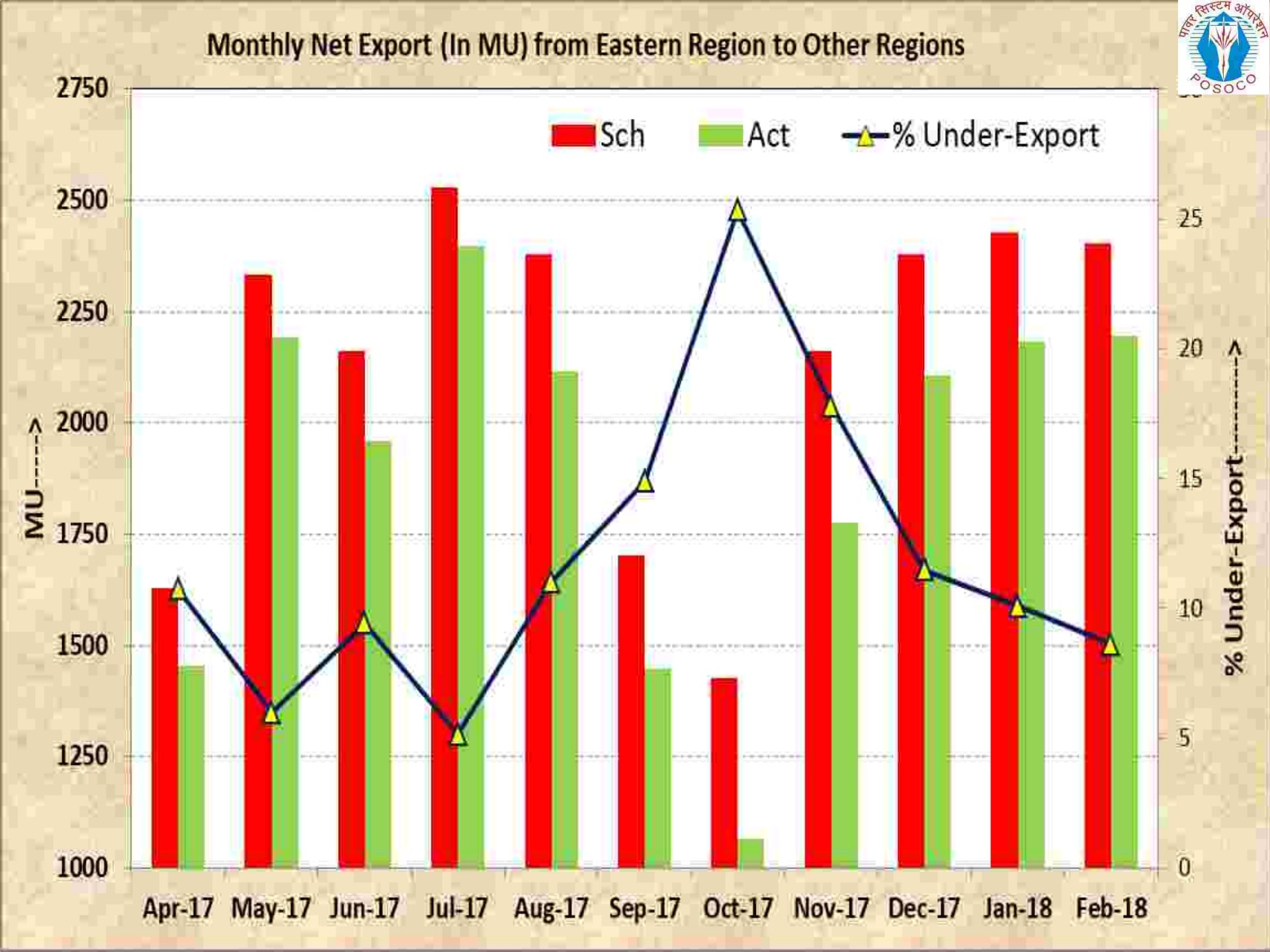

Net Energy (MU) Import from Bhutan
2016-17
2017-18
1200
1000
800
600
400
200
0
Apr 151 216
May 253 310
Jun 554 525
Jul 1031 1055
Aug 1040 1064
Sep 1012 932
Oct 938 621
Nov 415 231
Dec 204 104
Jan 91 37
Feb 46 62


Net Energy (MU) Export to Nepal
2016-17
2017-18
300
250
200
150
100
50
0
Apr 179 209
May 169 219
Jun 154 179
Jul 139 155
Aug 144 147
Sep 117 138
Oct 79 104
Nov 104 114
Dec 162 214
Jan 206 285
Feb 209 265


Net Energy (MU) Export to Bangladesh
2016-17
2017-18
400
350
300
250
200
150
100
50
0
Apr 306 344
May 327 353
Jun 324 351
Jul 315 364
Aug 329 362
Sep 321 351
Oct 342 343
Nov 311 298
Dec 271 235
Jan 267 278
Feb 311 264

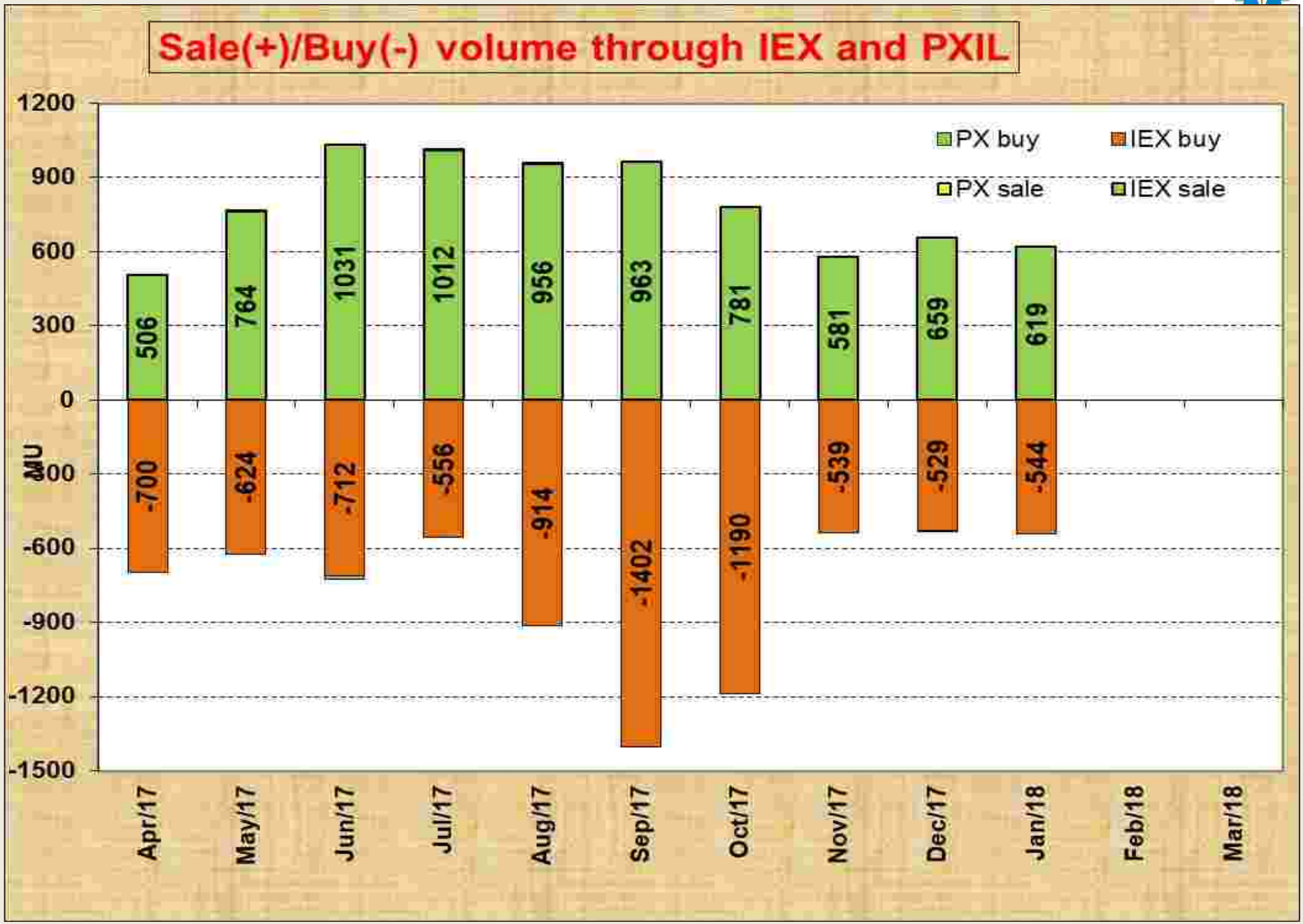
Overdrawl by E. Region

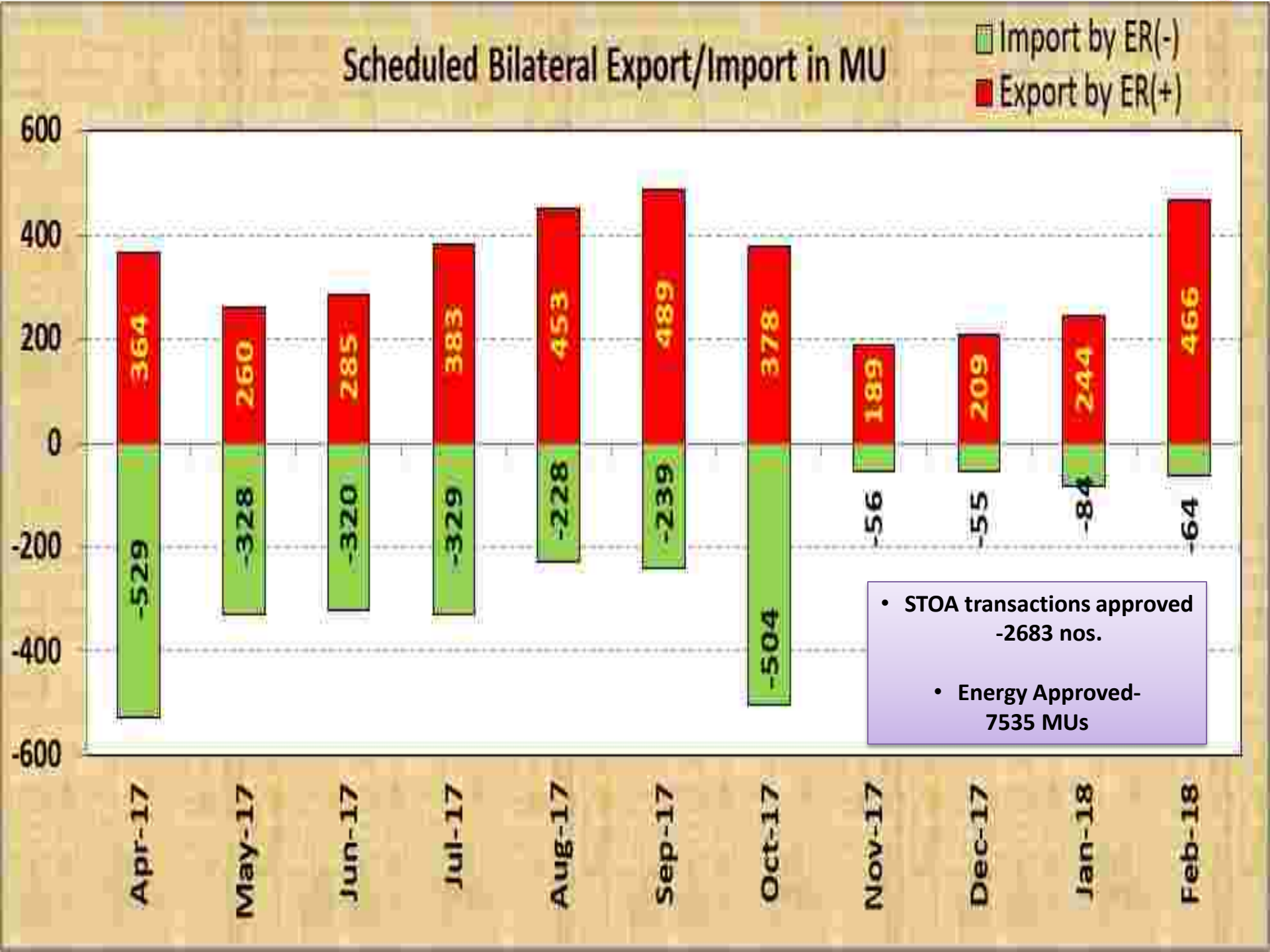
Monthly Net Export (In MU) from Eastern Region to Other Regions



Trading in Exchange and Bilateral STOA

Sale(+)/Buy(-) volume in MU through IEX and PXIL




Scheduled Bilateral Export/Import in MU
Import by ER(-)
Export by ER(+)
600
400
200
0
-200
-400
-600
364
260
285
383
453
489
378
189
209
244
466
-529
-328
-320
-329
-228
-239
-504
-56
-55
-84
-64
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
• STOA transactions approved -2683 nos.
• Energy Approved- 7535 MUs

New Transmission element and Generating stns. Added during Apr-17 to Feb-18

COD of New Generating Units :

- Dikchu Unit I of 48 MW on 12/04/2017.
- Dikchu Unit II of 48 MW on 28/05/2017.
- MTPS Unit#2 (Kanti Stage-II) of 195 MW on 01/07/17
- Tashiding Unit I & II (2 X 48.5 MW) on 18/10/17.
- Nabinagar Unit II (250 MW) on 10/09/17.

New Transmission line added :

1180 CKM Transmission lines added
400KV : -1016 CKM and 220KV :- 164 CKM

Issues…

- Power evacuation from hydro stations (≈2100 MW capacity) in Sikkim
  - Line constraints
  - Absence of LT contract of all the plants except Teesta-V
  - Simultaneous peaking absent
- Phasing of thermal plants in E.Region for FGD installation
  - Capacity inadequacy due to simultaneous shutdown program of a number of units in 2nd half of 2022
  - Network constraints due to shutdown of units at Lower voltage levels in DVC & WB :Review of transmission system strengthening.

Issues… (contd.)

- High voltage & inadequate reactive power absorption
  - Arambagh (> 420 kV almost 100% time)
  - Sagardighi units can absorb more MVAR
  - Outage of 50 MVAR L/reactor of VAL-Meramundali-I at Meramundali

- Reduced reliability of power evacuation from 4X150 MW U. Indravati HPS
  - 3x105 MVA 400/220kV ICT-I tie breaker, 220kV Bus coupler and transfer bus breakers are not in service at 400/220kV Indravati (OHPC) S/s.
  - Target dates given by OHPC for replacement of CT and Breakers are too long

Annexure-4

NATIONAL ELECTRICITY PLAN

ERPC Meeting

16-03-2018

GOA

NATIONAL ELECTRICITY PLAN

Section 3(4) of the Electricity Act, 2003 stipulates that "The Authority shall prepare a National Electricity Plan and notify such plan once in five years."

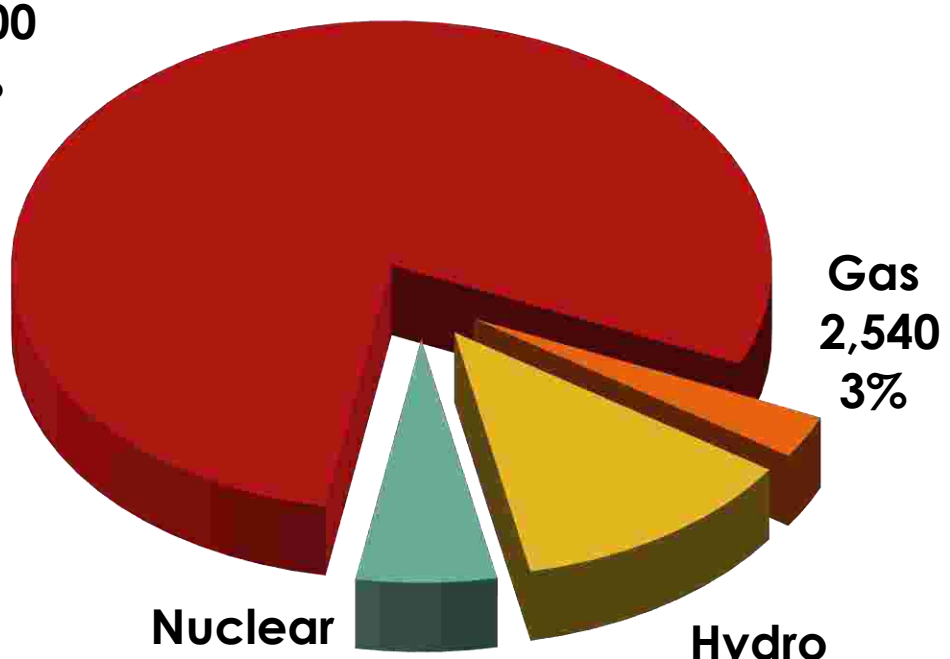
NATIONAL ELECTRICITY PLAN

National Electricity Plan (NEP) includes

- Review of the current Plan (12th Plan : 2012-17)
- Demand Projections for the years 2021-22 and 2026-27
- Capacity addition requirement from conventional sources

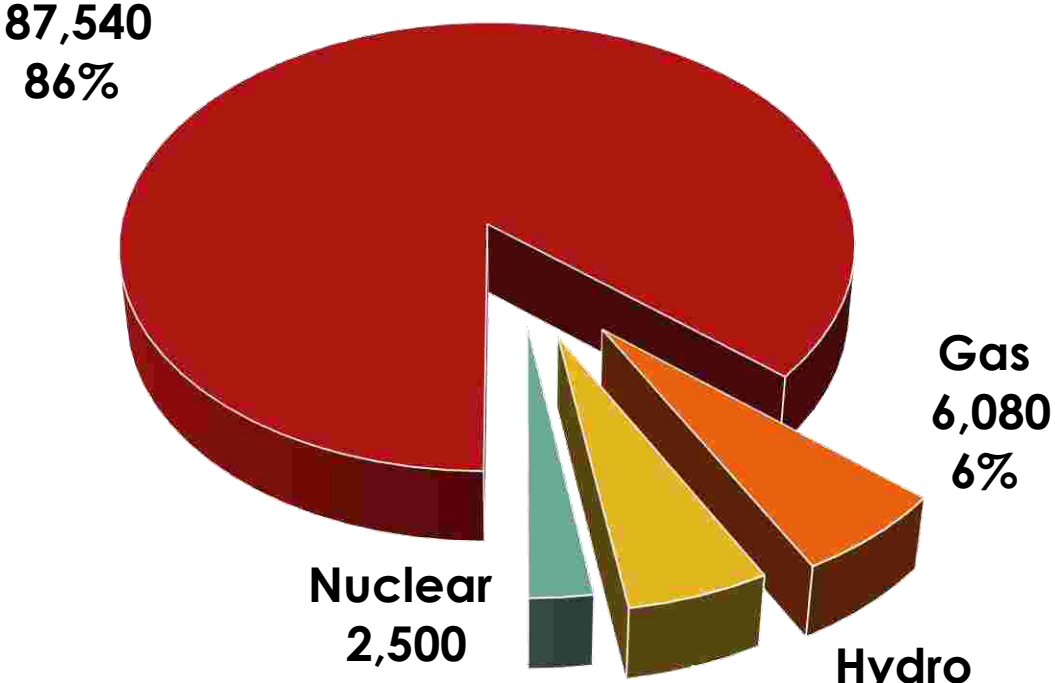
CONVENTIONAL CAPACITY ADDITION DURING 12th PLAN (2012-17) (Type wise)

TARGET



TOTAL 88,537 MW

ACTUAL CAPACITY ADDITION



TOTAL – 99,210 MW

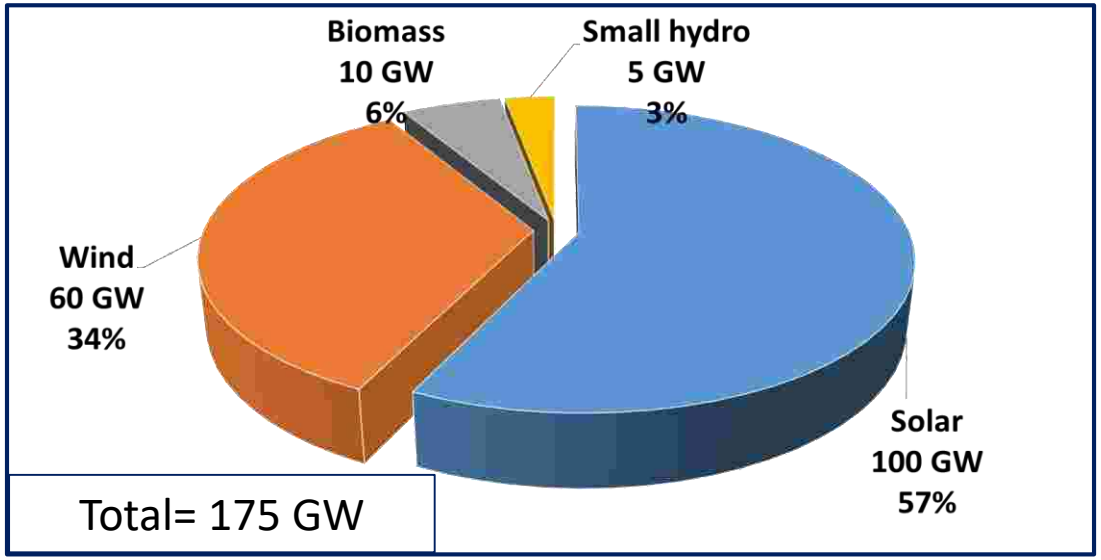
DEMAND

Year	Peak Demand (GW)	Energy Requirement (BU)
2021-22	225.7	1,566
2026-27	298.8	2,047

DEMAND REDUCTION DUE TO DSM

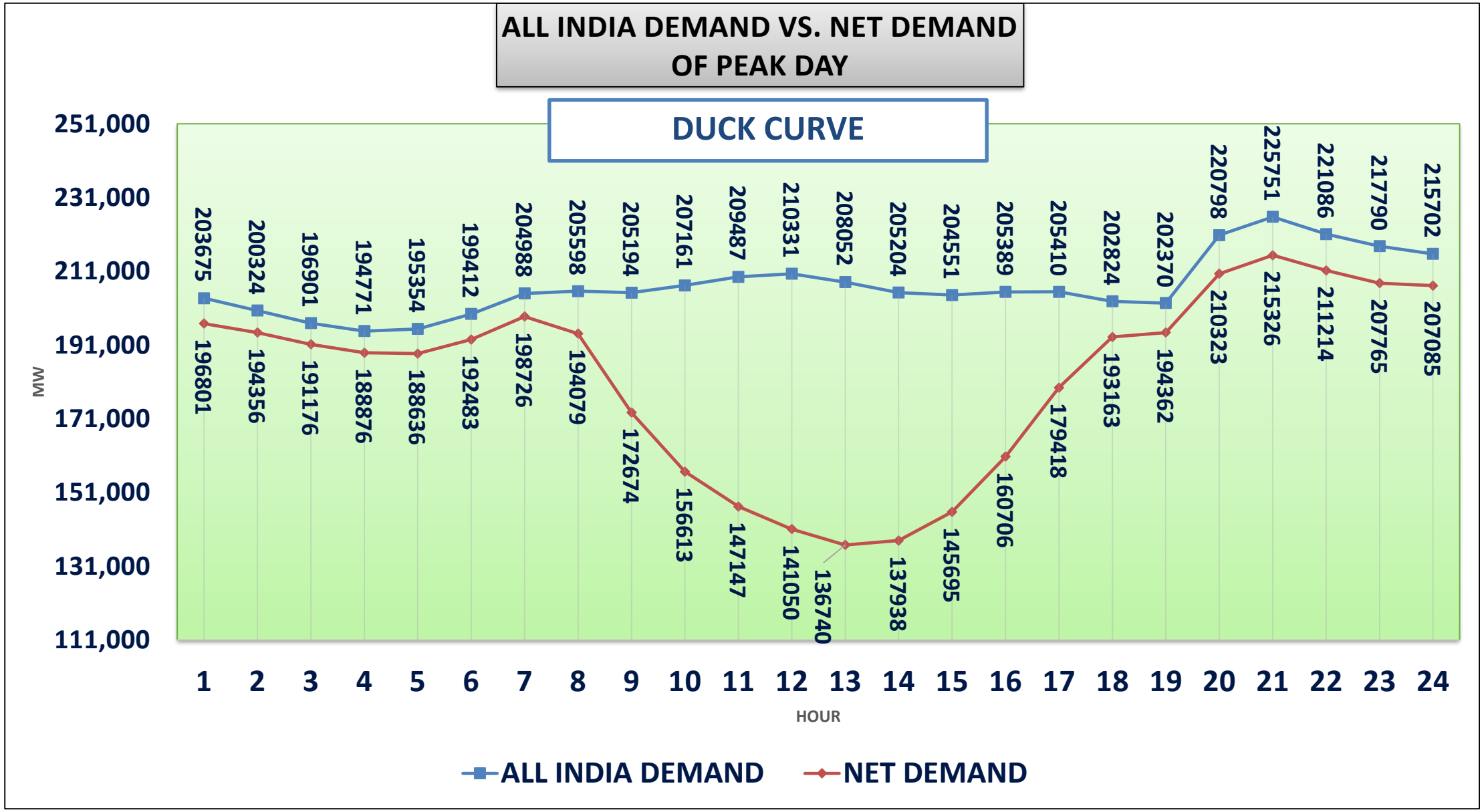
Year	Energy Requirement (BU)	Peak Requirement (GW)
2021-22	206	9
2026-27	273	12

RES INSTALLED CAPACITY BY MARCH,22

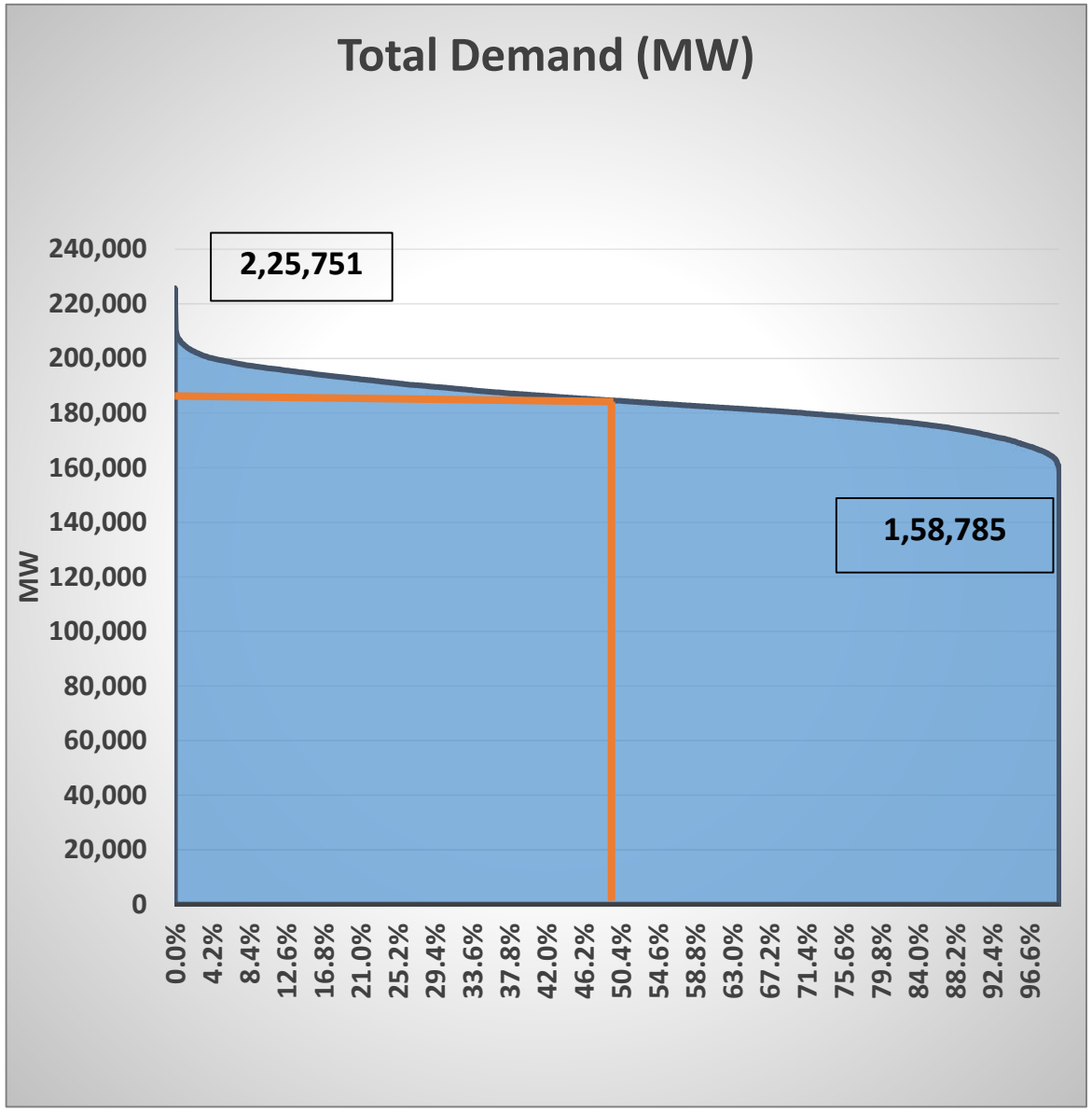


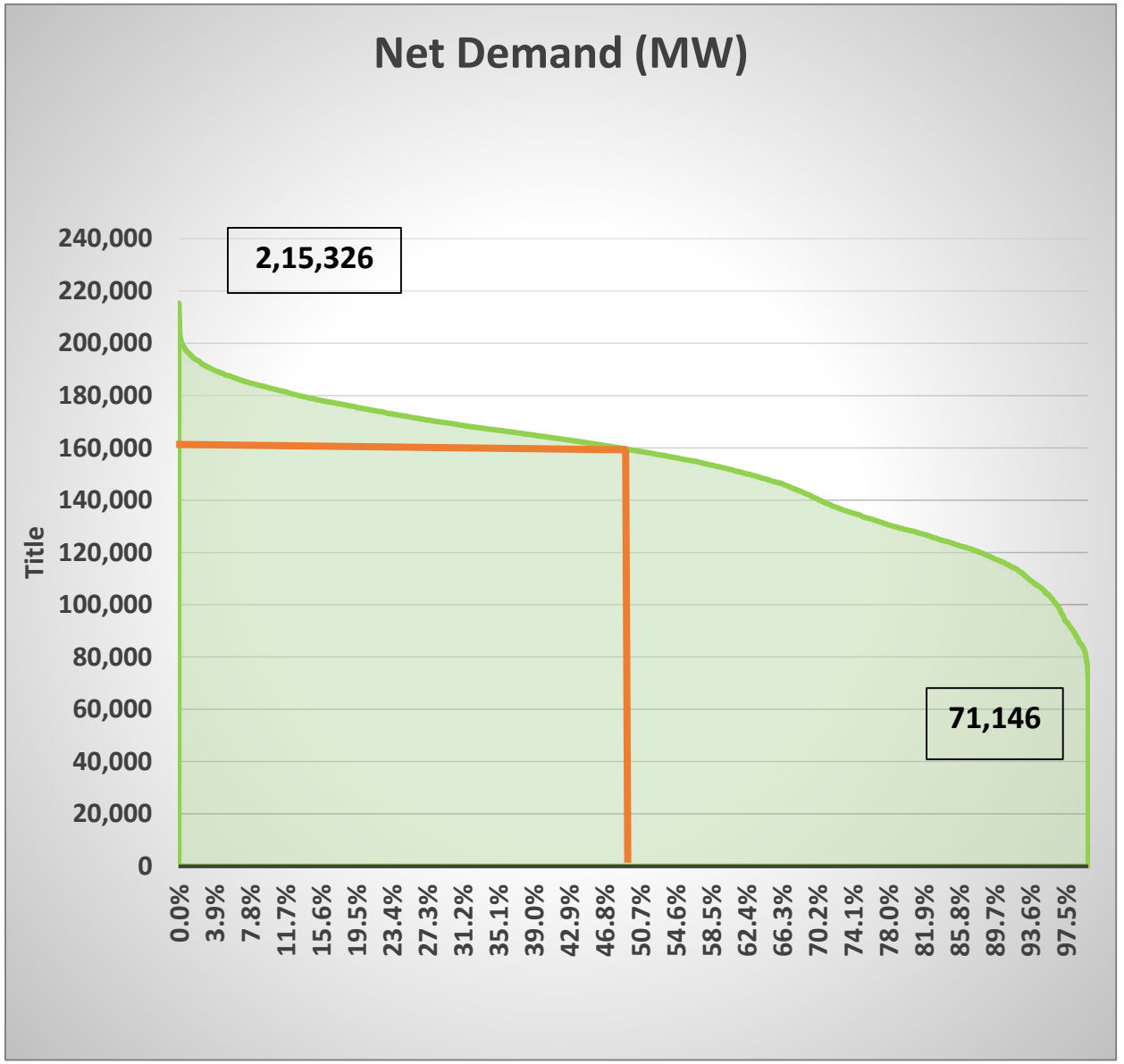
Total= 175 GW

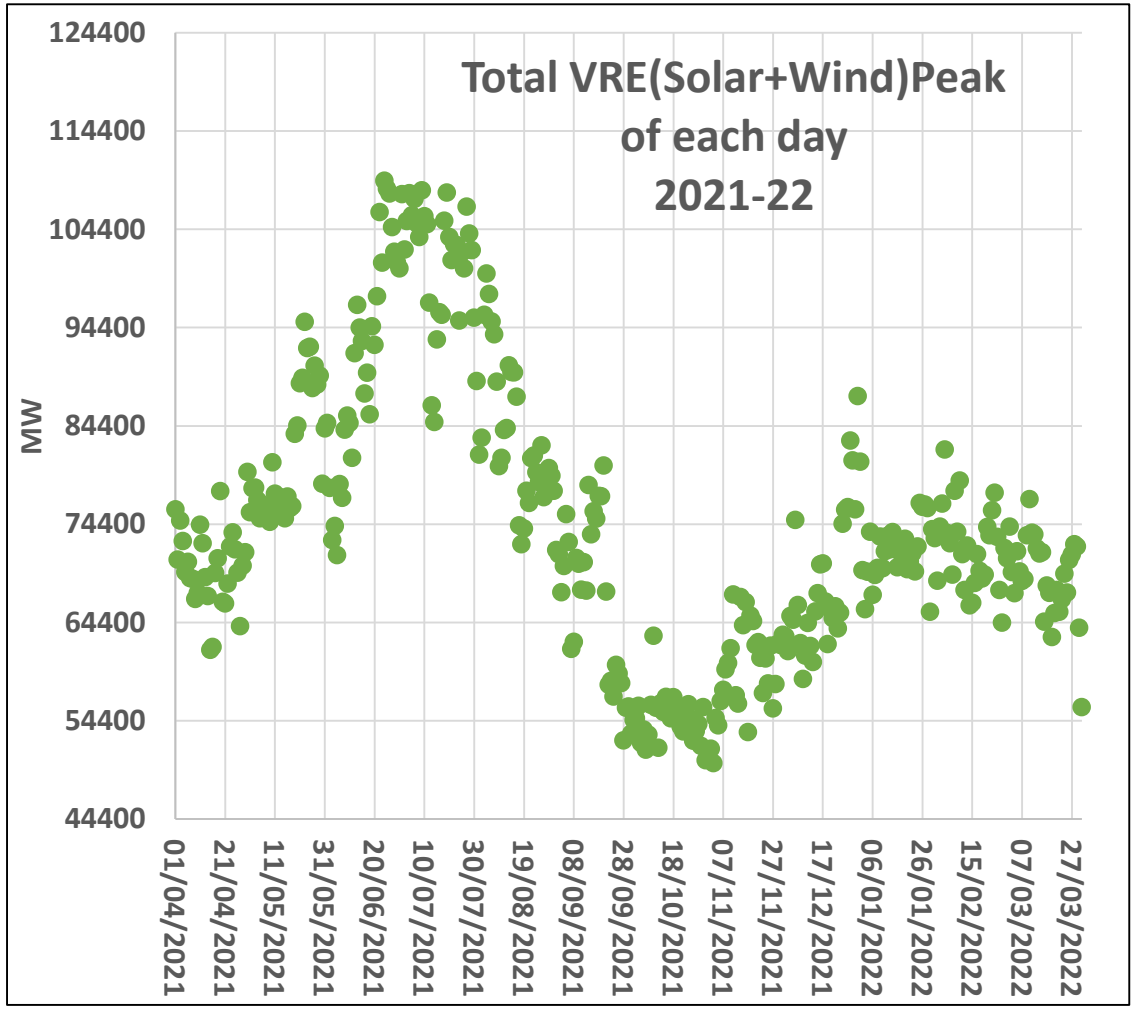
TYPICAL ALL INDIA DEMAND & NET LOAD CURVE (2021-22)

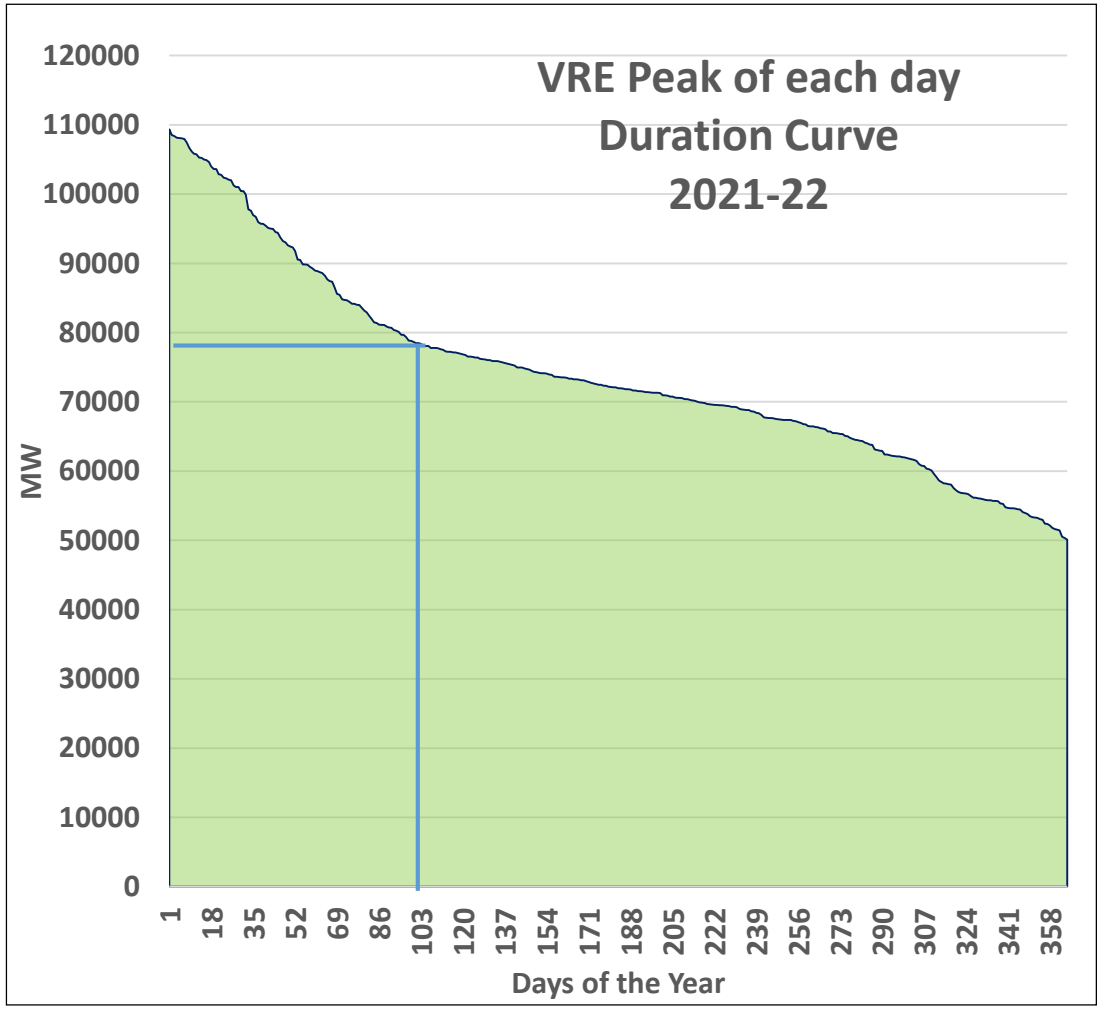


ALL INDIA LOAD DURATION CURVES (2021-22)






Total VRE(Solar+Wind)Peak of each day 2021-22
MW
124400
114400
104400
94400
84400
74400
64400
54400
44400
01/04/2021
21/04/2021
11/05/2021
31/05/2021
20/06/2021
10/07/2021
30/07/2021
19/08/2021
08/09/2021
28/09/2021
18/10/2021
07/11/2021
27/11/2021
17/12/2021
06/01/2022
26/01/2022
15/02/2022
07/03/2022
27/03/2022


VRE Peak of each day Duration Curve 2021-22
MW
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1
18
35
52
69
86
103
120
137
154
171
188
205
222
239
256
273
290
307
324
341
358
Days of the Year

BASE CASE(2017-22) ASSUMPTIONS

DEMAND(CAGR 6.18%)

Year	Peak Demand (GW)	Energy Requirement (BU)
2021-22	225.7	1,566

Capacity addition considered

Years	Committed Capacity (MW)			Coal based Capacity under construction (MW)	RES Capacity by March, 2022 (MW)	Retirement of Coal Based Plants (2017-22) (MW)
	Hydro	Nuclear	Gas			
2017-22	6,823	3,300	406	47,855	175,000	22,716

BASE CASE(2017-22) RESULT

Additional Coal based capacity Requirement during 2017-22 (MW)*	Coal Based Generation (Gross) (GWh)	Expected PLF% during 2021-22 During 2017-22*
6445	1072	56.5%

*Actual coal based capacity addition required during 2017-22 is 6,445 as per study even though 47,855 MW are expected to come between 2017-22. However, this addition of 47,855 MW of coal based capacity during 2017-22 would bring down the PLF as indicated in the result.

BASE CASE(2022-27) ASSUMPTIONS

DEMAND(CAGR 5.51%)

Year	Peak Demand (GW)	Energy Requirement (BU)
2026-27	298.8	2,047

Capacity addition considered

Years	Committed Capacity (MW)			Coal based Capacity under construction during 2017-22 (MW)	RES Capacity by March, 2027 (MW)	Retirement of Coal Based Plants (2022-27) (MW)
	Hydro	Nuclear	Gas			
2022-27	12,000	6,800	0	47,855	275,000	25,572

BASE CASE(2022-27) RESULT

Additional Coal based capacity Requirement during 2022-27 (MW)	Coal Based Generation (Gross) (GWh)	Expected PLF% during 2026-27
46,420	1259	60.5%

COAL REQUIREMENT (2021-22 & 2026-27)

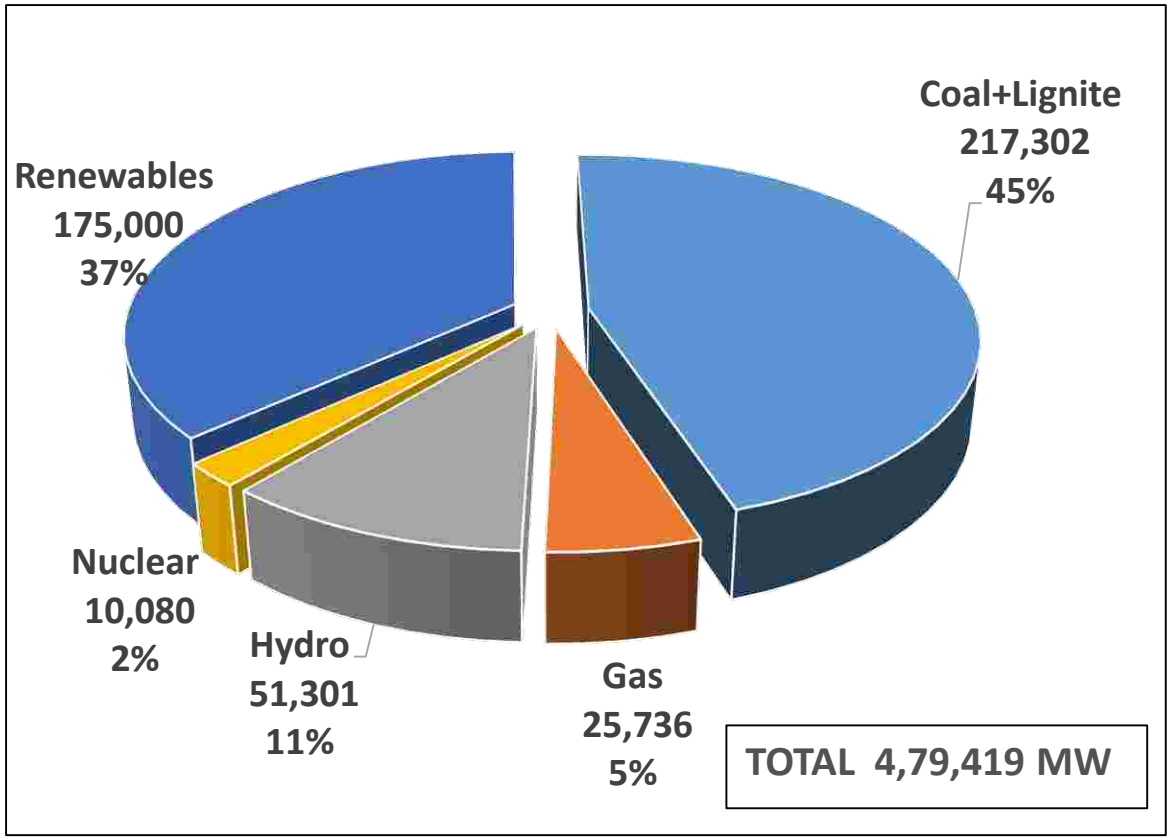
(BASE CASE)

Description	Unit	2021-22	2026-27
RES IC	GW	175	275
Total coal based generation*	BU	1072	1259
Total Coal Requirement (including 50 MT imported)	MT	735	877

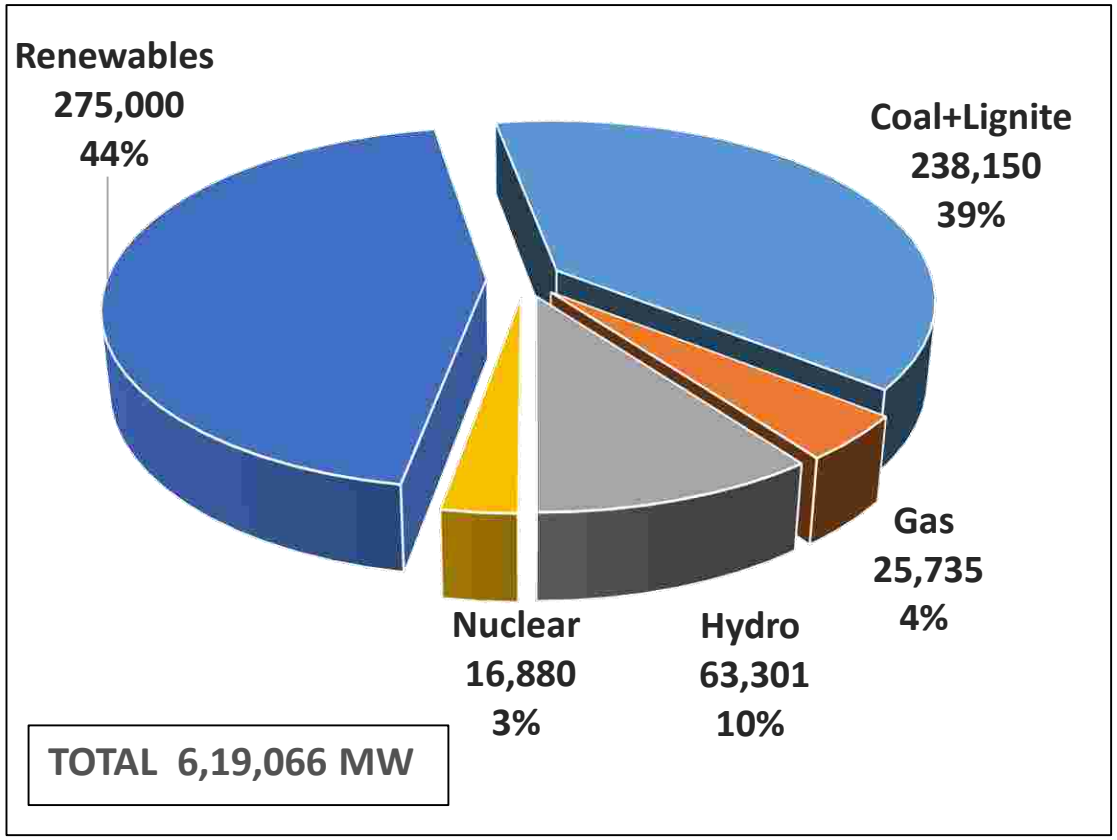
*Considering 30% reduction in Hydro Generation assuming failure of monsoon

Projected Installed Capacity(Base Case)

March,2022

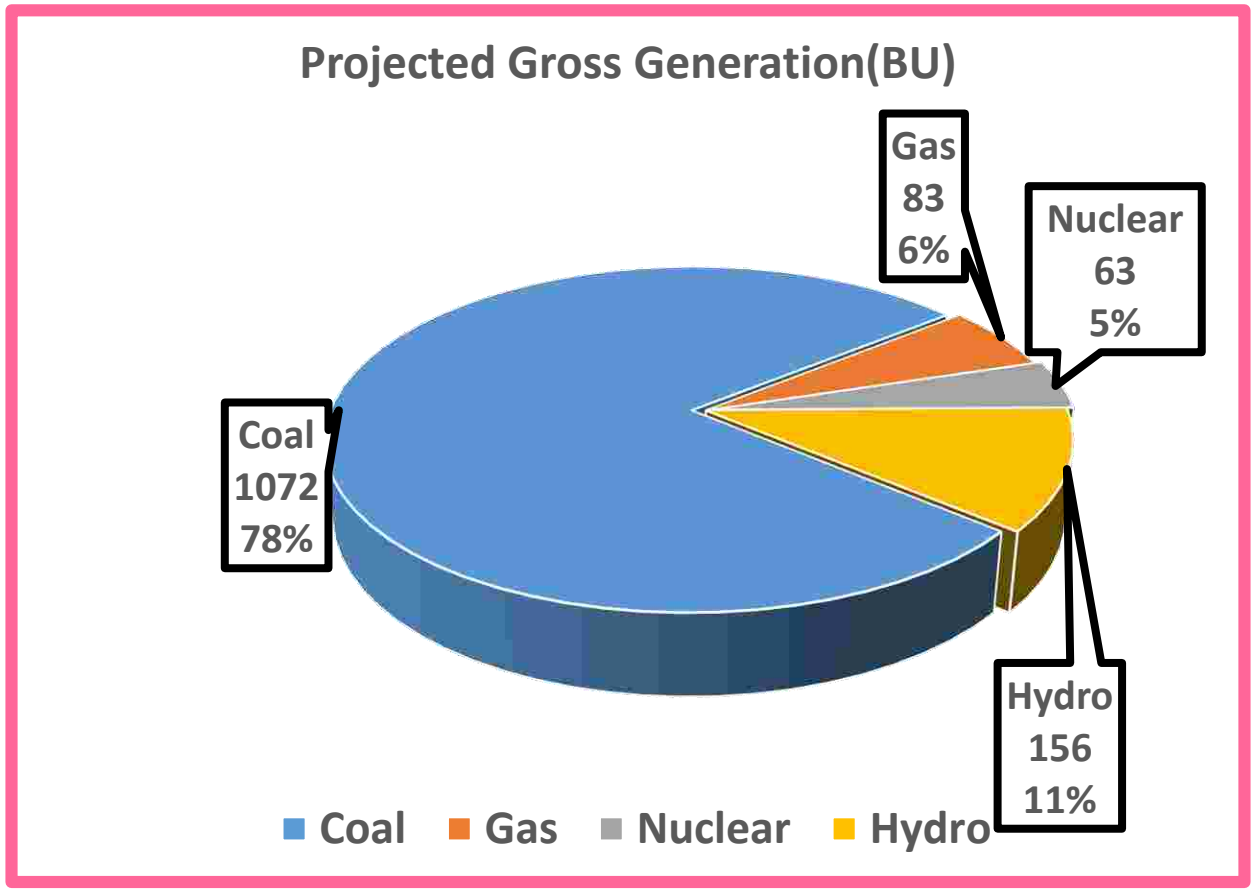


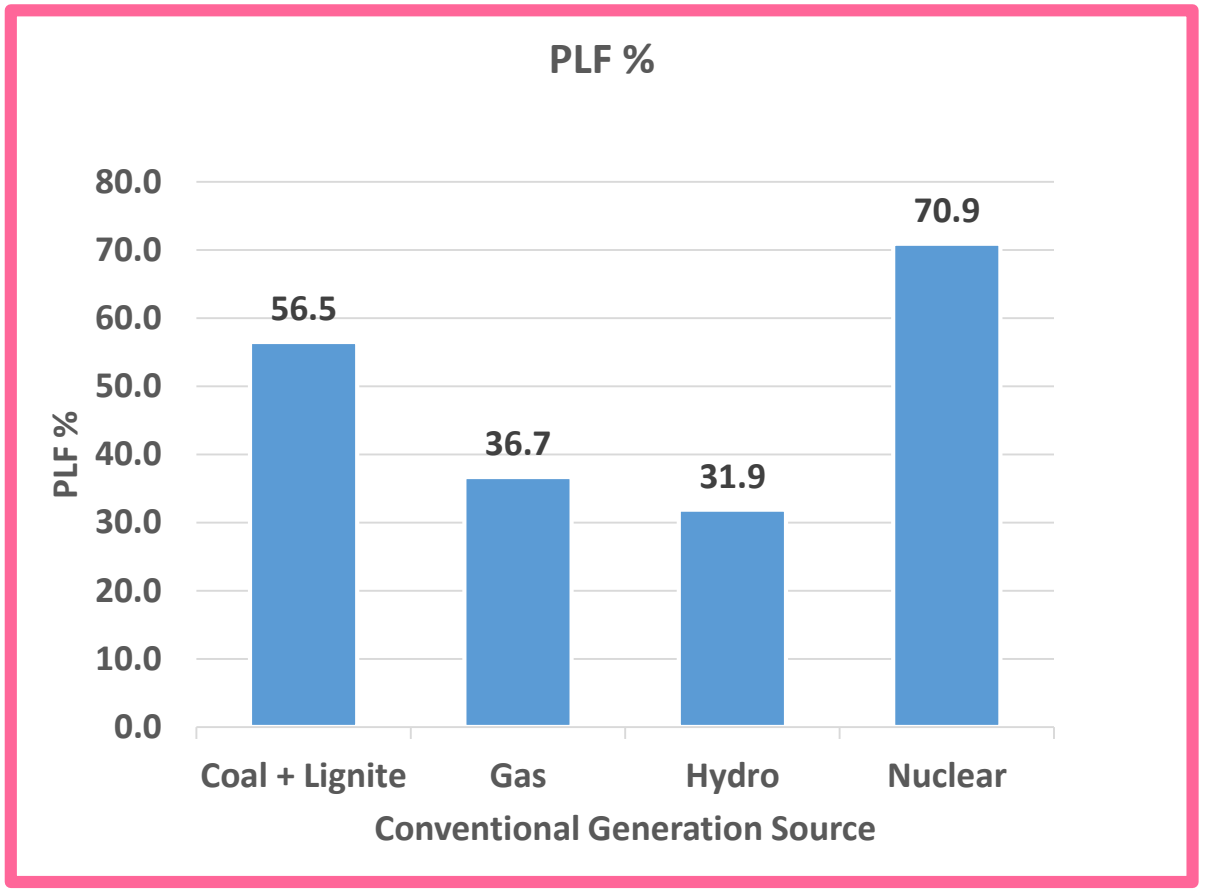
March,2027



ALL FIGURES IN MW

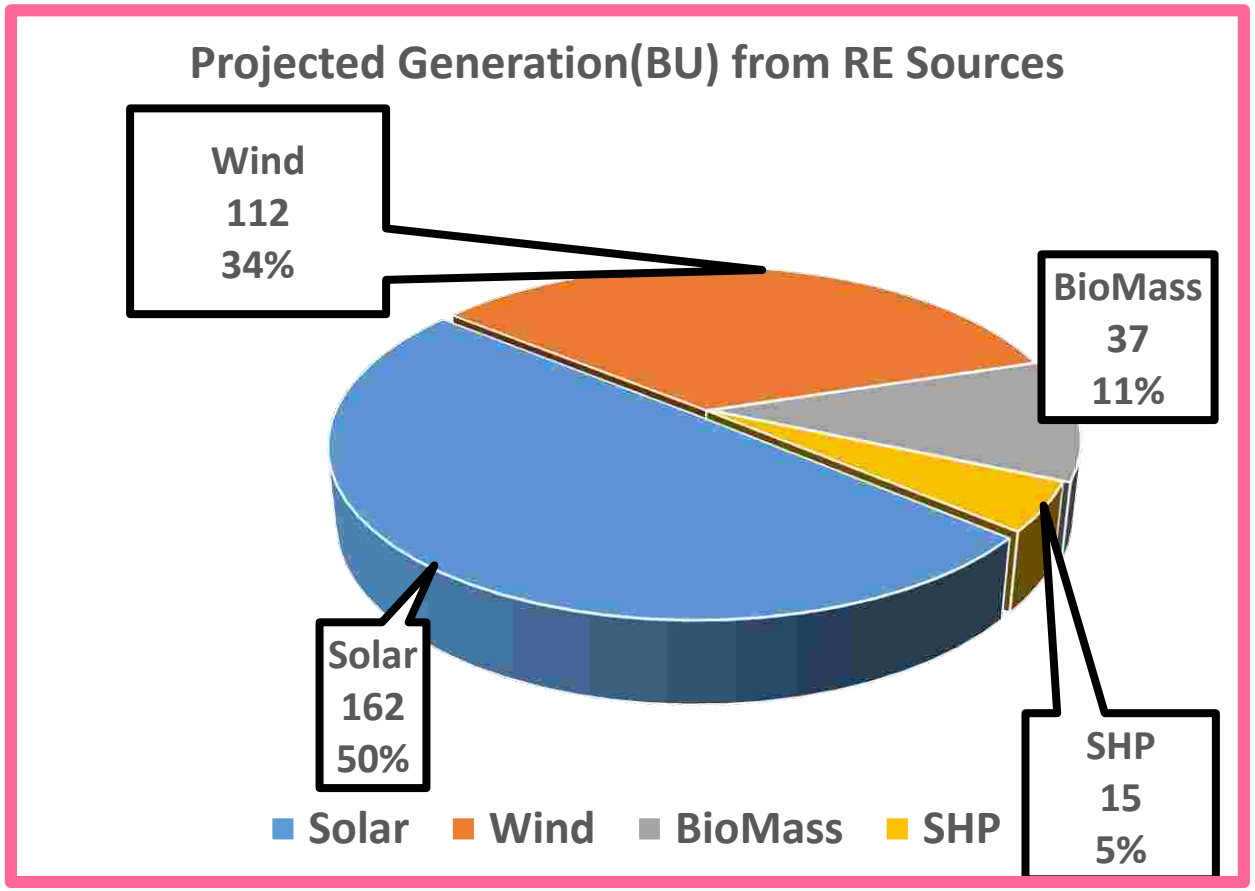
Projected Generation(BU) and PLF(%) from Conventional Sources in 2021-22 (Base Case)





ALL FIGURES IN BU

Projected Generation(BU) from Renewable Energy Sources in 2021-22



TOTAL RE GENBERATION PROJECTED IN 2021-22 – 326 BU

ALL FIGURES IN BU

India's Intended Nationally Determined Contribution (INDC)

40 % cumulative power installed capacity from non-fossil fuels by 2030.

Year	Likely IC (GW)	Likely IC of Fossil Fuel (GW)	Likely IC of Non-Fossil Fuel (GW)	% of Non-Fossil Fuel in IC
March 2022	479.4	243.0	236.4	49.3%
March 2027	619.0	263.9	355.1	57.4%

EASTERN REGION

Eastern Region Demand 2021-22
(as per 19th EPS)

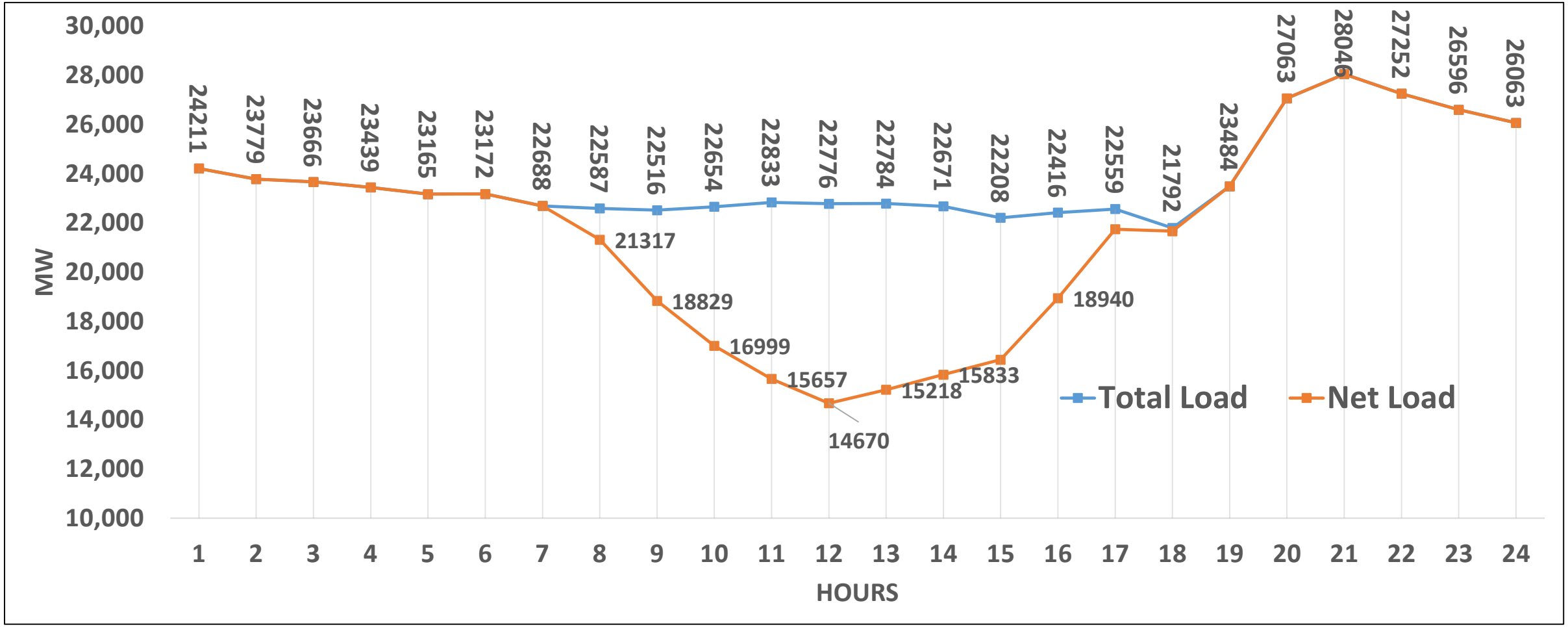
	2021-22		2026-27	
	Peak demand(GW)	Energy requirement(BU)	Peak demand(GW)	Energy requirement(BU)
Bihar	6.576	38.416	9.308	54.363
Jharkhand	5.193	30.649	6.626	39.252
Odisha	5.340	32.164	6.273	37.453
West Bengal	12.688	69.361	15.680	85.590
Sikkim	0.170	0.638	0.216	0.810
Eastern Region	28.046	171.228	35.674	217.468

Eastern Region Renewable Energy Target for 2021-22

STATE	Solar Power (MW)	Wind Power (MW)	Small Hydro Power+ Biomass Power (MW)	TOTAL RES (MW)
Bihar	2,493	0	269	2,762
Jharkhand	1,995	0	10	2,005
Orissa	2,377	0	115	2,492
West Bengal	5,336	0	398.5	5,735
Sikkim	36	0	52.11	88
TOTAL (Eastern Region)	12,237	0	845	13,082

*source:MNRE

Projected Total and Net Load Curve for Typical Day in Eastern Region



Note: The projected annual Solar generation available during 2021-22 in Eastern region is expected to be 18.91 BU

CYBER SECURITY IN POWER SYSTEM

"There are only two types of companies: Those that have been hacked and those that will be hacked." Robert S. Mueller, III, Director FBI made this famous quote but almost by the time he made the quote it was out of date – it should be 'There are only two types of companies: Those that have been hacked and those that don't know they have been hacked.'

Vijay MENGHANI

CHIEF ENGINEER (IT),

CENTRAL ELECTRICITY AUTHORITY

CISO, Ministry OF POWER

Cyber Security

- ***Cyber security refers to the protection of the networks, hardware, and software from attacks, damage, or unauthorized access and rejection of services.***
- ***It basic involves:***
  - Identify Infrastructure
  - Assess/Evaluate Vulnerabilities/Threats/Risks
  - Implement Security Controls
  - Verify Implementation of Security Controls
  - Ensure Compliance to Audit

Cyber Security Initiatives in India

- 17.10.2000: Information Technology Act,2000 (No. 21 of 2000) – IT Act ,notified.This was amended in 2008. It is the primary law in India dealing with Cyber Crime and electronic commerce.
- 10.01.2014:National Critical Information Infrastructure Protection centre (NCIIPC) was created by Government of India under section 70 A of IT Act.
- Two important documents of NCIIPC:
  1. Guidelines for protection of critical Infrastructure (CII)
  2. Framework for evaluation of Cyber Security
- Computer Emergency response Teams (CERT-In) under section 70(B) and sector specific CERTs constituted
- As per Rule 12(1) (a) of IT Rules 2013, it is mandatory to report specific cyber security incidents to CERT-In.
- **ISGF Documentation**: ISGF has prepared a framework for laying down procedures for securing India's Smart Grid from cyber-attacks.
- **ISO: 27001**: The Government of India, under the Information Technology Act, 2000 and the Rules therein for Reasonable Security Practices published in 2011, require all organisations to implement ISO:27001 as the recommended Information Security Management System for legal compliance.

Cyber Security in Power sector

- Indian Electricity Grid code Clause 4.6.5

  " All utilities shall have cyber security framework to identify the critical cyber asset and protect them so as to support reliable operation of the Grid."

- IS-16335 :2015 Power Control Systems-Security Requirement

It specifies requirement for identification and protection of critical assets for all entities involved in generation, transmission , distribution and trading of electric power .

- **CERC (Communication System for inter-State transmission of Electricity) Regulations, 2016.**
  - "CEA shall formulate and notify technical standards, cyber security requirements, protocol for the communication system for Power Sector within the country including the grid integration with the grid of the neighbouring countries".
  - 13. Cyber Security:

    (i) Communication infrastructure shall be planned, designed and executed to address the network security needs as per standard specified by CEA.

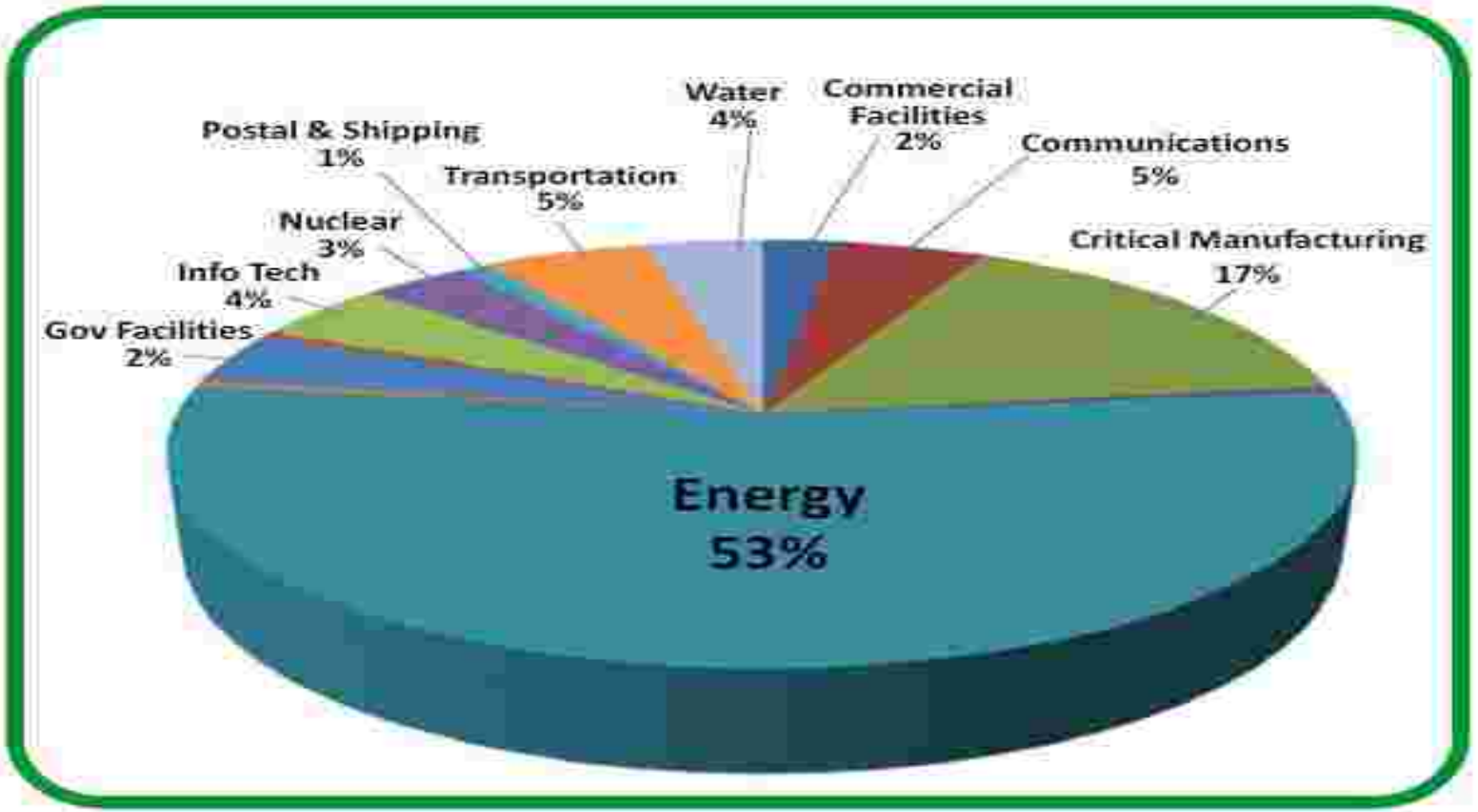
Recent Cyber Attacks

- Cyber-attack in the form of ransomware virus hitting more than 150 countries on 12.05.2017.
- Black out in three cities of USA: A series of power outages in Los Angeles, San Francisco, and New York City left commuters stranded on 21.04.2017, yet to be recognized, whether due to cyber-attack.
- Cyber Attack on Ukraine's power grid on 17.12.2016.
- Cyber Attack on Hydropower Generation in New York in year 2013.
- Cyber Attack on Korea Hydro and Nuclear Co Limited in December, 2014.
- Security breach in Iran's Nuclear plant in 2010.

2017 : Cyber attacks

- **2017**
- February: The Cloudbleed bug was discovered by Google Project Zero team.
- April: A hacker group calling itself "The Dark Overlord" posted unreleased episodes of *Orange Is the New Black* TV series online after they failed to extort online entertainment company Netflix.
- May: WannaCry ransomware attack started on Friday, 12 May 2017, and has been described as unprecedented in scale, infecting more than 230,000 computers in over 150 countries.
- May: 25,000 digital photos and ID scans relating to patients of the Grozio Chirurgija cosmetic surgery clinic in Lithuania were obtained and published without consent by an unknown group demanding ransoms. Thousands of clients from more than 60 countries were affected.[87] The breach turned attention to weaknesses in Lithuania's information security.
- June: 2017 Petya cyberattack.
- May–July 2017: The Equifax breach.
- September 2017: Deloitte breach.
- **Indian Power Sector: Nov 2017 : Hydro Utility in Northern Region**
  - **Feb,2018 : Discom website , ransom call in Bitcoin**

Utility as target of Cyber attack



According to US Deptt Of Home land security's Industrial Control system Computer Emergency response team (ICS-CERT) , majority of Cyber attacks in 2013 were related to Energy Industry.

Areas Vulnerable to Cyber Attacks

- **Hardware Layer:** Embedded components such as Programmable Logic Controllers (PLCs) and Remote Terminal Units (RTUs) are hardware modules executing software required for information communication and control.

- **Firmware Layer:** The firmware resides between the hardware and software. It includes data and instructions able to control the hardware.

- **Software Layer:** Power Control Systems employ a variety of software platforms and applications, and vulnerabilities in the software base may range from simple coding errors to poor implementation of access control mechanisms.

- **Network Layer:** Vulnerabilities can be introduced into the power control system network in different ways namely the firewalls, modems, fieldbus network, communications systems and routers, remote access points and protocols and control network.

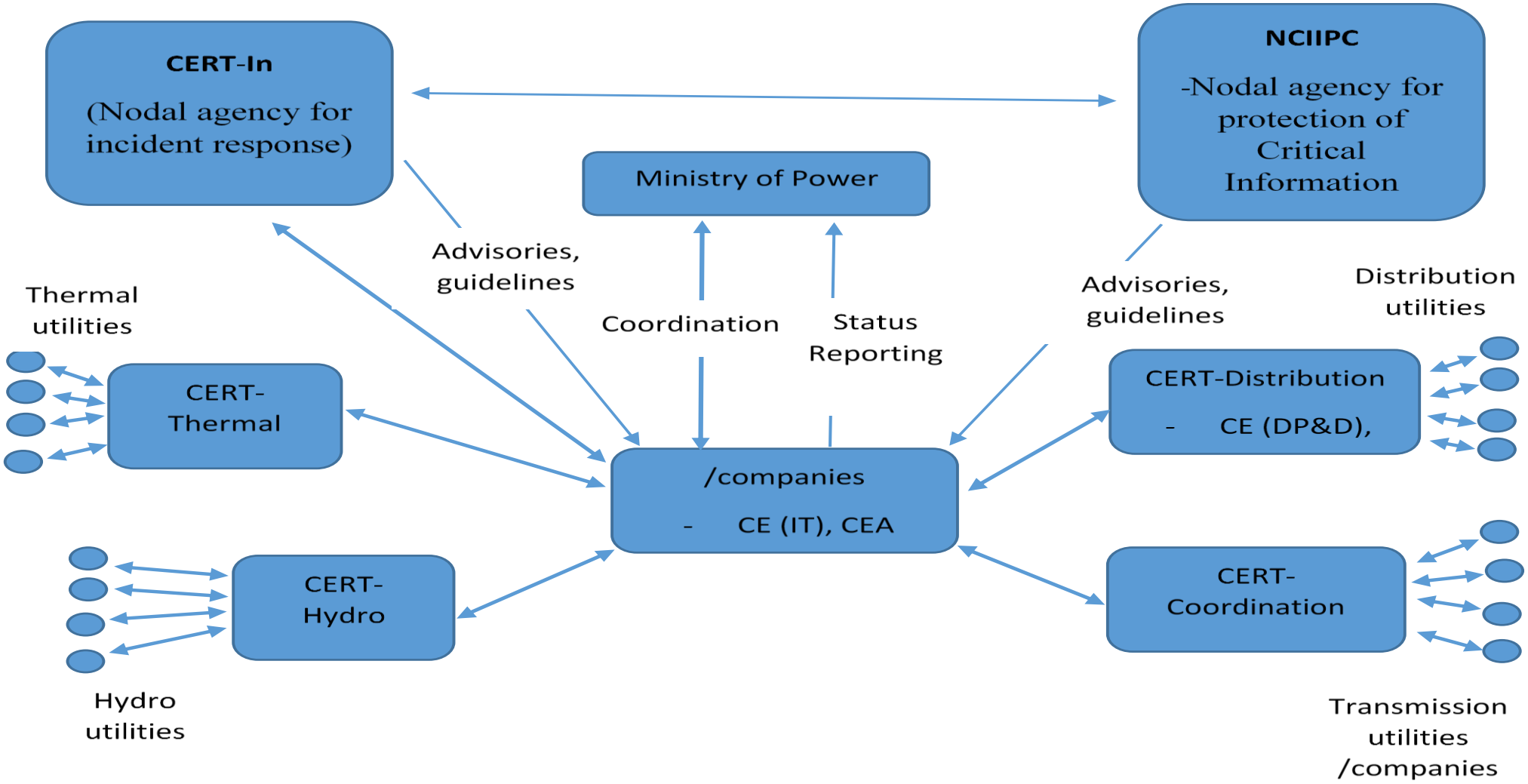
- **Process Layer:** All the aforementioned power control system layers interact to implement the target power control system processes.

Issues in Cyber security

- To frame a cyber-security program to facilitate development of Cyber Security Standards
- create a platform for sharing cyber security incidents
- strengthening of the cyber security system in power generation, transmission, and distribution sectors.

- There are six areas, which need to be addressed for cyber security:
  1. **Vulnerability assessment** in order to categorize the devices in terms of high risk and general vulnerabilities.
  2. **Vulnerability assessment area**, extended to attacks from an insider, attack on the computer monitoring and controlling devices, attack on the SCADA network, and programming of malware into the control system devices.
  3. Prepare framework for **testing of equipment**.
  4. **Asset mapping** of all critical infrastructure equipment and periodic monitoring of these equipment for cyber security compliance.
  5. Provide a complete **monitoring solution** to report on malicious connections.
  6. **Auditing** and conformance procedure.
- Formulate provisions in regards to bidding to incorporate provisions for acceptance of technical standards and testing certificate of other countries.

Organization structure for Cyber Security in Power system



Cyber Security in Power system

- Vulnerability:
  - Generation : UMPP and Renewable generating stations(like Solar Inverter)
  - Transmission: Protection system and communication
  - System Operation: SCADA-EMS
  - Distribution: Smart meters
- February ,2013 CEA brought out report on Guidelines mandating clearance from " Security Angle" wherever sensitive equipment is procured from overseas as well as for the procurement of electronic products by Government or its agencies for Power sector
  - It lists out Critical equipment in Power sector considering physical and cyber security aspects.
  - Also list out Electronic products deployed in Power system having security implication.

Constitution of Committee under Member (E&C)

- Ministry of Power vide letter dated 21.3.2017 constituted a committee under Chairmanship of Member (E&C).
- **To look into issues of power firms seeking to enter Indian Power transmission sector and to study the related issues of Cyber Security.**
- **To look into matter related to Standards of Technical specification, Testing standards and Sourcing of equipment/materials.**
- Members of the Committee:
  - Director (Transmission),MOP.
  - Sh.V.N. Kothari, Director D/O Commerce
  - Chief Engineer (PSETD),CEA
  - Chief Engineer (IT),CEA
  - Director(Projects), PGCIL
  - ED(NTAMC), PFCIL
  - Director (Public policy & Economic Taxation), IEEMA
  - Co-opted Chief Engineer (legal), Chief Engineer (F&CA) & GM (POSOCO)
- Meetings held on 28.3.2017 and 20.4.2017
- Report submitted on 19.7.2017

Issue 1 Foreign Firms in Transmission

1. Relevant service is “Service incidental to energy distribution (CPC 887) .

2. The GATS schedule in the WTO, India has not taken any commitments on this particular service and, therefore, we retain the full policy space to restrict the tendering process as per its requirements and considerations. With regard to non-committed sectors, such as, in this particular case, India can place restrictions on national treatment or market access.

Issue 1. Foreign Firms in Transmission(Contd.)

- While we are in a position to limit the participation of foreign countries in the tendering process here in India, the case of Japan, South Korea and Singapore stand out separately since we have a Free Trade Agreement (FTA) with them.
  - Even in the case of these three countries, there is a provision to exclude them in two specific instances.
  - The first being the case where the purchase made is for the Government only and for non-commercial use. An example in this regard would be any purchase made by the BSF or the BRO etc. The other instance is that we can invoke a security exception which is permissible under Article XVI of GATS.
- However, it seems that due caution has to be exercised in invoking the **security exception and the Department of Commerce has pointed out that it has not really been tested in any case so far**
- **"principle of reciprocity" -** if any foreign country debars firms of a country from bidding in their market on a flimsy ground, the same stance could be adopted by country for firms from that particular foreign country.

Issue 1. Foreign Firms in Transmission(Contd.)

- National Capital Good Policy 2016

" To make procurement of Heavy Electric Equipment under local competitive bidding and not under international competitive bidding (ICB) in domestically funded projects under Ministry of Power, Ministry of Steel and Ministry of Non-Conventional Energy , CPSUs and in the projects funded by PFC and REC."

- CEA Notification vide CEA/PEETD/205/218-296 dated 19.5.2016

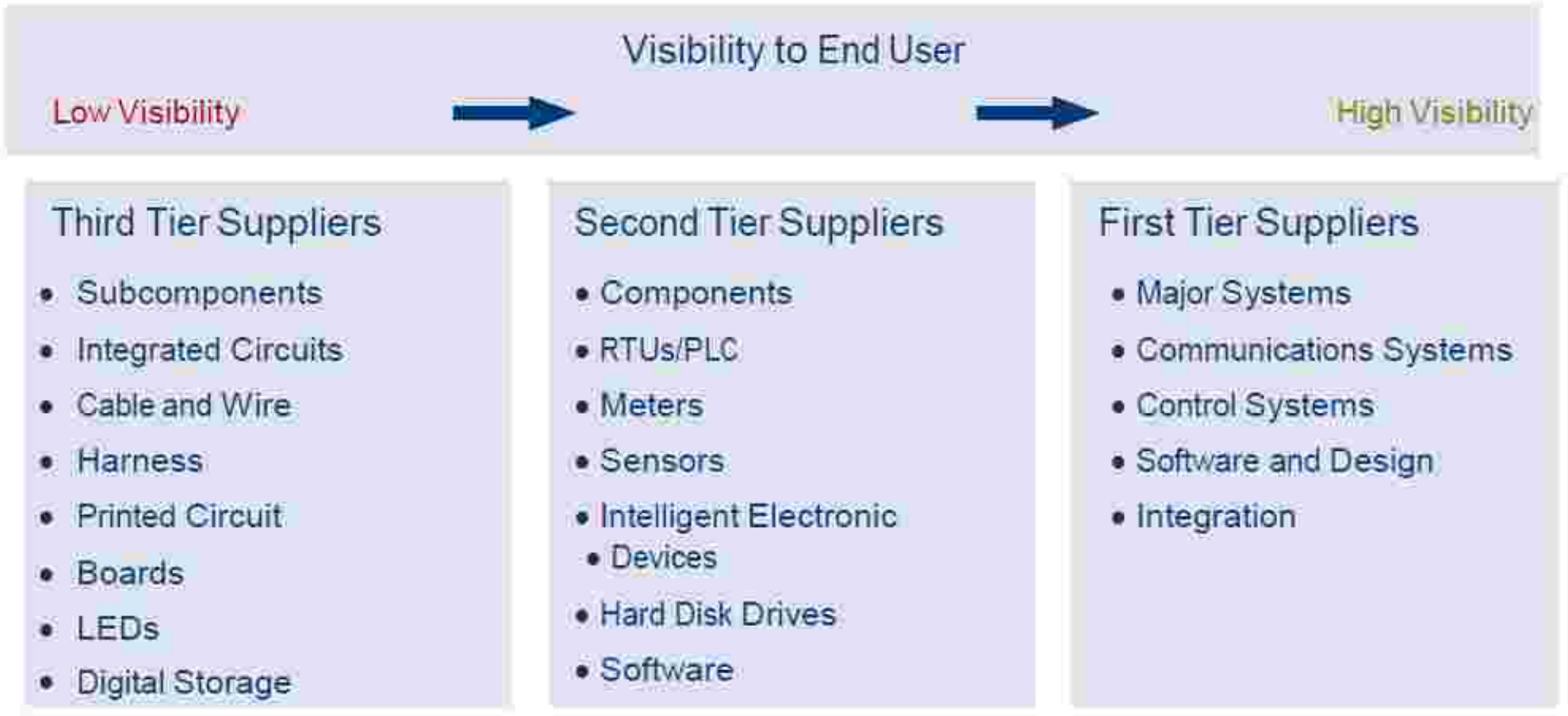
(http://www.cea.nic.in/reports/others/ps/psetd/domestic_competitive_bidding_2016.pdf)

- Preferred market access in Telecom : http://www.dot.gov.in/pma-policy

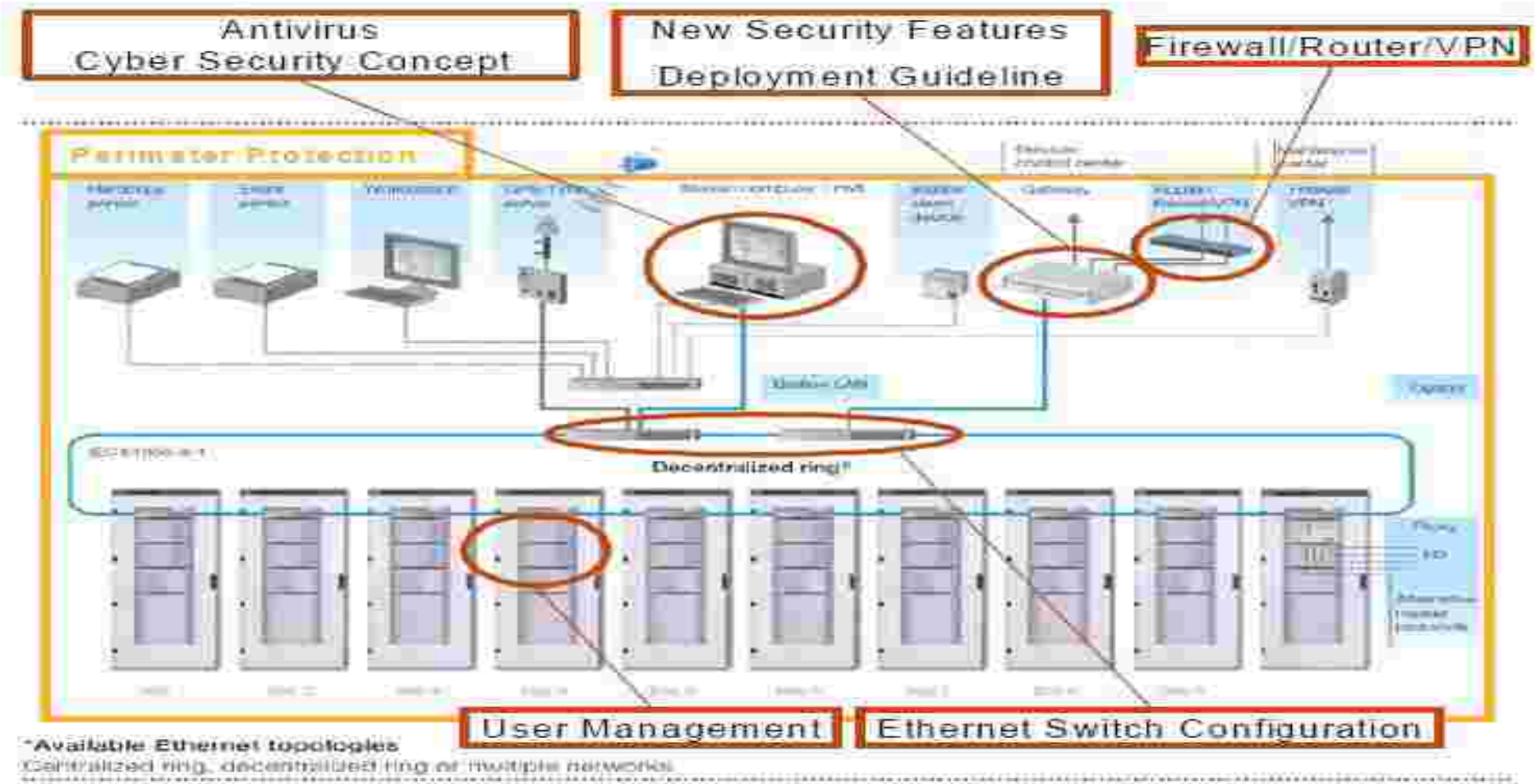
- However only these restriction would not be sufficient to deal with Cyber security

Supply chain of a utility

Figure 1. Utility Supply Chain



Sub station Protection



International experience

- The Australian Government in 2012 had intervened to block a privately owned Chinese Communication Company from winning lucrative contracts to help build the $ 36 billion fiber optic National Broadband Network. The decision, it seems was based on the advice from the Australian Security Intelligence Organization (ASIO).
- China Cyber Security Law (w.e.f.1.6.2017)
- Article 23 Critical network equipment and special cybersecurity products can only be sold or provided after being certified by a qualified establishment, and are incompliance with national standards. China's cyberspace administrative bodies and the relevant departments under the State Council will **draft a catalogue of critical network equipment and special products.**
- Article 35 Critical information infrastructure operators that purchase network products and services that might affect national security must pass a national security review.

Issue No. 2 Technical standards for material and equipment

- CEA Technical standards for construction and connectivity to grid does not specifically provide for Cyber security. These stipulates technical requirements .
- In procurement procedure testing following provisions may be incorporated:
  - The organization shall induct only those network elements which have been tested as per relevant contemporary Indian or international Security Standards (e.g. ISO/IEC 15408 standards, for Information Security Management System against ISO 27000 series Standards, BIS standards IS 16335: 2015 for power control systems etc.).
  - Vulnerability and Penetration test of Main and Back-up system shall be conducted during the FAT (Factory Acceptance Test). Accredited labs (like M/S Standardisation Testing and Quality Certification, a GOI enterprise) shall carry out third party security audit (Vulnerability and Penetration test) of SCADA/EMS system at site.
  - “Safe to connect’ certification from supplier of hardware, software including their manufacturer, vendor, and service provider

Action to be taken

- Framing and implementation of Institutional and Legal, Technical, Contractual and Universal testing of equipment policy.

- **Institutional and Legal framework:** Every organization shall establish:
  - an institutional framework for ensuring compliance of legal, contractual and technical framework to make the system nearly 100% secure from cyber-attacks,
  - legal framework to incorporate various mandatory provisions for compliances from procurement to installation to operation.

- **Technical framework:** The security policy to lay down technical framework to be followed for the operation of the system to ensure cyber-security.

- **Contractual framework and Universal Testing:** The bidding documents should be so framed so as to encourage only firms which are manufacturing equipment in India to participate in the bid, including certification from the supplier that the equipment is “Safe to Connect”.
  - The equipment procured under the specified guidelines shall be required to be tested for 100% reliability from any vulnerability from malware and cyber-attacks.

Action points on Cyber Security

- Review of CEA Regulations to incorporate suitable provisions for compliance of Cyber Security .
- Testing standards and procedure for cyber security compliance .
- Creation of test bed at CPRI .
- Guidelines for procurement to incorporate provisions for more local content and cyber security compliance.
- Scheme of testing and cyber security audit of all SCADA/EMS .
- CEA is coordinating cyber security in power sector. Further action to enhance cyber security awareness, preparation of crisis management plan and Cyber security audit in state utility specifically in distribution utilities is required, for this CEA will interact vigorously with State and formulate action plan so activities like appointment of CISO, identification of critical assets and crisis management plan is completed in a time bound manner.
- Formation of a umbrella organisation on cyber security issues in power sector " Power Security Council of India "
- Training and certification program on Cyber Security to be formulated

Cyber Security Preparedness

- Since last two years through CERT (Thermal, Hydro , Transmission and Distributions) efforts are made to sensitize and prepare all utilities for cyber security in power system
- Not much progress and lot need to be done .
- Organisation structure and documents are **necessary but not sufficient** as cyber security threat is too pervasive and it strike weak points too suddenly and more dangerous than a natural disaster .

Social Engineering : Man & Mind

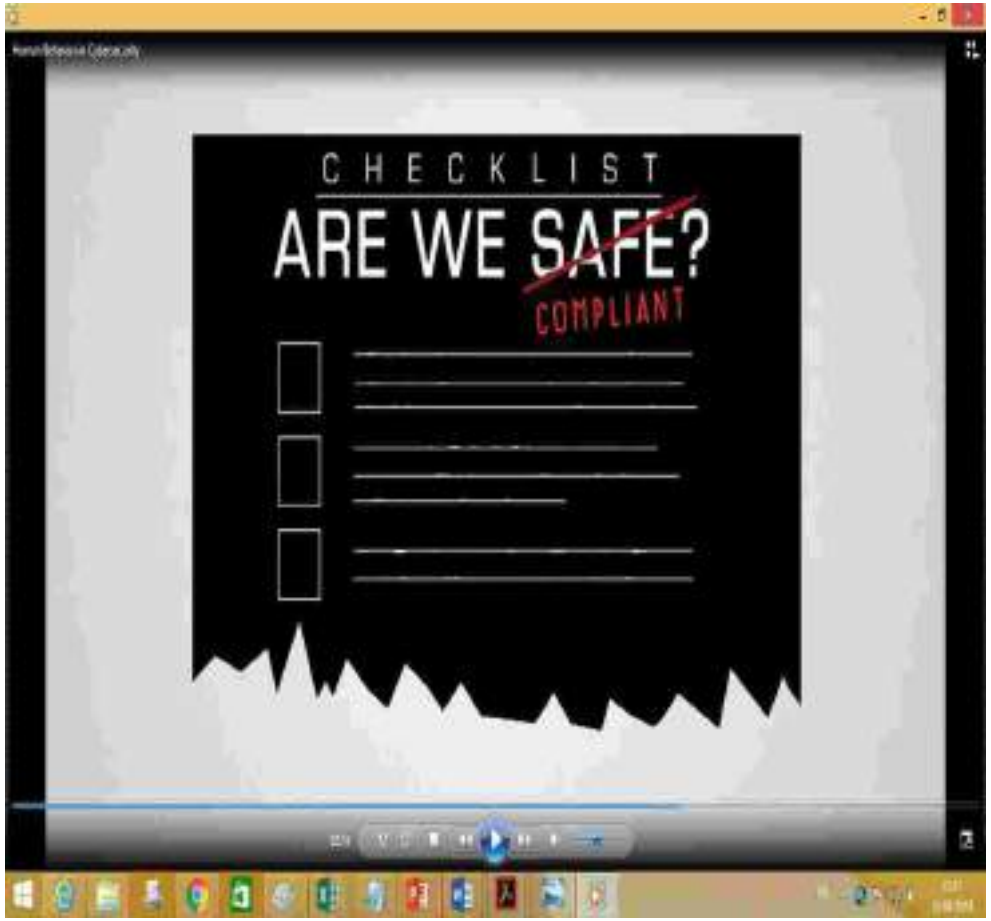
ONLY AMATEUEURS ATTACK MACHINES, PROFESSIONALS TARGET PEOPLE

IF YOU THINK TECHNOLOGY CAN SOLVE YOUR SECURITY PROBLEMS, THEN YOU DON'T UNDERSTAND THE PROBLEMS AND YOU DON'T UNDERSTAND THE TECHNOLOGY.

Response to a question you never had

Creating distrust

Invest in both : Technology and People



Present Status 1: Appointment of organization & plant level Chief Information Security Officers (CISO)

- **Single point of contact between organization and CEA/Sectoral CERT/CERT-In for all cyber security matters**
- **Accountability for implementing Cyber Security policies at organization level**

Present Status

- **4 Nodal officers – Sectoral CERTs**
- **121 Nodal officers – power utilities/IPPs**
  - CERT-Thermal (32)
  - CERT-Hydro (29)
  - CERT-Transmission (20)
  - CERT-Distribution (40)

Way Forward

- **Request State Chief Secretaries to facilitate nomination of CISOs of state utilities (within 15 days)**
- **Request IPP heads to submit CISO nominations (within 15 days)**

2. Identify organization-wise Critical Infrastructure

- For implementing security policies & controls over the identified critical infrastructure
- Security auditing of the identified critical infrastructure.
- Vulnerability assessment & penetration testing of identified critical infrastructure

Present Status

- NTPC, NHPC and PGCIL have identified their infrastructure in respect of business criticality and implemented ISO 27001 controls

Way Forward

- Instruct nodal officers of power utilities/IPPs to identify their critical infrastructure and submit status to CEA (within 15 days)
- Collection of security policies & control implementation status from nodal officers of power utilities/IPPs (within 1 month)
- Request nodal officers to conduct security audit, vulnerability assessment & penetration testing of the identified critical infrastructure

3. Formulate Crisis Management Plan (CMP)

- **Organization specific plan for tackling IT/operation related crisis**

Present Status

- **NTPC, NHPC and PGCIL have drafted their CMPs**
- **NHPC has submitted CMP for Hydro sector**
- **Distribution CMP has been prepared and issued in December,2017.**
- **CERT-In conduct workshops on CMP**

Way Forward

- **Request CERT-In to conduct CMP workshops for power sector utilities (within 15 days)**
- **Instruct nodal officers of utilities/IPPs to attend CERT-In workshop on CMP (within 1 month)**
- **After workshops, instruct nodal officers to prepare their organization specific CMP (within 2 months)**

4. Security Mock Drills

- Readiness of organization to tackle cyber incidences
- Mock drills are facilitated by CERT-In

Present Status

- PGCIL participated in mock drill in the past

Way Forward

- Instruct NTPC, NHPC and PGCIL to participate in mock drills at their organization level in co-ordination with CERT-In (within 3 months)
- Nodal officers of other utilities (sector specific) and CEA representatives can be invited in mock drills for acclimatization.
- Thereafter, instruct other utilities to conduct mock drill at their end in coordination with CERT-In (within 6 months)

5. Information Sharing & Analysis Centre (ISAC) – Power

- **Common platform for sharing & analyzing cyber security incidences in Power Sector**

Present Status

- **ISAC-Power static page is available on CEA website**
- **ISAC-Power page provides information about nodal officers, links to IT act, rules, guidelines & presentations**

Way Forward

- **Develop dynamic and database supported ISAC-Power portal for better coordination between stakeholders.**
  - **Concept paper for ISAC-Power (**within 1 month**)**
  - **Design & develop ISAC-Power portal (**within 6 months**)**

6. Trainings / workshops on Cyber Security

Present Status

- CERT-In organizing cyber security workshops.
- Sectoral CERTs organizing workshops/presentations (last workshop conducted on 15.02.17 by PGCIL)
- **CEA with IPPAI taken imitative and organized three Regional workshops in Bangalore, Mumbai & Delhi**

Way Forward

- Request to DG, NPTI to conduct cyber security courses for power utilities.
- Nodal officers of power utilities to register themselves for CERT-In workshops.
- All Nodal officers to submit quarterly reports to CEA on training attended / organized by them on cyber security

CISO Nomination

CISO Nomination Status SR		
Sector	Received	Not Received
Hydro	All State Utilities	Private Utilities
Thermal	NTPC. Tamilnadu, Karnataka	Telangana(TSGENCO),Kerala(KSEB), Andhra Pradesh (APGENCO), IPPs,Nuclear
Transmission	All State Utilities	Private Transmission Licensees
Distribution	Karnataka(5),Andhra Pradesh(2/4),Tamilnadu,Kerala	Andhra Pradesh (2-Central , Eastern),Kerala(KINESCO, Infopark), Tamilnadu (Technopark), Lakshdeep,A&N Islands

CISO Nomination

	CISO Nomination Status-ER	
Sector	Received	Not Received
Hydro	West Bengal, Odisha	Jharkhand (DVC, JUVNL)
Thermal	Bihar (KBUNL Muzaffarpur, NPGCPL Patna), Jharkhand (TVNL), West Bengal (DVC, WBSEDCL, CESCL, WBPDCl)	Bihar (BSPGCL), Jharkhand (JUVNL), Andaman Nicobar (ED A&N)
Transmission	Bihar, Odisha, West Bengal	Jharkhand, Sikkim
Distribution	Bihar(BSPHCL, SBPDCL), Jharkhand (Tata Steel Ltd.), Odisha (CESCL), West Bengal (WBSEDCL, CESCL)	Bihar (NBPDCL), Jharkhand (JSEB, JUSCO), Odisha (NEESCO, SOUTHCO, WESCO) West Bengal (IPCL)

Quarterly Preparedness Monitoring -AGENDA

(Status as on :)

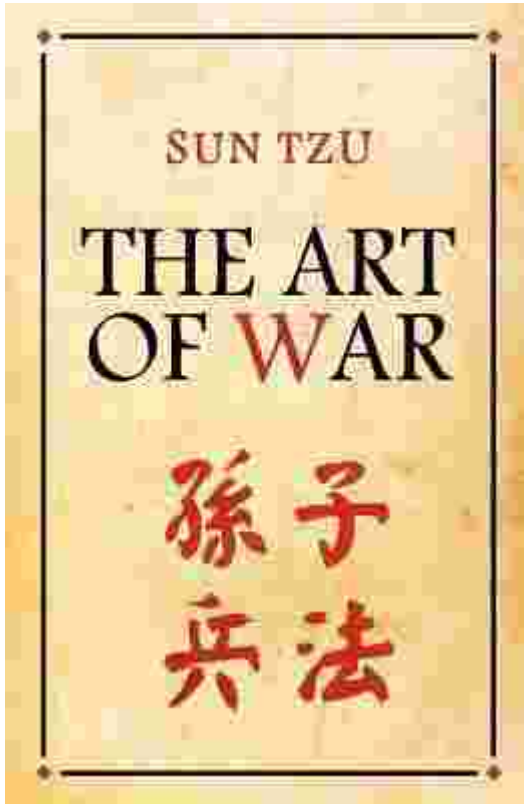
S.No.	State	Sector (G/T/D)	Utilities	Status of CISO Nomination	Critical Infra Identified	Crisis management Plan Prepared	Status of CS mock drill	Status of Training/ Workshops organized/ participated by utility	Action taken on CERT-In/NCIIPC Advisories
1	Tamilnadu	T	TANGEDCO	Yes/No	Yes/No	Yes/No	Done on ____		

Tools

No	Name	Download URL
1	TeraTerm	https://ttssh2.osdn.jp/index.html.en
2	WinSCP	https://winscp.net/eng/docs/start
3	GeoIP	https://www.maxmind.com/en/geoip2-services-and-databases
4	Sigcheck	https://docs.microsoft.com/en-us/sysinternals/downloads/sigcheck
5	HashMyFiles	http://www.nirsoft.net/utils/hash_my_files.html
6	FTK Imager	https://accessdata.com/product-download/ftk-imager-lite-version-3.1.1
7	Strings	https://technet.microsoft.com/en-us/sysinternals/bb897439.aspx
8	TCPView	https://docs.microsoft.com/en-us/sysinternals/downloads/tcpview
9	WireShark	https://www.wireshark.org/
10	Process Explorer	https://docs.microsoft.com/en-us/sysinternals/downloads/process-explorer
11	Process Monitor	https://docs.microsoft.com/en-us/sysinternals/downloads/procmon
12	Reg Ripper	https://github.com/keydet89/RegRipper2.8
13	Event Viewer	Windows –[Admin Tools]–[Event Viewer]
14	Autoruns	https://docs.microsoft.com/en-us/sysinternals/downloads/autoruns
15	Windows Registry Recover	http://www.mitec.cz/wrr.html
16	Windows Prefetch Folder	C:¥Windows¥Prefetch

Cyber security : Many battles and A war

If you know the enemy and know yourself, you need not fear the result of a hundred battles.
If you know yourself but not the enemy, for every victory gained you will also suffer a defeat.
If you know neither the enemy nor yourself, you will succumb in every battle.”



Each of these three points of 5th Century B.C book directly applies to the world of cyber Security.

New IT initiatives and need of support from States

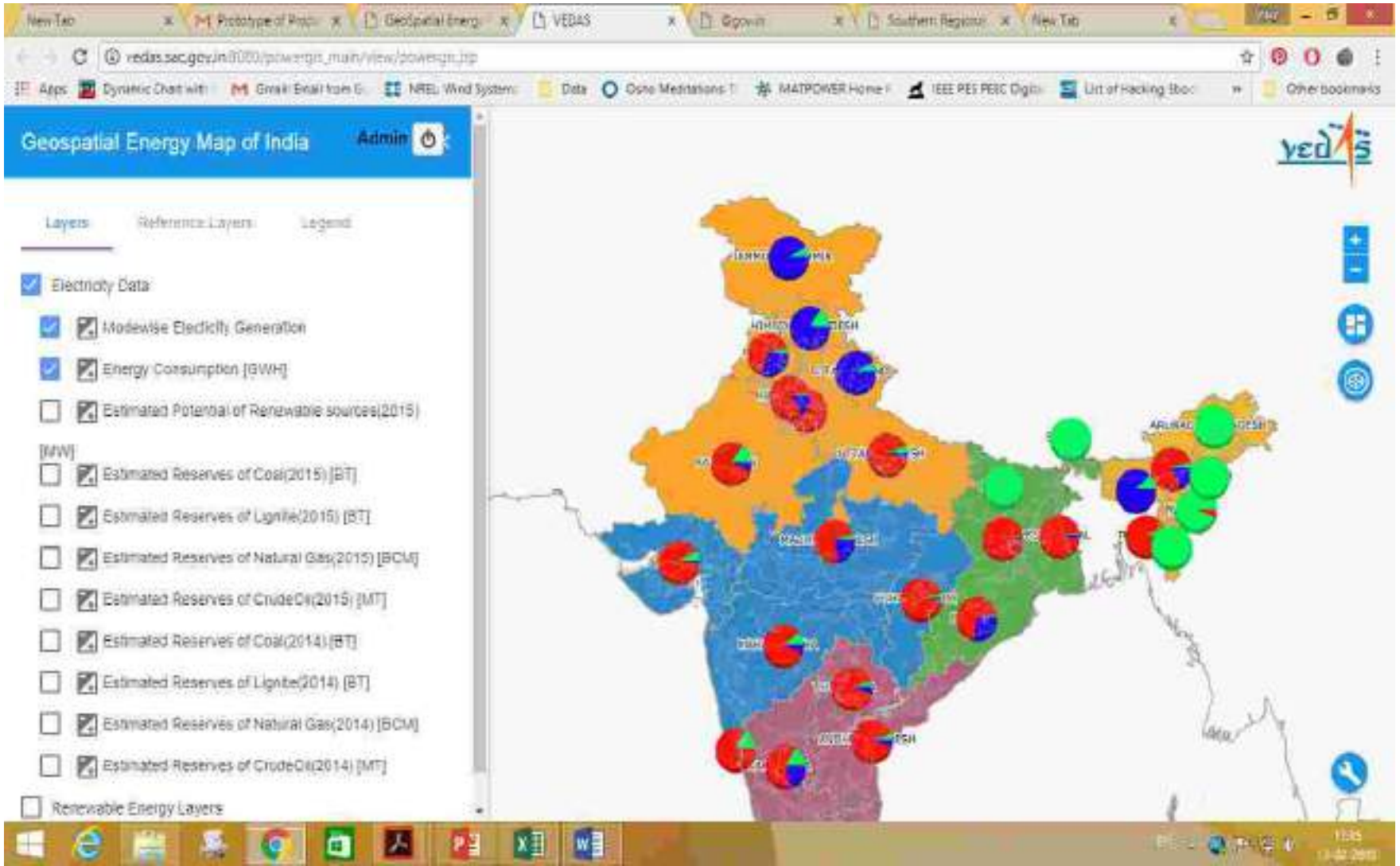
- National Power Portal(NPP) –Dashboard and Data analytic for power sector at one place
  - Data entry for all six application is being done and report is being generated in testing phase. Launched by Hon'ble Power Minister on 14th November,2017
  - Five to be held in next two months.
  - While data of Coal supply is fed regularly in NPP, the data entry **by generating station for daily generation report (DGR) in NPP is yet to pickup.**
  - If there is requirement of training , CEA can arrange regional workshops

- Geo Spatial Energy Map
  - NITI Aayog on the instruction of PMO initiated this project .
  - ISRO and CEA are preparing Geo spatial map o all Generation, transmission and distribution assets.
  - Any state which want GIS mapping of its assets above 33 kV (initially) , can get it done free of cost
  - Map would be useful for operation and asset management .
  - **Format for Data shared by concerned Divisions of CEA with all state utilities . Data from Transmission and Distribution utilities is awaited.**

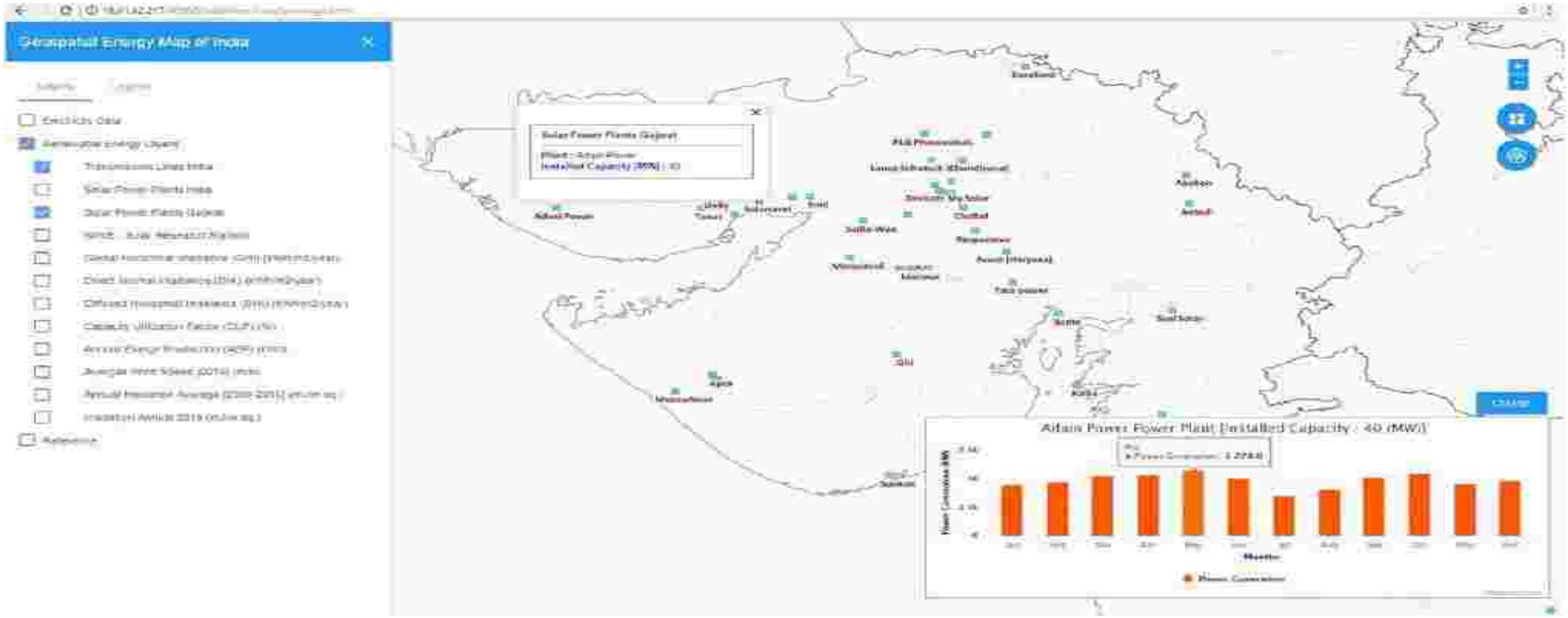
Installed Capacity

State wise Information

ISRO-CEA Geo spatial Energy Map



Geo Spatial Map with layer control



Shared Responsibility

"As the world is increasingly interconnected, everyone shares the responsibility of securing cyberspace."

— **Newton Lee**, **Counterterrorism and Cybersecurity: Total Information Awareness**

IT adoption can change Life

Twitter & MOP Mobile Application

A success story of Village Electrification

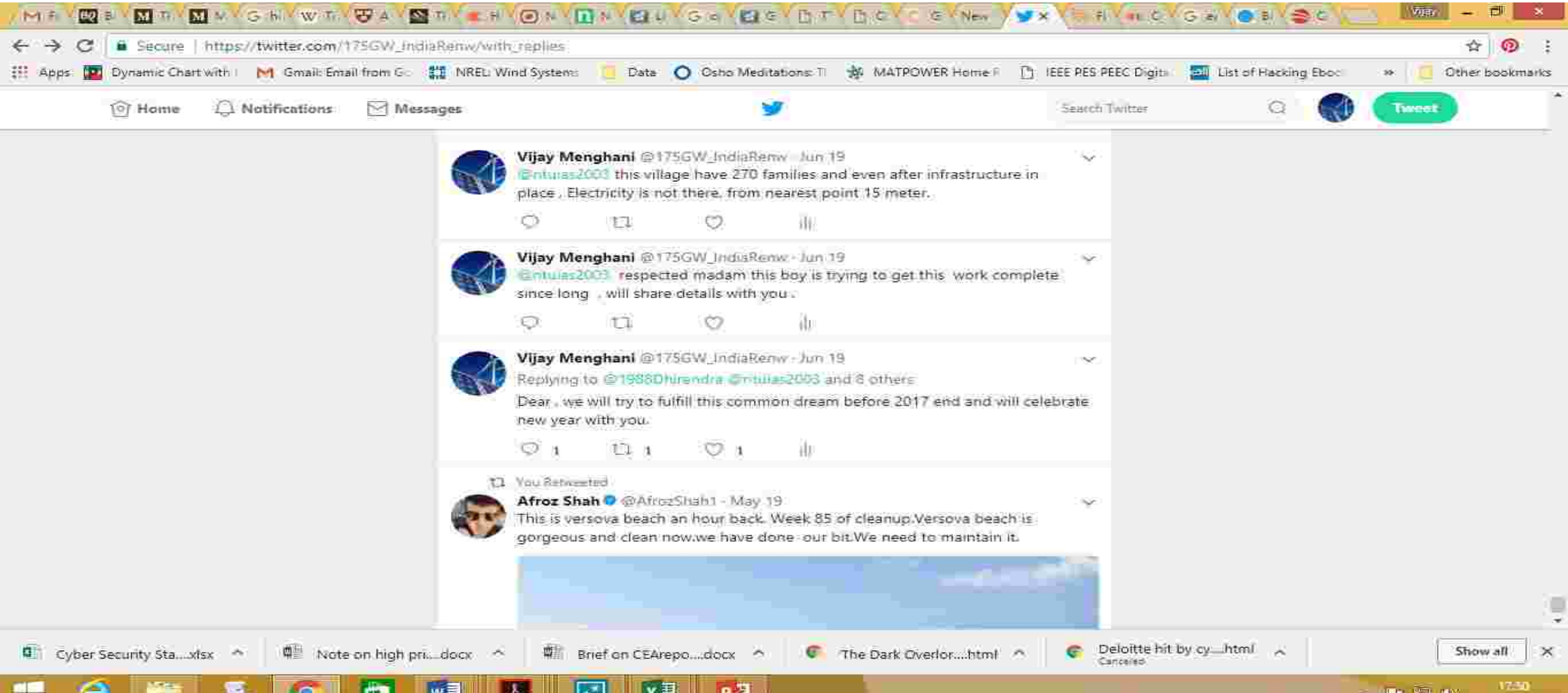
10th June,2017 A village boy from Bharthapur , Kanpur Dehat UP tweet

10th June ,2017

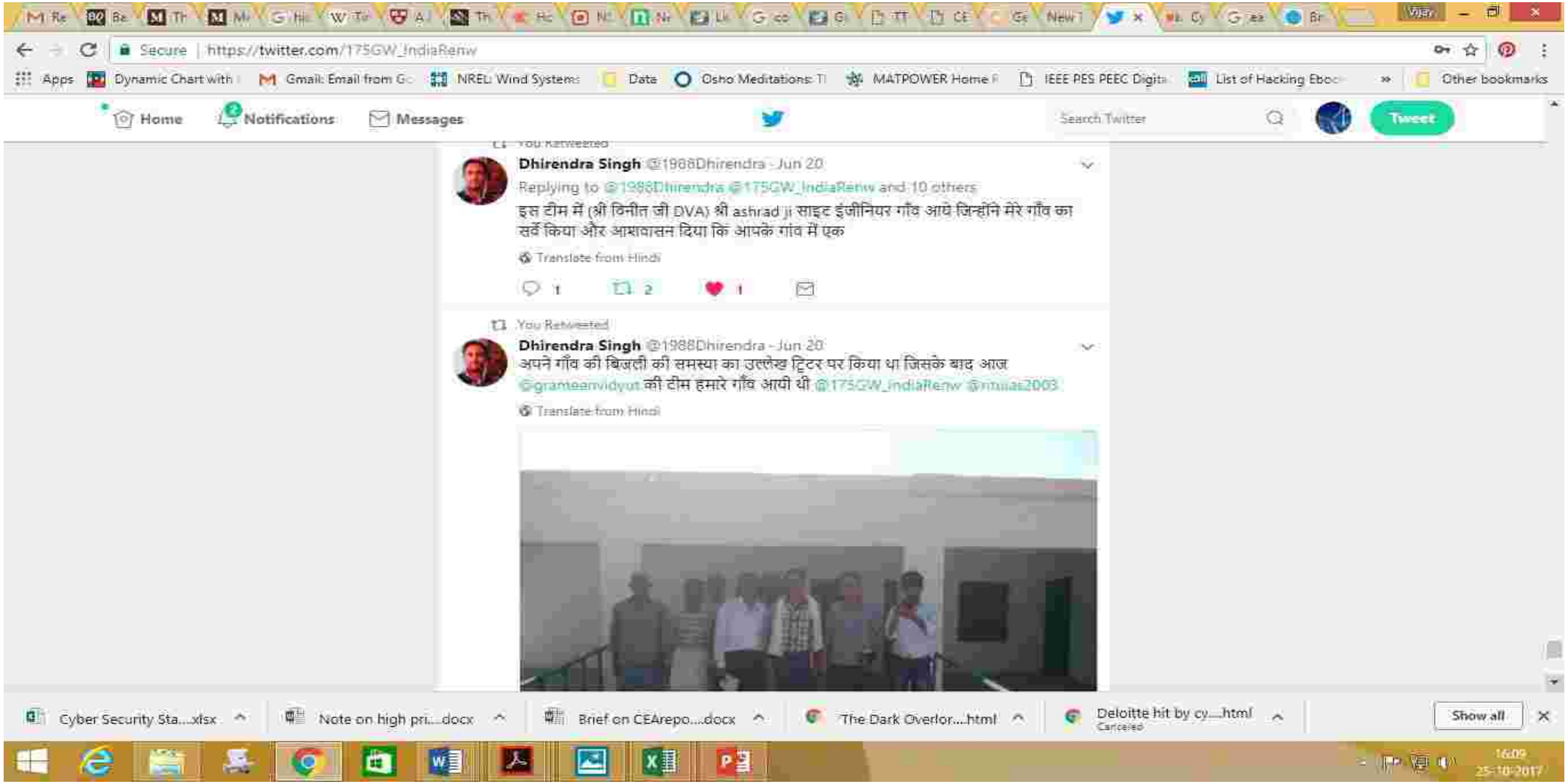
15th June,17 Garv2 App study

18th June,2017

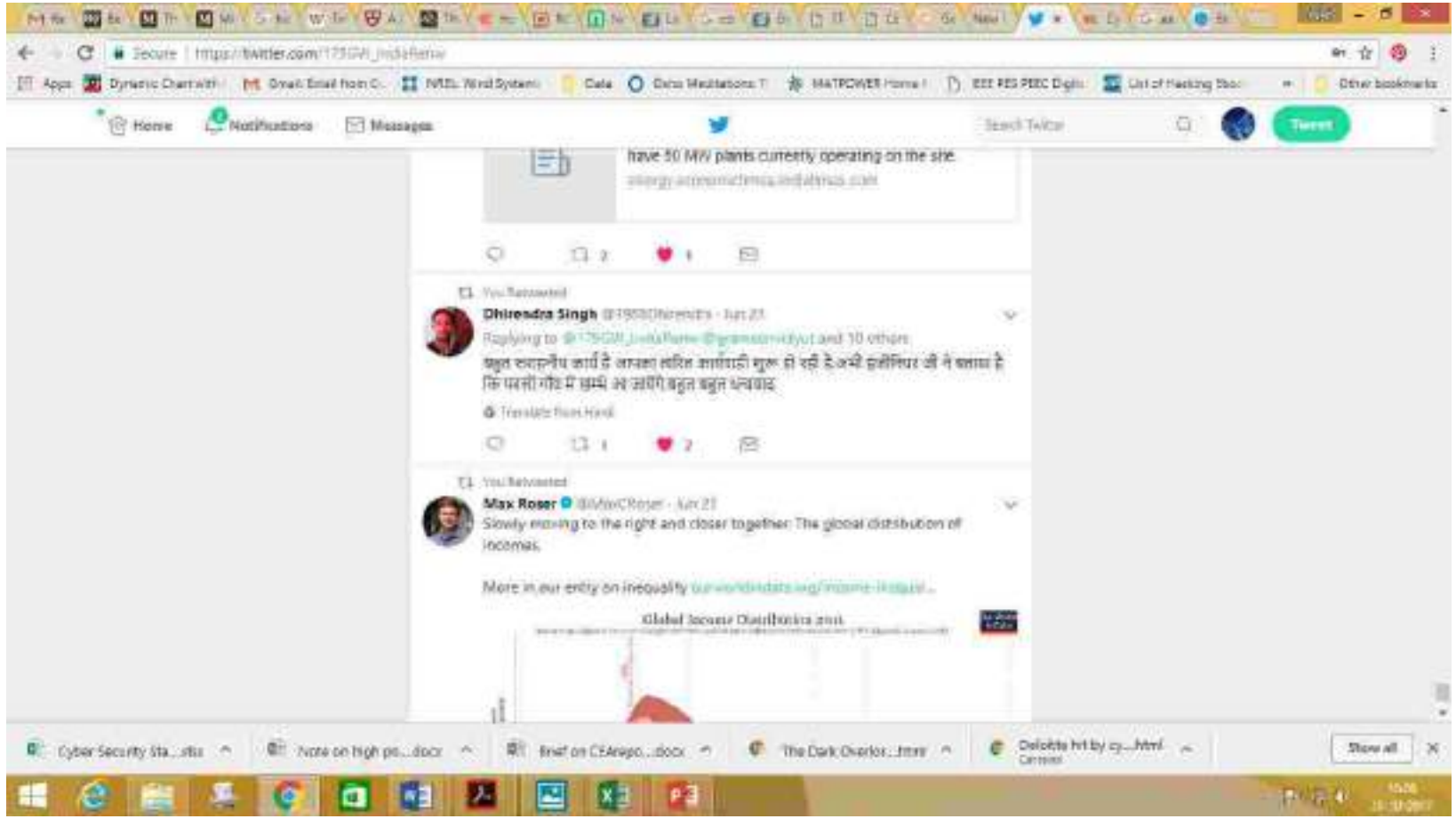
19th June,2017 Contact with REC



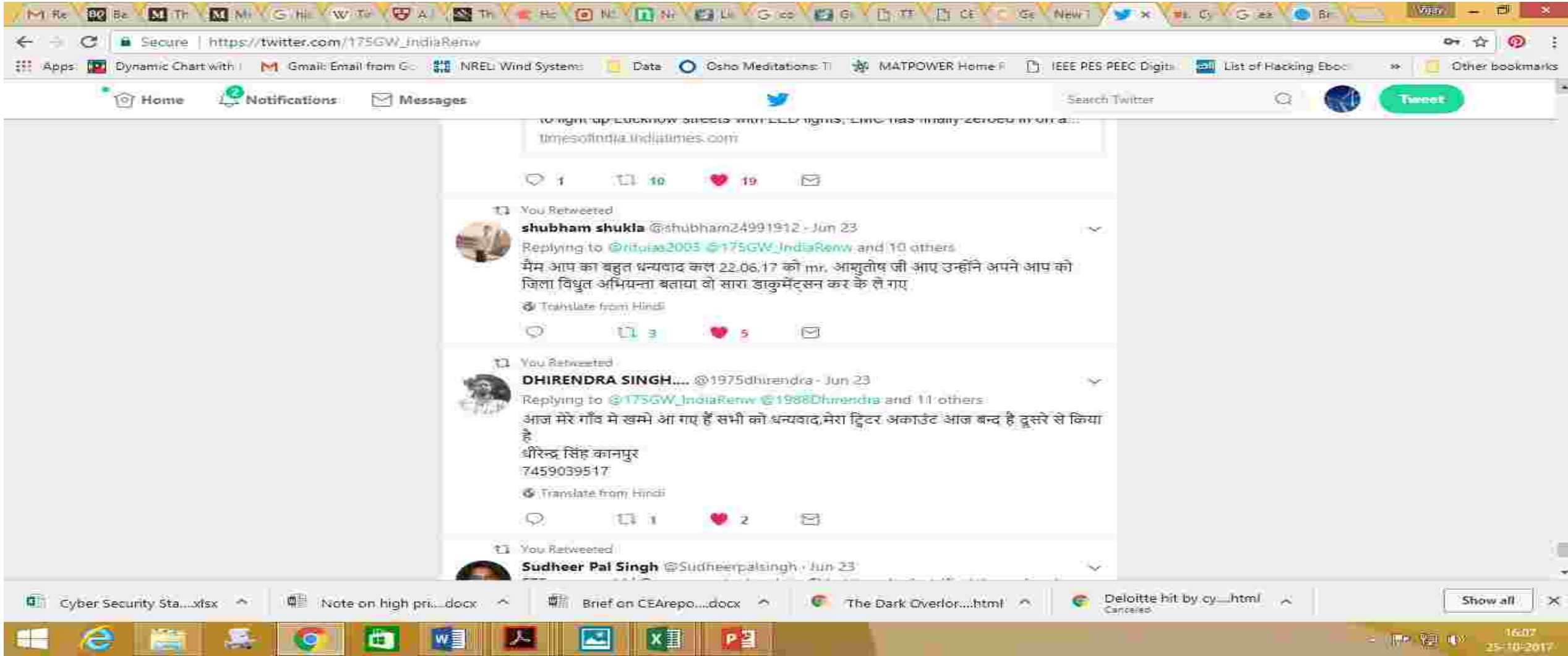
20th June,2017 REC TEAM REACHED VILLAGE



21st June,2017 Engineer informed applicant

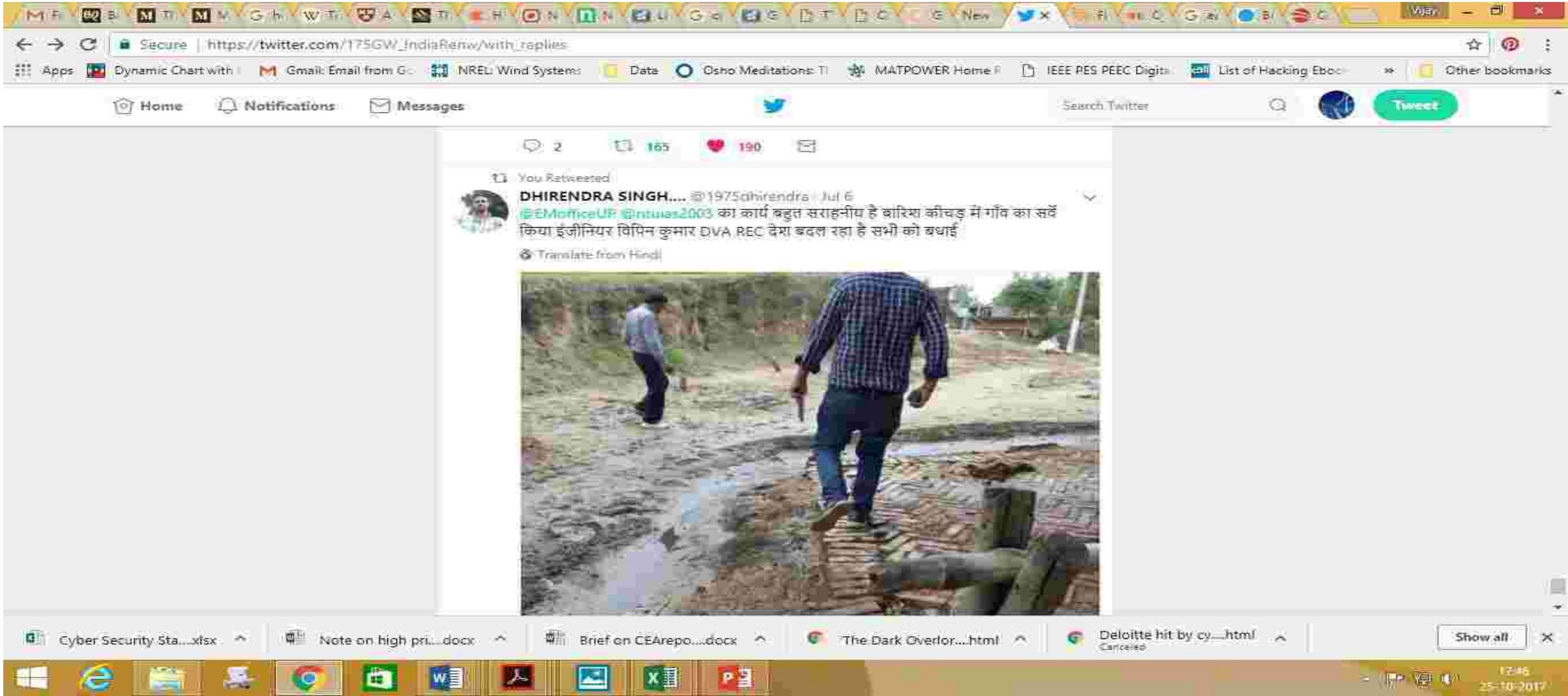


22rd June,2017 Documents collection by REC



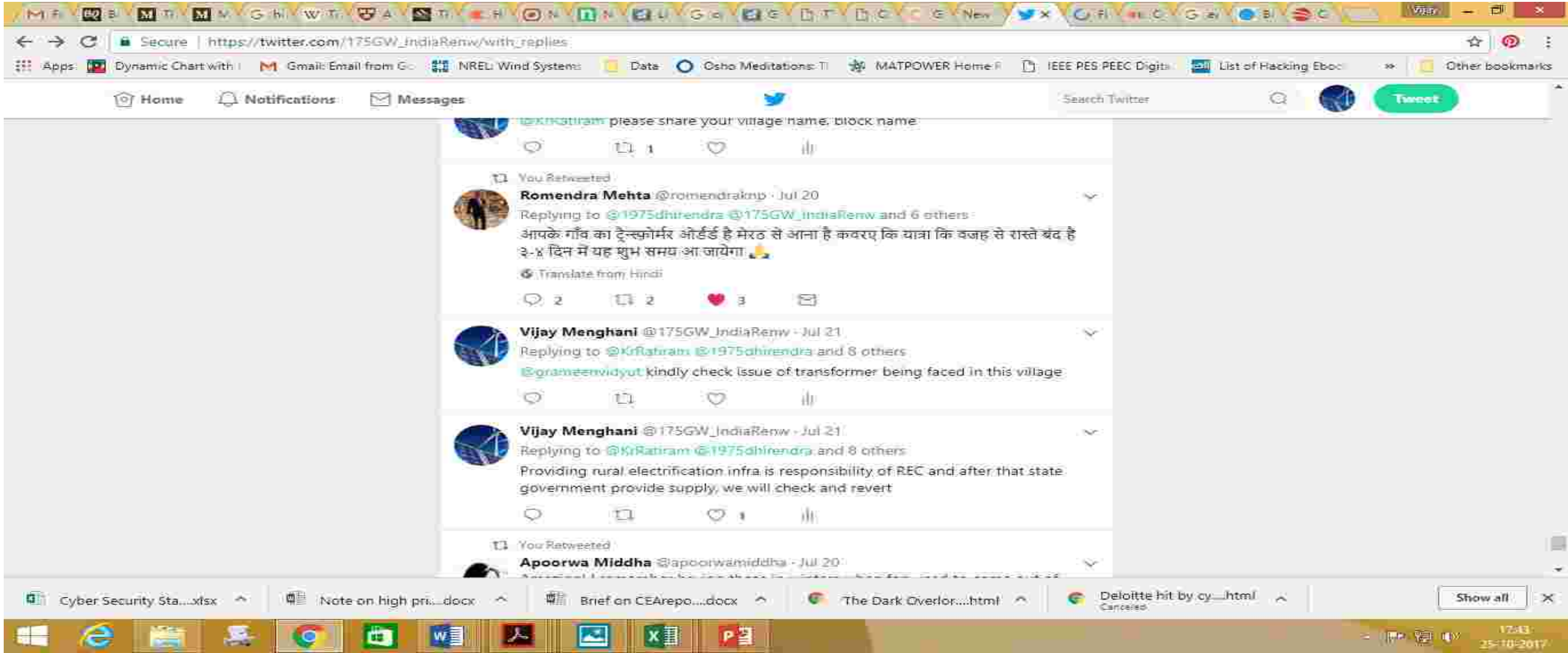
24th June ,17 Pillar reached village

6th July,2017 REC village survey



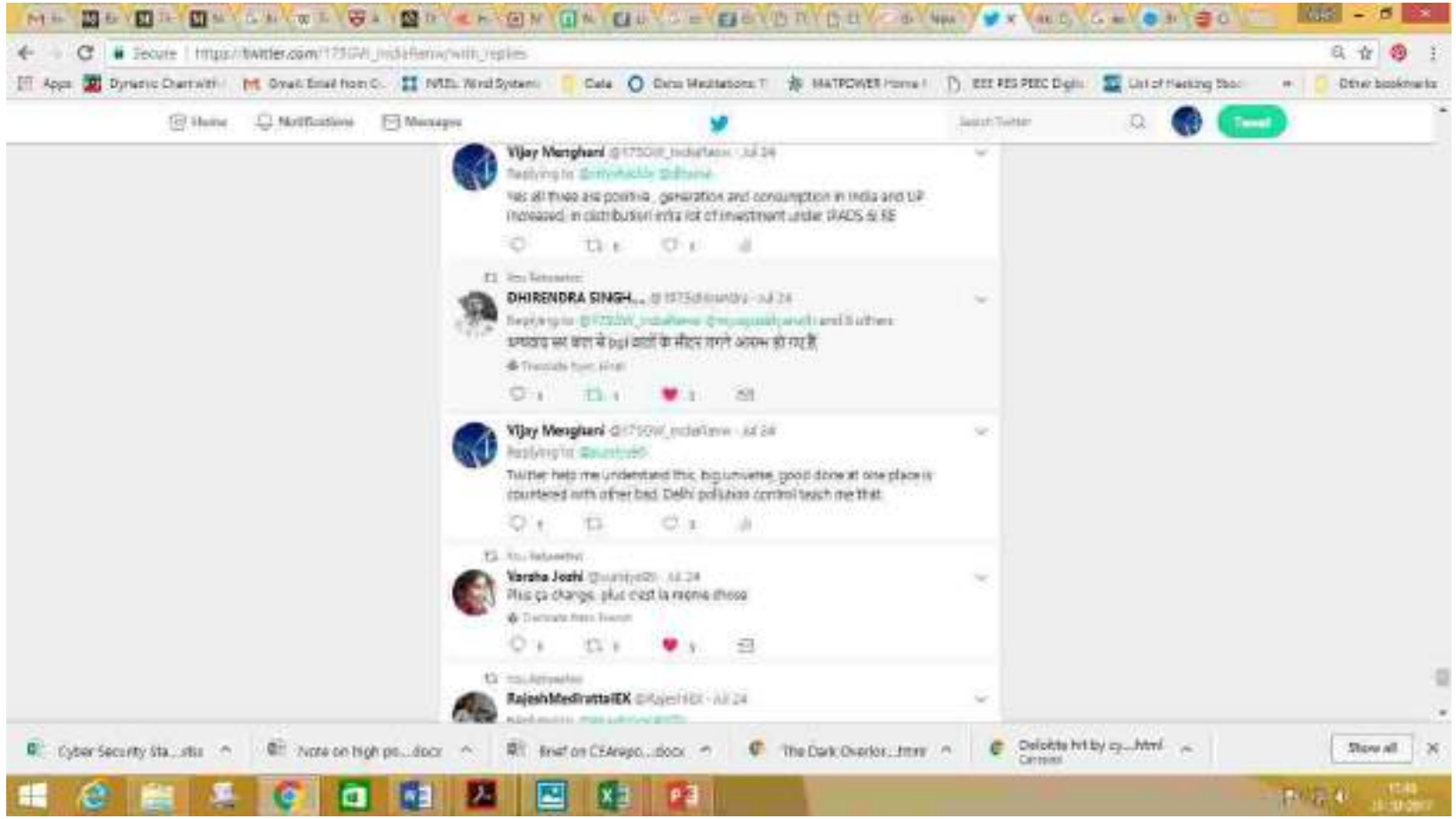
7th July ,2017 All worked together

20th July,17 REC Implementation agency inform reason of delay in transformer delay



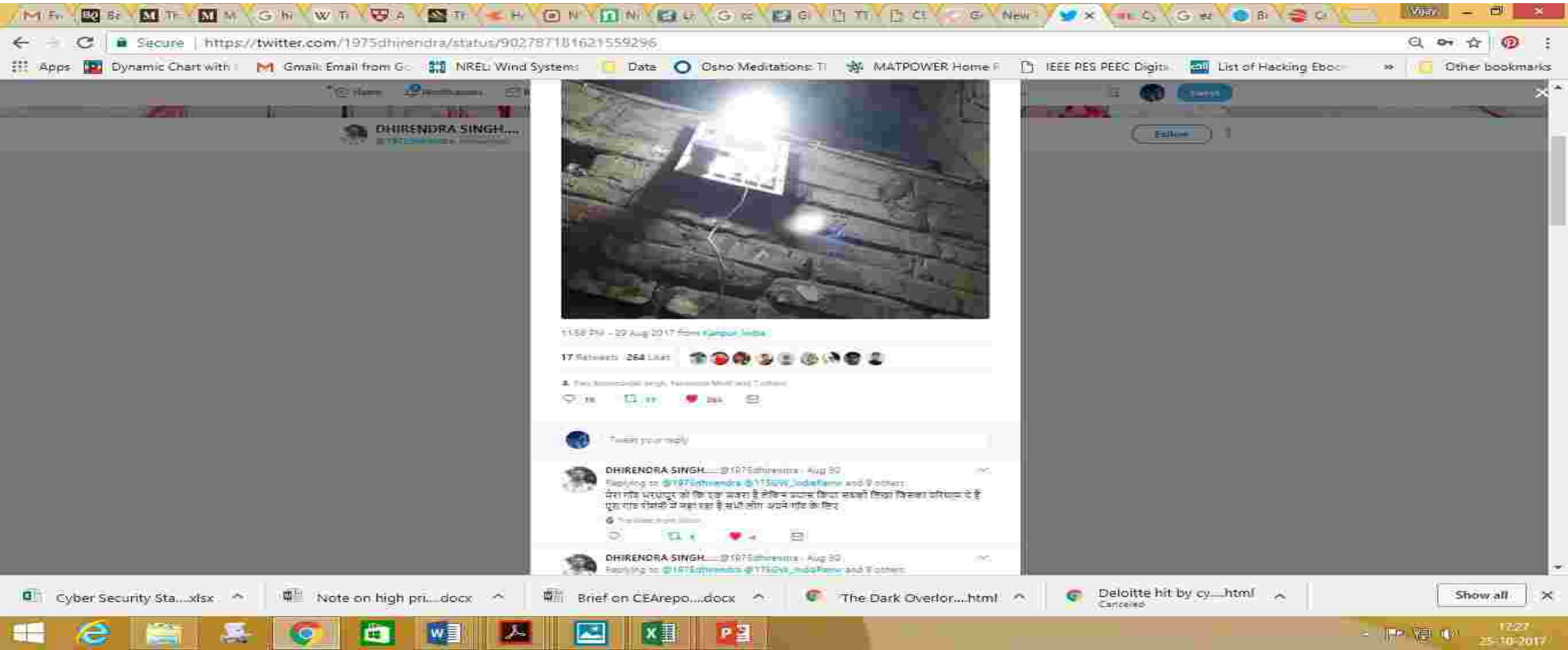
23rd July 17 Encourage locals to get connection and issue of Transformer discussed with REC

24th July 17 Discom provided meters

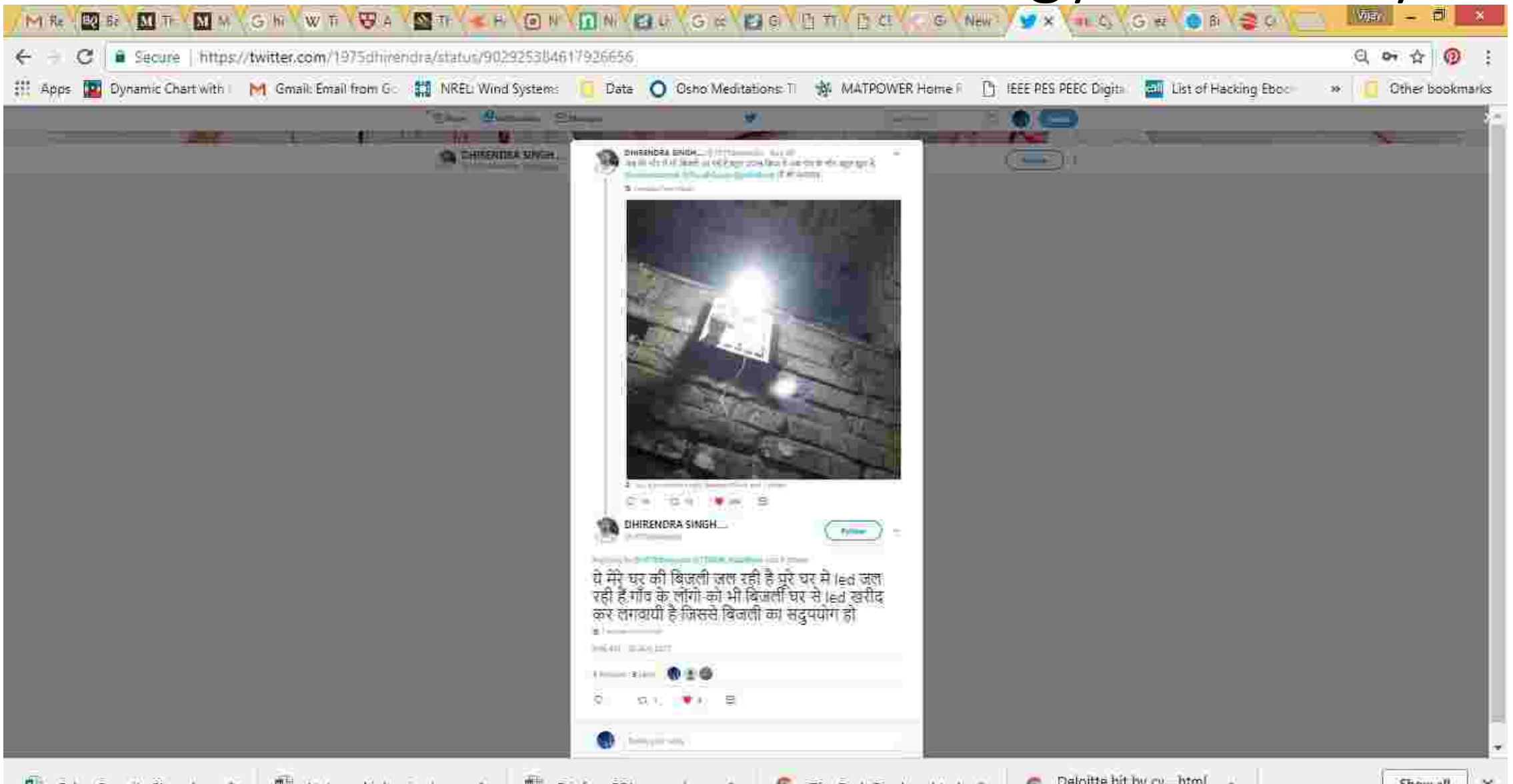


14th Aug,2017 Village Electrified within 64 days

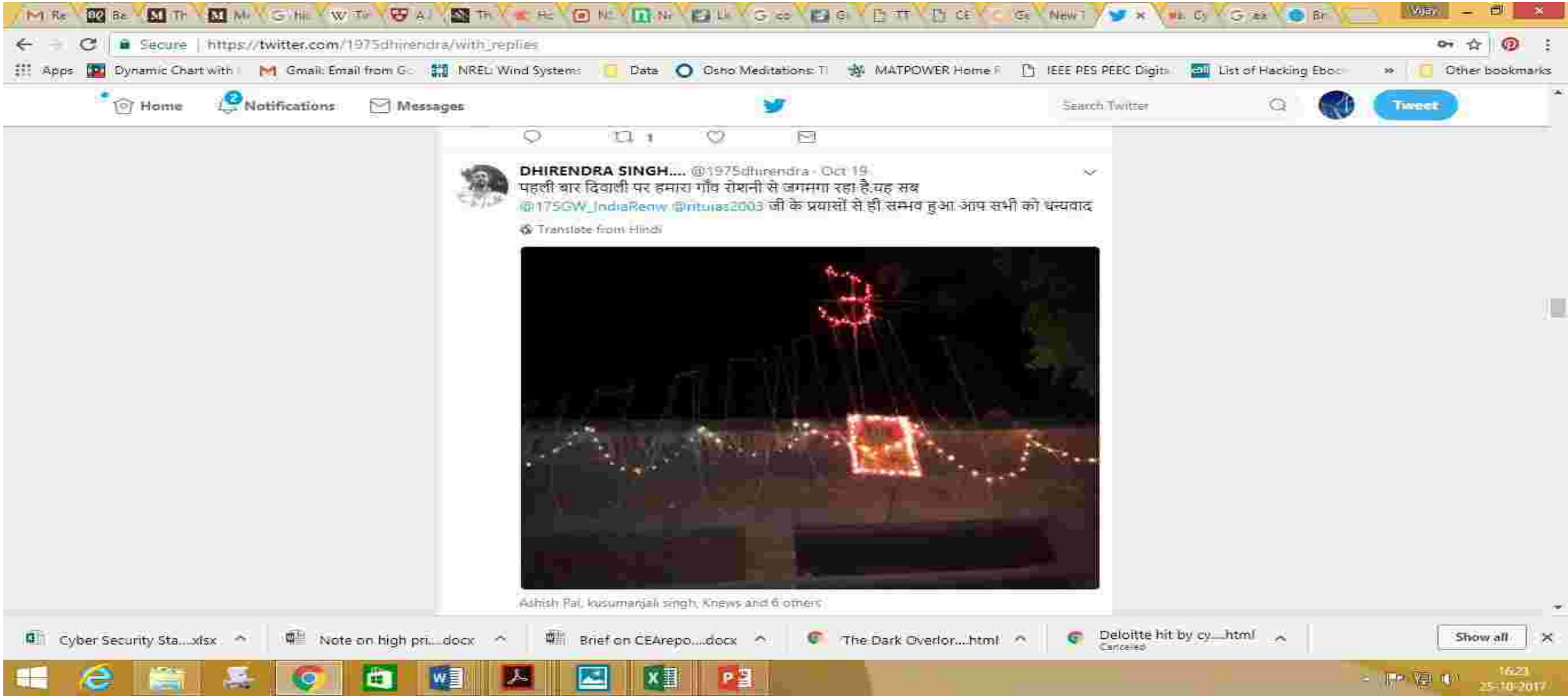
Happiness reached home



Aware consumer consume Energy Efficiently



Happy Diwali from a remote village



Diye Se Diya Jale

Let us work together to bring Light in life of everyone.

Thank you

vmenghani@nic.in

Operational Analysis for Optimization of Hydro Resources & facilitating Renewable Integration in India

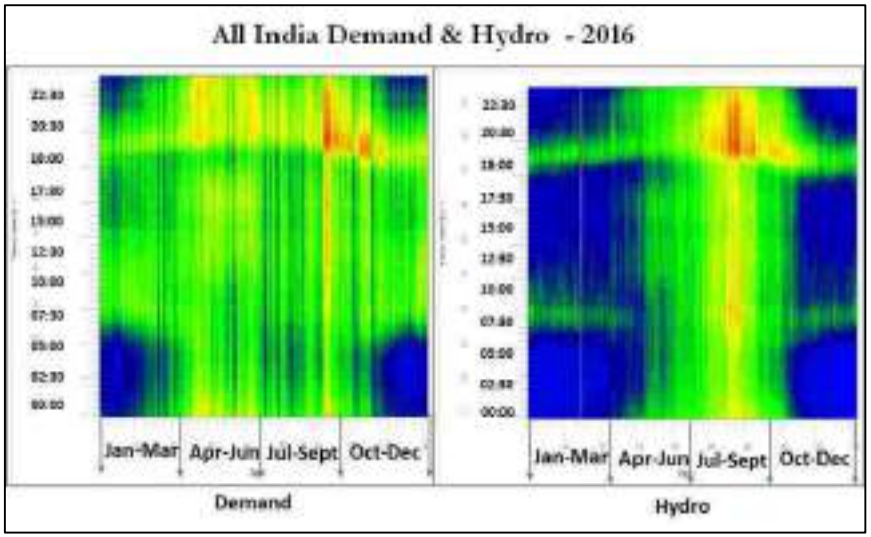
Chronology

- 21-Nov-2016 : Working Group on Hydro Resource (18th FOLD)
- 16-Feb-2017 : Survey Questionnaire Distribution & interaction
- 18-Apr-2017 : 1st Meeting of the FOLD WG at NLDC, New Delhi
- 09-Jun-2017 : Draft Report circulated for comments
- 19-Jun-2017 : Report endorsed by FOLD in the 19th Meeting
- 23-Jun-2017 : Release of Report by Hon'ble MOSP (at 60th FoR)
- 28-Jun-17 : Review by Joint Secretary (Hydro), MoP, GoI
- 10-Jul-2017 : Constitution of MoP Sub-Committee(Hydro)
- 12-Jul-2017 : 1st Meeting of MoP-Subcommittee (Hydro)
- 14-Jul-2017 : 2nd Meeting of MoP-Subcommittee (Hydro)
- 17-Jul-2017 : 3rd Meeting of the Subcommittee (Hydro) thru. VC

Motivation

- **Sub optimal operation of some hydro generators**
  - Scope for optimization & flexible operation along with economic gains
  - Requirement of flexibility in view of large scale Renewable Integration

- **Hydro Power - a source of flexibility & reliability**
  - Overload capability
  - Peaking support
  - Fast ramping
  - Primary Response
  - Voltage Regulation
  - Black Start Capability



- **Constitution of FOLD Working Group**

FOLD Working Group on Hydro (21-Nov-2016)

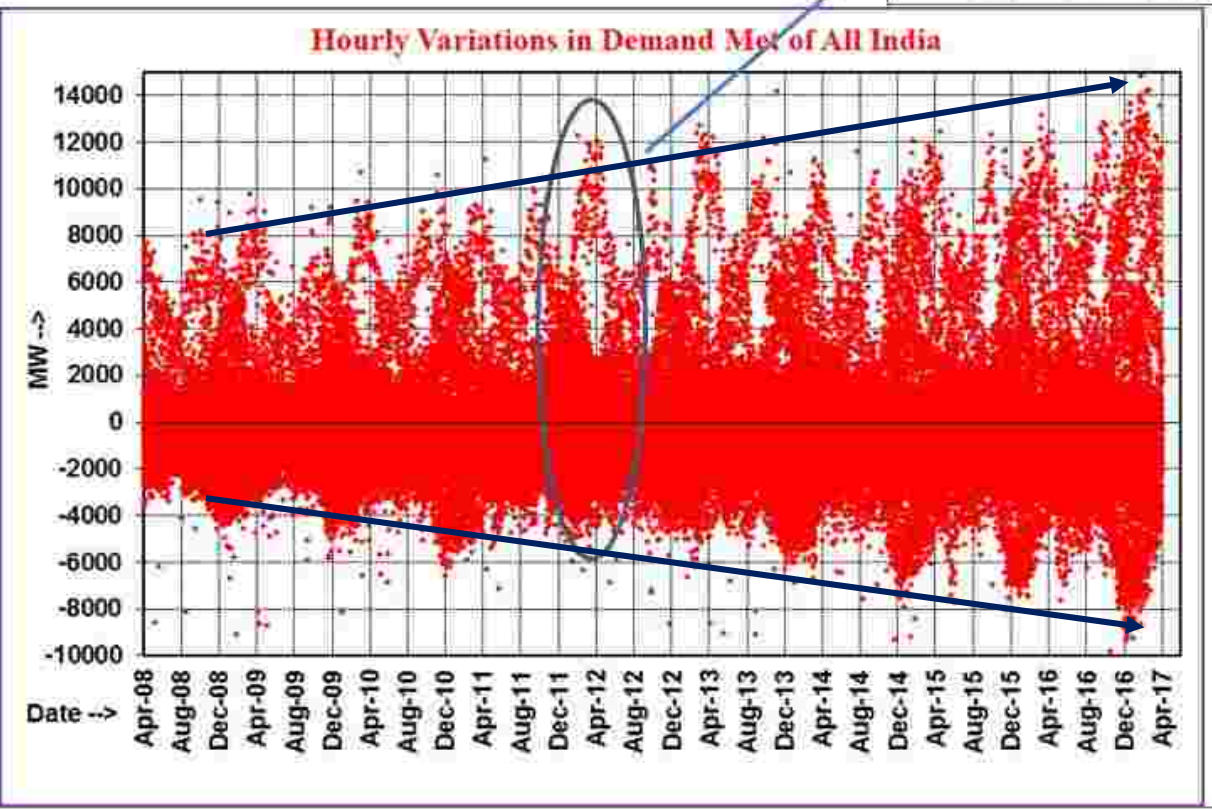
Terms of Reference(ToR):

1. To study the existing capability of hydro stations in States and Interstate level
2. To study the existing tariff and operating norms for hydro stations
3. To study the prevailing practices for scheduling and utilization of available capabilities of hydro stations and the existing constraints/issues withholding full utilization.
4. To study the operating constraints in respect of inflows, hydrology, water release, rate of reservoir depletion, machine capabilities etc.

Terms of Reference(ToR)

5. To explore the possibilities for utilizing available hydro stations as a flexible resource for primary response, secondary control (AGC), load following, peaking, pumped storage, reactive energy, Black-start etc.
6. To explore the possibilities of integrated operation of tandem hydro stations or stations on same river basin.
7. To study the availability of existing communication facility between the stations and control centers.
8. To suggest possible mechanisms and regulatory interventions for optimizing/enhancing utilization of existing hydro capabilities without violating the identified constraints.
9. Any other related matter.

Hourly Variation in all-India Demand (2008-17)



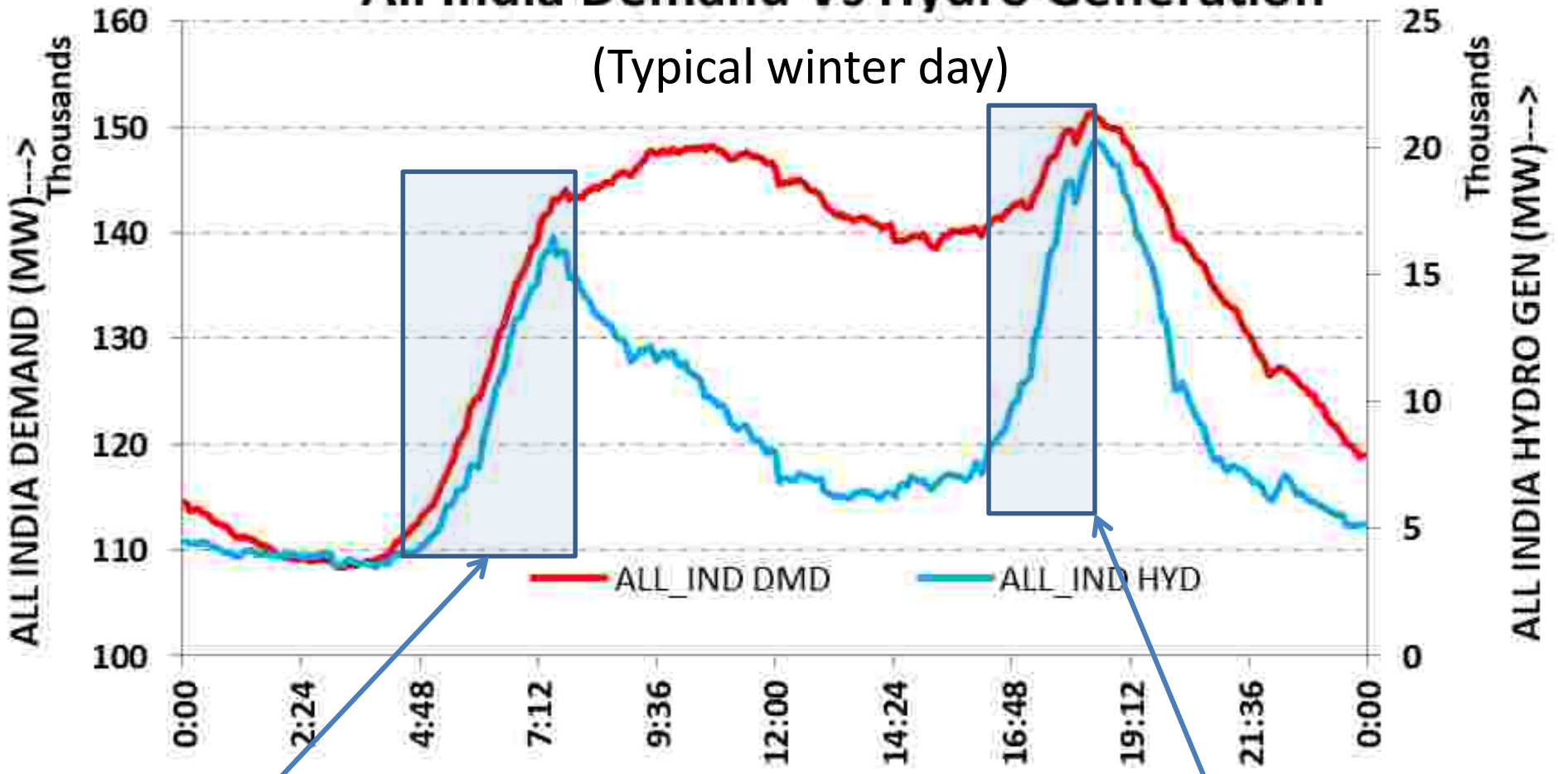
Flexible Resources for Grid Operation to manage variability of demand & RE generation:

- **Flexible Hydro / Gas generation**
- **Grid level Energy Storage**

The envelope is likely to widen further due to changes in load pattern

All India Demand Vs Hydro Generation

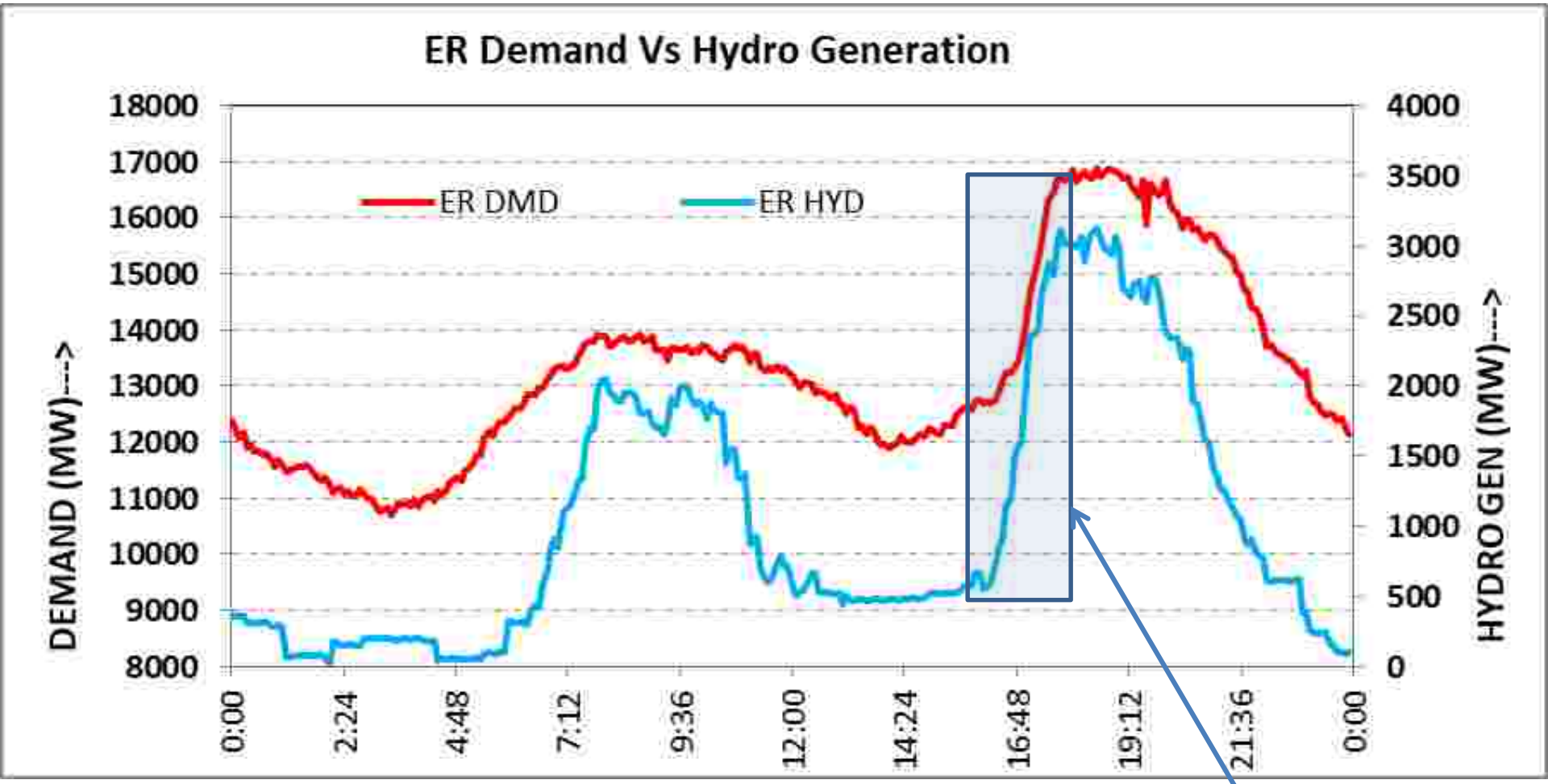
(Typical winter day)



All India Demand Ramp Rate :- **156 MW/Min**
All India Hydro Generation Ramp Rate :- **59 MW/Min**
(Time considered 04:00 Hr to 07:00 Hr)

All India Demand Ramp Rate :- **91 MW/Min**
All India Hydro Generation Ramp Rate :- **112 MW/Min**
(Time considered 16:30 Hr to 18:00 Hr)

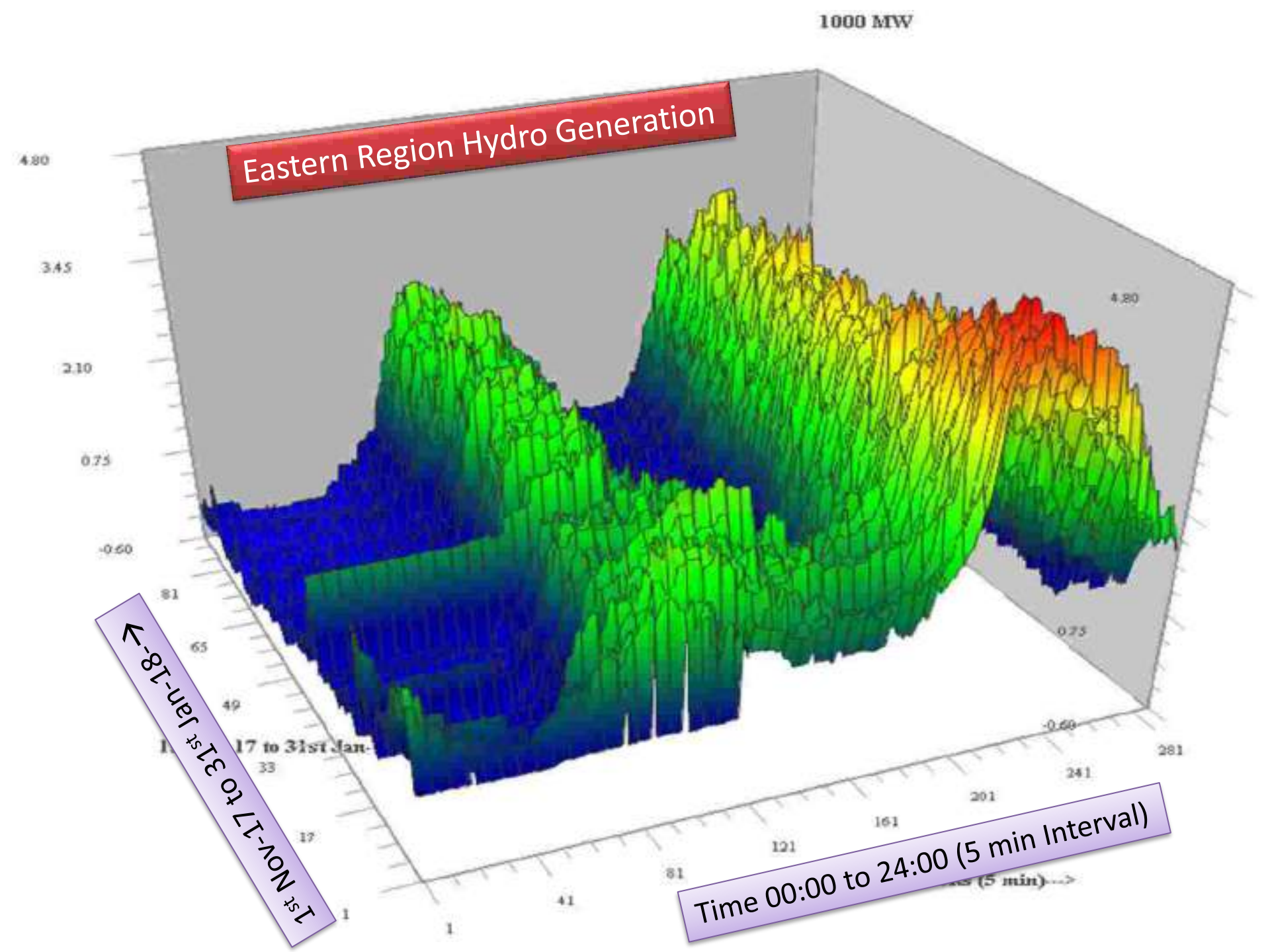
18-12-2017

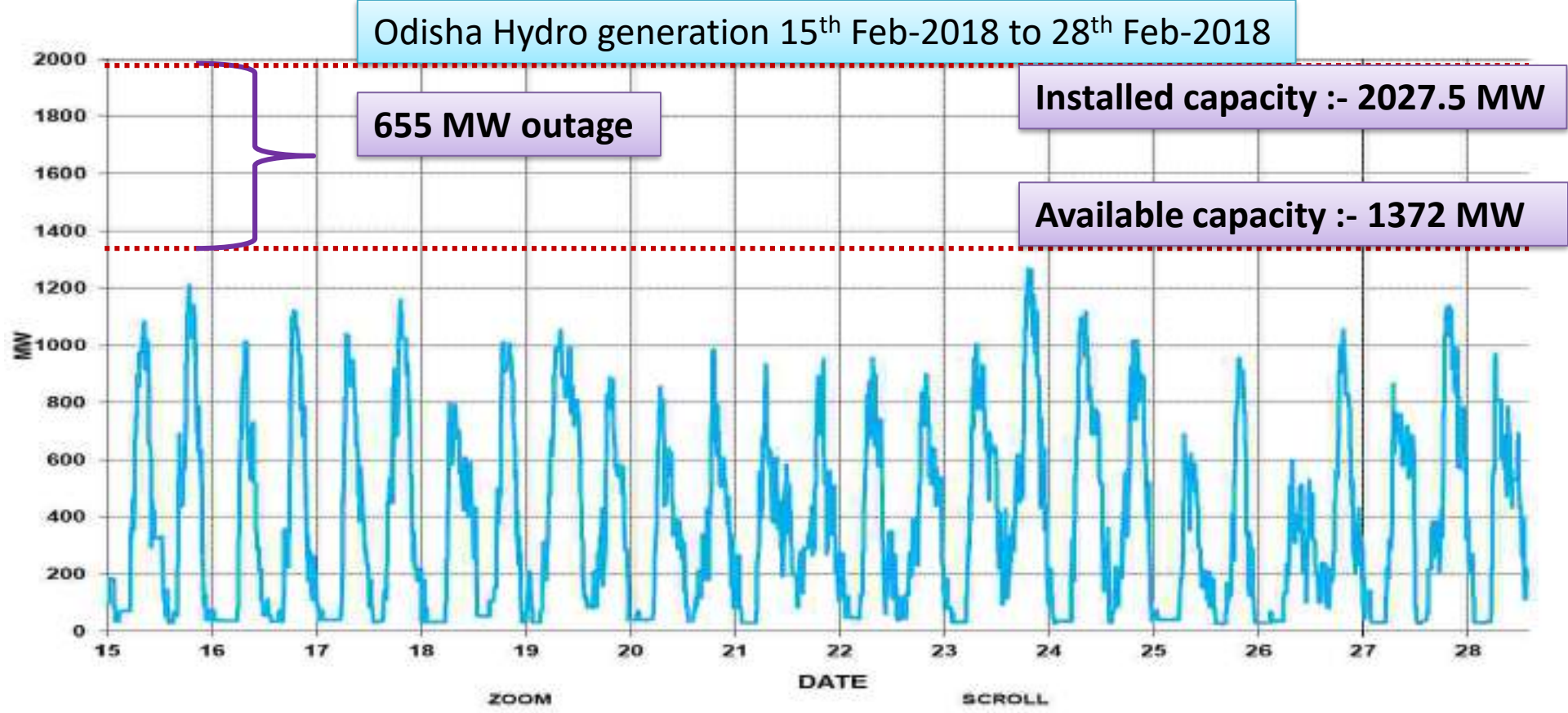


ER Demand Ramp Rate :- **49 MW/Min**

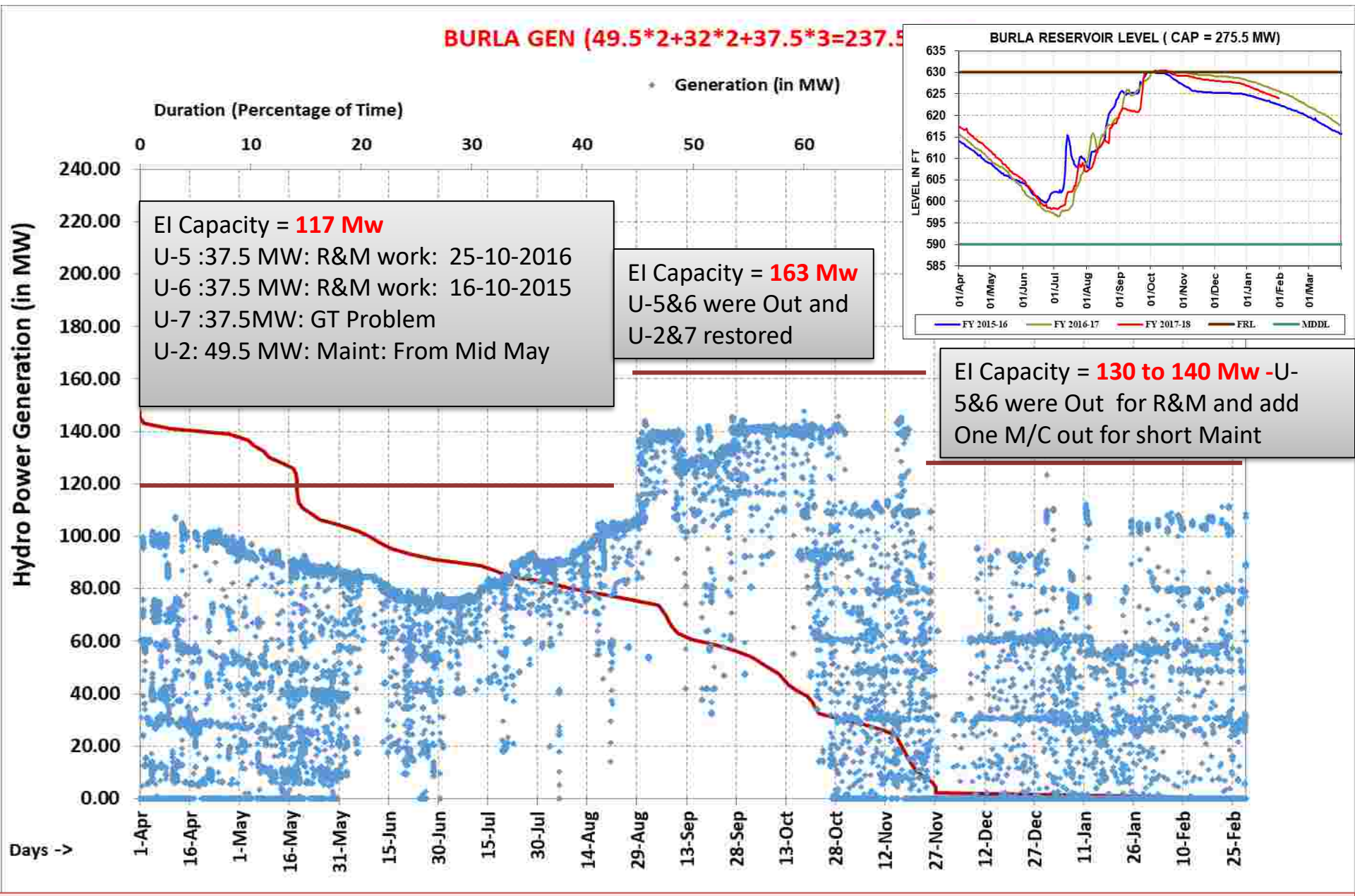
ER Hydro Generation Ramp Rate :- **29 MW/Min**

(Time considered 16:30 Hr to 17:45 Hr)

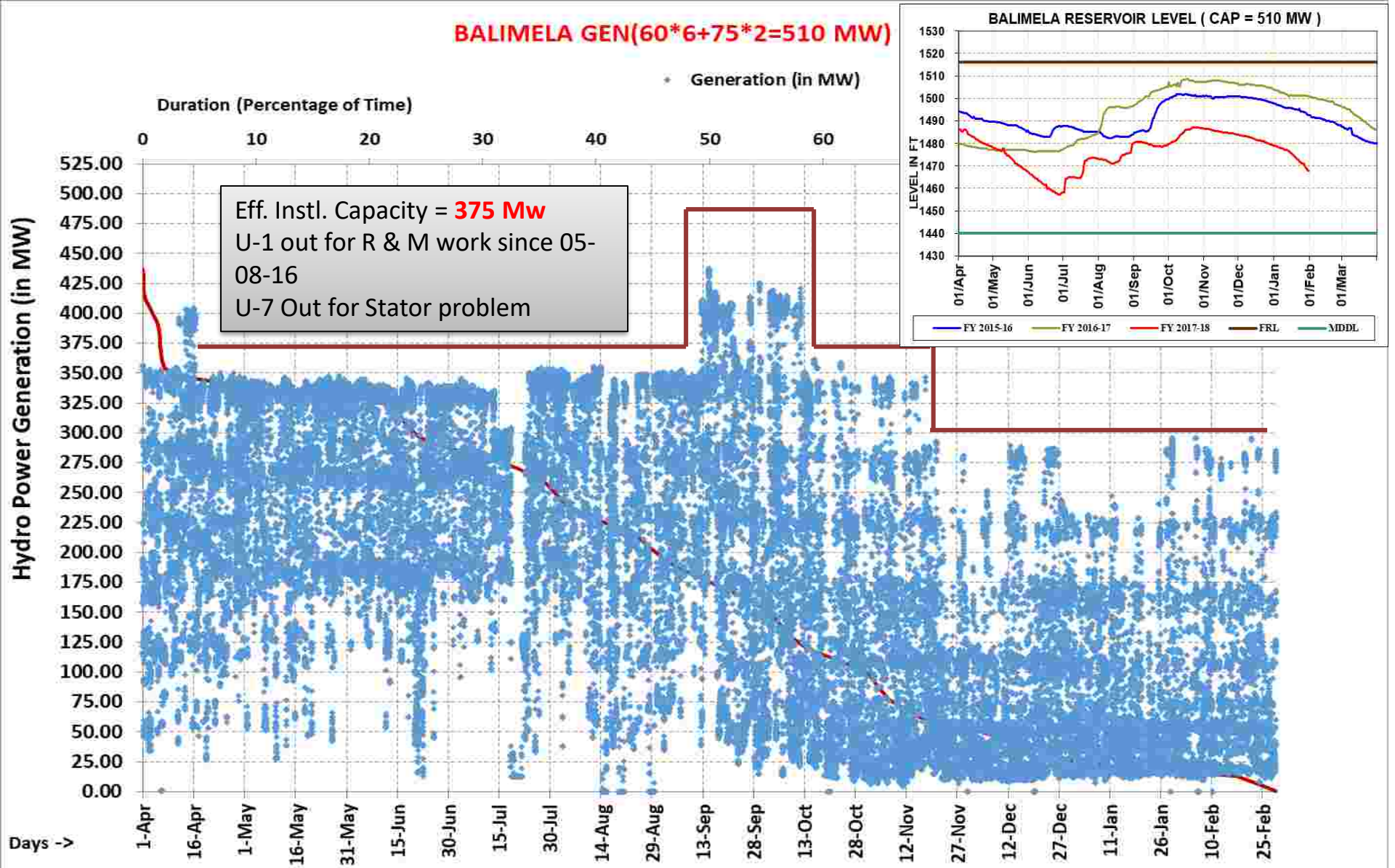

1000 MW
Eastern Region Hydro Generation
4.80
3.45
2.10
0.75
-0.60
81
65
49
33
17
1
1st Nov-17 to 31st Jan-18->
1
41
81
121
161
201
241
281
Time 00:00 to 24:00 (5 min Interval)



	Long Outage	Forced Outage
Burla	75 : U-5(37.5 mw), U-6(37.5 mw)	81.5: U-2(49.5 mw) U-4(32 mw)
Chipilima	24 :U-3 (24mW)	
Rengali		50: U-5(50 mw)
Balimela	195 : U-1(60 mw)U-7(75 Mw) U-2(60Mw)	
Up Kolab	80 : U-2(80 Mw)	
Indravati		150 U-3(150 Mw)
Total:	374	281.5

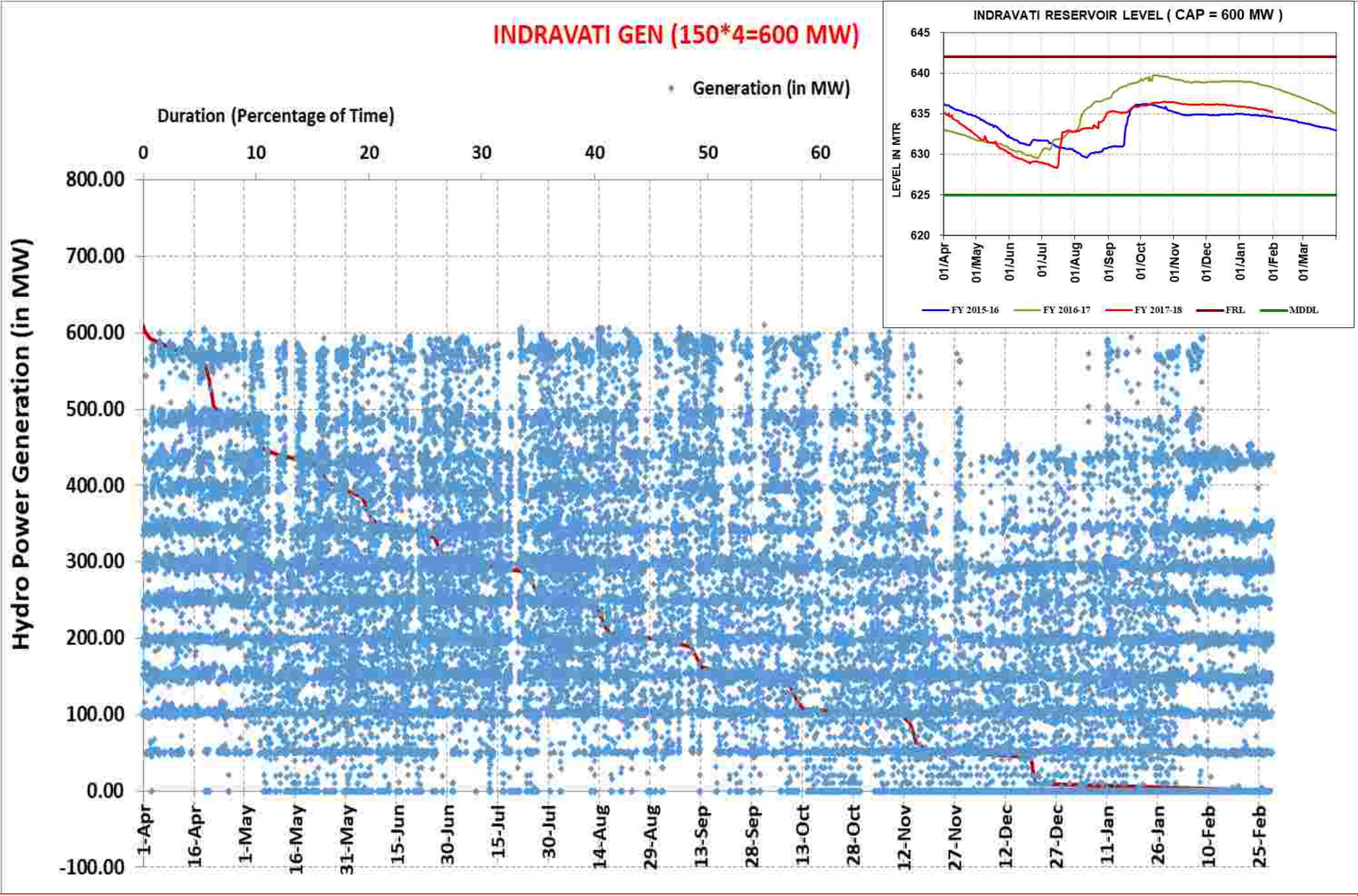


Effective Installed capacity over the period was less due to outage of multiple units for different reasons.
U- 5 & 6 were out for R&M work since 2015
Around **30 to 40 MW** less generation during Peak as per the Units on Bar



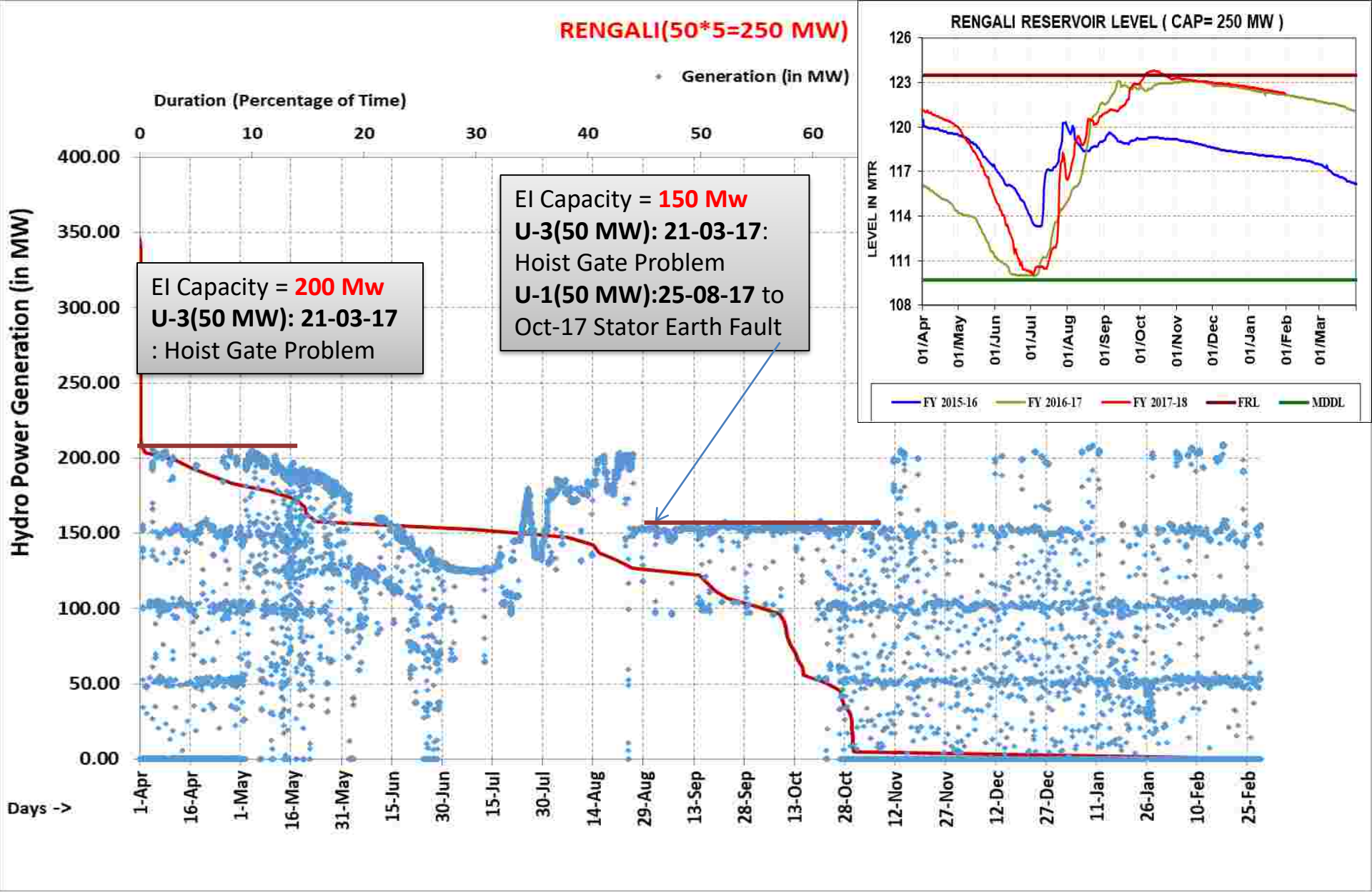
Available capacity over the period was less due to **long outage of U-1(60 MW), U-2(60 MW) for R&M Work and U-7(75 MW) for Gen stator Problem**

Around **50 MW** less generation during Peak

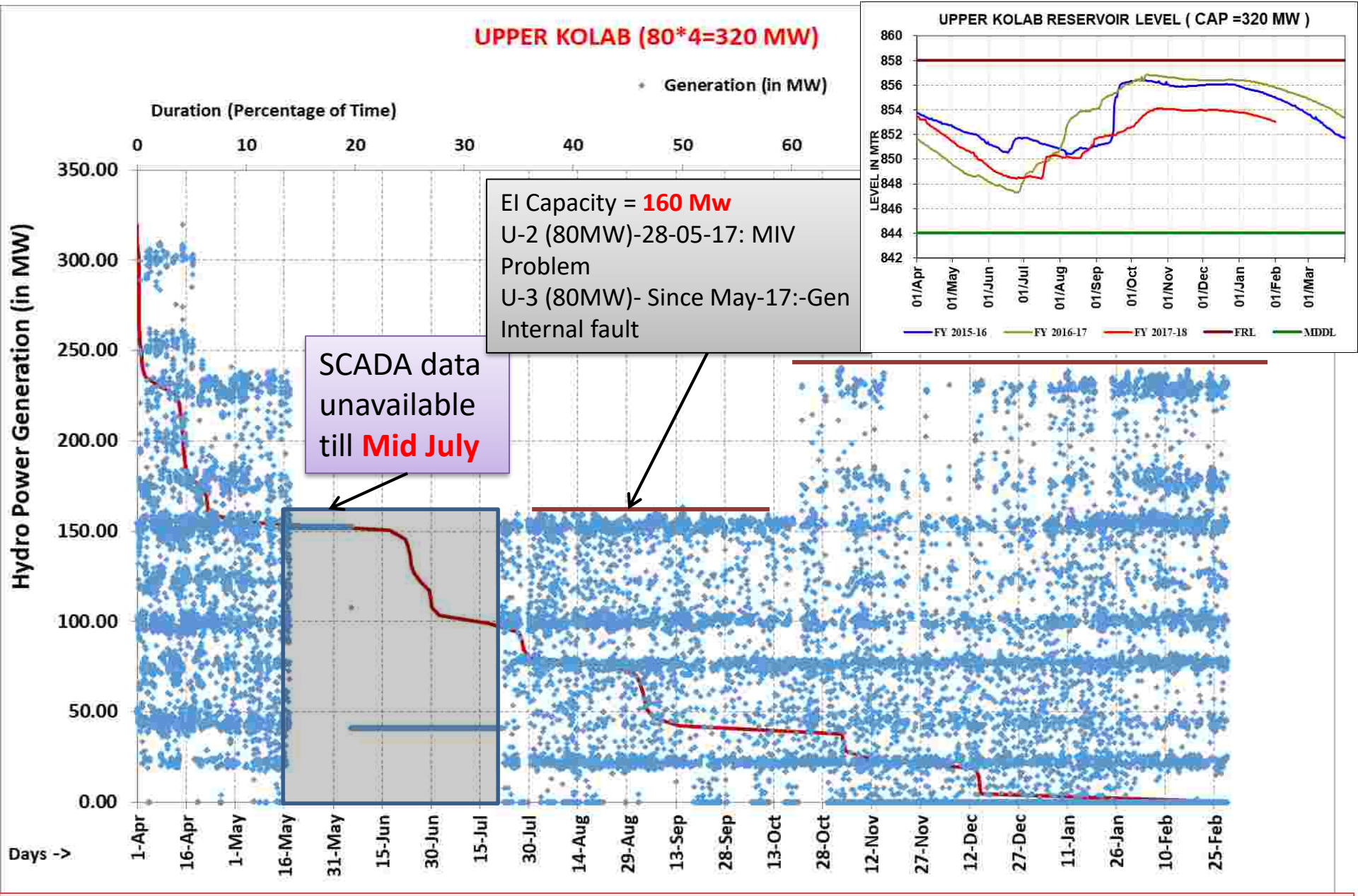


Achieves Peak generation of 600 MW on daily Basis

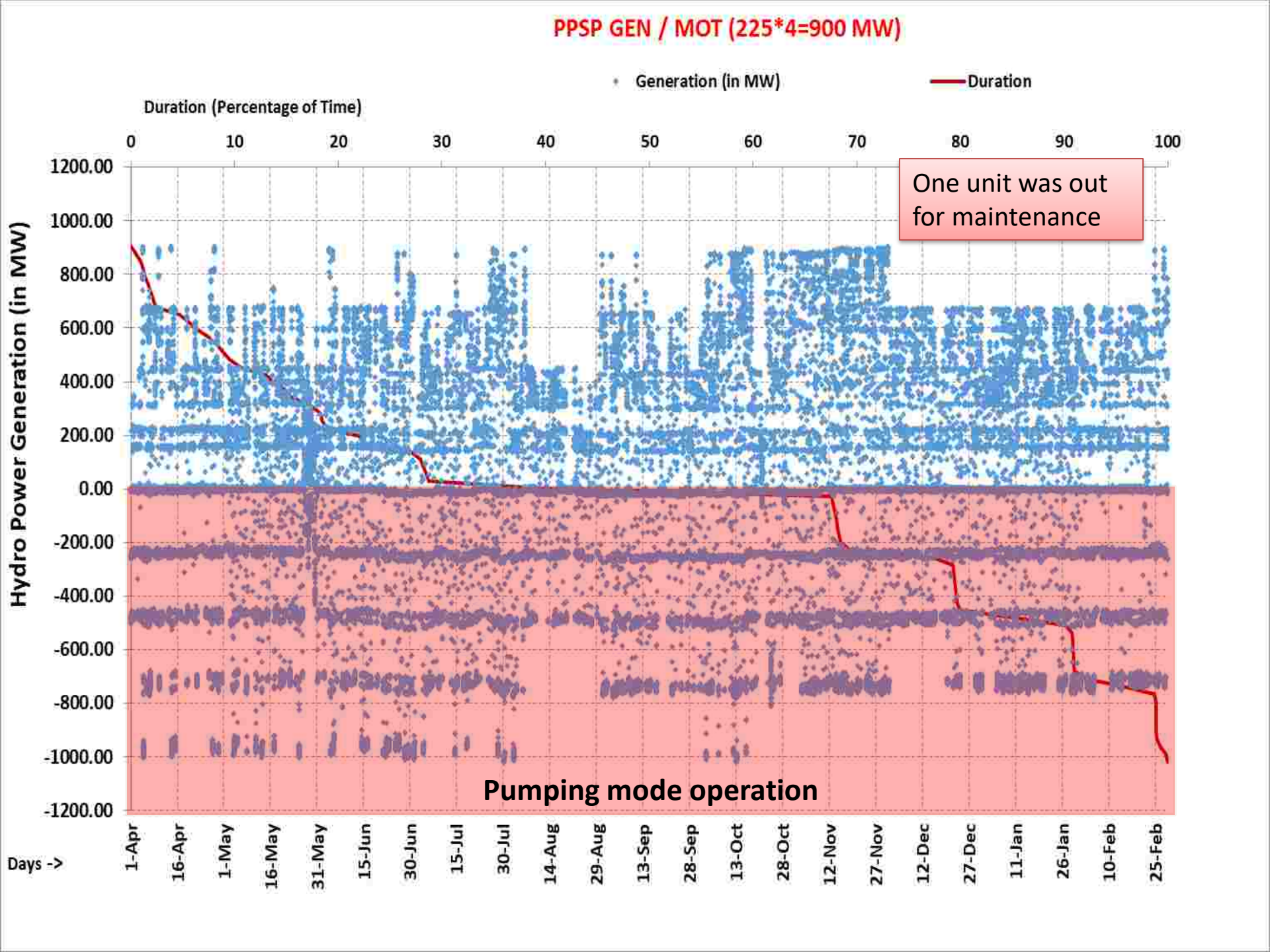
During Nov to Dec – 17 and Feb- 18 period One unit was out for maintenance work

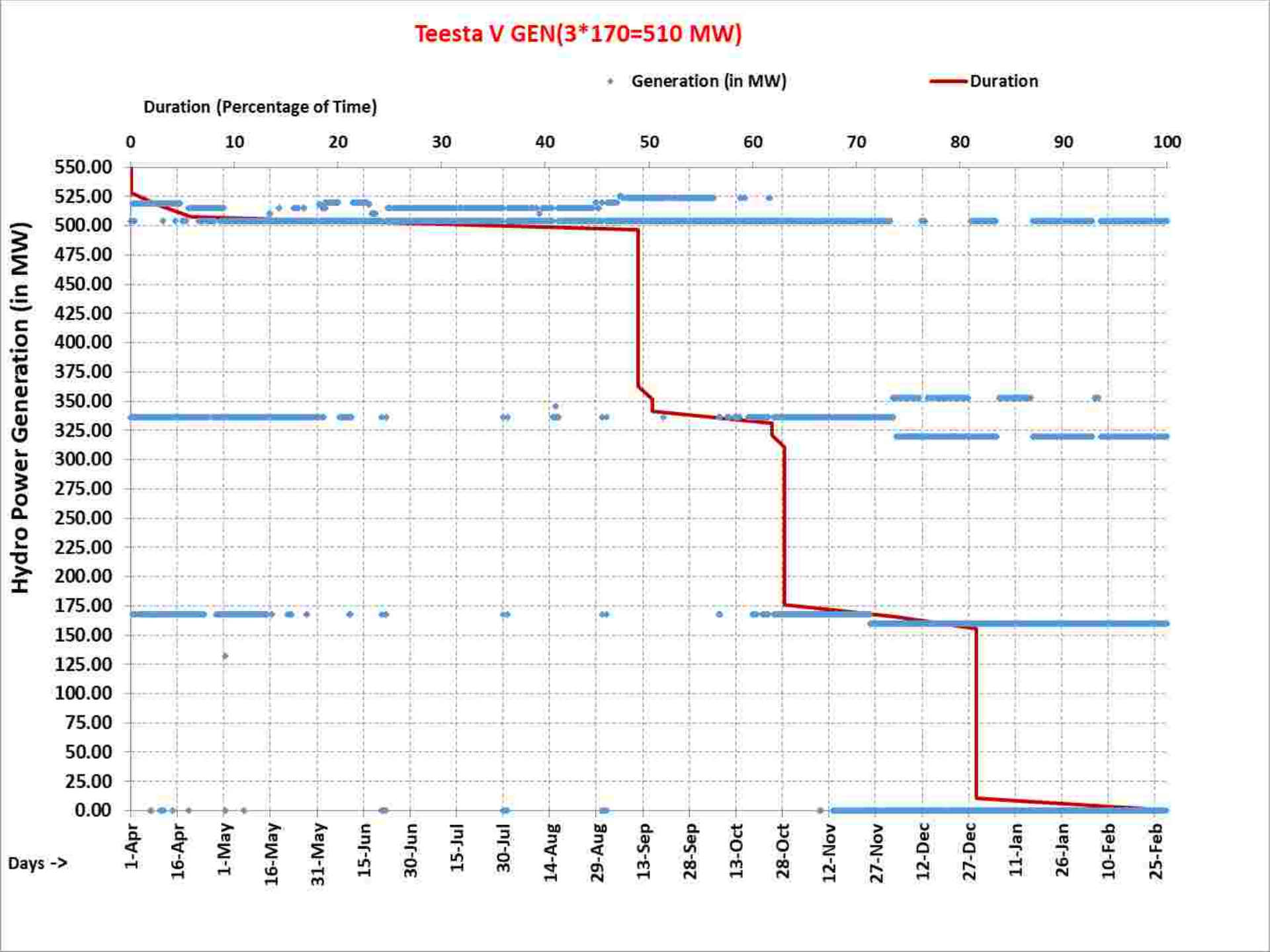


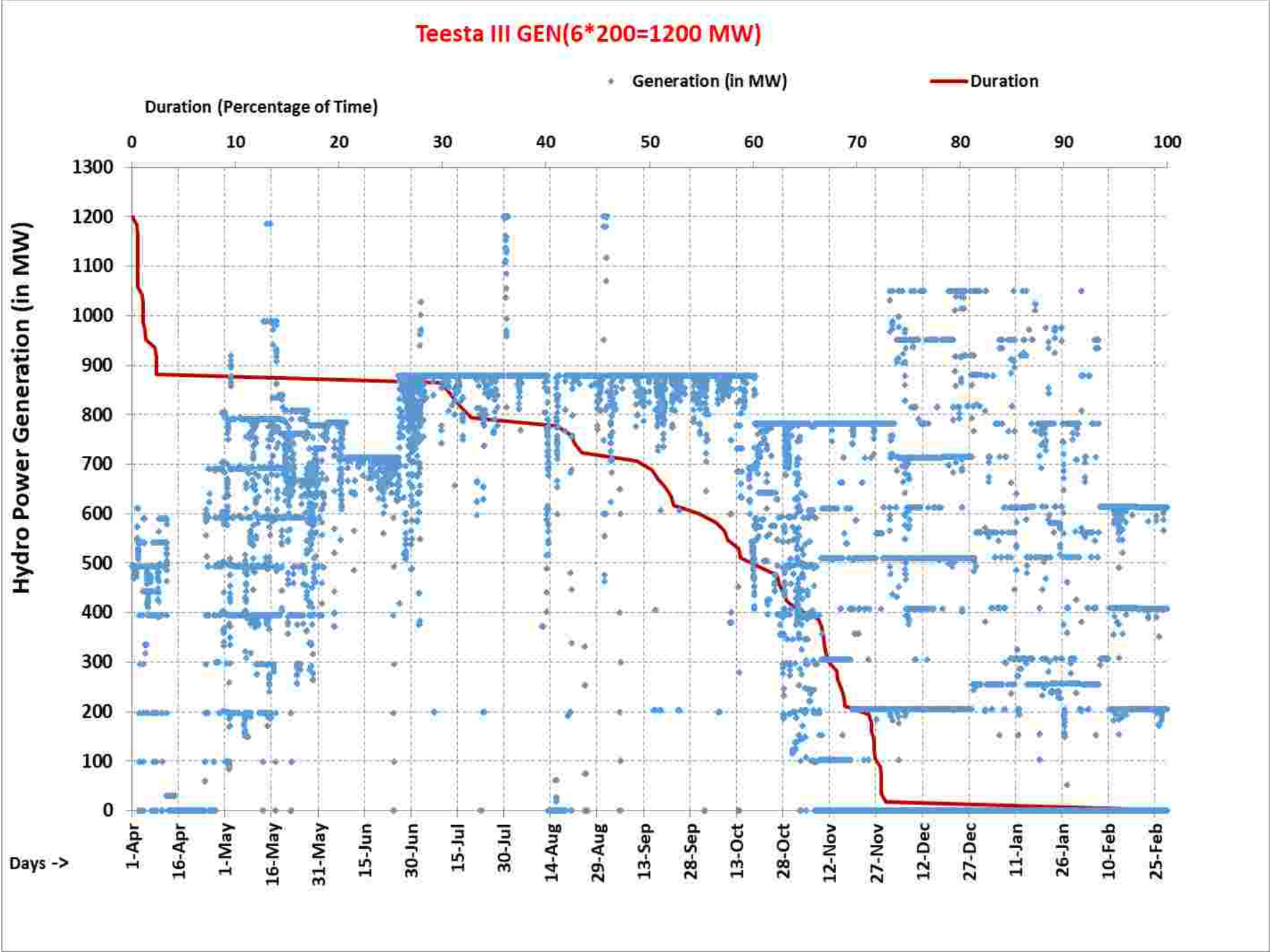
Effective Installed capacity over the period was less due to **long outage of U-3 (50 Mw) for** Hoist Gate Problem and from Dec Onward one unit Outage for Short Maintenance work.

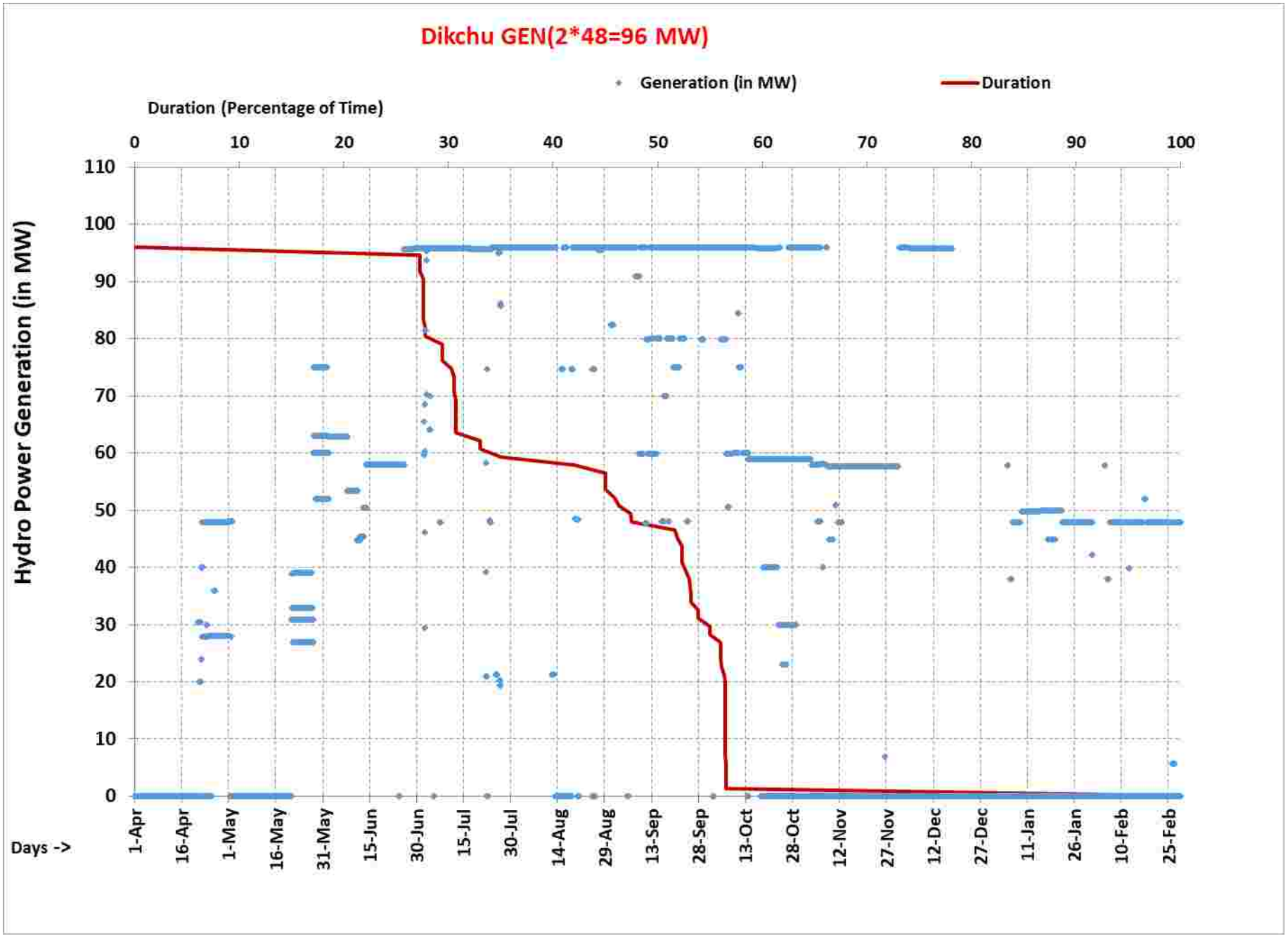


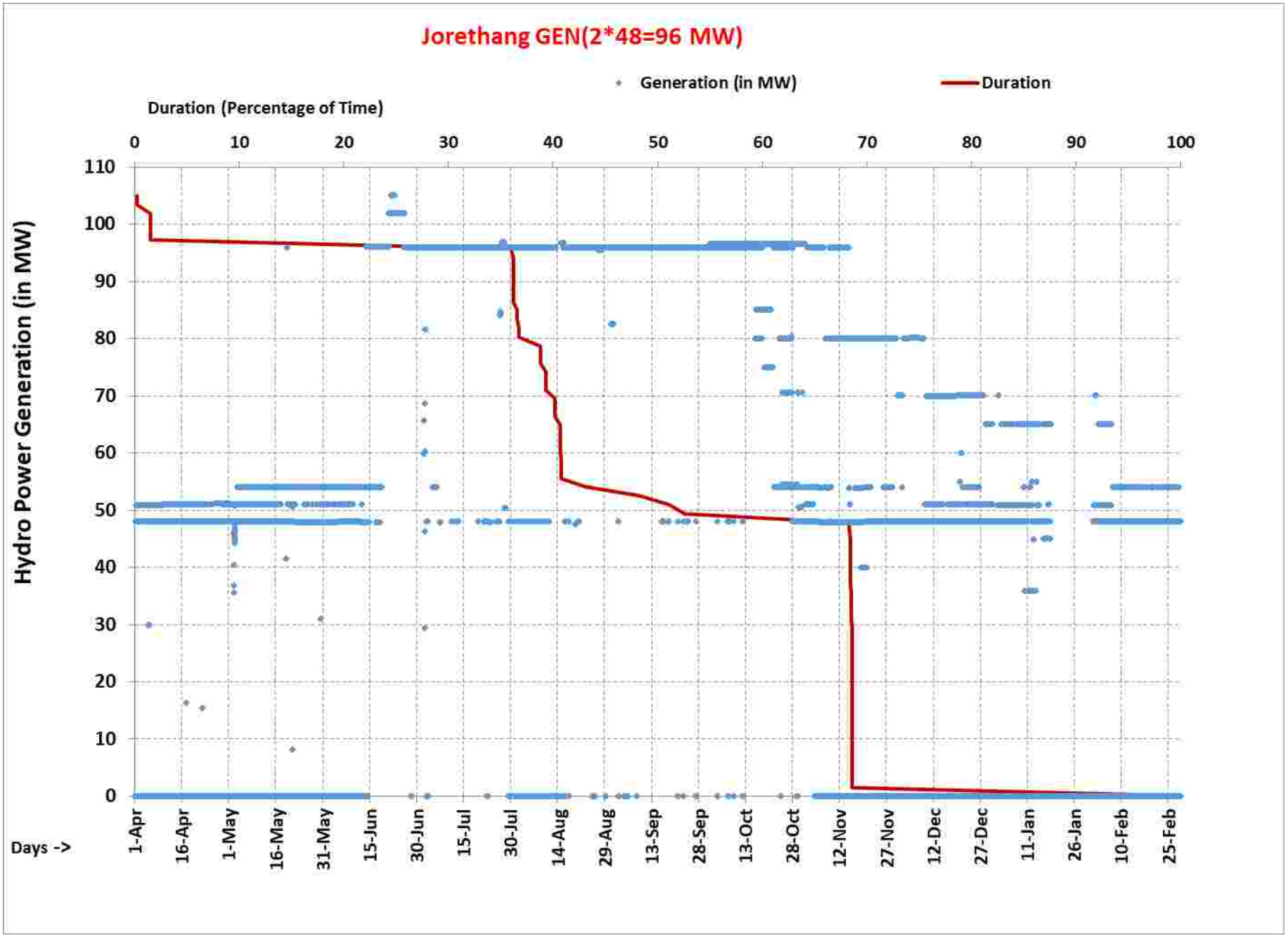
Effective Installed capacity over the period was less due to **long outage of U-2 (80 Mw) for repair of MIV and draft tube gate Leakage**


PPSP GEN / MOT (225*4=900 MW)
Generation (in MW)
Duration
Duration (Percentage of Time)
0
10
20
30
40
50
60
70
80
90
100
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
-200.00
-400.00
-600.00
-800.00
-1000.00
-1200.00
Hydro Power Generation (in MW)
One unit was out for maintenance
Pumping mode operation
Days ->
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
11-Jan
26-Jan
10-Feb
25-Feb


Teesta V GEN(3*170=510 MW)
Generation (in MW)
Duration
Duration (Percentage of Time)
0
10
20
30
40
50
60
70
80
90
100
Hydro Power Generation (in MW)
550.00
525.00
500.00
475.00
450.00
425.00
400.00
375.00
350.00
325.00
300.00
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
Days ->
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
11-Jan
26-Jan
10-Feb
25-Feb


Teesta III GEN(6*200=1200 MW)
Generation (in MW)
Duration
Duration (Percentage of Time)
0
10
20
30
40
50
60
70
80
90
100
Hydro Power Generation (in MW)
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Days ->
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
11-Jan
26-Jan
10-Feb
25-Feb


Dikchu GEN(2*48=96 MW)
Generation (in MW)
Duration
Duration (Percentage of Time)
0
10
20
30
40
50
60
70
80
90
100
Hydro Power Generation (in MW)
110
100
90
80
70
60
50
40
30
20
10
0
Days ->
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
11-Jan
26-Jan
10-Feb
25-Feb


Jorethang GEN(2*48=96 MW)
Generation (in MW)
Duration
Duration (Percentage of Time)
0
10
20
30
40
50
60
70
80
90
100
Hydro Power Generation (in MW)
110
100
90
80
70
60
50
40
30
20
10
0
Days ->
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
11-Jan
26-Jan
10-Feb
25-Feb

Conclusions

- Despite having a hydro fleet of more than 1900MW capacity, around 1400MW (average) only of OHPC was available for generation at any point of time.

- By optimizing maintenance plan and avoiding long outages due to breakdown, additional 400MW capacity can be harnessed for providing peaking support

- Purulia PSP operation (both generating and motoring) can be utilised as a flexible resource with appropriate incentives.

- Complexity in despatching plants with their reservoirs in tandem with upstream plant being scheduled as per day-ahead short-term market requirement while downstream plant schedule has to meet obligations towards its long-term beneficiaries.

Annexure-B3

Details of stations/Units required to operate under RGMO/FGMO as per IEGC							Whether operating under RGMO	indicate in case of status is not available
Name of State	Type	Name of Uitlity	Sector (CS/SS/Private)	Name of Station	Name of Stage/ Unit	Installed capacity (MW)		
JHARKHAND	Thermal	TVNL	SS	Tenughat	1	210	No	Difficulties in implementing RGMO & exemption not
			SS		2	210	No	
	Hydro	JSEB	SS	Subarnrekha	1	65	Yes	
			SS		2	65	Yes	
WEST BENGAL	Termal	WBPDCL	SS	Bandel TPS	1	82.5	No	
			SS		2	82.5	No	
			SS		3	82.5	No	
			SS		4	82.5	No	
			SS		5	210	No	
			SS	Santaldih	5	250	No	Unit#6 could not be implemented because of some technical problem
			SS		6	250	No	
			SS	Kolaghat	1	210	No	Nil
			SS		2	210	No	Nil
			SS		3	210	No	Nil
			SS		4	210	No	Nil
			SS		5	210	No	Nil
			SS		6	210	No	Nil
			SS	Bakreshwar	1	210	Yes	
			SS		2	210	Yes	
			SS		3	210	Yes	
			SS		4	210	Yes	
			SS		5	210	Yes	
			SS	Sagardighi	1	300	No	Without OEM support it is not possible to put in FGMO/RGMO. At present OEM support is not
			SS		2	300	No	
	Hydro		SS	PPSP	1	225	Yes	In 134th OCC WBPDCL informed that the units are in RGMO/FGMO mode
			SS		2	225	Yes	
			SS		3	225	Yes	
			SS		4	225	Yes	
	Thermal	CESC	SS	Budge-Budge	1	250	Yes	
			SS		2	250	Yes	
			SS		3	250	Yes	
			SS	Haldia	1	300	Yes	
			SS		2	300	Yes	
	Thermal	DPL	SS	DPL	7	300	Yes	
Orissa		OPGC	SS	IB TPS	1	210	No	Not adequate response in RGMO
			SS		2	210	No	
	Hydro	OHPC	SS	Burla	1	49.5	No	
			SS		2	49.5	No	
			SS		3	32	No	
			SS		4	32	No	
			SS		5	37.5	No	
			SS		6	37.5	No	
			SS		7	37.5	No	
			SS	Balimela	1	60	No	
			SS		2	60	No	
			SS		3	60	No	
			SS		4	60	No	
			SS		5	60	No	
			SS		6	60	No	
			SS		7	75	No	
			SS		8	75	No	
			SS	Rengali	1	50	No	
			SS		2	50	No	
			SS		3	50	No	
			SS		4	50	No	
			SS		5	50	No	
			SS	Upper Kolab	1	80	No	
			SS		2	80	No	
			SS		3	80	No	
			SS		4	80	No	
			SS		1	150	No	

			SS	Indravati	2	150	No	
			SS		3	150	No	
			SS		4	150	No	
			64					
Central Sector	Thermal	DVC	CS	Bokaro-A	1	500	No	RGMO will be service once the unit comes in CMC mode of operation. It will be done shortly in presence of BHEL experts.
			CS	Bokaro-B	3	210	No	Not possible due to non availability of Electro hydraulic governing. The units will be decommissioned shortly.
			CS	CTPS	3	140	No	Not possible due to non availability of Electro hydraulic governing. The units will be decommissioned shortly.
			CS		7	250	Yes	
			CS		8	250	Yes	
			CS	DTPS	4	210	No	Not possible due to non availability of Electro hydraulic governing. The units will be decommissioned shortly.
			CS	Mejia	1	210	No	Not possible due to non availability of Electro
			CS		2	210	No	
			CS		3	210	No	Action has been initiated to put in RGMO, but testing is not yet completed.
			CS		4	210	Yes	
			CS		5	250	Yes	
			CS		6	250	Yes	
			CS	Mejia - B	7	500	Yes	
			CS		8	500	Yes	
			CS	DSTPS	1	500	Yes	
			CS		2	500	Yes	
			CS	KODERMA	1	500	Yes	
			CS		2	500	Yes	
			CS	RTPS	1	600	Yes	
			CS		2	600	Yes	
	Hydro		CS	Panchet	1	40	No	RGMO mode of operation
			CS		2	40	No	would not be possible for
	Thermal	NTPC	CS	Farakka STPP-I	1	200	Yes	
			CS		2	200	Yes	
			CS		3	200	Yes	
			CS	Farakka STPP-II	1	500	Yes	
			CS		2	500	Yes	
			CS	Farakka-U#6		500	Yes	Kept in RGMO mode from April, 2014
			CS	Kahalgoan STPP	1	210	Yes	
			CS		2	210	Yes	
			CS		3	210	Yes	
			CS		4	210	Yes	
			CS		5	500	Yes	
			CS		6	500	Yes	
			CS		7	500	Yes	
			CS	Talcher STPP Stg-I	1	500	Yes	
			CS		2	500	Yes	
			CS	Barh	5	660	Yes	
			CS	Barh	6	660	Yes	
	Hydro	NHPC	CS	Teesta HEP	1	170	Yes	
			CS		2	170	Yes	
			CS		3	170	Yes	
			42					
	Thermal	IPP	PS	Maithon RB TPP	1	525	Yes	
			PS		2	525	Yes	
			PS	Sterlite	1	600	Yes	
			PS		2	600	Yes	
			PS		3	600	Yes	
			PS		4	600	Yes	
			PS	Adhunik Power	1	270	Yes	

			PS	Adhunik Power	2	270	Yes	
IPP	Hydro	IPP	PS	JLHEP	1	48	No	(RoR project with 3 hours pondage)
			PS		2	48	No	
			PS	Chujachen HEP	1	49.5	No	(RoR project with 3 hours pondage)
			PS		2	49.5	No	
			PS	Teesta Urja	1	200	No	could be put in RGMO mode but because of transmission evacuation constraint RGMO/FGMO is disabled
			PS		2	200	No	
			PS		3	200	No	
			PS		4	200	No	
			PS		5	200	No	
			PS		6	200	No	
			PS	Dikchu	1	48	No	(RoR project with 3 hours pondage)
			PS		2	48	No	

Annexure-B3A

FGMO / RGMO Performance of ISGS/IPPs in E. Region

Agenda B3

CERC order dt. 31/07/17 on Petition No. 84/MP/2015

Section 23 (a):

- *"… the Commission, starting from the month of **September, 2017** shall be closely watching the **primary response of ISGSs** as reported by POSOCO/NLDCs.*
- *At the State level, **SLDCs** shall report the frequency response of **intra-State generators** to the **concerned SERCs**."*

Section 23(c)

- *"All **ISGSs** are directed to **provide primary response compulsorily** in terms of Regulation 5.2 (f), (g), (h) and (i) of the Grid Code **failing which** we would not hesitate in **initiating action under Section 142** of Electricity Act, 2003 for not providing desired RGMO/FGMO response without any valid reasons."*

N.B. All ISGSs have been communicated about Hon'ble Commission's order vide letter no ERLDC/SS/FGMO/2017/2505 dated 25-08-17.

Section 24

- *"….. The Committee (on implementation of FGMO / primary response) has also recommended that **there is no requirement for granting any exemption even to LMZ units** from operation under RGMO/FGMO with manual intervention*
- *… has the **option** of either expediting the R&M of old units which shall include **installation of new EHG governors** capable of providing adequate primary response or*
- *to go in for **retrofit of mechanical governors** for adopting RGMO features or*
- *to operate on **FGMO with manual intervention**…"*

Regulation 24(2) of CERC Terms & Conditions of Tariff 2014-19

- *IV) The **rate of return** of a new project shall be **reduced by 1%** for such period as may be decided by the Commission, if the generating station or transmission system is found to be declared under commercial operation without commissioning of any of the Restricted Governor Mode Operation (RGMO)/ Free Governor Mode Operation (FGMO), data telemetry, communication system up to load dispatch centre or protection system:*
- *V) as and when any of the above requirements are found **lacking in a generating station** based on the report submitted by the respective RLDC, RoE shall be **reduced by 1%** for the period for which the deficiency continues:*

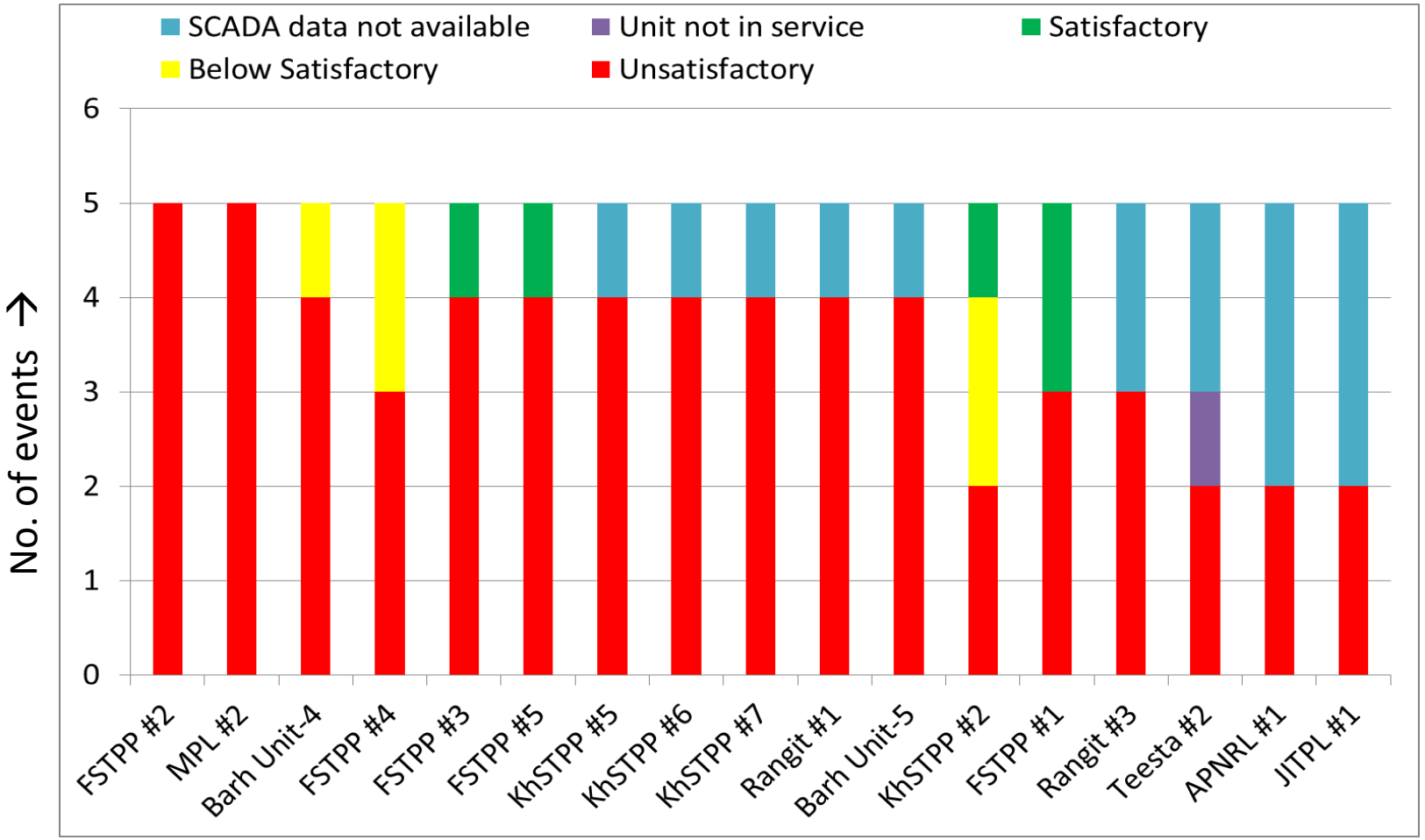
Performance of ISGS units in Eastern region with regard to RGMO/FGMO *Nov'17 to Feb'18*

As per Regulation 5.2 (f), (g), (h) and (i) of the Grid Code

Brief description of the events

Event description	Amount of generation/ load loss	Initial Frequency (Hz)	Final frequency (Hz)	Frequency Change (Hz)
Generation loss at Talwandi at 07:14 hrs on 12-11-17	1097 MW	49.99	49.9	-0.09
Load loss at Padge at 12:58 hrs on 09-12-17	1400 MW	50.05	50.17	0.12
Generation loss at Dadri at 17:29 hrs on 09-12-17	1305 MW	49.93	49.84	-0.09
Generation loss at Teesta III at 17:34 hrs at 10-01-18	1050 MW	50.02	49.96	-0.06
1250 MW generation loss at Koderma & Bokaro-A and 350 MW load loss at 10:46 hrs on 30-01-18	Effective generation loss 900 MW	49.9	49.84	-0.06

Performance of ISGS units

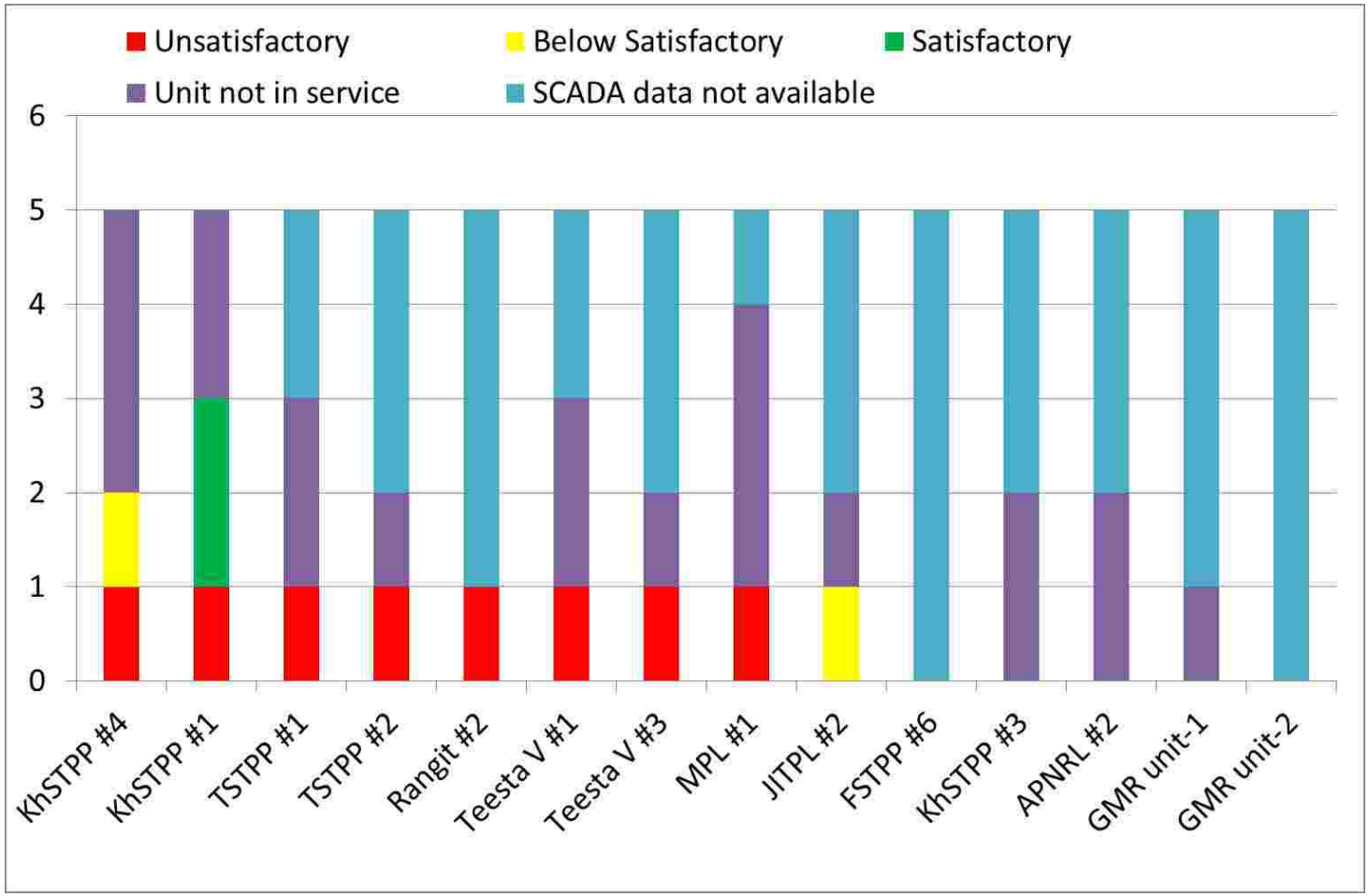


Satisfactory response -> More than 70% of ideal response

Below satisfactory response -> Within 30 - 70% of ideal response

Unsatisfactory response -> Less than 30% of ideal response and negative response

Performance of ISGS units (contd.)



Satisfactory response -> More than 70% of ideal response

Below satisfactory response -> Within 30 - 70% of ideal response

Unsatisfactory response -> Less than 30% of ideal response and negative response

Event wise performance of ISGS units in Eastern region with regard to RGMO/FGMO

Generation loss at Talwandi at 07:14 hrs on 12-11-17. Frequency changed from 49.99 Hz to 49.90 Hz

Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
FSTPP #3	153.0	158.0	5.0	5.5	91%	Satisfactory
KhSTPP #2	179.2	184.2	5.0	6.5	77%	Satisfactory
KhSTPP #1	149.2	153.0	3.8	5.4	71%	Satisfactory
Barh Unit-4	505.6	515.2	9.6	18.2	52%	Below Satisfactory
FSTPP #4	377.8	384.6	6.8	13.6	50%	Below Satisfactory
FSTPP #2	152.4	153.6	1.2	5.5	22%	Unsatisfactory
MPL #2	510.5	513.9	3.4	18.4	19%	Unsatisfactory
FSTPP #1	146.3	147.0	0.7	5.3	14%	Unsatisfactory
JITPL #1	436.0	435.0	-1.0	15.7	-6%	Unsatisfactory
FSTPP #5	299.9	298.7	-1.2	10.8	-11%	Unsatisfactory

Data/Reason given by generator
Initial generation more than I/C
Negative response

Load loss at Padge at 12:58 hrs on 09-12-17. Frequency changed from 50.05 Hz to 50.17 Hz

Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
FSTPP #4	471.6	465.1	-6.5	-22.1	29%	Unsatisfactory
FSTPP #5	376.4	371.7	-4.7	-17.6	27%	Unsatisfactory
FSTPP #3	209.8	207.9	-2.0	-9.8	20%	Unsatisfactory
KhSTPP #7	491.8	487.4	-4.4	-23.0	19%	Unsatisfactory
FSTPP #2	193.5	192.7	-0.7	-9.1	8%	Unsatisfactory
FSTPP #1	183.6	183.2	-0.4	-8.6	4%	Unsatisfactory
MPL #2	518.0	517.0	-1.0	-24.2	4%	Unsatisfactory
KhSTPP #6	485.1	484.2	-0.9	-22.7	4%	Unsatisfactory
KhSTPP #5	491.5	491.5	0.0	-23.0	0%	Unsatisfactory
Barh Unit-4	658.6	658.6	0.0	-30.8	0%	Unsatisfactory
Barh Unit-5	641.1	643.6	**2.5**	-30.0	-8%	Unsatisfactory
APNRL #1	272.8	274.9	**2.1**	-12.8	-16%	Unsatisfactory
KhSTPP #2	189.0	190.9	**1.9**	-8.8	-22%	Unsatisfactory

Data/Reason given by generator
Initial generation more than I/C
Negative response

Generation loss at Dadri at 17:29 hrs on 09-12-17. Frequency changed from 49.93 Hz to 49.84 Hz

Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
FSTPP #1	170.2	176.2	6.0	5.7	106%	Satisfactory
KhSTPP #2	199.7	201.8	2.1	6.6	31%	Below Satisfactory
KhSTPP #7	499.5	501.2	1.8	16.6	11%	Unsatisfactory
KhSTPP #5	491.8	493.3	1.5	16.3	9%	Unsatisfactory
FSTPP #3	211.7	212.3	0.6	7.0	9%	Unsatisfactory
MPL #2	510.0	511.0	1.0	16.9	6%	Unsatisfactory
Barh Unit-4	664.3	664.7	0.4	22.1	2%	Unsatisfactory
FSTPP #2	199.3	199.4	0.1	6.6	2%	Unsatisfactory
Teesta V #2	179.0	179.0	0.0	5.9	0%	Unsatisfactory
Teesta V #3	178.4	178.4	0.0	5.9	0%	Unsatisfactory
FSTPP #4	500.9	500.9	0.0	16.6	0%	Unsatisfactory
KhSTPP #6	492.4	491.8	**-0.6**	16.3	-4%	Unsatisfactory
JITPL #1	469.0	468.0	**-1.0**	15.6	-6%	Unsatisfactory
FSTPP #5	465.5	464.3	**-1.2**	15.5	-8%	Unsatisfactory
Barh Unit-5	645.9	643.9	**-2.0**	21.4	-9%	Unsatisfactory
APNRL #1	275.7	273.6	**-2.1**	9.2	-23%	Unsatisfactory

Data/Reason given by generator
Initial generation more than I/C
Negative response

Generation loss at Teesta III at 17:34 hrs at 10-01-18. Frequency changed from 50.02 Hz to 49.96 Hz

Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
FSTPP #1	188.4	193.6	5.1	4.7	110%	Satisfactory
JITPL #2	529.0	533.0	4.0	13.1	30%	Below Satisfactory
KhSTPP #1	189.9	191.2	1.3	4.7	27%	Unsatisfactory
FSTPP #3	199.9	201.3	1.3	5.0	27%	Unsatisfactory
MPL #2	507.0	509.0	2.0	12.6	16%	Unsatisfactory
MPL #1	509.0	511.0	2.0	12.6	16%	Unsatisfactory
KhSTPP #5	495.9	496.2	0.3	12.3	2%	Unsatisfactory
KhSTPP #6	431.8	431.8	0.0	10.7	0%	Unsatisfactory
Barh Unit-5	642.0	641.6	-0.5	15.9	-3%	Unsatisfactory (Above 630 MW FGMO is not in service due to reheater problem)
FSTPP #4	471.3	470.6	-0.7	11.7	-6%	Unsatisfactory
FSTPP #2	199.3	198.8	-0.5	4.9	-10%	Unsatisfactory
FSTPP #5	471.9	469.9	-2.1	11.7	-18%	Unsatisfactory
KhSTPP #4	215.7	214.7	-1.0	4.8	-20%	Unsatisfactory
Barh Unit-4	651.7	646.5	-5.3	16.2	-33%	Unsatisfactory (Reduction of generation was being taken place due to tripping of coal mill)
KhSTPP #7	274.9	271.4	-3.5	6.8	-52%	Unsatisfactory
KhSTPP #2	203.7	200.5	-3.2	5.1	-63%	Unsatisfactory

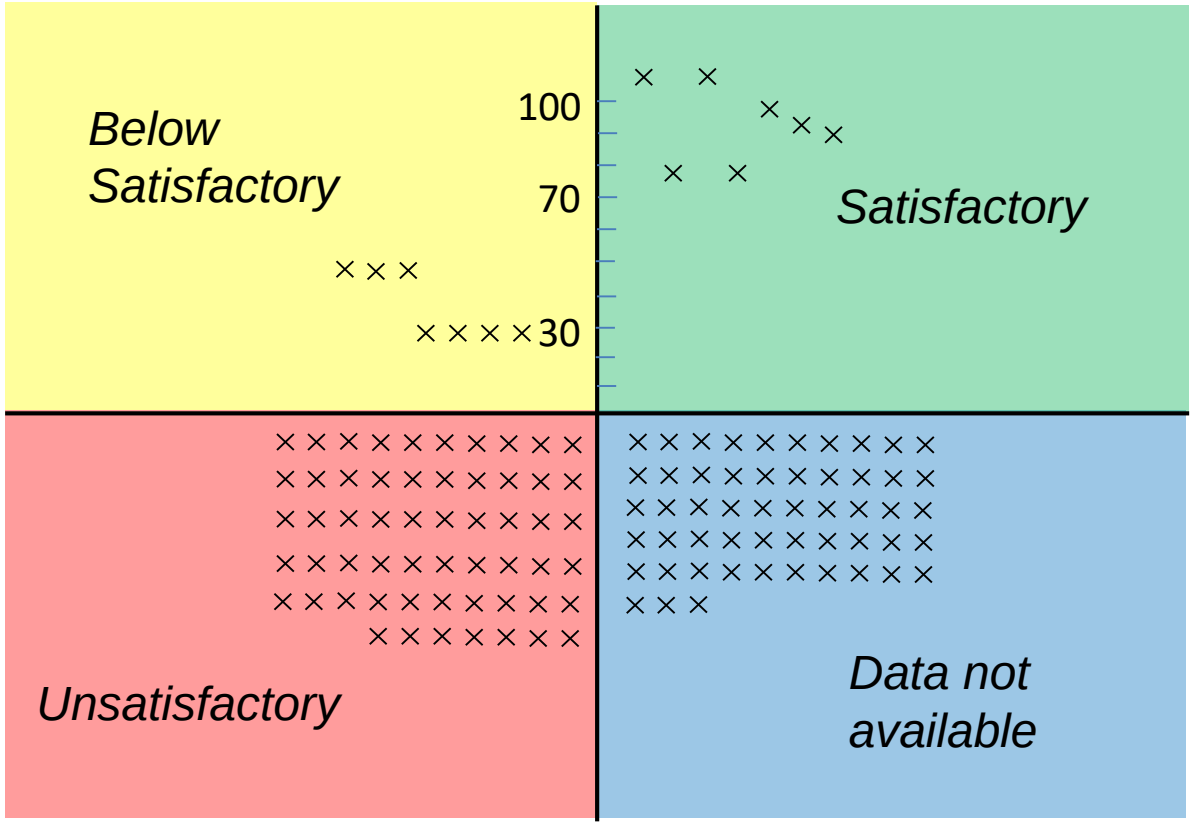
Data/Reason given by generator
Initial generation more than I/C
Negative response

1250 MW generation loss and 350 MW load loss at Koderma at 10:46 hrs on 30-01-18. Frequency changed from 49.90 Hz to 49.84 Hz

Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #1	126.5	129.7	3.2	3.3	97%	Satisfactory
KhSTPP #2	210.7	212.9	2.2	5.5	41%	Below Satisfactory
KhSTPP #4	212.8	214.7	1.9	5.5	35%	Below Satisfactory
FSTPP #4	346.5	349.5	3.1	9.0	34%	Below Satisfactory
KhSTPP #5	491.8	493.3	1.5	12.8	11%	Unsatisfactory
KhSTPP #7	507.1	508.3	1.2	13.2	9%	Unsatisfactory
MPL #2	506.0	507.0	1.0	13.2	8%	Unsatisfactory
Barh Unit-4	634.6	633.6	-1.0	16.5	-6%	Unit generation was more than schedule, further loading could not be picked up due to boiler side transient conditions
Barh Unit-5	428.6	427.6	-1.0	11.1	-9%	RGMO was out due to FD fan problem
FSTPP #3	155.3	155.0	-0.4	4.0	-9%	Unsatisfactory
FSTPP #1	147.4	146.9	-0.5	3.8	-13%	Unsatisfactory
FSTPP #2	158.6	157.8	-0.9	4.1	-21%	Unsatisfactory
KhSTPP #6	492.1	487.1	-5.0	12.8	-39%	Unsatisfactory

Data/Reason given by generator
Initial generation more than I/C
Negative response

Summary of unit responses

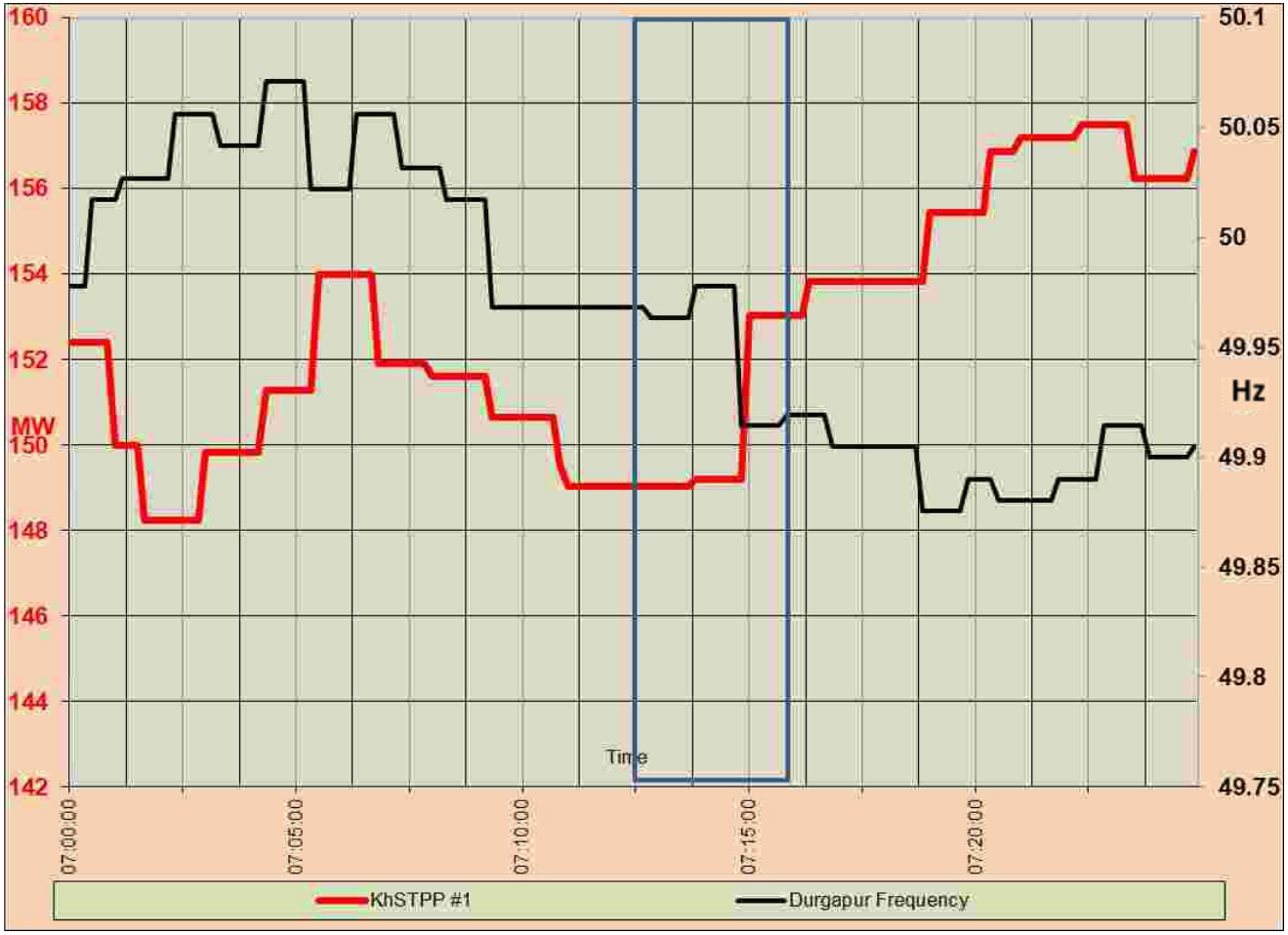


Observations

- Out of 35 units within the scope of monitoring by ERLDC, only one or two units have so far been able to exhibit satisfactory response
- Response of none of the units is consistent in nature
- Non-availability of real time data is a major impediment in monitoring the performance of the units
- Cooperation from all ISGSs / IPPs is solicited for making available 1sec or 5 sec interval data from their respective DCS, for each incident of frequency response evaluation
- SLDCs are requested to share the observations in respect of the units within their own jurisdiction, with RLDC, for proper understanding of the region-wide performance
- Roadmap may be chalked out for improving generator responses in a time-bound manner

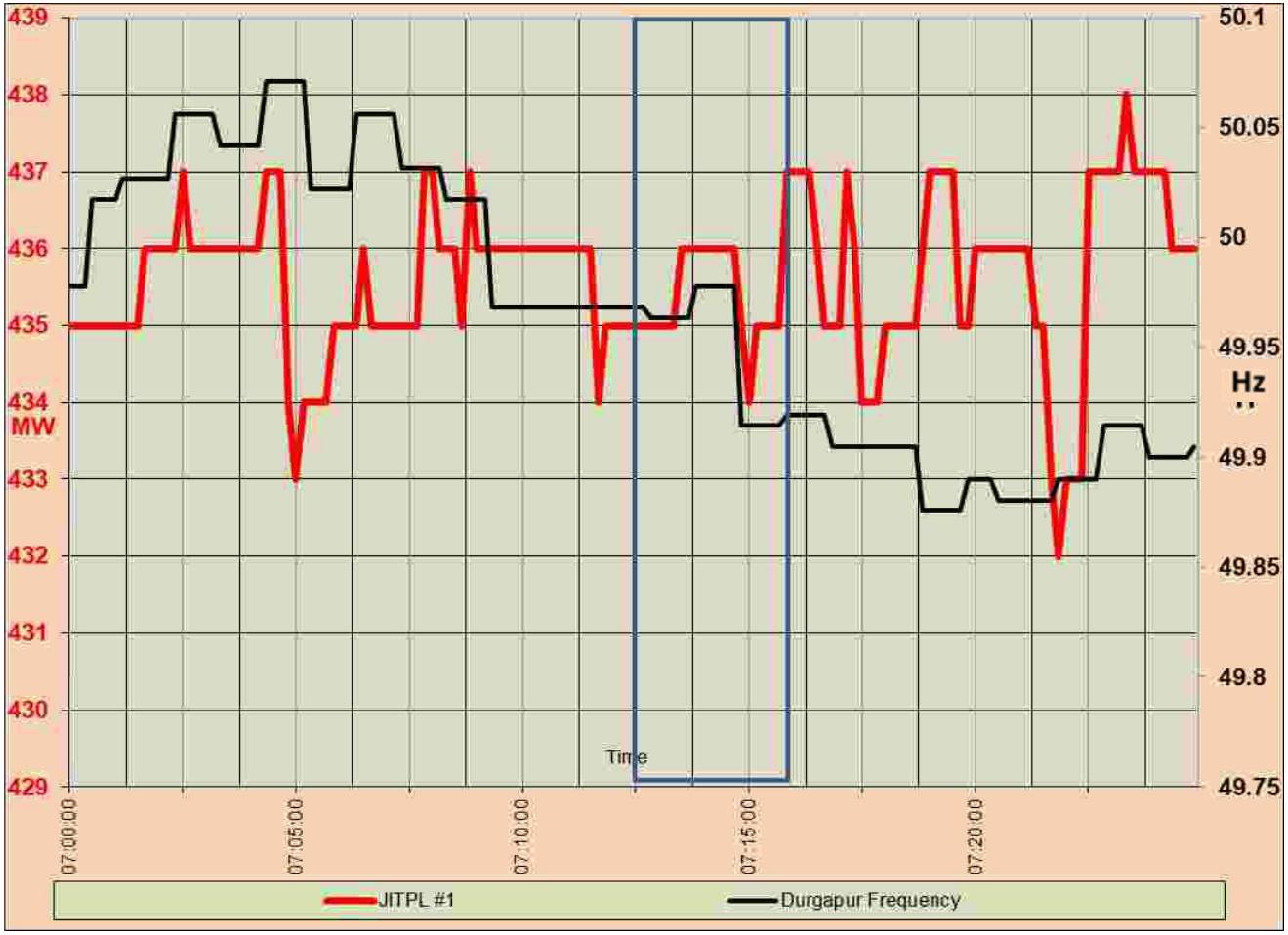
Governor response of various generators during the mentioned events

Change in generation of KhSTPP #1 during Generation loss at Talwandi at 07:14 hrs on 12-11-17.



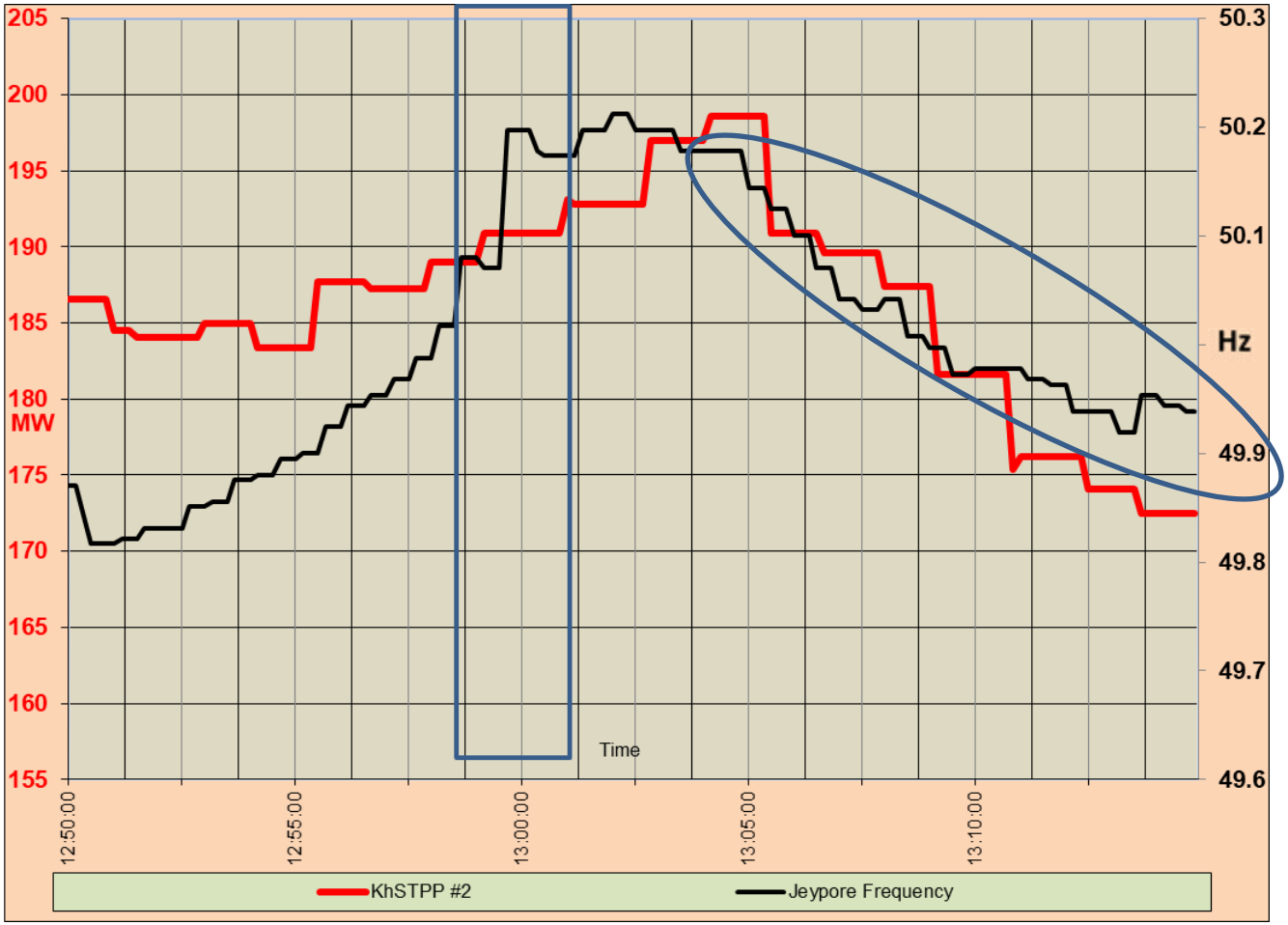
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #1	149.2	153.0	3.8	5.4	71%	Satisfactory

Change in generation of JITPL #1 during Generation loss at Talwandi at 07:14 hrs on 12-11-17.



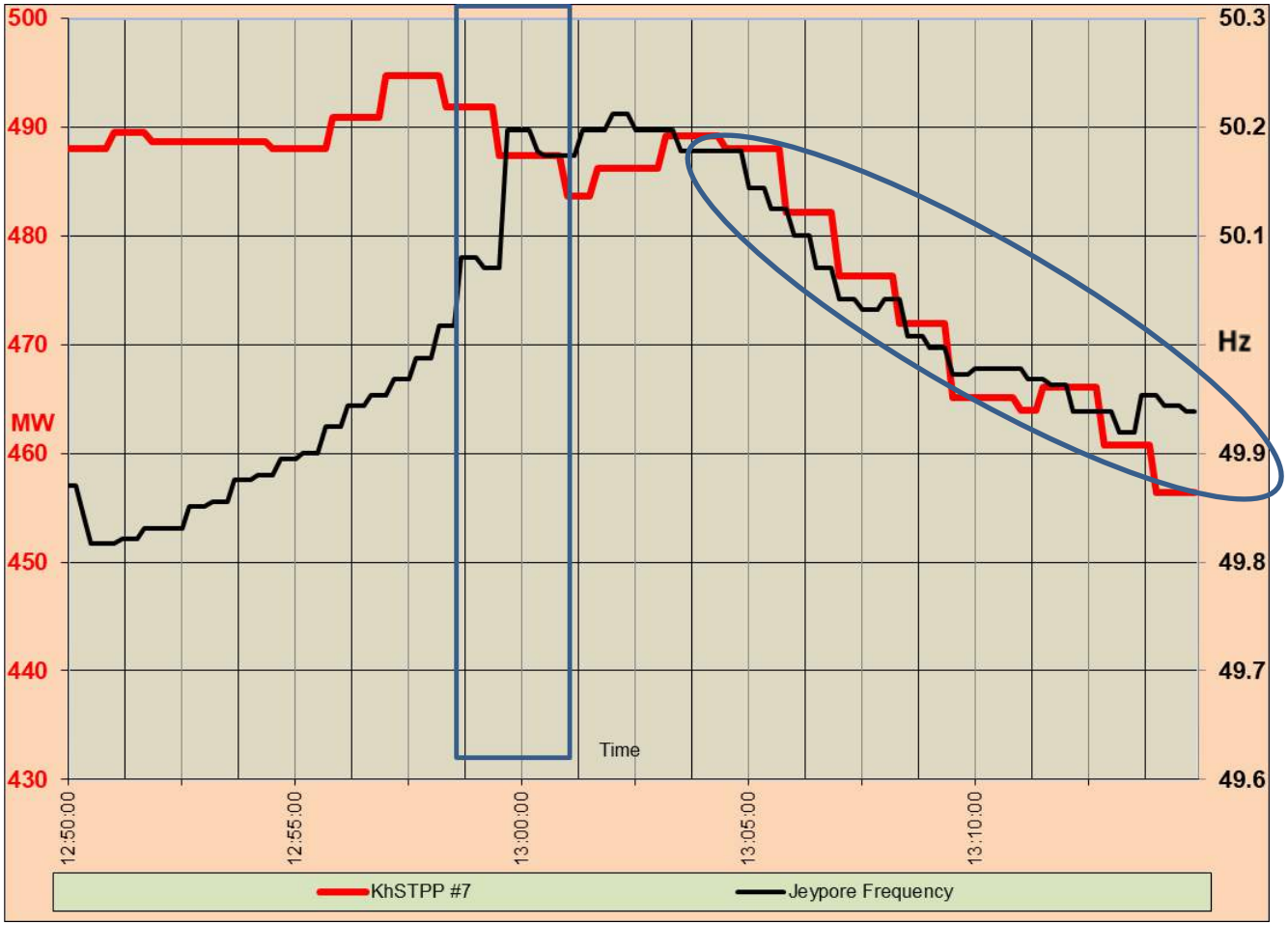
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
JITPL #1	436.0	435.0	-1.0	15.7	-6%	Unsatisfactory

Change in generation of KhSTPP #2 during Load loss at Padge at 12:58 hrs on 09-12-17



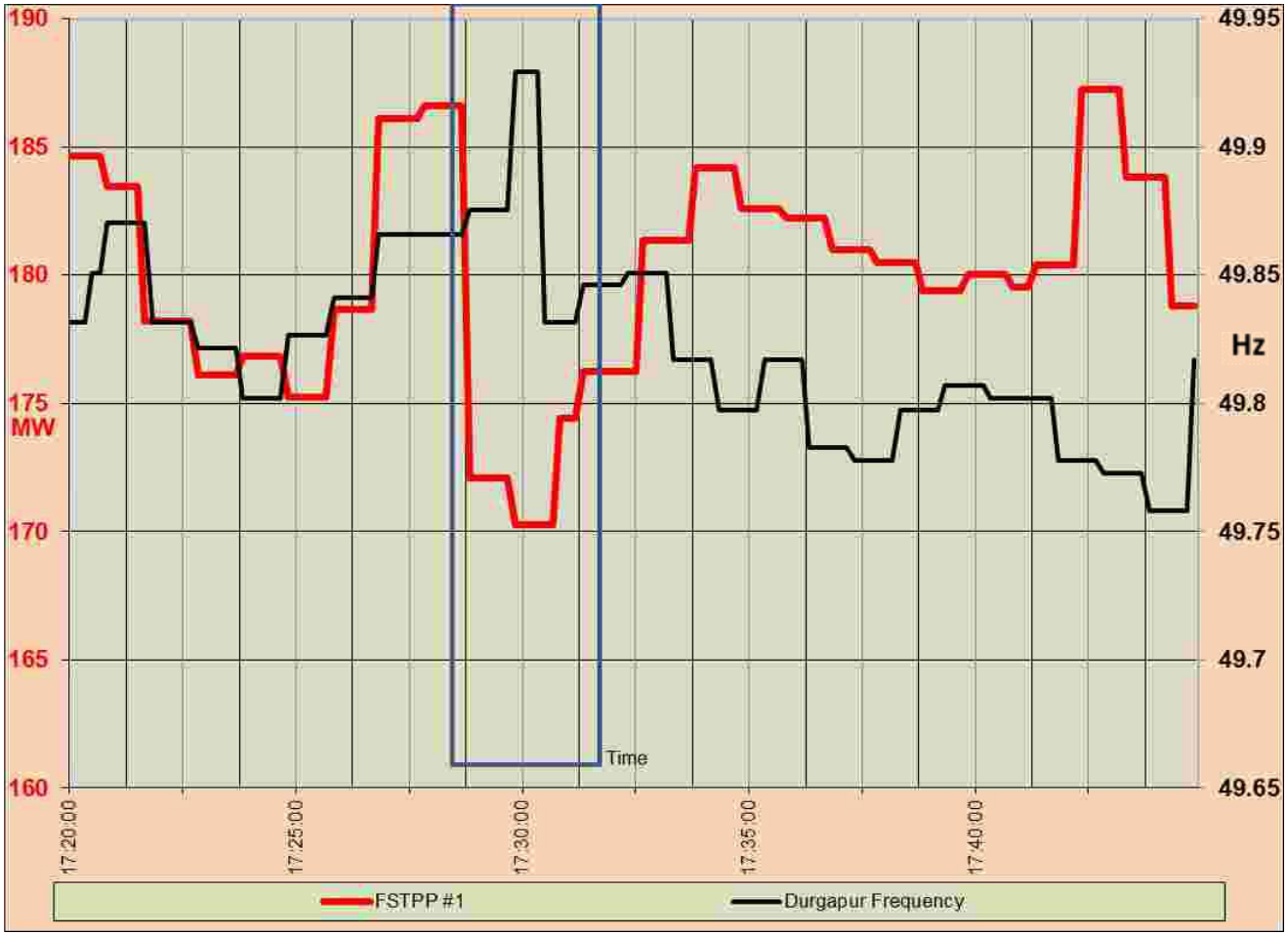
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #2	189.0	190.9	**1.9**	-8.8	-22%	Unsatisfactory

Change in generation of KhSTPP #7 during Load loss at Padge at 12:58 hrs on 09-12-17



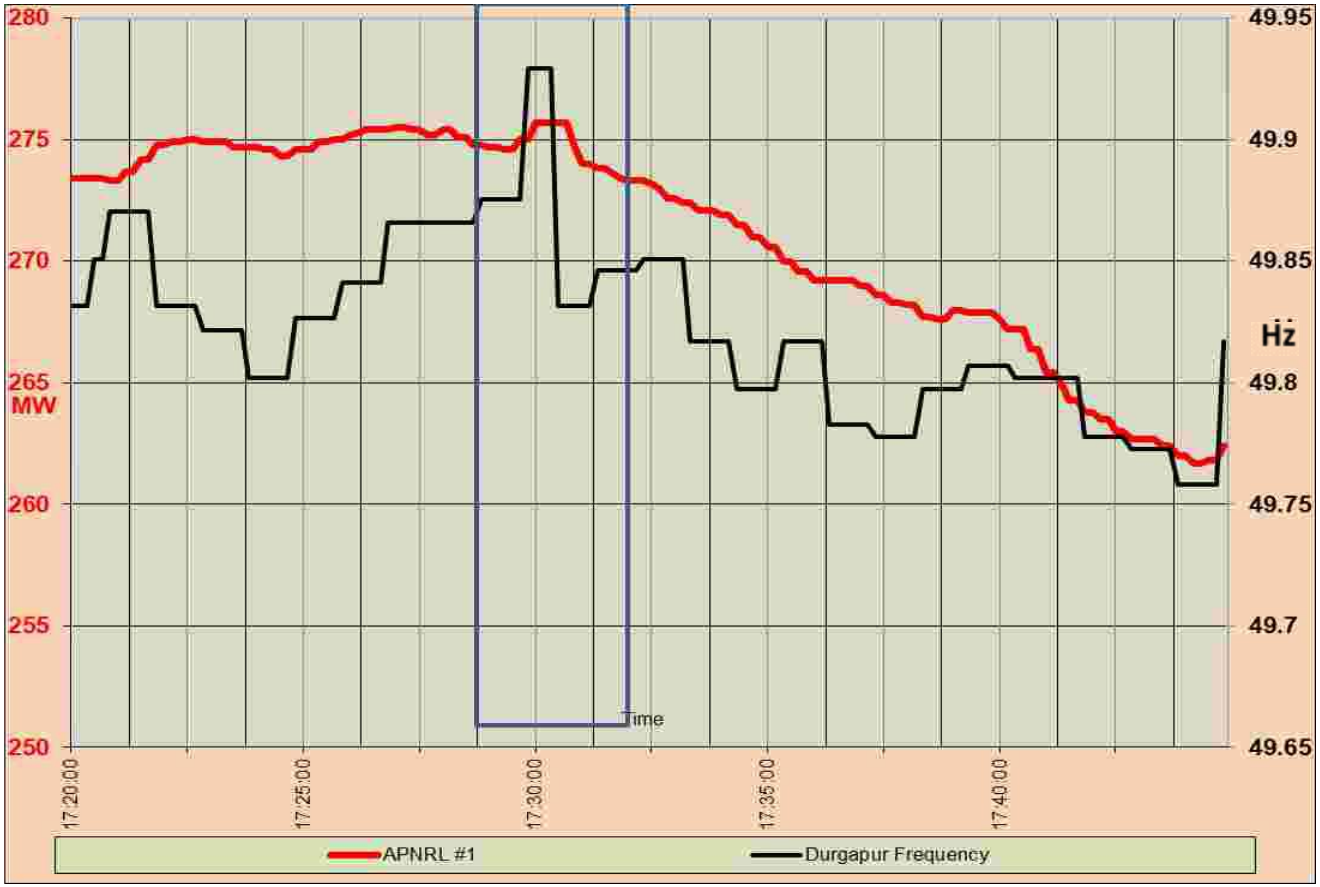
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #7	491.8	487.4	-4.4	-23.0	19%	Unsatisfactory

Change in generation of FSTPP #1 during Generation loss at Dadri at 17:29 hrs on 09-12-17



Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
FSTPP #1	170.2	176.2	6.0	5.7	106%	Satisfactory

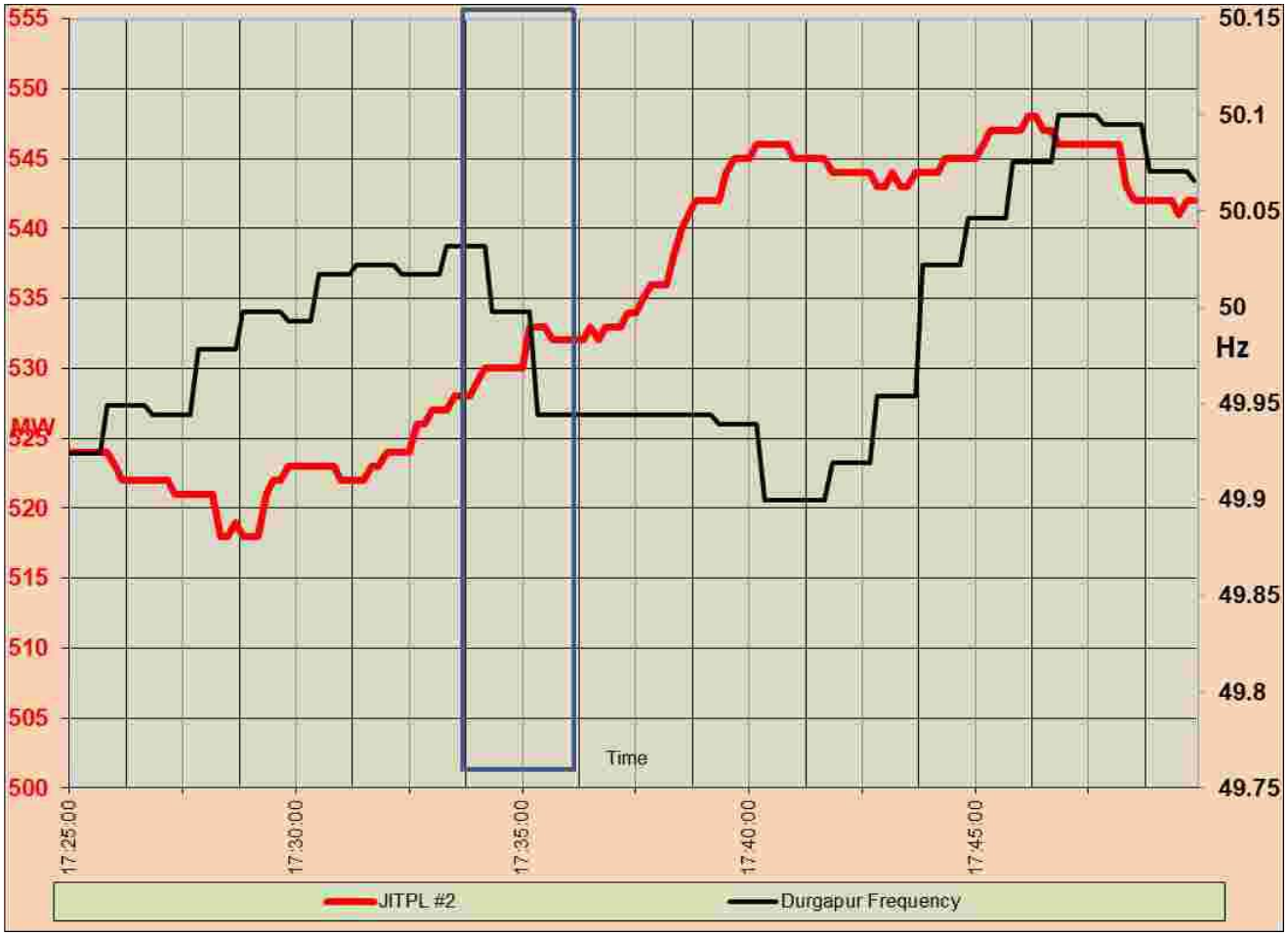
Change in generation of APNRL #1 during Generation loss at Dadri at 17:29 hrs on 09-12-17



Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
APNRL #1	275.7*	273.6	**-2.1**	9.2	-23%	Unsatisfactory

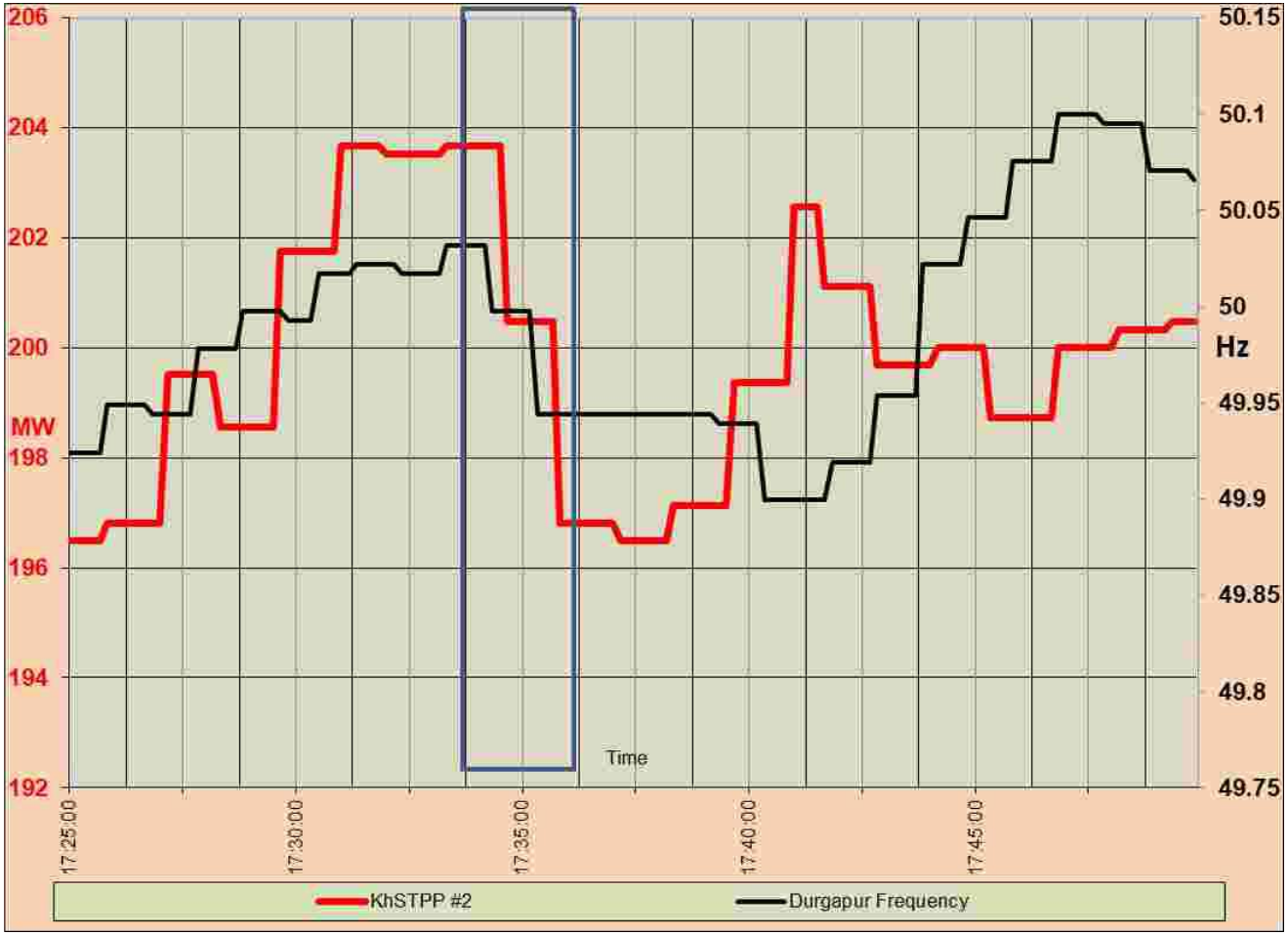
*Initial generation more than I/C

Change in generation of JITPL #2 during Generation loss at Teesta III at 17:34 hrs at 10-01-18



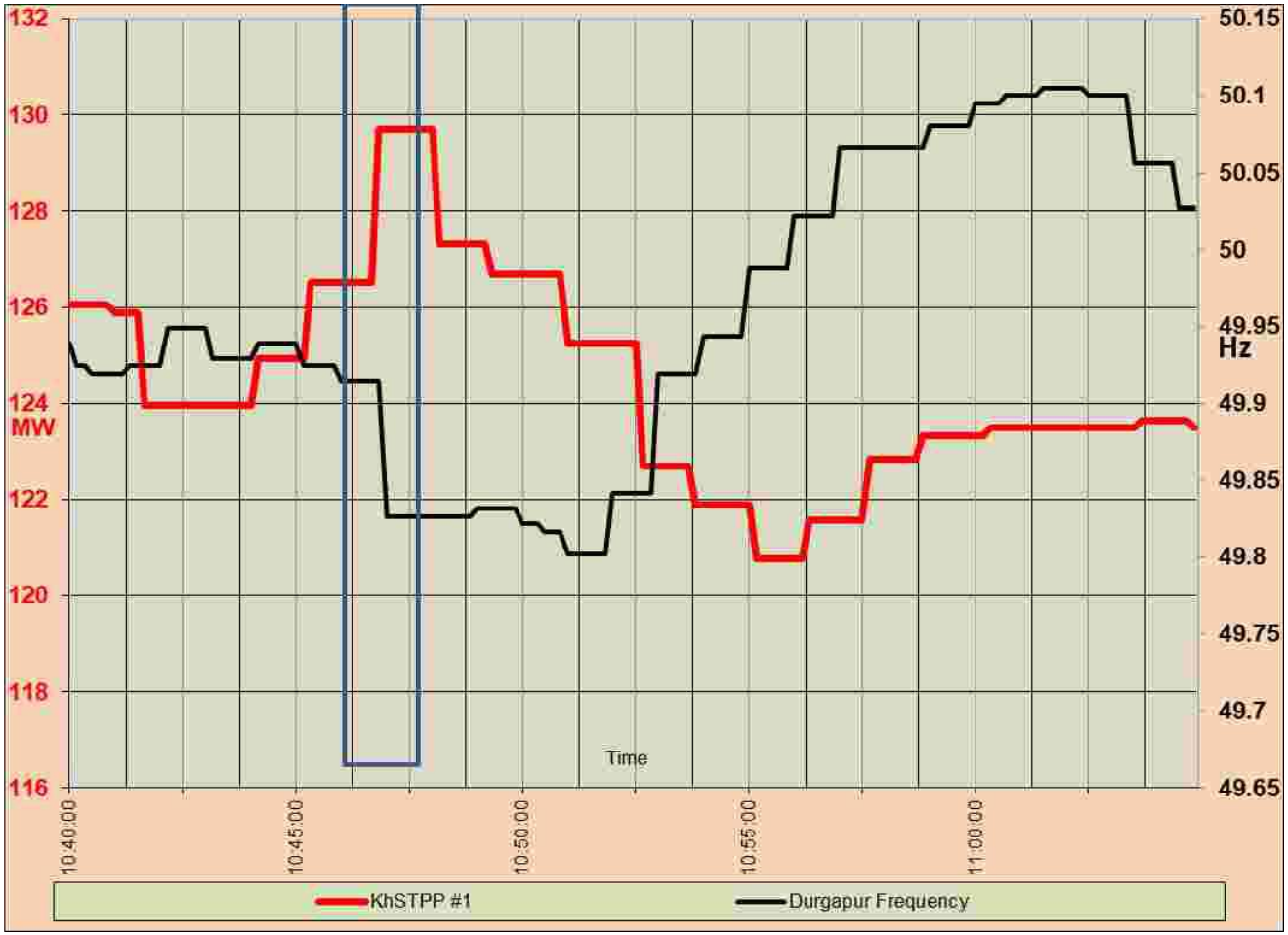
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
JITPL #2	529.0	533.0	4.0	13.1	30%	Below Satisfactory

Change in generation of KhSTPP #2 during Generation loss at Teesta III at 17:34 hrs at 10-01-18



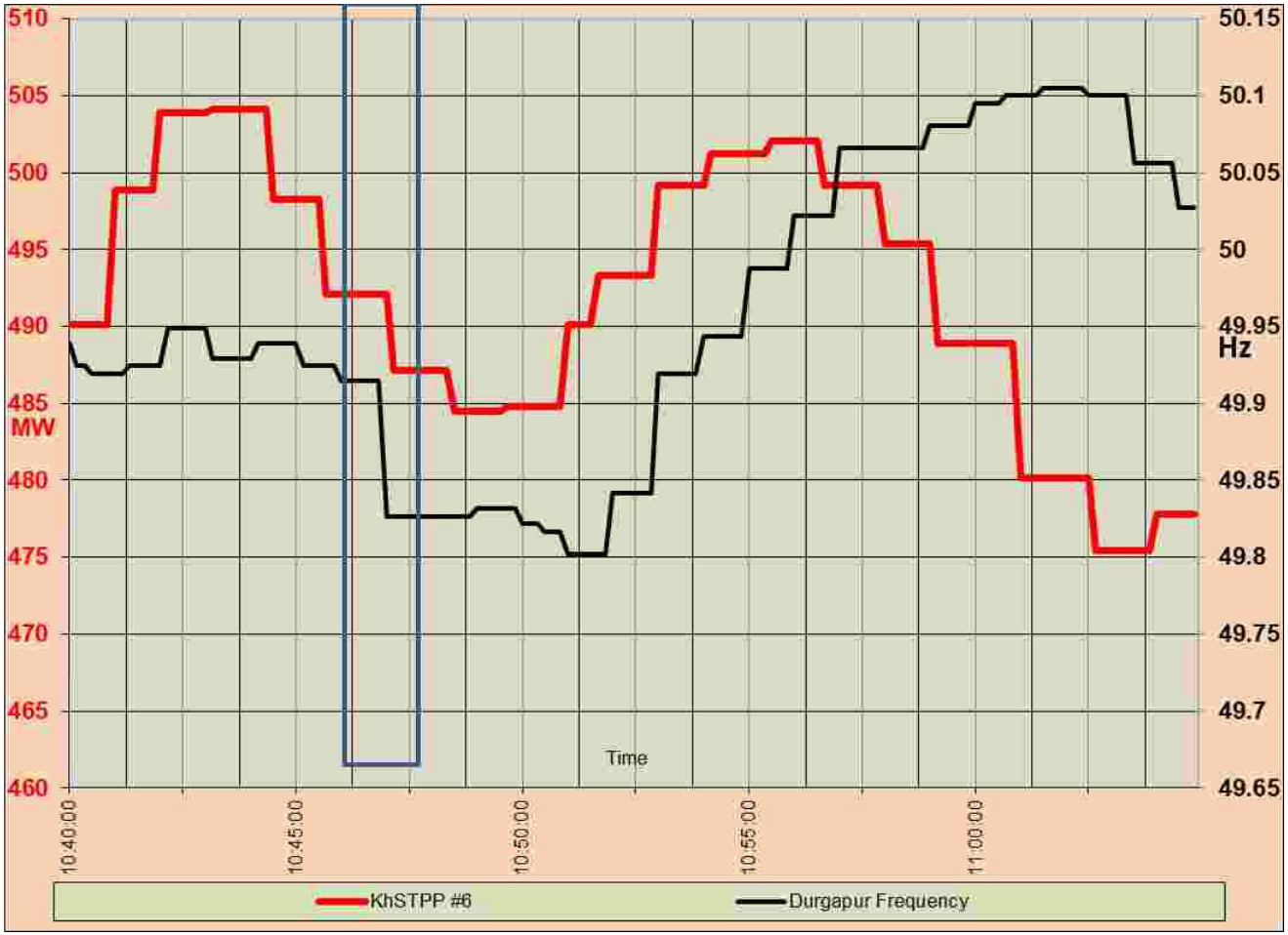
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #2	203.7	200.5	-3.2	5.1	-63%	Unsatisfactory

Change in generation of KhSTPP #1 during event at Koderma at 10:46 hrs on 30-01-18



Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #1	126.5	129.7	3.2	3.3	97%	Satisfactory

Change in generation of KhSTPP #6 during event at Koderma at 10:46 hrs on 30-01-18



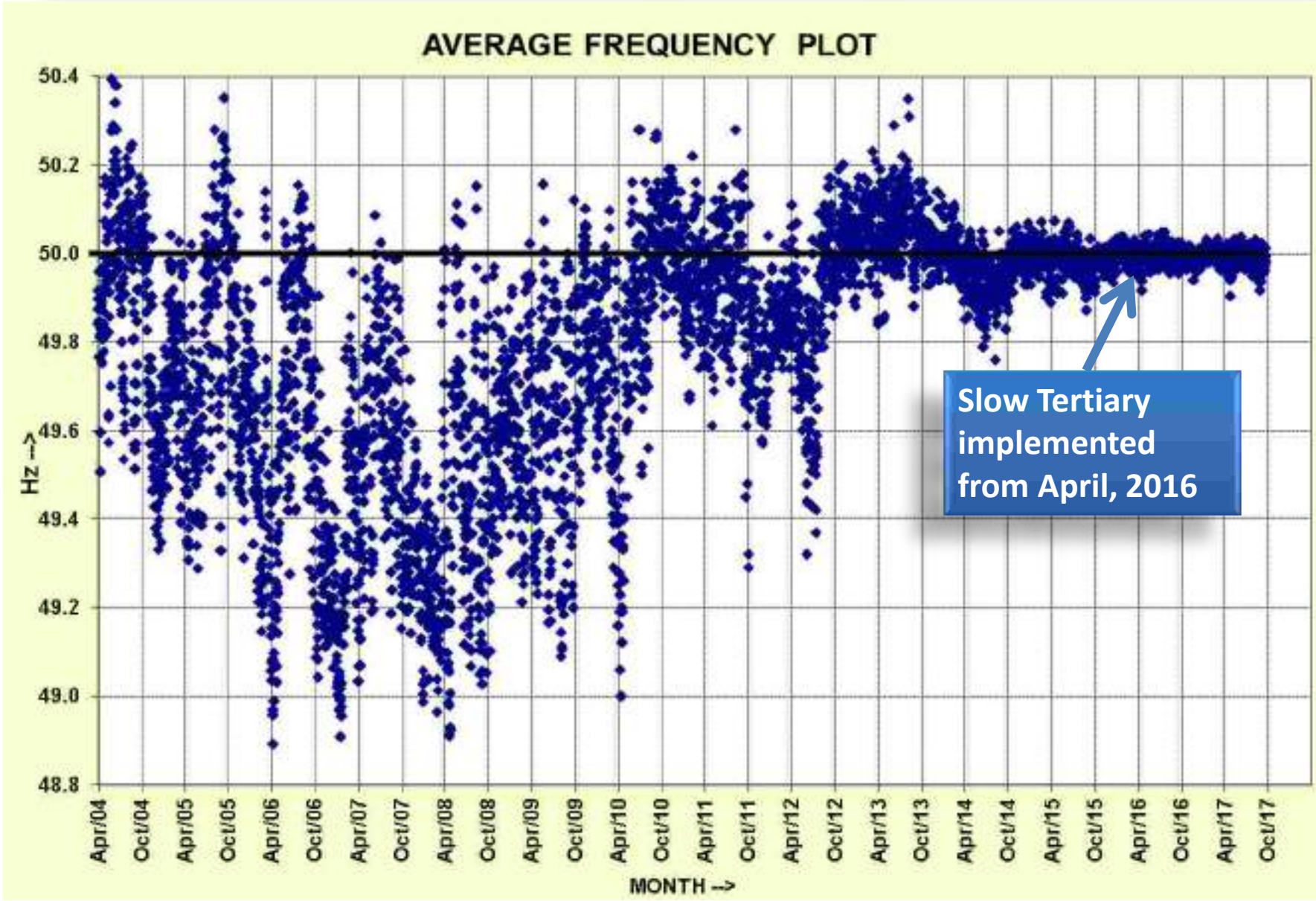
Name	Initial generation	Final generation	Change in generation	Ideal response	% of Ideal response	Remarks
KhSTPP #6	492.1	487.1	-5.0	12.8	-39%	Unsatisfactory

Annexure-B5

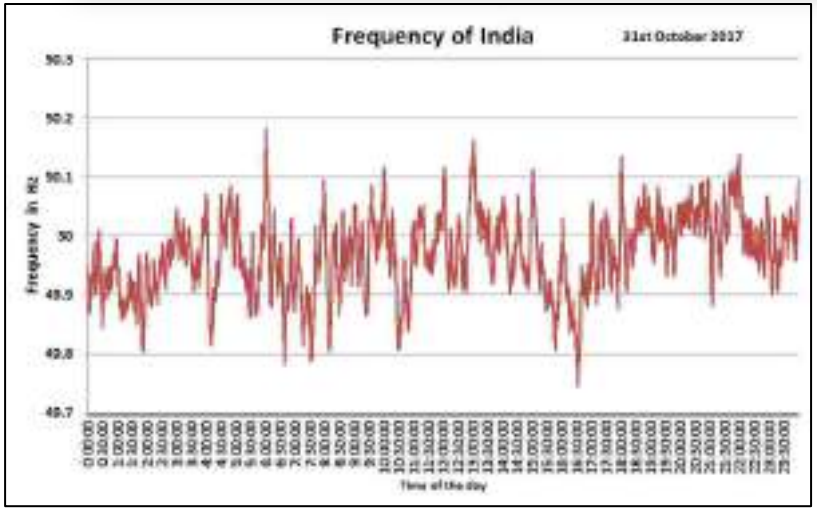
Introduction of Secondary Frequency Control in Indian Power System

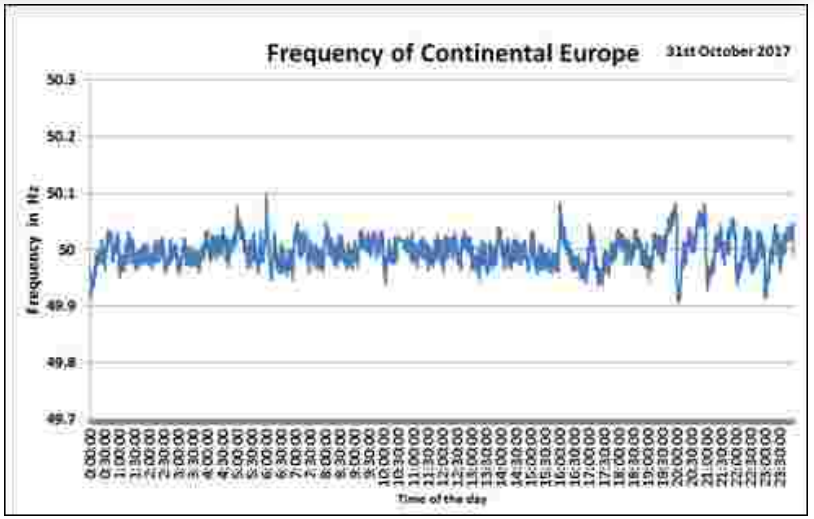
16th Mar 2018

Frequency Profile over the years…



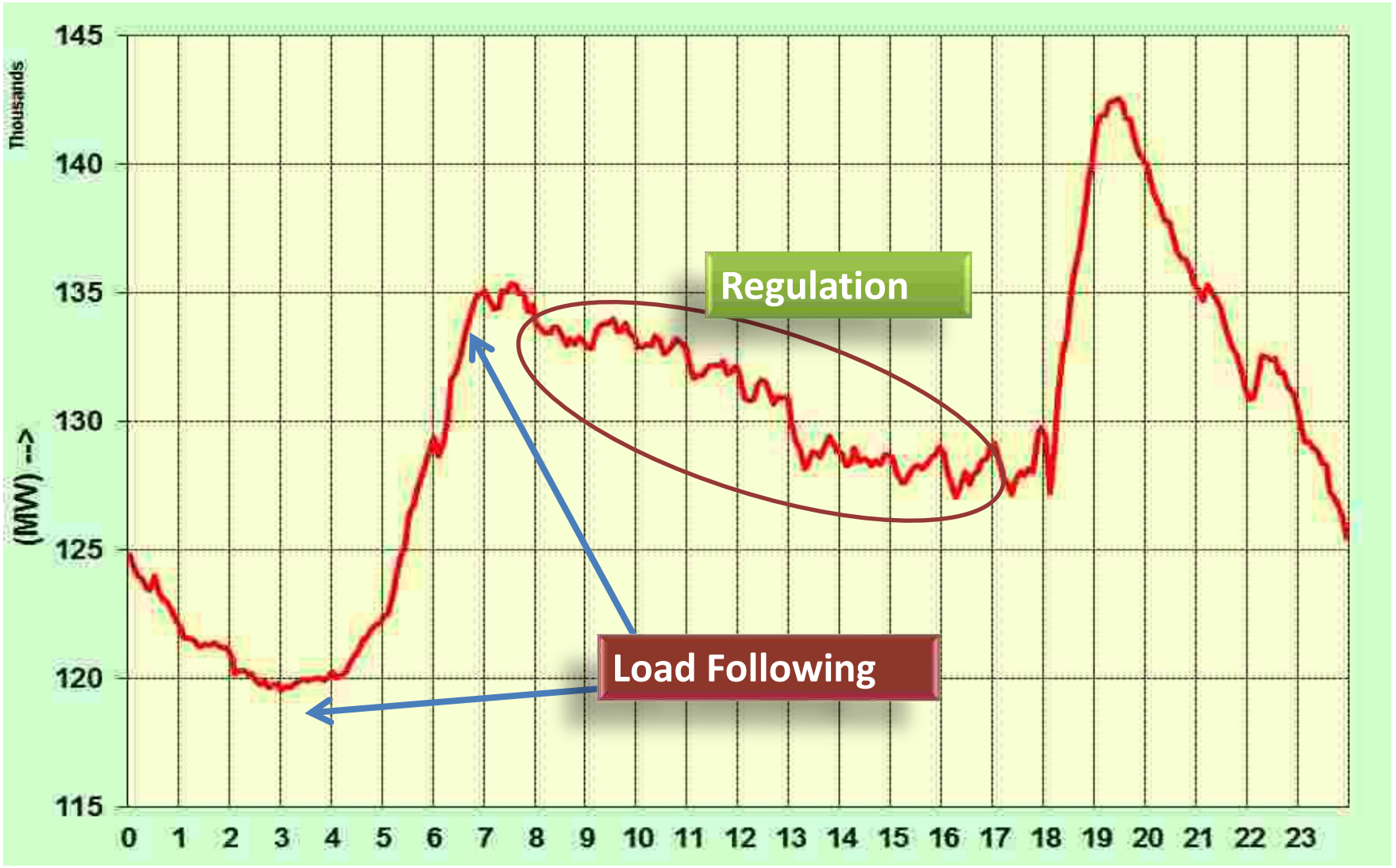
India…Catching up with Best in the World



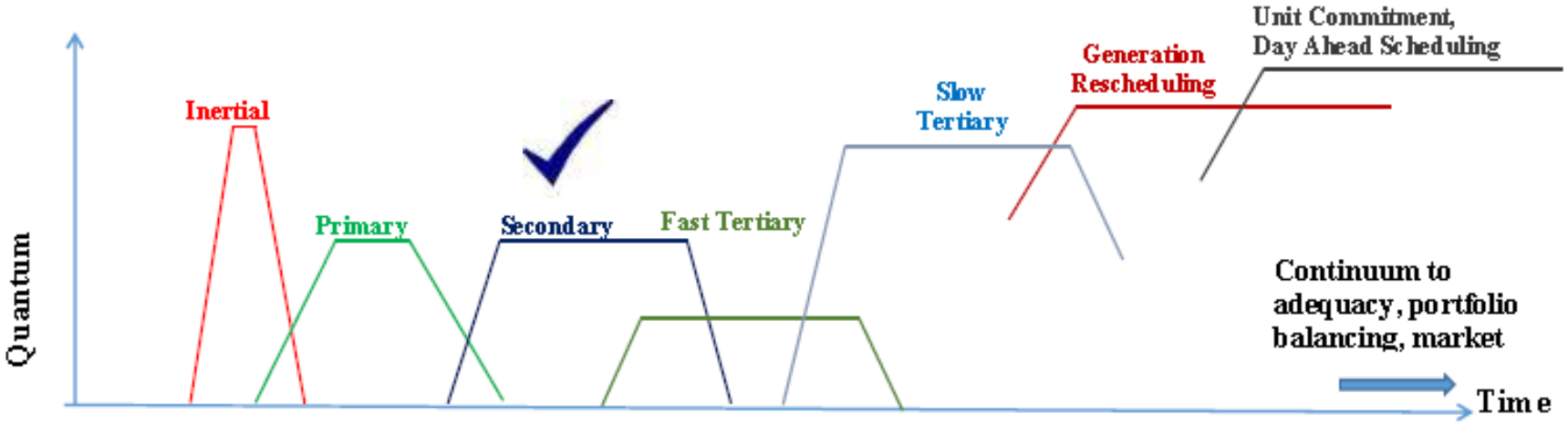


S.No	Description	Values for	
		CE	India
1	Standard Deviation (Hz)	0.019	0.042
2	Frequency Variation Index (FVI) in Hz	0.0036	0.020
3	Instantaneous maximum frequency (Hz)	50.060	50.154
4	Instantaneous minimum frequency (Hz)	49.916	49.885
5	15-minute maximum average frequency (Hz)	50.033	50.065
6	15-minute minimum average frequency (Hz)	49.965	49.952
7	% of time frequency within 49.90-50.05 Hz	99.61	81.08
8	% of time frequency below 49.90 Hz	0.00	0.06
9	% of time frequency above 50.05 Hz	0.39	18.86

Load Following and Regulation

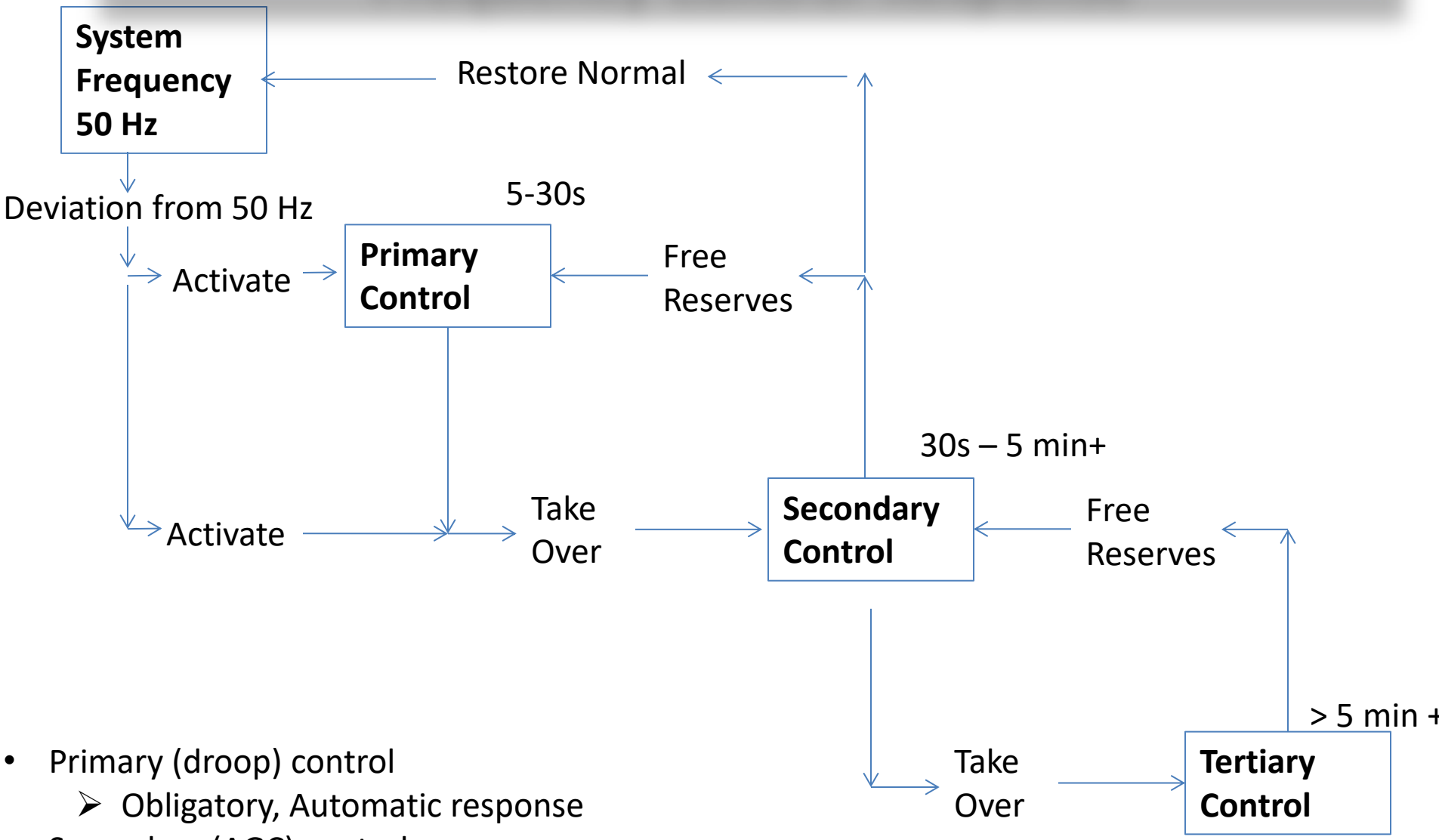


Frequency Control Continuum in India



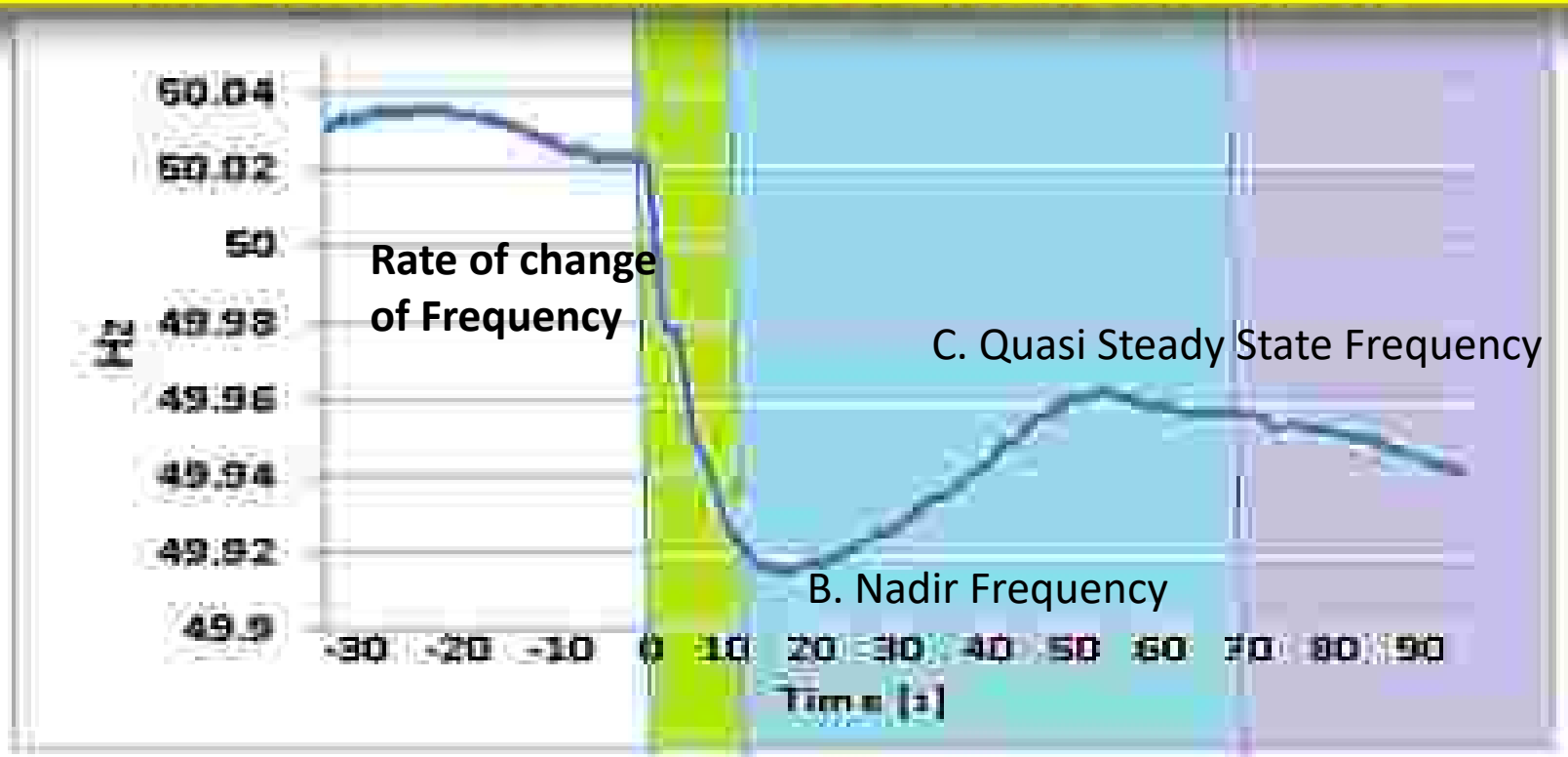
Response → Attribute	Inertial	Primary	Secondary	Fast Tertiary	Slow Tertiary	Generation Rescheduling/Market	Unit Commitment
Time	First few secs	Few sec - 5 min	30 s – 15 min	5 - 30 min	> 15 – 60 min	> 60 min	Hours/ day-ahead
Quantum	~ 10000 MW/Hz	~ 4000 MW	~ 4000 MW	~ 1000 MW	~ 8000-9000 MW	Load Generation Balance	Load Generation Balance
Local / LDC	Local	Local	NLDC / RLDC	NLDC	NLDC / SLDC	RLDC / SLDC	RLDC / SLDC
Manual / Automatic	Automatic	Automatic	Automatic	Manual	Manual	Manual	Manual
Centralized / Decentralized	Decentralized	Decentralized	Centralized	Centralized	Centralized/ Decentralized	Decentralized	Decentralized
Code / Order	IEGC / CEA Standard (?)	IEGC / CEA Standard	Roadmap on Reserves	Ancillary Regulations	Ancillary Regulations	IEGC	IEGC
Paid / Mandated	Mandated	Mandated	Paid	Paid	Paid	Paid	Paid
Regulated / Market	Regulated	Regulated	Regulated	Regulated	Regulated / Market	Regulated / Market	Regulated / Market
Implementation	Existing	Partly Existing	Pilot	Yet to start	Existing	Existing	Existing

Frequency Control Response

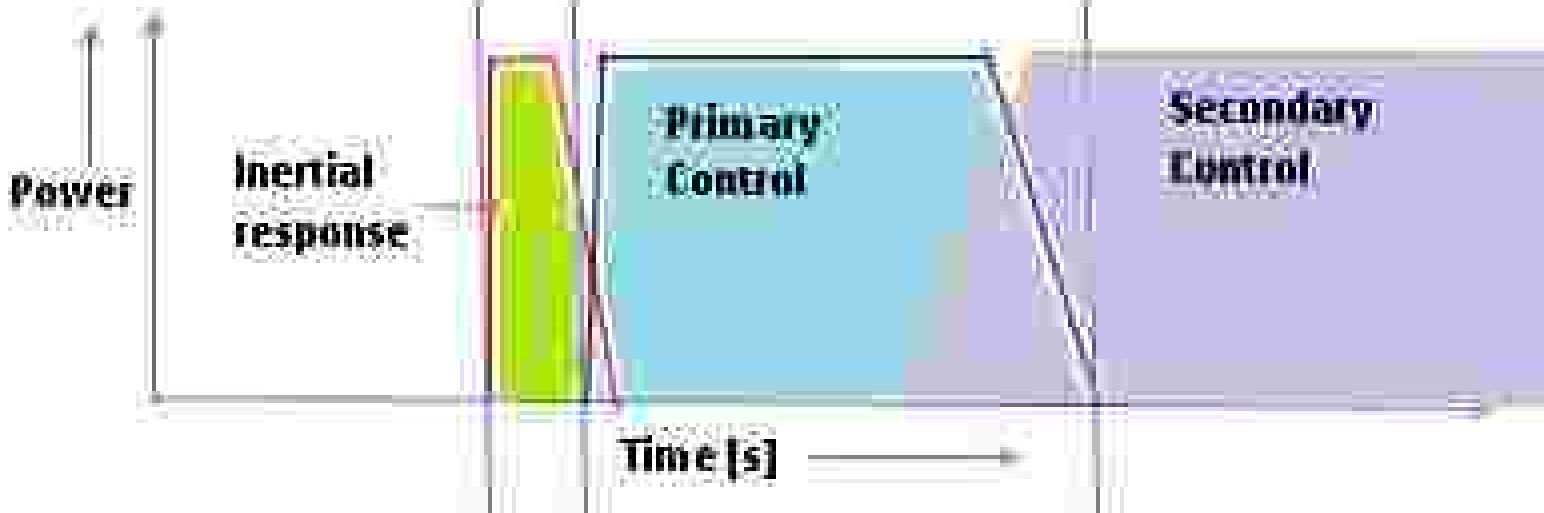


- Primary (droop) control
  - Obligatory, Automatic response
- Secondary (AGC) control
  - Spinning reserve, NLDC/RLDC/SLDC controlled, Automatic Generation Control (AGC)
- Tertiary control
  - Tertiary Reserve and response from State, Manual

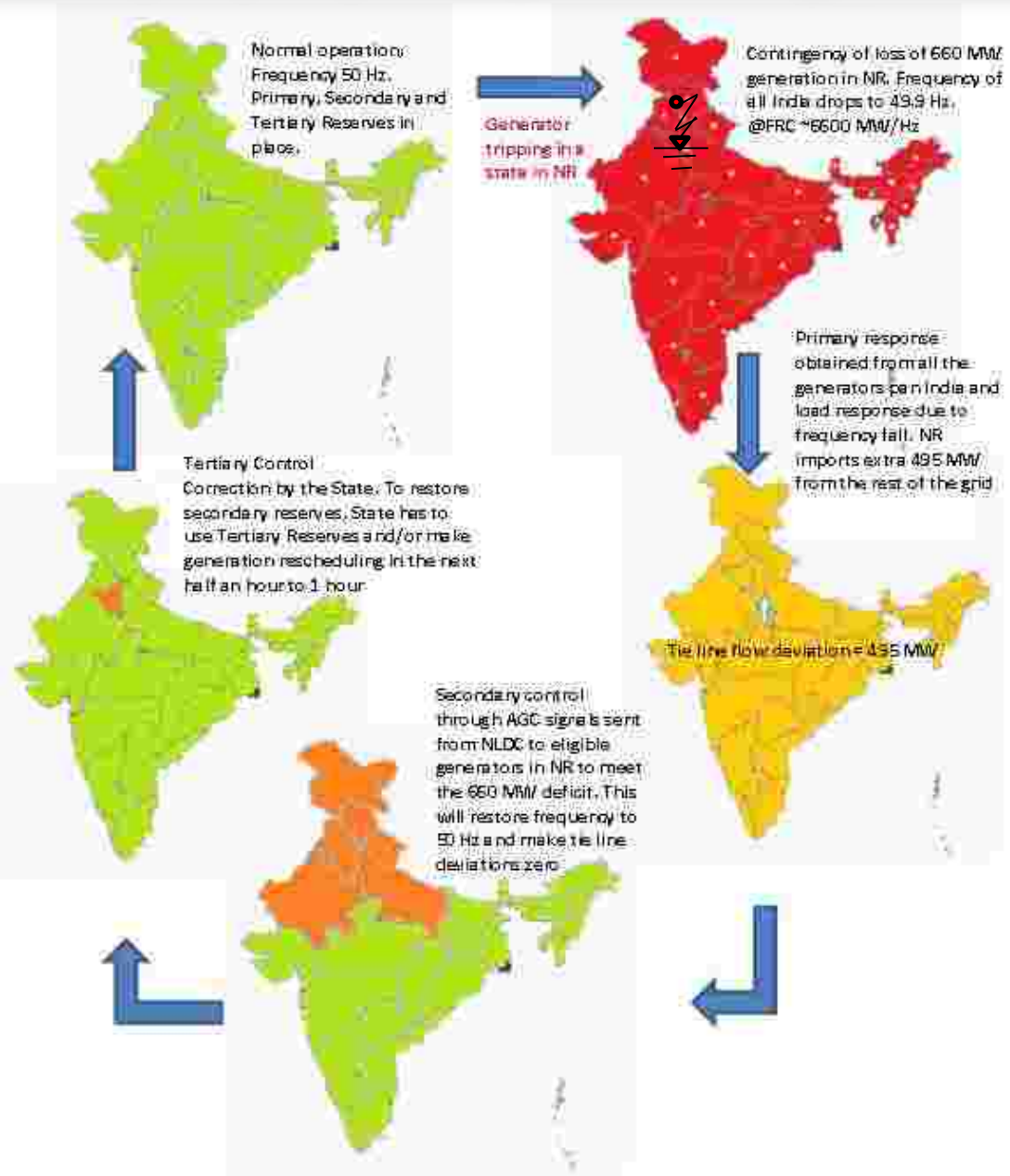
Immediate Frequency Response after an Event



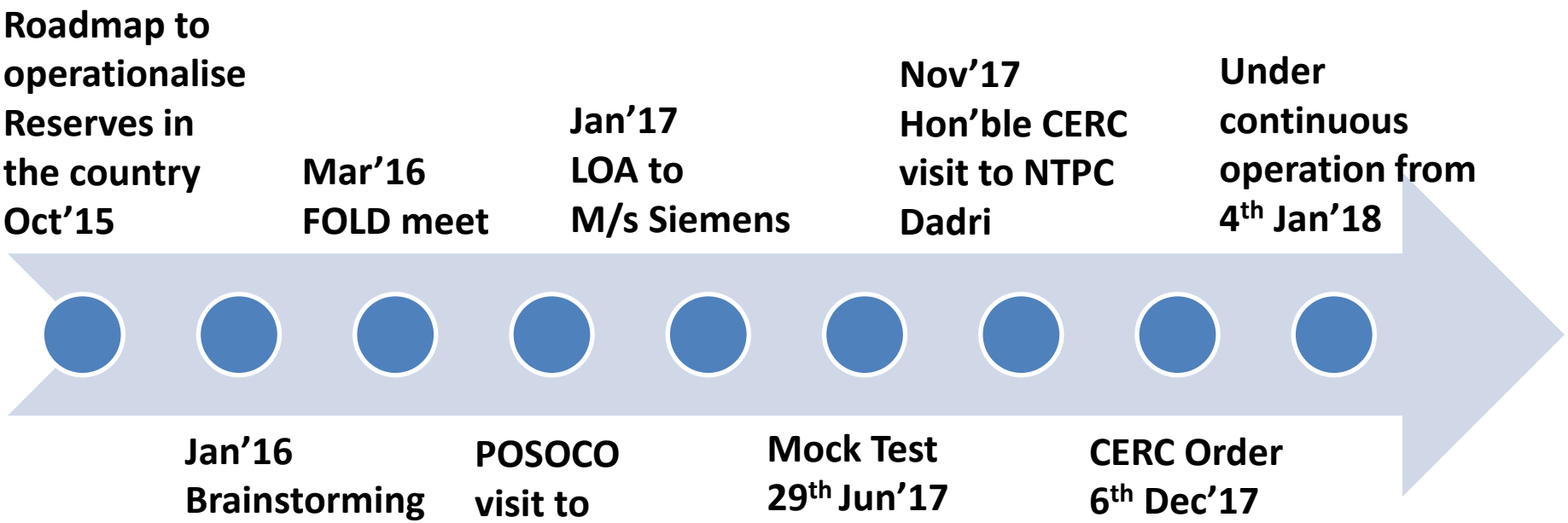
- Importance of Inertia
- Load
- Frequency Nadir
- Quasi Steady State Frequency



All in a day's play…Repeated again and again

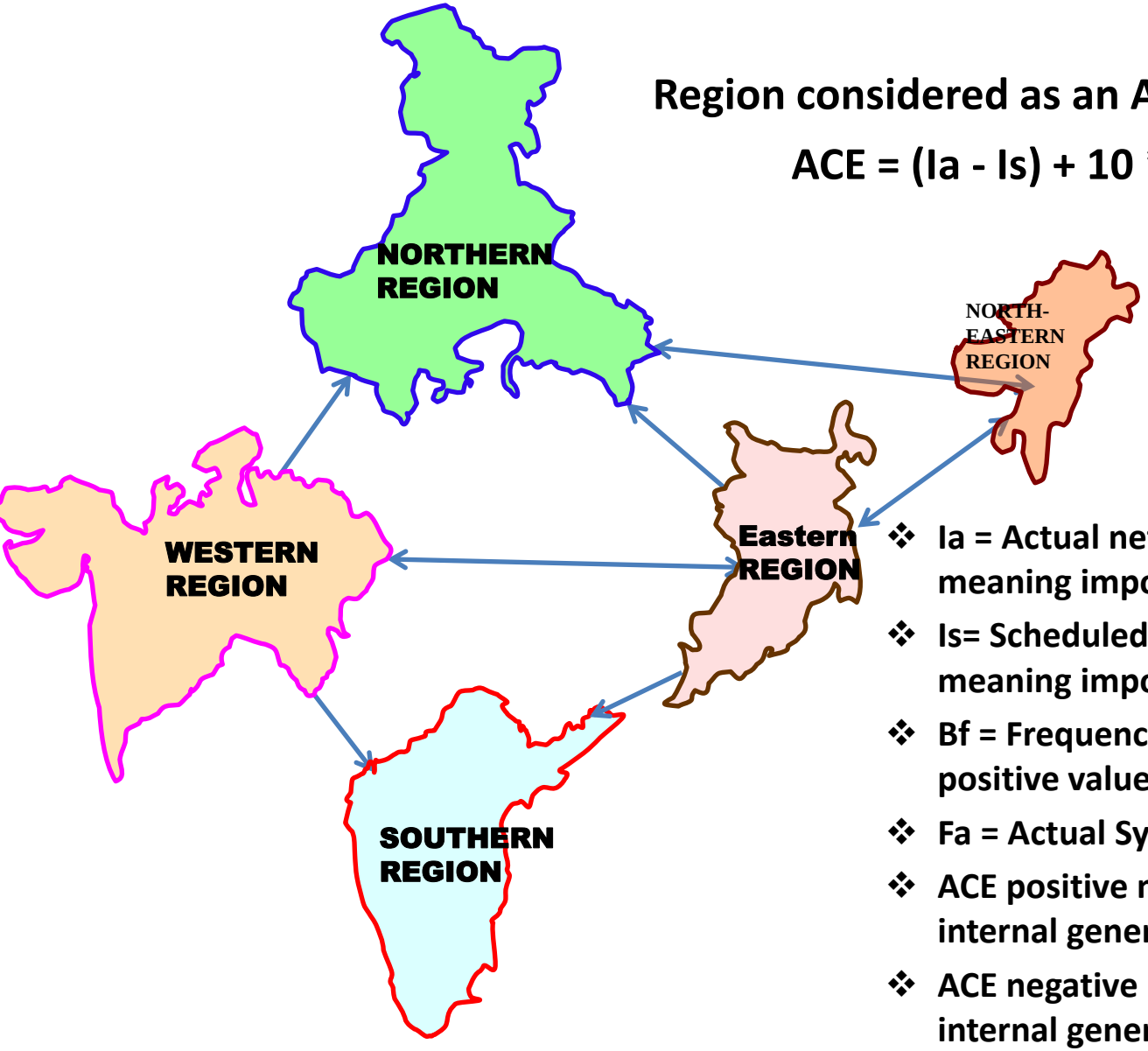


Timeline of Activities



Region considered as an Area for secondary control

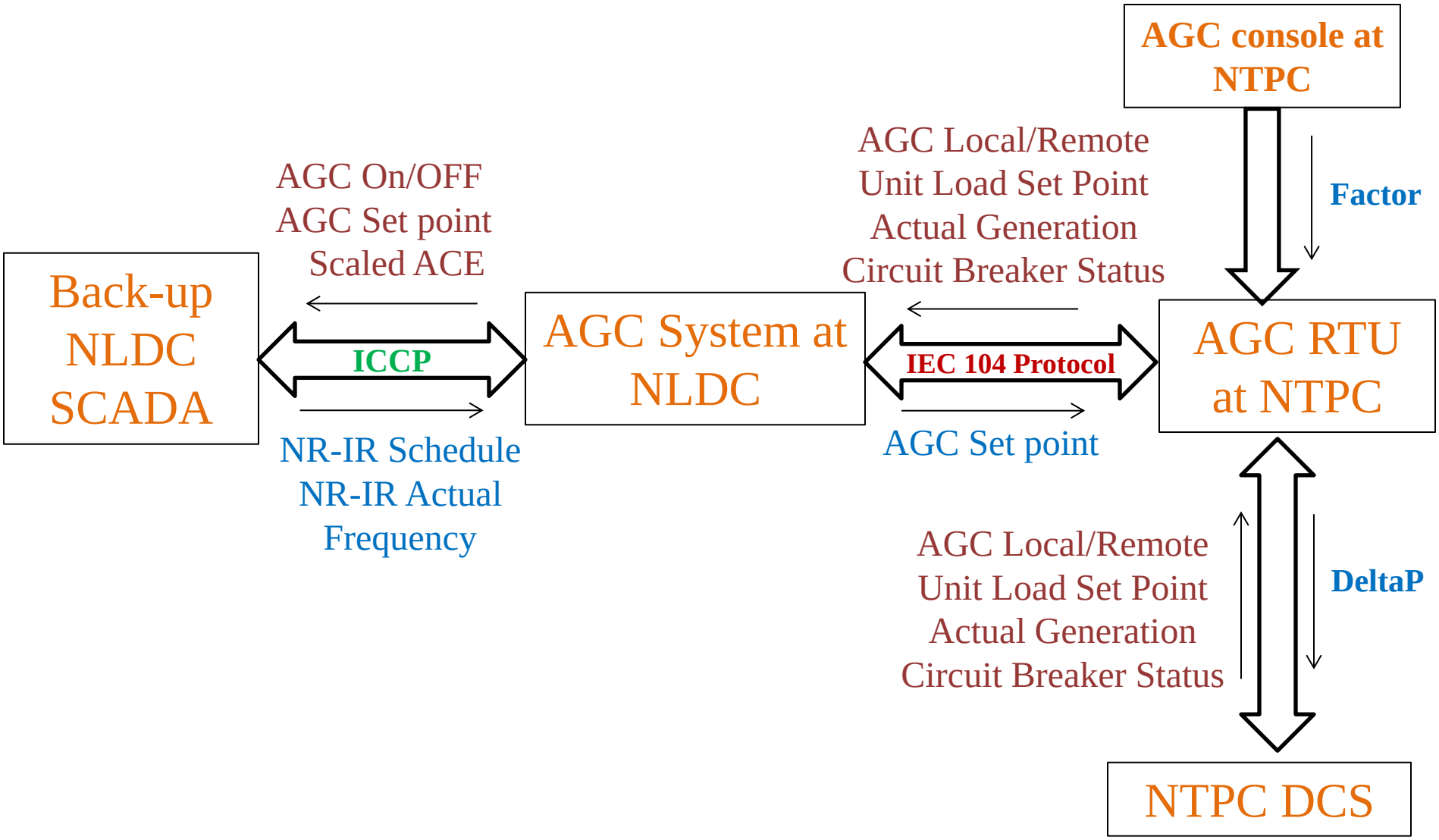
ACE = (Ia - Is) + 10 * Bf * (Fa - 50)



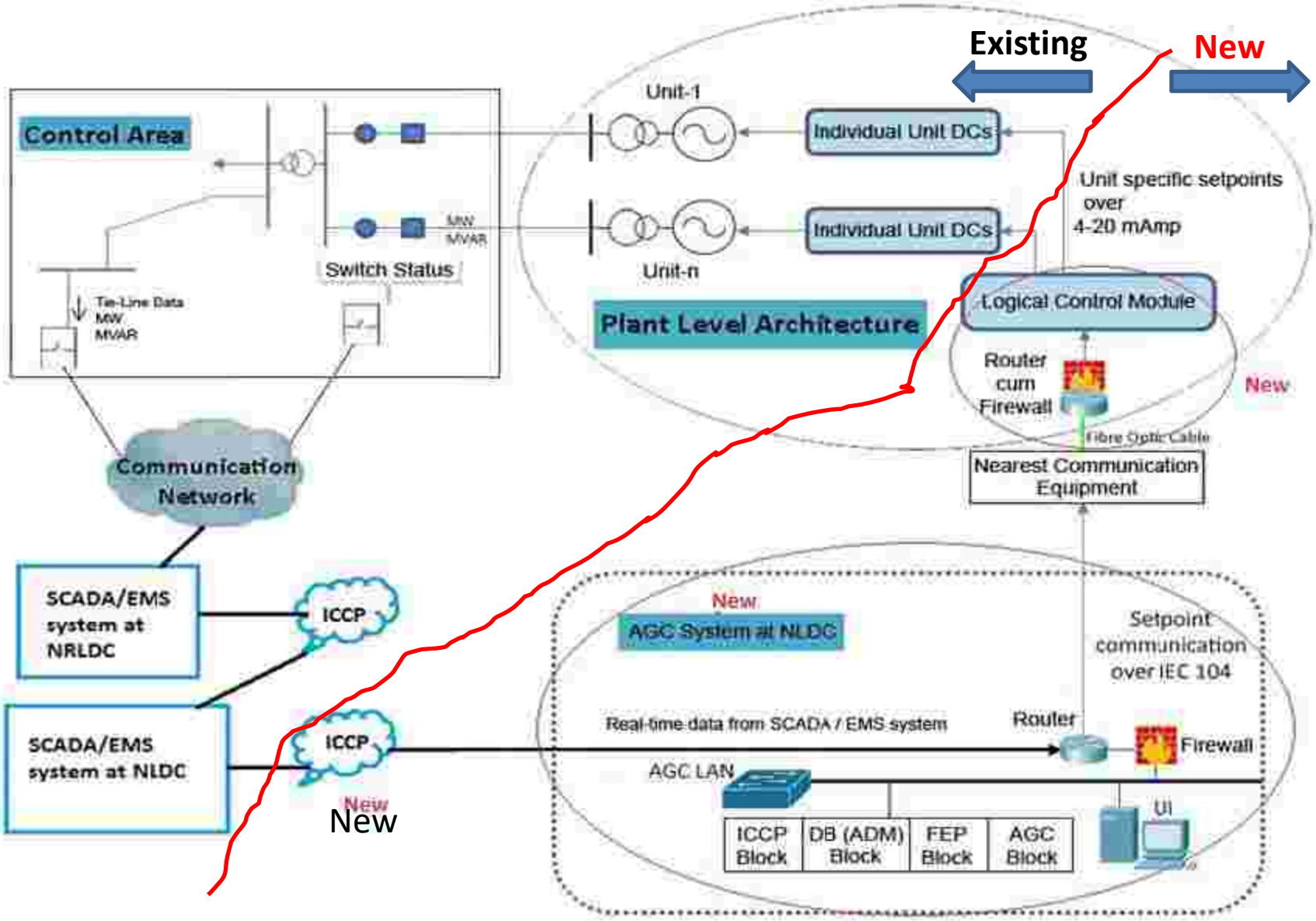
- ❖ Ia = Actual net interchange, negative for NR meaning import by NR
- ❖ Is= Scheduled net interchange, negative for NR meaning import by NR
- ❖ Bf = Frequency Bias Coefficient in MW/0.1 Hz, positive value
- ❖ Fa = Actual System Frequency
- ❖ ACE positive means NR is surplus and NR internal generation has to back down
- ❖ ACE negative means NR is deficit and NR internal generation has to increase

- Tie line bias mode and Frequency bias only mode both possible
- Interchange scaled using a factor of 15, changeable

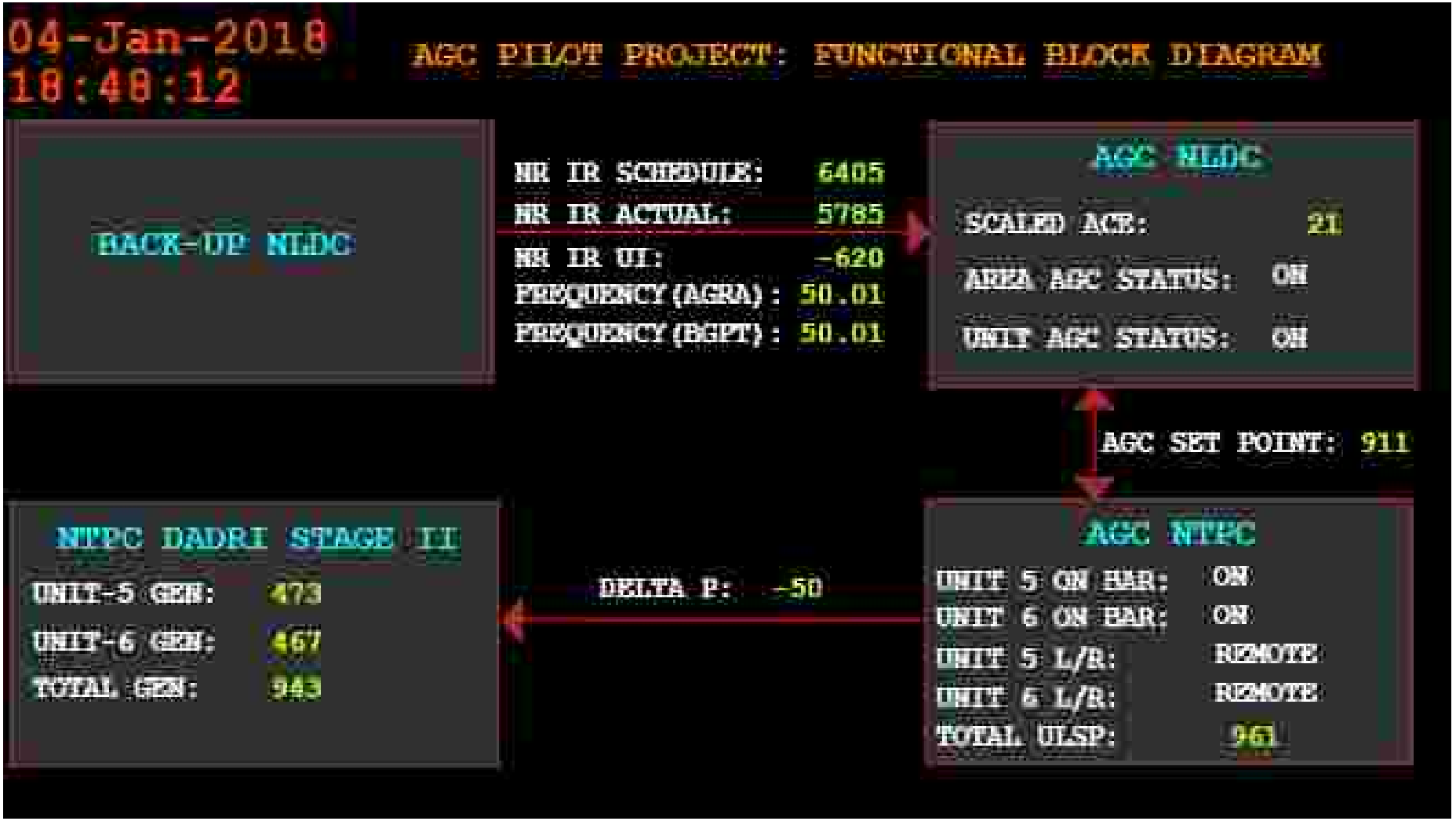
Data Flow in AGC Project



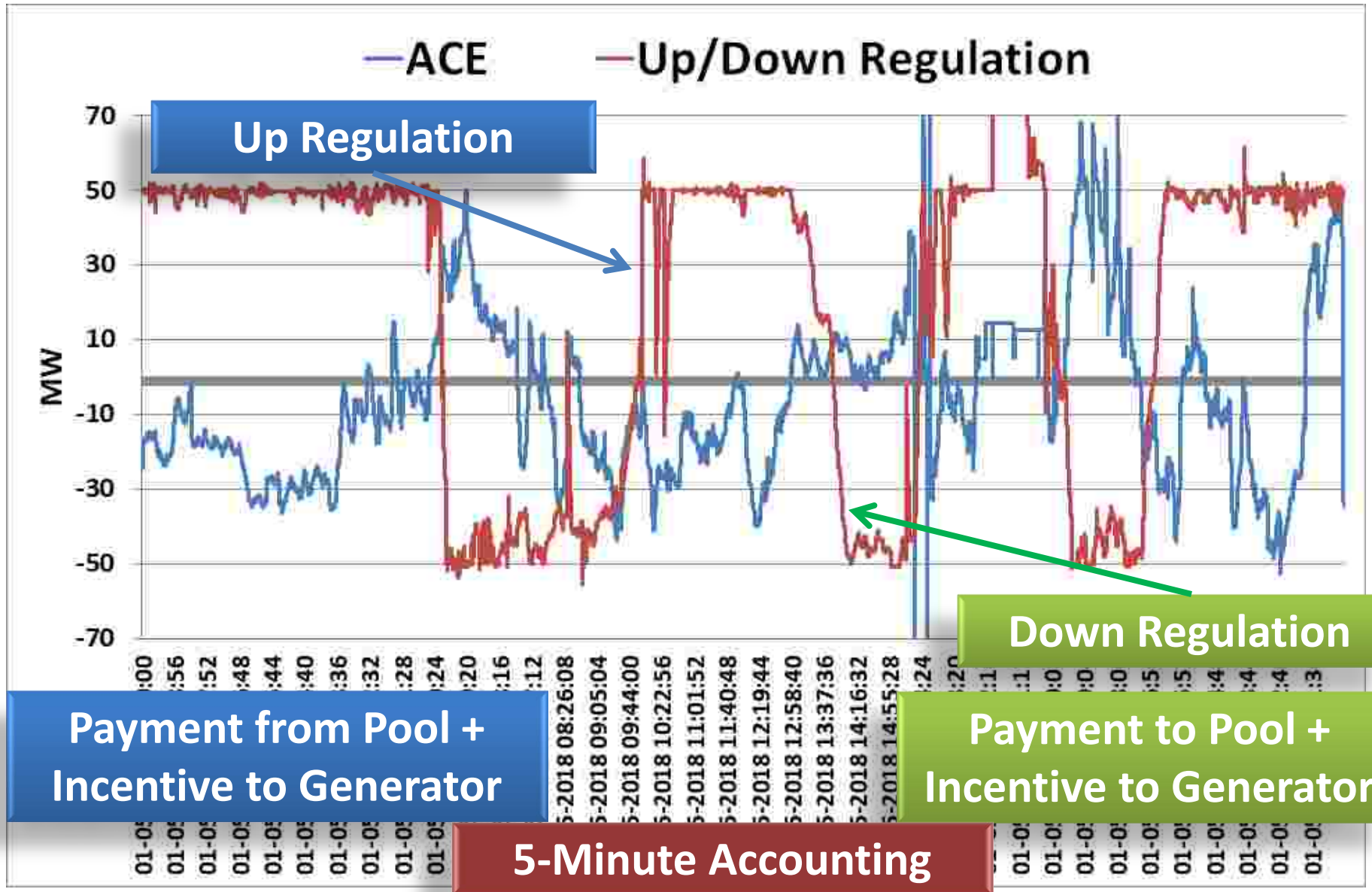
Architecture of the Project



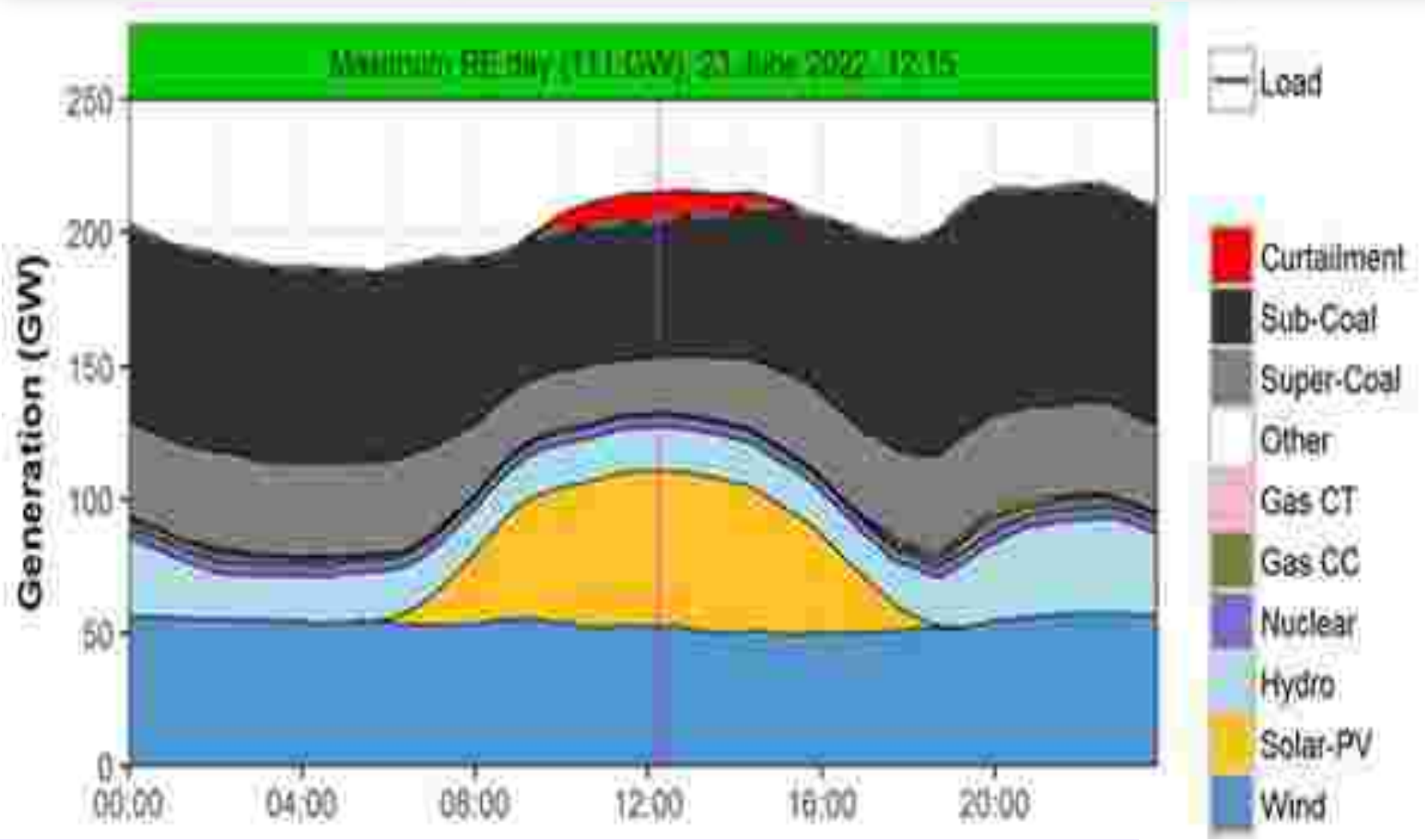
Display at NLDC



AGC Compensation Mechanism



Future Ready AGC for 175 GW of RE by 2022



- Forecasting of Load & RE
- Use of Pumped Storage Plants
- Automatic controls

Detailed implementation plan to operationalize the spinning reserves in the country

- Detailed plan submitted to CERC on 14th July 2017
- Secondary Control as an Ancillary Service.
- https://posoco.in/download/detailed-modus-operandi-on-operationalization-of-spinning-reserves/?wpdmdl=13461
- **Phase-I**
  - All the ISGS generators whose tariff is regulated / adopted by CERC
- **Phase-II**
  - To improve the availability of Reserves
  - All Regional Entity generating stations scheduled by RLDCs
  - Over and above the Phase-I power stations

Essential requirements for Secondary Control

- Shall bear the cost of secondary control hardware at the plant end
  - Including the cost of the fibre optic cable
- Shall share DC and Schedule like ISGS generators on day ahead basis
  - Subsequent revisions with RLDCs
- The generating units shall have working control systems for turbine, boiler and governor
  - Governor response plots/graphs of past incidents have to be submitted to RLDC
- Existing wide band communication node
  - Within a radius below 30-40 km from the plant
  - Detailed survey is given in Annexe-VI of the report

Coordinated action items

- Ensuring accurate load forecasting and Renewable Energy (RE) forecasting.
- Proper scheduling by each state including indication of reserves
- Evaluate Area Control Error (ACE) of each control area
- The SLDCs must also monitor the primary response from the generating units within the state
- Periodic monitoring of the data quality needs to be done at the RPC forums
- Fibre optic communication from Regional Entity power plant to nearest CTU node and there on to RLDCs/NLDC
- Ensure adequate reserves for secondary control
- Renewable Energy (RE) resources under AGC

Pathway to Pan-India AGC Rollout

1
Generation Plant

100+
Generation Plants

1 GW
Generation plant under pilot

65 GW+
By 2022

₹ 1 Crore
Project Cost

₹ 150 Crore+
Pan-India roll out

2000
Highly Skilled Manhours

25000+
Highly Skilled Manhours

50 km
Existing Communication path

1000s km
Existing Communication path

6 km
Optical Fibre (GI Piped)

140 km+
Optical Fibre (GI Piped)

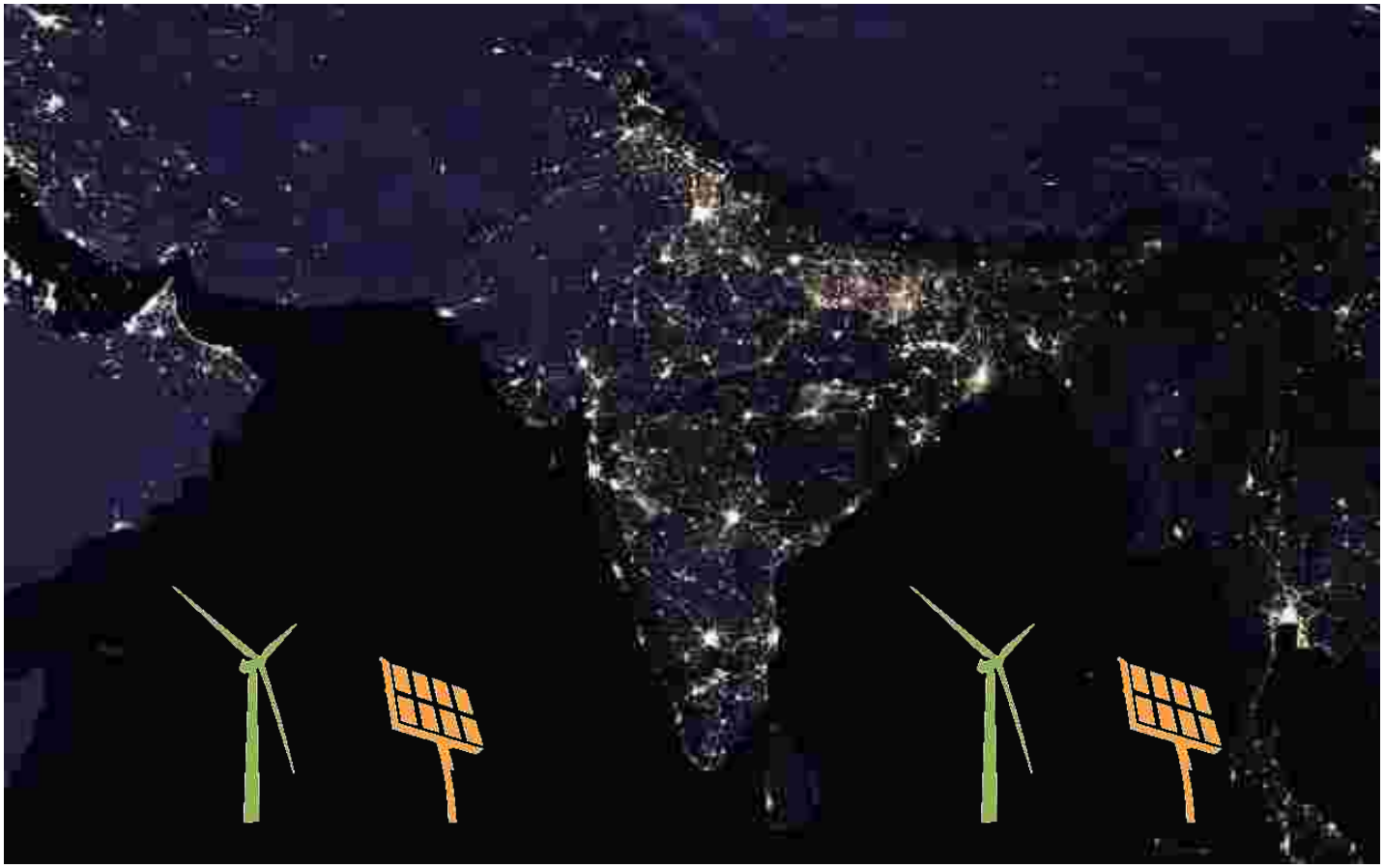


Image Credit: NASA

Eastern Regional Power Committee

Minutes of Special Meeting on issues related to charging of 220kV Biharsharif-Tenughat line at 400 kV level held on 14th December, 2017 at ERPC, Kolkata

Shri J. Bandyopadhyay, Member Secretary, ERPC, at the outset, welcomed Director (Projects), BSPTCL and all the other participants from Powergrid, ERLDC, JUSNL and TVNL in the meeting. He informed that this special meeting was convened as per the decision of 36th TCC on issues related to charging of 220kV Biharsharif-Tenughat line at 400 kV level. The following issues were discussed:

- TVNL informed that one 250 MVA, 400/220kV ICT was charged from 220kV side along with the line reactor which is charged as bus reactor.
- Powergrid informed that scope of POWERGRID under deposit work of TVNL has been almost completed except old ICT. The scope of POWERGRID under deposit work of JUSNL at Biharshariff has been completed except stringing of one span due to non availability of shutdown.
- Director (Projects), BSPTCL informed that after charging of 220kV Biharsharif-Tenughat line at 400 kV level, the power availability at 220kV bus at Biharshariff will reduce. Since 400/220kV ICTs at 400kV Biharshariff S/s were already overloaded, there will be a constraint to draw power from 400kV Biharshariff. He requested to expedite the installation of 4th ICT (500MVA, 400/220kV ICT) at Biharshaff which was already approved in standing committee.
- ED, ERLDC informed that due to charging of 220kV Biharsharif-Tenughat line at 400 kV level, Bihar drawl at 220kV bus will be affected and problems in 220kV system may be aggravated specially during summer peak load.
- Powergrid informed that commissioning of 4th ICT at Biharshaff will take one and half year.
- Director (Projects), BSPTCL informed that argumentation of 315 MVA, 400/220kV ICT of Pasauli with 500 MVA may be differed and the same 500MVA ICT may be utilised at Biharshaff.
- Powergrid informed that the same may be done subjected to availability of bay equipment at other places and it would take around 6 to 7 months.

A) Line termination at TVNL end

- TVNL informed that Powergrid may terminate the line at 400kV bays at TVNL
- Powergrid clarified that termination of the line is not in their scope of work. Moreover the line is belongs to JUSNL hence they cannot terminate without JUSNL concurrence.
- TVNL was advised to make an agreement with JUSNL for termination of the line and convey the same to Powergrid to do the needful.

B) Charging of 2nd 250 MVA ICT at TVNL

- It was informed that the 2nd 250 MVA ICT at TVNL should be commissioned prior to charging of the line at 400kV level for complete evacuation of TVNL generation.

- TVNL informed that Powergrid is implementing Nitrogen based fire fighting system additionally which needs consent from BHEL.

- TVNL was advised to settle the issue with BHEL and convey to Powergrid.

C) Strengthening of Line

- It was informed that that 220 kV Tenughat- Biharsharif line is in very bad shape and need strengthening before charging at 400 kV level. The ground clearance may not meet the safety clearance requirement for 400kV level between some spans. It was further informed that line spans are very long and there may be a requirement of installation of new towers.

- It was emerged that the line was jointly maintained by JUSNL and BSPTCL as per their respective geographical area. The line has total 506 towers out of which JUSNL is looking after 290 towers and rest 216 towers are being maintained by BSPTCL.

- JUSNL and BSPTCL were advised to do survey of their respective portion of the line and assess the requirements like ground clearance, sag etc for charging the line at 400kV level. A report on the assessment may be submitted by March 2018.

- JUSNL/TVNL informed that they will face problem in power evacuation during strengthening of 220 kV Tenughat- Biharsharif line due to outage.

- Powergrid was advised to expedite 220kV TVNL-Govindpur line so that TVNL power can be evacuated during outage of 220 kV Tenughat- Biharsharif line.

D) O&M of 220kV Tenughat- Biharsharif line

- JUSNL informed that the line is being maintained by JUSNL & BSPTCL jointly and JUSNL suggested that O & M of the line may be taken over by any one constituent

- Director (Projects), BSPTCL informed that they cannot maintain the Jharkhand portion because of high dense forest area. If JUSNL wants to take over the line then JUSNL may come up with a proposal.

- JUSNL and BSPTCL were advised to discuss the issue bilaterally and settle.

E) System Study

- Director (Projects), BSPTCL suggested that a system study needs to be done with the existing/future network to assess the advantage of upgrading 220 kV Tenughat-Biharsharif line at 400kV level

It was agreed that before charging of Tenughat- Biharsharif line at 400 kV level separate meeting(s) will be convened by ERPC Secretariat with JUSNL, TVNL, BSPTCL, PGCIL & ERLDC to settle other operational and commercial issues.

Meeting ended with vote of thanks to the chair.

****

PMU Installation and commissioning status of ER as on 12.01.2018

Annexure-B25

S.No	Region	State	Sub-Station	Owner/ Utility	S/S type	PMU	TOTAL PANEL QTY	PMU Delivery status	Cable Delivery status	Erection	Cable laying	CT/PT/DI termination	Commissio ning	Integration	SAT	Remarks
			78			296	175	74	75	66	65	64	64	43	60	
1	ER-II	West Bengal	Arambagh	WBSETCL	CR	3	1	Yes	Yes	done	done	done	done	done	done	
2	ER-II	West Bengal	BAKRESHWAR TPS	WBSETCL	CR	4	1	Yes	Yes	done	done	done	done	done	done	
3	ER-II	West Bengal	Bidhannagar	WBSETCL	CR	3	1	Yes	Yes	done	done	done	done	done	done	
4	ER-II	West Bengal	JEERAT	WBSETCL	CR	2	1	Yes	Yes	done	done	done	done	done	pending	SAT pending as customer didn't agree to witness SAT.
57	ER-II	West Bengal	Alipurduar	Powergrid	CR	6	7	Yes	Yes	partially done	partially done	partially done	partially done	Pending	pending	Work started on 22.12.2016. 4 PMU panels and network panel installed. Rest 2 PMU panels could not be erected because location not finalised. Cable laying and termination at PMU panel completed for 6 feeders. CT/PT interfacing pending due to unavailability of shutdown. PGCIL is asking to take DI points from field, which is not in scope. Work is held up. Team demobilised.
6	ER-II	West Bengal	KASBA	WBSETCL	CR	3	1	Yes	Yes	done	done	done	done	done	done	
7	ER-II	DVC	DSTPS	DVC	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
67	ER-I	BIHAR	BANKA	Powergrid	Kiosk	4	5	Yes	Yes	done	done	done	done	Pending	pending	SAT pending.
9	ER-II	DVC	MEJIA-B	DVC	CR	2	1	Yes	Yes	done	done	done	done	done	done	Integrated on 07.12.2016
45	ER-II	Jharkhand	Bokaro TPS	DVC	CR	1	1	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mtrs.
11	ER-II	DVC	Raghunathpur TPS	DVC	CR	3	1	Yes	Yes	done	done	done	done	done	done	
33	Odisha	Orissa	Bolangir	Powergrid	CR+Kiosk	2	3	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
13	ER-II	DVC	Bokaro	DVC	CR	2	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 24.06.2016
14	ER-II	DVC	CTPS(Chanderpura)	DVC	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mtrs.
78	ER-I	Bihar	Barauni PP	Bihar	CR	0	0	No	No	N/A	N/A	N/A	N/A	N/A	N/A	Substation deleted.
16	Odisha	Orissa	MENDHASAL	OPTCL	CR	2	1	Yes	Yes	done	done	done	done	done	done	
17	Odisha	Orissa	MERAMANDALI	OPTCL	CR	6	2	Yes	Yes	done	done	done	done	done	done	
18	Odisha	Orissa	RENGALI	OPTCL	CR	2	1	Yes	Yes	done	done	done	done	done	done	Integrated on 22.06.2017
37	Odisha	Orissa	GMR	GMR	Kiosk	3	4	Yes	Yes	done	done	done	done	Pending	pending	SDH Panel not commisioned, powergrid supervision required for SAT activity
20	Odisha	Orissa	BALIMELA(H)	OPTCL	CR	3	1	Yes	Yes	done	done	done	done	done	done	
21	ER-II	West Bengal	Durgapur	Powergrid	CR	5	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 30.05.2016.
15	Odisha	Orissa	Budhipadar	OPTCL	CR	10	0	No	Yes	pending	pending	pending	pending	pending	pending	Manufactured, waiting for FAT. Will be dispatched after FAT.
23	Odisha	Orissa	Indrawati	Powergrid	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
24	Odisha	Orissa	Indrawati HPS	OPTCL	CR	1	1	Yes	Yes	done	done	done	done	done	done	Team deployed in substation. Permission for panel installation & cable laying given but no work permission in existing control panel is given. Team was idle for more than. 10 days.
25	Odisha	Orissa	JEYPORE	Powergrid	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
26	ER-II	West Bengal	MAITHON	Powergrid	CR	7	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 21.06.2016.
27	ER-II	West Bengal	MALDA	Powergrid	CR	2	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 24.06.2016
28	Odisha	Orissa	Rengali	Powergrid	Kiosk	2	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 04.05.2016
29	Odisha	Orissa	ROURKELA	Powergrid	Kiosk	5	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 21.04.2016
30	ER-II	West Bengal	Binaguri	Powergrid	CR	7	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 28.07.2016

PMU Installation and commissioning status of ER as on 12.01.2018

S.No	Region	State	Sub-Station	Owner/ Utility	S/S type	PMU	TOTAL PANEL QTY	PMU Delivery status	Cable Delivery status	Erection	Cable laying	CT/PT/DI termination	Commissioning	Integration	SAT	Remarks
31	ER-II	West Bengal	SUBHASHGRAM	Powergrid	Kiosk	2	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 22.06.2016
32	Odisha	Orissa	Baripada	Powergrid	CR	3	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 30.01.2017.
75	ER-I	Jharkhand	Jharkhand Pool (Chan	Powergrid	Kiosk	4	1	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mts.
34	Odisha	Orissa	ANGUL	Powergrid	Kiosk	10	11	Yes	Yes	done	done	done	done	done	done	PMU integrated on 24.03.2017.
35	Odisha	Orissa	Keonjhar	Powergrid	CR	2	3	Yes	Yes	done	done	done	done	done	done	PMU integrated on 18.01.2017.
36	Odisha	Orissa	Jharsuguda	Powergrid	Kiosk	8	9	Yes	Yes	done	done	done	done	done	done	PMU integrated on 29.07.2016
74	ER-I	Bihar	Kishanganj (karandegh	Powergrid	CR	4	1	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mts.
8	ER-II	DVC	Kodarma TPS	DVC	CR	3	1	Yes	Yes	done	done	done	done	Pending	done	SDH panel does not exist.
39	ER-II	West Bengal	Baharampur	Powergrid	CR	2	3	Yes	Yes	done	done	done	done	done	done	PMU integrated on 10.05.2016
40	ER-II	West Bengal	Birpara	Powergrid	CR	4	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 15.07.2016.
41	ER-II	DVC	CTPS B	DVC	CR	3	1	Yes	Yes	done	done	done	done	done	done	mom/sat signature pending from powergrid end.
42	ER-II	DVC	KALYANESWARI	DVC	CR	4	1	Yes	Yes	done	done	done	done	done	done	PMU integrated on 02.01.2017.
43	ER-II	DVC	PARULIA	DVC	CR	5	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 21.02.2017.
44	ER-II	West Bengal	Purulia PSP	WBSETCL	CR	2	1	Yes	Yes	done	done	done	done	done	done	
66	ER-I	BIHAR	LakhiSarai	Powergrid	Kiosk	4	5	Yes	Yes	done	done	done	done	Pending	done	SAT completed. Integration planed
46	ER-II	West Bengal	Durgapur TPS	DVC	CR	3	1	Yes	Yes	done	done	done	done	done	done	
73	ER-I	Jharkhand	Daltonganj	Powergrid	Kiosk	2	3	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Site on-hold as Substation is under construction.
22	ER-II	West Bengal	FARRAKA	NTPC	CR	5	2	Yes	Yes	done	done	done	done	pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mtrs.
54	Odisha	Orissa	Ind barath	Ind barath	Kiosk	1	1	Yes	Yes	pending	pending	pending	pending	pending	pending	Permission awaited
10	ER-II	DVC	Maithon RB TPS	DVC	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Work started on 04.07.2016. Panel shifted. Team demobilised due to access issue and panel location issue. Team deputed again 18th August, I&C done, integration pending due to communication break with control center.
51	Odisha	Orissa	Jindal	JITPL	CR	2	1	Yes	Yes	pending	pending	pending	pending	pending	pending	Permission awaited
5	ER-II	West Bengal	Kolaghat TPS	WBSETCL	CR	4	1	Yes	Yes	done	done	done	done	done	done	
52	Odisha	Orissa	Monnet	Monnet	CR	1	1	Yes	Yes	pending	pending	pending	pending	pending	pending	Permission awaited
55	ER-II	Sikkim	New Melli	Powergrid	CR	0	0	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Substation deleted.
76	ER-I	Jharkhand	Patratu	Jharkhand	CR	3	1	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	Permission awaited.
53	Odisha	Orissa	Strelite	Strelite	CR	3	1	Yes	Yes	done	done	done	done	pending	done	SDH not commisioned
48	Odisha	Orissa	TALCHER	NTPC	CR	5	2	Yes	Yes	pending	pending	pending	pending	pending	pending	Permission awaited
58	ER-II	West Bengal	Rajarhat	Powergrid	CR	2	1	Yes	Yes	done	pending	pending	pending	Pending	pending	Site on-hold. Work withheld due to localite agitation issue.
59	ER-I	Jharkhand	JAMSHEDPUR	Powergrid	CR	6	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 14.02.2017
60	ER-I	BIHAR	Kahalgaon(KHSTPP)	NTPC	CR	6	2	Yes	Yes	done	done	pending	pending	Pending	pending	Work on-hold. NTPC asked to use Armoured cable. Out of scope. Team idemobilized from site. Site assumed as closed as per PRM in Kolkatta.
61	ER-I	BIHAR	Purnea	Powergrid	CR	6	2	Yes	Yes	done	done	done	done	done	done	PMU integrated on 13.04.2017

PMU Installation and commissioning status of ER as on 12.01.2018

S.No	Region	State	Sub-Station	Owner/ Utility	S/S type	PMU	TOTAL PANEL QTY	PMU Delivery status	Cable Delivery status	Erection	Cable laying	CT/PT/DI termination	Commissioning	Integration	SAT	Remarks
62	ER-I	BIHAR	PATNA	Powergrid	Kiosk	6	7	Yes	Yes	done	done	done	done	done	done	PMU integrated on 11.04.2017
63	ER-I	Jharkhand	RANCHI	Powergrid	Kiosk	12	13	Yes	Yes	done	done	done	done	done	done	
64	ER-I	BIHAR	SASARAM(Pusauli)	Powergrid	CR+Kiosk	9	3	Yes	Yes	done	done	done	done	done	done	
65	ER-I	BIHAR	BARH	NTPC	CR	4	1	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
12	ER-II	DVC	MEJIA	DVC	CR	5	2	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mtrs.
38	ER-II	Sikkim	RANGPO	Powergrid	CR	4	1	Yes	Yes	done	done	done	done	Pending	done	S/S couldn't be integrated because distance between PMU panel and SDH is more than 100 mtrs.
68	ER-I	Jharkhand	Chaibasa	Powergrid	Kiosk	4	5	Yes	Yes	done	done	done	done	done	done	
69	ER-I	BIHAR	765kv Gaya	Powergrid	Kiosk	11	12	Yes	Yes	done	done	done	done	done	done	PMU integrated on 24.02.2017
70	ER-I	Jharkhand	765/400kV Ranchi (N)	Powergrid	Kiosk	8	9	Yes	Yes	done	done	done	done	done	done	PMU integrated on 24.02.2017
71	ER-I	Bihar	Biharshariff	Powergrid	CR	9	3	Yes	Yes	done	done	done	done	done	done	
72	ER-I	Bihar	MUZAFFAPUR	Powergrid	CR	5	2	Yes	Yes	done	done	done	done	done	done	
49	ER-II	Sikkim	TEESTA	NHPC	CR	1	1	Yes	Yes	done	done	done	done	done	pending	SAT pending due to no supervision
77	ER-I	Jharkhand	Tenughat	Jharkhand	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	SDH panel not commisioned
19	Odisha	Orissa	U.KOLAB	OPTCL	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Communication Link not available.
56	ER-II	Sikkim	TT Pool	Powergrid	CR	0	0	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Substation deleted.
50	Odisha	Orissa	Uttara	Powergrid	CR	2	1	Yes	Yes	done	done	done	done	Pending	done	Communication link from s/s to ERLDC not available.
47	Odisha	Orissa	TTPS(Talcher)	OPTCL	CR	3	1	Yes	Yes	pending	pending	pending	pending	pending	pending	Permission awaited

ER PMU site activity Summary:

Sl. No.	Region	Utility	As per approved BOQ		Supplied		Installed		Commissioned		Integrated to ERLDC/ SLDC	
			No. of Substations	No. of PMU	S/S	PMU	S/S	PMU	S/S	PMU	S/S	PMU
1	ER-I	Powergrid	15	94	15	94	14	92	14	92	10	76
2	ER-I	NTPC	2	10	2	10	2	10	1	4	0	0
3	ER-I	Jharkhand	2	5	2	5	1	2	1	2	0	0
4	ER-I	Bihar	0	0	0	0	0	0	0	0	0	0
	ER-I	**Total**	**19**	**109**	**19**	**109**	**17**	**104**	**16**	**98**	10	76
1	ER-II	Powergrid	10	41	10	42	9	35	8	33	7	29
	ER-II	NHPC	1	1	1	1	1	1	1	1	1	1
2	ER-II	NTPC	1	5	1	5	1	5	1	5	0	0
3	ER-II	DVC	13	37	13	37	13	37	13	37	7	22
4	ER-II	WBSETCL	7	21	7	21	7	21	7	21	7	21
	ER-II	**Total**	**32**	**105**	**32**	**106**	**31**	**99**	**30**	**97**	**22**	**73**
1	Odisha	Powergrid	10	38	10	38	10	38	10	38	6	30
2	Odisha	OPTCL	8	29	7	19	6	16	6	16	5	14
3	Odisha	NTPC	1	5	1	5	0	0	0	0	0	0
4	Odisha	IPP	5	10	5	10	2	6	2	6	0	0
	Odisha	**Total**	**24**	**82**	**23**	**72**	**18**	**60**	**18**	**60**	**11**	**44**
	ER	**Total**	**75**	**296**	**74**	**287**	**66**	**263**	**64**	**255**	**43**	**193**

A. Replacement of RTUs and Upgradation of SAS:

Replacement of existing S-900 and C264 RTUs installed in ULDC phase-I along with upgradation of RTU/SAS/ Remote Operation RTUs for dual reporting to both Main ERLDC & Backup ERLDC over IEC 60870-5-104 Protocol and lack of maintenance support due to non-availability of spares.

S.n	Region	Name of Substations	Remarks
1	ER-II	Durgapur	RTU to be replaced
2	ER-II	Malda	RTU to be replaced
3	ER-II	Binaguri	RTU to be replaced
4	ER-II	Siliguri220	RTU to be replaced
5	ER-II	Birpara	RTU to be replaced
6	ER-II	Subhasgram	RTU to be replaced
7	ER-II	Dalkhola	RTU to be replaced
8	ER-II	Gangtok	RTU to be replaced
9	ER-II	Maithon	RTU to be replaced
10	ER-II	Berhampore	Hardware/License upgradation
11	ER-II	Rangpo	Hardware/License upgradation
12	ER-II	NewMelli	Hardware/License upgradation
13	ER-I	Biharsharif	RTU to be replaced
14	ER-I	Jamshedpur	RTU to be replaced
15	ER-I	Purnea 400	RTU to be replaced
16	ER-I	Purnea 220	RTU to be replaced
17	ER-I	Sasaram HVDC	RTU to be replaced
18	ER-I	Muzaffarpur	RTU to be replaced
19	ER-I	Patna	SAS to be replaced
20	ER-I	Banka	Hardware/License upgradation
21	ER-I	Lakhisarai	Hardware/License upgradation
22	ER-I	Ranchi	SAS to be replaced
23	ER-I	New Ranchi	Hardware/License upgradation
24	ER-I	Chaibasa	Hardware/License upgradation
25	ER-I	Gaya	Hardware/License upgradation
26	ER-I	Sasaram 765	Hardware/License upgradation
27	ER-I	Ara	Hardware/License upgradation
28	Odisha Projects	Jeypore	RTU to be replaced
29	Odisha Projects	Baripada	RTU to be replaced
30	Odisha Projects	Indravati	RTU to be replaced
31	Odisha Projects	Rourkela	RTU to be replaced
32	Odisha Projects	Rengali	RTU to be replaced
33	Odisha Projects	Angul	Hardware/License upgradation
34	Odisha Projects	Jharsuguda	Hardware/License upgradation
35	Odisha Projects	Bolangir	Hardware/License upgradation
36	Odisha Projects	Keonjhar	Hardware/License upgradation
37	Odisha Projects	Pandiabili	Hardware/License upgradation
38	Odisha Projects	Talcher HVDC	Hardware/License upgradation

B. Implementation of BCU based Substation Automation System at Purnea 220 KV, Ara 220 KV, Birpara220KV, Siliguri220KV, Sasaram S/s in addition to the replacement of RTUs for data reporting to ERLDC through single RTU/SAS as per advice of ERLDC.

C. Replacement of DCPS for replacement of old DCPS commissioned in ULDC phase-I:

Following old DCPS & UPS in 18 nos. Central Sector locations is decided to be replaced:

Sr. No.	Location	Item
1	Durgapur	UPS
2	ERLDC, Kolkata	2x4 kw DCPS with parallel operation
3	Durgapur	
4	Kanchanpur	
5	Barkot	
6	Jamui	
7	Maldah	
8	Siliguri 400	
9	Jamshedpur	
10	Siliguri 220	
11	Rengali	
12	Birpara	
13	Rourkela	
14	Purnea 220	
15	Indravati	
16	Muzaffarpur	
17	Biharsharif	
18	Sasaram HVDC	

D. Laying of OPGW in the second circuit of following links commissioned in ULDC Phase-I:

S/n	Name of links	Length (Km)
1	Rourkela-Talcher	171
2	Durgapur-Jamshedpur	175
3	Durgapur-Farakka	150
4	Biharsharif-Sasaram	193
5	Biharsharif-Kahalgaon	202
6	LILO portion of Biharsharif-Balia at Ara	12
	Total	**903**

Annexure - B32

SUMMARY OF DEVIATION CHARGE RECEIPT AND PAYMENT STATUS

BILL UPTO 21.01.18 (Week -42 of 2017 - 18)

Last Payment Disbursement Date - 06.02.18

Figures in Rs. Lakhs

CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
WR	15.21672	0.00000	213162.74086	210724.58745	-2422.93669
SR	59662.79325	57664.69530	1949.69432	1996.29043	2044.69406
NER	82221.57044	83846.32536	4167.45508	4167.45508	-1624.75492
NR	35679.32904	34580.00968	6579.51941	5345.94081	-134.25924
BSPHCL	11440.77354	10109.05911	86.21581	0.00000	1245.49862
JUVNL	7905.13157	6671.62753	2.81650	0.00000	1230.68754
DVC	7984.81596	7984.81596	2738.95914	2717.70495	-21.25419
GRIDCO	17976.13416	17650.87223	499.59727	1374.61594	1200.28060
WBSETCL	21857.97255	21471.94062	0.00000	19.21540	405.24733
SIKKIM	451.12768	0.00000	569.14621	242.21842	124.19989
NTPC	7772.20372	7735.62777	56.81036	69.14964	48.91523
NHPC	0.00000	0.00000	2147.45370	2106.41421	-41.03949
MPL	120.39243	100.21070	471.41211	471.41211	20.18173
STERLITE	0.00000	0.00000	0.00000	0.00000	0.00000
APNRL	307.80879	152.42236	201.89761	0.00000	-46.51118
CHUZACHEN (GATI)	42.43510	42.43504	320.47820	319.95746	-0.52068
NVVN (IND-BNG)	279.39906	256.30819	241.70377	244.38748	25.77458
JITPL	393.23110	393.24229	719.37103	708.43739	-10.94483
GMR	148.75835	47.76643	1543.33169	1496.20680	53.86703
IND BARATH	92.45858	0.00000	0.00000	0.00000	92.45858
TPTCL(DAGACHU)	1789.16796	1729.07440	36.08101	36.24336	60.25591
JLHEP (DANS ENERGY)	575.24233	520.71137	199.75178	199.72818	54.50736
BRBCL(NABINAGAR)	191.81421	209.81556	850.02373	853.22229	-14.80279
NVVN (IND-NEPAL)	944.26766	927.78670	382.64592	392.10200	25.93704
HVDC SASARAM	2.33430	2.33430	98.27192	97.10608	-1.16584
HVDC-ALIPURDUAR	0.90856	0.90856	88.63301	82.43488	-6.19813
TEESTA-III(TUL)	1036.14766	1036.12766	1310.95066	1308.91624	-2.01442
DIKCHU	53.96014	53.96016	517.56329	516.17818	-1.38513
Tashiding (THEP)	73.81559	51.06203	61.69695	61.69695	22.75356
OPGC	0.03626	0.00000	0.00000	0.00000	0.03626
Pool Balance	0.00000	649.69506	-4616.73798	0.00000	3967.04292
Addl Deviation charge	13272.34130	20906.84774	0.00000	0.00000	-7634.50644
IRE	0.00000	0.00000	118.68184	0.00000	-118.68184
VAE	0.00000	0.00000	11232.52739	0.00000	-11232.52739
TOTAL	**259019.24671**	**253239.13931**	**245738.69259**	**235551.62173**	

% Realization **97.77** **As on** **06.02.18**

Receivable: Receivable by ER POOL Payable Payable by ER POOL

Received Received by ER POOL Paid Paid by ER POOL

"- ve" Payable by ER pool "+ ve" Receivable by ER pool

Annexure - B33

Current Status of Letter of Credit (LC) amount against UI charges for ER constituents

Figures in Lacs of Rupees

Sl No	ER Constituents	No. of weeks in which Deviation Charge payable	No of times payment was delayed during 2015-16	Total Deviation charges payable to pool during 2016-17	Average weekly Deviation Charge liability	LC Amount	Due date of expiry	Remarks
		(A)	(B)	(C)	(D)	(E)	(F)	(G)
1	BSPHCL	44	44	10288.28725	194.11863	213.53049	16.11.2018	Opened for 213.53049 Lac
2	JUVNL	45	45	12078.12053	227.88907	250.67797	**Already expired on 31.01.2018**	**Reminder issued on 29.01.18**
3	SIKKIM	6	6	43.59053	0.82246	0.90471	07.03.2018	Opened for 1.60277 Lacs
4	APNRL	31	31	514.12213	9.70042	10.67046	31.05.2018	Opened for ₹ 10.67046 Lacs
5	CHUZACHEN	6	5	24.43612	0.46106	0.50716	31.03.2018	Opened for ₹ 0.50716 Lacs
6	JITPL	18	3	1304.7548	24.61802	27.07982	**About to expire on 08.02.2018**	**Reminder issued on 05.02.18**
7	GMR	12	4	367.39848	6.93205	7.62525	**Not Opened**	Letter issued on 22/08/17
8	IND-BARATH	48	36	96.68933	1.82433	2.00676	**Not Opened**	Letter issued on 04/01/18
9	TPTCL	45	3	1287.684311	24.29593	26.72552	31.03.2018	Opened BG for ₹ 26.72552 Lacs
10	JLHEP	27	24	346.25598	6.53313	7.18644	24.09.2018	Opened for 7.18644 Lacs
11	BRBCL	48	3	343.15334	6.47459	7.12205	31.03.2018	Opened for ₹ 7.12205 Lacs
12	NVVN(IND-NEP)	36	5	419.02891	7.90621	8.69683	26.09.2018	Opened for ₹ 8.69683 Lacs
13	TEESTA-III(TUL)	3	3	109.40403	2.06423	2.27065	21.09.2018	Opened for 2.27065 Lacs

Annexure-B36.1

List of Meter & Location for AMR 4th Phase

S.No	MAKE	Meter Serial No	LOCATION
1	L&T	NP-7885-A	LAKHISARAI(PG)
2	L&T	NP-7886-A	
3	L&T	NP-7429-A	
4	L&T	NP-7429-A	
5	L&T	NP-7887-A	
6	L&T	NP-7430-A	
7	L&T	NP-7888-A	
8	L&T	NP-7431-A	
9	ELSTER	NR-4451-A	ALIPURDUAR(PG)
10	ELSTER	NR-4452-A	
11	ELSTER	NR-3717-A	
12	ELSTER	NR-4622-A	
13	ELSTER	NR-4625-A	
14	ELSTER	NR-4447-A	
15	ELSTER	NR-4446-A	
16	ELSTER	NR-3725-A	
17	ELSTER	NR-4617-A	
18	ELSTER	NR-3716-A	
19	ELSTER	NR-3718-A	
20	GENUS	ER-1104-A	
21	GENUS	ER-1146-A	
22	GENUS	ER-1005-A	
23	GENUS	ER-1006-A	
24	GENUS	ER-1002-A	
25	GENUS	ER-1004-A	
26	ELSTER	ER-1295-A	KISHANGANJ(BSPTCL)
27	GENUS	ER-1158-A	
28	GENUS	ER-1156-A	
29	GENUS	ER-1157-A	
30	GENUS	ER-1287-A	NPGC(BSPTCL)
31	GENUS	ER-1282-A	
32	GENUS	ER-1052-A	OPGC
33	GENUS	ER-1063-A	
34	GENUS	ER-1027-A	
35	GENUS	ER-1112-A	
36	GENUS	ER-1026-A	
37	GENUS	ER-1030-A	
38	GENUS	ER-1053-A	
39	GENUS	ER-1066-A	
40	GENUS	ER-1068-A	
41	GENUS	ER-1060-A	
42	ELSTER	NR-3714-A	TEESTA-III
43	ELSTER	NR-3715-A	
44	ELSTER	NR-4450-A	
45	ELSTER	NR-3720-A	
46	ELSTER	NR-4623-A	
47	ELSTER	NR-3719-A	
48	ELSTER	NR-4456-A	
49	ELSTER	NR-4618-A	
50	ELSTER	NR-4454-A	
51	ELSTER	NR-4453-A	
52	GENUS	ER-1250-A	MOTIHARI(BSPTCL)
53	GENUS	ER-1245-A	
54	GENUS	ER-1286-A	MOTIPUR(BSPTCL)
55	GENUS	ER-1288-A	
56	GENUS	ER-1111-A	ATRI(GRIDCO)
57	GENUS	ER-1007-A	
58	GENUS	ER-1248-A	RAXAUL(BSPTCL)
59	GENUS	ER-1249-A	
60	GENUS	ER-1113-A	SAMANGARA(GRIDCO)
61	GENUS	ER-1073-A	
62	GENUS	ER-1223-A	SAMASTIPUR(BSPTCL)
63	GENUS	ER-1121-A	EMSS(CESC)
64	GENUS	ER-1126-A	
65	GENUS	ER-1227-A	BETIAH(BSPTCL)
66	GENUS	ER-1173-A	
67	GENUS	ER-1116-A	BHOGRAI(GRIDCO)
68	GENUS	ER-1114-A	JALESWAR(GRIDCO)

16 New Locations with 68 Meters

S.No	MAKE	Meter Serial No	LOCATION
69	GENUS	ER-1290-A	APNRL
70	GENUS	ER-1135-A	BERHAMPORE(PG)
71	GENUS	ER-1140-A	
72	GENUS	ER-1265-A	BIHARSHARIFF(PG)
73	GENUS	ER-1108-A	BINAGURI(PG)
74	GENUS	ER-1102-A	
75	GENUS	ER-1076-A	
76	GENUS	ER-1128-A	
77	GENUS	ER-1125-A	
78	GENUS	ER-1106-A	BIRPARA(PG)
79	GENUS	ER-1109-A	
80	GENUS	ER-1110-A	
81	GENUS	ER-1071-A	DALKHOLA(PG)
82	GENUS	ER-1072-A	
83	GENUS	ER-1166-A	DARBHANGA(DMTCL)
84	GENUS	ER-1263-A	GAYA(PG)
85	GENUS	ER-1170-A	
86	GENUS	ER-1297-A	JAMSHEDPUR(PG)
87	GENUS	ER-1215-A	
88	GENUS	ER-1043-A	KHARAGPUR(WB)
89	GENUS	NR-4615-A	KISHANGANJ(PG)
90	GENUS	NR-4434-A	
91	GENUS	ER-1293-A	
92	GENUS	ER-1296-A	
93	GENUS	ER-1159-A	
94	GENUS	ER-1154-A	
95	GENUS	ER-1143-A	MALDA(PG)
96	GENUS	ER-1150-A	
97	GENUS	ER-1008-A	MEJIA(DVC)
98	GENUS	ER-1031-A	
99	GENUS	ER-1055-A	MIRAMUNDALI(GRIDCO)
100	GENUS	ER-1054-A	
101	GENUS	ER-1165-A	MOTIHARI(DMTCL)
102	GENUS	ER-1167-A	
103	GENUS	ER-1122-A	MPL
104	GENUS	ER-1123-A	
105	GENUS	ER-1124-A	
106	GENUS	ER-1129-A	
107	GENUS	ER-1226-A	MUZAFFARPUR(PG)
108	GENUS	ER-1299-A	NABINAGAR(BRBCL)
109	GENUS	ER-1292-A	
110	GENUS	ER-1294-A	
111	ELSTER	NR-4620-A	NEW MELLI(PG)
112	ELSTER	NR-4621-A	
113	GENUS	ER-1099-A	PANDIABILI(PG)
114	L&T	NP-8052-A	
115	GENUS	ER-1175-A	PURNEA(PG)
116	GENUS	ER-1176-A	
117	GENUS	ER-1298-A	RAMCHANDARPUR(PG)
118	GENUS	ER-1020-A	RENGALI(PG)
119	GENUS	ER-1028-A	ROURKELA(PG)
120	GENUS	ER-1029-A	
121	GENUS	ER-1012-A	SUNDERGARH(PG)
122	GENUS	ER-1093-A	
123	GENUS	ER-1100-A	
124	GENUS	ER-1019-A	
125	GENUS	ER-1118-A	
126	GENUS	ER-1022-A	
127	GENUS	ER-1021-A	
128	GENUS	ER-1023-A	
129	GENUS	ER-1117-A	
130	GENUS	ER-1119-A	
131	GENUS	ER-1062-A	
132	GENUS	ER-1067-A	
133	GENUS	ER-1061-A	
134	GENUS	ER-1070-A	
135	GENUS	ER-1065-A	
136	GENUS	ER-1064-A	

25 Existing Locations with 68 Meters

Annexure-B36.1

List of Meter & Location for AMR 4th Phase

S.No	MAKE	Meter Serial No	LOCATION
1	L&T	NP-7885-A	LAKHISARAI(PG)
2	L&T	NP-7886-A	
3	L&T	NP-7429-A	
4	L&T	NP-7429-A	
5	L&T	NP-7887-A	
6	L&T	NP-7430-A	
7	L&T	NP-7888-A	
8	L&T	NP-7431-A	
9	ELSTER	NR-4451-A	ALIPURDUAR(PG)
10	ELSTER	NR-4452-A	
11	ELSTER	NR-3717-A	
12	ELSTER	NR-4622-A	
13	ELSTER	NR-4625-A	
14	ELSTER	NR-4447-A	
15	ELSTER	NR-4446-A	
16	ELSTER	NR-3725-A	
17	ELSTER	NR-4617-A	
18	ELSTER	NR-3716-A	
19	ELSTER	NR-3718-A	
20	GENUS	ER-1104-A	
21	GENUS	ER-1146-A	
22	GENUS	ER-1005-A	
23	GENUS	ER-1006-A	
24	GENUS	ER-1002-A	
25	GENUS	ER-1004-A	
26	ELSTER	ER-1295-A	KISHANGANJ(BSPTCL)
27	GENUS	ER-1158-A	
28	GENUS	ER-1156-A	
29	GENUS	ER-1157-A	
30	GENUS	ER-1287-A	NPGC(BSPTCL)
31	GENUS	ER-1282-A	
32	GENUS	ER-1052-A	OPGC
33	GENUS	ER-1063-A	
34	GENUS	ER-1027-A	
35	GENUS	ER-1112-A	
36	GENUS	ER-1026-A	
37	GENUS	ER-1030-A	
38	GENUS	ER-1053-A	
39	GENUS	ER-1066-A	
40	GENUS	ER-1068-A	
41	GENUS	ER-1060-A	
42	ELSTER	NR-3714-A	TEESTA-III
43	ELSTER	NR-3715-A	
44	ELSTER	NR-4450-A	
45	ELSTER	NR-3720-A	
46	ELSTER	NR-4623-A	
47	ELSTER	NR-3719-A	
48	ELSTER	NR-4456-A	
49	ELSTER	NR-4618-A	
50	ELSTER	NR-4454-A	
51	ELSTER	NR-4453-A	
52	GENUS	ER-1250-A	MOTIHARI(BSPTCL)
53	GENUS	ER-1245-A	
54	GENUS	ER-1286-A	MOTIPUR(BSPTCL)
55	GENUS	ER-1288-A	
56	GENUS	ER-1111-A	ATRI(GRIDCO)
57	GENUS	ER-1007-A	
58	GENUS	ER-1248-A	RAXAUL(BSPTCL)
59	GENUS	ER-1249-A	

16 New Locations with 68 Meters

S.No	MAKE	Meter Serial No	LOCATION
69	GENUS	ER-1290-A	APNRL
70	GENUS	ER-1135-A	BERHAMPORE(PG)
71	GENUS	ER-1140-A	
72	GENUS	ER-1265-A	BIHARSHARIFF(PG)
73	GENUS	ER-1108-A	BINAGURI(PG)
74	GENUS	ER-1102-A	
75	GENUS	ER-1076-A	
76	GENUS	ER-1128-A	
77	GENUS	ER-1125-A	
78	GENUS	ER-1106-A	BIRPARA(PG)
79	GENUS	ER-1109-A	
80	GENUS	ER-1110-A	
81	GENUS	ER-1071-A	DALKHOLA(PG)
82	GENUS	ER-1072-A	
83	GENUS	ER-1166-A	DARBHANGA(DMTCL)
84	GENUS	ER-1263-A	GAYA(PG)
85	GENUS	ER-1170-A	
86	GENUS	ER-1297-A	JAMSHEDPUR(PG)
87	GENUS	ER-1215-A	
88	GENUS	ER-1043-A	KHARAGPUR(WB)
89	GENUS	NR-4615-A	KISHANGANJ(PG)
90	GENUS	NR-4434-A	
91	GENUS	ER-1293-A	
92	GENUS	ER-1296-A	
93	GENUS	ER-1159-A	
94	GENUS	ER-1154-A	
95	GENUS	ER-1143-A	MALDA(PG)
96	GENUS	ER-1150-A	
97	GENUS	ER-1008-A	MEJIA(DVC)
98	GENUS	ER-1031-A	
99	GENUS	ER-1055-A	MIRAMUNDALI(GRIDCO)
100	GENUS	ER-1054-A	
101	GENUS	ER-1165-A	MOTIHARI(DMTCL)
102	GENUS	ER-1167-A	
103	GENUS	ER-1122-A	MPL
104	GENUS	ER-1123-A	
105	GENUS	ER-1124-A	
106	GENUS	ER-1129-A	
107	GENUS	ER-1226-A	MUZAFFARPUR(PG)
108	GENUS	ER-1299-A	NABINAGAR(BRBCL)
109	GENUS	ER-1292-A	
110	GENUS	ER-1294-A	
111	ELSTER	NR-4620-A	NEW MELLI(PG)
112	ELSTER	NR-4621-A	
113	GENUS	ER-1099-A	PANDIABILI(PG)
114	L&T	NP-8052-A	
115	GENUS	ER-1175-A	PURNEA(PG)
116	GENUS	ER-1176-A	
117	GENUS	ER-1298-A	RAMCHANDARPUR(PG)
118	GENUS	ER-1020-A	RENGALI(PG)
119	GENUS	ER-1028-A	ROURKELA(PG)
120	GENUS	ER-1029-A	
121	GENUS	ER-1012-A	
122	GENUS	ER-1093-A	
123	GENUS	ER-1100-A	
124	GENUS	ER-1019-A	
125	GENUS	ER-1118-A	
126	GENUS	ER-1022-A	
127	GENUS	ER-1021-A	

25 Existing Locations with 68 Meters

60	GENUS	ER-1113-A	SAMANGARA(GRIDCO)		128	GENUS	ER-1023-A	SUNDERGARH(PG)	
61	GENUS	ER-1073-A			129	GENUS	ER-1117-A		
62	GENUS	ER-1223-A	SAMASTIPUR(BSPTCL)		130	GENUS	ER-1119-A		
63	GENUS	ER-1121-A	EMSS(CESC)		131	GENUS	ER-1062-A		
64	GENUS	ER-1126-A			132	GENUS	ER-1067-A		
65	GENUS	ER-1227-A	BETIAH(BSPTCL)		133	GENUS	ER-1061-A		
66	GENUS	ER-1173-A			134	GENUS	ER-1070-A		
67	GENUS	ER-1116-A	BHOGRAI(GRIDCO)		135	GENUS	ER-1065-A		
68	GENUS	ER-1114-A	JALESWAR(GRIDCO)		136	GENUS	ER-1064-A		

Approximate cost for integrating 150 new meters with AMR (by taking 20% escalation from the AMR Phase-2 PO (LOA Ref # ER-II/KOL/CS/I-1352/P-1398 Dated 27.10.2016**))**

Supply Portion

SL No.	Line Item	Unit	Qty (Old LOA)	New Qty	Unit Price in old LOA	New Unit price (20% escalation)	Total Price
1	Supply of all required hardware along with Accessories	per SEM	249	150	874	1048.8	157320
2	Armored RS-485 Cable	mtr	14000	8500	90	108	918000
3	PVC pipes of ISI make min dia 50 mm or higher	mtr	16148	3700	84	100.8	372960
4	Data Concentrator Unit	no	37	22	90000	108000	2376000
5	MOXA Converter	no	37	27	4091	4909.2	132548.4
						Total	**3956828.4**

Service Portion

SL No.	Line Item	Qty (Old LOA)	New Qty	Unit Price in old LOA	New Unit price (20% escalation)	Total Price
1	Installation , Testing and commissioning Including integration with ERLDC / customization Cost for works of Implementation of Automatic Meter Reading (AMR) for SEM in Eastern Region At Data Center	249	150	5858	7029.6	1054440
2	Installation , Testing and commissioning Including integration with ERLDC / customization Cost for works of Implementation of Automatic Meter Reading (AMR) for SEM in Eastern Region At Sub Station	249	150	7500	9000	1350000
3	Laying of Armored RS-485 cable in PVC pipe	14000	8500	22.9	27.48	233580
					Total	**2638020**

AMC Portion

SL No.	Line Item	Qty (Old LOA)	New Qty	Unit Price in old LOA	New Unit price (20% escalation)	Total Price
1	Comprehensive AMC for all hardware /software/ Equipment installed under this project for 1st year After warranty (per SEM) -KIOSK type Sub Station	249	150	3306	3967.2	595080
2	Comprehensive AMC for all hardware /software/ Equipment installed under this project for 2nd year After warranty (per SEM) -KIOSK type Sub Station	249	150	3637	4364.4	654660
3	Comprehensive AMC for all hardware /software/ Equipment installed under this project for 3rd year After warranty (per SEM) -KIOSK type Sub Station	249	150	4001	4801.2	720180
4	Comprehensive AMC for all hardware /software/ Equipment installed under this project for 4th year After warranty (per SEM) -KIOSK type Sub Station	249	150	4401	5281.2	792180
					Total	**2762100**

Total cost for Supply	3956828
Total cost for Service	2638020
Total cost for AMC	2762100
Total	**9356948**

Date of Commercial Operation(DOCO) of the Asstes

Annexure-B37

A	Split Bus arrangment for various substation in Eastern Region	DOCO	Approved Cost	Standing Committee Reference	RPC Meeting Reference	Sharing of Charges
01	Split Bus arrangment with tie line breaker for 400kV Biharsharif Substation	15/05/17	Rs.135.16 Cr.(including IDC of Rs.5.14 Cr.).	SCM meeting of ER on 20.09.10.	15th ERPC meeting on 28.09.10	As per New Sharing methodology of PoC
B	**Eastern Region Strengthening Scheme-VII**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	2nos 400kV line bays at Purulai PPSP(New) of West Bengal	26/07/17	Rs.71.35 Cr.(including IDC of Rs.3.96 Cr.).	SCM meeting of ER on 08.02.12	21st ERPC Meeting at Kolkata on 21.04.14	As per New Sharing methodology of PoC
C	**Eastern Region Strengthening Scheme-IX**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	Installation of 2x125MVAR Bus Reactor and associated 400kV bays at Rengali Sub station	03/08/17	Rs.196.58 Cr.(including IDC of Rs.10.65 Cr.).	SCM meeting of ER on 05.01.13.	22nd ERPC Meeting on 25.08.12 & 24th ERPC meeting on 27.04.13	As per New Sharing methodology of PoC
02	Installation of 125 MVAR Bus Reactor in parallel with existing 50 (3x16.67) MVAR Bus Reactor at Biharsharif S/S using existing 400kV reactor bay.	13/10/17				
03	Replacement of 1 no. of 1x315 MVA,400/220 kV ICT with 1x500 MVA,400/220kV ICT(2nd) at Maithon Substation	25/10/17				
04	Installation of 125 MVAR Bus Reactor after replacing existing 50 MVAR Bus Reactor II at Jamshedpur S/S using existing 400kV reactor bay	17/11/17				
05	Installation of 125 MVAR Bus Reactor in parallel with existing 50 MVAR Bus Reactor I at Jamshedpur S/S using existing 400kV reactor bay	03/12/17				
D	**Transmission System for Development of Pooling Station in Northern Region Part of West Bengal and Transfer of Power from BHUTAN to NR/WR**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	LILO of 220kV D/C Birpara-Salakati Transmission line along-with associated bays at HVDC terminal at Alipurdwar	21/09/17	Rs.4404.57 Cr.(including IDC of Rs. 383.38 Cr.).	6th, 8th , 10th , 11th, & 16th SCM meeting of ER on 22.06.06,05.11.07,14.09.09,20 .09.10&02.05.14 respectively.	-	As per New Sharing methodology of PoC
02	315 MVA 400/220/332kV ICT-II along-with assocaited bays at HVDC terminal at Alipurdwar	21/09/17				
03	LILO of 400kV D/C Binaguri(Siliguri)-Bongaigaon Transmission line(quad) along-with associated bays at HVDC terminal at Alipurdwar	21/09/17				
04	315 MVA 400/220/332kV ICT-I along-with assocaited bays at HVDC terminal at Alipurdwar	21/09/17				
05	125 MVAR Bus Reactor-I(BR-I) along-with assocated bays at HVDC terminal at Alipurdwar	21/09/17				
06	125 MVAR Bus Reactor-II(BR-II) along-with assocated bays at HVDC terminal at Alipurdwar	21/09/17				
07	800kV Multi terminal HVDC Agra-Alipurduar-Biswanath Chariali Pole-3 at Agra & APD along-with associated bays	21/09/17				
08	800kV Multi terminal HVDC Agra-Alipurduar-Biswanath Chariali Pole-4 at Agra & APD along-with associated bays	21/09/17				
E	**Eastern Region Strengthening Scheme-XII**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	1 no. 500 MVA Single Phase Spare unit of 765/400kV ICT(Cold Spare) for Eastern Region to be stationed at Angul Sub-station	25/09/17	Rs.522.29 Cr.(including IDC	2nd 2013 SCM meeting of ER	25th ERPC meeting on 21.09.13	As per New Sharing

02	Shifting of 1x315 MVA, 400/220kV ICT from any suitable location (after replacement by 1x500 MVA ICT) and install it at Jamshedpur 400/220Kv Substation as 3rd ICT along-with associated bays	16/12/17	of Rs.33.24 Cr.).	on 27.08.13.	25th ERPC meeting on 21.09.13	methodology of PoC
F	**Eastern Region Strengthening Scheme-III**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	Installation of 1x500 MVA 400/220kV ICT-II and associated bays at Pandiabili GIS Substation	19/11/17	Rs. 1512.08 Cr. (including IDC of Rs. 96.92 Cr.).	08/11/2008 at Bhubaneswar	Special(9th) ERPC meeting on 30/12/2008 & 10th ERPC meeting on 11/04/2009 at Port Blair	As per New Sharing methodology of PoC
G	**POWERGRID works associated with common transmission system for Phase II Generation Projects in Odisha**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	2nos 400kV GIS Line bays at Jharsuguda(Sundargarh) Substation for termination of OPGC(IBTPS)-Jharsuguda(Sundargarh) 400 Kv D/C Line(Line under TBCB)	22/11/17	Rs. 844.64 Cr. (including IDC of Rs. 50.27 Cr.).	16th SCM meeting of ER on 02.05.14 & 17th SCM of ER on 25.05.15	24th ERPC meeting on 27.04.13 & 30th ERPC meeting on 20.06.15	As per New Sharing methodology of PoC
02	Split Bus arrangement at 400 Kv Bus at Sundargarh Substation with GIS	22/11/17				
H	**Eastern Region Strengthening Scheme-XIV**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
01	Modification of 132kV bus arrangement including switchgear to Double Main(DM) Scheme with GIS at 220/132kV Birpara Substation	31/10/17	Rs. 167.01 Cr. (including IDC of Rs. 10.09 Cr.).	16th SCM meeting of ER on 02/05/2014 at NRPC, New Delhi	26th ERPC meeting on 18.01.14 & 27th ERPC meeting on 31.05.14	As per New Sharing methodology of PoC
I	**Establishment of Communication System under Expension/Upgradation of SCADA/EMS system at SLDC of Eastern Region (DVC)**	**DOCO**	**Approved Cost**	**Standing Committee Reference**	**RPC Meeting Reference**	**Sharing of Charges**
a)	**31 nos. OPGW Fibre Optic Cable on EHV Transmission Line links**					
01	Howrah (DVC)-Belmuri	10/10/17				
02	MTPS A-Barjora	10/10/17				
03	Durgapur(DVC)-Mejia	10/10/17				
04	Durgapur - Parulia	10/10/17				
05	DTPS - Jamuria	10/10/17				
06	DTPS - Kalipahari	10/10/17				
07	Burddwan – DTPS(Waria)	10/10/17				
08	Belmuri-Burdwan	10/10/17				
09	DTPS(Waria)-ASP	10/10/17				
10	CTPS-Baida	10/10/17				
11	CTPS-Purulia	10/10/17				

Annexure-C1

FGD PLANNED- ER

Sr. No.	Developer	Name of Project	Sector	State	Region	Prime Mover	Unit No	Total Capacity	DT-of COMMISSIONING (MM/DD/YYYY)	Age in years	Type of Fuel	FGD Phasing Plan for Implementation (MM/DD/YYYY)	ESP Phasing plan for implementation (MM/DD/YYYY)	Remarks
1	NTPC	BARH II	Central Sector	Bihar	ER	Steam	4	660	**20/11/2013**	4	COAL	9/30/2021		FGD POSSIBLE
2	NTPC	BARH II	Central Sector	Bihar	ER	Steam	5	660	**04/03/2015**	2	COAL	3/31/2022		FGD POSSIBLE
3	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	1	210	**31/03/1992**	25	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
4	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	2	210	**17/03/1994**	23	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
5	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	3	210	**24/03/1995**	22	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
6	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	4	210	**18/03/1996**	21	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
7	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	5	500	**31/03/2007**	10	COAL	12/31/2022		FGD POSSIBLE
8	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	6	500	**16/03/2008**	9	COAL	12/31/2022		FGD POSSIBLE
9	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	Steam	7	500	**31/07/2009**	8	COAL	12/31/2022		FGD POSSIBLE
10	NTPC	NABI NAGAR TPP	Central Sector	Bihar	ER	Steam	1	250	**20/03/2016**	1	COAL	12/31/2021		FGD POSSIBLE
11	NTPC	NABI NAGAR TPP	Central Sector	Bihar	ER	Steam	2	250	**04/04/2017**	0	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
12	NTPC & Bihar	MUZAFFARPUR TPS	Central Sector	Bihar	ER	Steam	3	195	**31/03/2015**	2	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
13	NTPC & Bihar	MUZAFFARPUR TPS	Central Sector	Bihar	ER	Steam	4	195	**24/03/2017**	0	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
14	Adhunik Power&Natural Resourc	MAHADEV PRASAD STPP	Private Sector	Jharkhand	ER	Steam	1	270	**19/11/2012**	5	COAL	6/30/2022		FGD POSSIBLE
15	Adhunik Power&Natural Resourc	MAHADEV PRASAD STPP	Private Sector	Jharkhand	ER	Steam	2	270	**29/03/2013**	4	COAL	6/30/2022		FGD POSSIBLE
16	D.V.C	BOKARO `A` TPS	Central Sector	Jharkhand	ER	Steam	1	500	**22/03/2016**	1	COAL	6/30/2022	6/30/2022	FGD POSSIBLE
17	D.V.C	CHANDRAPURA(DVC)	Central Sector	Jharkhand	ER	Steam	7	250	**04/11/2009**	8	COAL	12/31/2022		FGD POSSIBLE
18	D.V.C	CHANDRAPURA(DVC)	Central Sector	Jharkhand	ER	Steam	8	250	**31/03/2010**	7	COAL	12/31/2022		FGD POSSIBLE
19	D.V.C	KODARMA TPP	Central Sector	Jharkhand	ER	Steam	1	500	**20/07/2011**	6	COAL	12/31/2021		FGD POSSIBLE
20	D.V.C	KODARMA TPP	Central Sector	Jharkhand	ER	Steam	2	500	**15/02/2013**	4	COAL	12/31/2021		FGD POSSIBLE
21	TATA Power Co.	JOJOBERA TPS	Private Sector	Jharkhand	ER	Steam	2	120	**02/01/2001**	16	COAL	12/31/2021		FGD POSSIBLE
22	TATA Power Co.	JOJOBERA TPS	Private Sector	Jharkhand	ER	Steam	3	120	**02/01/2002**	15	COAL	12/31/2021		FGD POSSIBLE
23	TATA Power Co. MPL	MAITHON RB TPP	Private Sector	Jharkhand	ER	Steam	1	525	**01/09/2011**	6	COAL	9/30/2021		FGD POSSIBLE
24	TATA Power Co.MPL	MAITHON RB TPP	Private Sector	Jharkhand	ER	Steam	2	525	**24/07/2012**	5	COAL	6/30/2022		FGD POSSIBLE
25	TenughatVN Ltd	TENUGHAT TPS	State Sector	Jharkhand	ER	Steam	1	210	**14/04/1994**	23	COAL	12/31/2020	12/31/2020	FGD POSSIBLE
26	TenughatVN Ltd	TENUGHAT TPS	State Sector	Jharkhand	ER	Steam	2	210	**10/10/1996**	21	COAL	12/31/2020		FGD POSSIBLE
27	GMR	KAMALANGA TPS	Private Sector	Odisha	ER	Steam	1	350	**29/03/2013**	4	COAL	12/31/2021		FGD POSSIBLE
28	GMR	KAMALANGA TPS	Private Sector	Odisha	ER	Steam	2	350	**28/09/2013**	4	COAL	12/31/2021		FGD POSSIBLE
29	GMR	KAMALANGA TPS	Private Sector	Odisha	ER	Steam	3	350	**21/03/2014**	3	COAL	9/30/2021		FGD POSSIBLE
30	Ind barath	IND BARATH TPP	Private Sector	Odisha	ER	Steam	1	350	**25/02/2016**	1	COAL	3/31/2022	3/31/2022	FGD POSSIBLE
31	JIPL	DERANG TPP	Private Sector	Odisha	ER	Steam	1	600	**10/04/2014**	3	COAL	3/31/2021		FGD POSSIBLE
32	JIPL	DERANG TPP	Private Sector	Odisha	ER	Steam	2	600	**24/01/2015**	2	COAL	3/31/2021		FGD POSSIBLE
33	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	1	500	**19/02/1995**	22	COAL	12/31/2022		FGD POSSIBLE
34	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	2	500	**27/03/1996**	21	COAL	12/31/2022		FGD POSSIBLE
35	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	3	500	**21/02/2003**	14	COAL	12/31/2022		FGD POSSIBLE
36	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	4	500	**25/10/2003**	14	COAL	12/31/2022		FGD POSSIBLE
37	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	5	500	**13/05/2004**	13	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
38	NTPC	TALCHER STPS	Central Sector	Odisha	ER	Steam	6	500	**06/02/2005**	12	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
39	OPGCLtd	IB VALLEY TPS	State Sector	Odisha	ER	Steam	1	210	**02/06/1994**	23	COAL	9/30/2021	9/30/2021	FGD POSSIBLE
40	OPGCLtd	IB VALLEY TPS	State Sector	Odisha	ER	Steam	2	210	**22/10/1995**	22	COAL	9/30/2021	9/30/2021	FGD POSSIBLE
41	Sterlite Energy Ltd	STERLITE TPP	Private Sector	Odisha	ER	Steam	2	600	**29/12/2010**	6	COAL	3/31/2022		FGD POSSIBLE
42	C.E.S.C. Pvt.	BUDGE BUDGE TPS	Private Sector	West Bengal	ER	Steam	1	250	**16/09/1997**	20	COAL	12/31/2022		FGD POSSIBLE
43	C.E.S.C. Pvt.	BUDGE BUDGE TPS	Private Sector	West Bengal	ER	Steam	2	250	**06/03/1999**	18	COAL	12/31/2022		FGD POSSIBLE

44	C.E.S.C. Pvt.	BUDGE BUDGE TPS	Private Sector	West Bengal	ER	Steam	3	250	**29/09/2009**	8	COAL	12/31/2022		FGD POSSIBLE
45	C.E.S.C. Pvt.	SOUTHERN REPL. TPS	Private Sector	West Bengal	ER	Steam	1	68	**10/04/1991**	26	COAL	3/31/2022		FGD POSSIBLE
46	C.E.S.C. Pvt.	SOUTHERN REPL. TPS	Private Sector	West Bengal	ER	Steam	2	68	**12/08/1990**	27	COAL	12/31/2021		FGD POSSIBLE
47	D.P.L.	D.P.L. TPS	State Sector	West Bengal	ER	Steam	6	110	**03/07/1985**	32	COAL	3/31/2022	3/31/2022	FGD POSSIBLE
48	D.P.L.	D.P.L. TPS	State Sector	West Bengal	ER	Steam	7	300	**24/11/2007**	10	COAL	6/30/2022	6/30/2022	FGD POSSIBLE
49	D.P.L.	D.P.L. TPS EXT.	State Sector	West Bengal	ER	Steam	8	250	**31/03/2014**	3	COAL	3/31/2022	3/31/2022	FGD POSSIBLE
50	D.V.C	DURGAPUR STEEL TPS	Central Sector	West Bengal	ER	Steam	1	500	**29/07/2011**	6	COAL	6/30/2021		FGD POSSIBLE
51	D.V.C	DURGAPUR STEEL TPS	Central Sector	West Bengal	ER	Steam	2	500	**23/03/2012**	5	COAL	6/30/2021		FGD POSSIBLE
52	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	1	210	**01/03/1996**	21	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
53	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	2	210	**24/03/1997**	20	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
54	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	3	210	**25/03/1998**	19	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
55	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	4	210	**12/10/2004**	13	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
56	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	5	250	**01/10/2007**	10	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
57	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	6	250	**31/03/2007**	10	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
58	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	7	500	**30/09/2010**	7	COAL	9/30/2021	9/30/2021	FGD POSSIBLE
59	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	Steam	8	500	**26/03/2011**	6	COAL	9/30/2021	9/30/2021	FGD POSSIBLE
60	D.V.C	RAGHUNATHPUR TPP	Central Sector	West Bengal	ER	Steam	1	600	**24/08/2014**	3	COAL	3/31/2022		FGD POSSIBLE
61	D.V.C	RAGHUNATHPUR TPP	Central Sector	West Bengal	ER	Steam	2	600	**18/01/2016**	1	COAL	3/31/2022		FGD POSSIBLE
62	M/s Haldia Energy Limited	HALDIA TPP	Private Sector	West Bengal	ER	Steam	1	300	**14/01/2015**	2	COAL	12/31/2022		FGD POSSIBLE
63	M/s Haldia Energy Limited	HALDIA TPP	Private Sector	West Bengal	ER	Steam	2	300	**16/02/2015**	2	COAL	12/31/2022		FGD POSSIBLE
64	Bishagarh Power Co.	India Power TPP	Private Sector	West Bengal	ER	Steam	1	150	**07/06/2017**	0	COAL	3/31/2022		FGD POSSIBLE
65	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	1	200	**01/01/1986**	31	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
66	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	2	200	**24/12/1986**	31	COAL	12/31/2022		FGD POSSIBLE
67	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	3	200	**06/08/1987**	30	COAL	12/31/2022		FGD POSSIBLE
68	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	4	500	**25/09/1992**	25	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
69	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	5	500	**16/02/1994**	23	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
70	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	Steam	6	500	**07/03/2011**	6	COAL	12/31/2022	12/31/2022	FGD POSSIBLE
71	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	1	210	**16/01/1993**	24	COAL	6/30/2022	6/30/2022	FGD POSSIBLE
72	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	2	210	**13/08/1990**	27	COAL	3/31/2021	3/31/2021	FGD POSSIBLE
73	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	3	210	**16/12/1985**	32	COAL	9/30/2021	9/30/2021	FGD POSSIBLE
74	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	4	210	**24/01/1984**	33	COAL	3/31/2022	3/31/2022	FGD POSSIBLE
75	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	5	210	**28/12/1993**	24	COAL	6/30/2021	6/30/2021	FGD POSSIBLE
76	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	Steam	6	210	**17/03/1991**	26	COAL	12/31/2021	12/31/2021	FGD POSSIBLE
77	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	Steam	1	300	**20/07/2008**	9	COAL	12/31/2020	12/31/2020	FGD POSSIBLE
78	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	Steam	2	300	**21/12/2007**	10	COAL	3/31/2021	3/31/2021	FGD POSSIBLE
79	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	Steam	3	500	**14/12/2015**	2	COAL	3/31/2022		FGD POSSIBLE
80	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	Steam	4	500	**15/12/2016**	1	COAL	3/31/2020		FGD POSSIBLE
81	WBPDC	SANTALDIH TPS	State Sector	West Bengal	ER	Steam	5	250	**07/11/2007**	10	COAL	3/31/2021	3/31/2021	FGD POSSIBLE
82	WBPDC	SANTALDIH TPS	State Sector	West Bengal	ER	Steam	6	250	**29/06/2011**	6	COAL	12/31/2021	12/31/2021	FGD POSSIBLE

27715 MW -82 Units

ESP UPGRADATION PLAN AVAILABLE

S. NO.	Developer	Name of Project	Sector	State	Region	Unit No	Total Capacity	DT-of COMMISSIONING (MM/DD/YYYY)	Age in years	FGD Phasing Plan for Implementation (DD/MM/YYYY)	ESP Phasing plan for implementation (DD/MM/YYYY)	Remarks
1	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	1	210	**31/03/1992**	25	31/12/2022	31/12/2022	FGD POSSIBLE
2	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	2	210	**17/03/1994**	23	31/12/2022	31/12/2022	FGD POSSIBLE
3	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	3	210	**24/03/1995**	22	31/12/2022	31/12/2022	FGD POSSIBLE
4	NTPC	KAHALGAON TPS	Central Sector	Bihar	ER	4	210	**18/03/1996**	21	31/12/2022	31/12/2022	FGD POSSIBLE
5	NTPC	NABI NAGAR TPP	Central Sector	Bihar	ER	2	250	**04/04/2017**	0	31/12/2022	31/12/2022	FGD POSSIBLE
6	NTPC & Bihar	MUZAFFARPUR TPS	Central Sector	Bihar	ER	3	195	**31/03/2015**	2	31/12/2022	31/12/2022	FGD POSSIBLE
7	NTPC & Bihar	MUZAFFARPUR TPS	Central Sector	Bihar	ER	4	195	**24/03/2017**	0	31/12/2022	31/12/2022	FGD POSSIBLE
8	D.V.C	BOKARO `A` TPS	Central Sector	Jharkhand	ER	1	500	**22/03/2016**	1	30/06/2022	30/06/2022	FGD POSSIBLE
9	TenughatVN Ltd	TENUGHAT TPS	State Sector	Jharkhand	ER	1	210	**14/04/1994**	23	31/12/2020	31/12/2020	FGD POSSIBLE
10	Ind barath	IND BARATH TPP	Private Sector	Odisha	ER	1	350	**25/02/2016**	1	31/03/2022	31/03/2022	FGD POSSIBLE
11	NTPC	TALCHER STPS	Central Sector	Odisha	ER	5	500	**13/05/2004**	13	31/12/2022	31/12/2022	FGD POSSIBLE
12	NTPC	TALCHER STPS	Central Sector	Odisha	ER	6	500	**06/02/2005**	12	31/12/2022	31/12/2022	FGD POSSIBLE
13	OPGCLtd	IB VALLEY TPS	State Sector	Odisha	ER	1	210	**02/06/1994**	23	30/09/2021	30/09/2021	FGD POSSIBLE
14	OPGCLtd	IB VALLEY TPS	State Sector	Odisha	ER	2	210	**22/10/1995**	22	30/09/2021	30/09/2021	FGD POSSIBLE
15	D.P.L.	D.P.L. TPS	State Sector	West Bengal	ER	6	110	**03/07/1985**	32	31/03/2022	31/03/2022	FGD POSSIBLE
16	D.P.L.	D.P.L. TPS	State Sector	West Bengal	ER	7	300	**24/11/2007**	10	30/06/2022	30/06/2022	FGD POSSIBLE
17	D.P.L.	D.P.L. TPS EXT.	State Sector	West Bengal	ER	8	250	**31/03/2014**	3	31/03/2022	31/03/2022	FGD POSSIBLE
18	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	1	210	**01/03/1996**	21	31/12/2022	31/12/2022	FGD POSSIBLE
19	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	2	210	**24/03/1997**	20	31/12/2022	31/12/2022	FGD POSSIBLE
20	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	3	210	**25/03/1998**	19	31/12/2022	31/12/2022	FGD POSSIBLE
21	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	4	210	**12/10/2004**	13	31/12/2022	31/12/2022	FGD POSSIBLE
22	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	5	250	**01/10/2007**	10	31/12/2022	31/12/2022	FGD POSSIBLE
23	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	6	250	**31/03/2007**	10	31/12/2022	31/12/2022	FGD POSSIBLE
24	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	7	500	**30/09/2010**	7	30/09/2021	30/09/2021	FGD POSSIBLE
25	D.V.C	MEJIA TPS	Central Sector	West Bengal	ER	8	500	**26/03/2011**	6	30/09/2021	30/09/2021	FGD POSSIBLE
26	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	1	200	**01/01/1986**	31	31/12/2022	31/12/2022	FGD POSSIBLE
27	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	4	500	**25/09/1992**	25	31/12/2022	31/12/2022	FGD POSSIBLE
28	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	5	500	**16/02/1994**	23	31/12/2022	31/12/2022	FGD POSSIBLE
29	NTPC	FARAKKA STPS	Central Sector	West Bengal	ER	6	500	**07/03/2011**	6	31/12/2022	31/12/2022	FGD POSSIBLE
30	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	1	210	**16/01/1993**	24	30/06/2022	30/06/2022	FGD POSSIBLE
31	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	2	210	**13/08/1990**	27	31/03/2021	31/03/2021	FGD POSSIBLE
32	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	3	210	**16/12/1985**	32	30/09/2021	30/09/2021	FGD POSSIBLE
33	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	4	210	**24/01/1984**	33	31/03/2022	31/03/2022	FGD POSSIBLE
34	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	5	210	**28/12/1993**	24	30/06/2021	30/06/2021	FGD POSSIBLE
35	WBPDC	KOLAGHAT TPS	State Sector	West Bengal	ER	6	210	**17/03/1991**	26	31/12/2021	31/12/2021	FGD POSSIBLE
36	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	1	300	**20/07/2008**	9	31/12/2020	31/12/2020	FGD POSSIBLE
37	WBPDC	SAGARDIGHI TPS	State Sector	West Bengal	ER	2	300	**21/12/2007**	10	31/03/2021	31/03/2021	FGD POSSIBLE
38	WBPDC	SANTALDIH TPS	State Sector	West Bengal	ER	5	250	**07/11/2007**	10	31/03/2021	31/03/2021	FGD POSSIBLE
39	WBPDC	SANTALDIH TPS	State Sector	West Bengal	ER	6	250	**29/06/2011**	6	31/12/2021	31/12/2021	FGD POSSIBLE

11020 MW 39 UNITS

Annexure

Name of the Element	Power Flow	
	Before	After
Bus I & III (Maithon A)		
400 KV Maithon-Mejia I,II	27 each (Mejia)	162 each (Maithon)
400 KV Maithon-Kahalgaon II	69 (Maithon)	189 (Maithon)
400 KV Maithon-Jamshedpur	168 (Jamshedpur)	108 (Maithon)
400 KV Maithon-Gaya D/c	228 each (Gaya)	126 each (Gaya)
2*500 MVA ICT at Maithon	374	248
Bus II & IV (Maithon B)		
400 KV Maithon-MPL D/c	360 each (Maithon)	314 each (Maithon)
400 KV Maithon-Raghunathpur	194 (Maithon)	70 (Maithon)
400 KV Maithon-Ranchi	66 (Ranchi)	112 (Ranchi)
400 KV Maithon-Durgapur D/c	36 (Maithon)	112 each (Durgapur)
400 KV Maithon-Kahalgaon I	69 (Maithon)	22 (Kahalgaon)
400 KV Maithon-Mejia III	22 (Mejia)	342 (Mejia)

Changes in 220 KV Network		
220 KV Maithon-Dhanbad D/c	134 each (Dhanbad)	125 each (Dhanbad)
220 KV Maithon-Kalyaneshwari D/c	39 each (Kalyaneshwari)	10 each (Maithon)
220 KV Mejia-Kalyaneshwari T/c	86 each (Kalyaneshwari)	110 each (Kalyaneshwari)
220 KV Kalyaneshwari-CTPS A	65 (CTPS A)	60 (CTPS A)
220 KV Dhanbad-CTPS B	41 each (CTPS B)	30 each (CTPS B)
220 KV CTPS A-CTPS B	195 each (CTPS A)	200 each (CTPS A)

Note: Direction of power flow is towards S/s mentioned in parenthesis

Voltage Changes		Bus I & III		Bus II & IV	
		Bus I	Bus III	Bus II	Bus IV
	Before Splitting	415 KV	417 KV	412 KV	414 KV
	After Splitting	414 KV	411 KV	419 KV	416 KV

Minor voltage difference between connected buses is due to measurement errors

Annexure - C7.1

STATUS OF REACTIVE CHARGES

RECEIVABLE IN ER POOL AS PER PUBLISHED A/C UPTO 21.01.18 (2017 -18)
AS ON 06.02.18

CONSTITUENT	AMOUNT RECEIVABLE IN THE POOL (Rs.)	AMOUNT RECEIVED IN THE POOL (Rs.)	TOTAL OUTSTANDING(Rs.)
BSPHCL	378537	378537	0
JSEB	1137688	1137688	0
DVC	357122	357122	0
GRIDCO	235533541	231414556	4118985
WBSETCL	525917884	500268147	25649737
SIKKIM	502926	325817	177109
TOTAL	763827698	733881867	29945831

Note: (+ve) means payable by utility & (-ve) means receivable by utility

Annexure - C7.2

SUMMARY OF RRAS CHARGE RECEIPT AND PAYMENT STATUS

BILL from 03.04.17 to 21.01.18 (upto Week - 42 of 2017 - 18)
Last Payment Disbursement Date -06.02.18

Figures in Rs. Lakhs

CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
FSTPP STG-I & II	358.99724	357.46082	4910.92856	4874.05035	**-35.34179**
FSTPP STG-III	9.89411	8.15645	641.57757	631.18344	**-8.65647**
KhSTPP STG-I	223.07371	220.14860	2695.00135	2665.46803	**-26.60821**
KhSTPP STG-II	88.10747	88.02270	7708.79661	7632.25068	**-76.46117**
TSTPP STG-I	136.18211	135.92269	327.66223	327.66223	**0.25943**
BARH STG-II	475.35635	463.46420	4387.40998	4316.64479	**-58.87304**
BRBCL (Nabinagar)	16.24978	16.24978	1742.33265	1713.81262	**-28.52003**
TOTAL	**1307.86076**	**1289.42523**	**22413.70895**	**22161.07214**	**-234.20128**

% Realization **98.59** **As on** **06.02.18**

Receivable: Receivable by ER POOL Payable Payable by ER POOL

Received Received by ER POOL Paid Paid by ER POOL

"- ve" Payable by ER pool "+ ve" Receivable by ER pool

Annexure - C7.3

SUMMARY OF CONGESTION CHARGE RECEIPT AND PAYMENT STATUS

Bill upto 07.01.2013
Last Payment Disbursement Date - 13.05.2013

Figures in Rs. Lakhs

CONSTITUENTS	Receivable	Received	Payable	Paid	Outstanding
BSEB	0.67823	0.67823	0.39118	0.39118	0.00000
JSEB	16.37889	16.37889	2.61323	2.61323	0.00000
DVC	0.00000	0.00000	6.24040	6.24040	0.00000
GRIDCO	5.34488	5.34488	0.00000	0.00000	0.00000
WBSETCL	0.00000	7.42249	4.32834	11.75083	0.00000
SIKKIM	0.65609	6.20909	0.00000	5.55300	0.00000
NTPC	6.93152	6.93152	7.42249	7.42249	0.00000
NHPC	0.70445	0.70445	0.05875	0.05875	0.00000
MPL	4.81694	4.81694	0.85169	0.85169	0.00000
STERLITE	7.70504	7.70504	0.00000	0.00000	0.00000
Pool Balance	0.00000	0.00000	21.30996	21.30996	0.00000
TOTAL	**43.21604**	**56.19153**	**43.21604**	**56.19153**	0.00000

% Realization **As on 31.05.2015**

Receivable:	Receivable by ER POOL	Payable	Payable by ER POOL
Received	Received by ER POOL	Paid	Paid by ER POOL

"- ve" Payable by ER pool "+ ve" Receivable by ER pool

Annexure - C7.4

DETAILS OF DISBURSEMENT TO POWER SYSTEM DEVELOPMENT FUND

Sl No	Nature of Amount	Amount transferred to PSDF (Rs in Lac)	Date of Disbursement	Cheque No	Remarks
1	**Opening Balance (upto 31.03.16)**	**86464.58111**			
2	Addl. Dev	83.33978	01.04.16		Addl Dev Charge 15-16
3	Addl. Dev	43.77416	05.04.16		Addl Dev Charge 15-16
4	Addl. Dev	31.83984	07.04.16		Addl Dev Charge 15-16
5	Addl. Dev	52.08622	11.04.16		Addl Dev Charge 15-16
6	Addl. Dev	107.23773	13.04.16		Addl Dev Charge 15-16
7	Addl. Dev	220.15330	19.04.16		Addl Dev Charge 15-16
8	Addl. Dev	76.84824	21.04.16		Addl Dev Charge 15-16
9	Addl. Dev	20.84026	26.04.16		DSM Interest 2014-15(Paid by APNRL)
10	Addl. Dev	10.01920	26.04.16		Addl Dev Charge 16-17
16	Addl. Dev	432.25696	28.04.16		Addl Dev Charge 16-17
17	Addl. Dev	117.08707	02.05.16		Addl Dev Charge 16-17
18	Addl. Dev	41.65418	04.05.16		Addl Dev Charge 16-17
19	Addl. Dev	114.33049	06.05.16		Addl Dev Charge 15-16 & 16-17
20	Deviation Interest	38.50018	06.05.16		Deviation Interest
21	Addl. Dev	35.54178	10.05.16		Addl Dev Charge 16-17
22	Addl. Dev	448.87953	31.05.16		Addl Dev Charge 16-17
23	Addl. Dev	170.51274	29.06.16		Addl Dev Charge 16-17
24	Reactive Charges	530.57497	28.09.16		Reactive Charges_15-16
25	Reactive Charges	1000.00000	26.12.16		Reactive Charges_16-17
26	Reactive Charges	779.39811	14.02.17		Reactive Charges_16-17
27	Reactive Charges	500.00000	29.03.17		Reactive Charges_16-17
28	Reactive Charges	203.61904	26.04.17		Reactive Charges_16-17
29	Reactive Charges	394.80618	30.05.17		Reactive Charges_16-17
30	Reactive Charges	256.53944	28.06.17		Reactive Charges_16-17
31	Reactive Energy Charge	248.26904	31.07.17		Reactive Charges_17-18
32	Reactive Energy Charge	128.44284	29.08.17		Reactive Charges_17-18
33	Reactive Energy Charge	103.22685	26.09.17		Reactive Charges_17-18
34	Reactive Energy Charge	249.14078	31.10.17		Reactive Charges_17-18
35	Reactive Energy Charge	172.20693	30.11.17		Reactive Charges_17-18
36	Reactive Energy Charge	200.00000	15.12.17		Reactive Charges_17-18
37	Reactive Energy Charge	100.00000	05.01.18		Reactive Charges_17-18
38	Reactive Energy Charge	558.45339	06.02.18		Reactive Charges_17-18
	Total	**93934.16034**			

Annexure-C8.1

	2016-17				2017-18		
DSM account Reconciliation Status of ER constituents and Inter Regional							
Name of The Utility	**Q1 (04.07.16)**	**Q2 (03.10.16)**	**Q3 (04.01.17)**	**Q4 (05.04.17)**	**Q1(04.07.17)**	**Q2(09.10.17)**	**Q3(08.01.18)**
Inter Regional							
WR	NO	NO	YES	NO	NO	NO	NO
SR	YES	YES	NO	YES	YES	NO	NO
NER	NO	NO	YES	YES	YES	NO	NO
NR	NO	NO	NO	NO	NO	NO	YES
Intra Regional							
BSPHCL	YES	YES	YES	YES	YES	NO	NO
JUVNL	YES	YES	YES	YES	YES	NO	NO
DVC	YES	YES	YES	YES	YES	NO	NO
GRIDCO	YES	YES	YES	YES	YES	YES	YES
WBSETCL	YES	YES	YES	YES	YES	YES	YES
SIKKIM	YES	YES	YES	NO	NO	NO	NO
NTPC	YES	YES	YES	YES	YES	YES	YES
NHPC	YES	YES	YES	YES	YES	YES	NO
MPL	YES	YES	YES	YES	YES	YES	YES
VEDANTA	NO	NO	NO	NO	N/A	N/A	N/A
APNRL	YES	YES	YES	YES	YES	YES	YES
CHUZACHEN(GATI)	YES	NO	YES	YES	YES	YES	YES
NVVN(Ind-Bng)	YES	YES	YES	YES	YES	YES	YES
NVVN(Ind-Nep)	YES	YES	YES	YES	YES	YES	YES
GMR	YES	YES	YES	YES	YES	NO	NO
JITPL	YES	YES	YES	YES	YES	YES	NO
INBEUL	NO	NO	NO	NO	NO	NO	NO
TPTCL (DAGACHU)	YES	YES	YES	YES	YES	NO	YES
JLHEP(DANS ENERGY)	YES	YES	YES	YES	YES	NO	NO
BRBCL	YES	YES	YES	YES	YES	YES	NO
POWERGRID (ER-I)	N/A	N/A	YES	YES	YES	YES	YES
POWERGRID (ER-II)	N/A	N/A	N/A	N/A	N/A	N/A	NO
TUL (TEESTA-III)	N/A	N/A	N/A	NO	NO	NO	NO
DIKCHU	N/A	N/A	N/A	N/A	YES	NO	YES
SHIGA (TASHIDING)	N/A	N/A	N/A	N/A	N/A	N/A	NO

Note:
(1)The dates in the bracket indicates the date of sending the Reconciliation statements by ERLDC to utilities.
(2) YES Indicates that signed reconciliation statement received by ERLDC
(3) NO Indicates that signed reconciliation statement is not received by ERLDC

Annexure-C8.5

Reconciliation Between Open Access department of ERLDC and SLDCs, STUs

Sl. No.	STUs / SLDCs Name	Apr-17	May-17	Jun-17	Quarter-II(Jul-17-Sep-17)	Quarter-III(Oct-17-Dec-17)
	Date of Issuance	17-May-17	15-Jun-17	14-Jul-17	Oct-17	Jan-18
1	West Bengal - SLDC and STU	YES	YES	YES	NO	NO
2	DVC - SLDC	YES	YES	YES	YES	NO
3	OPTCL-SLDC and STU	YES	YES	YES	YES	NO

ccess department of ERLDC and Applicants

Sl. No.	Applicants Name	Quarter-I(Apr-17-June-17)	Quarter-II(Jul-17-Sep-17)	Quarter-III(Oct-17-Dec-17)
	Date of Issuance	25-07-2017	17-10-2017	16-01-2018
1	Calcutta Electric Supply Company	YES	YES	YES
2	Maithon Power Limited	YES	NA	NO
3	GMR Kamalanga Energy Limited	YES	YES	NO
4	Jindal India Thermal Power Limited	YES	YES	YES
5	Jharkhand State Electricity Board	YES	NO	NO
6	SAIL Rourkela Steel Plant	NO	NO	NO
7	TATA Steel Ferro Alloy Plant Bamnipal	YES	YES	NA
8	TATA Steel Ferro Alloy Plant Joda	YES	YES	NA
9	Tata Steel Limited Kalinganagar	NO	NO	NA
10	West Bengal State Distribution Company Ltd.	YES	NO	NA

Access department of ERLDC and CTU

Sl. No.	STUs / SLDCs Name	Apr-17	May-17	Jun-17	Quarter-II(Jul-17-Sep-17)	Quarter-III(Oct-17-Dec-17)
	Date of Issuance	17-May-17	15-Jun-17	14-Jul-17	13-Oct-17	18-Jan-18
1	CTU(POWERGRID)	YES	NO	YES	YES	NO

Annexure-C11

List of drifted meters to be replaced in Phase-III

SNO	LOCATION	METER SNO	FEEDER NAME	Region
1	JEERAT(WB)	NP-6445-A	400 KV JEERAT (WBSETCL) - BERHAMPORE(PG)	ER-II
2	JEERAT(WB)	NP-6446-A	400 KV JEERAT (WBSETCL) - SUBHASGRAM	ER-II
3	RANCHI(PG)	NP-7853-A	400 KV RAGHUNATHPUR 1	ER-I
4	RANCHI(PG)	NP-7871-A	400 KV RAGHUNATHPUR 2	ER-I
5	ALIPURDUAR(PG)	NR-3716-A	400 KV POLE-3 MAIN BAY-AGRA(NR)	ER-II
6	ALIPURDUAR(PG)	NR-3718-A	400 KV POLE-3 TIE BAY AGRA(NR)	ER-II
7	NEW MELLI(PG)	NR-4620-A	220 KV JORETHANG(JLHEP)-1	ER-II
8	NEW MELLI(PG)	NR-4621-A	220 KV JORETHANG(JLHEP)-2	ER-II
9	TEESTA-III	NR-3714-A	400 KV SIDE OF TEEST-III HEP GT-1	ER-II
10	TEESTA-III	NR-3715-A	400 KV SIDE OF TEEST-III HEP GT-2	ER-II
11	TEESTA-III	NR-4450-A	400 KV SIDE OF TEEST-III HEP GT-3	ER-II
12	TEESTA-III	NR-3720-A	400 KV SIDE OF TEEST-III HEP GT-4	ER-II
13	TEESTA-III	NR-4623-A	400 KV SIDE OF TEEST-III HEP GT-5	ER-II
14	TEESTA-III	NR-3719-A	400 KV SIDE OF TEEST-III HEP GT-6	ER-II
15	TEESTA-III	NR-4456-A	400 KV TEESTA-III - DICKCHU (MAIN)	ER-II
16	TEESTA-III	NR-4618-A	400 KV TEESTA-III - DICKCHU (CHECK)	ER-II
17	TEESTA-III	NR-4454-A	400 KV TEESTA-III - RANGPO (MAIN)	ER-II
18	TEESTA-III	NR-4453-A	400 KV TEESTA-III - RANGPO (CHECK)	ER-II
19	JINDAL (GRIDCO)	NP-6502-A	220KV JAMSHEDPUR (DVC)	ODHISA PROJECT
20	JAMSHEDPUR (DVC)	NP-6010-B	220 KV JINDAL	ER-I
21	GANGTOK(PG)	NP-6026-A	132KV CHUZACHEN(GATI)	ER-II
22	RANGPO(PG)	NP-7958-A	132 KV CHUZACHEN (GATI)	ER-II

2nd Third Party Protection Audit:

2nd Third Party Protection Audit for Sub-stations of Eastern Region has been started from July, 2015. Till date (31st Jan 2018) the audit team has completed two nos 765kV, 32 nos of 400 kV, 4 nos 220kV and 11 nos 132kV Sub-stations. The list of substations is as follows:

1)	400kV Jeerat (PG)	Completed on 15th July 2015
2)	400kV Subashgram (PG)	Completed on 16th July 2015
3)	400kV Kolaghat TPS (WBPDCL)	Completed on 7th August 2015
4)	400/220kV Kharagpur (WBSETCL)	Completed on 7th August 2015
5)	400 &220kV Bidhannagar (WBSETCL)	Completed on 8th September, 2015
6)	400kV S/s Durgapur (PG)	Completed on 10th September, 2015
7)	400/220kV DSTPS(DVC)	Completed on 9th September, 2015
8)	400/220kV Mejia (DVC) TPS	Completed on 11th September, 2015
9)	400/220/132kV Mendhasal (OPTCL)	Completed on 2nd November, 2015
10)	400/220kV Talcher STPS (NTPC)	Completed on 3rd November, 2015
11)	765/400kV Angul (PG)	Completed on 4th November, 2015
12)	400kV JITPL	Completed on 5th November, 2015
13)	400kV GMR	Completed on 5th November, 2015
14)	400kV Malda (PG)	Completed on 23rd February, 2016
15)	400kV Farakka (NTPC)	Completed on 24th February, 2016
16)	400kV Behrampur(PG)	Completed on 25th February, 2016
17)	400kV Sagardighi (WBPDCL)	Completed on 25th February, 2016
18)	400kV Bakreswar (WBPDCL)	Completed on 26th February, 2016
19)	765kV Gaya(PG)	Completed on 1st November, 2016
20)	400kV Biharshariff(PG)	Completed on 3rd November, 2016
21)	220kV Biharshariff(BSPTCL)	Completed on 3rd November, 2016
22)	400kV Maithon (PG)	Completed on 18th May, 2017
23)	132kV Gola (DVC)	Completed on 17th May, 2017
24)	132kV Barhi (DVC)	Completed on 18th May, 2017
25)	132kV Koderma (DVC)	Completed on 18th May, 2017
26)	132kV Kumardhubi (DVC)	Completed on 19th May, 2017
27)	132kV Ramkanali (DVC)	Completed on 19th May, 2017
28)	220kV Ramchandrapur	Completed on 1st June, 2017
29)	400kV Jamshedpur (PG)	Completed on 1st June, 2017
30)	132kV Patherdih (DVC)	Completed on 31st May, 2017
31)	132kV Kalipahari (DVC)	Completed on 30th May, 2017
32)	132kV Putki (DVC)	Completed on 31st May, 2017
33)	132kV ASP (DVC)	Completed on 30th May, 2017
34)	132kV Mosabani (DVC)	Completed on 2nd June, 2017
35)	132kV Purulia (DVC)	Completed on 1st June, 2017
36)	400kV Jaypore(PG)	Completed on 2nd January, 2018
37)	220kV Jeynagar (OPTCL)	Completed on 2nd January, 2018
38)	400kV Indravati (PG)	Completed on 4th January, 2018
39)	400kV Indravati (OHPC)	Completed on 4th January, 2018
40)	220kV Theruvali (OPTCL)	Completed on 5th January, 2018

Annexure-C14.3

UFR Inspection Report of OPTCL substations on 02.01.2018 & 05.01.2018

The ERPC UFR inspection group visited 220/132/33kV Jayanagar, 132/33kV Sunabeda and 220/132/33kV Terubali substations of OPTCL for UFR Audit on 02.01.2018 & 05.01.2018. The team physically inspected the feeders which are connected with UFRs at the above sub-stations. The report of the inspection is furnished below:

Sl. No.	Name of the substations	Feeder connected with UFR	Voltage rating	Adopted UFR setting	Tested initiated frequency	UFR make
			(kV)	(Hz)	(Hz)	
1	220/132/33kV Jayanagar	Tentui Khunti	132	48.6	48.6	Alstom Micom P442
2		Boriguma	33	49.0	49.04	AREVA Micom P141
3	132/33kV Sunabeda	Laxmipur	33	49.0	49.02	AREVA Micom P141
4		Nandapur	33	48.6	48.63	AREVA Micom P141
5	220/132/33kV Terubali	Bisam Cuttak	33	49.0	49.0	SEL-751A

The above UFR setting were tested with help of Secondary injection Kit owned by OPTCL. The UFRs are provided with direct trip wiring and tripped at desired frequency. During the inspection, it was found that load (average 0.2 MW & peak 0.5 MW) of 33kV Laxmipur feeder is almost negligible compared to the desired load of 8 MW as per the UFR feeder list submitted by SLDC, Odisha.

Final list of links executed/to be executed under Fiber Optic Communication System in lieu of existing Unified Load Despatch & Communication (ULDC) Microwave links in Eastern Region

Sl no	Link Name	Link Length (Km)
A	**Central Sector**	
1	MTPS (Kati)- Muzaffarpur 400	23.909
2	Durgapur (CS) - Bidhannagar	12.004
3	Maithon-Ranchi	199
4	Hatia-Ranchi 400 (CS)	21.003
5	Sasaram (CS) - Gaya 765 (CS)	149.003
6	Muzzaffarpur - Biharshariff (CS)	129.638
7	ERLDC-Kasba (UGFO)	10.7
B	**BSPTCL Sector**	
1	Samastipur-Baroli	64
2	Samastipur-Hajipur	61
3	Samastipur-Kati	76
4	BTPS-Biharshariff	64
5	Biharshariff-Bodhagaya	80
6	Biharshariff-Fatua	46
7	Fatua-Jhakhanpur	26
8	Jakkanpur-SLDC Patna (UGFO)	6
C	**OPTCL Sector:**	
1	Chainpal-Meramandali	7
2	Talcher (TSTPS)- Meramandali	45
3	Duburi-Meramandali	96
4	Meramandali-Mendhasal	100.593
5	Tarkera- Budhipadhar	109
6	Rourkela-Tarkera	15
7	Mancheswar-Bhubaneswar SLDC	4
8	Bhubaneshwar SLDC-Vidyut Bhawan (Last Mile)	1.5
D	**WBSETCL Sector:**	
1	Bidhannagar- Barjora	25.624
2	Barjora- Bishnupur	42.803
3	Bishnupur- Arambag	50.789
4	Kolaghat TPS- Howrah SLDC	69.207
5	NJP-NBU	14
6	NBU-Binaguri	1
7	Rishra-Bighati	9
8	Bighati-BTPS	23
9	BTPS-Dharampur	18
10	Dharampur-Jeerat	8
11	Arambag- Kolaghat	78.26
12	132 kV Lilua-Rishra	17.03
13	132 kV Howrah- Lilua (WBSETCL)	12.459
14	132 Kv Kasba - Salt Lake (WBSETCL)	22.585
15	LILO at Liluah-Rishra	2.34
16	Saltlake S/s to Abhikshan Bhawan (UGFO)	0.514
17	Vidyut Bhawan to Saltlake GIS (UGFO)	1.03
18	Bidhannagar400-Bidhannagar220	0.91

E	DVC Sector:	
1	132 kV Maithon SLDC - MHPS	1
2	MHPS- 132 kV Kalyaneswari	2
3	220 kV Kalyaneswari - Mejia A	55
4	220 kV Mejia - Waria	34
5	220 kV Waria DTPS - Parulia	21
6	220 kV Parulia - Durgapur	1
7	132 kV Kalyaneswari - CTPS A	87
8	CTPS A - BTPS	32
9	220 kV Ramchandrapur - Chandil	33
10	Mejia A - Mejia B (UGFOC)	4.7
11	400 kV Barhi-KTPS	20.723
12	220 Kv Koderma-KTPS	17.559
13	Bokaro-Ramgarh	54.887
14	Konar-Bokaro	23.733
15	Konar-Barhi	58.455
16	Maithon-Kalyaneshwary	6.854
17	MHPS-Panchet	14.599
18	CTPS 132 kV C/R to CTPS-A 220 kV C/R	0.8
19	Kalyneshwari-Kalipahari	27.91
20	LILO at Raghunathpur	21.83
21	Kodarma TPS-Kodarma 400/220 S/s	0.787
22	BTPS A-BTPS B	1.265
23	Ramgarh220-Ramgarh 132	0.735
24	DSTPS-RTPS	69.182

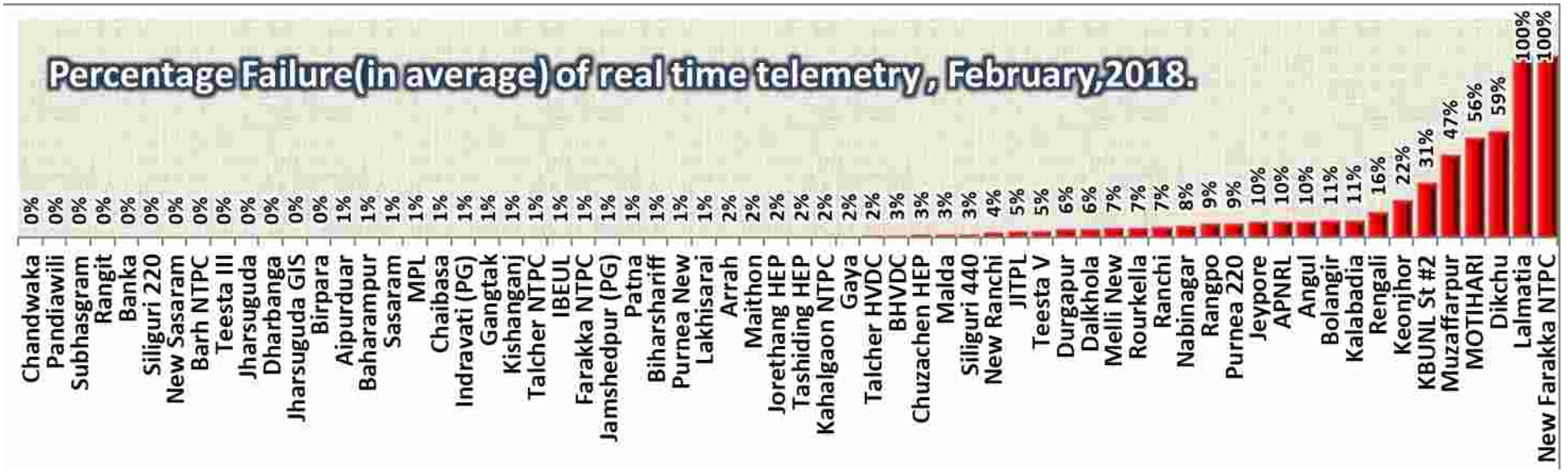
Final list of links executed/to be executed under Fiber Optic Communication System in ER under Expansion of Wideband Communication Network in ER

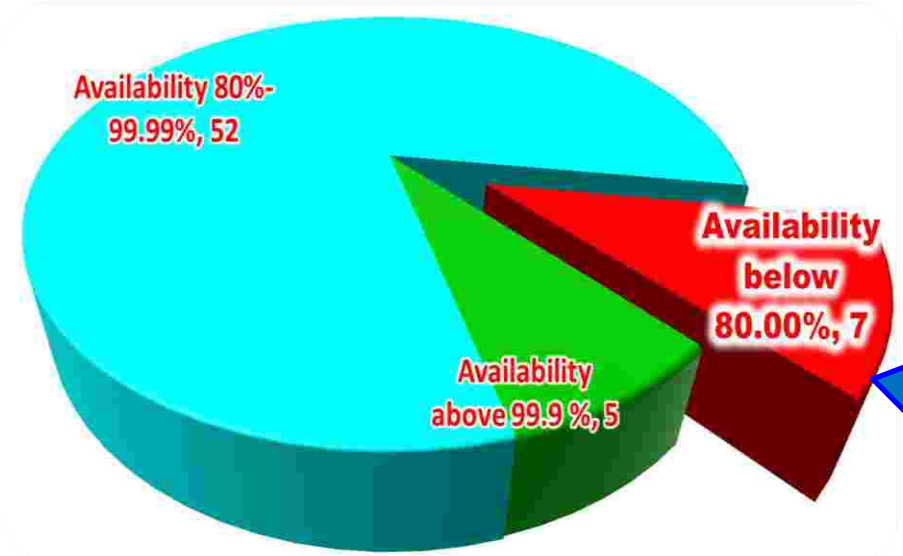
S/n	Link Name	Link Length (Km)
1	Dhalkola-Purnea	40.94
2	Birpara-Siliguri	80.44
3	LILO of Malda-Binaguri at Purnea	58.22
4	Baripada-Jamshedpur	140.91
5	Subhashgram -Jeerat	63.99
6	Bolangir - Jeypore	308.32
7	Bolangir - Angul	200.63
8	Rengali - Keonjhar	100.25
9	Ara -Patna	64.00
10	Ranchi 400 - Ranchi 765	78.00
11	Banka-Kahalgaon	48.95
12	Rangit - Gangtok (upto T-85)	22.00
13	400 KV Purnea S/s to LILO of Malda- Binaguri TL Section (Binaguri Section)	60.50
14	Patna-Barh	92.53
15	Teesta V - TP Rangpo/Binaguri	110.38
16	LILO at Sundargarh (Rourkela-Raigarh)	22.89
17	Angul- Jharsuguda	286.40
18	Uttara-Mendhasal (Pandiabili)	27.797
19	132 KV Rangpo S/s to LILO Siliguri-Gangtok (CS)	3.737
20	New Melli-Rangpo	25.40
21	MPL-Maithon PG	31.50
22	Indravati HPS - Indravati PG	3.79
23	Maithon - Kahalgaon	171.83
24	Biharsharif-Koderma	109.00
25	Siliguri 400 - Kishagunj (Incl LILO)	98.65
26	Baripada- Keonjhar	157.54
27	Dalkhola - Malda	116.15
28	Birpara - Alipurduar	59.184
29	Barh-Kahalgaon	215.22
30	Chandawa-Ranchi	68.31
31	LILO of Biharsharif-Kahalgaon at Lakhisarai	31.63
32	Daltonganj-Sasaram	196.13
33	Dalkhola-Siliguri LILO at Kishanganj (Dalkhola-Kishanganj)	31.09
34	Gaya-Chandwa	117.13
35	Jamshedpur-Chaibasa	47.86
36	Biharsharif-Banka	178.89
37	Purnea400-Purnea220	1.99
38	Punatsangchu- Alipurduar	63.78

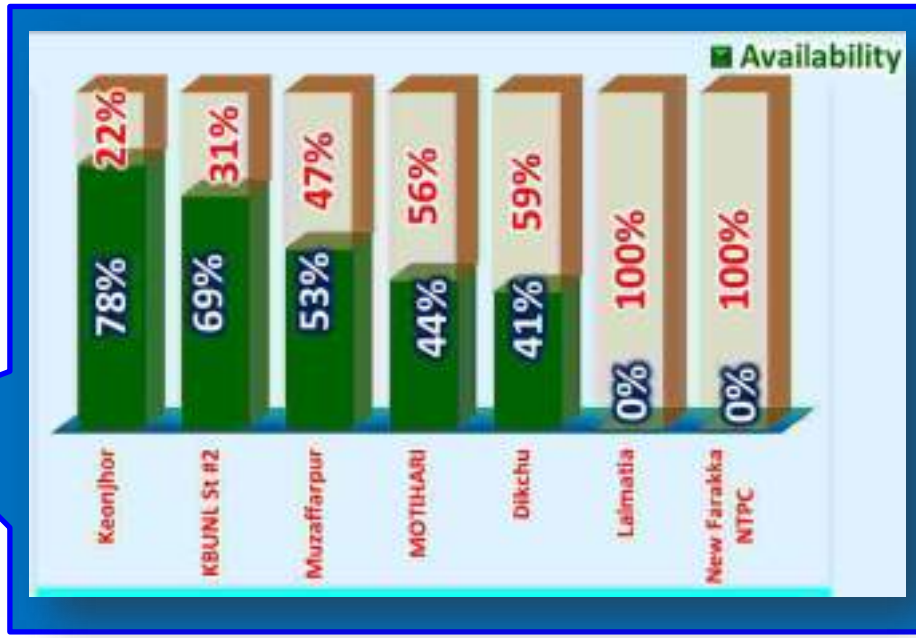
S/n	Link Name	Link Length (Km)
39	Rourkela-Raigarh(Rourkela to LILO at Sundargarh)	123
40	Ranchi-Rourkela	144.97
41	Siliguri-Gangtok	126.064
42	Bongaingaon-Gelephu	55.00

Overview of real time telemetry of Eastern region

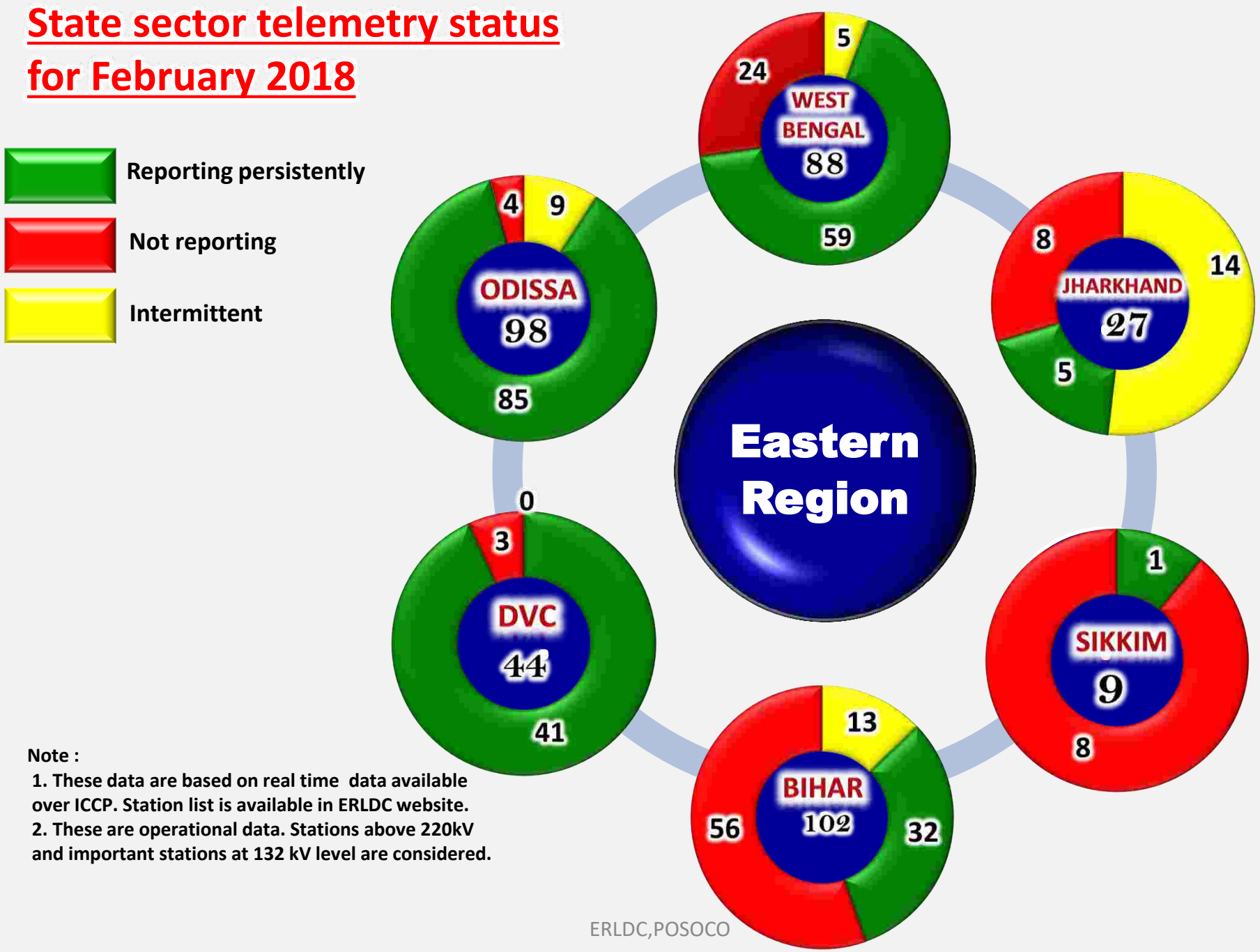
Annexure-C20







State sector telemetry status for February 2018



Note :

1. These data are based on real time data available over ICCP. Station list is available in ERLDC website.
2. These are operational data. Stations above 220kV and important stations at 132 kV level are considered.

Major concerns

- **Prolong outage:**
  - **New Farakka (NTPC) since 09-09-2017.**
  - **Lalmatia(NTPC) since 01-01-2018.**
- **Non availability of Unit side data→**
  - **Farakka STPS (Unit #6).**
  - **GMR (Unit #1, Unit #2, Unit #3)**

BIHAR

List of station having availability higher than 90%

Biharsharif(220kV)	BODH GAYA(220kV)	Darbhanga(220kV)	Hajipur(220kV)	KHAGAUL(220kV)	Madhepura(220kV)
Pusauli(220kV)	Sipara(220kV)	BARH(132kV)	BARIPAHARI(132kV)	BETIAH(132kV)	BIHTA(132kV)
Chhapra(132kV)	DIGHA(132kV)	Hajipur Old(132kV)	Jakkanpur(132kV)	Khagaria(132kV)	Kundra(132kV)
LAKHISARAI(132kV)	Raxaul (132kV)	Sabour(132kV)	Sasaram(132kV)	Shekhpura(132kV)	Sitamarhi(132kV)
Sonenagar(132kV)	Vaishali(132kV)	Valmikinagar(132kV)	Wazirganj(132kV)		

List of station having availability higher than 10% and less than 90%

Fatuha(220kV)	GOPALGANJ(220kV)	Kishanganj new(220kV)	Samastipur new(220kV)	Uda Kishanganj(220kV)	BANJARI(132kV)
Dalsinghsarai(132kV)	DHAKA(132kV)	Dumraon(132kV)	Jagdishpur(132kV)	Jai Nagar(132kV)	KARBIGAHIA(132kV)
Kusheswar Asthan (132kV	Runisaidpur(132kV)	SAHARSA(132kV)	Sherghati(132kV)	Shitalpur(132kV)	SKMCH(132kV)

List of stations having availability (less than 10% or RTU not integarated)

Begusarai(220kV)	DEHRI(220kV)	sonenagar new(220kV)	Arrah(132kV)	Aurangabad(132kV)	Banka(132kV)
Belaganj(132kV)	BIKRAMGANJ(132kV)	BUXAR(132kV)	Chandauti(132kV)	Dhandaha(132kV)	Ekangarsarai(132kV)
Ekma(132kV)	Forbisganj(132kV)	Gaighat(132kV)	Gangwara(132kV)	GOH(132kV)	Harnaut(132kV)
Hathidah(132kV)	HULASGANJ(132kV)	Imamgunj(132kV)	Jahanabad(132kV)	Jamalpur(132kV)	Jamui(132kV)
Jandaha(132kV)	Kahalgaon(132kV)	Karmnasa(132kV)	Karpi(132kV)	Katihar(132kV)	Katra(132kV)
Kishanganj(132kV)	Kochas (Dinara)(132kV)	Koshi(132kV)	Madhubani(132kV)	MASAURHI(132kV)	MASRAKH(132kV)
Mithapur(132kV)	Mohania(132kV)	Motihari(132kV)	Muzaffarpur (Ramdayalu)(132kV)	Nalanda(132kV)	Naugachhia(132kV)
Nawada(132kV)	Pandaul(132kV)	Phulparas (132kV)	Purnea(132kV)	RAFIGANJ(132kV)	Rajgir(132kV)
Ramnagar(132kV)	Samastipur(132kV)	Siwan(132kV)	Sonebarsa(132kV)	Sultanganj(132kV)	Supaul(132kV)
TEHTA(132kV)	Tekari(132kV)				

DVC

List of station having availability higher than 90%

BOKARO A TPS(400kV)	DURGAPUR TPS(400kV)	MEJIA B TPS(400kV)	RAGHUNATHPUR(400kV)	TISCO(400kV)	BARHI(220kV)
BURNPUR(220kV)	CTPS 1(220kV)	CTPS 2(220kV)	CTPS B(220kV)	DHANBAD(220kV)	DURGAPUR(220kV)
HOWRAH(220kV)	JAMSHEDPUR(220kV)	KALYANESWARI(220kV)	MEJIA A TPS(220kV)	MOSABANI(220kV)	PATRATU(220kV)
RAMGARH(220kV)	WARIA TPS(220kV)	ASP(132kV)	BAIDA(132kV)	BARDWAN(132kV)	BARJORA(132kV)
BELMURI(132kV)	CHANDIL(132kV)	GOLA(132kV)	HAZARIBAG(132kV)	JAMURIA(132kV)	KALIPAHARI(132kV)
KODARMA(132kV)	KUMARDHUBI(132kV)	MAITHON HPS(132kV)	NORTH KARANPURA(132kV	PANCHET HPS(132kV)	PARULIA(132kV)
PATHERDIH(132kV)	PURULIA(132kV)	PUTKI(132kV)	RAMGARH(132kV)	RAMKANAL(132kV)	

List of station having availability less than 10%

GIRIDHI(132kV)	KHARAGPUR(132kV)	NIMIAGHAT(132kV)

JHARKHAND

List of station having availability higher than 90%

Chandil(220kV)	Patratu(220kV)	Tenughat(220kV)	Hatia-I(132kV)	Jadugoda(132kV)

List of station having availability higher than 10% and less than 90%

Ramchandrapur(220kV)	Adityapur(132kV)	Chakradharpur(132kV)	Daltonganj(132kV)	Dumka(132kV)	Golmuri(132kV)
Japla(132kV)	Kamdara(132kV)	Kanke(132kV)	Lalmatia(132kV)	Latehar(132kV)	Namkum(132kV)
Noamundi(132kV)	Pakur(132kV)				

List of station having availability less than 10%

Hatia-II(220kV)	Deoghar(132kV)	Garawah(132kV)	Goilkera(132kV)	Jamtara(132kV)	Manique(132kV)
Rajkharsawan(132kV)	Sahebganj(132kV)				

WEST BENGAL

List of station having availability higher than 90%

Arambag(400kV)	Domjur(220kV)	Gokarna 400kv(400kV)	Haldia TPP(400kV)	Howrah(220kV)	Kasba(220kV)
KTPS(400kV)	Lakshmikantapur(220kV)	Midnapur(220kV)	PPSP(400kV)	Satgachia(220kV)	Subhasgram(220kV)
Durgapur(400kV)	Bakreswar(400kV)	Kharagpur(400kV)	Sagardighi(400kV)	CHANDITALA(400kV)	Asansol(220kV)
DPL(220kV)	Durgapur(220kV)	Gokarna(220kV)	Rishra(220kV)	NJP(220kV)	BTPS(132kV)
Liluah(132kV)	Rammam(132kV)	Saltlake(132kV)	Titagarh(132kV)	NBU(132kV)	Ashoknagar(132kV)
Adisaptagram(132kV)	Borjora(132kV)	Bighati(132kV)	Kursiang(132kV)	NPPSP(400kV)	FOUNDRY PARK(220kV)
IPCHL(220kV)	JK NAGAR(220kV)	NEWTOWN3(220kV)	SADAIPUR(220kV)	DHARAMPUR(220kV)	Budge Budge(CESC)(220kV)
Chakmir(CESC)(132kV)	Majherhat(CESC)(132kV)	Southern(CESC)(132kV)	Botanical gurden(CESC)(132kV)	New Coshipur(CESC)(220kV)	rincep street(CESC)(132kV
Parklane(CESC)(132kV)	Titagarh(CESC)(132kV)	BT Road(CESC)(132kV)	Jadavpur(CESC)(132kV)	EM Bypass(CESC)(220kV)	Chakmir(CESC)(132kV)
ast Calcutta(CESC)(132kV	Dum Dum(CESC)(132kV)	Taratala(CESC)(132kV)	BBD Bag(CESC)(132kV)	Belur(CESC)(132kV)	

List of station having availability higher than 10% and less than 90%

STPS(220kV)	Bishnupur(132kV)	Maldah(132kV)	Tcf-2(132kV)	New Bishnupur(220kV)	

List of station having availability less than 10%

Haldia New(220kV)	Jeerat(400kV)	Dalkhola(220kV)	Krishnanagar(220kV)	KLC Bantala(220kV)	Barasat(132kV)
Bongaon(132kV)	Haldia Old(132kV)	Kolaghat(132kV)	Raigunj(132kV)	Sainthia(132kV)	Birpara(132kV)
Chalsa(132kV)	Tcf-1(132kV)	Tcf-3(132kV)	Tarakeswar(132kV)	Alipuduar(132kV)	Gangarampur(132kV)
Joka(132kV)	Kalimpong(66kV)	Hizli(132kV)	TLDP3(220kV)	TLDP4(220kV)	Patuli(CESC)(132kV)

ODISHA

List of station having availability higher than 90%

Mendhasal(400kV)	Meramundali(400kV)	JSPLA(400kV)	GMR(400kV)	Jayanagar(220kV)	Balimela HPS(220kV)
Uper Kolab HPS(220kV)	Theruvalli(220kV)	Indravati HPS(220kV)	Bhanjanagar(220kV)	Narendrapur(220kV)	Bidanasi(220kV)
Chandaka(220kV)	Nayagarh(220kV)	Rengali HPS(220kV)	TTPS(220kV)	NALCO(220kV)	;ali swiching station(22(
Joda(220kV)	Duburi New(400kV)	Duburi Old(220kV)	Paradeep(220kV)	Bhdrakh(220kV)	Balasore(220kV)
Budhipadar(220kV)	IB TPS(220kV)	Tarkera(220kV)	Barkote(220kV)	TATA POWER(220kV)	JSL(220kV)
TSIL(220kV)	VEDANTA(220kV)	JSPL(220kV)	MIL(220kV)	OPTCL (Podia)(220kV)	Sunabeda(132kV)
Machhkund HPS(132kV)	Rayagada(132kV)	Chhatrapur(132kV)	Aska(132kV)	Bhubaneswar (132kV)	Akhusinga(132kV)
Basta(132kV)	Balugaon(132kV)	Khurda(132kV)	Puri(132kV)	Cuttack(132kV)	Choudwar(132kV)
ICCL(132kV)	Chainpal(132kV)	Rairangpur(132kV)	Baripada(132kV)	Jajpur Road(132kV)	Angul(132kV)
Boinda(132kV)	Kendrapara(132kV)	Rourkela(132kV)	Burla HPS(132kV)	Chiplima HPS(132kV)	Sambalpur(132kV)
Rajgangapur(132kV)	Bargarh(132kV)	ARYAN(132kV)	NBVL(132kV)	EMAMI(132kV)	ARATI(132kV)
AISCL(132kV)	IMFFA(132kV)	MINAKHEE(132kV)	OPCL(132kV)	Bolangir Old(132kV)	Bolani(132kV)
Soro(132kV)	Sonepur(132kV)	Anandpur (132kV)	ACC, Bargarh(132kV)	Barpalli(132kV)	Digapahandi(132kV)
Jaleswar(132kV)	Chhend(132kV)	Karanjia(132kV)	Patnagarh(132kV)	Pattamundai(132kV)	Phulbani(132kV)
Kalarangi(132kV)					

List of station having availability higher than 10% and less than 90%

Bolangir New(220kV)	Dhenkanal(132kV)	Kamakhyanagar(132kV)	SHYAM(132kV)	OCLRJ(132kV)	OCL(132kV)
Kesura(132kV)	Parlakhemundi(132kV)	Sundargarh(132kV)			

List of station having availability less than 10%

VISA(220kV)	Kesinga(132kV)	Sijua(132kV)	VEDANTA(LANGIGARH)(132kV)

Details of Eastern Region

A. Telemetry not provided

A.1 Generating Stations

Sl. No.	User Name	Name of Generation Stations	Date of first sysnchonisation	Total Generation Capacity (in MW)	Remarks by constituentes / ERLDC 05/03/2018
1	IPP	400 KV GMR (3X 350 MW)	Apr-13	1050	As per ERLDC guidelines no express voice / VOIP phones.
2		400 JITPL (600 x 2)	Jun-14	1200	Frequent outage of real time data. No alternate data channel and express voice commuincation integrated with ERLDC and its Exchange.
3		IBEUL (2 x 350 MW)	Jul-16	700	No alternate data channel and as per ERLDC guidelines no express voice /VOIP phones provided . Unit sides data not available.
		Total (Non-telemetered stations)	**3**	**2950**	

A.2 Sub - Stations (765 & 400 kV)

Sl. No.	User Name	Name of sub-Stations	Voltage level	Date of first sysnchonisation	Remarks by constituentes / ERLDC 05/03/2018
1	OPTCL	JSPL (Meramundali -400)	400 kV	Sep'10	Status are not reporting.

A.3 Sub - Stations (220 kV & 132 kV)

Sl. No.	User Name	Name of sub-Stations	Voltage level	Target date as per User	Remarks by constituentes / ERLDC 05/03/2018
1	OPTCL	OPTCL CPP : 220 KV BPSL,CONCAST,BSL,JSL,TSIL,VISSA	220 / 132 kV	Dec-13	CONCAST NO DATA , JSL KV,HZ, not available . TSIL NO analog and Status data .BPSL NO Bus Kv and frequency,VISSA -Status data not Available .BSL TRF data is not available.
2		Samangara	220		Data not integrated at SLDC
1	WBSETCL	Foundary Park	220		Data not integrated at SLDC
2		Hura	220		Data not integrated at SLDC
1	JSEB	Hatia New	220 kV	Sept-16	No Data available . Target Missed
2		Japla	132 KV	Sept-16	No Data available . Target Missed
3		Dumka	220 KV	Sept-16	No Data available . Target Missed

B. Telemetry provided but not working / working intermittently

B.1 Generating Stations

Sl. No.	User Name	Name of Generation Stations	Total Generation Capacity (in MW)	Target date as per User	Remarks by constituentes / ERLDC 05/03/2018
1	WBSETCL	TLDP (III) (4x 33)	132	Time Schedule not submitted	Data Not Available
2		TLDP (IV) (2x 40)	80	Time Schedule not submitted	Data not stable
3		Rammam	132	Time Schedule not submitted	Data not stable
4		TCF 1	132	Time Schedule not submitted	Data not stable
5		TCF 2	132	Time Schedule not submitted	Data not stable
6		TCF 3	132	Time Schedule not submitted	Data not stable
7		TLDP 4	220	Time Schedule not submitted	Data not stable
8		TLDP 3	1260	Time Schedule not submitted	Kolaghat Chaibasa (Kharagpur Line 1) line flow and status data not available.
1	JUSNL	220 KV Tenughat (2X 210 MW)	420	Time Schedule not submitted	Status data not Available. Patratu line flow data not reporting since 01/04/16.
2		220 KV Patratu (4x 50 + 2x100 + 4x110)	840	Time Schedule not submitted	No Data available .
1	NTPC	400 kV Farakka : (3x 200 + 2 x 500 MW + 600) Unit-6 LV side MW/MVAR not available	2100	Time Schedule not submitted	Unit-6 LV side MW/MVAR not available since08/03/17.MW/MVAR of Farakka-Kahalgaon 3&4 not reporting since (09/09/2017)
2		BRBCL/Nabinagar TPP (4x250 MW)	1000	Time Schedule not submitted	Communication Link was restored on 15-09-16 but Complete SCADA data yet to be restored.. As per ERLDC guidelines no express voice /VOIP phones provided . Target date 30th Aug 2016.

B.2		Sub - Stations			Remarks by constituentes / ERLDC 05/03/2018
Sl. No.	User Name	Name of sub-Stations	Voltage level	Target date as per User	Data not reporting
1	BSPTCL	Begusarai	220	Target date yet to provide	Data provided but not reporting due problem in PLCC Link
2		DEHRI	220	Target date yet to provide	Data not available
3		sonenagar new	220	Target date yet to provide	Data not available
4		Arrah	132	Target date yet to provide	Data not available
5		Aurangabad	132	Target date yet to provide	Data not available
6		Banka	132	Target date yet to provide	Data not available
7		Belaganj	132	Target date yet to provide	Data not available
8		BIKRAMGANJ	132	Target date yet to provide	Data not available
9		BUXAR	132	Target date yet to provide	Data not available
10		Chandauti	132	Target date yet to provide	Data not available
11		Dhandaha	132	Target date yet to provide	Data not available
12		Ekangarsarai	132	Target date yet to provide	Data not available
13		Ekma	132	Target date yet to provide	Data not available
14		Forbisganj	132	Target date yet to provide	Data not available
15		Gaighat	132	Target date yet to provide	Data not available
16		Gangwara	132	Target date yet to provide	Data not available
17		GOH	132	Target date yet to provide	Data not available
18		Harnaut	132	Target date yet to provide	Data not available
19		Hathidah	132	Target date yet to provide	Data not available
20		HULASGANJ	132	Target date yet to provide	Data not available
21		Imamgunj	132	Target date yet to provide	Data not available
22		Jahanabad	132	Target date yet to provide	Data not available
23		Jamalpur	132	Target date yet to provide	Data not available
24		Jamui	132	Target date yet to provide	Data not available
25		Jandaha	132	Target date yet to provide	Data not available
26		Kahalgaon	132	Target date yet to provide	Data not available
27		Karmnasa	132	Target date yet to provide	Data not available
28		Karpi	132	Target date yet to provide	Data not available
29		Katihar	132	Target date yet to provide	Data not available
30		Katra	132	Target date yet to provide	Data not available
31		Kishanganj	132	Target date yet to provide	Data not available
32		Kochas (Dinara)	132	Target date yet to provide	Data not available
33		Koshi	132	Target date yet to provide	Data not available
34		Madhubani	132	Target date yet to provide	Data not available
35		MASAURHI	132	Target date yet to provide	Data not available
36		MASRAKH	132	Target date yet to provide	Data not available
37		Mithapur	132	Target date yet to provide	Data not available
38		Mohania	132	Target date yet to provide	Data not available
39		Motihari	132	Target date yet to provide	Data not available
40		Muzaffarpur (Ramdayalu)	132	Target date yet to provide	Data not available
41		Nalanda	132	Target date yet to provide	Data not available
42		Naugachhia	132	Target date yet to provide	Data not available
43		Nawada	132	Target date yet to provide	Data not available
44		Pandaul	132	Target date yet to provide	Data not available
45		Phulparas	132	Target date yet to provide	Data not available
46		Purnea	132	Target date yet to provide	Data not available
47		RAFIGANJ	132	Target date yet to provide	Data not available
48		Rajgir	132	Target date yet to provide	Data not available
49		Ramnagar	132	Target date yet to provide	Data not available
50		Samastipur	132	Target date yet to provide	Data not available
51		Siwan	132	Target date yet to provide	Data not available
52		Sonebarsa	132	Target date yet to provide	Data not available
53		Sultanganj	132	Target date yet to provide	Data not available
54		Supaul	132	Target date yet to provide	Data not available
55		TEHTA	132	Target date yet to provide	Data not available
56		Tekari	132	Target date yet to provide	Data not available

1	OPTCL	VISA(220kV)	220KV	Target date yet to provide	Data not available
2		Kesinga(132kV)	132	Target date yet to provide	Data not available
3		Sijua(132kV)	132	Target date yet to provide	Data not Available
4		VEDANTA(LANGIGARH)(132kV)	132	Target date yet to provide	Data not Available
1	JUSNL	Hatia-II(220kV)	220	Target date yet to provide	Data not Available
2		Deoghar(132kV)	132	Target date yet to provide	Data not Available
3		Garawah(132kV)	132	Target date yet to provide	Data not Available
4		Goilkera(132kV)	132	Target date yet to provide	Data not Available
5		Jamtara(132kV)	132	Target date yet to provide	Data not Available
6		Manique(132kV)	132	Target date yet to provide	Data not Available
7		Rajkharsawan(132kV)	132	Target date yet to provide	Data not Available
8		Sahebganj(132kV)	132	Target date yet to provide	Data not Available
1	WBSETCL	Haldia New(220kV)	220	Target yet to be provided	Data not Available
2		Dalkhola(220kV)	220	Target yet to be provided	Data not available
3		Krishnanagar(220kV)	220	Target yet to be provided	Data not available
4		KLC Bantala(220kV)	220	Target yet to be provided	Data not available
5		Barasat(132kV)	132	Target yet to be provided	Data not available
6		Bongaon(132kV)	132	Target yet to be provided	Data not available
7		Haldia Old(132kV)	132	Target yet to be provided	Data not available
8		Kolaghat(132kV)	132	Target yet to be provided	Data not available
9		Raigunj(132kV)	132	Target yet to be provided	Data not available
10		Sainthia(132kV)	132	Target yet to be provided	Data not available
11		Birpara(132kV)	132	Target yet to be provided	Data not available
12		Chalsa(132kV)	132	Target yet to be provided	Data not available
13		Tcf-1(132kV)	132	Target yet to be provided	Data not available
14		Tcf-3(132kV)	132	Target yet to be provided	Data not available
15		Tarakeswar(132kV)	132	Target yet to be provided	Data not available
16		Alipuduar(132kV)	132	Target yet to be provided	Data not available
17		Gangarampur(132kV)	132	Target yet to be provided	Data not available
18		Joka(132kV)	132	Target yet to be provided	Data not available
19		Kalimpong(66kV)	66	Target yet to be provided	Data not available
20		Hizli(132kV)	132	Target yet to be provided	Data not available
21		TLDP3(220kV)	220	Target yet to be provided	Highly Intermittent
22		TLDP4(220kV)	220	Target yet to be provided	Highly Intermittent
23		Patuli(CESC)(132kV)	132	Target yet to be provided	Highly Intermittent
2	POWERGRID	RANCHI	400	Target yet to be provided	Highly Intermittent
4		Muzzaffarpur	400	Target yet to be provided	Highly Intermittent
5		Keonjhor	400	Target yet to be provided	Highly Intermittent
6		Biharshariff	400	Target yet to be provided	Highly Intermittent
1	DVC	GIRIDHI(220kV)	220	Target yet to be provided	Highly Intermittent
2		KHARAGPUR(132kV)	132	Target yet to be provided	Data not stable,Status data not available.
3		NIMIAGHAT(132kV)	132	Target yet to be provided	Data not available
1	Sikkim	Geyzing	132	Target yet to be provided	Data not available
2		LLHP, Gantok	66	Target yet to be provided	Data not available
3		Mamring	66	Target yet to be provided	Data not available
4		Mangan	66	Target yet to be provided	Data not available
5		Namchi	66	Target yet to be provided	Data not available
6		Phudong	66	Target yet to be provided	Data not available
7		Sichey	66	Target yet to be provided	Data not available
8		Tadong	66	Target yet to be provided	Data not available