

भारत सरकार
केन्द्रीय विद्युत प्राधिकरण
प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग
सेवा भवन, रामकृष्णपुरम्, नई दिल्ली 110066

क्र. सं. : 26/10/2014-प्र. यो. प. मू./545-558

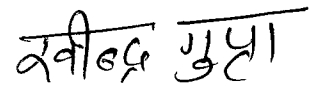
दिनांक: 10th October, 2014

- | | | | |
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विषय :- पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 37वीं बैठक ।
महोदय,

पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 37वीं बैठक का कार्यवृत्त केन्द्रीय विद्युत प्राधिकरण की वेबसाइट www.cea.nic.in
पर लिंक Home page – Power Systems-Standing Committee on Power System Planning-Western Region) पर उपलब्ध है।

संलग्न – उपरोक्त



(रवीन्द्र गुप्ता)
निदेशक



भारत सरकार / Government of India
विद्युत मंत्रालय / Ministry of Power
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority
प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग
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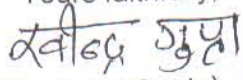
No. 26/10/2014-SP&PA/545-558

Date: 10th October, 2014

- | | | | |
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Sub: 37th meeting of the Standing Committee on Power System Planning in Western Region
Sir,

The minutes of the 37th meeting of the Standing Committee on Power System Planning in Western Region held on 5th September 2014 at Mumbai is available on CEA website (www.cea.nic.in at the following link: Home page-Wing Specific Document-Power Systems-Standing Committee on Power System Planning-Western Region).

Yours faithfully,

(Ravinder Gupta)
Director, SP&PA

Minutes of the 37th Meeting of Standing Committee on Power System Planning in Western Region held on 5-09-2014 at Mumbai

- 1.0** The 37th meeting of the Standing Committee on Power System Planning of Western Region was held on Friday 5th September, 2014 at NTPC Western Regional Headquarters, Andheri (East), Mumbai. The list of participants is enclosed at Annexure – 1.
- 2.0 Confirmation of the minutes of 36th meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on 29.08.2013 at NRPC, Katwaria Sarai, New Delhi.**
- 2.1 Director (SP&PA), CEA stated that the minutes of the 36th SCPSPWR were issued vide CEA letter No.26/10/2013-SP&PA/559-572 dated 26th September 2013. No comments have been received from any constituent of WR. Minutes may be confirmed.
- 2.2 ED, MSETCL stated that state distribution companies are the utilities, which have to bear the cost of the new transmission schemes; it would be prudent, if impact of the new schemes on the transmission tariff is indicated in the agenda / minutes of the meeting. EE, GUVNL also requested for inclusion of the cost of the new transmission schemes.
- 2.3 Director (SP&PA), CEA stated that the transmission tariff for ISTS schemes is determined through POC mechanism in vogue. It is difficult to predict what would be the impact of new scheme(s) on the transmission tariff after 4-5 years down the line, when the scheme(s) would get commissioned. He added that the tentative cost of the new scheme (s) would be included in the agenda / minutes henceforth.
- 2.4 Thereafter, the minutes of the 36th SCPSPWR were confirmed.
- 3.0 Review of Progress on Earlier Agreed Transmission Schemes.**
- 3.1 The status of implementation of transmission projects under tariff based competitive bidding are enclosed at Annexure-2 and the status of transmission schemes under implementation by POWERGRID is enclosed at Annexure-3.
- 4.0 In principle approvals granted to POWERGRID.**
- 4.1 Director (SP&PA), CEA said that in order to control overvoltage conditions at various sub-stations in the Western grid, CEA has given in principle approval for use of line reactors as bus reactors to POWERGRID till the associated line is commissioned. He requested POWERGRID to intimate status of commissioning of line reactor as bus reactor and restoration of bus reactor as line reactor.

4.2 POWERGID provided the following status of the various schemes for which in principle approval was given by CEA:

S.No.	Line Reactors (MVAR)	Substation	Associated Transmission Line	Date / schedule of	
				Comm. of Line reactor as Bus Reactor	Restoration of Bus Reactor as Line Reactor
(i)	1X240	Satna 765 kV S/s	Satna – Gwalior 765 kV S/C line	Direct as L/R	01.03.2014
	1X240	Gwalior 765 kV S/s	Satna – Gwalior 765 kV S/C line	01.01.2014	01.03.2014
(ii)	1X240	Bina 765 kV S/s	Bina – Gwalior 765 kV S/C line	01.03.2014	07.05.2014
	1X240	Gwalior 765 kV S/s	Bina – Gwalior 765 kV S/C line	01.02.2014	07.05.2014
(iii)	1X240	Indore 765 kV S/s	Indore – Vadodara 765 kV S/C line	01.04.2014	05.05.2014
(iv)	2X50	Jabalpur 400 kV S/s	MB Power TPS – Jabalpur pool 400 kV D/C line	01.01.2014	08.08.2014
(v)	2X80	Aurangabad 400 kV S/s	Wardha – Aurangabad 400 kV D/c line	17.01.2014, 20.01.2014	---
(vi)	1X240	Satna 765 kV S/s	Satna – Gwalior 765 kV S/C line (2 nd line)	Direct as L/R	06.08.2014
	1X240	Gwalior 765 kV S/s	Satna – Gwalior 765 kV S/C line (2 nd line)	31.01.2014	06.08.2014
(vii)	1X240	Gwalior 765 kV S/s	Gwalior – Jaipur 765 kV S/C line	01.03.2014	---
(viii)	2X330	Wardha 765 kV S/s	Wardha – Raipur Pool 765 kV D/C line	28.02.2014, 28.03.2014	---
(ix)	2X240	Aurangabad 765 kV S/s	Wardha – Aurangabad 765 kV D/C line	28.02.2014, Direct as L/R	01.07.2014, 03.07.2014
(x)	2X240	Aurangabad 765 kV S/s	Aurangabad-Padghe 765 kV D/C line	31.07.2014, 05.08.2014	---
(xi)	2X240	Jabalpur 765 kV S/s	Jabalpur pool – Dharamjaigarh 765 kV D/C line	01.04.2014 (Ckt#1-1x240)	---
(xii)	2X240	Raipur pool 765 kV S/S	Raipur pool – Champa 765 kV D/C line	24.05.2014, Direct as L/R	---, 19.05.2014
(xiii)	2x330	Wardha 765 kV S/s	Wardha-Aurangabad 765 kV D/C line	28.12.2013, 30.12.2013	08.07.2014, 08.07.2014
(xiv)	2x240	Raipur Pool 765 kV S/s	Raipur Pool–Wardha 765 kV D/C line	19.08.2014, 27.08.2014	---

4.3 Members noted the above.

5.0 Procurement of one no. 333 MVA, 765/400 kV and two nos. of 500 MVA, 765/400 kV ICTs for Western Region – POWERGRID proposal.

5.1 Director (SP&PA), CEA stated that at present seventy two (72) units of 500 MVA, 765/400 kV single phase ICTs and twelve (12) units of 333 MVA 765/400 kV single phase ICTs are under operation at various 765/400 kV substations in Western Region as given below:

S. No	Name of Substation	Capacity(MVA)	No. of ICT of 500 MVA	No. of ICT of 333 MVA
1	Bilaspur	4500	9	0
2	Wardha	4500	9	0
3	Seoni	4500	9	0
4	Satna	2000		6
5	Indore	3000	6	0
6	Jabalpur	3000	6	0
7	Sholapur	3000	6	0
8	Gwalior	3000	6	0
9	Tamnar	4500	9	0
10	Kotra	4500	9	0
11	Durg	1500	3	0
12	Bina	2000		6
		TOTAL	72	12

5.2 He added that each of the above sub-station has one single phase unit as spare. These transformers are manufactured outside India at works of ABB, Hyundai, BTW and Hyosung. If any of these units fails, it has to be transported to off shore works of manufacturer for the repair, which is a time consuming process. During the repair period, failure of second unit may lead to overloading of the other units operating in parallel and may cause transmission constraint. In view of above, POWERGRID has proposed to procure two (2) nos. single phase 500 MVA capacity and one (1) no. single phase 333 MVA capacity 765/400 kV ICT as spare for Western Regional Grid. The issue was also deliberated in the 35th meeting of Standing Committee on Power System Planning in WR, wherein the proposal was not agreed by the WR constituents and POWERGRID was requested to give priority to periodic maintenance and monitoring of these ICTs.

5.3 GETCO said that POWERGRID can procure the spare transformers as a part of their inventory but the constituents should not be burdened with the additional tariff on account of capital investment made in spare transformers. MSETCL endorsed the views of Gujarat.

5.4 On a query about failure of 765/400 kV transformers, POWERGRID informed that instances of failure of one unit has already been reported at Moga and Lucknow

substation. These transformers carry large quantum of power and failure of second unit may cause constraints in the power transmission. Further, the proposal of spare transformers has already been agreed in SR and NR standing committee meetings.

5.5 After further deliberations, to improve the reliability, members agreed with the proposal. However, commercial implication of the scheme would be deliberated in WRPC forum.

6.0 Procurement of spare 765 kV reactors for Western Region – POWERGRID proposal.

6.1 Director (SP&PA), stated that POWERGRID has informed that at present six (6) units of 765 kV, 110 MVAR single phase reactors and one hundred two (102) units of 765 kV, 80 MVAR single phase reactors are under operation at their substations in Western Region. The voltage at 765 kV buses in WR is generally high and failure of any one unit of the reactor may lead to overvoltage in the system. POWERGRID has proposed procurement of one unit of 765 kV, 110 MVAR single phase reactors and two units of 765 kV, 80 MVAR single phase reactors as spare reactors for Western Regional Grid.

6.2 To improve the reliability, members agreed with the proposal. However, commercial implication of the scheme would be deliberated in WRPC forum.

7.0 Procurement of spare 125 MVAR, 400 kV reactors for Western Region – POWERGRID proposal.

7.1 Director (SP&PA), stated that POWERGRID has informed that at present ten (10) units of 400 kV, 125 MVAR reactors are under operation and fifteen (15) units of 400 kV, 125 MVAR reactors are under various stages of commissioning at their substations in Western Region. The voltage at 400 kV buses in WR is generally high and failure of any one unit of the reactor may lead to overvoltage in the system. POWERGRID has proposed procurement of two unit of 400 kV, 125 MVAR reactors as spare reactors for Western Regional Grid.

7.2 To improve the reliability, members agreed with the proposal. However, commercial implication of the scheme would be deliberated in WRPC forum.

8.0 Provision of 400/220 kV, 2X500 MVA ICTs at Parli (POWERGRID) 400 kV and LILO of 220 kV MSETCL lines at Parli (PG).

8.1 Director (SP&PA), CEA said that POWERGRID has informed that the existing 2X315 MVA 400/220 kV ICTs at Parli (MSETCL) gets loaded above 280 MW per ICT and the 500 MVA ICT gets loaded beyond 490 MW. 220 kV outgoing lines from Parli (MSETCL) substation are loaded beyond 150 MW. The 220kV Parli-Murud line is frequently loaded beyond 200 MW and 220 kV Parli-Parbhani line is also loaded above 200 MW. Outage of any one or more line would lead to overloading of other lines and eventual cascade tripping. To avoid overloading of the ICTs / 220 kV lines, POWERGRID has proposed that installation of 2x500MVA, 400/220kV ICTs at Parli (PG) Station. He requested MSETCL to intimate 220kV lines from Parli (PG) for dispersal of power to Maharashtra.

8.2 ED, MSETCL stated that the problem of overloading at Parli is observed due to low generation at Parli generating station. MSETCL is implementing Nanded 400/220 kV

substation, therefore the proposal of POWERGRID needs to be studied. They would carry out necessary system studies and would intimate the requirement of transformers and 220 kV outlets for dispersal of power from Parli (PG) 400/220 kV substation within 15 days.

- 8.3 WRLDC suggested that augmentation of the 220 kV outlets from 400/220 kV Parli (PG) (Talegaon) S/S and inter-connecting 220 kV Warora (old) with 400 kV Warora (New) may be considered for addressing the overloading of existing 220 kV lines from Parli.
- 8.4 MSETCL vide their letter dated 24.09.2014 has recommended establishment of 1X315 MVA, 400/220 kV ICT at Parli (PG) 400 kV switching station instead of the proposed 2X500 MVA ICTs by shifting of one 315 MVA ICT from Aurangabad (PG).
- 8.5 As MSETCL recommendation of establishment of 1X315 MVA, 400/220 kV ICT at Parli (PG) 400 kV switching station does not fulfill the N-1 planning criteria, the proposal would be reviewed in the next standing committee meeting.

9.0 Contingency arrangement for transmission lines emanating from Champa 765/400 kV pooling station- Agenda by POWERGRID.

- 9.1 Director (SP&PA), CEA stated that the transmission system for evacuation of power from IPP generation projects of about 21000 MW, inter alia, consists of establishment of 765/400 kV pooling stations at Raigarh (Kotra), Raigarh (Tamnar), Champa, and their interconnection. The power would be evacuated through Champa / Raigarh – Raipur – Wardha – Aurangabad 765 kV corridor and Champa- Dharamjaigarh 765 kV corridor.
- 9.2 He added that at Champa 765/400 kV pooling station, power from IPP generation projects viz. KSK Mahanadi (3600 MW), Lanco Amarkantak (1320 MW) and NTPC Lara (1600 MW) generation project would be pooled. The 765 kV transmission lines planned from Champa 765/400 kV pooling stations, inter alia, includes Champa – Raipur pool 765 kV D/C line, Champa – Dharamjaigarh 765 kV S/C line, Champa – Raigarh (Kotra) 765 kV S/C line. POWERGRID has informed that 765/400 kV Champa pooling station is getting delayed due to land acquisition problems, where as these lines would be commissioned progressively in earlier time frame.
- 9.3 He further added that the power from the IPP generation projects in Chhattisgarh is mainly wheeled through Raipur- Wardha 400 kV D/c line and to provide another path for evacuation of power, in principle approval to the contingency arrangement till the availability of Champa Pooling station has been given to POWERGRID. In phase-I of the arrangement, Raipur Pool-Champa pool 765 kV D/C (by bunching ckt-I & ckt-II) would be inter-connected with Champa pool-Dharamjaigarh 765 kV S/C line bypassing Champa pooling station so as to form Raipur pool–Dharamjaigarh 765 kV S/C line (Schematic shown in exhibit-I). In phase –II, the bunching of Raipur Pool-Champa pool 765 kV D/C line would be opened. One circuit of Raipur Pool- Champa pool 765 kV D/C (ckt-I) would be connected with Champa pool - Dharamjaigarh 765 kV S/C line bypassing Champa pooling station so as to form Raipur pool – Dharamjaigarh 765 kV S/C line. The other circuit of Raipur pool – Champa pool 765 kV D/C line (ckt-II) would be connected with Raigarh Pool (Kotra) - Champa pool 765 kV S/C line by bypassing Champa pooling station so as to form Raigarh (Kotra) – Raipur pool 765 kV S/C line (Schematic shown in exhibit-II).

- 9.4 He said that the load flow studies carried out by POWERGRID indicate that with this contingency arrangement, about 780 MW of power can be evacuated, provided Dharamjaigarh – Jabalpur 765 kV D/C under implementation by M/s Sterlite Grid Ltd is available. Without Dharamjaigarh – Jabalpur 765 kV D/C line, an additional 350 – 400 MW power can only be evacuated through the contingency arrangement. He requested POWERGRID the status of the contingency arrangement and progress of commissioning of Champa Pooling station.
- 9.5 AGM, POWERGRID informed that the phase-I of the contingency arrangement has been completed and phase-II of the arrangement is expected to be completed by December 2014. The Champa pooling sub-station is expected to be commissioned by June, 2015.
- 9.6 After further deliberations, members concurred with the contingency arrangement.

Exhibit-I

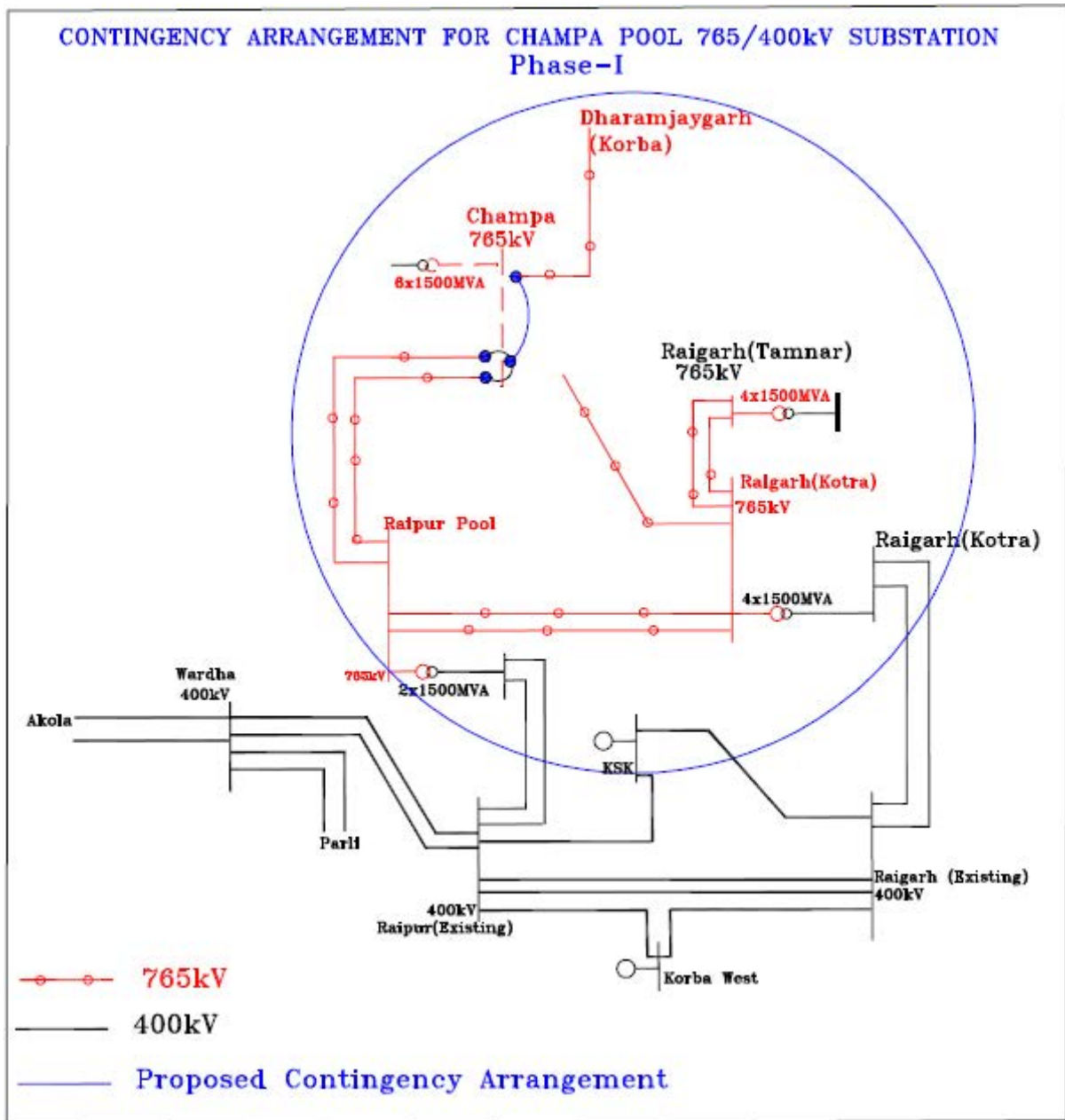
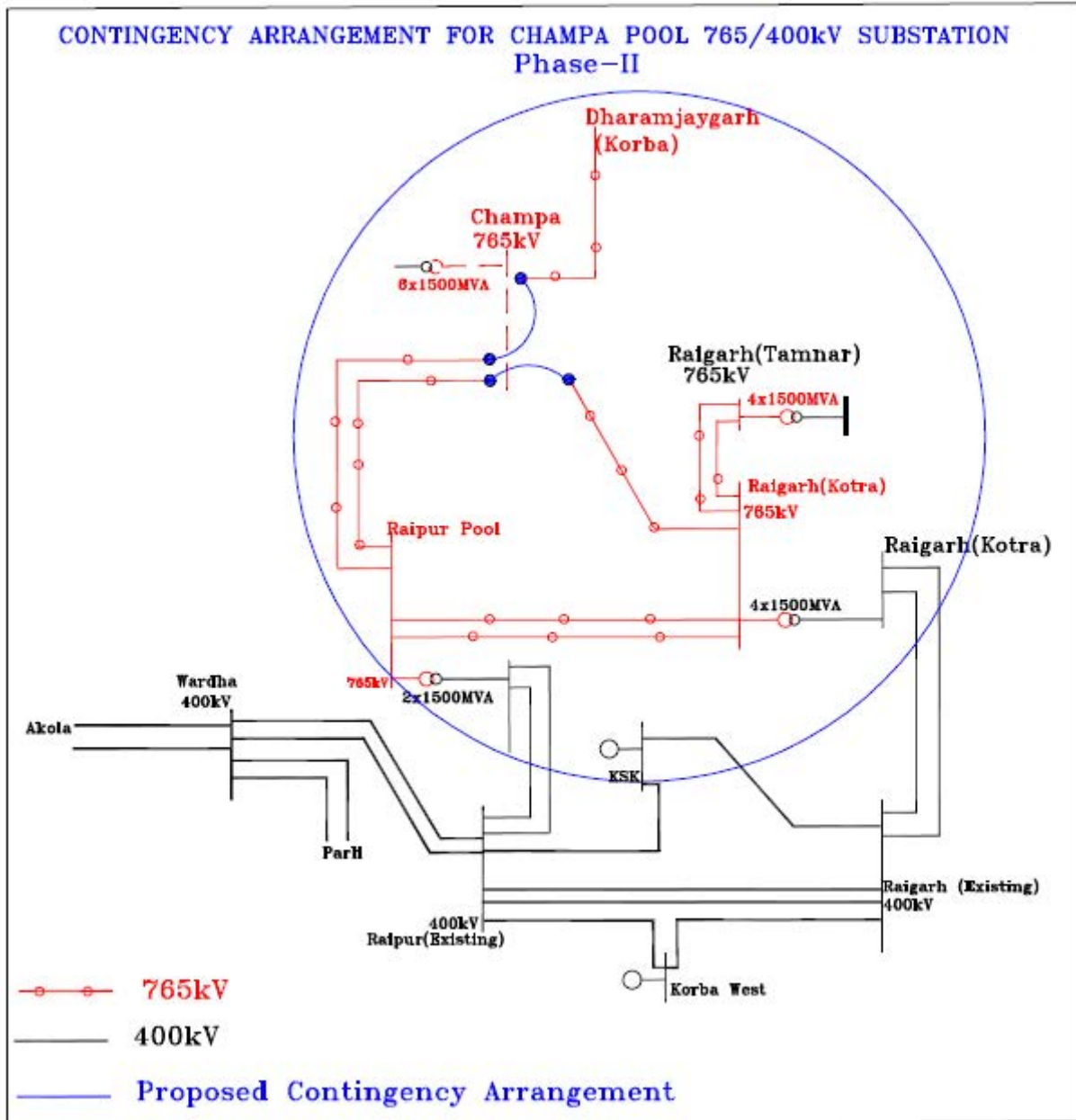


Exhibit-II



10.0 Proposal of Series Reactors in Western Region- Agenda by POWERGRID

- 10.1 Director (SP&PA), CEA stated that short circuit studies carried out by POWERGRID for 2017-18 condition indicates the short circuit level of 70 kA at Wardha 400 kV bus, 47 kA at Wardha 765 kV bus, 96 kA at Champa 400 kV bus and 70 kA at Champa 765 kV bus. The short circuit levels are exceeding the design limit of 40 kA and 50 kA at Wardha and Champa respectively.
- 10.2 He added that to limit the short circuit level, POWERGRID has proposed bus splitting of 765 kV and 400 kV bus along with provision of 12 ohm series reactor. The details of the proposal at Wardha and Champa 400 kV and 765 kV buses are given below:

S. No.	BUS	Series Reactor (Line / Bus)	Bus Split Arrangement	
			Bus A	Bus B
1.	Wardha 400 kV	<ul style="list-style-type: none"> ➤ 12 ohm on both circuits of Wardha – Mauda 400 kV D/c line. ➤ 12 ohm on both circuits of Wardha – Warora Pool/Parli 400 kV D/c line 	<ul style="list-style-type: none"> ➤ Wardha – Raipur 400 kV D/c line ➤ Wardha – Akola 400kV D/c line ➤ Wardha – Aurangabad (PG) 400kV D/c line ➤ 400kV side of 1no. 1500 MVA, 765/400kV ICT ➤ 400kV side of 3nos. 315MVA, 400/220kV ICT ➤ 400kV, 50MVAR Bus Reactor 	<ul style="list-style-type: none"> ➤ Wardha – Mauda 400 kV D/c line ➤ Wardha – Warora Pool/Parli 400kV D/c line ➤ 400kV side of 2nos. 1500 MVA, 765/400kV ICT
2.	Wardha 765 kV	<ul style="list-style-type: none"> ➤ 12 ohm on Wardha 765 kV Bus Sectionalizer 	<ul style="list-style-type: none"> ➤ Wardha – Seoni 765 kV 2xS/c line ➤ Wardha – Nizamabad 765kV D/c line ➤ 765kV side of 3nos. 1500 MVA, 765/400kV ICT ➤ 765kV, 3x110MVAR Bus Reactor ➤ 765kV, 3x80MVAR Bus Reactor 	<ul style="list-style-type: none"> ➤ Wardha – Raipur Pool 765 kV 2xD/c line ➤ Wardha – Aurangabad 765 kV 2xD/c line
3.	Champa 400 kV		<ul style="list-style-type: none"> ➤ Champa Pool – Lanco TPP 400 D/c line ➤ Champa Pool – Lara STPP 400 D/c line ➤ Champa Pool – Karnataka PCL 400kV D/c line ➤ 400kV side of 3nos. 1500 MVA, 765/400kV ICT ➤ 400kV, 80MVAR Bus Reactor 	<ul style="list-style-type: none"> ➤ Champa Pool – KSK Mahanadi PCL 400 2xD/c line ➤ Champa Pool – MB TPP 400 D/c line ➤ 400kV Side of 3nos. 1500 MVA, 765/400kV ICT
4.	Champa 765 kV	<ul style="list-style-type: none"> ➤ 12 ohm on both circuits of Champa Pool – Raipur Pool 765 kV D/c line ➤ 12 ohm on both circuits of Champa Pool – Raigarh Pool (Kotra) 765 kV 2xS/c line ➤ 12 ohm on both circuits of Champa Pool – Dharamjaigarh 765 kV 2xS/c line 	<ul style="list-style-type: none"> ➤ Champa Pool – Raipur Pool 765kV D/c line ➤ Champa Pool – Raigarh Pool (Kotra) 765kV S/c line 1 ➤ 765kV side of 3nos. 1500 MVA, 765/400kV ICT ➤ 765kV, 3x80MVAR Bus Reactor 	<ul style="list-style-type: none"> ➤ Champa Pool – Dharamjaigarh Pool 765kV 2xS/c line ➤ Champa Pool – Raigarh Pool (Kotra) 765kV S/c line 2 ➤ 765kV side of 3nos. 1500 MVA, 765/400kV ICT

- 10.3 He further added that short circuit studies with above proposal indicates short circuit level of 38 kA at Wardha 400 kV Bus-A, 40 kA at Wardha 400 kV Bus-B, 38 kA at Wardha 765 kV Bus- A & B both, 49 kA at Champa 400 kV Bus-A &B both, 40 kA at Champa 765 kV Bus-A and 31 kA at Champa 765 kV Bus-B. Thus, it is seen that the short circuit level at Wardha 400 kV and 765 kV buses and Champa 400 kV bus are near to their design limits. The possibility of replacing the existing equipments of 40 kA rating with higher rating needs to be explored.
- 10.4 ED, MSETCL stated that the series reactor reduces the power flow on the lines but also increases the reactive losses. He suggested that the option of provision of Fault Level Limiter should also be explored by POWERGRID, though it is costlier. He opined that the fault level studies may be carried out in 10-15 year time horizon. He also requested POWERGRID to share the operational experiences of Fault Level Limiter / Series Reactor of utilities worldwide.
- 10.5 POWERGRID stated that the Fault Level Limiter is same as series reactor with additional provision of capacitor. The capacitor gets by passed in the event of fault. Thus, it does not disturb the normal power flow on the line. World wide the highest voltage level, at which Fault Level Limiter is installed, is at 220 kV level.
- 10.6 MPPTCL stated that the possibility of provision of series reactor with fixed component (say 12 ohm) and variable component (say 1 ohm) may be explored by POWERGRID. POWERGRID stated that the value of 12 ohm series reactor is chosen as it is seen that incremental benefit in reducing the short circuit level is very less vis-a-vis increase in value of series reactor. Regarding replacement of 40 kA equipments with higher rating equipments POWERGRID stated that it would require bus shutdown which is difficult to avail but the same would be explored after implementation of bus splitting at Wardha and Champa. POWERGRID informed that proposal of series reactor to contain short circuit level in NR has already been agreed in NR standing committee meeting.
- 10.7 After further discussion, it was decided that POWERGRID would organize a meeting of prospective vendors of Fault Level Limiter / Series reactor with WR beneficiaries within next 15 days to discuss the technological issues / operational experiences.
- 10.8 MSETCL vide their letter dated 24.09.2014 has requested POWERGRID to share the short circuit studies for split bus arrangement and series reactor proposals at Wardha (PG) in view of the proposed Warora 765/400 kV pooling station.

11.0 Bus Splitting of Kahalgaon STPS Stage I and Stage II – Agenda by WRPC

- 11.1 Director (SP&PA), CEA stated that the Kahalgaon STPS generation project of NTPC in Eastern Region has an installed capacity of 2340 MW (Stage-I: 4X210 MW, Stage-II: 3X500 MW). In Stage-I, the constituents of ER, NR and SR have got the power allocation and while in Stage-II constituents of ER, NR and WR have got the

power allocation. Standing Committee on Power System Planning of ER, in its meeting held on 20.09.2010 has agreed the bus splitting scheme at Maithon, Durgapur, Kahalgaon and Biharsharif substations in Eastern Region to contain fault level at these substations. The estimated cost of the scheme of bus splitting of Kahalgaon STPS Stage-I and Stage-II, to be implemented by NTPC is about 98.94 crores. The scheme was approved by ERPC in its 24th meeting held on 27.04.2013. The scheme has also been approved by NR in their 29th NRPC meeting and 26th TCC meeting held on 13.09.2013 and 12.09.2013 respectively. The scheme was taken up for discussion in the 24th WRPC/TCC meeting held in Oct., 2013, wherein, it was suggested that scheme should be first taken up for discussion in the Standing Committee meeting of WR.

- 11.2 On query of MS (WRPC) regarding the high cost of bus splitting, NTPC stated that the implementation of bus splitting arrangement in generating switchyard is more complex in nature when compared with that of sub-station. In the present case, scheme envisages operation of Kahalgaon as two electrically independent power stations each with a separate station power supply system as well as rotating auxiliaries' safety. He added that various packages of the scheme are ready for award and requested for the approval of the scheme.
- 11.3 GETCO stated that WR constituents were not in agreement with the ER constituents' contention of sharing of the cost of scheme between Kahalgaon Stage-I and Stage-II in ratio of their annual fixed cost as agreed in the ERPC meeting. As per CERC regulation in vogue, the cost should be apportioned in the ratio of installed capacity.
- 11.4 After further deliberations, the scheme was agreed by the members. Regarding the apportionment of the cost of implementation of the scheme between Kahalgaon Stage-I and Stage-II, WR constituents were of the view that the same should be on the basis of installed capacity of Kahalgaon Stage-I and Stage-II.

12.0 Applications for Connectivity and Long Term (Open) Access for Phase-II Generation Projects in Orissa as per CERC Regulations, 2009

- 12.1 Director (SP&PA), CEA stated that a comprehensive transmission system comprising of high capacity 765 kV transmission corridor from Odisha to NR via WR for evacuation of power from phase-I IPPs (Installed Capacity: 10090 MW with LTA Quantum: 6080 MW) in Odisha is already under implementation. The corridor includes 765/400 kV sub-stations at Angul and Jharsuguda along with 2 circuits of 765 kV from Angul to Jharsuguda and Jharsuguda to Dharamjaigarh. In addition another 765 kV D/c line in Angul-Jharsuguda-Dharamjaigarh corridor has been planned for evacuation of power from generation projects in Srikakulam area in Southern Region (Installed Capacity: 1320 MW, LTA Quantum: 1240 MW). In the Connectivity / Long-Term Access Meeting of Eastern Regions constituents held on 5th January, 2013, transmission system for the following phase-II generation projects in Orissa was discussed and finalized:

Sl No	Applicant	Installed Capacity (MW)	LTA Quantum (MW)	Comm. Schedule	Target Beneficiary Regions			
					WR	SR	NR	ER
1.	Sterlite Energy Ltd.	Included under Phase-I (2400 MW)	1000	Commissioned	400	-	400	200
2.	GMR Kamalanga Energy Ltd	350 (1x350)	220	Sep, 2017	220	-	-	-
3.	OPGC	1320 (2x660)	600	July, 2017	200	200	200	-
4.	Darlipalli	1600 (2x800)	793.25	Oct 2016	-	-	-	793.25
	Sub-Total	3270	2613.25		820	200	600	993.25
5.	Srikakulam	1320 (2x660)	1240	Jun'15		1240		
	Total	6990	3853.25		820	1440	600	993.25

12.2 Director (SP&PA), CEA added that studies carried out by POWERGRID, to evolve the transmission system for evacuation and transfer of power from above mentioned generation projects, indicate that a 765 kV D/c line from Jharsuguda to Raipur Pool would be required in addition to the 2 nos. 765 kV D/c lines already planned between Jharsuguda and Dharamjaigarh for transfer of power beyond Jharsuguda. Further, LILO of one Rourkela – Raigarh 400 kV D/c line at Jharsuguda is under implementation as part of phase-I transmission system. In order to strengthen the 400kV interconnection, LILO of the 2nd Rourkela–Raigarh 400 kV D/c line at Jharsuguda was required. Accordingly, the following transmission system has been agreed in the Standing Committee meeting and Long-Term Access Meeting of Eastern Regions constituents held on 05-01-2013 and also in the 24th TCC / ERPC meeting held on 26-27 April, 2013:

A. Transmission System for Immediate Evacuation of Generation Projects

- (i) **GMR Kamalanga Energy Ltd (350 MW):** Through Ph-I System i.e. GMR-Angul 400kV D/c line.
- (ii) **Sterlite Energy Ltd. (2400 MW) :** Sterlite – Jharsuguda 400 kV D/c line
- (iii) **OPGC (1320 MW) :** OPGC – Jharsuguda 400 kV D/c (triple snowbird) line
- (iv) **Darlipalli (1600 MW) :** Darlipalli – Jharsuguda 765 kV D/c line
- (v) **Srikakulam (1320 MW) :** Srikakulam – Srikakulam Pool 400 kV D/c line

B. Common transmission system

B1 Being Implemented by POWERGRID

- Angul – Jharsuguda (Sundargarh) – Dharamjaigarh 765 kV D/c line.

This line is being implemented by POWERGRID as a part of evacuation system from generation projects in Srikakulam area of Andhra Pradesh in Southern region. The same would also be utilized for evacuation of power phase-II generation projects in Odisha.

B2 To be implemented through Tariff based Competitive Bidding Route

Transmission Scheme	Estimated Line Length (km)
i) Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line	350
ii) LILO of both circuits of Rourkela - Raigarh 400 kV D/c (2 nd line) at Jharsuguda (Sundargarh)	2x400 kV D/c line : each about 30 km

Note:

- CTU to provide 2x240 MW switchable line reactors at Jharsuguda (Sundargarh) end on Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 2x240 MW switchable line reactors at Raipur Pool end on Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 2 no. of 765kV line bays each at Jharsuguda (Sundargarh) and Raipur Pool for termination of Jharsuguda (Sundargarh) – Raipur Pool 765 kV D/c line.
- CTU to provide 4 nos. of 400kV line bays at Jharsuguda (Sundargarh) for termination of LILO of both circuits of Rourkela - Raigarh 400 kV D/c (2nd line).

B3 To be implemented by POWERGRID

- Addition of 2x1500MVA, 765/400kV ICT at Jharsuguda (Sundargarh).
- Addition of 2x1500MVA, 765/400kV ICT at Angul
- Split bus arrangement at 400kV and 765kV bus in both Angul and Jharsuguda (Sundargarh) substations.

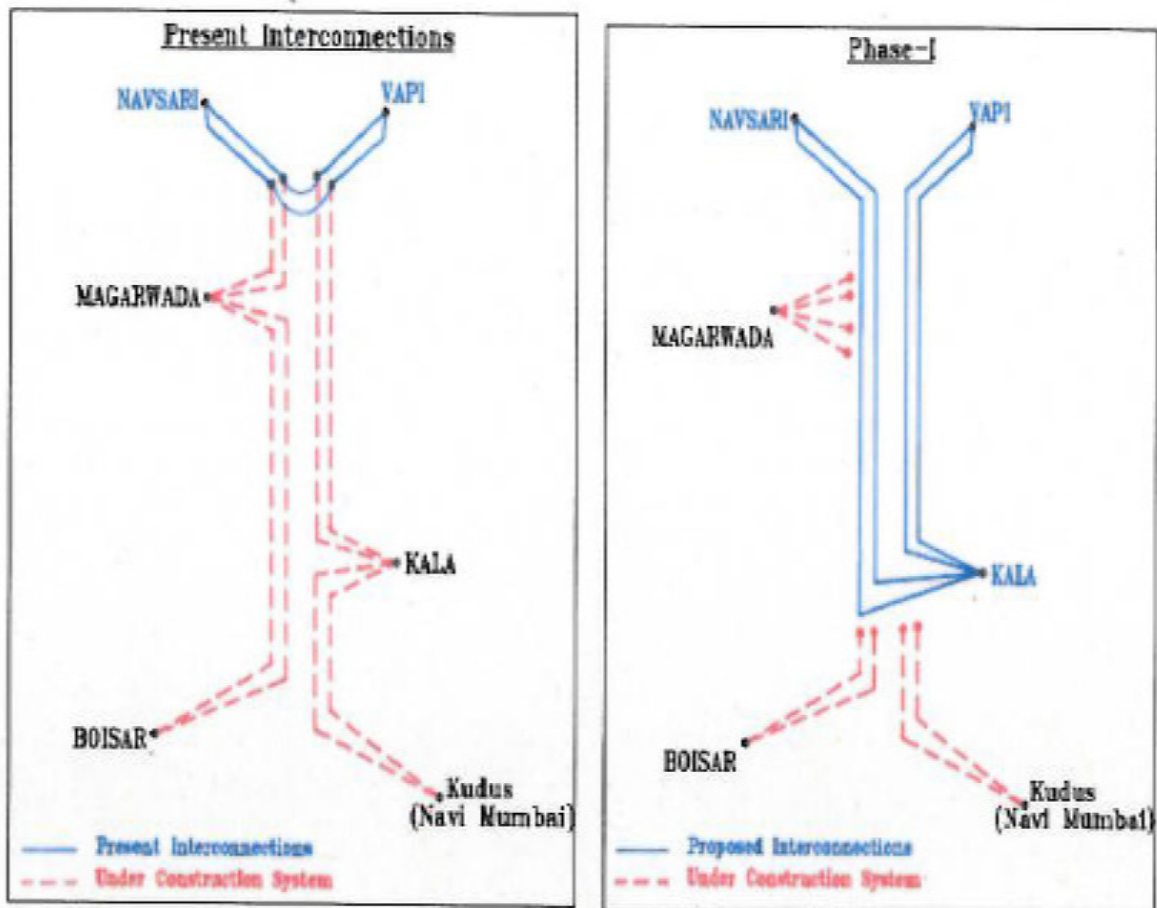
12.3 As the above transmission system has already been agreed in Standing Committee Meeting of ER and ERPC meeting, Members concurred with the proposal.

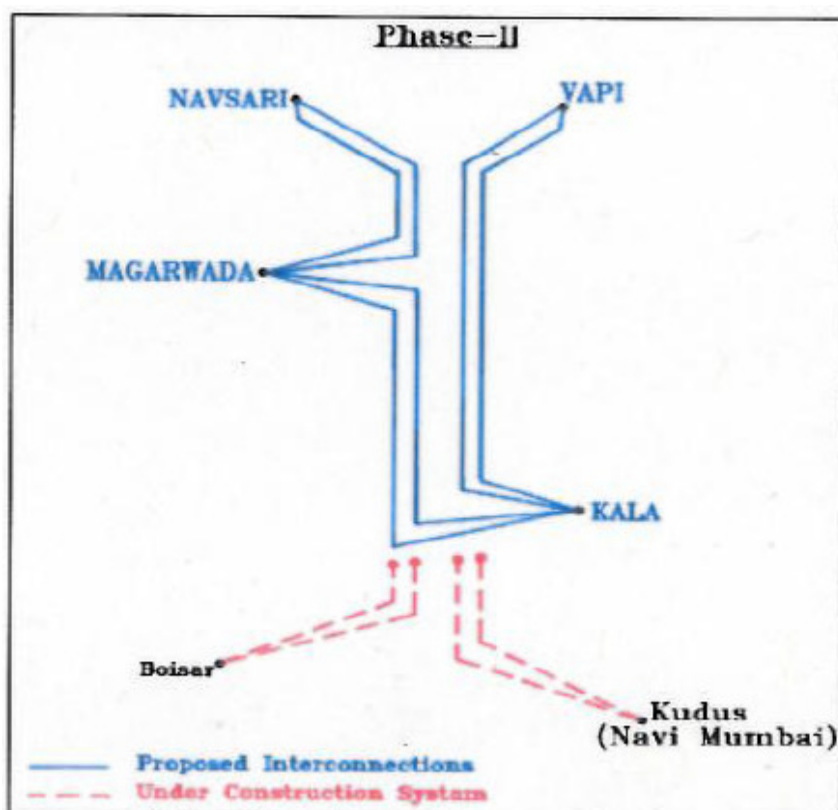
13.0 Contingency arrangement for Kala 400/220 kV substation of POWERGRID

13.1 Director (SP&PA), CEA stated that establishment of 400/220 kV 2x315 MVA Kala S/S (GIS) in UT of DNH by LILO of both circuits of 400 kV Vapi-Kudus D/C line and establishment of 400/220 kV 2x315 MVA Magarwada S/S (GIS) in UT of DD by LILO of both circuits of 400 kV Navsari-Boisar D/C line is being implemented by POWERGRID as regional system strengthening scheme. POWERGRID is facing severe RoW issues in implementing both the lines beyond Kala towards Kudus and Boisar. POWERGRID has proposed a contingency arrangement in two phases as given below, in order to utilise the completed portions of the above lines and Kala and Magarwada sub-stations.

- a) **Phase-I** : Opening of interconnection of Navsari-Vapi 400 kV D/C lines at the start of multi-circuit point and connecting it in a manner so as to form Vapi-Kala 400 kV D/c line and Kala-Navsari 400 kV D/C line.

- b) Opening of one circuit of Vapi-Khadoli 220 kV D/C (existing) line near Khadoli and connecting it with Kala-Khadoli 220 kV D/C line, so as to form Vapi-Khadoli 220 kV S/C, Kala-Vapi 220 kV S/C and Kala-Khadoli 220 kV S/C
- c) **Phase II** : LILO of Kala- Navsari 400 kV D/C line at 400/220 kV Magarwada substation thereby making the following
- Vapi- Kala 400 kV D/C line.
 - Kala – Magarwada 400 kV D/C line.
 - Maragwada – Navsari 400 kv D/C line.





13.2 He added that the interconnection of Navsari 400 kV (GIS) and Vapi 400 kV substation was agreed in 34th SCM of WR held on 09-05-2012 as an interim arrangement to provide an additional feed to Vapi. This was implemented through interconnection of Navsari–Boisar and Vapi-Navi Mumbai (Kudus) 400 kV D/C lines at a point where multi circuit portion of these lines starts. In principle approval of CEA for the contingency arrangement as indicated above was granted to POWERGRID to enable UTs of DNH and D&D to draw power from Kala and Magarwada ISTS substations respectively. This would also help in relieving the over loading of existing transformers at Vapi 400/220 kV substation of POWERGRID and 220/66 kV Bhilad sub-station of GETCO. He requested POWERGRID to inform the status of implementation of the contingency arrangement.

13.3 POWERGRID informed that the Phase-I of the interim arrangement has already been implemented and Phase-II would be implemented by October 2014.

13.4 Director (SP&PA), CEA stated that the interim arrangement would be restored to original configuration after the completion of remaining portions of the above 400 kV lines and completion of 220 kV bays at Khadoli.

13.5 After further deliberations, Members concurred with interim arrangement proposal.

14.0 Creation of 6th 220 kV bay at Omkareshwar HEP switchyard.

14.1 Director (SP&PA), CEA stated that Omkareshwar HEP (8 X65 MW) 520 MW of NHDC LTD. (Narmada Hydroelectric Development Corporation Limited- a joint venture of NHPC Ltd. and Govt. of Madhya Pradesh) is located in Khandwa district of Madhya Pradesh. At present the power from Omkareshwar HEP is evacuated through the following five nos. of 220 kV lines:

- (i) Omkareshwar HEP – Khandwa 220 kV S/C line

- (ii) Omkareshwar HEP – Chhegaon 220 kV S/C line.
- (iii) Omkareshwar HEP – Barwaha 220 kV S/C line.
- (iv) Omkareshwar HEP – Julwaniya 220 kV S/C line.
- (v) Omkareshwar HEP – Nimrani 220 kV S/C line (this line is tapped at tower location no. 320 for Barwaha).

14.2 He informed that MPPTCL has implemented six nos. of 220 kV lines for evacuation of power from Omkareshwar HEP. At present there are only five nos. of 220 kV line bays at generation switchyard, the sixth circuit was being utilised by making tapping arrangement in the Omkareshwar HEP – Nimrani 220 kV S/C line for Barwaha. MPPTCL has requested NHDC to create 6th line bay in the space available at generation switchyard. While, NHDC intended to utilise the available space for 220 kV bus reactor to control over voltage at generation switchyard.

14.3 Director (SP&PA), CEA further informed that a meeting was held in CEA on 10.06.2014 with MPPTCL and NHDC Limited, wherein, following was agreed:

- (i) Space available for one 220 kV bay at Omkareshwar generation switchyard would be utilised for provision of sixth 220 kV line bay.
- (ii) MPPTCL in coordination with NHDC would implement the 6th 220 kV line bay at their own cost.
- (iii) The O & M arrangement for the sixth 220 kV line bay would be decided mutually between MPPTCL and NHDC.
- (iv) The 800/1 CTs would be provided on Barwaha-1, Barwaha-2 and Chhegaon 220 kV line bays. Necessary swapping of CTs for effecting the above, if required, would be done by NHDC.

14.4 He added that with the creation of sixth 220 line bay at Omkareshwar generation switchyard, the evacuation arrangement from Omkareshwar would be as under:

- (i) Omkareshwar HEP – Khandwa 220 kV S/C line
- (ii) Omkareshwar HEP – Chhegaon 220 kV S/C line.
- (iii) Omkareshwar HEP – Barwaha 220 kV D/C line.
- (iv) Omkareshwar HEP – Julwaniya 220 kV S/C line.
- (v) Omkareshwar HEP – Nimrani 220 kV S/C line.

14.5 Members noted the same.

15.0 FSC on Mundra – Zerda 400 kV D/C line – GETCO proposal

15.1 Director (SP&PA), CEA stated that GETCO has requested CEA to study the proposal of providing series compensation on Mundra – Zerda 400 kV D/C line-2 in order to increase power transfer capacity of the line (line length being 331 km), to improve stability of network for evacuation of 2640 MW power from APL Mundra and to load the line up to its thermal capacity.

15.2 He added that studies were carried out for 2016-17 conditions to check the feasibility of provision of about 40% Fixed Series Compensation (FSC) on the Adani- Zerda 400 kV D/C line-2 with out Adani-Zerda 400 kV D/C line-1 in service. A loading of 950 MW per circuit on Adani-Zerda 400 kV line-2 was observed in the event of outage of Adani-Dehgam 400 kV D/C line (n-1-1). With the addition of Adani-Zerda line-1 and without FSC, even loadings on the Adani-Zerda and Adani-Dehgam lines were observed. The proposal was also studied considering addition of Halvad,

Shankari and Bhuj pool sub-stations along with associated network. A loading of about 300 MW per circuit was seen on Adani-Zerda 400 kV D/C lines and Adani-Dehgam 400 kV D/C line. It was seen that provision of FSC on the Line-2 results in uneven loadings on the Adani-Zerda lines. The proposal was also studied with FSC on both the Adani-Zerda 400 kV D/C lines to avoid uneven loading, It was seen this does not have substantial impact in increasing the power flow on these lines. As requested by GETCO, the proposal was further studied with both circuits of Adani-Zerda 400 kV D/C line-1 being looped in and looped out at Charanka and 40% FSC on Adani-Zerda 400 kV D/C line-2. No substantial changes in the power flow pattern were observed. Thus study results do not support the provision of 40% FSC on Adani-Zerda 400 kV D/C line-2. These studies results were communicated to GETCO and also included in the agenda.

- 15.3 He further added that the Adani-Zerda 400 kV D/C line-2 is directly connected to the generation switchyard of M/s Adani Power, sub synchronous resonance (SSR) studies also needs to be carried out while considering provision of FSC on this line.
- 15.4 WRLDC shared that high amplitude oscillations probably due to sub synchronous resonance were observed in the grid on 30th May 2014 as well as 5th Sep., 2014. WRLDC suggested that detailed studies may be taken up to establish the occurrence of SSR at Mundra and identify measures to damp the same. Member Secretary, WRPC stated that the issue of oscillations observed on 30th May 2014 has already been taken up in the OCC meeting of WRPC.
- 15.5 GETCO stated that Adani- Zerda 400 kV D/C line-2 would be commissioned by March 2015 whereas commissioning of Adani- Zerda 400 kV D/C line-1 would take one more year and may go beyond March 2015. GETCO further added that the proposal of FSC on Adani-Zerda 400 kV D/C line-2 has been dropped as of now and the same may be reviewed, if required, at a later date.
- 16.0 Aurangabad (PG) 400/220 KV, 2 x 315 MVA ICTs along with its associated bays, commercial burden on Maharashtra- Agenda by MSETCL.**
- 16.1 Director (SP&PA), CEA stated that MSETCL vide their letter dated 17.04.2014 has stated that establishment of 400/220 kV, 2x315 MVA ICTs at Aurangabad (PG) was made a part of the minutes of the 28th Standing Committee meeting on Power System Planning of WR held on 6th December, 2008 without any discussion and further no discussions were held on the issue till 36th SCM of WR. With the commissioning of the above asset, POWERGRID has claimed the monthly transmission from 1.02.2014, which is not justified as the scheme is burdening the consumers of Maharashtra.
- 16.2 Director (SP&PA), CEA further stated that the matter of establishment of 400/220 kV 2x315 MVA ICTs at Aurangabad (PG) has been duly deliberated and accordingly included in the minutes of the various Standing Committee meetings of WR. He narrated the chronology of discussions held in various standing committee meetings and other forums as given below:
- (i) In the 27th SCM of WR held on 30.07.2007 at Indore, the issue of allocation of 2 no's of 400 kV bays at Aurangabad substations of MSETCL for termination of Wardha – Aurangabad 400 kV D/C line, planned as a part of Mundra UMPP evacuation system was discussed. Due to non-availability of space for two numbers of bays at existing Aurangabad (MSETCL) 400 kV substation, a new

400 kV substation at Aurangabad was proposed. In the meeting, it was decided that the proposal of creation of a new 400 kV substation would be reviewed after MSETCL furnishes their plan with respect to Aurangabad.

- (ii) The transmission system associated with Mundra UMPP and Sasan UMPP, even though was approved by the WR constituents, some constituents were not signing the BPTA with PGCIL due to commercial implications in sharing of transmission charges.
- (iii) The issue was discussed in a meeting taken by Chairperson CEA with WR constituents on 10.12.2007 at Pune, wherein, it was agreed that the total transmission system of Sasan and Mundra UMPP would be divided into two components.
 - Generation specific scheme – The transmission charges for elements covered under this would to be shared only by the beneficiaries of the UMPP.
 - Common transmission system strengthening scheme – Transmission charges for the elements would be pooled with regional charges of the existing systems.
- (iv) In the joint meeting of Standing Committees on Power System Planning of NR and WR held on 10.6.2008 at New Delhi, transmission elements were identified based on the above principle, which also included creation of a new 400/220 kV 2x315 MVA substation Aurangabad. The same was also concurred by the WR constituents in the 8th meeting of WRPC held on 12.09.2008. Subsequently, the scheme was included as a part of annexure of the minutes of the 28th Standing Committee Meeting of WR held on 6.12.2008.
- (v) The agenda for the 30th Standing Committee meeting of WR at item no.2.1 I (b) included - Inter Connection at 220 kV level of the state grid with proposed ISTS stations. Under this item, constituents were requested to inform the present status of implementation of 220 kV inter connections from the ISTS substations including Aurangabad.

16.3 WRLDC stated that the recently commissioned substations in Maharashtra namely, Warora 400 kV, Akola 765/400 kV, Taptitanda 765 kV (charged at 400 kV), Sholapur 765/400 kV were underutilized due to inadequate 220 kV downstream outlets. WRLDC highlighted that quarterly feedback elaborating constraints in transmission elements had already been shared by POSOCO with all the stakeholders and suggested that the same may be suitably considered by STU/CTU/CEA in their transmission plan.

16.4 Member Secretary, WRPC informed that in the Transmission Review Meetings (TRM) of WRPC 220 kV outlets from new 400 kV substations were specifically being monitored. However, TRM meeting has not been held for long time. WRPC would soon start holding the TRM at regular intervals.

16.5 ED, MSETCL informed that they are carrying out system studies and would intimate the requirement of 2x315 MVA transformers at Aurangabad (PG) 400/220 kV substation and 220 kV outlets from the sub-station within 15 days.

- 16.6 Members noted the same.
- 16.7 MSETCL vide their letter dated 24.09.2014 has inform that have already taken up the work of establishment of 400/220 substation at Taptitanda and 765/400 kV Ektoni substation. The load flow studies carried out considering Aurangabad(PG) 400/220 kV substation shows only a marginal difference in the loading of 400/220 kV ICTs at Aurangabad (MSETCL) and Taptitanda (MSETCL) 400 kV substations. The proposal is not beneficial to Maharastra state. However, MSETCL has recommended to retain 1X315 MVA, 400/220 kV ICT at Aurangabad (PG) and shifting of the second 1X315 MVA, 400/220 kV ICT at Aurangabad (PG) to Parli (PG) 400 kV switching station.
- 16.8 MSETCL is requested to intimate the 220 kV outlets from Aurangabad (PG) 400/220 kV substation along with its implementation schedule. Further, the one 1x315 MVA 400/220 kV transformer at Aurangabad (PG) as agreed by MSETCL does not fulfill the N-1 planning criteria, the requirement of 2nd transformer at Aurangabad (PG) would be discussed in the next standing committee meeting.
- 17.0 Installation of additional 2x500MVA, 400/220kV Transformer at Indore (PG) 765 kV Substation - Agenda by MPPTCL.**
- 17.1 Director (SP&PA), CEA stated that MPPTCL has proposed installation of 2x500 MVA, 400/220kV transformers at 765kV S/s Indore (PGCIL) due to the following:
- Demand of West Discom of MP has touched 4100 MW during 2013-14 and is expected to rise further this year.
 - The 4x315 MVA, 400/220kV ICTs installed at 400kV S/s Indore (MPPTCL) are carrying more than 930 MW of power and Indore is getting feed of about 175 MW from Barwaha 220 kV S/s.
 - Out of the 4 nos. 315 MVA transformers, two are single phase banks of 105 MVA transformers, which are more than 30 years old.
 - There would be over loading of 400/220kV transformers at Indore in case of contingency conditions during peak load season.
- 17.2 He added that for drawal of power from Indore (PG), MPPTCL has proposed LILO of both circuits of Indore-II-Ujjain 220 kV D/C line at Indore (PG).
- 17.3 Members discussed and agreed with MPPTCL proposal of installation of 2x500MVA, 400/220kV transformers along with six nos. of 220 kV bays at Indore (PG) 765/400 kV Substation. MPPTCL was requested to intimate additional 2 no. 220 kV lines for drawal of power from Indore (PG).
- 17.4 POWERGRID informed that 30 months would be the implementation schedule for the above scheme. MPPTCL requested POWERGRID for early implementation of the scheme.
- 18.0 Installation of additional 1x315MVA, 400/220kV Transformer at Itarsi (PG) 400 kV Substation – Agenda by MPPTCL**
- 18.1 Director (SP&PA), CEA stated MPPTCL has proposed an additional 1x315MVA, 400/220kV transformer at Itarsi (PG) 400kV S/s to ensure the reliability of supply to 220 kV substations around Itarsi and Betul area due to the following:

- The 220 kV substations around Itarsi and Betul area viz. Sarni, Betul, Handia, Hoshangabad, Itarsi and Pipariya are dependent on 220 kV supply available from Satpura TPS and Itarsi 400/220kV S/s (PG).
- At present there is only one no. 315MVA, 400/220kV ICT installed at Itarsi (PGCIL) 400kV S/s.
- The 500 MVA (3X167), 400/220kV ICT at Satpura TPS have already rendered useful life of 35 years and frequent problems are experienced. There is no spare transformer available; therefore the reliability of the 500 MVA, 400kV ICT at Satpura is uncertain.
- The 62.5 MW units at Satpura TPS supplying power on 220 kV are being abandoned in a phased manner by MPPGCL, therefore loading and dependency on 315MVA, 400/220kV ICT at Itarsi is increasing.
- on partial outage of generation at 220 kV level at Satpura TPS, about 300MW load has been recorded on the single transformer at Itarsi (PG) 400 kV S/s

18.2 After discussion, Members agreed with MPPTCL proposal of an additional 1x315 MVA, 400/220kV transformer along with two nos. of 220 kV bays at Itarsi (PG) 400/220 kV S/s, to ensure the reliability of supply to 220 kV substations around Itarsi and Betul area.

18.3 POWERGRID informed that 30 months would be the implementation schedule for the above scheme. MPPTCL requested POWERGRID for early implementation of the scheme

19.0 400 kV 125 MVAR Bus reactor at Navi Mumbai (2 no.) - Agenda by POWERGRID

19.1 Director (SP&PA), CEA stated that Vikroli-Navi Mumbai 400 kV S/C line to be implemented by Tata Power, as an STU line, involves laying of 12 kms stretch out of the total 35 km length of the line as underground cable. POWERGRID has proposed installation of two nos. 400 kV, 125 MVAR bus reactors at Navi Mumbai substation as reactive compensation for the cable portion. The two nos. of 400 kV bays at Navi Mumbai constructed for termination of Vapi – Navi Mumbai 400 kV D/C line (which now is being terminated at Kudus due to severe RoW issues) shall be utilized for installation of the bus reactors.

19.2 MSETCL informed that for the Navi Mumbai 400/220 kV substation, there is no direct feed from the ISTS source. The Pune–Navi Mumbai 400 kV D/C line implementation has been deferred in view of severe RoW issues. Vapi–Navi Mumbai 400 kV D/C line has been terminated at Kudus 400 kV substation of MSETCL due to RoW issues in the Kudus- Navi Mumbai section. Navi Mumbai 400 kV substation is getting connected with MSETCL network through LILO of Kharghar- Padghe 400 kV S/C line at Navi Mumbai and its implementation also involves laying of about 1.5 km underground cable. For gainful utilization of Navi Mumbai 400 kV substation, a direct feed from ISTS source is required. Till that time, it would not be prudent to connect Vikroli with Navi Mumbai sub-station. He added that MSETCL would convey their views on the proposal in 15 days time.

19.3 MSETCL vide their letter dated 24.09.2014 has stated that Tata Power Company (TPC) has modified their scheme of 400 kV interconnection of Vikroli 400 kV substation as there is no ISTS source at Navi Mumbai 400 kV substation. Now TPC will construct Kharghar- Vikroli 400 kV D/C line, therefore installation of 125 MVAR 400 kV bus reactor at Navi Mumbai 400 kV substation towards compensation for cable portion in Vikroli- Navi Mumbai 400 kV S/C line was not required.

19.4 In view of above, proposal of POWERGRID for provision of two nos. of 400 kV 125 MVAR Bus reactors at Navi Mumbai 400 kV substation is dropped.

20.0 Laying of cable in DGEN- Vadodara 400 kV D/C line at DGEN end- Agenda by POWERGRID

20.1 Director (SP&PA), CEA stated that DGEN-Vadodara 400 kV D/C line is being implemented through tariff based competitive bidding route. The issue regarding severe RoW constraint in Dahej SEZ/GIDC area for implementing the DGEN-Vadodara 400 kV D/C was discussed in CEA on 30.10.2013, wherein, a committee comprising of members from GIDC, POWERGRID, Torrent Energy Limited and Dahej SEZ was formed to explore the alternatives for laying DGEN – Vadodara 400 kV D/C line in the RoW constraint area. The report submitted by the committee was discussed in the meeting held on 16.12.2013 in CEA, wherein, it was decided that cable laying for about 3 km length would be required to overcome the RoW constraint in Dahej SEZ / GIDC area for the DGEN – Vadodara 400 kV D/C line.

20.2 Director (SP&PA), CEA further stated that POWERGRID has proposed installation of a 400 kV, 1X125 MVAR Bus reactor at Vadodara to compensate the additional reactive power generated by the 3 km cable of the DGEN – Vadodara 400 kV D/C line.

20.3 GETCO stated that WR constituents were not involved while agreeing for provision of 3km cables in Dahej SEZ / GIDC area section of the DGEN-Vadodara 400 kV D/C line. For any change in scope of works of already agreed schemes, approval of the constituents needs to be taken.

20.4 Member (Power System), CEA considering the suggestion of GETCO stated that in future modifications in scope of works of already agreed scheme would be put up for approval of the standing committee.

20.5 After further deliberations, Members agreed for installation of a 400 kV, 1X125 MVAR Bus reactor at Vadodara to compensate the additional reactive power generated by the 3 km cable of the DGEN – Vadodara 400 kV D/C line.

21.0 Reconfiguration / Utilisation of the Essar – Bachau 400 kV D/C line.

21.1 Director (SP&PA), CEA stated that M/s Essar Power Gujarat Limited (EPGL) has been granted connectivity for 2440 MW and LTA for 250 MW by CTU. Essar-Bachau 400 kV D/C line is under implementation by POWERGRID for providing connectivity with the ISTS to M/s EPGL. Phase-I of the project i.e. Essar Salaya Ph-I (2X600 MW) has already been commissioned, whereas Ph-II of the project is delayed due to non-availability of MOEF clearance and forest clearance of coal / water corridor for the project. M/s EPGL has not yet taken up the implementation of 2 nos. of 400 kV bays for termination of the Essar-Bachau 400 kV D/C line at Essar switchyard. Gujarat has PPA of 1000 MW in Essar Salaya Ph-I (2X600 MW) and two nos. 400 kV D/C lines were planned for evacuation of the power towards their load centres. Out of which Essar-Hadala 400 kV D/C line has already been commissioned and the Essar-Amreli 400 kV D/C line is partly completed towards the Amreli end. The balance portion of the Essar-Amreli 400 kV D/C line is likely to be completed by April 2015. At Essar generation switchyard all the four nos. bays has been commissioned by M/s EPGL.

- 21.2 Director (SP&PA), CEA further stated on the request of M/s EGPL, a meeting was held in CEA on 06.05.2014 with POWERGRID, GETCO and EGPL, wherein, the following decisions were taken to facilitate utilisation of the Essar – Bachau 400 kV D/C line under implementation by POWERGRID, which otherwise would have remained idle, for the want of 400 kV bays at Essar switchyard, on technical considerations only and without having any implications on the existing commercial arrangement between the parties involved:
- Essar- Bachau 400 kV D/C line could be terminated in Essar Salaya Ph-I generation switchyard.
 - M/s EPGL to implement two nos. of 400 kV bays along with provision of 125 MVAR bus reactor by March 2015.
 - As an interim arrangement the two nos. 400 kV Amreli bays could be utilised for terminating the Essar – Bachau 400 kV D/C line at Essar Ph-I switchyard till the implementation of two no. of 400 kV bays by M/s EPGL or completion of Essar-Amreli 400 kV D/C line, whichever is earlier.
 - Necessary arrangements for facilitating the above would be made by M/s EGPL.
 - POWERGRID / CTU and EPGL to coordinate regarding the implementation of the interim arrangement.
 - CTU to carry out studies for possible reconfiguration of Essar - Bachau 400 kV D/C line at Bachau end for relieving evacuation constraints of Mundra CGPL power.
 - In case of any abnormal power flow beyond 400 KV Hadala / 400 KV Bhachau (PG), anticipated till commissioning of 400 KV D/C EPGL – Amreli line, 400 KV D/C EPGL – Bhachau (PG) line will be opened.
- 21.3 POWERGRID informed that Essar-Bachau 400 kV D/C line is a dedicated transmission line, whose transmission charges has to be borne by the generation project developer after COD of the generation project. With the above reconfiguration, GETCO has to bear the transmission charges of the line till the commissioning the M/s EGPL generation project.
- 21.4 GETCO stated that in Essar Salaya Ph-I of M/s EGPL, Gujarat has PPA of 1000 MW for which technical and commercial issues are already settled. Further, they do not want to get into any kind of complications on technical or commercial grounds due to termination of Essar-Bachau 400 kV D/C line in Essar Salaya Ph-I generation switchyard. Therefore, they do not agree with the proposal.
- 21.5 POWERGRID informed that Essar-Bachau 400 kV D/C line was expected to be completed by December 2014. To avoid theft of conductor, POWERGRID requested to allow idle charging of the Essar-Bachau 400 kV D/C line from Essar end. This would be done by terminating the line at Essar Salaya Ph-I generation switchyard and opening it from Bachau end. GETCO stated that POWERGRID may charge the Essar-Bachau 400 kV D/C line Bachau end.

21.6 After further discussion, the proposal of reconfiguration / utilisation of Essar – Bachau 400 kV D/C line was not agreed. In order to avoid conductor theft, POWERGRID may charge the Essar-Bachau 400 kV D/C line from Bachau end.

22.0 Evacuation of Renewable Energy generations located in WR and NR to Northern Region states

22.1 Director (SP&PA), CEA stated that the following transmission system for evacuation of renewable energy generations located in WR and NR was agreed in the 36th meeting of SCSPWR. :

Western Region (Gujarat):

- i. Bhuj Pool–Banaskantha 765 kV D/c
- ii. Banaskantha -Chittorgarh 765 kV D/c
- iii. Banaskantha-Sankhari 400 kV D/c
- iv. 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV-2x500MVA) sub-station each at Bhuj Pool and Banaskantha.
- v. Associated reactive compensation (Bus reactors & line reactors)

Northern Region (Rajasthan):

- i. Chittorgarh-Ajmer (New) 765 kV D/c
- ii. Ajmer (New)-Suratgarh (New) 765 kV D/c
- iii. Suratgarh (New)-Moga (PG) 765 kV D/c
- iv. Chittorgarh-Chittorgarh (RVPN) 400 kV D/c (Quad)
- v. Ajmer (New)- Ajmer (RVPN) 400 kV D/c (Quad)
- vi. Suratgarh (New)- Suratgarh 400 kV D/c (Quad)
- vii. 2x1500 MVA, 765/400 kV sub-station each at Chittorgarh, Ajmer (New) and Suratgarh (New)
- viii. Associated reactive compensation (Bus reactors & line reactors).

22.2 He added that Ministry of Power vide its letter no.11/43/2012-PG dated 07.02.2014 has approved the implementation of the ISTS portion of the Green Energy Corridor to be included in the KfW / GIZ funding proposal, under compressed time schedule by POWERGRID. As the KfW funding would be available in three tranches i.e. tranche-I, II & III, the transmission scheme to be implemented by POWERGRID has been phased out accordingly, which is given below:

(a) Green Energy Corridors-ISTS-Part-A (Tranche-I)

Rajasthan (Northern region)

- Ajmer (New)- Ajmer (RVPN) 400kV D/c (Quad) – 57km
- Chittorgarh (New)- Chittorgarh (RVPN) 400kV D/c (Quad)-25km
- Establishment of 2x1500 MVA, 765/400kV S/s at Chittorgarh
- Establishment of 2x1500 MVA, 765/400kV S/s at Ajmer (New)

Tamil Nadu (Southern region)

- Tirunelveli Pooling Station - Tuticorin Pooling Station 400 kV 2xD/c (Quad) -1st ckt 57km/2nd ckt – 55km
- Establishment of 2x500 MVA, 400/230kV S/s at Tirunelveli Pooling Station

(b) Green Energy Corridors-ISTS-Part-B (Tranche-II)

Gujarat (Western Region)

- Establishment of 765/400/220 kV (765/400 kV - 2x1500 MVA & 400/220 kV- 2x500MVA) sub-station at Banaskantha
- Banaskantha – Chittorgarh 765kV D/C -285 km
- Banaskantha-Sankhari 400 kV D/C-26 km

Rajasthan (Northern region)

- Chittorgarh – Ajmer(New) 765kV D/C -200km

(c) Green Energy Corridors-ISTS-Part-C (Tranche-III)

Gujarat (Western Region)

- Establishment of 765/400/220 kV (765/400 kV-2x1500 MVA & 400/220 kV- 2x500 MVA) sub-station at Bhuj Pool
- Bhuj Pool – Banaskanta 765kV D/c -315km

22.3 He further added that as per the studies carried out by POWERGRID the following reactive compensation (Bus reactors and line reactors) associated with transmission system for evacuation of renewable energy generations located in WR and NR was required:

BUS REACTORS:

S. No.	Substation	Rating
1	Chittorgarh S/s - 2x1500 MVA, 765/400kV	1x240 MVAR, 765kV 1x125 MVAR, 420kV
2	Ajmer S/s - 2x1500 MVA, 765/400kV	1x240 MVAR, 765kV 1x125 MVAR, 420kV
3	Banaskantha sub-station 765/400/220 kV (765/400 kV - 2x1500 MVA & 400/220 kV- 2x500MVA)	1x330 MVAR, 765kV 1x125 MVAR, 420kV
4	Bhuj Pool sub-station 765/400/220 kV (765/400 kV - 2x1500 MVA & 400/220 kV- 2x500MVA)	1x330 MVAR, 765kV 1x125 MVAR, 420kV

LINE REACTORS:

S. No.	Line	From end	To end
1	Banaskantha – Chittorgarh 765 kV D/c line	1x330 MVAR, 765kV (switchable) in each circuit	1x240 MVAR, 765kV (switchable) in each circuit
2	Banaskantha – Bhuj Pool line 765 kV D/C line.	1x330 MVAR, 765kV (switchable) in each circuit	1x330 MVAR, 765kV (switchable) in each circuit
3	Chittorgarh – Ajmer 765 kV D/c line	1x240 MVAR, 765kV (switchable) in each circuit	1x240 MVAR, 765kV in each circuit (switchable)

22.4 Members concurred with the proposed reactive compensation.

23.0 System for increasing capacity of Inter-State Transmission system for import of power into SR up to 2018-19.

23.1 Director (SP&PA), CEA stated that presently the power deficit in Southern Region is of the order of 3400 MW. This situation has arisen mainly due to – (i) delay / deferment of anticipated generation projects, for example, Krishnapattam UMPP (4000 MW), Cheyyur UMPP (4000 MW), Udangudi TPS (2120-MW), IPP projects in Nagapatanam / Cuddalore area (3000 to 4000 MW), Kundankulam APP (2000 MW), Kalpakkam PFPR (500 MW), East cost project in Srikakulam (1320 MW), Gas based projects in Vemagiri (about 3000 MW) etc. and (ii) also due to non-availability of gas for existing gas projects in Southern Region. Looking at the generation projects which are in pipe line or under planning stage and may materialized by 2018-19, generation addition capacity in the range of 22,000 MW (pessimistic scenario) to 30,000 MW is anticipated in Southern Region. In view of this, Southern Region may be in a deficit situation in the range of 10,000 MW to 16000 MW by the end of 2018-19. The existing / planned system can facilitate import of about 9000-10000 MW into Southern Region. To achieve the import objective of 16000 MW, following additional inter-regional transmission links along with system strengthening within the Southern grid has already been agreed by the SR constituents in their 37th SCPSR held on 31.07.2014:

S. No.	Scheme	Transmission elements
1.	Scheme-I: Additional inter-Regional AC link for import into Southern Region i.e. Warora-Warangal - Hyderabad-Kurnool 765kV link	<ul style="list-style-type: none"> (i) Establishment of 765/400kV substations at Warangal (New) with 2x1500 MVA transformer and 2x240 MVAR bus reactors. (ii) Warora Pool -Warangal (New) 765 kV D/c line with 240 MVAR switchable line reactor at both ends. (iii) Warangal (New) –Hyderabad765 kV D/c line with 330 MVAR switchable line reactor at Warangal end. (iv) Warangal (New) – Warangal (existing) 400 kV (quad) D/c line. (v) Hyderabad– Kurnool 765 kV D/c line with 240 MVAR switchable line reactor at Kurnool end. (vi) Warangal (New) – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends. (vii) LILO of Kurnool-Thiruvelam 765 kV D/c at Cuddapah (viii) Cuddapah- Hoodi 400kV (quad) D/c line with 63 MVAR switchable line reactor at both ends
2.	Scheme-II: HVDC Bipole link between Western region (Chhattisgarh) and Southern region (Tamil Nadu)	<ul style="list-style-type: none"> (i) Raigarh (HVDC Stn) – Pugalur (HVDC Stn) 6000 MW HVDC bipole (ii) Establishment of Raigarh HVDC Stn with 6000 MW HVDC terminals. (iii) Establishment of Pugalur HVDC Stn with 6000 MW HVDC terminals (or Alternatively: (i) with Pugalur HVDC Stn with 4000 MW terminal, <u>and</u> (ii) Madakkathara, in Kerala HVDC Stn with 2000 MW terminal and inter-connection

		<p>with existing 400kV AC S/S at Madakkathara</p> <p>(iv) Raigarh HVDC Station – Raigarh (Existing) 400kV (quad) 2xD/c lines (or with bay extension)</p> <p>(v) Pugalur HVDC Station – Pugalur (Existing) 400kV (quad) D/c line.</p> <p>(vi) Pugalur HVDC Station – Arasur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Arasur end.</p> <p>(vii) Pugalur HVDC Station – Thiruvalem 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.</p> <p>(viii) Pugalur HVDC Station – Edayarpalayam 400 kV (quad) D/c line with 63 MVAR switchable line reactor at Edayarpalayam end.</p> <p>(ix) Edayarpalayam – Udumulpeta 400 kV (quad) D/c line.</p> <p>(x) Establishment of 400/220kV substation with 2x500 MVA transformers at Edayarpalayam and 2x125 MVAR bus reactors.</p>
	<p>Scheme-III:</p> <p>Strengthening of transmission system beyond Vemagiri</p>	<p>(i) Vemagiri-II – Chilakaluripeta 765kV D/c line with 240 MVAR switchable line reactor at both ends.</p> <p>(ii) Chilakaluripeta – Cuddapah 765kV D/c line with 240 MVAR switchable line reactor at both ends.</p> <p>(iii) Chilakaluripeta – Podli 400kV (quad) D/c line</p> <p>(iv) Chilakaluripeta – Narsaraopeta 400kV (quad) D/c line</p> <p>(v) Cuddapah – Madhugiri 400kV (quad) D/c line with 80 MVAR switchable line reactor at both ends.</p> <p>(vi) Cuddapah-Hindupur 400kV (quad) D/c line with 80 MVAR switchable line reactor at Hindupur end.</p> <p>(vii) Srikaukulam Pooling Station – Garividi 400 kV (Quad) D/c line with 80 MVAR switchable line reactor at Garividi end.</p> <p>(viii) Establishment of 765/400kV substations at Chilakaluripeta and Cuddapah with 2x1500 MVA transformers and 2x240 MVAR bus reactors each.</p> <p>(ix) Establishment of 400/220kV substations at Podli with 2x315 MVA transformers and 2x125 MVAR bus reactors.</p>

23.2 Director (SP&PA), CEA further stated that to achieve some control of power flow on the Raichur – Sholapur 765 kV 2xS/C lines, 3000 MVA (2x1500 MVA) Phase Shifting Transformer (PST) 0 – 20 degree at Sholapur has also been agreed in the 37th SCPSR.

23.3 Members inquired about the cost the Phase Shifting Transformer (PST) and its operational experience worldwide. POWERGRID stated that cost of Phase Shifting Transformer (PST) is about 15 to 25 % higher than that of the conventional transformers. At present, there are no 765 kV Phase Shifting Transformer installed any where in the world.

23.4 MSETCL vide their letter dated 24th Sep., 2014 has requested POWERGRID for joint study for establishment of PST at Solapur (PG). In this regard, the detailed study carried out by POWERGRID was included as a part of the agenda for the meeting.

However, for modeling of PST in load flow studies, MSETCL may approach POWERGRID / CEA.

23.5 After deliberations, members agreed with the proposal.

24.0 New transmission schemes in Gujarat for RES generation.

24.1 Director (SP&PA), CEA stated that the intra-state transmission system required for integration of RES generation in the states of Gujarat was agreed in the 36th SCM of WR held on 29.08.2013. Subsequently, during the meeting held on 19.02.2014 in CEA, it was deliberated that the transmission schemes, which have already been awarded for implementation or was planned to be awarded during the next 5-6 months would not be considered for financial assistance under KfW funding. Accordingly, GETCO has proposed the following transmission schemes in place of the approved schemes which are already awarded / tendered for financial assistance by MNRE:

S.No.	Name of Transmission Element
(a) Transmission lines (400/220 kV):	
1	400 kV D/C Bhogat-Kalavad line (Quad).
2	220KV D/C Bhogat- Moti Gop line.
3	LILO of one circuit of 220 D/C Hadala – Sartanpar at Wankaner 220 kV substation (with AL-59).
4	LILO of 220 S/C Lalpar – Sartanpar at Wankaner 220 kV substation (with AL-59) (M/C tower by replacement of existing 132 kV towers)
5	LILO of both circuits of 220KV D/C Tebhda – Nyara line at Moti Gop substation (M/C line)
(b) 220 kV Sub-Stations:	
1	Upgradation of 132 kV Wankaner substation to 220 kV level
2	3X100 MVA, 220/66 kV Moti Gop substation (Dist. Jamnagar)
(c) Transmission lines feeder bays	
1	400 KV Feeder Bays : 2 no. at Bhogat, 2 no. at Kalavad
2	220 KV Feeder Bays : 2 no. at Bhogat

24.2 Members noted the same.

25.0 Inter-regional System Strengthening Scheme for NR & WR

25.1 Director (SP&PA), CEA stated that the transmission system for transfer of power from IPPs of SR to WR / NR was reviewed and agreed as WR-NR system strengthening scheme in the 35th Meeting of Standing Committee on Power System Planning of Western Region (SCPSPWR) held on 03.01.2013.

- (i) Solapur – Pune 765kV S/c (2nd) line.
- (ii) Jabalpur Pooling station - Orai 765 KV D/c line.

- (iii) Orai – Aligarh 765kV D/c line.
- (iv) Aligarh – Hapur 765kV D/c line.
- (v) Orai – Orai (UPPTCL) 400kV D/c (Quad) line.
- (vi) LILO of one circuit of Satna-Gwalior 765 KV line at Orai S/s.
- (vii) 2x1000MVA, 765/400KV substation at Orai S/s.
- (viii) LILO of Agra-Meerut 765 kV S/c line at Aligarh S/s.
- (ix) 2x1500MVA, 765/400KV S/s at Aligarh.
- (i) LILO of Kanpur – Jhatikara 765 kV S/c at Aligarh S/s)

25.2 He added that in the 31st SCSPNR held on 02.01.2013, due to changed scenario in NR, it was agreed that Aligarh–Hapur 765 kV D/C line would be taken up later date as per system requirement. In the meeting, it was also agreed that Orai sub-station would be developed as GIS and Aligarh sub-station would be initially developed as switching station (GIS).

25.3 He further added that, in the 36th SCSPWR Aurangabad- Sholapur 765 kV D/C line was agreed in lieu of Sholapur- Pune 765 kV (2nd) S/C line as system strengthening scheme for export of power to SR.

25.4 He said that taking the above changes into account, the elements of the WR-NR system strengthening scheme are as given below. These elements are being implemented by POWERGRID into two parts.

Part-A

- (ii) Aurangabad-Solapur 765 kV D/C line.

Part-B

- (iii) Jabalpur Pooling station - Orai (GIS) 765 kV D/c line
- (iv) Orai (GIS) - Aligarh (GIS) 765 kV D/c line
- (v) Orai (GIS) – Orai(UPPTCL) 400kV D/c (Quad) line
- (vi) LILO of one circuit of Satna-Gwalior 765 KV D/c line at Orai (GIS)
- (vii) Establishment of 2x1000MVA, 765/400 kV GIS substation at Orai (GIS)
- (viii) LILO of Agra-Meerut 765 kV S/c line at Aligarh (GIS)
- (ix) Establishment of 765 kV GIS Switching Station at Aligarh
- (x) LILO of Kanpur – Jhatikara 765 kV S/c at Aligarh (GIS)

25.5 He further stated that in the 34th SCSPNR held on 08.08.2014, the following reactive compensation as part of Inter-Regional System Strengthening Scheme for WR and NR was approved to facilitate charging and maintaining the voltage within stipulated limits under various network operating conditions:

		Approximate Line length	Line Reactor- From bus/circuit	Line Reactor- To bus/circuit
	Line Reactors			
1.	Aurangabad – Solapur 765 kV D/c	275 km.	240 MVAR (Switchable)	240 MVAR
2.	Jabalpur Pooling station - Orai (GIS) 765 kV D/c	360 km.	330 MVAR	330 MVAR
3.	Orai (GIS) – Aligarh (GIS) 765 kV D/c	280 km.	240 MVAR	240 MVAR
4.	Orai (GIS) – Orai (UPPTCL) 400 kV D/c (Quad)	30 km.	-	-
5.	LILO of one circuit of Satna-Gwalior 765 kV D/c at Orai (GIS)	60 km.		
	Existing Satna-Gwalior 765kV S/c	360 km.	240 MVAR	240 MVAR *

		Approximate Line length	Line Reactor- From bus/circuit	Line Reactor- To bus/circuit
			<i>(Switchable)</i>	
	Satna-Orai 765kV S/c	320 km.	<i>240 MVAR (Switchable)</i>	<i>240 MVAR</i>
	Orai-Gwalior 765kV S/c	130 km.		<i>240 MVAR * (Switchable)</i>
6.	LILO of Agra-Meerut 765 kV S/c line at Aligarh	30 km.	-	
	Existing Agra-Meerut 765kV S/c	270 km.		<i>240 MVAR (Switchable)</i>
	Agra-Aligarh 765kV S/c	130 km.	-	-
	Aligarh-Meerut 765kV S/c	200 km.		<i>240 MVAR (Switchable)</i>
7.	LILO of Kanpur – Jhatikara 765 kV S/c at Aligarh S/s	30 km.		
	Existing Kanpur-Jhatikara 765kV S/c	465 km.	<i>330 MVAR (Switchable)</i>	<i>330 MVAR (Fixed)</i>
	Kanpur-Aligarh 765kV S/c	330 km.	<i>330 MVAR (Switchable)</i>	<i>330 MVAR (Switchable)</i>
	Aligarh-Jhatikara 765kV S/c	190 km.		<i>330 MVAR (Presently fixed to be made Switchable)</i>
	Bus Reactors			
8.	2x1000MVA, 765/400KV GIS substation at Orai	2x330MVAR bus reactor		
9.	765KV Switching Station at Aligarh (GIS)	2x330MVAR bus reactor		

* Existing non-switchable line reactor at Gwalior end of Satna – Gwalior line which is to be LILOed at Orai to be converted into switchable line reactor.

25.6 Members agreed with the changes in the scheme and the reactive compensation.

26.0 Establishment of new 400/220 kV substations in Western Region and underlying 220 kV network.

26.1 Director (SP&PA), CEA stated that 400/220 kV substations at Magarwada in Daman & Diu, Betul in Madhya Pradesh and Vadodara in Gujarat were being implemented by POWERGRID under various transmission schemes. For gainful utilization, the 220 kV transmission lines needs to be implemented in the matching time of the 400/220 kV substations by the respective state transmission utilities. He requested MPPTCL, GETCO and Daman & Diu to intimate the status of implementation of underlying transmission system for drawal of power from these sub-stations.

26.2 GETCO informed that Vadodara-Venkatpur 220 kV D/C line and LILO of both ckts. of Jambua- Gotri 220 kV D/C line at Vadodara was planned for dispersal of power from Vadodara 765/400/220 kV substation. These lines would be implemented in the matching time frame of the 400/220 kV substation.

26.3 MPPTCL requested POWERGRID to provide the location of the proposed Betul substation. POWRRGRID informed that the land for Betul 400 kV substation has already been acquired and details of location would be furnished to MPPTCL. MPPTCL informed that after getting location details of Betul substation, they would intimate the 220 kV outlets from Betul 400/220 kV substation.

26.4 There was no representative from Daman & Diu in the meeting.

26.5 Members noted the same.

27.0 Delinking of Associated Transmission System of Krishnapatnum with commissioning of Krishnapatnum UMPP in Western Region

27.1 Director (SP&PA), CEA stated that the transmission system for evacuation of power from Krishnapatnum UMPP and additional transmission capacity between WR-SR was agreed in the 27th SCPSPWR held on 0.7.2007. The elements of the transmission system have been revised since then. The transmission elements associated with Krishnapatnum UMPP has been delinked from the generation project and has been agreed to be implemented as system strengthening schemes due to uncertainty in implementation of Krishnapatnum UMPP. The brief on the revision and changes in the transmission system in are given below:

- (i) The following transmission system for evacuation of power from Krishnapatnum UMPP and additional transmission capacity between WR-SR was discussed and agreed n the 27th SCPSPWR held on 0.7.2007:

Transmission system for evacuation of power from Krishnapatnum UMPP and additional transmission capacity between WR-SR

Scheme	Transmission system
Scheme A: Increasing SR-WR Inter-Regional Transmission Capacity through HVDC back-to-back	1) Narendra – Kolhapur 400kV D/C line 2) 1000 MW HVDC back-to-back at Narendra (or at Kolhapur, to be decided based on land availability) of which 500 MW through shifting of equipment from Sasaram.
Scheme B Synchronous Inter-connection of SR and WR	1) Raichur - Sholapur 765kV S/C line-1
Scheme C: Evacuation System for Krishnapatnum UMPP	1) Krishnapatnum UMPP – Nellore 400 kV, Quad D/C line 2) Krishnapatnum UMPP – Kurnool 400kV, Quad D/C line 3) Krishnapatnum UMPP –Gooty, 400 kV, Quad D/C line 4) Raichur - Sholapur 765kV S/C line-2 5) Sholapur – Pune 765kV S/C line 6) Kurnool – Raichur 765kV S/C line 7) 765kV substations at Kurnool, Raichur, Sholapur and Pune, with 765/400kV 3000 MVA transformers at each of the substations. 8) Inter-linking of Raichur 765kV (PG) S/S with Raichur(KPTCL) 400kV S/S
Scheme D System strengthening in Western Region corresponding to power from Krishnapatnum UMPP	1) Pune (WR) – Navi Mumbai (WR) 400kV D/C line

- (ii) From the implementation point of view, POWERGRID divided the Scheme-C into three parts (Part-A, Part-B and Part-C), as given below.

ATS of Krishnapatnum UMPP under scope of POWERGRID	
Part	Transmission system
Part-A	1) Krishnapatnum UMPP – Nellore 400 kV, Quad D/C line 2) Krishnapatnum UMPP –Gooty, 400 kV, Quad D/C line
Part-B	1) Establishment of new 765/400 kV substations at Raichur, Sholapur and Pune with 2X1500 MVA ICTs and 1X240 MVAR bus reactors. 2) LILO of existing Raichur- Gooty 400 kV D/C Quad line at Raichur (New) substation. 3) Raichur - Sholapur 765kV S/C line 4) Sholapur – Pune 765kV S/C line 5) Pune (New) – Pune 400 kV Quad D/C line.
Part-C	1) Establishment of new 765/400 kV substations at Kurnool with 2X1500 MVA ICTs and 1X240 MVAR bus reactor. 2) Krishnapatnum UMPP- Kurnool (new) 400 kV D/C Quad line with 63 MVAR line reactors at each end on both circuits. 3) Kurnool (New) – Raichur 765 kV S/C line. 4) LILO of N'Sagar – Gooty 400 kV S/C line at Kurnool (New) substation. 5) Kurnool (New) – Kurnool (APTRANSCO) 400 kV D/C Quad line.

- (iii) The 2nd Raichur- Sholapur 765 kV S/C line was decided to be implemented through tariff based competitive bidding route.
- (iv) Scheme–D: System strengthening in Western Region corresponding to power from Krishnapatnum UMPP, to be implemented by POWERGRID as WRSSSV.
- (v) Scheme-A i.e, Kolhapur / Narendra 1000 MW HVDC back-to-back link along with Narendra – Kolhapur 400 kV D/c line was scheduled for commissioning in the year 2010-11, anticipating the surplus in Southern Region (including power from various upcoming IPPs in Srikakulam, Tuticorin, Krishnapatnum complex) to transfer power from South to West / North till the commissioning of Raichur - Sholapur 765 kV lines. Due to high cost involved in shifting and re-commissioning of HVDC module from Sasaram, the scheme was not a techno-economic solution. Accordingly, in the 31st SCM of WR, in place of Scheme-A the following transmission system was agreed as inter-regional System Strengthening Scheme between SR-WR associated with new IPP Generation Projects in Nagapattinam / Cuddalore:
- New 400 kV substations each at Narendra (GIS) and Kolhapur (GIS) (to be upgraded to 765 kV).
 - Narendra – Kolhapur 765kV D/c line (initially to be operated at 400 kV)
 - LILO of both circuits of existing Kolhapur – Mapusa 400 kV D/c line at proposed Kolhapur 400 kV s/s

- 400 kV interconnection between Narendra (existing) and Narendra 400 kV GIS S/s
 - Kolhapur – Padghe 765 kV D/c one circuit via Pune (initially to be operated at 400 kV)
- (vi) Subsequently establishment of Pune 765/400 kV substation as GIS and its interconnection at 400 kV level through LILO of both circuits of Aurangabad – Pune 400 kV D/c line & Parli – Pune 400 kV D/c line at Pune 765/400 kV GIS was agreed in the 30th and 32nd SCM of WR respectively.
- (vii) In the 36th SCM of WR, LILO of one ckt of Aurangabad-Padghe 765 kV D/C line at Pune in lieu of Kolhapur-Padghe 765 kV D/C one ckt via Pune was agreed as system strengthening scheme in WR for transfer of power to SR from IPPs in Chhattisgarh.
- (viii) In the 33rd SCM of SR held on 20.10.2011, Part-B and some elements of Part-C of ATS of Krishnapatnum UMPP was de-linked from the commissioning of Krishnapatnum UMPP generation project and their implementation was taken up as system strengthening scheme due to the following reasons:
- Delay / Uncertainty in implementation of Krishnapatnum UMPP generation project.
 - Synchronous interconnection of WR and SR grid.
 - To increase inter-regional transmission capacity between WR and SR.
- (ix) The transmission elements under **Part-B** delinked from ATS of KUMPP are as given below:
- (i) Establishment of new 765/400 kV substations at Raichur and Sholapur with 2X1500 MVA ICTs and 1X240 MVAR bus reactors.
 - (ii) Establishment of new 765/400 kV GIS substation at Pune with 2X1500 MVA ICTs and 1X240 MVAR bus reactor.
 - (iii) LILO of existing Raichur- Gooty 400 kV D/C Quad line at Raichur (New) substation.
 - (iv) Raichur - Sholapur 765kV S/C line
 - (v) Sholapur – Pune 765kV S/C line
 - (vi) LILO of both circuits of Aurangabad – Pune 400 kV D/c line at Pune 765/400 kV GIS
 - (vii) LILO of both circuits of Parli – Pune 400 kV D/c line at Pune 765/400 kV GIS
- (x) The transmission elements under **Part-C (Part-C1)** delinked from ATS of KUMPP is as given below:
- (i) Establishment of new 765/400 kV substations at Kurnool with 2X1500 MVA ICTs and 1X240 MVAR bus reactor.
 - (ii) LILO of N'Sagar – Gooty 400 kV S/C line at Kurnool (New) substation.
 - (iii) Kurnool (New) – Kurnool (APTRANSCO) 400 kV D/C Quad line.
- (xi) The transmission elements under **Part-C (Part-C2)** which have been deferred in view of uncertainty of KUMPP are as given below:
- (i) Krishnapatnum UMPP- Kurnool (new) 400 kV D/C Quad line with 63 MVAR line reactors at each end on both circuits.

- (ii) Kurnool (New) – Raichur 765 kV S/C line.
- (xii) Further the Krishnapatnum UMPP – Gooty 400 kV D/C line , transmission element of Part-A, has been realigned as Nellore pooling station – Gooty 400 kV D/C quad line and is being implemented as Regional system strengthening scheme. Kurnool (New) – Raichur 765 kV S/C line has also been taken up regional system strengthening scheme.
- (xiii) In the 32nd SCM of WR POWERGRID has requested for review of Pune – Navi Mumbai 400kV D/C line, being implemented as WRSS-V, in view of severe RoW constraints envisaged in its implementation. In the meeting, it was decided that instead of dropping this line MSETCL would review and suggest an alternative location for termination of line from Pune for onward dispersal of power. No proposal has been received from MSETCL in this regard till date.

27.2 The summary of the changes / modifications in the transmission system for evacuation of power from Krishnapatnum UMPP and additional transmission capacity between WR-SR is tabulated below:

Transmission system associated with KUMPP and additional transmission capacity between WR-SR					
Original scheme			D/M /NC	Modified scheme	
S. No.	Transmission elements	SS/ ATS		SS/ ATS	Transmission elements
(i)	Narendra – Kolhapur 400kV D/C line	SS	M	SS	New 400 kV substations each at Narendra (GIS) and Kolhapur (GIS) (to be upgraded to 765 kV).
					Narendra – Kolhapur 765kV D/c line (initially to be operated at 400 kV)
(ii)	1000 MW HVDC back-to-back at Narendra/Kolhapur				LILO of both circuits of existing Kolhapur – Mapusa 400 kV D/c line at proposed Kolhapur 400 kV s/s
					400 kV interconnection between Narendra (existing) and Narendra 400 kV GIS S/s
(iii)	Raichur - Sholapur 765kV S/C line-2	SS	NC	SS	same
(iv)	Krishnapatnum UMPP – Nellore 400 kV	ATS	D	ATS	same
(v)	Krishnapatnum UMPP – Gooty	ATS	M	SS	Nellore pooling station- Gooty 400 kV D/C line.
(vi)	Establishment of new 765/400 kV substations at Kurnool with 2X1500 MVA ICTs and 1X240 MVAR bus reactor.	ATS	M	SS	same
(vii)	LILO of N'Sagar – Gooty 400 kV S/C line at Kurnool (New) substation.	ATS	M	SS	same

(viii)	Kurnool (New) – Kurnool (APTRANSCO) 400 kV D/C Quad line	ATS	M	SS	same
(ix)	Krishnapatnum UMPP-Kurnool (new) 400 kV D/C Quad line with 63 MVAR line reactors at each end on both circuits.	ATS	D	ATS	same
(x)	Kurnool (New) – Raichur 765 kV S/C line	ATS	M	SS	same
(xi)	Establishment of new 765/400 kV substations at Raichur and Sholapur with 2X1500 MVA ICTs and 1X240 MVAR bus reactors.	ATS	M	SS	same
(xii)	Establishment of new 765/400 kV GIS substation at Pune with 2X1500 MVA ICTs and 1X240 MVAR bus reactor.	ATS	M	SS	same
(xiii)	LILO of existing Raichur-Gooty 400 kV D/C Quad line at Raichur (New) substation.	ATS	M	SS	same
(xiv)	Raichur - Sholapur 765kV S/C line	ATS	M	SS	same
(xv)	Sholapur – Pune 765kV S/C line	ATS	M	SS	same
(xvi)	LILO of both circuits of Aurangabad – Pune 400 kV D/c line at Pune 765/400 kV GIS	ATS	M	SS	same
(xvii)	LILO of both circuits of Parli – Pune 400 kV D/c line at Pune 765/400 kV GIS	ATS	M	SS	same
(xviii)	Pune – Navi Mumbai 400kV D/C	SS	M	SS	Modified proposal to be received from MSETCL

Note: ATS: Associated Transmission System, SS: System Strengthening, M: Modified, NC: No Change, D: Deferred

27.3 Members agreed and noted the modifications.

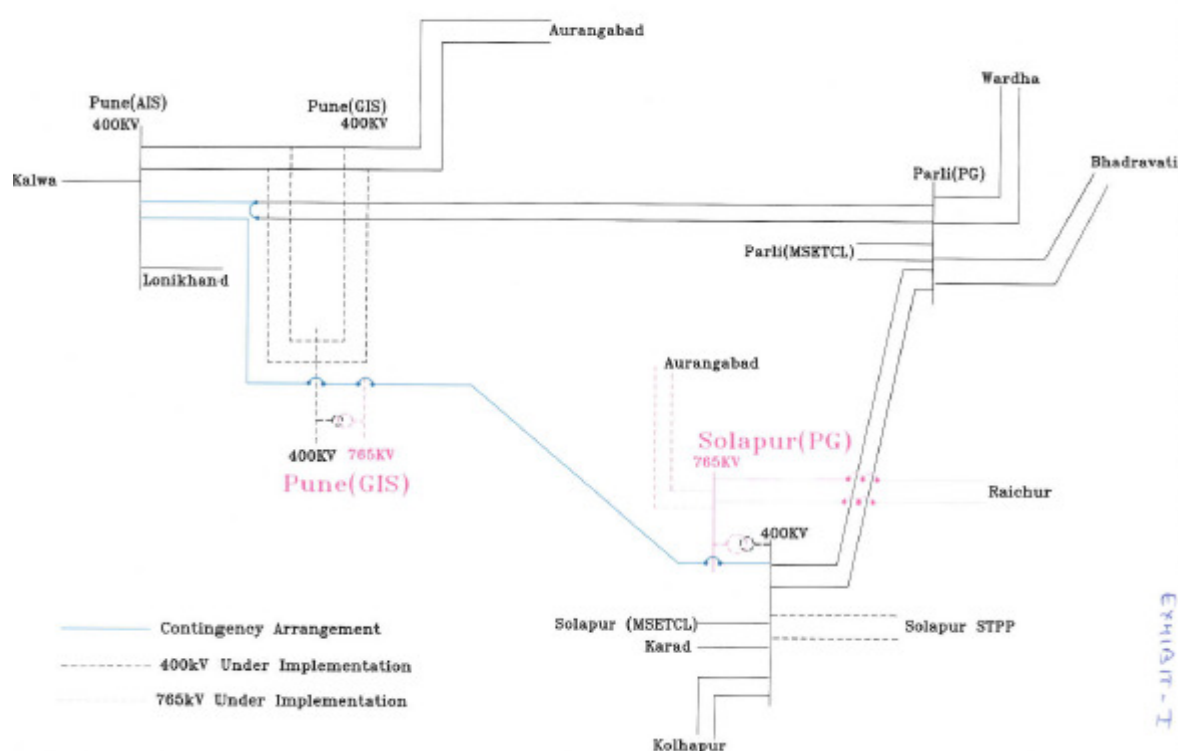
28.0 Contingency arrangement for operation of Pune (GIS) - Sholapur 765 kV S/C line.

28.1 Director (SP&PA), CEA stated that Pune (GIS) – Solapur 765kV S/C line along with Pune 765/400 kV GIS being implemented by POWERGRID was agreed as a part of transmission system for Krishnapatnum UMPP. Due to uncertainty in implementation of KUMPP and the requirement of increasing the inter-regional transmission capacity between WR-SR, most of the transmission elements, which were part of the ATS of Krishnapatnum UMPP were de-linked from the commissioning of Krishnapatnum UMPP generation project and their implementation was taken up as system strengthening scheme.

28.2 He added that Pune 765/400 kV GIS, as informed by POWERGRID, was expected to be commissioned by December 2014 / January 2015, whereas the Pune (GIS) – Solapur 765kV S/C line shall be ready in earlier time frame. Therefore, to provide an additional feed to Solapur, POWERGRID has proposed a contingency arrangement, wherein, Pune (GIS) – Solapur 765kV S/C line would be charged at of 400 kV level. This would be effected through following. The schematic diagram of the arrangement is given below.

- (i) Charging of Pune (GIS) – Solapur 765kV S/C line at 400 kV by passing Pune (GIS) and connecting to the existing Pune (AIS) substation utilizing LILO of Parli- Pune (AIS) 400 kV line at Pune (GIS).
- (ii) One no. 400 kV bay at Pune 400 kV AIS would be released by bunching of the existing Parli – Pune 400kV D/C line. This bay would be utilized for terminating the Solapur-Pune (GIS) 765 kV line charged at 400 kV level.
- (iii) Out of 2 nos. of 400kV bays available at Solapur, one bay would be arranged for Solapur – Solapur STPP and another one would be utilized in terminating the Pune (GIS) – Solapur line.

Contingency Arrangement of Pune (GIS) 765kV Substation



28.3 WRLDC informed that during peak load conditions in Maharashtra, four no. of 400 kV circuits between Parli and Pune carry around 1500-1800 MW of power. With the proposed bunching of the Parli-Pune 400 kV D/C, as suggested in the interim arrangement, outage of this line would be a N-2 contingency and power may rush through the Parli–Lonikhand-Pune 400 kV D/C line and via Parli–Solapur-Pune(GIS)-Pune(AIS) 400 kV D/C line. Therefore, it is suggested that N-2 security of the system

and overloading of the Pune-Solapur 400 kV D/C line may be re-examined with the proposed contingency arrangement.

- 28.4 POWERGRID informed that studies carried out with 1250 MW export from WR to SR over Solapur-Raichur 765 kV 2xS/C lines has been included in the agenda. The proposed interim arrangement provides an additional in feed to Solapur, which helps in power transfer to SR, in case of outage of one circuit of Parli–Solapur 400 kV S/C line.
- 28.5 After further deliberations, it was agreed that POWERGRID would re-examine the contingency arrangement, in light of observations made by WRLDC.

29.0 Additional 400 kV feed to Goa

- 29.1 Director (SP&PA), CEA stated that the Goa met the peak demand of 489 MW during the period April to July 2014 and as per the 18th EPS, the peak demand is expected to grow to 815 MW by the end of 12th Plan (2016-17). At present demand of Goa is mainly catered through Mapusa 3x315 MVA, 400/220 substation, which gets, it feed from Kolhapur 400 kV substation through a 400 kV D/C line. Goa system is also connected with Maharashtra and Karnataka through 220 kV lines. As per the new Planning Criteria under “n-1-1” contingency of 400 kV Kolhapur – Mapusa D/C line, there shall be severe constraints, in meeting the demand of Goa on remaining 220 kV network. To improve the reliability of power supply in Goa, an additional 400 kV in feed to Goa along with new 400/220 kV substation in South of Goa has been proposed. The details of new sub-station along with 400 kV inter-connections and 220 kV outlets would be worked out jointly by CEA, POWERGRID and Electricity department of Goa.
- 29.2 MS, WRPC that instead of providing an additional 400 kV substation to Goa for meeting their load, the already existing 220 kV link from Southern Region may be utilized.
- 29.3 WRLDC informed that high voltage is experienced in South Maharashtra during off-peak periods therefore, augmentation of 220 kV connectivity from Kolhapur 400/220 kV substation or from Southern Region side may also be considered.
- 29.4 After further deliberations, the proposal of additional 400 kV feed to Goa was deferred.

30.0 LILO of Raipur (PGCIL) – Urla 220 kV line at proposed Borjhara 220 kV substation- Agenda by CSPTCL.

- 30.1 Director (SP&PA), CEA informed that 220/132 kV, 3X160 MVA Urla substation in Chhattisgarh feeds power supply to industries and urban area of Raipur, where peak load of 400 MVA has already been observed. CSPTCL has planned to upgrade the existing Borjhara 132 kV substation to 220 kV substation which is located about 8 km from Urla substation to relieve loading on Urla ICTs and has proposed the following scheme:

S.No.	Transmission proposal	Implementation Phase
1	1X160 MVA, 220/132 kV substation at Borjhara	Phase I

2	LILO of 220 kV Raipur (PGCIL) - Urla line on multi circuit towers at Borjhara	
3	LILO of Bhilai- Gudhiyari 132 kV line at 220/132 kV substation at Borjhara	
4	LILO of 220 kV Khedemara (Bhilai) – Urla line at Borjhara	Phase II
5	1X160 MVA, 220/132 kV ICT at Borjhara substation	

30.2 He added that the proposal involves LILO of a 220 kV line emanating from inter state Raipur 400/220 kV substation and the Borjhara substation is proposed for meeting their capital city load.

30.3 He further stated that CSPTCL has intimated that works under Phase-I have already been included in the capital investment plan for the year 2013-16 and works under Phase-II would be included in the capital investment plan for the year 2016-19. Provision of 3rd 160 MVA, 220/132 kV transformer at Borjhara substation would be made depending on the actual loading on the transformers after commissioning of the substation.

30.4 After deliberations, member agreed with the proposal of CSPTCL.

31.0 New Transmission schemes in South Gujarat area- Agenda by GETCO.

31.1 Director (SP&PA), CEA stated that South Gujarat area is predominantly industrial load and high load growth is anticipated in this area. GETCO has informed that during less availability of generation from gas based generation projects in South Gujarat, many 220 kV lines are getting critically loaded and 220 kV network is not capable of handling any contingency in the area. To contain overloading of 220 kV network, some of 220 kV / 132 kV lines are being opened. Therefore, to strengthen transmission network in South Gujarat, GETCO has proposed two nos. 400 kV substations at Vav and Chikhli with the following 400 kV interconnections:

- (i) LILO of one circuit of 400 kV Ukai TPS – Kosamba 400 kV D/C line at proposed 400 kV Vav substation of GETCO.
- (ii) LILO of one circuit of 400 kV D/C Jhanor – Navsari (PG) line at proposed 400 kV Vav substation of GETCO.
- (iii) LILO of both circuits of Kakrapar – Vapi (PG) 400 kV D/C line at proposed 400 kV Chikhli substation of GETCO.
- (iv) LILO of one circuit of 400 kV Ukai TPS – Kosamba 400 kV D/C line at proposed 400 kV Chikhli substation of GETCO.

31.2 He added that the above proposed interconnections involve LILO of inter-state transmission line namely, Jhanor – Navsari 400 kV D/C line and Kakrapar – Vapi 400 kV D/C line. The Vav and Chikhli 400 kV substations proposed by GETCO is for feeding their loads in South Gujarat,

31.3 On a query on the feasibility of implementation of LILO of one circuit of 400 kV Ukai TPS – Kosamba 400 kV D/C line at proposed 400 kV Chikhli substation, GETCO informed that it would be difficult to implement due to RoW issues and they would review the same, if required.

31.4 After deliberations, members agreed with the proposal of GETCO.

32.0 Modifications in the already agreed schemes in the 36th SCM of WR / 18th LTA meeting of WR constituents held on 29.08.2013.

32.1 Director (SP&PA), CEA stated that the additional system strengthening scheme for Sipat STPS, Chhattisgarh IPPs and ATS for Gadarwara STPS was agreed in the 36th SCM of WR / 18th LTA meeting of WR constituents held on 29.08.2013. In addition 4000 MW Raigarh (Kotra) – Pugalur HVDC was also agreed for export of power to Southern Region.

32.2 He added that in view of changed deficit scenario in SR and to enable import of about 16000 MW in Southern Region, the Raigarh (Kotra) – Pugalur 4000 MW HVDC has been upgraded to 6000 MW and a new Warora pool-Warangal-Hyderabad-Kurnool 765 kV D/C line has also been planned. In view of above, following modifications in the already agreed scheme are proposed :

Approved in the 36 th SCM of WR	Modified Scheme
<p>Additional Transmission System Strengthening for Sipat STPS</p> <p>(i) Sipat – Bilaspur Pooling Station 3rd 765 kV S/c line.</p> <p>(ii) Bilaspur Pooling Station – Dhanwahi pooling station 765 kV D/c line.</p> <p>(iii) Establishment of new 2X1500, 765/400 kV Dhanwahi Pooling Station.</p> <p>(iv) LILO of both circuits of Jabalpur - Orai 765 kV D/C at Dhanwahi pooling station.</p> <p>(v) LILO of all circuits of Vindhyaal – Jabalpur 400 kV 2xD/c line at Dhanwahi pooling station.</p>	<p>Additional Transmission System Strengthening for Sipat STPS</p> <p>(i) Sipat – Bilaspur Pooling Station 3rd 765 kV S/c line.</p> <p>(ii) Bilaspur Pooling Station – Rajnandgaon 765 kV D/c line.</p>
<p>Additional System Strengthening Scheme for Chhattisgarh IPPs</p> <p>(i) Raipur (Pool) – Rajnandgaon 765 kV D/c line.</p> <p>(ii) Rajnandgaon – Pooling station near Warora 765 kV D/c line.</p> <p>(iii) LILO of one circuit of Aurangabad – Padghe 765 kV D/c line at Pune.</p> <p>(iv) Establishment of new substation near Rajnandgaon 765/400 kV,</p>	<p>Additional System Strengthening Scheme for Chhattisgarh IPPs</p> <p>(i) Raipur (Pool) – Rajnandgaon 765 kV D/c line.</p> <p>(ii) Rajnandgaon – Pooling station near Warora 765 kV D/c line.</p> <p>(iii) LILO of one circuit of Aurangabad – Padghe 765 kV D/c line at Pune.</p> <p>(iv) Establishment of 765 kV Rajnandgaon switching station.</p>

Approved in the 36 th SCM of WR	Modified Scheme
<p>2x1500 MVA substation.</p> <p>(v) LILO of all circuits of Raipur/Bhilai – Bhadrawati 400 kV lines at Rajnandgaon.</p> <p>(vi) Raigarh (Kotra) - Champa (Pool) – Dharamjaigarh 765 kV 2nd S/c line.</p>	<p>(v) Raigarh (Kotra) - Champa (Pool) – Dharamjaigarh 765 kV 2nd S/c line.</p>
<p>Transmission System Associated with Gadarwara STPS (2x800MW) of NTPC Ltd.</p> <p>i) Gadarwara STPS-Jabalpur Pool 765 kV D/C</p> <p>ii) Gadarwara STPS-Warora (Pooling Station) 765 kV D/C</p> <p>iii) Warora (Pooling Station)- Parli (New) 765 kV D/C</p> <p>iv) Parli (New)-Solapur 765 kV D/C</p> <p>v) LILO of both circuits of Wardha-Parli (PG) 400 kV D/C line at Warora (Pooling Station) (Quad)</p> <p>vi) Establishment of 2x1500 MVA 765/400 kV Warora (Pooling Station)</p> <p>vii) Parli (New)-Parli (PG) 400 kV D/C (Quad)</p> <p>viii) Establishment of 2x1500 MVA 765/400 kV Parli (New) S/S</p>	<p>Transmission System Associated with Gadarwara STPS (2x800MW) of NTPC Ltd.</p> <p>i) Gadarwara STPS-Jabalpur Pool 765 kV D/C</p> <p>ii) Gadarwara STPS-Warora (Pooling Station) 765 kV D/C</p> <p>iii) Warora (Pooling Station)- Parli (New) 765 kV D/C</p> <p>iv) Parli (New)-Solapur 765 kV D/C</p> <p>v) Warora 765/400 kV (Pooling Station) – Warora (MSETCL) 400 kV D/C Quad line.</p> <p>vi) Establishment of 2x1500 MVA 765/400 kV Warora (Pooling Station)</p> <p>vii) Parli (New)-Parli (PG) 400 kV D/C (Quad)</p> <p>viii) Establishment of 2x1500 MVA 765/400 kV Parli (New) S/S</p>

32.3 With regard to interconnection between Warora 765/400 kV (Pooling Station) and Warora (MSETCL) through a 400 kV D/C Quad line, MSETCL stated that they would revert back in 15 days time on the.

32.4 After deliberations, members approved the above modifications.

32.5 MSETCL vide their letter dated 24.09.2014 had stated that there is a space constraint at their Warora 400 kV substation and had suggested to explore the possibility of LILO of both ckts of Wardha (PG) – Warora (MSETCL) 400 kV D/C at Warora (PG) 765/400 kV pooling station.

32.6 In view of space constraint at Warora (MSETCL) 400 kV substation as informed by MSETCL, no change is proposed in the 400 kV connectivity of Warora 765/400 kV pooling station, which has been agreed as a part of **Transmission System Associated with Gadarwara STPS (2x800MW) of NTPC Ltd.**

32.7 In view of above, the modifications in the scheme finalized in the 36th SCM is as given below:

Approved in the 36 th SCM of WR	Modified Scheme
<p>Additional Transmission System Strengthening for Sipat STPS</p>	<p>Additional Transmission System Strengthening for Sipat STPS</p>

Approved in the 36 th SCM of WR	Modified Scheme
<p>(i) Sipat – Bilaspur Pooling Station 3rd 765 kV S/c line.</p> <p>(ii) Bilaspur Pooling Station – Dhanwahi pooling station 765 kV D/c line.</p> <p>(iii) Establishment of new 2X1500, 765/400 kV Dhanwahi Pooling Station.</p> <p>(iv) LILO of both circuits of Jabalpur - Orai 765 kV D/C at Dhanwahi pooling station.</p> <p>(v) LILO of all circuits of Vindhychal – Jabalpur 400 kV 2xD/c line at Dhanwahi pooling station.</p>	<p>(i) Sipat – Bilaspur Pooling Station 3rd 765 kV S/c line.</p> <p>(ii) Bilaspur Pooling Station – Rajnandgaon 765 kV D/c line.</p>
<p>Additional System Strengthening Scheme for Chhattisgarh IPPs</p> <p>(i) Raipur (Pool) – Rajnandgaon 765 kV D/c line.</p> <p>(ii) Rajnandgaon – Pooling station near Warora 765 kV D/c line.</p> <p>(iii) LILO of one circuit of Aurangabad – Padghe 765 kV D/c line at Pune.</p> <p>(iv) Establishment of new substation near Rajnandgaon 765/400 kV, 2x1500 MVA substation.</p> <p>(v) LILO of all circuits of Raipur/Bhilai – Bhadrawati 400 kV lines at Rajnandgaon.</p> <p>(vi) Raigarh (Kotra) - Champa (Pool) – Dharamjaigarh 765 kV 2nd S/c line.</p>	<p>Additional System Strengthening Scheme for Chhattisgarh IPPs</p> <p>(i) Raipur (Pool) – Rajnandgaon 765 kV D/c line.</p> <p>(ii) Rajnandgaon – Pooling station near Warora 765 kV D/c line.</p> <p>(iii) LILO of one circuit of Aurangabad – Padghe 765 kV D/c line at Pune.</p> <p>(iv) Establishment of 765 kV Rajnandgaon switching station.</p> <p>(v) Raigarh (Kotra) - Champa (Pool) – Dharamjaigarh 765 kV 2nd S/c line.</p>

33.0 Commissioning of 2X80 MVAR 400 kV line reactors associated with Aurangabad – Boisar 400 kV Quad line as bus reactors at Aurangabad.

33.1 Director (SP&PA), CEA stated that the Aurangabad-Boisar 400 kV D/C quad line, being implemented as a part of the transmission system associated with IPPs in Chhattisgarh by POWERGRID, is scheduled for commissioning by May 2015 whereas the associated line 2x80 MVAR line reactors at Aurangabad are ready for commissioning. Therefore, POWERGRID has proposed to commission the 2X80 MVAR 400 kV line reactors associated with Aurangabad – Boisar 400 kV Quad line as bus reactors at Aurangabad till the availability of the line to control the overvoltage whenever required.

33.2 Members agreed with the proposal of POWERGRID.

34.0 Commissioning of 240 MVAR, 765 kV Line Reactors as Bus Reactor at Jabalpur pool substation.

34.1 POWERGRID informed that 765/400 kV Jabalpur pooling substation was commissioned in January 2014. The voltage at Jabalpur pooling substation in the range of 780-799 kV has been observed for about 25% of the time in the month of June and July 2014. The Jabalpur pool-Bina 765 kV S/C (3rd) line under implementation by POWERGRID and Jabalpur-Bhopal 765 kV S/C line under implementation by M/s Bhopal Dhule Transmission Company Limited are scheduled for commissioning in 2-3 months time frame, whereas the associated line reactors at Jabalpur pool substation, under scope of POWERGRID, are ready for commissioning. POWERGRID proposed to commission the associated line reactors as bus reactors, till the commissioning of the 765 kV lines to contain the voltages within acceptable limits, whenever required.

34.2 After deliberations, commissioning of 240 MVAR, 765 kV line reactors associated with Jabalpur pool – Bina 765 kV S/C (3rd) line and Jabalpur-Bhopal 765 kV S/C line at 765/400 kV Jabalpur pool substation, as bus reactor was agreed.

35.0 Open Access Meeting.

35.1 The minutes of the 19th meeting on Connectivity, Open Access (Medium term and Long term) applications in Western Region is being issued separately by POWERGRID.

The meeting ended with thanks to the chair.

List of Participants during the 37th Meeting of Standing Committee of Power System Planning in WR held on 05-09-2014 at Mumbai.

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Status of implementation of transmission projects under tariff based competitive bidding

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
1.	Scheme for enabling import of NER/ER surplus by NR	PFC ENICL(Sterlite Technologies Ltd) Milestones : LOI place on 7.1.2010, SPV acquired on 31.3.2010 Trans. license received on 4.11.2010 Approval u/s 164 received on 21.6.2011, Tariff adoption on 2.11.2010 Original COD: March 2013	(i) Bongaigaon-Siliguri 400 kV Quad D/C	Length-444ckm, Locations-610, Foundation-610, Tower Erection-610, Stringing completed-415 ckm The progress of Bongaigaon-Siliguri line has been affected due to delay in getting forest clearance, law & order problem in Assam and row issues. Line expected to be commissioned by 10/14
			(ii) Purnea-Biharsharif 400 kV D/C Quad D/C	Line Commissioned in 9/2013
2.	System Strengthening in NR for import of power from North Karanpura and other projects outside NR and System Strengthening in WR for import of power from North Karanpura and other projects outside Western Region and also for projects within Western Region.	REC NKTCL(Reliance Power Transmission Company Ltd) Milestones : SPV acquired by Reliance on 20-05-2010 (Effective date) Approval u/s 164 received on 12.08.2013	1. Sipat/Korba (Pooling) – Seoni 2. Lucknow-Bareilly 3. Bareilly-Meerut 4. Agra-Gurgaon 5. Gurgaon-Gurgaon (PG) 6. Gurgaon S/S	Matter was in CERC for revision of tariff and extension of date of commissioning. NKTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013. Appellate Tribunal has given final judgment on 2.12.13 setting aside CERC order and allowing the appeal. NKTCL is initiating steps for implementing of order. The judgment of Appellate Tribunal accepts delay in clearance under section-164 as force majeure. According NKTCL have requested MoP to extend the validity of section 68 clearance vide their letter dtd 14.1.2014 Beneficiaries have appealed SC. Work Yet to start.
3.	Talcher-II Augmentation System	REC TTCL(Reliance Power Transmission Company Ltd.) Milestones : LOI issued on 18-12-2009 SPV acquired by Reliance on 27-04-2010 (Effective date)	(i)Talcher II- Rourkela 400 kV D/C Quad line (ii)Talcher II – Behrampur 400 kV D/C line (iii)Behrampur-Gazuwaka 400 kV D/C line (iv)400/220 kV, 2x315 MVA Behrampur substation	Matter was in CERC for revision of tariff and extension of date of commissioning. TTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013. Appellate Tribunal has given final judgment on 2.12.13 setting aside CERC order and allowing the appeal. TTCL is initiating steps for implementing of order. The judgment of Appellate Tribunal accepts delay in clearance under section-164 as force majeure. According TTCL have requested MoP to extend the validity of section 68 clearance vide their letter dtd 14.1.2014. Beneficiaries have appealed SC. Work yet to start.
4.	Transmission System Associated with Krishnapattnam UMPP- Synchronous interconnection between SR and WR (Part-B)	REC RSTCL(Consortium of Patel-Simplex- BSTranscomm) Milestones: LOI placed on 16.12.2010 SPV acquired on 7.1.2011 Trans. license received on 24.8.2011 Approval u/s 164 received on 29.8.2011 Tariff adoption on 12.8.2011 Original COD : Jan 2014	(i) Raichur-Sholapur 765 kV S/C line-1-208 ckm	Commissioned on 30.6.2014

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
5.	System strengthening common for WR and NR	PFC JTCL(Sterlite Grid) Milestones: LOI placed on 31.01.2011 Special Purpose Vehicle acquired on 31.03.2011 Scheduled Completion Date is 31.03.2014. Transmission License granted on 12.10.2011. Tariff adoption approval on 28.10.2011 Clearance under Section 164 : received on 12.07.2013	(i) Dhramjaygarh-Jabalpur 765 kV D/C 765 kV lines	Length-760ckm, Locations-985, Foundation-714, Tower Erection-666, Stringing completed-250ckm, Progress affected due to pending forest Clearance(284 Ha in MP and 114Ha in Chhattisgarh) and Severe row problem. JTCL informed vide email dtd 21.8.2014 that forest proposal has been forwarded to CCF, Jabalpur for forest involved in MP and in case of Chhattisgarh the proposal is with Nodal officer, Champa. Line expected to be commissioned by 04/15
			(ii) Jabalpur-Bina 765 kV S/C line	Length-237ckm, Locations-610, Foundation-550, Tower Erection-544, Stringing completed-185ckm, Progress affected due to pending forest Clearance (140Ha in MP) and Severe row problem. JTCL informed vide email dtd 21.8.2014 that forest proposal has been forwarded to CCF, Jabalpur for forest involved in MP. Line expected to be commissioned by 02/15
6.	System strengthening for WR	PFC BDTCL(Sterlite Grid) Milestones: LOI placed on 19.1.2011 SPV acquired on 31.3.2011 Trans. license received on 12.10.2011 Approval u/s 164 received on 29.01.2013 Tariff adoption on 28.10.2011 Original COD : Mar2014	(i) Jabalpur-Bhopal 765 kV S/C line	Length-260ckm, Locations-664, Foundation-626, Tower Erection-594, Stringing completed-204ckm, Progress affected due to pending forest Clearance (112Ha in MP) and Severe row problem. BDTCL informed vide email dtd 21.8.2014 that forest proposal has been forwarded to Minister for forest involved in MP. Line expected to be commissioned by 02/15
			(ii) Bhopal-Indore 765 kV S/C line	Length-176ckm, Locations-455, Foundation-455, Tower Erection-454, Stringing completed-174ckm, Progress affected due to Severe row problem at 1 locs and matter in Distt court. Line expected to be commissioned by 10/14
			(iii) 2x1500 MVA 765/400 kV substation at Bhopal	Commissioned in 7/2014
			(iv) Bhopal-Bhopal (MPPTCL) 400 kV D/c quad line.	Commissioned in 7/2014

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
			(v) Aurangabad-Dhule 765 kV S/C line	Length-192ckm, Locations-509, Foundation-509, Tower Erection-509, Stringing completed-192ckm, Line expected to be commissioned by 10/14
			(vi) Dhule-Vadodara 765 kV S/C line	Length-263ckm, Locations-680, Foundation-640, Tower Erection-635, Stringing completed-213ckm, Line is expected to complete by 30.10.2014 but bays at Vadodra s/s by pgcil will be ready by Dec2014. Line expected to be commissioned by 12/14
			(vii) 2x1500 MVA, 765/400 kV substation at Dhule	CEA Inspection completed and s/s is ready for energisation since 31.1.14.
			(viii) Dhule - Dhule(Msetcl)400 kV D/C Line	Length-36ckm, Locations-56, Foundation-56, Tower Erection-56, Stringing completed-36ckm, Line completed but could not be commissioned due to non-availability of bays by MSETCL at their Dhule s/s
7.	Transmission system associated with IPPs of Nagapattinam/ Cuddalore Area-Package A	PFC PGCIL Milestones: SPV acquired on 29/03/2012 Tr. License issued on 15.7.2013 Tariff adoption by CERC on 9.5.2013. Clearance U/s 164 received on 9.12.2013. Scheduled COD 29.3.2015 (30months effective from 20.6.13, date of grant of license) Work awarded on 16.5.2014 to M/s Gammon and M/s IComm	(i) Nagapattinam Pooling Station-Salem 765 kV D/C line - 200ckm (ii) Salem-Madhugiri 765 kV S/C line -217km	Length-400ckm, Locations-543, Foundation-24, Tower Erection-0, Stringing completed-0ckm Length-217ckm, Locations-619, Foundation-19, Tower Erection-0, Stringing completed-0ckm
8.	Transmission System associated with IPPs of Vemagiri Area-Package A	REC PGCIL Milestones: SPV acquired on 18/04/2012	(i) Vemagiri Pooling Station-Khammam 765 kV 1xD/C (1 st ckt.) line. (ii) Khammam-Hyderabad 765 kV 1xD/C (1 st ckt.) line.	Put on hold as commissioning of the associated generating station is delayed due to non-availability of gas. As per the order of CERC dtd. 27.9.2013 the execution of project has been terminated.
9.	Transmission System required for evacuation of power from Kudgi TPS (3x800 MW in Phase-I) of NTPC Limited.	REC KudgiTCL (M/s L&T Infrastructure Development Projects Limited) Milestones: LOI placed on31/07/13	(i)Kudgi TPS – Narendra 400 kV 2xD/C line (I&II)	Length-36ckm, Locations-46, Foundation-4, Tower Erection-0, Stringing completed-0ckm, Scheduled completion : 28.02.2015(18month)

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
		SPV acquired on 30.8.2013 PG submitted on 22.8.2013 Tr. License application filed in CERC on 2.9.2013 and application for tariff adoption filed on 2.9.2013. Tr. License issued on 7.1.2014 and tariff adoption by CERC on 8.1.2014. Clearance U/s 164 – issued 24.4.2014 Awarded EPC contract 7.1.2014 detailed contract signed on 24.2.2014 Financial closure on 24.2.2014	(ii)Narendra (New) – Madhugiri 765 kV D/C line	Length-760ckm, Locations-867, Foundation-309, Tower Erection-47, Stringing completed-0ckm, Scheduled completion : 31.12.2015(28 months),
			(iii)Madhugiri – Bidadi 400 kV/D/C Line	Length-190ckm, Locations-247, Foundation-54, Tower Erection-12, Stringing completed-0ckm, Scheduled completion : 31.12.2015(28 months)
10.	Transmission system for system strengthening in SR for import of power from ER	REC Vizag Transmission Limited Milestones: (i) LOI placed on 31.07.13 (ii) Special Purpose Vehicle acquired on 30.8.2013 (iii) Tr. License issued on 8/1/2014 and tariff adoption by CERC on 23/1/2014 (iv) Clearance U/s 164 – received on 21.05.2014 (v) Schedule COD 30.8.2016 Work awarded on 28.2.2014 to Tata Proj. Icomm, L&T and M/s Gammon	(i) Srikakulam PP – Vemagiri-II Pooling Station 765 kV D/c line-334km	Length- 668ckm, Locations-868, Foundation-87, Tower Erection-0, Stringing completed-0ckm,
			(ii) Khammam(existing) – Nagarjuna Sagar 400 kV D/c line-145km	Length- 292ckm, Locations-400, Foundation-12, Tower Erection-0, Stringing completed-0ckm,
11	Transmission System for Patran 400kV S/S	PFC PTCL(Techno Electric and Engineering Company Ltd.) Milestones: (i) LOI placed on 17.09.2013 (ii) SPV acquired on 13.11.2013 (iii) Application for adoption of tariff filed in CERC. Hearing on 18.03.2014. (iv) Application for grant of License filed in CERC. Hearing on 18.03.2014 (v) Clearance under Section 164 : Request not received in MoP (vi) Scheduled COD: 13.05.2016.	(i) LILO of both circuits of Patiala-Kaithal 400kV D/c at Patran (Triple snow Bird Conductor)	Work yet to award
			(ii) 2x500 MVA, 400/220 kV Substation at Patran	Work yet to award
12	Eastern Region System Strengthening Scheme-VI	PFC DMTCL (Essel Infraprojects Ltd.) Milestones: LOI placed on 17.10.2013 Special Purpose Vehicle acquired on 10.12.2013 Application for adoption of tariff filed in CERC on Hearing on 27.02.2014 and order for tariff	(i) 2x500 MVA, 400/220 kV GIS Substation at Darbhanga with space for future extension (1x500 MVA)	Land identified and demarcation is completed. Legal vetting under progress
			(ii) 2x200 MVA, 400/132 kV GIS Substation at Mothihari with space for future extension (1x200 MVA)	Partially land(8.5 acre)for s/s acquired and soil investigation is u/p.

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
		adoption issued by CERC on 20.5.2014 Application for grant of License filed in CERC. Hearing on 27.02.2014 and license received on 30.5.2014 Clearance u/s 164 : received in 9/2014 Scheduled COD: 01.07.2016.	(iii) Muzaffarpur(PG)-Darbhanga 400 kV D/c line with triple snowbird conductor (iv) LILO of Barh – Gorakhpur 400 kV D/c line at Mothihari, 400kV 2xD/C quad	Order for tower package placed Order for tower design and testing placed
13	Part ATS for RAPP U-7&8 in Rajasthan	PFC RAPPTCL(Sterlite Grid Ltd) Milestones: (i) LOI placed on 17/09/13 (ii) Special Purpose Vehicle acquired on 12/03/2014 (iii) Scheduled COD : 28.02.2016. (iv) Clearance under Section 164 : Request not received in MoP	(i) RAPP - Shujalpur 400kV D/C line	Engg work started and EPC Contract awarded. work expected to start by 11/2014. Forest proposal (30 ha) has been initiated.
14	ATS of Unchahar TPS	REC UnchaharTCL(PGCIL) Milestones: (i) LOI placed on 14/02/14. (ii) SPV acquired on 24/03/2014. (iii) Transmission license granted (iv) Tariff charged adopted by CERC and approval recd on 3.7.2014 (v) Clearance under Section 164 : Newspaper/Gazette publication completed, Application submitted to CEA/MoP is under process Scheduled completion : 23/09/2016	(i) Unchahar - Fatehpur 400 kV D/C line	Procurement process is under progress and award by Nov2014
15	Eastern Region System Strengthening Scheme-VII	PFC PKTCL(Sterlite Grid Ltd.) Milestones: (i) LOI placed on 17.09.2013 (ii) Special Purpose Vehicle acquired on 09.12.2013 (iii) Application for adoption of tariff filed in CERC. Hearing on 27.02.2014. (iv) Application for grant of License filed in CERC. Hearing on 27.02.2014. (v) Clearance under Section 164 : Request not received in MoP (vi) Scheduled COD: 09.03.2016.	(ii) Purulia PSP(WB) – Ranchi (PG) 400 kV D/C line (iii) Chaibasa – Kharagpur 400 kV D/C line	Work yet to start..
16.	NR System strengthening Scheme-NRSS-XXXI(Part-A)	REC PGCIL Milestones: (i) LOI placed on 26/02/14.	(i) 7x105 MVA (1 phase), 400/220 kV GIS at Kala amb (ii) LILO of both ckt of Karcham Wangtoo-	S/s package awarded to siemens on Aug 2014

S.N.	Name of the Project	BPC / Implementing Agency / Milestones	Scope of works	Current Status
		(ii) Special Purpose Vehicle acquired on 12/05/2014. (iii) Transmission license granted (iv) Tariff charges adopted CERC (v) Clearance under Section 164 : is under process will be applied after finalisation of land for s/s which shall be finalised by Dec2014. (vi) Scheduled COD : 12/07/2017	Abdullapur 400 kV D/c line at Kala Amb(on M/C tower) (iii) 40% series compensation on 400 kV Karcham Wangtoo – Kala Amb D/C line at Kala Amb end	
17.	Northern Region System Strengthening Scheme, NRSS-XXXI (Part-B)	REC M/s Essel Infraprojects Ltd Milestones: (i) LOI placed on 26/02/14. (ii) SPV acquired on 12/05/2014. (iii) Transmission license application filed in CERC on 13/05/14. (iv) Tariff adoption by CERC: under process in CERC for adoption. (v) Clearance under Section 164 : submitted in MoP in 9/2014 (vi) Scheduled completion : 12/09/2016	(i) Kurukshetra-Malerkotla 400 kV D/C line (ii) Malerkotla-Amritsar 400 kV D/C line	Survey work for route alignment of transmission lines is under progress

Status of transmission schemes under implementation by POWERGRID

STATUS OF WESTERN REGION TRANSMISSION SCHEME

Sl. No.	Description of Scheme	Estimated Cost (Rs. Cr)	Date of firming up in WR standing committee	Date of FR	Date of investment approval	Target date as of now	Remarks
1	Western Region System Strengthening Scheme-II	5222	20 th (23.01.04)	Sep'05 (Rev)	July'06		
	Set-A: For absorbing import in eastern and central part of WR Grid (POWERGRID)	1700					commissioned
	Set-B: For regional strengthening in Southern Maharashtra (100 % private)	1050				Commissioned	Commissioned
	a) Parli(PG) - Pune 400kV D/c					commissioned	
	b) Pune - Aurangabad 400kV D/c					commissioned	
	c) Parli(PG) - Solapur 400kV D/c					commissioned	
	d) Solapur - Kolhapur 400kV D/c					commissioned	
	e) LILO of Lonikhand - Kalwa 400kV D/c line at Pune					commissioned	
	f) LILO of Sholapur - Karad 400kV S/c line at South Solapur					commissioned	
	Set-C: For regional strengthening in Gujarat (100 % private)	600				---	Implementation by Reliance
	a) Rajgarh - Karamsad 400kV D/c					---	
	b) Limdi(Chorania) - Ranchodpura 400kV D/c					commissioned	
	c) Ranchodpura - Zerda(Kansari) 400kV D/c					commissioned	

	Set-D: For regional Strengthening in Northern Madhya Pradesh (POWERGRID)	1050					commissio ned
2	Western Region System Strengthening -V a) 400 kV Vapi- Navi Mumbai D/c b) LILO of 400 kV Lonikhand/Pune - Kalwa line at Navi Mumbai c) Establishment of 400/220 kV, 2 x 315 MVA new S/s (GIS) at Navi Mumbai d) 220 kV Vapi-Khadoli D/c.	478	25 th (30.09.06)	Jan'07	Dec'07	Changed to Vapi-Kudus 400 kV D/c line Dec'14 Substation is ready and shall be commissio ned matching with line commissio ned	Under implement ation Severe ROW & Forest issue
3	Tr. System of Mundra Ultra Mega Power Project (4000 MW) a) Mundra – Bachchau-Ranchodpura 400 kV (Triple) D/c b) Mundra – Jetpur 400 kV (Triple) D/c c) Mundra – Limbdi 400 kV (Triple) D/c d) Gandhar-Navsari 400 kV D/c e) Navsari- Boisar 400 kV D/c f) LILO of both circuits of Kawas-Navsari 220 kV D/c at Navsari (PG) g) Wardha-Aurangabad 400 kV(Quad) D/c (with provision to upgrade at 1200 kV at later date) g) Aurangabad - Aurangabad 400 kV(Quad)	4546	26 th (23.02.07)	Jun'07	Oct'08	Commissio ned Commissio ned Commissio ned Commissio ned Mar'15 Commissio ned Dec'15 Commissio ned	Under implement ation Severe ROW & Forest issue

	Substations a) 40% Fixed Series Compensation each on Wardha - Aurangabad 400 kV D/c at Wardha end b) Establishment of new 400/220 kV, 2x315 MVA substation at Navsari & Bachchau c) Establishment of new 765/400 kV, 3x1500 MVA, substation at Wardha for charging of Seoni - Wardha 2xS/c lines at 765 kV level					Dec'15 Commissioned Commissioned	Commissioning matching with the line
4	Tr. System associated with DVC, Maithon in ER (Part system) a) Ranchi-WR Pooling Station 765kV S/c	1100	27 th (30.07.07)	Sept'07	Aug'08	Commissioned Commissioned	commissioned
5	Transmission system associated with Krishnapatnam (5x800 MW) (WR Portion)-now delinked from Krishnapatnam UMPP a) Raichur – Sholapur 765 kV S/c b) Sholapur – Pune 765 kV S/c c) LILO of 400kV Aurangabad- Pune D/c & Parli- Pune D/c lines at Pune(GIS) d) Establishment of new 765/400 kV substations at Pune with 2x1500 MVA transformation capacity	1928	27 th (30.07.07)	Jan'08		Mar'15 Commissioned Oct'14 Oct'14 Jan'15	Under implementation
6	Split Bus arrangement and reconfiguration/shifting of terminating lines at Raipur 400kV S/s a) Splitting 400kV Raipur bus into two sections between existing line bays of Chandrapur-1 & Chandrapur-2 through bus sectionaliser.	16	28 th (06.12.08)	Apr'09	Aug'10	Commissioned	Commissioned

	<p>b) Bypass 400kV Bhatapara-Raipur-Bhilai line at Raipur and restore the line as 400kV Bhatapara-Bhilai S/c</p> <p>c) Shifting of Chandrapur-2 and Chandrapur-3 line bays from Section Raipur-B* to Raipur-A*.</p>						
7	<p>Associated transmission system of VSTPP-IV and Rihand-III</p> <p>a) Rihand-III-Vindhyachal Pool 765 kV D/c (initially to be op. at 400kV)</p> <p>b) Vindhyachal-IV Vindhyachal Pool 400kV D/c(Quad)</p> <p>c) Vindhyachal Pool-Satna 765 kV 2xS/c</p> <p>d) Satna -Gwalior 765 kV 2xS/c</p> <p>e) Gwalior – Jaipur(South) 765 kV S/c</p> <p>f) Vindhyachal Pool-Sasan 765 kV S/c</p> <p>g) Vindhyachal Pool-Sasan 400 kV D/c</p> <p>h) Establishment of 765/400kV, 2x1500 MVA substation at Vindhyachal Pool</p>	4673	29 th (10.09.09)	Sep'09	Mar'10	<p>Mar'15</p> <p>Commissioned</p> <p>Commissioned</p> <p>Dec'14</p> <p>Commissioned</p> <p>Dec'14</p> <p>Commissioned</p> <p>Commissioned</p> <p>Mar'15</p>	Under implementation
8	<p>Establishment of 400/220kV substation in UT DNH</p> <p>a) LILO of Vapi- Navi Mumbai 400kV D/c at Kala S/s in UT DNH</p> <p>b) Establishment of 400/220kV, 2x315 MVA substation at Kala in UT DNH</p>	181	28 th (06.12.08)	Jan'10	Jul'11	<p>Commissioned</p> <p>Commissioned</p> <p>Commissioned</p>	Commissioned
9	<p>Establishment of 400/220kV substation in UT Daman</p> <p>a) LILO of Navsari-Boisar 400kV D/c at Magarwada in UT Daman-30 km</p>	234	30 th (08.07.10)	Mar'10	Jan'12	<p>Oct'14</p>	Under implementation

	b) Establishment of 400/220kV, 2x315 MVA substation at Magarwada					Oct'14	
10	Western Region System Strengthening Scheme-XIII a) Bachau(PG) – Versana(GETCO) 400kV D/c-10 km	49	30 th (08.07.10)	Jan'11	Dec'11	Dec'14	Under implementation
11	Solapur STPP(2x660MW) transmission system a) Solapur STPP – Solapur (PG) 400kV D/c (Quad) b) Augmentation of 400/220kV ICT by 1x315MVA transformer (3 rd) at Solapur (PG)	630	30 th (08.07.10)	Jul'11	Sep'13	Dec'14 Mar'15	Under implementation
12	Solapur STPP (2x660MW) transmission system (Part-A) a) Solapur STPP – Solapur (PG) 400kV 2nd D/c (Quad)					June'16	Tendering under progress
13	Augmentation of transformer and bays in Western Region a) Installation of 400/220kV, 1x315MVA transformer (3rd) at Mapusa(PG) along with 2 nos. 220kV line bays at Mapusa (PG) sub station b) Installation of 400/220kV, 1x500MVA transformer (3rd) at Navsari c) Two nos. 400kV line bays at 765/400kV Indore(PG) Substation d) Two nos. 220kV line bays at 400/220kV Pirana(PG) Substation.	65	30th/32nd (WR SCM)	Aug'11	June'12	Commissioned Commissioned 1no Bay-Commissioned, 2nd Bay-Sep'14 Oct'14	Under implementation

14	Transmission system for evacuation of Kakrapar Atomic Power Project unit 3 &4 (2x700 MW) a) Kakrapar NPP – Navsari 400kV D/c – 65 km b) Kakrapar NPP – Vapi 400kV D/c - 120 km	250	31 st (27.12.10)	Nov'12	-	Oct'16	Under Implementation
15	Transmission System associated with Mauda Stage-II (2x660 MW) a) Mauda II – Betul 400KV D/c (Quad)-210 km b) Betul– Khandwa 400KV D/c (Quad)-180 km c) Khandwa – Rajgarh 400kV D/c (2nd)-215 km d) Establishment of 400/220kV 2x315MVA substation at Betul	1100	32 nd (13.05.11)	Apr'12	Sep'13	May'16	Under Implementation
16	Provision of 1x315MVA ICT for reliable auxilliary power supply at HVDV back to back station at Bhadravati	143	33 rd (21.10.11)	June'12	-	Dec'14	Under Implementation
17	Installation of Reactors in Western Region a)420kV, 125 MVAR Reactors at Jabalpur, Khandwa, Shujaplur, Bhatpara , Raigarh & Aurangabad 400kV substation b) 420kV , 80MVAR Reactor at 400kV Solapur Substatoin.	83	33 rd (21.10.11)	Jan'12	Sep'11	Commissioned Nov'14	Under implementation
18	Installation of Reactors in Western Region (Part-II) a)420kV, 125 MVAR Reactors at Damoh (PG), Bachau (PG), Pirana (PG), Seoni (PG), Parli (PG) , Raipur (PG), Itarsi (PG) and Gwalior (PG) 400kV Substations b) 420kV, 63MVAR Reactor at 400kV Raipur (PG) substation.	98	34 th (09.05.12)	Aug'12	-	Dec'14 Commissioned	Under Implementation

19	<p>Establishment of Pooling Station at Champa and Raigarh (Near Tamnar) for IPP Generation Projects in Chhattisgarh</p> <p>a) Champa Pooling Station - Raipur Pooling Station 765kv D/c</p> <p>b) Raigarh Pooling Station (near Kotra) - Raigarh pooling (near Tamnar) 765kV D/c</p> <p>c) Champa Pooling Station - Dharamjaygarh Pooling Station 765kv S/c</p> <p>d) Raigarh Pooling Station (near Kotra) - Champa pooling 765kV S/c</p> <p>e) Establishment of 765/400kV 6x1500MVA Champa Pooling Station</p> <p>f) Establishment of 765/400kV 3x1500MVA Raigarh Pooling Station (near Tamnar)</p>	2066.85	29th (10.09.09)	Apr'10		<p>Commissioned by-passing Champa Pool</p> <p>Commissioned</p> <p>Commissioned by-passing Champa Pool</p> <p>March'15</p> <p>June'15</p> <p>Commissioned</p>	Under Implementation
20	<p>Integration of Pooling Station in Chhattisgarh with Central part of WR for IPP generation projects in Chhattisgarh</p> <p>a) Raipur Pooling Station - Wardha 765kV D/c</p>	1452.87	29th (10.09.09)	Apr'10		Nov'14	Under Implementation
21	<p>Transmission system strengthening in Western Part of WR for IPP generation projects in Chhattisgarh</p> <p>a) Aurangabad(PG) – Boisar 400kV D/c (Quad)</p> <p>b) Wardha-Aurangabad (PG) 765kV D/c</p> <p>c) Establishment of 765/400kv 2x1500MVA auraganbad (PG) S/s</p> <p>d) Augmentation of transformation capacity at Boisar by 400/220kv, 1x500MVA</p>	2150.93	29th (10.09.09)	March' 11		<p>June'15</p> <p>Commissioned</p> <p>Commissioned</p> <p>Nov'14</p>	Under Implementation

22	<p>System strengthening in North/West part of WR for IPP Projects in Chhattisgarh</p> <p>a) Aurangabad (PG) – Padghe(PG) 765kV 1xD/c</p> <p>b) Vadodara – Asoj 400kV D/c(Quad)</p> <p>c) Padghe – Padghe(PG) 400kV D/c (Quad)</p> <p>d) Establishment of 765/400kV 2x1500MVA Padghe(PG) S/s [GIS]</p>	2073.26	29th (10.09.09)	May'10		<p>March'16</p> <p>Commissioned by-passing 765/400kV Vadodara S/s</p> <p>March'16</p> <p>March'16</p>	Under Implementation
23	<p>System Strengthening in Raipur-Wardha Corridor for IPP projects in Chhattisgarh</p> <p>a) Raipur Pooling station - Wardha 765kV 2nd D/c</p>	1432.81	29th (10.09.09)	June'10		Dec'15	Under Implementation
24	<p>System strengthening in Wardha-Aurangabad corridor for IPP projects in chhattisgarh</p> <p>a)Wardha-Aurangabad (PG) 765kV 2nd D/c</p>	1238.65	29th (10.09.09)	June'10		March'15	Under Implementation
25	<p>WR-NR HVDC interconnector for IPP Projects in Chhattisgarh</p> <p>a) A ± 800kV, 3000Mw HVDC bipole between Champa Pooling Station-Kurukshetra (NR) (provision to upgrade to 6000MW at a latter date)</p> <p>b) Kurukshetra(NR) - Jalandhar 400kV D/c(Quad) one ckt. via 400/220kV Nakodar</p> <p>c) LILO of Abdullapur – Sonapat 400kV D/c(triple) at Kurukshetra</p> <p>d) Establishment of 3000MW 800KV HVDC bipole terminal each at Champa Pooling station and Kurukshetra(NR) respectively: to be upgraded to 6000MW.</p>	8492.18	29th (10.09.09)/ 30th (08.07.10)	Dec'11		<p>Dec '15</p> <p>Dec'15</p>	Under Implementation

	e) Establishment of 400/220kV 2x500 MVA S/s at Kurukshetra						
26	Inter-regional system strengthening scheme for WR and NR-Part A a) Solapur - Aurangabad 765kV D/c		36 th (29.08.13)			Nov'15	Under Implementation
27	Transmission System Associated with Lara STPS-I (2x800MW) a) Lara STPS-I - Raigarh (Kotra) Pooling Station 400 kV D/c line - 110km b) Lara STPS-I - Champa Pooling Station 400 kV D/c (quad) line.-20km	380.98	17 th (03.01.13)	Aug'13		Oct'15 Apr'17	Under Implementation
28	Transmission System Strengthening in WR-NR Transmission Corridor for IPPs in Chattisgarh a) Up-gradation of + 800kV, 3000MW HVDC bipole between Champa Pooling Station - Kurukshetra (NR) to 6000MW b) Kurukshetra (NR) - Jind 400kV D/c (Quad)	5536.56	35 th (04.01.13)	Dec'13	21.06.14	45months from date of investment approval	