



भारत सरकार / Government of India  
विद्युत मंत्रालय / Ministry of Power  
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority  
प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग  
System Planning & Project Appraisal Division  
सेवा भवन ए आर. के. पुरम, नई दिल्ली-110066  
Sewa Bhawan, R. K. Puram, New Delhi-110066 [ISO: 9001:2008]  
वेबसाइट / Website: www.cea.nic.in



No. 26/10/2013-SP&PA/559-572

Date: 26<sup>th</sup> September, 2013

- |   |  |
|---|--|
| 1 The Member (PS),<br>Central Electricity Authority,<br>Sewa Bhawan, R. K. Puram,<br>New Delhi-110066   | 8 Chief Engineer (Trans),<br>Nuclear Power Corp. of India Ltd.,<br>9S30, VS Bhavan, Anushakti Nagar,<br>Mumbai-400094<br>Fax 022-25993570    |
| 2 The Member Secretary,<br>Western Regional Power Committee,<br>MIDC Area, Marol, Andheri East, Mumbai<br>Fax 022 28370193                          | 9 The Executive Director (Engg.),<br>NTPC Ltd., Engg. Office Complex,<br>A-8, Sector-24, NOIDA 201301<br>Fax 0120-2410201/2410211            |
| 3 The Director (Projects ),<br>Power Grid Corp. of India Ltd.,<br>"Saudamini", Plot No. 2, Sector-29,<br>Gurgaon-122001<br>Fax 0124-2571760/2571932 | 10 The Chief Engineer,<br>Electricity Department,<br>The Government of Goa, Panaji<br>Fax 0832 2222354                                       |
| 4 Chairman and Managing Director,<br>MPPTCL, Shakti Bhawan,<br>Rampur, Jabalpur-482008<br>Fax 0761 2664141  | 11 Executive Engineer (Projects)<br>UT of Dadra & Nagar Haveli,<br>Department of Electricity, Silvassa<br>Ph. 0260-2642338/2230771           |
| 5 The Managing Director,<br>CSPTCL, Dangania,<br>Raipur (CG)-492013<br>Fax 0771 2574246/ 4066566  | 12 Executive Engineer<br>Administration of Daman & Diu (U.T.)<br>Department of Electricity<br>Moti Daman-396220<br>Ph. 0260-2250889, 2254745 |
| 6 The Managing Director,<br>GETCO, Sardar Patel Vidyut Bhawan,<br>Race Course, Baroda-390007<br>Fax 0265-2338164                                    | 13 GM, WRLDC<br>Plot no F-3, MIDC Area, Msarol,<br>Andheri(East) Mumbai-400093<br>Fax no 022-28235434  |
| 7. Director (Operation),<br>MAHATRANSCO, 'Prakashgad', Plot<br>No.G-9, Bandra-East, Mumbai-400051<br>Fax 022-26390383/26595258                      | 14 CEO, POSOCO<br>B-9, Qutab Institutional Area, Katwaria Sarai<br>New Delhi-110016<br>Fax 011-26852747                                      |

**Sub:** 36<sup>th</sup> meeting of the Standing Committee on Power System Planning in Western Region

Sir,

The minutes of the 36<sup>th</sup> meeting of the Standing Committee on Power System Planning in Western Region held on 29<sup>th</sup> August 2013 at NRPC, Katwaria Sarai, New Delhi is available on CEA website ([www.cea.nic.in](http://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,

(K. K. Arya)

Chief Engineer (I/C)

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

क. सं. : 26/10/2013-प्र. यो. प. मू./559-572

दिनांक: 26.09.2013

- |   |   |    |  |
|---|---|----|--|
| 1 | सदस्य (विद्युत प्रणाली),<br>केन्द्रीय विद्युत प्राधिकरण,<br>सेवा भवन, आर के पुरम्,<br>नई दिल्ली-110066                                  | 8  | मुख्य अभियंता (पारेषण),<br>न्यूक्लीयर पावर कॉरपोरेशन ऑफ इंडिया लि,<br>9एस30, वीएस भवन, अणुशक्ति नगर,<br>मुम्बई-400094 फैक्स सं. 022-25993570                           |
| 2 | सदस्य सचिव,<br>पश्चिमी क्षेत्रीय विद्युत समिति, एम. आई. डी. सी क्षेत्र,<br>मेरोल, अंधेरी पूर्व, मुम्बई-400094<br>फैक्स सं. 022-28370193 | 9  | कार्यपालक निदेशक (अभियांत्रिकी),<br>नेशनल थर्मल पावर कॉरपोरेशन लि,<br>इंजीनियरिंग ऑफिस कॉम्प्लेक्स, ए-8, सैक्टर-24,<br>नोएडा-201301 फैक्स सं. 0124-2410201             |
| 3 | निदेशक (परियोजना),<br>पावरग्रिड कॉरपोरेशन ऑफ इंडिया लि.,<br>सौदामिनी, प्लॉट सं. 2, सैक्टर-29, गुडगाँव-122001<br>फैक्स सं. 0124-2571760  | 10 | मुख्य अभियंता,<br>विद्युत विभाग, गोवा सरकार, पणजी<br>फैक्स सं. 0832-2222354  |
| 4 | अध्यक्ष एवं प्रबन्ध निदेशक,<br>एम.पी.पी.टी.सी.एल. शक्ति भवन,<br>रामपुर, जबलपुर-482008<br>फैक्स सं. 0761-2664141                         | 11 | कार्यपालक इंजीनियर (परियोजनाएं),<br>दादरा एवं नागर हवेली संघ शासित क्षेत्र,<br>विद्युत विभाग, सिलवासा,<br>फोन नं. 0260-2642338   |
| 5 | प्रबन्ध निदेशक<br>छत्तीसगढ़ रा. वि. बोर्ड,<br>दानगनिया, रायपुर (छत्तीसगढ़) -492013<br>फैक्स सं. 0771-2574246                            | 12 | कार्यपालक इंजीनियर,<br>विद्युत विभाग, दमन एवं दीव संघशासित क्षेत्र प्रशासन,<br>मोती दमन, पिन-396220<br>फोन नं. 0260-2250889, 2254745                                   |
| 6 | प्रबन्ध निदेशक,<br>जी.ई.ट्रां.नि.लि. सरदार पटेल विद्युत भवन,<br>रेस कोर्स, बड़ोदा-390007<br>फैक्स सं. 0265-2338164                      | 13 | कार्यपालक निदेशक, (विशेष आमंत्रित),<br>डब्लू आर एल डी सी, प्लॉट संख्या-एफ 3,<br>एम आई डी सी एरिया, मेरोल,<br>अंधेरी पूर्व, मुम्बई-400093,<br>फैक्स संख्या-022-28235434 |
| 7 | निदेशक (प्रचालन),<br>महाद्रांसको, प्रकाशगड, प्लॉट संख्या-जी 9,<br>बांद्रा-पूर्व, मुम्बई-400051<br>फैक्स 022-26390383 / 26595258         | 14 | कार्यपालक निदेशक, एनएलडीसी<br>बी-9, कुतुब इन्स्टीट्यूशनल एरिया,<br>कटवारिया सराय, नई दिल्ली-110016<br>फैक्स 011-26852747   |

विषय :- पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 36वीं बैठक - कार्यवृत्त ।  
महोदय,

पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 36वीं बैठक का कार्यवृत्त केन्द्रीय विद्युत प्राधिकरण की वेबसाइट [www.cea.nic.in](http://www.cea.nic.in)  
पर लिंक Home page - Power Systems-Standing Committee on Power System Planning-Western Region) पर उपलब्ध है।

संलग्न - उपरोक्त

भवदीय,

के.के.आर्य

(क. का. आर्य)

मुख्य अभियन्ता (प्रभारी)

**Minutes of the 36<sup>th</sup> Meeting of Standing Committee on Power System Planning in Western Region held on Thursday 29<sup>th</sup> August 2013 at NRPC , New Delhi**

---

---

- 1.0 The 36<sup>th</sup> meeting of the Standing Committee on Power System Planning of Western Region was held on Thursday 29<sup>th</sup> August, 2013 at NRPC Katwaria Sarai, New Delhi. The list of participants is enclosed at Annex – I.
- 2.0 **Confirmation of the minutes of 35<sup>th</sup> meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on 3<sup>rd</sup> January 2013 at M.P Hall, Power Grid Township Sector-43, Gurgaon.**
  - 2.1 Director (SP&PA), CEA stated that the minutes of the 35<sup>th</sup> SCPSPWR were issued vide CEA letter No.26/10/2013-SP&PA/74-87 dated 4<sup>th</sup> February 2013. Subsequently, POWERGRID had requested for modification in item no. 17.10 of the minutes and a corrigendum was issued on 5<sup>th</sup> March, 2013. He requested for confirmation of the minutes of the meeting along with corrigendum.
  - 2.2 The minutes of the meeting along with corrigendum were confirmed by the committee.
- 3.0 **Review of Progress on Earlier Agreed Transmission Schemes.**
  - 3.1 The status of ongoing schemes in Western Region as furnished by POWERGRID is enclosed at Annexure-II. The status of transmission schemes being implemented through tariff based competitive bidding is enclosed at Annexure- III.
  - 3.2 **Status of LILO of one circuit of 400 kV D/C Mundra UMPP – Chorania line at Halvad (GETCO) substation, as an interim arrangement:** The LILO of one circuit of 400 kV D/C Mundra UMPP – Chorania line at Halvad (GETCO) substation was agreed as an interim arrangement till the planned network from Halvad sub-station was completed in the 34<sup>th</sup> SCM, in order to provide operation flexibility. In the 36<sup>th</sup> SCM, GETCO had informed that the interim arrangement along with the Halvad 400 kV substation is planned to be commissioned by February 2014.
  - 3.3 **LILO of 400 kV S/c line between Raipur (PG) and Khedamera (Bhilai) at Raipur (Raita) 400kV substation and provision of 2X50 MVAR switchable line reactors at Raita end.** In the 34<sup>th</sup> standing committee meeting, interalia, provision of 2x50 MVAR switchable line reactors at Raipur (Raita) end of Raipur (Raita)-Jagdalpur 400 kV D/C line was agreed instead of 1x125 MVAR bus reactor at Raipur (Raita). In the 36<sup>th</sup> SCM, CSPTCL had informed that they were not implementing the agreed LILO arrangement.
  - 3.4 **Status of 10 nos. of bus reactors agreed in the 33<sup>rd</sup> SCM of WR:** In the 36<sup>th</sup> SCM POWERGRID had informed that the order for six no. 1x125 MVAr bus reactors has already placed and these reactors are scheduled to be commissioned by Jabalpur – March 2014, Khandwa- January 2014, Shujalpur- May 2014, Bhatapara-May 2014, Raigarh- March 2014 and Aurangabad- June 2014. GETCO had informed that the 1x125 MVAr bus reactors at Ranchodpura (08.07.2013), Versana (25.07.2013), Amreli (12.07.2013) and Rajkot (05.08.2013) has already been commissioned.
  - 3.5 **Status of 17 nos. of bus reactors agreed in the 34<sup>th</sup> SCM of WR:** In the 36<sup>th</sup> SCM MSETCL informed that 1x125 MVAr bus reactors at Nanded, Solapur, Kolhapur and Akola would be commissioned by December 2014.

GETCO informed that 63 MVAR bus reactor at Jetpur (11.07.2013) and 125 MVAR bus reactor at Limbdi (26.07.2013) has already been commissioned. The 125 MVAR bus reactor at Zerda would be commissioned by December 2013.

MPPTCL informed that 80 MVAR bus reactors at Bhopal would be commissioned by March, 2014. The 1x125 MVAR bus reactor at Nagda, would be commissioned by September 2014 by replacing one of the existing 2x50 MVAR bus reactor at Nagda substation.

POWERGRID informed that the 1X125 MVAR bus reactors at Bachau, Pirana, Itarsi, Seoni, Parli, Raipur and Gwalior would be commissioned by December 2014 and 1X125 MVAR bus reactors at Damoh would be commissioned by April 2014.

#### 4.0 **Contingency arrangement for Rihand–III and Vindhyachal–IV projects of NTPC.**

4.1 Director (SP&PA), CEA stated that following transmission system associated with Vindhyachal-IV and Rihand-III was agreed in the 29<sup>th</sup> and 32<sup>nd</sup> SCM of WR:

- (i) Rihand-III – Vindhyachal Pooling Station 765kV 2xS/C (initially operated at 400kV)
- (ii) Vindhyachal-IV – Vindhyachal Pooling Station 400kV D/c (Quad)
- (iii) Vindhyachal Pooling Station–Satna 765kV 2xS/c (initially to be operated at 400kV)
- (iv) Satna – Gwalior 765kV 2xS/c
- (v) Sasan – Vindhyachal Pooling Station 765kV S/c
- (vi) Sasan – Vindhyachal Pooling Station 400kV D/c
- (vii) Establishment of 765/400kV 2x1500MVA S/s at Vindhyachal Pooling Station
- (viii) Gwalior – Jaipur 765/400 kV S/c.

4.2 He said that due to non availability of associated transmission system in the matching time frame of Vindhyachal-IV generation project, an interim arrangement was agreed based on deliberations held in the 32<sup>nd</sup>, 33<sup>rd</sup> and 35<sup>th</sup> SCM of WR. The interim arrangement was required as Vindhyachal -pooling substation was getting delayed due to land acquisition problems and to facilitate the evacuation of power from Vindhyachal–IV and Sasan UMPP generation projects.

- a. Completion of Vindhyachal IV- Sasan 400kV D/c (bypassing at Vindhyachal Pooling Station).
- b. Interconnection of Vindhyachal-IV STPP 400 kV bus with the existing Vindhyachal-III STPP (by NTPC) along with 1x125 MVAR bus reactor at Bina.
- c. Completion of Sasan - Satna 765kV 2XS/c lines along with 1000 MVA 765/400 kV ICT at Sasan.
- d. Completion of Satna – Bina 765kV S/c.
- e. Completion of 765kV Bina - Gwalior S/c.
- f. Installation of 765/400kV transformers each at Bina and Gwalior S/s

4.3 Director (SP&PA), CEA stated that power from Vindhyachal-IV is presently being evacuated through the above interim arrangement. Further with second unit of Rihand-III expected by December 2013 and delay in implementation of the 765/400 kV Vindhyachal pooling station, POWERGRID has proposed the following interim arrangement till the completion of 765/400 kV, 2X 1500 MVA Vindhyachal PS:

- Bunching of both circuits of Rihand III - Vindhyachal Pooling station line and interconnection with one circuit of Vindhyachal PS – Sasan 400 kV D/C line by bypassing Vindhyachal PS.
- Bunching of both circuits of Vindhyachal IV - Vindhyachal Pooling station 400 kV D/C (quad) line and interconnection with another circuit of Vindhyachal PS – Sasan 400 kV D/C line by bypassing Vindhyachal PS.
- Bunching of both circuits of Vindhyachal PS – Satna 765 kV 2XS/C lines and interconnection with Sasan–Vindhyachal PS 765 kV S/C line through bypassing Vindhyachal PS.
- Bus sectionalizers between Rihand-III and existing stages at Rihand and between Vindhyachal-IV and existing stages at Vindhyachal are to be kept open.
- The 400 kV line section between Vindhyachal and Sasan (of LILO one circuit of Vindhyachal – Jabalpur 400 kV D/C line at Sasan) shall be kept open. Further, the transformation capacity at Sasan 765/400 kV switchyard shall be 2X1000 MVA, for full evacuation of power from Rihand-III & Vindhyachal-IV STPP.

4.4 Director (SP&PA), CEA informed that to facilitate the evacuation of power from Rihand-III and Vindhyachal-IV, in principle approval of the above interim arrangement was given to POWERGRID by CEA in June 2013 with following observations:

- Generation from Vindhyachal-IV or Rihand –III is evacuated over 400 kV S/C lines up to Sasan. In case of outage of the 400 kV S/C line, the entire generation of 1000 MW from Vindhyachal-IV or Rihand –III stage would be lost.
- For full evacuation of 2000 MW power from Rihand-III and Vindhyachal-IV, 2X1000 MVA, 765/400 kV transformation capacity at Sasan is required. In case outage of any 1000 MVA ICT at Sasan, there would be overloading of other ICT. To avoid overloading generation back down at Rihand-III / Vindhyachal-IV would be required.

NTPC has requested for the review of the interim arrangement proposed by POWERGRID and has suggested options for improving the reliability of evacuation of power.

4.5 DGM POWERGRID informed in the meeting that land at Vindhyachal Pool was available and Vindhyachal Pool S/S would be commissioned with in a year. Therefore, the interim arrangement would be required for one year. Based on the request from NTPC, interim arrangement as above has been reviewed and the following modified interim arrangement is proposed :

- Interconnection of one circuit of Rihand III - Vindhyachal Pooling station line with one circuit of Vindhyachal PS – Sasan 400 kV D/C line bypassing Vindhyachal PS.
- Interconnection of one circuit of Vindhyachal IV - Vindhyachal Pooling station 400 kV D/C (quad) line with another circuit of Vindhyachal PS – Sasan 400 kV D/C line bypassing Vindhyachal PS.
- Interconnection of the other circuits of Rihand III - Vindhyachal Pooling station line and Vindhyachal IV - Vindhyachal Pooling station line so as to form interconnection between Rihand-III and Vindhyachal-IV.
- Bunching of both circuits of Vindhyachal PS – Satna 765 kV 2XS/C lines and interconnection with Sasan–Vindhyachal PS 765 kV S/C line through bypassing Vindhyachal PS.
- Bus sectionalizers between Rihand-III and existing stages at Rihand are to be kept open.
- The 400 kV line section between Vindhyachal and Sasan (of LILO one circuit of Vindhyachal – Jabalpur 400 kV D/C line at Sasan) shall be kept open. Further, the transformation capacity at Sasan 765/400 kV switchyard shall be 2X1000 MVA, for full evacuation of power from Rihand-III & Vindhyachal-IV STPP.

4.6 NTPC agreed with the modified interim arrangement proposed. NTPC further requested that in case of any contingency in the above interim arrangement, if required, one unit of Rihand-III shall be connected to existing stages of Rihand.

4.7 Members concurred with the above interim arrangement till the availability of Vindhyachal 765/400 kV pooling station.

4.8 Members also agreed that in case of commissioning of Rihand-III unit-2 before implementation of above interim arrangement, the generation of unit-2 of Rihand-III shall be evacuated through existing Vindhyachal generation bus through HVDC back to back depending on the available system margins as agreed in the 31<sup>st</sup> SCM of NR.

5.0 **Termination of 400 kV D/C (2<sup>nd</sup>) line from Khandwa to Rajgarh at Indore in place of Rajgarh.**

5.1 Director (SP&PA), CEA said that the transmission system associated with Mauda-II generation project of NTPC was agreed in the 31<sup>st</sup> and 32<sup>nd</sup> SCM and consist of the following:

- (i) Mauda-II – Betul 400 kV D/C (quad) line.
- (ii) Betul – Khandwa 400 kV D/C (quad) line.
- (iii) Khandwa – Rajgarh 400 kV D/c line.
- (iv) Establishment of 2X315 MVA, 400/220 kV Betul (GIS) substation.

- 5.2 He said that the area in which Rajgarh substation is located has been notified as Bird Sanctuary by Madhya Pradesh Government. The Khandwa – Rajgarh 400 kV D/C (2<sup>nd</sup>) line, will pass through the Bird Sanctuary and there would be delay in completion of the transmission system. Mauda-II generation project is scheduled for commissioning by December 2015. Due to anticipated delay in implementation of Khandwa – Rajgarh 400 kV D/C (2<sup>nd</sup>) line, POWERGRID has proposed termination of the Khandwa – Rajgarh 400 kV D/C (2<sup>nd</sup>) line at Indore (PG) 400 kV substation instead of at Rajgarh. Based on the request from POWERGRID, CEA has given in principle approval of revised transmission system from Mauda-II generation project of NTPC, as given below, in April 2013 to enable POWERGRID to go ahead with the tendering activities for the revised system.
- (i) Mauda-II – Betul 400 kV D/C (quad) line.
  - (ii) Betul – Khandwa 400 kV D/C (quad) line.
  - (iii) **Khandwa – Indore (PG) 400 kV D/c line.**
  - (iv) Establishment of 2X315 MVA, 400/220 kV Betul (GIS) substation.
- 5.3 GM, WRLDC suggested that the interconnection of Betul sub-station with WR grid either by LILO of Koradi-Satpura 400 kV line at Betul or by connecting Betul with Seoni through a 400 kV line.
- 5.4 After further discussion, revised system from Mauda-II as indicated above was agreed. It was also decided that interconnection of Betul with other grid point would be studied separately.
- 6.0 **Review of transmission system associated with Solapur STPP 1320 MW (2X660 MW) of NTPC.**
- 6.1 Director (SP&PA), CEA said that following transmission system associated with Solapur STPP (2X660 MW) generation project of NTPC was agreed in the 30<sup>th</sup> SCM:
- (i) Solapur NTPC- Solapur (PG) 400kV D/c line.
  - (ii) Solapur NTPC - Pune (PG) 400kV (Quad) D/c line.
  - (iii) Augmentation of 400/220kV ICT by 1x315 MVA transformer at Solapur (PG).
- 6.2 He said that when the transmission system was planned a no. of gas based generation projects were envisaged in SR and it was anticipated that SR would export power to WR and NR. The envisaged generation in SR is not happening and SR is facing huge power deficit. In view of the changed generation scenario, the transmission system from Solapur STPP was reviewed and is given below:
- (i) Solapur NTPC- Solapur (PG) 400kV D/c (**Quad**) line.
  - (ii) Solapur NTPC - Pune (PG) 400kV (Quad) D/c line (deferred as of now, and shall be taken up as and when required in future).
  - (iii) Augmentation of 400/220kV ICT by 1x315 MVA transformer at Solapur (PG). (by shifting 3<sup>rd</sup> transformer from Wardha to Solapur)

- 6.3 He added that in-principle approval for the modifications in the transmission system associated with Solapur STPP was given to POWERGRID in April 2013 so that they can go ahead with the tendering activities for the revised system. Further, NTPC has requested to provide additional 400 kV D/C outlet from Solapur STPP in order to utilize the 2 no. Pune line bays either through LILO of any existing line or 2<sup>nd</sup> outlet to Solapur (PG).
- 6.4 MSETCL stated that 3<sup>rd</sup> ICT at Solapur is not required. CTU informed as decided in the 35<sup>th</sup> SCM, the 3<sup>rd</sup> ICT at Solapur (PG) is being shifted from Wardha (PG).
- 6.5 After further discussions, members agreed with the following transmission system from Solapur STPP for which in principle approval has been given by CEA to POWERGRID in April 2013 to expedite its implementation.
- (i) Solapur NTPC- Solapur (PG) 400kV D/c (**Quad**) line.
  - (ii) Solapur NTPC - Pune (PG) 400kV (Quad) D/c line (deferred as of now, and shall be taken up as and when required in future).
  - (iii) Augmentation of 400/220kV ICT by 1x315 MVA transformer at Solapur (PG). (by shifting 3<sup>rd</sup> transformer from Wardha to Solapur).
- 6.6 With regard to 2<sup>nd</sup> 400 kV outlet from Solapur STPP the following transmission system was agreed as Solapur STPP-Part A:
- a) Solapur NTPC- Solapur (PG) 400kV D/c (Quad) 2<sup>nd</sup> line in lieu of Solapur NTPC - Pune (PG) 400kV (Quad) D/c line agreed earlier with Solapur STPP.
- 7.0 **Approval for conversion of Line reactors into Bus reactors at Kasor (GETCO) as an interim arrangement.**
- 7.1 Director (SP&PA), CEA stated that Kasor (GETCO) 400 kV substation is experiencing high voltage during light load conditions. The 400 kV line bays and line reactors (2x50MVAR) at Kasor end of Kasor-Rajgarh 400kV D/c line has been charged and are out of service. Kasor-Rajgarh 400kV D/c line is being implemented by M/s Reliance Power Transmission Ltd., and is not yet ready because of forest clearance issues. In order to contain high voltage at Kasor sub-station, POWERGRID has proposed utilizing the Line bays and Line reactors associated with Kasor-Rajgarh 400 kV D/c line as Bus reactor bays and Bus reactors at Kasor (GETCO) substation till the availability of Kasor-Rajgarh 400 kV D/c line as an interim arrangement.
- 7.2 He said that CEA has given in principle approval for the proposal of POWERGRID for conversion of Line reactors and Line bays into Bus reactor and Bus reactor bay at Kasor (GETCO) substation to contain the over voltages as an interim arrangement till the availability of Kasor-Rajgarh 400 kV D/c line.
- 7.3 Members agreed with the proposal.



- 8.0 **Commissioning of 1X240 MVAR, 765 kV Bus reactor and 1500 MVA, 765/400 kV transformer at Raigarh pooling station (Kotra).**
- 8.1 Director (SP&PA), CEA stated that during light load conditions, the voltage at Raigarh (existing) substation is in the range 430 kV-435 kV. POWERGRID has intimated that one 240 MVAR bus reactor along with 1X1500 MVA, 765/400 kV ICT at Raigarh (Kotra) pooling station and the 400 kV D/c line between Raigarh pooling station and Raigarh (existing) was ready and has requested for in principle approval of CEA for charging of 240 MVA bus reactor at Raigarh (Kotra) through the 765/400 kV, 1500 MVA ICT and the Raigarh (Kotra) – Raigarh (existing) 400 kV D/C line to control over voltage.
- 8.2 He added that in principle approval was given to POWERGRID for commissioning of 1X240 MVAR, 765 kV Bus reactor and 1500 MVA, 765/400 kV transformer at Raigarh pooling station (Kotra) as it will help in containing the over voltage at Raigarh (existing).
- 8.3 POSOCO informed that the 240 MVAR bus reactor, 765/400 kV ICT and 400 kV line has already been commissioned and a voltage relief of about 10 kV is observed during light load conditions at Raigarh (existing) 400 kV substation.
- 8.4 Members agreed with the proposal.
- 9.0 **System Strengthening Scheme in WR for transfer of power to SR**
- 9.1 Director (SP&PA), CEA stated that second circuit of Solapur-Pune 765 kV S/C line was agreed in the 30<sup>th</sup> SCM of WR as a part of transmission system strengthening with in WR and NR for transfer of power from IPP generation projects in Southern Region to target beneficiaries in WR and NR. Subsequently, in the 35<sup>th</sup> SCM of WR the above line was agreed to be taken up as WR-NR system strengthening scheme due to slow progress of generation projects in SR and grant of LTA to IPPs in WR with target beneficiaries in NR. Further, Kolhapur-Padghe 765 kV D/C one ckt via Pune was agreed as a part of transmission system associated with new IPP generation projects in Nagapattinam / Cuddalore in the 31<sup>st</sup> SCM of WR. Due to non-availability of most of the envisaged generation in Southern Region, huge power deficit is being faced by Southern Region states and the inter-regional links between Southern Region and Western Region i.e. Solapur – Raichur 765kV 2xS/c and Wardha – Hyderabad 765kV D/c lines would be used to export power of IPPs in Chhattisgarh to Southern Region.
- 9.2 He added that system studies carried out by POWERGRID, corresponding to 2016-17 condition, considering revised load generation scenario indicate loading on Wardha – Hyderabad 765kV D/c line to the tune of 3500 MW and loading on Solapur – Raichur 765kV 2xS/c line is about 750 MW. Under outage of one ckt. of Wardha – Hyderabad 765kV line, the loading on the other ckt is about 2900 MW and power flow on Raichur – Solapur lines increases to 1100 MW. To balance the loading between these two corridors from WR to SR (Wardha-Hyderabad and Raichur–Solapur) Aurangabad–Solapur 765kV D/c line has been considered. It is observed that the loading on Wardha – Hyderabad is about 2500 MW and loading on Solapur – Raichur is about 1500 MW. The loading under contingency of Wardha – Hyderabad 765kV one circuit reduces to 2400MW.
- 9.3 He said that in principle approval was given to POWERGRID to implement Aurangabad- Solapur 765kV D/c line in lieu of Solapur-Pune 765 kV S/c (2<sup>nd</sup> ckt) and 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 in May 2013, as system strengthening scheme in WR for transfer of power to SR from IPPs in Chhattisgarh.

- 9.4 MD, GETCO stated that we are planning/constructing many 765 kV transmission lines where reactive power management is an issue, while many countries have restricted their transmission voltage to 500 kV.
- 9.5 MSETCL stated that at present the planning studies are done on MW basis whereas here is need for reactive planning studies on all India basis in view of extensive development of 765 kV network. He requested to include the cost of the schemes and its incremental impact on the tariff.
- 9.6 SE, WRPC emphasized upon the need of having a reactive power policy. He suggested that for controlling high voltage, reactive compensation may be planned for demand reduction up to 70% of the peak demand and opening of lines may be considered to control over voltage for reduction of demand below 70%.
- 9.7 COO, CTU stated that construction of new lines is getting difficult day by day because of severe RoW issues. The 765 kV lines are being planned keeping emerging load generation scenario and electricity market development in view. He added that reactive compensation is planned based on the off peak conditions. Further while granting connectivity / LTA, generation developer are asked to provide bus reactor(s) at their generation switchyard. Also line reactors are planned on the 765 kV lines to provide 100 % reactive compensation. Regarding the cost of the schemes, the same would be indicated in the proposals.
- 9.8 After deliberations, members agreed with the proposal.

#### 10.0 **Transmission system associated with Mundra UMPP (5X800 MW).**

- 10.1 Director (SP&PA), CEA stated that the generation specific transmission system associated with Mundra UMPP consists of the following elements which has already been commissioned:
- (i) Mundra UMPP – Bachau - Ranchodpura 400 kV D/C (triple snowbird) line.
  - (ii) Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) line.
  - (iii) Mundra UMPP – Jetpur 400 kV D/C (triple snowbird) line.
- 10.2 He said that revised Transmission Planning Criteria, 2013 specifies review of existing / already planned transmission scheme to be N-1-1 compliant. The criteria specifies that subsequent to the outage of a 400 kV S/C line, the system shall be able to survive a permanent single phase to ground fault on a 400 kV line close to the bus. Accordingly, system studies have been carried out to review the existing transmission system associated with Mundra UMPP. The system studies have been carried out considering full dispatch from generation projects in Mundra complex and under the contingency of outage of Mundra UMPP – Bachau 400 kV D/C line, the angular separation of 36 degree between Mundra and Limbdi is observed. To overcome this, POWERGRID has proposed the following transmission system strengthening as an immediate measure in the transmission system associated with Mundra UMPP generation project:

- a) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) at Bachau.
- b) LILO of one circuit of under construction Bachau – Varsana 400 kV D/C line at Mundra UMPP (the LILO portion shall be with triple snowbird conductor).

10.3 He said that CEA has given in principle in June 2013 for the above transmission system strengthening proposed for Mundra UMPP.

10.4 Members agreed with the proposed system strengthening for Mundra UMPP.

#### 11.0 Interim arrangement around Indore and Vadodara.

11.1 Director (SP&PA), CEA stated that in the 35<sup>th</sup> SCM, interconnection of Vadodara-Asoj 400 kV D/C line and Vadodara-Pirana 400 kV D/C line by bypassing Vadodara S/S so as to form Pirana-Asoj 400 kV D/C line was agreed as a contingency arrangement till the availability of Vadodara S/S. MPPTCL has requested POWERGRID for providing two number bays at Indore (PG) 400 kV substation for termination of the Pithampur – Indore (PG) 400 kV D/c line. POWERGRID has informed that there is delay in implementation of 2 nos. of bays at Indore (PG) and Vadodara 765/400 kV sub-station is also getting delayed due to land acquisition problems.

11.2 He said that POWERGRID has informed that Indore (PG)-Vadodara 765 kV S/C line, Vadodara-Pirana 400 kV D/C (Quad) line and Vadodara-Asoj 400 kV D/C (Quad) line approved as a part of IPP projects in MP and Chhattisgarh (HCPTC-IV & V) are expected to be commissioned by October 2013. In order to transfer power from the IPPs in MP and Chhattisgarh to Gujarat and provide connectivity to Pithampur (MPPTCL) 400 kV sub-station, POWERGRID has proposed following interim arrangement till the availability of 765/400 kV Vadodara S/S.

- a) Opening of 1<sup>st</sup> ckt of Indore (MPPTCL)-Indore (PG) 400 kV D/C line at Indore (PG) end and connecting it with Indore (PG)-Vadodara 765 kV S/C line by bypassing Indore (PG) S/S.
- b) Connecting Vadodara end of the above Indore (MPPTCL)-Vadodara line to one circuit of Vadodara-Asoj 400 kV D/C line by bypassing Vadodara S/S so as to form Indore (MPPTCL)-Asoj 400 kV S/C line.
- c) Bunching of Vadodara-Pirana 400 kV D/C line and connecting it with other circuit of Vadodara-Asoj (GETCO) 400 kV line by bypassing Vadodara S/S
- d) LILO of 2<sup>nd</sup> ckt of Indore (MPPTCL)-Indore (PG) 400 kV D/C line at Pithampur (MPPTCL) (till the availability of two 400 kV bays at Indore (PG)).

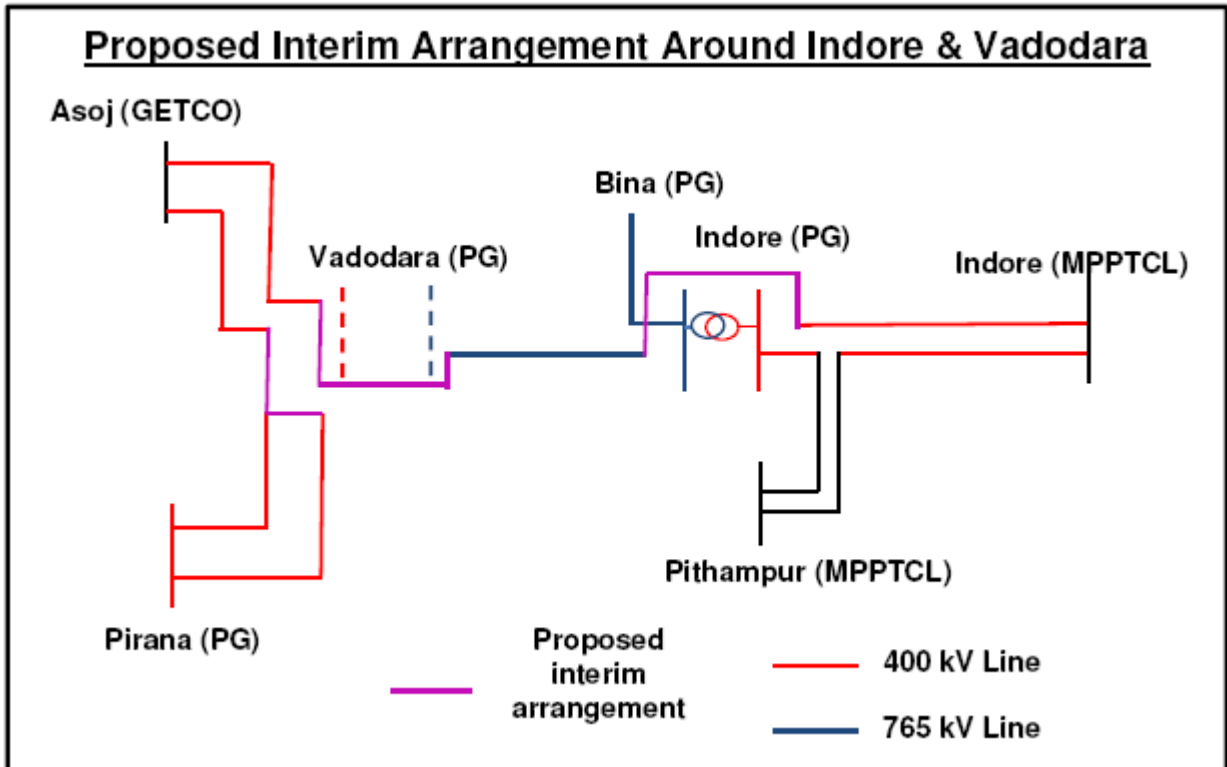
The interim arrangement proposed would result in following configuration:

i) Indore (MPPTCL)-Asoj 400 kV S/C line by bypassing Indore (PG) and Vadodara sub-stations. The length of the line would be around 380 km and for charging of the above line POWERGRID has informed that following reactive compensation would be available:

- a) 125 MVAR bus reactor at Indore (MPPTCCL)

- b) 240 MVAR line reactor (at 765 kV) charged at 400 kV at Indore (PG)
- c) 50 MVAR bus reactor at Asoj (GETCO)
- ii) Asoj-Pirana 400 kV S/C line by bypassing Vadodara sub-stations
- iii) Indore (MPPTCL)-Pithampur (MPPTCL) 400 kV S/C line
- iv) Indore (PG)-Pithampur (MPPTCL) 400 kV S/C line

A diagram showing the interim arrangement is given below:



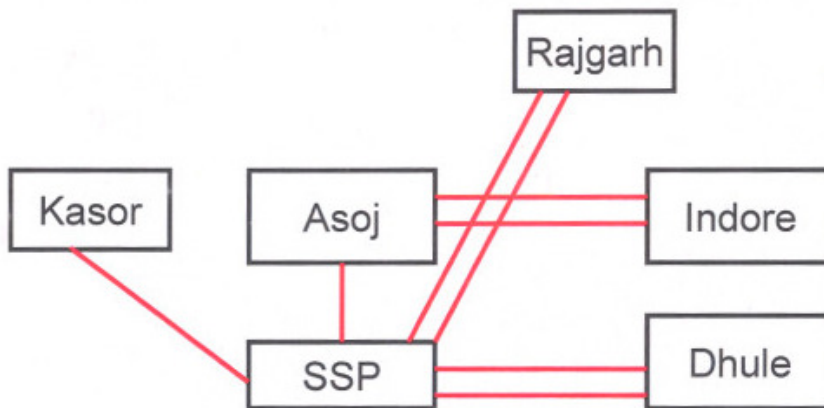
- 11.3 On a query from GETCO regarding time frame in which Vadodara 765/400 kV S/S would be commissioned and about charging of Indore-Asoj 380 km long line, DGM, POWERGRID informed that land for Vadodara S/S is available and is expected to be commissioned by December 2015. The reactors available at Indore (MPPTCL), Indore (PG) and Asoj would be used for charging the line.
- 11.4 On a query from MPPTCL regarding availability of 2 no. 400 kV bays at Indore (PG), DGM POWRGRID informed that the bays would be available by January 2014.
- 11.5 MD, GETCO requested for provision of 2x500 MVA 400/220 kV transformation capacity at Vadodara sub-station to meet their load demand at Vadodara.
- 11.6 After further discussion, Members agreed with the interim arrangement till the availability of 400 kV bays at Indore (PG) and Vadodara 765/400 kV sub-station. Members also agreed with the request of GETCO to provide 2x500 MVA 400/220 kV at Vadodara with 4 no. 220 kV bays.
- 12.0 **Proposal for modification in existing network arrangement for smooth evacuation of power from Sardar Sarovar Power (SSP) project - agenda by GETCO.**
- 12.1 Director (SP&PA), CEA stated that the associated transmission system of SSP (1450 MW) is as given below:

- (i) SSP- Asoj 400 kV S/C line.
- (ii) SSP – Kasor 400 kV S/C line.
- (iii) SSP – Rajgarh 400 kV D/C line.
- (iv) SSP – Dhule 400 kV D/c line.

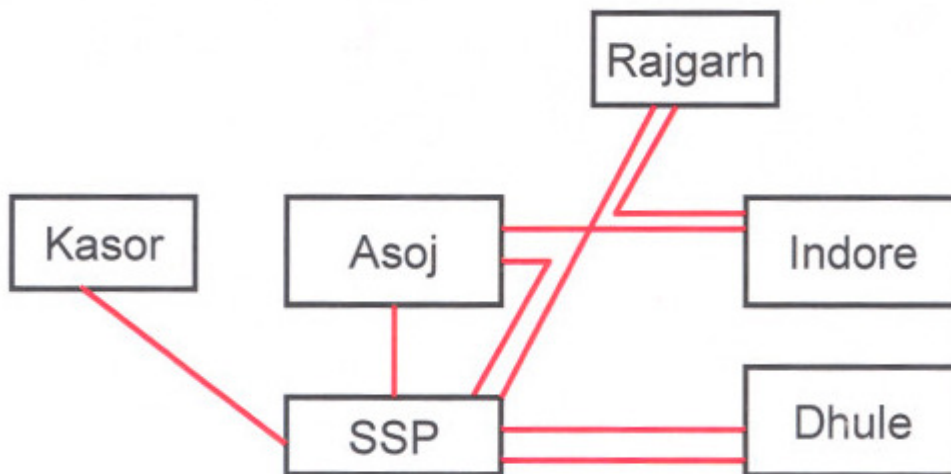
GETCO has informed that power generated from SSP mainly flows towards Gujarat through SSP-Asoj and SSP-Kasor 400 kV S/C lines and it is very difficult to avail outage of these lines for planned maintenance. The Asoj - Indore 400 kV D/c lines and SSP – Rajgarh 400 kV D/c lines cross each other. GETCO has proposed interconnection of these lines at the crossing point which would result in an additional circuit from SSP to Asoj with following reconfiguration:

- (i) SSP- Asoj 400 kV S/C line (existing).
- (ii) SSP- Asoj 400 kV 2<sup>nd</sup> S/C line (reconfigured).
- (iii) SSP – Kasor 400 kV S/C line.
- (iv) SSP – Rajgarh 400 kV S/C line (reconfigured)
- (v) Rajgarh-Indore 400 kV S/C line (reconfigured).
- (vi) Indore – Asoj 400 kV S/C line (reconfigured).
- (vii) SSP – Dhule 400 kV D/c line.

The diagram for existing and proposed configuration is given below:



**Existing Configuration**

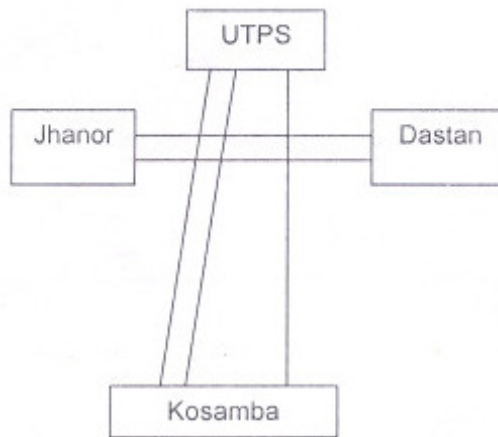


**Proposed configuration**

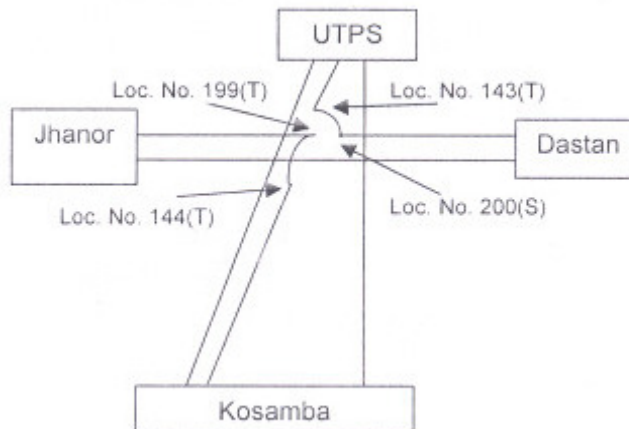
- 12.2 He said that the length of the existing line between SSP and Asoj is 83 km whereas the length of the second interconnection after reconfiguration would be about 340 km and unequal power flow on these lines. Further, the interim arrangement proposed by POWERGRID around Vadodara provides two nos. of additional in feeds to Asoj. The system studies carried out with interim arrangement and with about 1200 MW dispatch at SSP, indicates normal power flows even in case of outage of SSP- Asoj or SSP – Kasor 400 kV S/C line.
- 12.3 WRLDC informed that if both the lines from SSP to Dhule are available, about 400 MW flows towards Dhule, because of high voltage problem at SSP, one circuit of SSP-Dhule has to be kept open. Providing reactor at Dhule to contain over voltage could solve the problem.
- 12.4 MS, WRPC informed that Narmada Control Authority (NCA) has requested for providing line reactors at Rajgarh and Dhule. The issue has also been deliberated in the PSC of NCA and OCCM of WRLDC wherein installation of reactors at Raigarh and Dhule has been agreed. Further, NCA has requested WRPC to take up the matter in Standing Committee meeting on Power System Planning in WR. He opined that the providing 63 MVAR line reactors (switchable) at Dhule and Rajgarh end of the SSP-Dhule 400 kV D/C line and SSP- Rajgarh 400 kV D/C line respectively would help in containing over voltage at Sardar Sarovar
- 12.5 After further discussion, Members agreed with provision of 2X63 MVAR (switchable) line reactors at Dhule and Rajgarh end each in 400 kV lines from SSP. The existing network configuration from SSP would continue. In case of difficulty in taking outage of SSP- Asoj or SSP – Kasor 400 kV S/C line, necessary arrangements may be made in the generation switchyard so that more power is evacuated through SSP- Dhule and SSP- Rajgarh 400 kV D/C line.
- 13.0 **Proposal for modification in existing network arrangement for smooth operation of power system in South Gujarat- agenda by GETCO**
- 13.1 Director (SP&PA), CEA stated that GETCO has intimated that generation from coastal coal based power projects (Mundra UMPP, Mundra Adani, Essar Vadinar) has increased while generation from gas based power projects in south Gujarat (TPGL, GSEG, Kawas, Gandhar etc.) has been reduced considerably due to high cost / non-availability of gas. This has caused overloading in the 220 kV network in South of Gujarat. The lines viz., Jhanor – Haldarwa 220 kV D/C line, Kawas- Ichchapore 220 kV D/C line, Kosamba – Kim 220 kV S/C line, Ukai – Mota 220 kV D/c line etc. are operating at thermal rating. To avoid overloading GETCO has suggested the following modification in the existing 400 kV network as an interim arrangement till availability of Kosamba-Vapi 400 kV D/C line :
- (i) Inter connection of one circuit of Ukai– Kosamba 400 kV D/c line of GETCO with Jhanor – Navsari (Dastan) 400 kV D/C line of POWERGRID at the point of intersection, so as to form Ukai – Navsari 400 kV S/C line and Jhanor – Kosamba 400 kV S/C line.
  - (ii) LILO of Jhagadia - Haldarwa 220 kV S/c line at Jhanor TPS. This would help in control loading of Jhanor-Haldarwa 220 kV D/C line.

The exhibits showing existing and proposed arrangement are given below:

**Present configuration:**



**Proposed configuration**



- 13.2 GM, WRLDC stated that high loading of 220 kV network would be controlled with provision of an additional ICT at Kosamba. After, the proposed reconfiguration there would be 400 kV S/C between Jhanor TPS to Navsari (Dastan).
- 13.3 MD, GETCO stated that reconfiguration of the existing network has been proposed after carrying out detailed studies. By making this interconnection arrangement, there would be direct connectivity of 400 KV Kosamba (GETCO) substation with Jhanor TPS and Navsari (Dastan-PG) substation with Ukai TPS. This will greatly helps in evacuation of power from new 500 MW unit at Ukai TPS. Also, it will result in operational flexibilities in South Gujarat area. In near future, after commissioning of 400 KV D/C Chorania (Limdi) - Kosamba line, 400 KV Kosamba substation will receive power from UMPP Mundra. The 2<sup>nd</sup> ICT at Kosamba would be implemented with in a month and at present to control overloading on 220 kV lines bus splitting arrangement at Kosamba and opening of 400/220 kV ICT at Ukai is being practiced.
- 13.4 NTPC stated that no space was available in the present switchyard. However, for two no. 220 kV bays for LILO of Jhagadia - Haldarwa 220 kV S/c line at Jhanor TPS, extension of the 220 kV bus would be required. Space for extension of the switchyard was available.

- 13.5 After further discussion, LILO of Jhagadia - Haldarwa 220 kV S/c line at Jhanor TPS by GETCO was agreed. Members also agreed the interconnection of Jhanor - Navsari 400 kV line and Ukai – Kosamba 400 kV line as an interim arrangement and the same would be reviewed when the present 400 kV interconnection between Navsari-Vapi (an interim arrangement) would be removed or in case of any grid restrictions.
- 14.0 **Interim arrangement for 765/400kV Champa Pooling Substation under High Capacity Corridor – V for IPPs in Chhattisgarh.**
- 14.1 Director (SP&PA), CEA stated that 765/400 kV Champa Pooling station has been planned along with Champa Pool – Raigarh Pool (Kotra) 765kV S/c line, Champa Pool – Raipur Pool 765kV D/c line and Champa Pool – Dharamjaygarh/Korba 765kV S/c line. POWERGRID had informed that these lines shall be ready progressively from October, 2013 to December, 2013 and there is delay in implementation of 765/400kV Champa Pooling substation due to land acquisition problem. To evacuate power from IPPs being pooled at Champa pooling station POWERGRID has proposed the following interim arrangement:
- (i) Interconnection of Raigarh Pool (Kotra) - Champa Pool 765kV S/c with Champa Pool – Dharamjaygarh 765kV S/c line bypassing Champa Pool.
  - (ii) Out of the KSK Mahanadi - Champa Pool 400 kV 2xD/c line, one 400 kV D/c line shall be terminated to LILO of one circuit of Raigarh – Raipur 400 kV D/c line (as per existing arrangement). The other 400 kV D/c from KSK Mahanadi to Champa shall be extended to Raipur (Existing) by connecting this to Champa Pool – Raipur Pool 765 D/c line (charged at 400 kV & bunching and interconnecting this line with one circuit Raipur Pool – Raipur (existing) 400 kV D/c line). This arrangement shall make KSK Mahanadi – Champa Pool (Champa Pool bypassed) – Raipur Pool (bunching of 765 kV D/c line and bypassing Raipur Pool 765 kV bus) – Raipur (existing) line charged at 400 kV. Also the other circuit of Raipur Pool – Raipur (existing) 400 kV D/c line shall remain with existing arrangement connected to 765/400 kV ICTs at Raipur Pool.
- 14.2 COO, CTU informed that the interim arrangement was proposed due to delay in implementation of 765/400 kV Champa pooling station due to land acquisition issues. The land for the Champa pooling station has been acquired and the interim arrangement proposed above is not required at present. The interim arrangement, if required, would be revised based on the progress of line bays and lines terminating at Champa pooling station.
- 14.3 Members noted the same.
- 15.0 **MPPTCL Proposal of Installation of Line shunt reactors on Nagda-Indira Sagar and Indira Sagar-Satpura 400kV Lines at 400kV S/s at Nagda, Indira Sagar HEP and Satpura TPS end.**
- 15.1 Director (SP&PA), CEA stated that MPPTCL has intimated that Madhya Pradesh is experiencing very high voltage during the off peak condition and to control over voltages many of the 400 and 220kV lines are to be kept open in the State. Indira Sagar-Nagda 400kV line being main evacuation line from Indira Sagar HEP has to



be tripped due to over voltage. Further, the power corridor from Satpura TPS and Indira Sagar HEP to load centers of Western MP is passing through 400kV bus of Indira Sagar HEP and tripping of 400kV ISP-Nagda and 400kV ISP-Satpura lines because of high voltage isolates the loads of Western MP from the generation at Indira Sagar and Satpura. This situation shall become more critical after addition of generating capacity at Satpura TPS. The normal voltage observed at Indira Sagar is in the range of 420-430 kV. At present there is no reactive compensation (line / bus) provided at Indira Sagar. The matter of tripping of lines due to over voltages has been raised and discussed at different platforms between MPPTCL, ISP and WRPC.

15.2 He added that for controlling over voltage, MPPTCL has proposed to install following reactors:

- (i) 125 MVAR, 400kV Bus reactor at Indira Sagar HEP (to be provided by NHDC / NVDA)
- (ii) 50 MVAR Line reactor for Indira Sagar-Satpura 400kV S/C line at Satpura 400 kV Substation (to be provided by MPPGCL)
- (iii) 50 MVAR Line reactor for Indira Sagar-Nagda 400kV line at Nagda 400kV Substation (to be provided by MPPTCL)

15.3 In order to avoid tripping of Indira Sagar-Nagda and Satpura-Indira Sagar 400 kV lines due to over voltage, Members agree with the proposal of MPPTCL.

#### 16.0 **Additional System Strengthening based on new Transmission Planning Criteria for Mundra UMPP (5x830 MW)**

16.1 Director (SP&PA), CEA stated that CEA has given in principle approval to POWERGRID for following transmission system strengthening for Mundra UMPP generation project:

- a) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) at Bachau.
- b) LILO of one circuit of under construction Bachau – Versana 400 kV D/C line at Mundra UMPP (the LILO portion shall be with triple snowbird conductor).

16.2 He said that with the establishment of Bhuj pooling station as a part of transmission system strengthening for renewable energy sources in Gujarat, LILO section of **item b above** would be terminated at Bhuj pooling station, thus forming Mundra-Bhuj 400 kV D/C line and the Bachau – Versana 400 kV D/c line would be restored to its original configuration. Thus, the additional transmission system strengthening has been proposed for Mundra UMPP, to comply with 'N-1-1' criteria of the new Transmission Planning Criteria and is given below:

- i) LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/c (triple snowbird) at Bachau.
- ii) Mundra UMPP – Bhuj Pooling station 400 kV D/c line (triple snowbird)

- 16.3 He said that with the above proposal, **the LILO of Mundra UMPP- Limbdi at Saurashtra Pool agreed in 35<sup>th</sup> SCM stands deleted.** The Load Flow studies carried out indicate that line loadings and angles are within their limits. Presently, SPS has been planned with Mundra UMPP to back down generation in the event of “n-1-1” contingency. To avoid backing down of available generation the scheme mentioned above needs to be implemented on urgent basis by POWERGRID in compressed time schedule.
- 16.4 Members agreed with the proposal to be implemented by POWEGRID in compressed time schedule.
- 17.0 **Additional transmission system strengthening for Sipat STPS (2x500 + 3x660 MW).**
- 17.1 Director (SP&PA), CEA stated that the immediate evacuation from Sipat STPS consists of following elements which have been commissioned:
- (i) Sipat – Bilaspur Pooling Station 765 kV 2xS/c line
  - (ii) 2x1000 MVA, 765/400 kV transformers at Sipat STPS.
- 17.2 He said that in previous SCM, NTPC had requested to provide an additional 765 KV circuit from Sipat to Bilaspur / any other location to enhance the redundancy in the evacuation system, as there have been several instances of station outages at Sipat. In some of the instances, tripping of one of the 765 KV Sipat-Bilaspur Pooling station line has led to tripping of other 765 KV line. WRPC/RLDC has also recommended strengthening of transmission system from Sipat with additional 765 KV circuit to Bilaspur Pooling station. To enhance redundancy in the Sipat evacuation system POWERGRID has proposed the following additional transmission system strengthening:
- (i) Sipat – Bilaspur Pooling Station 3<sup>rd</sup> 765 kV S/c line.
  - (ii) Bilaspur Pooling Station – Dhanwahi pooling station 765 kV D/c line.
  - (iii) Establishment of new 2X1500, 765/400 kV Dhanwahi Pooling Station.
  - (iv) LILO of both circuits of Jabalpur - Orai 765 kV D/C at Dhanwahi pooling station.
  - (v) LILO of all circuits of Vindhyachal – Jabalpur 400 kV 2xD/c line at Dhanwahi pooling station.
- 17.3 COO (CTU), stated that Dhanwahi 765/400 kV pooling station proposed as a part of the system strengthening, interconnects the Bilaspur pooling station with Jabalpur (WR) and Orai (NR).
- 17.4 After deliberations, members agreed with the additional transmission system strengthening for Sipat STPS.

**18.0 400 kV interconnection of Gwalior 765/400 kV substation**

- 18.1 Director (SP&PA), CEA stated that Bina – Gwalior 765 lines and Gwalior – Agra 765 lines has been charged at its rated voltage of 765 kV. With this upgradation there is no 400 kV interconnections at Gwalior. Presently the Gwalior substation has transformation capacity of 2x1500 MVA at 765/400 kV level and 3x315 MVA at 400/220 kV level.
- 18.2 He added that in order to provide 400 kV anchoring at Gwalior, it is proposed to establish a new 400/220 kV substation near Morena and interconnect it with Gwalior through a 400 kV D/c (quad) line. This will improve the reliability of power supply in Gwalior area and also help in effective utilization of 765/400 kV transformers at Gwalior. MPPTCL needs to plan 220 kV outlets for drawal of power from the proposed 400 kV substation at Morena.
- 18.3 MPPTCL has indicated 220 kV D/C lines to Morena (MP) and Sabaigarh (MP) as 220 kV outlets from proposed Morena sub-station. The same would be firmed up after finalization of location of Morena 400 kV sub-station.
- 18.4 Members agreed with the proposal.

**19.0 Additional Strengthening at Raipur and Raigarh (Tamnar) 765/400 Substations.**

- 19.1 Director (SP&PA), CEA stated that at present is only 1x1500 MVA, 765/400 transformer at Raipur 765/400 kV pooling station and to improve the reliability of this substation, it is proposed to augment the transformation capacity by 1x1500 MVA, 765/400 kV transformer. Further, Raigarh (Tamnar) pooling station is connected to Raigarh (Kotra) through 765 kV D/c line and to improve the reliability of power transfer from generating stations connecting at Raigarh (Tamnar) substation, it is proposed to LILO both circuits of Jharsuguda – Dharamjaigarh 765 kV 1xD/c line at Raigarh (Tamnar), which is passing in close vicinity of Raigarh (Tamnar) 765/400 kV pooling station.
- 19.2 DGM POWERGRID said that at Raigarh (Tamnar) about 4500 MW generation is getting connected at 400 kV level and only 3 no. 1500 MVA 765/400 kV transformers are there at Raigarh (Tamnar), therefore an additional 4<sup>th</sup> 1500 MVA 765/400 kV transformer at Raigarh (Tamnar) is proposed.
- 19.3 After discussion, Members agreed with the following:
- a) Augmentation of 2<sup>nd</sup> 1x1500 765/400 kV transformer at Raipur sub-station
  - b) LILO both circuits of Jharsuguda – Dharamjaigarh 765 kV 1xD/c line at Raigarh (Tamnar)
  - c) Augmentation of 4<sup>th</sup> 1x1500 765/400 kV transformer at Raigarh (Tamnar) sub-station.

**20.0 Evacuation of Renewable Energy generations located in WR and NR to Northern Region states.**

- 20.1 GM, POWERGRID stated that POWERGRID has prepared a report on Green Energy Corridors based on the envisaged renewable capacity (42 GW) addition in the 12<sup>th</sup> Plan period in the 8 number Renewable Energy (RE) rich states. The report covers a comprehensive scheme for strengthening of Intra State as well as Inter-

state transmission system and other related infrastructure to address challenges associated with large scale renewable integration. Subsequently, CEA convened a meeting in May 2013 for assessing RES (Renewable Energy Source) capacity additions in the states of Rajasthan, Himachal Pradesh, J&K, Gujarat, Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh by the end of 12<sup>th</sup> Plan period. As per the assessment, the quantum of RES generation expected by the end of 12<sup>th</sup> Plan period is 32 GW and the same is given as under:

(i)	Rajasthan	-	5694 MW
(ii)	Himachal Pradesh	-	1281 MW
(iii)	J&K	-	476 MW
(iv)	Gujarat	-	4729 MW
(v)	Maharashtra	-	4063 MW
(vi)	Andhra Pradesh	-	4827 MW
(vii)	Karnataka	-	4290 MW
(viii)	Tamil Nadu	-	7353 MW

20.2 He said that with above quantum of envisaged Renewable capacity addition, it is expected that some of the RE rich state including Gujarat, Rajasthan may have more RE capacity than the capacity required for fulfilling their Renewable Purchase Obligations (RPO). Further, such RE rich host state may also not absorb RE energy locally particularly during the other than peak hour condition. Inherent characteristics of renewables necessitates requirement of adequate balancing generation reserves to take care of Intermittency / variability. Further, the IEGC stipulates, renewable energy plants to have "MUST RUN" status and shall not be subjected to "merit order dispatch" principles.

20.3 He added that Kutch in Gujarat is one of the renewable rich pocket in the country endowed with Wind and Solar Generation potential. In 12<sup>th</sup> Plan period, Gujarat has envisaged about 900 MW Wind and 180 MW Solar generation capacity additions alone in Kutch area. In addition, applications for Connectivity of 600 MW wind generation capacity in Kutch complex has also been received by the CTU. Likewise, Rajasthan has also envisaged 5694 MW Renewable capacity addition during 12<sup>th</sup> Plan period, increasing total RE capacity to about 8100 MW. Considering the above, in order to facilitate transfer of RE power from the RE rich potential States to other States as well as absorption of RE power within the RE rich states (host state), transmission system strengthening both at intra state and inter-state level has been identified. Further, in order to identify transmission requirement for transfer of RE power from the RE rich potential States to other States, studies have been carried out for the 2016-17 time frame considering 18<sup>th</sup> EPS demand for Seasonal Light Load condition (Monsoon off peak) in which renewable is maximized. In such scenario, maximized renewable dispatch scenarios (Wind-70%, Solar-80%) have been considered in other than the peak demand hours (80% of EPS peak demand for WR/SR/ER) for studies. As per the analysis of historical trends of NR demand during monsoon season, demand of Northern region is considered as 95% of the peak demand as the region has a typical flat load profile over the day due to its agricultural load during the monsoon periods when renewable is maximized. In this scenario, special area dispatch i.e. full dispatch from Kutch complex generations viz. Mundra UMPP (4150 MW) as well as Adani Mundra (4620 MW) is considered.

- 20.4 He stated that in view of the envisaged RE capacity addition in Kutch complex in Gujarat and existing/planned capacities of conventional generation, it is proposed that a 765/400kV pooling station near Bhuj may be established. Bhuj pool substation may be interconnected to a pooling station in northern part of Gujarat viz. Banaskantha at 765kV level an upcoming Solar generation hub. This substation is also proposed to be anchored with existing 400kV Sankhari (GETCO) substation, a major Solar Pooling hub. Considering the requirement of onward dispersal of power outside Gujarat to other states, a High capacity transmission corridor is being proposed right from the Gujarat (WR) to Punjab in NR via Rajasthan. Towards this, Banaskantha substation is proposed to be connected to southern/central part of Rajasthan at Chittorgarh and Ajmer in Rajasthan at 765kV level.
- 20.5 He added that out the capacity addition of 5694 MW in Rajasthan, about 2000 MW is envisaged near Bhadla (distt. Jodhpur), Jaisalmer belt etc in 12th plan period. With already existing generation and low power demand in the area there is a need for strengthening to transfer power out of the area. RRECL has informed about development of a solar park near Bhadla of about 2000 MW additional capacity in future. Therefore, establishment of 765/400kV substation at Bhadla with Bhadla-Ajmer 765kV D/c and 400kV interconnection to Bhadla and Pokhran (new-RVPN) has been considered. With this interconnections, 765kV Ajmer, a major power pooling point, shall aggregate power from WR/Gujarat through Banaskantha / Chittorgarh as well as Bhadla(Jodhpur) in Rajasthan. There is a need for providing a low impedance corridor for evacuation of power beyond Ajmer, for onward dispersal of above power outside Rajasthan. Therefore a 765kV High capacity transmission corridor is proposed towards Moga in Punjab, a major load centre in NR, via Suratgarh pooling station in Rajasthan over 765kV network. Moga is also connected to Kishenpur in J&K, which is large hydro pocket in Jammu & Kashmir. In this manner, this shall facilitate integration of Renewable with hydro complex, enabling supply side balancing through Hydro resources. Accordingly following inter state transmission system is proposed :

#### **Gujarat (Western Region)**

- (i) Bhuj Pool – Banaskantha 765kV D/c
- (ii) Banaskantha – Chittorgarh 765kV D/c
- (iii) Banaskantha – Sankhari 400kV D/c
- (iv) Establishment of 765/400 kV, 2x1500 MVA S/s at Bhuj Pool
- (v) Establishment of 765/400 kV, 2x1500 MVA S/s at Banaskantha.
- (vi) Associated reactive compensation (Bus reactors & Line reactors)

#### **Rajasthan (Northern region)**

- (i) Chittorgarh – Ajmer(New) 765kV D/c
- (ii) Ajmer(New) - Suratgarh(New) 765kV D/c
- (iii) Suratgarh(New)-Moga(PG) 765kV D/c
- (iv) Bhadla(New)- Ajmer(New) 765kV D/c
- (v) Chittorgarh (New)- Chittorgarh (RVPN) 400kV D/c (Quad)
- (vi) Ajmer (New)- Ajmer (RVPN) 400kV D/c (Quad)
- (vii) Suratgarh (New)- Suratgarh (existing) 400kV D/c (Quad)
- (viii) Bhadla (New)- Bhadla (RVPN) 400kV D/c (Quad)
- (ix) Bhadla (New)- Pokaran (new-RVPN) 400kV D/c (Quad)
- (x) Establishment of 2x1500 MVA, 765/400kV S/s at Chittorgarh
- (xi) Establishment of 2x1500 MVA, 765/400kV S/s at Ajmer (New)

- (xii) Establishment of 765/400 kV (2x1500 MVA) & 400/220 kV (2x500 MVA), S/s at Bhadla (new)
- (xiii) Establishment of 2x1500 MVA, 765/400kV S/s at Suratgarh (New).
- (xiv) Associated reactive compensation (Bus reactors & Line reactors).

- 20.6 MD, GETCO stated that the renewable generation generally comes up at 220kV level, therefore 220 kV voltage level needs to be provided at the 765/400kV pooling station being proposed at Bhuj and Banaskantha.
- 20.7 After discussion, Member (PS), CEA opined that due to urgent requirement of strengthening for Mundra UMPP/Adani Mundra generation projects as well as short gestation period of Renewable, transmission strengthening may be implemented in a compressed time schedule.
- 20.8 Members agreed that due to early requirement the following scheme may be implemented in compressed schedule by POWERGRID:

**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).

- 20.9 It was also agreed that the renewable generations would be allowed to inject in the ISTS at Bhuj, Banaskantha, Chittorgarh, Ajmer etc., if they apply for LTA quantum which is atleast 25% of their installed capacity.

- 20.10 The following system was also discussed and approved. However, it was decided that this system shall taken up for implementation only after receipt of application for Connectivity and LTA for sufficient quantum from Solar/ wind generation developers around Bhadla area:

- i. Bhadla (New)-Ajmer (New) 765 kV D/c
- ii. Bhadla (New)-Bhadla (RVPN) 400 kV D/c (Quad)
- iii. Bhadla (New)-Pokhran New (RVPN) 400 kV D/c (Quad)
- iv. 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) sub-station at Bhadla (New)

20.11 The intra-state transmission system required for integration of RES generation in the states of Gujarat and Maharashtra as identified by CEA, CTU & states were also agreed. The details of the above intra-state transmission system are given at **Annexure-V** for Gujarat and at **Annexure – VI** for Maharashtra.

**21.0 Installation of 125 MVAR Bus reactor at Birsinghpur TPS switchyard by MPPGCL- Agenda proposed by MPPTCL**

21.1 Director (SP&PA), CEA stated that MPPTCL has intimated that the voltage at 400 kV substation of Birsinghpur TPS remains high above 425 kV most of the time and with the outage of 500 MW unit at Birsinghpur TPS the voltage rises above 430 kV. To control the voltage at Birsinghpur 400 kV substation, lines emanating from Birsinghpur are required to be opened. The over voltage issue at Birsinghpur has also been reported by NLDC in their operational feedback.

21.2 He said that to control over voltage at Birsinghpur, MPPTCL has proposed installation of one 125 MVAR bus reactor at Birsinghpur TPS switchyard by MPPGCL.

21.3 Members agreed with the installation of 1x125 MVAR bus reactor at Birsinghpur TPS to be provided by MPPGCL.

**22.0 Evacuation of Power from Adani Mundra Generation Project**

22.1 COO, CTU stated that M/s Adani Power Limited (APL) has established a 4620MW generation project at Mundra in Kutch dist. Gujarat. From their generation project, M/s Adani Power has tied up 3966 MW of power under long term, the details of which are as given below:

- Gujarat : 2000MW
- Maharashtra : 200 MW
- Haryana : 1424 MW
- LTOA : 342 MW (With Punjab and Rajasthan (NR) as target beneficiaries without Long Term PPA)
- In addition 200 MW power has been tied up under MTOA.

22.2 He added that for transfer of power to Haryana (PPA for 1424 MW), M/s Adani Power Limited had established Mundra – Mohindergarh ± 500kV HVDC 2500MW Bi-pole & Mohindergarh - Dhanonda 400kV (Quad) D/c lines as dedicated transmission system. Additionally, M/s Adani Power Limited had set up Mohindergarh – Bhiwani (PG) 400kV D/c line for 342 MW LTA to Punjab and/or Rajasthan beyond Mohindergarh considering that 342 MW power would be available at Mohindergarh HVDC terminal. This LTA for 342 MW was approved with point of injection of power as Bhiwani Substation of POWERGRID. M/s Adani Power Ltd. had applied to CERC for grant of transmission license for the dedicated transmission system consisting of Mundra – Sami - Dehgam, Mundra – Mohindergarh HVDC bipole, Mohindergarh – Dhanonda, Mohindergarh – Bhiwani, lines, electrode lines and other associated works. CERC vide its order dated 29/07/2013 has directed that transmission license be granted to Adani Power Limited. M/s Adani Power vide letter dated 21/05/2013 has applied for Long Term Access at their generation switchyard for 342MW. As per the LTA application, point of injection is Adani Generation bus. Now with the grant of license, the Adani bus is to be treated as ISTS bus and accordingly LTA is to be granted from Adani generation bus.

22.3 He further informed that as per the CERC order dated 29/07/2013 as per para 11 “as the subject transmission system developed by the petitioner is already being used as per PPA dated 07/08/2008 for supply of power to UHBVNL & DHBVNL for a quantum of 712 MW each the petitioner shall be deemed to be long term access customer for 1424 MW.” Accordingly, 1424 MW PPA with Haryana is also to be treated as LTA from Adani Mundra generation bus and M/s Adani has to bear the transmission charges and losses for this. Accordingly LTA to M/s Adani Power Limited is deemed to be granted for about 1500 MW (1424 for PPA and losses (exact figure shall be worked out in consultation with NRLDC)) from generation bus from the date of operation of the Adani system as ISTS system and M/s Adani shall bear the transmission charges for the same. In long term perspective, an additional line from Adani Mundra generation bus to Banaskantha / Bhuj pooling station needs to be considered and integrated with the high capacity corridor being planned with RE generation projects in Rajasthan and Gujarat

22.4 After deliberations, the following was agreed by the members:

- i. As per CERC order the PPA of Haryana would be from Adani Bus and Adani shall bear the transmission charges & losses for the same. Accordingly, the transfer of power to Haryana shall be from Adani Mundra generation project considering an injection of about 1500 MW (1424 for PPA and losses (exact figure shall be worked out in consultation with NRLDC)) at generation bus. This shall be applicable from the date of operation of Adani transmission system as ISTS system.
- ii. LTA of 342 MW to NR from Adani Mundra generation was formalized with injection point as Adani Mundra generation bus in place of Bhiwani and with present SPS in place. SPS scheme shall be reviewed after commissioning of Mundra – Zerda 400 kV D/c line. LTA of 342 MW for NR from Mundra generation bus as well as other power transfer through ISTS i.e. LTA of 200 MW to Maharashtra & MTOA for 200 MW from Adani Mundra generation bus can become effective from the date of operation of the Adani system as ISTS system.
- iii. In long term perspective, an additional line from Adani Mundra generation bus to Banaskantha / Bhuj pooling station was agreed.

### 23.0 **Response to POSOCO report on Operational Feedback on Transmission Constraints**

23.1 Director (SP&PA), CEA stated that POSOCO in its report on ‘Operational Feedback on Transmission Constraints - April 2013’ has listed transmission lines and ICTs which are experiencing constraints due to overloading and also the nodes experiencing high voltage. The constraints mentioned in the report are:

- a) Overloading of Kawas-Ichapore 220 kV line
- b) Overloading of Sugan – Vapi 400 kV S/C line
- c) Parli – Lonikhand 400 kV D/C line
- d) 400 kV D/C lines emanating from Mundra UMPP.
- e) ICT constraint on 3X315, 400/220 kV ICT at Vapi.



f) Nodes experiencing high voltages Raipur, Raigarh, Birsinghpur, Khandwa, Damoh, Bhopal, Nagda, Rajgarh, Bhadravati, Wardha, Dhule, Kolhapur, Bhusawal, Akola, Solapur, Mapusa, Bhilai, Lonikhand, Parli.

23.2 He said that to control over voltage in Western Region installation of 27 nos. of bus reactors at various locations in WR has been agreed in the 33<sup>rd</sup> and 34<sup>th</sup> SCM of WR. Some reactors have already been commissioned and others are under various stages of implementation. In DNH, Kala 400/220 kV substation has already been planned which would relieve the loading of Vapi ICTs. For Kawas-Ichapore overloading, the LILO of one circuit of Kawas-Vav at Ichapore may be implemented as decided in the 34<sup>th</sup> SCM of WR. Additional interconnection with Vapi has already been planned to avoid overloading of Sugan-Vapi 400 kV S/C line. With regard to Mundra UMPP, additional system strengthening has also been agreed.

23.3 Members noted the above.

#### 24.0 **Additional evacuation line from Vindhyachal-IV & V STPP (3x500 MW)**

24.1 Director (SP&PA), CEA stated the immediate evacuation of Vindhyachal-IV & V STPP (VSTPP) consists of Vindhyachal-IV generation switchyard-Vindhyachal Pool 400 kV D/c (Quad) line. NTPC have requested to provide additional outlet from Vindhyachal-IV generation switchyard in order to increase the reliability of the power evacuation system for VSTPP-IV & V project. Further, to meet the “n-1-1” contingency as stipulated in revised planning criteria, following additional transmission system for Vindhyachal-IV & V is proposed:

(i) Vindhyachal-IV & V STPP – Vindhyachal Pool 400 kV D/c (Quad) 2<sup>nd</sup> line.

24.2 Members agreed with the proposal.

#### 25.0 **Termination of Vapi – Navi Mumbai 400kV D/c line at upcoming Kudus substation of MSETCL.**

25.1 Director (SP&PA), CEA stated that in the previous meeting termination of Vapi – Navi Mumbai 400 kV D/c line at Kudus substation of MSETCL was agreed due to severe RoW problem. MSETCL have informed POWERGRID in May, 2013 that all bays available at Kudus are earmarked for the lines already sanctioned. There is no space at Kudus for termination of Vapi-Navi Mumbai line. MSETCL has suggested that LILO of only one circuit of Tarapur – Padghe 400 kV D/c may be done at Kudus. This would release two bays, which could be used for termination of Vapi-Navi Mumbai line.

25.2 He added that POWERGRID has informed that due to severe Right-of-Way constraint in the portion between Kudus and Navi Mumbai, the line portion between Kudus and Navi Mumbai cannot be constructed. Hence, it is proposed to modify Vapi-Navi Mumbai 400kV D/c line under WRSS-V as Vapi-Kudus 400kV D/c line.

25.3 MSETCL stated that it was difficult to implement the 220 kV lines from the Navi Mumbai 400/220 kV substation due to severe RoW problems. POWERGRID stated LILO of 400 kV Lonikhand/Pune – Kalwa S/C line at Navi- Mumbai 400 kV substation was being implemented by laying of cables near Navi Mumbai and at present cable

trench works was in progress. MSETCL can share the cable corridor for laying of the 220 kV lines for evacuating power from Navi Mumbai 400 kV substation.

- 25.4 After deliberation, Members agreed with the following:
- a) LILO of only one circuit of Tarapur-Padghe 400 kV D/C line at Kudus for providing 2 no. bays for termination of Vapi-Navi Mumbai 400 kV D/C line at Kudus.
  - b) Vapi-Navi Mumbai 400kV D/c line agreed under WRSSS-V modified as Vapi-Kudus 400kV D/c line.
- 25.5 Members requested MSETCL to take up 220 kV lines for drawal of power from Navi Mumbai 400/220 kV substation.
- 25.6 Chairman and Member (PS), CEA enquired about the status of implementation of two nos. of 400 kV bays at Dhule (MSETCL) 400 kV substation for termination of the 400 kV D/C line from Dhule (IPTC) 765/400 kV substation. MSETCL informed that they have put up the proposal for their board approval. MSETCL enquired about the recovery of the capital cost of two nos. of 400 kV bays at Dhule. Chairman and Member (PS), CEA clarified that the capital cost of the two nos. of 400 kV bays at Dhule (MSETCL) shall be recovered through transmission charges for the bays as a part of national pool for interstate transmission system. MSETCL should implement the two no. of 400 kV bays at Dhule on priority basis as the Dhule(IPTC)-Dhule (MSETCL) 400 kV D/C line was scheduled for commissioning by March 2014.
- 26.0 Commissioning of 2x25% FSC of Rajgarh – Karamsad (Kasor) 400 kV D/c line.**
- 26.1 Director (SP&PA), CEA stated that Western Region Transmission Gujarat Private Limited (WRTGPL), a subsidiary of Reliance Power Transmission Limited is implementing Rajgarh – Kasor 400 kV D/c line which is held up due to forest clearance issues. This line was planned with 2x25 % fixed series compensation (FSC). POWERGRID has already implemented both line bays as well as FSC at Rajgarh. FSC is available since September 2011 but could not be commissioned due to non-availability of Rajgarh – Kasor 400 kV D/c line. Rajgarh – Kasor 400 kV D/c line is not likely to be commissioned in near future and commissioning of 2x25% FSC is pending since September 2011 and involves contractual issues. POWERGRID has proposed that the FSC may be tested and commissioned by connecting to some other 400 kV line emanating from Rajgarh 400 kV substation as an interim arrangement.
- 26.2 DGM, POWERGRID informed that FSC is proposed to be connected with Rajgarh-Nagda 400 kV D/C line. The testing and commissioning of FSC would be completed within 15 days.
- 26.3 After deliberation, Members agreed that FSC may be tested and commissioned by connecting it with Rajgarh-Nagda 400 kV D/C line to close the contractual issues. The FSC may be removed from the Rajgarh-Nagda 400 kV D/C line after testing and commissioning.

## 27.0 **Additional evacuation line from Sasan UMPP (6x660 MW)**

27.1 Director (SP&PA), CEA stated that POSOCO has recently reported multiple outages in the system and has suggested considering multiple outages for planning reliable evacuation system from major generation complexes. Based on this, the evacuation system from major generation complex Sasan (6x660 MW) has been reviewed. The immediate evacuation of Sasan UMPP consists of following elements:

- (i) Sasan UMPP – Satna 765 kV 2xS/c line
- (ii) Sasan UMPP – Vindhyachal Pool 765 kV S/c line
- (iii) 2x1000 MVA, 765/400 kV at Sasan UMPP

27.2 He added that system studies considering outage of Sasan – Satna 765 kV 2xS/c lines indicate power evacuation constraints from Sasan complex. Accordingly, it is proposed to provide one more 765 kV S/c line from Sasan to Vindhyachal Pool.

27.3 COO, CTU stated that this would provide additional link between two major generation complexes at Sasan and Vindhyachal.

27.4 After deliberations, Members agreed with the one more 765 kV S/C line (2<sup>nd</sup> circuit) from Sasan to Vindhyachal Pool.

## 28.0 **Augmentation of Transformation capacity at Damoh Station.**

28.1 Director (SP&PA), CEA stated that POWERGRID has intimated that loading on each 400/220 kV ICTs at Damoh sub-station has exceed 250 MW on several occasions and maximum loading on each ICT at the sub-station had gone up to 282 MW during April, 2013. Outage of one transformer may cause the tripping of other transformer. Therefore, POWERGRID has proposed to augment the transformation capacity at Damoh by installing an additional 1x500 MVA ICT to improve the reliability and meet the increased load demand.

28.2 Keeping the load growth in that area, MPPTCL agreed with the proposal of adding 3<sup>rd</sup> transformer at Damoh.

28.3 Members agreed with the proposal.

## 29.0 **Reactive Power Management in Western Regional grid**

29.1 Director (SP&PA), CEA stated that during the light load conditions in Western Region, it has been observed that voltages are in the range of 430-435 kV which is at critical limits. In the recent report of POSOCO “Operational Feedback on Transmission Constraints (April, 2013)”, over voltage has been reported at the following nodes.

*“Raipur, Raigarh, Birsinghpur, Khandwa, Damoh, Bhopal, Nagda, Rajgarh, Bhadrawati, Wardha, Dhule, Kolhapur, Bhusawal, Akola, Solapur, Mapusa, Bhilai, Lonikhand & Parli.”*

29.2 He said that during 33<sup>rd</sup> and 34<sup>th</sup> SCM, the issue of over voltage and requirement of reactive compensation in the grid was deliberated, where in 27 no. bus reactors were also agreed to contain over voltage in WR. With the market development, the variation of power flow on transmission corridor is increasing. Thus, for reactive

power management in the grid under such unpredictable scenario, it is necessary to provide adequate reactive compensation all over the grid. Keeping above in view, POWERGRID has proposed:

- a) 1x125 MVAR, 420 kV Bus Reactor at all the 400 kV substations of WR wherein presently no bus reactors are existing / planned by respective utility
- b) 1x330MVAR, 765 kV at all the 765 kV substations of WR wherein presently no bus reactors are existing / planned by respective utility
- c) 1x125 MVAR, 420 Bus Reactor in the generation switchyard of all generators by respective utility wherever no bus reactor exists to control the over-voltages in the system.
- d) Converting all line reactors at sending end into switchable line reactors (depending on space available)

29.3 POWERGRID intimated that at present 4 no. 400 kV sub-stations are not having bus reactors. The connectivity/LTA is granted to IPPs with provision of bus reactor at their generating switchyard.

29.4 MS, WRPC emphasized on the early implementation of already agreed reactors in the 33<sup>rd</sup> and 34<sup>th</sup> SCM of WR. Requirement of additional reactors could be arrived based on reactive power studies. He appreciated the installation of bus reactors at generating stations and opined that reactive compensation of the value corresponding to at least 10% of MW capacity of generation should be provided at the generator bus.

29.5 Members agreed with MS, WRPC view of arriving at requirement of additional reactive compensation based on reactive power studies. Further, the following was agreed:

- a) Bus Reactor of the value corresponding to at least 10% of MW capacity of generation in the generation switchyard of all generators by respective utility.
- b) Converting all line reactors at sending end into switchable line reactors (depending on space available)

### 30.0 **Additional System Strengthening Scheme for Chhattisgarh IPPs**

30.1 Director (SP&PA), CEA stated POWERGRID is implementing a composite high capacity corridor planned for Chattisgarh IPPs having 18,000 MW installed capacity. Considering the uncertainty of materialization of these IPPs, initially this high capacity corridor was planned with minimum redundancy. The immediate evacuation lines from Chattisgarh complex inter-alia consists of following lines:

- (i) Champa (Pool) – Kurukshetra  $\pm$  800 kV, 6000 MW HVDC bi-pole
- (ii) Raigarh (Kotra) – Pugalur  $\pm$  600 kV, 4000 MW HVDC bi-pole
- (iii) Raipur (Pool) – Wardha Pool 765 kV 2xD/c line
- (iv) Champa (Pool) – Dharamjaigarh 765 kV S/c line

30.2 He said that POWERGRID has informed that in the Chattisgarh complex progress of about 21,000 MW generation is encouraging and many of these are already

commissioned. Further, few projects have also taken connectivity over this corridor. To provide reliable evacuation of power from this complex, the following transmission system strengthening for Chhattisgarh IPPs is proposed:

- (i) Raipur (Pool) – Rajnandgaon 765 kV D/c line.
- (ii) Rajnandgaon – Pooling station near Warora 765 kV D/c line.
- (iii) LILO of one circuit of Aurangabad – Padghe 765 kV D/c line at Pune.
- (iv) Establishment of new substation near Rajnandgaon 765/400 kV, 2x1500 MVA substation.
- (v) LILO of all circuits of Raipur/Bhilai – Bhadrawati 400 kV lines at Rajnandgaon.
- (vi) Raigarh (Kotra) - Champa (Pool) – Dharamjaigarh 765 kV 2<sup>nd</sup> S/c line.

30.3 He informed that the LILO of one circuit of under implementation Aurangabad – Padghe 765 kV D/c line at Pune is proposed in lieu of already agreed LILO of one circuit of Kolhapur – Padghe at Pune for reliable interconnection of Pune at 765 kV level. CEA vide its letter dated 29<sup>th</sup> May 2013 has already accorded “in-principle” approval for the same while granting approval for Aurangabad – Solapur 765 kV D/c line.

30.4 MD, GETCO inquired about the progress, LTA quantum and PPA of the IPPs in Chattishgarh complex. MSETCL stated it would be difficult to get land for Warora pooling station.

30.5 DGM, POWERGRID stated that information requested by GETCO would be added in the details of IPPs (enclosed as Annexure IV) and regarding the location of the Warora pooling station, it was decided that it would be done in consultation with MSETCL.

30.6 After deliberations members agreed with the above proposal.

### 31.0 **Transmission system for increasing import of power into Southern Region**

31.1 Director (SP&PA), CEA stated that in the meeting of 31<sup>st</sup> Standing Committee meeting on Power System Planning for Western Region held on 27<sup>th</sup> December 2010 at Gurgaon, it was agreed to implement Wardha – Hyderabad 765 D/c line (inter-regional line between WR & SR). Subsequently in the 35<sup>th</sup> meeting of Standing Committee meeting on Power System Planning for Southern Region held on 4<sup>th</sup> January 2013 at Gurgaon, it was decided by SR constituents to anchor planned Hyderabad –Wardha 765kV D/C line at some intermediate station as the length of this line was becoming more than 500 km as per the preliminary survey. The increase in line length is due to line routing, to avoid Hyderabad City limits and Forest stretches. After discussions, it was decided in above meeting of SR that the location and connectivity at 400kV level of the intermediate station would be decided on the basis of joint studies/visit by CTU, APTRANSCO and CEA. During the joint studies of a team comprising of officers from CTU, CEA and APTRANSCO it was found that Nizamabad could be the perspective location for the intermediate station. POWERGRID and APTRANSCO has identified 3-4 locations around Nizamabad area, and the proposed line lengths of the Wardha – Nizamabad and the Nizamabad - Hyderabad would be approximately 250km.

31.2 He said that the connectivity of the intermediate station at Nizamabad was studied and the following system was finalized in joint studies with PGCIL, APTRANSCO, TNEB and KPTCL held in Hyderabad on 28-30 June 2013:

- (i) Establishment of Nizamabad 765/400kV substation with 2x1500 MVA transformers.
- (ii) Nizamabad – Dichpalli 400kV D/c line.
- (iii) Nizamabad – Yeddumailaram (Shankarapalli) 400kV D/c line.
- (iv) LILO of Nizamabad – Yeddumailaram (Shankarpalli) 400kV D/c line at Narsapur – by APTRANSCO.

31.3 In view of the above, Wardha – Hyderabad 765 kV D/c line agreed earlier shall now be Wardha – Nizamabad – Hyderabad 765 kV D/c.

31.4 Members noted the same.

**32.0 Transmission system associated with New IPP projects in Chattishgarh-Shifting of converter terminal associated with  $\pm$  600 kV 4000 MW, Raigarh (Kotra) – Dhule HVDC line from Dhule in Western Region to a suitable location in Southern Region.**

32.1 Director (SP&PA), CEA stated that in the 35<sup>th</sup> meeting of Standing Committee on Power System Planning for Western Region held on 3<sup>rd</sup> January 2013 at Gurgaon, it was agreed to terminate the HVDC terminal of Raigarh (Kotra) – Dhule HVDC bi-pole in Southern Region (near Chennai) instead of Dhule. Accordingly, CEA, SR constituents & POWERGRID have carried out the joint studies and proposed the following transmission scheme:

- (i) Raigarh (Kotra) – Pugalur  $\pm$  600 kV, 4000 MW HVDC bipole
- (ii) Pugalur HVDC Station – Pugalur Existing 400kV (quad) D/c line
- (iii) Pugalur HVDC Station – Arasur 400kV (quad) D/c line
- (iv) Pugalur HVDC Station – Thiruvalem 400kV (quad) D/c line
- (v) Pugalur HVDC Station – Edayarpalayam – Udumalpet 400kV (quad) D/c line
- (vi) Establishment of 400/220kV substation with 2x500 MVA transformers at Edayarpalayam

32.2 Members noted the same.

**33.0 Development of Analytics as part of Unified Real Time Dynamic State Measurement (URTDSM) scheme**

33.1 POWERGRID stated that implementation of Unified Real Time Dynamic State Measurement (URTDSM) scheme as system strengthening was agreed in the Joint meeting of all the five (5) Regional Standing committees on Power System Planning held on 05.03.2012. It consists of installation of Phasor Measurement Unit(PMU) at existing State, ISTS and IPP stations and lines at 400kV and above including that coming up by 2014-15, generation switchyard at 220kV and above, Phasor Data Concentrator(PDC) at all SLDC, RLDC & NLDC along with OPGW communication links. In URTDSM, the following analytics to visualize and analyze the real time phasor data are to be developed in parallel with implementation of the URTDSM scheme in association with premier academic institutions like IIT using PMU based measurement.

- (i) Vulnerability analysis of distance relays
- (ii) Linear state estimator
- (iii) Supervised Zone-3 distance protection scheme to prevent unwanted tripping of backup distance relays

- (iv) CT/CVT calibration
- (v) Line Parameter Estimation
- (vi) Control Schemes for improving system security (based on angular, voltage and frequency instability)

Based on the discussion, development of above analytics in association with IIT Bombay progressively in three(3) years has been undertaken which will be installed at all SLDC, RLDC, NLDC, RPC, CEA and CTU.

33.2 The Purpose and deliverables along with timeline for above analytics is given below.

#### DEVELOPMENT OF ANALYTICAL TOOLS USING PMU BASED PHASOR MEASUREMENTS

S No.	Task	Aim	Deliverables	Timeline
1.	Line Parameter Estimation	Estimate & Validate transmission line parameter.  Inputs required: a) PMU based phasor measurement at both ends of line, bus voltage phasor	<ul style="list-style-type: none"> <li>• Positive and Zero sequence Line parameter estimation (R,X,B)</li> <li>• Errors in line parameters will be logged for information to operator &amp; correction in linear state estimator parameter.</li> </ul>	February 2014
2.	On line vulnerability analysis of distance relays.	Development of software for validating distance relay characteristic (Zone-1, Zone-2, Zone-3) in real time basis by superimposing on field setting of distance relays.  Inputs required: b) PMU based phasor measurement at both ends of line, bus voltage phasor c) Distances relay characteristic and settings.	<ul style="list-style-type: none"> <li>• Visualization of relay characteristic and apparent impedance trajectory in the R-X plane.</li> <li>• Alarm / messages when thresholds are violated or apparent impedance is some margin (say 20%) from Zone 1, 2 or Zone 3 characteristics of the relay.</li> <li>• Identification of power swing beyond a configurable threshold due to any disturbance in the system</li> <li>• Identification of load encroachment condition in the system</li> <li>• Creation &amp; storage of distance relay characteristics of different lines using templates &amp; available settings</li> <li>• Data available in standard format(CSV, excel, comtrade)</li> <li>• Trigger input for DSA</li> </ul>	February 2014
3.	Linear State Estimator	Development of 3-phase linear state estimator, software based on weighted least square technique.  Inputs required: a) PMU based phasor measurement at both ends of line and bus voltage phasor,	<ul style="list-style-type: none"> <li>• Network topology processor to update the bus model</li> <li>• Bad data detection</li> <li>• Topology error detection to identify the switch device errors</li> <li>• Observability analysis to identify maximum observable network with available measurement.</li> <li>• Pseudo &amp; historical measurement generation in case of lack of observability.</li> <li>• Alarms &amp; warnings for model</li> </ul>	August-2014

S No.	Task	Aim	Deliverables	Timeline
		b) Substation bus switching scheme/topology	<p>inconsistencies &amp; limit violation.</p> <ul style="list-style-type: none"> <li>• Network connectivity/graph to provide: <ul style="list-style-type: none"> <li>• Island details</li> <li>• Issue alarm for loss of connectivity</li> <li>• visualisation by making line dotted/different colour</li> <li>• Component outage</li> </ul> </li> <li>• Visualization of state estimator output in tabular &amp; graphical form.</li> <li>• Power system condition can be played-back along with topology connectivity and flow measurement</li> <li>• Three phase State Estimator</li> </ul>	
4.	Supervised Zone-3 distance protection scheme to prevent unwanted tripping	<p>The analytics will provide adaptive Zone-3 backup protection to avoid unwanted Zone-3 tripping.</p> <p>Inputs required:</p> <ol style="list-style-type: none"> <li>PMU based phasor measurement at both ends of line and bus voltage</li> <li>Distance relay characteristics and settings of candidate line</li> </ol>	<ul style="list-style-type: none"> <li>• Identification of presence of persistent fault in the observable system.</li> <li>• Identification of presence of power swing &amp; load encroachment in the observable system.</li> <li>• The software will generate control signal for disabling of Zone -3 protection based on system condition and adopted protection philosophy</li> </ul>	February 2015
5.	CT/CVT Calibration.	<p>This module will evaluate the accuracy of these instruments.</p> <p>Inputs required:</p> <ol style="list-style-type: none"> <li>PMU based phasor measurement at both ends of line, bus voltage phasor</li> <li>Benchmarked PT to act as reference</li> <li>Linear State Estimator</li> </ol>	<ul style="list-style-type: none"> <li>• Evaluation of CT/CVT errors in magnitude</li> <li>• Evaluation of CT/CVT errors in phase</li> <li>• Identification of faulty CT/CVT from steady state and transient response</li> <li>• Computation of compensation factors for correcting the steady state response of CT/CVT for state estimation</li> <li>• Verification of measurements against benchmark-CT/CVT</li> <li>• Highlighting the variation using graphs</li> </ul>	May 2015
6	Emergency control for improving system security(Based on angular, voltage & frequency stability)	<p>The module will continuously monitor and analyse the stability (like voltage &amp; angular) based on the trajectories of various parameters like voltage, current phasors, breaker status etc</p> <p>Inputs required:</p> <ol style="list-style-type: none"> <li>PMU based phasor measurement at both</li> </ol>	<ul style="list-style-type: none"> <li>• Based on the analysis of the evolving trajectories a decision on whether to take an automatic control action and its quantum &amp; location shall be taken by such a scheme.</li> </ul> <p>Five such Wide-Area Emergency Control Schemes shall be developed, which will involve appropriate action in any or all regions, adaptively, depending on the event, such as Controlled system separation</p>	January 2016



S No.	Task	Aim	Deliverables	Timeline
		ends of line, bus voltage phasor	(adaptive islanding), Adaptation of relays and control systems using wide area Information etc.	

33.3 MS, WRPC stated that frequent interactions on developments works of the above analytics was required to keep the constituent members aware of the progress.

33.4 COO, CTU stated that a special meeting would be held with the constituents to make them aware about the progress and development of analytic tools.

33.5 Members noted the same.

#### 34.0 Proposal of STATCOM in Western Region

34.1 Director (SP&PA), CEA stated that in the meeting of 35<sup>th</sup> SCM of WR it was decided to provide  $\pm 400$  MVAR Static VAR Compensators (SVCs)/ STATCOMs at Gwalior, Aurangabad, Solapur and Satna Substations of POWERGRID in first phase. It was also decided that the choice of SVC/STATCOM would be evaluated through relevant studies for technology selection. Subsequently, to finalize the technology, size etc. which would be suitable to Indian Grid conditions, POWERGRID had appointed Dr. Narain G. Hingorani, a consultant of International repute in the field on HVDC, FACTS, Power electronics, Power System and T&D. After detailed deliberations with the consultant the following was concluded:

- a. For Dynamic compensation, STATCOM is preferred over SVCs in view of its faster response, requirement of less space and above all it is state of art technology.
- b. To reduce cost of STATCOM the dynamic compensation range may be reduced and the STATCOMs may be combined with mechanically switched Reactors and Capacitors controlled by STATCOM controller.
- c. The STATCOM would be primarily for dynamic compensation while the mechanically switched reactors/capacitors would be for reactive compensation under steady state.

34.2 Accordingly, POWERGRID has carried out revised studies comparing STATCOM with SVC. Based on the studies , STATCOMs has been proposed to meet the dynamic reactive compensation requirements at following sub-stations in WR:

S. No.	Substation	Dynamic Compensation	Mechanically Switched Compensation
		$\pm$ MVAR	Reactor   Capacitor

			MVAR	MVAR
1.	<b>Aurangabad</b>	<b>±300</b>	<b>2X125</b>	<b>1X125</b>
2.	<b>Gwalior</b>	<b>±200</b>	<b>2X125</b>	<b>1X125</b>
3.	<b>Satna</b>	<b>±300</b>	<b>2X125</b>	<b>1X125</b>
4.	<b>Solapur</b>	<b>±300</b>	<b>2X125</b>	<b>1X125</b>

It there are any space constraints for additional bays required for STATCOM at any of above substation, it is proposed that 400kV GIS bays shall be provided at those substations.

- 34.3 Members enquired about the tentative cost of the STATCOM proposed. COO, CTU informed that the budgetary cost indicated by the manufacturers is about 200 crores for each STATCOM.
- 34.4 Members agreed with the provision of STATCOM along with mechanically switched capacitors and reactors as indicated above.
- 35.0 **Commissioning of 3x80 MVAR, 765 kV Line Reactor as Bus Reactor at Raigarh Pooling Station (Kotra).**
- 35.1 Director (SP&PA), CEA stated that POWERGRID has given the proposal of commissioning of 3x80 (240) MVAR, 765 kV Line Reactor (of Raigarh (Kotra) pooling station – Raipur pooling station 765 kV line at Raigarh (Kotra) end) as Bus Reactor at Raigarh Pooling Station (Kotra) to contain the high voltage conditions at Raigarh (existing) 400 kV substation and had requested for in principle clearance of CEA.
- 35.2 CEA has given in principle approval the proposal of POWERGRID i.e., commissioning of 3x80 (240) MVAR, 765 kV Line Reactor as Bus Reactor at Raigarh Pooling Station (Kotra), as it was helping in containing high voltage at 400 kV Raigarh(existing) substation.
- 35.3 Members concurred with the above proposal.
- 36.0 **LILO of 400 kV Koradi II – Wardha (PG) D/c line to one circuit of 400 kV Warora Wardha (PG) D/c line - Agenda by MSETCL**
- 36.1 Director (SP&PA), CEA stated that the termination of the Koradi II – Wardha 400 kV D/C (quad) line of MSETCL at Wardha end in one circuit of Wardha – Akola 400 kV D/c line was agreed as an interim arrangement. MSETCL was to extend this line towards their load centers as permanent arrangement. MSETCL has now proposed to connect Koradi-II - Wardha 400 kV D/C quad line to one circuit of 400 kV Warora – Wardha (PG) D/c quad line instead of the interim arrangement agreed.
- 36.2 COO, CTU stated that the proposal of MSETCL will still inject power at Wardha 400 kV substation where the short circuit level was reaching its limit. It has already been

agreed in various meetings that the 400 kV D/C line from Koradi-II towards Wardha has to be extended and connected to some load centers. MSETCL has not given any proposal for termination of the line from Koradi-II.

36.3 MSETCL informed that they planned an intra-state system strengthening scheme for evacuation of power from IPPs such as Lanco Vidarbha , Jinbhuish etc. which included creation of 765/400 kV pooling station at Wardha. They have planned to terminate the 400 kV D/C line from Koradi-II at their Wardha pooling station. The intra state system strengthening scheme was also discussed in the 35<sup>th</sup> SCM of WR. But due to uncertainty of some IPP generation projects, MSETCL is reviewing the intra-state system strengthening scheme.

36.4 After deliberation, Members agreed with the proposal of MSETCL to terminate Koradi-II - Wardha 400 kV D/C quad line to one circuit of 400 kV Warora – Wardha (PG) D/c quad line as interim arrangement. MSETCL was also advised to expedite establishment of their Wardha pooling station.

### 37.0 **Installation of Shunt Reactor at Dabhol**

37.1 Director (SP&PA), CEA stated that Ratnagiri Gas & Power Pvt. Ltd. (RGPPL) in a letter addressed to MS, WRPC has informed that RGPPL has experiences black out twice in the recent past due to over voltage tripping of all the lines from RGPPL. The issue has been discussed in the 449<sup>th</sup> and 450<sup>th</sup> OCC meeting, where in it was suggested that a reactor of suitable rating be installed at RGPPL generating switchyard.

37.2 The issue was of over voltage at RGPPL was discussed and provision of 400 kV, 1X125 MVAR bus reactor at RGPPL generation switchyard to control over voltage was agreed by the members.

### 38.0 **Open Access Meeting.**

38.1 The minutes of the Connectivity, Open Access (Medium term and Long term) cases discussed in the 18<sup>th</sup> meeting of WR constituents regarding Connectivity / Long Term Access (LTA) applications in Western Region are available on the POWERGRID website.

The meeting ended with thanks to the chair.

**List of Participants during the 36<sup>th</sup> Meeting of Standing Committee of Power System Planning in WR held on 29-08-2013 at NRPC, Katwaria Sarai, New Delhi.**

S.No.	Name (S/Sh)	Designation	Contact No	Fax No/E-mail
<b>CEA</b>				
1.	Ravinder	Chairperson and Member (PS)	09971568444	ravinders.only@gmail.com
2.	K.K.Arya	CE(I/C)	9810455760	<a href="mailto:kkarya_2001@rediffmail.com">kkarya_2001@rediffmail.com</a>
3.	Ravinder Gupta	Director (SP &PA)	011-26732369	ravindergpt@yahoo.com
4.	P.Jindal	Director(SP & PA)	9818768460	-
5.	Awdhesh Kr. Yadav	Dy.Dir. (SP&PA)	011-26732308	<a href="mailto:awd@rediffmail.com">awd@rediffmail.com</a>
6.	Manjari Chaturvedi	Dy.Dir. (SP&PA)	011-26732310	<a href="mailto:manjari.cea@gmail.com">manjari.cea@gmail.com</a>
7.	Santosh Kumar	Dy.Dir. (SP&PA)	8860754509	<a href="mailto:ksantoshcea@gmail.com">ksantoshcea@gmail.com</a>
8.	Anita Gehlot	Dy.Dir. (SP&PA)	011-26732328	<a href="mailto:anitagahlot108@gmail.com">anitagahlot108@gmail.com</a>
<b>POWERGRID/ CTU</b>				
9.	Y. K Sehgal	COO, CTU	09650293194	<a href="mailto:ykseghal@powergridindia.com">ykseghal@powergridindia.com</a>
10.	R. K. singh	ED (WR-II)	9687721111	<a href="mailto:Rk.singh@powergridindia.com">Rk.singh@powergridindia.com</a>
11.	Subir Sen	GM (SG)	9650293185	<a href="mailto:subir@powergridindia.com">subir@powergridindia.com</a>
12.	Manju Gupta	DGM (CTU)	09910378111	<a href="mailto:manju@powergridindia.com">manju@powergridindia.com</a>
13.	Jasbir Singh	DGM	9650894944	<a href="mailto:jasbir@powergridindia.com">jasbir@powergridindia.com</a>
14.	A. Sen Sarma	DGM	9910041337	<a href="mailto:arindamsensarma@yahoo.com">arindamsensarma@yahoo.com</a>
15.	K.K.Gupta	CM(ENGG)	0712-2641482	<a href="mailto:kkgupta@powergridindia.com">kkgupta@powergridindia.com</a>
16.	Abhinav Verma	CM ((WR-II)	9428504062	<a href="mailto:abhinav.verma@powergridindia.com">abhinav.verma@powergridindia.com</a>
17.	Nikhilesh Dube	CM (WR1)	9422808938	<a href="mailto:20034@powergridindia.com">20034@powergridindia.com</a>
18.	Vineeta Agarwal	CM	9910045537	<a href="mailto:vineeta@powergridindia.com">vineeta@powergridindia.com</a>
19.	R V M M Rao	CM	9717296921	<a href="mailto:rvmrao@powergridindia.com">rvmrao@powergridindia.com</a>
20.	G. K. Gautam	Manager (WR-I)	9423762521	<a href="mailto:gkgautam@powergridindia.com">gkgautam@powergridindia.com</a>
21.	Kashish Bhambhani	Manager (SG)		<a href="mailto:kashish@powergridindia.com">kashish@powergridindia.com</a>
22.	Bhaskar Wagh	Design Engr	09560890352	<a href="mailto:bhaskarwagh@powergrid.in">bhaskarwagh@powergrid.in</a>
23.	Prashant	Design Engr	09560050236	<a href="mailto:prashant.pandey@powergridindia.com">prashant.pandey@powergridindia.com</a>
24.	Sandeep Kumar	Sr. Engineer		<a href="mailto:sandeepk@powergridindia.com">sandeepk@powergridindia.com</a>
<b>WRPC</b>				
25.	S.D.Taksande	Member Secretary	09820878384	<a href="mailto:sureshtaksande@rediffmail.com">sureshtaksande@rediffmail.com</a>
26.	Satyanarayan S	SE	09223399938	<a href="mailto:satyaguru@yahoo.com">satyaguru@yahoo.com</a>
<b>MPPTCL</b>				
27.	S K Nagesh	Director (Technical)	9425805261	<a href="mailto:sknagesh2006@gmail.com">sknagesh2006@gmail.com</a>
28.	K C Badkul	Director (Commercial)	9425150654	<a href="mailto:Dir.comm@mprtradeo.com">Dir.comm@mprtradeo.com</a>
29.	R.Sethi	CE(Plg&PS)	09425805228	<a href="mailto:ceps321@yahoo.com">ceps321@yahoo.com</a>
30.	M.M.Dhoke	ASE,PS	09425805237	<a href="mailto:mmdhoke@gmail.com">mmdhoke@gmail.com</a>
<b>GETCO/GUVNL</b>				
31.	S.K.Negi	MD,GETCO	09879200622	<a href="mailto:md.getco@gebmail.com">md.getco@gebmail.com</a>
32.	Dipak H. Patel	JE(System)	9925213273	<a href="mailto:desystem@gebmail.com">desystem@gebmail.com</a>

<b>MSETCL</b>				
33.	O. K. Yeospal	Director (Proj / Op)	09619079999	<a href="mailto:dirprj@mahatransco.in">dirprj@mahatransco.in</a>
34.	S G Kelkar	ED (Op)	9167279940	<a href="mailto:edop@mahatransco.in">edop@mahatransco.in</a>
35.	Sanjay S. Kulkarni	CE (STU)	9819363329	<a href="mailto:cectu@mahatransco.in">cectu@mahatransco.in</a>
36.	N. R. Sonkavday	SE (STU)	09987783924	n.sonkavday@rediffmail.com
<b>CSPTCL</b>				
37.	H.K.Pandey	SE(Planning)	09826460053	harish-pandey123@rediffmail.com
<b>NHDC</b>				
38.	S. Pagare	SM (E)	9425450780	<a href="mailto:subhashpagare@rediffmail.com">subhashpagare@rediffmail.com</a>
39.	Vinod K Singh	Mgr (E)	9425952513	<a href="mailto:vinodnhdc@rediffmail.com">vinodnhdc@rediffmail.com</a>
<b>NTPC Ltd.</b>				
40.	Dinkar Devate	GM(Elect)	9650992237	<a href="mailto:dinkar@ntpceoc.co.in">dinkar@ntpceoc.co.in</a>
41.	S. S. Mishra	AGM	09650991145	ssmishra@ntpceoc.co.in
42.	Anil Kaushik	AGM (PE-Elec)	09650992088	anilkaushik@ntpceoc.co.in
43.	Shilpa Agarwal	Mgr (Comml)	9650992680	sagarwal@gmail.com
<b>POSOCO</b>				
44.	P. Pentayya	GM (WRLDC)	09869072437	ppentayya@gmail.com
45.	S R Narasimhan	DGM,NLDC	9971117022	srnarasimhan@gmail.com
46.	K V S Baba	CM (WRLDC)	8527607575	<a href="mailto:kvsbaba@posoco.in">kvsbaba@posoco.in</a>
47.	Pushpa Seshadri	CM, WRLDC	9869404482	<a href="mailto:pushpa_seshadri@hotmail.com">pushpa_seshadri@hotmail.com</a>

## Annexure-II

Sl. No.	Description of Scheme	Est. 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 <sup>th</sup> (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 <b>(100 % private)</b>	1050				Nov'13	Implementation by Reliance
	a) Parli(PG) - Pune 400kV D/c					Nov'13	
	b) Pune – Aurangabad 400kV D/c					Nov'13	
	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 <b>(100 % private)</b>	600				Nov'13	Implementation by Reliance
	a) Rajgarh – Karamsad 400kV D/c					Nov'13	
	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 <b>(POWERGRID)</b>	1050					commissioned

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 <sup>th</sup> (30.09.06)	Jan'07	Dec'07	Mar'14  Changed to Vapi-Kudus 400 kV D/c line  Mar'14  Mar'14  commissioned	Under implementation
3	Tr. System of Sasan Ultra Mega Power Project (4000 MW)	5323	26 <sup>th</sup> (23.02.07)	Jun'07	Dec'08		Commissioned
4	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 <sup>th</sup> (23.02.07)	Jun'07	Oct'08	Jun'14  Commissioned  Commissioned  Commissioned  Commissioned  Dec'13  Commissioned  Jun'14  Dec'13	Under implementation
	Substations  a) 40% Fixed Series Compensation each on Wardha - Aurangabad 400 kV D/c at Wardha end					Mar'14	

	<p>b) Establishment of new 400/220 kV, 2x315 MVA substation at Navsari &amp; Bachchau</p> <p>c) Establishment of new 765/400 kV, 3x1500 MVA, substation at Wardha for charging of Seoni - Wardha 2xS/c lines at 765 kV level</p>					Commissioned	
						Commissioned	
5	<p>Tr. System associated with DVC, Maithon in ER (Part system)</p> <p>a) Ranchi-WR Pooling Station 765kV S/c</p>	1100	27 <sup>th</sup> (30.07.07)	Sept'07	Aug'08	Mar'13	Under implementation
						Mar'14	
6	<p>Transmission system associated with Krishnapatnam (5x800 MW) (WR Portion)- now delinked from Krishnapatnam UMPP</p> <p>a) Raichur – Sholapur 765 kV S/c</p> <p>b) Sholapur – Pune 765 kV S/c</p> <p>c) LILO of 400kV Aurangabad- Pune D/c &amp; Parli- Pune D/c lines at Pune(GIS)</p> <p>d) Establishment of new 765/400 kV substations at Sholapur &amp; Pune with 2x1500 MVA transformation capacity</p>	1928	27 <sup>th</sup> (30.07.07)	Jan'08		Oct'14 best effort Dec'13	Under implementation
						Dec'13	
						Oct'14	
						Oct'14	
						Oct'14	
7	<p>Split Bus arrangement and reconfiguration/shifting of terminating lines at Raipur 400kV S/s</p> <p>a) Splitting 400kV Raipur bus into two sections between existing line bays of Chandrapur-1 &amp; Chandrapur-2 through bus sectionaliser.</p>	16	28 <sup>th</sup> (06.12.08)	Apr'09	Aug'10	Dec'13	Under implementation



	<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>						
8	<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 <sup>th</sup> (10.09.09)	Sep'09	Mar'10	<p>Mar'14</p> <p>Mar'14</p> <p>Commissioned</p> <p>Mar'14</p> <p>Dec'13</p> <p>Dec'13</p> <p>Mar'14</p> <p>Commissioned</p> <p>Mar'15</p>	Under implementation
9	<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 <sup>th</sup> (06.12.08)	Jan'10	Jul'11	<p>Dec'13</p> <p>Dec'13</p> <p>Dec'13</p>	Under implementation
10	Installation of transformer at Vapi sub station	21	30 <sup>th</sup> (08.07.10)	Nov'10	Sep'11		Commissioned

	a) Installation of 400/220kV, 1x315MVA transformer (3rd) at Vapi(PG)						
11	Establishment of 400/220kV substation in UT Daman  a) LILO of Navsari-Boisar 400kV D/c at Magarwada in UT Daman-30 km b) Establishment of 400/220kV, 2x315 MVA substation at Magarwada	234	30 <sup>th</sup> (08.07.10)	Mar'10	Jan'12	Jan'14  Jan'14	Under implementation
12	Western Region System Strengthening Scheme- XIII  a) Bachau(PG) – Versana(GETCO) 400kV D/c-10 km	49	30 <sup>th</sup> (08.07.10)	Jan'11	Dec'11	Mar'14  Mar'14	Under implementation
13	Solapur STPP(2x660MW) transmission system  a) Solapur STPP – Solapur (PG) 400kV D/c b) Solapur STPP – Pune(PG) [Pune S/s under Krishnapatnam UMPP] 400kV D/c (Quad) c) Augmentation of 400/220kV ICT by 1x315MVA transformer (3 <sup>rd</sup> ) at Solapur (PG)	630	30 <sup>th</sup> (08.07.10)	Jul'11	Sep'13	June'15	Tendering under progress
14	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	65	30th/32nd (WR SCM)	Aug'11	June'12	June'14	Under implementation

	c) Two nos. 400kV line bays at 765/400kV Indore(PG) Substation d) Two nos. 220kV line bays at 400/220kV Pirana(PG) Substation.						
15	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 <sup>st</sup> (27.12.10)	Nov'12	-	June'15	Tendering under progress
16	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 <sup>nd</sup> (13.05.11)	Apr'12	Sep'13	June'15	Tendering under progress
17	Provision of 1x315MVA ICT for reliable auxilliary power supply at HVDV back to back station at Bhadravati	143	33 <sup>rd</sup> (21.10.11)	June'12	-	Feb'15	Tendering under progress
18	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 <sup>rd</sup> (21.10.11)	Jan'12	Sep'11	Jan'14 to Jun'14	Under implementation
19	Installation of Reactors in Western Region (Part-II)	98	34 <sup>th</sup> (09.05.12)	Aug'12	-	Dec'14 to Jun'14	Tendering under progress

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.						
--	--	--	--	--	--	--

## Status of Progress of Transmission Projects Awarded Through Tariff Based Competitive Bidding Route

1. **Name of transmission scheme:** System Strengthening in NR for import of Power from North Karanpura and other projects outside NR and System Sterengthening in WR for import of power from North Karanpura and other projects outside Western Region and also for projects within western Region

**Name of Transmission Company:** North Karanpura Transmission Company Limited (RPTL)

### Scope of work and physical progress (as on 31.7.2013)

Scope of work	Nominal Voltage (KV)	Length (ckm) / MVA	Remark
Sipat/Korba (Pooling) – Seoni S/C line	765	334	<p><b>NKTCL</b> approached <b>CERC</b> for advancement of date of completion on the ground of force majeure.</p> <p>1<sup>st</sup> hearing -08.09.2011</p> <p>14<sup>th</sup> hearing -24.07.12</p> <p>15<sup>th</sup> hearing-30.8.2012.</p> <p>16th hearing on 7.2.2013</p> <p>last hearing on 15.3.2013</p> <p>CERC order says NKTCL may approach to beneficiary for advancement of date of commissioning. NKTCL called a meeting in May 2013 with beneficiary to discuss the issue and meeting took place in July 2013. LTTC asked to developer to send the proposal for time extension on which they individually respond. Out of 43 beneficiary only one has responded rejecting any time extension so far. Response from rest is awaited.</p> <p>NKTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013 which has been admitted and the next hearing on the appeal in schedule in 1<sup>st</sup> week of Sept. 2013.</p> <p><b>Work yet to start</b></p> <p><b>Original COD : Nov 2013</b></p>
Lucknow-Bareilly S/C line	765	220	
Bareilly-Meerut S/C line	765	240	
Agra-Gurgaon D/C line	400	440	
Gurgaon-Gurgaon (PG) D/C line	400	40	
Gurgaon GIS	400/220	2x500	

## 2. Name of transmission scheme: Augmentation Talcher II Transmission System

Name of Transmission Company: Talchar Transmission Company Limited (RPTL)

### Scope of work and physical progress (as on 31.7.2013)

Scope of work	Nominal Voltage (kV)	Length (ckm) / MVA	Tower Loc./Land Acq.(%)	Stub Comp./Civil work (%)	Tower erected/Recp. Material (%)	Stringing Completed/ Erection (%)	Remark
Talcher II-Rourkela D/C line(Quad)	400	322	0	0	0	0	<p><b>TTCL</b> approached <b>CERC</b> for advancement of date of completion on the ground of force majeure.  1<sup>st</sup> hearing -08.09.2011  14<sup>th</sup> hearing -24.07.12  15<sup>th</sup> hearing-30.8.2012.  16th hearing on 7.2.2013  last hearing on 15.3.2013  On 9.5.2013 CERC order says TTCL may approach to beneficiary for advancement of date of commissioning. TTCL called a meeting in May 2013 with beneficiary to discuss the issue and meeting took place in July 2013. LTTC rejected any time extension during the meeting.  TTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013 which has been admitted and the next hearing on the appeal in schedule in 1<sup>st</sup> week of Sept. 2013.  <b>Work yet to start</b>   <b>Original COD : Oct 2012</b></p>
Talcher II-Bhrampur D/C line	400	440	0	0	0	0	
Bhrampur-Gazuwaka D/C line	400	580	0	0	0	0	
Bhrampur sub-station	400/220	2x315	0	0	0	0	

**3. Name of transmission scheme:** Scheme for enabling import of NER/ER surplus by NR

**Name of Transmission Company:** East North Interconnection Company Limited (Sterlite Grid)

**Scope of work and physical progress (as on 31.7.2013)**

Scope of work	Nominal Voltage (kV)	Length (ckm)	Tower Location	Stub Completed	Tower erected	Stringing Completed	Remark
Purnia – Biharsharif D/C line(Quad)	400	464	625	625	625	464	Line completed, CEA inspection of line under progress. <b>Original COD : March 2013</b>
Bongaigaon – Siliguri D/C line (Quad)	400	444	610	574	540	146	Stage-I forest clearance is awaited (12 hectare in WB& Assam). For assam portion, the proposal at RMoEF for approval. For west Bengal portion, letter has been submitted for allocation of non forest land West Bengal. Construction work has been hampered in Kokrajhar(Assam) due to law & order problem  <b>Scheduled date of completion: Dec 2013</b>  <b>Original COD : March 2013</b>

**4. Name of transmission scheme:** Scheme for System strengthening common for WR and NR

**Name of Transmission Company:** Jabalpur Transmission Company Limited (Sterlite Grid)

**Scope of work and physical progress(as on 31-7-2013)**

Scope of work	Nominal Voltage (kV)	Length (ckm)	Tower Loc	Stub Comp	Tower erected/	Stringing Completed	Remark
Dhramjaygarh-Jabalpur D/C line	765	754	980	664	175	0	(1) All type of tower testing completed. (2) Tower material as per schedule reached at site.
Jabalpur-Bina S/C line	765	236	610	493	340	67	(3) FC awaited for Dhramjaygarh-Jabalpur D/C line. (4) PTCC clearance awaited
<b>Scheduled date of completion: March 2014(original)</b>							



**5. Name of transmission scheme :** Transmission System Associated with Krishnapattnam UMPP – Synchronous interconnection between SR and WR ( Part- B)

**Name of Transmission Company:** Raichur Solapur Transmission Company Limited (A consortium of Patel Engg. B S Tanscom Ltd. and Simplex Infrastructure Ltd.)

**Scope of work and physical progress(as on 31-7-2013)**

Scope of work	Nominal Voltage	Length (ckm)	Tower Location	Stub Completed	Tower erected	Stringing Completed (KM)	Remark
Raichur-Sholapur S/C Line	765 kV	208	542	473	259	5	Tower material for A type tower reached at site. B & D type tower material yet to reach. Conductor and hardware/insulator partially reached at site, balance by Sept. end. Work on pile foundation is yet to start. Statuary clearance proposals are yet to submit.
<b>Scheduled date of completion: January 2014.(original)</b>							

**6. Name of transmission scheme:** Scheme for system strengthening for WR

**Name of Transmission Company:** Bhopal Dhule Transmission Company Limited (Sterlite Grid)

**Scope of work and physical progress(as on 31-7-2013)**

Scope of work	Nominal Voltage (kV)	Length (km) / MVA	Tower Loc./Land Acq.(%)	Stub Comp./ Civil work (%)	Tower erected/ Recp. Material (%)	Stringing Complete d/Erection (%)	Remark
Jabalpur-Bhopal S/C Line	765	261	686	541	332	39	PGCIL started bay execution at Jabalpur
Bhopal-Indore S/C Line	765	174	455	450	287	26	PGCIL started bay execution at Indore
765/400 kV substation at Bhopal, with 2x1500 MVA 765/400 kV	765/400	2x1500	100	24	67	0	Land leveling complete. Equip. supply 30%
Bhopal-Bhopal(MP) D/C Line	400	16	27	15	2	0	MPPTCL started Bay erection at Bhopal
Aurangabad-Dhule S/C Line	765	191	507	442	396	68	RoW issues affected progress. PGCIL started bay execution at aurangabad
Dhule-Vadodara S/C Line	765	263	680	491	341	30	FC awaited, RoW issues affected progress. PGCIL yet to start bay execution at Vadodara
765/400 kV substation at Dhule with 2x1500 MVA 765/400 kV	765/400	2x1500	100	88	85	25	Transformer dispatched. Balance equipts received at site. Erection started. Cable trench, road, CR u/p. other Civil Work completed.
Dhule-Dhule(Mh) D/C Line	400	36	55	43	33	1	RoW issues affected progress, MSETCL yet to start bay execution
<b>Scheduled date of completion: Mar 2014.(original)</b>							

**7. Name of transmission scheme:** Transmission System associated with IPP of Vemagiri Area (Package-A)

**Name of Transmission Company:** POWERGRID Vemagiri Transmission Limited (Formerly Vemagiri Transmission System Limited)

**Scope of work and physical progress (as on 31-7-2013)**

Scope of work	Nominal Voltage(kV)	Length (km)	Remark
Vemagiri Pooling station - Khammam D/C Line-I	765 (6 x Zebra ACSR or AAAC)	227.79	(1) LOI placed on 20/03/12 (2) Special Purpose Vehicle acquired on 18/04/2012 (3) Tr. License application filed in CERC on 19.4.2012 and application for tariff adoption filed on 19.4.2012 (4) Clearance U/s 164 – application submitted to CEA on 21.9.2012, gazette notification on 14/7/12 and public notice issued on 23.5.2012.
Khammam – Hyderabad D/C Line-I	765 (6 x Zebra ACSR or AAAC)	205.75	Status of the project execution activities : i) Route alignment completed ii) Submission for Forest clearances iii) Initiation of procurement activities, iv) Publication of the notification for grant of clearance under Section 164 of the Electricity Act, and submission of relevant documents to CEA and MoP, v) Submission of PERT chart to CEA etc. vi) Filing of applications for grant of licence and adoption of transmission charges on 20th April 2012 and 19th April 2012 respectively before CERC as per the stipulated timeline of the bidding documents.  Taking into consideration the uncertainty in availability of gas and the consequent uncertainty in the operational phase of the generating stations CERC vide order dated 9 <sup>th</sup> May 2013 stated that no useful purpose is likely to be served in the adopting the transmission charges and granting licence to the applicant.

			<p>Further, CERC in the aforementioned order stated that there is a need to examine the possibility of reconfiguring the required network in the Southern Region based on expected generation and the load and some elements of the transmission system may be combined with the other transmission systems being built / proposed to be built in the Region, if required. The Central Electricity Authority and the Central Transmission Utility were directed to undertake necessary review and re-examination of the entire matter afresh and file their decision/views in the matter.</p> <p>Presently licence has not been issued for implementing the project and the transmission charges are also not adopted.</p>
--	--	--	--

**8. Name of transmission scheme:** Transmission System associated with IPP of Nagapattinam/Cuddalore (Package-A)

**Name of Transmission Company:** POWERGRID NM Transmission Limited (Formerly Nagapattinam-Madhugiri Transmission Company Limited)

**Scope of work and physical progress (as on 31-7-2013)**

Scope of work	Nominal Voltage (kV)	Length (km)	Remark
Nagapattinam Pooling station- Salem D/C line	765	211.73	(1) LOI placed on 06/03/12 (2) Special Purpose Vehicle acquired on 29/03/2012 (3) Tr. License application filed in CERC on 4.4.2012 and application for tariff adoption filed on 4.4.2012. Tr. License issued on 15.7.2013 and tariff adoption by CERC on 9.5.2013.
Salem-Madhugiri S/C line	765	234.461	(4) Clearance U/s 164 – application submitted to CEA on 17.9.2012, gazette notification on 7/7/12 and public notice issued on 20.6.2012.  Status of the project execution activities :  i) Route alignment completed ii) Submission for Forest clearances iii) Initiation of procurement activities, iv) Publication of the notification for grant of clearance under Section 164 of the Electricity Act, and submission of relevant documents to CEA and MoP,

			<p>v) Submission of PERT chart to CEA etc.</p> <p>vi) Filing of applications for grant of licence and adoption of transmission charges on 4<sup>th</sup> April 2012 before CERC as per the stipulated timeline of the bidding documents.</p> <p>CERC took cognizance the fact that an Environmental clearance case against generation project of M/s. IL&amp;FS Tamil Nadu Power Company Limited (IL&amp;FS) was pending before National Green Tribunal (NGT), New Delhi and an order dated was passed on 23.05.2012 by the NGT wherein the Environmental Clearance (EC) for the generation project - the sole Long Term Transmission Customer (LTTC) viz., &amp; M/s.IL&amp;FS Tamil Nadu Power Company Limited, was suspended.</p> <p>The issue of suspension of Environmental clearance was also deliberated in the 29<sup>th</sup> meeting of the Empowered Committee on Transmission held on 15<sup>th</sup> June 2012 wherein it was observed that as M/s.IL&amp;FS Tamil Nadu Power Company Limited's Generation project, for which this scheme is primarily implemented, has become uncertain, therefore, implementation of the transmission scheme should be reviewed. It was further recommended to keep the implementation of the transmission scheme on hold.</p> <p>The order for adoption of Transmission charges was issued by CERC on 9<sup>th</sup> May 2013 and after a period of about 16 months from the filing of application, the order for issuance of Transmission license was issued on 15<sup>th</sup> July 2013.</p> <p>Transmission is a licensed activity and the delay in issuance of clearance to commence the project by way of grant of licence has a significant impact on the timeline for completing the project and also the project cost. In the absence of any express provisions in the tariff based bidding documents to take up activities consequent to such prolonged shift in timelines which are beyond the control of the developer (POWERGRID), CERC was approached to provide time and cost relief.</p> <p>The matter was heard by CERC on 8<sup>th</sup> August 2013 and the CERC order is awaited. Once the issue is resolved, the activities on the transmission line shall be taken up.</p>
--	--	--	--

## Details of IPP Projects in Chhattisgarh

S. No.	Applicant	Ins. Capacity (in MW)	Commiss. Schedule	PPA Status
<b>RAIGARH(KOTRA) COMPLEX</b>				
1	RKM Powergen Ltd.(4x360)	1440	Oct'13	Signed PPA with CSEB and PTC.
2	Athena Chhattisgarh Power Ltd.(2x600)	1200	Jun'14	Signed PPA with PTC for 1100 MW who in turn have signed PPA with CSPTCL (444 MW) and received Lol from UPPCL for 300 MW and PPA signed with Nepal Electricity Authority for 150MW.
3	SKS Power Gen. (Ch) Ltd.(4x300)	1200	Jun'14	Signed PPA for 37.5% of the project capacity with CSPTCL.
4	Korba West Power Co. Ltd.(1x600)	600	Oct'13	letter of comfort for 35% from CSPTCL has been received.
5	DB Power Ltd.(2x600)	1200	Oct'13	Signed PPA with CSPTCL – 450 MW, Tamil Nadu – 208 MW
6	Visa Power Ltd. (1x600+1x660)	1260	Mar'15	Signed PPA with WBSEDCL for 200 MW with an option to increase upto 510 MW and also signed PPA with CSPTCL (424 MW).
<b>RAIGARH(TAMNAR) COMPLEX</b>				
1	Jindal Power Ltd.(4x600)	2400	Sep'13	Tamil Nadu – 400 MW
2	Jindal Power Ltd. (225 MW from Dongamahua CPP+ 175MW from existing Tamnar TPS)	400	Existing	-
3	TRN Energy Pvt. Ltd.(2x300)	600	Mar'14	UP – 390 MW
4.	Jayaswal Neco(2x300MW)	600	Sep'16	As per MoU with state Govt., GoCG shall purchase 37.5% power and no other PPA has been signed yet.
5.	Sarda Energy Minerals(2x150MW+1x50)	350	Dec'16	
<b>JANJGIR-CHAMPA COMPLEX</b>				
1	KSK Mahanadi Power Co. Ltd (6x600)	3600	Aug'13 onwards	Signed PPA for 1010 MW with GUVNL, 1350 MW with CSPTCL and 450 MW with Goa.
2	Lanco Amarkantak Power Pvt. Ltd.(2x660)	1320	Jun' 14	35% PPA has been tied up with CSPTCL.
3	NTPC Lara-I(2x800MW)	1600	Sep'16	WR Constituents – 1600 MW
<b>RAIPUR COMPLEX</b>				
1	GMR Chhattisgarh Energy Pvt. Ltd. (2x685MW)	1370	Feb'14	Signed PPA with Chhattisgarh for sale of 35% of power.
<b>Dharamjaygarh/Kotra Complex</b>				
1	BALCO(4x300)	1200	Dec'13	Signed PPA with Tamil Nadu for 100 MW
2	Vandana Vidyut Ltd.(2x135+1x270)	540	Dec'13	Signed PPA for 35% of power with Chhattisgarh State Power Trading Co. Ltd.
<b>Total</b>		<b>20,820 MW</b>		

## The intra-state transmission system identified for RES generations in GUJARAT:

## Part A:

S.No.	Name of Transmission Element
<b>(a) 220 kV Transmission lines:</b>	
1	220KV D/C Amreli-Jasdan line
2	220KV D/C Radhanpur-Sankhari line
3	220KV D/C Varsana-Bhachau-Deodar line
4	220KV D/C Shapar-Jasdan line
5	LILO 220KV D/C Jamnvada-Varsana at 220KV Bhachunda line
6	220KV D/C Bhachunda-Nakhatrana line
7	220KV Dhama (New proposed substation) line
	220KV D/C Dhrangadhra- Dhama line
	220KV D/C Dhama-Becharaji line
8	220KV D/C Bhatia - Bhogat line
9	220KV D/C Bhogat - Ranavav line
10	220KV D/C Varsana - Charanka line
11	220KV D/C Halvad - Charadva
<b>(b) 220 kV Sub-Stations:</b>	
1	220KV Jasdan Substation, 220/132KV (2X100MVA), 220/66KV (2X100MVA), 4 nos of 220KV & 6 nos of 66KV Feeder bays.
2	220KV Charadva Substation (instead of earlier proposed Tankara substation), 220/66KV( 2X100MVA), 2 nos of 220KV bays
3	220KV Bhachunda Substation, 220/66KV (2X100MVA), 6 nos of 220KV & 6 no of 66KV bays.
4	220KV Dhama (New proposed Substation), 220/66KV (3x100MVA), 4 nos of 220KV & 6 no of 66KV bays.
<b>(c) Transmission lines feeder bays</b>	
1	220KV Feeder Bays 2 nos at Amreli, 2 nos at Shapar, 2 nos at Radhanpur, 2 nos at Sankhari, 2 nos at Varsana, 4 nos at Bhachau, 2 nos at Deodar, 2 nos at Nakhatrana, 2 nos at Charanka, 2 nos at Bhatia, 2 nos at Ranava, 4 nos at Bhogat, 2 nos at Dhrangdhara, 2 nos at Bechraji, 2 nos at Halvad.

## Part – B:

S.No.	Name of Transmission Elements
1	220 KV D/C Vadavi – Chhatral line (AI-59)
2	220 KV D/C Chorania – Salejada line (AI-59)
3	220 KV D/C Botad - Chorania line (AI-59)*

4	220 KV D/C Amreli – Vallabhipur(AI-59)
5	220 KV D/C Dhrangadhra – Chharodi (proposed S/S) line(AI-59)
6	220 KV D/C Vataman (PG) – Jasdan (proposed S/S) line (AI-59)
7	220 KV, 1 x 50 / 1 x 25 MVAR Bus Reactors each at 220 KV Moti Paneli, Bhatia, Nakhatrana, Bhachau, Deodar substations
8	220kV (Line +Reactor + Transformer) Bays

Note(\*) – Instead of 220 KV D/C Sarla – Chorania line, it is proposed to have 220 KV D/C Botad - Chorania line, because of 300 MW Wind Farm project is approved to be connected at 220 KV Botad substation. Further, strong 220 KV source is made to be available at 220 KV Sarla substation from 400 KV Halvad & 400 KV Shapar.

**Part – C:**

<b>400 kV Transmission lines &amp; associated feeder bays:</b>	
S.No.	Name of Transmission Element
1	400KV D/C Varsana-Halvad line
2	400KV D/C Hadala - Shapar line
3	400KV D/C Shapar- Pachham (Fedra) line
4	400KV Feeder Bays 2 nos at Varsana, 2 nos at Halvad, 2 nos at Hadala, 4 nos at Shapar, 2 nos at Pachham (Fedra)

**Part – D:**

S. No.	Name of Transmission Element	Quantum
1	400 KV Bhachunda substation (GIS) along with 400/220 KV, 3 x 315 MVA ICTs, 4 Nos. of 400 KV line bays & 125 MVAR Bus reactor (220/66 KV Bhachunda is already considered).	3 x 315 MVA
2	400 KV D/C Bhachunda – Varsana line.	140 RKM
3	400 KV D/C Bhachunda – Bhuj Pool (proposed PG s/s) line.	100 RKM
4	2 Nos. of 400 KV line bays each at Varsana & Bhuj Pool (PG) substations.	4 Nos.



**The intra-state transmission system identified for RES generations in MAHARASTRA:**

**Part – A: Schemes finalized but not yet implemented for ongoing RE generation projects**

Sr. No.	Name of line proposed for strengthening	District
1	132 kV Jath (Old) - Jath (New) D/C (2013-14)	Sangli
2	2nd ckt. stringing of 132 kV Satara Road - Satara MIDC SCDC (2013-14)	Satara
3	2nd ckt. stringing of 132 kV Aundh - Dahiwadi SCDC (2016-17)	Satara
4	220 kV Miraj - Ichalkaranji (Tilawani) S/C at 220 kV Sangli S/s. (2016-17)	Sangli
5	110 kV D/C line from 220 kV Miraj - Jaysingpur (2013-14)	Sangli/ Kolhapur
6	132 kV Satara MIDC - Aundh SCDC (2014-15)	Satara
7	132 kV Lonand MIDC - Shirwal SCDC (2014-15)	Satara
8	132 kV Kavthemahankal - Savlaj SCDC (2015-16)	Kolhapur
9	132 kV Kadegaon - Kirloskarwadi SCDC (2013-14)	Sangli
10	132 kV Kavthemahankal - Jath D/C (2015-16)	Sangli
11	LILO on 110 kV Chambukhadi - Kale S/C at 110 kV Bambavde S/s. (2016-17)	Kolhapur
12	220 kV Vita - Kadegaon SCDC (2016-17)	Sangli
13	LILO of 110 kV Oglewadi - Mayni S/C at 220/132-110 kV Kadegaon S/s. (2014-15)	Sangli
14	132 kV SCDC line from Patoda to Manjarsumba S/s. (2015-16)	Beed
15	2nd ckt. stringing of 132 kV Georai - Beed SCDC (2014-15)	Beed
16	2nd ckt. Stringing of 132 kV Babhaleshwar - Sangamner SCDC (2016-17)	Ahmednagar
17	2nd ckt. stringing of 132 kV Ahmednagar - Supa SCDC (2014-15)	Ahmednagar
18	2nd ckt. stringing of 132 kV Shevgaon - Bhenda D/C (2015-16)	Ahmednagar
19	2nd ckt. stringing of 132 kV Shevgaon - Pathardi D/C (2015-16)	Ahmednagar
20	132 kV Ahmednagar - Ahmednagar MIDC SCDC (2015-16)	Ahmednagar

21	2nd ckt. stringing of 132 kV Babhaleshwar - Ahmednagar MIDC SCDC (2016-17)	Ahmednagar
22	2nd ckt. stringing of 220 kV Gangapur - Valve - Jamde D/C (2015-16)	Nandurbar
23	Reconductoring of 100 kV Talegaon - Khopoli S/C (2016-17)	Pune
24	132 kV Sangola - Manegaon SCDC (2014-15)	Solapur
25	132 kV Daund - Shrigonda SCDC (2016-17)	Pune

**Part – B: Proposed transmission strengthening within state for conveyance to ISTS for the ongoing RE generation projects.**

Sr. No.	Particulars of Strengthening	Remarks
1	220 kV Valve - Dhule D/C line.	At 220 kV Jamde, Valve & Gangapur S/s. total installed capacity of wind generation is around 700 MW. In addition, application for 200 MW is in progress. Also, the work of MSPGCL's 150 MW solar project at Sakri (Shivajinagar) is in progress. For evacuation of the same, STU has planned 220 kV Sakri - Dhule D/C line with high ampacity conductor.
2	220 kV Dondaicha - Dhule D/C line	
3	220 kV Ahmednagar - Bhenda D/C (Instead of M/s. Vish Wind S/s. - Bhenda D/C)	At 220 kV Ahmednagar, grid connectivity for 400 MW projects has been issued out of which the work for 250 MW is in progress. For balance 150 Mw, land acquisition is in progress. At 220 kV Ahmednagar, there is no space. Also, it is not possible to lay 220 kV line near Ahmednagar S/s. However, the work of 200 MW Wind project of M/s. VishWind is in progress. This project is being connected by making LILo on 1 ckt. of 220 kV Ahmednagar - Babhaleshwar D/C line. Hence, for this proposed line, Wind Farm S/s. of M/s. Vish Wind can be considered instead of Ahmednagar S/s.
4	220 kV Satara MIDC - Lonand D/C with High Ampacity Conductor	Considering the potential in this area, this line can be considered.
5	LILo of 220 kV Karad-III (Shalgaon) - Karad-II and 220 kV Karad-I - Karad-II at Malharpeth	400/220 kV Karad-III (Shalgaon) has been cancelled. LILo of 220 kV Karad-I - Karad-II at 220 kV Malharpeth S/s. can be considered.
6	132 kV Panchpatta - Nashik D/C	Considering the Wind project developments in Ahmednagar district this line is required.
7	220 kV Sakri - Dhule D/C using High Ampacity Conductor	

8	Additional 1 x 200 MVA, 220/132 kV ICT each at 220 kV Bhenda & 220 kV Peth S/s.	
9	1 x 50 MVAR and 1 x 25 MVAR Bus reactors at 220 kV Dondaicha & 220 kV Dhule S/s. resp.	

**Part – C: Schemes finalized but not yet implemented for the proposed RE generation projects:**

Sr. No.	Name of line proposed for strengthening	District
1	LILO of 110 kV Vishrambag - Ashta S/C line at 220 kV Sangli S/s. (2015-16)	Sangli
2	132 kV 5 Star MIDC - Shiradwad D/C (2015-16)	Sangli
3	LILO of 132 kV Dahiwadi - Aundh S/C line at 132 kV Mhaswad S/s. (2015-16)	Satara
4	220 kV 5 Star MIDC - Hamidwada D/C (2013-14)	Kolhapur
5	132 kV S/C line from 220 kV Ichalkaranji (Tilawani) - Kurundwad (2015-16)	Kolhapur
6	2nd ckt. stringing of 132 kV Kale (T) - Warna SCDC (2016-17)	Satara
7	132 kV Oglewadi - Kale (T) D/C (2016-17)	Kolhapur
8	132 kV Ichalkaranji (Tilawani) - Jaysingpur SCDC (2016-17)	Kolhapur
9	2nd ckt. stringing of 220 kV Miraj - Ichalkaranji (Tilawani) SCDC (2013-14)	Kolhapur
10	LILO of 132 kV Lonand - Phaltan S/C at Phaltan MIDC (2014-15)	Satara
11	132 kV D/C line from 220 kV Sawantwadi - Kudal (2015-16)	Sindhudurg
12	132 kV Pimpalgaon - Ranwad SCDC (2015-16)	Nashik
13	LILO on 132 kV Ozar - Kalwan S/C at 220/132 kV Pimpalgaon S/s. (2014-15)	Nashik
14	LILO on 132 kV Kalwan - Satana SCDC at 220/132 kV Kalwan-II S/s. (2012-13)	Nashik
15	132 kV SCDC from 220 kV Sinnar-II - Sinnar (Malegaon)MIDC (2014-15)	Nashik
16	2nd ckt. stringing of 132 kV Manmad - Yeola SCDC (2014-15)	Nashik
17	LILO on 132 kV Paithan - Georai S/C at 220 kV Pachod S/s. (2016-17)	Aurangabad
18	132 kV Ahmedpur - Chakur SCDC (2013-14)	Latur
19	LILO of 132 kV Sawangi - Pishor at 220 kV Phulambri S/s. (2016-17)	Aurangabad
20	LILO of 132 kV Padegaon - Sillod S/C at 220 kV	Aurangabad

	Phulambri S/s. (2016-17)	
21	132 kV Kharda - Ashti D/C partly on M/C (2016-17)	Beed
22	132 kV Supa - Wadzire D/C (2013-14)	Ahmednagar
23	2nd ckt. stringing of 132 kV Shevgaon - Ghodegaon SCDC (2015-16)	Ahmednagar
24	2nd ckt. stringing of 132 kV Nandurbar - Visarwadi D/C (2015-16)	Nandurbar
25	132 kV Shirpur - Dondaicha SCDC (2013-14)	Nashik
26	2nd ckt. stringing of 132 kV Nampur - Malegaon SCDC (2015-16)	Nashik
27	2nd ckt. stringing of 132 kV Jeur - Karjat SCDC (2013-14)	Solapur
28	220 kV Phaltan (MIDC) - Walchandnagar D/C (2013-14)	Pune
29	132 kV Phaltan - Walchandnagar SCDC (2014-15)	Pune

**Part – D: Transmission system strengthening within state for conveyance to ISTS for the proposed RE generation projects.**

<b>Sr. No.</b>	<b>Particulars of Strengthening</b>
1	220 kV Bhalawani - Malinagar D/C. (Line is not possible due to lack of space at 220 kV Malinagar S/s. However, (1) 220 kV Bhalawani - Solapur (PG) D/C, (2) LILO on 220 kV Vita - Pandharpur S/C at Bhalawani and (3) LILO on 220 kV Pandharpur - Malinagar at Bhalawani S/s. needs to be considered instead of 220 kV Bhalawani - Malinagar D/C)
2	220 kV Chinchwad - Chakan D/C
3	220 kV Chinchwad - Urse D/C
4	LILO of 220 kV Chinchwad - Theur at Parvati S/s.
5	LILO of 220 kV Kharepatan - Pawas line Oni S/s.
6	132 kV Nandurbar - Dondaicha line
7	132 kV Dindori - Ozar D/C.
8	LILO of 220 kV Kandalgaon - Lonand S/C at proposed 400/220 kV Kesurdi S/s.(2016-17)
9	LILO of 220 kV Jejuri - Lonand S/C at 220 kV Lonand MIDC S/s. (2016-17)
10	LILO of one ckt. of 220 kV Dhule - Malegaon D/C at 220 kV Sayne S/s. (2012-13)
11	220 kV Malegaon - Kalwan-II D/C (2013-14)
12	220 kV Chakan - Lonikand-II D/C (2015-16)
13	Additional 1 x 200 MVA, 220/132 kV ICT at 220 kV Solapur S/s.
14	1 x 150 MVAR, 420 kV Controlled Bus Reactors (TCR) at 400 kV Alkud S/s.