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

**No. 26/10/2014-SP&PA/** 1-14 **Date: 25th Aug, 2015.**

1 The Member (PS),
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3 The Director (Projects ),
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4 Chairman and Managing Director,
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6 The Managing Director,
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7. Director (Operation),
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8 Chief Engineer (Trans),
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9 The Executive Director (Engg.),
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12 Executive Engineer
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**Sub:** 38th meeting of the Standing Committee on Power System Planning in Western Region

**Sir,**

The minutes of the 38th meeting of the Standing Committee on Power System Planning in Western Region held on 17th July 2015 at New Delhi is available on CEA website (www.cea.nic.in at the following link: Home page-Wing Specific Document-Power Systems-Standing Committee on Power System Planning-Western Region).

Yours faithfully,

(Awdhesh Kr. Yadav)
Director, SP&PA

भारत सरकार / Government of India
विद्युत मंत्रालय / Ministry of Power
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority
विद्युत प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग - I
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क• सं• : 26/10/2014–प्र. यो. प. मू./1–14 दिनांक: 25th August, 2015

1 सदस्य (विद्युत प्रणाली),
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2 सदस्य सचिव,
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3 निदेशक (परियोजना),
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5 प्रबन्ध निदेशक
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6 प्रबन्ध निदेशक,
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7 निदेशक (प्रचालन),
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8 मुख्य अभियंता (पारेषण),
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9 कार्यपालक निदेशक (अभियांत्रिकी),
नेशनल थर्मल पावर कॉरपोरेशन लि,
इंजीनियरिंग ऑफिस कॉम्पलैक्स, ए–8, सैक्टर–24,
नोएडा–201301 फैक्स सं. 0124–2410201

10 मुख्य अभियंता,
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11 कार्यपालक इंजीनियर (परियोजनाएं),
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12 कार्यपालक इंजीनियर,
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14 कार्यपालक निदेशक, एनएलडीसी
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*विषय :– पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 38वीं बैठक /*

महोदय,

पश्चिमी क्षेत्र विद्युत प्रणाली योजना की स्थाई समिति की 38वीं बैठक का कार्यवृत्त केन्द्रीय विद्युत प्राधिकरण की वेबसाइट www.cea.nic.in पर लिंक Home page – Power Systems-Standing Committee on Power System Planning-Western Region) पर उपलब्ध है।

संलग्न – उपरोक्त

(अवधेश कुमार यादव)
निदेशक

# Minutes of the 38th Meeting of Standing Committee on Power System Planning in Western Region held on 17.07.2015 at NRPC, Katwaria Sarai, New Delhi

Chief Engineer (SP&PA), CEA welcomed all the participants to the 38th meeting of Standing Committee on Power System Planning in Western Region. The list of participants is enclosed at Annexure – I.

Chief Engineer (SP&PA), CEA informed that the Member (PS), CEA was pre-occupied in a meeting with Ministry of Power, Govt. of India and will join the meeting later. He stated that Ministry of Power has issued timelines for activities involved from concept to commissioning of transmission projects. As per the new timelines, standing committee meetings needs to be held frequently, may be once in every quarter. He requested all utilities to send the agenda items well in advance so that the agenda for standing committee can be prepared and circulated in time. He further informed that MoP has delegated the power to approve the proposals under section 68 and under section 164 of Electricity Act, 2003 to the Chairperson, CEA.

He informed that GoI was targeting installation of about 1, 65,000 MW capability from renewable energy sources by the end of 13th plan i.e. 2022. Out of this, 1, 00,000 MW capacity addition was targeted from Solar Energy Sources (SES) and 65,000 MW capacity addition was targeted from Wind Energy Sources (WES). In respect of Solar power, around 22000 MWs capacity addition was expected from ultra-mega solar power parks. He stated that intra – state transmission scheme of Madhya Pradesh with estimated cost of Rs. 2100 crores has been approved by GoI under Green Energy Corridors and 40 % of the estimated cost of proposal scheme has been approved as loan from KFW. Maharashtra has also submitted Intra – State Transmission Scheme of about Rs. 386 Crs under green energy corridor for approval of GoI.

Chief Engineer (SP&PA), CEA requested Director (SP&PA) to take up the agenda items.

**1. Confirmation of the minutes of 37th meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on** 5th September, 2014 at NTPC Western Regional Headquarters, Andheri (East), Mumbai.

1.1. The minutes of 37th meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on 5th September, 2014 at NTPC Western Regional Headquarters, Andheri (East), Mumbai was circulated vide CEA letter no.26/10/2014-SP&PA/545-558 dated 10th October 2014.

1.2. GETCO vide their letter no. MD/STU/CEA-37th SCM/511/36 dated 12.11.2014 has sent their comments on point no. 2 (Inclusion of cost of new schemes in the minutes of the meeting), 20 (Laying of cable in DGEN-Vadodara 400 kV D/C line at DGEN end) and 22(Evacuation of Renewable Energy generations located in WR and NR to Northern Region states along with reactive compensation) of the minutes of meeting of the 37th Standing Committee on Power System Planning in Western Region held on 05.09.2014.

1.3. **Regarding point no.2 (**Inclusion of cost of new schemes in the minutes of the meeting) and **point no.22** (Cost of transmission scheme under Green Energy Corridor), Director (SP&PA), CEA stated that in the 37th Standing Committee on Power System Planning in Western Region held on 05.09.2014, inclusion of the cost of new schemes in the agenda/ minutes of the meeting was agreed. In the 37th SCM of WR POWERGRID proposal regarding procurement of spare 333 MVA 765/400 kV ICT, 500 MVA 765/400 kV ICT, 765 kV reactors and 400 kV bus reactors was also agreed by the members. However, the commercial aspect of the scheme was to be deliberated in the WRPC. Member Secretary (WRPC) informed that the matter was deliberated in the 27th WRPC meeting held on 22.11.2014 wherein WR beneficiaries were not agreeing to bear the expenses of spares and since maintaining healthiness and reliability of the transmission system was the responsibility of POWERGRID, PGCIL may suitably decide on procurement of spares or otherwise as beneficiaries would not be sharing the cost of spares.

1.3.1. The cost of the Transmission schemes agreed during the 37th Standing Committee on Power System Planning in Western Region is as given below:

| S.No. | Transmission System agreed during the 37th SCPSPWR | Approximate cost of the scheme ( Rs crores) |
|---|---|---|
| 1 | Installation of 2X500 MVA, 400/220 kV transformer at Indore(PG) 765 kV substation & Installation of 1X315 MVA, 400/220 kV transformer at Itarsi (PG) 400 kV substation (WRSS-XIV) | 93.96 |

1.3.2. The cost of the transmission schemes already under implementation on cost plus basis by POWERGRID or through tariff based competitive bidding route is as given below:

| Projects under construction in WR by POWERGID on cost plus basis | | | |
|---|---|---|---|
| **S.No.** | **Name of the scheme** | **Cost in Rs crores** | **YTC(levelised), Rs crores (@ 17% of the cost)** |
| 1 | Trans. System strengthening in Western part of WR for IPP Generation Projects in Chhattisgarh - part-D | 2127.51 | 361.68 |
| 2 | System Strengthening in North/West part of WR for IPP Project in Chhattisgarh. Part - E | 1746.65 | 296.93 |
| 3 | System Strengthening in Raipur - Wardha Corridor for IPP Project in Chhattisgarh - Part - F | 1422.85 | 241.88 |
| 4 | Transmission System Associated with Mauda - II Gen. Proj. (2x660 MW) | 1575.3 | 267.80 |
| 5 | Transmission System Associated with Solapur STPP (2x660MW) Gen. Proj. | 50.52 | 8.59 |
| 6 | Inter-Regional System Strengthening Scheme in WR and NR (Part-A) | 1315.9 | 223.70 |
| 7 | Inter-Regional System Strengthening Scheme in WR and NR (Part-B) | 6517.36 | 1107.95 |
| 8 | Transmission System Associated with KAKRAPAR APP - 3&4 | 378.71 | 64.38 |
| 9 | Transmission System Associated with LARA STPS - I NTPC | 400.47 | 68.08 |
| 10 | Green Energy Corridors: ISTS – Part B | 3705.61 | 629.95 |
| 11 | Green Energy Corridors: ISTS – Part C | 2247.37 | 382.05 |
| 12 | Transmission System strengthening associated with Mundra UMPP - Part A | 266.19 | 45.25 |
| | **Total** | 21754 | 3698 |

1.3.3. The cost of the transmission schemes already under implementation/ under bidding through tariff based competitive bidding route is as given below

| Projects under construction/bidding in WR through TBCB | | | | | |
|---|---|---|---|---|---|
| **S.No** | **Name of the scheme** | **Cost in Rs crores** | **YTC (levelised), Rs crores** | **BPC** | **Successful Bidder** |
| **Under Construction** | | | | | |
| 1 | System strengthening common for WR and NR | 2900 | 199.53 | PFCCL | Sterlite Transmission Projects Ltd |
| 2 | System strengthening for WR | 1720 | 142.128 | PFCCL | Sterlite Transmission Projects Ltd |
| 3 | Part ATS of RAPP U-7&8 in Rajasthan | 310 | 36.5 | PFCCL | Sterlite Grid Limited |

| | | | | | |
|---|---|---|---|---|---|
| **Bidding process completed** | | | | | |
| 4 | Transmission System Strengthening associated with Vindhyachal – V | 2845 | 210.99 | RECTPCL | POWERGRID |
| 5 | Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Ltd**.** | 275 | 58.4 | PFCCL | Instalaciones Inabensa S.A. |
| 6 | Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part- A) | 4070 | 290.147 | RECTPCL | POWERGRID |
| 7 | Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part- B) | 3684 | 256.7 | RECTPCL | POWERGRID |
| **Bidding under process** | | | | | |
| 8 | Additional System Strengthening for Sipat STPS | 867 | | PFCCL | |
| 9 | System strengthening for IPPs in Chhattisgarh and other generation projects in Western Region | 823 | | PFCCL | |
| 10 | Additional System Strengthening Scheme for Chhattisgarh IPPs – Part B | 1930 | | PFCCL | |
| **Bidding process to be taken up** | | | | | |
| 11 | Additional inter-Regional AC link for import into Southern Region i.e. Additional inter-Regional AC link for import into Southern Region i.e. Warora – Warangal - Hyderabad - Kurnool 765kV link and Warangal – Chilakaluripeta 765 kV link | 8570 | | PFCCL | |
| 12 | Common Transmission System for Phase-II Generation Projects in Odisha and Immediate Evacuation System for OPGC (1320 MW) Project in Odisha | 2748 | | PFCCL | |
| | **Total** | **30742** | | | |

1.4. Regarding point no.20 on Laying of cable in DGEN-Vadodara 400 kV D/C line at DGEN end, GETCO has stated that the scheme cannot be awarded as the due diligence was not done as per procedure to look for all options. GETCO vide their letter dated 09.02.2015 has not given go ahead to CTU for implementation of 400 kV, 125 MVAR bus reactor at 765/400 kV Vadodara substation to compensate reactive power due to proposed laying of 3 km cable in DGEN - Vadodara 400 kV D/C line at DGEN end.

1.4.1. Director(SP&PA), CEA stated that the transmission system associated with DGEN TPS(1200 MW) of Torrent Power Ltd was discussed and agreed during 31st and 32nd meeting of the Standing Committee on Power System Planning in Western Region held on 27.12.2010 and 13.05.2011 respectively. However, the implementation of the scheme has started w.e.f 17.03.2015, the day when the SPV, namely, DGEN Transmission Company Limited" **(DTCL)** was transferred to the successful bidder, "Instalaciones Inabensa, S.A., Spain". This project is being implemented through tariff based competitive bidding. The major events associated with the transmission scheme are as listed below:

(i) Empowered Committee in its 26th Meeting held on May 31, 2011 recommended the implementation of Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Limited and Interconnection between Srinagar (Uttarkhand) & Tehri as a single scheme to be taken up for implementation through tariff based competitive bidding route.

(ii) Ministry of Power vide Gazette Notification dated August 24, 2011 had appointed PFC Consulting Limited (PFCCL) as the Bid Process Coordinator (BPC) for the purpose of selection of Bidder as Transmission Service Provider (TSP) to establish transmission system for "Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Ltd. and Inter-connection between Srinagar (Uttarakhand) & Tehri" through tariff based competitive bidding process.

(iii) SPV by the name of **"DGEN & Uttrakhand Transmission Company Limited",** was incorporated as a wholly owned subsidiary of PFCCL on November 15, 2011.

(iv) Empowered Committee in its 29th Meeting held on June 15, 2012 deferred the scheme associated with "Interconnection between Srinagar (Uttarkhand) and Tehri" thereby revising the scheme from "Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Limited and Interconnection between Srinagar (Uttarkhand) & Tehri" to "Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Limited".

(v) Name of the SPV changed from "DGEN & Uttrakhand Transmission Company Limited" to "DGEN Transmission Company Limited" **(DTCL)** on 31.08.2012 by the BPC.

(vi) Ministry of Power vide Gazette Notification dated October 08, 2012 re-notified the earlier scheme to "Transmission System Associated with DGEN TPS (1200 MW) of Torrent Power Limited." for implementation through Tariff Based Competitive Bidding.

(vii) Empowered Committee in its 31st meeting held on February 18, 2013 revised the scope of the transmission scheme and recommended that the scheme may be re-notified accordingly.

(viii) Ministry of Power vide Gazette Notification dated October 03, 2013 had re-notified the transmission scheme with the revised scope.

(ix) A meeting was held in Central Electricity Authority, New Delhi on 30.10.2013 to discuss the issues related to RoW problem in Dahej GIDC/ SEZ area for DGEN – Vadodara 400 kV D/C line, wherein a team consisting of representatives from GIDC, POWERGRID, Torrent Energy Limited and Dahej SEZ (if required) was formed to explore the alternatives for laying DGEN – Vadodara 400 kV D/C line in the RoW constraint area.

(x) The feasibility report on route alignment of DGEN- Vadodara 400 kV D/C line from DGEN gantry to GIDC boundary submitted by the committee was discussed in a meeting held in the O/o Chief Engineer (SP&PA), CEA on 16.12.2013 and it was decided that cable laying would be required to overcome the RoW constraint in Dahej SEZ/ GIDC area for the DGEN – Vadodara 400 kV D/C line.

(xi) CEA vide its letter no. 101/11/PFC/ (DGEN)-SP&PA/2304-2306 dated December 19, 2013 intimated to PFCCL (BPC) that due to Right of Way issues pertaining to DGEN-Vadodara 400 kV D/C line at DGEN end, a cable laying of 400 kV XLPE of approx. 3 km length would be required from DGEN switchyard.

(xii) Accordingly, the amendment to the RfP document to include the specification of the 400 kV cables was issued to the bidders by PFCCL (BPC) on December 26, 2013. The bid process for the project was completed and the Letter of Intent was issued to the Successful Bidder, “Instalaciones Inabensa, S.A., Spain” on May 17, 2014.

(xiii) The 37th meeting of the Standing Committee on Power System Planning in Western Region (SCPSPWR) held on 5th September, 2014 wherein the issue of laying of cable in DGEN-Vadodara 400 kV D/C line at DGEN end and provision of 125 MVAR bus reactor at Vadodara was put as agenda for discussion and concurrence of WR constituents.

(xiv) The SPV, namely, DGEN Transmission Company Limited” **(DTCL)** was transferred to the successful bidder, “Instalaciones Inabensa, S.A., Spain” on 17.03.2015. M/s DTCL has already submitted application in CERC for grant of transmission license.

1.4.2. GETCO representative stated that various RoW alternatives with the participation of all WR constituents and also approval for such a material change in the scope of 400 kV D/c DGEN-Vadodara line having huge cost implications was not taken from the WR constituents in this case. Director(SP&PA), CEA stated though, in this case, GETCO was not involved but the decision for provision of cable in DGEN-Vadodara 400 kV D/C line at DGEN end to overcome the RoW issues was arrived at after deliberation among CEA, CTU, GIDC and Torrent Energy Limited. Further the issue of laying of cable in DGEN-Vadodara 400 kV D/C line at DGEN end and provision of 125 MVAR bus reactor at Vadodara was put as agenda for discussion and concurrence of WR constituents in the next standing committee meeting.

1.4.3. After further deliberation, GETCO agreed with the proposal of laying of cable at DGEN end of DGEN-Vadodara 400 kV D/C line to overcome RoW contraint including provision of 125 MVAR bus reactor at Vadodara. GETCO further stated that henceforth, any change of scope in the already agreed schemes needs to be finalized in consultation with WR constituents in the standing committee.

1.5. With the above deliberations the minutes of the 37th meeting of the Standing Committee on Power System Planning in Western Region were confirmed.

## 2. Review of Progress on Earlier Agreed Transmission Schemes.

2.1. The status of implementation of transmission projects under tariff based competitive bidding are enclosed at Annexure-II.

2.2. The status of transmission schemes under implementation by POWERGRID are enclosed at Annexure-III.

2.3. GETCO representative stated that Kosamba – Vapi 400 kV D/C line was agreed in the 35th SCM of WR to be implemented under ISTS. However there is no progress towards its implementation.

2.3.1. Director (SP & PA), CEA stated that Kosamba – Vapi 400 kV D/C line was agreed in the 31st SCM of WR held on 27.12.2010, as an interconnection between STU and CTU network to be implemented by GETCO. Subsequently, in the 35th SCM of WR it was agreed to be implemented as ISTS. The KAPP Stage – II transmission system i.e., KAPP-Navsari 400kV D/C line and KAPP – Vapi 400 kV D/C line is expected to be commissioned by October 2016. With commissioning of KAPP stage-II about 1200 MW power would be injected at 400 kV substations at Vapi and Navsari which are load centers. Further in the 37th SCM of WR augmentation of 400 kV network in southern Gujarat to be implemented by GETCO was agreed. In view of above, the proposal of 400 kV Kosamba – Vapi D/C needs to be reviewed through joint studies of CEA, CTU & GETCO.

## 3. In principle approvals granted to POWERGRID.

3.1. Director(SP&PA),CEA stated that the following proposals of POWERGRID regarding commissioning of line reactors as bus reactors till the availability of the associated line were agreed in principle by CEA for controlling overvoltage condition prevailing in the grid:

(i) Commissioning of 2X80MVAR, 400kV Line reactors associated with Aurangabad – Boisar 400kV D/C (Quad) line as bus reactor at 400kV Boisar substation.
(ii) Commissioning of Satna end 240MVAR, 765kV Line reactor associated with Satna – Vindhyachal 765kV circuit – 2 as bus reactor at Satna sub station.
(iii) Commissioning of 765 kV, 240 MVAR line reactor associated with Satna-Vindhyachal 765 kV S/c line-1 as bus reactor at Satna substation.

(iv) Commissioning of 765 kV, 240 MVAR Line Reactor associated with Jabalpur-Bina 765 kV S/C line-3 as Bus Reactor at Bina substation.
(v) Commissioning of 765 kV, 240 MVAR Line Reactor associated with Gwalior-Jaipur 765 kV S/C line (2nd circuit) as Bus Reactor at Gwalior substation.

The above line reactors commissioned as bus reactors were to be restored as line reactors with commissioning of the associated lines.

3.2. POWERGRID informed about the present status of the line reactors commissioned as bus reactors, which is given below:

| S.No. | Line Reactors ( MVAR) | Substation | Associated Transmission Line | Date / schedule of | |
|---|---|---|---|---|---|
| | | | | Comm. of Line reactor as Bus Reactor | Restoration of Bus Reactor as Line Reactor |
| (i) | 2X80 | Boisar 400 kV S/s | Aurangabad – Boisar 400kV D/C (Quad) line. | 07/01/2015, 11/01/2015 | |
| (ii) | 1X240 | Satna 765 kV S/s | Satna – Vindhyachal 765kV circuit – 1 | 13/11/2014 | 04/02/2015 |
| (iii) | 1X240 | Satna 765 kV S/s | Satna – Vindhyachal 765kV circuit – 2 | 14/01/2015 | |
| (iv) | 1X240 | Bina 765 kV S/s | Jabalpur-Bina 765 kV S/C line-3 | 13/11/2014 | 30/06/2015 |
| (v) | 1X240 | Gwalior 765 kV S/s | Gwalior- Jaipur 765 kV S/C line (2nd ckt.) | 24/11/2014 | |

3.3. Members noted the same.

**4. Measure to control fault level at pooling stations in Chhattisgarh and Wardha in Western Region- Agenda by POWERGRID**

4.1. Director (SP&PA), CEA stated that short circuit studies carried out by POWERGRID for 2017-18 condition indicates that the short circuit levels are exceeding the design limit of 40 kA and 50 kA at Wardha and Champa pool respectively. In the 37th meeting of SCPSP-WR bus splitting of 765 kV & 400 kV bus at Wardha and Champa along with provision of 12 ohm series reactor in lines / bus section, to limit the short circuit level was proposed by POWERGRID. In the meeting, it was decided that POWERGRID would organize a meeting of prospective vendors of Fault Level Limiter / Series reactor with WR beneficiaries to discuss the technological issues / operational experiences.

4.2. Accordingly, a workshop was organized by POWERGRID on 10th March 2015. In the workshop presentations were made by M/s Applied Materials on superconducting fault current limiter (15 kV), by M/s RXPE on fault current limiter

(110- 500 kV) and by M/s RXPE, by M/s Toshiba (275 kV) & by M/s Siemens – Trench Group (345 kV) on current limiting reactors. The presentation made in the workshop was circulated to the standing committee through e-mail by POWERGRID.

4.3. POWERGRID informed that high short circuit current is observed not only at Wardha and Champa but also at Raigarh(Kotra), Raigarh(Tamnar), Dharamjagarh, Raipur pooling station and Jharsuguda. The study results indicate that following measures need to be taken to control the fault levels of the substations in the Chhattisgarh area:

a. To improve the reliability of power transfer from generating stations connected at Raigarh Pool (Tamnar), a **new Raigarh Pool (Tamnar) – Dharamjaygarh 765 kV D/c Line** needs to be proposed instead of LILO of both ckts of Jharsuguda – Dharamjaygarh765kV D/c line at Raigarh (Tamnar) agreed in 36th SCM of Western Region because with the proposed LILO line, fault level of a number of substations incl. Dharamjaygarh, Raigarh (Tamnar) and Jharsuguda, is becoming very high. Also in 25th SCM of ER, concerns were raised by the constituents regarding rising values of fault level at Jharsuguda and nearby substations.

b. High fault levels at Champa pooling stations area may be contained with bus splitting arrangement at both 765kV & 400kV levels even without series reactors as proposed in the 37th SCM of WR.

c. Further, in the 30th WR Standing Committee Meeting, it was decided to keep following circuits in normally open condition at a later date:
   - Raigarh Pool (Kotra) – Raigarh (Existing) 400 kV D/c line.
   - Raipur Pool– Raipur (Existing) 400kV D/c line.

   These lines may be kept normally open and may be used depending on the system condition

d. The SC study results without and with the above arrangements (a. to c.) are shown at Table -1 - column 1 and 2 respectively. From the study result, it is evident that further measures are required to be taken up to contain the fault level at Raigarh Pool (Kotra) and Dharamjayagarh substation. Accordingly, it is proposed to split with switching arrangement the 765kV bus of Dharamjaygarh S/s and both 765kV & 400kV buses of Raigarh Pool (Kotra) in addition to 765 & 400kV bus of Champa pool as proposed under (b.). The results with the above splitting are shown at **Table-1** (Column-3).

## Table -1: SC study Results

| Sl. No | Substation | Voltage Level (in kV) | Designed SC MVA (in kA) | 1 | 2 | | 3 | |
|---|---|---|---|---|---|---|---|---|
| | | | | Base Case | • Without LILO of Jharsuguda-Dharamjaygarh 765kV D/c at Tamnar<br>• With Raigarh(Tamnar) – Dharamjayagarh 765kV D/c line<br>• With Champa split<br>• W/o RaigarhPool (Kotra) – Raigarh&Raipur Pool - Raipur 400kV D/c lines | | 2+<br>• Dharamjaygarh Split<br>• Raigarh (Kotra) Split | |
| | | | | | Part A | Part B | Part A | Part B |
| 1 | Dharamjaigarh | 400 | 50 | 37 | 36 | # | 33 | # |
| | | 765 | 50 | 70 | 69 | # | 41 | 38 |
| 2 | Raigarh Pool (Kotra) | 400 | 50 | 102 | 75 | # | 47 | 31 |
| | | 765 | 50 | 59 | 52 | # | 38 | 19 |
| 3 | Raipur Pool | 400 | 50 | 49 | 30 | # | 30 | # |
| | | 765 | 50 | 53 | 46 | # | 44 | # |
| 4 | Champa Pool | 400 | 50 | 90 | 51 | 45 | 47 | 42 |
| | | 765 | 50 | 62 | 45 | 31 | 37 | 26 |
| 5 | Bilaspur Pool S/s | 400 | 40 | 40 | 40 | # | 40 | # |
| | | 765 | 40 | 46 | 46 | # | 44 | # |
| 6 | Raigarh Pool (Tamnar) | 765 | 50 | 61 | 50 | # | 38 | # |
| | | 400 | 50 | 55 | 51 | # | 45 | # |
| 7 | Raipur(Existing) | 400 | 40 | 47 | 26 | # | 26 | # |
| | Raipur (Existing) Split | 400 | 40 | 40 | 38 | # | 38 | # |
| 8 | Raigarh | 400 | 40 | 88 | 33 | # | 33 | # |
| 9 | Rajnandgaon | 765 | 50 | 35 | 35 | # | 34 | # |
| 10 | Sipat | 765 | 50 | 42 | 42 | # | 41 | # |
| | | 400 | 50 | 39 | 39 | # | 39 | # |

# BUS not Split.

e. The Single Line Diagram of the Splitted Substations are given below-

### (i) Dharamjaygarh Substation after 765 kV bus splitting:

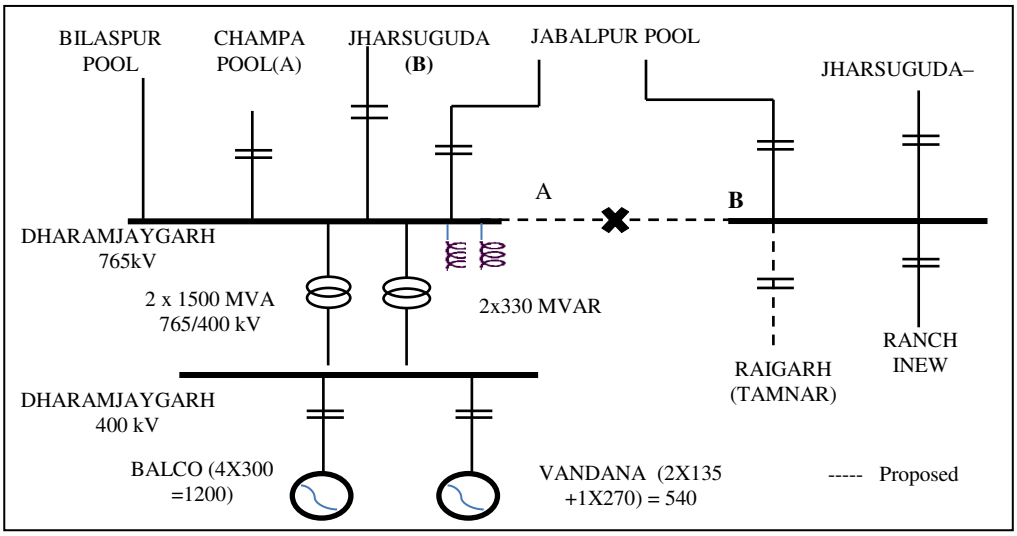


Fig. 1: Dharamjaygarh Substation after splitting.

| Dharamjaygarh S/s Voltage Level (in kV) | Description | | BUS Section A | BUS Section B |
|---|---|---|---|---|
| 400 | Generation (in MW) | | 1740 | - |
| | BUS Reactor (in MVAR) | Available | - | - |
| | | Proposed | 1x125 | - |
| | 765/400kV ICT(in MVA) | Available | 2x1500 | - |
| 765 | BUS Reactor(in MVAR) | Available | 2x330 | - |
| | | Proposed | - | 1X330 to be shifted from BUS Section A |

# Balco is a captive plant and LTA granted for 584MW (200MW by Balco & 384MW by CSPTCL)

**(ii) Raigarh Pool (Kotra) after 765 kV and 400 kV bus splitting :**

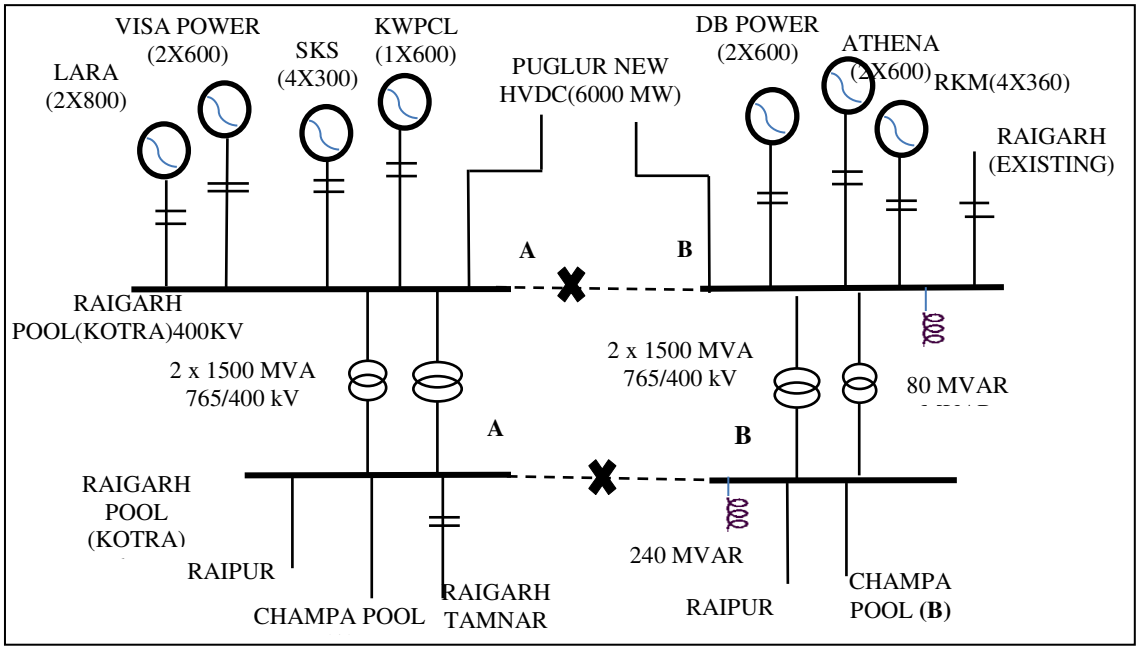



Fig. 2: Raigarh Pool (Kotra) after splitting.

| Raigarh Pool (Kotra) Voltage Level (in kV) | Description | | BUS Section A | BUS Section B |
|---|---|---|---|---|
| 400 | Generation (in MW) | | 3000 | 3840 |
| | BUS Reactor(in MVAR) | Available | - | 80 |
| | | Proposed | 1 X 125 | - |
| | 765/400kV ICT (in MVA) | Available | 2x1500 | 2x1500 |
| 765 | BUS Reactor (in MVAR) | Available | - | 240 |
| | | Proposed | 240 | |

**(iii) Champa Pool after BUS Splitting :**

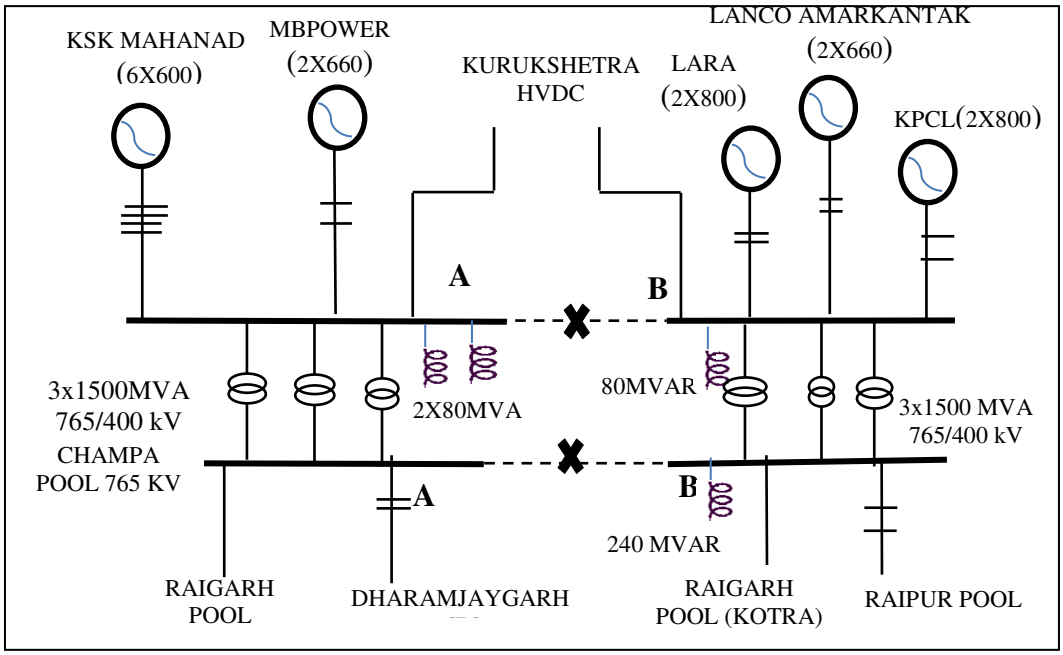



Fig. 3: Champa Pool after splitting.

| Champa Pool Voltage Level(in kV) | Description | | BUS Section A | BUS Section B |
|---|---|---|---|---|
| 400 | Generation (in MW) | Available | 4920 | 4520 |
| | BUS Reactor (in MVAR) | Available | 2x80 | 1x80 |
| | 765/400 kV ICT(in MVA) | Available | 3x1500 | 3x1500 |
| 765 | BUS Reactor (in MVAR) | Available | - | 240 |
| | | Proposed | 240 | - |

f. The overall proposal for the controlling high short circuit level is as summarized below:

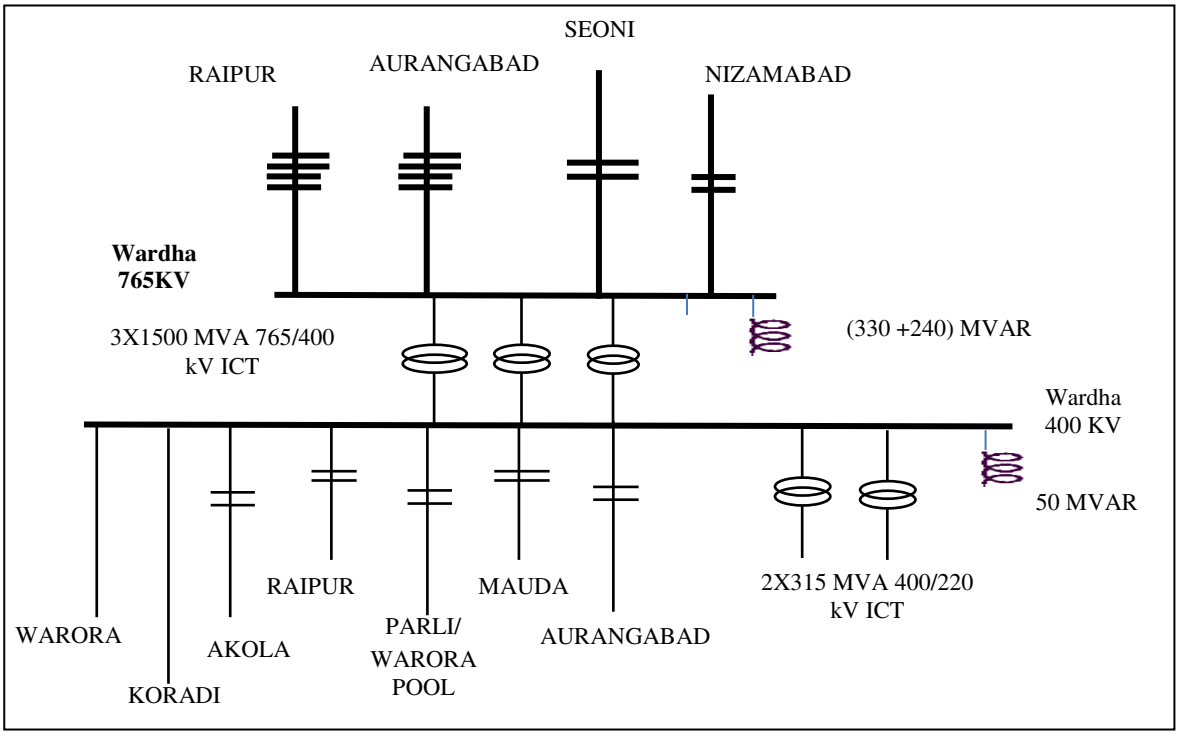
| | |
|---|---|
| 1. | Splitting Arrangement of following substations along with necessary switching arrangement<br><br>• Dharamjaygarh 765kV BUS as per Fig. 1.<br>• Raigarh Pool (Kotra) 400kV & 765kV BUS as per Fig. 2.<br>• Champa Pool 400 kV & 765kV BUS as per Fig 3. |
| 2. | Followings ckts shall be operated as normally open and may be switched on as per operational requirement of grid:<br><br>• Raigarh Pool (Kotra) – Raigarh (Existing) 400 kV D/c line.<br>• Raipur Pool– Raipur (Existing) 400kV D/c line |
| 3. | Reactors:<br><br>• 1x125 MVAR BUS Reactor at 400 kV BUS Section A of Dharamjaygarh Substation.<br>• 1x330MVAR BUS Reactor at 765 kV BUS Section A to be shifted to 765kV Bus Section B of Dharamjaygarh S/s<br>• 1x125 MVAR BUS Reactor at 400 kV BUS Section A of Raigarh Pool |

| | |
|---|---|
| | (Kotra) S/s.<br>• 1x240MVAR BUS Reactor at 765 kV BUS Section A of Raigarh Pool (Kotra) S/s.<br>• 1x240MVAR BUS Reactor at 765 kV BUS Section A of Champa Pool |
| 4. | Additional System for Power Evacuation from Generation Projects pooled at Raigarh (Tamnar):<br>• Dharamjaygarh B- Raigarh (Tamnar) 765kV D/c line |

Note # 1 : Wherever there is space constraint, GIS bay would be used.

# 2 : The interconnection between 4x600MW TPP and 4x250MW TPP of M/S Jindal Power may normally remain in open condition and be switched on as per operational requirement of grid.

4.4. POWERGRID further stated that short circuit level of 765kV Wardha bus reaches about 45 kA and that at 400kV bus reaches about 79 kA in 2018-19 condition. At 400kV Wardha bus, major fault current contributories are: Warora Pool D/c line (16kA), Warora (MSETCL) S/c line (7.7kA), Koradi – II (MSETCL) S/c line (9.6kA) Mauda D/c line (5.6kA) and 765/400kV ICTs (26kA). Warora Pool contributes the most at Wardha 400kV bus therefore the option of bypassing Mauda – Wardha 400kV D/c line at Wardha bus and connecting it with Wardha – Warora Pool 400kV D/c (Quad) line so as to form Mauda – Warora Pool 400kV D/c (Quad) line needs to be explored as with this configuration the fault level at 400kV Wardha bus reduces by 20kA to about 59.5kA. It is also observed that the interconnection with MSETCL system contributes about 17.6 kA at 400kV Wardha bus and addition of 3x660MW generation at Koradi would exaggerate the problem. The single line diagram is as given below:



4.5. Member Secretary (WRPC) enquired about the no. of evacuation outlets from Mauda STPS generation switchyard. Director (SP&PA), CEA clarified that there are two nos. of 400 kV D/C quad line from Mauda STPS, one to Betul and other to Wardha. Superintending Engineer (WRPC) enquired whether the short circuit current values indicated are symmetrical or asymmetrical. He said that the asymmetrical short circuit values in the transient period just after the fault are high as compared to the symmetrical short circuit values. The current values during the transient period also needs to be looked into while ascertaining the short circuit level at a substation. POWERGRID clarified that the values indicated are symmetrical values for 3 phase short circuit conditions.

4.6. AGM, NTPC suggested POWERGRID that while carrying out the short circuit studies the X/R ratio at various grid points particularly at generating bus should also indicated. This is very important figure which are used as input parameter for unit PSS tuning in addition to other design checks for Circuit Breaker and plant system design.

4.7. Chief Engineer, MSETCL stated that for controlling the short circuit levels, restriction of contribution from the generators also needs to be thought of. He suggested that the new pooling stations should be planned with switchgear of 63 kA rating. He further suggested that replacement of existing switchgear with 63 kA rating needs to be taken up wherever the fault level was expected to increase beyond the designed rating. POWERGRID clarified that replacement of exiting switchgear with higher rating would need major changes in the substation and long shutdown for executing the works.

4.8. After further deliberations it was decided that the proposal for limiting short circuit level would be further studied jointly by CEA and CTU. For limiting the fault current at Wardha substation MSETCL would also be involved. The final proposal after joint study would be put up in the next standing committee meeting of WR.

**5. Retention of Aurangabad (PG) 400/220 KV, 2 x 315 MVA ICTs along with its associated bays and provision of 2X500MVA, 400/220kV ICT to Parli (PG) switching station- Agenda by MSETCL**

5.1. Director(SP&PA), CEA stated that in the 37$^{th}$ Standing Committee Meeting of CEA on Power system planning in Western Region, POWERGRID has proposed installation of 2x500MVA, 400/220kV ICTs at Parli (PG) switching station in view of high loading observed on 400/220 kV ICTs and 220 kV lines emanating from 400/220 kV Parli (MSETCL) substation. MSETCL has proposed to retain 1X315MVA, 400/220kV ICT out of 2X315MVA 400/220kV ICT at Aurangabad (PG), and shifting of second 1X315MVA, 400/220kV ICT from Aurangabad (PG) to Parli (PG) 400kV switching station as they have already taken up the work of establishment of 400/220 substation at Taptitanda and 765/400 kV Ektuni substation to cater Aurangabad load. As the proposal of one no. of 400/220 kV ICT at Aurangabad (PG) and Parli 400 kV switching station by MSETCL was not fulfilling the N-1 transmission planning criteria, it was agreed that the provision of 2$^{nd}$ 400/220 kV ICTs at Aurangabad(PG) and Parli (PG) 400 kV substation would be discussed in the next SCMPSPWR.

5.2. Subsequently, MSETCL has consented for retention of 2X315MVA, 400/220 kV ICT at Aurangabad (PG) and provision of 2X500MVA, 400/220kV ICT at Parli (PG) switching station, in view of the N-1 Transmission Planning Criteria and overloading of 400/220 kV ICTs observe at their Aurangabad and Parli 400/220 kV substations. MSETCL has planned the following 220 kV network for dispersal of power from Aurangabad (PG) and Parli(PG) 400/ 220 kV substation:

Aurangabad (PG) 400/220 kV, 2X315 MVA substation:

(i) LILO of both circuits of Chitegaon- Shendra 220 kV D/C line at Aurangabad (PG) 400/220 kV, 2X315 MVA substation.

Parli (PG) 400/220 kV, 2X500 MVA substation:

(i) LILO of both circuits of Parli - Harngul 220 kV line at Parli (PG) 400/220 kV, 2X500 MVA substation.

(ii) LILO of both circuits of Parli- Osmanabad 220 kV D/C line at Parli (PG) 400/220 kV, 2X500 MVA substation.

5.3. Director (SP&PA), CEA stated that MSETCL has proposed LILO of two nos. of 220 kV D/C lines at Parli 400/220 kV station therefore it would require eight no. of 220 kV bays.

5.4. After deliberations, Members agreed with the POWERGRID proposal of installation of 2x500MVA, 400/220kV ICTs at Parli (PG) switching station along with provision of eight nos. of 220 kV bays. MSETCL was requested to implement the 220 kV interconnections as soon as possible at Aurangabad (PG) 400/220 kV, 2X315 MVA substation as it is already in operation. The 220 kV interconnections at Parli (PG) needs to be implemented by MSETCL in the matching time frame of the establishment of 2X500 MVA ICTs at Parli (PG).

## 6. Additional 400 kV feed to Goa

6.1. Director (SP&PA), CEA stated that the peak demand met by Goa during the year 2014-15 was 489 MW and as per the 18$^{th}$ EPS, the peak demand of 815 MW was expected by the end of 12$^{th}$ Plan (2016-17) and 1192 MW by the end of 13$^{th}$ plan (2021-22). At present demand of Goa is mainly catered through Mapusa 3x315 MVA, 400/220 kV substation, which gets feed from Kolhapur 400 kV substation through a 400 kV D/C line. Goa system is also connected with Maharashtra and Karnataka through 220 kV lines. In persuasion of decisions made in the meeting held on 2.03.2015 at CEA, New Delhi regarding the transmission plan for implementation of 24x7 power supply in the State of Goa, provision of a second 400 kV substation in Goa along with its interconnections with the Inter State Transmission System has been jointly studied by CEA, CTU and Electricity Department of GOA. Also as per the new Planning Criteria under “n-1-1” contingency of 400 kV Kolhapur – Mapusa D/C line, there will be severe constraints, in meeting the demand of Goa on remaining 220 kV network. To improve the reliability and power supply situation in Goa, an additional 400 kV in feed to Goa was required.

6.2. He further stated that two alternatives have been explored as second 400 kV substation in Goa:

1. New 2x500MVA, 400/220kV Substation at Xeldem
   OPTION 1: Narendra (existing) - Xeldam 400 kV D/C (quad) line.
   OPTION 2: Narendra (existing) - Xeldam– Mapusa400 kV D/C (quad) line.

2. New 2x500MVA, 400/220kV Substation at Ponda
   OPTION 1: Narendra (existing) - Ponda 400 kV D/C (quad) line.
   OPTION 2: Narendra (existing) - Ponda– Mapusa400 kV D/C (quad) line.

As there is space constraint at Ponda therefore the new 400 kV substation may be established at Xeldam. The following Inter State Transmission System scheme is proposed:

(i) Establishment of 2X500 MVA, 400/200 kV substation at Xeldam and its interconnection with Narendra (existing) 400 kV substation through 400 kV D/C line with quad conductor. The interconnection between the existing 220 kV Xeldam substation and the proposed 400/220 kV Xeldam substation could be through bus extension or through 220 kV interconnecting lines, as the case may be.

(ii) 400kV (Quad) connectivity between the new substation at Xeldem and Mapusa to take care of any N-1-1 contingencies involving outage of any one 400kV infeed to Goa.

6.3. Member Secretary, WRPC enquired about the alternative of LILO of Narendra – Kolhapur 400 kV D/C line at Xeldam. Director (SP&PA), CEA informed that Narendra- Kolhapur is a 765 kV D/C line which would be initially operated at 400 kV level. Therefore, establishment of Xeldam 400 kV substation by LILO of Narendra-Kolhapur line would require upgradation of Xeldam substation to 765 kV level whenever the Narendra- Kolhapur D/C line is operated at 765 kV level.

6.4. POWERGRID enquire about the interconnection between the proposed Xeldam 400/220 substation and existing Xeldam 220 kV substation. Interconnection through bus extension was possible only if sufficient space was available at the existing substation. Chief Engineer, Goa Electricity Department clarified that space is available at the existing Xeldam 220 kV substation.

6.5. POWERGRID informed that 765 kV operation of Narendra-Kolhapur D/C line is not envisaged in near future and the alternative of LILO of this line at Xeldam could be explored. This alternative would increase the utilisation of Narendra-Kolhapur D/C line. WRLDC stated that LILO of Narendra-Kolhapur D/C line at Xeldam could also be seen as an alternative.

6.6. Director (SP&PA), CEA informed that Narendra 765/400 kV substation and Narendra (existing) 400 kV substation of POWERGRID are not in close vicinity rather , they are located about 150 km away from each other. The ISTS scheme for Goa involves feed from Southern Region, therefore the scheme needs to be discussed in the standing committee meeting on power system planning in southern region also.

6.7. After deliberations it was decided that the alternative suggested would be studied jointly by CEA and CTU and based on its merit the same would be included in the scheme that would be put in the SR SCM for their approval.

## 7. Transmission System Strengthening associated with Mundra UMPP.

7.1. Director (SP&PA), CEA stated that the following System Strengthening associated with Mundra UMPP was agreed in the 36th Standing Committee on Power System Planning of WR held on 29.08.2013:

(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).

The Mundra UMPP – Bhuj Pooling station 400 kV D/c line would be routed through Bachau 400 kV substation. The Mundra UMPP- Bachau section of the line would be implemented first so as to establish LILO of one circuit of Bachau – Versana 400 kV D/C line at Mundra UMPP. The Bachau – Bhuj pool section of the line, would be implemented in matching time frame of establishment of 765/400 kV Bhuj pool station.

MoP has approved implementation of the scheme by POWERGRID under compressed time schedule.

7.2. Subsequently, POWERGRID has requested that the routing of Mundra UMPP – Bhuj pool 400 kV D/C line through Bachau 400 kV substation may be removed from the scope of works and has suggested for direct 400 kV line between Mundra UMPP and Bhuj Pool due to severe RoW constraints in vicinity of Bachau. POWERGRID has sought in - principle approval of CEA for the change in scope and modification of MoP O.M no.15/9/2013-Trans dated 5/25-9-2014, vide which MoP has approved implementation of the scheme by POWERGRID under compressed time schedule.CEA has suggested that POWERGRID may immediately take up the implementation of **item (i)** of the System strengthening scheme associated with Mundra UMPP viz., LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/c (triple snowbird) at Bachau and modification in the scope of item (ii) would be taken up after deliberation in the Standing committee meeting on power system planning in WR. In view of the above, POWEGRID has split the system strengthening associated with Mundra UMPP into two parts viz. Part A and Part B. Part A of the scheme consists LILO of both circuits of Mundra UMPP – Limbdi 400 kV D/C (triple snowbird) at Bachau. The balance portion of the scheme as **Part B**. Part A of the scheme is already under implementation by POWERGRID and modifications in the **Part B** have been put for approval of WR Standing committee members.

7.3. CTU stated that as per the already agreed scheme Mundra UMPP (CGPL)- Bhuj pool 400 kV D/C was being routed through Bachau and its length was about 175 kms. With suggested modification by POWERGRID due to severe RoW issues, the line goes straight from Mundra UMPP (CGPL) to Bhuj pool and its length is about 100 kms.

7.4. Member Secretary, WRPC said that there was no interconnection between M/s CGPL Mundra UMPP and M/s Adani Mundra generation plant even though the two plant were located in close vicinity. In case of complete shutdown of one of the plant, start up power could have been easily extended from the other plant if some interconnection existed between them. He further said that some interconnection between the two generation plant could be planned which would be kept normally in

open condition and the same could be utilized for extending start up power requirements whenever required. Director (SP&PA) said that two generation projects have not been interconnected as this may result in high short circuit levels.

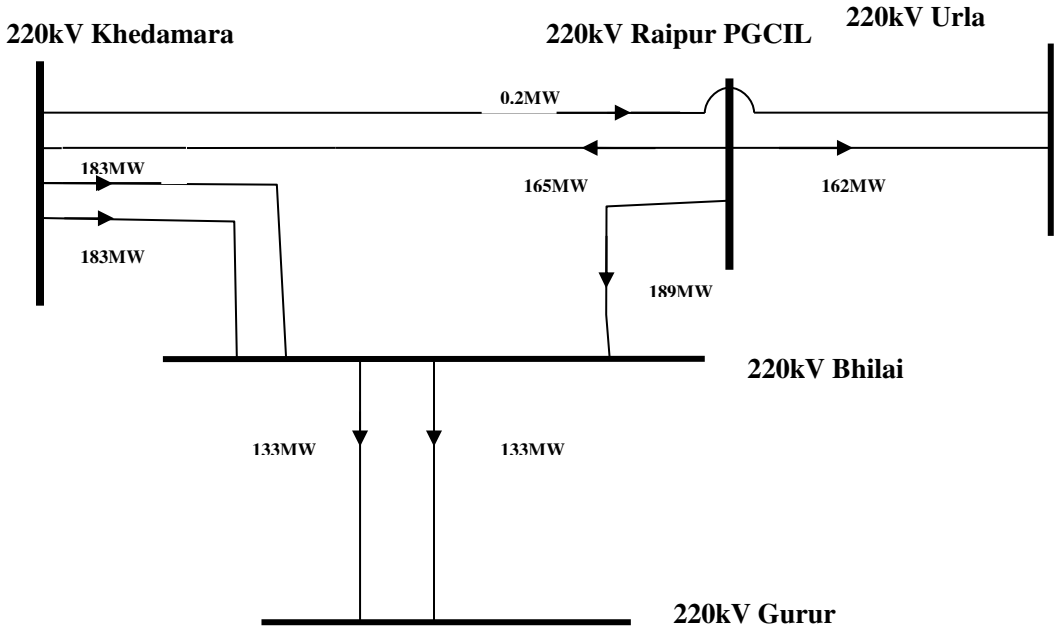
7.5. GETCO representative informed that Mundra (Adani) - Zerda 400 kV D/C line is expected to be commissioned by December 2015. Till the Bhuj pool 765/400 kV substation is commissioned this line could be used for evacuation of power from M/s CGPL Mundra UMPP.

7.6. WRLDC enquired about LILO of Mundra UMPP- Limdi 400 kV D/C line at Halvad 400 kV substation of GETCO. Director (SP&PA), CEA clarified that the LILO at Halvad was an interim arrangement and the LILO would be removed when the associated transmission line with Halvad substation are completed.

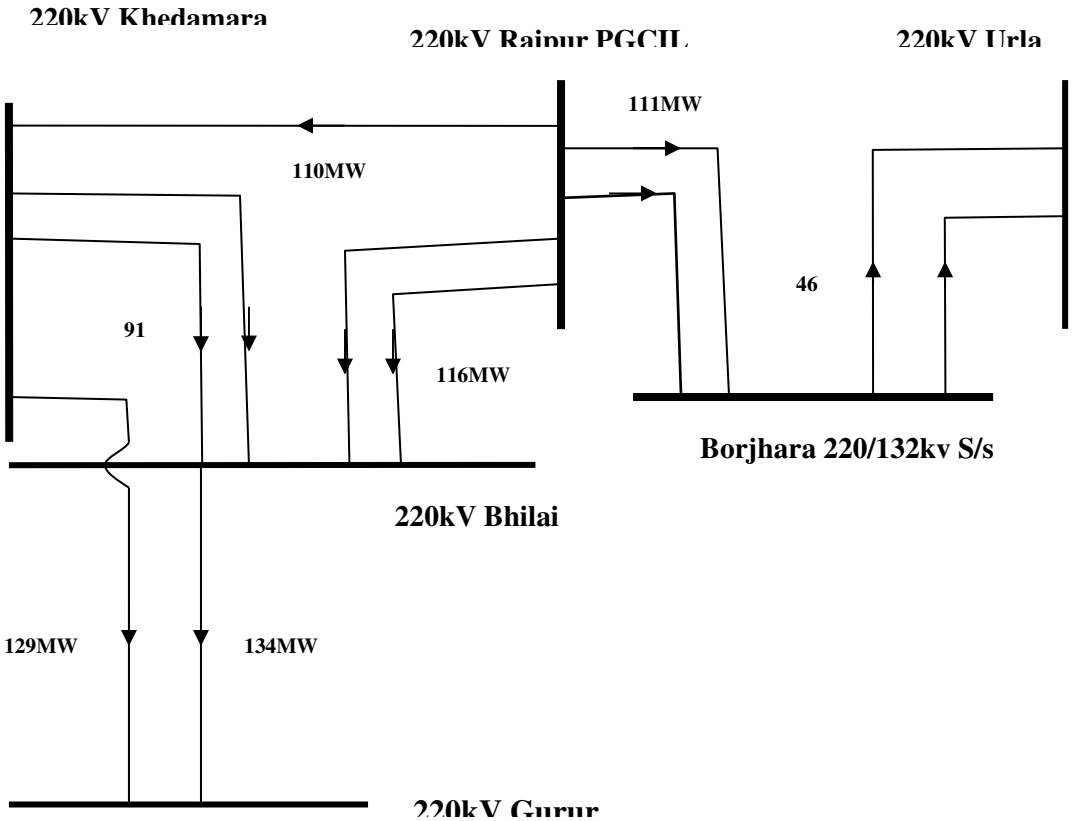
7.7. After deliberations direct routing of the Mundra- Bhuj pool 400 kV D/C line (triple snowbird) was agreed as Part-B of T**ransmission System Strengthening associated with Mundra UMPP.** Regarding utilization of Mundra(Adani)- Zerda 400 kV D/C line for evacuation of power from Mundra UMPP, GETCO was requested to submit a proposal to CEA/CTU. The interconnection between M/s CGPL UMPP and M/s Adani Mundra generation plant would be studied jointly by CEA, CTU and GETCO and the same would be put as agenda in the next standing committee meeting.

**8. Rearrangement of existing 220 kV circuit between 400/220 kV Khedamara (CSPTCL) and 400/220 kV Raipur, Kumhari (PGCIL).**

8.1. Director(SP&PA), CEA stated that CSPTCL has proposed rearrangement of existing 220 kV circuit between 400/220 kV Khedamara (CSPTCL) and 400/220 kV Raipur, Kumhari (PGCIL) due to high loading observed on Khedamara (CSPTCL) - Bhilai 220 kV D/C line and Raipur (PGCIL) - Bhilai 220kV S/C line. They are facing difficulty in manage contingencies/availing shut down for these lines. The single line diagram showing power flow results with present arrangement and after rearrangement (simulated by CSPTCL for 2016-17 conditions) is as shown below:



**Future arrangement**




8.2. The proposed rearrangement of existing 220 kV circuit between 400 kV Khedamara (CSPTCL) and 400 kV Raipur, Kumhari (PGCIL) is as under:

i. LILO of Khedamara (CSPTCL) – Raipur (PGCIL) 220 kV line at Bhilai. The Khedemara- Bhilai 220 kV S/C line and Bhilai – Gurur 220 kV S/C line would be reconfigured as Khedemara- Gurur 220 kV S/C bypassing the Bhilai 220 kV substation. The two nos. 220 kV bays freed at Bhilai would be used for establishment of LILO of Khedamara (CSPTCL) – Raipur (PGCIL) 220 kV line at Bhilai.

ii. In the 37th SCM of WR held on 5.9.2014 the LILO of 220 kV Raipur (PGCIL) – Urla at Borjhara S/s and LILO of 220 kV Khedemara (CSPTCL) –Urla line at Borjhara were agreed for feeding the proposed Borjhara S/s at 220 kV level. The 220kV S/C line from Khedamara – Borjhara line (formed after implementation LILO of 220 kV Khedemara (CSPTCL) –Urla line at Borjhara) would be LILO at 220kV Raipur PGCIL S/s.

8.3. Director (SP&PA), CEA said that for implementation of LILO of Khedamara – Borjhara line at 220kV Raipur PGCIL, 2nos of 220kV bays are required at Raipur 400/220 kV substation. The above rearrangement results in even distribution of power flow on 220 kV lines between 400/220 kV Khedamara (CSPTCL) and 400/220 kV Raipur, Kumhari (PGCIL).

8.4. After deliberations, provision of 2 nos. of 220kV bays at Raipur PGCIL S/s was agreed for LILO of Khedamara – Borjhara line at 220kV Raipur PGCIL substation.

Bays would be implemented by POWERGRID and LILO works would be carried out by CSPTCL. In case of space constraints, GIS bay would be provided in place of AIS bay.

**9. Modification in transformation capacity at Itarsi S/s**

9.1. Director (SP&PA), CEA stated that in the 37th Standing Committee Meeting on Power System Planning of WR held on 05.9.2014, MPPTCL proposal of an additional 1x315 MVA, 400/220kV transformer along with two nos. of 220 kV bays at Itarsi (PG) 400/220 kV S/s, to ensure the reliability of supply to 220 kV substations around Itarsi and Betul area was agreed. Subsequently POWERGRID has proposed that rating of additional (2nd) ICT to be installed at Itarsi be revised to 500MVA instead of 315MVA, as the cost of 400/220kV ICT of 500MVA and 315MVA is generally of same order.

9.2. The proposal of 1X500 MVA, 400/220 kV ICT along with two nos. of 220 kV bays at Itarsi (PG) 400/220 kV S/s was agreed by the members.

**10. POWER GRID works associated with system strengthening scheme for IPPs in Chhattisgarh and other Generation projects in Western Region.**

10.1. Director (SP&PA), CEA stated that the system strengthening for IPPs in Chhattisgarh and other generation projects in Western region was discussed and agreed in the 36th Standing Committee on power system planning of Western Region held on 29.08.2013. In 32nd Empowered Committee meeting on Transmission held on 17.01.2014, the scheme was recommended for implementation through TBCB. The scheme included Gwalior – Morena 400 kV D/C (quad) line and it was specified that 2 no. of 400 kV line bays existing at Gwalior 765/400 kV sub-station would be utilized for terminating Gwalior – Morena 400 kV D/C (quad) line.

10.2. Subsequently, POWER GRID had informed that due to severe space constraints at Gwalior 765/400kV substation, 2nos of existing 400kV line bays at Gwalior substation have already been utilized for installation of 2nos of 125MVAR bus reactors at Gwalior S/s under transmission system associated with phase – 1 generation projects in Odisha part – C.

10.3. AGM POWERGRID informed that in the 34th Standing Committee on Power system Planning of Western Region held on 9.05.2012, provision of bus reactors at seventeen locations was agreed to contain the voltage conditions in WR. This included provision of one no.125MVAR bus reactor at Gwalior 400kV S/s. In view of the space constraint, existing 50 MVAR bus reactor at Gwalior substation was replaced by the new 125 MVAR reactor and 50 MVAR bus reactor is used as spare reactor. In view of the space constraint two nos. of GIS bays at Gwalior substation is proposed for termination of Gwalior- Morena 400 kV D/C (quad) line.

10.4. After deliberations two nos. of GIS bays at Gwalior substation for termination of Gwalior- Morena 400 kV D/C quad line at Gwalior substation was agreed by the members.

**11. Erection of 132 kV D/C line from 132 kV Taloda substation (existing) of MSETCL to 132 kV Sarvala substation (proposed) of GETCO- proposal by Gujarat.**

11.1. Director (SP&PA), CEA stated that GETCO has given a proposal of erection of 132 kV D/C line from 132 kV Taloda substation (existing) of MSETCL to 132 kV Sarvala substation (proposed) of GETCO. The proposal has been made to provide alternative source of power supply to Tapi area as the existing five no. of 66 substations are fed through a long ( about 95 Kms) 66 KV S/C line from 220/66 kV ICTs at Ukai Hydro power station. Due to long length of the 66 KV line, the voltage profile of 66 KV Nizar substation, located at extreme end, is very poor i.e. about 58 kV.

11.2. The members observed that as per the definition of (ISTS) Inter State Transmission System (any system for the conveyance of electricity by means of main transmission line from the territory of one State to another State), the proposal of GETCO is an ISTS. Therefore, GETCO and MSETCL may further deliberate mutually on the proposal before putting it up for the approval of the standing committee.

**12. Issues related 400/220kV Navi Mumbai (PGCIL) S/s and associated 220kV interconnection with MSETCL.**

12.1. Director (SP&PA), CEA stated that the following scope of works were agreed in the 25th SCM of WR held on 30.09.2006 to be implemented under Western Regional system strengthening scheme (WRSS –V) by PGCIL:

(i) 400kV Vapi – Navi Mumbai D/C line.
(ii) LILO of 400kV Lonikhand/Pune – Kalwa line at Navi Mumbai.
(iii) Establishment of 400/220kV 2X315MVA new (GIS) at Navi Mumbai.
(iv) 220kV Vapi – Khadoli D/C line.

In 27th SCM of WR held on 30.07.2007, Pune (PG) – Navi Mumbai (PG) 400kV D/C line was agreed as a regional system strengthening scheme in Western Region to be implemented in time frame of Krishnapatnam UMPP. In the 32nd SCM of WR held on 13.05.2011, PGCIL requested for reconsideration of Pune (PG) – Navi Mumbai (PG) 400kV D/C line in view of severe RoW constraints envisaged during implementation and it was agreed that MSETCL could suggest alternative location for termination of line from Pune for onward dispersal of power.

In the 35th SCM of WR held on 3/1/2013, LILO of Kharghar – Padghe section of Lonikhand – Kalwa line-1 at Navi Mumbai was agreed instead of LILO of Lonikhand/ Pune – Kalwa 400kV S/C line-2 as agreed under WRSSS – V. It was also agreed for laying of 1.5km of 400kV underground cable near gantry of Navi Mumbai sub – station with an estimated cost of Rs 55 crores to expedite the implementation of LILO arrangement which was held up due to severe RoW issues.

In the 35th SCM of WR held on 3/1/2013, in view of severe RoW problem termination of 400kV Vapi – Navi Mumbai D/C line at Kudus S/s of MSETCL was agreed and PGCIL was to continue their efforts for completing the balance portion of the Vapi – Navi Mumbai 400kV D/C line.

MSETCL vide their letter dated 8th April, 2015 has requested for review of the 400kV Navi Mumbai (PG) S/s due to the following reasons:

a) 400/220kV Navi Mumbai (PG) S/s is not getting feed from ISTS source.
b) Burden of additional POC charges on Maharashtra as well as WR constituents.
c) High capital cost on account of underground cable and severe RoW constraints.

12.2. Chief Engineer, MSETCL stated that in view of the above developments as on date there was no ISTS source to Navi Mumbai. The Vapi - Navi Mumbai 400 kV D/C line has been terminated at Kudus which is about 80 km away. The LILO of Kharghar – Padghe 400 kV line at Navi Mumbai being presently implemented will only recirculate the power from intrastate network of MSETCL. If in future also if ISTS network was not being extended to Navi Mumbai 400 kV substation, then it should be shifted to some other location.

12.3. Director (SP&PA), CEA said that as per decision of 35th SCM of WR, POWERGRID was to continue their efforts for completing the balance portion of the Vapi – Navi Mumbai 400kV D/C line beyond Kudus. Even after completion of the Vapi – Navi Mumbai 400kV D/C line, Navi Mumbai substation would be beneficially utilized only if the downward 220 kV network is established by MSETCL. The alternatives solutions needs to be discussed and evaluated before arriving at any final decision.

12.4. CTU suggested that CEA, CTU and MSETCL should carry out joint study for exploring effective utilization of Navi Mumbai 400 kV substation and put a proposal in the next standing committee meeting.

12.5. Members agreed with the suggestion of CTU.

**13. Development of infrastructure for Transmission System strengthening for evacuation of power from New and Renewable energy based power projects in Madhya Pradesh – under green energy corridors.**

13.1 Director (SP&PA), CEA stated that Government of Madhya Pradesh through its New & Renewable Energy Department (MPNRED) has taken the policy initiative for implementation of Wind, Solar, Biomass and Mini-Micro hydel power based projects. In response to request for proposal of MPNRED, various developers have shown interest for development of RE project with a cumulative capacity of about 5850 MW in MP state. These projects shall be developed during the next 5 years and the capacity wise details are as given below:

| S.No | RE projects proposed in next 5 years | Capacity in MW |
|---|---|---|
| 1 | Wind Power | 2704.55 |
| 2 | Solar Power | 2588.42 |
| 3 | Mini-Micro Power Projects | 282.70 |
| 4 | Biomass Power Projects | 271.40 |
| | Total | **5847.07** |

The transmission system strengthening associated with the RE projects would be implemented by Madhya Pradesh Power Transmission Company Limited (MPPTCL). The broad details of the transmission system proposed are as given below:

a) The total cost of the transmission system strengthening proposed has been estimated as Rs. 4700 crores. This is further divided into Phase-I works, Phase-II works and RE interconnection works.

b) The estimated cost of transmission schemes proposed under Phase-I works is Rs. 2100 crores and inter-alia, includes creation of 3 nos. of 400 kV substations ( namely Mandsaur, Ujjain and Sagar), 8 nos. of 220 kV substations ( namely at Sendhwa, Gudgaon, Kanwan, Suwasara, Ratangarh, Sailana, Jaora and Susner), 670 ckm of 400 kV line and 1278 ckm of 220 kV lines. Phase-I works are targeted to be completed by 2018. The details are enclosed as Annexure-IV.

c) The estimated cost of transmission schemes proposed under Phase-II works is Rs. 1475 crores and inter-alia, includes 2 nos. of 400 kV substation ( namely at Ratangarh and Sailana) , 3 nos. of 220 kV substations (namely at Sonkatch, Petlawad and Sheopur kalan), 340 ckm of 400 kV lines, 816 ckm of 220 kV lines and 6 no. of 220 kV STATCOMs. Phase-II works are targeted to be completed by 2020. The Phase-II works would be considered by MPPTCL after review in 2016 based on the works completed and expected RE projects. The details of Phase – II are enclosed as Annexure-V.

d) The estimated cost of transmission schemes proposed under RE interconnection works is Rs. 1125 crores. This includes development of transmission works required for interconnection of the renewable projects with the MP grid. This would be executed by MPPTCL at the cost of project developers.

13.2 Director (SP&PA), CEA further said that the above intrastate transmission schemes has been planned by MPPTCL for absorption of power from the renewable energy sources in Madhya Pradesh. The intrastate scheme under Phase-I includes 400kV D/C line from Indore (PGCIL) 765/400kV S/s to Ujjain 400kV S/s, which would require two nos. of 400 kV bays at Indore 765/400 kV substation of POWERGRID.

13.3 MPPTCL representative stated that the proposed works under the scheme are intra state transmission works and it also includes a 400kV D/C interconnector line between new 400kV S/s at Ujjain to 765/400kV S/s of PGCIL at Indore having route length of about 45 KMs to enhance system security, stability and reliability. This interconnector shall mainly be used for anchoring of the intra-state system with CTU network and there shall not be any substantial power flow from intra-state to inter-state system over these lines under normal conditions. This interconnector will require construction of 2 Nos. 400kV feeder bays at Indore (PGCIL) 765/400kV S/s. These bays may be constructed by PGCIL as a part of Green Energy Corridor Scheme.

13.4 Members noted the intrastate transmission scheme planned by MPPTCL for absorption of power from renewable energy sources in Madhya Pradesh. Members also agreed for provision of two nos. of 400 kV bays at Indore 765/400 kV substation by POWERGRID for termination of Indore (PGCIL) - Ujjain of 400kV D/C line as

system strengthening. In case of space constraint, GIS bay may be provided in place of AIS bay.

## 14. Operational feedback by NLDC.

14.1. The operational feedback by NLDC on Transmission constraints in Western Region for the quarter January to March 2015 was discussed and the summary of the deliberations on Transmission line constraints and ICT constraints are as given below:

### Transmission Line Constraints

| Sl. No | Corridor | Description of the constraints | Deliberations in the 38th SCM |
|---|---|---|---|
| 1. | 400 kV Aurangabad(PG) -Aurangabad (MSETCL) D/C | Critical Loading of 400 kV Aurangabad (PG) - Aurangabad (MSETCL) D/C leading to n-1 non-compliance. | Discussed at item no.15 |
| 2. | Constraints in 400 kV Khandwa – Dhule - Bableshwar-Padghe corridor | 400 kV Khandwa-Dhule - Bableshwar-Padghe corridors carrying more than 500 MW in each ckt. The corridor is N-1 non-compliant. | Dhule 2X1500 MVA, 765/400 kV Dhule substation along with 400 kV interconnection line with Dhule (MSETCL) already completed. 400 kV bays at Dhule (MSETCL) are not ready. With completion of 400 kV bays at Dhule(MSETCL), loading on Khandwa – Dhule line would be relieved. MSETCL to expedite the implementation of 400 kV bays at Dhule 400 kV substation. |
| 3. | 765 kV Tirora-Koradi III -Akola II D/C and 765/400 kV ICT at Tirora and 765/400 kV ICT at Akola II | The system is not n-1 compliant. It has been observed that tripping of 765 kV Tirora ICT or 765 Akola II ICT would cause sudden increase in the power on Tirora-Warora lines causing oscillations in the grid. | With the completion of Tiroda-Koradi III –Akola II-Aurangabad III 765 kV 2XS/C lines, the situation would improve. At present the Akola II- Aurgangabad III (Ektuni) section is charged at 400 kV level. MSETCL to expedite the implementation the Tiroda ATS on priority. |
| 4. | 400kV Wardha-Parli D/C | High loading of Wardha-Parli D/C | Warora pool – Parli(new) -Solapur 765 kV D/C line has already been planned as system strengthening in Western Region to facilitate dispersal of power beyond Warora pooling station and the same is under implementation through tariff |

| Sl. No | Corridor | Description of the constraints | Deliberations in the 38th SCM |
|---|---|---|---|
| | | | based competitive bidding route by POWERGRID. |
| 5. | 400kV Parli(PG)-Sholapur(PG) D/C | Critical loading of Parli(PG)-Sholapur(PG) D/C and frequent operation of associated SPS | Warora pool – Parli(new) -Solapur 765 kV D/C line has already been planned as system strengthening in Western Region to facilitate dispersal of power beyond Warora pooling station and the same is under implementation through tariff based competitive bidding route by POWERGRID.<br><br>Aurangabad (PG) - Sholapur 765 kV D/C line is already under implementation by POWERGRID and is expected to be completed by December 2015. |
| 6. | 400 kV Aurangabad-Pune D/C | The transmission system at 220kV Pune is inadequate (only 2 lines from 220kV Pune (PG)). 400/220kV one ICT at Pune is kept open to control loading on 220kV lines from Pune (PG). | With the interconnection of Pune (GIS) 765/400 and Pune (PG) 400 kV substations through LILO of 400KV D/C Parli(PG) – Pune(PG) & Pune(PG) – Aurangabad I (Waluj) line at Pune (GIS), the loading of Aurangabad I (Waluj) –Pune(GIS) 400 kV D/C line would get reduced.<br><br>MSETCL to plan more 220 kV outlets from Pune (PG) 400/220 kV substation. |
| 7. | 765kV Sasan-Satna D/C | High loading of 765kV Sasan-Satna lines. | Gwalior- Jaipur 765 kV S/C 1 and 2 are expected to be commissioned by July 2015 and August 2015 respectively.<br><br>Further Sasan- Vinhyachal pool 765 kV S/C line (2nd) has also been planned and is to be implemented through tariff based competitive bidding route. Presently its bidding process is going on. |
| 8. | 400 kV SSP-Asoj S/C and SSP-kasor S/C | Continuous loading of above 550MW in SSP-Asoj and SSP-Kasor. | Constraint not observed in this quarter. |

**ICT Constraints**

| Sl. No | ICT & Season/ Antecedent Conditions | Description of the constraints | Deliberations in the 38th SCM |
|---|---|---|---|
| 1 | 2x500MVA, 400/220kV Asoj ICTs<br><br>SSP generating full and many units at Wanakbori, Ukai, Gandhar, GPEC kept out on Merit order despatch. | It is observed that the loading on ICTs at Asoj (2x500MVA) are in the range of 300-370 MW resulting in 'N-1' non-compliance. | 3rd ICT at Asoj commissioned on 16.03.2015, and loading on existing ICTs relieved. |
| 2 | 2X315 MVA Khandwa ICTs<br><br>Madhya Pradesh meeting high demand of above 7000 MW | It is observed that the loading on ICTs at Khandwa (2x315MVA) are above 200 MW and additional ICT has to be proposed. | 1X315 MVA, 400/220 kV ICT (2nd) at Chhegaon is under implementation by MPPTCL and is expected to be completed by December 2015. This would relieve loading on Khandwa ICTs. |
| 3 | 2X315 MVA Satna ICT<br><br>Madhya Pradesh meeting high demand of above 7000 MW | It is observed that the loading on ICTs at Satna (2x315MVA) are above 200 MW and additional ICT has to be proposed. | From Satna (PG) 400/220 kV S/s 220 kV substations of MPPTCL at Satna(MP), Maihar and Katni S/s are fed. During the peak demand of MP State (above 7000MW), it is difficult to maintain the supply of Satna area in case of outage of one 315MVA ICT at Satna(PG) S/s. Therefore, in order to maintain the reliability of supply in Satna area, installation of additional transformer (3rd) 500 MVA, 400/220kV ICT at Satna (PGCIL) S/s with provision of 2 Nos. 220kV feeder was agreed. |
| 4 | 2 X 1500 MVA Aurangabad (PG) ICTs<br><br>Maharashtra meeting high demand of above 18500 MW | It is observed that the loading on ICTs are more than 800 MW resulting in 'N-1' non-compliance. | Discussed at item no.15 |

| | | | |
|---|---|---|---|
| 5 | 3 X 315 MVA Bhopal ICTs<br><br>Madhya Pradesh meeting high demand of above 7000 MW | It is observed that the loading on ICTs at Bhopal (3x315MVA) are above 200 MW and additional ICT has to be proposed | 1X315 MVA, 400/220 kV ICT (4th) at Bhopal is under implementation by MPPTCL and is expected to be completed by December 2015.This would relieve loading on the existing ICTs at Bhopal. |
| 6 | 1X500 MVA Satpura ICT<br><br>Madhya Pradesh meeting high demand of above 7000 MW and commissioning of Satpura Unit 10 & 11 | The ICT is getting loaded above 200 MW for most of the time. Additional ICT to be proposed | Installation of 1x500MVA additional transformer (2nd ) at Itarsi(PG) has already been agreed which will provide adequate support to 500MVA transformer at Satpura TPS |
| 7 | 2 X 315 MVA Chakkan ICTs<br><br>Maharashtra meeting high demand of above 18500 MW | It is observed that the loading on ICTs at Chakkan (2x315MVA) are above 200 MW and additional ICT has to be proposed | MSETCL to plan additional ICTs at Chakan and Lonikhand I 400/220 kV substations and more nos. of 220 kV outlets from Pune(PG) and Lonikhand-II 400/ 220 kV substation |
| 8 | 3X315 MVA Lonikhand ICTs<br><br>Maharashtra meeting high demand of above 18500 MW | Loading on ICTs at Lonikhand (3x315 MVA) are above 200 MW and additional ICT has to be proposed or 2x500MVA ICTs at Lonikhand-II are underutilized and the 220 kV lines from Lonikhand II and Pune (PG) to be expedited. | MSETCL to plan additional ICTs at Chakan and Lonikhand I 400/220 kV substations and more nos. of 220 kV outlets from Pune(PG) and Lonikhand-II 400/ 220 kV substation |

14.2. Members agreed to take action as deliberated above. For relieving ICT constraint at Satna(PG) 400/22 kV substation the following scheme was agreed:

(i) Installation of additional (3rd) 500MVA, 400/220kV ICT at Satna (PG) S/s with provision of 2 Nos. 220kV line bays by POWERGRID. In case of space constraint, GIS bay may be provided in place of AIS bay.

**15. Shifting of 400 kV Aurangabad I (Waluj) – Pune(PG) D/C line from 400 kV Waluj to 765/400 KV Aurangabad (PGCIL) – proposal by MSETCL.**

15.1. Director (SP&PA), CEA stated that MSETCL has put up proposal for re-orientation of Aurangabad I (Waluj)-Pune 400 kV D/C line as Aurangabad (PG) -Pune (PG) 400 kV D/C line as per decision taken in joint meeting of MSETCL and WRLDC held 26-02-2015 for calculation of import Total Transfer Capacity (TTC) and Available Transfer Capacity (ATC) of Maharashtra control area. In the meeting it was agreed that constraints for import of power in Maharashtra control area was mainly observed at Aurangabad and shifting 400 KV Aurangabad I (Waluj)– Pune-PG D/C line from 400 kV Waluj to 765/400 KV Aurangabad (PGCIL) would improve the transfer capability of Maharashtra control area. As per Load Flow study for the year 2015-16 carried out by MSETCL power flow of about 2200 MW on Aurangabad (PG) - Aurangabad I (Waluj) 400 kV D/C quad line is observed with Aurangabad I (Waluj)– Pune-PG 400 KV D/C line and with re-orientation of Aurangabad I (Waluj)– Pune-PG 400 KV D/C line as Aurangabad(PG)- Pune(PG) 400 kV D/C power flow on Aurangabad (PG) - Aurangabad I (Waluj)400 kV D/C quad line reduces to about 1100 MW.

15.2. He further stated that alternatively, the proposal of MSETCL is basically LILO of both circuits of Aurangabad I (Waluj) - Pune 400 kV D/C at Aurangabad (PG) 765/400 kV substation and it involves creation of 4 nos. of 400 kV bays at Aurangabad (PG) 765/400 kV substation. This would result in second interconnection between Aurangabad I (Waluj) and Aurangabad (PG) through a 400 kV D/C (Twin Moose) line. The existing interconnection is through a 400 D/C quad moose line.

15.3. Chief Engineer, MSETCL said that for shifting of 400 KV Waluj – Pune (PG) D/C line from 400 kV Waluj to 765/400 KV Aurangabad (PGCIL) only two nos. of 400 kV bays were required at Aurangabad (PG) 765/400 kV substation. The Aurangabad I (Waluj) - Aurangabad section of the Waluj – Pune 400 kV D/C line may be kept idle.

15.4. WRLDC representative stated that the 2X1500 MVA 765/400 kV Aurangabad substation and Aurangabad- Aurangabad I (Waluj) 400 kV interconnection was the limiting factor for calculation of import capability of Maharastra. The power flow in Maharastra control area at Aurangabad 2X1500, 765/400 kV substation, was restricted to about 1500 MW. The flow on Aurangabad (PG) - Waluj 400 kV D/C quad line was limited to about 1400 MW, and in future it could be enhanced to about 1700 MW only after completion of works of replacement existing CTs of line bays at Aurangabad I (Waluj) with high turn ratio CTs. With re-orientation of Aurangabad I (Waluj) -Pune 400 kV D/C line as Aurangabad (PG) -Pune (PG) 400 kV D/C line shifting, the flow on 400 kV interconnection between Aurangabad- Aurangabad I (Waluj) would get reduced. In this context MSETCL has put up the proposal. WRLDC representative further stated that the flow on the 400 kV interconnection between Aurangabad (PG) - Aurangabad I (Waluj) also gets reduced with the commissioning of Aurangabad – Sholapur 765 kV D/C line.

15.5. Director (SP&PA), CEA stated that Pune-Sholapur 765 kV S/C line along with the Pune 765/400 (GIS), 2X1500 ICTs has already been commissioned. With the interconnection of Pune(GIS) 765/400 and Pune(existing) 400 kV substations through LILO of 400KV D/C Parli - Pune & Pune - Aurangabad line at Pune (GIS) , the loading of Aurangabad I (Waluj) -Pune 400 kV D/C line would get reduced which in turn would reduce the flow on Aurangabad I (Waluj)- Aurangabad(PG) 400 kV interconnection. Apart from these the already planned scheme under implementation at Aurangabad are:

**By MSETCL**

(i) Establishment of Aurangabad III (Ektuni) 765/400 kV substation along with Aurangabad II (Taptitanda) - Aurangabad III (Ektuni) 400 kV D/C quad line.

(ii) Establishment of Aurangabad II (Taptitanda) 2X500 MVA, 400/220 kV substation along with 220 kV interconnection for drawal of power

(iii) Aurangabad II (Taptitanda) - Bableshwar- Kudus 400 kV D/C quad line.

(iv) Aurangabad III (Ektuni) – Aurangabad (PG) 765 kV D/C line.

(v) Akola- Aurangabad III (Ektuni) 765 kV 2X S/C lines.

(vi) 220 kV interconnection lines for drawl of power from Aurangabad (PG) 422/220 kV substation.

**By POWERGRID**

(vii) Aurangabad (PG) - Boisar 400 kV D/C quad line.

(viii) LILO of one circuit Aurangabad (PG) - Padghe (PG) 765 D/C line at Pune (GIS).

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

With implementation of above schemes, Aurangabad 765/400 kV substation and Aurangabad (PG) – Aurangabad I (Waluj) 400 kV interconnection would not a limiting factor for import of power in Maharastra control area.

15.6. After further deliberations, it was agreed that the MSETCL proposal of shifting of 400 KV Aurangabad I (Waluj) – Pune(PG) D/C line from 400 kV Waluj to 765/400 KV Aurangabad (PGCIL) would be further studied jointly by CEA,CTU,WRLDC and MSETCL considering the schemes under implementation as mentioned above.

**16. Construction of 132 kV SCDC line from 220/132 kV Nephanagar S/S (MP, MPPTCL) to proposed 132 kV Dharni (MSETCL) S/S Dist. – proposal by MSETCL.**

16.1. Director (SP&PA), CEA stated that MSETCL has proposed establishment of a 132 kV Dharni substation (in Maharastra) and its interconnection with 220/132 KV Nepanagar sub-station located in Madhya Pradesh through 132 kV S/C line (of about 55 kms). MSETCL has made the proposal due to very low voltage of 23kV to 25 kV being observed at the existing Dharni 33/11 kV substation located in Melghat tribal area in Amravati district (about 20 kms from Madhya Pradesh boundary) and to cater to future load growth. At present Dharni 33 kV substation is fed through a 33 kV S/C line, about 90 kms in length, from 132/33 kV Hiwarkhed substation.

16.2. The members observed that as per the definition of (ISTS) Inter State Transmission System (any system for the conveyance of electricity by means of main transmission line from the territory of one State to another State), the proposal of MSETCL is an ISTS. Therefore, MSETCL and MPPTCL may further deliberate mutually on the proposal before putting it up for the approval of the standing committee.

**17. Establishment of Badnawar 400/220KV S/s and Kirnapur 400/132kV S/s- Agenda by MPPTCL**

17.1. Director (SP&PA), CEA stated that MPPTCL is establishing 2X315 MVA, 400/220KV Badnawar substation by LILO of both circuits of 400kV Nagda – Rajgarh D/C line at Badnawar and 2X100 MVA, 400/132kV Kirnapur (Distt-Balaghat substation by LILO of 400kV S/c line between Bhilai and Seoni at Kirnapur as a part of intrastate transmission system strengthening works in Madhya Pradesh, which are targeted to be completed by year 2016-17. Both the 400kV Nagda – Rajgarh400 kV D/C line and Bhilai – Seoni400 kV S/C line are owned and operated by MPPTCL and creation of 400kV substations at Badnawar and Kirnapur have already been approved by State Government and Madhya Pradesh Electricity Regulatory Commission (MPERC).

17.2. These intrastate schemes has been taken up by MPPTCL to cater to the prospective load growth and critical loadings of existing lines and has been put for information of the members.

17.3. Members noted the same.

**18. Provision of two nos. of 220 kV bays at 3x315 MVA, 400/220 kV Mapusa (Colvale) substation – Agenda by Goa Electricity Department.**

18.1. Director (SP&PA), CEA stated that Goa Electricity Department has received power requisition of about 100 MW (60 MW from Electronic Manufacturing Cluster unit at Teum and 40 MW from Airport Authority of India for new International Airport at Mopa). To meet the load requirement, Goa Electricity Department has proposed to establish a 2X63 MVA, 220/33 kV Tuem substation along with its interconnection with Mapusa (Colvale) 400/220 kV substation through a 220 kV D/C line (of about 8 km length). For termination of the 220 kV D/C line at Mapusa (Colvale) substation Goa Electricity Department has requested for provision of two nos. of 220 kV bays 3x315 MVA, 400/220 kV Mapusa (Colvale)substation.

18.2. He further informed that Goa Electricity Department, as a part of its intrastate transmission system, has planned Mapusa (Colvale)- Kadamba-Verna- Cuncolin 220 kV D/C line. For termination of this line at Mapusa (Colvale) 400/220 kV substation, two no. of additional bays are also required.

18.3. Goa Electricity Department representative informed that out of the 4 nos. of bays required, two nos. of 220 kV bays were already available at Mapusa (Colvale) 400/220 kV substation (implemented along with the 3rd 315 MVA ICT) and only two nos. of additional bays were required.

18.4. After deliberation provision of two nos. of 220 kV bays at Mapusa (Colvale) 400/220 kV substation for termination of the proposed Mapusa (Colvale)- Teum 220 kV D/C line was agreed to be implemented by POWERGRID. In case of space constraints, GIS bay may be provided in place of AIS bays.

**19. Provision of Multi-Circuit Towers at 400kV Navsari and Vapi end while construction of KAPP – Navsari 400kV D/c line and KAPP – Vapi 400kV D/c line under Transmission system Associated with Kakrapar APP 3 & 4 – agenda by POWERGRID.**

19.1. Director (SP&PA), CEA stated that KAPP - Navsari 400kV D/c and KAPP - Vapi 400kV D/c line under Transmission system Associated with Kakrapar APP – 3 & 4 are under construction by POWERGRID. Looking into the criticalities in the - ROW for lines in future, POWERGRID has proposed that KAPP - Navsari 400kV D/c and KAPP - Vapi 400kV D/c lines be terminated on multi-circuit towers at Navsari and Vapi as detailed below:

a. Termination of KAPP – Navsari 400kV D/c (twin) line at Navsari sub-station on multi-circuit towers (about 10 nos. towers / about 3.5 kms). KAPP – Navsari 400kV D/c (twin) line shall be terminated on the top level of the multi-circuit towers. Future circuits shall be with the provision of quad type conductor and will be strung on the bottom level.

b. Termination of KAPP – Vapi 400kV D/c (twin) line at Vapi sub-station on multi-circuit towers (about 3 nos. towers). KAPP – Vapi400kV D/c (twin) line shall be terminated on the top level of the multi-circuit towers and future circuits shall be with the provision of quad type conductor and will be strung on the bottom level.

19.2. After deliberations members agreed to the POWERGRID proposal.

**20. Transmission System Strengthening associated with Vindhyachal V Project of NTPC – agenda by POWERGRID**

20.1. Director (SP&PA), CEA stated that Vindhyachal Pooling station – Jabalpur Pooling Station 765kV D/c along with 1x1500MVA (3rd), 765/400kV ICT at Vindhyachal Pooling Station was agreed as the transmission system strengthening for Vindhyachal V generation project (1x500MW) of NTPC in the 34th SCMPSP-WR/16th meeting of Western Region constituents regarding connectivity and Long-term Access applications of Western Region held on 09.05.2012. The transmission line is being implemented through tariff based competitive bidding. The extension of substation is being implemented by POWERGRID in two parts viz., Part A and Part B as given below:

**Substation extension for Transmission system associated with Vindhyachal V project of NTPC - Part A**

- Installation of 1x1500MVA, 765/400kV (3rd) ICT at Vindhyachal Pooling station.

**Substation extension for Transmission system associated with Vindhyachal V project of NTPC – Part B (associated with TBCB scheme)**

- Two (2) nos of 765kV bays each at Vindhyachal Pooling Station and Jabalpur Pooling Station for Vindhyachal Pooling station – Jabalpur Pooling Station 765kV D/c line.

- 1x330MVAR, 765kV line reactor along with 850Ω NGR on both circuits and at both ends of Vindhyachal Pooling Station – Jabalpur Pooling Station 765kV D/c line.

20.2. NTPC informed that Vindhyachal V unit is scheduled for commissioning in October 2015 and its synchronization is expected by August 2015.

20.3. Director (SP&PA), CEA informed that 330 MVAR line reactor has not been included in the scope of works, either in the 30th Empowered Committee minutes (wherein the scheme has been recommended for implementation through tariff based competitive bidding) or in the RfP (Request for Proposal) document for the scheme.

20.4. CTU stated that since the line length of Vindhyachal Pooling station – Jabalpur pooling station 765 kV D/C line is around 350km, the provision of 1x330MVAr line reactor at each end of both circuits need to be included in POWERGRID scope of works.

20.5. Members agreed with the provision of 1x330MVAr line reactor at each end of both circuits of Vindhyachal Pooling station – Jabalpur pool 765 kV D/C line. Members also noted the substation extension works associated with Vindhyachal V project of NTPC being implemented by POWERGRID a given below:

**Substation extension for Transmission system associated with Vindhyachal V project of NTPC - Part A**

- Installation of 1x1500MVA, 765/400kV (3rd) ICT at Vindhyachal Pooling station.

**Substation extension for Transmission system associated with Vindhyachal V project of NTPC – Part B (associated with TBCB scheme)**

- Two (2) nos of 765kV bays each at Vindhyachal Pooling Station and Jabalpur Pooling Station for Vindhyachal Pooling station – Jabalpur Pooling Station 765kV D/c line.

- 1x330MVAR, 765kV line reactor along with 850Ω NGR on both circuits and at both ends of Vindhyachal Pooling Station – Jabalpur Pooling Station 765kV D/c line.

**21. Interim power evacuation arrangement for Rihand–III (2x500MW) and Vindhyachal–IV (2x500MW) projects**

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

(i) Rihand-III – Vindhyachal Pooling Station 765kV 2xS/C (initially to be 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.

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 32nd, 33rd, 35th& 36thSCM of WR. Further a meeting was convened on 18.06.2014 at NLDC New Delhi under the chairmanship of Member (GO & D) to review the contingency arrangement for evacuation of Rihand Stage-III and Vindhyachal IV projects in which the following revised contingency arrangement was agreed (indicated in sketch shown at **figure-3**)

a Splitting the 400 kV bus at Vindhyachal Stage-IV and connecting one unit on one bus with Rihand III TPP though one circuit of Rihand III – Vindhyachal Pool – Vindhyachal Stage-IV (by passing Vindhyachal pool). The other unit at Vindhyachal Stage-IV would be connected to Western Region. The two buses would be disconnected from each other by opening all the relevant breakers. Vindhyachal Pool substation is yet to be ready and would be bypassed.

b 400 kV Vindhyachal - Sasan one circuit (bypassing Vindhyachal Pool) would be in service and connected in Western Region.

c 400 kV Rihand –Sasan other circuit (bypassing Vindhyachal Pool) would have to be kept open as otherwise it would lead to direct connection of the Northern Region and Western region grids through this connection.

d Sasan 400 kV would have three 400 kV connections; two to Vindhyachal STPS and one to Jabalpur.

e The loading on Vindhyachal HVDC back to back would be controlled depending on the margins available in Western and Northern Region. If more margin is there in Northern Region due to outage of units at Singrauli/Rihand/Anpara complex, up to 500 MW power could be maintained on Vindhyachal HVDC back to back from West to North in addition to the unit at Vindhyachal Stage-IV connected to Rihand.

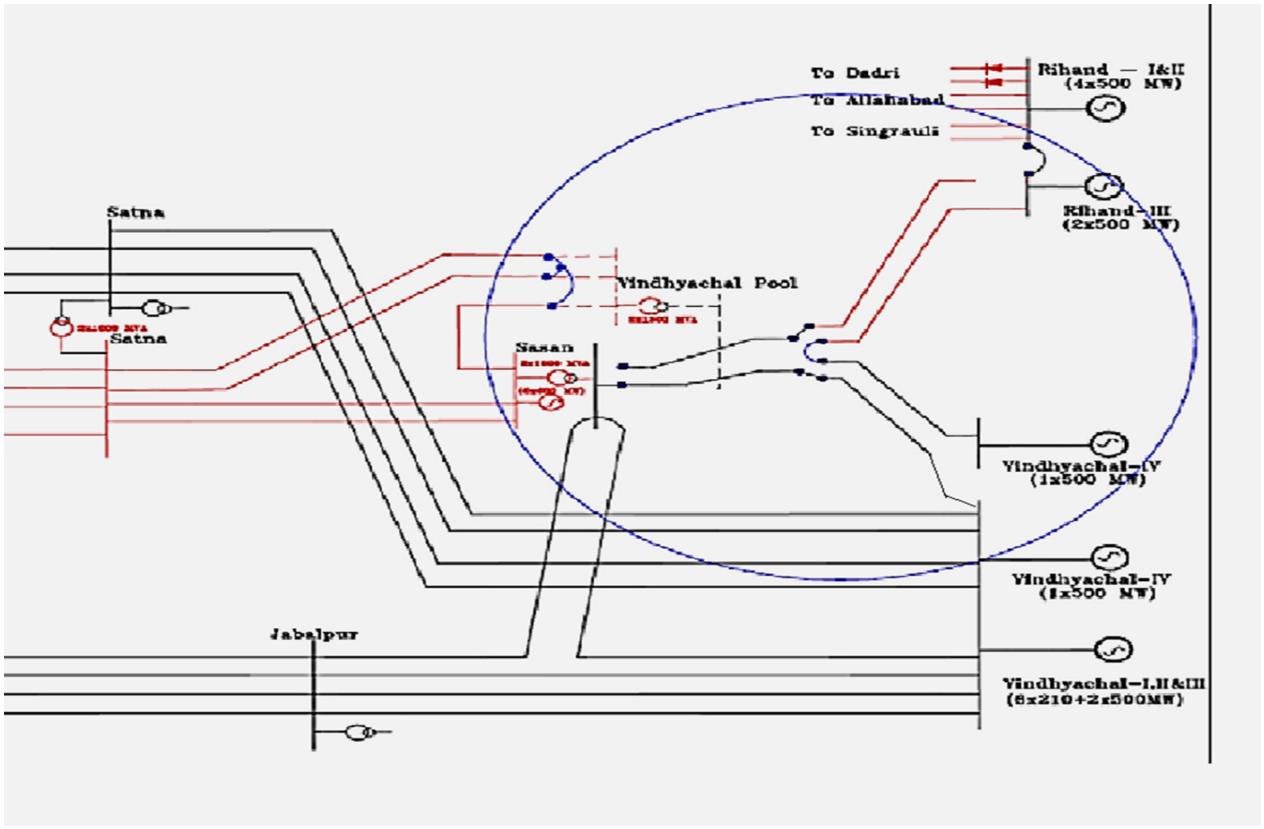



**Figure-3: Contingency Arrangement at Vindhyachal IV &Rihand III**

21.2. AGM, CTU informed that Vindhyachal Pooling Station has already been charged along with following associated elements.

(i) Sasan – Vindhyachal Pool 400kV D/c line
(ii) 1x1500MVA, 765/400kV ICT at Vindhyachal Pool
(iii) Vindhyachal Pool – Satna 765kV 2x S/c line
(iv) Sasan – Vindhyachal 765kV S/c line
(v) One ckt of Vindhyachal IV – Vindhyachal Pool 400kV D/c line

However, due to power transfer capacity constraints in WR-NR corridor (Gwalior-Agra 765 kV 2X S/C lines), the above interim arrangement (evacuation of 2x500MW units of Rihand III and 1x500MW unit of Vindhyachal IV through NR system) needs to be continued.

21.3. AGM, NTPC informed that Vindhyachal V 500 MW unit scheduled commissioning is October 2015 and its synchronization is expected by August 2015. He enquired about evacuation arrangement Vindhyachal-V.

21.4. AGM, CTU informed that the Gwalior – Jaipur 765 kV (1st) S/C line is expected to be commissioned by July 2015 and 2nd S/C by August 2015. Therefore, power evacuation of Vindhyachal-V 500 MW would be through its associated transmission system.

21.5. After deliberations the above interim arrangement (evacuation of 2x500MW units of Rihand III and 1x500MW unit of Vindhyachal IV through NR system) was agreed by the members.

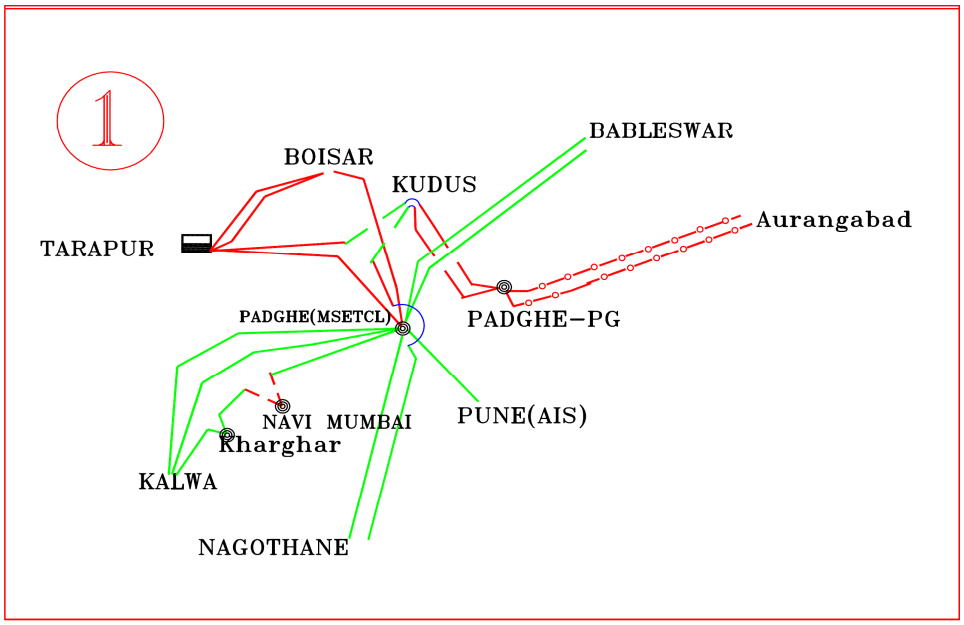
**22. Rearrangement of transmission lines at Kudus substation (MSETCL) - agenda by POWERGRID.**

22.1. Director (SP&PA), CEA stated that as per information provided by POWERGRID the Aurangabad (PG) – Padghe 765kV D/c line along with Padghe 765 kV substation and Padghe- Kudus 400 kV D/C line is expected to be commissioned by Dec'15. Aurangabad (PG) – Padghe 765kV D/c line would provide a direct infeed from ISTS network to the major load centers in and around Kudus / Padghe region of Western Maharashtra. However, Kudus (MSETCL) 400 kV substation was delayed. For termination of Padghe - Kudus 400 kV D/C line at Kudus end the following arrangement has been evolved by POWERGRID and MSETCL till commissioning of Kudus (MSETCL) 400 kV substation:

**A. Interim arrangement before commissioning of Kudus (MSETCL) 400 kV substation.**

(i) Connection of LILO ends of Tarapur – Padghe (MSETCL) at Kudus with Padghe (PG) – Kudus 400kV D/c (quad) line, so as to form Padghe (PG) – Padghe (MSETCL) 400kV line and Padghe (PG) – Tarapur 400kV line.

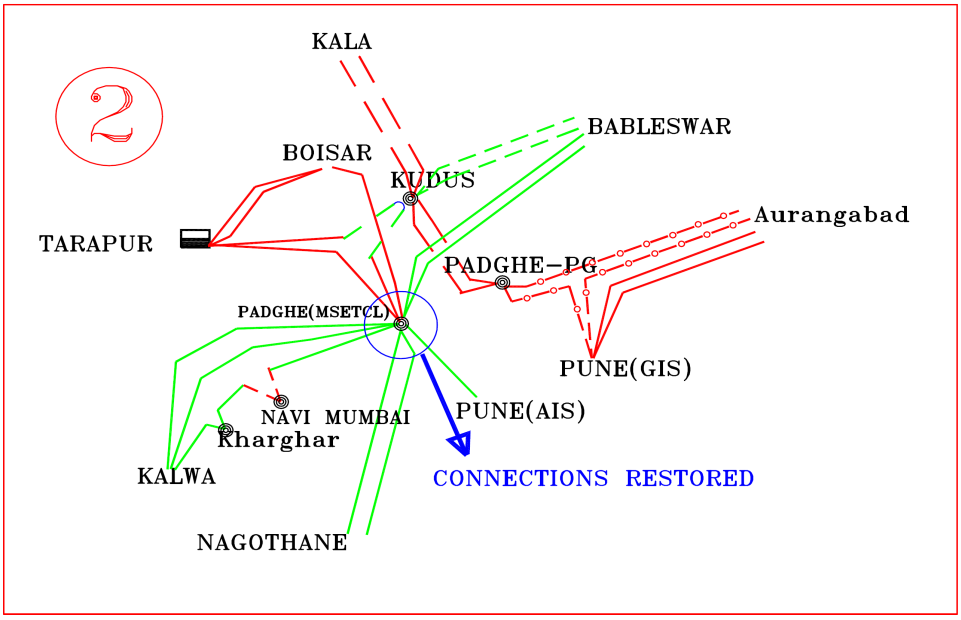
(ii) Connecting one ckt of Padghe (MSETCL) – Nagothane 400kV D/c line with Padghe (PG) – Padghe (MSETCL) (via Kudus) 400kV S/c line after bypassing Padghe (MSETCL) so as to form Padge (PG ) to Nagothane (MSETCL) 400 kV S/c line. This reduces the loading on Padghe (PG) – Padghe (MSETCL) 400 kV S/C line.




**B. Re-arrangement after commissioning of Kudus (MSETCL) 400 kV substation along with associated elements.**

(i) The interim rearrangement A to restored back so as to form Padgh(PG)-Kudus 400 kV D/C line, Padghe (MSETCL) – Nagothane 400kV line, Tarapur-Kudus 400 kV S/C line and Kudus – Padghe (MSETCL) 400kV line.

(ii) Bypassing the LILO of Tarapur – Padghe (MSETCL) 400kV S/c line at Kudus end so as to form Tarapur – Padghe (MSETCL) 400kV direct line. This reduces the loading on Kudus – Padghe (MSETCL) 400 kV S/C line.




The interim arrangement / rearrangement is to be implemented by MSETCL.

22.2. WRLDC representative stated that Tarapur- Boisar 400 kV D/C line being shorter in length as compared to Tarapur- Padghe(MSETCL) 400 kV D/C line, therefore the above interim arrangement may cause overloading of Tarapur- Boisar 400 kV D/C line. This needs to be looked into before finalizing any interim arrangement.

22.3. Director (SP&PA), CEA informed that LILO of both ckt. of Tarapur-Padghe(MSETCL) 400 kV D/C line at Kudus was proposed as a part STU plan by MSETCL in the 32nd SCM of WR. Subsequently, in the 36th SCM of WR, it was modified to LILO of one ckt. Tarapur-Padghe (MSETCL) 400 kV D/C line at Kudus to make available two nos. of 400 kV bays for termination of Vapi- Navi Mumbai 400 kV D/C at Kudus. With this, there is a direct 400 kV S/C link between Tarapur and Padghe. However, the concern raised by WRLDC needs to be looked into.

22.4. CE, MSETCL stated that from 3000 MVA, 765/400 kV Padghe(PG) substation only one 400 kV D/C line to kudus has been planned. Additional 400 kV outlets from Padghe (PG) to load centers, say Boisar, needs to be planned. Director (SP&PA), CEA informed that a 400 kV D/C quad line between Aurangabad and Boisar has already been planned and is under implementation. Further in the 32nd SCM of WR MSETCL has intimated that Padghe (PG)- Nalasopara 400 kV D/C quad line was proposed as a part of their STU plan, but no progress has been made in its implementation.

22.5. CTU stated that Aurangabad (PG)-Padghe 765 kV D/C line would provide a direct infeed from ISTS network to the major load centers in and around Kudus / Padghe region of Western Maharashtra. In view of delay in implementation of Kudus (MSETCL) 400 kV substation, the interim arrangement has been proposed to enable Maharastra to draw power from Padghe(PG) 765/400 kV substation.

22.6. After deliberations, the interim arrangement proposed was agreed to be implemented by MSETCL. The aspect of overloading on Tarapur-Boisar 400 kV D/C line would be further studied and changes required, if any, in the interim arrangement would be put in the next standing committee meeting.

## 23. Gadarwara STPS : Revision of Transmission System & LTA Quantum

23.1. Director (SP&PA), CEA stated that LTA was granted to Gadarwara STPP of NTPC with system strengthening in WR in the 36th Standing Committee Meeting of Western Region constituents / 18th Meeting on Connectivity and Long term Open Access applications of Western region held on 29.08.13 at NRPC, Delhi. In the 32nd meeting of the Empowered Committee on Transmission held on 06-02-2014, the transmission scheme was recommended for implementation through tariff based competitive bidding in two parts: Part (A) & Part (B) as detailed below.

**Part (A)**

- Gadarwara STPS – Jabalpur Pool 765kV D/c line
  *(As per interim arrangement, LILO of existing Seoni – Bina 765kV S/c line at Gadarwara STPP would be established. At a later date, LILO portion would be delinked from Seoni – Bina 765kV S/c line to restore the Seoni – Bina 765kV s/c direct, and the LILO portion would be extended to the Jabalpur 765/400kV Pooling Station to form the proposed Gadarwara STPS – Jabalpur Pool 765kV D/c line)*
- Gadarwara STPS – Pooling Station (near Warora) 765 kV D/c line
- Establishment of 2x1500 MVA, 765/400 Substations at Pooling Station (near Warora)
- LILO of both circuits of Wardha - Parli (PG) 400 kV D/c quad line at Pooling Station (near Warora).

**Part (B):**

- Pooling Station (near Warora) – Parli (new) 765 kV D/c line
- Parli (new) – Solapur 765 kV D/c line
- Establishment of 2x1500 MVA, 765/400 Substations at Parli (new)
- Parli (new) – Parli (PG) 400 kV D/c (Quad) line

23.2. Subsequently, in a meeting held at CEA on 12-01-2015 to discuss the phasing of transmission elements of the above transmission system, the following was decided:

- Entire power from Gadarwara STPS may be evacuated through Part A of the transmission system identified with Gadarwara STPS of NTPC.

- Part B of the Gadarwara STPS transmission system is now to be implemented as System Strengthening in Western Region (WRSS-XV) to facilitate dispersal of power beyond Warora pooling station.

23.3. Further, 2X80 MVAR switchable line reactor along with 500 ohm NGR at Warora Pool end of Parli (PG) – Warora Pool 400 kV D/c quad line (formed after LILO of Wardha-Parli(PG) 400 kV D/C quad line at Warora Pool ) was included in the scope of works through Amendment III dated 14.02.2105 to the RFP of Gadarwara (Part A). Due to LILO of Parli (PG) – Warora Pool 400 kV D/c line (quad) was without any reactor at Warora end.

23.4. NTPC vide letter dated 08-01-2015 has indicated revised LTA quantum of 1507.99 MW instead of earlier quantum of 1586.15MW. The revised quantum for beneficiaries is as given below:

CSPDCL: 60.32MW, MP: 754.00MW, Gujarat: 199.48MW, Maharashtra: 248.55MW, Goa: 9.95MW, DNH: 5.73MW, DD: 3.76MW, Unallocated: 226.20MW

Revised intimation for grant of LTA incorporating above modification i.e. LTA for Gadarwara to be made effective subject to commissioning of Part A of the transmission system as mentioned above was agreed in the 20th LTA meeting of WR constituents held on 17.02.2015 at POWERGRID.

23.5. Members agreed with changes made in the Gadarwara STPS transmission system

**24. LTA and Connectivity Application of NTPC Ltd. for Khargone TPP (2x660MW) and Connectivity Application of 2x660MW Dwarkesh Energy Ltd. in Madhya Pradesh**

24.1. Director (SP&PA), CEA stated that Connectivity and Long term Access application of M/s NTPC Ltd. for 2x660MW Khargone TPP and connectivity application of M/s Dwarkesh Energy Ltd (DEL) Torniya Thermal Power Project (2x660MW) both in Khandwa, Madhya Pradesh was discussed in the 16th Meeting of WR constituents regarding connectivity and Long Term Access held on 9th May 2012.

Khargone TPP has got WR constituents as its beneficiary with following allocation:

| | |
|---|---|
| Madhya Pradesh | : 622.14 MW |
| Chhattisgarh | : 49.77 MW |
| Gujrat | : 164.57 MW |
| Maharashtra | : 205.06 MW |
| Goa | : 8.21 MW |
| UT of DNH | : 4.73 MW |
| UT of DD | : 3.10 MW |
| Unallocated | : 186.61 MW |

The anticipated commissioning schedule as informed by NTPC was - U1: June 2019; U2: April 2020 and startup power requirement at 400kV level was tentatively by Oct'17. NTPC had requested connectivity at 400kV level via LILO of one circuit of Rajgarh – Khandwa 400kV D/c line( which passes very near to the generation project) in addition to the identified evacuation system which may be used for startup power. The LILO may be bypassed at Khargone TPP switchyard after commissioning of the identified evacuation system and may be utilized under contingency condition.

M/s DEL has applied only for connectivity and their beneficiaries are not known. The generation project has been delayed on account of coal block allocation issues and the anticipated schedule indicated is U1: Mar'19; U2: Sep'19. M/s DEL has agreed to submit the LTA application but no clear timeline has been committed.

In view of mismatch in the time schedule of Khargone TPP (and also its startup power requirement) and DEL TPP, the following transmission system has been proposed for the two generation project:

- **<u>Tr. System for Khargaon TPP (1320 MW)</u>**
  (i) LILO of one ckt of Rajgarh-Khandwa 400kV D/c line at Khargone TPP#
  (ii) Khargone TPP Switchyard – Khandwa pool 400kV D/c (Quad) line

- **<u>Tr. System for strengthening of WR associated with Khargaon TPP (1320 MW)</u>**
  (i) 765/400kV, 2x1500MVA pooling station at Khandwa pool
  (ii) Khandwa pool – Indore 765kV D/c line

Note: #The LILO shall be used for startup power. After commissioning of balance transmission system, the LILO would be bypassed at Khargone TPP switchyard and may be utilized only under contingency condition.

- **Tr. System for DEL TPP (1320 MW)**
  (i) DEL TPP Switchyard – Khandwa pool 400kV D/c (Quad) line
  (ii) Khandwa pool – Dhule 765kV D/c line
  (iii) Augmentation of 765/400kV, Khandwa pool substation by 1x1500MVA ICT

The transmission system associated with Khargone TPP needs to be taken up first for implementation and transmission system for M/s DEL shall be taken up upon receipt of LTA application.

- **WR- NR system strengthening**
  (i) Indore – Chittorgarh 765 kV D/C line

24.2. AGM, NTPC informed that the contract for EPC package for Khargone TPP has been awarded on 31st March 2015. The commissioning schedule of Unit #1 is November 2018 and Unit #2 is May 2019. The start-up power would be required by April 2018. Therefore, LILO of one ckt of Rajgarh-Khandwa 400kV D/c line at Khargone TPP needs to be implemented by April 2018 to meet the startup power requirement and subsequent commissioning activities. Khandwa pool- Indore 765 kV D/C line has proposed as system strengthening with Khargone TPS. As compared to this line Khandwa pool- Dhule 765 kV D/C line proposed with DEL TPP is shorter in length. He suggested that Khandwa pool- Dhule 765 kV D/C line may be taken up as system strengthening associated with Khargone TPP instead of the proposed Khandwa pool- Indore 765 kV D/C line as WR constituents were the beneficiaries of the project.

24.3. MPPTCL representative stated that Madhya Pradesh has got about 50% allocation from the Khargone TPP and they would like to draw their share of power directly from generation switchyard at 400 kV level.

24.4. CTU stated that there cannot be simultaneous interconnection of the generation project both with CTU and STU system. If MPPTCL directly wants to draw their share of power then one unit of Khargone TPP has to be isolated. NTPC clarified that MP has got 50% allocation in both the units therefore it was not possible to isolate one unit for Madhya Pradesh.

24.5. MPPTCL further state that the transmission system proposed with Khargone TPP is Khargaon TPP Switchyard – Khandwa pool 400kV D/c (Quad) line and Khandwa pool – Indore 765 kV D/C line. With commissioning of the project the LILO of Rajgarh-Khandwa 400 kV line at Khargone TPP would be removed and there would no 400 kV interconnections. The power from the project would be radially fed at Indore 765 kV substation as the Khandwa pool- Dhule 765 kV D/C line is proposed with DEL TPP whose commissioning schedule is still uncertain. MPPTCL suggested that in view of the uncertainty of Dwarkesh generation project , Khandwa pool- Dhule 765 kV D/C line may also be taken up for implementation as system strengthening in WR associated with Khargone TPP.

24.6. Director (SP&PA), CEA stated that if the Indore-Khandwa pool – Dhule 765 kV D/C line is taken up system strengthening in WR associated with Khargone TPP, it would strengthen the Indore-Vadodara-Dhule 765 kV S/C corridor. Also Khargone TPP has WR constituents as its beneficiary and the beneficiary of the Dwarkesh generation project was not known as it has applied only for connectivity, therefore Indore-Chittorgarh 765 kV D/C line proposed as WR- NR strengthening may not be associated with Khargone and Dwarkesh generation project.

24.7. After further deliberations, the following transmission system associated with Khargone TPP and Dwarkesh TPP was agreed:

**A. Transmission System for Khargaon TPP (1320 MW)**

(i) LILO of one ckt of Rajgarh-Khandwa 400kV D/c line at Khargone TPP#
(ii) Khargaon TPP Switchyard – Khandwa pool 400kV D/c (Quad) line

**B. Transmission System for strengthening of WR associated with Khargaon TPP (1320 MW)**

(i) 765/400kV, 2x1500MVA pooling station at Khandwa pool.
(ii) Khandwa pool – Indore 765kV D/c line.
(iii) Khandwa pool – Dhule 765 kV D/C line.

Note: #The LILO shall be used for startup power and commissioning activities requirement. After commissioning of balance transmission system, the LILO would be bypassed at Khargone generation switchyard and may be utilized only under contingency condition.

Transmission system under A is for connectivity for Khargone TPP and Transmission system under B is for LTA of Khargone TPP

**C. Transmission System for DEL TPP (1320 MW)**

(i) DEL TPP Switchyard – Khandwa pool 400kV D/c (Quad) line

Till date, DEL has applied only for connectivity and not for LTA. After receipt of LTA application from DEL, the additional transmission strengthening required for transfer of power would be identified.

**25. WR – NR Inter Regional Strengthening Scheme – Agenda by POWERGRID**

25.1. Director (SP&PA), CEA stated that POWERGRID has carried out a comprehensive study for assessing the requirement of additional transmission system keeping in view the existing allocation / LTA; LTA granted on the basis of target regions, firm PPAs & new LTA application submitted for transfer of power from various IPPs in Western Region. The total LTA quantum granted to NR from all the generation projects in WR and ER including the central sector allocation is about 27000MW (WR Projects: 15200 MW and ER projects: 11700 MW)

Additional requirement (other than already granted) of about 2000MW power transfer from WR to NR has been considered followed by additional PPA signed/LTA application from following generation projects in WR:

*Table-1*

| Sl No. | Generation Projects | Additional Allocation to NR (MW) | Date of commencement of PPA/LTA |
|---|---|---|---|
| 1 | TRN Energy Ltd. | 240 | 30-10-2016 |
| 2 | Shirpur Power Pvt. Ltd. | 35 | 01-02-2015 |
| 3 | MB Power (MP) Ltd. | 175 | 01-06-2015 |
| 4 | MB Power (MP) Ltd. | 169 | 30-10-2016 |
| 5 | KSK Mahanadi Power Company Ltd | 1000 | 30-10-2016 |
| 6 | DB Power, Chhattisgarh Ltd. | 235 | 30-11-2016 |
| 7 | Maruti Clean Coal & Power Ltd | 205 | 30-11-2016 |
| | **Sub-total** | **2059** | |

The following requirement of power transfer has been indicated from other new generation projects in WR:

*Table-2*

| Sl. No. | Generation Projects | Capacity (MW) | Remarks |
|---|---|---|---|
| 1 | KhargaonTPP(NTPC) | 1320 | Applied Connectivity & LTA for 1244 MW to WR |
| 2 | Surguja Power Pvt Ltd. (IPP) | 600 | Applied for connectivity for 490 MW, LTA application to be submitted |
| 3 | Dwarkesh Energy Ltd. (IPP) | 1320 | Applied for connectivity(for 1240.8 MW, LTA application to be submitted |
| 4 | LancoVidarbha Thermal Power Pvt. Ltd. (IPP) | 1320 | Granted connectivity for 1320 MW |
| 5 | Jimbhuvish Power Generation Pvt. Ltd. (IPP) | 600 | Applied for connectivity for 600 MW |
| | **Sub-total** | **5160** | |

Out of these new projects of 5160MW capacity, about 1244MW from Khargaon TPP is proposed to be allocated to WR. Out of the balance 3916MW, it has been assumed that at least half of the quantum i.e. 2000MW shall be allocated to NR. Accordingly, total of about 4000MW additional power needs to be transferred from WR to NR. With this, the power transfer requirement from WR and ER projects to NR is about 31000MW (WR Projects: 19200 MW and ER projects: 11700 MW)

The studies have been carried out with varying availabilities of renewable generation i.e, Low Renewables (10%) and High Renewables (Solar: 80%, Wind: 80%). From the study report, it emerges that in order to cater to power transfer requirement of generation projects in WR mentioned in Tables 1 and 2 to NR, the proposed WR-NR corridor (Indore-Chittorgarh 765kV D/c line) is needed. However, even with this corridor, loading on Agra – Gwalior 765kV 2xS/c line and on Jabalpur – Orai 765kV D/c line crosses 3250MW (2430MW under n-1) and 3100MW respectively under high renewable condition. Accordingly, the additional corridor viz. Vindhyachal Pool-

Allahabad-Lucknow 765kV D/c corridor is essential to take care of varying availability of Renewable generation in Gujarat (WR).

Accordingly, the following transmission system has been proposed by POWERGRID:

**I. <u>WR-NR Strengthening System- Part-A</u>**

(i) Indore(WR) – Chittorgarh(NR) 765kV D/c line

**II. <u>WR-NR Strengthening System- Part-B</u>**

(ii) Vindhyachal Pool (WR) – Allahabad (NR) 765kV D/c line
(iii) LILO of Fatehpur – Sasaram 765kV S/c line at Allahabad
(iv) Allahabad - Lucknow 765kV D/c line
(v) Bareilly – Muzaffarnagar 765kV D/c line
(vi) Muzaffarnagar – Aligarh 765kV D/c line
(vii) LILO of Meerut – Bhiwani 765kV S/c line at Muzzaffarnagar
(viii) Muzaffarnagar – Meerut (New) 400kV D/c (Quad) line
(ix) Muzaffarnagar – Shamali (UP) 400kV D/c (Quad) line

25.2. Director (SP&PA), CEA further stated that Indore (WR) – Chittorgarh (NR) 765kV D/c line between WR-NR was also proposed in the 20th LTA meeting of WR constituents held on 17.02.2015. CEA has conveyed their views on the proposed corridor to CTU pointing out that:

(i) 2700 MW LTA for NR surrendered by CSPTrdCL could be granted to the IPPs who have sought 2000 MW of additional LTA for NR and

(ii) The already planned interconnection between WR-NR was adequate to handle additional 4000 MW import to NR and

(iii) Additional system strengthening requirements between WR- NR or WR-SR may only be taken up after receipt of the LTA application from the IPP generation project/ additional import requirements by the beneficiaries, if required.

25.3. CTU stated that 2700 MW LTA for NR from the IPPs located in Chhattishgarh surrendered by CSPTrdCL is subject to payment of relinquishment charges. CSPTrdCL has reduced their share of power from the IPPs from 35% to 5-7.5% and have also transferred the LTA quantum to the respective IPPs. LTA rights are non-transferable, therefore all these issues needs to be settled before allocating the LTA quantum surrendered by CSPTrdCL to the IPPs who have sought additional LTA for NR.

25.4. AGM, PGCIL stated that the quantum of power purchase agreements signed by IPPs with beneficiaries in NR exceeds the quantum of LTA taken by these IPPs for NR by 2000 MW and they have sought additional LTA for NR. Even if we assume that LTA of CSPTrdCL transferred to respective IPPs is allocated to the IPPs who have sought additional LTA for NR, then also, only 700 MW would be available to them against the 2000 MW LTA sought. A new corridor still needs to be planned for the balance 1300 MW LTA sought for NR.

25.5. CSPTrdCL representative stated that they have already executed the power purchase agreement for 5% of power with all the IPPs except for Lanco Power Ltd. (Unit 2, 3 &4).

25.6. SE, WRPC enquired whether the IPPs have given their acceptance to the LTA quantum transferred by CSPTrdCL to the respective IPPs, consequent to the change in policy by Chhattisgarh Govt. of taking only 5-7.5% of power from the IPPs. CSPTrdCL representative stated that the only few IPPs have shown their willingness and they would take up with other IPPs also for giving their acceptance.

25.7. Director(SP&PA), CEA said that comprehensive studies has been analysed and we have the following observation on the studies done by POWERGRID:

(i) The new generation project of 4000 MW in WR, for whom LTA of 2000 MW has been assumed for NR, has only applied for connectivity and they are yet to apply for LTA. The corridor ( whether WR-SR or WR-NR) needs to be evolved based on the regions/ target regions specified in the LTA application of the generation project

(ii) In the high renewables cases, increased dispatches from renewable energy sources in Rajasthan also needs to be considered. In the studies high dispatch has been considered only from renewable energy sources in Gujarat.

(iii) Bishwanath Chariyali- Agra HVDC bipole line has been kept out of service in the studies which need not be the case as in the 2018-19 time frame power from hydro generation projects in Bhutan would be available for evacuation through HVDC line.

(iv) Along with LTA application of Barethi STPS project of M/s NTPC, Barethi STPS - Etawah 765 kV D/C line has been proposed, which again is a 765 kV link between WR and NR. Barethi STPS - Etawah 765 kV D/C line has not been considered in the proposed WR-NR system strengthening scheme.

(v) In the 36th standing committee meeting of NR held on 13.07.2015, NR constituents have agreed only with part system proposed under **Part-B** of the WR-NR transmission system strengthening scheme.

Therefore, it is required that the studies for the proposed WR – NR Inter Regional Strengthening Scheme needs to be relooked and studied again incorporating the observations made.

25.8. CTU stated that the LTA intimation to IPPs, who have sought addition LTA for NR, has already been issued along with the Indore- Chittorgarh 765 kV D/C line based on the deliberations held in the 20th LTA meeting of WR constituents held on 17.02.2015. In case of revision of the system, the LTA intimation also needs to be revised. CTU further stated that as per CERC regulation 2009, LTA applications are to be processed in time bound manner, hence the new WR-NR corridor needs to be finalised at the earliest

25.9. Member (Power System), CEA stated that in the 36th standing committee meeting of NR held on 13.07.2015, NR constituents have agreed only for the three elements namely, Indore – Chittorgarh 765 kV D/C line, Vinhyachal pool (WR) – Allahabad (NR) 765 kV D/C and LILO of Fatehpur – Sasaram 765kV S/c line at Allahabad out

of the total nine nos. of transmission elements proposed under the WR-NR transmission system strengthening scheme. In view of the observations made, revised studies needs to be carried out jointly by CEA and CTU.

**26. Interconnection of 1150 kV National Test Station with Satna#3 Line emanating from Bina (PG) substation – Agenda by POWERGRID**

26.1. Director (SP&PA), CEA stated that POWERGRID in collaboration with Indian equipment manufacturers has constructed the 1150kV National Test Station comprising 1000 MVA 1150/400/33 kV auto transformer (bank of single phase 333 MVA), 1150kV and 400kV Bays, Single Circuit (S/C) line of approx. 1.1 km and Double Circuit (D/C) line of approx. 0.8km at Bina, Madhya Pradesh. This project was executed under Public-Private-Partnership (PPP) model with POWERGRID providing the engineering support and basic infrastructure by constructing the test bays and test line whereas equipment and other hardware have been designed and developed by 35 Indian Manufacturers at their own cost and provided for field operation at test station to gain operational experience.

Further to installation of 1150kV equipment's and construction of 1150kV test lines, 1150kV Bay-I, 1150kV S/C line and 1150kV D/C line has been progressively charged from 400kV Bina bus through a 400kV Circuit Breaker, to 1150kV voltage level through 3-phase bank of 1-phase 400/1150kV Auto Transformers. Construction and installation activities in the Bay-II are nearing completion.

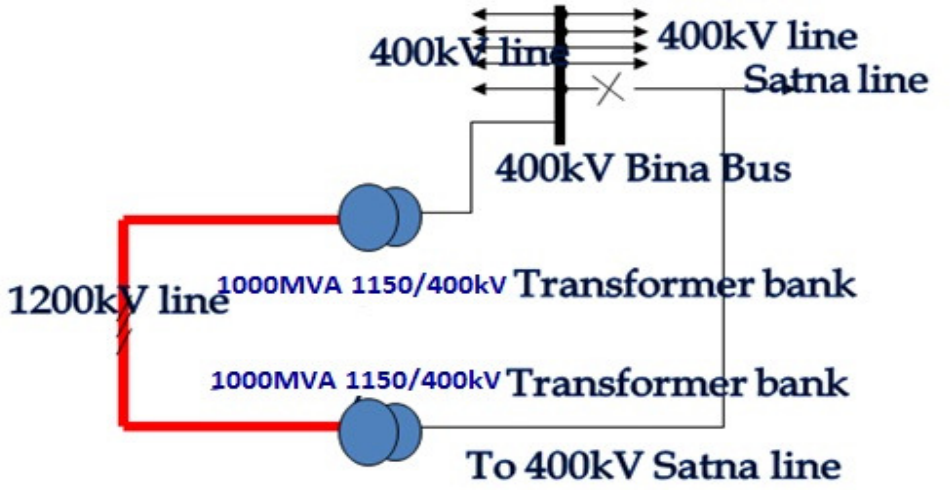



**Figure: 1150kV Test Station schematic**

26.2. Further, POWERGRID has given a proposal to experiment the power flow through the test station by interconnection of test station through Bina (PG) – Satna#3 line as shown below:

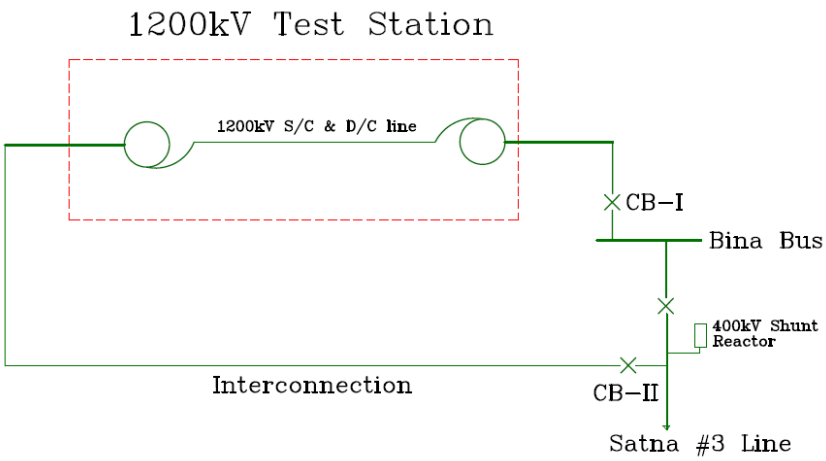



**Figure: Interconnection schematic**

1150kV equipment's in the Test Station shall be charged to their rated voltage i.e. 1150kV through closing of 400kV Circuit Breaker (CB - I) in the Bina Bus. To facilitate power flow through the test station, Bina (PG)-Satna#3 400 kV S/C line would be connected to the test station by closing the Circuit Breaker (CB-II) at the 400kV side of the test station. Bina (PG)-Satna#3 400 kV S/C line would be isolated from Bina Bus by opening the existing line isolator of Satna#3 line. The line reactor (63MVAR) connected to Satna#3line shall be thus operated as a bus reactor if necessary.

Load Flow studies carried out by POWERGRID shows that the power flow in the Satna line connection through 1150kV test station is about 162MW and power flows in remaining lines (Satna # 1, 2 & 4 lines) are about 284MW in each ckt.

26.3. The committee observed that at present there are four nos. of 400 kV lines between Bina and Satna 400 kV substation of POWERGRID and out of these four ckts one ckt would be connected through the test station. Even in case of outage of 400 kV line3 to satna other three circuits to satna were adequate from power flow point of view. As such the POWERGRID proposal to experiment the power flow through the test station by interconnection of test station through Bina (PG) – Satna#3 line was agreed by the members. It was also agreed that the switching sequence for the proposal needs to be finalized in consultation with POSOCO/WLDC/WRPC.

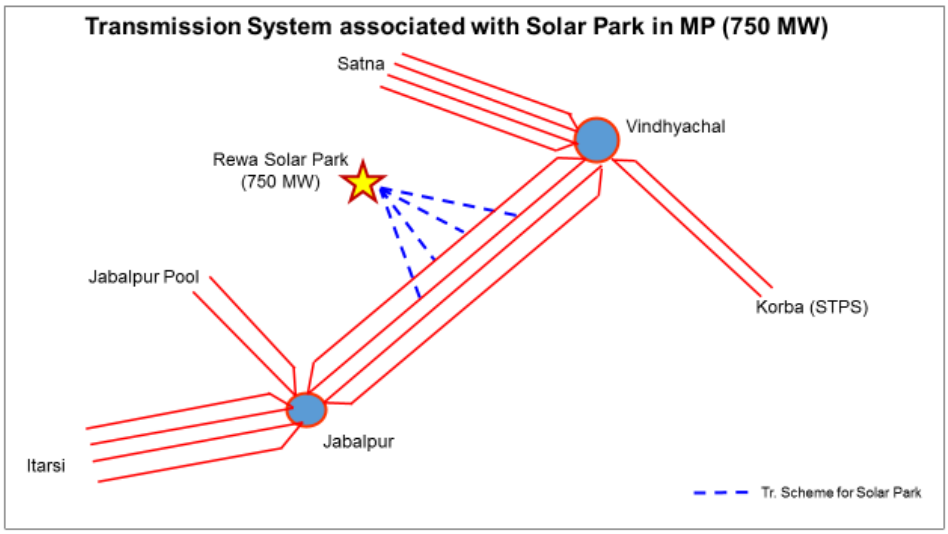
## 27. Transmission system for Ultra Mega Solar Power Parks in Rewa, MP (750 MW)

27.1. Chief Engineer (SP&PA), CEA informed that this item was not circulated as a part of the agenda for the meeting as the solar power developer has not applied for Connectivity/Long Term Access (LTA) to the nodal agency i.e., CTU. Ministry of Power vide their dated 16.07.2015 has requested to finalize the transmission scheme of ultra mega solar power park Rewa (750 MW) & Neemuch & Agar (750 MW) in Madhya Pradesh in the ensuing Standing Committee meeting of Western Region in view of the short construction period of about 12-15 months for solar parks. Accordingly, agenda for Transmission system for Ultra Mega Solar Power Parks in Rewa, MP (750 MW) is placed for discussion and finalization by the WR constituents as good progress has been made by this project.

27.2. Government of India has taken initiative for development of Ultra Mega Solar Power parks in various parts of the country. As part of above initiative, an ultra-mega solar

Power park of 750 MW capacity is being developed by JVC of SECI & MP Urja Vikas Nigam Ltd (MPUVNL) in Rewa district of Madhya Pradesh. Power from above project is envisaged to be transferred to its various beneficiaries including Madhya Pradesh. As per the available information, Rewa Ultra Mega Solar Power Park (750 MW) is scheduled for commissioning in Aug'16. The following transmission system has been proposed by POWERGRID for Rewa Ultra Mega Solar park (750MW).

(i) Establishment of 400/220kV, 3x500 MVA Pooling station at Rewa
(ii) LILO of Vindhyachal – Jabalpur 400kV 2nd D/c line (circuit-3&4) at Rewa Pooling Station
(iii) 1x125 MVAr bus reactor at Rewa Pooling Station
(iv) 6 Nos. 220kV Line bays at Rewa Pooling station (for its interconnection with solar park)




The estimated cost of the proposed transmission scheme is about Rs 360 crores.

27.3. MPPTCL representative informed that they have first right of refusal for 30% of the power in Rewa solar park.

27.4. POWERGRID informed that Ministry of Power, vide letter dated 08.01.15 assigned POWERGRID to take up the construction of transmission lines including pooling station from nine (9) solar parks being set up in seven(7) states including Rewa solar park in Madhya Pradesh on compressed time schedule. For evacuation of power from Rewa solar park, it is proposed to establish a 400/220kV Pooling station at Rewa, with 3x500 MVA transformation capacity and its interconnection through LILO of 400 kV Vindhyachal-Jabalpur D/c line. Further, to address reactive power issues especially during low / no generation periods like in evening/night hours, 1x125 MVAr Bus reactor at 400kV Rewa Pool is proposed. Considering short gestation period of solar park, land has to be identified in contiguous to solar power park for development of Pooling Station & allotted to POWERGRID by Government of MP/Solar park developer to facilitate timely implementation of ISTS scheme matching with the commissioning schedule of solar parks.

27.5. POWERGRID confirmed that they are yet to receive the Connectivity/Long Term Access (LTA) application from Govt. of MP/solar park developer. Regarding Connectivity/LTA application, POWERGRID informed that they have already

requested MNRE to impress upon the solar park developer to apply for connectivity/LTA to CTU for above solar parks at the earliest.

27.6. Director (SP&PA), CEA said that the above evacuation system for Rewa ultra mega solar park has been proposed by POWERGRID assuming that the entire power would be evacuated through interstate transmission system. The LTA application of the project developer specifies the beneficiary of the project and with LTA application the evacuation pattern from the project becomes clear, whether it is entirely through InterSTS or IntraSTS or through both inter and intra STS. The transmission system needs to be finalized after ascertaining the evacuation requirements (interstate/intrastate/or both).

27.7. After deliberation, the transmission system for Rewa solar park was agreed in principle by the members with the assumption that entire power would be evacuated through ISTS. The implementation to be taken up only after receipt of the LTA application from the Rewa Solar park developer. In case Madhya Pradesh take their share of 30% power from Rewa Solar park directly into their intrastate (MPPTCL) network by building the transmission system rather than evacuating the entire power into ISTS and then absorbing into their intra state system, in that case the transmission system for Rewa solar park needs to be revised.

**28. Open Access Meeting.**

28.1. The minutes of the 21st meeting on Connectivity, Open Access (Medium term and Long term) applications in Western Region is being issued separately by POWERGRID.

The meeting ended with thanks to the chair

**Annexure -I**

**List of Participants during the 38th Meeting of Standing Committee of Power System Planning in WR held on 17-07-2015 at NRPC, Katwaria Sarai, New Delhi.**

| S.No. | Name (S/Sh) | Designation | Contact No | E-mail |
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| 34. | | | | |

## Status of TBCB Tr. Projects

**Annexure II**

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| 1. | Scheme for enabling import of NER/ER surplus by NR | **PFC**<br>ENICL(Sterlite Technologies Ltd)<br><br>**Milestones :**<br>(i) LOI place on 7.1.2010,<br>(ii) SPV acquired on 31.3.2010<br>(iii) Trans. license received on 4.11.2010<br>(iv) Approval u/s 164 received on 21.6.2011,<br>(v) Tariff adoption on 2.11.2010<br><br>Original COD: March 2013 | (i) Bongaigaon-Siliguri 400 kV Quad D/C | **Line Commissioned in 11/2014** |
| | | | (ii) Purnea-Biharsharif 400 kV D/C Quad D/C | **Line Commissioned in 9/2013** |
| 2. | System Strengthening in NR for import of power from North Karanpura and other projects outside NR and System Strengthening in WR for import of power from North Karanpura and other projects outside Western Region and also for projects within Western Region. | REC<br><br>NKTCL (Reliance Power Transmission Company Ltd)<br><br>**Milestones :**<br>(i) SPV acquired by Reliance on 20-05-2010 (Effective date)<br>(ii) Approval u/s 164 received on 12.08.2013. | 1. Sipat/Korba (Pooling) –Seoni<br>2. Lucknow-Bareilly<br>3. Bareilly-Meerut<br>4. Agra-Gurgaon<br>5. Gurgaon-Gurgaon (PG)<br>6. Gurgaon S/S | Matter was in CERC for revision of tariff and extension of date of commissioning.<br>NKTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013. Appellate Tribunal has given final judgment on 2.12.13 setting aside CERC order and allowing the appeal. NKTCL is initiating steps for implementing of order. The judgment of Appellate Tribunal accepts delay in clearance under section-164 as force majeure. According NKTCL have requested MoP to extend the validity of section 68 clearance vide their letter dtd 14.1.2014<br>Beneficiaries have appealed SC.<br><br>**Work Yet to start.** |
| 3. | Talcher-II Augmentation System | REC<br><br>TTCL(Reliance Power Transmission Company Ltd.)<br><br>**Milestones :**<br>(i) LOI issued on 18-12-2009.<br>(ii) SPV acquired by Reliance on 27-04-2010 (Effective date). | (i)Talcher II- Rourkela 400 kV D/C Quad line<br><br>(ii)Talcher II – Behrampur 400 kV D/C line<br><br>(iii)Behrampur-Gazuwaka 400 kV D/C line<br><br>(iv)400/220 kV, 2x315 MVA Behrampur substation | Matter was in CERC for revision of tariff and extension of date of commissioning.<br>TTCL filed an appeal in appellate tribunal challenging CERC order of 9.5.2013. Appellate Tribunal has given final judgment on 2.12.13 setting aside CERC order and allowing the appeal. TTCL is initiating steps for implementing of order. The judgment of Appellate Tribunal accepts delay in clearance under section-164 as force majeure. According TTCL have requested MoP to extend the validity of section 68 clearance vide their letter dtd 14.1.2014.<br>Beneficiaries have appealed SC.<br><br>**Work yet to start.** |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| 4. | Transmission System Associated with Krishnapattnam UMPP-Synchronous interconnection between SR and WR (Part-B) | REC<br><br>RSTCL(Consortium of Patel-Simplex- BSTranscomm)<br><br>**Milestones:**<br>(i) LOI placed on 16.12.2010<br>(ii) SPV acquired on 7.1.2011 Trans. license received on 24.8.2011<br>(iii) Approval u/s 164 received on 29.8.2011.<br>(iv) Tariff adoption on 12.8.2011<br>(v) Original COD : Jan 2014 | (i) Raichur-Sholapur 765 kV S/C line-1-208 ckm | **Commissioned on 30.6.2014** |
| 5. | System strengthening common for WR and NR | PFC<br><br>JTCL(Sterlite Grid)<br><br>**Milestones:**<br>(i) LOI placed on 31.01.2011<br>(ii) Special Purpose Vehicle acquired on 31.03.2011<br>(iii) Scheduled Completion Date is 31.03.2014.<br>(iv) Transmission License granted on 12.10.2011.<br>(v) Tariff adoption approval on 28.10.2011<br>(vi) Clearance under Section 164 : received on 12.07.13 | (i) Dhramjaygarh-Jabalpur 765 kV D/C 765 kV lines | **Length-760ckm,**<br>**Locations-992,**<br>**Foundation-992,**<br>**Tower Erection-971,**<br>**Stringing completed-706 ckm,**<br><br>Progress affected due to pending forest Clearance(284 Ha in MP and 114Ha in Chhattisgarh) and Severe row problem.<br>JTCL informed, stage-II clearance has been issued in MP and is pending in Chhattisgarh.<br><br>**Line expected to be commissioned by 08/15** |
| | | | (ii) Jabalpur-Bina 765 kV S/C line | **Line commissioned in 06/2015** |
| 6. | System strengthening for WR | PFC<br><br>BDTCL(Sterlite Grid)<br><br>**Milestones:**<br>(i) LOI placed on 19.1.2011<br>(ii) SPV acquired on 31.3.2011<br>(iii) Trans. license received on 12.10.2011<br>(iv) Approval u/s 164 received on29.01.2013<br>(v) Tariff adoption on28.10.2011<br>Original COD : Mar2014 | (i) Jabalpur-Bhopal 765 kV S/C line | **Line commissioned in 06/2015** |
| | | | (ii) Bhopal-Indore 765 kV S/C line | **Line commissioned in 10/14** |
| | | | (iii) 2x1500 MVA 765/400 kV substation at Bhopal | **Commissioned in 7/2014** |
| | | | (iv) Bhopal-Bhopal (MPPTCL) 400 kV D/c quad line. | **Commissioned in 7/2014** |
| | | | (v) Aurangabad-Dhule 765 kV S/C line | **Line commissioned in 10/14** |
| | | | (vi) Dhule-Vadodara 765 kV S/C line | **Commissioned in June 2015** |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| | | | (vii) 2x1500 MVA, 765/400 kV substation at Dhule | **Commissioned in June 2015** |
| | | | (viii) Dhule - Dhule(Msetcl)400 kV D/C Line | **Line ready for commissioning since 9/2014 (400 kV bays by MSETCL at Dhule s/s is under construction and schedule for completion by Mar 2015)** |
| 7. | Transmission system associated with IPPs of Nagapattinam/ Cuddalore Area- Package A | PFC<br><br>PGCIL<br><br>**Milestones:**<br>(i) SPV acquired on 29/03/2012<br>(ii) Tr. License issued on 15.7.2013<br>(iii) Tariff adoption by CERC on 9.5.2013.<br>(iii) Clearance U/s 164 received on 9.12.2013.<br>(iv) Scheduled COD 29.3.2015 (30months effective from 20.6.13, date of grant of license)<br><br>Work awarded on 16.5.2014 to M/s Gammon and M/s IComm | (i) Nagapattinam Pooling Station-Salem 765 kV D/C line - 200ckm | **Length- 534 ckm,<br>Locations-543,<br>Foundation-355,<br>Tower Erection-119,<br>Stringing completed-36ckm** |
| | | | ( ii) Salem-Madhugiri 765 kV S/C line –217km | **Length-244ckm,<br>Locations-647,<br>Foundation-587,<br>Tower Erection-452,<br>Stringing completed-71 ckm** |
| 8. | Transmission System associated with IPPs of Vemagiri Area-Package A | REC<br><br>PGCIL<br><br>**Milestones:**<br>SPV acquired on 18/04/2012 | (i) Vemagiri Pooling Station–Khammam 765 kV 1xD/C (1st ckt.) line.<br>(ii) Khamam-Hyderabad 765 kV 1xD/C (1st ckt.) line. | Put on hold as commissioning of the associated generating station is delayed due to non-availability of gas.<br>**The scheme is under consideration of CERC for the decision of its implementation.** |
| 9. | Transmission System required for evacuation of power from Kudgi TPS (3x800 MW in Phase-I) of NTPC Limited. | REC<br>KudgiTCL (M/s L&T Infrastructure Development Projects Limited)<br><br>**Milestones:**<br>(i) LOI placed on31/07/13<br>(ii) SPV acquired on 30.8.2013<br>(iii) PG submitted on 22.8.2013<br>(iv) Tr. License application filed in CERC on2.9.2013 and application for tariff adoption filed on 2.9.2013. Tr. License issued on 7.1.2014 and tariff adoption by CERC on 8.1.2014.<br>(v) Clearance U/s 164 – issued 24.4.2014<br>(vi) Awarded EPC contract 7.1.2014<br>(vii) Detailed contract signed on 24.2.2014<br>(viii) Financial closure on 24.2.2014 | (i)Kudgi TPS – Narendra 400 kV 2xD/C line (I&II) | **Construction of line completed on 27.03.2015** |
| | | | (ii)Narendra (New) – Madhugiri 765 kV D/C line | **Length-760ckm,<br>Locations-867,<br>Foundation-723,<br>Tower Erection-600,<br>Stringing completed-222ckm,<br><br>Scheduled completion : 31.12.2015 (28 months)** |
| | | | (iii)Madhugiri – Bidadi 400 kVD/C Line | **Length-190ckm,<br>Locations-235,<br>Foundation-183,<br>Tower Erection-134,<br>Stringing completed-12 ckm,<br><br>Scheduled completion : 31.12.2015(28 months)** |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| 10. | Transmission system for system strengthening in SR for import of power from ER | REC<br><br>Vizag Transmission Limited<br><br>**Milestones:**<br>(i) LOI placed on 31.07.13<br>(ii) Special Purpose Vehicle acquired on 30.8.2013<br>(iii) Tr. License issued on 8/1/2014 and tariff adoption by CERC on 23/1/2014<br>(iv) Clearance U/s 164 – received on 21.05.2014<br>(v) Schedule COD 30.8.2016<br><br>Work awarded on 28.2.2014 to Tata Proj. Icomm, L&T and M/s Gammon | (i) Srikakulam PP – Vemagiri-II Pooling Station 765 kV D/c line-334km | **Length- 668ckm,**<br>**Locations-877,**<br>**Foundation-313,**<br>**Tower Erection-91,**<br>**Stringing completed-0ckm,** |
| | | | (ii) Khammam(existing) – Nagarjuna Sagar 400 kV D/c line-145km | **Length- 292ckm,**<br>**Locations-400,**<br>**Foundation-282,**<br>**Tower Erection-189,**<br>**Stringing completed- 76 ckm,** |
| 11 | Transmission System for Patran 400kV S/S | PFC<br><br>PTCL(Techno Electric and Engineering Company Ltd.)<br><br>**Milestones:**<br>(i) LOI placed on 17.09.2013<br>(ii) SPVacquired on 13.11.2013<br>(iii) Application for adoption of tariff filed in CERC. Hearing on 18.03.2014.<br>(iv) Application for grant of License filed in CERC. Hearing on 18.03.2014<br>(v) Clearance under Section 164 : Request not received in MoP<br>(vi) Scheduled COD: 13.05.2016. | (i) LILO of both circuits of Patiala-Kaithal 400kV D/c at Patran (Triple snow Bird Conductor) | Scheduled date: March 16 |
| | | | (ii) 2x500 MVA, 400/220 kV Substation at Patran | Land 0%<br>Civil work 0%<br>Equip Supply 0%<br>Equip. Erection 0%<br>Scheduled date: March 16 |
| 12 | Eastern Region System Strengthening Scheme-VI | PFC<br><br>DMTCL (Essel Infraprojects Ltd.)<br><br>**Milestones:**<br>(i) LOI placed on 17.10.2013<br>Special Purpose Vehicle acquired on 10.12.2013<br>(ii) Tariff adoption approval issued by CERC on 20.5.2014<br>Transmission license received on 30.5.2014<br>(iii) Clearance u/s 164: received in 4/9/2014.<br><br>**Scheduled COD: 01.07.2016.** | (i) 2x500 MVA, 400/220 kV GIS Substation at Darbhanga with space for future extension (1x500 MVA) | Land 100%<br>Civil work 12%<br>Equip Supply 0%<br>Equip. Erection 0%<br>Scheduled date: June 16 |
| | | | (ii) 2x200 MVA, 400/132 kV GIS Substation at Mothihari with space for future extension (1x200 MVA) | Land 100%<br>Civil work 7%<br>Equip Supply 0%<br>Equip. Erection 0%<br>Schedule – June -16 |
| | | | (iii) Muzaffarpur(PG)-Darbhanga 400 kV D/c line with triple snowbird conductor | Loc 152<br>Fdn 209<br>TE 97<br>STG 0 KM<br>Scheduled : August - 16 |
| | | | (iv) LILO of Barh – Gorakhpur 400 kV D/c line at Mothihari, 400kV 2xD/C quad | Length - 52<br>Loc 209<br>Fdn 97<br>TE 7<br>STG 0 KM |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| 13 | Part ATS for RAPP U-7&8 in Rajasthan | PFC<br><br>RAPPTCL(Sterlite Grid Ltd)<br><br>Milestones:<br>(i) LOI placed on 17/09/13<br>(ii) Special Purpose Vehicle acquired on 12/03/2014<br>(iii) Scheduled COD : 28.02.2016.<br>(iv) Clearance under Section 164 : Request not received in MoP | (i) RAPP - Shujalpur 400kV D/C line | Engg work started and EPC Contract awarded. work expected to start by 11/2014. Forest proposal (30 ha) has been initiated.<br>Length – 310 km<br>Loc 524<br>Fdn 490<br>TE 433<br>Stg 187 ckm<br>Scheduled: Nov -15 |
| 14 | ATS of Unchahar TPS | REC<br><br>UnchaharTCL(PGCIL)<br><br>**Milestones:**<br>(i) LOI placed on 14/02/14.<br>(ii) SPV acquired on 24/03/2014.<br>(iii) Transmission license granted<br>(iv) Tariff charged adopted by CERC and approval recd on 3.7.2014<br>(v) Clearance under Section 164: Newspaper/Gazette publication completed, Application submitted to CEA/MoP is under process.<br><br>**Scheduled completion: 23/09/2016** | (i) Unchahar - Fatehpur400 kV D/C line | Length – 60 Kms<br>Scheduled : Sept -16 |
| 15 | Eastern Region System Strengthening Scheme-VII | PFC<br><br>PKTCL (Sterlite Grid Ltd.)<br><br>**Milestones:**<br>(i) LOI placed on 17.09.2013<br>(ii) Special Purpose Vehicle acquired on 09.12.2013<br>(iii) Application for adoption of tariff filed in CERC. Hearing on 27.02.2014.<br>(iv) Application for grant of License filed in CERC. Hearing on 27.02.2014.<br>(v) Clearance under Section 164 : Request not received in MoP<br>(vi) **Scheduled COD: 09.03.16.** | (ii) Purulia PSP(WB) – Ranchi (PG) 400 kV D/C line<br><br>(iii) Chaibasa – Kharagpur 400 kV D/C line | **Length – 370 kms**<br>**Scheduled: April – 16**<br><br>Loc 421<br>Fdn 294<br>TE 231<br>Stg 13 ckm<br>Scheduled: March -16 |
| 16. | NR System strengthening Scheme-NRSS-XXXI(Part-A) | REC<br><br>PGCIL<br><br>**Milestones:**<br>(i) LOI placed on 26/02/14.<br>(ii) Special Purpose Vehicle | (i) 7x105 MVA (1 phase), 400/220 kV GIS at Kala amb<br><br>(ii) LILO of both ckt of Karcham Wangtoo-Abdullapur 400 kV | **S/s package awarded to siemens on Aug 2014**<br><br>Length – 6 kms<br>Loc 11<br>Fdn 11 |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| | | acquired on 12/05/2014.<br>(iii) Transmission license granted<br>(iv) Tariff charges adopted CERC<br>(v) Clearance under Section 164 : is under process will be applied after finalisation of land for s/s which shall be finalised by Dec2014.<br><br>(vi) **Scheduled COD : 12/07/2017** | D/c line at Kala Amb(on M/C tower)<br><br>(iii) 40% series compensation on 400 kV Karcham Wangtoo – Kala Amb D/C line at Kala Amb end | TE 11<br>Stg 6 ckm<br>Scheduled: Aug -15 |
| 17. | Northern Region System Strengthening Scheme, NRSS-XXXI (Part-B) | REC<br><br>M/s Essel Infraprojects Ltd<br><br>**Milestones:**<br>(i) LOI placed on 26/02/14.<br>(ii) SPV acquired on 12/05/2014.<br>(iii) Transmission license application filed in CERC on 13/05/14.<br>(iv) Tariff adoption by CERC: under process in CERC for adoption.<br>(v) Clearance under Section 164 : submitted in MoP in 9/2014<br>(vi) **Scheduled completion : 12/09/2016** | (i) Kurukshetra-Malerkotla 400 kV D/C line<br><br>(ii) Malerkotla-Amritsar 400 kV D/C line | **Length – 278kms**<br>**Loc 375**<br>**Fdn 215**<br>**TE 53**<br>**Stg 2 km**<br>**Schedule : Sept -16**<br><br>**Length – 298kms**<br>**Loc 412**<br>**Fdn 168**<br>**TE 55**<br>**Stg 0 km**<br>**Schedule : Sept -16** |
| 18. | Northern Regional System Strengthening Scheme, NRSS-XXIX | REC<br><br>Sterlite Technologies Ltd.<br><br>**Milestones:**<br>The LoI has been issued on 23.05.2014. | (i) Jullandhar – Samba 400 kV D/C line<br><br>(ii) Samba – Amargarh 400 kV D/C line<br><br>(iii) GIS Sub- station at Amargarh 400/220 kV S/s.<br><br>(iv) LILO of both circuit of Uri – Wagoora Line 400 kV D/C line. | **Loc 270**<br>**Fdn 356**<br>**TE 188**<br>**Stg 126 km**<br><br>**Length – 574 kms**<br><br>Land 6%<br>Civil work 7%<br>Equip Supply 0%<br>Equip. Erection 0%<br><br>**Length -6 kms**<br><br>**Scheduled completion** : 05/08/18 |
| 19. | Transmission System associated with DGEN TPS (1200 MW) of Torrent Power Ltd. | PFC<br><br>M/s Instalaciones Inabensa, S.A. Spain<br><br>**Milestones:**<br>(i) LoI issued on 19.05.2014<br>(ii) **Approval under section 68 on 30.01.2014.** | (i) DGEN TPS – Vadodara 400 kV D/C, Twin Moose line.<br>(ii) Navsari – Bhestan 220 kV D/C line | Work was awarded to MS. Instalaciones |

| S.N. | Name of the Project | BPC / Implementing Agency / Milestones | Scope of works | Current Status |
|---|---|---|---|---|
| 20. | Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part-A) | REC<br><br>PGCIL<br><br>**Milestones:**<br>(i) Date of issuance of RFQ :15.08.2014<br>(ii) Date of RFP:14.11.2014<br>**(iii)** Date of signing of TSA: 09.02.2015 | (i) Gadarwara STPS-Jabalpu Pool 765 D/C line<br>(ii) Gadarwara STPS-Warora P.S. (New) 765 D/C line<br>(iii) LILO of both Ckts. Of Wardha-Parli 400 kV D/C at Warora P.S. (2xD/C).<br>(iv) Warora 765/400 kV P.S. (2x1500 MVA). | Land 6%<br>Civil work 7%<br>Equip Supply 0%<br>Equip. Erection 0% |
| 21. | Transmission System associated with Gadarwara STPS (2x800 MW) of NTPC (Part-B). | REC<br><br>PGCIL<br><br>**Milestones:**<br>(i) Date of issuance of RFQ :07.08.2014<br>(ii) Date of RFP:14.11.2014<br>(iii) Date of signing of TSA: 09.02.2015 | (i) Warora P.S.-Parli (New) 765 kV D/C line<br>(ii) Parli(New)-Solapur 765 D/c line<br>(iii) Parli (New)-Parli (PG) 400 kV D/C (Quad) line<br>(iv) 765/400 kV Parli (New) Sub-station (2x1500 MVA). | Land 6%<br>Civil work 7%<br>Equip Supply 0%<br>Equip. Erection 0% |
| 22. | Transmission System Strengthening associated with Vindhyachal- V | REC<br><br>PGCIL<br><br>**Milestones:**<br>(i) Date of issuance of RFQ :20.08.2014<br>(ii) Date of RFP:22.10.14<br>(iii) SPV has been acquired by the successful bidder on 26.02.2015<br>(iv) Date of filing of petition for adaptation of tariff and grant of license : 26.02.2015 | (i) Vindhyachal P. S-Jabalpur P. S. 765 kV D/C line. | **Completion Target: June,2018** |

**Annexure-III**

**STATUS OF TRANSMISSION SCHEMES UNDER IMPLEMENTATION BY POWERGRID IN WESTERN REGION**

| Sl. No. | Description of Scheme | Estimated Cost (Rs. Cr) | Date of firming up in WR standing committee | Date of investment approval | Target date as of now | Remarks |
|---|---|---|---|---|---|---|
| 1 | Western Region System Strengthening Scheme -II | 5222 | 20th (23.01.04) | July'06 | | |
| | Set-A: For absorbing import in eastern and central part of WR Grid (POWERGRID) | 1700 | | | Commissioned | |
| | Set-B: For regional strengthening in Southern Maharashtra **(100 % private)** | 1050 | | | Commissioned | |
| | Set-C: For regional strengthening in Gujarat **(100 % private)** | 600 | | | --- | Implementation by Reliance |
| | a) Rajgarh – Karamsad 400kV D/c | | | | --- | |
| | b) Limdi(Chorania) – Ranchodpura 400kV D/c | | | | commissioned | |
| | c) Ranchodpura – Zerda(Kansari) 400kV D/c | | | | commissioned | |
| | Set-D: For regional Strengthening in Northern Madhya Pradesh **(POWERGRID)** | 1050 | | | commissioned | |
| 2 | Western Region System Strengthening -V | 721 | 25th (30.09.06) | Dec'07 | | Under implementation |
| | a) 400 kV Vapi- Navi Mumbai D/c | | | | Mar'16 | Changed to Vapi-Kudus 400kV D/c line; Severe ROW & Forest issue |
| | b) LILO of 400 kV Lonikhand - Kalwa line at Navi Mumbai | | | | Sep'15 | Cable work in progress. Critical ROW issues |
| | c) Establishment of 400/220 kV, 2 x 315 MVA new S/s (GIS) at Navi Mumbai | | | | Substation is ready and shall be commissioned matching with line | |
| | d) 220 kV Vapi- Khadoli D/c. | | | | commissioned | |
| 3 | Tr. System of Mundra Ultra Mega Power Project (4000 MW) | 4824 | 26th (23.02.07) | Oct'08 | | Under implementation |
| | a) Mundra – Bachchau -Ranchodpura 400 kV (Triple) D/c | | | | Commissioned | |
| | b) Mundra – Jetpur 400 kV (Triple) D/c | | | | Commissioned | |
| | c) Mundra – Limbdi 400 kV (Triple) D/c | | | | Commissioned | |
| | d) Gandhar-Navsari 400 kV D/c | | | | Commissioned | |
| | e) Navsari - Boisar 400 kV D/c | | | | Dec'15 | Severe ROW & Forest issue. Forest Clearance awaited. |
| | f) LILO of both circuits of Kawas-Navsari 220 kV D/c at Navsari (PG) | | | | Commissioned | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | g) Wardha-Aurangabad 400 kV(Quad) D/c (with provision to upgrade at 1200 kV at later date) | | | | Mar'16 | Contract terminated 01 out of 02 nos. due to unsatisfactory performance and fresh tender taken up. The package has been Bifurcated into two package 01 pkg. awarded in Dec'14 and second pkg. awarded in Feb'15. |
| | g) Aurangabad (PG) -Aurangabad I (Waluj) 400 kV(Quad) | | | | Commissioned | |
| | **Substations** | | | | | |
| | a) 40% Fixed Series Compensation each on Wardha - Aurangabad 400 kV D/c at Wardha end | | | | Mar'16 | Commissioning matching with the line |
| | b) Establishment of new 400/220 kV, 2x315 MVA substation at Navsari & Bachchau | | | | Commissioned | |
| | c) Establishment of new 765/400 kV, 3x1500 MVA, substation at Wardha for charging of Seoni - Wardha 2xS/c lines at 765 kV level | | | | Commissioned | |
| 4 | Transmission system associated with Krishnapatnam (5x800 MW) (WR Portion)- now delinked from Krishnapatnam UMPP | 1928 | 27th (30.07.07) | | | Under implementation |
| | a) Raichur – Solapur (PG) 765 kV S/c | | | | Commissioned | |
| | b) Solapur(PG) – Pune 765 kV S/c | | | | Commissioned | |
| | c) LILO of 400kV Aurangabad I (Waluj) - Pune (PG) D/c & Parli (PG) - Pune (PG) D/c lines at Pune(GIS) | | | | Sep'15 | LILO of Parli (PG)-Pune (PG) at Pune (GIS) commissioned |
| | d) Establishment of new 765/400 kV substations at Pune (GIS) with 2x1500 MVA transformation capacity | | | | Commissioned | |
| 5 | Associated transmission system of VSTPP-IV and Rihand-III | 4673 | 29th (10.09.09) | Mar'10 | | Under implementation |
| | a) Rihand III- Vindhyachal Pool 765 kV D/c (initially to be op. at 400kV) | | | | July'15 | One ckt charged at 400kV on 26.06.14 by-passing Vindhyachal PS. |
| | b) Vindhyachal IV - Vindhyachal Pool 400kV D/c(Quad) | | | | Commissioned | |
| | c) Vindhyachal Pool - Satna 765 kV 2xS/c | | | | July'15 | One S/c line has been charged |
| | d) Satna -Gwalior 765 kV 2xS/c | | | | Commissioned | |
| | e) Gwalior – Jaipur(South) 765 kV S/c | | | | Commissioned | |
| | f) Vindhyachal Pool-Sasan 765 kV S/c | | | | Commissioned | |
| | g)Vindhyachal Pool-Sasan 400 kV D/c | | | | Commissioned | |
| | h) Establishment of 765/400kV, 2x1500 MVA substation at Vindhyachal Pool | | | | Commissioned | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Solapur STPP(2x660MW) transmission system | 63.32 | 30th (08.07.10) | Oct'13 | | Under implementation |
| | a) Solapur STPP – Solapur (PG) 400kV D/c (Quad) | | | | Ready for commissioning | Line completed in Apr'15 |
| | b) Augmentation of 400/220kV ICT by 1x500MVA transformer (3rd) at Solapur (PG) | | | | Jul'15 | |
| 7 | Solapur STPP (2x660MW) transmission system (Part-A) | 51.57 | 36th (29.08.13) | Mar'15 | | Award under progress |
| | a) Solapur STPP – Solapur (PG) 400kV 2nd D/c (Quad) | | | | Mar'17 | |
| 8 | Transmission system for evacuation of Kakrapar Atomic Power Project unit 3 &4 (2x700 MW) | 378.71 | 31st (27.12.10) | Feb'14 | | Under Implementation |
| | a) Kakrapar NPP – Navsari 400kV D/c – 38 km | | | | Oct'16 | |
| | b) Kakrapar NPP – Vapi 400kV D/c - 104 km | | | | Oct'16 | |
| 9 | Transmission System associated with Mauda Stage-II (2x660 MW) | 1575.3 | 32nd (13.05.11) | Sep'13 | | Under Implementation |
| | a) Mauda II – Betul 400KV D/c (Quad)-210 km | | | | May'16 | |
| | b) Betul– Khandwa 400KV D/c (Quad)-180 km | | | | May'16 | |
| | c) Khandwa – Indore(PG) 400kV D/c -215 km | | | | May'16 | |
| | d) Establishment of 400/220kV 2x315MVA substation at Betul | | | | May'16 | |
| 10 | Provision of 1x315MVA ICT for reliable auxlliary power supply at HVDC back to back station at Bhadravati | 143 | 33rd (21.10.11) | - | Aug'15 | ICT commissioned in Mar'15. Balance work under progress. |
| 11 | Establishment of Pooling Station at Champa and Raigarh (Near Tamnar) for IPP Generation Projects in Chhattisagrh | 2066.85 | 29th (10.09.09) | May'11 | | Under Implementation |
| | a) Champa Pooling Station - Raipur Pooling Station 765kV D/c | | | | One ckt commissioned | Other ckt terminated at D'jaygarh bypassing Champa |
| | b) Raigarh Pooling Staiton (near Kotra) - Raigarh pooling (near Tamnar) 765kV D/c | | | | Commissioned | |
| | c) Champa Pooling Station - Dharamjaygarh Pooling Station 765kv S/c | | | | Commissioned by-passing Champa Pool | |
| | d)Raigarh Pooling Staiton (near Kotra) - Champa pooling 765kV S/c | | | | Commissioned | |
| | e) Establishment of 765/400kV 6x1500MVA Champa Pooling Station | | | | Mar'16 | Work delayed due to delay in land acquisation. |
| | f)Establishment of 765/400kV 3x1500MVA Raigarh Pooling Station (near Tamnar) | | | | Commissioned | |
| 12 | Transmission system strengthening in Western Part of WR for IPP generation proejcts in Chhattisgarh | 2150.93 | 29th (10.09.09) | Nov'11 | | Under Implemetation |
| | a) Aurangabad(PG) – Boisar 400kV D/c (Quad) | | | | Mar'16 | Stage-I Forest Clearance Awaited. Severe ROW |

| | | | | | | |
|---|---|---|---|---|---|---|
| | b) Wardha - Aurangabad (PG) 765kV D/c | | | | Commissioned | |
| | c) Establishement of 765/400kv 2x1500MVA auraganbad (PG) S/s | | | | Commissioned | |
| | d) Augmentation of transformation capacity at Boisar by 400/220kV, 1x500MVA | | | | Commissioned | |
| 13 | System strengthening in North/West part of WR for IPP Projects in Chhattisgarh | 2073.26 | 29th (10.09.09) | Dec'11 | | Under Implementation |
| | a) Aurangabad (PG) – Padghe(PG) 765kV D/c | | | | March'16 | |
| | b) Vadodara – Asoj 400kV D/c(Quad) | | | | Commisisoned | |
| | c) Padghe – Kudus 400kV D/c (Quad) | | | | March'16 | |
| 14 | System Strengthening in Raipur-Wardha Corridor for IPP projects in Chhattisgarh (DPR-6) | 1422.85 | 29th (10.09.09) | Jan'12 | | Under Implementation |
| | a) Raipur Pooling station - Wardha 765kV 2nd D/c | | | | March'16 | Stage-I Forest Clearance Awaited |
| 15 | WR-NR HVDC interconnector for IPP Projects in Chhattisgarh | 9569.76 | 29th (10.09.09) / 30th (08.07.10) | Mar'12 | | Under Implementation |
| | a) A $\pm$ 800kV, 3000Mw HVDC bipole between Champa Pooling Station-Kurukshetra (NR) (provision to upgrade to 6000MW at a latter date) | | | | Mar'16 | Completion matching with HVDC Champa Station. |
| | b) Kurukshetra(NR) - Jallandhar 400kV D/c(Quad) one ckt. via 400/220kV Nakodar | | | | Dec'15 | |
| | c) LILO of Abdullapur – Sonepat 400kV D/c(triple) at Kurukshetra | | | | Dec'15 | |
| | d) Establishment of 3000MW 800KV HVDC bipole terminal each at Champa Pooling station and Kurukshetra(NR) respectively: to be upgraded to 6000MW. | | | | Mar'16 | |
| | e) Establishment of 400/220kV 2x500 MVA S/s at Kurukshetra (GIS) 2x500MVA | | | | Sep'15 | |
| 16 | Inter-regional system strengthening scheme for WR and NR-Part A | 63.32 | 36th (29.08.13) | Oct'13 | | Under Implementation |
| | a) Solapur - Aurangabad 765kV D/c | | | | Dec'15 | Efforts being made to commission earlier (Sep/Oct'15) |
| 17 | Transmission System Associated with Lara STPS-I (2x800MW) | 400.47 | 17th (03.01.13) | Jun'14 | | Under Implementation |
| | a) Lara STPS-I – Raigarh (Kotra) Pooling Station 400 kV D/c line – 110km | | | | Apr'17 | |
| | b) Lara STPS-I – Champa Pooling Station 400 kV D/c (quad) line.-20km | | | | Apr'17 | |
| 18 | Transmission System Strengthening in WR-NR Transmission Corridor for IPPs in Chattisgarh | 5151.37 | 35th (04.01.13) | Jun'14 | | Award under progress |
| | a) Up-gradation of + 800kV, 3000MW HVDC bipole between Champa Pooling Station – Kurukshetra (NR) to 6000MW | | | | Mar'18 | |
| | b) Kurukshetra (NR) – Jind 400kV D/c (Quad) | | | | Mar'18 | |
| 19 | Inter-regional system strengthening scheme for WR and NR-Part B | 6517.36 | | Dec'14 | | Award placed in Mar'15 |
| | (a) 765KV D/C Jabalpur Pooling Station - Orai line | | | | Apr'18 | |
| | (b) 765KV D/C Orai - Aligarh line | | | | Apr'18 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) 400KV D/C Orai - Orai line (Q) | | | | Apr'18 | |
| | (d) LILO of one ckt of Satna-Gwalior 765KV 2x S/C line at Orai | | | | Apr'18 | |
| | (e) LILO of Agra - Meerut 765KV S/C at Aligarh | | | | Apr'18 | |
| | (f) LILO of Kanpur - Jhatikara 765KV S/C at Aligarh | | | | Apr'18 | |
| 20 | Wardha - Hyderabad 765kV Links | 3662.02 | | Feb'15 | | Award placed in Mar'15. |
| | (a) 765KV D/C Wardha - Hyderabad line | | | | May'18 | |
| | (b) 400KV D/C Nizamabad - Dichpali line | | | | May'18 | |
| 21 | GREEN ENERGY CORRIDORS:- Inter State Transmission Scheme (ISTS) - Part B | 3705.61 | 36 / 37th (29.08.13/ 05.09.14) | Apr'15 | Apr'18 | |
| | (a) 765KV D/C Banaskanta - Chittorgarh (New) line | | | | | |
| | (b) 765KV D/C Chittorgarh (New) - Ajmer (New) line | | | | | |
| | (c) 400KV D/C Banaskanta - Sankhari line | | | | | |
| | (d) Establishment of 765/400/220kV (765/400kV - 2x1500 MVA & 400/220kV - 2x500MVA) substation at Banaskanta | | | | | |
| 22 | GREEN ENERGY CORRIDORS:- Inter State Transmission Scheme (ISTS) - Part C | 2247.37 | 36 / 37th (29.08.13/ 05.09.14) | July'15 | July'18 | Award under progress. |
| | (a) 765KV D/C Bhuj Pool - Banaskanta line | | | | | |
| | (d) Establishment of 765/400/220kV (765/400kV - 2x1500 MVA & 400/220kV - 2x500MVA) pooling station at Bhuj | | | | | |
| 23 | Transmission System Strengthening Associated with Vindhyachal V - Part A | | 34th (09.05.12) | Feb'15 | | Award under progress |
| | (a) 1x1500MVA, 765/400kV ICT at Vindhyachal Pooling Station | | | | July'17 | |
| 24 | Transmission System Strengthening Associated with Vindhyachal V - Part B | | 34th (09.05.12) | | | DPR under preparation |
| | (a) 2 nos of 765kV Line bays alongwith 2x330MVAR Line Reactor at Vindhyachal Pooling Station | | | | | |
| | (a) 2 nos of 765kV Line bays alongwith 2x330MVAR Line Reactor at Jabalpur Pooling Station | | | | | |
| 25 | **STATCOMs in Western Region** | | 36th (29.08.13) | Mar'15 | | Award under progress |
| | (a) Aurangabad | | | | | |
| | (b) Gwalior | | | | | |
| | (c) Solapur | | | | | |
| | (d) Satna | | | | 2018-19 | |
| 26 | Western Region System Strengthening Scheme XIV | 93.96 | 37th (05.09.14) | | 30 Months from date of investment approval | |
| | (a)2x500MVA, 400/220kV transformer alongwith six nos of 220kV bays at Indore (PG) 765/400kV Substation | | | | | |
| | (b)1x500MVA, 400/220kV transformer alongwith two nos of 220kV bays at Itarsi (PG) 400/220kV S/s | | | | | |

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| 27 | Powergrid works associated with Part-A of Transmission system for Gadarwara STPS of NTPC | | 36/37th (29.08.13 / 05.09.14) | | | DPR under Preparation |
| | (a) 2 nos. 765 kV line bays at 765/400kV Jabalpur Pooling Station of POWERGRID {for Gadarwara STPS (NTPC) - Jabalpur PS 765 kV D/c} | | | | | |
| 28 | Powergrid works associated with Part-B of Transmission system for Gadarwara STPS of NTPC i.e. WRSS XV | | 36/37th (29.08.13 / 05.09.14) | | | DPR under Preparation |
| | (a) 2 nos. 765 kV line bays at 765/400kV Solapur sub-station of POWERGRID {for Parli New (TBCB) - Solapur (PG) 765 kV D/c} | | | | | |
| | (b) 2 nos 400kV line bays at existing 400kV Parli (PG) Switching Station of POWERGRID {for Parli New (TBCB) - Parli (PG) 400kV D/c (quad)} | | | | | |
| 29 | Powergrid works associated with System Strengthening for IPPs in Chhattisgarh and other generation projects in Western Region | | 36th (29.08.13) | | | DPR under Preparation |
| | (a) 1 no. 765 kV line bay at 765/400kV Vindhyachal Pooling Station of POWERGRID {for Sasan UMPP - Vindhyachal PS (PG) 765 kV 2nd S/c} | | | | | |
| | (b) 2 no. 400 kV line bays at 765/400kV Vindhyachal Pooling Station of POWERGRID {for Vindhaychal (IV/V) STPP switchyard (NTPC) - Vindhyachal PS (PG) 400 kV 2nd D/c (quad)} | | | | | |
| | (c) 2 no. 400 kV line bays at Gwalior Substation {for Gwalior - Morena 400 kV D/c (quad)} | | | | | |
| | (d) 2 nos. 765 kV line bays at 765/400kV Pune (GIS) sub-station of POWERGRID {for LILO of one circuit of Aurangabad(PG) – Padghe(PG)765 kV D/c at Pune (GIS) (PG)} | | | | | |
| | (e) 2 nos. 765 kV line bays at 765/400kV Champa Pooling Station of POWERGRID {1for Champa PS(PG) - Raigarh (Kotra) PS(PG) 765 kV 2nd S/c, 1 for Champa PS(PG) – Dharamjaigarh(PG) 765 kV 2nd S/c} | | | | | |
| | (f) 1 no. 765 kV line bay at 765/400kV Raigarh (Kotra) Pooling Station of POWERGRID {for Champa PS(PG) - Raigarh (Kotra) PS(PG) 765 kV 2nd S/c} | | | | | |
| | (g) 1 no. 765 kV line bay at 765/400kV Dharamjaigarh Pooling Station of POWERGRID {for Champa PS(PG) – Dharamjaigarh(PG)765 kV 2nd S/c} | | | | | |
| 30 | Powergrid works associated withAdditional System Strengthening Scheme Chhattisagrh IPPs Part-B | | 36/37th (29.08.13 / 05.09.14) | | | DPR under Preparation |
| | (a) 2 nos. 765 kV line bay at 765/400kV Raipur Pooling Station of POWERGRID {for Raipur PS(PG) – Rajnandgaon (TBCB) 765 kV D/c} | | | | | |
| 30 | Powergrid workds associated with Additional System Strengthening for Sipat STPS | | 36/37th (29.08.13 / 05.09.14) | | | DPR under Preparation |

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|---|---|---|---|---|---|---|
| | (a) 3 nos. 765 kV line bays at 765/400kV Bilaspur Pooling Station of POWERGRID (1 no. for Sipat STPS(NTPC) - Bilapur PS(PG) 3rd 765kV S/c, 2 nos. for Bilaspur PS(PG)-Rajnandgaon(TBCB) 765 kV D/c) | | | | | |
| | (b) 2 nos. 240 MVAR, 765 kV switchable line reactors at 765/400kV Bilaspur PS end for Bilaspur PS(PG) - Rajnandgaon(TBCB) 765 kV D/c | | | | | |
| 31 | Transmission System Strengthening associated with Mundra UMPP- Part A | 266.19 | 36th (29.08.13) | | 30 months from date of investment approval | |
| | (a) LILO of both circuits of Mundra UMPP-Limbdi 400kV D/c (triple snowbird) line at Bachau | | | | | |
| 32 | Transmission System Strengthening associated with Mundra UMPP- Part B | | 36/38th (29.08.13 / 17.07.15) | | | DPR under Preparation |
| | (a) Mundra UMPP - Bhuj Pool 400kV D/c line (triple snowbird) | | | | | |
| 33 | Bays for Transmission System Associated with DGEN Torrent Energy Ltd (1200MW) | | 13/14th(27.12.10/13.05.2011) | | | DPR under Preparation |
| | (a) 2nos 400kV Bays at Vadodara (GIS) | | | | | |
| | (b) 2nos 220kV Bays at Navsari (GIS) | | | | | |

**Annexure-IV**

| S.No. | Transmission element | Length (KM)/Substation capacity (MVA). |
|---|---|---|
| **1** | 220kV D/C line from Julwaniya 400kV S/s to Sendhwa 220kV S/s | 35 |
| **2** | 220/132kV S/s at Sendhwa. | 1X160+ 1X63 = 223MVA |
| **3** | 220kV D/C line from Betul 220kV S/s to Gudgaon 220kV S/s | 35 |
| **4** | 220/132kV S/s at Gudgaon | 1X160+ 1X63 = 223MVA |
| **5.** | 220/132kV S/s at Kanwan | 1X160+ 1X63 = 223MVA |
| **6.** | 220kV D/C line from Badnawar 400kV S/s to Kanwan 220kV S/s | 20 |
| **7.** | 220kV D/C line from Kanwan 220kV S/s to Dhar 220kV S/s | 35 |
| **8.** | 400/220kV S/s at Mandsaur | 2x315+2x160 =950MVA |
| **9.** | 400kV D/C line from Nagda 400kV S/s to Mandsaur 400kV S/s | 100 |
| **10.** | LILO both circuits of Nagda - Neemuch 220kV line at Mandsaur 400kV S/s | 20 |
| **11.** | LILO both circuits of Badod-Kota-Modak 220kV line at Suwasara 220kV S/s | 20 |
| **12.** | 220kV D/C line from Mandsaur 400kV S/s to Marut Shakti Pool 220kV S/s | 65 |
| **13.** | 220/132kV S/s at Suwasara | 2x160+1x63 =383MVA |
| **14.** | 220/132kV S/s at Ratangarh 400kV S/s | 2x160+1x63 =383MVA |
| **15.** | 220kV D/C line from Neemuch 220kV S/s to Ratangarh 400kV S/s | 65 |
| **16.** | 220kV/132 S/s at Sailana 400kV S/s | 2x160+1x63 =383MVA |
| **17.** | 220kV Interconnector between Sailana 400kV S/s and Ratlam Switching 220kV S/s | 25 |
| **18.** | 2nd Circuiting of Ratlam Switching - Daloda 220kV line | 72 |
| **19.** | LILO of Ratlam-Daloda 220kV line at Jaora 220kV S/s | 15 |
| **20.** | 220/132kV S/s at Jaora (Upgradation) | 2x160 =320MVA |
| **18.** | 400/220kV S/s at Sagar (Upgradation) | 2x315=630MVA |
| **19.** | LILO of one circuit of Satna(PGCIL) - Bina(PGCIL) 400kV line at Sagar 400kV S/s | 35 |
| **20.** | 400/220kV S/s at Ujjain | 2x315+2x160 =950MVA |
| **21.** | 400kV D/C line from Nagda 400kV S/s to Ujjian 400kV S/s | 55.00 |
| **22.** | 400kV D/C line from Indore(PGCIL) 765kV S/s to Ujjian 400kV S/s | 45.00 |
| **23.** | 220kV D/C line from Rajgarh(B) 220kV S/s to Susner 220kV S/s | 72.00 |
| **24.** | LILO both circuits of Ujjain - Badod 220kV and Ujjain-Nagda 220K line at Ujjain 400kV S/s | 40.00 |
| **25.** | 220kV D/C line from Badod 220kV S/s to Susner 220kV S/s | 35.00 |
| **26.** | 220kV D/C line from Ujjain 400kV S/s to Susner 220kV S/s | 100.00 |
| **27.** | 400kV D/C line from Ashta 400kV S/s to Ujjian 400kV S/s | 100 |
| **28.** | 220/132kV S/s at Susner | 2x160+1x63 =383MVA |

**Annexure-V**

| S.No. | Transmission element | Length (KM)/Substation capacity (MVA). |
|---|---|---|
| **1** | 220/132kV S/s at Sonkatch | 1x160+1x63 =223MVA |
| **2** | 220kV D/C line from Ashta 400kV S/s to Sonkatch 220kV S/s | 50 |
| **3** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Sendhwa 220kV S/s. | - |
| **4** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Gudgaon 220kV S/s. | - |
| **5.** | 220kV D/C line from Kukshi 220kV S/s to Rajgarh(D) 220kV S/s | 60 |
| **6.** | 220/132kV S/s at Petlawad | 1x160+1x63 =223MVA |
| **7.** | 220kV D/C line from Badnawar 400kV S/s to Petlawad 220kV S/s | 50 |
| **8.** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Suwasara 220kV S/s | - |
| **9.** | 400/220kV S/s at Ratangarh (Upgradation) | 2x315+2x160 +1x63=1013 MVA |
| **10.** | 400kV D/C line from Mandsaur400 to Ratangarh 400kV S/s. | 100 |
| **11.** | 220kV D/C line from Ratangarh 400kV S/s to Bhanpura 220kV S/s | 100 |
| **12.** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Ratangarh 400kV S/s | - |
| **13.** | 400/220kV S/s at Sailana (Upgradation) | 2x315=630MVA |
| **14.** | 400kV D/C line from Badnawar400 to Sailana 400kV S/s | 70 |
| **15.** | 220kV D/C line from Sailana 400kV S/s to Jaora 220kV S/s | 36 |
| **16.** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Sailana 400kV S/s | - |
| **17.** | 1 No. STATCOM of (+)100/(-)100 MVAR,220kV at Susner 220kV S/s | - |
| **18.** | 220/132kV S/s at Sheopurkalan | 2x160+1x63 =383MVA |
| **19.** | Sabalgarh - Sheopurkalan 220kV D/C line | 110 |