



Government of India
Ministry of Power
Central Electricity Authority
System Planning & Project Appraisal Division
Sewa Bhawan, R. K. Puram, New Delhi-110066
वेबसाइट / Website: www.cea.nic.in



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No. 1/9/SP&PA-2013 /

Dated: 27.09.2013

-As per list enclosed-

Sub: Minutes of 32nd Standing Committee Meeting of Power System Planning of Northern Region held on 31.08.2013.

Sir,

The minutes of 32nd Standing Committee Meeting on Power System Planning in Northern Region have been uploaded on CEA website : www.cea.nic.in (path to access – Home Page -Wing specific document /power system related reports / standing committee on power system planning / Northern region) for information and necessary action please.

Yours faithfully,


(B. K. Sharma) 27/9/13

Director (SP&PA)

-List of Addressee-

<p>1 - Member Secretary NRPC 18-A Shajeed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi - 110016</p>	<p>2. Director (W&P) UPPTCL, Shakti Bhawan Extn,3rd floor, 14, Ashok Marg, Lucknow - 226 001 (Fax-0522-2287822)</p>	<p>3. CEO, POSOCO B-9, Qutab Institutional Area Katwaria Sarai New Delhi - 110016. (Fax : 26852747)</p>
<p>4. Director (Projects) NTPC, NTPC Bhawan, Core 7, Scope complex- 6, Institutional Area, LodhiRoad, New Delhi-110003 (Fax-01 1-24361018)</p>	<p>5. Director (Projects) PTCUL, Urja Bhawan, Campus, Kanwali Road Dehradun- 248001. Uttarakhand (Fax-0135-2763431)</p>	<p>6. Member (Power) BBMB, Sectot-19 B Madya Marg, Chandigarh-1 60019 (Fax-01 72-2549857)</p>
<p>7. Director (T&RE) NHPC Office Complex, Sector - 33, NHPC, Faridabad - 121 003 (Fax-0129-2256055)</p>	<p>8. Director (Operations) Delhi Transco Ltd. Shakti Sadan, Kotla Marg, New Delhi - 11 0 002 (Fax-01 1-23234640)</p>	<p>9. Chief Engineer (Transmission) NPCIL,9- S-30 Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai - 400 094 (Fax-022-25993570, 25563350)</p>
<p>10. Director (Projects) POWERGRID, Saudamini, Plot no. 2, Sector - 29, Gurgaon-122 001 Fax-0124-2571932'</p>	<p>11. Director(Technical) Punjab State Transmission corporation Ltd. (PSTCL), Head Office The Mall, Patiala - 147 001 (Fax-0 1 75-230401 7)</p>	<p>12. Chief Engineer (Operation) Ministry of Power, UT Secretariat, Sector-9 D Chandigarh - 161 009 (Fax-01 72-2637880)</p>
<p>13. Director (Technical) RRVPL, Vidyut Bhawan, Jaipur- 302 005. Fax 0141-2740794</p>	<p>14. Director (Technical) HVPNL Shakti Bhawan, Sector -6 Panchkula - 134 109 (Fax-01 72-2560640)</p>	<p>15. Managing Director, HP PowerTransmission Corporation Ltd. Barowalias, Khalini, SHIMLA-171002 (Fax-01 77-2623415)</p>
<p>16. Director(Technical) HPSEB Ltd. Vidyut Bhawan, SHIMLA-171004 (Fax-01 77-2813554)</p>	<p>17. Director(Technical) THDC Ltd. Pragatipuram, Bypass Road, Rishikesh- 249201 Uttarakhand, (Fx-0135-</p>	<p>18. Development Commissioner (Power), Lottery Building, Behind Civil Secretariat Srinagar (Fax : 0194-2452173)</p>
<p>19. Sh. R.K. Madan Managing Director, Adani Power Ltd Adani House Plot no. 83, Sec-32 Institutional Area Gurgaon, Haryana</p>	<p>20.COO (CTU) POWERGRID, Saudamini, Plot no. 2, Sector - 29, Gurgaon-122 001 (Fax-0124-2571809)</p>	

MOM of 32nd Standing Committee Meeting on Power System Planning in Northern Region held on 31st August, 2013 at NRPC, Delhi.

List of participants is enclosed at **Annexure 1**.

Chairperson & Member (PS), CEA welcomed the participants of 32nd Standing Committee Meeting of Power System Planning in Northern Region. He thanked them for their presence in the meeting. He congratulated constituents for keeping in view, the long term perspective planning and approving inter-state transmission schemes. Implementation of these lines would help in transfer of power across the Northern region. He also appreciated POSOCO for active participation in Standing Committee Meetings and providing inputs regarding operational constraints & transmission planning.

Member (PS), CEA asked Director (SP& PA), & CTU to take up the agenda items for discussion.

1.0 Confirmation of minutes of 31st Standing Committee Meeting held on 02.01.2013

1.1 Director (SP&PA) stated that the minutes of the 31st meeting of Standing Committee on Power System Planning in Northern Region held on 02.01.2013 at Gurgaon, were circulated vide CEA letter No. 1/9/10-SP&PA/ dated 04.02.2013 and uploaded on website. The comments received from the constituents on above minutes of meeting were taken up for discussions as described below.

1.2 UPPTCL has indicated vide their letter dated 13/5/2013 that LILO of Agra (UP)- Shamshabad 220kV S/c line at Agra PG mentioned in the minutes, needs to be corrected as LILO of Shamshabad –Firozabad 220kV S/c line at Agra (PG). It was noted and minutes of the meeting may be considered as corrected accordingly.

1.3 NRLDC and RVPNL mentioned that Agra (UP) – Bharatpur 220 kV S/c remains open frequently due to overloading. It was suggested by NRLDC to consider LILO of this line at Agra (PG) S/s with augmentation of transformation capacity at Agra (PG) S/s. After discussion members agreed for LILO of Agra – Bharatpur 220 kV S/c line at Agra (PG) and augmentation of transformation capacity at Agra(PG) S/s by 1X315 MVA 400/220 kV ICT along with associated bays (ICT shall be provided from the spared unit after replacement of ICTs at Ballabgarh /

Mandaula and shall be refurbished before installation). Members agreed that these works are required urgently and therefore, should be carried out under ISTS strengthening scheme by POWERGRID in compressed time schedule. POWERGRID agreed for the same and informed that above works shall be covered under **NRSS-XXXIV** as indicated in **Para-29.0**

- 1.4 HVPNL has requested to provide additional 1x315 MVA, 400/220kV transformer at 400kV Kaithal substation, out of the transformers that would get spared at 400kV Ballabgarh / Mandaula S/s after replacement by 500 MVA ICTs. HVPNL also mentioned their requirement of 2 nos. of 220kV line bays at Kaithal S/s. It was proposed that after the replacement of the transformer at Ballabgarh / Mandaula the spared transformer shall be refurbished & installed at Kaithal S/s and POWERGRID will provide 2 nos.220 kV line bays at Kaithal S/s for HVPNL. These works would be implemented under Regional System Strengthening Scheme **NRSS-XXXIV** as indicated in **Para-29.0**. Members agreed for the same.
- 1.5 Ballabgarh - Greater Noida (new) 400kV D/c (5km) line with multi-circuit towers in 5 km stretch of the above line from Ballabgarh was approved under NRSS-XXXIII in 31st SCM of NR. HVPNL had requested that the Haryana / CTU should be allowed to utilize the second D/c line on these multi- circuit towers as per their future requirements.
- 1.6 Member (PS), CEA explained that the above line is an ISTS line to be implemented through TBCB route and the utilization of multi-circuit portion of this line in future, shall be as per the decision of Standing Committee. **Members agreed for the same.**
- 1.7 HVPNL requested that provision of SVC at Hissar might be considered along with Nalagarh and Lucknow. Member (PS) explained that in the last SCM, it was agreed that SVC at Hissar may be firmed up later and put up to Standing Committee again. It was also informed that the earlier approved SVCs at Lucknow and Nalagarh are proposed to be changed to STATCOMs. The combined effect of all these proposed STATCOMs in the National Grid would be studied again. In case, the studies indicate the requirement of STATCOM at Hissar, the same will be taken up in forth coming SCM.

After the above, members approved the minutes of 31st SCM of NR.

2.0 Evacuation of 4 nos. of HEP's of HP in Chandrabhaga/ Chenab basin

- 2.1 Director, CEA explained that during the 30th & 31st Standing Committee Meeting of NR, the transmission system for evacuation of power from Chandrabhaga / Chenab Basin was discussed and agreed. As per this transmission system, the power from generation projects in the downstream of Seli HEP i.e. Reoli Dugli (420 MW), Sach Khas (267 MW), Purthi (300 MW), Duggar (236 MW) and Kirthai-I (400MW in J&K) HEPs are to be evacuated upto Kirthai-II HEP, beyond which a high capacity (Quad HTLS) 400 kV D/c line has been planned up to Kishtwar Pooling station. HPPTCL has now indicated that 4 nos. state HEPs with total capacity of 218MW (Saichu Sachkhas-104 MW, Saichu-43 MW, Chiroti Saichu-26 MW & Lujai-45 MW) would also be evacuated through this corridor, by LILO of one circuit of 400kV Reoli-Kirthai-II D/c (twin HTLS) at Saichu Sachkhas where power from these HEPs shall be pooled at 132kV and injected at 400kV level by construction of 132/400kV substation by HPPTCL.
- 2.2 Considering the revised quantum of power (about 2000 MW) to be evacuated over this corridor, it was proposed that the above corridor may be built with triple HTLS conductor in place of twin HTLS conductor as planned and approved earlier.
- 2.3 Director (SP&PA), CEA stated that HPPTCL will have to ensure that the switchyard/ substation equipments and 400 kV busbar / cables at their above proposed 132/400 kV pooling station should have a capacity equivalent to the high capacity line to be LILoed. Further, 2 Nos. 400 kV line bays are to be provided by HPPTCL at their proposed 132/400 kV pooling substation.
- 2.4 Member (PS), CEA asked HPPTCL about the time frame of the proposed generations. HPPTCL indicated that these projects are at initial stage and DPR of these projects are under preparation and environmental clearance for these projects has not been given so far.
- 2.5 Member (PS) also advised HPPCL to apply for connectivity / LTA to CTU as per CERC regulations, in respect of above HEPs. HPPCL agreed for the same.
- 2.6 Members discussed that the above proposed evacuation scheme does not meet the reliability criteria of N-1-1 as per revised Transmission Planning Criteria. However considering the difficult hilly terrain and severe R-o-W constraints in the

area it was explained that additional corridor in this area is not possible and therefore, it was agreed to proceed with the above scheme. Member (PS), CEA advised that considering the difficult terrain, the proposed high capacity line could be erected through pre-fabricated towers and helicopter stringing could be adopted.

Members agreed for the above.

3.0 400kV intra-state transmission system of Punjab

3.1 Director, CEA informed that PSTCL has proposed following composite 400kV power evacuation system for Mukerian(1320MW), Gidderbaha (2640MW) and Mansa(1320MW) TPS:

- i. Gidderbaha-Muktsar 400 kV D/c
- ii. LILO of both circuits of Talwandi Sabo-Muktsar 400 kV D/c line at Gidderbaha S/s
- iii. LILO of one circuit of Rajpura TPS-Nakodar 400 kV D/c at Dohra S/s
- iv. Dhuri-Amloh 400kV D/c
- v. Rajpura TPS -Rajpura 400kV D/c (additional link)
- vi. Makhu-Dasuya 400 kV D/c
- vii. Mansa-Barnala 400kV D/c
- viii. Talwandi-Mansa TPS 400kV D/c
- ix. Barnala-Amloh 400kV D/c
- x. Mukerian-Wadala Granthian(Near Batala) 400kV D/c
- xi. Mukerian-Doraha (near Machiwara) 400kV D/c
- xii. Wadala Granthian-Nakodar 400kV D/c
- xiii. Establishment of 2x500 MVA, 400/220 kV new substation at Wadala Granthian, Doraha, Amloh, Barnala,Mansa and Dasuya
- xiv. Augmentation of 400/220 kV transformer each at Rajpura, Dhuri, Muktsar with 1x500MVA.

- 3.2 POWERGRID enquired the status of Gidderbaha TPS from NTPC. NTPC stated that due to coal problem, this generation project is delayed and its commissioning schedule is uncertain as on date. It was noted that though the above proposed evacuation system is adequate to transfer the generated power to the state load centers but there are very less no. of ISTS touch points in the above proposed system to export / import power from / to Punjab. PSTCL was asked to work out their export / import capacity requirements and furnish these figures for examining the adequacy of proposed evacuation system.
- 3.3 COO, POSOCO desired that each state should come out with such figure regarding export / import capacity requirement and this should be considered while planning the transmission system. There is also need to take in to account the commercial aspects of state's generation dispatch. Individual state's requirements to be studied for special condition, like in case of Himachal / Uttarakhand, zero state generation should be considered while examining their adequacy of import requirements.
- 3.4 Member (PS) informed that transmission planning studies of each state would be carried out jointly by CEA, CTU, NRLDC and concerned state in a time bound manner with the objective that the states can update their network representation, Loads and State Generations to study on a common data-base and arrive at a number for import and export capacity requirements for each state. He further mentioned that the study results of this exercise will be discussed in next Standing Committee Meeting.
- 3.5 COO (CTU), POWERGRID stated that a particular time line should be provided to all states and states should provide their network / projected loads details 10 days in advance to the scheduled date of above meeting. Accordingly, following program was finalized for carrying out the studies:

October first week : Haryana	October last week : Punjab
November First week : Uttar Pradesh	November last week : Delhi
December first week- Rajasthan	December Last week- Uttarakhand
January First week- Jammu & Kashmir	January Last week- Himachal Pradesh

In view of the above, it was proposed that the above, **composite evacuation system of PSTCL shall be deferred and it will be taken up in forth coming SCM.**

Members agreed with the same.

4.0 Inter-connection of 2 nos. of 400kV Lines at Allahabad (PG) 400 kV Substation from Bara generation project

4.1 Director (SP&PA), CEA stated that Bara STPS (3x660 MW) is a State IPP generation project, under construction in Uttar Pradesh and UPPTCL had desired to interconnect the Bara Generation project (expected by May'14) with 400/220 kV Allahabad (PG) substation for providing start-up power and evacuation of generation from one unit as the planned evacuation system of the Bara generation project being developed under PPP mode by UPPTCL is delayed. He also informed that UPPTCL is not present in the meeting.

4.2 COO, CTU informed that the load flow studies indicate that there are transmission constraints for evacuation of additional power beyond Allahabad with existing 400 kV lines in Allahabad-Fatehpur-Kanpur corridor. Even under (n-1) contingency the line loadings are of the order of 800-850MW/ckt. As such, the proposed connectivity of Bara generation project with Allahabad (PG) does not appear to be feasible option and UP should come up with some other alternative. POSOCO endorsed the views of CTU.

4.3 He further mentioned that as per information given by NTPC, Meja TPS would be commissioned around December'2015 and LTA of 400 MW for Meja TPS, has already been granted through a 400kV D/c (Twin moose) line from Meja to Allahabad (PG) S/s. It was pointed out by POWERGRID that evacuation of Meja generation would also face constraints incase the planned evacuation system for Meja generation being implemented by UPPTCL, is delayed. He requested M/s NTPC to interact with UPPTCL in this regard. M/s NTPC informed that they are coordinating with UPPTCL.

After deliberations, Members agreed that evacuation of Bara TPS through Allahabad (PG) S/s is not feasible and UPPTCL should expedite the planned evacuation system of Bara TPS.

5.0 Studies for High Voltage for identification of Reactors

5.1 DGM, CTU explained that during the 24th TCC & 27th NRPC Meeting held on 29th and 30th Nov.'12, the issue of reactive power management and high voltage control was discussed. In the meeting, it was desired that CTU would carry out studies for identifying reactive compensation required in intra-state network at 220 kV level. Accordingly, the studies have been carried out by CTU and bus reactors at following substations were proposed under light load conditions:

400kV			220kV		
S.No.	SUBSTATION	MVAr	S.No.	SUBSTATION	MVAr
1	RISHIKESH	125	1	KAITHAL	25
2	HINDAUN	125	2	ABDULLAPUR	25
3	PANCHKULA-PG	125	3	CHHABRA	25
4	SULTANPUR	125	4	FATEHABAD	25
5	GORAKHPUR(UP)	2X125	5	KIRORI	25
6	SONEPAT-PG	125	6	BIKANER	25
7	MANESAR	125	7	HISAR-PG	25
8	KAITHAL	125	8	RAJWEST	25
9	PANKI	125	9	BARMER	25
10	JAIPUR(S)	125	10	RATANGARH	25
11	BASSI	125	11	PANCHKULA	25
12	MERTA	125	12	REWALI	25
			13	MAHARANIBAGH	2X25
			14	JALLANDHAR-PG	25
			15	JALLANDHAR-BBMB	25
			16	VERPAL	2X25
			17	KHASSA	2X25

5.2 POSOCO stated that load is growing at a rapid pace and therefore requirement of reactors at 220 kV level needs to be analysed critically. POWERGRID informed that the studies have been carried out considering a load of about 18500 MW scenario based on the inputs from NRLDC and agreed that the requirement of

reactors may be reviewed during the studies for the states network. POSOCO proposed that the reactors at 400 kV level need to be taken up on priority.

- 5.3 Regarding reactor at Panki S/s, it was discussed that as Panki S/s is a very old station of UPPTCL, the proposed reactor at Panki S/s can be installed at Kanpur S/s which is in close proximity to Panki S/s.
- 5.4 Members opined that the above mentioned 400kV reactors can be taken up for implementation in the first phase.
- 5.5 POSOCO stated that Western Rajasthan faces high voltage problem and adequate reactors need to be provided. RVPNL informed that Bus reactors are being provided at Jodhpur, Merta, Akal, Barmer, Ramgarh and Bhadla S/s. POWERGRID stated that as per the feedback from their Operation Services department, additional 400kV reactors may be provided at Mandaula, Meerut, Kankroli and Bassi. Reactor at Bassi S/s is already covered in above proposal and at Kankroli, SVC is being implemented. Regarding Meerut and Mandaula, members felt that bus reactors are not required presently.
- 5.6 COO (CTU) stated that a particular time line should be provided to all states so that they would come up with proper studies about their requirement for reactive compensation in 220 kV intra-state system in future. It was decided that studies would be verified along with studies to be held in the months of October '13 to January '13 as mentioned in **item no. 3 above**. Considering this, following Bus Reactors at 400 kV level were proposed:

S.No.	SUBSTATION	MVA _r
1	HINDAUN	125
2	PANCHKULA-PG	125
3	SULTANPUR	125
4	GORAKHPUR(UP)	2X125
5	SONEPAT-PG	125
6	MANESAR	125
7	KAITHAL	125
8	KANPUR(PG)	125

9	JAIPUR(S)	125
10	BASSI	125
11	MERTA	125

Members agreed for the implementation of above 400 kV reactors subject to space availability. It was also agreed that the reactors shall be provided by the owner of the respective substation.

6.0 Evacuation System for Lalitpur (3x660 MW) STPS

6.1 Director (SP&PA), CEA stated that Lalitpur STPS (3x660 MW) is state sector generation project under construction in Uttar Pradesh and 1st unit is expected by December, 2014. The project was discussed during 31st Standing Committee meeting on 02/01/2013 and UPPTCL was advised to have another meeting with CEA and CTU after examination of the above proposal so that the evacuation system for Lalitpur could be firmed up. UPPTCL had proposed following transmission system for Lalitpur TPS:

- i. 765 kV Lalitpur – Agra (765/400 kV) (UP) 2xS/C lines (400 kms)
- ii. Establishment of 765/400 kV, 2x1500 MVA, Agra (UP) substation
- iii. Establishment of 765/220kV, 2x300 MVA substation at Lalitpur switchyard (under the scope of the generation developer)
- iv. Establishment of a 220/132 kV, 2x100 MVA substation at Lalitpur
- v. Establishment of 400/132 kV, 2x300 MVA Agra (South) substation
- vi. 220 kV Lalitpur – Jhansi D/C line (90 km) with one circuit to be LILOOed at 220/132 kV Lalitpur substation.
- vii. LILO of one circuit of existing 400kV Agra (UP) – Agra (PG) 2xS/C line at 765/400 kV Agra (UP) (10 Km)
- viii. LILO of existing 400 kV Agra (UP) – Muradnagar S/C line at Agra (UP) 765/400 kV substation
- ix. 400 kV Agra (UP) 765/400 kV – Agra (South) S/C line.
- x. 765kV Line and Bus Reactors:
 - (a) 2x330 MVAr 765kV Line reactors at Lalitpur end of 765 kV Lalitpur – Agra (765kV) UP 2xS/c lines.
 - (b) 1x330 MVAr, 765kV Bus reactor at Lalitpur generation switchyard

(c) 2x240 MVAR 765kV Line reactors at Agra end of 765 kV Lalitpur –Agra (765 kV) UP 2xS/c lines.

(d) 1x240 MVAR, 765kV Bus reactor at Agra (765 kV) UP S/s

6.2 In this regard, Joint meetings of CTU, CPRI, Bangalore and UPPTCL were held in CEA in March 2013 on the above proposal. After detailed discussion, following additional system was recommended for evacuation of power from Lalitpur TPS. The details of the studies are given in the agenda.

- i. 50% Fixed Series Compensation (FSC) in 765 kV Lalitpur-Agra (UP) 2xS/c lines along with SSR protection in Lalitpur Generating Plant.
- ii. An additional requirement of 1x330 MVAR 765 kV bus reactor (2nd) at 765kV Lalitpur generation switchyard in addition to the provision of bus and line reactors as proposed by UPPTCL (Item-2x above). For charging of 765kV Lalitpur-Agra lines, it would be preferable to charge it from Agra end.
- iii. In place of single circuit 400 kV Agra (UP) 765/400 kV – Agra (South) line, a 400 kV D/C line should be constructed to meet contingency of a line outage.
- iv. LILO of one circuit of 765kV Jabalpur-Orai D/C at Lalitpur to provide stable operation of the Lalitpur generation.
- v. UPPTCL has to take appropriate measures for development of 220/132kV network in Agra and its adjoining areas to supply load of 1100 MW or more from 400kV Agra (UP) & Agra (South) sub-stations. Otherwise, generation at Lalitpur may be required to back down due to system constraint.

6.3 POWERGRID stated that U.P has asked for an additional interconnection of Lalitpur generation with Bina S/s (PG).

6.4 No representative was present from UPPTCL in the meeting. Members agreed that Bina S/s being an important part of (NR-WR) Inter-Regional corridor should not be disturbed. Members noted that 1100MW load will be drawn at Agra 220 & 132kV level. Members also agreed that proposed LILO of 765 kV Jabalpur-Orai line at Lalitpur is for stability purpose and not for evacuation of generation. As such, UPPTCL needs to ensure that 765 kV Lalitpur-Agra D/c lines are available for evacuation at the time of LILO of one circuit of 765kV Jabalpur-Orai D/C line.

Members agreed to the above proposal.

7.0 LILO of Sikar-Neemrana 400kV D/c line at Babai (RRVPNL)

- 7.1 RRVPNL vide its letter dated 17/01/2013 proposed for “LILO of one ckt of Sikar-Neemrana 400kV line at Babai to enhancing the reliability of power supply to Delhi/NCR region”. RVPNL stated that the proposed LILO would also increase the flexibility of the system. POSOCO stated that the proposed LILO would help in the grid operation.
- 7.2 POWERGRID stated that the load flow studies indicate that LILO of Sikar-Neemrana at Babai results in off-loading of Sikar-Babai section of this line and proposed LILO of one circuit would also cause unbalanced loadings on Sikar-Neemrana lines. It was decided that the utility of proposed LILO needs to be further studied in consultation with Rajasthan/ Haryana. POSOCO suggested that there is a need to provide more interconnections from Rajasthan towards Haryana / Punjab side.

Members agreed to the above.

8.0 Study for Series reactors

- 8.1 POWERGRID stated that growth in the network and generation has resulted in increase in short circuit level in NCR areas. To limit the short circuit level, splitting of the 400 kV ring was proposed during 2008-09. But in the light of grid failure in July'12 and to meet the (N-1-1) security level as per Revised Transmission Planning criteria of CEA, it has become necessary to review the earlier approved bus-splitting arrangement and possibility of alternative measures to control the short circuit level at 400 kV substations in/around Delhi. The earlier approved bus-splittings is described below.
- 8.2 There were mainly five splitting approved earlier:
- i. The Agra-Ballabgarh and Ballabgarh- Gurgaon 400kV S/c lines are on the same dia of one & half breaker scheme employed at Ballabgarh. Just by opening the main breaker and keeping the tie breaker closed the required splitting can be achieved and any time we can close the main breakers. Hence the Splitting arrangement may be retained.

- ii. Dadri-I and Dadri-II are connected at 400 kV Loni road S/s. At Dadri, adequate feeders exist on both buses for evacuation of power. Hence the Splitting arrangement may be retained.
- iii. After splitting of Bawana CCGT, it would be connected to Delhi by 400/220kV transformers. Further, it is connected to 400 kV ring via Abdullapur. Further with connectivity to Bhiwani 765/400kV S/s bus no constraint is expected in drawing power from the grid or injecting power into the grid. Hence the original envisaged splitting can be retained.
- iv. With the splitting of Dadri-Ballabgarh 400kV line from Ballabgarh end, Maharaniabagh, Greater Noida and Nawada would be fed radially from Dadri. In case of D/c outage power supply to the areas would be drastically affected. The splitting needs to be revisited
- v. Meerut is one of the major substation in Northern region. Power from Eastern and Western region are to be pooled at Meerut through 765kV lines. Further generation from Tehri complex would also be pooled at Meerut. Hence connectivity with Meerut is vital. With bus-split arrangement at Mandaula S/s, in case of outage of Mandaula-Meerut 400kV D/c line, the power supply from Meerut to Mandaula Substation (an important load center of Delhi) would be affected. This bus- splitting needs to be revisited.

8.3 Keeping above in view, the detailed studies were carried out and based on the studies, following series line & bus reactors were proposed:

- i. Dadri-Mandaula 400kV Ckt-I & II – 2nos
- ii. Dadri-Maharaniabagh 400kV Ckt – 1nos
- iii. Dadri-Greater Noida 400kV Ckt – 1nos
- iv. Ballabgarh-Bamnoli 400kV Ckt-I & II – 2nos
- v. Ballabgarh-Nawada 400kV Ckt-I – 1nos
- vi. awana-Mandaula 400kV Ckt-I & II – 2nos
- vii. Bawana-Mundka 400kV Ckt-I & II – 2nos
- viii. Jhattikhara-Mundka 400kV Ckt-I & II – 2nos
- ix. Series bus reactors of at 400 kV Mandaula & Ballabgarh substations

- 8.4 It was also stated that 400 kV, Greater Noida substation being implemented under ISTS through Ballabgarh – Greater Noida 400 kV D/c line may not be connected to 765kV network of UPPTCL as it would increase the short circuit level. If it is to be connected then proper sectionalizing arrangement may be provided in such a manner that 400 kV Dadri-Greater Noida-Nawada-Ballabgarh line is kept isolated from main bus of 765/400 kV Greater Noida substation of UPPTCL under normal operation and only connected as a contingency measure when requirement arises.
- 8.5 DTL suggested that in place of series reactors, bus splitting may be considered. COO (CTU) stated that with the splitting of existing 400 kV buses, there is lack of reliability and it is more prone to physical damages as well. Further, so much growth of parallel paths/ loops would render bus-splitting ineffective.
- 8.6 The issue was deliberated and it was decided that initially only two series bus reactors and series line reactors on any one D/c line may be taken up in first phase and subsequently with the acquired operational experience, the other proposed series reactors could be considered for implementation.
- 8.7 Accordingly, implementation of following series reactors was agreed:
- Series bus reactors**
- i. 400 kV Mandaula substation
 - ii. 400kV Ballabgarh substation
- Series Line reactors:**
- iii. Dadri-Mandaula 400kV Ckt-I & II – 2 Nos.
- 8.8 POWERGRID stated that in the studies 12 ohms series reactors were considered. However, since we are going for only few locations initially, the impedance of proposed series reactors needs to be reviewed.
- 8.9 Member (PS) stated that considering the urgency of implementation of series reactors to control high short circuit levels in Delhi 400 kV ring system, the above agreed works should be carried out by POWERGRID in compressed time schedule

Members agreed to the above.

9.0 Transmission System Plan for Delhi

9.1 Director (SP&PA), CEA stated that CEA has prepared transmission system plan for Delhi to meet power transmission requirements in XII and XIII plan period. This transmission system plan includes establishment of following 400/220kV substations in Delhi:

- i. Establishment of 400/220kV 2x315MVA+2x500MVA GIS substation at Rajghat by LILO of one circuit 400kV Mandaula-Bawana D/c line
- ii. Establishment of 400/220kV 4x500MVA GIS substation at Tuglakabad by LILO of 400kV Bamnoli-Samaypur D/c line
- iii. Establishment of 400/220kV 2x315MVA+2x500MVA GIS substation at Dwarka with 400kV D/c line from Jhatikara substation POWERGRID
- iv. Establishment of 400/220kV 2x500MVA GIS substation at Karampura with 400kV D/c line from Jhatikara substation POWERGRID
- v. Establishment of 400/220kV 2x315MVA GIS substation at Rangpuri with LILO of 400kV Bamnoli-Tuglakabad D/c line
- vi. Establishment of 400/220kV 2x500MVA GIS substation at Shalimarbagh by LILO of Bawana-Karampura 400kV D/c line
- vii. Establishment of 400/220kV 2x315MVA+2x500MVA GIS substation at Hamidpur by LILO of one ckt of Bawana-Mandola 400kV D/c line

9.2 POWERGRID mentioned about the R-o-W constraints in execution of the proposed Transmission system in Delhi. CEA informed that planning of above 400 kV substations and associated lines has been carried out in consultation with DTL Engineer.

9.3 General Manager (Planning), DTL stated that there are R-o-W constraints in implementing above planned transmission system.

Member (PS), CEA asked DTL to first confirm the availability of R-o-W by actual site visits and identify the planned works which are not feasible due to non-availability of R-o-W. Thereafter, DTL should approach CEA with their alternative proposal so that the above planned Transmission Systems can

be reviewed. The revised proposal may also be discussed during the above proposed state-wise meeting with DTL (refer item no.3.5 above).

Members noted the same.

10.0 Additional System Strengthening based on new Transmission Planning Criteria

10.1 DGM, CTU stated that the transmission scheme for Mundra UMPP (5x830 = 4150 MW) generation complex was planned and implemented considering Transmission Planning Criteria of 1994 which stipulated system adequacy under “n-1” contingency. The beneficiaries of the project are in both, WR and NR. The Transmission Planning Criteria has been revised with effect from February, 2013 and it stipulates planning of transmission system under “n-1-1” contingency. In the revised Planning Criteria (clause 2.3), it has been indicated that the earlier systems may be reviewed and additional strengthening may be planned. Accordingly, the transmission systems for the generation complexes in Western Region was reviewed and following system strengthening has been proposed to meet the “n-1-1” contingency criterion:

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

* With above proposed LILO, LILO of Mundra UMPP- Limbdi at Saurashtra Pool scheme agreed in 35th Meeting of Standing Committee of Western Region on Power system Planning may be deleted.

**With the implementation of Bhuj Pool, the LILO of Bachau – Varsana line may be opened and the line from Mundra UMPP may be terminated at Bhuj Pool.

10.2 To avoid backing down of available generation, the scheme mentioned above needs to be implemented on urgent basis.

Members agreed with the above proposal.

11.0 Evacuation of Power from Adani Mundra Generation Project

11.1 COO (CTU), POWERGRID informed that M/s Adani Power Limited (APL) has established a 4620MW generation project at Mundra in Kutch dist. Gujarat. From their generation project, M/s Adani Power has tied up 3966 MW of power under long term:

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

11.2 For transfer of power to Haryana (PPA for 1424 MW), M/s Adani Power Limited had established Mundra – Mohindergarh ± 500kV HVDC 2500MW Bi-pole & Mohindergarh - Dhanonda 400kV (Quad) D/c lines as dedicated transmission system. Additionally, M/s Adani Power Limited had set up Mohindergarh – Bhiwani (PG) – 400kV D/c line for 342 MW LTA to Punjab and/or Rajasthan beyond Mohindergarh considering that 342 MW power would be available at Mohindergarh HVDC terminal. This LTA for 342 MW was approved with point of injection of power as Bhiwani Substation of POWERGRID. M/s Adani Power Ltd. had applied to CERC for grant of transmission license for the dedicated transmission system consisting of Mundra – Sami - Dehgam, Mundra – Mohindergarh HVDC bipole, Mohindergarh – Dhanonda, Mohindergarh – Bhiwani, lines, electrode lines and other associated works. CERC vide its order dated 29/07/2013 has directed that transmission license be granted to Adani Power Limited.

11.3 M/s Adani Power vide letter dated 21/05/2013 has applied for Long Term Access at their generation switchyard for 342MW. As per the LTA application point for LTA is Adani Generation bus. Now with the grant of license, the Adani bus is to be treated as ISTS bus and accordingly LTA is to be granted from Adani generation bus.

11.4 It was further informed that as per the CERC order dated 29/07/2013 as per para 11 *“as the subject transmission system developed by the petitioner is already*

being used as per PPA dated 07/08/2008 for supply of power to UHBVNL & DHBVNL for a quantum of 712 MW each the petitioner shall be deemed to be long term access customer for 1424 MW.” Accordingly, 1424 MW PPA with Haryana is also to be treated as LTA from Adani Mundra generation bus and M/s Adani has to bear the transmission charges and losses for this. Accordingly LTA to M/s Adani Power Limited is deemed to be granted for about 1500 MW (1424 for PPA and losses (exact figure shall be worked out in consultation with NRLDC)) from generation bus from the date of operation of the Adani system as ISTS system and M/s Adani shall bear the transmission charges for the same.

11.5 It was informed that considering the above studies were carried out and results of the studies were deliberated.

11.6 Considering the above deliberations, Member (PS), CEA summarized the following:

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

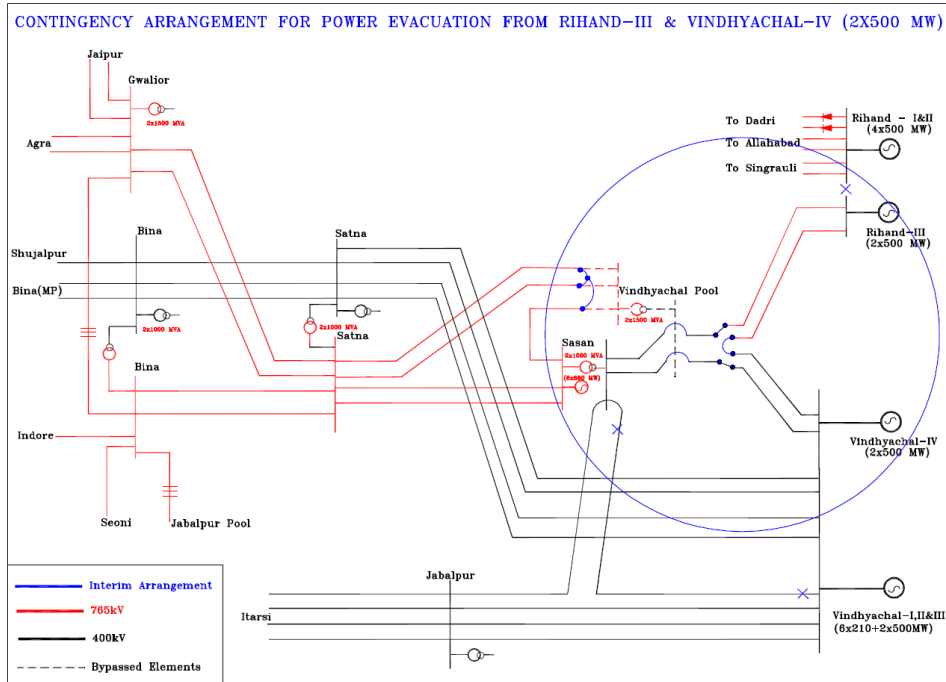
Members agreed to the above proposal.

12.0 Contingency arrangement for Rihand–III & Vindhyachal–IV projects of NTPC.

12.1 Director (SP&PA), CEA stated that following transmission system associated with Vindhyachal-IV and Rihand-III was agreed:

- (i) Rihand-III–Vindhyachal Pooling Stn 765kV 2xS/C (initially op. at 400kV)
- (ii) Vindhyachal-IV – Vindhyachal Pooling Stn 400kV D/c (Quad)
- (iii) Vindhyachal Pooling Stn–Satna 765kV 2xS/c (initially to be op. 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.

12.2 The above system is being implemented by POWERGRID. However, due to the delay in establishment of 765/400kV 2x1500MVA Vindhyachal pool, due to delay in acquisition of land, an interim arrangement has been implemented for Vindhyachal-IV through bypassing of Vindhyachal Pool 765/400 kV substation. This was also discussed in the last SCM meeting. Presently, one unit of Vindhyachal-IV and Rihand-III are in operation. Second unit of Rihand-III is expected to be synchronized in Setemeber'13. POWERGRID has informed following modified interim arrangement with Rihand-III –Vindhyachal Pool transmission lines so that power for both units of Rihand can be evacuated :



- Interconnection of one circuit of Rihand III - Vindhychal Pooling Station (Vindhayachal PS) line with one circuit of Vindhychal PS – Sasan 400 kV D/C line by bypassing Vindhychal Pooling Station.
- Interconnection of one circuit of Vindhychal IV - Vindhychal PS 400 kV D/C (quad) line with another circuit of Vindhychal PS – Sasan 400 kV D/C line by bypassing Vindhychal PS.
- Interconnection of other circuit of Rihand-III - Vindhychal PS 400 kV D/C (quad) line with another circuit of Vindhychal IV - Vindhychal PS 400 kV D/C line by bypassing Vindhychal PS.
- Bunching of both circuits of Vindhychal PS – Satna 765 kV 2XS/C lines and interconnection with Sasan–Vindhychal PS 765 kV S/C line through bypassing Vindhychal PS.
- Bus sectionalizers between Rihand-III and existing stages at Rihand are to be kept open.
- The 400 kV line section between Vindhychal and Sasan (of LILO one circuit of Vindhychal – Jabalpur 400 kV D/C line at Sasan) shall be kept open.

12.3 This interim arrangement was discussed and agreed in the 36th SCM meeting of WR.

- 12.4 In the event of any constraints faced by NTPC due to outages in this interim arrangement, it was proposed that NTPC may isolate one unit of Rihand-III and connect it with existing Rihand Generation evacuation system.
- 12.5 Members also agreed that in case of commissioning of Rihand-III unit-2 before implementation of above interim arrangement, the generation of Rihand-III unit-2 shall be evacuated through existing Vindhyachal generation bus through HVDC Back to Back depending on the available system margins as agreed in 31st SCM of NR.

Members discussed and agreed to the above proposal.

13.0 Tehri PSP Transmission System

- 13.1 POWERGRID stated that due to severe constraints in transportation of 500 MVA, 765/400 kV ICTs (Single Phase units) to Tehri Pooling station, POWERGRID proposed to provide 4 nos. of 800 MVA ICTs (14 Single Phase Units including 2 nos. spare units) instead of 3nos. of 1500 MVA ICTs. The four nos. of 800 MVA, 765/400 kV ICTs shall be able to evacuate from Tehri / Koteshwar HEPs. Accordingly Transmission system for Tehri PSP was modified as:
- i. Tehri Generation – Tehri Pooling Stn. 400 kV S/c (Quad Conductor)
 - ii. Establishment of 765/400 kV, 4x800 MVA ICTs and GIS substation at Tehri Pooling station
 - iii. Augmentation of 765/400 kV, 2x1500 MVA transformation capacity by 1x1500 MVA at Meerut
 - iv. Charging of Tehri Pooling – Meerut line at 765 kV level
 - v. Modification of Series Capacitors for operation at 765 kV level
- 13.2 The members noted that under outage of one transformer the capacity would be reduced to 2400MVA for a short period till the spare transformer can be brought in the system.

Members agreed to the above proposal.

14.0 Shifting of 50MVAR line reactor at Kankroli to Kanpur

- 14.1 During 31st Standing Committee Meeting for Power System Planning for Northern Region, LILO of RAPP- Kankroli D/c line at Chhitorgarh S/s was agreed. It was

also agreed that the 50MVAR line reactors at Kankroli end may be converted as bus reactor at Kankroli. However, there are space constraints for bay extension at Kankroli. Accordingly, 50MVAR line reactors at Kankroli are proposed to be diverted to Kanpur to be used as line reactors on Allahabad-Kanpur 400kV D/c line proposed under NRSS-XXX.

14.2 POSOCO mentioned that there is a high voltage problem in the vicinity of Kankroli, RAPP S/s and insisted for not shifting the Reactors from Kankroli.

14.3 Member (PS), CEA advised that the proposed shifting of the line reactors may be taken up after commissioning of SVC at Kankroli S/s.

Members agreed to the above.

15.0 Evacuation of Power from Sainj HEP and extension of 2nos. circuits of 400kV Parbati-III HEP- Parbati Pooling Station line (being constructed by PKTCL) upto Sainj HEP Switchyard

15.1 Director, CEA explained that the issue of evacuation of power from Sainj HEP was discussed in the last three Standing Committee Meetings of NR, wherein it was proposed that injection of Sainj HEP of HPPCL could be through LILO of Parbati-II – Parbati-III 400 kV line, however in case of outage of one circuit, 10% overload generation and 0.95 pu at both ends there may be certain constraints and generation would have to be backed down as the cable is rated for only 2400 amps. HPPCL had agreed to back down the generation at Sainj, if required with a view to prevent the overloading of the XLPE cable of Parbati-III switchyard.

15.2 Subsequently, NHPC informed that backing down of generation at Sainj HEP does not safeguard the overheating of XLPE cable provided at Parbati-III switchyard and as such the arrangement is not acceptable to NHPC. After deliberations it was decided to form a committee consisting of representatives from CTU, CEA, HPPTCL, HPPCL & NHPC to solve the issue and if required joint site visit may be undertaken. In line with above a joint visit was undertaken on 6th and 7th May 2013. During the visit it was observed that it would be feasible to LILO 400 kV direct circuit from Parbati-II to Parbati Pooling station (Banala) for evacuation of power from Sainj HEP. HPPTCL has agreed to construct additional towers for LILO arrangement.

15.3 The above proposal was discussed in detail during a meeting held in CEA on 14/05/2013. During the meeting NHPC raised its concern that with the implementation of the LILO arrangement, evacuation of power from Parbati-II (800MW) would be dependent on Parbati-III & Sainj and there would not be any direct link to Parbati Pooling station. CEA & CTU stressed that keeping in view that long term planning, the most optimum solution is through the proposed LILO of Parbati-II to Parbati Pooling station 400 kV line at Sainj. Accordingly, after detailed deliberations following were agreed:

- i. For evacuation of Sainj HEP power, LILO of 400 kV direct circuit from Parbati-II HEP to Parbati Pooling station (Banala) shall be implemented by HPPTCL.
- ii. HPPCL shall install suitable scheme at Sainj HEP generation station to ensure that current flowing through the cable at Parbati-III does not exceed 2400 Amps. This SPS scheme will back down the Sainj generation accordingly.
- iii. In case of permanent outage of Sainj switchyard 400 kV bus, bypass of LILO arrangement will be carried out by HPPTCL for evacuation of power from Parbati-II generation.
- iv. The above proposed arrangement should be implemented expeditiously by HPPTCL as the generation of Sainj is expected to be commissioned by December 2014.

15.4 Members observed that simultaneous occurrence of conditions viz. outage of one section i.e. Sainj- Parbati Pooling, 10% overload generation and 0.95 p.u. at both ends are remote. Under such condition HPPCL has agreed to back down its generation. Considering the constraints in the area, members agreed for the same. HPPCL is also to ensure that the equipment's in the generating switchyard and GIS have the same current carrying capacity as that of the 400 kV line to be LILoed at Sainj HEP.

15.5 HPPCL informed that Sainj project is expected by Dec'14. PKTCL is constructing 400 kV 2xS/c lines from Parbati-I HEP to Koldam HEP. Portion of these lines between Parbati-III HEP and Parbati Pooling Station has been completed for evacuation of Parbati-III HEP. **It was proposed that PKTCL may be requested**

to extend these 400 kV lines up to Sainj HEP switchyard by December, 2014 matching with the scheduled commissioning of Sainj HEP for evacuation of power from Sainj HEP.

Members agreed to the above.

16.0 Proposal for STATCOM in Northern Region

16.1 POWERGRID stated that during 31st Standing Committee meeting for Power System Planning for NR, +/- 400 MVAR SVC at Lucknow & Nalagarh was agreed. Further analysis was carried out to finalise the technology, size etc. suitable to Indian Grid.

16.2 It was informed that POWERGRID appointed Dr. Narain G. Hingorani, an International consultant in the field on HVDC, FACTS, Power Electronics, Power System and T&D. The technology issue of SVC v/s STATCOM was discussed in detail with the consultant in association with CEA and it was concluded that hybrid configuration i.e. STATCOM with a coordinated control of mechanically switched reactor and/or capacitor may be adopted. STATCOM is preferred over SVCs in view of its faster response, requirement of less space and above all its state of art technology. STATCOM would primarily be for dynamic compensation while mechanically switched reactors/capacitors would be for reactive compensation under steady state. Accordingly the earlier approved SVC at Nalagarh and Lucknow were reviewed and following was proposed:

Substation	Mechanically switched Compensation		Dynamic compn. (STATCOM)
	Reactor (MSR) MVAR	Capacitor(MSC) MVAR	MVAR
Lucknow	2x125	1x125	+/- 300
Nalagarh	2x125	2x125	+/- 200

Members agreed to the above proposal.

17.0 Replacement of 6 nos. of Towers of 400 kV Ballabgarh- Bamnoli D/c line with Multi-circuit towers

17.1 Director, CEA stated that 400 kV Ballabgarh-Bamnoli D/c is an existing line of Delhi ring and it belongs to DTL. HVPNL proposed to utilize R-o-W of part of this line (6 towers) near NH-8 to construct their approved 400 kV Daultabad-Gurgaon D/c line by employing 6 nos. multi-circuit towers due to severe R-o-W constraints near NH-8 for crossing. The proposal was agreed by DTL & HVPNL and the conversion of 6 nos. D/c towers to multi-circuit towers has been completed. Presently, both the 400 kV Ballabgarh-Bamnoli D/c line and Daultabad-Gurgaon D/c line are in operation.

Members noted the same.

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

18.1 Director, CEA opined that in view of the requirement of meeting revised transmission planning redundancy criteria (N-1-1), transmission strengthening for Mundra UMPP was identified along with an interconnection at 400kV Bhuj Pooling station with Mundra UMPP. In addition, keeping in view the long term perspective, an addition line is planned from Adani Mundra generation bus to Bhuj Pool. Considering requirement of transmission strengthening beyond Bhuj Pooling station due to integration of Generation from Mundra UMPP and Adani Mundra in Kutch (Gujarat) as well as envisaged renewable capacity in Gujarat and Rajasthan in 12th plan period, a comprehensive transmission system strengthening is evolved.

18.2 POWERGRID informed that it is envisaged to add about 32 GW capacity through Renewable Energy sources (RES) during 12th plan period based on the meeting held amongst CEA, POWERGRID and respective RE resource rich states viz. Rajasthan, HP, J&K, Gujarat, Maharashtra, Tamil Nadu, Karnataka & AP. Out of this, Rajasthan envisaged 5694MW renewable generation capacity addition with 35% (about 2000MW) of RES capacity addition near Bhadla (Jodhpur) and Jaisalmer belt etc. In addition, RRECL also informed about development a solar park of 2000MW additional capacity near Bhadla. Gujarat has also envisaged renewable capacity addition of about 4729MW in 12th Plan.

- 18.3 Considering renewable capacity in Rajasthan (8100 MW) & Gujarat (8300 MW) by 12th plan, RE concentration in certain pockets of these states & very short gestation period viz. Wind generation (12-16 months) & Solar Generation (9-12 months) as compared for transmission infrastructure (30-36 months) development, it is prudent to strengthen grid interconnection through Inter-state transmission system(ISTS). Proposed ISTS shall also enlarge much needed power-balancing area, addressing various issues of grid integration of renewable including balancing mechanism. In addition, RVPN & GETCO have also identified Intra state transmission scheme to disperse and absorb the RE energy.
- 18.4 SE (RVPN) suggested that mostly large scale renewable generation generally comes up at 220kV voltage level, therefore 765/400kV Bhadla Substation should also possess 220kV voltage level so that it can directly integrate renewable. It was agreed to include 220kV voltage level through 2x500 MVA, 220/400kV transformer at 765/400kV Bhadla (New) substation. Members agreed for the proposal.
- 18.5 Further, SE (RVPN) opined that due to volatility RE generation, high capacity and length of proposed 765kV transmission corridors, it is prudent to provide adequate reactive compensation in the form of static (line and bus reactors) as well as dynamic reactive compensation (STATCOMs).
- 18.6 CEO (POSOCO) emphasized that additional 400kV links may be provided from intermediate 765/400kV substations for further dispersal of power which shall strengthen the interconnections.
- 18.7 Considering the requirement of transmission strengthening beyond Bhuj Pooling station due to integration of Generation from Mundra UMPP and Adani Mundra in Kutch (Gujarat) complex as well above envisaged renewable capacity in Gujarat and Rajasthan, a comprehensive ISTS strengthening was proposed as under:

Western Region (Gujarat):

- i. Bhuj Pool–Banaskanta 765 kV D/c
- ii. Banaskanta -Chittorgarh 765 kV D/c
- iii. Banaskanta-Sankhari 400 kV D/c
- iv. 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) sub-station each at Bhuj Pool and Banaskanta

- v. Associated reactive compensation (Bus reactors & line reactors)

Northern Region (Rajasthan):

- vi. Chittorgarh-Ajmer (New) 765 kV D/c
 - vii. Ajmer (New)-Suratgarh (New) 765 kV D/c
 - viii. Suratgarh (New)-Moga (PG) 765 kV D/c
 - ix. Bhadla (New)-Ajmer (New) 765 kV D/c
 - x. Chittorgarh-Chittorgarh (RVPN) 400 kV D/c (Quad)
 - xi. Ajmer (New)- Ajmer (RVPN) 400 kV D/c (Quad)
 - xii. Suratgarh (New)- Suratgarh 400 kV D/c (Quad)
 - xiii. Bhadla (New)-Bhadla (RVPN) 400 kV D/c (Quad)
 - xiv. Bhadla (New)-Pokhran New (RVPN) 400 kV D/c (Quad)
 - xv. 2x1500 MVA, 765/400 kV sub-station each at Chittorgarh, Ajmer (New) and Suratgarh (New)
 - xvi. 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) sub-station at Bhadla (New)
 - xvii. Associated reactive compensation (Bus reactors & line reactors)
- 18.8 After discussion, Member (PS), CEA opined that due to urgent requirement of above strengthening for Mundra UMPP/Adani Mundra as well as short gestation period of Renewable, transmission strengthening may be implemented in a compressed time schedule.

- 18.9 **Members agreed that due to early requirement the following comprehensive ISTS strengthening scheme may be implemented in compressed schedule by POWERGRID:**

Western Region (Gujarat):

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

Northern Region (Rajasthan):

- i. Chittorgarh-Ajmer (New) 765 kV D/c
- ii. Ajmer (New)-Suratgarh (New) 765 kV D/c

- iii. Suratgarh (New)-Moga (PG) 765 kV D/c
 - iv. Chittorgarh-Chittorgarh (RVPN) 400 kV D/c (Quad)
 - v. Ajmer (New)- Ajmer (RVPN) 400 kV D/c (Quad)
 - vi. Suratgarh (New)- Suratgarh 400 kV D/c (Quad)
 - vii. 2x1500 MVA, 765/400 kV sub-station each at Chittorgarh, Ajmer (New) and Suratgarh (New)
 - viii. Associated reactive compensation (Bus reactors & line reactors)
- 18.10 It was also agreed that the renewable generations would be allowed to inject in the ISTS at Bhuj, Banaskantha, Chittorgarh, Ajmer etc., if they apply for LTA quantum which is atleast 25% of their installed capacity.
- 18.11 The following system was also discussed and approved. However, it was decided that this system shall be taken up for implementation only after receipt of application for Connectivity and LTA for sufficient quantum from Solar/ wind generation developers around Bhadla area:
- i. Bhadla (New)-Ajmer (New) 765 kV D/c
 - ii. Bhadla (New)-Bhadla (RVPN) 400 kV D/c (Quad)
 - iii. Bhadla (New)-Pokhran New (RVPN) 400 kV D/c (Quad)
 - iv. 765/400/220kV (765/400 kV-2x1500 MVA & 400/220kV- 2x500MVA) sub-station at Bhadla (New)

18.12 The intra-state transmission system required for integration of RES generation in the states of Rajasthan and Himachal Pradesh as identified by CEA, CTU & states were also agreed. The details of the above intra-state transmission system are given at **Annex-2** for Rajasthan and at **Annex-3** for Himachal Pradesh.

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

19.1 POWERGRID informed that as decided in the Joint meeting of all the five(5) Regional Standing committees on Power System Planning held on 05.03.2012, the activity of development of following analytics using PMU based measurements as part of Unified Real Time Dynamic State Measurement (URTDSM) was undertaken with IIT Bombay in association with premier academic institutions like IIT:-

- i. Line Parameter Estimation

- ii. Vulnerability analysis of distance relays
 - iii. Linear state estimator
 - iv. Supervised Zone-3 distance protection scheme to prevent unwanted tripping of backup distance relays
 - v. CT/CVT calibration
 - vi. Control Schemes for improving system security (based on angular, voltage and frequency instability)
- 19.2 The aim, deliverables, timelines and cost of each analytics were explained to the members and it was informed that these analytics are being developed in association with CEA, POSOCO, and CTU/POWERGRID.

After deliberations, Members decided that after developing above mentioned analytics, the same may be informed to the RPC.

20.0 Evacuation of Power from Malana-II HEP (100 MW)

- 20.1 Director, CEA explained that for evacuation of power from Parbati-II & Parbati-III Hydroelectric projects of NHPC and Koldam Hydroelectric project of NTPC, a composite transmission scheme was evolved. In a meeting held on 23.02.04 in CEA it emerged that Parbati-II evacuation system would be available during the time frame of commissioning of Allain Dhuangan /Malana-II HEPs. Accordingly, power of Allain Duhangan HEP (192 MW) and Malana-II (100 MW) was also planned to be evacuated through the same corridor by pooling at Parbati Pooling Station.
- 20.2 Considering the above, following scheme was discussed and finalized in 14th and 16th Standing Committee Meeting of Power System Planning of Northern Region held on 30/12/02 and 24/03/2004 respectively:

Parbati-II (800 MW)

- i. Parbati II- Koldam 400 kV (Quad) 2*S/C
- ii. Parbati II – Koldam 400 kV (Quad) S/C with Realignment at Koldam

Koldam (800 MW)

- iii. Koldam – Nalagrh 400 kV D/c (Quad)

- iv. Koldam – Ludhiana 400 kV D/c (Triple) Parbati-III (520 MW)
- v. LILO of Parbati-II- Koldam at Parbati Pooling Station, 400 kV D/C (QUAD)
- vi. LILO of one ckt of Parbati-II – Parbati Pooling at Parbati-III
- vii. Parbati Pooling – Amritsar 400 kV D/c
- viii. Establishment of 400 kV Parbati Pooling station

Allain Duhangan HEP (192 MW) of M/s AD Hydro and Malana-II HEP (100MW) of M/s EPPL

- ix. Injection of power from Allain Duhangan & Malana-II at Parbati Pooling Station

20.3 The implementation of Parbati-II to Koldam 400 kV line was planned through Parbati Koldam Transmission Company Ltd. (A JV of Reliance and POWERGRID). Due to certain policy issues, MOU agreement could not be signed. AD hydro requested MOP for implementation of ADHEP- Nalagarh 220kV D/c line in case of delays in identified scheme as their project was scheduled to commission by Apr'2008. During the 21st SCM held on 3/11/2006 it was discussed and agreed that considering that the 400 kV system may not be available at the time of commissioning of the generation project it was decided that M/s AD Hydro may construct Allain Duhangan – Nalagarh 220 kV D/c line. During the meeting the issue of evacuation of power from Malana-II was also discussed.

20.4 Subsequently, while discussing the evacuation arrangement for Malana-II HEP, it was suggested to M/s A D Hydro to upgrade the conductor of the line, so as the power from both the projects i.e. Malana-II and Allain Duhangan can be evacuated through the 220kV D/c line. In the recommendation letter of CEA to MOP on grant of sec-68 to M/s AD Hydro it was mentioned that out of the total 400MW transmission capacity of the 220 kV D/c AD Hydro-Nalagarh line, 192MW would be utilized for evacuation of Allain Duhangan HEP and balance capacity would be made available to other projects of Parbati/Beas valley. It was suggested to M/s A D Hydro to upgrade the conductor of the line, so as the power from both the projects i.e. Malana-II and Allain Duhangan can be evacuated through the 220 kV D/c line. However, AD HEP expressed their reservation for the changes in the conductor of this line as 80 % of single zebra conductor was already delivered. So there was no option left other than to go ahead with the single Zebra conductor

line. Further considering the commissioning schedule of generation of Allain Duhangan as well as for Malana-II HEPs and scenario prevailing at that time, it was decided that Malana-II may be evacuated through LILO of one ckt of Allain Duhangan – Nalagarh 220 kV D/c line. In the meeting taken by Chairperson, CEA wherein M/s AD Hydro and M/s EPPL was present it was decided that both parties would mutually decide on sharing of the cost and M/s AD Hydro would take up the issue with CERC regarding sharing of their line cost.

- 20.5 Considering that AD HEP – Nalagarh 220 kV D/c line is not adequate for reliable evacuation of power from both the projects, the issue was again discussed in 30th and 31st Standing Committee Meeting on Power System Planning of Northern Region. During these meetings it has been decided that a 220 kV D/c line shall be constructed from Chhaur substation to Parbati Pooling Station by HPPTCL and evacuation of power of Malana-II HEP shall be delinked from AD Hydro – Nalagarh 220 kV D/c line to provide the reliability of power evacuation of both HEPs.
- 20.6 In view of the urgency of implementation of the 220 kV Chhaur-Parbati Pooling Station D/c line, Member (PS) asked about the present status of this line from HPPTCL.
- 20.7 HPPTCL informed that they have finalized the funding of this line and the proposal for Forest clearance has also been submitted to Forest Department. He informed that the line is targeted for commissioning by April'2016.

Members noted the same.

21.0 Converting 2x80 MVAR fixed reactors at Gorakhpur end of 400kV Barh-Gorakhpur D/C line into switchable line reactors.

Director, CEA informed that Barh - Gorakhpur 400kV D/c (under construction by POWERGRID) having 2x80 MVAR fixed line reactors at Gorakhpur end, is to be LILOed at Motihari in Bihar (to be constructed through TBCB). After LILO, length of each section would be more than 150 km. For better reactive power management and system operation, it was proposed to convert these fixed line reactors into switchable line reactors. It was also informed that the same has also been agreed in the previous meeting of Standing Committee in Eastern Region

held on 05-01-2013. The scheme would be implemented by POWERGRID under Eastern Region Strengthening Scheme **ERSS-IX**.

Members noted the same.

22.0 Provision of Bus reactor at Parbati-II HEP

22.1 Director, CEA explained that provision of 400 kV, 125 MVAR bus reactor at Parbati-II HEP and 400 kV, 80 MVAR bus reactor at Parbati-III HEP, was approved in 15th NRPC meeting held on 24th December, 2009. Subsequently, in 24th TCC/27th NRPC meeting held on 29-30th Nov., 2012 at Amritsar, NHPC representative informed about space constraints at Parbati-II & Parbati-III HEP to accommodate above proposed bus reactors. It was decided in the 27th NRPC meeting that a committee comprising of CEA, CTU and NHPC would carry out a site visit at Parbati complex for exploring the feasibility and space for providing the above bus reactors. The site visit was carried out in May, 2013 and it was observed that space for bus reactor is not available at Parbati-III HEP. However, the committee observed that at Parbati-II HEP GIS hall (at 1st Floor), space is available for providing one no. 400 kV GIS bay for bus reactor and 400 kV 125 MVAR bus reactor (or 3 single phase units of 41.66 MVAR) can be accommodated at the space available at Ground Floor where presently a temporary store is located. In view of this, it was proposed that NHPC may provide 125 MVAR bus reactor at Parbati-II HEP.

Members agreed for the above proposal.

23.0 Requirement 2 nos. 220 kV line bays at 400/220 kV Bhinmal (POWERGRID)

23.1 Director, CEA stated that RRVPNL has intimated that at present 4 nos. of 220 kV line bays provided at 400/220 kV Bhinmal S/s (PG) have been utilized by RRVPNL for feeding their 220 kV S/s. They have requested for providing additional 2 nos. 220 kV line bays at Bhinmal S/s under ISTS for feeding the load of their new 220 kV Sayla S/s. The same are proposed to be implemented under ISTS by POWERGRID under NRSS-XXXIV as indicated in Para-29.0.

Members agreed for the above proposal.

24.0 POSOCO report on Operational Feedback on Transmission Constraints

24.1 Operational constraints raised by POSOCO and the remedial measures for these constraints were discussed and described below.

24.2 Transmission System for evacuation of 1140MW (2x110MW+2x210MW+2x250MW) at Parichha

The associated transmission system for recently commissioned 2x250 MW units at Parichha is yet to be commissioned. As UPPTCL was not present in the meeting, so the status of progress of work for interim measure could not be discussed. Member (PS), CEA directed that a meeting with UPPTCL may be called in this regard.

24.3 Transmission System for evacuation of 1200MW Rosa TPS in Uttar Pradesh

POWERGRID stated that with the commissioning of 400/220 kV Shahjahanpur (PG) substation which is expected by March, 2014 the constraint of loadings may be overcome.

24.4 Tie-line between Unnao and Panki substation of U.P

400 kV Unnao-Panki line is often loaded in the range of 700- 900 MW. POWERGRID stated that Lucknow-Kanpur 400kV D/c has been approved under NRSS-XXII and commissioning of this line will provide relief to Unnao-Panki 400 kV line. Preliminary activities for implementation of Lucknow-Kanpur line have been initiated.

COO, POSOCO mentioned that the possibility of re-conductoring of Unnao-Panki line with high capacity conductor needs to be explored. It was decided that the same would be taken up with UPPTCL.

24.5 220kV Sarna- Hiranagar line overloading

220kV Hiranagar-Jammu S/c line is getting overloaded during winter and summer. The envisaged 220kV RSD-Hiranagar D/C and the 220 kV network downstream of 400 kV Samba is yet to be commissioned. To remove the congestion, J&K requested that the LILO of the Sarna-Hiranagar 220 kV line at 400/220kV Samba (PG) substation may be implemented as an ISTS scheme.

POWERGRID informed that 400/220kV, 2x315 MVA Samba substation has been commissioned and the evacuation arrangement at 220 kV level is to be carried out by PDD, J&K.

POSOCO stated that the proposed LILO would help in relieving the congestion as well as meeting J&K load from ISTS grid at Samba.

Considering the constraints being faced in J&K, **Members agreed to the request of PDD, J&K and accordingly, the LILO of 220 kV Sarna-Hiranagar line at 400/220 kV Samba S/s (PG) was agreed under ISTS strengthening. It was decided that as Samba was already commissioned these works are required urgently and will be carried out by POWERGRID in compressed time schedule. POWERGRID informed that scheme would be taken up under NRSS-XXXIV as indicated in Para-29.0.** PDD, J&K was directed to implement additional 220 kV works to draw power from Samba 400/220 kV substation.

Member (PS) directed PDD, J&K to submit the program with firm schedule of completion of their 220kV lines/substations for drawing power from 400/220 kV Samba and New Wanpoh S/s of POWERGRID. He desired a commitment from Govt. of J&K in this regard.

24.6 High loading in western UP during peak loading condition

During low hydro generation and increased drawl by Western UP and Uttarakhand, 400 kV lines viz. Dadri-Muradnagar, Meerut-Muzzafar Nagar and 400/220 kV Meerut transformers get overloaded.

POWERGRID informed that additional 400/220 kV, 1x500 MVA ICT at Meerut S/s is already under implementation. Further, with the commissioning of 400 kV Bareilly-Kashipur-Roorkee-Saharanpur D/c (quad) line, the existing lines will be relieved from high loadings. The Bareilly-Kashipur-Roorkee line is expected by March'14.

24.7 New element pending since long could be suggested for expedite

POWERGRID asked various constituents for the present status of the following transmission elements which has been pending from a long time:

- i. Underlying 220kV network of 400/220kV for Deepalpur, Kabulpur and Manesar in Haryana.

- ii. 400kV Daultabad-Gurgaon D/C
- iii. 400kV Dadri-Loni Road and underlying 220kV network of Loni road
- iv. LILO of 400kV Dehar-Bhiwani BBMB
- v. LILO of 400kV Dehar-Panipat

Haryana informed that about 250-300 MW load has been connected at Kabulpur & Deepalpur S/s and 400 kV Daultabad-Gurgaon D/c line is also commissioned. NTPC informed that R-o-W for 3-4 tower locations of 400 kV Dadri-Loni road D/c line is still pending. DTL informed that Loni road S/s is ready. Regarding 220kV outlets from the 400/220 kV Loni Road substation, DTL informed that 220 kV cables are in tendering stage.

POWERGRID informed that commissioning of LILO of 400 kV Dehar-Bhiwani (BBMB) & Dehar-Panipat is targeted before Aug'2014. CEO, POSOCO stressed upon the high voltage problems at Dehar and insisted for early commissioning of these LILO sections. POWERGRID agreed for the same.

24.8 **Upcoming network in Northern region may be expedited**

POSOCO stated that following elements are required for early commissioning:

- i. 400kV Dhanoda-Bhiwani PG D/C
- ii. 400kV Ring network in Punjab system
- iii. Connectivity of J&K valley system with the rest of the grid
- iv. 400kV substation in Western UP (Bagpat, Aligarh, Orai)
- v. 400kV substation in Uttarakhand e.g Dehradun, Srinagar
- vi. 400kV interconnection of Uttarakhand i.e 400kV Bareilly-Kashipur, 400kV Kashipur-
- vii. Roorkee and 400kV Roorkee-Saharanpur
- viii. 400 kV Rihand-III-Vindhyachal pooling station D/C
- ix. Enhancing the connectivity of NR system with WR system.

CEO (POSOCO) mentioned about the voltage constraints in Punjab area during paddy season and opined that more strengthening is required in Punjab at 400 & 220 kV level.

Member (PS) advised that in order to assess the power requirement with the variations in paddy season, hydro & thermal scenarios, PSTCL should provide exact load projections under different scenarios. Member (PS) also desired that a joint planning study may be carried out by CTU with PSTCL and NRLDC to identify the transmission strengthening requirements in Punjab.

Members agreed for the same.

25.0 Integrated transmission system in Uttarakhand to be implemented by PTCUL

- 25.1 Director (SP&PA) CEA informed that the issue of implementation of integrated transmission system for evacuation of power from various hydro projects (including Central Sector, State Sector & IPPs) in Uttarakhand (UITP) was discussed in various Standing Committee meetings as well as in TCC & NRPC meetings. The issue was discussed in the 2nd TCC and 3rd NRPC meeting held on 10/11/2006 wherein Chairman / Members observed that PTCUL could take up the “intra-state transmission system” up to the pooling point on their own, for which there was no requirement of any commitment of payment of transmission charges by other constituents and arrangement of recovery of transmission charges will be only between PTCUL and the generators. While taking up the implementation of transmission system, the agreement for payment of transmission charges could not be signed with some of the Inter-state generators.
- 25.2 It was further informed that PTCUL took up the matter in NRPC meetings for declaring the system for granting the system as deemed ISTS, however no consensus could be reached. PTCUL took up the matter with CERC for declaring the integrated scheme as deemed ISTS scheme. CERC has issued order dated 31/01/2013 regarding declaration of UITP as deemed ISTS. As per the order, CERC had accorded the status of deemed ISTS to above integrated transmission system of Uttarakhand and directed PTCUL to segregate the transmission lines carrying inter-state power and approach the CTU which is the nodal agency for vetting of the comprehensive scheme in accordance with the connectivity regulations. Further, CTU has been directed by CERC to study the transmission system and in case any modifications are suggested by CTU, the same shall be

- incorporated and implemented by the PTCUL. CTU has also been directed to monitor the implementation of ISTS portion of the UITP scheme.
- 25.3 CTU, POWERGRID informed that they had a preliminary meeting with PTCUL on 28/05/2013, wherein PTCUL explained the status of the various transmission elements of the UITP scheme.
- 25.4 During the meeting, it was explained by the CTU that the transmission system needs to be prioritized & phased in such a manner that power does not get bottled up from any generator. It was also informed by the PTCUL that at present their 1st priority is for Alaknanda Basin as the generation projects in other basins may take some time.
- 25.5 During the deliberations it was observed that Tapovan Vishnugad (520 MW) project of NTPC, a major project in the basin, may come up first. NTPC informed that the Tapovan Vishnugadh project is likely to be commissioned by Feb, 2016 and expressed their concern for evacuation of power from their project.
- 25.6 CTU representative stated that the issue of evacuation of power from Tapovan Vishnugadh was discussed during the 28th NRPC meeting of NRPC held on 26/04/2013 wherein it was deliberated that the transmission scheme had already been granted the deemed ISTS status and as per the BPTA already signed, beneficiaries had agreed to pay transmission charge for all central sector projects, existing and future as per applicable CERC regulation. During the meeting beneficiaries agreed for the payment of transmission charges corresponding to MW allocation of Tapovan Vishnugad by Govt of India in line with CERC Regulations.
- 25.7 CTU further stated that as per CERC order petitioner has to ensure that generators enter into appropriate agreements with the petitioner and CTU for bearing the transmission charges till they identify and enter into PPAs with the beneficiaries outside the State. It was also informed that as per present scenario there are about 15 generators with a total capacity of about 2950 MW and out of these generators 3 projects with a total capacity of about 875 MW have applied for LTA.
- 25.8 Member (PS), CEA enquired about the other generation projects which have applied for LTA through this transmission system. CTU informed that Phata Byong

(76 MW) and GMR Badrinath (300 MW) have applied for LTA in addition to Tapovan Vishnugadh (520 MW). Member (PS), CEA also enquired about the status of GMR Badrinath project. It was informed that as per BPTA agreement the date of LTA is December 2014, however it has been gathered that the generation project is delayed. As of now LTA of GMR Badrinath shall start after the commissioning of the evacuation system by PTCUL.

25.9 Member (PS), CEA observed that main transmission corridor i.e. Pipalkoti-Srinagar-Kashipur 400 kV D/c (Quad) line is to be implemented matching with the commissioning of Tapovan Vishnugad project and this corridor may be treated as deemed ISTS line from the date of its commissioning. Constituents agreed for the same.

25.10 On query regarding the status of the lines for evacuation of power from Tapovan Vishnugad project, PTCUL informed that they have placed the orders for 400 kV Srinagar – Kashipur D/c line and order for other lines is under advanced stage of tendering / award. Members opined that PTCUL shall make all efforts to commission the transmission system matching with the commissioning of Tapovan Vishnugad HEP. For evacuation of power from the other projects, it was agreed that PTCUL shall phase the transmission system matching with the generation projects.

Members agreed with the above.

26.0 Strengthening of power supply to 400 KV, Amritsar S/s

26.1 Director (SP&PA), CEA explained that 400/220kV, 2x315MVA Amritsar S/s of POWERGRID, is presently connected to the grid through 400kV Amritsar-Jalandhar S/c line. To meet the growing power demand of the area, augmentation of transformation capacity of Amritsar S/s by an additional 400/220kV, 1x500MVA transformer has already been taken up. As a part of associated transmission system for Parbati-III HEP, a 400kV D/c line from Parbati Pooling Station to Amritsar is already under construction and 400kV, Kurushetra-Malerktla-Amritsar D/c line has been approved recently. However under low hydro conditions, with revised reliability criteria of (n-1-1), under outage of both circuits of Amritsar-Malerkotla 400kV D/c line, the power supply to Amritsar S/s and nearby area would be mainly dependent on a 400kV S/c line from Jalandhar S/s.

Considering the above, it is proposed to strengthen the interconnection between Jalandhar and Amritsar substations by **LILO of one circuit of 400 kV Parbati Pooling Station – Amritsar D/c line at Jalandhar substation**. The scheme would be implemented by POWERGRID under **NRSS-XXXIV** as indicated in **Para-29.0**

After deliberations, members agreed for the above proposal.

27.0 Absorption/ transfer of power from Jhajjar Complex-HVPN

27.1 Director (SP&PA), CEA stated that Haryana has tied up about 3300MW power to be injected in Jhajjar/ Mohindergarh/ Daulatabad area. Constraints in absorption of available generation/injection were being observed in Jhajjar area. To mitigate the constraints, following system strengthening was agreed during the 31st standing committee meeting:

- i. Establishment of a new 400/220kV, 2X315 MVA substation near Farukhnagar area of Gurgaon by LILO of both circuits of 400kV Dhanonda- Daulatabad D/c line - by HVPNL
- ii. Augmentation with 400/220kV, 1X315MVA, ICT (3rd) at each Kaboolpur (Rohtak) S/s & 1x315 MVA, 400 kV, ICT (4th) at Daulatabad S/s- by HVPNL
- iii. 400 kV Dhanonda- Bhiwani(PG) D/c line and LILO of 400kV Bahadurgarh-Bhiwani(PG) line at Kaboolpur(HVPN) S/s -by HVPNL in place of already approved 400 kV Kaboolpur- Bhiwani(PG) D/c line - by HVPNL
- iv. Augmentation with 400/220kV, 500MVA ICT(4th) at Sector-72 Gurgaon (PG) Substation- by POWERGRID

27.2 He explained that HVPNL has informed that 400kV Daultabad-Sector-72 Gurgaon D/c line had already been commissioned in June 2013 and LILO of 400kV Bahadurgarh-Bhiwani (PG) line at Kaboolpur is also nearing completion and HVPNL has requested to reassess the requirement of Dhanoda-Bhiwani 400kV D/c. It was mentioned that a joint study was carried out and based on the joint studies the above strengthening was proposed. Nevertheless studies were carried again with 1500MW HVDC injection, with and without considering Dhanonda-Bhiwani (PG) 400 kV D/c line and results of the studies were deliberated. It was informed that there may be transmission constraints during the outage of one

circuit of Mohindergarh – Bhiwani 400 kV line, as the remaining Mohindergarh-Bhiwani circuit (Twin Moose) would get critically loaded. With the addition of Dhanonda – Bhiwani 400 kV D/c line these constraints are mitigated.

- 27.3 HVPNL stated that after the grant of licence to M/s Adani Power Limited, the transmission system established by APL has become ISTS system and this strengthening should also be taken up as ISTS strengthening.
- 27.4 Matter was further deliberated and it was opined that instead of Dhanonda – Bhiwani 400 kV D/c line, Mohindergarh – Bhiwani (PG) 400 kV D/c line would be a better option as it would be directly emanating from the Mohindergarh HVDC Station.
- 27.5 POSOCO suggested that considering the small length of the proposed line as well as future power flow requirement, the above line may be constructed with Twin HTLS conductor.
- 27.6 Keeping above in view, following transmission scheme was agreed for implementation under Regional System Strengthening Scheme **NRSS-XXXV**:
- i. Mohindergarh – Bhiwani 400 kV D/c line with Twin HTLS
 - ii. 2 nos. of 400 kV line bays at Mohindergarh to be provided by M/s APL at their Mohindergarh switchyard.
 - iii. 2 nos. of 400 kV line bays at Bhiwani (PG) to be provided by POWERGRID.

Members agreed to the above proposal.

28.0 220 kV Line bays at 765/400/220 kV Kurushetra S/s (PG)

- 28.1 Director (SP&PA) stated that HVPNL has intimated that they would be requiring 4 nos. of 220 kV line bays at Kurushetra S/s under implementation by POWERGRID and these 4 nos. 220 kV line bays would be utilised for their planned (i) LILO of one circuit of existing 220 kV Pehowa-Kaul D/c line at Kurushetra (PG) S/s and (ii) LILO of one circuit of existing 220 kV Bastara-Kaul D/c line at Kurushetra (PG) S/s.
- 28.2 HVPNL has informed that this arrangement will enable them to feed 400-500 MW load from Kurushetra S/s.

28.3 CTU, POWERGRID informed that 6 nos of 220kV line bays are being provided at Kurukshetra. HVPNL agreed to plan two additional feeders from Kurukshetra.

Members agreed to the above.

29.0 As discussed and agreed in earlier paragraphs the following works will be covered under Regional System Strengthening Scheme NRSS-XXXIV and would be carried out by POWERGRID under compressed time schedule:

- i. LILO of Agra – Bharatpur 220 kV S/c line at Agra (PG)
- ii. 1X315 MVA 400/220 kV ICT at Agra(PG) along with associated bays (ICT shall be from the spared ICTs available after replacement of ICTs at Ballabgarh / Mandaula)
- iii. 1x315 MVA 400/220 kV transformer at 400kV substation Kaithal along with associated bays (spared ICT available after replacement of ICTs at Ballabgarh / Mandaula S/s shall be installed).
- iv. 2 nos., 220kV line bays at Kaithal S/s
- v. 2 nos. 220 kV line bays at 400/220 kV Bhinmal S/s (POWERGRID)
- vi. LILO of Sarna- Hiranagar 220kV S/c at 400/220kV Samba S/s
- vii. LILO of one circuit of 400 kV Parbati Pooling Station – Amritsar D/c line at Jalandhar S/s (PG)
- viii. 2 nos., 400kV line bays at Bhiwani (PG) S/s

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Annexure-1

List of participants for the 32nd Standing Committee Meeting of Northern Region held on 31.08.2013 at NRPC, Delhi.

	Name	Designation
CEA		
1.	Sh. Ravinder	Chairperson & Member (PS)
2.	Sh. K.K. Arya	Chief Engineer I/c (SP&PA)
3.	Sh. B.K. Sharma	Director (SP&PA)
NRPC		
4.	Sh. P.K. Pahwa	Member Secretary
PGCIL		
5.	Sh. Y.K. Sehgal	COO (CTU)
6.	Sh. Mukesh Khanna	DGM(CTU)
7.	Sh. A. Sensarma	DGM (OS)
8.	Sh. Jasbir Singh	DGM (Comml)
9.	Sh. V. Thiagarajan	CDE(CTU)
10.	Ms. R.P. Joshi	Sr. Engineer(CTU)
11.	Ms. Ankita Singh	Engineer (CTU)
12.	Sh. Nunavath Ravi	Engineer (CTU)
13.	Ms. Shruti Tiwari	Engineer (OS)
NTPC		
14.	Sh. S.S. Mishra	AGM (Engg.)
15.	Ms. Sagarika Mohanty	DGM (PE-Elect.)
16.	Ms. Shilpa Agarwal	Manager (Comml)
DTL		
17.	Sh.A.C Agrawal	DGM(T)
18.	Sh. Roop Kumar	GM (Plg.)
HPPTCL		
19.	Sh.R.K Sharma	Director (Proj)
20.	Sh. Sandeep Sharma	Sr. Manager(Plg)
HVPNL		
21.	Sh. R.K.Arora	Advisor
22.	Sh. R.C Malhotra	Director (Technical)
23.	Sh. J.K. Juneja	Chief Engineer (Plg)
24.	Sh. S.B. Moudgil	Chief Engineer
RVPNL		
25.	Sh L.N. Nimawat	Chief Engineer (PPM)
26.	Ms. Sona Shishodia	XEN(PSS)

J&K PDD

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|-----|---------------------|---------------|
| 27. | Sh. Asgar Ali Majaz | Dev. Comm.(P) |
| 28. | Sh. Sanjay Sharma | E.E |

POSOCO

- | | | |
|-----|---------------------|--------------|
| 29. | Sh. S.K Soonee | CEO (POSOCO) |
| 30. | Sh. S.R. Narasimhan | DGM |
| 31. | Sh. N. Nallarasan | DGM |

NRLDC

- | | | |
|-----|---------------------|---------------|
| 32. | Sh. P. Mukhopadhyay | GM |
| 33. | Sh Rajiv Porwal | Chief Manager |

PSTCL

- | | | |
|-----|----------------|----------|
| 34. | Sh. Anil Gupta | ASE(Plg) |
| 35. | Sh. V.K Garg | CE(Plg) |

BBMB

- | | | |
|-----|-------------------|----------|
| 36. | Sh. Kuldeep Singh | Addl. SE |
|-----|-------------------|----------|

Annexure-2**RAJASTHAN****Total Amount (Rs. in Crore) = 3449****DETAILS****(Rs. in Lakhs)**

S.No.	Proposed Transmission System for Power Evacuation Scheme of Solar Power Projects in Rajasthan	Unit	kMs/ Nos	Unit Rate	Estimated Cost (excluding IDC)	Estimated Cost (including IDC)
1	765 kV S/C Ajmer (PGCIL's proposed 765/400 kV GSS)-Phagi(RVPN's U/C 765 kV GSS) line (Including estimates of 2 nos 765kV bays and PLCC equipment)	kMs	150	227.89	35976.78	40308.38
2	400 kV GSS at Banswara (Upgradation of approved 220 kV switching station at Banswara)					75740.12
i	2x500 MVA , 400/220 kV GSS at Banswara				18675.76	20924.32
ii	2x160 MVA , 220/132 kV & 2x40/50 MVA , 132/33 kV transformers at proposed 400/220 kV GSS Banswara					
iii	125 MVAR, 400 kV bus type shunt reactor at Banswara					
iv	400 kV D/C Banswara-Chittorgarh line (Quad Moose conductor) with 2x50 MVAR line reactors at Both ends of line (Estimates for 2 Nos.400kV bays at Chittorgarh & Line reactors cost included in estimates of 400/220 kV GSS Banswara)	kMs	200	210.96	42191.20	47271.02
v	220 kV interconnections (D/C) at proposed 400 kV GSS Banswara (To be identified)	kMs	100	42.23	4223.00	4731.45
vi	132 kV interconnections (D/C) at proposed 400 kV GSS Banswara (To be identified)	kMs	100	25.11	2511.00	2813.32
vii	Additional 220 kV bays at 400 kV GSS Banswara(14 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Banswara estimates			
viii	Additional 132 kV bays at 400 kV GSS Banswara(16 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Banswara estimates			

ix	Additional 33 kV bays at 400 kV GSS Banswara(20 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Banswara estimates			
3	400 kV GSS at Bhadla (Solar Park)					221810.68
i	2x500 MVA , 400/220 kV GSS at Bhadla (Solar Park)				20688.10	23178.94
ii	2x160 MVA , 220/132 kV & 2x40/50 MVA , 132/33 kV transformers at proposed 400/220 kV GSS Bhadla (Solar Park)					
iii	125 MVAR, 400 kV bus type shunt reactor at Bhadla (Solar Park), 2x					
iv	400 kV D/C Bhadla (Solar Park)-Jodhpur (PGCIL's proposed 765/400 kV GSS) line (Quad Moose conductor) with 2x50 MVAR line reactors at Both ends of line (Cost of reactors included in cost of 400/220 kV GSS Bhadla)	kMs	200	210.96	42191.20	47271.02
v	400 kV D/C Bhadla (Solar Park)-Deedwana line (Quad Moose conductor) with 2x80 MVAR line reactors at Both ends of line (Cost of reactors included in cost of 400/220 kV GSS Bhadla)	kMs	300	210.96	63286.80	70906.53
vi	400 kV D/C Deedwana – Jaipur (North) line (Quad Moose conductor) with 2x50 MVAR line reactors at Both ends of line (Including estimates of 2x50 MVAR line reactors)	kMs	200	210.96	43799.78	49073.27
vii	220 kV interconnections (D/C) at proposed 400 kV GSS Bhadla (Solar Park) (To be identified)	kMs	100	42.23	4223.00	4731.45
viii	132 kV interconnections (D/C) at proposed 400 kV GSS Bhadla(Solar Park) (To be identified)	kMs	100	25.11	2511.00	2813.32
ix	Additional 220 kV bays at 400 kV GSS Bhadla (Solar Park)(14 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Bhadla (Solar Park) estimates			
x	Additional 132 kV bays at 400 kV GSS Bhadla (Solar Park)(16 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Bhadla (Solar Park) estimates			
(xi)	Additional 33 kV bays at 400 kV GSS Bhadla (Solar Park)(20 bays considered in 400kV GSS estimate)	Nos.	Included in 400kV GSS Bhadla (Solar Park) estimates			

4	220 kV GSS at Undoo (Upgradation) (Distt. Barmer)					7004.81
i	220/132kV,2x160 MVA & 132/33kV, 2X40/50 MVA GSS at Undoo (New Location)				2793.76	3130.13
ii	220 kV D/C line from proposed 220 kV GSS Undoo to proposed 400/ 220 kV GSS Pokaran	kMs	70	42.23	2956.10	3312.01
iii	132 kV interconnections (D/C) at proposed 220 kV GSS Undoo (To be identified)	kMs	20	25.11	502.20	562.66
iv	Additional 220 kV bays at 220 kV GSS Undoo (6 bays considered in 220kV GSS Undoo estimate)	Nos.	0	85.98	0.00	0.00
v	Additional 132 kV bays at 220 kV GSS Undoo (10 bays considered in 220kV GSS Undoo estimate)	Nos.	0	53.00	0.00	0.00
vi	Additional 33 kV bays at 220 kV GSS Undoo (10 bays considered in 220kV GSS Undoo estimate)	Nos.	0	12.00	0.00	0.00
Total (1+2+3+4) (Rs. Lac)						344863.99
Total (1+2+3+4) (Rs. Crore)						3449

Annexure-3**HIMACHAL PRADESH**

Total Amount (Rs. in Crore) = 271

DETAILS**Part A: Proposal by HPPTCL for Intra-State RE Transmission:****(Rs. in Crore)**

Sr.N	Scheme	Line length (ckm)	Distt.	Basin	COD	Estimated Cost
1	33/220 kV, 100 MVA sub station at Fozal with LILO of 220/400 kV Prini – Nalgarh Line	14	Kullu	Beas	2013-14	80
2	132 kV D/C line from Tangnu Romai to 132/220 kV Sunda P.S	24	Shimla	Yamuna (Pabbar valley)	2015-16	13
3	132 kV D/C line from Rupin HEP to 132/220 kV Sunda sub station	44	Shimla	Yamuna (Pabbar valley)	2016-17	21
4	66/220 kV, 80/100 MVA sub station at 132/220 kV Sunda sub station with 66 kV Sunda-Andhra D/C line	6	Shimla	Yamuna (Pabbar valley)	2016-17	77
					Total	191

Part B: Proposal by HPSEB for Intra-State RE Transmission:**(Rs. in Crore)**

Sl. No.	Name of the Inter-connection point	Brief Description of the Work	Estimated cost
1	33/11 kV S/St. Barsaini	33 kV S/C line on D/C structures with WOLF conductor between Jari & Bajaura l/c 4 No. bays	4.12
2	33/11 kV, 2x1.6 MVA S/St. Sihunta	C/o 33kV S/C line with Wolf Conductor from 33 kV Sub-Station Jassore a/w terminal bay at Sihunta and Jassore.*	5.52
3	Proposed 33/132 kV S/Stn. Bijni	Strengthening of 33 kV line between Pandoh & Bijni	1.60
		C/o 33 kV line between Padhar & Bijni	5.20
4	22/66 kV Nogli	Providing additional 20 MVA. 66/22 kV Power	4.80

	S/Stn.	transformer a/w spare bay at 10 MVA, 66/22 kV Nogli for evacuation of power from SHEP's Andhra-Nogli Zone.	
		Augmentation of Nogli-Samoli 66 kV line with AL59 conductor	20.00
5	33 kV, S/Stn. Shillai	Augmentation of transformer from 2.5 to 6.3 MVA & c/o of 33 kV S/C line on D/C Structures between Shillai and Sataun a/w terminal bays.	3.50
6	33 kV, S/Stn. Sataun	33 kV S/C line between Sataun & Paonta	3.20
7	66/22 kV, S/Stn. Samoli (3x5.33 MVA)	Augmentation of 2 nd 66/22 kV, 10 MVA transformer at Samoli to 20 MVA.	2.30
8	22 kV, S/Stn. Hatkoti	Construction of 66/22 kV, 2x10 MVA S/Stn. at Hatkoti alongwith 66 kV S/C line on D/C Tower (20km) from Hatkoti to Samoli.	17.00
9	Switchyard at Ghanvi-II (HEP)	Augmentation of 66 kV D/C line between Ghanvi-II to Kotla with HTLS conductor.	4.00
10	66/22 kV Nathpa S/Stn.	Augmentation of transformer from 6.3 MVA to 20 MVA at Nathpa Sub-Station alongwith VCB (6No.) and construction of 66 kV S/c line from Nathpa to Wangtoo.	1.53
11	33/11 kV S/St. Palchan	33 kV S/C line on D/C structures with wolf conductor (8km.) between Palchan & Prini	1.53
		The construction of 33 kV S/C line on D/c structures with wolf conductor (12km.) between Prini & Naggar.	1.98
Total (Rs. in Crore)			79.55