



**Government of India
Central Electricity Authority
SP&PA Division
R.K. Puram, New Delhi -110066**



F.No. 1/9/SP&PA-12/

Dated: 20/1/12

-As per list enclosed-

Sub: The 30th meeting of the Standing Committee on Power System Planning of Northern Region

Sir,

It is intimated that the minutes of 30th meeting of the Standing Committee on Power System Planning of Northern Region held on **19th December 2011(Monday)** at **NRPC Conference Room, Katwaria Sarai, New Delhi** have been uploaded on the CEA website www.cea.nic.in (*path to access- wing specific document / power system related reports/ standing committee on power system planning/northern region*).

Your comments/suggestions are welcome.

Thanking You.

Yours faithfully,

(B.K.Sharma)
Director (SP&PA)

-List of Addresses-

1. Member Secretary NREB, 18-A Shajeed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi – 110016 (Fax-011-26865206)	7. Director (Transmission) UPPTCL, Shakti Bhawan Extn,3rd floor, 14, Ashok Marg, Lucknow - 226 001 (Fax-0522-2288410)	13. Development Commissioner (Power), Civil Secretariat, JAMMU - 180 001 (Fax-0191-2545447, 2530265)
2. Director (Projects) NTPC, NTPC Bhawan, Core 7, Scope complex– 6, Institutional Area, Lodhi Road, New Delhi – 110003 (Fax-011-24361018)	8. Director (Transmission) Urja Bhawan, Kawali Road, Dehradun, Uttaranchal - 248 001 (Fax-0135-2762460)	14. Member (Power) BBMB, Sectot-19 B Madya Marg, Chandigarh-160019 (Fax-0172-2549857)
3. Director (Technical) NHPC Office Complex, Sector – 33, NHPC, Faridabad - 121 003 (Fax-0129-2277941)	9. Director (Operations) Delhi Transco Ltd. Shakti Sadan, Kotla Marg, New Delhi - 110 002 (Fax-011-23234640)	15. Chief Engineer (Transmission) NPCIL,9- S-30 Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai - 400 094 (Fax-022-25993570, 25563350)
4. Director (Projects) POWERGRID, Saudamini, Plot no. 2, Sector - 29, Gurgaon-122 001 (Fax-0124-2571932)	10. Director(Technical) Punjab State Transmission corporation Ltd. (PSTCL), Head Office The Mall, Patiala - 147 001 (Fax-0175-2304017)	16. Chief Engineer (Operation) Ministry of Power, UT Secretariat,Sector-9 D Chandigarh - 161 009 (Fax-0172-2637880)
5. Sr. Vice President, PTC Ltd, 2nd floor, 15 NBCC Tower, Bhikaji Cama Place, New Delhi – 110066 (Fax-011-41659145)	11. Director (Projects) HVPNL Shakti Bhawan, Sector -6 Panchkula - 134 109 (Fax-0172-2560640)	17. Managing Director, HP PowerTransmission Corporation Ltd. Himfed Bhawan, Panjari, old MLA Quarters, SHIMLA-171004 (Fax-0177-2626284, 2626283)
6. Director(Technical) HPSEB Ltd. Vidyut Bhawan, SHIMLA-171004 (Fax-0177-2813554)	12. Director(Technical) THDC Ltd. Pragatipuram, Bypass Road, Rishikesh- 249201 Uttaranchal (Fx-0135-2431519)	18. Director (Transmission) RRVPNL, Vidyut Bhawan, Janpath Jyoti Nagar, Jaipur Rajasthan Fax-0141-2740794

Minutes of 30th Standing Committee Meeting on Power System Planning of Northern Region held on 19th December 2011 at NRPC, New Delhi

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

Member (PS), CEA welcomed the participants of 30th Standing Committee Meeting of Power System Planning of Northern Region and thanked them for their presence in the meeting despite inclement weather and problems in traveling due to road/air traffic disruptions.

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

1. Confirmation of minutes of 29th Standing Committee Meeting held on 29.12.2010

Director (SP&PA), CEA stated that Minutes of 29th meeting were uploaded on CEA website and intimation in this regard, was sent to members vide CEA letter no.-1/9/2010-SP&PA dated 20.1.2011. He informed that CEA has not received any comments on the minutes of the above meeting.

Regarding transmission system for Orissa phase-II projects & Orissa UMPP, HVPN representative stated that a 765 kV sub-station near Ambala was proposed as per the minutes of above meeting. He mentioned that Ambala would be about 40 km from Kurushetra where HVDC terminal was planned and therefore this location needed to be changed. POWERGRID representative explained that the location of 765 kV sub-station was tentatively indicated as Ambala in the Minutes of 29th Standing Committee Meeting of NR would be reviewed as per the firming up of generation addition of Orissa Phase-II generators, load requirement and network development.

As no other comment was received from members, the minutes of 29th Standing Committee meeting were confirmed.

2. Interconnection of Sewa-III HEP (3x3 MW) with evacuation system of Sewa-II HEP (120 MW) for improving system reliability

Director (SP&PA), CEA stated that Power Development Department (PDD) / J&K State Power Development Corporation (JKSPDC) had requested for connectivity of Sewa-III HEP(3x3 MW) with evacuation system of Sewa-II for improving system reliability and reducing generation loss. Sewa-III HEP of J&K SPDC was commissioned in 2003-04 and evacuation of power from the project is being made through local 33 kV transmission system which is prone to interruptions on account of various faults, thereby incurring loss of generation from this power house. He stated that JKSPDC had informed that the 33 kV line (3km) from Sewa-III to Sewa-II generating switchyard along with its terminating bay had already been constructed and a 33/132 kV, 10 MVA transformer alongwith its bays had also been erected at Sewa-II generating switchyard.

RVPNL representative commented that a small machine integrated with a large system might lead to higher short circuit levels at Sewa-III generation switchyard and to avoid the situation, J&K should strengthen its 33kV network for evacuation. J&K representative intimated that the proposed interconnection is only for

improving reliability and for evacuation of power under normal conditions, adequate 33kV evacuation system had been provided. Further, at Sewa-II HEP, 4 nos of 132 kV ckts were available and therefore the proposed interconnection would not cause any problem in evacuation of power. Regarding short circuit level at Sewa-III, 33 kV generation switchyard, it was explained that injection of fault current from Sewa-II generators would get restricted by 132/33 kV interconnecting transformer and it was confirmed by studies that short circuit levels at Sewa-III 33 kV generation switchyard was within its rating. It was also mentioned that similar issue had already been deliberated in the earlier Standing Committee Meetings and incase adequate transmission system had been provided for evacuation of power from any State Generating Station and interconnection was requested for improving reliability the same was agreed.

In view of the above, members agreed for the above proposal of interconnection of Sewa-III HEP (3x3 MW) with Sewa-II HEP (120 MW).

3. Power Evacuation System of 750 MW Gas based combined cycle power project at Bamnauli

Director (SP&PA), CEA stated that Pragati Power Corporation Ltd. (PPCL) intimated that 750 MW gas based combined cycle power project at Bamnauli, New Delhi would be commissioned by June 2015. PPCL had intimated that land had already been acquired for the project, clearance from Ministry of Environment & Forest had been obtained, NOC from Ministry of Civil Defence and Civil Aviation Authority had been received, Long term PPA had already been signed with Delhi DISCOMS, Water requirement had been tied up with Delhi Jal Board, Open Access applied to STU i.e Delhi Transco Ltd and NOA for setting up plant had been placed on M/s BHEL.

PPCL also informed that shifting of 400 kV Overhead transmission line from Bamnauli to Ballabhgarh and Bamnauli to Bawana with underground cables for accommodating the plant was at advanced stage.

Director (SP&PA), CEA mentioned that transmission system in and around Delhi was very sensitive to high short circuit level. Considering this, short circuit study of Delhi network has been carried out for the 12th plan period taking into consideration splitting of 400 kV buses at Samaypur, Dadri, Mandaula, Bawana and Jhatikalan as per the recommendations of 26th Standing Committee Meeting for Power System Planning of Northern Region. The results of studies indicated following short circuit level at Bamnauli and adjoining buses:-

Bamnauli (400kV Bus)- 29.8 kA ,
Samaypur(400 kV Bus)- 29 .5 kA,
Jhatikalan(400 kV Bus)- 30.65 kA,
Bamnauli(220 kV Bus) – 39.10 kA

The above results were found to be within designed rating of the 400/220 switchgear equipment installed. POWERGRID stated that the SC level at Bamnauli 220 kV is close to 40 kA and necessary splitting at 220 kV level should be taken up by DTL. DTL confirmed that they had already taken up the splitting of 220 kV bus in

their system. RVPNL stated that this issue was under the purview of STU and deliberations were not required in Standing Committee Meeting. Director (SP&PA), CEA stated that considering the high short circuit levels in Delhi area, the above issue was included for the information of members.

NRLDC representative enquired about the status of the bus splitting at various 400 kV substations of Delhi ring. DTL representative informed that physical works were almost complete at Bawana substation and splitting would be carried out before the commissioning of module-2 of Bawana CCGT which was expected by March/April 2012. Regarding Mandaula substation, POWERGRID stated that works related to LILO of Bareilly – Mandaula 400 kV D/c line were under progress and Mandaula splitting would be carried out after completion of above LILO work, which was expected in next 6-8 months.

NTPC representative stated that the splitting of Dadri 400 kV bus would be carried out after the commissioning of Dadri – Loni Road 400 kV D/c line and Loni Road substation of DTL. DTL informed that 400 kV Loni Road S/s was expected by June 2012.

POWERGRID representative stated that as per operational feedback received from ED(SO&NLDC) all the substations (where bus-splitting had been planned) should also have provision for interconnecting facilities so that during emergency these could be used for operational flexibility.

NTPC representative stated that as per ATS finalized for Dadri-II, no provision of bus sectionaliser between the split buses was originally envisaged. In view of feedback from ED (SO&NLDC) as mentioned above, NTPC proposed to provide bus sectionaliser between the split bus sections of Dadri generation switchyard.

After detailed deliberations the proposal of injection of power at 400 kV Bamnauli bus was agreed subject to completion of bus-splitting at various 400 kV S/s of Delhi ring. It was also agreed that NTPC would provide 400 kV bus sectionaliser between the split bus sections of Dadri generation switchyard.

4. Utilization of 400kV Roorkee Substation (PG) by PTCUL

Director (SP&PA), CEA stated that PTCUL had intimated regarding severe Right- of- Way constraints in the vicinity of the 400 kV Roorkee substation, due to which it was not possible to construct 220kV double circuit line from this substation. He further informed that PTCUL had proposed to set up their 220/33 kV, 2x50 MVA S/s in the premises of POWERGRID's 400/220 kV Roorkee substation.

POWERGRID representative proposed that the above works might be carried out by them on deposit work basis and subsequent O&M might also be carried out by POWERGRID.

DTL & RVPNL stated that POWERGRID should not enter into construction of 33kV substation facilities in their 400/220 kV switchyard as this would set a new precedence and similar requests might follow from other constituents in future. DTL

representative suggested for laying of 220 kV cables or pole type towers to overcome R-o-W constraint. PTCUL stated that laying of 220 kV cables was also not feasible.

After detailed discussions, it was decided that a committee consisting of CEA, POWERGRID, PTCUL, DTL and RVPNL be formed to undertake a site visit to explore all possible options for taking 220 kV outlets from 400 kV Roorkee substation. The issue will be revisited by the members thereafter.

5. Shifting of Line reactor from Merta S/s to Kota S/s

Director (SP&PA), CEA stated that Kota –Merta 400kV D/c line was planned with 50MVAR line reactor at Merta S/s and one circuit of the line had been LILOed at M/s Shree Cement's generation switchyard at Beawar for providing connectivity. With the above arrangement, the length of Shree Cement- Merta line had reduced to less than 80km and as such 50 MVAR line reactor was not required for this line. He informed that POWERGRID had proposed to shift this 50 MVAR line reactor to Kota S/s for its use as Bus Reactor.

RVPNL representative informed that this reactor might be used as a bus reactor at Merta S/s. POWERGRID representative stated that according to studies carried out with 50 MVAR bus reactor at Kota, the reactor would provide a voltage drop of approximately 5 kV at Kota & also help in reducing over voltages in the nearby area so the reactor might be used as a bus reactor at Kota. He also mentioned that 1 no. of 400 kV bus reactor bay would be required at Kota to implement above proposal.

Members agreed to the above proposal.

6. Connectivity of Hamirpur (Mattansidh) 220/132kV S/s of HPSEB with Hamipur 400/220kV S/s of POWERGRID

Director (SP&PA), CEA informed that HPSEB Ltd. had proposed to construct 220kV D/c line from Hamirpur(PG) substation to their existing 220 kV Hamirpur (Mattansidh) S/s and the existing 220kV D/c Jullandhar- Hamirpur(HPSEB) (ISTS) line be connected to Hamipur (PG) substation. HPPTCL representative informed that the distance from Hamirpur (HPSEB) to 400/220 kV Hamirpur(PG) substation is about 4 km.

POWERGRID representative stated that the above proposal was equivalent to LILO of Jullandhar – Hamirpur(HPSEB) 220 kV D/c (ISTS) line at 400/220 kV Hamirpur(PG) substation. POWERGRID also informed that 400/220 kV Hamirpur(PG) Substation & LILO of one circuit of Parbati Pooling station – Amritsar 400 kV D/c line at Hamirpur(PG) were already under construction as a part of NRSS-XX scheme and the 220 kV connectivity at this substation was urgently required for stable/reliable operation of the Parbati Pooling – Hamirpur – Amritsar 400 kV line as well as for effective utilization of Hamirpur 400/220 kV substation. He proposed to take up the works of LILO of 220kV Julandhar –Hamirpur D/c at Hamirpur (PG) S/s, as an ISTS scheme as the existing Jullandhar – Hamirpur 220 kV D/c line was an ISTS line.

Considering the urgency of work and the scope being very small, it was agreed that the above works might be carried out by POWERGRID as a part of some on-going scheme.

It was further informed that HPPTCL requested for four 220 kV line bays at Hamirpur 400/220 kV substation i.e. two for connecting their Kangoo S/s and two for connecting their proposed substation at Palampur. POWERGRID representative intimated that 6 nos. of line bays were already being provided at 400/220 kV Hamirpur(PG) substation. Out of these, 4 bays shall be utilized for LILO of 220 kV Jullandhar – Hamirpur D/c line and two bays could be provided for interconnection of proposed Kangoo S/s (HPSEB). The additional two nos. of 220 bays could be considered in future when required. POWERGRID requested HPPTCL to expedite the 220kV D/c interconnection from Hamirpur 400/220 kV substation.

Members agreed to the above proposal.

7. Installation of Bus Reactors and augmentation of transformation capacity at Dehar Generation Switchyard

Director (SP&PA), CEA stated that in order to control high voltages in the system (particularly during low hydro and light load conditions) at Dehar, a 125 MVAR bus reactor at Dehar generation switchyard was agreed during 15th meeting of Northern Regional Power Committee held on 23rd and 24th December, 2009.

POWERGRID representative informed that during low hydro period, the 400/220kV, 250 MVA ICT at Dehar got overloaded. At several instances, this ICT was opened to avoid over loading, resulting in loss of interconnection between 400kV and 220kV levels at Dehar resulting in less reliable power supply to Punjab and this had also been highlighted in the Operation Feedback on Transmission Constraints submitted by NRLDC. It was also informed that the present ICT is more than 30 years old. The issue was discussed during the 29th Standing Committee Meeting held on 29/12/2010 and it was proposed to augment the existing transformation capacity by one additional 500 MVA transformer. In case of space constraint, it was proposed that existing 250 MVA transformer might be kept as spare and proposed 500MVA transformer be installed. BBMB had indicated space & transportation constraints for installation of 500 MVA ICT at Dehar. In 21st NRPC meeting, it was recommended that BBMB & POWERGRID would carry out joint inspection for availability of space at Dehar. Accordingly, Joint site visit of POWERGRID and BBMB was carried out and the main findings of the visit are listed below:

(a) **Installation of Bus Reactor at Dehar:** There is space constraint for installation of a bus reactor with conventional AIS bay equipments. Hence, GIS equipment needs to be considered for Bus Reactor. BBMB informed that transportation & installation of 125 MVAR reactor at Dehar is not feasible and option of 80 MVAR reactor may be explored. RVPNL stated that in view of the requirement of 125 MVAR reactor and transportation/space constraints, 2X63 MVAR Reactors might be considered.

After detailed discussions, it was agreed to provide 2 nos. of 63 MVAR bus reactors controlled through a single 400 kV bay.

(b) **Replacement of 250 MVA ICT with 500 MVA ICT:** There is space constraint for installation of 500 MVA ICT and also the existing 220kV ICT bay would require to be upgraded. The 220kV bay equipment needs to be replaced with GIS equipment which will create sufficient space for installation of higher rating transformer. It was informed that it is not feasible to transport the 500 MVA ICT (single phase units) as load bearing capacity of bridges en-route is only 80 Tonnes and therefore it was proposed to provide 315 MVA (3x105 single phase units) ICT alongwith the necessary bay equipment. **Accordingly, it was agreed to replace the existing 1x250 MVA ICT by 3x105 MVA single phase ICTs at Dehar. Further, it was also agreed to provide one no. spare single phase ICT unit for reliability.**

BBMB representative stated that the above proposed provision of reactors and ICTs were system strengthening requirement and therefore these works should be carried out as ISTS scheme.

POWERGRID representative informed that prima-facie current rating of existing 400kV switchyard equipment and majority of 220kV equipment were suitable for 315MVA ICT and might be retained after joint review by POWERGRID/BBMB. Control & Relay panels & Protection, Fire fighting aspect would also be jointly reviewed. Dismantling of existing equipments, modification of foundation and installation of new ICTs in place of existing ones would also be required. Regarding provision of reactor POWERGRID informed that the layout of bay and approach road for above reactor/reactors would be finalised by BBMB & POWERGRID. It was also stated that extension of switchyard by GIS switchgear might be required. It was agreed that the detailed BOQ would be worked out by POWERGRID in consultation with BBMB.

After detailed deliberations, members agreed that the above works might be taken up as an ISTS scheme.

8. Provision of 125 MVAR Bus Reactor at Koteshwar

Director (SP&PA),CEA stated that the transmission system in Tehri area was frequently experiencing over voltages under light load conditions and therefore it was necessary to provide a bus reactor either at 400kV Tehri Pooling Station or at 400kV Koteshwar HEP Switchyard of THDC subject to space availability. POWERGRID representative intimated that space was not available at Tehri Pooling station, however as per their information space is available at 400kV Koteshwar HEP Switchyard (THDC). PDD J&K representative enquired about the system studies carried out for arriving at the size of the proposed reactor. POWERGRID representative informed that the system studies had been carried out and the results indicated the reduction in voltage by 11kV/ 9 kV/ 7 kV considering 125/ 2x50 / 80 MVAR bus reactors respectively considered at Koteshwar HEP. In view of above, it was proposed to provide 125 MVAR bus reactor at 400kV Koteshwar HEP Switchyard.

RVPNL representative suggested that in case of space constraint/ transportation limitation, 2X63MVAR reactors might be provided instead of 125 MVAR.

It was finally decided that THDC would provide either 125 MVAR or 2x63 MVAR reactors controlled through a single 400 kV bay depending upon the feasibility.

Members agreed to the above proposal.

9. Two Nos. of 220kV bays at Pithoragarh S/s

Director (SP&PA), CEA stated that PTCUL had requested for 2 Nos. of 220kV bays at Pithoragarh substation (PG) for terminating their proposed 220kV Almora - Pithoragarh D/c line.

POWERGRID representative stated that at Pithoragarh substation, already four nos. of 132 kV line bays had been provided. He requested PTCUL to assess the total load to be connected to Pithoragarh S/s (PG) and limit the same to the capacity of one 400 kV circuit operated at 220 kV, as this substation is established through LILO of one ckt of 400 kV Dhauliganga – Bareilly line (op. at 220 kV). PTCUL agreed for the same.

After deliberations, it was agreed to provide space for 2 nos. of 220 kV bays at Pithoragarh 220/132 kV substation of POWERGRID. The cost of implementing these 220 kV line bays at Pithoragarh S/s would be borne by PTCUL.

Members agreed to the above proposal.

10. Evacuation of power from HEPs in Satluj Basin & Chandrabhaga Basin:

POWERGRID representative explained that a lot of new hydro generation projects were planned in the upper part of Satluj Basin, Spiti Valley and Chandrabhaga Basin of Himachal Pradesh. There is an identified hydro potential of about 3500 MW in upper part of Satluj basin & Spiti valley (Satluj basin) and about 3500 MW in Chandrabhaga Basin. For implementation of transmission system, there are severe Right-of-Way constraints, the terrain is very tough and the area is snow-bound. The issue of transmission system for upper part of Satluj Basin, Spiti Valley (Satluj Basin), Chandrabhaga Basin and Beas Basin in Himachal Pradesh was discussed during the 29th Standing Committee Meeting of Northern Regional Transmission Planning held on 29/12/2010, wherein it was decided that a Task Force having representatives from Govt. of HP, HPPCL, HPPTCL, CEA and POWERGRID would be constituted to study and revise the Master Plan. Accordingly, a site visit was undertaken by the Task Force from 19/09/2011 to 29/09/2011 to identify the availability of corridors, location of proposed pooling stations, feasibility of construction of lines, progress of generation projects etc. Based on the observations of the Task Force and considering the power transfer requirement, transmission system alongwith the phasing of the works was firmed up. The proposed transmission system includes implementation of various pooling stations and high capacity common transmission corridors. The transmission lines shall involve many new technologies like adoption of HTLS conductor, construction of lines through high snow / avalanche areas etc. Considering the difficulties in implementation of the lines, it was proposed to involve SASE (Snow and Avalanche Study Establishment) and some international consultants for reliable operation.

It was further informed that for upper part of Satluj Basin, applications for open access have been received for about 885 MW out of 3500 MW and similarly for Chandrabhaga Basin, applications for open access have been received only for 520 MW out of 3500 MW. As per the load generation scenario, most of the power generated from these projects would have to be transmitted out of the state, therefore the identified transmission system was proposed to be developed as ISTS system. Further, as there are uncertainties, the system strengthening beyond the proposed pooling points shall be identified as per the power transfer requirement. It was also proposed that the transmission system for the projects which are more than 50 MW and having common transmission corridor is proposed to be taken up as ISTS system and the projects which are below 250 MW & with independent transmission line are proposed to be developed as dedicated system.

Subsequently, POWERGRID representative explained the details of transmission system (**refer Annex-II**) planned by the Task Force, for Satluj basin & Spiti valley projects.

For upper part of Satluj Basin and Spiti valley projects it was informed that establishment of 66/220/400 kV GIS Pooling Station at Wangtoo was required by Mid 2014 to match commissioning of SHPs in Bhaba Khad (57 MW) and Sangla Valley (40 MW) + LILO of 220 kV Kashang- Bhaba D/c Line and LILO of both circuits of 400 kV Karcham Wangtoo-Abdullapur D/c line at Wangtoo S/s. It was also proposed that works of 400 kV Wangtoo substation alongwith the LILO works of above lines would be carried out by HPPTCL (STU) as these works were required for evacuation of power from SHPs. It was further explained that the other projects which have made progress are Kashang stage-I&II, Shongtong Karcham, Changu Yangthang and Tidong-I. Regarding Kashang-I (65 MW) HPPCL representative informed that work is in progress and project was likely to be commissioned by 2013. For Kashang-II (65 MW), it was informed that the work was awarded and project is likely to be commissioned by 2015. For Shongtong Karcham HEP, it was informed that land had been acquired, DPR submitted to CEA, in principle environment clearance obtained & final clearance was expected shortly, civil package to be awarded shortly and bid opening of E&M package would be in end of January 2012. Project is expected to be commissioned by 2017.

HPPTCL representative stated that Kashang-I was likely to be commissioned by 2013. For evacuation of power from Kashang-I, they are constructing a 220 kV D/c line from Bogtu to Kashang. Accordingly, power can be evacuated through Bogtu - Bhabha 220 kV D/c line. HPPTCL informed that Tidong-I (100 MW) was under construction and likely to be commissioned by December 2014. Since, Jangi Pooling station may not come up by December 2014, Tidong-I power shall be temporarily evacuated by LILO of one circuit of 220 kV D/C Kashang- Bhaba line at Tidong-I HEP. These works shall be carried out by HPPTCL. Later on when Jangi P.S. is commissioned, Tidong-I - Jangi 220 kV D/c line shall be constructed and also Kashang – Jangi 220 kV D/c line with single HTLS conductor shall be established. These works are proposed to be carried out by HPPTCL.

HPPTCL representative further informed that works for Kashang-II (65 MW) had also been awarded and commissioning is expected by 2015. It was suggested that Kashang-II would also have to be evacuated through existing 220 kV Bhabha-Kunihar D/c line as Jangi pooling station might not be available in that time frame,

however some constraints would be faced for evacuation of total generated power of Kashang-I&II and Tidong-I HEPs during contingency of outage of one circuit of 220 kV Bhabha-Kunihar D/c line. POWERGRID representative stated that establishment of Jangi pooling station would be taken up with further stages of Kashang / Tidong.

Regarding Chango Yangthang HEP (140 MW), POWERGRID representative stated that LTOA application was received as per 2004 regulations of CERC from the developers of Chango Yangthang (140 MW) and as per the site visit the investigation activities were in progress. Representative of Chango Yangthang HEP stated that DPR had been submitted to CEA for concurrence and environment clearance, land acquisition etc would be taken up after concurrence of project by CEA and they intended to commission the project by March 2017.

Subsequently, POWERGRID representative explained the details of the generation projects and proposed transmission system (**refer Annex-II**) planned by the Task Force, for Chandrabhaga Basin projects.

It was observed that Miyar (120 MW) and Seli (400 MW) HEPs, were being developed by Moser Baer, would be the first two projects in Chandrabhaga Basin. Member (PS) enquired about the status of these projects. Representative of Moser Baer explained that DPR for Miyar was submitted to CEA on 29th April 2011, EAC had recommended granting of Final Environmental Clearance on 12th November 2011, FAC had recommended diversion of Forest Land on 29th Nov 2011, Section-4 for acquisition of private land had been notified and acquisition was expected by May 2012 and they would be commissioning the 1st unit by June 2016. Similarly, for Seli HEP, Moser Baer explained that DPR was submitted to CEA on 12th Dec 2011, Final Environment Clearance expected by July 2012, Acquisition of private land expected by June 2012 and they would be commissioning the 1st unit by October 2017. Moser Baer also informed that they had already applied for connectivity to the CTU.

Member (PS), CEA advised Moser Baer that they should apply for LTA and submit the requisite BG to initiate the process of implementation of transmission system for power evacuation. Representative of Moser Baer agreed for the same.

Member (PS), CEA requested HPPTCL to impress upon the generators through Government of HP to apply for connectivity and LTA as per CERC regulation so that the transmission system could be optimally utilized.

POWERGRID representative stated that considering the time frame of generation, tough terrain and difficult working conditions, it was necessary that actions towards the implementation were initiated at the earliest.

Subsequently the constraints / challenges that would be faced during implementation of the transmission system were explained, as summarised below:

1. **Generation Switchyard Capacity:** As most of generations shall be connected through LILO of high capacity common corridors, therefore the generation switchyard should have capacity equivalent to the capacity of the line and generation switchyard should not become a bottleneck for utilization of line.

2. **Switchyard capacity of Pooling Stations:** The major 400 kV Pooling Stations are proposed at Wangtoo, Jangi, Ka Dogri and Sissu / Gramphu. The switchgear & busbar rating of the pooling stations should be equivalent to 3150 / 4000 Amps depending upon the power handling requirement.
3. **Challenges / Issues in Implementation:** For evacuation of power from above basins, the lines would have to traverse through high altitude, tough mountainous terrain, snow bound & glacier prone areas etc. Broadly, following issues would have to be considered:
 - a. Tough / Snow Bound terrain: Due to Tough / Snow Bound terrain, special design would be required.
 - b. Short Working Season: Due to heavy snow during winters, the working season in these areas is very less i.e. about 5-6 months in a year. Further, these areas generally remain cut off from mainland during heavy snow period. Considering these factors, the total period required for construction would increase substantially.
 - c. Avalanche / Glacier prone area: Most of the area in Lahaul / Spiti valley is glacier / avalanche prone. Hence, for tower spotting, help from SASE, Ministry of Defence and local population would be required. Avalanche protection measure would also be required.
 - d. Design of transmission line: At Rohtang Pass, there is a snow of about 8-10 feet and there are high speed winds. In addition, lines would be traversing through very high altitude and snow bound regions. For design of transmission lines, especially for crossing Rohtang Pass, services of some international consultant might be required.
 - e. Environmental Issues: In some areas there is lot of forest involvement. Advance action for addressing environmental issues should be taken up.
 - f. Land Acquisition: Land acquisition process may be initiated after site selection of location of various Pooling Stations.
 - g. Transportation Problems: Most of the roads are 'Kutchra' roads and there are many bridges with a maximum load bearing capacity of 9 tonnes. While implementation, this may create a bottleneck. This issue needs to be analyzed in advance.
4. **HTLS Conductor Selection:** Most of the lines are proposed with HTLS conductor to keep the weight of tower to the minimum and to have maximum power transfer capacity. The conductor would also be facing ice loading and heavy winds. Conductor selection is to be carried out with extra care. Further to avoid high MVAR loss and to restrict transmission losses under contingency conditions, it is proposed to select the conductor considering maximum conductor temperature as 130° C.
5. **High Initial Cost:** The generators would be coming up in a phased manner. The cost of the transmission system would be very high, as it has to keep the margins for future capacity addition.
6. **Difficult assessment of civil works:** In many areas, there are loose rocks and almost vertical mountains. A lot of benching and revetment would be required. In many areas avalanche protection measures would also be required.

Considering these aspects, it would be very difficult to assess the exact quantities of civil works for lines.

7. **LILO of Alternate circuits for balanced loading:** Evacuation of many of the generation projects is proposed through LILO of one circuit of high capacity common corridor line at the generation projects. It would be preferable that LILO of alternate circuit is carried out to have balanced loadings on both the circuits to the possible extent.
8. **Other Issues:**
 - The generation plant size varies from as low as about 40 MW to as high as about 650 MW. However, due to tough terrain only one / two high capacity transmission corridors can be constructed. There would be a wide variation in the commissioning schedule of the generation projects.
 - Long term open access applications for most of the projects have not been received, however as per the load generation scenario of Himachal Pradesh most of the power generated from these projects would have to be transmitted out of the state. The transmission systems proposed to be developed as ISTS system.
 - The transmission system of the generation projects, which are proposed to be connected through LILO of high capacity corridor or through shared corridor, should be implemented as ISTS system as the transmission line would be having a specialized design and use new technologies. This is also required considering that a large amount of generation would be transferred through corridor and the reliability of the corridor would be very important.
 - System strengthening beyond the proposed pooling points shall be identified as per the power transfer requirement.

After explaining the above, following was proposed for approval:

- a) Transmission scheme alongwith the phasing of works for evacuation of power from HEPs located in Satluj Basin & Chandrabhaga Basin of Himachal Pradesh.
- b) Out of the above planned transmission scheme, the transmission elements which may be taken up as ISTS elements were also proposed (**refer Annex-II**). Generally the high capacity common transmission corridors, which are to be used for more than one generator, have been proposed as ISTS.
- c) The generation would be coming up in a diversified time frame, however due to limited corridor availability, provision has to be kept for future projects also.
- d) The implementation of corridor shall start after the grant of connectivity and submission of BG from 1st applicant in the corridor. In this regard it is to mention that for Chandrabhaga Basin, connectivity applications have been received for Miyar (120 MW) and Seli (now changed to 400 MW from 320 MW). In order to evacuate the generation from these two projects, implementation of high capacity corridor from these generation projects upto Hamirpur S/s, would be necessary. Similarly in upper part of Satluj and Spiti valley, applications of connectivity and LTA have been received from Kashang, Shongtong and Chango Yangthang HEPs. In order to evacuate the generation from these hydro projects, implementation of high capacity corridor from Ka Dogri Pooling station to Wangtoo Pooling station, would be necessary. A reconfirmation about the commissioning date of these projects would be taken at the time of submission of BG and efforts would

be made to commission the transmission scheme matching with commissioning schedule of generation as declared by developers.

e) A senior level meeting of the project developers may be convened by Govt of HP / HPPTCL wherein the developers should be impressed upon to apply for connectivity / LTA as per CERC regulations.

RVPNL representative stated that the initial cost of transmission system would be very high and system would be under utilized. Member (PS) stated that the cost and recovery of the transmission charges come under the purview of CERC and based on the present methodology these transmission works would be included in the PoC mechanism.

Member (PS) also mentioned that there would be very low generation from these projects during winters, which might result in problem of high voltages in the system, therefore adequate bus reactors need to be provided.

After detailed deliberations and considering the transportation constraints, it was agreed that **50 MVAR bus reactor would be provided by all the generators having capacity of more than 100 MW and 80 MVAR bus reactor would be provided by all the generators having capacity of more than 300 MW. Further it was agreed that 125 MVAR bus reactor might be provided at Jangi Pooling station and 80 MVAR bus reactor each might be provided at Sissu & Ka Dogri pooling station. In case of transportation limitation these bus reactors would be provided as single phase units.**

Members agreed to the above proposal.

11. Evacuation of Power from the Chenab Basin Projects in J&K

Director (SP&PA), CEA stated that JKSPDC had informed that hydro projects with a total capacity of about 4200 MW were planned in Chenab Basin for execution in the 12th plan period through various modes. In addition to above, additional hydro projects with capacity of about 2075 MW had also been identified. Details of the projects identified for 12th plan and for future, were given in the agenda. For evacuation of power from the above projects it had been proposed by PDD, J&K to establish a 765 kV pooling station in Kishtwar region, which might be connected to Kishenpur S/s at 765 kV level.

Member (PS), CEA enquired about the status of the above generation projects planned in the state. PDD J&K representative informed the status of various projects as given below:

Kirthai-I (240 MW): This would be a State Sector Project to be executed on EPC basis and tendering activities would be taken up in next 3 months. DPR of the project would be completed by Feb 2012. Regarding land availability, it was informed that part of land had already been acquired and balance acquisition was in progress. EIA studies are in progress.

Kirthai-II (990 MW): DPR submitted to CEA. Project would be executed on EPC basis and tendering activities would be taken up in next 3 months.

Kiru (600 MW) and Kawar (520 MW) : It was informed that a JV company of J&KSPDC, NHPC & PTC had been formed and Promoters agreement has been signed. The JV Company is named as Chenab Valley Power Projects limited. DPR of these projects are being revised and tendering activities would be taken up in 2012.

Pakal Dul (1000 MW): This project would also be implemented by Chenab Valley Power Projects limited. TEC of the project has been obtained. Land acquisition is in progress and Tenders have been floated.

Bursar (1020 MW): It is a central sector project to be executed by NHPC. DPR of the project is under preparation.

Sawalkot (1600-1800 MW): The project is to be developed by J&KSPDC. DPR is expected to be finalized by March 2012. Access Road to the project site is under construction.

Ratle (810 MW): This project is being developed by M/s GVK (IPP). Connectivity and LTA application have been received by POWERGRID. The evacuation system for this project has been finalized.

Lower Kalnai (48 MW): EPC contract for this project is expected by September 2012.

It was also informed that there were severe Right-of-Way constraints in Chenab basin (Hilly region) and separate evacuation lines from individual project would not be feasible.

Member (PS), CEA mentioned that recently the master plan for the evacuation of power from hydro projects located in Himachal Pradesh had been revised by a Task Force (constituted in 29th Standing Committee Meeting). This Task Force had undertaken a site visit and based on their findings in regard to physical progress made by generators, availability of corridors and other constraints etc., the master plan was revised. He suggested that a similar Task Force consisting of representatives from J&KSPDC, PDD J&K, NHPC, CEA & POWERGRID might be constituted for preparing a comprehensive master plan indicating common transmission corridors for evacuation of generation from identified hydro projects located in Chenab Valley. The Task Force may undertake a site visit to assess the physical progress made by generators, availability of corridors and other constraints. He advised JKSPDC to give the detailed status of generation projects including milestones achieved and the anticipated commissioning schedule of identified projects to enable Task Force to carry out the phasing of planned transmission works accordingly. It was also requested that JKSPDC/ developers of the hydro projects might apply to CTU for connectivity / LTA as per the CERC regulations.

In view of the above, it was decided to form a Task Force comprising of officers of CEA, POWERGRID, PDD J&K, JKSPDC and NHPC to assess the availability of corridors and prepare a comprehensive transmission system for evacuation of power from the hydro projects located in Chenab Basin in J&K. JKSPDC would inform the time frame of the identified generation projects and advise Project Developers to seek the Grid connectivity and Long Term Access from CTU in line with the CERC regulations.

Members agreed to the above proposal.

12. Evacuation of Power from Parbati-III HEP

POWERGRID representative informed that the transmission scheme for evacuation of power from Parbati-II, Parbati-III and Koldam HEPs was discussed in 14th, 15th and 16th Standing Committee Meetings of Northern region and a composite transmission scheme was evolved for evacuation of power from Parbati-II, Parbati-III and Koldam HEPs as indicated in the agenda. The transmission system was evolved considering that Parbati – II and Koldam generation would materialize before Parbati-III and at the time of commissioning of Parbati-III, the transmission system of Parbati-II would be available. As per the information available, Parbati-III is likely to be commissioned during 2012-13 whereas Parbati-II generation project would come up later.

Member (PS), CEA asked NHPC to confirm the schedule of Parbati-III and Parbati-II. NHPC representative informed that Parbati-III is expected by July 2012. Regarding Parbati-II, NHPC informed that it was not possible to give any firm schedule for Parbati-II, however as per present scenario, it might be considered as 2014-15.

POWERGRID representative further explained that in the 29th Standing Committee Meeting of Northern Region held on 29/12/2010, it was decided that a portion of Parbati-II Koldam 400 kV S/c lines be advanced to match with Parbati-III which would include from point of LILO of Parbati-II – Koldam lines for Parbati-III inter connection, to point of LILO of above lines at Parbati Pooling station (5-6 Kms). Now, as per the present scenario, commissioning of Parbati Pooling Station – Amritsar 400 kV D/c line may also get delayed due to wildlife / forest constraints. He mentioned that considering the urgency for implementing evacuation arrangement for Parbati-III HEP, it was agreed in the 23rd NRPC meeting to take up the implementation of 400 kV S/c lines from Parbati-III to Koldam on priority by last quarter of 2011-12. Accordingly, PKTCL was requested to take up the implementation of the line section of Parbati-II-Koldam lines (i.e. from Parbati-III to Koldam) at the earliest, to match with the generation of Parbati-III HEP.

POWERGRID representative also stated that Parbati-III-Koldam 400 kV lines would not only provide an alternate evacuation path incase of constraints in completion / operation of Parbati Pooling to Amritsar 400 kV D/c line but would also integrate the two generations i.e. Parbati-III and Koldam to help in stable operation of the grid.

Member (PS), CEA enquired about the status of the lines from PKTCL. PKTCL representative confirmed that they were putting in their best efforts for completion of these lines, but the Stage-II Forest Clearance was still pending. PKTCL also requested for payment of transmission charges in respect of above lines from the date of their commissioning.

After detailed deliberation, it was decided that PKTCL would make all efforts to complete one circuit of the Parbati-III-Koldam 400 kV Quad line by July 2012 and complete the other circuit in next 4-5 months. It was also agreed that the payment of the transmission charges in respect of above lines would be from the date of their commissioning.

Members agreed to the above proposal.

13. Koldam-Ludhiana 400 kV D/c-Part of Koldam Transmission system

POWERGRID representative stated that a composite transmission scheme was evolved for Parbati-II, Parbati-III and Koldam HEPs. During the 26th Standing Committee Meeting the implementation schedule of Koldam-Ludhiana 400 D/c line was discussed and it was decided that the commercial operation date (COD) of 400kV Koldam – Ludhiana D/c line would be nine months after the commissioning schedule of Koldam HEP. Subsequently, it was informed by CEA that the time frame of Koldam – Ludhiana 400 kV D/c line would be matching with the time frame of Parbati-II HEP.

NTPC representative stated that as per CEA, 400 KV Koldam-Ludhiana D/c line was part of ATS for Parbati-II HEP and therefore this line should not be considered as a part of ATS for Koldam HEP. However, NTPC did not have any objection for the commissioning of 400 KV Koldam – Ludhiana D/C line matching with the time frame of Koldam HEP. On a query from Member (PS), CEA, NTPC representative informed that the Koldam HEP was expected by March 2013.

POWERGRID representative stated that considering the present power flow scenario especially during the last paddy season, it had been observed that the loading towards Nalagarh – Mohali was on the higher side and at times became critical. This problem was more prominent after the commissioning of Karcham Wangtoo HEP, which had come up without the commissioning of Karcham Wangtoo – Abdullapur 400 kV D/c line. It is expected that injection of Koldam generation at Nalagarh would further overload the existing system beyond Nalagarh and to mitigate this problem, it is necessary to commission 400 kV Koldam – Ludhiana D/c line matching with the Koldam generation.

After detailed deliberations, it was decided that PKTCL would make all efforts to complete 400 KV D/C Koldam – Ludhiana Transmission Line by March 2013.

Members agreed to the above proposal.

14. Delinking of Agra-Samaypur and Samaypur-Gurgaon(PG) 400kV S/c lines from Samaypur and making a direct Agra-Gurgaon 400kV S/c line as part of NRSS-XIII

Director (SP&PA), CEA informed that as per the decision taken in 23rd Standing Committee Meeting held on 16/02/08, 400kV Agra-Samaypur and Samaypur-Gurgaon S/c lines were to be delinked from Samaypur and made as Agra-Gurgaon direct line to reduce the short circuit level at 400 kV Samaypur S/s.

POWERGRID representative intimated that as per the Operational feedback dated 5th April, 2010 from ED(SO & NLDC) on transmission constraints, given to CEA and CTU, *“Many 400kV substations in NR such as 400kV Bawana, 400kV Dadri, 400kV Mandaula, 400kV Samaypur, 400kV Jhatikalan More etc. have been planned for split mode operation. Provision for interconnecting these split buses during emergency is required.”*

In view of the above, the scheme was re-examined and it was noted that both, Agra and Gurgaon lines were terminated in the same diameter of Samaypur 400 buses. As such it was proposed to delink these lines from Samaypur by keeping the Tie-breaker of Agra and Gurgaon lines as closed, while remaining two main line breakers would be kept open under normal condition and under any contingency, the main breakers could be closed as per requirement.

Members noted the same.

15. Evacuation of Power from Rihand-III (2x500 MW)

POWERGRID representative informed that for immediate evacuation of power from Rihand-III, two nos. of 765 kV S/c lines (to be initially charged at 400 kV), towards Vindhyachal pooling point were planned in the earlier Standing Committee Meeting of Northern Region. Subsequently award for the same was placed for the implementation of above lines. After Detailed survey, it was found that the construction of these lines would involve approximately 17 Hectare forest land (Protected) in UP and 217 Hectare forest land (both reserved and protected forest) in MP and it was not possible to obtain Forest clearance for two single circuit line corridors in the same time frame. However, POWERGRID expected to get forest clearance for one line corridor. In view of the above, it was agreed in 21st NRPC held on 1st June 2011 that Rihand III -Vindhyachal Pooling Point 765 kV lines (to be initially operated at 400 kV) be implemented as a Double circuit line instead of 2x765 kV S/c lines to reduce the corridor requirement.

POWERGRID representative further informed that the commissioning schedule of the transmission system as Dec'12 whereas NTPC representative stated the commissioning schedule of generating units at Rihand-III is Mar'12 & Jun'12. POWERGRID representative stated that power from Unit-1 could be evacuated by utilising existing margins in the transmission system under normal operating conditions. For unit-2 evacuation, he proposed to transfer this power to Vindhyachal Bus through HVDC Back-to-Back system from where power could be evacuated through Vindhyachal contingency scheme under normal operating conditions. The details of Vindhyachal contingency scheme are as given below:

- Completion of Vindhyachal IV- Sasan 400kV D/c (bypassing at Vindhyachal Pooling Station) and bunching of both ckts. to make single ckt only
- Completion of Sasan - Satna 765kV S/c (to be operated at 400kV level) with termination at 765kV yard as planned by interconnecting 400kV and 765kV yards as well as interconnect Vindhyachal IV- Sasan 400kV bunched line
- Completion of Satna – Bina 765kV S/c (to be operated at 400kV level) with termination at 765kV yard as planned by interconnecting 400kV and 765kV yards

Members agreed to the above proposal.

NTPC representative stated that the interim arrangement planned for Vindhyachal-IV evacuation alongwith existing VSTPP bus would be handling

additional injection of 1000MW power from Vindhyachal-IV. The evacuation of power (after injections of 500MW from second unit of Rihand-III in VSTPP bus) under n-1 contingency may have some constraints depending upon the actual situation, network condition /availability of various generations in the complex. He further stated that considering the likely delay in implementation of Rihand-III evacuation system by Dec-12 due to considerable forest clearance involved in 765 kV Rihand-III – Vindhyachal Pool D/c line, an interim arrangement for Rihand-III evacuation had become essential.

In view of above, NTPC representative proposed to explore the possibility of using second 400kV quad line (Vindhyachal–IV to Vindhyachal pool) and its further interconnection with 765KV Sasan- Satna 2nd S/c line charged at 400kV. This arrangement would facilitate the availability of 2 separate circuits and power from 2nd unit (500 MW) of Rihand- III could be evacuated under ‘n-1’ contingency as well.

POWERGRID representative intimated that there were some space constraints at their Satna S/s, however it would be further examined in association with NTPC for ascertaining the feasibility of suggested interim arrangement for Rihand-III evacuation.

Member (PS), CEA concluded that incase the above suggested interim arrangement was found feasible , the same would be put to next Standing Committee Meeting of NR for consideration. He also mentioned that above interim arrangement would have to be approved by standing Committee of WR as well.

16. 2 Nos. of 220 kV bays at Chamera Pooling Station for HPPTCL

Director (SP&PA), CEA stated that provision of 2 nos. of 220 kV line bays at Chamera Pooling Station was agreed as regional strengthening scheme in 29th Standing Committee Meeting for feeding 220 kV Karian substation of HPPTCL. The same was also agreed in 20th NRPC meeting held on 01/03/2011. Now HPPTCL had indicated their requirement as one no. of 220kV bay by September 2012.

Member (PS) CEA asked HPPTCL to confirm the requirement of bay. HPPTCL representative confirmed the requirement as one no. 220 kV line bay.

POWERGRID representative stated that the 220 kV line bay was under tendering and it would not be feasible to implement the bay in the time frame of September/October 2012. After detailed deliberation and considering the urgency of the requirement as mentioned by HPPTCL, it was decided that POWERGRID might explore the possibility of providing an additional 220 kV bay in their ongoing project for establishment of Chamera Pooling station (within quantity variation).

POWERGRID agreed for the same.

17. Evacuation of Power from Malana-II

Director (SP&PA), CEA informed that the evacuation of power from Malana-II HEP was evacuated by LILO of one ckt of AD HEP – Nalagarh 220 kV D/c line of M/s AD Hydro at 220/132 kV, Chhaur substation of M/s Everest Power Pvt. Ltd. and power from generation project was injected at Chhaur by a 132 kV D/c line. He mentioned that for reliable evacuation of power from both the projects (300 MW), it was proposed to construct a 220 kV D/c line from Chhaur to Parbati Pooling station enabling injection of power from the Malana-II HEP at Parbati Pooling Station (ISTS). From Parbati Pooling Station, power can be evacuated over ISTS system. He further proposed that a 400/220 kV ICT alongwith its bays would also be needed as 220 kV level has not been planned at Parbati Pooling Station earlier.

HPPTCL representative informed that 2 nos. 220 kV line bays were required by them at Parbati Pooling Station.

After detailed deliberation, it was decided to provide 2 nos. of 315 MVA ICTs (7x105 MVA single phase units) alongwith 4 nos. of 220 kV line bays (2 bays for Everest power and 2 bays for HPPTCL). POWERGRID representative informed that space was available at Parbati Pooling Station switchyard for accommodating 2 nos 400/220 kV ICTs and 4 nos 220 kV line bays only. Regarding cost sharing of the above works, following was proposed:

- Chhaur – Parbati pooling station 220 kV D/c line – **to be implemented by M/s Everest Power at their cost.**
- The cost of switchyard extension including 2 nos. of 400 kV ICT bays and complete 220 kV switchyard with 4 nos of 220 kV line bays, 1 bus coupler bay and 2 nos ICT bays - **50% cost to be borne by Everest Power and 50% cost as ISTS scheme.**
- 400/220 kV ICTs - 4x105 MVA single phase ICTs to be provided under ISTS and 3x105 MVA single phase ICTs to be provided at the cost of M/s Everest Power

Members agreed to the above proposal.

18. Implementation of 400 kV, Kishenpur – New Wanpoh D/c line

Director (SP&PA), CEA stated that 400 kV, Kishenpur – New Wanpoh D/c line was being implemented as part of NRSS-XVI. Considering the ROW constraints for crossing the Pir Panjal mountain range, it was proposed to utilize a part of corridor of 132 kV Pampore – Wanpoh – Ramban – Batote – Udhampur about 7-8 km) D/c line for constructing 400 kV, Kishenpur – New Wanpoh D/c line by providing multi-circuit towers accommodating two 400 kV circuits and two 220 kV circuits for PDD, J&K and dismantling existing 132 kV line in Pir Panjal section. Subsequently, PDD, J&K informed that they would use their existing 132 kV line corridor in future for long term requirement of wheeling of power within the state. In view of the above, it was decided to implement 400 kV, Kishenpur–New Wanpoh D/c line through an alternate route to pass Pir Panjal area by diverting this line to the west of Jawahar tunnel.

PDD, J&K representative suggested that while planning the new transmission line from Kashmir valley to Jammu region, the line routing of the line along Mughal road or Poonch area might be considered. POWERGRID representative informed that most of the foundations of above line had already been completed and hence the suggestion of J&K could not be implemented for this line. However for new transmission lines, PDD J&K would be consulted about the routing of the line.

Members agreed for implementation of the 400 kV, Kishenpur–New Wanpoh D/c line through an alternate route proposed by POWERGRID.

19. Construction of 765/400kV Bulandshahar, Kurukshetra, Varanasi and Kanpur substations as Gas Insulated Substations

Director (SP&PA), CEA informed that during the 19th (Special) NRPC meeting, it was agreed that in case of land constraints, 765 kV, Bulandshahar substation would be taken up as GIS. As there is lot of problem in land acquisition in the area, POWERGRID is taking up Bulandshahar substation as GIS station. Similarly, in view of difficulty in procurement of adequate land for AIS 765/400kV, 2x1500MVA Varanasi, Kanpur substations and Kurukshetra HVDC terminal station alongwith its AC switchyard are also proposed to be taken up as GIS for timely completion of transmission schemes.

Members agreed to the proposal.

20. Connectivity between 400/220kV Pooling station of POWERGRID at Chamba and Bairasuil HEP of NHPC

Director (SP&PA), CEA stated that presently, there was only one 220kV D/c Bairasuil- Pong Transmission Line (line length: 96.82kMs) for evacuating the generation from 180MW of Bairasuil HEP. This line is already 31 years old (DOCO - 18/05/1980) and it passes through very difficult mountainous terrain. There have been instances of sinking of tower foundations of this line in past, resulting in damage to 220 kV Bairasiul- Pong transmission line. There were several instances of cross arms damage and snapping of conductors. Simultaneous tripping of both the circuits has also been observed on several occasions over last few years thereby jeopardizing evacuation of power from Bairasiul Project.

In view of above, POWERGRID had proposed an alternate 220 kV S/c evacuation line from Bairasuil HEP to Sarna 220kV Substation of PSTCL.

HPPTCL representative stated that there were severe R-o-W constraints in Himachal Pradesh, therefore this line should be constructed as D/c line. POWERGRID stated that as per the information, only one 220 kV bay was available at Bairasuil and therefore 220 kV S/c line had been proposed. HPPTCL representative opined that line should be constructed as D/c line and initially both circuits might be bunched at both ends and with the future power transfer requirement the bunching could be opened and both the circuits could be used.

After detailed deliberations following scheme was agreed as ISTS scheme:

- Implementation of Barasuil – Sarna 220 kV D/c line bunched at both ends.
- Provision of 1 no. of 220 kV bay at Bairasuil by NHPC
- Provision of 1 no. of 220 kV bay at Sarna (PSTCL)

Member (PS), CEA enquired about the space availability at Sarna S/s for accommodating 2nos, 220 kV line bays. PSTCL representative informed that they need to examine the availability of space and would confirm it later.

Members agreed to the proposal subject to the confirmation of availability of space by PSTCL.

21. Provision of Static Var Compensator (SVC)

POWERGRID representative stated that the load demand in Northern region was growing at a fast pace and power had to be imported from other regions to meet the peak demand and the large interconnected grid posed the challenge of operation of lines under various seasonal and operational conditions. There are large number of hydro power stations in Northern Region whose generation reduces to very low levels during winter season. Load demand increases to very high levels in Haryana / Punjab area during paddy season. All these factors necessitate the proper reactive power management for efficient operation of the grid.

POWERGRID carried out the system studies considering the existing/planned transmission system in Northern region. Based on results of these system studies, they proposed to provide Static Var Compensators (SVC) at following substations:

- Ludhiana S/s - (+) 600 MVAR / (-) 400 MVAR
- Kankroli S/s - (+) 400 MVAR / (-) 300 MVAR
- New Wanpoh S/s - (+) 300 MVAR / (-) 200 MVAR

RVPNL representative enquired about the specific requirement of providing SVC at these locations and discussed about the operation of the SVCs. POWERGRID representative stated that in Punjab system required dynamic reactive support to avoid voltage collapse particularly in paddy season, Kankroli S/s was directly connected to RAPP as well as it was an inter-regional node connecting Northern and Western regions and oscillations had been observed on several occasions in this area, the New Wanpoh S/s was a radially fed system and low voltage at 400 kV level had been experienced at this substation during winter peak load conditions.

NRLDC representative stated that considering the operating conditions of the grid, it was very much necessary to provide SVC in northern part of the grid to maintain the reliability and security of the system.

HVPNL representative stated that Haryana also faced similar grid conditions as of Punjab during peak load conditions when agriculture demand was very high and therefore provision of SVC in Haryana area should also be considered.

Member (PS), CEA suggested to agree with the above proposal in the interest of Grid security and supply of quality power. He advised POWERGRID to carry out system studies for assessing the requirement of SVC in Haryana and put up the proposal for consideration in next Standing Committee Meeting.

After detailed deliberations, members agreed to the above proposal.

Minutes of the meeting in respect of additional agenda items:

1. Evacuation of power from Sainj HEP

Director (SP&PA), CEA stated that evacuation of power from Sainj HEP was discussed during the Connectivity/Long term Access Meeting held on 29/12/10, alongwith 29th SCM of NR. During the meeting, it was discussed and agreed that a 400/132kV substation would be created wherein Sainj power would be pooled at 132kV and stepped up to 400kV. Connectivity to ISTS was agreed through LILO of one circuit of Parbati-II to Parbati-III/ Parbati Pooling at proposed 400/132kV substation. The above work was to be carried out by HPPTCL. Now, it is understood that HPPCL have changed the step up voltage to 400 kV instead of 132 kV and HPPTCL intends to carry out the above referred LILO directly at generation project. He requested HPPTCL to confirm the above change. HPPTCL representative confirmed the same.

Director (SP&PA), CEA further mentioned that NHPC had indicated the current carrying capacity of the 400 kV XLPE cable provided at Parbati-III generation switchyard as 2400 Amps whereas under contingency of outage of one circuit between Parbati-II to Parbati Pooling Station assuming 0.9 power factor, 0.9 pu voltage & 10% overload generation, the current passing through cable would be 2587 Amps without Sainj generation and 2784 Amps with Sainj generation. Under normal operating condition, no problem was envisaged in evacuation of combined generation of Parbati-II, Parbati-III & Sainj HEPs. He asked HPPTCL whether it would be feasible to shift injection of Sainj generation below Parbati-III Switchyard by LILO of Parbati-III – Parbati Pooling Station 400kV S/c at Sainj. Director, HPPTCL informed that shifting injection point as suggested above, would increase the length of LILO portion by 10 kms and moreover, it would not be feasible to get R-o-W in that area.

Member (PS), CEA stated that in view of above, injection of Sainj Generation might be kept as planned earlier. He asked NHPC to review the cable rating by considering ambient temperature, group derating factor and explore the possibility of increasing current rating of cables by modifying laying/spacing of cables. Further the overloading capacity of cable could be utilized after consultation with cable manufacturer.

NHPC representative agreed to review the cable rating as suggested above to mitigate the above constraint.

It was also decided that if the current capacity constraint of the cable persisted even after the above review was done by NHPC, then the generation at Sainj, Parbati-II and Parbati-III HEPs would have to be backed down proportionately incase of contingency of outage of 400 kV Parbati-II to Parbati Pooling circuit. However, occurrence of above situation appears to be very remote as it includes outage of one circuit, 10% overload generation, 0.9 pu voltage and 0.9 power factor.

Members agreed for the above proposal.

2. Transmission system for Kotlibhel HEP of NHPC

Director (SP&PA), CEA stated that a composite 400 kV transmission system for evacuation of Kotlibhel-1A (195 MW), Kotlibhel-1B (320 MW) and Kotlibhel-2 (530 MW) HEPs was evolved in the 23rd SCM on Power System Planning of Northern Region held on 16/2/2008. He also mentioned that NHPC vide their letter dated 24/10/2011 informed that Forest Advisory Committee has cleared Kotli Bhel-IA HEP (195MW) only and therefore the earlier planned transmission system might be reviewed. He proposed that in view of the reduced generation at Kotlibhel i.e. 195 MW plus 10% overload the connectivity of Kotlibhel may be considered at 220 kV. However, NHPC should apply for connectivity and LTA indicating the time frame, and beneficiaries of the project. Thereafter, the injection point in ISTS network and transmission system for evacuation of power from Kotli Bhel-IA HEP would be evolved.

Members agreed for the same.

3. Augmentation of Transformation Capacity and provision of additional 220 kV bays in Northern Region

a) Amritsar S/s:

POWERGRID stated that augmentation of 400/220kV transformation capacity by 1x315 MVA capacity at Amritsar was agreed during the 18th NRPC meeting and during 29th Standing Committee Meeting held on 29/12/2010. He mentioned that PSTCL vide their letter dated 20/06/2011 desired that the augmentation might be considered with transformer capacity of 500 MVA (instead of 315 MVA) due to the load growth in the state. PSTCL representative also desired 3 nos. of 220 kV line bays for drawl of power from Amritsar. He also informed that only one additional ICT could be accommodated at Amritsar. He proposed to provide 1 no. of 500 MVA ICT along with ICT bays & 3 nos. of 220 kV line bays at Amritsar S/s.

Members agreed to the above proposal.

b) Allahabad, Bassi, Meerut and Kishenpur S/s:

POWERGRID stated that presently Allahabad, Bassi and Kishenpur S/s had a transformation capacity of 2x315 MVA while at Meerut it was 3x315MVA. The maximum loading on each ICT had gone up to 294 MW at Allahabad, 305 MW at Bassi, 240MW at Meerut and 300 MW at Kishenpur. It was also mentioned that the additional ICT (4x105MVA) at Kishenpur was approved in 21st NRPC meeting and additional ICT at Bassi, Meerut and Allahabad was approved in 24th NRPC meeting. As such, he proposed to augment the transformation capacity by 4x105 MVA, ICT at Kishenpur, 1x500 MVA, 400/220 kV ICT each at Bassi & Meerut and 1x315 MVA, 400/220 kV ICT at Allahabad. Regarding provision of 220 kV line bays alongwith these four ICTs it was agreed that no additional 220 kV line bay shall be provided.

Member (PS) advised that concerned STU should inform POWERGRID regarding their requirement of 220 kV line bays at respective substation, at least 24 months in advance so that bays could be constructed in time.

Members agreed to the above proposal.

c) Ludhiana S/s and Moga S/s:

Ludhiana S/s : POWERGRID representative stated that PSTCL requested for an additional ICT of 1x500MVA at Ludhiana substation due to high load growth in the area and also requested for additional 3 nos. 220 kV line bays. He mentioned that presently 3x315 MVA transformers and 6 nos. of 220 kV line bays were available at Ludhiana. In addition, one spare 1x315 MVA ICT was approved and kept in uncharged condition at Ludhiana for utilization by NR substations in the event of failure of transformer. Considering the load growth in Ludhiana area, He proposed to provide additional 1x500 MVA ICT along with 3 nos. of 220 line bays at Ludhiana.

PSTCL intimated that the above 220 kV line bays at Ludhiana S/s might be constructed on priority as the same were required urgently. POWERGRID agreed for the same.

Members agreed to the above proposal.

Moga S/s: POWERGRID stated that PSTCL proposed for replacement of existing 3x250MVA transformers by 3x500MVA ICTs due to load growth in area. He mentioned that Moga S/s was commissioned in 1994 and existing transformers were about 19 years old. Moga S/s has an existing transformation capacity of 1065MVA, (3x250+1x315MVA). Considering the projected load, it was proposed to replace existing 2x250 MVA ICTs with 2x500 MVA ICT, making the total 400/220kV transformation available at Moga as 1565 MVA. It was also proposed that the 2 nos. of 250 MVA ICTs (to be replaced at Moga) would be kept as spare ICTs after refurbishment and utilized incase of failure of ICT at any S/s in NR. Chief Engineer, PSTCL intimated the urgent need of two(2) nos of 220kV line bays at Moga substation. POWERGRID agreed to provide these bays on priority.

Members agreed to the above proposal.

d) Requirement of 400/220 kV ICTs at other locations as per 2016-17 studies

In addition to above, studies have been carried out in the time frame of 2016-17 to work out the requirement of ICTs at other locations also. From the studies requirement of augmentation of ICTs has been observed at various locations in Northern region. After detailed deliberations following transformer augmentation capacity, in addition to above was agreed:

400kV S/s	Aug. proposed	220kV Line bays to be provided
Samba	3x105MVA	---
Gurgaon	1x500 MVA	---
Mandaula	1x500 MVA	---

Hamirpur	3x105 MVA	2 nos
Jallandhar	1x500 MVA	2 nos
Panchkula	1x500 MVA	---

It was also agreed that 220 kV bays would be provided as per the requirement of, STU. It was decided that respective STU would inform its requirement of 220 kV bays to POWERGRID at least 2 years in advance.

Members agreed to the above proposal.

e) 1x105 single phase spare unit at Wagoora S/s

POWERGRID representative stated that 4 nos. of 315 MVA ICTs (105 MVA, Single Phase units) and one, 105 MVA spare unit (provided with the initial two ICTs) were existing at Wagoora substation. It was mentioned that existing spare ICT unit could not be used for 4th ICT bank due to the difficulty in mobility of spare unit in switchyard and its switching arrangement. In view of this, it was proposed to provide one additional 105 MVA, single phase ICT unit as spare at Wagoora S/s along with 4th bank of ICTs.

Members agreed to the above proposal.

4. Creation of 400/220 kV Substation at Patran

PSTCL representative stated that Patiala and Sangrur district of Punjab had a lot of agriculture load. He requested to provide a 400/220 kV S/s at Patran by LILO of Patiala-Kaithal 400kV D/c line. He explained that Patran was surrounded by 5 nos of 220kV grid stations, namely Mansa, Rajla, Sangrur, Sunam & Patran, having total transformation capacity of 1180 MVA. In addition, 3 nos of 220kV new substations were also coming up in the area, at Pasiana, Bangan & Kakarla. Keeping above in view, it was necessary to establish a 400kV substation in this area. POWERGRID representative stated that POSOCO had also recommended a 400 /220kV substation in this Punjab area in their report on partial Grid Disturbance of 20thJuly 2011. He proposed to establish new 400/220 kV S/s with 2x500 MVA ICTs at Patran by LILO of both circuits of Patiala-Kaithal 400kV D/c line as ISTS scheme.

Members agreed to the above proposal.

5. Evacuation of power from RAPP

Director (SP&PA) stated that the generation from RAPP-5&6 was evacuated through RAPP-Kankroli 400kV D/c and RAPP-Kota 400kV S/c lines. He mentioned that RAPP-5&6 generating station was facing high voltage condition. and one circuit of 400kV RAPP-Kankroli D/c was kept open. Under such condition, tripping of

400kV RAPP-Kota S/c resulted in oscillations as only one circuit of 400 kV RAPP-Kankroli line was available for evacuation of RAPP 5&6 units. In order to contain the occurrence of high voltage and improve connectivity of RAPP 5&6, the following measures were proposed:

- Preponement of 125 MVAR bus reactor covered under the evacuation system of RAPP-7&8 for early commissioning.
- Preponement of RAPP-Kota section of 400kV RAPP-Jaipur D/c (with one circuit via Kota) covered under the evacuation system of RAPP-7&8. This would provide two numbers of 400kV lines from RAPP to Kota for stable operation of RAPP 5&6 units.

Member (PS), CEA asked NPCIL to confirm the commissioning schedule of RAPP 7&8 units. NPCIL representative stated that there had been some initial delays of about 6 months in start of work, however the schedule of commissioning was maintained as December 2015 as informed earlier.

POWERGRID representative stated that as per studies carried out for 12th plan end time frame there was injection of power from Anta to Kota resulting in critical loading on 400 kV Anta-Kota S/c line. He proposed that a joint study might be carried out by CEA, RRVPNL and POWERGRID to analyse the critical loading of Anta – Kota 400 kV S/c line.

Members agreed to the above proposal of pre-ponement of works and for carrying out joint studies.

6. Evacuation of power from Luhri

Director (SP&PA), CEA stated that SJVNL had informed that Luhri generating station would be Air Insulated Substation (AIS) and there would be difficulty in providing 4 nos of 400KV bays for LILO of Rampur – Nalagarh 400 kV D/c line. He also mentioned that during the 29th Standing Committee Meeting a tentative evacuation system was indicated after the preliminary system studies and it was decided that transmission system for the project would be again taken up for consideration after receipt of connectivity and LTA application from SJVNL.

POWERGRID representative intimated that SJVNL was yet to apply for connectivity and LTA. He further observed that in the absence of LILO of Rampur – Nalagarh 400 kV D/c line at Luhri HEP, the generation would be radially connected with a 400 kV D/c line without any anchoring at generation end resulting in problem of oscillations.

Member (PS), CEA suggested that the evacuation system for Luhri HEP would be finalized after the receipt of connectivity and LTA application by CTU from SJVNL.

Members agreed to the above proposal.

7. LILO of Jalandhar-Hamirpur 220kV line at Nehrian near Amb by HPSEB:

POWERGRID representative stated that HPSEB Ltd had proposed to construct 220/132 kV, 1x160/200 MVA substation at Nehrian (near Amb) and requested for LILO of both circuits of 220kV D/c Jalandhar-Hamirpur ISTS line at this substation. HPPTCL representative agreed with the above proposal of HPSEB.

Members agreed to the above proposal.

8. Provision of 400kV bays at Bhinmal and Sikar S/s

Director (SP&PA), CEA stated that RVPN was expecting additional generation of 2650 MW renewable energy (Solar & wind) in next 3-4 years. The proposed generation projects were located in six major locations i.e. Ramgarh, Bhadla, Akal, Phalodi, Tinwari, Bapi and Amarsagar. He mentioned that for evacuation of power from these generations, within Rajasthan a composite transmission system had been evolved by CEA, POWERGRID & RVPNL which was proposed to be integrated with ISTS at Bhinmal and Sikar S/s of POWERGRID.

For the above integration of RVPN system and ISTS, it was proposed to provide two nos. of 400 kV line bays each at Bhinmal and Sikar S/s under ISTS system for the termination of 400 kV D/c lines being constructed by RVPN.

POWERGRID representative enquired about the time frame for these 400 kV bays. RVPNL representative stated that they would intimate POWERGRID in due course of time.

Members agreed to the above proposal.

Annexure-I

List of participants for the 30th meeting of Standing Committee on Power System Planning in Northern Region, held on 19.12.2011 at NRPC, New Delhi

	Name	Designation
CEA		
1.	Sh. Ravinder	Member (PS) - in chair
2.	Sh. K.K.Arya	Chief Engineer I/c (SP&PA)
3.	Sh. B. K. Sharma	Director (SP&PA)
4.	Sh. Rajeev Kumar	Deputy Director (SP&PA)

NRPC

1.	Sh. P.K. Pahwa	Member Secretary I/c
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PGCIL

3.	Sh. Pankaj Kumar	ED (Engg.)
4.	Sh. S. C. Singh	GM (NR-II)
5.	Sh. Mukesh Khanna	DGM (Engg)
6.	Sh. Vibhay Kumar	DGM
7.	Sh. Thyagrajan	CDE(Engg.)
8.	Ms. Ankita Singh	Engineer

NTPC

1.	Sh. S. K.Patnaik	GM (PP&M)
2.	Sh. V.K.Padha	GM (Comm.)
➤	Sh. Abhijit Sen	AGM (Project Engg.)
➤	Sh. P.K.Goyal	DGM (PP&M)
➤	Sh. S.S.Mishra	DGM (Engg.)
➤	Sh. Shankar Saran	DGM (Comm.)
➤	Ms. Shilpa Agarwal	DM (Comm.)

NHPC

1.	Sh. M.S.Babu	ED
2.	Sh. Rajeev Kumar	AM

DTL

1.	Sh. Raj Bhartiya	ED (Tech.)
2.	Sh. Roop Kumar	GM (SLDC)
3.	Sh. A.C.Agrawal	DGM (Plg.)

4. Sh. Pankaj Kr, Vijay Manager (Plg.)

RRVNL

1. Sh. B.N. Saini Director (Operation)
2. Sh. L.N. Nimawat SE (P&P)
3. Ms. Sona Shishodia Addl. Ex. Engr.

HVPNL

1. Sh. R.K.Arora Director (Tech.)
2. Sh. C.D.Sangwan Ex. Engr (Plg.)

HPPCL

1. Sh. B.S.Negi DGM

HPPTCL

1. Sh. V.K. Kaprate Director
2. Sh. Sandeep Sharma Sr. Mgr.

PSTCL

1. Sh. R.K.Sharma CE (Planning)
2. Sh. B.S.Sandhu Deputy CE
3. Sh.Akshay Kumar Sr. Ex. Engr.

J&K

1. Sh. M.A.Salroo Development Commissioner (Power)
2. Sh. A.R.Tak Advisor

NPCIL

1. Sh. R.K.Oke CE (Trans.)

PTCUL

1. Sh. Kamal Kant GM (C&R)
2. Sh. S.C. Bhasin GM (Proj.)
3. Sh. A.K.Agrawal DGM

NRLDC

1. Sh. V.V.Sharma GM
2. Sh. Rajiv Porwal Ch. Mgr.

NLDC

1. Sh. Amandeep Singh Sr. Engr.
2. Sh. Nripen Mishra Engineer

ANNEXURE-II

A. UPPER PART OF SATLUJ BASIN & SPITI VALLEY (SATLUJ BASIN)

The list of identified hydro projects in the Upper Part is given below:

S.No.	Project	MW	Time Frame	Developer	Status of Application for Access to Grid as per CERC regulations
1	SHPs	142	2014		
2	Shongtong Karcham	450	Mar' 2015	HPPCL	Received
3	Kashang-I	65	2013	HPPCL	Received
4	Kashang-II & III	130	2015	HPPCL	Received
5	Kashang-IV	48		HPPCL	
6	Tidong-I	100	2015	Nagarjuna Constructions Group	Received
7	Chango Yangthang	140	2016	Bhilwara Group	Received
8	Yangthang Khab	261			X
9	Ropa	60			X
10	Khab	636			X
11	Tidong-II	90			X
12	Jhangi Thopan	480			X
13	Thopan Powari	480			X
14	Sumte Khatang	130			X
15	Lara Sumte	104			X
16	Mane-Nadang	70			X
17	Lara	60			X
18	Killing-Lara	40			X
	Total	3486			

Planned Transmission System alongwith phased development for upper part of Satluj Basin and Spiti Valley (Satluj Basin)

- **SHPs** : Establishment of 66/220/400 kV GIS Pooling Station at Wangtoo by Mid 2014 to match commissioning of SHPs in Bhaba Khad (57 MW) and Sangla Valley (40 MW) + LILO of 220 kV Kashang- Bhaba D/c Line and LILO of both circuits of 400 kV Karcham Wangtoo-Abdullapur D/c line at Wangtoo. – **Proposed Implementation through STU.**

HPPTCL proposed to implement this substation by Mid 2014 and they have tied up the funds from ADB. The switchgear rating and bus capacity etc. at Wangtoo substation should be equivalent to 4000 Amps.

- **Kashang-I (65 MW), Kashang-II (65 MW) and Tidong-I (100 MW)** : During the meeting HPPTCL stated that Kashang-I is likely to be commissioned by 2013. For evacuation of power from Kashang-I, HP is constructing a 220 kV D/c line from Bogtu to Kashang. Accordingly, power can be evacuated through Bogtu - Bhabha 220 kV D/c line. HPPTCL stated that Tidong-I is under construction and is likely to be commissioned by December 2014. Since, Tidong-I (100 MW) is due for commissioning in December, 2014 and Jangi Pooling station may not come up by that time, Tidong-I power shall be temporarily evacuated by LILO of one circuit of 220 kV D/C Kashang- Bhabha line at Tidong-I HEP. These works shall be carried out by HPPTCL. Later on when Jangi P.S. is commissioned, Tidong-I - Jangi line shall be constructed and also Kashang – Jangi 220 kV D/c line with inle HTLS conductor shall be established. These works are proposed to be carried out by HPPTCL.

HPPTCL further informed that works for Kashang-II (65 MW) has also been awarded and commissioning is expected by 2015. It was suggested that Kashang-II is also evacuated through 220 kV system as Jangi pooling station may not be available in that time frame, however some constraints may be faced during contingency of outage of one circuit. POWERGRID stated that establishment of Jangi Pooling station may be taken up with further stages of Kashang.

- **Shongtong Karcham** : During the meeting it was informed that Shongtong Karcham HEP (450 MW) is likely to be commissioned by 2017. For transfer of power from this project, following is proposed:
 - Shongtong Karcham – Wangtoo 400 kV D/c Line (Quad HTLS Conductor –Equivalent to about 3000MW) – 18 km - **Proposed Implementation as ISTS**
 - Switchyard Capacity etc. must be able to handle about 2800-3000MW power planned in the upstream of the generation project. It is proposed that the GIS switchyard may be designed with 4000 Amps switchgear. However, the cable capacity from Pot head yard to GIS switchyard may be augmented with generation addition in the upstream projects.
- **Kashang-III (65 MW) & Kashang-IV (48 MW) and Tidong-II (90 MW) HEP:** Evacuation of power from Kashang –I (65 MW), Kashang –II (65 MW) and Tidong-I (100 MW) is discussed above. With the commissioning of other stages of Kashang and Tidong, the power shall be injected at Jangi pooling station. The Jangi Pooling station shall be established by this time frame. Transmission scheme for Kashang & Tidong shall be as given as below:
 - Kashang-Jangi Pooling Station 220 kV D/c line (Single HTLS- Equivalent to 300 MW capacity) - **Proposed Implementation as STU network**
 -
 - 2x315 MVA (7x105 MVA units) 220/400 kV GIS Pooling Station at Jangi (with 4000 Amps. switchgear) (with space provision for 3rd ICT) - **Proposed Implementation as ISTS**

- LILO of one ckt. of Shongtong –Wangtoo 400 kV Line at Jangi - ***Proposed Implementation as ISTS***
- Tidong – Jangi Pooling Station 220 kV D/c line - ***Proposed Implementation as STU network***

Note: After coming up of Kashang III & Tidong-II and its inter-connection with Jangi Pooling Station, the Kashang-Bogtu 220kV line has to be kept in open condition.

- **Chango Yangthang (140 MW):** Chango Yangthang is envisaged to be commissioned by 2017. Following transmission system is proposed matching with Chango Yangthang:
 - Chango Yangthang – Proposed site of Ka Dogri Pooling Station 220 kV D/c line – 18 km - ***Proposed Implementation by developer***
 - Proposed Site of Ka Dogri – Jangi Pooling Station 400 kV D/c line (Twin Moose) to be initially charged at 220 kV – 50 km ***Proposed Implementation as ISTS***
 - Provision of 3rd 400/220 kV ICT (3 nos. of 105 MVA Single Phase units) at Jangi Pooling Station - ***Proposed Implementation as ISTS***
- **Yangthang Khab (261 MW):**
 - 220 kV Yangthang Khab- Ka Dogri D/c Line with HTLS conductor - adequate for 300 MW capacity – 4 km - ***Proposed Implementation as ISTS***
 - 2x315 MVA (7x105 MVA units) 220/400 kV GIS Pooling Station at Ka Dogri - ***Proposed Implementation as ISTS***
 - Charging of Ka Dogri – Jangi line at 400 kV level - ***Proposed Implementation as ISTS***
 - Direct termination of Chango Yangthang at Ka Dogri Pooling Station - ***Proposed Implementation by generation developer***
- **Khab (636 MW):**
 - Khab – Jangi Pooling Station 400 kV D/c line – 20 km - ***Proposed Implementation as ISTS***
- **Jangi Thopan (480 MW) & Thopan Powari (480 MW) :**
 - LILO of one circuit of Jangi Pooling Station – Wangtoo 400 kV D/c (Quad HTLS) line at generation project - ***Proposed Implementation as ISTS***
 - Switchgear Capacity at Generation switchyard must be equivalent to 4000 Amps.
- **Ropa (60 MW)**
 - Direct injection to Jangi Pooling station by a 220 kV D/c line - ***Proposed Implementation by generation developer***
 - The generation of SHPs in the area may be injected at Ropa Generation Switchyard
- **Other Projects of Spiti Valley (Satluj Basin)**
 - The generation of these projects can be injected at Ka Dogri Pooling Station.

- From Killing Lara (40 MW), Lara (60 MW) & Mane Nadang (70 MW), a combined 220 kV D/c line can be constructed upto Lara Sumte HEP. From Lara Sumte HEP(104MW), a high capacity 220 kV line (with twin Moose conductor) can be constructed upto Ka Dogri Pooling Station - ***Proposed Implementation as ISTS except for the generators below 50 MW.***
- Augmentation of transformation capacity would be required at Ka Dogri. Space for 2 additional ICTs of 315 MVA (105 MVA single phase units) would be required. These transformers can be provided progressively matching with the generation addition. - ***Proposed Implementation as ISTS***

NOTE :

Present / Planned system beyond Wangtoo station would be capable of handling about 500-600 MW of power (to be confirmed with the development of the generation projects). One more additional high capacity line (400 kV Quad) from Wangtoo towards Haryana/Punjab shall be required which can be constructed through the right bank of the river.

B CHANDRABHAGA BASIN (LAHAUL & SPITI AREA)

The list of identified projects in the upper part is given below:

S.No.	Project	MW	Time Line	Developer	Status of Application for Connectivity / Access to Grid as per CERC regulations
1	Chhatru	120	2018	DCM Sriram	X
2	Teling	94			X
3	Shangling	44		Reliance Power	X
4	Jispa	300		HPPCL	X
5	Tandi	104		ABG Shipyard	X
6	Rashil	130		ABG Shipyard	X
7	Bardang	126		ABG Shipyard	X
8	Tignet	81		Amar-Mitra JV	X
9	Pattam	60			X
10	Seli	400	2017	Moser Baer	Connectivity Application Received
11	Miyar	120	2017	Moser Baer	Connectivity Application Received
12	Reoli Dugli	420	2018	L&T	X
13	Sach Khas	149	2018	L&T	X
14	Purthi	300		Reliance Power	X
15	Duggar	236		Tata + SN Power	X
16	SHPs	300			
17	Other	500			
	Total	3500			

Planned Tr. System alongwith Phased development for Chandrabhaga Basin

The total power in this area is about 3850 MW (considering 10% overload). Out of these projects, two projects namely, Miyar & Seli are expected to come up by 2017 and three projects Chhatru, Reoli Dugli & Sach Khas are expected by 2018. The next project expected in this area would be Jispa. The status and time frame of other projects are not yet clear.

Based on the progress of generation, availability of corridors, severe R-o-W constraints near Seli, quantum of power, it was considered prudent to develop two transmission corridors, one towards Hamirpur and the other towards J&K. It is proposed that the corridor to start from Seli HEP would go towards Hamirpur and the other corridor to start from Reoli Dugli would go towards J&K. The corridor capacity towards Hamirpur would be of the order of 2500 MW and corridor capacity towards J&K would be about 1500 MW.

Keeping above observations in view, following transmission system is proposed which is matched with the sequence of commissioning of generation projects:

CHANDRABHAGA CORRIDOR-I

Seli HEP (400 MW): Earlier the Project size was 320 MW, however with the detailed investigations, the project size is revised to 400 MW.

- 400 kV D/c Line (Twin HTLS-Adequate for about 2000 MW) from Seli to the site of 400 kV Pooling Station near Sissu /Gramphu (Pooling Station shall not be constructed during this time frame) - ***Proposed Implementation as ISTS***
- From site proposed near Sissu/Gramphu Pooling Station – Hamirpur 400 kV D/c (Triple HTLS – adequate for 2500 MW capacity) – For this line section, Rohtang Pass is to be crossed. There is about 8-10 feet of snow at Rohtang Pass during winters and working season is very less. For implementation of overhead line, SASE and some international expert would have to be involved. Special design with pole type towers may be required which can be firmed up during detailed engineering. - ***Proposed Implementation as ISTS***

Miyar HEP(120 MW) :

- Step up of Miyar generation at 400 kV level
- LILO of one circuit of Seli – Hamirpur (via Rohtang) 400 kV D/c line (Twin HTLS) at Miyar - ***Proposed Implementation as ISTS***

Note : During the meeting it was informed that Miyar would come up earlier than Seli, the line from Miyar to Hamirpur (configuration explained under Seli system) may be taken up initially and the same can be extended to Seli.

Chhatru HEP (120 MW) : With the coming of Chhatru HEP, following is proposed:

- Establishment of 2x315 MVA (7x105 Single Phase units) 400/220 kV GIS Pooling station near Sissu / Gramphu - ***Proposed Implementation as ISTS***
- Chhatru – Sissu / Gramphu GIS Pooling Station 220 kV D/c line (HTLS adequate for 300 MW per circuit) - ***Proposed Implementation as ISTS***
- LILO of both circuits of Seli - Hamirpur line at Sissu/ Gramphu GIS Pooling Station.- ***Proposed Implementation as ISTS***

Teling & Shangling HEP (94 & 44 MW) : For evacuation of power from these projects, following is proposed:

- LILO of one circuit of Chhatru – Sissu / Gramphu Pooling Station 220 kV D/c (HTLS) at Teling - ***Proposed Implementation as ISTS***
- LILO of one circuit of Chhatru – Sissu / Gramphu Pooling Station 220 kV D/c (HTLS) at Shangling - ***Proposed Implementation by STU or developer***

Note: The capacity of generation switchyards at Chhatru, Teling & Shangling HEPs must be equal to power handling capacity of 300 MW otherwise there would be constraints during contingency of outage of one circuit.

Jispa (300 MW): For evacuation of power from Jispa HEP, following is proposed:

- Jispa – Sissu / Gramphu Pooling Station 400 kV D/c line - ***Proposed Implementation as ISTS***

Bardang HEP (126 MW) : Following is proposed for Bardang HEP

- Step up at 400 kV
- LILO of one circuit of Seli – Sissu / Gramphu Pooling Station 400 kV D/c (Twin HTLS) - ***Proposed Implementation as ISTS***

Rasil HEP (130 MW)

- Step up at 400 kV
- LILO of one circuit of Seli – Sissu / Gramphu Pooling Station 400 kV D/c (Twin HTLS) - ***Proposed Implementation as ISTS***

Tandi HEP (104 MW)

- Step up at 400 kV
- LILO of one circuit of Seli – Sissu / Gramphu Pooling Station 400 kV D/c (Twin HTLS) - ***Proposed Implementation as ISTS***

Pattam HEP (60 MW) :

- Step up at 220 kV
- Pattam – Miyar 220 kV D/c - ***Proposed Implementation as ISTS***
- Provision of 1x250 MVA(4 nos. of 83.3MVA Single Phase units), 220/400 kV GIS Pooling Station at Miyar. In case of space constraints at Miyar switchyard, a separate pooling station would be required.- ***Proposed Implementation as ISTS***

Tignet HEP (81 MW)

- Step up at 220 kV
- LILO of one circuit of Pattam – Miyar 220 kV D/c - ***Proposed Implementation as ISTS***

For Pattam & Tignet HEP transmission systems, it is assumed that Pattam would be coming up prior to Tignet. In case Tignet HEP materializes before Pattam, 220 kV D/c line and provision of ICTs shall have to be matched with Tignet HEP.

NOTE: (Additional system beyond Hamirpur would be planned based on the requirement / commissioning of new projects.) - ***Proposed Implementation as ISTS***

CHANDRABHAGA CORRIDOR-II

It was proposed that the generation projects in the downstream of Seli HEP i.e. Reoli Dugli (420 MW), Sach Khas (149 MW), Purthi (300 MW) and Duggar (236 MW) may be evacuated through Jammu region as these projects are close to that region, there are severe R-o-W constraints from Seli to Reoli Dugli and it may not be feasible / reliable to evacuate full 3850 MW through single corridor.

Reoli Dugli HEP (420 MW) & Sach Khas (149 MW): Both these projects are allocated to L&T and investigations for preparation of DPR are in progress. As per preliminary discussions, these projects are expected to come up by 2018. Following transmission scheme is proposed for evacuation of power from these projects:

- Generation step up at 400 kV level (for both projects)
- Reoli Dugli– Kishtwar 400 kV D/c (Twin HTLS-Adequate for 1500 MW) - ***Proposed Implementation as ISTS***
- Establishment of 400 kV switching station at Kishtwar - ***Proposed Implementation as ISTS***
- LILO of Dulhasti / Ratle – Kishenpur 400 D/c (Quad) line at Kishtwar - ***Proposed Implementation as ISTS***
- LILO of one circuit of Reoli – Kishtwar at Sach Khas - ***Proposed Implementation as ISTS***
- Generating Switchyard capacity to be kept for 1500 MW at each Power House.

Purthi HEP (300 MW) : Following transmission system is proposed with Purthi HEP

- Generation step up at 400 kV level
- LILO of one circuit of Reoli – Kishtwar 400 kV D/c at Generating station - ***Proposed Implementation as ISTS***
- Generating Switchyard capacity to be kept for 1500 MW at Power House.

Duggar HEP (236 MW): Following is proposed for transfer of power from Duggar

- Generation step up at 400 kV level
- LILO of one circuit of Reoli – Kishtwar 400 kV D/c at Generating station - ***Proposed Implementation as ISTS***
- Generating Switchyard capacity to be kept for 1500 MW at Power House.

Note: Initially some margins may be available beyond Kishtwar, however system strengthening would be required depending on the generation addition. - ***Proposed Implementation as ISTS***