

**Agenda Note for 31st meeting of the Standing Committee on Power
System Planning of Northern Region**

1. Confirmation of minutes of 30th Standing Committee Meeting held on 19.12.2011

Minutes of 30th meeting was uploaded on CEA website and intimation in this regard, was sent to members vide CEA letter no.-1/9/2010-SP&PA dated 20.1.2012. Observations received from various constituents are as given below:

- a. RRVPN has observed that LILO of existing ISTS line for providing connectivity to new generation projects should be avoided to the extent possible as this arrangement reduces the redundancy and reliability of lines and thus affect the transfer of power from the generation projects for which the lines were planned.**

This issue is included for deliberation as agenda item no.28.

- b. NLDC has observed that interim arrangement agreed for evacuation of unit –I of Rihand-III (2x500 MW) TPS is not adequate under N-1 contingency.**

In this context it is stated that minutes clearly indicate that agreed system is adequate for evacuation of unit-1 generation under normal operating conditions.

- b. NLDC has also observed that augmentation of ICTs at Ludhiana ad Moga would result in transformation capacity of more than 1000 MVA at both substations and new substations should be planned instead of augmenting ICTs at existing substations.**

In this regard, it is mentioned that establishment of new substation in Ludhiana and Moga area is not feasible due to non-availability of land and R-o-W constraints in laying new lines. Further, due to high concentrated load growth in this area augmentation of transformation capacity is necessary at these substations and therefore the same was agreed.

The minutes of the meeting may please be confirmed.

2. Reliability of Power Supply to J&K

There was complete collapse of power supply to Kashmir Valley on 6th & 7th January 2012 due to heavy snowfall and breakdown / tripping of all three existing links between Jammu region and Kashmir valley. All the existing and under construction lines are routed through Udhampur – Batote – Banihal- Peerpanjal pass. PDD J&K has informed that the common corridor of existing transmission lines is highly prone to snow storms, landslides and other natural calamities making whole power transmission unreliable.

Further, it is to mention that the power supply to Jammu and Kashmir is basically through 400/220 kV, Kishenpur substation and any major fault at this substation may lead to disruption of power supply to the state. It is therefore necessary that an alternate path is made available for transfer of power from Jammu region to Kashmir valley. PDD J&K has also requested for planning an alternative route for providing the reliable power supply to J&K. Here it is also to be mentioned that J&K is connected to NR Grid mainly through Kishenpur - Moga 765 kV 2xS/c lines (operated at 400 kV line). Any failure in these lines may also disrupt the generation in J&K endangering the grid. Therefore alternate connection to J&K is also required for safe operation of the grid. In addition, PDD J&K has also informed that high load growth is anticipated in northern part of Kashmir and to cater to projected loads, a 400/220 kV substation at Amargarh (in North Kashmir area) may be planned.

Keeping above in view, following transmission system is proposed as ISTS strengthening scheme:

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- Jullandhar – Samba 400 kV D/c
- Samba –Amargarh 400 kV D/c
- LILO of both circuits of Uri – Wagoora 400 kV D/c line at Amargarh
- Establishment of 2x315 MVA, 400/220 kV GIS substation at Amargarh

The above transmission scheme would result into a complete 400 kV ring in J&K with different sources of power supply and improve the reliability of power supply to the state.

PDD J&K has also requested that the new 400 kV D/c line may be routed through a different corridor i.e. via Akhnoor, Rajouri and Mogul Road, . This would have dual benefit i.e. the line would be constructed through a different corridor which is away from the existing line corridor as well when the demand in Akhnoor / Rajouri increases, the new 400 kV substation can be established by LILO of proposed 400 kV Samba – Amargarth line.

As decided during the 30th SCM, a committee comprising of CEA, POWERGRID, NHPC, PDD J&K and JKSPDC visited J&K to assess the feasibility of transmission corridors for evacuation of power from the generation projects located in Chenab valley. The committee also looked into the feasibility of implementing a new transmission corridor through Moghul Road. It was observed that a wild life sanctuary located near Shopian falls enroute of the Moghul Road. Further, the mountains have loose rocks and construction would be difficult. PDD J&K has assured that they would provide all the necessary assistance and support for obtaining requisite clearances from J&K Government.

Considering the fact that the above transmission scheme is required for improving the reliability of power in Kashmir Valley, the scheme needs to be taken up on urgent basis.

Members may discuss and concur.

3. Delinking of RAPP – Shujalpur 400 kV D/c line with RAPP 7&8 generation RAPP

RAPP – Shujalpur 400 kV D/c line was approved as the associated transmission system of RAPP-7&8 in the 29th SCM held on 29/12/2010. As per the information, the RAPP generation is now expected by Feb 2016 (NPCIL may confirm). However, after the grid collapse of July 2012, it is observed that strengthening of West – North interconnections needs to be taken up on priority. It is therefore, proposed that 400 kV, RAPP – Shujalpur D/c line may be de-linked with the RAPP 7&8 generation and be

implemented at the earliest. This would also require establishment of 400 kV switchyard at RAPP 7&8 matching with the commissioning of above line. The line has already been taken up through competitive bidding.

Members may discuss and concur.

4. Provision of 400 kV line bays at Srinagar S/s (PTCUL) for terminating 400 kV Srinagar-Tehri pooling point D/c line

400kV Srinagar (PTCUL)- Tehri pooling station D/c (Quad) line was agreed during the 29th SCM as regional strengthening scheme. The line is being taken up through Tariff based Competitive bidding route. While processing the scheme for implementation it was gathered that there are space constraints at Srinagar substation of PTCUL. To assess the availability of space, a joint visit of CEA and POWERGRID was undertaken on 11-12th April 2012 to study the feasibility of construction of 400kV line bays at Srinagar substation for termination of the line. During the site visit it was observed that at Srinagar 400/220 kV substation (under construction) of PTCUL sufficient space is not available in the switchyard for accommodating two nos of 400 kV AIS line bays. Two nos. 400 kV line bays can however be accommodated in available space, if the same are constructed as GIS bays. Under such scenario bus extension through GIS duct shall be required. There is an elevation difference of about 10m in AIS v/s proposed GIS level. Implementation of extension of 400kV AIS through GIS bus duct & GIS bays would be for the first time in India and detailed engineering shall be required.

Considering the above issues associated with implementation of bays, it has been decided that the termination bays at Srinagar (PTCUL) and Tehri Pooling station (POWERGRID) may be excluded from bidding and implemented through POWERGRID.

Members may note.

5. Construction of four (4) nos. 400 kV line bays at 400/200 kV Sub-station of PTCUL at Kashipur

The construction of 400 kV Bareilly-Kashipur D/C line & 400 kV Kashipur-Roorkee D/C line was agreed as a part of NRSS-XXI during 27th SCM of Northern Region held on 30.05.2009. For termination of these lines, four (4) nos. 400 kV bays

are to be constructed at 400/220 kV Kashipur sub- station of PTCUL. These transmission lines are under construction whereas the MOU for construction of 400 kV bays at 400/220 kV Kashipur sub-station could not be finalized till date in spite of regular interactions with PTCUL because of the following:

1. PTCUL has been demanding POWERGRID to pay land lease.
2. PTCUL has been demanding 15% of total cost as supervision charges where as POWERGRID proposes payment of 15% of erection cost only as supervision charges to PTCUL.

In view of non-finalisation of the above MOU and likelihood of non-completion of 400 kV bay construction work at Kashipur, POWERGRID has proposed to connect 400 kV D/c Bareilly-Kashipur & 400 kV D/C Kashipur-Roorkee line sections directly, by-passing 400/220 kV Kashipur Sub-station.

Members may discuss.

6. Evacuation of Power from Malana-II

The evacuation of power from Malana-II HEP was planned by LILO of one ckt of AD HEP – Nalagarh 220 kV D/c line of M/s AD Hydro at Chhaur 220/132 kV substation of M/s Everest Power Pvt. Ltd.(EPPL) and power from generation project is to be injected at Chhaur by 132 kV D/c line. AD HEP – Nalagarh 220 kV D/c line is not adequate for reliable evacuation of power from both the projects especially during under contingency condition.

Accordingly, the issue was discussed in the 30th SCM of Northern region, wherein it was agreed 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. It was also decided to provide 2 nos. of 400/220 kV, 315 MVA ICTs (7x105 MVA single phase units) alongwith 4 nos. of 220 kV line bays (2 bays for M/s EPPL and 2 bays for HPPTCL).

Subsequently, HPPTCL informed that due to ROW constraints only one 220 kV line can be constructed from Chhaur to Parbati Pooling station. In addition it was also

informed by HPPTCL that HP intends to inject about 170 MW power from Small HEPs at Chhaur which would be further transferred to Parbati Pooling station. The hydro generation from these SHPs would be coming up in phases. HPPTCL has informed that they intend to construct this line. There are several regulatory issues which need to be addressed:

1. Presently Malana-II generation is directly connected to ISTS grid, for which Long Term Open Access has been processed and granted by CTU.
2. For transfer of power, M/s EPPL is liable to pay PoC charges as per CERC regulations and incase this line is constructed by HPPTCL (STU), M/s EPPL would also have to bear STU charges in addition to PoC charges.
3. Incase the above line is constructed by M/s EPPL, subsequent injection of power by HPPCL may not be feasible as line constructed by the generation developer would be termed as a dedicated line.
4. Chhaur substation is a part of dedicated transmission system constructed by M/s EPPL.
5. As Long Term Open Access to M/s EPPL is granted through ISTS system, the change in its connectivity through STU grid may not be possible.
6. The generation from SHPs would also be evacuated through ISTS grid and shall have to bear PoC charges, although they would be state generators.

Keeping above in view and considering the fact that only one 220 kV D/c line can be constructed, following is proposed:

- Implement 220 kV, Chhaur – Parbati Pooling station D/c line (with twin moose conductor) as part of ISTS scheme which would take care of power evacuation from Malana-II HEP as well as of future SHPs.

- The 2x315 MVA, 400/220 kV ICTs along with 220 kV switchyard including requisite bays at Parbati Pooling station may be implemented as ISTS scheme
- With the coming up of generation from SHPs, M/s EPPL may apply for transmission license for 132/220 kV Chhaur substation.
- In case of space constraints at existing Chhaur substation, HPPTCL may construct a new 220 kV substation (adjacent to existing Chhaur substation) and interconnect it with existing substation at 220 kV level and future SHPs may seek LTOA from CTU beyond Chhaur substation.

Members may discuss and concur.

7. LILO of Gladini – Hiranagar S/c line at Samba 400/220 kV substation

220 kV, Sarna – Jammu (Gladini) S/c line was implemented as a part of Salal transmission system (ISTS). Subsequently, LILO of this line at Hiranagar was carried out by PDD J&K at their cost. Now PDD J&K intends to LILO Gladini – Hiranagar section of this line at 400/220 kV Samba substation of POWERGRID for meeting load requirement of the area. As this line is a part of ISTS system, therefore the proposal is put up to Standing Committee for consideration

Members may concur.

8. Space at 400/220 kV Roorkee (Puhana) substation(POWERGRID) for establishing 220/33 kV substation of PTCUL

During the 30th SCM PTCUL had informed that there are 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 and therefore 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. 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 team of representatives from CEA, DTL, RVPNL, PTCUL and POWERGRID visited Roorkee 400/220 kV substation and following was observed:

- It is not feasible to accommodate the two nos. of 220/33 kV transformers along with 33 kV bays and control facilities in the vacant land available outside switchyard area within the boundary of POWERGRID substation.
- Committee also looked into the feasibility of taking out 220 kV overhead feeders and found that the construction of 220 kV overhead line is not feasible even with gantry structure and pipe bus as adequate clearances are not available.
- The only feasible option is to take 220 kV outlets through 220 kV underground cables. The laying of cable would involve crossing State owned Roorkee – Dehradun Road adjacent to 400/220 kV POWERGRID substation. The width required for laying 2 circuits of 220 kV cable would be approx. 1.6 meter. Committee does not envisage any constraint in implementation of this option.

Members may note.

9. Taking up of Transmission system of Singrauli-III TPS(1x500 MW) as System Strengthening Scheme

During the 29th Standing Committee Meeting of Northern Region following transmission system was planned for evacuation of power from Singrauli –III TPS (1x500 MW)

- Singrauli – Allahabad 400 kV S/c (due to ROW constraints, about 50 km section of Singrauli-Allahabad line to be strung on existing 400 kV D/c tower from Singrauli end.
- Allahabad - Kanpur 400 kV D/c

NRLDC vide their letter no. NRLDC/TS/Rihand-3/314 dated 29/03/2012 had raised concerns for transmission constraints in the existing Rihand / Singrauli / Anpara /Obra complex. In addition, it is to mention that from Meja TPS one 400 kV D/c line was planned only up to Allahabad, considering that Allahabad – Kanpur 400 kV D/c line

would be available in the matching time frame which would facilitate power evacuation from Meja also. Presently Singrauli-III (1x500 MW) has been delayed, however considering the requirement of transmission system from Singrauli/Rihand/Obra/Anpara complex as well as power transfer requirement beyond Allahabad, it is considered prudent to take up the above identified transmission scheme as system strengthening. Accordingly following is proposed:

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- Singrauli – Allahabad 400 kV S/c (due to ROW constraints, about 50 km of Singrauli Allahabad section to be strung on existing 400 kV D/c tower from Singrauli end. (If required strengthening of existing towers would be carried out) Allahabad - Kanpur 400 kV D/c. **Members may concur the proposal.**

10. System Strengthening to overcome constraints in Northern Region

a) High loading in Nathpa Jhakri - Nalagarh lines:

From the operation experience it has been observed that during the paddy season loading on 400 kV Nathpa Jhakri – Nalagarh – Patiala lines remains on the very high side i.e in the range of 800 MW per circuit and outage of one circuit in this corridor results in the overloading on the remaining circuit, thus endangering the grid security whereas loading on Nathpa Jhakri – Panchkula – Abdullapur line remains on the lower side. To alleviate this problem, it is necessary to provide alternate supply to Patiala. For providing alternate supply to Patiala, studies were carried out with Panchkula – Patiala 400 kV D/c line. From the results of the studies, it is observed that this line provides a relief to Nathpa Jhakri – Nalagarh lines as well as help during the contingency of outage of one circuit Nathpa Jhakri – Nalagarh 400 kV line.

Further as indicated above, loading from Nathpa Jhakri / Karcham Wangtoo complex towards Punjab remains on higher side whereas loading towards Abdullapur is lower. During August 2012 oscillations were observed by NRLDC through PMU (installed at Karcham Wangtoo HEP) and generation was limited to their installed capacity barring overload generation. Further, it is to mention that 400 kV Karcham Wangtoo – Abdullapur D/c line is constructed with Quad conductor and in order to increase loadability of this line for better sharing of loading, it is proposed to provide 40% series

compensation on 400 kV Karcham Wangtoo – Abdullapur D/c line. This would improve the loadability of Karcham Wangtoo – Abdullapur 400 kV D/c as well as help in reducing the oscillations.

b) Constraint in 400 kV Unnao-Panki S/C line

As per NLDC, 400 kV Unnao-Panki S/C line forms a vital link in the several grand loops of EHV lines from Kanpur-Panki-Unnao- Lucknow in the Central U.P. and Moradabad- Muradnagar –Muzaffarnagar -Meerut- Mandaula -Bawana- Bamnauli- Ballabgarh. The loading on 400 kV Unnao- Panki line often remains to 600-700 MW. It may be mentioned that 400 kV Luknow substation of POWERGRID is connected strongly with Unnao S/s and 400 kV Kanpur S/s(POWERGRID) with 400 kV Panki S/s of UPPTCL. Both Kanpur and Panki S/s are important for import of power from Eastern Region. A strong inter-connection between Kanpur and Lucknow S/s would improve the reliability of the grid. Hence a 400kV D/c line between Kanpur and Luknow (POWERGRID) is proposed under system strengthening scheme of NR.

c) Additional Corridor to Amritsar

400/220 kV Amritsar substation is having 2x315 MVA transformation capacity and considering the load growth in Amritsar area, augmentation of transformation capacity by 1x500 MVA is under implementation. At present Amritsar S/s is being fed by a 400 kV S/c line from Jullandhar and is also going to be connected with Parbati Pooling station by a 400 kV D/c line. In addition, as part of PSTCL system, 400 kV Makhu – Amritsar D/c line is being constructed for providing connectivity of STU grid with ISTS grid. Although, Amritsar S/s is planned to be connected to Parbati Pooling station and Makhu (PSTCL substation), however the power supply to Amritsar area would be mainly through Jullandhar 400 kV substation as during winters the generation of hydro projects would reduce to very low levels as well as in case of low generation at Talwandi Sabo TPS(State IPP) Makhu S/s may also draw power from Amritsar. It is therefore necessary that power supply arrangement to Amritsar S/s is augmented.

POWERGRID is establishing HVDC station at Kurukshetra for supply of power from pit head generating stations of Chattisgarh. For augmenting power supply to

Amritsar S/s, following transmission works are proposed to be implemented under system strengthening scheme of NR:

- 400 kV Kurukshetra – Malerkotla D/c line
- 400 kV Malerkotla – Amritsar D/c line

e) Augmentation of Transformation capacity at 400/220 kV Ballabgarh substation

Review of loading pattern of 400/220 kV ICTs at Ballabgarh sub-station of POWERGRID during last one year has revealed that loading on all the ICTs operating at this Substation had exceeded 250 MW on several occasions and maximum loading on each ICT at the sub-station had gone up to 292 MW during January 2012.

In view of such increased loading pattern and to meet any eventuality in the event of failure of anyone of the ICTs at the above sub-station, POWERGRID proposes for augmentation of transformation capacity by replacing 3x315 MVA ICTs by 3x500 MVA ICTs to cater to N-1 contingency of ICT and to avoid cascade tripping of remaining ICTs in service. The dismantled 315 MVA ICTs shall be maintained as Regional spare after refurbishment.

f) Augmentation of Transformation capacity at 400/220 kV Mandola substation

During 30th meeting of the Standing Committee on Power System Planning of Northern Region held on 19th December 2011, augmentation of transformation capacity at Mandola substation by 1x500MVA ICT was approved. It is mentioned that due to the space constraint at the above substation, this augmentation is not feasible. However looking into the load growth, it is proposed to replace existing 3 nos. of 315 MVA ICTs with 3x500 MVA ICTs. The dismantled 315 MVA ICTs shall be maintained as Regional spare after refurbishment.

f) 220 kV BTPS – Ballabgarh D/C

NLDC has informed that 220 kV Ballabgarh-Badarpur D/c line is a vital link between BTPS and the ISTS. During summer/ monsoon months the line is overloaded due to heavy import by Delhi to feed South Delhi area. During winter off-peak period the line is overloaded due to export of surplus generation in Delhi. Tripping of this line is

likely to cause a cascade failure. To take care of above, additional feed to South Delhi is required to be planned directly from 765/400 kV Jhatikara S/s or some other suitable source so as to reduce dependency of south Delhi load on 220 kV Ballabgarh – Badarpur line. For providing additional power supply to south Delhi area, it is proposed that a Voltage Source convertor (VSC) Station of 500 MW may be planned which can be connected through HVDC cable and can be used for bi-directional flow of power. This would help in regulating the power flow on inter-state lines. Considering the land constraints, this substation may be implemented as Multi level substation including basement level. It is proposed that POWERGRID in association with DTL may locate suitable space in Mehrauli or Vasant kunj area to accommodate the above VSC station and prepare a detailed proposal for consideration of constituents in the next meeting.

Keeping above in view, following transmission works are proposed as System Strengthening scheme :

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- 400 kV Panchkula – Patiala D/c line
- 40% Series Compensation on 400 kV Karcham Wangtoo – Kala Amb D/c line
(establishment of 400/220 kV Kala Amb substation is proposed in agenda item no.17)
- 400 kV Kurukshetra – Malerkotla D/c line
- 400 kV Malerkotla – Amritsar D/c line
- 400 kV Lucknow (PG) – Kanpur (PG) D/c line
- Augmentation of transformation capacity at 400/220 kV Ballabgarh substation by replacing existing 3x315 MVA ICTs with 3x500 MVA ICTs. The 3x315 MVA ICTs shall be kept as regional spares after refurbishment.
- Augmentation of Transformation capacity at Mandola by replacing 3x315 MVA ICTs with 3x500 MVA ICTs. The dismantled 315 MVA ICTs shall be maintained as Regional spare after refurbishment.

Incase of space constraints for bay extension in any of the existing substation, the substation extension is proposed to be carried out with GIS equipment.

Members may concur the above proposal.

11. Absorption/ transfer of power from Jhajjar Complex

Haryana has tied up about 3300MW power to be injected in Jhajjar/ Mohindergarh/ Daulatabad area.

S.No	Generation available in Jhajjar complex	Haryana Allocation
1	Adani Power to be injected at Dhanonda Substation by Feb. 2013	1424 MW
2	50% of IGSTPS (Jhajjar-I) (3X 500MW)	693 MW
3	MGSTPS (CLP Jhajjar) (2X660MW)	1188MW
		3305MW

Presently, there are constraints in absorption of available generation/injection in Jhajjar area (which is likely to continue in next 2-3 years) due to which power is being injected into ISTS network. To mitigate the problem, joint studies were carried out by CEA, POWERGRID and HVPNL and the following system strengthening is proposed:

- Establishment of a new 400/220kV, 2X315 MVA substation near Farukhnagar area of Gurgaon by LILO of both circuits of 400kV Dhanonda- Daulatabad D/c line by HVPNL
- Augmentation with 400/220kV, 1X315MVA, ICT (3rd) at each Kaboolpur(Rohtak) & Daulatabad S/s by HVPNL- To meet outage of ICT
- Augmentation with 400/220kV, 500MVA ICT(4th) at Sector-72 Gurgaon (PG) Substation by POWERGRID- To meet outage of ICT
- 400 kV Dhanonda- Bhiwani(PG) D/c line (to be implemented by HVPNL on priority) in place of already approved 400 kV Kaboolpur- Bhiwani(PG) D/c line & LILO of 400kV Bawana-Bhiwani(PG) line at Kaboolpur(HVPM) S/s by HVPNL

Members may note.

12. 220kV Transmission line from NTPC Faridabad- Provision of 2 no. of 220kV bays at Faridabad Gas Power Project (Agenda by HVPNL)

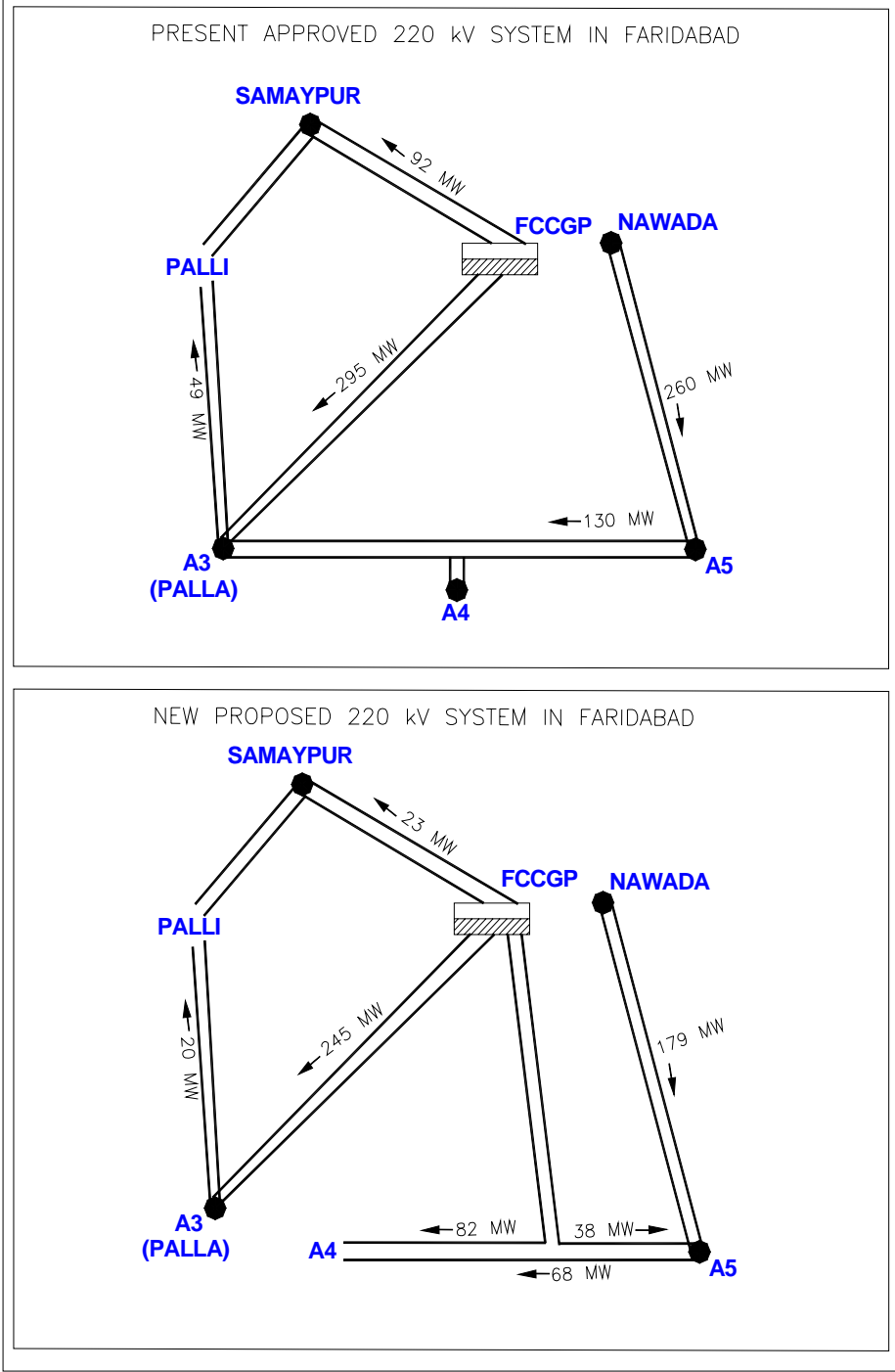
Presently evacuation from Faridabad CCGT (430 MW) is at 220 kV. There are 2 nos. of 220 kV D/C lines, one D/C line towards 220 kV Samaypur S/S of BBMB and other line towards 220 kV Palla S/S of HVPNL. During the 27th SCM of NR, NTPC had

proposed that one of the 220 kV Samaypur- Ballabgarh line be bypassed at Samaypur and connected directly to one of the 220 kV Faridabad - Samaypur line, thus creating an alternative route, as Faridabad GPP has witnessed several station blackouts on account of major failure at Samaypur S/s. HVPNL informed during the meeting that they would be establishing 400 /220 kV Nawada substation which would be connected to 220 kV Palla substation via intermediate 220 kV substations. Hence, this would provide desired outlets for reliable evacuation of power from Faridabad GPP even under line contingency condition. Hence the proposal of NTPC was dropped. The planned system of HVPNL from 400/220 kV Nawada S/s includes:

- 220 kV Nawada-A5 D/c line
- 220 kV A5-A3(Palla) D/c line
- LILO of one circuit of 220kV A5-A3 D/c at A4

HVPNL has now informed that 220 kV Nawada-A5 D/c line and A5-A4 sections of 220kV line are in progress. However there are severe right-of-way constraints between A4 and A3 (Palla) section due to reserve forest area. Accordingly, HVPNL has now proposed the LILO of one circuit of 220 kV A5-A4 D/c line at Faridabad generating station. HVPNL has indicated that proposed arrangement would provide additional connectivity to Faridabad generation. The single line diagram and study results of HVPNL's present proposal and final arrangement are indicated on next page:

SINGLE LINE DIAGRAM AND STUDY RESULTS OF HVPNL'S PRESENT PROPOSAL AND FINAL ARRANGMENET ARE AS BELOW:



Members may deliberate on the above proposal of HVPNL.

13. Transmission System for transfer of power from IPPs of SR to WR/ NR

Following transmission corridors were planned for transfer of power from SR IPPs to Western and Northern Region.

- i) Solapur-Pune 765 kV S/c (2nd) line
- ii) Jabalpur Pooling station - Orai 765 KV S/c line
- iii) Orai – Bulandshahar 765kV S/c line
- iv) Buandshahar – Sonipat 765kV S/c line
- v) Orai – Orai(UPPCL) 400kV D/c (Quad) line
- vi) Sonipat - Kurushetra 400 KV D/c (Quad) line
- vii) Sonipat (New) - Sonipat 400 KV D/c (Quad) line
- viii) Bulandshahar-Hapur (UPPCL) 400 KV D/c (Quad) line
- ix) 2x1000MVA, 765/400 KV substation at Orai by LILO of one circuit of Satna-Gwalior 765 KV D/c line
- x) 2x1500MVA, 765/400KV S/s at Bulandshahar by LILO of Agra-Meerut 765 kV S/c line
- xi) 2x1500MVA, 765/400KV S/s at Sonipat by LILO of Bhiwani-Meerut 765 kV S/c line

The above transmission system was discussed and finalized in the following meetings:

NR

- o 28th SCM held on 23/02/2010.
- o 16th NRPC Meeting held on 16/04/2010 and also mentioned in the 20th NRPC meeting held on 01/03/2011.

SR

- o 29th SCM held on 27/8/2009
- o 11th SRPC held on 17/9/2009

Subsequently, with the coming up of more generation in western region with target beneficiaries in Northern region the above transmission system was modified. **Modification in the earlier approved scope of “Common Transmission System for Transfer of power from IPP in SR to WR & NR” scheme is as under:**

- i) Solapur-Pune 765 kV S/c (2nd)- **Deleted**
- ii) Jabalpur Pooling station - Orai 765 KV D/c – **Changed from S/c to D/c**
- iii) Orai – Bulandshahar 765kV D/c - **Changed from S/c to D/c**

- iv) Buandshahar – Sonipat 765kV D/c - **Changed from S/c to D/c**
- v) Sonipat (New) – Kaithal 400kV D/c(Quad) –**Addition**

For implementation of above transmission system regulatory approval from CERC was taken. However, considering the slow progress of generation projects in southern region, the above transmission scheme was not taken up for implementation. From the present generation scenario it is observed that more and more generation is coming up in western region and imports from Western region to Northern region are increasing. During the recent two grid disturbances it was observed that there is a need to provide strengthening between Northern and Western regions. Further it is observed that:

- UP is establishing 765 kV substation at Greater Noida under PPP mode and already awarded the works. It has been gathered that the site identified for 765 kV Greater Noida and Bulandshahar S/s are in close proximity. Establishment of two 765 kV substations in close proximity is not desirable.
- Kanpur – Jhatikara 765 kV S/c line is under construction, which is about 450 km long and for smooth operation it is desirable to LILO this line at some substation to reduce its length.
- Earlier a 765/400 kV substation at Sonipat was planned, however with the coming up of CLP Jhajjar & Aravali Jhajjar generations as well as considering the injection of power from Adani at Mohindergarh, there is a need to review the requirement of establishment of 765/400 kV substation at Sonipat.

Considering the above, it is proposed that the establishment of 765/400 kV substation at Bulandshahar may be shifted to Aligarh and LILO of Kanpur – Jhatikara 765 kV S/c line is also carried out at Aligarh. Further it is also proposed that instead of taking 765 kV D/c line from Aligarh to Sonipat, 765 kV D/c line may be taken towards Hapur substation. Accordingly, it is proposed to take up the following transmission works as System Strengthening Scheme of NR:

(NRSS-XXXII)

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

Members may discuss & concur the above proposal.

14. 125 MVAR Bus Reactor at Koteshwar

During the 30th SCM of NR, it was deliberated that transmission system in Tehri area is frequently experiencing over voltages under light load conditions and it was agreed to provide 125 MVAR bus reactor at Koteshwar switchyard. It is informed by POWERGRID that Koteshwar is a commissioned project and bus reactor at Koteshwar generating station was proposed due to space constraints at Tehri Pooling station. THDC, during the 25th NRPC meeting proposed that the above mentioned 125 MVAR bus reactor at Koteshwar may be provided by POWERGRID. After detailed deliberations, the same was agreed in the 25th NRPC meeting.

Members may note.

15. Establishment of 400/220 kV substation at Patran

A 400/220 kV substation was approved in the 30th Standing Committee Meeting of Power System Planning of Northern region. This substation is being developed through Tariff Based Competitive Bidding. Considering the fact that the location of this substation is in a very fertile area of the Punjab where the acquisition of land is going to be a challenging task, it is proposed to develop this substation as Gas Insulated substation.

Members may note.

16. Evacuation of Power from Sainj HEP (100 MW)

The evacuation of power from Sainj HEP was discussed during the 30th SCM of NR and it was stated that injection of Sainj Generation project of HPPCL shall be through LILO of Parbati-II – Parbati-III 400 kV line however in case of outage of one circuit, 10% overload generation, 0.9 pu voltage and 0.9 power factor there may be certain constraints and generation would have to be backed down.

Subsequently NHPC vide their letter dated 24/02/2012 informed that enhancement of current carrying capacity of 400 kV XLPE cable is not possible and accordingly evacuation of power of Sainj through XLPE cable provide at Parbati-III HEP is not feasible. In view of this, Member (PS), CEA reviewed the situation with HPPCL and informed to NHPC vide letter dated 30/04/2012 that cable limitation may come in case of outage of one circuit, 10% over generation, 0.9 pu voltage and 0.9 power factor and possibility of occurrence of above contingency is very remote. In view of this HPPCL agreed to back down the generation at Sainj, if required with a view to prevent the overloading of the XLPE cable of Parbati-III switchyard. Considering the above, HPPCL was advised to implement LILO of 400 kV Parbati-II – Parbati-III line for evacuation of power from Sainj HEP.

NHPC vide their letter dated 16/07/2012 has informed that backing down of generation at Sainj HEP does not safeguard the overheating of XLPE cable provided at parbati-III switchyard and as such the arrangement is not acceptable to NHPC.

Members may deliberate.

17. Establishment of 400/220 kV substation at Kala Amb

HPPTCL vide their letter dated 03/09/2012 has informed that the present load in Kala Amb / Poanta / Giri area is about 350 MVA, which is likely to increase to about 500 MVA by 2015-16 whereas the available generation and transmission network in the area is not adequate to meet the present load. At present there is only one 400/220 kV

substation at Nalagarh which is feeding to Chandigarh, Punjab & Himachal and one more 400/220 kV substation at Hamirpur is expected to be commissioned soon.

In order to meet the present and future load requirement of the area, HPPTCL has proposed for establishment of a 400/220/132 kV substation at Kala Amb by LILO of one circuit of either N'Jhakri – Abdullapur or Karcham Wangtoo – Abdullapur 400 kV line. The matter has been analysed and it is observed that N'Jhakri – Abdullapur 400 kV D/c line has already been looped in looped out at Panchkula and LILO of the same line has been approved at Sainj (near Simla). Considering the capacity of the line, it would not be desirable to LILO the N'Jhakri – Abdullapur line at Kala Amb. Further, it is to mention that Karcham Wangtoo – Abdullapur 400 kV D/c line is also passing in close proximity to Kala Amb area and to meet the loads in the area, the LILO of the Karcham Wangtoo – Abdullapur 400 kV D/c can be carried out at Kala Amb. HPPTCL has proposed to LILO only one circuit 400 kV line however LILO of one circuit would result into unbalanced loading, it is therefore proposed that LILO of both the circuits may be carried out at Kala Amb. Considering the issues of hilly terrain & scarcity of land in Himachal Pradesh, it is proposed to establish this substation as GIS station. HPPTCL has proposed the substation as 400/220/132 kV substation, however it is proposed that the substation is established as 400/220 kV and further strengthening may be carried out by HPPTCL. HPPTCL should also confirm the number of 220 kV line bays required at this substation. In case the constituents agree, the above proposed works can be taken up as system strengthening scheme of NR **(NRSS-XXXI)**.

Members may discuss and concur.

18. Constraints in NR GRID as per NLDC

NLDC vide their letter dated 18/10/2012 have informed constraints in Grid Operation in Northern Region. Remedial measures for many of these constraints in ISTS network have already been planned / are being planned. The states may also take up adequate action to address the constraints being observed in state transmission system. The constraints to be addressed are mentioned below:

Transmission Line Constraints

S. No	Corridor	Season/ Antecedent Conditions	Description of the constraints	Action taken / Required from Planning
1	Tehri-Koteshwar evacuation system	Summer-Monsoon season, High hydro conditions	Evacuation of Tehri (4x250 MW) and Koteshwar (4x100 MW) HEP is through 765 kV series compensated double circuit line from Tehri pooling point to Meerut. This line is presently charged at 400 kV. On 10 -September 2012 when the generation in the complex was 1350 MW (1050 at Tehri and 300 MW at Koteshwar), one circuit of Tehri pooling point – Meerut-ckt-1 tripped. Oscillations were observed. All the running four units of Tehri and three units of Koteshwar tripped. The FSC of the line was not in service. However the availability of FSC is not visible to the operator in the NRLDC control room. Similar oscillations were observed on 3 rd February 2011 whenever generation at Tehri exceeded 700 MW and only one circuit of 400 kV Tehri-Meerut was available.	For evacuation of power from Tehri-I, Tuning of PSS was recommended in year 2003 by CEA and CTU. Considering the quantum of power, Series comp was proposed with Koteshwar.
2	220 kV Lucknow-Chinhat S/C		Overloading of 220 kV Lucknow-Chinhat line is being observed subsequent to the commissioning of 2nd 400/220 kV, 500 MVA ICT at Lucknow_PG.	UPPTCL may respond
3	220 kV Mainpuri-Harduanj	Monsoon/ Summer	Inadequate margin for handling N-1 contingency. At many occasion it has led to islanding of NAPS.	UPPTCL may respond
4	220 kV Mainpuri-Ferozabad	Monsoon/ Summer	220kV Ferozbad – Agra line kept open to control overloading	UPPTCL may respond
5	220 kV Samaypur-Ballabgarh (3 circuits) 220 kV Ballabghah – Charkhi Dadri 220 kV Samaypur –Charkhi Dadri	Monsoon/ Summer	These circuits form a parallel path from Ballabgarh to Hissar. Due to the outage of 400/220kV, 500MVA ICT at Bhiwani (BBMB) and inadequate 220kV outlets from Manesar, Gurgaon, Daulatabad, Kabulpur, Deepalpur the existing 220kV lines in the corridor are heavily loaded. Outage of these circuits is likely to cause interruption in power supply in southern Haryana	STUs may implement the adequate 220 kV outlets from these substations. POWEGRID has also commissioned 765/400/220kV substation at Bhiwani. STU are also requested to inform name of 220 kV outlets from these substations. Further

				BBMB may commission the transformer at the earliest
6	400 kV Singrauli-Anpara S/C	When generation at Anpara/Obra is low and Rihand/Singrauli Generation is at peak	400 kV Singrauli and Anpara is an important tie line between two generating stations. This line is normally loaded in the range of 500-600 MW	There are severe ROW constraints in this area. There is a space constraint at Singrauli for extension of switchyard. In addition fault level in this area is very high.

ICT Constraints

S. No	ICT (400/220 kV ICT's)	Season/ Antecedent Conditions	Description of the constraints	Action taken / Required from Planning
1	500 MVA, 400/220 kV Bhiwani	Long outage of this ICT	220kV Khetri-Chirawa line is opened to control the loading of Hisar-Hisar (IA) D/C. Consequently the reliability of power supply in Hissar district & the reliability of interconnection between Haryana & Rajasthan is reduced. The reliability of evacuation from Suratgarh in North Rajasthan is also affected.	It is understood that the conductor on Hisar-Hisar (IA) D/C was replaced with high capacity conductor. HVPN/BBMB may supplement. Transformer should be provided by BBMB at the earliest. POWERGRID is providing 400/220 kV 2x315 MVA ICTs at Bhiwani 765/400/220 kV substation. HVPN may reconfigure the 220 kV connectivity & loads to draw power from this new substation.

Members may discuss.

19. HTLS Kurukshetra :

Establishment of HVDC terminal station at Kurukshetra was planned as part of High Capacity Transmission Corridor for IPPs in Chattisgarh. While acquiring the land for Kurukshetra it was suggested that the transmission lines near the Kurukshetra substation may be taken up as multi-circuit lines considering the present and future provision and it was also suggested that LILO of Sonipat-Abdullapur 400 kV D/c line may also be carried out on multi-circuit towers. Accordingly, following lines have been taken up on multi-circuit towers:

- 400 kV Kurukshetra – Jullandhar D/c (Quad) – about 5 km portion on multi-circuit
- LILO of 400 kV Abdullapur – Sonipat D/c (Triple) at Kurukshetra – about 16 km on multi-circuit

While finalizing the conductor configuration for the above lines, techno-economic comparison of conventional ACSR conductor v/s HTLS conductor was carried out by POWERGRID and it was observed that use of HTLS conductor with multi-circuit towers would be techno-economically a better option compared to 400 kV D/c (Triple Snowbird / Quad Moose) on multi-circuit towers.

Keeping above in view, POWERGRID is going ahead with HTLS conductor instead of conventional ACSR conductor.

Members may note.

20. Modifications in the Transmission System for Phase-I IPPs in Jharkhand & West Bengal

The transmission system for evacuation of power from phase-I IPPs in Jharkhand & West Bengal was earlier approved and grouped into Part-A, Part-B & Private Sector. The same is enclosed at **Annexure-1**. Subsequently, following minor modification have been made in the scheme:

(i) Re-Grouping of Scope of Works

According to the progress of the phase-I generation projects, scope of work has been re-grouped in three groups viz. Part-A1, Part-A2 and Part-B.

(ii) Change from AIS sub-station to GIS sub-station

In view of the land acquisition problems, 400 kV Jharkhand pooling station, 765/400kV Varanasi sub-station and 765/400kV Kanpur sub-station are being constructed as GIS sub-stations.

(iii) Balia – Varanasi 765kV S/c line in place of ‘LILO of Gaya – Balia 765 kV S/c line at Varanasi’

As part of the above transmission scheme, LILO of Gaya – Balia 765 kV S/c line at Varanasi was planned for onward transfer of power from Gaya as well as for providing 765 kV interconnection between Balia and Varanasi. After site selection of Varanasi substation, it has been observed that the estimated LILO distance of Gaya – Balia 765 kV S/c line at Varanasi comes to about 110 km and for implementing this LILO, 110 km of 765 kV D/c line would have to be constructed. This lengthy LILO would result into unbalanced loading on Gaya – Varanasi 765 kV lines. Further, it is also to mention that the LILO tapping point of Gaya – Balia line is close to Balia substation.

Keeping above in view, it is proposed to implement Varanasi – Balia 765 kV S/c direct line instead of above mentioned LILO. This would provide necessary connectivity between two major pooling stations i.e. Balia and Varanasi. Further, with the direct 765 kV interconnection instead of construction of 110 km of 765kV D/c line, the overall cost of the project would reduce and modified arrangement would lead to overall optimization. Considering these modifications the final scheme is enclosed at **Annexure-2.**

Members may note.

21. Spare ICT 500 MVA

One no. of spare ICT of 400/220 kV, 500 MVA was approved in 26th NRPC meeting. This ICT is proposed to be kept at Neemrana. It is proposed to include the above spare ICT either in a planned strengthening scheme or shall be taken up as a part of new strengthening scheme.

Members may note.

22. Evacuation of power from Chenab Basin Projects in J&K – Perspective Scheme

During the 30th Standing Committee Meeting of Power System Planning for Northern region the issue of evacuation of power from various hydro projects located in Chenab Basin of J&K, was discussed and it was decided that a task force may be constituted with participation from J&KSPDC, PDD J&K, CEA & POWERGRID to undertake a site visit and plan the comprehensive transmission system for implementation in phased manner matching with the generation commissioning schedule for the evacuation of power.

Based on the discussions with NHPC, J&K SPDC and PDD, J&K the status of the identified generation projects is given as under:

a) Kirthai-I HEP(240 MW) : This would be a State Sector Project. It was informed that the power potential studies are under revision and the project capacity would be 350 MW instead of 240 MW. Investigations are under progress and DPR would be ready by Mid 2013 and TEC is expected by end 2013. Implementation period for the project is 5 years from investment approval date. EIA studies were completed for 240 MW which needs to be revised due to revised power potential. Regarding land availability, it was informed that part of land has already been acquired and balance acquisition in progress. Project is expected to be commissioned during 13th plan.

b) Kirthai-II HEP(990 MW): DPR submitted to CEA for concurrence. The same was discussed and necessary changes to be made in DPR were informed to JKPDC. The revised DPR is under preparation. The Project would be executed on EPC basis and tendering activities have been taken up. Pre-constructions activities are in progress. Project is expected to be commissioned during 13th plan.

c) Generation Projects of Chenab Valley Power Projects Limited (CVPPL):

It was informed that Kiru HEP(600 MW), Kwar HEP(520 MW) and Pakaldul HEP(1000 MW) are being executed by a JV company of J&KSPDC, NHPC & PTC named as CVPPL . The JV Company has been formed and Promoter agreement has been signed.

- Pakal Dul HEP (1000 MW): TEC of the project has been obtained earlier by NHPC. The same would be transferred to CVPPL. Forest clearance obtained

from Forest Deptt. J&K. MoEF accorded environment clearance. Construction activities started. Tenders floated for civil works. Land acquisition is in progress and tenders have already been floated. Commissioning schedule of the project is 72 months from investment approval. Project is expected to be commissioned during 13th plan.

- Kiru HEP (660 MW): DPR to be resubmitted to CEA after revision. MoEF accorded clearance for pre-construction activities and TOR for EIA studies finalized. Forest proposal likely to be submitted soon. Commissioning schedule of the project is 54 months from the date of Government approval. Project is expected to be commissioned during 13th plan.
- Kwar HEP (560 MW): Power potential revised to 560 MW. DPR submitted to CEA for concurrence. MoEF accorded clearance for pre-construction activities and TOR for EIA studies finalized. The commissioning schedule of the project is 54 months from the date of Government approval. Project is expected to be commissioned during 13th plan.

d) Bursar HEP (1020 MW): It is a central sector project which would be executed by NHPC. 500 ha forest land in Kishtwar high altitude national Park involved. NOC for National park is yet to be given. DPR of the project is under preparation by NHPC. It was gathered that the location and capacity of the project may change. The project is in survey & investigation stage.

e) Sawalkot HEP (1856MW): As per the information the project size is being revised to 1856 MW. Hydrology of the project is yet to be approved. At present there is no access road upto the project. For reaching project site, tunnel is to be constructed. Generation project is to be developed by JKSPDC. Access Road is under construction. Revised DPR is under preparation and likely to be submitted to CEA by Mid 2013.

f) Ratle HEP (850 MW) : This is an IPP being developed by M/s GVK. The concurrence of CEA was accorded on 22.10.2012. The evacuation system for the generated power has been approved by SCM of NR. The Developer has applied for Connectivity and LTA from CTU.

NOTE: Except for Ratle HEP, None of the Developers of the above projects has applied for connectivity/LTA. Until the connectivity / LTA application is received by CTU, the transmission system for evacuation of power from these projects cannot be finalized. However a perspective plan has been evolved which may require revision / updation depending on the progress / time frame of the generation projects.

Major Observations of Site visit

- Serious Right-of-Way constraints due to difficult mountainous terrain were observed enroute to Kirthai-I to Kwar HEPs. It was concluded that maximum two transmission corridors can be accommodated between these locations.
- The generation projects in the Chenab basin would be coming up in a widespread time frame from early 13th Plan period to end of 13th Plan period. Accordingly, it was considered prudent that two 400 kV high capacity corridors of about 3000 MW and 2300 MW capacity having switchgear rating of 4000 Amps respectively may be planned in the Chenab basin to cater to various identified generation projects. It is mentioned that about 1500 MW power of generation projects located in Himachal Pradesh and J&K border area will also be evacuated through the high capacity transmission corridor planned for Kirthai-I and Kirthai-II HEPs.
- Task force visited the site for establishing 765/400 kV Pooling station at Kishtwar. Prima facie, the site appeared to be in order.
- It was observed that Pakaldul HEP is likely to be commissioned first considering its physical progress.
- Based on the above, the transmission system alongwith the phasing of the works was conceptualized.

Perspective Transmission System alongwith phased development for Hydro projects located in Chenab Basin J&K

High capacity common corridor-I:

This corridor would be merged with the corridor planned with Himachal Pradesh hydro projects of 1500 MW capacity located in Chandrabhaga basin. The total capacity of this corridor would be about 3000 MW.

- **Kirthai-I HEP(350 MW):**

- LILO of one circuit of 400 kV D/c (Quad HTLS Conductor –Equivalent to about 3000MW) line from Reoli Dugli HEP (HP) – Kishtwar Pooling station Line
- Switchyard Capacity etc. must be able to handle about 3000MW power generated by the generation projects located in upstream of the Kirthai-II generation project. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 80 MVAR Bus Reactor

- **Kirthai-II HEP(990 MW) :**

- LILO of one circuit of 400 kV D/c (Quad HTLS Conductor –Equivalent to about 3000MW) line from Reoli Dugli HEP (HP) – Kishtwar Pooling station Line
- Switchyard Capacity etc. must be able to handle about 3000MW power generated by the generation projects located in upstream of the Kirthai-II generation project. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 125 MVAR Bus Reactor

High capacity common corridor-II:

- **Kiru HEP(660 MW) :**

- 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station (**High capacity common corridor-II**)
- Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru HEP. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
- 400 kV, 125 MVAR Bus Reactor

- **Kwar HEP(560 MW) :**

- LILO of one circuit of 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station

- Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru HEP. It is proposed that the GIS switchyard equipments and XLPE cables provided may be designed for carrying 4000 Amps current.
 - 400 kV, 125 MVAR Bus Reactor
- **Pakaldul HEP(1000 MW) :**
 - LILO of one circuit of 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Kiru HEP – Kishtwar Pooling station
 - Establishment of 400 kV switching station at Kishtwar (establishment of Kishtwar substation has also been proposed with Himachal Projects).
 - Establishment of 400/220 kV, 2x315 MVA substation near Gurdaspur/Sirhand by LILO of both circuits of 765 kV (operated at 400 kV) Kishenpur – Moga S/c lines.
 - 765 kV Kishtwar- Gurdaspur/Sirhand D/c line (to be operated at 400 kV initially)
 - Switchyard Capacity etc. must be able to handle about 2300MW power generated by the generation projects located in downstream of the Kiru HEP. It is proposed that the GIS switchyard equipment and XLPE cables provided may be designed for carrying 4000 Amps current.
 - 400 kV, 125 MVAR Bus Reactor
- **Bursar HEP (1020 MW) :**
 - 400 kV D/c (Twin HTLS Conductor –Equivalent to about 1200MW) line from Bursar HEP – Kishtwar Pooling station.
 - 400 kV, 125 MVAR Bus Reactor
- **Sawalkote HEP(1856 MW):**
 - LILO of both circuits of 400 kV Kishenpur-Wagoora D/c line at Sawalkote
 - LILO of both circuits of 400 kV Kishenpur-New Wanpoh D/c line at Sawalkote
 - Charging of Kishenpur – Gurdaspur/ Sirhind 2 xS/c lines at 765 kV level
 - 400 kV, 125 MVAR Bus Reactor

Tentative Phasing of System

Pakaldul project will be the first to come in Chenab basin, initially a 400 kV D/c (Triple HTLS Conductor –Equivalent to about 2300MW) line from Pakaldul HEP – Kishtwar Pooling station shall be constructed and extended to upstream side projects as per their commissioning schedule. The upgradation of Kishtwar pooling station to 765/400 kV, 2 x1500 MVA and operation of Kishtwar-Gurdaspur/Sirhand D/c line at 765 kV will be taken up matching with the next project commissioning in Chenab basin. In this time frame charging of Gurdaspur/Sirhind – Moga 765 kV lines shall also be taken up. Further with coming up of more generation an additional 765 kV D/c line shall also be planned from Gurdaspur / Sirhind to some suitable location.

With the addition of more generation the augmentation of Kishtwar pooling station by additional 2x1500 MVA, 765/400 kV ICTs and implementation of 2nd 765 kV D/c line from Kishtwar to Punjab area (exact location to be decided later on) will be taken up as per the requirement matching with the commissioning schedule of upstream projects in Chenab basin.

It may be noted that the above transmission plan is a conceptual plan and its updation / revision would be required based on the network topology and firm time schedule of the generation projects. It is also necessary that the project developers apply to CTU for the connectivity & LTA so that the above plan can be firmed up.

Members may note.

23. Rihand-III Transmission system:

For immediate evacuation of power from Rihand-III, 765 kV Rihand III - Vindhyachal Pooling Point D/c line (to be initially operated at 400 kV) has been planned. This line traverses through protected forest in Uttar Pradesh and both reserved and protected forest in MP. The line is expected by September'2013. The first unit of Rihand-III generation project is expected to be commissioned in December'12. The second unit is expected to be commissioned by March'13. The power from Unit-1 may be evacuated by utilising existing margins in the transmission system under normal operating conditions. For unit-2 evacuation, it is proposed that power may be transferred to existing Vindhyachal 400kV Bus through HVDC Back to Back.

Presently first unit of Vindhyachal-IV has been commissioned. The Vindhyachal-IV generation is connected with existing generation Vindhyachal generation bus and is being evacuated over existing 400kV lines. The second unit of Vindhyachal-IV is expected to be commissioned by Mar'13. The status of various elements proposed in the area is as below:

S no.	Elements	Commn. Schedule
	Transmission Line	
1	Rihand III -Vindhyachal Pooling Point 765 kV D/c (to be initially operated at 400 kV)	September'13
2	Vindhyachal-IV – Vindhyachal pooling stn 400kV D/c	Forest clearance awaited. Expected by December'13
3	Vindhyachal pooling stn- Sasan 400kV D/c	Ready for charging
4	Sasan - Satna 765kV 2x S/c	1 ckt- Nov'12 2nd ckt- Feb/Mar'13(Forest clearance awaited)
5	Satna-Bina 765kV 2xS/c	Commissioned
	Substation	
1	Vindhyachl pooling station	Land Acquisition in progress. Land by Dec'12
2	Sasan	1x1000MVA trf installed.
3	Satna & Bina	765/400 kV commissioned

With the commissioning of 2nd unit of Rihand-IV, power from the generation would be evacuated to existing Vindhyachal generation bus though HVDC back to back. No constraint is expected in evacuation of power under normal conditions.

Members may note.

24. Proposal for Static VAR Compensators (SVC) in Northern Region.

In the recent past, major grid disturbances had been experienced in NEW grid on 30-07-2012 and 31-07-2012. The Enquiry Committee was constituted by Ministry of Power to analyze the causes of these disturbances and to suggest measures to avoid recurrence of such disturbance in future. Based on the analysis of these grid disturbances the committee recommended the following :

“ Reactive Power Planning : *In order to avoid frequent outages / opening of lines under over voltages and also providing voltage support under steady state and dynamic conditions, installation of adequate static and dynamic reactive power compensators should be planned*’. The committee has recommended 6 months time frame for this reactive power planning in all the regions.

In view of the above recommendation, the system studies are being carried out to ascertain the quantum of dynamic reactive power compensation required in Northern Region. **The studies shall be presented in the meeting and the quantum of dynamic compensation to be provided will be finalized after discussions in the meeting.** However, based on the preliminary studies completed so far, the following locations have been identified for providing dynamic reactive compensation:

- Nallagarh 400/220kV substation: Nallagarh is connected to Nathpa Jhakri (1500MW) & Karcham Wangtoo (1000 MW) generation complexes through 400kV lines. Such large generation in a small pocket has created many difficulties during operation. As per NRLDC report on Operational feedback for October 2012 there have been sudden closure of all generating units at Karcham Wangtoo and Jhakri HEP on account of silt flushing and there was a generation loss of 2800MW. This has been experienced on more than one occasion. The sudden dropping of units results light loading of 400kV lines and causes grid operational constraints. In future, generation from Koldam HEP (800MW) & Parbati HEPs(1320 MW) would also be pooled at Nallagarh. This may cause operational constraint due to high voltage in area due to offloading of lines and occurrence of oscillations in the grid which may affect other generations connected to it. In view of the above, **SVC having control of voltage of (+5%) to (-5%) is proposed at Nallagarh.** This will help in both damping and controlling voltage in the area.
- Interconnection points of inter-regional lines: The load demand in Northern region is growing at a fast pace and power has to be imported from other regions to meet the peak demand. The large interconnected grid poses the challenge of operation of lines under various seasonal and operational conditions. This is particularly true for Northern region because as an importer of energy from other regions based on market forces,

the flow of energy from other regions may change resulting in high or light loading of lines. The region from which power is to be imported and the quantum will vary widely. Operational experience has indicated that multiple contingency is a reality. Under such conditions, system stabilizing controls should be available for the grid operator. Accordingly, static compensators are proposed at Luknow S/s and Fatehpur S/s. Luknow S/s is connected to Balia and Gorakhpur substations while Fatehpur S/s is connected to Gaya S/s and Sasaram S/s by 765kV lines through which power from ER is imported. The dynamic compensators at these locations shall help in damping any inter-regional oscillations and during black start. **It is proposed to provide SVC having a control of voltage of (+3%) to (-3%) at Lucknow and Fatehpur substations.**

- Hissar 400/220kV substation: Hissar is an important grid substation connecting the Southern part of NR with Northern part. It is connected to important substations like Bhiwadi, 765/400kV Bhiwani and Moga . These substations experience wide variation in voltage due to wide seasonal load variation. During peak load conditions when agriculture demand is very high the voltage variation is very large. Accordingly **It is proposed to provide SVC having a control of voltage of (+ 5%) to (- 5%) at Hissar substation.**

Members may discuss and concur.

25. Common Data Base among STUs, CTU and CEA

POWERGRID as a part of capacity building initiative has taken up the initiative of providing the system study software (PSS/E) to the state utilities. The software is world renowned software and being used CTU, CEA & RLDC. POWERGRID has provided software to all state utilities, State Load dispatch centers and state Regulatory commission. The software is being distributed along with laptops in phased manner along with training. Already one such program for Northern Region constituents was held in September at Delhi. The second one would be held in December. This initiative by POWERGRID would provide a common platform for all utilities to exchange system studies and details of transmission system .

Presently, States usually model their transmission system in detail, however their inter-connections with Regional grid at boundaries are being modeled as lumped load or

generator due to lack of data or due to differences in data-base format maintained by different utilities. Such assumptions drastically affect the studies particularly while planning Intra-state and Inter-state EHV system. It is therefore necessary that a common standard format for the data-base may be followed by all utilities to enable free exchange of data. This would also help in carrying out system studies in a better manner. In view of above, it is proposed that a team at regional level may be formed with members from CEA, CTU, RLDC, RPC and Northern region state transmission utilities. This team would develop a data-base for Transmission Planning for Northern region for present and year wise till 2016-17. This data-base can be posted on the website of CEA, CTU and STUs. Integration of the regional data-base with other regions to create a National Database would be created by another team consisting of members of CEA and CTU. It is proposed that CTU may co-ordinate this activity. State utilities are requested to nominate their representative for the group constituted for developing Northern Region Data-base within 15 days.

Members may concur.

26. Establishment of 220/66 kV substation at U.T Chandigarh and connectivity with ISTS through Panchkula 400/220 kV S/s of POWERGRID (Agenda by UT Chandigarh)

Maximum peak load of Chandigarh is about 363 MW and the projected max. load is 439 MW by 2016-17. Presently the load of Chandigarh is being fed from three different sources namely Kishangarh (3x100 MVA Power Transformers), Mohali (Load restricted to 2x80 MVA) & 66 kV D/c line from Dhulkote.

Load Flow Studies have been carried out by POWERGRID for U.T Electricity Board (Chandigarh) for their 220/66kV Transmission System for Present as well as for future Scenarios. It has been observed from load flow studies that under normal and contingency conditions, some of the system elements gets critically loaded Therefore, the strengthening of transmission system is required at various points at U.T Chandigarh. Here it may be mentioned that presently there is no ISTS inter-connection available to the Chandigarh's transmission system. The connectivity of Chandigarh transmission system with ISTS would help in providing reliable power supply to this area.

In view of the above, it is proposed to take up the following transmission works as System Strengthening Scheme of NR:

- A 220 kV D/c line from Sector-47 S/s to Panchkula 400/220 kV Substation of POWERGRID
- Establishment of 3x100 MVA, 220/66 kV substation at Sector-47

Members may deliberate and concur.

27. Provision of PMU's under URTDSM Project

The Unified Real Time Dynamic State Measurement (URTDSM) Project was approved in the Joint Standing Committee Meeting held on 5th March 2012. In line to approval, the Detailed Project Report (DPR) has been finalized and petition has also been filed with CERC for Regulatory Approval. As per advice of CERC, the project details have also been discussed in the RPC forums of WR, NR, ER & SR. The project details shall be discussed in the upcoming NERPC meeting.

Broadly the scope under the DPR is as follows:

- Installation of 1739 PMUs
- Computer hardware and software at SLDC/RLDC/NLDCs.
- Installation OPGW based communication system (approx 10667km)
- Development of analytics.
- Consultancy services.

The estimated Project Cost as per DPR is Rs.655.98 Crores. As per discussions, the installation of PMUs and associated communication system at IPPs has also been included in the DPR. The NIT for this shall be issued shortly.

As per Joint Standing Committee approval 15% of the PMUs to be installed under this project are to be manufactured in India. Subsequent to this approval during the discussion with prospective Bidders, it has emerged that 15% of PMU quantity may not attract the Vendors to establish manufacturing facility in India. Hence this percentage is to be enhanced. This enhanced provision shall help establish indigenous manufacturing and utilities shall also have O&M support available within India. Therefore, provision for 30% PMUs to be manufactured & supplied from India shall be kept under URTDSM Project. **Members may concur the proposal.**

28. Connectivity of New Generating Stations through LILO arrangement (Agenda by RRVPNL)

RRVPNL had informed that as per accepted practice CTU is responsible for development of evacuation system for Inter-State Generating Stations from the switchyard of the generating station. It has been further stated that PGCIL is routinely recommending LILO of existing transmission lines for providing connectivity to new generating stations seeking LTOA to ISTS. Though provided in CERC Regulations, LILO connectivity should be allowed only in exceptional cases as it compromises the redundancy & power dispatch from existing generating stations whose evacuation system is to be shared by new generating plant. RRVPNL had requested for suitable guidelines to allowing LILO connectivity to new generating stations either temporarily or permanently and for sharing of transmission charges and losses without adversely impacting the existing ISTS customers. **Members may deliberate the above issue.**

Transmission System for Phase-I Generation Projects in Jharkhand & West Bengal

I. Transmission System for Phase-I Gen. Projects in Jharkhand & West Bengal : Part-A

- Ranchi – Gaya 400 kV (Quad) line via pooling station proposed near Essar / Corporate generation projects
- Ranchi New (765/400kV S/s) - Dharamjayagarh / near Korba 765kV S/c
- Establishment of 400kV Pooling Station (Jharkhand Pool) near Essar and Corporate generation projects. This will be a switching station without ICTs
- New 2x1500 MVA, 765/400 kV substation at Varanasi
- Gaya – Varanasi 765 kV S/c
- LILO of Gaya - Balia 765 kV S/c line at Varanasi
- 400kV connectivity for new 765/400kV S/s at Varanasi
 - Varanasi - Sarnath (UPPCL) 400kV D/c (quad)
 - LILO of Sasaram - Allahabad 400kV line at Varanasi

II. Trans. System for Phase-I Generation Projects in Jharkhand & West Bengal: Part-B

- New 2x1500 MVA, 765/400 kV substation at Kanpur
- Varanasi – Kanpur 765 kV D/c
- Kanpur – Jhatikra 765 kV S/c
- 400kV connectivity for new 765/400kV S/s at Kanpur
 - Kanpur (765/400kV) - Kanpur (Existing) 400kV D/c (quad)

III. Private Sector line: In addition to the above work to be undertaken by PGCIL,

In addition to the above work to be undertaken by PGCIL, Dharamjayagarh – Jabalpur 765kV D/C line (2nd line) would be under the scope of private sector. Associated 765kV line bays at Dharamjayagarh and Jabalpur sub-station would be under the scope of POWERGRID.

I. Transmission system for Phase-I generation projects in Jharkhand and West Bengal (WB) - Part-A1:

- Establishment of 400kV GIS Jharkhand Pooling Station near Essar and Corporate generation projects (depending upon progress of Essar and Corporate IPPs). This will be a switching station without ICTs.
- Ranchi – Gaya 400 kV D/C Quad line via proposed Jharkhand Pooling Station near Essar/ Corporate generation projects

II. Transmission system for Phase-I generation projects in Jharkhand and West Bengal - Part-A2:

- Ranchi New (765/400kV S/s) – Dharamjayagarh/near Korba 765kV S/C line
- New 2x1500 MVA, 765/400 kV GIS substation at Varanasi
- Gaya – Varanasi 765 kV S/C
- Varanasi- Balia 765 kV S/C

III. Transmission system for Phase-I generation projects in Jharkhand and West Bengal - Part-B:

- New 2x1500 MVA, 765/400 kV GIS substation at Kanpur
- Varanasi – Kanpur 765 kV D/C
- Kanpur – Jhatikra 765 kV S/C
- 765/400 kV Kanpur – Kanpur(Existing) 400 kV D/C Quad line
- 400kV connectivity for new 765/400kV S/s at Varanasi
 - ✓ Varanasi - Sarnath (UPPCL) 400kV D/C Quad line
 - ✓ LILO of Sasaram - Allahabad 400kV line at Varanasi
 - ✓ Opening of LILO of one circuit of Sasaram-Allahabad 400kV D/C line at Sarnath.

IV. Private Sector line:

In addition to the above work to be undertaken by PGCIL, Dharamjayagarh – Jabalpur 765kV D/C line (2nd line) would be under the scope of private sector. Associated 765kV line bays at Dharamjayagarh and Jabalpur S/S would be under the scope of POWERGRID.