



भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केन्द्रीय विद्युत प्राधिकरण

Central Electricity Authority

विद्युत प्रणाली योजना एवं मूल्यांकन-I प्रभाग

Power System Planning & Appraisal-I Division

No. 1/9/39<sup>th</sup> /PSP&PA-I/2016 /311-330

Dated: 12.05.2017

-As per list enclosed-

विषय: उत्तरी क्षेत्र की विद्युत प्रणाली योजना पर स्थायी समिति की 39वीं बैठक के लिए एजेंडा

**Sub: 39<sup>th</sup> Meeting of Standing Committee on Power System Planning of Northern Region - Agenda for the meeting**

Sir/ Madam,

The Agenda for 39<sup>th</sup> Meeting of Standing Committee on Power System Planning of Northern Region, has been uploaded on CEA website: [www.cea.nic.in](http://www.cea.nic.in) (path to access – Home Page -Wing specific document/power system related reports/ Standing Committee on Power System Planning/ Northern Region).

The date and venue of the meeting will be intimated separately.

Yours faithfully,

(अवधेश कुमार यादव) / (Awdhesh Kr Yadav)

निदेशक/ Director

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**Copy to:**

PPS to Member (PS), CEA

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4.	Director (Technical), Punjab State Transmission Corporation Ltd. (PSTCL) Head Office The Mall Patiala -147001 Fax-0175-2304017	5.	Member (Power) BBMB, Sectot-19 B Madhya Marg, Chandigarh-1 60019 (Fax-01 72-2549857)	6.	Director (Operation) Delhi Transco Ltd. Shakti Sadan, Kotla Marg, New Delhi-110002 (Fax-01123234640)
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13.	Chief Engineer (Transmission) NPCIL, 9-S-30, Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai-400094 Fax-022-25993570	14.	Director (T&RE) NHPC Office Complex, Sector-33, NHPC, Faridabad-121003 (Fax-0129-2256055)	15.	Director (Projects) NTPC, NTPC Bhawan, Core 7, Scope Complex-6, Institutional Area, Lodhi Road. New Delhi (Fax-011-24361018)
16.	Director (Technical) THDC Ltd. Pragatipuram, Bypass Road, Rishikesh-249201 Fax: 0135-2431519)	17.	Director (Projects) POWERGRID Saudamini Plot no. 2, Sector - 29. Gurgaon-122 001 (Fax-0124-2571809)	18.	CEO, POSOCO B-9, Qutab Institutional Area, Katwaria Sarai New Delhi – 110010 (Fax:2682747)
19.	COO (CTU) POWERGRID, Saudamini, Plot no. 2, Sector -29, Gurgaon-122 001 (Fax-0124-2571809)				

## **Agenda of the 39<sup>th</sup> Meeting of Standing Committee on Power System Planning of Northern Region**

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### **1.0 Confirmation of the Minutes of the 38<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region held on 30.5.2016 .**

- 1.1 The Minutes of **38<sup>th</sup> meeting** of the Standing Committee on Power System Planning of Northern Region (SCPSPNR) were issued vide CEA letter no. 1/9/38/2016/PSP&PA-I/721-739 dated 8<sup>th</sup> June, 2016. Subsequently, POWERGRID vide letter no C/CTU/N/PLG dated 23-6-2016 and RRVPNL vide their letter no RVPN/SE(P&P)/PSS/D.596 dated 16.6.2016 made some observations on the minutes of the meeting. Some of the observations made by PGCIL and RRVPNL were considered and CEA's vide letter 1/9/38/2016/PSP&PA-I dated 20.7.2016 and 19.10.2016 issued corrigendum-I and corrigendum-II to the minutes of the meeting (copy enclosed at Annexure-I & II). The other observations, which require further deliberations, have been included as the agenda for this meeting.
- 1.2 The minutes of the 38<sup>th</sup> meeting of SCPSPNR along with the corrigendum-I & II may be confirmed.

### **2.0 Review of intra state transmission scheme for evacuation of power from western part of Rajasthan**

- 2.1 In the 38<sup>th</sup> meeting of SCPSPNR held on 30/05/2016, following intra-state transmission system in Rajasthan was agreed to be implemented by RRVPNL for interconnection with inter-state transmission system viz. Bhuj-Banaskantha-Chittorgarh-Ajmer-Bikaner-Moga 765 kV D/C line under green energy corridor-I:
- i) Korna (RRVPNL)-Ajmer (PG) 765/400 kV S/S 765 kV D/c line with 2x240 MVAR, 765 kV line type switchable shunt reactors at Korna and Ajmer substations (line and bays at Korna to be implemented by RRVPNL).
  - ii) LILO of 2<sup>nd</sup> ckt. of 400 kV D/C Bhadla (RRVPN) – Bikaner (RRVPN) line at Bikaner (PG) (LILO line to be implemented by RRVPNL)

Note:

- *POWERGRID to provide 2 nos. of 765 kV line bays at 765/400 kV Ajmer (PG) along with 2x240 MVAR, 765 kV line type switchable shunt reactors*
  - *POWERGRID to provide 2 nos. of 400 kV line bays at 765/400 kV Bikaner (PG)*
- 2.2 RRVPNL vide letter dated 16/02/2017 addressed to POWERGRID has mentioned that in view of implementation of 765 kV Fatehgarh pooling station (to be initially operated at

400kV) under ISTS, RRVPN has reviewed their RE evacuation plan from Western Rajasthan. RRVPN has now proposed the following 400kV interconnection in place of Korna 765/400 kV GSS and its connectivity with Ajmer:

- Jaisalmer –Fatehgarh 400kV D/C Quad Moose line
- Akal –Fatehgarh 400kV S/c Quad Moose line

2.3 The studies furnished by RVPNL along with the proposal shows injection of about 1350MW of intra state power to inter-state network at Fatehgarh. The transmission scheme for Fatehgarh solar park (1000MW) was conceptualized for evacuation of power from Fatehgarh solar park (1000MW) as well as other upcoming renewable (wind/solar) generation projects in ISTS in Fatehgarh/Pokharan area. POWERGRID has already received additional connectivity applications of 2100MW of RE power (wind / solar) for injection at Fatehgarh S/s. LTA applications of about 3750MW (LTA sought for NR-3260MW) has already been granted for injection at Green Energy Corridor (765/400/220kV Bhuj Pool: 3050MW and 765/400kV Banasknatha S/s:700MW) in Gujarat. The studies have not shown any injection at 765/400kV Chittorgarh (POWERGRID) substation from Banakasnth (Gujarat). In addition, Fatehgarh-Bhadla 765kV D/c line has been considered in the studies, whereas the line has been agreed to be initially operated at 400kV. In view of above, no margins would be available on green energy corridor especially on 765kV Bhadla-Bikaner-Moga line to carry additional intra state power for injection at Fatehagrah.

2.4 Further, RRVPN vide its letter dated 16/06/2016 has requested the following corrigendum at item no 19.6 of the minutes of 38<sup>th</sup> meeting of SCSPNR:

- (i) POWERGRID to provide 2 nos. of 765 kV line bays at 765/400 kV Ajmer (PG) along with 2x240 MVAR, 765 kV line type switchable shunt reactors
- (ii) POWERGRID to execute LILO of 2<sup>nd</sup> ckt. of 400 kV D/C Bhadla (RRVPN) – Bikaner (RVPN) Quad Moose line at Bikaner 765/400 kV (PG) GSS (in addition to already approved first circuit in 36<sup>th</sup> meeting of SCSPNR) and also provide two nos. of 400kV line bays at 765/400kV Bikaner

RVPNL has requested to the implement the above elements under ISTS.

As per minutes of 38<sup>th</sup> meeting of SCSPNR, item no (i) is already under scope of POWERGRID, whereas item no (ii) has been agreed to be implemented by RRVPNL.

2.5 RVPNL has reviewed their proposal of Korna –Ajmer 765kV D/c line and has now proposed following 400kV interconnections with 765/400 kV Fatehgarh Pooling Station (to be initially operated at 400kV).

- i) Jaisalmer –Fatehgarh 400kV D/C Quad Moose line
- ii) Akal –Fatehgarh 400kV S/c Quad Moose line

2.6 Further, RVPNL vide their letter dated 28.4.2016 has submitted that in light of changed scenario due to non-materialization of the solar and wind generations projects, which had earlier taken the connectivity from RVPNL network, it was found that following interconnections with PGCIL are not required: -

- a) 2 no of 765 kV line bays at 765/400 kV Ajmer(PG) S/S along with 2x240 MVAR, 765 kV line type switchable shunt reactors for termination of RVPN's 765 kV D/C Korna-Ajmer line
- b) 2 no of 400 kV line bays at 765/400 kV Bikaner (PG) S/S along with LILO of second circuit of 400 kV D/C Bhadla-Bikaner line at Bikaner (PG).
- c) 2 no of 400 kV line bays at 765/400 kV Fatehgarh(PG) S/S along with 400 kV D/C Jaisalmer(2)-Fatehgarh(PG) line (Quad Moose)
- d) 1 no of 400 kV line bay at 765/400 kV Fatehgarh (PG) S/S along with 400 kV S/C Akal-Fatehgarh(PG) line (Quad Moose)

2.7 Members may deliberate.

### **3.0 Up-gradation of Tehri Pooling Station – Meerut 765kV 2xS/c lines (operated at 400 kV) at its rated voltage.**

3.1 To facilitate power transfer from Tehri Generation complex, two nos. of 765kV S/c line between Tehri Pooling and Meerut were planned and are presently operating at 400kV level. Further, up-gradation of this line at 765kV level was envisaged along with Tehri PSP (1000 MW), which is under implementation and is expected to commission by 2019-20. THDC vide their letter dated 14.2.2017 has informed that constraints are being observed in evacuation of power from Tehri / Koteshwar generation complex under contingency condition. THDC has mentioned that during planned shutdown of one circuit of 400kV Meerut–Koteshwar pooling station line, oscillations were observed at Tehri and Koteshwar hydro projects on 22.11.2016 at a power level of 1150 MW through single circuit. Subsequently, oscillations were damped on reduction of the generation.

3.2 POWERGRID vide their letter dated 17.2.2017 has stated that up-gradation of Tehri Pooling - Meerut line at 765kV level will facilitate reliable evacuation of power even during contingency conditions. Accordingly, Powergrid has proposed that up-gradation of this line at 765kV level may be de-linked with Tehri PSP generation and carried out on priority.

3.3 The results of the studies in the event of outage of one circuit of Tehri-Meerut 765 kV 2xS/c lines (charged at 400 kV) and when the lines are operated at rated voltage are enclosed at Exhibit-1 and Exhibit-2.

3.4 Members may discuss.

#### **4.0 Two number of 132kV bays at PGCIL's Balia (765) S/S:**

4.1 UPPTCL vide their letter 1772 / C.E. (Trans. Plan.) /CEA dated 12.09.2016 has informed that UPPTCL has plan to connect 132/33 kV, 2x40 MVA S/S at Bansdih (Balia) with Balia (765 kV) of POWERGRID. For its connectivity to Balia (PG) two number of 132 kV bays are required at Balia (765) S/S. 132/33 kV Bansdih substation alongwith 132kV lines is planned to be completed by March/April, 2017. The scope of works proposed by UPPTCL is under:

- (i) Construction of 132/33 kV, 2x40 MVA S/S Bansdih (Balia)
- (ii) Balia (765) – Bansdih (Balia) 132 kV D/C line) – 62 km.
- (iii) Construction of LILO of one ckt of Balia (765) – Bansdih 132 kV D/C line at existing 132/33 kV 2x40 MVA substation Sikandarpur (Balia).

4.2 UPPTCL may kindly furnish the expected loading on 132kV outlets and confirm the status of above proposed schemes. PGCIL may confirm the availability of the bays along with transformation capacity at Balia (PG).

4.3 POWERGRID has informed that the transformation capacity at Balia (PG) 765/400 kV – 3000 MVA and 400/132 kV – 200 MVA. POWERGRID has also confirm the availabilty of space for 2 no. 132kV bays at Balia (PG).

4.4 **Members may deliberate.**

#### **5.0 Requirement of 1 (one) no. additional 220kV bay at 400/220kV Substation at Puhana (PG):**

5.1 PTCUL vide their letter no 2294/Dir(P)/220kVS/S Puhana Roorkee dated 26.11.2016 has intimated that presently four nos. of 220kV bays are available at 400/220kV S/s at Puhana. Out of which, 2 nos. of bays have been utilized for LILO of 220kV Haridwar- Roorkee line at Puhana(PG) and 2 nos are proposed to be utilized for LILO of Roorkee- Nara 220kV S/c line at Puhana (PG). Further, PTCUL has proposed 2 nos. of additional bays for 220kV D/c line from Puhana (PG) to Pirankaliyar. Therefore, total 6 (six) nos of 220 kV bays will be required by PTCUL.

5.2 In the 35<sup>th</sup> meeting of SCPSPNR held on 3.11.2014, PTCUL had requested for provision of one no. of 220kV bay at 400/220kV Puhana (PG) under ISTS in addition to the 4 nos. of 220kV bays available at Puhana (PG). PTCUL proposal for provision of one no. of additional 220kV bay at 2x315 MVA 400/220kV Puhana (PG) under ISTS was agreed. Considering RoW issue, termination of the three number of 220kV lines through cables at 400/220kV Puhana (PG) was also agreed.

- 5.3 PTCUL may kindly furnish the expected loading on 220kV outlets (6 nos.) and the termination details (cables or overhead lines) in view of RoW issues at 400/220kV S/s at Puhana indicated earlier.
- 5.4 POWERGRID has confirm the availability of space for one number ICT and one no. additional 220 kV bay.
- 5.5 Members may deliberate.
- 6.0 Requirement of 2 (two) nos. of additional 220kV bay at 400/220kV S/s at Patran:**
- 6.1 400/220 kV S/s at Patran has been implemented through Tariff Based Competitive Bidding (TBCB) route by M/s Patran Transmission Company Limited (PTCL). The scope of establishment of 400/220 kV S/s at Patran by PTCL, inter alia, involves construction of 6 nos. of 220 kV line bays and space provision for 6 nos. 220 kV line bays.
- 6.2 Punjab State Transmission Corporation Ltd (PSTCL) is presently implementing LILO of both circuits of existing Patran-Rajala 220 kV D/C line (LILO of one circuit of this line already done at Kakrala) at Patran 400/220 kV S/s. This would occupy 4 nos. 220 kV bays at Patran (ISTS) 400/220 kV S/s. PSTCL had also proposed LILO of both circuits of existing Sunam-Mansa 220 kV D/C line (LILO of one circuit already done at Jhunir) at Patran 400/220 kV S/s. This would also require another 4 nos. of 220 kV bays at Patran 400/220 kV S/s. Out of 4 nos. 220 kV line bays, two bays are already available at Patran 400/220 kV S/s and two more additional 220kV bays would be required. PSTCL vide their letter no. Memo no. 977/P-1/240 dated 11.11.2016 has requested for 2 nos. of extra 220kV line bays at Patran 400/220kV S/s.
- 6.3 CEA vide their letter dated 3.2.2017 requested PSTCL to furnish the load flow studies justifying the requirement of additional two nos. 220 kV bays at Patran 400/220 kV S/s. Regarding PSTCL query of implementing agency for the additional 2 nos. 220 kV bays, CEA clarified that M/s PTCL would provide only the space for the 220 kV line bays and the bays needs to be implemented by PSTCL at its own cost.
- 6.4 PSTCL vide their email dated 15.2.2017 furnished load flow study for requirement of 220kV bays at Patran 400/220kV S/s corresponding to 13<sup>th</sup> plan network. The study furnished by PSTCL had been examined and it was observed that that power flow is mostly towards Mansa, Jhunir and Patran (PSTCL). Rajila and Sunam are drawing their power from Patiala and Dhuri respectively. (Study results enclosed at Annexure-III). For implemenation of above purposed system, PSTCL need to constuct 80-100km of 220kV line along with two number of bays at Patran 400/220kV S/s. Therefore, it was suggested that alternative proposals like 220kV D/C line from Patran to Jhunir with LILO of second circuit of Sunam–Mansa at Jhunir or 220kV D/C line from Patran to Mansa or reconfigurations of the existing 220kV network may be considered. With this no additional bays would be required at Patran.
- 6.5 PSTCL may present their case and members may delibrate.

**7.0 Requirement of 4 nos. of 220kV bays and augmentation by 1x500MVA, 400/220kV transformer at 400kV Substation at Jajji (Sonapat):**

7.1 HVPNL vide their letter dated 30.8.2016 has requested for four nos. of 220kV bays at 400/220kV S/S at Jajji (PG) for LILO of both circuits of their Mohana–Samalkha 220 kV D/C line at Jajji (PG) in year 2019-20. Further, HVPNL vide their letter no. Ch.72/HSS-152/ Vol. - XVIII dated 8.9.2016 has informed that HVPNL has planned three no. 220kV substations at Mohana (460 MVA), Samalkha (360 MVA) and Rai HSIIDC (520 MVA). From the letter, it is inferred that these substations would get their feed from 400/220kV S/S at Jajji(PG). Therefore, HVPNL has requested to augment the transformation capacity by 1x500 MVA at 400/220kV Jajji (PG) (Sonapat) substation under Regional system strengthening scheme in FY- 2020-21.

7.2 HVPNL may furnish the following details:

- (i) Existing loading of 220kV outlets from Jajji 400/220kV S/s
- (ii) the connectivity of the proposed three numbers 220kV S/s i.e. Mohana(460 MVA), Samalkha(360 MVA) and Rai HSIIDC(520 MVA) and their time frame of implementation
- (iii) load flow studies for the above proposal

7.3 The existing 400/220kV Jajji (PG) (Sonapat) substation in Haryana has installed capacity of 2x315 MVA. POWERGRID has confirmed the availability of space for additional 4 no. 220 kV line bays. POWERGRID to intimate the existing 220 kV connectivity at their Jajji sub-station and confirm the space for additional 500 MVA, 400/220 kV transformer along with associated ICT bays.

7.4 Members may deliberate.

**8.0 220kV bays at 400kV S/Ss at Prithla 400/220kV S/s being implemented through TBCB route:**

8.1 HVPNL vide their letter dated 30.8.2016 has requested for the following 220kV bays at Prithla 400/220kV substation:

- (i) Two no. 220kV bays for Prithla (400)-Prithla(HVPNL) 220kV D/c line
- (ii) Four no of 220kV bays for LILO of existing 220kV Palwal –Rangala Rajpur D/C line at Prithla(400) (FY 2019-20)
- (iii) Two number of 220kV bays for 220kV Prithla(400) – Sector-78, Faridabad S/S D/C line (FY-2020-21)

8.2 The 400/220kV, 2x500 MVA GIS S/s at Prithla along with 8 nos. of 220kV line bays is under implementation through Tariff based competitive bidding (TBCB) route with commissioning schedule of May, 2019.



- 8.3 HVPNL is requested to expedite the implementation of the above proposed 220kV outlets from Prithla 400/220kV S/s in the matching time-frame so as to avoid creation of stranded assets. HVPNL may furnish the present progress of above 220kV lines.
- 8.4 Members may deliberate.
- 9.0 Two nos. of 220kV bays at 400/220kV substation Abdullapur (PG) in (Yamunanagar)**
- 9.1 HVPNL has planned a 220kV substation at village Rajokheri, Distt. Ambala. The planned substation will be directly interconnected to 4x315 MVA, 400/220kV Abdullapur (PG) substation. Subsequently, HVPNL vide memo no. Ch-27/408/K-121 dated 08/02/2017 has requested to provide two nos. of 220kV line bays at 400kV Abdullapur (PG) substation for feeding the proposed 220kV substation Rajokheri.
- 9.2 PGCIL has to confirm the availability of space for two nos. of 220kV line bays at 400/220kV Abdullapur (PG) substation.
- 9.3 HVPNL may kindly furnish the upstream and downstream connectivity of the proposed Rajokheri 220kV S/s. The time frame of implementation along with the load flow studies may also be furnished.
- 9.4 Members may deliberate.
- 10.0 Connectivity to Dhaulasidh Hydro Electric Power Project (66MW) of M/s SJVNL in Himachal Pradesh**
- 10.1 The issue of connectivity to Dhaulasidh Hydro Electric Power Project of 66MW (Plus 10% inbuilt overload capability to meet grid requirement) of M/s SJVNL in Himachal Pradesh was discussed in the 38<sup>th</sup> meeting of SCPSPNR, wherein, it was decided that a joint meeting would be called by CEA with CTU, SJVNL and HPPTCL/HPSEBL.
- 10.2 Accordingly, a meeting was held in CEA on 10.1.2017, wherein representative from CTU and SJVNL has participated. In the meeting, it was decided that connectivity to Daulasidh HEP can be provided through Dhaulasidh HEP – Hamirpur (PG) 220 kV D/C line. The line along with two number of 220kV bays at Hamirpur (PG) would be constructed by SJVNL. The minutes of the meeting are enclosed at Annexure –IV.
- 10.3 The connectivity application of Daulasidh is included in the connectivity/LTA agenda.
- 10.4 Members may deliberate.
- 11.0 400/220kV substations at Rajghat (Maharanibagh-II) and Karampura in NCT of Delhi:**
- 11.1 Establishment of 400/220kV Rajghat S/s along with Dwarka, Tugalakabad and Karampura were approved as part of the scheme “400/220kV substation in NCT of Delhi during 12<sup>th</sup> Plan period” in the 34<sup>th</sup> meeting of SCPSPNR held on 8<sup>th</sup> August, 2014. Further, Rajghat–

Maharanibagh 400kV D/c (HTLS) line was planned as “NRSS XXXIX” scheme for reliability of power supply in the 36<sup>th</sup> meeting of SCPSPNR held on 13-07-2015.

- 11.2 Dwarka and Tugalkabad 400/220kV S/Ss along with its 400kV interconnection are under implementation by POWERGRID. Implementation of Karampura 400/220kV S/s could not be taken due to non-availability of land for S/s and RoW problem in laying of 400kV interconnecting lines. A meeting was held in CEA on 14.7.2016 with CTU, Delhi DISCOMs and DTL, wherein, it was agreed to drop the the proposed substation at Karampura due to non-availability of land for the S/s.
- 11.3 DTL vide their letter dated 26/10/2016 had informed that land for Rajghat 400/220kV S/s at the earlier proposed location near IP Extn. is not feasible due to upcoming solar power complex and ROW constraint in laying of transmission lines associated with it. DTL has suggested land near the existing 400kV Maharanibagh for construction of 400/220kV Rajghat substation.
- 11.4 POWERGRID vide their letter dated 26.12.2016 informed that DTL has now proposed land near existing Maharanibag sub-staion for the proposed Rajghat sub-staion. As the proposed 400/220kV Rajghat (Maharanibagh-II)(GIS) sub-station is contiguous to existing 400/220kV Maharanibagh (GIS) sub-station, POWERGRID has proposed that instead of 400 kV Rajghat – Maharanibagh D/C line with HTLS conductor alongwith two nos. of 400kV GIS bays each at Rajghat and Maharanibagh, (proposed under “NRSS-XXXIX” for reliability of power supply in the 36<sup>th</sup> meeting of SCPSPNR held on 13/07/2015), the 400kV busbar of 400/220kV Maharanibagh (GIS) sub-station may be extended to Rajghat (Maharanibagh-II) and provision of a 400kV bus sectionaliser alongwith 400/220kV Rajghat (GIS) sub-station may be kept. The 400kV bus sectionaliser between 400/220kV Rajghat (GIS) sub-station and 400/220kV Maharanibagh (GIS) sub-station is proposed to be normally kept open to address the high fault level at both sub-station. The two 400kV buses can be interconnected through the bus sectionaliser to provide reliability of power supply in the event of contingency only. This proposal was also discussed and agreed in the meeting held on 20.12.2016 at DTL office, New Delhi. Therefore, POWERGRID had requested for in-principle approval for provision of sectionaliser in proposed 400/220kV Rajghat (Maharanibagh-II) (GIS) sub-station and dropping of 400 kV D/C line between Rajghat and Maharanibagh.
- 11.5 A meeting was held in CEA on 4.1.2017 with representatives from DTL and POWERGRID, wherein, the above proposal was agreed. Accordingly, CEA vide their letter dated 1/9/38th/PSPA-I/23 dated 16.1.2017 conveyed in-principle approval for extending the 400kV busbar of 400/220kV Maharanibagh (GIS) sub-station to Rajghat (Maharanibagh-II) with a provision of a 400kV bus sectionaliser and dropping the NRSS-XXXIX scheme subject to concurrence of the members of SCPSPNR.

The modified scope of 400/220kV Rajghat is as follows:

Establishment of 4x500MVA, 400/220kV GIS Substation at Rajghat (Near Maharani Bagh or Maharani Bagh -II)

400kV

- a) Line Bays: 4 Nos.
- b) 500 MVA, 400/220kV ICTs: 4 Nos.
- c) 125MVAr Bus Reactor: 1 Nos.
- d) Transformer Bay: 4 Nos.
- e) Reactor bay: 1 Nos.

In addition to above scope, the 400kV bus bar of Maharani Bagh GIS substation may be extended to Rajghat (Maharani Bagh-II) and provision of a 400kV bus sectionaliser alongwith the 400/220kV GIS at Rajghat may be kept.

220kV

24 Nos. of Bays:

- a) Line Bays: 12 Nos.
- b) Transformer Bays: 8 Nos. (4 Nos. for 400/220kV ICTs & 4 Nos. for 220/33kV ICTs)
- c) Bus Coupler bays: 2 Nos.
- d) Bus Sectionaliser bays: 2 Nos.

11.6 Susequently, DTL vide their letter 24.04.2017 addressed to POWERGRID has requested to shift the Rajghat (Maharani Bagh-II) 400/220 kV substation from its present location at Maharani Bagh to Gopalpur in North Delhi, in view of high fault level (beyond 60 kA) and severe RoW constraints in taking out 220 kV and 33 kV feeders. The additional land at existing 220 kV Gopalpur sub-station can be utilized for construction of 400 kV substation (GIS) and the connectivity with the ISTS would remain the same i.e. LILO of both circuits of Mandola-Bawana 400 kV D/C line.

11.7 DTL has forwarded power flow study.

11.8 Members may deliberate.

**12.0 UT of Chandigarh's proposal regarding handing over of 220/66kV substation at Kishangarh, Manimajra to PGCIL and to treat it as ISTS point:**

12.1 UT of Chandigarh vide their letter no SEE/OP/S-1/193/2014/1666 dated 14.6.2016 has submitted the proposal of handing over of 220/66kV substation at Kishangarh, Manimajra to PGCIL and to treat it as ISTS point. The 220/66kV Manimajra S/s and Nalagarh-Manimajra 220 kV D/C line is owned by UT of Chandigarh, however the project was

executed by POWERGRID and since then operated and maintained by POWERGRID. At present UT of Chandigarh is getting ISTS power from following lines:

- a) Dhulkote-Chandigarh 66 kV D/C line
- b) Mohali-Chandigarh 66 kV 2xD/C line
- c) Nalagarh-Kishangarh (Manimajra) 220 kV D/C line

12.2 UT of Chandigarh has also informed that metering is done at Nalagarh end and all applicable losses are borne by Chandigarh, which is a substantial amount. Therefore, UT of Chandigarh has requested that since there is no ISTS interconnection point available in Chandigarh presently, the 220/66kV S/s at Kishangarh, Manimajra may be handed over to PGCIL and may be treated as ISTS point.

12.3 The Nalagarh-Kishangarh (Manimajra) 220 kV D/C being a natural inter-state line members may deliberate the handing over of Nalagarh-Kishangarh (Manimajra) 220 kV D/C line line along with Kishangarh (Manimajra) 220 kV sub-staion to POWERGRID.

### **13.0 Loading at Raebareli 220/132 kV Substation**

13.1 The issue of overloading of all three 100 MVA transformers at Raebareli was deliberated in the 34<sup>th</sup>, 36<sup>th</sup> and 37<sup>th</sup> meetings of SCPSPNR held on 03-11-2014, 13-07-2015 and 20-01-2016 respectively. During 37<sup>th</sup> meeting of SCPSPNR, it was agreed 'in principle' to replace two nos. of 100 MVA, 220/132 kV ICTs with two nos. of 200 MVA ICTs, as space is not available for providing additional ICT. It was also proposed that one out of the two replaced transformers may be installed at Sitarganj S/s, which is getting overloaded and the other unit may be used as the regional spare. Subsequently, the same has been agreed in 38<sup>th</sup> meeting of NRPC held on 25-10-2016.

13.2 In view of urgent requirement of replacement of transformers indicated by UPPTCL vide its letter dated 18-01-2017, POWERGRID is implementing the scheme with the following scope of works:

- a. Replacment of two nos. of 100 MVA, 220/132 kV ICTs at Raebareli S/s with two nos. of 200 MVA ICTs 220/132 kV ICTs .
- b. One out of the two replaced 100 MVA, 220/132 kV ICTs from Raebareli S/s may be installed at Sitarganj S/s and the other may be used as the spare unit.

13.3 Although the scheme was agreed 'in principle' in the 37<sup>th</sup> meeting of SCPSPNR, members may concur the scheme.

#### **14.0 Transmission system for Ultra Mega Solar Park in Fatehgarh, distt. Jaisalmer Rajasthan**

14.1 Transmission system for Ultra Mega Solar Park in Fatehgarh, Jaisalmer agreed in the 38<sup>th</sup> meeting of SCPSPNR held on 30-05-2016 is given below:

- i. Establishment of 400 kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)
- ii. Fatehgarh Pooling sub-station - Bhadla (PG) 765 kV D/C line (initially to be operated at 400kV)
- iii. 2 Nos. of 400kV line bays at Fatehgarh Pooling substation
- iv. 1x125 MVAR Bus reactor at 400 kV Fatehgarh Pooling sub-station

**Note:** (i) Park Developer to construct 400 kV line from M/s AREPL solar park to Fatehgarh pooling station and provide 1x125 MVAR bus reactor at generation switchyard.

14.2 Subsequently, based on the POWERGRID'S observations on MOM of 38<sup>th</sup> SCPSPNR regarding 400kV line bays at Bhadla (PG) for termination of 765kV Fatehgarh PS- Bhadla (PG) D/c line (initially to be op at 400kV), CEA vide its letter dated 19.10.2016 has issued Corrigendum-II to the minutes of 38<sup>th</sup> meeting of SCPSPNR, which inter-alia included the following in the note of the scheme "Transmission system for Ultra Mega Solar Park in Fatehgarh, Jaisalmer":

**Note:** (ii) POWERGRID to provide two number of line bays at Bhadla (PG)

14.3 In the 36<sup>th</sup> meeting of the Empowered Committee on Transmission held on 26<sup>th</sup> July, 2016, the scheme was recommended for implementation through Tariff Based competitive bidding route with the following scope of works:

- i. Establishment of 400 kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)
- ii. Fatehgarh Pooling sub-station - Bhadla (PG) 765 kV D/C line (initially to be operated at 400kV)
- iii. 2 Nos. of 400kV line bays at Fatehgarh Pooling substation
- iv. 1x125 MVAR Bus reactor at 400 kV Fatehgarh Pooling sub-station
- v. Space for future 220 kV ( 6 Nos.), 400 kV ( 6 Nos.) and 765 kV (4 Nos.) line bays along with line reactors at Fatehgarh Pooling station
- vi. Space for future 220/400 kV transformers (2 Nos.) 400/765 kV transformers (2 Nos.) along with associated transformer bays at each level
- vii. Space for future 765 kV bus reactor along with associated bays

**Note:**

- a) Park Developer to construct 400 kV D/C line from M/s AREPL solar park along with 1x125 MVar bus reactor at generation switchyard.
- b) POWERGRID to provide 2 nos. of 400 kV line bays at Bhadla (PG) for Fatehgarh Pooling Station- Bhadla D/C line (initially to be operated at 400 kV)
- c) The Solar park developer (M/s AREPL) to provide adequate land for 765/400 kV pooling station adjacent to the proposed solar park for which, transmission licensee shall coordinate with M/s AREPL including commercial aspects for transfer of land.
- d) Solar park developer (M/s AREPL) to provide 2 nos. of 400kV line bays at Fatehgarh Pooling Station for termination of 400kV D/C line from AREPL solar park to 400kV Fatehgarh Pooling station.

The commissioning schedule of the scheme is December 2018.

- 14.4 CERC, during the proceedings for Regulatory Approval has desired that the complete scope may be informed in the meeting of Standing Committee. Accordingly, the complete scope as given above.
- 14.5 This is for kind information of the members. Members may note.
- 14.6 Further, CTU has informed that they have received a no. of application from RE power developers for connectivity at Fatehgarh solar park. CTU may present.
  
- 15.0 Grant of Long Term Access (Revised) to NTPC Ltd. for its Tanda TPS Stage-II (2x660 MW) for 395.42 MW to NR Beneficiaries:**
- 15.1 The intra state transmission schemes for evacuation of power from Tanda Ext. (2x500MW) along with Parichha TPS Extn. (2x250MW), Harduaganj Extn (2x250MW) were agreed in the 26<sup>th</sup> meeting of SCPSPNR held on 13.10.2008. The Intra-State Transmission schemes, interalia, included the following system for evacuation of power from Tanda-II generation project:
  - a) Tanda – Gonda 400kV quad D/C line
  - b) Gonda – Shahjahanpur(PG) 400kV quad D/C line
  - c) 2x315 MVA, 400/200kV S/s at Shahjahanpur by LILO of both circuits of Lucknow (PG) – Bareilly (PG ) 400kV D/C line.
  - d) LILO of Azamgarh – Sultanpur 400kV line at Tanda
  - e) Establishment of 400kV substation at Gonda with 400/220kV, 2x315 MVA ICTs
  
- 15.2 In the 30<sup>th</sup> meeting of SCPSPNR / LTA meeting held on 19<sup>th</sup> December 2011, the connectivity for Tanda -II project was agreed through 2x 315 MVA, 400/220 kV ICT at Tanda by inter-connecting Tanda-II 400 kV generation with existing 220 kV bus of Tanda-

I. It was also agreed that the interconnecting arrangement along with 400/220kV ICT at Tanda-II generating switchyard would be provided by NTPC.

15.3 NTPC had applied for LTA for 484.28 MW with Punjab, Delhi, Haryana, Rajasthan, HP, Chandigarh, J&K as beneficiaries. As per the LTA application, the beneficiaries of Tanda TPS along with quantum allocated are: PSEB (53.96MW), UPPCL (824.59MW), UPCL (27.88MW), Delhi Discoms (86.46MW), Haryana Discoms (36.96 MW), Rajasthan Discoms (74.56 MW), HPSEB (22.75 MW), PDD (46.72 MW), EDC (Union Territory of Chandigarh) (4.08MW). For drawing its share from Tanda-II generation project, UP is implementing its own system. Following transmission system was agreed in the 31st meeting of the SCPSPNR / LTA meeting held on 02.01.2013 for granting LTA to NTPC for 484.28 MW:

- a) Tanda TPS – Sohawal 400 kV D/c line
- b) Sohawal – Lucknow (New) (PG) 400 kV D/c line

15.4 Regarding LILO of Azamgarh- Sultanpur 400 kV S/c line at Tanda, it was mentioned in the minutes of the LTA meeting held on 02.01.2013, that it being an intra state system, the matter may be discussed between UPPTCL and NTPC.

15.5 Considering above, the transmission system for evacuation of power from Tanda – II as agreed in the SCPSPNR / LTA meeting in NR is as follows:

I. Transmission system under scope of NTPC

a) Connectivity system

- 2x 315 MVA, 400/220 kV ICT at Tanda by connecting Tanda-II 400 kV generation with existing 220 kV bus
- 1x125 MVAR, 400 kV bus reactor at Tanda-II

b) For Power Evacuation

- 4 nos. of 400 kV line bays (2nos. for Tanda- Gonda 400 kV D/C line and 2 nos. for Tanda – Sohawal 400 kV D/C line)

II. Intra-State Transmission System under scope of UPPTCL: -

- Tanda – Gonda 400kV quad D/C line
- Gonda – Shahjahanpur (PG –) 400kV quad D/C line
- 2x315 MVA, 400/200kV S/s at Shahjahanpur by LILO of both circuits of Lucknow (PG) – Bareilly (PG) 400kV D/C line.
- Establishment of 400kV substation at Gonda with 400/220kV, 2x315 MVA ICTs.
- LILO of Azamgarh- Sultanpur 400 kV S/c line at Tanda (to be further discussed between NTPC and UPPTCL)

III. Inter State Transmission System (for LTA of 484.28):

Under TBCB scope

- Tanda TPS – Sohawal 400 kV D/c line
- Sohawal – Lucknow (New) (PG) 400 kV D/c line

Under POWERGRID scope

- 4 nos. of 400 kV bays at Sohawal
- 2 nos of 400 kV bay at Lucknow (PG)

- 15.6 In the 34<sup>th</sup> meeting of Empowered Committee held on 13/04/15, the ISTS system associated with Tanda was decided to be implemented under TBCB. The LOI was issued to M/s Essel Infraprojects Ltd. as the successful bidder on 09/10/2015. However, the SPV could not be transferred due to non-signing of TSA by three LTCCs namely PSPCL, TPDCL & BRPL for the transmission project and implementation of the scheme is held up. The matter of non-signing of TSA was discussed during the 36<sup>th</sup> meeting of the Empowered Committee on transmission held on 26/07/16. In the meeting it was decided that the PFCCL (BPC) may take up the issue with MoP and MoP may direct NTPC to sign the TSA for balance portion of 140.42 MW for which the designated LTCCs i) PSPCL (53.96 MW) ii) Tata Power (51.79 MW) and iii) BSES Rajdhani (34.67 MW) have not signed the TSA. In case of non-signing of LTA & TSA, the implementation of the system cannot be taken up.
- 15.7 A meeting was held on 11.11.2016 in CEA, wherein the issue of revised LTA quantum from 484.28 MW to 395.42 MW of Tanda Stage-II was discussed as PSPCL, TPDCL & BRPL had surrendered their allocated power from Tanda-II generation project and UP had given consent for purchasing the surrendered power. This additional power allocation to UP is under consideration of M.O.P, Government of India. In the meeting, it was decided that NTPC would submit the revised LTA application / formal request to CTU in line with the CERC Regulations and detailed procedures for grant of connectivity and LTA. Based on the request of NTPC, CTU would process the proposal of NTPC in consultation with CEA and other stakeholders.
- 15.8 Subsequently, NTPC vide its letter dated 24/12/16 has revised the total LTA quantum from Tanda Stage-II to 395.42 MW instead 484.28 MW and power allocation to PSPCL, TPDCL & BRPL has been excluded. The period of LTA is from Jan'19 onwards for 25 years. CTU, considering the change in quantum of LTA, have circulated the agenda vide their letter dated 16.1.2107 to the Northern Region constituents for their observations. UPPTCL vide their email dated 27/01/2017 and 15/02/2017 had expressed certain reservations regarding requirement of ISTS facility.
- 15.9 A meeting was held in CEA on 11.04.2017 with CTU, UPPTCL, NTPC and PFCCL (minutes of the meeting enclosed as Annexure -V ) wherein the following was agreed :



- a) Review of the Tanda–Sohawal–Lucknow 400 kV D/C line (Inter State Transmission system associated with Tanda-II TPS) as suggested by UPPTCL, would be deliberated in the forthcoming meeting SCPSPNR and its implications on the ISTS beneficiaries (other than UPPTCL) of the Tanda-II generation project.
- b) Keeping in view the present situation (review of ISTS system, issues in implementation of Tanda-Gonda-Shajahapur 400 kV D/C line under PPP mode), taking up the implementation of LILO of 400 kV Sultanpur – Azamgarh S/C line at Tanda-II by UPPTCL was agreed in principle subject to ratification in next meeting of SCPSPNR to take care of evacuation requirements from unit 1 of Tanda-II. Further, NTPC would explore the implementation of 2 nos. of 400 kV additional line bays at NTPC switchyard.

15.10 Members may deliberate.

**16.0 Establishment of 220/66kV, 2X160MVA GIS Substation at Hallo Majra, Chandigarh.**

- 16.1 Establishment of 220/66kV, 2X160MVA GIS Substation at Hallo Majra, Chandigarh was approved in 36<sup>th</sup> meeting of SCPSPNR in July 2015 with following scope of work:
  - Establishment of 2x160MVA, 220/66 kV over ground GIS S/s at Chandigarh( Hello Majra)
  - 220kV D/c line from Chandigarh to Panchkula (PG) substation (including cable in Chandigarh portion)
- 16.2 Implementation of the above scheme was allocated to Powergrid by Ministry of Power under compressed time schedule. Subsequently, in Power for All meeting for Chandigarh in Ministry of Power in Feb'2016, it was desired to explore the option for making this 220/66 kV S/s underground and UT Chandigarh also requested for making this substation underground.
- 16.3 In view of above, establishment of Chandigarh 220/66 kV substation as underground station was discussed in 38th meeting of SCPSPNR held on 30/05/2016. In the minutes of the meeting and its amendment dated 20/07/16, it was suggested that POWERGRID may explore differential funding (for additional civil cost) either from UT of Chandigarh or through PSDF. Powergrid discussed the matter with UT Chandigarh and NLDC i.e. the nodal agency for PSDF to agree to provide differential funding. NLDC vide their letter dated 04/08/2016 has informed the categories of projects which are eligible for PSDF funding and it appeared that the proposal may not be eligible for PSDF funding. Similarly, UT Chandigarh during the discussions have informed that additional funding may not be feasible from their side.
- 16.4 As there was no clarity about the establishment of the underground substation in Chandigarh, Powergrid could not go ahead with its implementation activities. Matter was further discussed and considering the time already elapsed since approval of this substation, it was decided to go ahead with over ground GIS substation in Chandigarh as approved earlier.
- 16.5 Members may note.

## **17.0 Development of Transmission scheme for Solar Power Parks in Bhadla, Rajasthan**

- 17.1 In 37<sup>th</sup> meeting of SCPSPNR & 8<sup>th</sup> Meeting of Connectivity & Long Term Access held on 20.01.16, common transmission scheme for solar power parks including M/s Essel Saurya Urja Company of Rajasthan Ltd. (ESUCRL) (750MW) at Bhadla, Rajasthan was discussed and agreed. The agreed transmission scheme is as under:
- 765kV Bhadla (PG) – Bikaner(PG) D/c
  - 400kV Bhadla (PG)- Bhadla (RVPN) D/c (Quad)
  - Establishment of Pooling Station at Bhadla (PG) (765/400kV-3x1500MVA 400/220kV : 3x500MVA)
  - 2 nos. 400kV & 4 nos. 220kV line bays at Bhadla(PG) for interconnection of solar park interconnection
  - 1x240 MVAr switchable line reactor at each end (each ckt) of 765kV Bhadla(PG)-Bikaner(PG) D/c line
  - 1x240 MVAr (765kV) & 1x125 MVAr (400kV) Bus reactors at Bhadla Pooling Station
- 17.2 In the above said meeting, it was discussed and agreed that 220kV (M/s Saurya Urja & M/s Adani) and 400kV (M/s ESUCRL) connectivity transmission line from Solar Park Pooling station up to 765/400/220 kV Bhadla Pooling Station shall be developed by the respective applicants/SPPD. Accordingly following Connectivity transmission system was agreed to be granted to M/s ESUCRL:
- M/s Essel Saurya generation switchyard – Bhadla 400 kV D/c line (to be implemented by the applicant)
- 17.3 However, M/s ESUCRL (750 MW) later informed that laying of 60 km long D/c line from Solar Park Pooling station upto 765/400/220 kV Bhadla Pooling station would impact the project cost and the project may become unviable.
- 17.4 M/s ESUCRL vide letter dated 15/02/16 requested Powergrid to take up the development of connectivity transmission system i.e. interconnecting 400 kV D/c line from ESUCRL upto Bhadla Pooling station and delete the same from ESUCRL scope. In view of this, the intimations for connectivity and LTA could not be issued.
- 17.5 CEA vide letter dated 26/04/16 to MOP mentioned that Bhadla substation is a common pooling station for three solar park developers (M/s Saurya Urja, M/s Adani and M/s Essel Saurya), M/s Essel should construct the transmission lines from solar park to Bhadla Pooling station in line with M/s Saurya Urja & M/s Adani Renewable Solar park developers who are constructing their own lines from the respective solar parks to the Bhadla Pooling station, in line with the decision taken in the standing committee meeting.

17.6 M/s Essel vide letter dated 05.09.16 informed CTU that taking up implementation of connectivity transmission line will have huge additional capital expenditure and shall make their project unviable. Applicant may intimate regarding development of connectivity transmission system as well as their generation commissioning schedule.

17.7 Members may like to deliberate

### **18.0 Reconductoring of Badarpur–Ballabhgarh 220kV D/C line**

18.1 The issue of reconductoring of Badarpur–Ballabhgarh 220kV D/C line had been discussed in 37th and 38th meetings of SCSPNR held on 20.1.2016 and 30.5.2016 respectively. As no representative of BBMB was present in the 38th SCSPNR, it was decided that CEA would convene a meeting with CTU, DTL, HVPNL and BBMB. Meetings were held on 8.7.2016 and 10.1.2017 in CEA, wherein, it was decided that a committee consisting of CEA, BBMB, HVPNL, CTU would carry out the system studies.

18.2 Subsequently, studies were carried out and discussed with the representatives from CTU, BBMB, HVPNL, and DTL in a meeting held on 30.01.2017 at CEA. As per the studies following conclusions were derived:

1. Without Badarpur generation, to meet the peak demand of Delhi, Samaypur–Ballabhgarh–BTPS 220kV lines are getting overloaded, till the commissioning of Tuglakabad 400/220 kV substation. In this scenario, reconductoring of Samaypur–Ballabhgarh–BTPS 220kV lines along with augmentation / replacement of line bay equipment at BTPS is required.
2. After the commissioning of 400/220kV Tuglakabad S/s, the loads of South Delhi area are mostly fed through Tuglakabad 400/220 kV sub-station and the power flows on 220kV Badarpur–Ballabhgarh D/c line gets reduced substantially. However, in case of outage of one ckt. of the 3 nos. 220 lines between Samaypur and Ballabhgarh, the remaining ckts are loaded to their capacity.
3. Issue of auto-reclosing at Badarpur end of the Ballabhgarh-Badarpur 220 kV D/C line may be discussed in the OCC forum of NRPC.

18.3 A copy of the study report is enclosed at Annexure- VI . Members may deliberate.

### **19.0 Connectivity (6x660 MW) and LTA (4x660MW) Application of Barethi STPS of NTPC Ltd.**

19.1 Connectivity and LTA application of NTPC Ltd. for Barethi STPS (6x660 MW) was discussed during the 38<sup>th</sup> meeting of SCSPNR and 9th LTA/Connectivity meeting of Northern Region Constituents held on 30/05/2016 wherein the representative from NTPC informed that the expected commissioning schedule of the project would be in 2021-22 timeframe. As per application, LTA has been sought for 25 years. The applications were also discussed during the 22<sup>nd</sup> & 23<sup>rd</sup> meeting of SCSPWR held on 30/11/15 & 01/06/16

respectively for evacuation of power from the generation project. UPPTCL had certain reservations on the proposed system and it was agreed that the system may be reviewed jointly by CEA, UPPTCL, CTU & NTPC and thereafter may be finalized in the next Standing Committee meeting/NR LTA meeting.

- 19.2 Accordingly, a meeting was held on 23/11/2016 at UPPTCL office, Lucknow among CEA, POWER GRID & UPPTCL officials. During the meeting, following Transmission system was discussed for evacuation of power through Barethi STPP:

**Transmission System for Connectivity:**

- LILO of second Ckt. of Satna-Gwalior 765 kV 2x S/C line at Barethi STPP

**Transmission System for LTA:**

- Barethi STPP - Orai (PG) 765 kV D/c line\* # {LILO of first circuit of Satna – Gwalior 765 kV 2xS/c line at Orai may be extended to Barethi STPS so as to form Barethi STPS – Orai 765 kV D/c line and Satna – Gwalior 765 kV first S/c line may be straightened}
- Orai (PG) – Kanpur (PG) 765 kV D/c line
- LILO of one Ckt. of Agra (PG) - Fatehpur (PG) 765 kV D/c line at Kanpur (PG)
- Aligarh (PG) - Modipuram (UP) 765 kV D/c
- LILO of Hapur (UP) - G.Noida (UP) 765 kV S/c line at Modipuram (UP) (765kV D/c)

*\* 765 kV line bays at Barethi STPP shall be provided by the applicant.*

*# Barethi STPS - Orai 765kV D/c line such formed shall have 240 MVAR fixed line reactor in one circuit at Orai end. 240 MVAR fixed line reactor in other circuit at Orai end needs to be provided under the present scheme.*

- 19.3 The studies have been carried out with the above proposed transmission system by POWERGRID. POWERGRID may present the study details.

- 19.4 Members may deliberate.

**20.0 Operational Feedback (NR Region):**

S. No	Corridor	Season/ Antecedent Conditions	Description of the constraints	Remarks
1	400kV Dadri- Greater Noida	All time	High MW loading  Remarks: After the commissioning of 400kV Gr.Noida (765/400kV) - Gr.Noida (400kV) D/C, loading of 400kV Dadri-	UPPTCL to Respond

			Gr.Noida would be reduced.	
2	400kV Mahendragarh- Dhanonda D/C	All time	High MW loading  Remarks: High Loading was observed during to less/outage of generation at CLP Jhajjar (35% of time, generation was under outage & 30% of time under less generation.	HVPNL to Respond
3	400kV Singrauli- Anpara	All time	Full generation at Singrauli/Rihand and with Rihand stage-3 Unit#5 & 6 is also evacuating through the same complex, loading of Singrauli-Anpara becomes very high. Sometime due to low generation at Anpara –A, B & C and high generation at Rihand-Singrauli Complex, 400kV Singrauli-Anpara often get overloaded. Remarks: Multiple connectivity should be ensure for Singrauli-Anpara Or uprating of existing 400kV Singrauli- Anpara.	CTU/UPPTCL to Respond
4	400kV Anpara- Obra	Some times	Connected to generating station. (Anpara-B & C). Remarks:Loading on the same lines has reduced after the commissioning of 660MW generating unit-1 at Bara. The loading may likely to be increased in case of N-1 contingency of 765kV Bara – Mainpuri ckt-2 or N-1 contingency of single 765/400kV ICT at Mainpuri	UPPTCL to Respond
5	400kV Anpara- Sarnath-1 & 2	All time	Connected to generating station. (Anpara-B & C) Remarks: The loading may be reduced after commissioning of Anpara D – Unnao S/c line.	UPPTCL to Respond
6	400 kV Bamnoli- Jhatikara D/C line	Some time	Connected to 765 kV Jhatikara S/S	CTU / DTL to respond
7	Underlying network of following substation is		220kV network not available; 1. Bhiwani (Haryana) 2. Jind (PG) 3. Sohawal (PG)	STUs/CTU to Respond

	not available		4. New Wanpoh (PG) 5. Kurukshetra(PG) 6. Chittorgarh (RVPNL)	
<b>ICT Constraints</b>				
S. No	ICT/Constraint	Season/ Antecedent Conditions	Description of the constraints	Remarks
1	765/400kV Phagi ICTs (2 X 1500 MVA)	December	Two ICTs of 1500MVA each capacity at 765/400kV Phagi S/s. and not N-1 compliant beyond 1700MW. On commissioning of 765kV Phagi-Bhiwani 2nd ckt on 29/09/2016, loading at 765/400kV ICTs has been reduced slightly. Afterwards, on commissioning 400kV Phagi-Heerapura D/C, the loading of 765/400kV ICTs at Phagi has been increased again and it would further increase after commissioning of upcoming 400kV Phagi-Ajmer D/C and generation at Chhabra Super Critical. Remarks: 3rd ICT of 1500MVA capacity at Phagi should be expedited as Rajasthan experiences high load in winter.	RRVPNL to Respond
2	765/400kV ICTs of Unnao (2 X 1000 MVA)	Security issues of 765 kV Anpara- Unnao or n-1 contingency of Unnao ICT	Evacuation of Anpara C thermal power station through 765 kV Anpara-Unnao.  Unnao ICTs are loaded more than ~1100MW and not N-1 compliant.	UPPTCL to Respond
3	400/220 kV Agra(UP) (2 X 315MVA + 1 X 500MVA)	All time	High loading at Agra and not N-1 compliant beyond 800MW.	UPPTCL to Respond

4	400/220kV Mainpuri (2 X 315 MVA)	All Time	Two ICTs of 315 MVA each loaded in the range of ~230 MW and not N-1 compliant. Remarks: To be expedited planned 3 <sup>rd</sup> ICT of 500MVA at Mainpuri.	CTU to Respond
5	400/220kV Azamgarh (2 X 315 MVA)	October	Two ICTs of 315MVA each and loading of both ICTs is more than 400 MW, which is not N-1 compliant.	UPPTCL to Respond
6	400/220kV Sultanpur (2 X 315 MVA)	All Time	Two ICTs of 240 MVA each. Loading at Sultanpur is in range of ~300-330 MW, which is not N-1 compliant	UPPTCL to Respond
7	400/220kV Wagoora (4 X 315MVA)	Security issues of 220KV Network at Wagoora, only 4 ckts are there	Four ICTs of 315MVA each loaded in 200-225MW. 4 Ckts of 220kV level; 220kV Wagoora Pampore D/C, 220kV Wagoora-Zainkote D/C. All four lines are critically loaded.	PDD, J&K/CTU to Respond
8	Single ICTs at following 400kV Nodes:		1. Chhabra (Rajasthan) – 1 x 315 MVA 2. Kalisindh (Rajasthan) – 1 x 315 MVA 3. Rajwest (Rajasthan) – 1 x 315 MVA 4. Bhiwani (BBMB) – 1 x 500 MVA 5. Agra(PG) – 1 x 315 MVA (2nd ICT already planned) 6. Dehar (BBMB) – 1 x 250 MVA	STUs/CTU to Respond
9	400/220 kV Mau	Most time	Two ICTs of 200 MVA each. Loading at one ICT is in the range of 230 to 250 MW which is not n-1 compliant	UPPTCL to respond

## **21.0 Power evacuation plan for Nakhtan HEP (4x115 MW)**

- 21.1 Himachal Pradesh Power Corporation Limited (HPPCL) vide their letter HPPCL/EC/Nakhtan/EoP/2016/2673-79 dated 11.1.2017 has informed that they are in the process of taking up Nakhtan HEP (4x115 MW) for execution in near future and the DPR of the same is in the final stage. Therefore, they have requested to finalize the power evacuation plan as per the report submitted by CEA,
- 21.2 This hydroelectric project is located on Tosh Nallah and Parbati river tributaries of Beas River in District Kullu of Himachal Pradesh. As per the report on "Transmission system for upper part of Satluj Basin and Chandrabhaga Basin, CEA vide letter no. 8/16/SP&PA/2011/1727-32 dated 25.11.2011 has suggested the following for evacuation of power from Nakhtan HEP:-
- 21.3 *"Nakhtan HEP(520 MW)–Nakhtan HEP is located in the upstream of Parbati–II (earlier it was identified as Parbati–I with a capacity of 750 MW. Due to environmental issues, the project capacity has been revised to 520 MW and names as Nakhtan). Regarding evacuation of power from Nakhtan HEP, some new pooling station is in the vicinity of Parbati – II or Parbati –III or Parbati Pooling Station would have to be developed and the scheme would be integrated with Parbati/Koldam system. While finalizing the scheme, the constraint in switching capacity of Parbati/Koldem HEP is to be taken into account.*
- 21.4 Members may like to deliberate.

## **22.0 Creation of 220kV substation at Deoli Ahir (Mohindergarh) and associated transmission system:**

- 22.1 HVPNL vide their letter no. Ch92/408/K-117 dated 16.2.2017 has proposed for the establishment of 220 kV substation at village Deroli Ahir (in Mohindergarh District of Haryana) with a capacity of 2x160 MVA (220/ 132 kV)+2x100 MVA (220/33 kV)+1x5 MVA (33/11 kV) with following scope of works:-
1. Establishment of 220/132/33/11kV S/s at Deoli Ahir with the capacity of 2x160 MVA (220/132 kV)+2x100 MVA (220/33 kV)+1x5 MVA (33/11 kV)
  2. 220 kV D/C line from 400/220kV Substation, Dhanoda to proposed 220kV Deroli Ahir Substation, with ACSR Moose conductor (25 Km).
  3. 220 kV S/C Deroli Ahir-Narnaul line on D/C towers with ACSR Moose conductor (14 Km).
  4. Augmentation of 220kV Substation at Dhanonda from 2x100MVA, 220/132kV+100MVA, 220/33kV Transformers to (1x100+1x160) MVA,



## 220/132kV+100MVA, 220/33kV Transformers

22.2 From the studies furnished by HVPNL, it is observed that Dhanonda 400/220kV, 3x315 MVA, ICTs are overloaded and no augmentation in the transformation capacity at 400/220 kV level has been proposed. HVPNL may clarify.

22.3 Members may deliberate.

### **23.0 Issues related to transmission system for evacuation of power for Bajoli Holi HEP (180MW) of M/s GMR Energy Ltd. in Himachal Pradesh.**

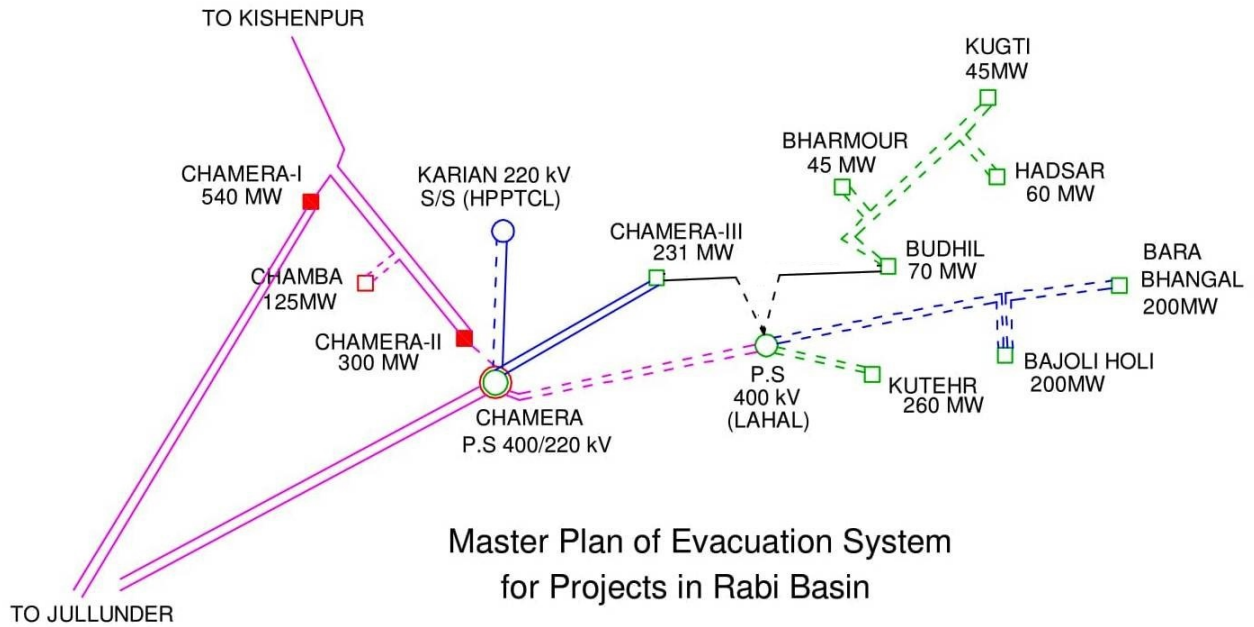
23.1 M/s GMR Energy Ltd. vide their letter dated 27.1.2017 informed that they are constructing Bajoli Holi HEP (3x60MW) on Ravi river in HP. Long Term access was granted to M/s GMR Bajoli Holi Hydropower Pvt. Ltd. in Mar'14 for 155 MW from August'2018 for 25 years through the following transmission system:

- Through 220 kV high capacity line from Bajoli Holi to Lahal Pooling Station of Himachal with Twin Moose conductor\*
- 400 kV D/c line from Lahal Pooling Station to Chamera Pooling Station (PG)\*

*\*As agreed earlier, above mentioned transmission system is to be implemented by HPPTCL.*

23.2 Further, GMR had mentioned that there would be possible delay in the implementation of transmission system to be implemented by HPPTCL for evacuation of power from the generation project due to difficult terrain, forest clearance and severe ROW problem. In view of these difficulties leading to imminent delay in the connectivity arrangement, following temporary arrangement is proposed by GMR, so that power can be evacuated from temporary arrangement till the originally planned system is completed:

- To connect from Plant bus to Lahal pooling station by the presently envisaged transmission line Bajoli Holi-Lahal P.S 220 kV D/c by expediting the commencement and completion of construction
- Lahal P.S – Budhil HEP 220 kV D/c line (nearing completion)
- Budhil HEP – Chamera-III 220 kV S/c line (existing)
- Chamera-III – Chamera Pooling station through existing ISTS transmission system.



23.3 HPPTCL may present the status of transmission system for evacuation of power from Bajoli Holi HEP and interim arrangement in case of delay in the transmission system.

23.4 Members may deliberate.

**24.0 Agenda proposed by PTCUL for consideration of Transmission Network upto 400 kV S/s Srinagar of UITP Scheme developed by PTCUL as part of System Strengthening of Northern Region and modifications in the UITP scheme for Alakhnanda Basin.**

24.1 PTCUL vide their letter 303 /Dir. (Projects)/PTCUL/ PGCIL dated 16.2.2017 has proposed to consider some of the transmission Network elements of UITP scheme, which are common for all Generators, under System Strengthening of Northern Region. Further, PTCUL vide their letter 896/dir(P)/PTCUL/CEA dated 27.4.2016 has requested for inclusion of the following in the agenda:

- i. LILO of 400kV Vishnuprayag –Muzzafrnagar line at proposed Pipalkoti 400kV S/s for evacuation of power of upcoming generators in Alakhnanda basin.
- ii. modification in the scope for evacuation of power from Vishnugarh HEP and Pipalkoti HEP as approved in the 38<sup>th</sup> meeting of SCSPNR held on 30.5.2016.
- iii. Consideration of transmission network upto Srinagr 400kV S/s of UITP scheme developed by PTCULfor evacuation of power of upcoming

generators in Alakhnanda basin as a part of System Strengthening of Northern Region so as to ensure recovery mechanism for transmission charges of transmission network developed by PTCUL:

- a) 400 kV Srinagar S/s.
- b) 400 kV DIC Transmission Line from Srinagar Power house to Srinagar S/s.
- c) 400 kV DIC Srinagar to Kashipur.
- d) 2 Nos. 400 kV Bays at Kashipur 400 kV S/s
- e) Pipalkoti - Srinagar 400 kV D/C Line.
- f) Vishugad - Pipalkoti 400 kV D/C Line.
- g) LILO of 400 kV D/C Line from Vishnuprayag to Muzaffarnagar at 400 kV S/s Pipalkoti
- h) 400 kV S/s at Pipalkoti

- 24.2 PTCUL is developing UITP (Uttarakhand Integrated Transmission Project) scheme in Uttarakhand for evacuation of Power from mainly Central Sector Generating Stations (CSGS) to the beneficiaries of Northern Region. PTCUL has been granted status of Deemed ISTS Licensee by CERC vide its Order dated 31.01.2013. CTU is the Nodal Agency for granting Connectivity and Open Access to the Generators in line with the applicable CERC Regulations. Therefore, PTCUL has requested all Generators to approach PGCIL for seeking Connectivity and Open Access on the Deemed ISTS network. Accordingly, NTPC, THDC, Lanco and L&T have approached PGCIL for Connectivity and Open Access or are in the process of applying to PGCIL for the same.
- 24.3 UITP Scheme is being developed by PTCUL as per concurrence received from CEA way back in 2007 and funded by financial institutions like ADB & PFC. Therefore, lots of Project Implementation activities were initiated by PTCUL from early 2008 for timely completion of UITP Scheme, in order of facilitate evacuation of Power from these Generators. Therefore, projects which were awarded earlier in 2010 like 400 kV S/s Srinagar and 400 kV D/C Transmission Line from Srinagar P/H to Srinagar S/s, were executed as per plan. Also, NTPC was initially provided Open Access in year 2009, then it was changed to year 2011, subsequently it was changed to year 2013 and now as per IA executed between PTCUL and NTPC. COD of 1<sup>st</sup> unit of Tapovan Vishnugad HEP (520MW) has been considered as March, 2019.
- 24.4 Recently, Srinagar 400 kV S/s and 400 kV D/C Transmission Line from Srinagar PH to Srinagar S/s has been commissioned by PTCUL as a part of deemed ISTS network and accordingly, petition for determination of YTC (Yearly Transmission Charges) for these elements were filed by PTCUL before the CERC. In the matter, it is to apprise that CERC at various hearing in the matter has directed PTCUL to enter into necessary Agreements with the Generators in order to securitize the recovery of Transmission Charges for the deemed ISTS network. It was also

advised by the CERC that PTCUL should take all necessary steps in order to ensure the recovery of the investment being made by PTCUL.

- 24.5 UITP Scheme was planned in order to facilitate the upcoming Generating Projects in the Uttarakhand and their beneficiaries in Northern Region. Also, considering the importance of this Scheme, CEA has given concurrence for execution of the Transmission Projects. Financial Institutions like ADB and PFC are also funding the UITP Scheme and considering the same PTCUL had initialed the Tendering Process and implementation Activities for construction of Transmission System. PTCUL is making huge investment in UITP Scheme but there is inordinate delay in execution of Generation Projects.
- 24.6 In the 36<sup>th</sup> meeting of SCPSNR held on 13.7.2015 UPPTCL, on the issue of modification of UITP scheme by PTCUL, has observed that LILO of one circuit of Vishnuprayag - Muzaffarnagar 400 kV D/C Line at Srinagar HEP(330 MW) was not indicated in the single line diagram, therefore it was not clear which of the two circuits was being LILOed at Piplakoti 400kV S/s. Correction in the SLD along with load flow studies was requested by UPPTCL. In the meeting it was agreed that the observations of UPPTCL would be discussed in next SCM.
- 24.7 Members may deliberate.

#### **25.0 Evacuation of New Generation Project in 13<sup>th</sup> Plan (2017-2022):**

- 25.1 During the 38<sup>th</sup> meeting of SCPSNR, the proposal of UPPTCL on the transmission system for evacuation of power from 1x660 MW Panki Extension TPS, 1x660 MW Harduaganj Extn., 2x660 MW Obra “C” TPS and 2x660 MW Jawaharpur (Etah) TPS along with some 765 kV and 400kV Substations was agreed in-principle. In the meeting, POWERGRID raised the concern about the high short circuit at various nodes in Northern region and it was decided that a detailed study on the short circuit would be presented in the next meeting of SCPSNR and would be a part of outcome of committee constituted to look into the high short circuit levels in Singrauli, Anpara generation complexes as well as other nodes in the northern region.
- 25.2 Accordingly, a meeting was held on 23-11-2016 at UPPTCL office, Lucknow among CEA, POWERGRID and UPPTCL officials. During the meeting, it was found that evacuation system from 1x660 MW Panki Extension TPS, 1x660 MW Harduaganj Extn., 2x660 MW Obra “C” TPS and 2x660 MW Jawaharpur (Etah) TPS along with some 765 kV and 400kV Substations is in order. However, it was observed that fault level at Bagpat and Modipuram is 41kA and 31kA respectively. With implementation of Modipuram–Bagpat 400kV D/C line the fault level at these buses increases to 48kA and 40 KA. Therefore, it was suggested to drop Modipuram –Bagpat 400kV D/C line.
- 25.3 Members may deliberate

## **26.0 Study to limit high Short Circuit level of various Substations in NR (Phase 2)**

26.1 Due to large growth in transmission network and addition of generation, there has been an inherent increase in short circuit level of the various substations in Northern Region. The increase in short circuit level has resulted in a scenario where, in some cases, the short circuit current has crossed the short circuit withstand capability of the substations. Study has been carried out in the 2019-20 timeframe to mitigate this problem of high short circuit current. From the results, it is seen that the problem of high short circuit level is observed in pockets (where each pocket consists of a group of substations having high fault level) in Northern region. Few such pockets are given below:

- i. Various substation associated with high capacity D/c (Quad Moose) ring of NCR,
- ii. Meerut, Bagpat, Abdullapur, Panchkula and Patiala,
- iii. Bhiwani, Hissar, Mahendergarh and Moga,
- iv. Agra,
- v. Kanpur, Panki, Fatehpur and Allahabad,
- vi. Singrauli, Anpara and Rihand,
- vii. Lucknow, Bareilly and Unnao

26.2 Considering the fact that corrective measure taken at one substation will have a dispersed effect in reducing short circuit current in neighboring substations, it is prudent to resolve the issue of high short circuit level in phases. One such attempt had already been made to reduce the short circuit current of substations associated with NCR ring (may be considered as Phase 1). Study has been carried out presently for 2019-20 time frame. Further, based on the severity of high short circuit level and strategic importance of the location of substation, some more substations have been taken up presently as under phase 2, to limit the short circuit current. The following substations have been considered under phase 2:

### **26.2.0 Substations associated with high capacity D/c (Quad Moose) ring of NCR:**

26.2.1 In the 32<sup>nd</sup> Standing Committee meeting of Power System Planning of Northern Region a number of series line reactors, series bus reactors and bus split arrangement at Bawana and Dadri were proposed to contain the short circuit level of the substations associated with NCR ring. Detail of the above mentioned proposed system is enclosed at **Annexure–VII**. After detailed deliberation, it was agreed that only 2 nos. of series line reactor and 2 nos. of series bus reactor is to be implemented under Phase- I and the rest of the proposed elements may be taken up after gaining operational experience. The following series line reactors and series bus reactors were approved for implementation:

- a. 12ohm Series bus reactor at 400/220kV Mandola(PG),
- b. 12ohm Series bus reactor at 400/220kV Ballabgarh(PG),
- c. 12ohm Series line reactor on both circuits of Dadri–Mandola 400kV D/c line at Mandola S/s end.

26.2.2 Study was carried out for 2019-20 time frame including the above series bus reactors and series line reactors and the results are as tabulated below:

	With only 2 nos. of series line reactors and 2 nos. of series bus reactors	With all approved series line reactors and bus reactors indicated at Annex-VIII (without Bus split at Bawana & Dadri)	With complete proposed scheme including Bus split at Bawana & Dadri
	3 ph fault current	3 ph fault current	3 ph fault current
NAWADA	28.72	16.99	16.48
BAWANA 1	52.45	46.24	22.79
BAWANA 2	-	-	35.74
DADRI-NCR 2	-	-	23.47
DADRI-NCR 1	49.56	45.20	34.86
BAMNOLI	32.37	30.74	30.62
G. NOIDA	35.62	18.92	17.95
MUNDKA	39.71	31.91	31.42
JHATIKARA 1	37.77	30.27	30.11
JHATIKARA 2	32.94	31.48	31.37
RAJGHAT	44.60	35.16	32.94
TUGHLAKABAD	33.90	29.56	29.39
MANDOLA1	43.41	41.95	40.36
MANDOLA 2	35.02	31.14	29.92
BALLABHGARH 1	34.34	29.71	29.23
BALLABHGARH 2	34.70	30.48	30.29
MAHARANIBAGH	28.96	25.06	24.37

26.2.3 From above results, it is observed that installing the approved bus reactors at Ballabgharh and Mandola and series line reactors on both circuits of Dadri – Mandola 400kV D/c line, is not sufficient to limit the short circuit current of all buses associated with NCR ring. It is also seen that after considering all the proposed series reactors and bus split arrangement at Bawana and Dadri, the short circuit of all above mentioned substations come within limit (except for Mandola, which gets addressed after controlling fault current level at Meerut separately). Thus considering the criticality of the issue, it is proposed that the remaining elements may be approved as proposed in the 32<sup>nd</sup> meeting of SCPSNR to contain the short circuit level in NCR ring. Schematics of Series line reactor and series bus reactor, proposed to be installed in the NCR ring is shown in the figure 1 as follows:

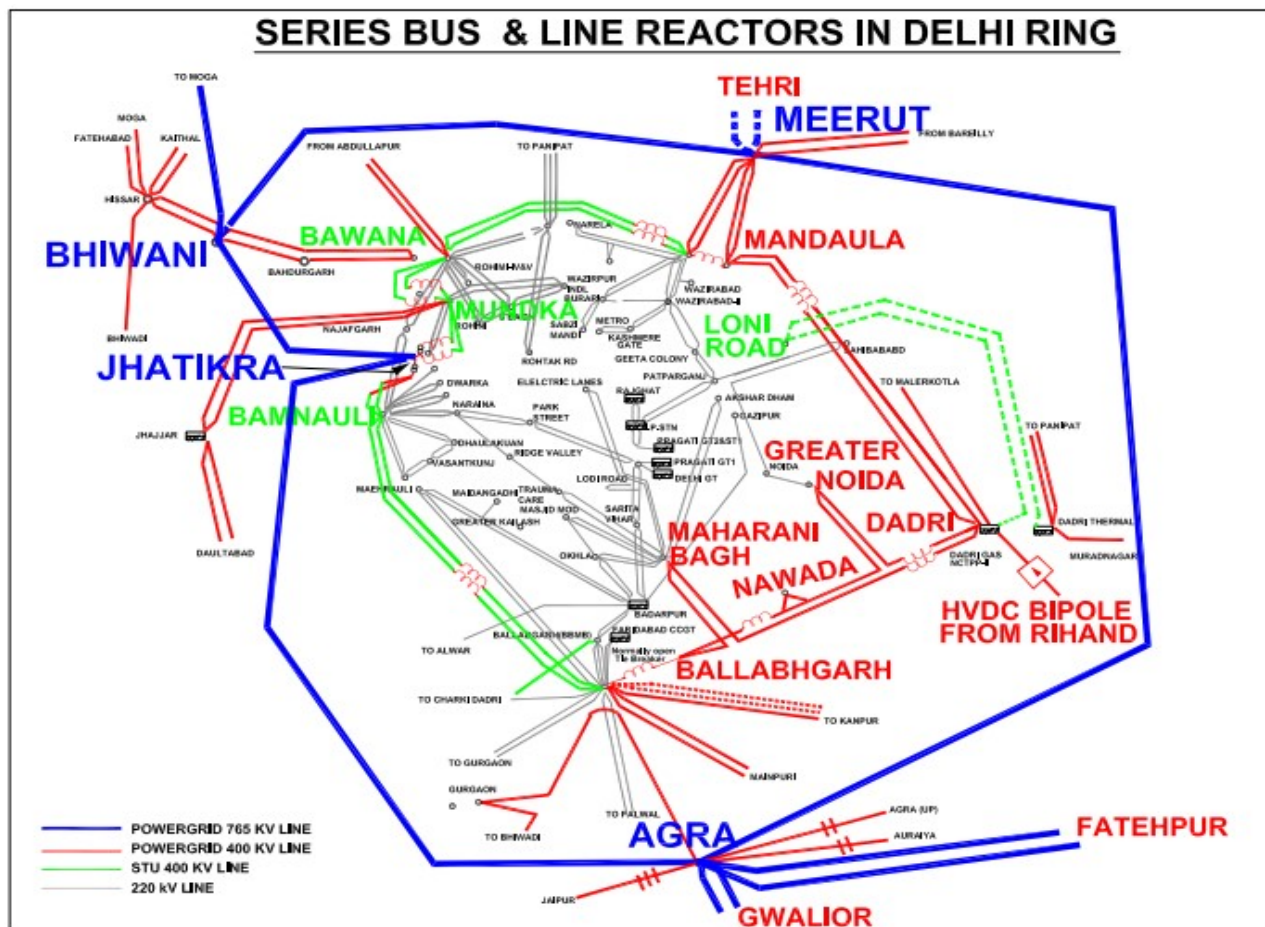


FIGURE 1

### 26.3.0 Meerut Substation:

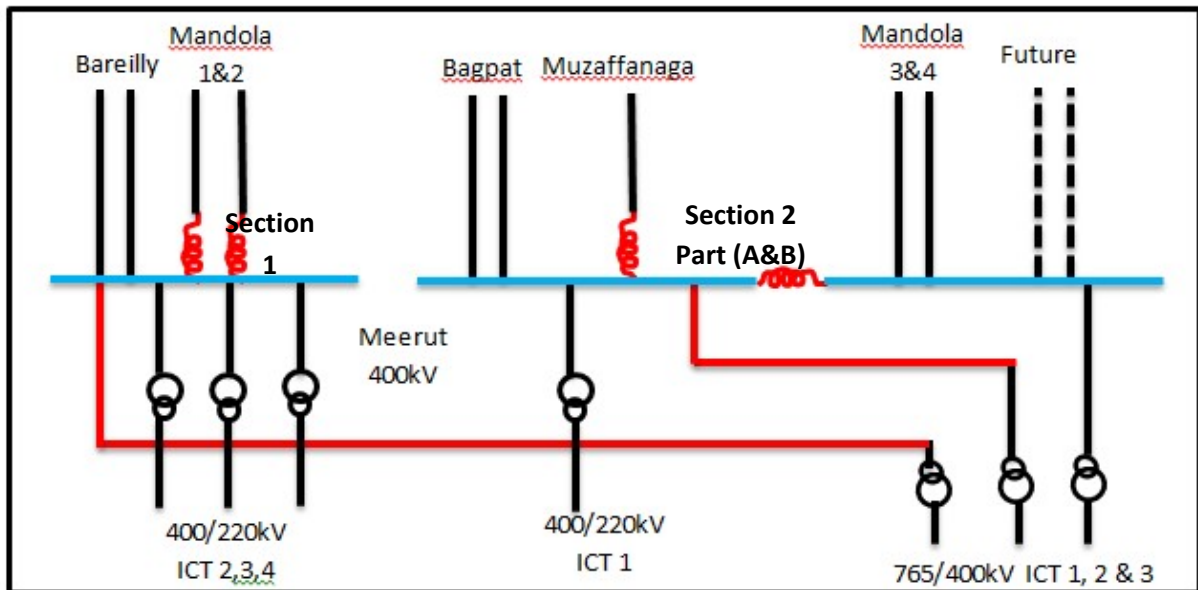
26.3.1 Considering all proposed arrangements and series reactor elements in the NCR ring, it was seen that the short circuit fault current of Meerut substation was still 60kAmps. To contain the short circuit fault current of Meerut substation, following arrangement is proposed (details shown in the figure 2).

- a. 765kV Tehri Pooling –Meerut D/c line (presently charged at 400kV) would be shifted from 400kV to 765kV switchyard at Meerut after upgradation. Two nos. of bays which get vacated after shifting may be utilised as following:
- b. 400kV Meerut bus may be split in two sections-  
Section 1:
  - i. 400kV feed from 765/400kV ICT- 3
  - ii. 400kV Bareilly- Meerut D/c line
  - iii. 400kV Meerut – Mandola D/c line (Ckt I & II)

iv. 400/220kV ICT 2, 3, 4 (315\*2 + 500 MVA)

Section 2 consisting of two parts (A & B):

- i. Part A - 400kV Meerut – Bagpat D/c line, 400kV Meerut – Muzaffanagar line, 400kV feed from 765/400kV ICT 2 and 400/220kV ICT 1 (315 MVA)
  - ii. Part B - 400kV Meerut – Mandola D/c line (ckt 3 & 4), 400kV feed from 765/400kV ICT 1 and space for future expansion.
  - iii. 12ohm series bus reactor between Part A and B of section 2.
- 12ohm series line reactor on Meerut – Mandola 400kV D/c line (Ckt I & II) at Meerut end and on Meerut - Muzaffanagar 400kV line at Meerut end.



**FIGURE 2**

26.3.2 It can be seen that after Meerut 400kV bus has been split in mainly two sections, where each of the bus section can act as an independent substation with two or more reliable power infeed and sufficient out feeds. Further, all sections of Meerut 400kV bus will be interconnected with each other through 400kV Mandola. With the above arrangement, the short circuit level of the sections is:

Substation	3 phase fault current
<b>Base case</b>	
Meerut	60kAmp



<b>After proposed re-arrangement</b>	
Meerut 1	32kAmp
Meerut 2 Part A	37kAmp
Meerut 2 Part B	30kAmp

26.3.3 The above re-arrangement also significantly affects short circuit level of 400/220kV Mandola substation which reduces as given as follows:

<b>Substation</b>	<b>3 phase fault current</b>
<b>Original Case</b>	
Mandola 1	41kAmp
Mandola 2	30kAmp
<b>With proposed re- arrangement</b>	
Mandola 1	36kAmp
Mandola 2	28kAmp

#### **26.4.0 400/220kV Kanpur Substation:**

26.4.1 After considering above proposed arrangement/elements in NCR ring and at 400kV Meerut, it was seen that the fault level of 400/220kV Kanpur substation is still 58kAmps.

In 2019-20 timeframe, based on studies, it is envisaged that 400/220kV Kanpur would have power infeed mainly from following lines:

- a. Two circuits from Fatehpur,
- b. Three circuit from Allahabad,
- c. Two circuits from 765/400kV Kanpur(New),

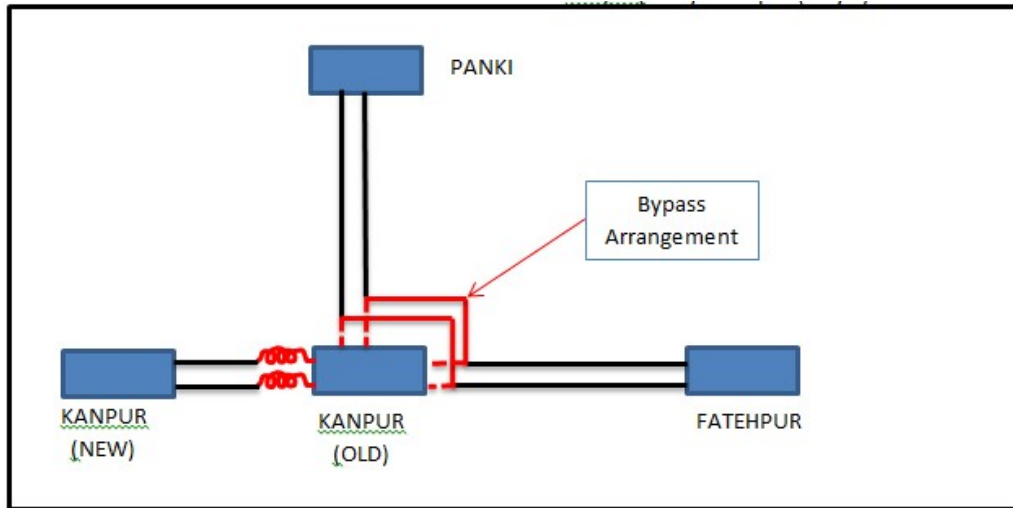
Similarly, it is envisaged that power is drawn mainly through following lines from 400/220kV Kanpur:

- a. Two circuits to Panki,
- b. Three circuits to Ballabgarh (with FSC),
- c. One circuit to Agra,
- d. Two circuits to Auriya (during low generation at Auriya)

26.4.2 To contain the short circuit fault current of (400/220kV) Kanpur substation, the following two re-arrangement option (detail shown in Figure 3.1 & 3.2) are proposed:

**OPTION 1**

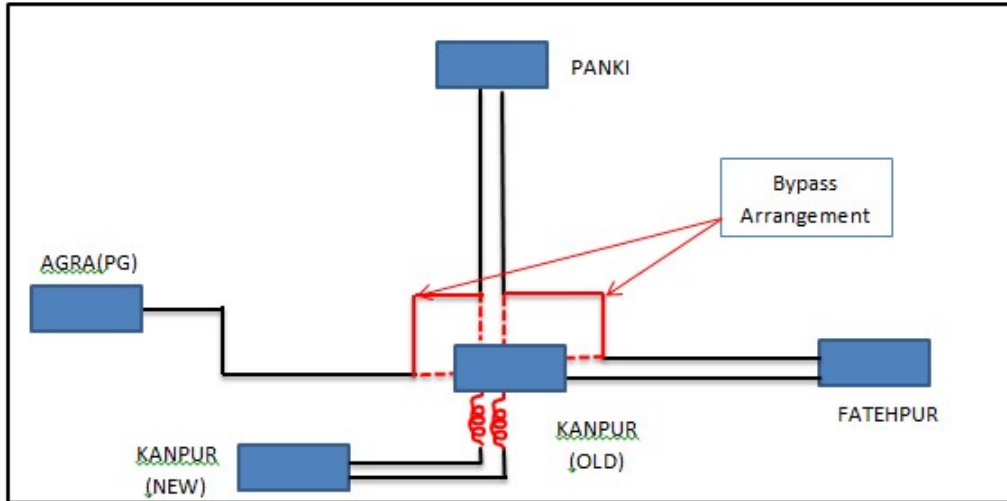
- a. Fatehpur–(400/220kV) Kanpur 400kV D/c and (400/220kV) Kanpur-Panki D/c 400kV lines to be disconnected at (400/220kV) Kanpur end and connecting them directly (i.e. Fatehpur will be directly connected to Panki through 400kV D/c lines).
- b. Two 12ohm series line reactors on both circuits of (400/220kV) Kanpur – (765/400kV) Kanpur (New), 400kV D/c line at (400/220kV) Kanpur end.



**FIGURE 3.1**

**OPTION 2**

- a. One circuit of Fatehpur –(400/220kV) Kanpur 400kV D/c and one circuit of (400/220kV) Kanpur-Panki D/c 400kV lines (say circuit 1) to be disconnected at (400/220kV) Kanpur end and connecting them directly (i.e. Fatehpur will be directly connected to Panki through one 400kV line).
- b. Agra(PG) - (400/220kV) Kanpur 400kV line and remaining circuit of (400/220kV) Kanpur –Panki D/c 400kV lines to be disconnected at (400/220kV) Kanpur end and connecting them directly (i.e. Agra(PG) will be directly connected to Panki through one 400kV line).
- c. Two 12ohm series line reactors on both circuits of Kanpur (400/220kV)–Kanpur(New) (765/400kV) 400kV D/c line at (400/220kV) Kanpur end.



**FIGURE 3.2**

Panki is connected to a reliable power source from Unnao and Obra/Rewa Road, and after above re-arrangement, Panki will also be directly connected to another reliable source Fatehpur(for option 1), or Fatehpur and Agra(PG) (for Option 2), instead of Kanpur(present case) for drawl of power. Considering the above no constraints in power flow is expected.

After considering the above arrangement at (400/220kV) Kanpur, the short circuit level of (400/220kV) Kanpur, Panki and Kanpur(new) is as follows:

Substation	3phase fault current
<b>Base Case</b>	
Kanpur(new)	53kAmp
Kanpur	58kAmp
Panki	52kAmp
<b>With proposed re- arrangement Option 1</b>	
Kanpur(new)	33kAmp
Kanpur	36kAmp
Panki	26kAmp
<b>With proposed re- arrangement Option 2</b>	
Kanpur(new)	33kAmp
Kanpur	38kAmp
Panki	26kAmp

### **26.5.0 Bhiwani(PG), Hissar, Mahendergarh, and Dhanonda Substations.**

- 26.5.1 After considering the proposed arrangement/elements stated above, it was seen that the short circuit level of Bhiwani(PG), Hissar, Mahendergarh, and Dhanonda substations was 62kAmps, 50kAmps, 53kAmps & 54kAmps.
- 26.5.2 As per 2019-20 basecase, power flows from Mahendergarh to Bhiwani(PG), from Bhiwani(PG) to Hissar(PG) and then from Hissar(PG) to Moga(PG). There are 4 nos. of 400kV lines from Mahendergarh to Bhiwani(PG) (2 nos. existing and 2 nos. under construction), 4 nos. of 400kV lines from Bhiwani(PG) to Hissar(PG) (one line through Bhiwani BBMB) and 4 nos. of 400kV lines from Hissar(PG) to Moga(PG) (one line through Fatehabad).
- 26.5.3 Considering the above scenario, following is proposed at Bhiwani(PG), Hissar(PG), Mahendergarh, and Dhanonda(HVPSNL) substations (details also shown in figure 4).
- Mahendergarh–Bhiwani (PG) 400kV D/c line (ckt. I & II) and Bhiwani(PG)-Hissar (PG) 400kV D/c line (ckt II & III) to be disconnected from Bhiwani end and directly connected as Mahendergarh–Hissar 400kV D/c line.
  - Bhiwani (PG)–Hissar (PG) 400kV line (ckt. I) and Hissar (PG)–Fatehabad(PG) 400kV line to be disconnected at Hissar end and directly connected as Bhiwani(PG) – Fatehabad (PG) 400kV line.
  - Bhiwani (BBMB)–Hissar (PG) 400kV line and Hissar(PG) -Moga(PG) 400kV line (ckt I) to be disconnected at Hissar end and directly connected as Bhiwani(BBMB)– Moga (PG) 400kV line.
  - Bhiwani(PG) 400kV bus may be split into two sections(A & B) proposed to be connected using a 12ohm series reactor as:

#### **Section A :**

- 400kV feed from 765/400kV ICT I
- 2 nos. of 400/220kV ICT (I & II)
- Bhiwani(PG) - Jind 400kV D/c line
- Bhiwani(PG) – Bhiwani(BBMB) 400kV line
- Bhiwani(PG) – Bawana 400kV line
- Bhiwani(PG) – Bahadurgarh 400kV line

#### **Section B :**

- 400kV feed from 765/400kV ICT II
- Bhiwani(PG) - Mahendergarh 400kV D/c line
- Bhiwani(PG) – Babai(RRVPSNL) 400kV line

iv. Space for future expansion

Section A and B is proposed to be connected using a **12ohm series reactor**.

- e) **12ohm series line reactor** on both circuits of Mahendergarh–Dhanonda 400kV D/c line at Mohendergarh end.

After above re-arrangement, short circuit level at Bhiwani(PG), Hissar, Mahendergarh, and Dhanonda is:

<b>Substation</b>	<b>3phase fault current</b>
<b>Base Case</b>	
Bhiwani(PG)	62kAmp
Hissar	50kAmp
Mahendergarh	53kAmp
Dhanonda	54kAmp
<b>After proposed re- arrangement</b>	
Bhiwani(PG) Section A	39kAmp
Bhiwani(PG) Section B	38kAmp
Hissar	33kAmp
Mahendergarh	36kAmp
Dhanonda	46kAmp

26.5.4 It can be observed from the above table that after the proposed re-arrangement works at Bhiwani(PG) and Hissar(PG) and series reactor in Mahendergarh – Dhanonda 400kV D/c line, the short circuit level has come down significantly. Further, from the studies, it was observed that at Dhanonda S/s, there is a significant contribution in fault current from Jhajjhar generating station. This is because Dhanonda is directly connected to Jhajjhar generation through a very small 400kV D/c line and also is connected to Jhajjhar generation through Daulatabad. If suitable re-arrangement can made, short circuit level of Dhanonda can be brought further down.

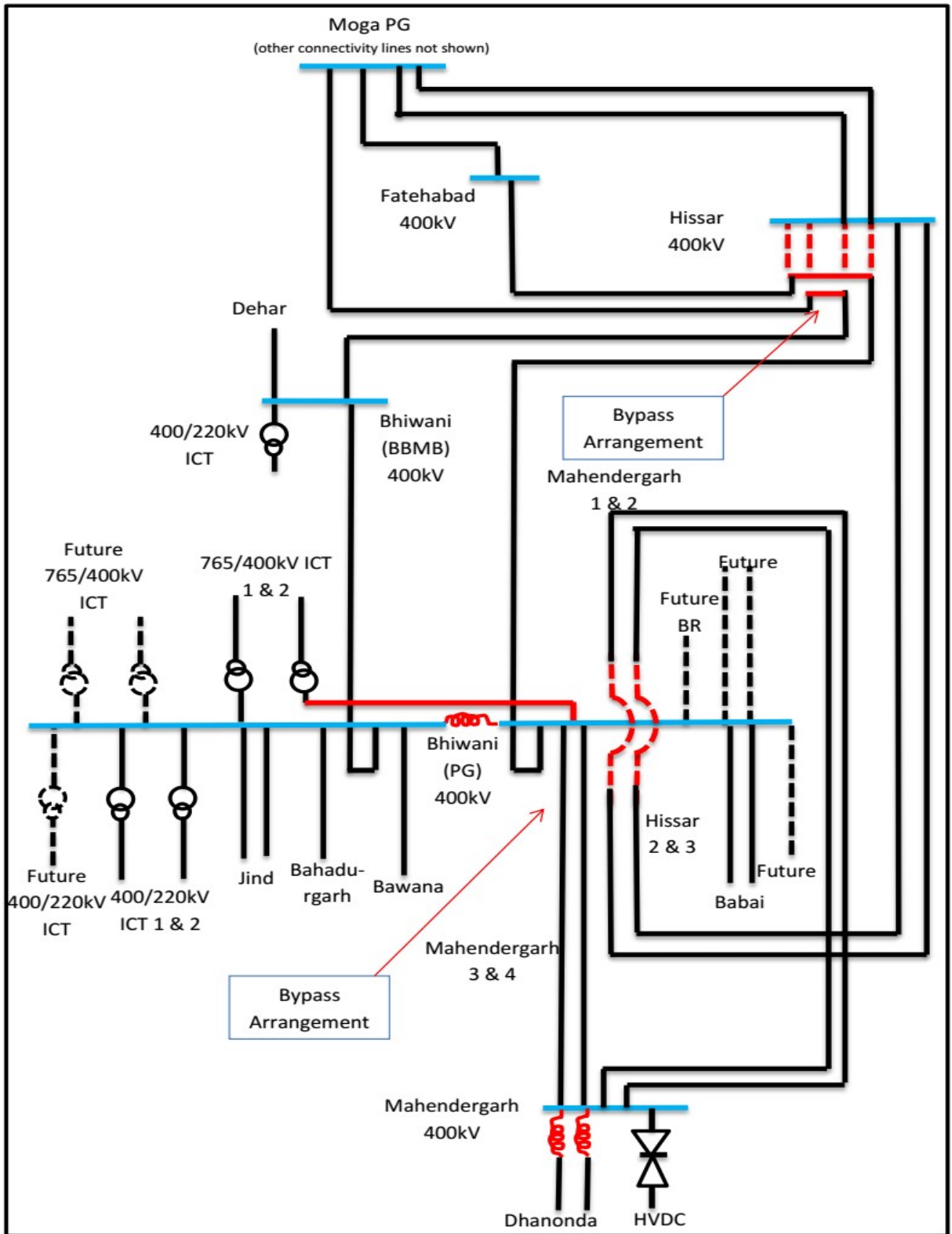


FIGURE 4

### **26.6.0 Anpara, Singrauli and Rihand:**

26.6.1 The issue of high short circuit level at Anpara, Singrauli and Rihand has been under discussion for last few Standing Committee Meetings of Power System Planning of Northern Region, but could not be resolved. Study has been carried out in this regard and following is proposed to contain the short circuit current at these substation within limits. Based on the study, following two options are proposed:

#### **OPTION 1** (details also shown in figure 5)

- i. LILO of Anpara–Mau 400kV line at Obra,
- ii. Anpara–Obra 400kV line (existing) and Anpara–Singrauli 400kV line to be disconnected from Anpara 400kV end and directly connected as Singrauli–Obra 400kV line.
- iii. 12ohm series line reactor to be installed in Singrauli–Obra 400kV line at Singrauli end (formed after the bypass arrangement at Anpara).

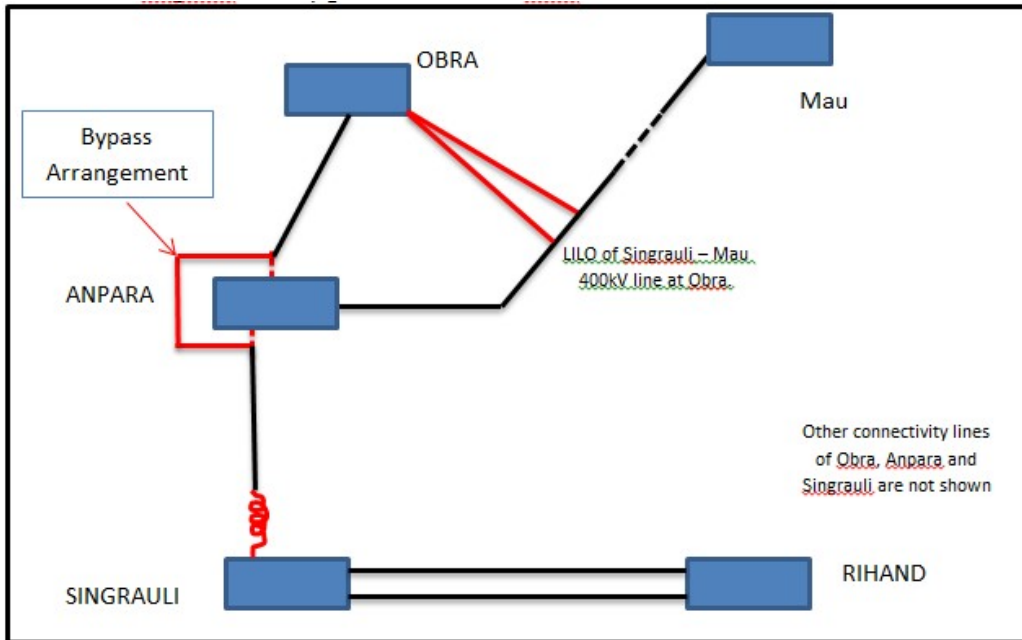
#### **OPTION 2**

- i. Anpara–Obra 400kV line ckt – 2 (new line),
- ii. Anpara–Obra 400kV line (existing) and Anpara–Singrauli 400kV line to be disconnected at Anpara 400kV end and directly connected as Singrauli–Obra 400kV line.
- iii. 12ohm series line reactor to be installed on Singrauli – Obra 400kV line at Singrauli end (formed after bypass arrangement at Anpara).

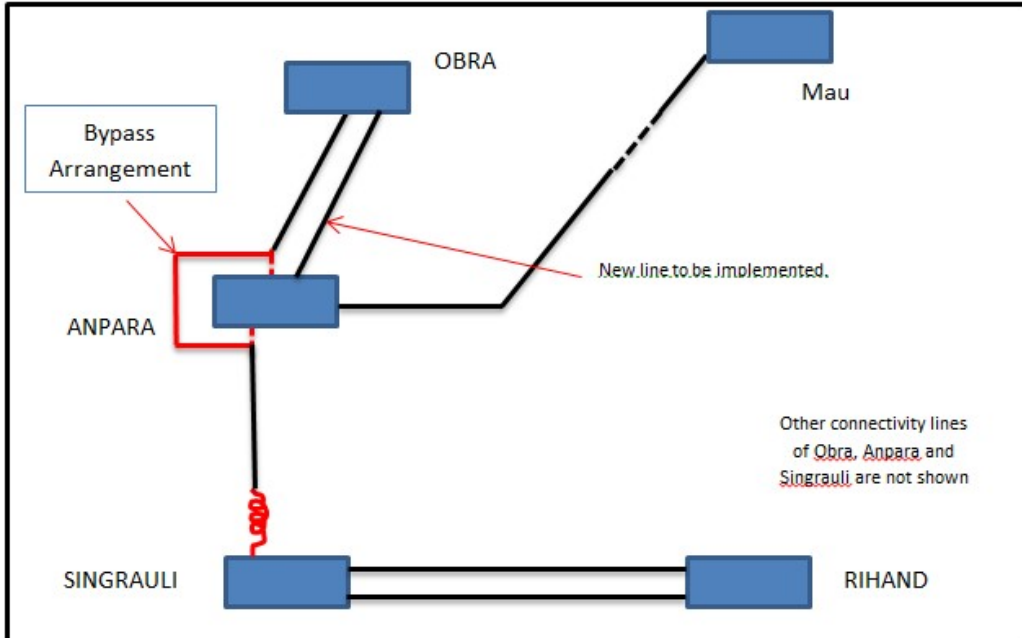
Comparison of result for both the options is tabulated below:

<b>Substation</b>	<b>3pf fault current.</b>		
	Present case	Option 1	Option 2
Singrauli 400kV	45.1 kAmp	35.7 kAmp	35.5 kAmp
Anpara 400kV	47.9 kAmp	34 kAmp	35.5 kAmp
Rihand	31.0 kAmp	28.6 kAmp	28.5 kAmp

26.6.2 Proposals are so made that short circuit current of these substation are brought within limit and at the same time the connectivity between the substations is not lost. Option 1 is preferable compared to option 2 because it leads to lesser construction work and more reduction in short circuit level.



**FIGURE 5 (option 1)**



**FIGURE 6 (option 2)**



### **26.3 Summary:**

Total Scope under Phase II

- a. 12ohm Series Line reactors in following lines:
  - Dadri-Maharanibagh 400kV Ckt I at Maharanibagh end
  - Dadri-Greater Noida 400kV Ckt I at Greater Noida end
  - Ballabhgarh-Bamnoli 400kV Ckt-I & II at Ballabhgarh end
  - Ballabhgarh-Nawada 400kV Ckt-I at Ballabhgarh end
  - Bawana-Mandaula 400kV Ckt-I & II at Mandaula end
  - Bawana-Mundka 400kV Ckt-I & II at Mundka end
  - Jhattikra-Mundka 400kV Ckt-I & II at Jhatikara end
  - Meerut – Mandola 400kV D/c line Ckt I & II at Meerut end
  - Meerut - Muzaffanagar 400kV line Ckt I at Meerut end
  - Kanpur (400/220kV)–Kanpur(New) (765/400kV) 400kV D/c line Ckt I & II at (400/220kV) Kanpur end
  - Mahendergarh–Dhanonda 400kV D/c line Ckt I & II at Mohendergarh end
  - Singrauli–Obra 400kV line Ckt I at Singrauli end.
- b. 12ohm Series Bus reactors at the following Substation:
  - Mandaula substations
  - Ballabhgarh substations
  - Meerut substation
  - Bhiwani(PG) substation.
- c. Following bypass arrangement is to be carried out
  - Mahendergarh–Bhiwani (PG) 400kV D/c line (ckt. I & II) and Bhiwani(PG)-Hissar(PG) 400kV D/c line (ckt II & III) to be disconnected from Bhiwani end and directly connected as Mahendergarh – Hissar 400kV D/c line.
  - Bhiwani (PG)-Hissar(PG) 400kV line (ckt. I) and Hissar(PG) – Fatehabad(PG) 400kV line to be disconnected at Hissar end and directly connected as Bhiwani(PG) – Fatehabad(PG) 400kV line.
  - Bhiwani (BBMB)–Hissar(PG) 400kV line and Hissar(PG) -Moga(PG) 400kV line (ckt I) to be disconnected at Hissar end and directly connected as Bhiwani(BBMB) – Moga(PG) 400kV line.
  - Fatehpur–Kanpur(400/220kV) 400kV D/c and Kanpur(400/220kV)-Panki D/c 400kV lines to be disconnected at (400/220kV) Kanpur end and connecting them directly (i.e. Fatehpur will be directly connected to Panki through 400kV D/c lines) (option 1) Or

- One circuit of Fatehpur–Kanpur (400/220kV) 400kV D/c and one circuit of Kanpur(400/220kV)-Panki D/c 400kV lines (say circuit 1) to be disconnected at Kanpur(400/220kV) end and connecting them directly (i.e. Fatehpur will be directly connected to Panki through one 400kV line) and Agra(PG)-Kanpur(400/220kV) 400kV line and remaining circuit of Kanpur(400/220kV)-Panki D/c 400kV lines to be disconnected at Kanpur(400/220kV) end and connecting them directly (i.e. Agra(PG) will be directly connected to Panki through one 400kV line) (option2)
  - Anpara–Obra 400kV line (existing) and Anpara–Singrauli 400kV line to be disconnected from Anpara 400kV end and directly connected as Singrauli – Obra 400kV line.
- d. LILO of Anpara–Mau 400kV line at Obra Option(1) or Anpara – Obra 400kV line ckt – 2 (new line) (option – 2)
- e. Shifting/reorientation works inside substations to accommodate the splitting/bypass arrangements.

26.4 Regarding all the above mentioned proposals of series reactor and reorientation/bypass arrangements, it is to mention that it may not always be possible to implement this through AIS elements. So, a judicious combination of AIS and GIS (mainly GIS ducts) is proposed for implementation. Further, especially in the bypass arrangement, it is to mention that wherever possible, provision may be kept to bring back the system to original condition, if contingency so calls for.

26.5 Regarding the remaining substations of NR, where the short circuit level has crossed the rated withstand capacity, it is to mention that the same will be taken up in the upcoming SCM of NR in a phased manner.

## 27.0 Reactive Power Compensation Requirement Studies in Northern Region

27.1 After the Grid Disturbance in July'12, the need for proper reactive power management was emphasised for reliable and secure operation of the grid. The issue of reactive compensation was discussed during 29<sup>th</sup> meeting of NRPC held on 13/09/2013, wherein, it was deliberated that adequate reactive compensation need to be provided at 400kV as well as at 220 kV level to contain the high voltages in the grid so as the opening of lines during light load conditions can be avoided. Accordingly, in the meeting, it was agreed that the studies may be carried out by CTU for the proposal for installation of bus reactors at 400 & 220 kV level.

27.2 CTU had carried out studies for the same and 400kV and 220kV reactors were proposed. The same was discussed in 32<sup>nd</sup> meeting of SCSPNR held on 02/01/2013, wherein following reactors proposed at 400 kV level were agreed.

Sl. No.	SUBSTATION (400 kV)	MVA <sub>r</sub>
1	HINDAUN	125
2	PANCHKULA-PG	125
3	SULTANPUR	125

4	GORAKHPUR(UP)	125
5	SONEPAT-PG	125
6	MANESAR	125
7	KAITHAL	125
8	KANPUR (PG)	125
9	JAIPUR	125
10	BASSI	125
11	MERTA	125

- 27.3 Regarding 220kV bus reactors, it was agreed that the requirement would be firmed up by CTU in consultation with the States after the validation of network details for their respective state. Accordingly, the network details for 2018-19 were sent to all states for validation. States were also requested to provide for the same in various NRPC meetings. During the NRPC meetings, it was agreed that CTU would carry out the studies based on the data supplied by STUs and data available with CTU and circulate the findings among all Northern Region Constituents.
- 27.4 Accordingly, based on the data provided by all states and data available with CTU for 220kV and below network for 2018-19, System Studies have been carried out by Powergrid and following was observed:

#### **Approach to study**

- Light load condition for year 2018-19 has been simulated in the studies. In winter of 2015, the minimum demand of Northern region was observed. Considering the same maximum/minimum ratio and year wise proportional increase as per 18<sup>th</sup> EPS of CEA, minimum load of about 32,500 MW has been simulated for 2018-19 scenario.
- Load power factor of 0.98 has been considered.
- In the base case, all Shunt Capacitors at 220kV have been switched off.
- All the proposed 400kV and 765kV reactors have been considered.
- Total Import of Northern region has been considered as 6300 MW with the generation of 27500 MW within region.
- State wise load considered is enclosed at **Annexure-VIII**
- List of Generations considered is enclosed at **Annexure-IX**

#### **Studies and Analysis at 220 kV level**

The base case studies were carried out considering the above approach and data provided by all states and data available with CTU for 220kV and below network for 2018-19 conditions. The list of 220kV buses under base case having voltage more than 1.1 p.u is enclosed at **Annexure-X**. Further, study has been carried out to identify the reactive compensation required to maintain 1.0 pu at 220kV level.

Flow of reactive power over long distance as well as through transformers is not desirable. Reactive power should be compensated locally so that reactive MVAR generated at a

voltage level is absorbed at the same level while maintaining the voltage. Hence to identify and compensate the MVAR at the same voltage level at which it is generated, studies were carried out by isolating the 400kV and 220kV grids by switching off the 400/220kV transformers. To ensure that base case real power flows from 400kV to 220kV are maintained, equivalent fictitious generation with MW absorption and injections in base case has been considered at 400kV and 220kV buses. MVAR exchange was considered to be zero.

- Studies indicate requirement of about 500 MVAR of shunt reactors at 220kV level. The stations along with MVAR requirement is tabulated below:

S.No.	Bus Name	State	MVAr
1	JINDPG 220.00	HARYANA	-39.4437
2	FATEHABAD PG220.00	HARYANA	-21.5877
3	CHAM-POL 220.00	HIMACHAL	-54.2145
4	KISHENPUR 220.00	J&K	-32.6675
5	JALAN-PG 220.00	PUNJAB	-87.1586
6	NAKODARPG 220.00	PUNJAB	-45.4432
7	AMRIT-PG 220.00	PUNJAB	-33.9622
8	MAKHU 220.00	PUNJAB	-30.4009
9	DHURI4 220.00	PUNJAB	-27.4196
10	AKAL-2 220.00	RAJASTHAN	-37.3708
11	SURATH-2 220.00	RAJASTHAN	-33.963
12	BIKANE-4 220.00	RAJASTHAN	-25.8396
13	BARMER 220.00	RAJASTHAN	-24.9423
			-494.4136

- Requirement of shunt reactors was observed mainly at certain locations, where cable is connected at 220kV, large load centres located far from generating units and connected to many lines, which are lightly loaded under off peak conditions.

S.No.	Bus Name	State	Reactors Proposed (MVAr)
<b>220 kV</b>			
1	Jind (PG)	Haryana	25

2	Fatehabad (PG	Haryana	25
3	Chamera Pooling Stn.	HP	2x25
4	Kishenpur	J&K	25
5	Jalandhar	Punjab	2x25
6	Nakodar	Punjab	2x25
7	Amritsar	Punjab	25
8	Makhu	Punjab	25
9	Dhuri	Punjab	25
10	Akal	Rajasthan	25
11	Suratgarh	Rajasthan	2x25
12	Bikaner	Rajasthan	2x25
13	Barmer	Rajasthan	25

#### 400kV level and above:

- For evolving the requirement of shunt reactors at 400kV level, the base case studies were repeated considering the same approach and data for 2018-19 conditions alongwith above mentioned additional reactors at 220kV level. The list of 400kV buses under base case having voltage more than 1.1 p.u is enclosed at Annexure-XI. Further study has been carried out to identify the reactive compensation required to maintain 1.0 pu at 400 kV level.
- At 400kV & above reactive power management is met by providing reactors on line and bus. POWERGRID lines, are inter-state lines, are generally longer and normally have line reactors. In addition 1 or 2 bus reactors are also provided at most of the 400kV and above substations. The cumulative MVAR of line reactors is almost same as bus reactors. Bus reactors along with line reactors are adequate to compensate for meeting the MVAR compensation requirement. POWERGRID has net reactive compensation of about 80%, as tabulated below.

		LINE MVAR		REACTIVE COMPENSATION			
S.No.	Utility	Line length(ckm)	Line MVAR generation	Line Reactors (Mvar)	Bus Reactors(Mvar)	Total Mvar of ReCTORS	% Compensation
<b>400kV lines</b>							
1	<b>POWERGRID</b>	22392	12315.6	5113	6091	10162.35828	82.5%
2	<b>States (Total)</b>	9788	5383.4	1463	1552	2734.693878	50.8%
	UPPCL	4010	2205.5	913	782	1537.414966	69.7%
	DTL	247	135.85	0	50	45.35147392	33.4%
	RVPNL	2786	1532.3	550	430	888.8888889	58.0%
	PSTCL	1481	814.55	0	240	217.6870748	26.7%
	HVPNL	798	438.9	0	0	0	0.0%
	PTCUL	330	181.5		50	45.35147392	25.0%
	PDD	136	74.8	0	0	0	0.0%
	<b>sub total</b>	<b>32180</b>	<b>17699</b>	<b>6576</b>	<b>7643</b>	<b>12897.05215</b>	<b>72.9%</b>

- The same has also been calculated for state lines. It is seen that as the state lines are short lines. Hence, line reactors are normally not provided. With one or two bus reactors, the percentage of shunt compensation is low.
- Earlier, number of STU 400kV lines was low and compensation provided under ISTS was compensating STU lines also to some extent. As more and more states are now developing 400kV and above under state sector, the short fall in overall reactive compensation is increasing. Hence it is suggested that a norm should be established, for example 75-80% compensation should be ensured.
- Similar to 220 kV level, study has been carried out to identify the reactive compensation required to maintain 1.0 pu at 400kV level also. Studies indicate shunt reactor requirement of about 4300MVAR. The details of reactors required at 400 kV level is summarized below:

S.No	Bus Name	State	Reactors Proposed (MVAR)
<b>400 kV</b>			
1	Mandola(PG)	DELHI	125
2	Hissar(PG)	HARYANA	125
3	Kala Amb	HIMACHAL	125
4	Chamera Pooling Stn. (PG)	HIMACHAL	125
5	Kishenpur(PG)	J&K	125
6	Nakodar	PUNJAB	125
7	Jullandhar(PG)	PUNJAB	125
8	Moga(PG)	PUNJAB	125
9	Dhuri	PUNJAB	125
10	Patiala(PG)	PUNJAB	125
11	Ludhiana(PG)	PUNJAB	125
12	Ajmer(PG)	RAJASTHAN	125
13	Merta	RAJASTHAN	125
14	Ratangarh	RAJASTHAN	125
15	Chittorgarh(PG)	RAJASTHAN	125
16	Suratgarh(PG)	RAJASTHAN	125
17	Parichha	UP	125
18	Allahabad(PG)	UP	125
19	Mainpuri	UP	125
20	Unnao	UP	125
21	Gonda	UP	125
22	Meerut(PG)	UP	125
23	Kashipur	UTTARAKHAND	125
24	Srinagar	UTTARAKHAND	125
			3000

Studies were repeated after providing above proposed 220kV and 400 kV reactors and it was observed that voltages are generally within limits.

**Proposal:**

- STU should ensure that shunt capacitors are switched off particularly during light load conditions.
- The high voltage and MVAR surplus witnessed during operation could be mainly due to (i) Switching off shunt capacitors during high voltage do not take place, (ii) injection from 400kV level & above and (iii) generators are injecting MVAR into the grid. State should ensure that shunt capacitors are switched off when the voltage reaches a predetermined value say 1.02pu and generators should be impressed upon to absorb the MVAR within their capability limits during high voltage conditions.
- Reactors at various 400kV and 220 kV buses, as given above may be provided by the owner of the substation.

27.5 Above proposal was discussed in the 38<sup>th</sup> NRPC Meeting held on 24/10/2016 and was generally agreed by the constituents. DTL, during the meeting had stated that off peak load for Delhi may be further reduced to about 1300-1400 MW and revised studies may be carried out by CTU. In addition PSTCL has also forwarded certain observations regarding reactive compensation at Nakodar and Makhu. As per information from CTU, revised studies have been carried out.

27.6 CTU may present. Members may deliberate.

**28.0 Installation of 400kV and 220kV Shunt Bus Reactors in Rajasthan:**

28.1 RRVPNL vide their letter RVPN/SE(P&P)/XEN-2(P&P)/D dated 31.3.2017 has proposed to install 450 MVAR, 400kV and 220kV shunt bus reactors in Rajasthan to mitigate the high voltage problems. Further, RVPN intends to pose the aforesaid shunt reactor installation programme from PSDF.

28.2 Issue of high voltage in Northern Region was discussed in the 32<sup>nd</sup> meeting of SCSPNR held on 31-8-2013. In the meeting, it was decided that all states would assess with proper studies requirement of reactive power compensation at 220 kV voltage level in Intra State System. It was also discussed that Western Rajasthan faces high voltage problem and adequate reactors need to be provided at 220kV voltage level in pockets of renewable energy generation and this issue has also been raised and discussed continuously in the NRPC and OCC meetings.

28.3 RRVPNL has submitted that at following RVPN substations, during FY 2015-16 recorded voltage has exceeded maximum limit prescribed in the Indian Electricity Grid Code and on the basis of load flow studies, operational feedback by State Load Despatch Centre, recorded voltage and discussions in the various Standing & NRPC Meetings the Whole Time Directors (WTDs) of RVPN on dated 20.10.2016 have accorded administrative and financial approval for

installation of 400kV and 220kV bus type reactors at following substations to control the voltage :-

Name of sub-station	Nominal Bus Voltage (kV)	Recorded Maximum Voltage (kV)	MVAR Capacity of proposed Shunt Reactor
400 KV GSS Jodhpur	400	500	125
400 kV GSS Barmer	220	248	25
220 kV GSS RatanQarh	220	233	25
220 kV GSS Phalodi	220	250	25
220 kV GSS Dechu	220	263	25
220 kV GSS Dhorimanna	220	245	25
220 kV GSS Sanchor	220	254	25
220 kV GSS Balotra	220	255	25
220 kV GSS Dholpur	220	254	25
220 kV GSS Amarsagar	220	254	25
400 kV GSS Jodhpur	220	250	25
220 kV GSS Tinwari	220	250	25
220 kV GSS Badisid	220	248	25
220 kV GSS Jodhpur	220	255	25
			450

28.4 Members may deliberate and concur.

**29.0 Early Commissioning of 400kV D/C Samba-Amargarh Transmission Line, 400/220 kV GIS Substation at Amargarh and LILO of both circuits of 400kV Uri-Wagoora at Amargath under NRSS-XXIX Transmission Limited Project.**

29.1 M/s Sterlite Power Grid Venture Limited vide their letter NRSS-XXIX/EC/2017/04/01 dated 4.4.2017 has requested to consider Samba-Amargarh 400kV D/C transmission line, 400/220 kV GIS Substation at Amargarh and LILO of both circuits of 400kV Uri-Wagoora at Amargath under NRSS-XXIX Transmission Limited Project for early commissioning to ensure reliable power supply to Jammu and Kashmir by interconnecting Punjab to Kashmir valley by strengthening the National Grid.

29.2 The scheme NRSS-XXIX is under construction (TBCB) by NRSS-XXIX Transmission Limited, which is 100% subsidiary of Sterlite Power Grid Venture Limited (SPGVL). Element-I of the scheme i.e. Jalandhar-Samba 400kV D/c transmission line has been already commissioned in June 2016. M/s SPGVL intends to commission remaining elements i.e Samba-Amargarh 400 kV D/C line, 400/220 kV GIS substation at Amargarh and LILO of both circuits of Uri-Wagoora 400kV D/c line at Amargarh under NRSS-XXIX by July 2017 instead of scheduled COD of October 2018, which is 15 months ahead of the schedule.



29.3 M/s SPGVL has also mentioned that progress of this project has been reviewed in the review meeting on 23-01-2017 chaired by Hon'ble Deputy Chief Minister (Minister I/c Power) of J&K at Civil Secretariat Jammu. In the review meeting, POWERGRID and Power Development Department Jammu & Kashmir (JKPDD) confirmed to meet the schedule by July 2017.

29.4 Members may deliberate.

### **30.0 Transmission system for connectivity to Bilhaur TPS (2x660MW) of NTPC:**

30.1 The transmission system for connectivity to Bilhaur TPS (2x660MW) of NTPC was discussed in 36<sup>th</sup> meeting of SCPSPNR held on 13.7.2015, while discussing the transmission system for Ghatampur TPS. During the 37<sup>th</sup> meeting of SCPSPNR held on 20.1.2016, CTU stated that while discussing the transmission system for Ghatampur TPS, transmission system for connectivity to Bilhaur TPS (2X660MW) of NTPC was also agreed and the same needs to be mentioned in the SCPSPNR minutes for grant of connectivity to Bilhaur TPS. The connectivity of Bilhaur TPS (NTPC) was agreed to be granted through Bilhaur - Kanpur 400 kV D/C line following was agreed for connectivity to Bilhaur TPS:

Bilhaur - Kanpur 400 kV D/C line.

30.2 POWERGRID vide their letter C/CTU/N/PLG dated 14.2.2016 had given the observations and accordingly, point no 1.2.2.3 of the minutes of 37<sup>th</sup> meeting of SCPSPNR were modified as follows:

Connectivity of Bilhaur TPS (NTPC):

- Bilhaur –Kanpur 400 kV D/C (quad) line

30.3 Subsequently, POWERGRID vide their letter C/CTU/N/PLG dated 23-6-2016 has given the observations on minutes of 38<sup>th</sup> meeting which, inter-alia, included the connectivity of Bilhaur TPS (NTPC). Powergrid has mentioned that Bus Reactor of 125 MVAR may also be provided at Bilhaur generation switchyard to help in controlling the high voltages under light load conditions. The proposed modification to the MOM as well as the proposal of 1x125 MVAR Bus Reactor at Bilhaur generating stations was agreed by the constituents.

Accordingly, the Connectivity of Bilhaur TPS (NTPC)is as follows:

- Bilhaur –Kanpur 400 kV D/C (quad) line
- 1x125 MVAR Bus Reactor at Bilhaur generating stations

30.4 Now, Powergrid has informed that connectivity application has been closed due to non-signing of Transmission Agreement by M/s NTPC Ltd. within the stipulated period.

30.5 Members may like to deliberate.

### **31.0 Prime Minister Development Package for the state of J&K (PMDP-2015) / PMRRP-2015**

- 31.1 Under Secretary (Trans), MoP had forwarded a copy of letter dated 05.08.2016 from Under Secretary (IPDS), MoP along with three nos. of DPRs (Jammu, Kashmir and Ladakh) relating to transmission sector of J&K for examination and comments of CEA. A meeting was taken by Joint Secretary (Hydro), Ministry of Power on 21.09.2016 with Central Electricity Authority (CEA), Development Commissioner, Jammu & Kashmir Power Development Department(JKPDD) and POWERGRID to review the progress of DPR examination by CEA. Discussions were held with officials from JKPDD in CEA from 26.09.2016 to 28.09.2016 and transmissions schemes for Jammu, Kashmir and Ladakh region for consideration under PMDP-2015/ PMRRP-2015 were technically finalized and conveyed to MoP.
- 31.2 JKPDD had submitted the cost estimate of transmission schemes under PMDP-2015 based on approved Schedule of Rates(SoR) for the year 2016-17 on 03.10.2016 (Jammu and Ladakh) and 01.10.2016 (Kashmir) to CEA through e-mail and the comment on the same were sent to JKPDD on 06.10.2016 through e-mail. Discussions were again held with official from JKPDD in CEA from 14.10.2016 to 15.10.2016 and the cost estimate of transmission schemes for Jammu, Kashmir and Ladakh region for consideration under PMRRP-2015 were discussed and finalized.
- 31.3 Based on the above discussions, JKPDD vide its letter dated 02.11.2016 has submitted the final DPR of Jammu (costing Rs. 420.41 cr.), Kashmir (costing Rs. 414.44 cr.) and Ladakh (costing Rs. 354.74cr.) under PMDP-2015 incorporating our comments. The same has been examined and found to be generally in order and recommended to MoP.
- 31.4 It is to state that transmission scheme under these three DPRs of Jammu, Kashmir and Ladakh under PMRRP-2015 is a part of the transmission scheme proposed under DPR for system strengthening for Jammu and Kashmir region during 12<sup>th</sup> and 13<sup>th</sup> Five Year Plan. The balance work of transmission scheme proposed under DPR for system strengthening for Jammu and Kashmir region during 12<sup>th</sup> and 13<sup>th</sup> Five Year Plan needs to be vetted by CEA.
- 31.5 The summary of the schemes approved for Jammu, Kashmir and Ladakh Region under PMDP-2015 at an estimated cost of Rs. 1189.59 crore is attached at Annexure-XII. Following are the lines connected to ISTS system considered in the schemes approved for Jammu, Kashmir and Ladakh Region under PMDP-2015 :

#### **Jammu Region:**

1. LILO of Hiranagar-Bishnah 220kV D/C line from 400/220kV Jatwal Grid station

#### **Kashmir Region:**

1. New Wanpoh (PG) (400/220kV)-Mirbazar 220kV D/C line
2. Extension of Mirbazar-Alusteng 220kV D/C line upto 400/220kV New Wanpoh Substation (POWERGRID owned)

3. LILO of 220kV D/C Zainkote-Delina line at 2x315 MVA, 400/220kV Kunzar (Amargarh)S/s.(the s/s is being implemented by M/s Sterlite grid limited

**Ladakh Region:**

1. Phyang (POWERGRID)-Diskit (Nubra) 220kV S/C line on D/C towers line
2. Kargil-Padum(Zanaskar) 220kV S/C line on D/C towers line

31.6 Members may discuss and agree.

**32.0 Modification in scope of Intra-State transmission schemes under Green Energy Corridor planned for evacuation of Renewable energy addition in Renewable rich states.**

**32.1.0 Intra State Green Energy Corridor-I planned for evacuation of Renewable energy addition in Rajasthan:**

32.1.1. The intra-state transmission system required for integration of RES generation in the state of Rajasthan was agreed in the 32<sup>nd</sup> meeting of SCSPNR. RRVPNL has informed that due to inability of wind farm developers to get land for the proposed wind power projects in Banswara district, it has revised the scheme of RE Power Evacuation System in view of new wind and solar power projects in Jaisalmer, Bikaner, Jodhpur and Barmer districts in Rajasthan. RVPNL vide its mail dated 19-09-2014 had submitted the final DPR to CEA comprising revised list of intra-state transmission schemes costing about 1018.30 Crore in the State of Rajasthan to be funded from KfW and NCEF.

32.1.2 Revised Power Evacuation Systems for New Solar & Wind Power Projects in Jaisalmer, Bikaner, Jodhpur & Barmer Districts of Rajasthan is as follows:

S.No.	Name of the Scheme	Route Length (in km)	Estimated Cost (excluding IDC) (in Rs. Lacs)	Estimated Cost (including IDC) (in Rs. Lacs)
1	400/220 kV, 2x500 MVA GSS at Jaisalmer-2 alongwith 1x125 MVAR, 400 kV Bus Type Reactor	—	15030.74	19379.76
2	400 kV D/C Jaisalmer (2)-Barmer line (Twin Moose)	130	10469	13498.12
3	400 kV S/C Akal(1)-Jaisalmer (2) line (Twin Moose)	50	2729	3518.61
4	400 kV D/C Barmer-Bhimnal(PGCIL) line (Twin Moose)	140	11204	13902.43
5	400 kV Terminal Bay Equipment at 400/220 kV GSS Barmer (for termination of 400 kV D/C Jaisalmer (2) -	—	2807.02	3619.21

	Barmer line at Barmer end)			
6	400 kV Terminal Bay Equipment at 400/220 kV GSS Akal 1 (for termination of 400 kV S/C Akal (1) - Jaisalmer (2) line at Akal (1) end)	—	1411.66	1820.11
7	<b>220 kV GSS at Pokaran (New loc.) Jaisalmer Distt.):</b>			
	i. 220/132 kV, 1X160 MVA and 132/33 kV , 1x20/25 MVA GSS at Pokran (new loc.)	—	3981.11	5133.01
	ii. LILO of both circuits of U/C 220 kV D/C Ramgarh GTPP - Dechu line at Pokaran (5Km D/C each x 2 = 10 Km. D/C)	10	361.1	465.58
	iii. LILO of existing 132 kV S/C Chandan - Pokaran line at proposed 220 kV GSS Pokaran	10	239.3	308.54
8	<b>220/132 kV, 2x160 MVA and 132/33 kV, 2x40/50 MVA GSS at Undoo alongwith associated lines</b>			
	(i) 220/132 kV , 2x160 MVA and 132/33 kV, 2x40/50 MVA GSS at Undoo with additional 6 nos. 220 kV, 10 nos. 132 kV & 10 nos. 33 kV Bays	—	4976.71	6416.67
	(ii) 220 kV D/C interconnection at proposed 220 kV GSS Undoo to 220 kV GSS Pokaran	70	2958.1	3814
	(iii) 132 kV D/C interconnections at proposed 220 kV GSS Undoo	20	503.2	648.8
	(iv) 2 nos. 220 kV extension bays at 220 kV GSS Pokaran	—	171.96	221.72
	(v) 2 nos. 132 kV extension bays	—	106	136.67
9	<b>220 kV GSS at Kolayat alongwith associated 220 kV lines</b>			
	(i) (a) 220/132 kV, 1x160 MVA and 132/33 kV, 1X20/25 MVAGSS at Kolayat (New loc.)		3816.88	4921.26
	(b) 2 nos. 220 kV bays at 220 kV GSS Gajner	—	173.84	224.14
	(ii) 220 kV D/C Gajner (U/C 220 kV GSS) - Kolayat line	15	541.65	698.37
	(iii) LILO of existing 132 kV S/C Kolayat-Bajju line at proposed 220 kV GSS kolayat	10	239.3	308.54
10	<b>220 kV GSS at Chhatrail alongwith associated lines</b>			
	(i) (a) 220/132 kV, 1x160 MVA and 132/33 kV, 1X20/25 MVAGSS at Chatrail (Jaisalmer)	—	3677.8	4741.94
	(b) 2 nos. 220 kV bays at Ramgarh (400 kV GSS)	—	173.84	224.14
11	<b>220 kV GSS at PS-1/Bajju alongwith associated lines</b>			
	(i) (a) 220/132 kV, 1x160 MVA and 132/33 kV, 1x20/25 MVA GSS at PS - 1(New location)/Bajju	—	3816.88	4921.26

	(New location)			
	(b) 2 nos. 220kV bays at 400/220 kV GSS Bhadla	—	173.84	224.14
	(iii) LILO of existing 132 kV S/C PS1-Bajju line at proposed 220 kV GSS PS-1/Bajju	10	239.3	308.54
12	5 numbers 132 kV GSSs alongwith 132 kV approx. 25 km. D/C line around 220 kV GSSs as per solar potential in respective areas	125 Km.	9598.3	12375
		₹	<b>79400.53</b>	<b>101830.56</b>
		Say (₹)	<b>794 Cr</b>	<b>1018.31 Cr</b>

### 32.2.0 Intra State Green Energy Corridor -I planned for evacuation of Renewable energy addition in Himachal Pradesh:

32.2.1 The transmission works amounting to Rs. 271 Crore for evacuation of RE Power in Himachal Pradesh were discussed and agreed in the 32<sup>nd</sup> meeting of SCPSPNR held on 31.08.2013 at NRPC, New Delhi. However, in view of Himachal Pradesh not meeting the minimum amount of loan to be disbursed to a State under KfW financing, Himachal Pradesh was requested to revise the schemes in a meeting taken by Additional Secretary, MoP on 08.05.2014.

32.2.2 Accordingly, HPPTCL vide its letter dated 3.7.2014 and email dated 09-03-2017 has submitted the revised scope of intra-state transmission schemes under Green Energy Corridor. The intra-state transmission schemes for Himachal Pradesh in its present form comprises of seventeen (17) packages amounting to Rs 909.46 Crore.

32.2.3 The revised scope of works is as follows:

Package No.	Package Details	Total Estimated Cost (in Rs. Crores)
1	132 kV D/C Line from Tangnu Romai to 132/220 kV Sunda P.S	26
2	22/132 kV, 2x31.5 MVA sub station at Tangnu Romai HEP in Distt. Shimla	50
3	132/220 kV, 2x100 MVA GIS sub station at Dehan and 220 kV D/C Line between Dehan and 400/220 kV sub-station at Hamirpur (PGCIL)	227
4	33 kV GIS Switching station at Palchan, Distt. Kullu	8.4

5	132 kV D/C Line from Rupin S/s to 132/220 kV Sunda P.S	38
6	33/132 kV, 31.5 MVA GIS sub station in the yard of Rupin HEP	28.5
7	66/220 kV, 80/100 MVA sub station in the yard of 132/220 kV Sunda sub station with 66 kV Sunda-Andhra D/C Line	77
8	Providing additional 132/220 kV, 100 MVA Transformer at 132/220 kV, 100 MVA GIS sub station at Charor (ADB funded) in Distt. Kullu	39
9	66/220 kV, 100 MVA sub station at Heling by LILO of 220 kV Bajoli Holi- Lahal D/C line	90
10	Additional 400/220 kV, 315 MVA transformer at of 400/220 kV, 1x315 MVA sub station at Gumma(ADB funded) in Distt. Shimla.	70
11	Providing additional 33/132 kV, 31.5 MVA Transformer at 33/132 kV, 31.5 MVA GIS sub station at Pandoh in Distt. Mandi	24
12	33 kV Palchan – Prini line	8
13	220 kV Snail – Hatkoti line	30
<b>TOTAL</b>		<b>715.9</b>

**Detail of packages in respect of works to be executed by HPSEBL under KfW Scheme**

**Package A: - Executing Agency – CE (ES), HPSEBL, Hamirpur**

	<b>Package Details</b>	<b>Total Estimated Cost (in Rs. Cr.)</b>
1	Providing additional 10 MVA, 66/22 kV power transformer a/w spare bay at 10 MVA, 66/22 kV Nogli for evacuation of power from SHEPs in Andhra Nogli Zone	5.93
2	Augmentation of Kotla- Nogli-Samoli 66 kV line with AL59 conductor (60 Km)	19.62
3	Augmentation of 2nd 66/22 kV, 10 MVA transformer at Samoli to 20 MVA	2.7
4	Construction of 66/22 kV, 2x10 MVA sub station at Hatkoti alongwith 66 kV S/C line on D/C towers (20 Kms) from Hatkoti to Samoli	21.94
5	Augmentation of 66 kV D/C line between Ghanvi-II to Kotla with HTLS conductor (8 Kms)	2.18
6	Construction of 66 kV S/C line from Nathpa to Wangtoo a/w terminal bays	10

7	C/O 66/22 kV 2x25/31.5 MVA S/St at Andhra and 22kV Controlling Substation at Gumma(22kV D/C line Andhra to Gumma 6 km)	19.74
8	Construction of 66/22 kV, 1x10 MVA sub station Rukti at Shaung alongwith 22 kV S/C line(4 Km) from the Yard of Rukti I to yard of Shaung Power House.	11.88
9	Construction of 66/22 kV, 1x10 MVA sub station at yard of Pooh alongwith 66 kV S/C line.	15.47
<b>Total Package A</b>		<b>109.46</b>

**Package B.1: - Executing Agency – CE (Op), South, HPSEBL, Shimla.**

	<b>Package Details</b>	<b>Total Estimated Cost (in Rs. Crores)</b>
1	Augmentation of transformer from 2.5 MVA to 6.3 MVA and construction of 33 kV S/C line on D/C structures between Shillai and Sataun a/w terminal bays (20 Kms)	3.5
2	33 kV S/C line between Sataun & Paonta	3.2
3	22KV S/C line on D/C structures and cross arms ( 0.15Sq. In “WOLF” cond.) between Hatkoti and Kotkhai a/w terminal bays and space for spare feeder bay	6.36
4	22KV D/C line (0.15Sq. In “DOG” cond.) between Jhakri and Rampur i/c terminal bays	4.32
5	22KV S/C line on Double structures (0.15Sq. In “DOG” cond.) between Rampur and Nogli i/c terminal bays	2.16
6	22KV D/C line ACSR 0.15Sq. In “WOLF” cond.) between Karcham ( existing control point) and 22/66/220 KV Karcham P.S. a/w terminal bays and space for spare feeder bay	3
7	Augmentation of 33 KV existing line between Dadahu and Dhaula Kuan & Dhaula Kuan and Giri with WOLF conductor	1.22
<b>Total Package B.1</b>		<b>23.76</b>

**Package B.2: - Executing Agency – CE (Op), Central Zone, HPSEBL, Mandi.**

	<b>Package Details</b>	<b>Total Estimated Cost (in Rs. Crores)</b>
1	33 kV line from Prini to 220/33 kV sub station in the yard of Allain Dhuangan HEP with 33 kV XLPE cable.	4.37
2	LILO of 33 KV Pandoh- Bijni line at proposed 33/132 KV Pandoh Sub-Station.	0.7
3	Strengthening of 33 KV D/C Pandoh-Bijini line with WOLF conductor.	3.58
4	Interlinking of 33 kV Naggar Bajora Feeder at six pole structure laranketo under Electrical S/Div HPSEBL Naggar	0.1
5	Conversion of 33 kV Bajora Naggar feeder S/C line into D/C with AL 59 Dog 2 Conductor under ESD Naggar. (32.613 Kms)	7.74
6	Conversion of 33 kV Double Circuit Overhead line to Underground cable from Dhunkara (Jari) to Manikaran under Electrical Sub Div. Jari (13 Kms)	12.98
7	Reconductring &strengthening of 11 KV Barshani &manikaran feeder from 33/11 kV Substation Barshaini and 33/11 kV Substation Dunkhara under ESD Jari	0.2
8	Strengthening of 33 KV S/C Padhar to Bijini line with WOLF conductor.	1.27
	<b>Total Package B.2</b>	<b>30.94</b>

**Package B.3: - Executing Agency – CE (Op), North, HPSEBL, Dharamshala.**

	<b>Package Details</b>	<b>Total Estimated Cost (in Rs. Crores)</b>
1	C/O 33 kV S/C line with WOLF conductor from 33 kV sub station Jassore a/w terminal bay at Sihunta and Jassore	5.43
2	Augmentation of existing 33 kV Gharola to LILO point at Karian with WOLF conductor of 33 kV line from Gharola to Chamba (48.5 Kms)	4.17
3	LILO of 33 kV Bharmour-Gharola line at Lahal	0.58
4	Strengthening / Up-gradation of existing S/C 33 kV feeder No.II from Baner Power House to 132/33/11 kV Sub-Station Dehan under ESD No.II Palampur	3.47
5	LILO of one circuit of 33 KV D/C line from Shahpur to Kangra at proposed 33/132 KV CHAMBI Sub-Station and LILO 33kV S/C line from Gaj to Shahpur at 33/132kV sub-station Chambi along with reconductoring of Gaj-Shahpur Line (New line 9.5 Km, reconductoring 18.5 Km)	6.79



6	33KV D/C line with WOLF conductor from Salooni to Koti i/c terminal bays	3.09
7	C/o 33 kV S/C link alongwith terminal equipment from 33/11 kV s/stn Darkata (Ranital) to 33/11 kV un-manned S/Stn Lunj under ED HPSEBL Shahpur	2.19
8	Augmentation of existing 33 kV line from Gaj Powerhouse to kangra with WOLF conductor. (18.5 Kms)	3.68
	<b>Total Package B.3</b>	<b>29.4</b>
	<b>Total (A+B1+B2+B3)</b>	<b>193.56</b>

32.3 Members may please note.

### **33.0 Strengthening of Intra-State Transmission System - Operational Constraints**

33.1 The Enquiry Committee constituted by Ministry of Power, Govt. of India, to analyze the causes of grid disturbances on 30<sup>th</sup> July, 2012 & 31<sup>st</sup> July, 2012 and to suggest measures to avoid recurrence of such disturbance in future had, interalia, recommended, "Intra-State transmission system needs to be planned and strengthened in a better way to avoid problems of frequent congestion".

33.2 In the NRPC meeting held on 30<sup>th</sup> November, 2012, it was decided that SLDCs should give half yearly feedback to STU regarding bottlenecks, constraints and overloading in the State transmission network for proper transmission planning. This exercise was to be completed by 10.10.2012 and thereafter repeated regularly at half yearly intervals i.e. on 1<sup>st</sup> January and 1<sup>st</sup> July of every year. All SLDCs were requested to submit copy of SLDC's advice to their STUs, to NRPC Secretariat, even if no constraints were observed.

33.3 This issue is being regularly monitored in OCC meetings of NRPC. SLDCs of all the states in Northern Region have submitted the details of the bottlenecks, constraints and overloading in their State transmission network is given at Annexure-XIII.

33.4 STUs are requested to update the remedial measures taken to remove the constraints.

33.5 Members may deliberate.

### **34.0 Connectivity & LTA to GHAVP Nuclear power plant (2x700MW) of M/s NPCIL in Haryana.**

34.1 The following evacuation system for Nuclear power generator (2x700MW) of M/s NPCIL for Gorakhpur Haryana Anu Vidyut Pariyojna (GHAVP) located at Fatehabad, Haryana was agreed in during the 37<sup>th</sup> meeting of SCPSPNR held on 20/01/2016

### **Connectivity:**

- Fatehabad - NPCIL generation 400kV D/C line

### **Long Term Access:**

- LILO of second circuit of Moga-Hisar 400kV D/C line at Fatehabad
  - LILO of both circuits of Moga-Hisar 400kV D/C line at NPCIL generation switchyard
- 34.2 In the 38<sup>th</sup> meeting of SCPSNR, NPCIL has informed that the commissioning schedule for unit 1 and 2 is August, 2023 and time frame of 3<sup>rd</sup> and 4<sup>th</sup> unit is not firmed up. As the time frame of 2x700 MW generation was beyond 13<sup>th</sup> plan, CTU has suggested the closing of the connectivity and LTA applications and NPCIL may re-apply subsequently. Revised studies would be carried out
- 34.3 CTU vide its letter dated 23-06-2016 has observed that as CTU has received the application for 2x700 MW only and accordingly studies were carried out for that capacity.
- 34.4 As the NPCIL's application for the connectivity and LTA has been closed as of now. Revised studies would be carried out after receiving fresh connectivity / LTA application.
- 34.5 Members may please note.

### **35.0 Power Evacuation of the projects in Chenab Basin and establishment of 400/132kV Substation at Kishtwar:**

- 35.1 Perspective transmission system alongwith phased development for Hydro projects located in Chenab Basin J&K was deliberated in 31<sup>st</sup> meeting of SCPSNR. It was agreed in the meeting that the 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 was also informed that it is necessary that the project developers apply to CTU for the connectivity & LTA so that the above plan can be firmed up.
- 35.2 JKPDC vide their letter dated 21.1.2017 (copy enclosed at Annexure-XIV) has suggested some points to be considered before planning the transmission system like fixing of transmission line route, geo investigation and survey of transmission line route, consideration of n-1 criteria for transmission of bulk power through hilly areas, identification of suitable land for pooling stations etc. JKPDC has requested for taking a coordinated action towards the above issues.
- 35.3 Chenab Valley Power Projects ltd has been making request for establishment of 400/132kV S/s at Kishtwar to provide construction power (approx. 40MW) for Pakaldul HEP(1000MW), Kiru (624 MW) and Kwar (540 MW).
- 35.4 The issue of establishment of 400/132kV S/s at Kishtwar was also discussed in 37<sup>th</sup> meeting of SCPSNR, wherein establishment of Kishtwar 400/132 kV substation was agreed subject to feasibility based on load flow studies by CEA and CTU.

- 35.5 As per the perspective plan discussed and arrived at in previous meetings of SCPSNR, the entire generations in Chenab valley falling in J&K is being pooled at Kishtwar pooling station. Also, Chenab Valley Power Projects ltd has informed that they have taken up the tendering activities of Pakaldul, Kiru and Kwar HEPs, therefore, finalisation of the perspective plan, phasing of its various transmission elements along with setting up of 400/132kV Kishtwar S/s needs to be taken up in coordinated manner.
- 35.6 JKPCDC/ CVPPL may kindly intimate the progress of HEPs in Chenab Valley. CTU may give the details of the connectivity/LTA application received from hydro project developers.
- 35.7 Members may deliberate.

### 36.0 Down Stream network by State utilities from ISTS Station

- 36.1 Augmentation of transformation capacity in various existing substations as well as addition of new substations along with line bays for downstream network are under implementation at various locations in Northern Region. States are requested to implement the 220kV system for proper utilization of the line bays and inform the status of planned 220kV system identified with following sub-stations:

S. No.	Substation	MVA Capacity	Downstream network requirement	Schedule
1	400/220kV Samba	3x315	Partially utilized. Balance 4 Nos 220 kV bays to be utilized.	April 2013
2	400/220kV New Wanpoh station	2x315	6 Nos 220 kV bays to be utilized.	Oct. 2013
3	400/220kV Parbati Pooling Station	2x315	2 Nos 220 kV bays to be utilized.	Apr'17
4	400/220kV Kurukshetra (GIS)	2x500	Downstream lines for 8 Nos 220 kV bays to be expedited.	440kV bay & 1no. ICT are ready for commissioning. 2 <sup>nd</sup> ICT expected by Mar'17.
5	400/220kV Bagpat GIS	2x500	Partially utilized. Balance 5 Nos 220 kV bays to be utilized.	Commissioned. 3 nos. of 220 kV downstream lines already commissioned- Shyamali, Muradnagar and

S. No.	Substation	MVA Capacity	Downstream network requirement	Schedule
				Bagpat connected
6	400/220 kV Saharanpur	2x315	Partially utilized. Balance 4 Nos 220 kV bays to be utilized.	Commissioned. 2 nos. 220 kV downstream lines commissioned.
7	400/220kV Dehradun	2x315	Partially utilized. Balance 4 Nos 220 kV bays to be utilized.	Total 6 bays for UPPTCL line. Only two bays commissioned. Balance 4 bays idle charged since long.
8	400/220kV Kotputli	2x315	Partially utilized. Balance 2 Nos 220 kV bays to be utilized.	Commissioned 02 nos. 220kV downstream lines commissioned on 27.05.2015.
9	400/220kV Jaipur South	2x500	Partially utilized. Balance 4 Nos 220 kV bays to be utilized.	Status of downstream system for balance 4 Nos 220 kV bays to be updated by RVVPNL.
10	400/220 kV Sohawal (06 nos 220 kV bays)	2*315	6 Nos 220 kV bays to be utilized.	Downstream system for 6 Nos 220 kV bays to be updated by UPPTCL.
11	Shahjahanpur 400/220 kV	2x 315 MVA	Partially utilized. Balance 5 Nos 220 kV bays to be utilized.	Downstream system for 5 Nos 220 kV bays to be updated by UPPTCL.

S. No.	Substation	MVA Capacity	Downstream network requirement	Schedule
12	Jalandhar 400/220 kV	1x 500 MVA	Partially utilized. Balance 2 Nos 220 kV bays to be utilized.	Downstream system for balance 2 Nos 220 kV bays to be updated by PSTCL.
13	02 nos. bays at Moga		Partially utilized. Balance 2 nos. of 220kV bays to be utilized.	Downstream system for 2 Nos 220 kV bays to be updated by PSTCL.

### 36.2 Establishment of new 400/220kV substations in Northern Region:

In addition, following under construction substations whose downstream network is to be implemented:

Sl. No.	Name of Substation	MVA Capacity	Expected Schedule	No of 220kV bays being provided
1	400/220kV Rajghat GIS	4x 500	-	12
2	400/220kV Dwarka-I GIS	4x 500	Sep'18	12
3	400/220kV Tughlakabad GIS	4x 500	June'18	16
4	400/220kV Parbati Pooling Station	2x315	Apr'17	2
5	220/66kV Chandigarh	2x 160	Feb'19	8
6	400/220kV Sohna Road S/s	2x500	May'19 (Under TBCB)	8
7	400/220kV Prithal S/s	2x500	May'19 (Under TBCB)	8
8	400/220kV Kadarapur S/s	2x500	May'19 (Under TBCB)	8
9	400/220kV Kala Amb GIS	7*105	Jul'17 (Under TBCB)-PG	6
10	400/220kV Amargarh GIS	7X105	Oct'18 (Under TBCB) (Sterlite Grid planning to prepone)	6

For the above 400/220kV substations, implementation of down below 220kV system needs to be commissioned for utilization of the system. Accordingly, the states are requested to implement the 220kV system in matching time frame and inform the status of planned 220kV system from these substations to CTU.

### 37.0 Any other agenda item –with the permission of chair.



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**Corrigendum-I to Minutes of 38<sup>th</sup> Meeting of  
Standing Committee on Power System Planning in Northern Region (SCSPNR)  
held on 30<sup>th</sup> May, 2016 at NRPC, Katwaria Sarai, New Delhi**

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The Minutes of 38<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region were issued vide . 1/9/38/2016/PSP&PA-I/721-739 dated 8<sup>th</sup> June, 2016. Following corrigendum is issued based on the observations/Comments received from PGCIL.

**Corrigendum # 1**

Powergrid vide their letter No C/CTU/N/PLG dated 23-6-2016 had given the observations on **para no. 26.7 under the item no. '26.0 Underground GIS at UT Chandigarh'**

As per the minutes of 38<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region the para 26.7 is as under:

26.7 Member (Power System), CEA stated that team of CEA and Powergrid jointly visited the proposed site and recommended option with GIS underground and ICTs over ground. The proposal may be agreed. After detailed deliberations, it was decided that Powergrid would explore differential funding from UT of Chandigarh.

Based on Powergrid observations, **the para 26.7 is modified as under:**

26.7 Member (Power System), CEA stated that team of CEA and Powergrid jointly visited the proposed site and recommended option with GIS underground and ICTs over ground. The proposal may be agreed. After detailed deliberations, the option with GIS underground and ICTs (oil filled) over ground for establishment of 220/66kV GIS at Chandigarh was agreed. It was also decided that Powergrid would explore the possibility of funding either from UT of Chandigarh or through PSDF for the additional civil cost.

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**Corrigendum-II to Minutes of 38<sup>th</sup> Meeting of  
Standing Committee on Power System Planning in Northern Region (SCSPNR)  
held on 30<sup>th</sup> May, 2016 at NRPC, Katwaria Sarai, New Delhi**

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The Minutes of 38<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region were issued vide 1/9/38/2016/PSP&PA-I/721-739 dated 8<sup>th</sup> June, 2016. PGCIL vide letter No C/CTU/N/PLG dated 23-6-2016 and RRVPNL vide their letter no RVPN/SE(P&P/PSS/D.596 dated 16.6.2016 had given the observations on the minutes. Following corrigendum is issued based on the observations/Comments received from PGCIL and RRVPNL:

**Corrigendum-II# 1**

**Observations on the Minutes of 38<sup>th</sup> Standing Committee Meeting on Power System Planning held on 30/05/2016 made by RRVPNL:**

**10.0 Operational Feedback on Transmission Constraint: April 2016**

In the minutes of 38<sup>th</sup> SCSPNR following has been mentioned Under Item No. 10.1 I (8) regarding **Under lying 220 kV network of Bhiwadi:**

220 kV Bhiwadi (Pg) - Bhiwadi (Raj) D/C line to be commissioned by July, 2016

The above sentence of the minutes under Item No. 10.1 I (8) is replaced as:

*Second circuit of Bhiwadi(PG) – Bhiwadi(RVPN)D/C line to be commissioned by July 2016*

**Corrigendum-II# 2**

**Observations on the Minutes of 38<sup>th</sup> Standing Committee Meeting on Power System Planning held on 30/05/2016 made by Powergrid**

**11.0 OPGW on main transmission line being LILOed**

Under para 11.2 (a) OPGW following has been mentioned:



“Thus, it is proposed that the provision of OPGW in the main line may be taken up by the respective owner of the transmission system to provide communication connectivity to these new substations.”

Powergrid has made the observation that in the above, provision of Approach Cable, FODP and Communication Equipment at both ends needs to be added. Accordingly, the above sentence of the minutes under para 11.2 (a) OPGW is replaced as:

*Thus, it is proposed that the provision of OPGW in the main line along with Approach Cable , FODP and Communication Equipment at both ends may be taken up by the owner of the transmission system to provide communication connectivity to these new substations.*

Similarly, under para 11.2 (b) **Communication equipment** following has been mentioned:

“In these cases, end to end communication establishment will not be possible unless the communication equipment including for other end is commissioned.”

In the above also, Powergrid has made the observation that provision of approach cable and FODP needs to be added. Accordingly, the above sentence under para 11.2 (b) **Communication equipment** is replaced as:

*In these cases, end to end communication establishment will not be possible unless the communication equipment including approach cable and FODP for other end is provided.*

Also the following is included in para 11.2:

*POWERGRID further informed that for some of the lines being implemented under TBCB, it has been observed that planning for OPGW is considered between Gantry of one station to Gantry of other station under RfP document but FODP, approach cable and Communication Equipment at end stations is not covered. In these cases, end-to-end communication establishment will not be possible. Hence provision of FODP, approach cable is required to be made accordingly by the respective owners.*

Members deliberated on above points and agreed for the same.’

## **15.0 Transmission system for Ultra Mega Solar Park in Fatehgarh, distt. Jaisalmer, Rajasthan**

Powergrid has made the observation that the 400kV line bays at Bhadla (PG) for termination of 765kV Fatehgarh PS- Bhadla (PG) D/c line (initially to be op at 400kV) has been missed out from the transmission scheme's scope mentioned in para 15.5 of the 38<sup>th</sup> SCM minutes. Accordingly, the scope of the scheme '**Transmission system for Ultra Mega Solar Park in Fatehgarh, distt. Jaisalmer, Rajasthan**' to be taken up for implementation under ISTS through TBCB route **is as follows:**

- i). 765 kV Fatehgarh Pooling station - Bhadla (PG) D/C line (initially to be operated at 400kV)
- ii). Establishment of 400kV Pooling Station at Fatehgarh (with a provision to upgrade at 765kV level)
- iii). 2 nos of 400kV line bays at Fatehgarh Pooling station
- iv). 1x125 MVAR Bus reactor at 400kV Fatehgarh Pooling station

**Note:** (i) Park Developer to construct 400 kV line from M/s AREPL solar park to Fatehgarh Pooling station.

(ii) Powergrid to provide two number of line bays at Bhadla(PG)

#### **18.0 220kV bays at 400/220 kV Baghpat (PG) and Saharanpur (PG) substations:**

PGCIL has made the observation that the time frame of the 220 kV works informed by UPPTCL, has been missed out in the Minutes. Accordingly, Para 18.3 and Para 18.5 of the minutes are modified as follows:

*18.3 In addition to above, UPPTCL plan to connect further as follows:*

- (i) *Stringing of 220kV II<sup>nd</sup> ckt of Baghpat (PG) to Baghpat (UP) 220kV line – July 2016*
- (ii) *Stringing of 220kV II<sup>nd</sup> ckt from Baghpat (PG) to Baraut (UP) 220kV line – July 2016*
- (iii) *Baghpat (PG) – Modipuram (II) 220kV D/c line(to be commissioned alongwith Modipuram II which is expected by Mar. '17)*
- (iv) *LILO of Moradnagar II (UP) – Shamli 220kV S/c line at Baghpat (PG) – July 2016*

*Thus, remaining 8 nos 220 kV would be utilised.*

*18.5 CE, UPPTCL further informed that for utilization of bays at Saharanpur (Pg), the following downstream elements are planned:*

- (i) *LILO of Saharanpur -Nanauta 220kV S/c line at Saharanpur PG (400kV) S/s: commissioned*
- (ii) *LILO of Khara - Shamli 220kV S/c line at Saharanpur (PG) (by July 2016)*
- (iii) *Saharanpur(PG) - Saherswa (UPPTCL 220kV) 220kV D/c line (by July '17)*
- (iv) *LILO of one ckt. of Khodri-Saharanpur 220kV D/c line at Saherswa (220/132/33 kV 2x160, MVA Saherswa S/s is under construction)*
- (v) *Thus, the remaining 4 nos 220 kV would be utilised.*

#### **21.0 Mismatch of network at the time of deceleration of Date of Commercial Operation (DOCO)**

The expected schedule of 7x105 MVA Kala Amb S/S mentioned at Sl. No.8 of Para 21.4 has been in inadvertently recorded as Oct', 2018, which is corrected as *July 2017*.

#### **31.0 Augmentation of 400/220 kV Agra (PG) substation**

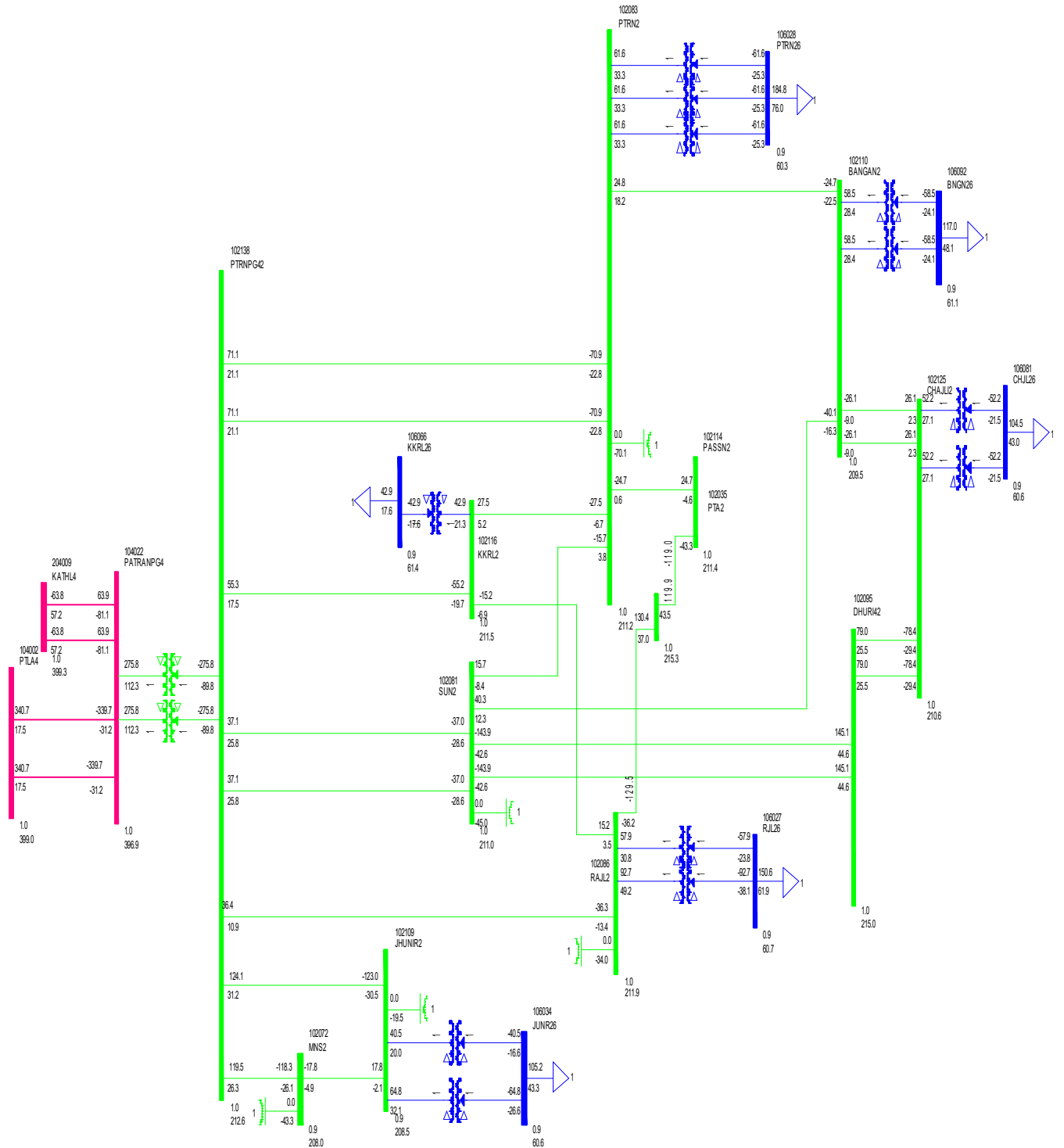
Following is included as **para 31.3** of the minutes:

*31.3 CTU informed that that second 315MVA ICT at Agra (PG) has been agreed under NRSS XXXIV and is under implementation. It is expected to be commissioned by July 2017. Keeping this in view, it was there is no requirement of 500 MVA ICT. Members agreed to the same.*

**Status of URTDSM Project for 38<sup>th</sup> Standing Committee meeting of Power System Planning of Northern Region:**

<ul style="list-style-type: none"> <li>• <b>Engineering Progress:</b> <ul style="list-style-type: none"> <li>▪ Engineering completed.</li> </ul> </li> <li>• Present Status of Supply and Installation of PMUs, Control Center equipment:</li> </ul>									
S.No	Region	PMUs (No of Substations)				Development System PDS (No of Control Centers)			Remarks
		Total	Supplied	Commissioned	Integrated	Total	Supplied	Installation	
1	NR	113	72	54	10	13	13	10	
<ul style="list-style-type: none"> <li>• Balance supply of PMUs in NR likely to be completed by Aug'16</li> <li>• Plan for Commissioning of Substations – average of 6 substations per month in NR</li> <li>• Number of trained personnel in NR: 46</li> <li>• Control center Development system (PDS) commissioned and integration testing of PMUs in progress</li> <li>• Demo testing of Control Center software applications is in progress by ALSTOM R&amp;D and Project teams.</li> <li>• Control Center Integrated FAT likely by: Oct-Nov 2016</li> </ul>									
<ul style="list-style-type: none"> <li>• Development of Analytical Tools Using PMU Based Phasor Measurements by POWERGRID in association with IIT-B</li> </ul>									
Sr. No.	Analytics				Status				
1.	Line Parameter Estimation				Prototype Completed				
2.	On line vulnerability analysis of distance relays				Prototype Completed				
3.	Linear State Estimator				Under development				
4.	Supervised Zone-3 distance protection scheme to prevent unwanted tripping				Prototype completed, Pilot Scheme under implementation				
5.	CT/CVT Calibration				Under development				
6.	Control for improving system security (Based on angular, voltage & frequency stability)				Under development				

load flow study for requirement of 220kV bays at Patran 400/220kV S/s



**Minutes of meeting held on 10.1.2017 in CEA, under the chairmanship of Chief Engineer (PSP&PA-I) regarding the connectivity of (i) Daula sindh HEP and (ii) Luhri Stage-I HEP of M/s SJVNL in Himachal Pradesh.**

List of participants is enclosed at Annexure- A.

Chief Engineer(PSPA-I), CEA welcomed all the participants to the meeting and following deliberations were made in the meeting regarding the two projects of SJVNL:

**(i) Daulasidh HEP (66MW)**

Director (PSPA-I) stated that the issue of connectivity of Dhaulasidh HEP (66 MW) of M/s SJVN Ltd. was discussed in 38<sup>th</sup> meeting of the Standing Committee Meeting on Power System Planning of NR held on 30.5.2016 wherein it was decided that a meeting would be called by CEA with CTU, SJVNL and HPPTCL/HPSEBL. He enquired about the status of the project.

SJVNL representative stated that the power from the project is proposed to be evacuated outside the state and they had already applied for its connectivity to Powergrid. TEC for the project has been given by the state government. The project is anticipated to be commissioned by 2022. For connectivity of the project, earlier a meeting was held on 9.9.2015 (minutes enclosed) with the officials from HPSEBL and SJVNL and three options (i) LILO of Dehra-Hamirpur 132kV D/c line at Daulasidh (ii) Daulasidh –Mattansidh (HPSEB)132kV D/c line (iii) Daulasidh –Mattansidh(PGCIL) 220kV D/C line were explored and after deliberations it was found that the option(iii) i.e. Daulasidh –Mattansidh(Hamirpur) 220kV D/C line is techno-economical as the other options would also entail overhead charges like LTA/MTOA, wheeling charges, SLDC/operating charges for availing HPSEBL transmission system.

CTU representative stated that the nearest ISTS point to Daulasidh HEP is 400/220kV Mattansidh (Hamirpur) only.

After deliberations, it was decided that connectivity to Daulasidh HEP can be provided through Dhaulasidh HEP – Hamirpur (PG) 220 kV D/C line. The line along with two number of 220kV bays at Hamirpur (PG) would be constructed by SJVNL.

**(ii) Luhri HEP Stage-I (210MW)**

Chief Engineer(PSPA-I), CEA stated that SJVNL vide their letter dated 7.9.2016 had requested to evolve the transmission scheme for evacuation of power from Luhri HEP Stage-I(2x80+2x25 MW) and requested SJVNL to update the status of the project.

SJVNL representative stated that the project Luhri HEP (LHEP) is on Satluj river. The upstream and downstream projects are Rampur and Koldam respectively. Initially, LHEP was contemplated as single stage project of 775 MW. Thereafter, project layout was reviewed and it was decided to develop LHEP in three stages with capacity of 210 MW (St-I), 220 MW (St-II) and 339 MW(St-III). He further stated that earlier the Stage-I and Stage-II of the project were to be implemented by SJVNL and Stage-II was given to HPCL. But, recently, Government of Himachal Pradesh has allocated the implementation of the third stage of the project to SJVNL also.

CTU representative stated that earlier transmission system for Luhri HEP with capacity of 775 MW was discussed in the 29<sup>th</sup> meeting of the Standing committee on Power System Planning of NR held on 20.1.2011 and following transmission system was agreed:

**Associated transmission for Luhri generation:**

- LILO of Rampur-Nallagarh 400kV line at Luhri
- Luhri-Mohali 400kV D/c (Triple Conductor)

**System Strengthening:**

- Mohali-Malerkotla 400kv D/c
- LILO of one circuit of Nallagarh - Patiala line at Mohali 400kV D/c
- Establishment of 2x315 MVA 400/220kV GIS substation at Mohali

SJVNL representative stated that for connectivity of Luhri Stage-I, LILO of Rampur-Nallagarh 400kV line at Luhri may be considered.

CEA/CTU clarified that stated that this line always remains overloaded and SPS has already been installed on this line, hence connectivity cannot be granted through LILO of this line. Director (PSPA-I), CEA enquired about the commissioning schedule of the three stages.

SJVNL representative stated that Stage –I is expected to be commissioned by 2023, Stage-II by 2025 and Stage-III by 2027. Presently, Stage-II and III are in PFR stage.

Chief Engineer(PSPA-I), CEA stated under integrated planning, a common transmission system along with a pooling station may be evolved for evacuation of power of the project where the power from all the three stages could be pooled and injected to the ISTS system, provided the time gap between the implementation of stages is minimum.

SJVNL representative stated that they would discuss the matter and would revert back accordingly.

Meeting ended with the thanks to chair.

**Annexure-A**

**List of Participants of the meeting held on 10.01.2017 in CEA regarding connectivity of (i) Daula sindh HEP and (ii) Luhri Stage-I HEP of M/s SJVNL in Himachal Pradesh**

<b>Sr. No</b>	<b>Name (Mr/Ms)</b>	<b>Designation</b>	<b>Organisation</b>
1.	Ravinder Gupta	Chief Engineer(PSPA-1)	CEA
2.	Awdhesh Kumar Yadav	Director (PSPA- 1)	CEA
3.	Manjari Chaturvedi	Deputy Director (PSPA- 1)	CEA
4.	Jitesh Shrivastava	Astt. Director	CEA
5.	Mukesh Khanna	Addl. General Manager	Powergrid
6.	Rashmi Pant Joshi	Dy. Manager	Powergrid
7.	RPS Sidhu	Senior Manager	SJVNL
8.	Chandan Mehta	Dy. Manager	SJVNL

**Minutes of Meeting regarding “Associated Transmission System for Tanda STPS Stage II (2 x 660 MW) for 395.42 MW LTA to NR beneficiaries” held on 11.04.2016.**

List of Participants is enclosed as Annexure-I.

Chief Engineer (PSPA-I), CEA welcomed all the participants to the meeting and stated that the meeting has been convened to discuss the issues raised by POWERGRID and NTPC regarding “Associated Transmission System for Tanda STPS Stage II (2 x 660 MW)” vide their letters dated 24<sup>th</sup> March, 2017 and 31<sup>st</sup> March, 2017 respectively. (copy enclosed as Annexure- II)

1. CEA informed that the intra state transmission schemes for evacuation of power from Tanda Ext. (2x500MW) along with Parichha TPS Extn. (2x250MW), Harduaganj Extn (2x250MW) were agreed in the 26<sup>th</sup> meeting of the Standing Committee on Power System Planning of Northern Region(SCPSPNR) held on 13.10.2008. The Intra-State Transmission schemes, interalia, included the following system for evacuation of power from Tanda-II generation project:
  - f) Tanda – Gonda 400kV quad D/C line
  - g) Gonda – Shahjahanpur(PG) –) 400kV quad D/C line
  - h) 2x315 MVA, 400/200kV S/s at Shahjahanpur by LILO of both circuits of Lucknow (PG) – Bareilly (PG )400kV D/C line.
  - i) LILO of Azamgarh – Sultanpur 400kV line at Tanda
  - j) Establishment of 400kV substation at Gonda with 400/220kV, 2x315 MVA ICTs

Further during the 30<sup>th</sup> meeting of SCPSPNR / LTA meeting held on 19<sup>th</sup> December 2011, the connectivity for Tanda -II project was agreed through 2x 315 MVA, 400/220 kV ICT at Tanda by inter-connecting Tanda-II 400 kV generation with existing 220 kV bus of Tanda-I. Interconnecting arrangement along with 400/220 kV ICT at Tanda-II generating switchyard would be provided by NTPC.

Subsequently, NTPC had applied for LTA for 484.28 MW with Punjab, Delhi, Haryana, Rajasthan, HP, Chandigarh, J&K as beneficiaries. For drawing its share from Tanda-II generation project, UP is implementing its own system. Following transmission system was agreed in the 31<sup>st</sup> meeting of the SCPSPNR / LTA meeting held on 02.01.2013 for granting LTA to NTPC for 484.28 MW:

- c) Tanda TPS – Sohawal 400 kV D/c line
- d) Sohawal – Lucknow (New) (PG) 400 kV D/c line

Regarding LILO of Azamgarh- Sultanpur 400 kV S/c line at Tanda, it is mentioned in the minutes of the LTA meeting held on 02.01.2013, that it being an intra state system, the matter may be discussed between UPPTCL and NTPC.



2. CEA stated that a meeting was held on 11.11.2016 in CEA, wherein the issue of revised LTA quantum from 484.28 MW to 395.42 MW of Tanda Stage-II was discussed as PSPCL, TPDCL & BRPL had surrendered their allocated power from Tanda-II generation project and UP had given consent for purchasing the surrendered power. This additional power allocation to UP is under consideration of M.O.P, Government of India. In the meeting, it was decided that NTPC would submit the revised LTA application / formal request to CTU in line with the CERC Regulations and detailed procedures for grant of connectivity and LTA. Based on the request of NTPC, CTU would process the proposal of NTPC in consultation with CEA and other stakeholders.
3. CTU stated that NTPC vide its letter dated 24/12/16 has revised the total LTA quantum from Tanda Stage-II to 395.42 MW from 484.28 MW. As the change in total LTA quantum was less than 100 MW, no fresh LTA application has been submitted by NTPC. Considering the change in quantum of LTA, they have circulated the agenda vide their letter dated 16.1.2107 to the Northern Region constituents for their observations. CTU further informed that UPPTCL vide their email dated 27/01/2017 and 15/02/2017 had expressed certain reservations regarding requirement of ISTS facility.
4. UPPTCL stated that about 70% of the power from the project has been allocated to U.P. and they are implementing Tanda – Gonda – Shahjahanpur 400 kV Quad D/C line. Further, with implementation of already agreed LILO of Azamgarh – Sultanpur 400 kV S/C line at Tanda-II, the above intra-state system would be sufficient for evacuation of entire power from the Tanda-II and there is no requirement of any other transmission system from Tanda-II only because of outside shares. UPPTCL also informed that this LILO work was never abandoned in any meeting subsequent to the 26<sup>th</sup> meeting of SCSPNR and the requirement of additional bays at Tanda arose only to cater LTA.
5. NTPC stated that synchronisation of 1<sup>st</sup> unit of Tanda-II is July, 2018 with its COD by January 2019. Therefore, the transmission system for evacuation of power from Tanda –II is required by July 2018. UPPTCL informed that 40% of the work of Tanda – Gonda – Shahjahanpur 400 kV Quad D/C line along with 400/220 kV Gonda S/s has been completed. This system is being implemented through PPP mode.
6. CEA stated that as per the progress report of PSPM division CEA, for Tanda –Gonda line, out of 240 locations, stub casting has been done for 97 locations and towers have been erected at 54 locations and for Gonda - Shajahanpur 400 kV line, out of 543 locations, stub casting has been done for 296 locations and towers have been erected at 140 locations. UPPTCL informed that the line/s would be completed by or before July, 2018. However, in case of delay / non availability of 400 kV Tanda – Gonda D/C line, the LILO of 400 kV Sultanpur – Azamgarh line at Tanda – II, which would be implemented by UPPTCL, would take care of the synchronization requirement, start-up power requirement and evacuation requirement for unit-I of Tanda-II generation project. They have already taken approval for implementation of the

LILO line. However, for termination of this line at Tanda-II, two no. of 400 kV bays are required at Tanda-II generation switchyard. He requested the members to give go ahead for taking up the implementation of LILO of 400 kV Sultanpur–Azamgarh line at Tanda-II.

7. NTPC informed that presently they are implementing 4 nos of 400 kV GIS line bays. Therefore, no 400 kV bay is available for terminating the LILO of 400 kV Sultanpur – Azamgarh line at Tanda-II generation switchyard. However, space is available for implementation of additional 400 kV bays at Tanda-II switchyard. Tanda-II generation switchyard being GIS, provision of additional 2 nos. 400 kV line bays needs to be discussed with the contractor.
8. Regarding UPPTCL's proposal of reviewing the Inter-State transmission system, i.e. Tanda – Sohawal – Lucknow 400 kV D/C line and the intra-state agreed being adequate for evacuating the entire power from Tanda-II, CEA/CTU stated that prima facie, it is observed that without Tanda – Sohawal – Lucknow 400 kV D/C line, there are some constraints in the 220 kV network of UPPCL. Also, in case of non-implementation of ISTS system, the other beneficiaries of the project may be required to pay additional STU charges/losses for using STU transmission system. Therefore, the matter needs to be deliberated in the forthcoming meeting of the Standing Committee on Power System Planning of Northern Region.

UPPTCL stated that the constraints in their 220 kV network, if any, could be taken care with provision of high capacity conductors. As far as the Tanda–Sohawal–Lucknow 400 kV D/C line is concerned, if the same is required in light of commercial issues likely to affect other beneficiaries, Tanda-Sohawal section may only be considered for delivering the share of other beneficiaries of Tanda-II. UPPTCL further stated that intra- state network system evolved in 26<sup>th</sup> meeting of SCPSPNR is sufficient to evacuate 100% power irrespective of beneficiary. Further, in view of revised load generation scenario and strong 400 kV interconnections of Lucknow (PG) sub-station with Shahajahanpur (PG) and Sultanpur (UP) substations, the Sohawal- Lucknow 400 kV DC is not justified.

CEA/CTU informed that the entire bidding process of the ISTS line (Tanda–Sohawal–Lucknow 400 kV D/C line) has been completed except for transfer of the SPV to the successful bidder in view of the non-signing of TSA by three beneficiaries (as they have surrendered their share of power). As on date, the time available for implementation of the ISTS scheme is only 14- 15 months and with review of the scheme, it would be to implement in the time frame of Tanda-II generation project. Also the review of the scheme implies annulment of the bidding process.

PFCCCL representative, the BPC, stated that they have already completed the bidding process for the scheme except for the transfer of SPV to the successful bidder and have also incurred expenses for carrying out the bidding process. With review of the transmission system at this stage, they would not be able to recover their expenses.

9. Regarding the query raised by NTPC about the control jurisdiction of Tanda-II generation, it was opined that Clause 6.4. (2) of Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 states that

*The following generating stations shall come under the respective Regional ISTS control area and hence the respective RLDC shall coordinate the scheduling of the following generating stations:*

- a) Central Generating Stations (excluding stations where full Share is allocated to host state),*
- b) Ultra-Mega power projects*

As Tanda-II is a Central Generating Station having more than one beneficiary, hence NRLDC will coordinate the scheduling from Tanda-II generation project..

UPPTCL stated that at Clause6.4(2)(c)of the above regulation the following clause is included:

*(iii) If a generating station is connected both to ISTS and the State network, scheduling and other functions performed by the system operator of a control area will be done by SLDC only, if state has more than 50% Share of power. The role of concerned RLDC, in such a case, shall be limited to consideration of the schedule for inter state exchange of power on account of this ISGS while determining the net drawl schedules of the respective states. If the State has a Share of 50% or less, the scheduling and other functions shall be performed by RLDC as it is an ISTS generation and other States are also its beneficiaries, therefore, scheduling would be done by NRLDC.*

UP is having more than 50% share in Tanda-II TPS, therefore the it would come under control jurisdiction of SLDC.

NTPC clarified that this Clause is applicable to cases other than (a) and (b) quoted above. However, they may approach CERC as per the Clause6.4(3) which states that: *There may be exceptions with respect to above provisions, for reasons of operational expediency, subject to approval of CERC*

10. After further deliberation, the following was agreed: -

- a) Review of the Tanda–Sohawal–Lucknow 400 kV D/C line (Inter State Transmission system associated with Tanda-II TPS) as suggested by UPPTCL, would be deliberated in the forthcoming meeting SCPSPNR and its implications on the ISTS beneficiaries (other than UPPTCL) of the Tanda-II generation project.
- b) Keeping in view the present situation (review of ISTS system, issues in implementation of Tanda-Gonda-Shajahapur 400 kV D/C line under PPP mode), taking up the implementation

of LILO of 400 kV Sultanpur – Azamgarh S/C line at Tanda-II by UPPTCL was agreed in principle subject to ratification in next meeting of SCPSPNR to take care of evacuation requirements from unit 1 of Tanda-II. Further, NTPC would explore the implementation of 2 nos. of 400 kV additional line bays at NTPC switchyard.

Meeting ended with thanks to the chair.

## **Report on Reconductoring of 220kV Samaypur –Ballabgarh –BTPS lines**

### **Background:**

Delhi met the peak demand of 6261 MW in the year 2016 and the peak demand is expected to increase to about 6700 MW in the year 2017. Badarpur Thermal Power Station with an installed capacity of 3x95+2x210 MW plays crucial role in meeting the demand of Delhi. However, due to the prevailing pollution norms 3x95 MW units are under shut down and only 2x210 MW units of BTPS is under operation, which would also be closed in near future. The demand of South Delhi area is mainly met from Maharani Bagh 400/220 kV substation, BTPS and Badarpur–Ballabgarh 220kV D/C line. Badarpur–Ballabgarh 220kV D/C line is a very old line, which is owned by BBMB and it experiences high loading of the order of 160 MW/ckt during peak demand conditions of Delhi. Under the outage of one ckt. of Ballabgarh – Badarpur 220 kV D/C line, the other circuit would be loaded beyond its design limit. Delhi Transco Limited (DTL) has proposed reconductoring of Badarpur–Ballabgarh 220kV D/C line of BBMB with HTLS conductor.

The issue of reconductoring of Badarpur–Ballabgarh 220kV D/C line has already been discussed in 37<sup>th</sup> and 38<sup>th</sup> meetings of the Standing Committee on Power System Planning of Northern Region (SCPSPNR) held on 20.1.2016 and 30.5.2016 respectively. In the SCPSPNR, HVPNL had stated that the transmission system of Haryana is integrated with BBMB & DTL systems and reconductoring of Badarpur–Ballabgarh 220kV D/C line (to enable Delhi to draw more power) may overload the Haryana transmission system, especially when BTPS is not generating. As no representative of BBMB was present in the 38<sup>th</sup> SCPSPNR, it was decided that CEA would convene a meeting with CTU, DTL, HVPNL and BBMB.

Further, DTL vide their letter dated 10.10.2016 has informed that a meeting was held on 23.6.2016 among the member states of BBMB chaired by JS (Power), MoP, wherein, following was decided:

*“DTL would expedite planned transmission system for Delhi and other measures for clear supply to Delhi. Strengthening of 220kV Ballabgarh –BTPS double circuit and 220kV Samaypur – Ballabgarh sections of BBMB would be done by DTL at its own cost”.*

A meeting was held on 8.7.2016 in CEA, wherein, it was decided that a committee consisting of CEA, BBMB, HVPNL, CTU would carry out the system studies and bring out various pros and cons of re-conducting of 220kV Samaypur–Ballabgarh–BTPS lines including the change in the switchgear rating of all the pertinent nodes and DTL would furnish the drawl of power through these lines.

Secretary (Power), NCT of Delhi vide D.O letter dated 08-12-2016 addressed to Joint Secretary (Trans), MoP (copy enclosed) raised the issue of re-conductoring of 220kV Samaypur –Ballabhgarh –BTPS lines and consequential change in rating of equipment to be made at respective 220kV S/Ss. In the letter, she has requested that the works may be given to POWERGRID (due to urgency of work and the lines being ISTS) and funding of the scheme may be done from Power System Development Fund (PSDF) as this being a transmission system strengthening scheme.

The issue was further deliberated in a meeting held on 10.1.2017 in CEA, wherein, following was decided:

1. System studies would be carried out in CEA within 15 days' time frame along with the representatives from CEA, CTU, BBMB, HVPNL and DTL.
2. DTL would furnish the details of anticipated load (2018-19 time frame) of the substations being fed through these lines. DTL would also submit a copy of the proposal of re-conducting of Samaypur –Ballabhgarh –BTPS 220kV lines to BBMB.
3. HVPNL would furnish the details of the augmentations purposed in and around Samaypur and Ballabhgarh area upto 2018-19 time frame.
4. Based on the system studies, the augmentations required in the substations/transmission lines in addition to the re-conductoring of Samaypur –Ballabhgarh –BTPS 220kV lines would be identified.
5. The preparation of DPR/s for the proposal of augmentation required (if any) & re-conductoring works and funding of the proposal would be taken up by BBMB subsequently.

Based on the inputs provided by DTL, HVPNL and BBMB, system studies were carried out in CEA. The studies were discussed with the representatives from CTU, BBMB, HVPNL, and DTL in a meeting held on 30.01.2017 at CEA, New Delhi.

#### **Assumptions made in the Load flow studies:**

- DTL had furnished a study file after updating transmission network of Delhi and loads. The load flow studies were carried out with updated network of Delhi in the study file of CTU for 2017-18 time frame.
- Peak load of Delhi as 6680 MW was considered in the system studies.
- HVPNL furnished the load data for Haryana network. Based on HVPNL inputs, the loads at nodes in and around Ballabhgarh were increased. The load at Pali S/s was increased from 105 MW to 150 MW, at Dadri BBMB from 50MW to 100 MW, at Palwal from 146 MW to 200 MW. At Ballabhgarh (BBMB) load of 200MW has been considered.
- In the Base case, 2x210 MW generation at Badarpur has been considered.

- The following cases were studied:

Base Case	Without Tugalakabad S/s, with 2x210 MW generation at Badarpur TPS	Exhibit-I
	Outage of one circuit of Badarpur –Ballabhgarh 220kV D/C line	Exhibit-II
	Outage of one ckt. of 220kV Samaypur- Ballabhgarh 220 kV D/C line	Exhibit-III
SCENARIO-I	Base case + without Badarpur TPS	Exhibit-IV
	Outage of one circuit of Badarpur –Ballabhgarh 220kV D/C line	Exhibit-V
	Outage of one ckt. of 220kV Samaypur- Ballabhgarh 220 kV D/C line	Exhibit-VI
SCENARIO-II	Base case + with Tugalakabad S/s and without Badarpur TPS	Exhibit-VII
	Outage of one circuit of Badarpur –Ballabhgarh 220kV D/C line	Exhibit-VIII
	Outage of one ckt. of 220kV Samaypur- Ballabhgarh 220 kV D/C line	Exhibit-IX

#### Observations of the study results:

##### 1. Base Case with 2x210 MW generation at BTPS and without Tuglakabad 400/220 kV substation:

In the Base Case, the power flow on 220kV Badarpur –Ballabhgarh D/c is line is 290 MW (145 MW per ckt.), whereas, 220kV Samaypur–Ballabhgarh D/c line is critically loaded (202 MW per ckt.). In case of outage of one circuit of 220kV Badarpur –Ballabhgarh D/c line, the other circuit gets overloaded (225 MW). In case of outage of one circuit of Ballabhgarh-Samaypur 220kV D/c line, the remaining two circuits between Samaypur and Ballabhgarh gets overloaded (310 MW and 210 MW).

##### 2. SCENARIO – I without BTPS generation and without 400/220kV Tuglakabad substation:

In Scenario-I, power flow on 220kV Badarpur–Ballabhgarh D/C line is about 500MW (247 MW each ckt.). In case of outage of one circuit of 220kV Badarpur–Ballabhgarh D/c line, loading of 385

MW is observed on the other circuit. Power flow on 220kV Samaypur–Ballabgarh D/c line is 543 MW (271 MW each ckt.) and power flow on 220kV Samaypur–Ballabgarh S/c line is 209 MW. In case of outage of one circuit of Ballabgarh- Samaypur 220kV D/c line, loading of 414 MW and 318 MW is observed on the remaining two circuits between Samaypur and Ballabgarh. Thus, it is seen that in the Scenario-I, Samaypur–Ballabgarh 220 kV lines (D/C + S/C) and Ballabgarh–Badarpur 220 kV D/C lines are overloaded.

### 3. **SCENARIO – II without BTPS generation and with 400/220kV Tuglakabad substation:**

In Scenario-II, power flow on 220kV Badarpur –Ballabgarh D/c line is 93MW (46.5 MW each ckt.). Power flow on 220kV Samaypur–Ballabgarh D/c line is 260 MW (130 MW each ckt.) and in case of outage of one circuit of Ballabgarh- Samaypur 220kV D/c line, loading of 196 MW and 150 MW is observed on the remaining two circuits between Samaypur and Ballabgarh.

#### **Analysis of study result:**

1. As per the details provided by BBMB, the current rating of Ballabgarh–Samaypur 220 kV D/C line, Ballabgarh – Samaypur 220 kV S/C line and Ballabgarh–Badarpur 220 kV D/C line is 575 Amp (220 MVA), 455 Amp (173 MVA) and 525 Amp (200 MVA) respectively. Therefore,
  - In the Base Case, out of the 5 nos. of 220 kV lines feeding power to Badarpur from Samaypur substation, 3 nos. are loaded to their full capacity (Samaypur – Ballabgarh D/C + S/C line) and loading on 2 nos. (Ballabgarh-Badarpur 220 kV D/C line) are within their limits.
  - In scenario-I (when the BTPS generation (376 MW) is zero), all the 5 nos. of 220 kV lines feeding power to Badarpur from Samaypur substation are overloaded.
  - In Scenario – II (without BTPS generation and with 400/220kV Tuglakabad substation), loadings on all the 5 nos. of 220 kV lines feeding power to Badarpur from Samaypur 220 kV substation are normal. However, in case of outage of one ckt. of the 3 nos. 220 lines between Samaypur and Ballabgarh, the remaining ckts are loaded to almost their capacity.
2. In Base Case, out of the total drawl at Samaypur from Ballabgarh (Samaypur) 400/220 kV ICTs (1233 MW), 45% of the power flow is towards Ballabgarh (BBMB) and balance on 220 kV other outlets (8 in no.) from Samaypur. Out of the total power received at Ballabgarh (BBMB) from Samaypur, 50% of the power flow towards Badarpur.
3. In case of scenario-I (when the BTPS generation (376 MW) is out), 202 MW of additional power flow is seen on Ballabgarh (BBMB)-Badarpur 220 kV D/C line and balance feed to Badarpur bus is seen through Noida, Alwar and DIAL-Mehrauli 220 kV lines. The 188 MW of additional power flow on Ballabgarh (BBMB)-Badarpur 220 kV D/C line is available through additional drawl of 52 MW from Ballabgarh (Samaypur) 400/220 ICTs and balance power of about 150 MW is



redistributed from other 220 kV outlets from Samaypur (8 nos. of 220 kV lines) towards Ballabhgarh.

4. Thus, it is seen that out the total power drawn at Samaypur 220 kV bus through Ballabhgarh (Samaypur) 400/220 ICTs, about 46% of the power is dispersed through Samaypur – Ballabhgarh 220 kV lines (D/C+S/C) and balance is dispersed through other 220 kV lines (8 nos.). Even in case of increased power flow on Ballabhgarh-Badarpur 220 kV D/C line, when there is no generation at BTPS, the power is redistributed from other 220 kV outlets from Samaypur towards Ballabhgarh (BBMB) and additional drawl from Ballabhgarh (Samaypur) 400/220 kV ICTs is only about 52 MW. No overloading is observed in and around Samaypur, Ballabhgarh area in HVPNL network except for the overloading on Samaypur-Badarpur-Ballabhgarh 220 kV lines. Therefore, to avoid overloading of these lines, the existing zebra conductor could be replaced with high current carrying conductors (HTLS conductor).
5. In case of scenario-II (without BTPS generation and with 400/220kV Tuglakabad substation), power demand of South Delhi is mainly met from Tuglakabad 400/220 kV substations and import of power through Ballabhgarh-Badarpur 220 kV D/C line is very less (about 46 MW per ckt.).
6. As per the information furnished by BBMB, 220kV equipment ratings at Ballabhgarh substation is found adequate for the anticipated power flow.

#### **RECOMMENDATION:**

- A. To meet the peak demand of Delhi till the commissioning of Tuglakabad 400/220 kV substation, the following transmission system strengthening is required:
  - a) Reconductoring of following 220 kV lines:
    - Samaypur-Ballabhgarh (BBMB) 220 kV D/C line (4.23 km)
    - Samaypur-Ballabhgarh (BBMB) 220 kV S/C line (5.5 km)
    - Ballabhgarh (BBMB)-Badarpur 220 kV D/C line (24.73 km)
  - b) Replacement / Augmentation of line bay equipment at Badarpur switchyard.
- B. After commissioning of 400/220kV Tuglakabad S/s, the loads of South Delhi area are mainly fed through Tuglakabad S/S. The power flow on 220kV Badarpur-Ballabhgarh D/c line get reduced substantially. However, in case of outage of one circuit of the 3 nos. 220 lines between Samaypur and Ballabhgarh (BBMB), the remaining two circuits are loaded to their capacity.

**Proposed System to contain short circuit current level of substation associated with high capacity NCR ring.**

**1. 12ohm Series Line reactors in following lines:**

- Dadri-Mandaula 400kV Ckt-I & II
- Dadri-Maharanibagh 400kV Ckt I
- Dadri-Greater Noida 400kV Ckt I
- Ballabgarh-Bamnoli 400kV Ckt-I & II
- Ballabgarh-Nawada 400kV Ckt-I
- Bawana-Mandaula 400kV Ckt-I & II
- Bawana-Mundka 400kV Ckt-I & II
- Jhattikra-Mundka 400kV Ckt-I & II

**2. 12ohm Series Bus reactors at the following Substation:**

- Series bus reactors of 12 ohm at 400 kV Mandaula & Ballabgarh substations.

**3. Bus split arrangements at the following Substation:**

- Bus split arrangement of Dadri and Bawana was proposed to be retained.
- Further, it was proposed that 400/220kV Greater Noida substation of UPPTCL may not be connected to 765/400kV Greater Noida(New) substation of UPPTCL under normal condition and only connected as a contingency measure(The same has however not been considered in studies presently. UPPTCL may advise).

Out of the above proposed arrangements/elements, following elements were agreed to be implemented:

- 12ohm Series Line reactors in Dadri-Mandaula 400kV Ckt-I & II
- 12ohm Series Bus reactors at 400/220kV Mandaula & Ballabgarh substations.

**Annexure – VIII**

<b>S.No</b>	<b>State</b>	<b>P(Load) in MW</b>
1	CHANDIGARH	230
2	J&K	1600
3	HIMACHAL	950
4	PUNJAB	4000
5	HARYANA	4050
6	DELHI	2500
7	RAJASTHAN	5900
8	UP	12500
9	UTTARAKHAND	900

**Total                      32500 MW**

## Annexure-IX

No.	Bus Name	Area Name	PGen (MW)
1	KASHANG 220.00	NORTH	18.2
2	LAHAL 400.00	NORTH	13
3	GOINDWAL 220.00	NORTH	402.6
4	LALITPUR 765.00	NORTH	1147.6
5	RAPS_C4 400.00	NORTH	1055.7
6	RATLE 400.00	NORTH	61
7	UNCHAHAR4 400.00	NORTH	284.5
8	SHONGTONG 400.00	NORTH	10.8
9	LATA_TAPOVAN200.00	NORTH	10.5
10	PHATABYUNG 220.00	NORTH	7
11	SINGOLI_BHAT220.00	NORTH	9.1
12	TAPO_VISHNU 400.00	NORTH	28
13	VISHNU_PIPAL400.00	NORTH	23.9
14	LOWERJHELMUM1132.00	NORTH	9.8
15	UPPERSIND 132.00	NORTH	9.9
16	KISHANNGA-GE220.00	NORTH	30.8
17	BAGLIHAR4 400.00	NORTH	21.7
18	BAJAURA1 132.00	NORTH	0.4
19	MALANA1 132.00	NORTH	8
20	KANGRA1 132.00	NORTH	2.1
21	BASSI1 132.00	NORTH	5.6
22	GIRI1 132.00	NORTH	5.6
23	PALAMPUR 132.00	NORTH	1.7
24	LARJI1 132.00	NORTH	11.7

S.No.	Bus Name	Area Name	PGen (MW)
71	BARKHER 132.00	NORTH	67.1
72	KUNDARK 132.00	NORTH	67.1
73	ROSA-TP1 220.00	NORTH	447.3
74	KHARA2 220.00	NORTH	53.7
75	HARDUGN2 220.00	NORTH	495.8
76	PARICHA2 220.00	NORTH	477.2
77	PANKI2 220.00	NORTH	82
78	TANDA2 220.00	NORTH	246
79	MEJA 400.00	NORTH	765
80	BARA 400.00	NORTH	1147.6
81	KARCHNA 400.00	NORTH	695.5
82	PARICHHA 400.00	NORTH	289.8
83	VISHNU4 400.00	NORTH	231.8
84	ANPARA4 400.00	NORTH	944.7
85	ROSA-TP2 400.00	NORTH	347.7
86	OBRA4 400.00	NORTH	463.7
87	ANPARAC 765.00	NORTH	695.5
88	ANPARA-D 765.00	NORTH	579.6
89	SEWA-II 132.00	NORTH	11.2
90	MALAN-II 132.00	NORTH	9.3
91	GANGUWAL 132.00	NORTH	7.1
92	KOTLA 132.00	NORTH	7.2
93	BAIRASIUL2 220.00	NORTH	16.8
94	ADHYDRO 220.00	NORTH	17.9

25	BUDHIL	220.00	NORTH	6.5	95	SORANG	400.00	NORTH	7.2
26	BHABA2	220.00	NORTH	11.2	96	PONG	220.00	NORTH	36.9
27	BASPA4	400.00	NORTH	21.7	97	BHAKRA_L	220.00	NORTH	30.2
28	SAINJ	400.00	NORTH	7.2	98	BHAKRA_R	220.00	NORTH	73.2
29	UBDCPH-1	132.00	NORTH	2.9	99	DEHAR	220.00	NORTH	30.8
30	MUKERIAN-4	132.00	NORTH	43.6	100	SALAL2	220.00	NORTH	64.3
31	MUKERI-3	132.00	NORTH	29.1	101	TANAKPUR2	220.00	NORTH	52.7
32	ANANDGARH-2	132.00	NORTH	99.9	102	RAPS_B2	220.00	NORTH	328.1
33	UBDCPH-3	132.00	NORTH	23.5	103	UNCHAHR2	220.00	NORTH	782.9
34	MUKERI-1	132.00	NORTH	22.4	104	DADRI_TH	220.00	NORTH	620
35	MUKERI-2	132.00	NORTH	22.4	105	NAPP2	220.00	NORTH	101.5
36	JOGINDERNAGA	132.00	NORTH	59.6	106	CHAMER-3	220.00	NORTH	105
37	ANANDGARH-1	132.00	NORTH	50	107	JHAJJAR4	400.00	NORTH	215.2
38	LEHRAMOHABBA	220.00	NORTH	343	108	CHAMERA-2	400.00	NORTH	21.5
39	RSD	220.00	NORTH	335.5	109	CHAMERA-1	400.00	NORTH	38.7
40	ROPAR	220.00	NORTH	626.3	110	URIG-1	400.00	NORTH	34.4
41	BATHINDA	220.00	NORTH	328.1	111	RIHAND-G	400.00	NORTH	573.8
42	TALWANDISABO	400.00	NORTH	382.5	112	DULHASTI	400.00	NORTH	28
43	RAJPURA_TH	400.00	NORTH	811.4	113	DEHAR	400.00	NORTH	47.3
44	PANIPAT-1-4	220.00	NORTH	164	114	DADR-NCR	400.00	NORTH	281.1
45	YTPP	220.00	NORTH	447.3	115	KOLDAM	400.00	NORTH	57.4
46	PANIPAT-5-8	220.00	NORTH	685.9	116	RIHNDEXT	400.00	NORTH	573.8
47	KHEDAR	400.00	NORTH	347.7	117	KOTESHWA	400.00	NORTH	28.7
48	JHAJAR_N	400.00	NORTH	382.5	118	URIG-2	400.00	NORTH	86.9
49	RAMGARH21	132.00	NORTH	72.5	119	KARCHAMW	400.00	NORTH	35.9
50	RPS1	132.00	NORTH	128.2	120	SHRECEM	400.00	NORTH	172.1
51	MAHI-I	132.00	NORTH	37.3	121	PARBT-II	400.00	NORTH	28.7

52	JS1	132.00	NORTH	110.7
53	MAHI-II	132.00	NORTH	67.1
54	RAPS_A2	220.00	NORTH	223.7
55	GIRALTPS	220.00	NORTH	186.4
56	DHOLPU-4	220.00	NORTH	246
57	BARSINGS	220.00	NORTH	186.4
58	SURATH-2	220.00	NORTH	372.8
59	KTPS	220.00	NORTH	697.1
60	RAMGARH	220.00	NORTH	119.3
61	CHABRA-4	400.00	NORTH	434.7
62	KALISI-4	400.00	NORTH	695.5
63	RAJWEST	400.00	NORTH	313
64	KAWAI	400.00	NORTH	382.5
65	SURATG-4	400.00	NORTH	289.8
66	OBRAH1	132.00	NORTH	73.8
67	RIHND1	132.00	NORTH	223.7
68	KHAMBAKH	132.00	NORTH	67.1
69	UTRAULA	132.00	NORTH	67.1
70	MAQSUDPR	132.00	NORTH	67.1

122	PARBTI-3	400.00	NORTH	141.3
123	RAMPUR	400.00	NORTH	29.5
124	TEHRI4	400.00	NORTH	53.8
125	NATHPA4	400.00	NORTH	53.8
126	SINGRL4	400.00	NORTH	860.6
127	BHAKRA-L	66.000	NORTH	19.9
128	DHAKRANI	132.00	NORTH	3.1
129	KHATIMAH	132.00	NORTH	2.5
130	KALAGARH	132.00	NORTH	12.2
131	CHILLA-H	132.00	NORTH	13.3
132	KULHALHE	132.00	NORTH	2.8
133	DHALIPUR	132.00	NORTH	4.7
134	MOHAMDPUR	132.00	NORTH	0.9
135	PATHRI	132.00	NORTH	1.9
136	BHILANGA	220.00	NORTH	2.2
137	MANERI_2	220.00	NORTH	21
138	CHIBRO-H	220.00	NORTH	16.6
139	MANERI_1	220.00	NORTH	8.3
140	KHODRIHE	220.00	NORTH	5.5
141	SRINAGAR-HEP400.00		NORTH	23.7

**Annexure-X**

S.No.	Bus Name	V(P.U)	V(kV)		S.No.	Bus Name	V(P.U)	V(kV)
1	LEHRAMOHABBA	1.0821	238.05		45	NAKODARPG	1.0808	237.78
2	MOGA-PS	1.0803	237.67		46	GHUBAYA	1.0825	238.15
3	BAJAKHANA	1.082	238.03		47	MUKTSAR	1.0844	238.56
4	BATHINDA	1.0841	238.51		48	MALOUT	1.0838	238.45
5	DHURI4	1.0802	237.64		49	DHANAULA	1.0822	238.08
6	ABOHAR	1.0843	238.55		50	KOTKAPURA	1.084	238.48
7	NURMEHAL	1.0803	237.68		51	RAJGHAT2	1.0836	238.38
8	PRAGATI_BDR	1.0813	237.89		52	PATPARGANJ2	1.0832	238.31
9	INDRPA2	1.0836	238.4		53	PRAGATI_MND	1.0834	238.35
10	MANDOLA	1.0804	237.68		54	SABJIMANDI	1.0922	240.28
11	BURARI	1.0904	239.89		55	PARKSTREET	1.0814	237.9
12	SARITAVIHA_S	1.0814	237.9		56	LODIROAD2	1.0811	237.84
13	RIDGEVALLEY	1.0806	237.74		57	WAZIRABAD2	1.0821	238.06
14	GEETACOLONY	1.0824	238.13		58	KASHMIRIGATE	1.0818	237.99
15	MAHARANIBAGH	1.0812	237.87		59	MASJIDMOTH	1.0804	237.69
16	AIIMS	1.0811	237.85		60	ELECTRICLANE	1.0817	237.97
17	MERTA-42	1.0851	238.72		61	NAGAU	1.1047	243.03
18	RATANGAR	1.0967	241.27		62	AJMER	1.0856	238.84
19	BARMER	1.0828	238.22		63	GIRALTPS	1.0859	238.9
20	KUCHAMAN	1.0927	240.4		64	PHALODI	1.0968	241.29
21	BHOPALGA	1.0872	239.18		65	KHINVSAR	1.0937	240.6
22	BARSINGS	1.1108	244.38		66	SUJANGAR	1.1001	242.03
23	MAKRANA	1.087	239.15		67	KISHANGA	1.0875	239.26
24	BIKANE-4	1.1093	244.05		68	SRIDUNGA	1.1032	242.7
25	SIKAR-RS	1.0844	238.56		69	SURATH-2	1.1187	246.12

26	UDYOGVIH	1.1143	245.15		70	HANUMANG	1.1146	245.21
27	DHOD	1.0925	240.36		71	BAP_2	1.1016	242.35
28	BHADRA	1.0981	241.59		72	KARWAR	1.0844	238.57
29	KUCHERA	1.0962	241.17		73	NOKHA	1.1079	243.74
30	RAMGARH	1.0829	238.24		74	RAS_2	1.0808	237.77
31	RATANGAR	1.0959	241.1		75	BADNU	1.1068	243.5
32	AJMER42	1.0925	240.36		76	DEEDWANA	1.1	242
33	NIGHASAN	1.0922	240.29		77	MANPURI2	1.0807	237.76
34	ROSA-TP1	1.0922	240.29		78	HARDOI2	1.0802	237.64
35	SHJNP2	1.0912	240.06		79	BAKNTPR2	1.0856	238.84
36	ORAI2	1.0919	240.21		80	MAINPUR2	1.0864	239.01
37	PARICHA2	1.0886	239.5		81	DOHANA2	1.0835	238.36
38	CBGANJ2	1.0806	237.73		82	GONDA2	1.1012	242.26
39	DASNA	1.0868	239.1		83	BAH	1.0854	238.78
40	TANDA2	1.0825	238.14		84	LAKHIMPU	1.0916	240.15
41	GNOIDA	1.081	237.82		85	SIKAR-PG	1.0865	239.02
42	TANAKPUR2	1.0844	238.57		86	SITARGAN	1.0815	237.92
43	RAJGHAT	1.0816	237.95		87	ORAI UP	1.0962	241.16
44	MOGA-PG	1.0806	237.74					



**Annexure-XI**

S.No.	Bus Name	V(P.U)	V(kV)	S.No.	Bus Name	V(P.U)	V(kV)
1	BAGLIHAR4	1.0702	428.06	68	SAINJ	1.0559	422.37
2	TALWANDISABO	1.0924	436.95	69	DHURI	1.0879	435.17
3	MAKHU	1.0786	431.46	70	MUKATSAR	1.0836	433.46
4	NAKODAR	1.0802	432.09	71	RAJPURA_TH	1.0846	433.84
5	RAJPURA	1.0839	433.55	72	KHEDAR	1.0631	425.25
6	KIRORI	1.0628	425.14	73	NAWADA	1.0732	429.27
7	NUHIYANWALI	1.0659	426.37	74	BAWANA-G	1.0581	423.25
8	JAISALMER	1.0561	422.44	75	MERTA	1.0708	428.31
9	AKAL-4	1.0533	421.31	76	BARMER-4	1.0524	420.96
10	HERAPU-4	1.0561	422.44	77	RATANGAR	1.0897	435.87
11	BHILWA-4	1.0598	423.91	78	RAJWEST	1.0541	421.63
12	DEEDWANA	1.1025	441	79	AJMER	1.0983	439.32
13	AJMER-NW	1.1044	441.78	80	CHITTOR4	1.0618	424.73
14	CHITTORG-NEW	1.0718	428.71	81	JODHPU-4	1.0612	424.5
15	SIKAR	1.076	430.42	82	JAIPUR_RS	1.0604	424.18
16	BIKANE-4	1.1007	440.28	83	SURATG-4	1.1141	445.62
17	SURTRHNW	1.1156	446.22	84	MEJA	1.0829	433.17
18	MAINPURIUP	1.1134	445.36	85	BARA	1.088	435.21
19	KARCHNA	1.0862	434.48	86	REWA	1.0854	434.14
20	GNOIDAUP	1.1055	442.2	87	HAPUR	1.0936	437.44
21	GAZIABAD	1.0829	433.15	88	GONDA	1.1157	446.26
22	DASNA	1.0932	437.27	89	UNNAO4	1.0905	436.18
23	BARELI4	1.0884	435.38	90	UNNAFSC1	1.0525	421
24	UNNAFSC2	1.0525	421	91	PARICHHA	1.1111	444.44

25	LUCKN_UP	1.0811	432.43	92	MURADAB4	1.0892	435.68
26	MUZAFRN4	1.0698	427.92	93	MURADNG4	1.0725	428.99
27	PANKI4	1.072	428.81	94	ANPARA4	1.0688	427.5
28	ANPARA-D	1.0703	428.11	95	ANPARAC	1.0692	427.67
29	ROSA-TP2	1.094	437.6	96	OBRA4	1.0732	429.26
30	VARANASI	1.0656	426.26	97	SARNATH4	1.064	425.58
31	SULTANP4	1.0529	421.18	98	ALIGARH	1.0999	439.98
32	TANDA2	1.1108	444.32	99	ORAI UP	1.1103	444.11
33	BAGPAT	1.0721	428.84	100	SAHARANPUR	1.0621	424.84
34	ORAI	1.1063	442.52	101	NALLAGAR	1.0558	422.33
35	BAREL-PG	1.0901	436.03	102	AMRITSAR	1.0669	426.77
36	PANIPAT	1.0604	424.16	103	BAREFSC1	1.0786	431.45
37	LU-GKFC1	1.0651	426.03	104	LU-GKFC2	1.0651	426.03
38	URIG-1	1.0593	423.7	105	MAINFSC2	1.0901	436.02
39	FATEHABAD PG	1.0624	424.97	106	HISSAR	1.0527	421.06
40	KISHENPUR	1.0687	427.5	107	MOGA	1.0878	435.11
41	DADR-NCR	1.0588	423.51	108	ROORKEE	1.0656	426.22
42	AURYA4	1.055	422	109	BAWANA4	1.0582	423.3
43	BAMNOLI14	1.077	430.79	110	KANPUR	1.0717	428.69
44	MANDOLA	1.0701	428.02	111	GNOIDA4	1.0621	424.82
45	LUCK4-PG	1.0689	427.56	112	LUCK_FC1	1.1042	441.7
46	LUCK_FC2	1.1042	441.7	113	KOLDAM	1.0579	423.15
47	PATIALA	1.0603	424.11	114	AMARGARH	1.0642	425.67
48	SAMBA	1.0749	429.98	115	TEHR-POL	1.0639	425.58
49	LUCK74-P	1.0686	427.43	116	KOTESHWA	1.0635	425.42
50	URIG-2	1.0594	423.75	117	DADR-HVD	1.0583	423.33
51	MUNDKA	1.0595	423.81	118	SHRECEM	1.0519	420.75

52	MAINPURI	1.0915	436.62	119	JHATI-PG	1.062	424.79
53	SOHAW-PG	1.0712	428.46	120	FATEH-PG	1.0583	423.33
54	SHAHJ-PG	1.0943	437.72	121	PARBT-II	1.0557	422.3
55	PARBTI-3	1.056	422.39	122	PARBT-PO	1.0563	422.52
56	ALLAHABA	1.072	428.81	123	NEWWANPO	1.0659	426.36
57	JHATIK_S	1.0759	430.35	124	HAMIRPUR	1.0554	422.17
58	BARELINEW	1.09	436.01	125	KANPRNEW	1.0734	429.37
59	PATRAN	1.0637	425.47	126	RAJGHAT	1.0659	426.36
60	TUGHLAKABAD	1.0784	431.36	127	KARAMPURA	1.0603	424.12
61	TEHRI4	1.0624	424.95	128	WAGOORA	1.0592	423.69
62	KAITHAL	1.0592	423.67	129	MEERUT	1.0773	430.91
63	BAREFSC2	1.0786	431.45	130	MAINFSC1	1.0901	436.02
64	LUDHIANA	1.0628	425.13	131	JALANDHA	1.0657	426.28
65	BALLABHG	1.0778	431.13	132	MALERKOT	1.055	422.01
66	MAHARANI	1.0731	429.25	133	ALIGARH	1.1084	443.37
67	RISHIKE4	1.0621	424.82	134	KASHIPU4	1.0815	432.62

**Annexure-XII**

**Summary of the schemes approved for Jammu, Kashmir and Ladakh Region for Jammu, Kashmir and Ladakh Region under PMDP-2015 at an estimated cost of Rs. 1189.59 crore**

Region	Description	Quantity	Base Cost (in Rs. Lacs)	Escalated Cost @5% per annum (in Rs. Lacs)	Remarks
Jammu	New 220/66 KV Kathua and Samba Grid Sub-station	160 MVA (each)	14316	14889	4 nos. 220kV line bays, 4x53.33MVA, 220/66kV transformer and 5 nos. 66kV line bays
	New 220/33 KV Chowadhi Grid Sub-station	160 MVA	6578	6841	2 nos. 220kV line bays, 4x53.33MVA, 220/33kV transformer and 6 nos. 33kV line bays
	New 220/33 KV Nagrota Grid Sub-station	100 MVA	5720	5949	2 nos. 220kV line bays, 2x50MVA, 220/33kV transformer and 4 nos. 33kV line bays
	New 132/33KV Chattha Grid Sub-station	100 MVA	4124	4289	4 nos. 132kV line bays, 2x50MVA, 132/33kV transformer and 4 nos. 33kV line bays
	Augmentation of 132/66kV Kathua Grid Sub-station	50 MVA	441	458	with miscellaneous works
	Augmentation of 132/33 kV Janipur and Poni Chak Grid Sub-station	50 MVA (each)	1308	1360	with associated bays and miscellaneous works
	Augmentation of 132/33 kV Sidhra and Miran Sahib Grid Sub-station	50 MVA (each)	1706	1774	with miscellaneous works
	New 220kV D/C transmission lines (5 nos.)	33 km	3268	3399	-
	New 132kV D/C transmission line (1 no.)	8 km	584	607	-
	Reconducturing of 132kV line by HTLS	76 ckm	2280	2371	-
Twinning of bus bar of 220kV bus at Hiranagar from double zebra to double moose and strengthening of	-	100	104	-	

	structures.				
	<b>Sub-total</b>		<b>40425</b>	<b>42041</b>	
<b>Kashmir</b>	New 220/33 KV Batpora Tailbal Grid Sub-station (GIS)	160 MVA	6481	6808	2 nos. 220kV line bays, 4x53.33MVA, 220/33kV transformer and 6 nos. 33kV line bays
	New 220/33 KV Lassipora Grid Sub-station (GIS)	160 MVA	7251	7617	4 nos. 220kV line bays, 4x53.33MVA, 220/33kV transformer and 6 nos. 33kV line bays
	New 132/33 KV Khanyar Grid Sub-station (GIS)	100 MVA	4311	4642	4 nos. 132kV line bays, 2x50MVA, 132/33kV transformer and 6 nos. 33kV line bays
	New 132/33 KV Tengpora Grid Sub-station (GIS)	150 MVA	4998	5382	4 nos. 132kV line bays, 3x50MVA, 132/33kV transformer and 6 nos. 33kV line bays
	Augmentation of 132/33 kV Zainakote, Bemina, Chadoora and Khrew Grid Sub-station	50 MVA (each)	2615	2879	with associated bays and miscellaneous works
	Augmentation of 132/33 kV Cheshmashahi Grid Sub-station	50 MVA	441	459	with miscellaneous works
	New 220kV D/C transmission lines (5 nos.)	34.4 km	3407	3556	-
	New 132kV D/C transmission Cables (2 nos.)	18 km	8640	9214	-
	Reconducturing of 132kV line by HTLS	28 km	840	887	-
	<b>Sub-total</b>		<b>38984</b>	<b>41444</b>	
<b>Ladakh</b>	New 220/33 KV Diskit (Nubra) and Padum (Zaskar) Grid Sub-station	50 MVA (each)	7127.8	7413	1 no. 220kV line bay, 4x16.67MVA, 220/33kV transformer and 1 no. 33kV line bay
	New 220kV S/C transmission lines on D/C Towers (2 nos.)	307 km	25969.13	27008	-

	220kV line bay at 220/66kVPhyang (PGCIL)LEH S/S and 220/66kV Kargil (PGCIL) S/S	1 no. (each)	591.96	616	-
	25 MVar, 220/33kV bus reactor at Padum alongwith 220kV bay	1 no.	420.98	438	-
	<b>Sub-total</b>		<b>34110</b>	<b>35474</b>	
	<b>Total (in Rs. Lacs)</b>		<b>113519</b>	<b>118959</b>	
	<b>Total (in Rs. crore)</b>		<b>1135</b>	<b>1189.59</b>	-

Details of the bottlenecks, constraints and overloading in the Intra -State transmission network as furnished by NR States

**Uttar Pradesh**

Sr. No.	Name of Element
1	765/400KV ICTs at 765KV Unnao
2	400/220KV ICTs at Muradnagar New
3	400/220 KV ICT s at Azamgarh
4	400/220 KV ICT at Sultanpur
5	400/220KV ICT at Sarojini Nagar
6	400KV Panki - Unnao Line
7	220 kV Bareilly – Dohna Line
8	220KV Muradnagar - Baraut Line
9	220KV Muradnagar- Loni Line
10	220KV Sarnath - Ghazipur Line
11	220KV Lalitpur - Jhansi Line
12	220KV Agra - Gokul Line
13	220KV Gr. Noida - Noida Sec 20 Line
14	220KV Gr. Noida -- Noida Sec 62 Line
15	220KV Allahabad (PG) - Jhusi (UP) Line
16	220KV Pusauli - Shahupuri Line
17	220KV Meerut (PG)- Modipuram. - I, II Line
18	220KV Sultanpur - Sohawal Line
19	220KV NAPP - Simbholi Line
20	220KV Sultanpur - Sohawal Line
21	220KV Muzaffarnagar- Shamli Line

**Uttarakhand**

Sr. No.	Constraints in STU(PTCUL) system as observed by SLDC	Action Taken/Proposed by PTCUL (STU)
1	Overloading of 160 MVA at 220 kV Kashipur Substation.	Additional 01 No. of 220/132 kV 160MVA transformer has been proposed to be constructed at 400/220 kV S/s Kashipur. Overloading problem at 220 KV Kashipur would be resolved after commissioning of above 220/132 KV transformer at Kashipur S/s.
2	Overloading of 160 MVA at 220 kV	Overloading of 160 MVA at 220 KV Roorkee Substation would be resolved after

	Roorkee Substation.	1. commissioning of (2x 100MVA) 220/132 KV T/f at 220/132 KV S/s Pirankaliyar (under construction) and associated 132 KV DIC Pirankaliyar- Chudiyala line (under construction).  2. 400/220/33 KV Landhora (Roorkee) has been proposed above Substation will reduce loading of 220 kV Roorkee.
3	Overloading of (2 x 80) MVA at 220 kV Pantnagar Substation.	Overloading of (2x80) MVA at 220 KV Pantnagar S/s would be resolved after commission of (2 x 50) MVA S/s at Pantnagar.
4	Overloading of 220 kV Roorkee-Puhana line.	Overloading of 220 KV Roorkee- Puhana line would be resolved after commissioning of LILO 220 KV Roorkee Nara line at 400/220 kV S/s Puhana PGCIL and 132 KV D/C Pirankaliyar- Chudiyala line (under construction)
5	220 kV radial feeder for 220 kV Haldwani Substation.	LILO of one circuit 220 KV Kashipur-Pantnagar line at 220 KV Haldwani S/s has been proposed for additional power supply to 220 KV S/s Haldwani.
6	132 KV radial feeder for 132 KV Laksar Substation.	Overloading of 132 KV Roorkee-Laksar radial line would be resolved after re-conductoring with HTLS for 132 KV Roorkee-Laksar line (132 KV S/s Laksar would be connected to 132 KV S/s Manglore by 132 kV Laksar-Manglore line.) and LILO of 132 KV Laksar-Naitor line at 400/220 KV S/s Landhora (proposed) LILO of Laksar will be fed from power source one from Roorkee and other from Landhora.
7	132 KV radial feeder for 132 KV Manglore Substation.	Overloading of 132 KV Roorkee-Manglore radial line would be resolved after re-conductoring with HTLS conductor for 132 KV Roorkee-Laksar line.
8	131 KV radial feeder for 132 KV Ranikhet Sub station.	Additional power may be supplied to 132 KV Ranikhet S/s through 132 KV D/C Ranikhet-Bageshwar under construction). In future approx. 60 MW power would be pooled at 132 KV S/s Bageshwar.
9	132 KV radial feeder for 132 KV ELDCO Sitarganj.	132 KV S/s ELDCO Sitarganj would be connected to 132 KV S/s Kichha – Sitarganj (under construction)

### Haryana

Sr. No.	Name of Line	Remarks
1	220KV IA Hisar - Hisar_ - BB D/Cckt	Do not met (n-1) contingency in Synchronization mode.
2	220KV IA Hisar -Hisar PG D/Ckt	Do not met (n -1) contingency in Synchronization mode
3	220 kV Jorian – A/pur D/ckt	Overloading problem during DC RTP outage of both units.
4	220 kV Panchkula PG-Raiwali	Do not met (n-1) contingency.



	D/Ckt	
5	220 kV Madanpur – Raiwali line	Overloading on M/Pur-Raiwali and less load flow on Tepla - Madanpur line.
6	220 kV Kabulpur - Rohtak line	Overloading due to outage of PTPS units.
7	220Kv Dadri BBMB - Lulahir line	Heavy overloading observed in Synchronization mode.
8	220KV Dhanonda - Lulahir D/Ckts	Do not met (n-1) contingency
9	220 kV Jind - Kirori D/Ckts	Less load flow in synchronization mode.
10	400Kv Dhanonda - Daultabad D/Ckts	Shutdown could not be availed due to High Load Flow in Synchronization mode
11	220 kV Narwana – Hissar Line	Overloading observed in summer season.
12	400Kv Dhanonda-CLP D/Ckt	Less load flow on both Ckts in synchronized mode when CLP Units are running
13	400KV Khedar-Nuhiyawali Line	Less load flow on line in synchronized mode
14	400 kv Nawada LILO ckts	Failure of equipments on high load flow

## Punjab

Sr. No.	Section	Problem	Remedial Measures Proposed to STU
1	220KV S/s Lalton Kalan	3 No. 220 KV ckt, from power grid Ludhiana to Lalton kalan are running near to full load. To keep the line loadings within limits the following measures were taken: - 1. Segregation of 220 K V buses. 2. Opening of 220KV Lalton- Dhandari & 220 KV & 220 KV Lalton - Jagroan as per requirement.	Replacement of existing conductor with HTLS for 2 No. 220kV Lines (i.e. 400 kV Ludhiana - 220 kV Lalton Kalan 2 ckts.) may be expedited.
2	a) 132 KV Bhogpur HSP Ckt. b) 132KV Banga-Pha gwara	These ckts remained in open position due to following reasons:- 1) 132 KV Bhogpur-Hoshiarpur ckt to reduce the overloading of 2 x 90 MVA	Upgradation work of 132 KV S/Stn Hoshiarpur to 220 KV S/stn Hoshiarpur may be expedited.

	c) 132KV Banga Nawanshar	T/fs installed at 220 KV Jalandhar (BBMB). 2) 132 KV Banga-Phagwara ckt to reduce the overloading of 220/ 132 KV T/fs installed at 220 KV S/s Guraya. 3) 132 KV Banga - Nawanshar, ckt to reduce the overloading of 132 KV Nakkian-Nawanshar ckts & for safe operation of Nakkian Power house machines.	
3	132KV Bathinda – IGC Bathinda Line	This is a single ckt line feeding 3 no. 132KV grid sub stations. Maximum load of 400 Amp was observed on this line during the last paddy season(2016).	Upgradation of 132 kV Maur to 220 kV Maur with 1x100 MVA, 220/132 kV may be expedited
4	220KV s/s Mahilpur	2x100MVA, 220/132KV T/Fs experienced overloading.	Upgradation work of 132 KV S/Stn Hoshiarpur to 220 KV S/stn Hoshiarpur may be expedited.
5	132KV Chohal - Hamirpur	A load in the range of 450 A noted during summer	
6	220KV5/S BBMB Jalandhar	220/66KV, 2x100 MVA T/F experiencing over-loading problem	U/G of 132 kV Alawalpur to 220 kV with 1x100 MVA 220/66 kV t/f may be expedited.
7	132KV Shanan - Kangra-Pathankot	Old conductor of 0.15 sq.inch size has ageing effect	Ckt is connected with generating stations & power may also be imported from 132 KV Bassi. Replacement of old 0.15 sq" conductor with new 0.15 sq" conductors may be expedited
8	132KV Shanan - Kangra-Mamoon-Pathankot	Old conductor of 0.15 sq.inch size has ageing effect	Ckt is connected with generating stations & power may also be imported from 132 KV Bassi. Replacement of old 0.15 sq" conductor with new 0.15 sq" conductors may be expedited
9	220KV Verpal	Loading beyond 400	1 ) Commissioning of

	Balachack D/C	<p>MW on each ckt was experienced. The load was restricted to 330 MW by:-</p> <ol style="list-style-type: none"> <li>1. Opening of 220KV Verpa - Wadala Granthia D/C ckt.</li> <li>2. Operation of 220KV Butari S/ Stn from Jalandhar (BBMB) S/Stn radially.</li> <li>3. Opening of 220KV Sultanpur - Patti &amp; 220KV Sultanpur - Chola sahib.</li> </ol> <p>Otherwise tripping of any one ckt/ICT under such conditions would have resulted in tripping of the other ckt / ICTs</p>	<p>220KV Makhu-Rashiana &amp; 220KV Makhu Algon ckt &amp; shifting of load of Rashiana &amp; Algon S/ Stns onto 400kV S/Stn Makhu shall provide relief.</p> <p>2) Additional 500MVA T/F at Makku may also be explored to restrict the ICTs loading within limits.</p> <p>3)220KV Naraingarh -Verpal link may be explored.</p>
10	220 KV Kotla -Junga - Kartarpur PSTCL	<p>Loading in the range of 680 - 700 Amperes has been observed during 2016 summer.</p>	<p>1 ) LILO of 220 KV Jalandhar(PG) - Kotlajunga circuit at 220 KV Kartarpur Planned with HTLS conductor may be expedited.</p> <p>2) Conductor augmentation of 220kV Kartarpur - kotla -Junga D/C from Zebra to HTLS may be planned.</p> <p>Without above mentioned conductor augmentation (Sr.No.2) full utilization of planned HTLS conductor cannot be achieved.</p>
11	132KV Mukerian - Shri Har Gobind Pur D/C	<p>A load in the range of 275A on each ckt run during full generation of Mukerian Hydel. Any tripping may lead tripping of Machines .</p>	<p>As ckt i s connected with generating stations, possibility of new evacuating ckts may be explored.</p>
12	220KV Moga(PG)-	<p>Load in the range of 600</p>	<p>Possibility of new 220KV</p>

	Ajitwal, PSTCL	Amperes has been observed. To Avoid overloading of 220KV Lalton - Jagroan & 220KV Ludhiana(PG) -Jagro an remains in open position .	ckt from 400KV Moga (PG) - Ajitwal/ Jagroan may be explored.
13	220 kV Balachack Khassa D/C	During 2016 summer, tower breakdown & joint failures has been noted on 220 kV Balachack Khassa D/C which resulted in overloading of 220 kV Wadala Granthia K.S. Malhi & 220 kV Wadala Granthia Fatehgarh Churia ckts due to shifting of 6 nos. of 220 kV S/s load on these ckts.	220 kV Naraingarh to 220 kV Civil Lines D/C link may be explored.
14	High voltage problems at 400 kV 220 kV network	High voltages has been observed in 400 & 220 kV network of PSTCL during winter 2016.	A study by Powe Grid has been carried out to install reactors at strategic locations in Punjab Control Area. The report in this regard has already been sent to the O/o EIC/TS, PSTCL, Patiala vide this office letter no. 648 dt. 02-12-16, no. 839 dt. 27-12-16, no. 72 dt. 14-02-17 & no. 88 dt. 21-02-2017. The compliance of the same may be expedited.

It is pertinent to mention here that during last paddy i.e. 2016-17 PSPCL has imported power from outside the Punjab by keeping RTP units under s/d. during such conditions transmission N/W of PSTCL has experienced following constraints.

1	220 kV Kotla – Junga – Kartapur (PSTCL) & 220 kV Kotla – Junga – Jalandhar (PG)	A load more than 700 A was noted during this summer. To restrict the loading condition, the system was segregated as follows: -	1. A 400 kV S/s near Goraya with LILO of 220 kV Goraya – Jamsher & 220 KV Jamsher – Jadla ckts at new 400 kV s/s may be explored.
2	220 kV Jalandhar (PG) - Dasuya	1. Splitting of 220 kV buses at Jamsher. 2. Operation of 220 kV Sultanpur & 220 kV	2. New 220 kV ckts from Jalandhar (PG) – proposed 400 kV S/s may be explored.

		Badshahpur S/s radially from for Jalandhar(BBMB).	
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### Himachal Pradesh

Sr. No.	Name of Line/Sub station	Constraints/Remarks
1	i) 220 kV Khodri Mazari Giri D/C Line ii) 132 kV Solan- Giri (Kulhal) line	Presently kala Amb, Nahan Area is being feed through 220Kv khodri Mazari line of Utrakhand, besides radial feeding from Hamirpur via Solan at 132kV line. Voltage profile in this area is very poor. Power grid has finalised 400 sub-station Araindwala near Kala Amb and further HPSEBL has proposed 220/132Kv sub-station Trilokpur (Kala-Amb) with 220kv D/C line from this 400kv S/stn of PGCIL. The said 220kv sub-station of HPSEBL shall feed power to Kala Amb, Nahan to improve the voltage profile of this area.
2	220/132kV Kunihar Sub- Station	Parallel operation of existing transformers [i.e. one bank of 2X 100 MVA and one 200MVA] had been achieved and load up to 230MW had been met during the winter months. The utilization of existing power transformer (2X100MVA) available at kunihar at some other location shall now be abandoned
3	i) 220/132kV Sub/Stn Hamirpur ii) 132kV DIC line Hamirpur to Kangoo	i) To address the problem of over loading of transformers at 220kV sub-station at Hamirpur, HPSEBL is constructing 220Kv sub-station Nehrian (Near to Amb) by LILOing of 220kV D/C Jullandhar Hamirpur line. ii) To address the problem of capacity constrain in 132kV D/C line from Hamirpur to Kangoo for evacuating the power in summer month, HPSEBL proposed to construct the 220 kV S/C line on D/C towers from 400/220 kV Mattinsidh Sub Station of PGCIL to 220/132 kV S/Stn Kangoo.
4	132kV Bassi Hamirpur Line	Because of capacity constraint in 132kV Bassi Hamirpur Line HPSEBL at present is not able to utilize the 132 kV Double Circuit from Shanan Power house (PSEB) to Bassi Power House Of HPSEBL. Augmentation of this line with (HTLS) High Tension Load Sag conductor has been proposed.
5	i) 220kV Fozal Sub- station at Kullu ii) 132kV sub-station	Voltage problem of kullu area shall be addressed once 220kV sub- station at Fozal of HPPTCL and proposed 220kV substation at Prini in the yard of AD Hydro are executed,

	Bajaura	
6	220/132kVS/Stn Patti at Palampur	To resolve the Voltage problem in Palampur, area new 220/132kVS/Stn Patti has been proposed.
7	220/ 66kV Kotla Sub Station (Near Jeori)	Due to capacity constrain of 220/ 66kV Kotla sub-station full evacuation of power from differ IPPs is at present not possible. Power evacuation of all HEPs of HPSEBL as well as the IPPs in Andhra, Nogli and Kinnaur zone is made through 220/ 66kV Kotla sub- station (near jeori) of HPSEBL. Augmentation this sub-station i.e. from 131.05 MVA to 2x80/100MVA has been proposed.
8	220/ 132 kV S/Stn Karian	The voltage problem in the Chamba will be resolved after commissioning of 220kV/132Kv substation Karian by HPPTCL

## Delhi

Sr. No.	Name of S/Stn.	Installed Transformation Capacity	Total Load of S/Stn. In MW at the time of occurrence of 6261 MW met on 01.07.2016	Remedial Measures
	<b>400 kV</b>			
1	Mandola	2000	1316	All the four 400/20 kV 315 MVA ICT have been augmented to 400/220 kV 500 MVA ICT
2	Bamnauli	1630	1125	(n-1) criteria does not meet in case of outage of 500 MVA ICT
	<b>220 kV</b>			
1	Narela	300	211	TPDDL to shift the load to DSIDC Bawana once 220/66 kV Tikri Khurd S/Stn is commissioned the load would be shifted from Narela. The target date of commissioning of Tikri Khurd is Dec 2018.
2	Gopalpur	300	183	The issue is with regard to only one available 220/66 kV transformer. The ultimate solution is establishment of 66 kV GIS along

				<p>with 160 MVA Tx. In place of existing 220/66 kV Tx. It is under retendering stage and expected completion is two years from date of awrd of work. However, the target date of commissioning of system is December 2018.</p> <p>At present, a temporary 66 kV system is established at Shalimar Bagh to meet the exigency which would be readied by 31.05.2017.</p>
3.	Rohini	400	304	50 MVA load would be shifted to Kanjhawala before peak summer season by TPDDL.
4.	Najafgarh	400	272	
5.	Papankalan – I	560	355	About 50 MVA can be shifted to Peera Garhi through newly created 33 kV Mukherjee Park ckt – I & II from Peera Garhi.
6	OKHLA	500	308	Part load could be shifted to Masjid Moth after commissioning of 3 <sup>rd</sup> Tx. At Masjid Moth.
7.	Lodhi Road	200	166	Additional Tr. Expected by May 2017.
8.	Subzimandi	200	161	Ultimate solution is Chandrawal S/Stn. The sub-station is expected by Summer 2019.
9.	Parkstreet	400	251	<p>NDMC should shift maximum load to Electric Lane. At present NDMC feeder wise load</p> <p>33 kVBraid Road Ckt. I &amp; II (160 Amp)</p> <p>33 Kv Hanuman Road (160 Amp)</p> <p>33Kv Nirman Bhawan(130 Amp)</p> <p>66 KV B&gt;D&gt; Marg Ckt. I &amp; II (205 Amp)</p> <p>66 KV DMRC Ckt. I &amp; II (190 Amp)</p> <p>66 KV State Guest House Ckt. (40 Amp)</p> <p>66 KV School Lane ckt. (145 Amp)</p> <p>66 KV Ridge Valley Ckt. (off) / Shastri Park Ckt. I &amp; II (870 Amp).</p>

10.	Kashmiri Gate	200	99	
11.	IP Station	300	232	Load would be ease after commissioning of 3 <sup>rd</sup> Tr. at Lodhi Road.
12.	Masjid Moth	200	151	Additional Tf. Expected by May 2017.
13.	Wazirpur	200	143	The load is interchangeable with Shalimar Bagh
14.	Peeragarhi	200	112	Additional Tf. Expected by May 2017.

**Details of Transmission Lines that do not meet (N-1) reliability criteria.**

Sr. No.	Name of element	MW	MVAR	Remedial Measures
1	220 Kv Bamnauli -Dial Ckt-I	140	-31	The conductors are proposed to be augmented with HTLS conductors and the completion target is before Summer-19
2	220 Kv Bamnauli-Dial Ckt.-Ii	139	-28	
3	220 Kv Bamnauli-Papankalan-1 Ckt.-1	187	24	PPK -I & PPK- II are radially fed substations. To control the loading of PPK - I ckts LILO of One ck1 between Bamnauli-Nariana(HTLS) is proposed.
4	220 Kv Bamnauli-Papankalan-1 Ckt -11	162	3	
5	220 Kv Bamnaulj-Papankalan-11 Ckt.-1	154	28	400kV Dwarka Grid is also envisaged and both PPK -1 & PPK-11 would be fed through 400kV Dwarka Grid which would be the permanent solution. The Target date of commissioning of Dwarka before Summer 2019 .
6	220 Kv Bamnauli-Papankalan-11 Ckt.-11	150	26	
7	220 Kv Bawana -Rohini Ckt -1	160	6	The conductors are proposed with HTLS conductors and completion target is March - 18
8	220 Kv Bawana -Rohini Ckt.-11	137	3	
9	220 Ky Btps Ballabgarh Ckt. -I	-131	-11	Loading conditions would be resolved by commissioning of 400kV Tughalkabad. The Target date of commissioning is before summer-19 and reconductoring of ckts. is also
10	220 Kv Btps - Ballabgarh Ckt. -Ii	-128	-9	
11	220 Kv Gopalpur -Mandola Ckt.-I	-176	-22	The commissioning of 220kV Sanjay, Gandhi Transport Nagar and Chandrawal would ease the loading condition of
12	220 Kv Gopalpur -Mandola	-179	-25	



	Ckt.-Ii			Gopalpur. The Target dae of commissioning is before Summer – 19
13	220 Kv Maharani Bagh - Gazipur Ckt.- I	161	28	
14	220 Kv Maharani Bagh - Gazipur Ckt.- Ii	163	29	
15	220 Kv Mehrauli-Dial Ckt.- I	-115	-9	The conductors are proposed to be augmented with HTLS conductors and the completion target is before Summer - 19
16	220 Kv Mehrauli-Dial Ckt.- Ii	-116	-3	
17	220 Kv Mundka-Peeragarhi Ckt.- I	113	-20	
18	220 Kv Mundka-Peeragarh I Ckt.- Ii	144	-33	
19	220 Kv Narela-Mandola Ckt.- I	-105	-3	
20	220 Kv Narela-Mandola Ckt.- Ii	-104	0	
21	220 Kv Okhla - Btps Ckt. - I	-161	0	Okhla is proposed to be connected to 400 kV Tuglakabad S/Stn. after that loading will be reduce . The Sub-station is expected by Summer 2019.
22	220 Kv Okhla - Btps Ckt. - Ii	-162	-4	
23	220 Kv Patparganj-Geeta Colony Ckt.- I	-144	4	Establishment of 400 kV Maharani Bagh (New ) would resolve the loading conditions .
24	220 Kv Patparganj-Geeta Colony Ckt.- Ii	-139	-3	
25	220 Kv Pragati-Park Street Ckt.- I	113	-10	Establishment of 400 kV Maharani Bagh (New ) would resolve the loading conditions and interconnection with new stations.
26	220 Kv Pragati-Park Street Ckt.- II	141	-2	
27	220 Kv Wazirabad-Mandola Ckt.- I	-186	-25	Establishment of 400 kV Maharani Bagh (New ) would resolve the loading conditions.
28	220 Kv Wazirabad-Mandola Ckt.- Ii	-171	3	
29	220 Kv Wazirabad-Mandola Ckt.- III	-184	-31	
30	220 Kv Wazirabad-Mandola Ckt.- Iv	-191	-28	

No: JKSPDC/P-76/CP-II/5667-76

Dt: 21/01/2017

→ Member Power System,  
Central Electricity Authority  
Sewa Bhawan, New Delhi

**Subject: Power Evacuation from projects on Chenab basin.**

Sir,

The Chenab basin has 10478 Mw power potential as identified by CEA, out of which 7975 Mw are to be taken up for execution in the next coming years, however, evacuation of power from these projects is the most critical task once the projects get commissioned. Therefore the power evacuation should be in place prior to the commissioning of these projects.

Evacuation arrangement of upcoming power projects viz. Kirthai-I (390MW), Kirthai II (930MW), Kiru (624MW), Kawar (540MW), Pakal Dul (1000MW), Bursar (800MW), Sawalkote (1856MW), Ratle (850MW) and Lower Kalnai (48MW), in J&K was discussed in 30th meeting of the Standing Committee on Power System Planning of Northern Region on 19.12.2011, wherein 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 and advise Project Developers to seek the Grid connectivity and Long Term Access from CTU in line with the CERC regulations. JKSPDC was advised to inform the time frame of the identified generation projects.

Major observations of site visit, as recoded in the minutes of meeting of 31st Standing Committee Meeting are reproduced as under:-

- Serious Right-of-Way constraints due to difficult mountainous terrain were observed en-route 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 and beyond. 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 was mentioned that about 1500 MW power of generation projects located in HP and J&K border area will also be evacuated through the high capacity transmission corridor planned for Kirthai-I and Kirthai-II HEPs.
- It was informed that the 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 was envisaged by the said standing Committee as under (Installed capacities of some of the above projects have changed).

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CE (RSPA I)  
For urgent mfa please  
Kishup  
24/1/17

118/RSPA I  
23.1.17

Copy Member (Power System)  
By No. 186  
Date 23/01/17

Mr. Nayyar  
Sr. Director  
CEA  
25/1/17

**A. 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.

**i. Kirthai-I HEP(390 MW):**

- LILO of one circuit of 400 kV D/c (Twin HTLS Conductor Equivalent to about 1500MW) line from Reoli Dugli HEP (HP)– Kirthai-II generation switchyard.
- Switchyard Capacity etc. must be able to handle about 1500MW 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 3000 Amps current.
- 400 kV, 80 MVAR Bus Reactor

**ii. Kirthai-II HEP(930 MW) :**

- 400 kV D/c (Quad HTLS Conductor –Equivalent to about 3000MW) line from Kirthai-II HEP (HP) – Kishtwar Pooling station
- Termination of 400 kV D/c (Twin HTLS Conductor –Equivalent to about 1500MW) line from Reoli Dugli HEP (HP) at Kirthai-II generation switchyard
- 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

**B. High capacity common corridor-II:**

**i. Kiru HEP(624 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

**ii. Kwar HEP(540 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

**iii. Pakaldul HEP(1000 MW) :**



In the said meeting it was agreed 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 was also informed that it is necessary that the project developers apply to CTU for the connectivity & LTA so that the above plan can be firmed up.

In this regard, following points need to be considered before planning the work for the transmission system.

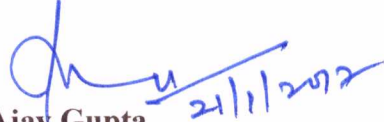
1. Decision has to be taken whether work is to be put on tender or on the analogy of tariff based bidding of Jalandhar-Samba-Amargarh power transmission line. The considerations like sinking zone, land slide zone, snow bound areas and effects of impounding of the dam reservoir of Baglihar HEP, change of ecology has also to be taken into consideration while fixing the route of transmission line.
2. No recce of the sites has been done till date nor geo investigations have been done for firming up of the route of the power transmission network from each of the projects. So far CEA has agreed to the evacuation proposal and the standing committee has approved the transmission network vide their letter No:1/9/SP&PA-12 dt: 04/02/2013.
3. However laying of transmission lines within and outside J&K would demand selection of voltages for transmission which at present is 400 KV but there may be constraints of corridor, space etc at the level of survey and investigation. Also we have to take into the consideration N-1 contingencies for transmission of bulk power through hilly areas, therefore immediate attention will have to be given to the corridors and voltage level of evacuation.
4. It is not out of place to mention that planning for a quad transmission line of 400 kv without N-1 contingency may result in loss of power flow during emergencies like break down etc and may also lead to the grid collapse which has to be foreseen at this stage.
5. Regarding pooling of bulk power within the state and outside state we may have to identify large areas of suitable land for pooling stations which will have to be identified and earmarked very soon to avoid complications in future.
6. In addition to above, after finalization of the corridors, we may have to notify the corridors for the information of people of the area to avoid any encroachment, construction in the right of way, therefore all connected resultant litigations likely to face in the future. This will hamper the completion of the transmission projects if not attended to at this inception stage.

Therefore it is obligatory that all the constituents and the beneficiary of the up-coming hydro system of Chenab basin shall have to pool all the resources together under one banner for taking a coordinated action towards the following critical issues of futuristic importance.

- i. Land for pooling stations
- ii. Finalization of corridors and selection of voltages for transmission with N-1 contingency.

- iii. Inter-state coordination under CEA with the beneficiary states/ CTUs/STUs.
- iv. Development of transmission infrastructure for J&K and for other states as well.
- v. Installation of equipment for series and shunt compensation in case of bulk transmission of the magnitude as stated above.
- vi. Lastly the beneficiary states/utilities would have to work on the demand requirement formula for the coming years so that system studies are carried out about power flow on each transmission line for each power house to each utility with the management of surplus power available from each resource.

Your kind intervention is sought in the matter.

  
**Ajay Gupta** 21/11/2022  
**Executive Director (E)**  
**Corporate Office JKSPDC**  
**Jammu.**

Copy for information to:

1. Commissioner/Secretary to Govt. Power Development Department.
2. Managing Director, CVPPL, for information.
3. Development commissioner of Power, PDD, for information
4. Ex. Director Northern Region-II, PGCIL, for information.
5. Ex. Director NHPC, Jammu, for information.
6. Chief Engineer, PS&PA, CEA Sewa Bhawan New Delhi,
7. PS to Hon'ble Minister for Power for information of Hon'ble Minister.
8. PS to Managing Director JKSPDC for information of M.D.