



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

To

-As per list enclosed-


विषय: उत्तरी क्षेत्र की ट्रांसमिशन पर स्थायी समिति की चतुर्थ बैठक के विषय में

Subject: 4th meeting of Northern Region Standing Committee on Transmission
 (NRSCT) – Minutes of Meeting

Sir/ Madam,

4th meeting of Northern Region Standing Committee on Transmission was held on 25th July, 2019 at NRPC Katwaria Sarai, New Delhi. Minutes of the meeting are available on CEA website: www.cea.nic.in (path to access – Home Page – Wing - Power System-PSPA-I- Standing Committee on Power System Planning- Northern Region).

Yours faithfully,


 (Goutam Roy) 09.08.2019
 Chief Engineer

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1.	Chairperson, CEA, Sewa Bhawan, RK Puram Sector-1, New Delhi-11006	2.	Member, Secretary, NRPC, 18-A Shajeed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi - 110016 (Fax-011-26865206)	3.	Director (Projects) PTCUL, Vidhyut Bhawan, Near ISBT -Crossing, Saharanpur Road, Majra, Dehradun-248002. Uttrakhand Fax-0135-2645744
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)
7.	Director (PP&D) RVPN, 3 rd Floor, Room no 330, Vidhyut Bhawan, Janpath, Jaipur-302005. Fax:-0141-2740794 ce.ppm@rvpn.co.in	8.	Director (Technical) HVPNL Shakti Bhawan, Sector-6 Panchkula-134109 Fax-0172-256060640	9.	Director (Technical) HPSEB Ltd. Vidut Bhawan, Shimla -171004 Fax-0177-2813554
10.	Managing Director, HPPTCL, Barowalias, Khalini Shimla-171002 Fax-0177-2623415	11.	Chief Engineer (Operation) Ministry of Power, UT Secretariat, Sector-9 D Chandigarh -161009 Fax-0172-2637880	12.	Development Commissioner (Power), Power Department, Grid Substation Complex, Janipur, Jammu, Fax: 191-2534284
13.	Director (Projects) POWERGRID Saudamini Plot no. 2, Sector - 29. Gurgaon-122 001 (Fax-0124-2571809)	14.	CEO, POSOCO B-9, Qutab Institutional Area, Katwaria Sarai New Delhi – 110010 (Fax:2682747)	15.	COO (CTU) POWERGRID, Saudamini, Plot no. 2, Sector -29, Gurgaon-122 001 (Fax-0124-2571809)
16.	Director (W &P) UPPTCL, Shakti Bhawan Extn,3rd floor, 14, Ashok Marg, Lucknow - 226 001 (Fax:0522-2287822)				

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Minutes of 4th Meeting of Northern Region Standing Committee on Transmission (NRSCT) held on 25.7.2019

List of participants is enclosed as Annexure –I.

Member(PS), CEA welcomed the participants to the meeting and stated that main agenda for the meeting is finalization of the transmission system for evacuation of power from Solar Energy Zones in Rajasthan under Phase-II. He further stated that Government of India has set a target of 175 GW of RE generation by 2021-22 and in order to meet the same, the transmission infrastructure is required to be constructed in advance keeping in view of short gestation period of RE generations.

Chief Engineer (PSPA-I), CEA stated that the transmission schemes for evacuation of 8.9 GW of RE generations in Rajasthan under Phase-I were agreed in the 2nd meeting of NRSCT and presently under bidding process. The transmission scheme for evacuation of RE generations in Rajasthan under Phase-II was discussed in the 3rd meeting of NRSCT however it was decided that the scheme needs further review and joint meeting needs to be conducted. Accordingly, the transmission schemes proposed in present meeting has been evolved after consultation with NR constituents. He then requested Director, PSPA-I(CEA) to take up the agenda for discussions.

1.0 Confirmation of the Minutes of the 3rd meeting of Northern Region Standing Committee on Transmission held on 24.05.2019.

1.1 CEA stated that the 3rd meeting of Northern Region Standing Committee on Transmission (NRSCT) was held on 24.05.2019 and the minutes of the meeting were issued vide CEA letter no. File No.CEA-PS-11-21(19)/1/2019-PSPA-I Division-Part (1) dated 17.7.2019. CEA further stated that the following observations were received from CVPPL and POSOCO:

1.2 CVPPL vide its letter CVPPL/Plg/2019/264 dated 23.07.2019 has furnished its observations regarding para no 2.3 and 2.9.1 of minutes:

Para no.2.3 of the MoM

2.3 CVPPL informed that -----Long term Access for Pakal Dul HE Project (1000 MW) has been submitted to CTU on **14.05.2019** -----.

May be modified as

2.3 CVPPL informed that -----Long term Access for Pakal Dul HE Project (1000 MW) has been submitted to CTU on **21.05.2019** -----.

Para no.2.9(i) of the MoM

2.9 After deliberations, following was agreed:

- i) CVPPL to apply for connectivity to CTU----- . M/s CVPPL to phase the implementation of the dedicated line as per the implementation timelines of the HEPs.

May be modified as

2.9 After deliberations, following was agreed:

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- i) CVPPL to apply for connectivity to CTU-----, M/s CVPPL to implement Kiru – Kwar - Pakaldul- Kishtwar 400 kV D/C quad HTLS dedicated line in one go for all the three HEPs of CVPPL

1.2.1 CEA stated modification proposed in para 2.3 was agreed. Regarding the modification in para 2.9(i), CEA stated that considering the different commissioning schedule of the HEPs, it was mentioned in the minutes that the dedicated line connecting the three HEPs may be implemented in phases. As M/s CVPPL intends to implement the dedicated line in one go in view of the close commissioning schedule of the three HEPs, therefore, the point no 2.9(i) is modified as given below:

2.9 After deliberations, following was agreed:

- i) CVPPL to apply for connectivity to CTU for Kiru and Kwar HEP so that connectivity intimation of Kiru, Kwar can be issued through Kiru-Kwar-Pakaldul-Kishtwar 400 kV D/C quad HTLS dedicated line to be implemented by M/s CVPPL.M/s CVPPL to implement Kiru-Kwar-Pakaldul- Kishtwar 400 kV D/C quad HTLS (with minimum capacity 4300 MVA* on each circuit at nominal voltage) dedicated line for all the three HEPs.

* To cater the power from Pakaldul (1000 MW), Kiru(624 MW), Kwar (540MW), Kirthai-I(390MW) & Kirthai-II(930MW) generation projects through single corridor. It may be noted that total evacuation requirement for above HEPs is about 3500 MW. Considering 10% overload capacity of HEPs, evacuation requirement is about 3855 MW. Further, HEPs are expected to generate reactive power of at least 48% of Pmax (i.e about power factor of 0.9). Thus, total evacuation requirement is about 4300 MVA. Accordingly, availability of suitable switchgear for termination of Quad HTLS may be explored by implementing agency and the same may be informed for finalization of system

1.3 PSTCL informed that following intra state work proposed by PSTCL is mentioned under point no 26.3(ii):

“LILO of both ckt of 400 kV Jalandhar – Kurukshetra D/c line at Dhanansu”.

PSTCL stated that LILO of only one circuit of 400 kV Jalandhar – Kurukshetra D/c line at Dhanansu was agreed in the 3rd meeting of NRSCT and same is mentioned in the minutes of the meeting held on 3rd& 4th June 2019 at PSTCL office, Patiala and Chandigarh to resolve the issues of high short circuit levels of Moga(PG) 400kV bus among CEA, CTU and PSTCL.

Accordingly, point no. 26.3(ii) is modified as:

“LILO of one ckt of 400 kV Jalandhar – Kurukshetra D/c line at Dhanansu”.

1.4 CTU stated that in the table at point no 22.10.7 regarding ‘ICT Augmentation works at existing Bhiwani (PG)ISTS S/S associated with LTA applications from SEZs in Rajasthan’ under Column 3i.e. Capacity/ckm 1x1500 MVA is mentioned instead of 1000 MVA.

The same may be read as:

1. ICT Augmentation works at existing Bhiwani (PG)ISTS S/S associated with LTA applications from SEZs in Rajasthan

Sl. No.	Scope of the Transmission Scheme	Capacity /ckm
1.	Augmentation with 765/400kV , 1x1000MVA, transformer (3 rd) at Bhiwani (PG) S/s	1x1000MVA , 765/400kV, 765kV ICT bay-1 400kV ICT bay-1

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- 1.5 CEA stated that POSOCO vide its letter dated 24.7.2019 has requested to incorporate some suggestions in the context of transmission planning studies for RE (agenda item no.-20) in the minutes of 3rd NRSCT. Therefore, following may be added under point 20.7 of the minutes of meeting of the 3rd NRSCT:
 “POSOCO stated that the following aspects in respect of Renewable Energy (RE) transmission planning merit attention: -
- a) Study on All India snapshot with high RE generation in Northern, Western and Southern Region simultaneously (a likely scenario) which would highlight the need for strengthening in other parts of the network so that congestion and RE curtailment is minimized.
 - b) Network behaviour under low RE and other generation scenarios.
 - c) Assessment of Equivalent Short Circuit Ratio (SCR) at different points of interconnection and ensuring the criteria of SCR of five & above as per the recent amendment to the CEA Technical Standards for Connectivity to the grid.
 - d) Evaluating other alternatives such as VSC based HVDCs to take care of uncertainties.
 - e) Evaluating transient stability, particularly in cases where the loadings on 765 kV Bikaner New-Moga D/C, 765 kV Vindhyachal Pool-Varanasi D/C, and 765 kV Bikaner-Khetri D/C are high enough to cause more than 20 degrees angular separation between adjacent buses under N-1 contingency.
- 1.6 Accordingly, the minutes of the 3rd NRSCT meeting along the modifications listed at 1.2, 1.3, 1.4 and 1.5 were confirmed by the constituents.

2.0 **Transmission scheme for controlling high loading and high short circuit level at Moga substation**

- 2.1 CEA stated that the transmission scheme for evacuation of 8.9 GW of RE power from Solar Energy Zones (SEZs) in Rajasthan was agreed technically in the 2nd NRSCT meeting held on 13.11.2018. Subsequently, Punjab had objected to the augmentation of 1x1500 MVA, 765/400 kV ICT (3rd) at Moga substation as it would further increase the fault level at Moga, which is already at higher side and with ISTS injection in west of Punjab (at Moga), their associated 220 kV network gets overloaded. Therefore, PSTCL had requested to review the proposal of additional 1x1500 MVA (3rd) transformer at Moga substation.

The observations made by PSTCL are as follows:

- a) As per their studies, in the paddy season, the loading 2x1500 MVA, 765/400kV transformers is only 17% and will further decrease with installation of additional transformer. Installation of third 1x1500 MVA, 765/400kV ICT at PGCIL Moga S/S may not be beneficial on account of power evacuation point of view as the MW flows through the ICTs at Moga remain unaffected because of its direct connectivity with Talwandi-Sabo TPS of 3x660 MW.
- b) In the light load conditions, Punjab's load reduces to about 3000-3500 MW especially in winters, problem of high bus voltages at 220/ 400/ 765kV buses arises.
- c) Fault level at PGCIL Moga has already exceeded design limit. Under these circumstances, it may not be beneficial for the system to have more 1x1500 MVA, 765/400 kV ICT & 765 /400 kV lines to be terminated at Moga.
- d) CTU studies shows about 4000 MW of RE power injection from Bikaner to Moga through 765 kV D/C line and drawl of about 3000 MW through 3 nos. of 765/400 kV ICTs at Moga. Injection of such quantum of power at Moga (in western side of Punjab) is going to overload the associated 400 kV and 220 kV systems of Punjab.

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- e) To control the short circuit level at Moga 220 kV and 400 kV level, bus splitting at 765 kV or 400 kV level may be considered and outlets may be planned from Moga so that their 220 kV system do not get overloaded.

2.2 CEA further stated that the issue was deliberated in the 3rd meeting of NRSCT, wherein it was agreed that studies would be carried by CEA and CTU in association with PSTCL, to evolve additional transmission schemes (inter-state as well as intra-state) in order to address the technical concerns raised by PSTCL. The same would be deliberated in a joint meeting of CEA, CTU and PSTCL to be held on 3rd/4th June 2019. The transmission scheme finalized in that meeting would also be included as agenda for the 45th NRPC meeting scheduled on 6th and 7th June 2019.

Accordingly, a meeting was held on 3rd& 4th June 2019 (minutes enclosed as Annexure-II) at PSTCL office, Patiala and Chandigarh, among CEA, CTU and PSTCL wherein, following was agreed:

- i) In order to resolve the issues of high short circuit levels of Moga(PG) 400kV bus, bus split arrangement will be required. The following splitting option resolves the issues of high short circuit level and high loading levels on 765/400kV transformers at Moga:

400kV Bus Section-1

- 400kV Kishenpur D/c feeders
- 400kV Hisar D/c feeders
- 2 nos. 765/400kV transformers
- 1 No. 80 MVAR or 125 MVAR Reactor based on feasibility

400kV Bus Section-2

- 400kV Jalandhar D/c feeders
- 400kV Bhiwani feeder
- 400kV Fatehabad feeder
- 400kV Nakodar feeder
- 400kV Talwandi Sabo/Malkana Feeder
- 4 nos. 400/220kV transformers
- 1 No. 80 MVAR or 125 MVAR Reactor based on feasibility

- ii) The above splitting arrangement would require relocation of the bays for bus section-1 for which existing buildings shall have to be relocated for space creation. Further, other options for interconnection of feeders of bus section-1 to 400kV main Bus (bus section-2) through GIS bus duct needs to be explored.

It was agreed in principle that the Bus Bar splitting at Moga would be done by suitable reengineering and it would become part of Bikaner- Moga 765 kV D/C line as a supplementary ISTS strengthening scheme. This Scheme shall remain associated with the transmission scheme of Bikaner-Moga 765 kV D/C line and would require to be completed in same time of the line. However, since Bikaner-Moga line is in advance stage of implementation, suitable operational measures in consultation with POSOCO shall need to be taken up.

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- iii) With the above proposed Moga bus split arrangement, 3rd 1x1500 MVA, 765/400kV transformer at Moga is not required as a part of the present scheme of Transmission system of Rajasthan Solar Energy Zones (8.9 GW).
- 2.3 CTU clarified that reactor rating is 50 MVAR at bus- 1 and 125 MVAR at bus -2. CTU also stated that as agreed in the meeting held on 3rd & 4th June, 2019 at PSTCL office, in case Bikaner-Moga 765 kV D/c line commissioned earlier to the proposed bus splitting, the quantum of injection to 400kV system through 765/400kV ICTs during intermediate period shall be restricted to 2000 MW, as per preliminary studies. Bikaner-Moga 765 kV D/c line is nearing completion and is now expected to be commissioned by Dec 2019, therefore, an interim arrangement is needed at Moga substation till the bus splitting proposal is implemented.
- 2.4 POSOCO stated that Kishenpur- Moga 765kV D/c line is presently operated at 400kV and in future the line would be operated at 765kV level, accordingly the space may be kept in 765kV switchyard at Moga S/s.
- 2.5 CEA stated that the charging of Kishenpur- Moga 765kV D/c line (operated at 400kV) at 765kV is linked with the hydro projects in J&K, the time frame of these projects are still uncertain. The modifications as well as the augmentation required in the transmission network would be reviewed based on the materialization of these hydro projects.
- 2.6 CTU stated that bus splitting would involve running parallel GIS bus (Main-I/Main-II) to the existing bus. The proposed bus section – I arrangement would be transferred to GIS bus. Further, bus sectionalisers between AIS and GIS would be required. To accomplish the same, for Nakodar and ICT-II (765/400kV) feeders, one additional GIS bay module would be required and it shall be double breaker switching scheme. This arrangement would also avoid dismantling of existing buildings.
- 2.7 After deliberations, following was agreed:
- (i) 400kV Bus splitting at Moga to be carried out in order to resolve the issues of high short circuit level and high loading levels
- 400kV Bus Section-1**
- 400kV Kishenpur D/c feeders
 - 400kV Hisar D/c feeders
 - 2 nos. 765/400kV transformers
 - 1 No. 50 MVAR
- 400kV Bus Section-2**
- 400kV Jalandhar D/c feeders
 - 400kV Bhiwani feeder
 - 400kV Fatehabad feeder
 - 400kV Nakodar feeder
 - 400kV Talwandi Sabo/Malkana Feeder
 - 4 nos. 400/220kV transformers
 - 1 No. 125 MVAR
- (ii) The above bus splitting would be taken up as Supplementary System strengthening scheme associated Bikaner-Moga line under ISTS.

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- (iii) A separate meeting be convened with CEA, CTU, POSOCO and PSTCL to finalise the interim arrangement at Moga substation for the intermediate period between commissioning of Bikaner-Moga 765 kV D/c line and implementation of 400kV bus splitting at Moga.

3.0 Transmission System for evacuation of Power from potential solar energy zones – Phase -II in Northern Region.

- 3.1 CEA stated that Govt. of India had set a target for establishing 175 GW renewable capacity by 2022, which includes 100 GW Solar, 60 GW Wind generation capacity. MNRE vide its order dated 08.06.2018 had constituted a Sub-Committee to identify ISTS connectivity for renewable energy projects from potential solar energy zones (SEZs) and potential wind energy zones (WEZs) of about 50 GW and 16.5 GW respectively. SEZs and WEZs envisaged in 7 RE rich states (Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh) were identified by SECI in association with MNRE in consultation with RE power developers.

To ease implementation of transmission infrastructure, it was proposed to bifurcate these requirements in two phases. A total of 20 GW solar & 9 GW wind projects has been planned in Phase-I (up to Dec'2020) and 30 GW solar & 7.5 GW wind has been planned for Phase-II (Dec' 2021). For Northern Region the same translates into a requirement of 10 GW solar in Phase-I (up to Dec'2020) and 10 GW solar in Phase-II (Dec'2021) totalling to 20 GW. The details of SEZs in Northern Region are given below:

State/District	Solar Energy Zones		
	Ph-1 (GW)	Ph-2 (GW)	Total
	2020	2021	
Rajasthan			
Jaisalmer (S: Ramgarh, Fatehgarh)	5	3	8
Jodhpur (S: Phalodi)	2	1	3
Bikaner (S: Kolayat/Pugal)	3	1	4
Barmer (S: Barmer)	0	5	5
Subtotal	10	10	20

MNRE has subsequently revised Solar Potential complexes details in Rajasthan for development by 2020/2021 in two phases, which is as under:

District	Taluk/Tehsil	Ph-1(GW) 2020	Ph-2(GW) 2021	Total
Jaisalmer	Kuchhri	-	4.00	4.00
	Fatehgarh	3.50	2.20	5.70
Jodhpur	Phalodi/Bhadla	3.55	1.75	5.30
Bikaner	Koyalat /Pugal	1.85	3.15	5.00
Total		8.90	11.1	20

The details of connectivity/LTA granted are as follows:

Sl no.	Location	St-II connectivity		LTA	
		Applied	Granted/Agreed	Applied (MW)	Granted (MW)

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		(MW)	for Grant (MW)		
1	Bhadla	3380 (13 nos.)	3380	3380 (13 nos.)	3380
2	Bhadla-II	1280 (2 nos.)	300+980 (agreed)	980	-
3	Fatehgarh	2050 (7 nos.)	1700+350 (Agreed)	1200 (4 nos.)	850+350 (Received)
4	Fatehgarh-II	2200 (5 nos.)	2200	2200 (5 nos.)	2200
5	Bikaner	1790 (5 nos.)	1290+500 (agreed)	1290 (4 nos.)	600+690 (agreed)

3.2 Out of total 20 GW REZ [Solar] in Rajasthan, transmission system for 8.9 GW in Bhadla (3.55 GW), Fatehgarh (3.5 GW), Bikaner (1.85 GW) complexes under Phase-I, was technically agreed in the 2nd meeting of Northern Region Standing Committee on Transmission (NRSCT) held on 13.11.2018.

3.3 In the 3rd meeting of NRSCT held on 24.5.2019 the transmission system for integration of balance 11.1 GW solar potential in Rajasthan [Phase –II :11.1GW] (Out of total 20 GW REZ [Solar]) from Ramgarh/Kuchheri (4 GW), Bikaner (3.15 GW), Bhadla (1.75GW) & Fatehgarh (2.2 GW) was deliberated. In the meeting RVPNL highlighted that the intra-state EHV transmission in Western Rajasthan is sufficient to evacuate about 10 GW RE projects (7.4 GW already commissioned and 1.3 GW under implementation). In addition to this, 2 GW, 2.1 GW and 2.211 GW of RE capacity addition is expected in the year 2020-21, 2021-22 and 2022-23 respectively. For evacuation of this additional 6.3 GW RE capacity, 765/400 kV Jodhpur GSS (Hingola) along with its interconnections with Phagi 765/400 kV GSS has been planned. Subsequently, RVPNL has provided the modified proposal for evacuation of additional RE capacity. The plan comprised upgradation of 400kV Jodhpur (Kakani) S/s to 765kV level along with its interconnections with Phagi 765/400 kV GSS and 400kV interconnections.

An additional RE capacity of 4.1 GW (3.1 GW Solar & 1 GW wind) in time frame of 2021-22 has been planned by Rajasthan in Intra state, which includes 3 GW Solar located in Jaisalmer (2.1 GW), Jodhpur (0.7 GW) & Bikaner Area (0.2 GW). Therefore, after accounting for development of above Solar generation (3 GW) in Intra state network in similar pockets, transmission system for only 8.1 GW (**Ramgarh/Kuchheri (1.9 GW), Bikaner (2.95 GW), Bhadla (1.05GW) & Fatehgarh (2.2GW)**) of RE potential was required to be planned under ISTS as compared to 11.1 GW system that has been proposed earlier and it was decided that that a joint study meeting would be convened to further deliberate on the scheme.

MoP vide its OM dated 14.6.2018 had notified the long term RPO trajectory, solar and non-solar, uniformly for all the States, wherein, RPO (%) (of total consumption Excluding Hydro) 10.5% for Solar and 10.5% for non- solar has been mentioned for 2021-22. However, RPO (%) as per the State Electricity Regulatory commission for 2021-22 furnished by respective State are as follows:

S.	State	RPO (%) of Total Consumption Excluding
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No		Hydro (as per SERC) for 2021-22	
		Solar	Non-Solar
1	Punjab	6.5	8
2	Haryana	8	3
3	Rajasthan	8.5	9.8
4	Uttar Pradesh	4	6

The study file was circulated to all the Northern region constituents to send their comments on the transmission system proposed as well as the on load flow file based on which the transmission system for evacuation of power from 8.1 GW RE (solar) projects has been proposed.

A joint study meeting was convened on 17.6.2019 & 18.6.2019 at Powergrid, Gurgaon, wherein, the representatives from CTU, POSOCO, Haryana, Punjab, Himachal Pradesh, Rajasthan and Delhi were present. No representative from UPPTCL, PTCUL and JKPDD attended the meeting. All the State representative furnished their load generation balance as well as existing and planned RE generations in their respective states. The comments furnished by the constituents were discussed and accordingly the load flow study was revised. Subsequently, PTCUL representative also got updated the network pertaining to them.

- 3.4 Incorporating the comments of the constituents the following alternatives are proposed for evacuation of power from 8.1 GW potential RE generation in Northern Region (**Ramgarh/Kuchheri (1.9 GW), Bikaner (2.95 GW), Bhadla (1.05GW) & Fatehgarh (2.2GW)**):

Alternative-1

- i) Establishment of 400/220kV, 4x500 MVA pooling station at suitable location near Ramgarh/Kuchheri in Distt Jaisalmer (Ramgarh-II PS)
- ii) Establishment of 400/220kV, 6x500MVA pooling station at suitable location near Bikaner (Bikaner-II PS)
- iii) Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Sikar (Sikar-II Substation)
- iv) Establishment of 765/400kV, 2x1500MVA substation at suitable location near Kadarapur (Kadarapur-II substation)
- v) Augmentation with 765/400kV, 2x1500MVA transformer (5th & 6th) at Fatehgarh-II PS
- vi) Augmentation with 400/220kV, 4x500MVA transformer at Fatehgarh-II PS
- vii) Augmentation with 765/400kV, 1x1500MVA transformer (4th) at Bhadla-II PS
- viii) Augmentation with 400/220kV, 3x500MVA transformer at Bhadla-II PS
- ix) Ramgarh-II PS –Fatehgarh-II PS 400 kV D/c Line (Twin HTLS)
- x) Ramgarh-II PS – Jaisalmer-II (RVPN) 400 kV D/c Line (Twin HTLS)
- xi) Fatehgarh-II PS – Bhadla-II PS 765kV D/c line (2nd)
- xii) Bhadla-II PS – Sikar-II 765kV 2xD/c line
- xiii) Sikar-II – Kadarapur-II 765kV D/c line
- xiv) Sikar-II – Neemrana 400kV D/c line (Twin HTLS)

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- xv) LILO of 765kV Jhatikara – Agra S/c line at Kadarpur-II
- xxvi) Kadarpur-II – Bareilly 765kV D/c line
- xxvii) Kadarpur-II – Prithala 400kV D/c line (Twin HTLS)
- xxviii) Bikaner-II PS – Khetri 400kV 2xD/c line (Twin HTLS line on M/c tower)
- xix) Khetri - Bhiwadi 400kV D/c line (Twin HTLS)
- xx) Bikaner-II PS – Bikaner (PG) 400kV D/c line (Twin AL59)
- xxi) Khetri - Gr. Noida (UPPCL) 765kV D/c line
- xxii) Power reversal on ± 500 kV, 2500MW Balia – Bhiwadi HVDC line upto 2000MW from Bhiwadi to Balia for solar maximized time
- xxiii) 220kV line bays for interconnection of solar projects at Bikaner-II PS (10 nos.), Ramgarh-II PS (7 nos), Fatehgarh-II PS (7 nos) & Bhadla-II PS (4 nos)
- xxiv) 1x125 MVar (420kV), 2x240 MVar (765kV) Bus Reactor each at Sikar-II & , Kadarpur-II Substation
- xxv) 2x125 MVar (420kV) Bus Reactor each at Bikaner-II & Ramgarh-II PS
- xxvi) 1x240 MVar Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla-II 765kV D/c line
- xxvii) 1x240 MVar Switchable line reactor for each circuit at Bhadla-II end of Bhadla-II – Sikar-II 765kV D/c line
- xxviii) 1x330 MVar Switchable line reactor for each circuit at Sikar-II end of Bhadla-II – Sikar-II 765kV D/c line
- xxix) 1x240 MVar Switchable line reactor for each circuit at each end of Sikar-II – Kadarpur-II 765kV D/c line
- xxx) 1x240 MVar Switchable line reactor for each circuit at each end of Kadarpur-II – Bareilly 765kV D/c line
- xxxi) 1x80 MVar Switchable line reactor for each circuit at each end of Bikaner-II – Khetri 400kV 2xD/c line
- xxxii) 1x240 MVar Switchable line reactor for each circuit at Gr. Noida end of Khetri – Gr. Noida (UPPCL) 765kV D/c line

Alternative-2

1. EHVAC Portion

- i) Establishment of 400/220kV, 4x500 MVA pooling station at suitable location near Ramgarh/Kuchheri in Distt Jaisalmer (Ramgarh-II PS)
- ii) Establishment of 400/220kV, 6x500MVA pooling station at suitable location near Bikaner (Bikaner-II PS)
- iii) Augmentation with 765/400kV, 2x1500MVA transformer (5th & 6th) at Fatehgarh-II PS
- iv) Augmentation with 400/220kV, 4x500MVA transformer at Fatehgarh-II PS
- v) Augmentation with 400/220kV, 3x500MVA transformer at Bhadla-II PS
- vi) Ramgarh-II PS –Fatehgarh-II PS 400 kV D/c Line (Twin HTLS)
- vii) Ramgarh-II PS – Jaisalmer-II (RVPN) 400 kV D/c Line (Twin HTLS)
- viii) Fatehgarh-II PS – Bhadla-II PS 765kV D/c line (2nd)
- ix) Bikaner-II PS – Khetri 400kV 2xD/c line (Twin HTLS line on M/c tower)
- x) Khetri - Bhiwadi 400kV D/c line (Twin HTLS)
- xi) Bikaner-II PS – Bikaner (PG) 400kV D/c line (Twin AL59)
- xii) Khetri - Gr. Noida (UPPCL) 765kV D/c line
- xiii) Power reversal on ± 500 kV, 2500MW Balia – Bhiwadi HVDC line upto 2000MW from Bhiwadi to Balia for solar maximized time

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- xiv) 220kV line bays for interconnection of solar projects at Bikaner-II PS (10 nos.), Ramgarh-II PS (7 nos), Fatehgarh-II PS (7 nos) & Bhadla-II PS (4 nos)
- xv) 2x125 MVA (420kV) Bus Reactor each at Bikaner-II & Ramgarh-II PS
- xvi) 1x240 MVA Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla-II 765kV D/c line
- xvii) 1x80 MVA Switchable line reactor for each circuit at each end of Bikaner-II – Khetri 400kV 2xD/c line
- xviii) 1x240 MVA Switchable line reactor for each circuit at Gr. Noida end of Khetri – Gr. Noida (UPPCL) 765kV D/c line

2. HVDC Portion

VSC based HVDC system between Bhadla-II PS and suitable location (near Aliganj) between Bareilly and Mainpuri

- i) ± 400 kV, 5000 MW HVDC terminal at Pooling point near Bhadla-II PS
- ii) ± 400 kV, 5000 MW HVDC terminal at Pooling point in suitable location (near Aliganj) between Bareilly and Mainpuri
- iii) ± 400 kV HVDC line (Quad) between Bhadla-II PS and suitable location (near Aliganj) between Bareilly and Mainpuri

EHVAC option 1 beyond Aliganj

- i) 5x1500MVA transformer at suitable location (near Aliganj) between Bareilly and Mainpuri
- ii) Aliganj- Bareilly (PG) 765kV D/c line
- iii) Aliganj- Mainpuri (UPPCL) 765kV D/c line
- iv) 1x125 MVA (420kV), 2x240 MVA (765kV) Bus Reactor at Aliganj Substation

EHVAC option 2 beyond Aliganj

- i) Aliganj- Bareilly (PG) 400kV D/c line (Twin HTLS)
- ii) Aliganj- Mainpuri (UPPCL) 400kV D/c line (Twin HTLS)
- iii) Aliganj- Hapur (UPPCL) 400kV D/c line (Twin HTLS)
- iv) 2x125 MVA (420kV) Bus Reactor at Aliganj Substation

3.5 CEA stated that to have detailed deliberations on the alternatives proposed above, a meeting was held on 24.7.2019 at NRPC in which most of the constituents preferred alternative 2. Summary of the discussions held in the meeting are as given below:

- i) In the meeting, RVPNL gave its preference for the 2nd alternative but raised the issue of high fault level at Bhadla(RVPN) 400 kV bus and high loading of Bikaner (PG)-Bikaner (RVPN) 400kV line. To overcome the issue of high fault level at Bhadla(RVPN) 400 kV bus, the option of bus sectionaliser at 400kV bus of Bhadla-II was studied. To overcome the issue of high loading of Bikaner (PG)- Bikaner (RVPN) 400kV line, the option of LILO of both circuits of Bikaner-Sikar 400kV D/c line at Bikaner-II was explored and it was found that the loading of Bikaner (PG)- Bikaner (RVPN) line was reduced. Also, it was also observed that with this LILO, Bikaner (PG) – Bikaner-II 400kV D/c line would not be required.
- ii) RVPN also proposed that since a large quantum of power is expected to flow towards Phagi, 400kV outlet at Phagi may be planned. It was agreed that while studying the all India scenarios with RE integration of all regions, the requirements of 400 kV outlets from Phagi would also be studied and proposed, if required.

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- iii) UPPTCL vide its letter no. 665/Dir (Comm & Plg)/UPPTCL/2019 dated 23.07.2019 communicated its observations on the above proposals. UPPTCL has informed that in view of the space constraints, lines proposed at Gr. Noida and Mainpuri are not feasible, however, UPPTCL suggested that the option of connectivity with 765kV Modipuram S/s may be explored.
- iv) HVPNL enquired about the line loadings in their system with increased generations at Panipat, Yamumnagar and Khedar to about 80%. The same was done and the loadings was found to be in order.
- v) POSOCO stated the following:
 - a) SCR of 3 nos of 220kV buses i.e Fatehgarh-II (about 4), Bhadla (aboutt 5) and Bhadla-II (about 5) is low.
 - b) Hydro despatches considered are low in NR and NER
 - c) Generations near load centres are high at some locations
 - d) Generation dispatch of some of pithead coal fired plants i.e. vindhyachal, Rihand etc. is low
- vi) CTU stated that fault currents are high at Bassi (about 45kA), Neemrana (about 50kA), Sikar (about 43kA) and, Bhiwadi (about 47kA) To overcome this issue, it was decided that suitable bus splitting or bypassing arrangement would be worked out separately.

3.6 All the members were of the view that steady state and dynamic reactive power support was required for the connected AC transmission system due to integration of large quantum of Renewable Energy. Therefore, VSC based HVDC has been considered in the Alternative -2 instead of LCC based HVDC as the same can also provide reactive power support just like STATCOM and may take care of the dynamic reactive power support for renewable integration. Further, the uncertainty of adequate short circuit level due to intermittent & variable nature of Renewable Energy can also be addressed by VSC based HVDC in comparison to LCC based HVDC.

3.7 HVDC Experts from POWERGRID explained that VSC based HVDC is widely used for integration of Renewable Energy across the world. The following Salient features of VSC based HVDC system was highlighted by HVDC expert from POWERGRID:

Salient features of a VSC based HVDC

- i) Best suitable option for integration of intermittent RE sources
- ii) Active and reactive power modulations possible to improve the stability of the connected AC System
- iii) Supports connected AC system due to its steady state and dynamic voltage and reactive power support
- iv) Reverse power transmission is feasible up to rated capability depending on the requirements
- v) Four Quadrant Operation is possible
- vi) Controllability of power compared to AC transmission
- vii) Grid Connection to weak/islanded AC Networks
- viii) Independent Control of Active and Reactive power
- ix) Supply of passive Networks and Black Start Capability
- x) Can be used as STATCOM even without active power transmission
- xi) Less foot print area compared to conventional HVDC system
- xii) In symmetric monopole configuration, standard transformers are required instead of converter transformers

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- xiii) Generally, no/very little amount of harmonics thus reduces requirement of AC/DC filters
- 3.8 As the constituents were in agreement with the implementation of Hybrid system, therefore, the transmission studies were reviewed for Alternative-2 based on the observations/suggestions given by the members. Further, instead of Aliganj (between Bareilly and Mainpuri), the option of HVDC terminal at suitable location near Modipuram was studied, which has reduced the length of the HVDC line (Quad) from Bhadla-II PS by about 90km. Further, considering inputs provided by UP and transmission expansion plan of Delhi, instead of Khetri- G.Noida 765 kV D/C line, Khetri-Narela 765 kV D/C line alongwith establishment of 765/400 kV 3x1500 MVA substation at Narela near Delhi and its 400 kV interconnection was proposed.
- 3.9 HVPNL suggested that even though the alternative involving VSC based HVDC system was costly, but has many advantages over AC systems for RE integration. Therefore, Govt of India may be approached for some financial support to the extent of cost difference between AC and DC option.
- 3.10 The following transmission system for evacuation of power from 8.1 GW potential RE generation, under Phase-II, in Northern Region (Ramgarh/Kuchheri-1.9 GW, Bikaner-2.95 GW, Bhadla- 1.05GW & Fatehgarh-2.2GW) was technically agreed by the members:

Transmission schemes for Solar Energy Zones (SEZs) in Rajasthan (8.1 GW) under Phase-II

A. EHVAC Portion

- i) Establishment of 400/220kV, 4x500 MVA pooling station at suitable location near Ramgarh/Kuchheri in Distt Jaisalmer (Ramgarh-II PS)
- ii) Establishment of 400/220kV, 6x500MVA pooling station at suitable location near Bikaner (Bikaner-II PS) with suitable bus sectionalisation at 400 and 220 kV level.
- iii) Establishment of 765/400kV, 3x1500MVA substation at suitable location in Narela (near delhi)
- iv) Augmentation with 765/400kV, 2x1500MVA transformer (5th & 6th) at Fatehgarh-II PS.
- v) Augmentation with 400/220kV, 4x500MVA transformer at Fatehgarh-II PS with suitable bus sectionalisation at 400 and 220 kV level
- vi) Augmentation with 400/220kV, 3x500MVA transformer at Bhadla-II PS with suitable bus sectionalisation at 400 and 220 kV level.
- vii) Augmentation with 765/400kV, 1x1500MVA (3rd) transformer at Bikaner(PG)
- viii) Ramgarh-II PS –Fatehgarh-II PS 400 kV D/c Line (Twin HTLS[§])
- ix) Ramgarh-II PS – Jaisalmer-II (RVPN) 400 kV D/c Line (Twin HTLS[§])
- x) Fatehgarh-II PS – Bhadla-II PS 765kV D/c line (2nd)
- xi) Bikaner-II PS – Khetri 400kV 2xD/c line (Twin HTLS[§] line on M/c tower)
- xii) Khetri - Bhiwadi 400kV D/c line (Twin HTLS[§])**
- xiii) Removal of LILO of one circuit of Bhadla-Bikaner(RVPN) 400kV D/c(Quad) line at Bikaner(PG). Extension of above LILO section from Bikaner(PG) upto Bikaner-II PS to form Bikaner-II PS – Bikaner (PG) 400kV D/c(Quad) line
- xiv) Khetri - Narela 765kV D/c line
- xv) LILO of 765kV Meerut – Bhiwani S/c line at Narela S/s

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- xvi) Removal of LILO of Bawana – Mandola 400kV D/c(Quad) line at Maharani Bagh/Gopalpur S/s. Extension of above LILO section from Maharani Bagh/Gopalpur upto Narela S/s so as to form Maharani Bagh – Narela 400kV D/c(Quad) and Maharani Bagh -Gopalpur-Narela 400kV D/c(Quad) lines.
- xvii) LILO of both circuits of Bawana – Mandola 400kV D/c(Quad) line at Narela S/s
- xviii) Power reversal on ± 500 kV, 2500MW Balia – Bhiwadi HVDC line upto 2000MW from Bhiwadi to Balia
- xix) 220kV line bays for interconnection of solar projects at Bikaner-II PS (10 nos.), Ramgarh-II PS (7 nos), Fatehgarh-II PS (8 nos) & Bhadla-II PS (4 nos)
- xx) 1x125 MVAR (420kV), 2x240 MVAR (765kV) Bus Reactor at Narela Substation
- xxi) 2x125 MVAR (420kV) Bus Reactor each at Bikaner-II & Ramgarh-II PS
- xxii) 1x240 MVAR Switchable line reactor for each circuit at each end of Fatehgarh-II – Bhadla-II 765kV D/c line (2nd)
- xxiii) 1x80 MVAR Switchable line reactor for each circuit at each end of Bikaner-II – Khetri 400kV 2xD/c line
- xxiv) 1x240 MVAR Switchable line reactor for each circuit at each end of Khetri – Narela 765kV D/c line

*** Due to space constraints 400kV bays at Bhiwadi S/s to be implemented as GIS
\$ with minimum capacity of 2200 MVA on each circuit at nominal voltage*

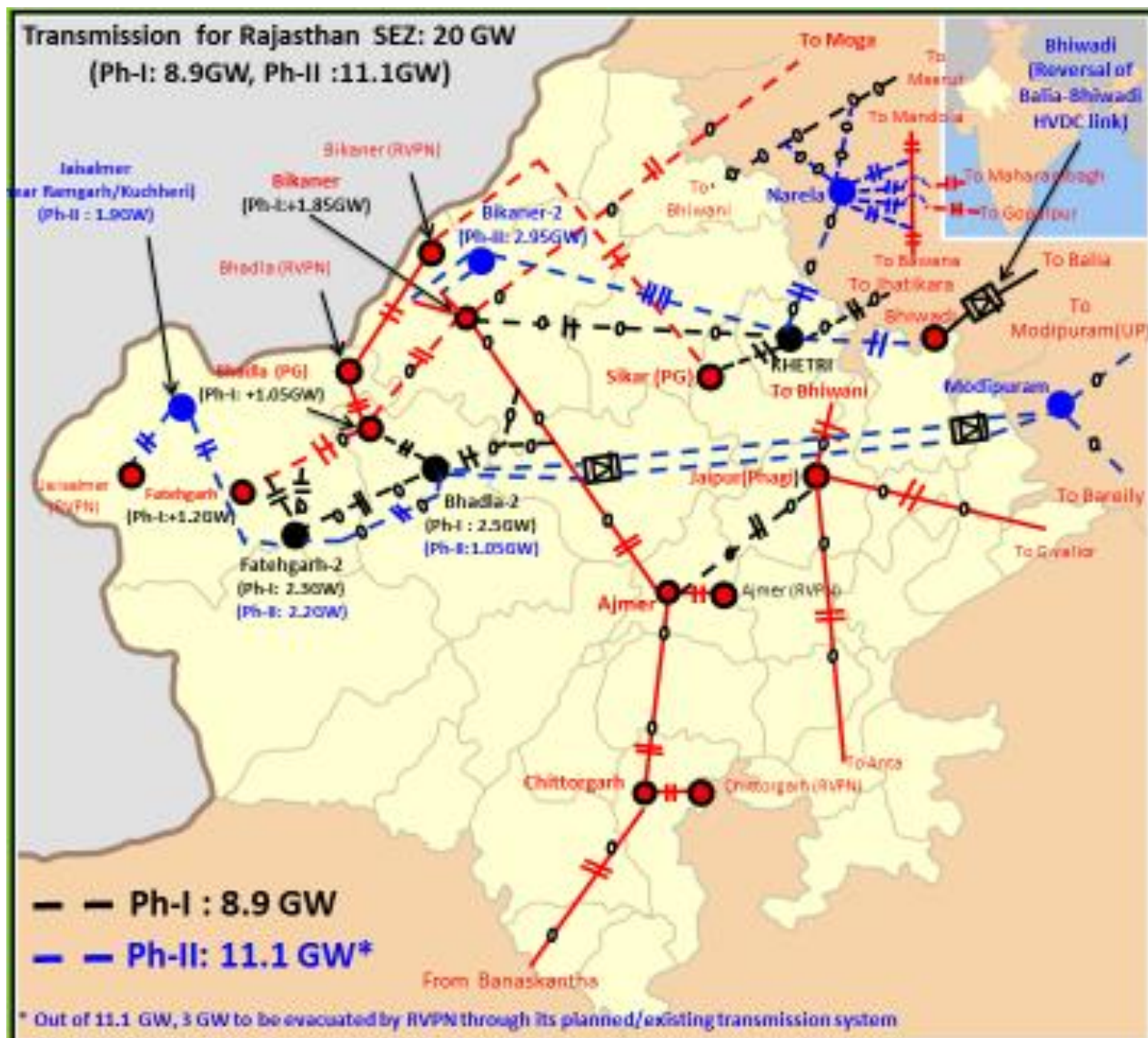
B. HVDC Portion

- 1) VSC based HVDC system between Bhadla-II PS and suitable location near Modipuram
 - i) ± 400 kV, 5000 MW HVDC terminal at Pooling point near Bhadla-II PS
 - ii) ± 400 kV, 5000 MW HVDC terminal at Pooling point in suitable location near Modipuram
 - iii) ± 400 kV HVDC line (Quad) between Bhadla-II PS and suitable location near Modipuram (on M/c tower)

AC interconnection at Pooling point in suitable location near Modipuram

- 2) 5x1500MVA transformer at suitable location (near modipuram)
- 3) Modipuram - Bareilly (PG) 765kV D/c line
- 4) Modipuram - Modipuram (UPPCL) 765kV D/c line
- 5) 2x240 MVAR (765kV) Bus Reactor at Modipuram Substation
- 6) 1x240 MVAR Switchable line reactor for each circuit at each end of Modipuram - Bareilly (PG) 765kV D/c line

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Simulation study with above transmission system is enclosed at **Exhibit-I**

4.0 Modifications in the Transmission schemes for Solar Energy Zones (SEZs) in Rajasthan (8.9 GW)

4.1 CEA stated that the transmission system for Solar Energy Zones (SEZs) in Rajasthan (8.9 GW) under Phase-I, was technically agreed in the 2nd meeting of Northern Region Standing Committee on Transmission (NRSCT) held on 13.11.2018. which inter-alia includes Fatehgarh II –Bhadla II 765 kV D/c line. Length of this transmission line was estimated to be approx 100 km (as the estimated length of Fatehgarh-Bhadla transmission line was also about 100 km). Hence no reactive compensation was proposed for this line. However, it has come to notice that the route length for which Fatehgarh Bhadla Transmission Limited has got approval for Fatehgarh-Bhadla 765 kV D/c line is 145 km rather than earlier estimated 100 km. Also, survey for Fatehgarh II- Bhadla II has been done by BPC which indicated the route length to be 187 km in view of the proposed extension in the boundaries of the protected area for Great Indian Bustard. Therefore, reactive compensation needs to be provided for Fatehgarh II –Bhadla II 765 kV D/c line.

Further LILO of Fatehgarh –Bhadla 765 kV D/c line (operated at 400 kV) Fatehgarh II substation has already been agreed as a part of the transmission system associated with 8.9 GW RE projects in Rajasthan. This LILO would result in formation of Fatehgarh –

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Fatehgarh II 765 kV D/c line (to be operated at 400 kV) and Fatehgarh II-Bhadla 765 kV D/c line. No reactors were provided in the Fatehgarh - Bhadla 765 kV line (operated at 400 kV level) as its length was anticipated to be around 100 kms. After its LILO at Fatehgarh-II, length of FatehgarhII–Bhadla 765 kV D/c line would be more than 150 kms, therefore there is need to provide switchable line reactors at Fatehgarh-II end of the Fatehgarh-II- Bhadla 765 kV D/C line

- 4.2 In view of the above, members agreed for provision of 240 MVAR switchable line reactor in each circuit at Fatehgarh II end of Fatehgarh II –Bhadla II 765 kV D/c line and Fatehgarh-II – Bhadla 765 kV D/C line.
- 4.3 CEA further stated that in the 3rd NRSCT, provision of 240 MVAR, 765 kV bus reactor with GIS bay was agreed as a part of the transmission scheme “Construction of Ajmer (PG) –Phagi 765 kV D/C line along with associated bays for Rajasthan SEZ”. It was also agreed that the spare 1x80 MVAR reactor of the existing 240 MVAR bus reactor at Phagi would also be used for proposed 240 MVAR bus reactor under ISTS. Subsequently, RVPN had intimated that no spare bus reactor with 240 MVAR bus reactor was available at Phagi (RVPN) S/s. therefore, it was proposed to include the 1x80 MVAR (single phase) spare unit along with 240 MVAR bus reactor at Phagi under ISTS.
- 4.4 After deliberations, members agreed for the following modifications in the already agreed transmission scheme for evacuation of 8.9 GW RE power from SEZ in Rajasthan.

S.No	Name of the scheme	Scope agreed in the 3 rd NRSCT	Modified scope agreed in the 4 th NRSCT
1.	Transmission system associated with LTA applications from Rajasthan SEZ Part-A(RTM)	<p>-----</p> <p>2. LILO of Fatehgarh (TBCB) – Bhadla (PG) D/c (765kV line op. at 400kV) line at Fatehgarh-2 so as to establish Fatehgarh (TBCB) – Fatehgarh -II 400kV D/c line (765kV line op. at 400kV) and Fatehgarh -II- Bhadla 400kV D/c line (765kV line op. at 400kV)*</p> <p>Charging of Fatehgarh-II – Bhadla section at 765kV level</p> <p>3. 2 no of 765kV bays at Bhadla for charging of Fatehgarh-II – Bhadla section at 765kV level</p> <p>-----</p>	<p>-----</p> <p>2. LILO of Fatehgarh (TBCB) – Bhadla (PG) D/c (765kV line op. at 400kV) line at Fatehgarh-2 so as to establish Fatehgarh (TBCB) – Fatehgarh -II 400kV D/c line (765kV line op. at 400kV) and Fatehgarh -II- Bhadla 400kV D/c line (765kV line op. at 400kV)*</p> <p>Charging of Fatehgarh-II – Bhadla section at 765kV level</p> <p>1X240 MVAR switchable line reactor in each circuit at Fatehgarh-II end of the Fatehgarh-II- Bhadla 765 kV D/C line</p> <p>3. 2 no of 765kV bays at Bhadla for charging of Fatehgarh-II – Bhadla section at 765kV level</p> <p>-----</p>

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2.	Transmission system associated with LTA applications from Rajasthan SEZ Part-B	<p>1. Fatehgarh-II – Bhadla -II 765kV D/c line</p> <p>2. 2 no of 765kV bays at both Fatehgarh-II & Bhadla -2 for Fatehgarh-II –Bhadla-II 765kV D/c line</p>	<p>1.Fatehgarh-II – Bhadla -II 765kV D/c line alongwith 1x240 MVAR switchable line reactor in each ckt at Fatehgarh-II end.</p> <p>2. 2 no of 765kV bays at both Fatehgarh-II & Bhadla -2 for Fatehgarh-II –Bhadla-II 765kV D/c line</p>
3.	Construction of Ajmer (PG)-Phagi 765 kV D/c line along with associated bays for Rajasthan SEZ	<p>1.Ajmer (PG)– Phagi 765kV D/c line 110km</p> <p>2.765kV bays at Ajmer(PG) and Phagi for Ajmer (PG)– Phagi 765kV D/c line</p> <p>3.1X240MVA, 765 kV Bus Reactor with GIS bay at Phagi 765/400 kV S/stn</p>	<p>1.Ajmer (PG)– Phagi 765kV D/c line</p> <p>2.765kV line bays (AIS) - 3 (2 bays at Ajmer (PG) S/stn and 1 bay at Phagi (RVPN) S/stn</p> <p>3. 1 complete GIS DIA 765kV (2 main breakers and 1 tie breaker at Phagi (RVPN) S/stn</p> <p>4. 765kV reactor bay (GIS) -1 (2nd main bay of new DIA being created for termination of 765kV D/c line from Ajmer)</p> <p>5.1X240MVA, 765 kV Bus Reactor (including 1X80 MVAR spare unit) with GIS bay at Phagi 765/400 kV S/stn</p>

5.0 HPPTCL's proposal for transmission elements to be included in GEC-II.

5.1 CEA stated that H.P. Power Transmission Corporation Limited (HPPTCL) vide its letter HPPTCL/Planning/GEC-II/2017-18-19820-21 dated 15.03.2018 has submitted the DPR for following intra-state transmission elements for evacuation of power from small hydroelectric plants in Himachal Pradesh to be included under GEC-II:

S. No.	Name of Transmission Project	Estimated Cost (Rs in Crore)
1	Construction of 220/66 kV, 80/100 MVA substation at Mindhal in Chenab basin in Distt. Lahaul & Spiti.	91.5
2	Construction of 400 kV D/c transmission line (initially charged at 220 kV) from 220/66 kV, 80/100 MVA substation at Mindhal to 400/220 kV GIS pooling station at Mazra in Distt. Chamba.	531.81

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3	Construction of 132/33 kV, 31.5 MVA GIS substation upstream of Malana-II HEP in Distt. Kullu along with LILO of one circuit of 132 kV Barsaini – Charor D/c transmission line.	75.28
4	Construction of 132 kV D/c transmission line from Chanju-I HEP to 220/132 kV substation at Mazra in Distt. Chamba.	36.98
5	Construction of 400/220 kV, 2x315 MVA GIS Pooling Station at Mazra along with LILO of 400 kV Chamera – I to Chamera – II S/c line in Distt. Chamba.	301.92
	Total	1037.49

5.2 CEA further stated that CEA vide its letter no. CEA-PS-11-21(17)/2/2018-PSPA-I Division dated 30.11.2018 has accorded concurrence to the proposal submitted by HPPTCL.

5.3 POSOCO pointed out that the adequacy of transmission system beyond Chamera Pooling point needs to be ascertained in view of the upcoming generations viz Kuteher, Bajoli Holi, Bara -Bhangal as well as the small HEPs in Himachal Pradesh which would be evacuated through Chamera Pooling Station.

5.4 HPPTCL clarified that there is no certainty about Bara -Bhangal HEP, however there are small HEPs which are coming at Karaian S/s and Lahal S/s. The kuteher injection which was initially planned 220 kV level would now be injecting power at 400 kV level. HPPTCL informed that Lahal pooling station is expected to be completed by Dec'19.

5.5 The intra-state transmission elements (given at item no 5.1 above) for evacuation of power from small hydroelectric plants in Himachal Pradesh to be included under GEC-II was noted by the members of NRSCT.

5.6 It was also agreed that adequacy of ISTS network beyond Chamera pool would be studied by CEA, CTU and HPPTCL. Any transmission system strengthening required would be put as an agenda in the NRSCT meeting.

6.0 Intra-State transmission works of HPPTCL posed for funding from Multilateral Development Banks:

6.1 CEA stated that HPPTCL vide its letter no HPPTCL/CEA/Vol-IV/2019-2533 dated 11.06.2019 has submitted the proposal related to following intra –state transmission works posed for funding from Multilateral Development Bank:

S.No.	Transmission Element	Estimated Cost (Rs in Crores)	Remarks
1	LILO of 132kV Giri-Kulhal transmission line at 132/33kV Paonta(Gondpur) sub-station	16.15	Required to provide reliable supply to Paonta area.
2	132/33kV, 2x20 MVA new sub-station in Rajgarh area at Charna by LILO of 132 kV Giri-Gaura S/c transmission line	65.78	Required to improve voltage profile and provide reliable supply to Rajgarh area.
3	Up gradation of existing 33/11kV sub-station Bahri (Dharampur) to	36.97	Required to provide reliable supply to

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	132/33kV, 2x16/20 MVA by LILO of 132kV Bassi-Hamirpur transmission line		Dharampur area.
4	<ul style="list-style-type: none"> 220/132kV, 2x100 MVA sub-station at Ochaghat (Solan) alongwith LILO of 132kV Solan-Gaura line at Ochaghat. Construction of 132 kV S/c transmission line from proposed 220/132 kV Ochaghat Substation to 132/33 kV Solan substation (using 4 km portion of dismantled 132 kV S/c Solan- Giri transmission line) 	113.94	Required to enhance reliability of power supply to Solan and Giri area.
5	<ul style="list-style-type: none"> Dismantling of 60 km portion of existing Giri-Solan 132 kV S/c line on S/c towers (64 km). Construction of 220 kV D/c transmission line from 220/132kV Ochaghat Substation to 400/220kV Arandwala (Kala Amb) substation (PGCIL)[34 km on D/c towers and 14 km on M/c towers]* 220 kV D/c Line from 220/132 kV Giri substation to 400/220kV Arandwala (Kala Amb) substation (PGCIL)[30 km on D/c towers and 14 km on M/c towers]*. <p>* Using RoW of dismantled portion of Giri-Solan 132 kV S/c line</p>	214.64	Required to enhance reliability of power supply to Solan and Giri area.
6	132/33kV, 2X31.5 MVA sub-station in Dharamshala area & 132kV D/c transmission line from proposed substation to 220/132 kV Patti (Dehan) substation	88.82	Required to meet the increased load demand in Dharmashala area which has been identified as a smart city.
	Total	536.30	

6.2 CEA further stated that the proposal submitted by HPPTCL has been examined by CEA and found to be technically in order except the transmission element mentioned at S. No. 1 i.e. LILO of Giri-Kulhal 132 kV transmission line at 132/33kV Paonta(Gondpur) sub-station, which is an inter-state transmission line between Uttarakhand and Himachal Pradesh, therefore, needs the approval of NRSCT as Giri-Kulhal 132 kV line is an ISTS line.

6.3 HPPTCL stated that at present, Paonta substation is connected to Giri substation by a single circuit line. This LILO would form 2nd circuit between Poanta and Giri substation which would improve the reliability of Poanta substation. Another option to improve the reliability of Paonta substation is to lay a direct line from Giri to Paonta but that is not feasible due to RoW issues.

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- 6.4 PTCUL stated that they have some apprehension regarding drawl of excess power by HPPTCL from Kulhal substation.
- 6.5 HPPTCL stated that they were drawing power from Giri-Kulhal line till 2012 but after that, there is no drawl of power. However, in order to take care of PTCUL's apprehension regarding drawl of excess power, HPPTCL may implement SPS.
- 6.6 After deliberations, the Intra-State transmission works of HPPTCL including LILO of Giri-Kulhal 132 kV transmission line at 132/33kV Paonta(Gondpur) sub-station (mentioned at point no 6.1 above) were agreed by the members of NRSCT. It was suggested that HPTCL may put SPS to limit the flow through the line to PTCUL. Issues regarding restrictions on quantum of power flow on Giri-Kulhal 132 kV transmission line was agreed to be sorted out mutually between HPPTCL and PTCUL.
- 6.7 CTU informed that construction of 400/220kV Kala Amb S/s including 6 no. 220kV bays was completed under ISTS as TBCB project. 2 no. of 220kV bays are identified for Kala Amb(TBCB) – Kala Amb(STU) 220 kV D/c line. Now, HPPTCL is proposing termination of Kala Amb – Ochaghat 220kV D/c and Kala Amb – Giri 220 kV D/c at Kala Amb S/s utilizing already constructed 4 no. 220kV bays. CTU requested to HPPTCL to expedite the completion of 220kV transmission lines. HPPTCL informed that Kala Amb – Ochaghat 220kV D/c and Kala Amb – Giri 220 kV D/c are expected to be completed by December, 2022.
- 7.0 Construction of 2 nos. of 400 kV bays under ISTS at 765/400 kV PGCIL substation, Varanasi:**
- 7.1 CEA stated that in the 38th meeting of Standing Committee on Power System Planning for Northern Region, Jaunpur-Varanasi (PGCIL) 400 kV D/c line and 400 kV bays at Varanasi (PGCIL) were approved. UPPTCL vide its letter no. 57/Dir(Comm & plg)/UPPTCL/2019/TWC Queries dated 26.06.2019 has informed that 400 kV Jaunpur substation(UPPTCL) is under construction and shall be completed by January 2021 and construction of Jaunpur-Varanasi (PGCIL) 400 kV D/c line will be completed by November 2020. In view of above, UPPTCL has requested to construct 02 nos 400 kV bays(GIS) at Varanasi (PGCIL) under ISTS scheme.
- 7.2 UPPTCL clarified that the bays would be required by January 2021.
- 7.3 After deliberations, members agreed for the implementation of the 2 no of 400 kV bays(GIS) at 765/400 kV Varanasi (PGCIL-GIS) substation for Jaunpur-Varanasi (PGCIL) 400 kV D/c line under ISTS with the implementation schedule of January 2021.
- 8.0 Up-gradation and Strengthening of Delhi transmission system Phase-I**
- 8.1 CEA stated that in the 3rd meeting of NRSCT, DTL has proposed for reconductoring of following 220kV transmission lines from zebra conductor to HTLS:
- i. Bawana-Rohini 220 KV line - D/C line
 - ii. Bawana-Shalimarbagh 220 KV line – D/C line
 - iii. Mandaula-Gopalpur 220 KV line – D/C line
 - iv. Mandaula to Wazirabad - 2 X D/C line

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- v. BTPS to Sarita Vihar - D/C line
- vi. Maharani Bagh to Lodhi Road – D/C line

After discussions in 3rd NRSCT, the proposal of re-conductoring of the following 2 nos. of 220kV lines of DTL with HTLS conductor was agreed:

- a. 220 kV BTPS-Sarita Vihar ckt-I & II
- b. 220 kV Maharani Bagh - Lodhi Road, ckt-I & II

Regarding remaining 4 nos. of transmission lines, it was opined that in view of implementation of 400/220 kV Gopalpur substation and Shalimar S/s as intra—state works, the loading on these lines will reduce. Therefore, it was agreed that CEA and DTL may be deliberate the proposal of reconductoring of following 220kV transmission lines of DTL:

- a. Bawana-Rohini 220 kV D/C line
- b. Bawana-Shalimarbagh 220 kV D/C line
- c. Mandaula-Gopalpur 220 kV D/C line
- d. Mandaula to Wazirabad 2 x D/C line

- 8.2 Subsequently, a meeting was held in CEA on 29.5.2019, wherein, DTL informed that works for Gopalpur 400 KV sub-station are presently under tendering process, and the substation is likely to be commissioned by 2021-22. DTL also stated that there is no proposal for establishment of 400 kV Shalimarbagh S/S. Therefore, immediate solution to meet with the summer peak demand was re-conducting of these lines, as the same could be completed within few months time and would provide the necessary relief to the system near Gopalpur and Wazirabad areas. DTL added that the Reconductoring of the lines from Rohini and Shalimarbagh to Bawana would provide necessary relief to Shalimarbagh area.

Considering the above facts, the proposal for re-conducting of transmission lines with HTLS conductor as proposed by DTL was agreed in principle subject to ratification in the next meeting of NRSCT.

- 8.3 Members concurred the in-principle approval for the reconductoring of following 220kV transmission lines of DTL:
- a. Bawana-Rohini 220 kV D/C line
 - b. Bawana-Shalimarbagh 220 kV D/C line
 - c. Mandaula-Gopalpur 220 kV D/C line
 - d. Mandaula to Wazirabad 2 x D/C line

9.0 **Additional 1x500 MVA 400/220kV Transformer at Amritsar Substation, Balachak;**

- 9.1 CEA stated that the issue of additional 1x500 MVA, 400/220kV (4th) transformer at Balachak was deliberated in 1st meeting of NRSCT held on 11.9.2018, wherein CTU had suggested that instead of augmentation of transformer capacity at 400/220kV Balachak S/s, PSTCL may shift the load to Makhu 400/220kV S/s after completion of its augmentation works at Makhu and PSTCL agreed for the same.

Subsequently, PSTCL vide their letter no 652/P-I/144 dated 14.11.18 has informed that they have carried out the studies with shifting load of Balachak at Makhu as well as additional 220kV links at 400kV Makhu S/s. However, no major change in the loadings

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of the transformers have been observed at Balachak. Therefore, PSTCL has proposed additional 1x500MVA, 400/220kV ICT at 400kV Amritsar S/S, Balachak s of POWERGRID under ISTS to meet n-1 contingency.

The issue was again deliberated in 3rd meeting of NRSCT held on 24.5.2019, wherein, POSOCO informed that existing transformation capacity of 1130(2x315+1x500) MVA at Balachak does not meet (n-1) contingency criterion. In the meeting it was decided that a site visit would be carried out by CTU and PSTCL at Balachak 400/220kV substation to explore the space availability for installation of 4th transformer and future bays.

In the 3rd NRSCT meeting, members in principle had agreed for the provision of 1x500 MVA ICT at Balachak 400/220 kV substation to be taken up under ISTS subject to space availability which would be ascertained through site visit. The site visit may be brought to notice of the members in the next NRSCT meeting.

- 9.2 CTU stated that a joint visit was held on 17.7.2019 at Amritsar S/S, Balachak by officials from POWERGRID and PSTCL and following was observed;
- i. Space in the existing switch yard was available only for one no. 400kV line bay adjacent to Malerkotla circuit-II bay in 400/220kV Amritsar S/s. Same could be utilized for installation of 4th ICT, at 400kV Side and the 220kV side of ICT shall be extended up to 220kV Yard in between boundary wall & 400kV line bays equipment. Further, in 220kV Switchyard, bus shall be extended for 4nos. of Bays (1no bay for proposed ICT & 3nos future line bays (only space).
 - ii. Further, it is also observed that existing 400kV AIS switchyard extension may be done for 2nos of future dia. (which can accommodate 2nos 400kV future line bays+ 1no future ICT bay-1no future Reactor bay). However, this can only be achieved with demolition of existing C type quarters cum transit camp, open Badminton court, Park, Community center, Road work, 2nos of Bore well along-with pump house.
- 9.3 In view of above, members agreed with the proposal for additional 1x500 MVA, 400/220kV (4th) transformer at Balachak under ISTS.
- 9.4 PSTCL requested that implementation to be carried out by June 2020 in compressed time schedule to ensure its availability in the next paddy season. CTU informed that implementation of transformer in such a short time period may not be feasible as the same has to be agreed in NCT & ECT wherein mode of implementation shall be decided. The timeline for implementation may be decided by NCT/ECT.
- 9.5 Members agreed the same.
- 10.0 **UPPTCL's proposal for intra-State works to strengthen the UP transmission network:**
- 10.1 UPPTCL stated that the following intra-State works to strengthen their intra-state transmission network to improve reliability and to feed future upcoming loads have been planned.
- 10.1.1 **Creation of 400/220/132 kV Mohanlalganj(Lucknow) GIS substation :-**
UPPTCL stated UPPTCL is facing following issues in and around Lucknow area:-
- a) High loading of Sarojnagar 400 kV, 2x500 + 3x200 MVA substation.

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- b) High loading of 220 kV downstream lines namely CG City – Raibarely PG, Sarojninagar(400) – Hardoi Road, Sarojninagar(400) – Gomtinagar(220) etc.
- c) Radial status of 220 kV Barabanki (presently fed from Sohawal PG).
- d) Fast increasing load in Lucknow near Sultanpur Road and Mohanlalganj area.
- e) Construction of 400/220/132 kV Sultanpur Road substation with LILO of Sarojninagar(400) – Sultanpur (400) 400 kV S/C line (approved in 26th SCM) through PPP mode is under litigation with UPPTCL and is quite uncertain.

To address the above mentioned issues, UPPTCL proposed 400/220/132 kV Mohanlalganj (Lucknow) GIS substation with connectivity as mentioned below :-

- i) Creation of 400/220/132 kV substation Mohanlalganj, Lucknow (2x500, 2x200 MVA)
- ii) LILO of 400 kV S/C line Sarojninagar (Lucknow) – Unnao (765) (original length of line 39 km.) at Mohanlalganj (400) – 37 km.
- iii) LILO of 400 kV S/C line Lucknow (PGCIL)400 – Sultanpur(400) UPPTCL line (original length of line 164 km.) at Mohanlalganj (400) – 6 km.
- iv) 220 kV D/C line Mohanlalganj (400) – Sultanpur Road (Awas Vikas) (220/33 kV 5x60 MVA)– 15 km (on moose conductor).
- v) 220 kV D/C line Mohanlalganj (400) – Bijnor (Lucknow) (220/132/33 kV, 2x160+2x40 MVA) – 20 km (on moose conductor).
- vi) LILO of 220 kV S/C line Chinhath (220) – CG City (220/33) at Mohanlalganj (400) – 31.7 km (on moose conductor).
- vii) LILO of one ckt. of 220 kV D/C line Barabanki (220) – Satrikh Road (220) at Mohanlalganj (400) – 20 km.
- viii) Nearby 132 kV downstream substation.

10.1.2 **Provision of 63 MVAR bus reactor at 400/220/132 kV Jaunpur substation and 2x50 MVAR line reactors on 400 kV Jaunpur - Obra 'B' and Jaunpur – Obra 'C' line :-**

UPPTCL stated that in 38th Standing Committee Meeting of Northern Region held on 30.05.2016, 400/220 kV substation Jaunpur and its connectivity with minor modification in 3rd NRSCT dated 24.05.2019 has been approved.

UPPTCL further stated that provision for bus and line reactors could not be informed to SCM earlier. The reactive compensation planned was as given below :-

- 63 MVAR Bus reactor at 400/220/132 kV Machhlishahar, Jaunpur substation.
- LILO of One ckt of 400 kV D/C line Obra 'B' – Obra 'C' at Machhlishahar, Jaunpur (400) -175 km. with 50 MVAR line reactors on each line at Machhlishahar, Jaunpur (400) end.

10.1.3 **Augmentation of transformation capacity from 2x200 MVA to 3x200 MVA at 400/132 kV Nehtaur, Bijnor (WUPPTCL) Substation :-**

UPPTCL stated that in 26th Standing Committee Meeting of Northern Region held on 13.10.2008, construction of 400/132 kV Nehtaur substation (2x200 MVA) and its connectivity through LILO of 400 kV Kashipur(400) – Rishikesh(400) was approved.

Presently, the load of Bijnor District is mainly being fed through Nehtaur 400 kV substation. Its 132 kV downstream connectivity are Bijnor, Chandpur, Morna, Kirtapur, Nazibabad, Nagina 132 kV substations. Also, more downstream connectivity have been planned at the Nehtaur 400 kV substation. Load is often more than 250

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MVA in peak hours and it will increase further. Thus, the substation existing capacity is N-1 non-compliant. Hence, in view of existing and future load growth, augmentation of transformation capacity from 2x200 MVA to 3x200 MVA at 400/132 kV Nehtaur, Bijnor (WUPPTCL) Substation has been proposed.

10.1.4 Augmentations of 63 MVAR bus reactor with 125 MVAR bus reactor at 400 kV Banda substation:-

UPPTCL stated that in 28th Standing Committee Meeting of Northern Region held on 23.02.2010, construction of 400/220 kV Banda substation and its connectivity i.e. 400kV Banda-Rewa Road D/C Quad line (177 km) and 400 kV Banda-Orai D/C Quad line (108 km) was approved. A bus reactor of 63 MVAR was also installed at Banda S/s. However, it has been observed that even during summer peak load conditions, high voltage persist on the substation and the installed 63 MVAR bus reactor is not sufficient to provide the required reactive compensation as the 400 kV Quad lines remains lightly loaded. Therefore, UPPTCL has proposed augmentation of 63 MVAR bus reactor by 125 MVAR bus reactor at 400 kV Banda substation to provide adequate reactive compensation.

10.1.5 Capacity of 400/220/132 kV Jaunpur Substation :-

UPPTCL stated that transformation capacity of 2x500 MVA at Jaunpur 400/220kV substation was approved in 38th meeting of SCPSPNR. In view of the anticipated loadings and to fulfil N-1 condition UPPTCL proposed to implement 3x315 MVA, instead of 2x500 MVA transformer at 400 kV substation Machhlishahar, Jaunpur. The transformation capacity at 220/132kV would be 2x160 MVA.

10.2 After deliberations, the above proposal of UPPTCL for intra state transmission schemes for strengthening of UP transmission network were agreed by the members of NRSCT.

11.0 Connectivity for Thermal/Hydro Projects, Stage-I/Stage-II for RE Projects and LTA

The details of Connectivity, Stage-I Connectivity, Stage-II Connectivity & LTA granted/agreed for grant to various IPPs in 23rd and 24th LTA/Connectivity meeting of NR held on 28.5.2019 and 26.6.2019 respectively as furnished by CTU are enclosed at Annexure- III.

Members noted the same.

Meeting ended with the thanks to chair.

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Annexure I**List of Participants of meeting of 4th NRSCT held on 25.07.2019**

S.No.	Name (Smt/Shri/Ms)	Designation	Mb. No.	Email
I	CEA			
1	P.S. Mhaske	Chairman		
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VII	HPPC (Haryana)			

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	Discom)			
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Minutes of Meeting held on 03.06.19/04.06.19 among CEA, POWERGRID & PSTCL at Patiala regarding Short circuit level at Moga S/s & Injection of power through Bikaner - Moga 765kV D/c line.

List of participants is enclosed at Annexure-I

In-line with decision taken in 3rd NRSCT meeting held on 24.05.19(MOM awaited) regarding Transmission system for Rajasthan Solar Energy Zone (8.9 GW), a meeting was held on 03.06.19 & 04.06.19 at PSTCL office, Patiala & Chandigarh to further deliberate on high short circuit level at Moga S/s (400kV & 220kV level) and overloading of 220kV level network in Western Punjab due to increased injection of power at 765/400 kV Moga S/s through Bikaner - Moga 765kV D/c line.

Chief Engineer (TS), PSTCL welcomed the participants and requested them to deliberate on the study scenario cases carried out by them regarding injection of power at 765/400kV Moga S/s in Punjab. It was deliberated that in order to resolve issues regarding high short circuit levels of Moga(PG) 400kV bus, a bus split arrangement is required. Based on the feasibility, various alternatives were discussed and the following option was found to be technically suitable:

400kV Bus Section-1

- 400kV Kishenpur D/c feeders
- 400kV Hisar D/c feeders
- 2 nos. 765/400kV transformers
- 1 No. 80 MVAR or 125 MVAR Reactor based on feasibility

400kV Bus Section-2

- 400kV Jalandhar D/c feeders
- 400kV Bhiwani feeder
- 400kV Fatehabad feeder
- 400kV Nakodar feeder
- 400kV Talwandi Sabo/Malkana Feeder
- 4 nos. 400/220kV transformers
- 1 No. 80 MVAR or 125 MVAR Reactor based on feasibility

With the above bus split arrangement, fault level of Bus section-1 & 2 is observed to be reduced to within the limits of 40 kA.

With the bus splitting proposed issue of high short circuit level at Moga is resolved and also the loading problem in Punjab flow is resolved.

With above arrangement there are no ISTS touch points to Punjab through Moga 765/400kV ICT (Bus section-1). However on Bus section-2, one circuit each of



Hisar/Bhiwani and Fatehabad is connected which takes care of some ISTS flows at Moga Bus. The flows have been checked at all ISTS stations and Punjab stations and the same remains N-1 compliant at all levels after adding the proposed system of Punjab which is as under at 2022 peak of 14800 MW.

Additional ICT at Balachak = 500 MVA

Additional ICT each at Makhu, Muktsar and Rajpura = 500 MVA each

Upgradation of ICT at Nakodar from 315 MVA to 500 MVA = 185 MVA

New 400 kV substation at Dhanansu by LILO of Jalandhar – Kurukshetra line – 2 X 315 = 630 MVA

New 400 kV substation at Ropar by LILO of Koldam – Ludhiana line – 2 X 500 MVA = 1000 MVA

PSTCL further stated that additional ICT of 500 MVA each at Dhanansu and Ropar in line with closure of GGSTP Ropar shall be planned to keep them N-1 compliant on closure of GGSTP Ropar. Further, any additional ICT if necessary shall be planned as per the real-time flows.

POWERGRID informed that with given space constraints at 765/400kV Moga substation, they would need to relocate the bays for bus section-1 for which existing buildings shall have to be relocated for space creation. Further, other options for interconnection of feeders of bus section-1 to 400kV main Bus (bus section-2) through GIS bus duct shall also be explored. Based on the suitability & feasibility of above option, above proposed bus split arrangement at 400kV Moga S/s shall be carried out separately as part of system strengthening.

It was in principal agreed that the above splitting of busbar will be done by reengineering as part of ISTS system at Moga and this scheme of splitting the busbar at Moga shall become part of the Bikaner-Moga line scheme as supplementary strengthening scheme and shall remain associated with the transmission scheme of Bikaner-Moga line. Technically both the above schemes are required to be completed in similar time frame. Powergrid informed that Bikaner-Moga line is in advance stage of implementation and considering the same it was agreed in principal that in case of completion of Bikaner-Moga line, before completion of bus splitting the way forward shall be as discussed below:

The implementation of Bikaner-Moga 765 kV D/C line considering the power flow from RE generation in Rajasthan who have been granted LTA (3.38 GW approx.) was deliberated and it was observed that with bus splitting there are no issues of any quantum of flow in this line. However, without bus splitting the quantum of injection into 400 kV system through 765/400 kV ICTs needs to be studied in detail. The preliminary studies reveals that in case of this loading exceeding 2000 MW (threshold) the Punjab system gets overloaded and the operational measures will



have to be taken. Punjab deliberated that before finalizing this issue, the operational measures to be taken needs to be agreed upon as Punjab shall not be liable to any load shedding due to the same. Powergrid deliberated that to finalize the operational measures, they need to consult their seniors and POSOCO and the issue shall be further deliberated during meeting scheduled on 13/14th June already fixed at CEA Delhi.

It was observed that some additional 400kV outlets from Moga 400kV bus section-1 or shifting of some circuits from Moga 400kV bus section-2 to Moga bus section-1 needs to be done. Shifting of some elements like Moga - Nakodar 400kV S/c line from bus section-2 to bus section-1 was studied and found not feasible as it results into overloading of Moga-Nakodar line, loading of ICTs at Moga and also at Nakodar. Further, LILO of Talwandi Sabo- Nakodar 400kV S/c line at Moga was studied but the field reports as gathered by PSTCL revealed that there is no possibility of connecting this LILO due to ROW issues.

It was also observed that with above bus split arrangement, loading levels on 765/400kV transformers at Moga reduces. Accordingly, need of 3rd 1x1500 MVA, 765/400kV transformer was reviewed. It emerged in the studies that with proposed Moga bus split arrangement, 3rd 1x1500 MVA, 765/400kV transformer at Moga may not be required as a part of the present scheme of Transmission system of Rajasthan Solar Energy Zones (8.9 GW).

CEA indicated that keeping in view charging of Kishenpur - Moga 400kV D/c line at 765kV level, future space for at least 2 nos. of 765kV diameters at Moga s/s may be explored by POWERGRID. Further, with charging of Kishenpur - Moga at 765kV level the 400kV bays vacated could be used for taking additional 400kV outlet from Moga bus section-1 and in that time frame implementation of Moga 3rd ICT could be taken up if required. However PSTCL stated that before planning any such link, the Punjab shall be supplied with all the study material with flows and acceptance of Punjab shall be a prerequisite, which was agreed in principal.

Further, as referred in the 3rd NIR SGT meeting, matter regarding agenda from PSTCL for creation of new 400/220kV substation at Ropar & Dhanansu was also discussed. As per the studies, following transmission system was agreed for implementation by PSTCL:

400/220kV Ropar S/s in the premises of existing 220kV Guru Gobind Singh Thermal Power(GGSSTP)

1. Establishment of 2x500 MVA, 400/220kV S/s at Ropar
2. LILO of both circuits of 400kV Koldam-Ludhiana(PG) 400kV D/c line at Ropar
3. 220kV interconnection (2xD/C-twin moose) of Ropar and existing 220kV Ropar bus
4. 1x125 MVAR, 420kV Bus Reactor at Ropar



400/220kV S/s at Dhansanu

1. Establishment of 2x315 MVA, 400/220kVAIS S/s at Dhansanu
2. LILO of one circuit of Jalandhar-Kurukshetra 400kV (direct) line at Dhansanu
3. 1x125 MVAR, 420kV Bus Reactor at Dhanansu.

The entire study and the viewpoint as emerged above was presented to the management of PSTCL and PSPCL on 04.06.19 at PSPCL guest house, Sector-10, Chandigarh and the above viewpoint was agreed upon in principal. The management was of considered opinion that the entire scheme of green corridor and the scheme of transmission system for solar system in Rajasthan should have no financial burden on Punjab as the same is being implemented as per Govt. of India guidelines.


CEA stated that the scheme has been technically agreed in the NRSCT except for provision of 3rd ICT at Moga. Punjab has raised some technical issues. The issues have been deliberated and technical solution has been found in terms of bus splitting. The commercial aspects of the scheme need to be raised at appropriate forum.

Powergrid representative agreed to the above technical deliberations in principal subject to final approval of their management.


PSTCL

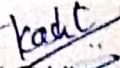

Sh. Sanjeev Gupta, CE/TS

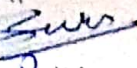

Sh. Paramjeet Singh, SE/Planning

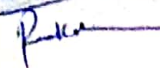

Sh. Kamal Krishan, ASE/Planning


CTU/POWERGRID

Sh. Rajesh Verma, Sr. DGM(CTU-Plg) 

Sh. Kashish Bhambhani, DGM(Smart Grid) 

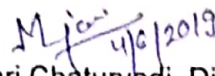
Sh. Sandeep Kumawat, Chief Manager(Smart Grid) 

Sh. V M S Prakash Yerubandi, Manager(CTU-Plg) 

Sh. K Deepak, Dy. Mgr(Engg.-S/s) 

CEA


Sh. Awdhesh Kr. Yadav, Director (PSP&A-I)


Ms. Manjari Chaturvedi, Director (PSP&A-I)

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List of participants

PSTCL

- Sh. Sanjeev Gupta, Chief Engineer (TS)
Sh. Paramjeet Singh, Supdt. Engineer(Planning)
Sh. Kamal Krishan, ASE/Planning

CEA

- Sh. Awdhesh Kr. Yadav, Director(PSP&A-I)
Ms. Manjari Chaturvedi, Director(PSP&A-I)

CTU/POWERGRID

- Sh. Rajesh Verma, Sr. DGM(CTU-Plg)
Sh. Kashish Bhambhani, DGM(Smart Grid) *Yadav*
Sh. Sandeep Kumawat, Chief Manager(Smart Grid)
Sh. V M S Prakash Yerubandi, Manager(CTU-Plg)
Sh. K Deepak, Dy. Mgr(Engg.-S/s) *g*

Additional Participants on 4.6.19:

1. CMD PSTCL
2. CMD, PSPCL
3. Director/Distribution, PSPCL
4. Director/Technical, PSTCL
5. CE/PPR, PSPCL
6. CE/P&M, PSTCL
7. CE/SLDC, PSTCL
8. Dy. CE/PR, PSPCL
9. Dy. CE/SLDC (Op), PSTCL

Annexure III

Applications granted as per 23rd Connectivity and LTA meeting of NR

Details of Stage-I connectivity granted as per 23rd Connectivity and LTA meeting of NR is as follows:

TABLE 1

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed location for Connectivity	Dedicated Tr. System
1.	1200002051	ACME Solar Holdings Limited	Jodhpur, Rajasthan	24/04/2019	300	Generator (Solar)	Bhadla-II PS (New)	ACME Solar Project – Bhadla-II PS (New) 220kV S/c line
2.	1200002052	ACME Solar Holdings Limited	Jodhpur, Rajasthan	24/04/2019	300	Generator (Solar)	Bhadla-II PS (New)	ACME Solar Project – Bhadla-II PS (New) 220kV S/c line
3.	1200002060	SBE Renewables Sixteen Private Limited	Jodhpur, Rajasthan	26/04/2019	300	Generator (Solar)	Bhadla-II PS (New)	SBE Renewables Sixteen Solar Project – Bhadla-II PS (New) 220kV S/c line
4.	1200002072	SBE Renewables Sixteen Private Limited	Jaisalmer, Rajasthan	30/04/2019	300	Generator (Solar)	Fatehgarh-II PS (New)	SBE Renewables Sixteen Solar Project – Fatehgarh-II PS (New) 220kV S/c line
5.	1200002030	Avaada Energy Private Limited	Bikaner, Rajasthan	12/04/2019	600	Generator (Solar)	Bikaner PS	Avaada Energy Power Plant – Bikaner PS 400kV S/c line

Details of Stage-II connectivity granted as per 23rd Connectivity and LTA meeting of NR is as follows:

TABLE 2

Sl. No.	Application No.	Applicant	Location	Date of Application	Quantum of Stage-I Sought/Granted (MW)	Stage-II Connectivity Sought (MW)/date	Quantum won / Land & Auditor Basis	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
1.	1200002038	ReNew Solar Energy (Jharkhand Four) Private Limited	Bikaner, Rajasthan	16/04/2019	500 (1200001621)	250 (31/03/21) revised to 30/04/21	Land & Auditor Certificate Basis	Bikaner PS	<ul style="list-style-type: none">• Pooling of power from ReNew Solar Energy (Jharkhand Four) Private Limited Solar Project(1200002038) at RSPPL Power Plant Switchyard (1200001432)• RSPPL Solar Plant Switchyard - Bikaner PS 400 kV S/c line(suitable to carry 900 MW at nominal voltage)

Applications granted as per 24th Connectivity and LTA meeting of NR

Details of Stage-I connectivity granted as per 24th Connectivity and LTA meeting of NR is as follows:

TABLE 3

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Connectivity Point	Dedicated Tr. System
1.	1200002084	Rayachoty Renewable Private Limited	Bikaner, Rajasthan	09/05/2019	300	Generator (Solar)	Bikaner*	Rayachoty Renewable Pvt. Ltd. (Solar Power Project) – Bikaner 220kV S/C line
2.	1200002083	Gangavathi Renewable Private Limited	Bikaner, Rajasthan	09/05/2019	300	Generator (Solar)	Bikaner*	Gangavathi Renewable Pvt. Ltd. (Solar Power Project) – Bikaner 220kV S/C line

* For effecting the Connectivity at Bikaner S/s, 1x500MVA, 400/220kV ICT at Bikaner S/s is required. 765/400kV Bikaner S/s is under implementation which is in advance stage of commissioning.

Details of Stage-II connectivity granted as per 24th Connectivity and LTA meeting of NR is as follows:

TABLE 3

Sl. No.	Application No.	Applicant	Location	Date of Application	Quantum of Stage-I Sought/Granted (MW)	Stage-II Connectivity Sought (MW)/date	Quantum won / Land & Auditor Basis	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
1.	1200002125	Avaada Energy Private Limited	Bikaner, Rajasthan	29/05/19	600 (1200002030)	350/30 th April'21	MSEDC L (Phase-II)	Bikaner	Avaada Energy Private Limited - Bikaner PS 400 kV S/c line alongwith associated bays at both

Sl. No.	Application No.	Applicant	Location	Date of Application	Quantum of Stage-I Sought/Granted (MW)	Stage-II Connectivity Sought (MW)/date	Quantum won / Land & Auditor Basis	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
									ends : under scope of applicant

Details of LTA granted as per 24th Connectivity and LTA meeting of NR is as follows:

TABLE 4

Sl. No	Application No./Date (Online)	Applicant	Connectivity/ Injection Point	Drawl Point	LTA (MW)/ Start & End Date (Sought)	Transmission system for LTA
1.	1200002109 (15/05/19)	Taranda Hydro Power Private Limited (Rala small Hydro Electric Project)	Wangtoo S/s of HPPTCL	Tata Power Delhi Distribution Limited	<ul style="list-style-type: none"> ➤ 1-12 years (from 01.10.2019 to 30.09.2031) - 12.65 MW ➤ 13-19 years & 9 months (from 01.10.2031 to 29.06.2039) - 9.25 MW 	<ul style="list-style-type: none"> ➤ Existing ISTS system <p>However, in addition to LTA system, following Transmission system of HPPTCL shall also be required for effecting LTA:</p> <p><u>Transmission system for Connectivity:</u></p>

Sl. No	Application No./Date (Online)	Applicant	Connectivity/ Injection Point	Drawl Point	LTA (MW)/ Start & End Date (Sought)	Transmission system for LTA
						Connectivity Point: 400/220/66kV Wangtoo S/s of HPPTCL being established through LILO of Karcham Wangtoo – Abdullapur/Kala Amb 400kV D/c (Quad) line (one circuit via Sorang HEP).
2.	1200002119 (21/05/19)	Chenab Valley Power Projects [P] Limited	Kishtwar Pooling Station (proposed)	NR (Target)	1000 MW (Start : 01/02/24 End : 31/01/64)	As per Annexure-A
3.	1200002058 (29/05/19)	Eden Renewable Cite Private Limited	Fatehgarh-II (new) PS, Rajasthan NR	NR-250+50 (Target)	300 MW (Start : 30/10/20 End : 02/12/45)	As per Annexure-B

Transmission system required for LTA

- Kishtwar - Kishenpur 400kV S/c (Quad) line (by utilizing towers of Kishenpur – Dulhasti 400kV D/c (Quad) line (Single Circuit Strung) - **Under the scope of ISTS**

In addition, following ISTS for Connectivity shall also be required for effecting LTA:

i. Under the scope of Generation Developer

- 400 kV D/c (Quad HTLS Conductor) line from Pakal Dul HEP – Kishtwar (GIS) Pooling station along with associated bays at both ends.
- GIS switchyard equipment and XLPE cables and other associated equipment to be designed for carrying 4000 Amps current.
- 420 kV, 125 MVAR Bus Reactor at Pakal Dul HEP.
- One and half breaker switching scheme for 400 kV Generation switchyard.

ii. Under ISTS – Proposed to be implemented through ISTS Transmission licensee

- Establishment of 400 kV GIS Pooling station at Kishtwar by LILO of one circuit of Kishenpur – Dulhasti 400kV D/c (Quad) line (Single Circuit Strung).
- 420 kV, 125 MVAR Bus Reactor at Kishtwar (GIS) Pooling Station

Transmission system required for LTA at Fatehgarh-II PS

- 1) Establishment of 765/400kV, 3X1500MVA ICT (2nd, 3rd & 4th) pooling station at suitable location near Fatehgarh in Jaisalmer Dist(Fatehgarh-II PS)
- 2) Establishment of 400/220kV, 1X500MVA, ICT (2nd) at Fatehgarh-II Pooling station
- 3) Establishment of 765/400kV, 2x1500MVA pooling station at suitable location near Phalodi/ Bhadla in Jodhpur (Bhadla-II PS)
- 4) Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Khetri
- 5) Charging of Fatehgarh-II PS–Bhadla section at 765kV level
- 6) LILO of both ckts of 765kV Ajmer – Bikaner D/c line at Bhadla-II PS
- 7) Fatehgarh-II PS – Bhadla -II PS 765kV D/c line
- 8) Bhadla-II PS – Bhadla (PG) 400kV D/c Line (Twin HTLS)
- 9) Bikaner(PG) – Khetri S/s 765kV D/c line
- 10)Khetri – Jhatikara 765kV D/c line
- 11)Khetri – Sikar (PG) 400kV D/c line (Twin AL59)
- 12)Augmentation with 1x1000MVA,765/400kV transformer (3rd) at Bhiwani (PG)
- 13)Ajmer (PG)– Phagi 765kV D/c line
- 14)Suitable scheme to limit fault current at Moga (PG) S/s.
- 15)Required Reactive Compensation

In addition, following ISTS for Connectivity, shall also be required for effecting LTA:

- 1) Establishment of 1x1500MVA, 765/400kV, Fatehgarh-II Pooling station at suitable location near Fatehgarh.
 - 2) Establishment of 1x500 MVA, 400/220kV ICT at Fatehgarh-II Pooling station
- LILO of Fatehgarh (TBCB) – Bhadla (PG) 765kV D/c line (to be operated at 400kV) at Fatehgarh-II so as to establish Fatehgarh (TBCB) – Fatehgarh-II 400kV D/c line (765kV line operated at 400 kV) and Fatehgarh-II - Bhadla 765kV D/c line or Fatehgarh-II – Bhadla-II 765 kV D/c line

Transmission Scheme for Rajasthan SEZ PH-II

