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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

-As per list enclosed-

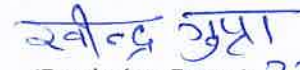
विषय: उत्तरी क्षेत्र की ट्रांसमिशन पर स्थायी समिति की पहली बैठक के विषय में

Sub: 1st Meeting of Northern Region Standing Committee on Transmission-
Minutes of Meeting

Sir/ Madam,

1st Meeting of Northern Region Standing Committee on Transmission was held on 11.9.2018 (Tuesday) at NRPC Katwaria Sarai, New Delhi. Minutes of 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,


(Ravinder Gupta) 23/10/18

Chief Engineer

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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.	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)

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Minutes of 1st Meeting of Northern Region Standing Committee on Transmission held on 11.9.2018 (Tuesday) NRPC Katwaria Sarai, New Delhi

List of participants is enclosed at Annexure-I.

Member (Power System), CEA welcomed the participants to the 1st meeting of Northern Region Standing Committee on Transmission (NRSCT). He requested Chief Engineer, CEA to take up the agenda.

Chief Engineer (PSPA-I), CEA stated that Govt. of India had set a target for establishing 175 GW renewable capacity by 2022 which, inter alia, includes 100 GW Solar, 60 GW Wind generation capacity. Gestation period of RE project is short in comparison to development of its transmission facilities. Therefore, transmission implementation need to be taken up in advance so that it can match with renewable generation addition. The agenda mainly includes the transmission scheme associated with Solar Energy Zones (SEZs) in Rajasthan. He requested Director (PSPA-I), CEA to take up the agenda items for discussions.

1.1 Confirmation of the Minutes of the 40th meeting of the Standing Committee on Power System Planning of Northern Region held on 22 June 2018.

1.2 CEA stated that the minutes of the 40th meeting of the Standing Committee on Power System Planning of Northern Region (SCPSPNR) were issued vide CEA letter no. CEA-PS-11-21(19)/1/2018-PSPA-I/I/1590/2018 dated 30th July, 2018. HVPNL vide their letter CH-8/HSS-152/Vol-20 dated 4.9.2018 had suggested some addition in item no 8 of the minutes i.e. LILO of both circuits of Madanpur –Kunihar 220kV D/c line at 220kV Pinjore (HVPNL) S/s. HVPNL suggestion brings more clarity to the final configuration of the line. Therefore, following may be added as point no 8.4 of the minutes:

8.4 After execution of LILOs by HVPNL and HPSEB/HPPTCL, the nomenclature of 220kV Kunihar –Madanpur line may be read as under:

220kV D/c Madanpur-Sector 32 Panchkula–PGCIL (Panchkula)-Pinjore–Baddi-Kunihar line with Baddi-Pinjore section as the interstate 220 kV D/C line.

1.3 CEA added that no further comments have been received from the constituents and requested the members to confirm the minutes of the 40th meeting of SCPSPNR along with addition of para 8.4 in item 8 of the minutes of the meeting.

1.4 Members confirmed the same.

2.0 Approval of 400 kV transmission lines and reactor of RRVPNL:

2.1 CEA stated that RRVPNL vide their letter no. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/F./D 689 dated 02.08.2018 had requested CEA to grant in-principle approval for the three transmission elements viz. Chabbra-Anta 400 kV S/C line, Chittorgarh–Bhilwara 400 kV D/C line and 1x50 MVAR 400kV reactor at Bhilwara, which are ready for commissioning.

2.2 To discuss the issue, a meeting was held on 6.8.2018 in CEA, wherein, following was agreed:

i) Intra-state transmission elements of RRVPNL were noted and agreed in principle

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as given below:

- a) Chhabra – Anta 400 kV S/C line.
- b) Chittorgarh – Bhilwara 400 kV D/C line.
- c) 1x50 MVAR Bus Reactor at 400 kV Bhilwara S/s.

The same would be formalized / brought to the notice of members of NRSCT.

- ii) RRVPNL to intimate NRSCT all intra state transmission schemes, which involve reconfiguration of ISTS elements, inter connection with ISTS elements and all 400 kV intra state schemes, which are already under implementation and has not been intimated earlier in Standing Committee on Power System Planning.
 - iii) RRVPNL to include new/planned intra state transmission schemes, which involve reconfiguration of ISTS elements, inter-connection with ISTS elements and all 400 kV intra state schemes as agenda of NRSCT for deliberation.
- 2.3 CEA further emphasized that post facto approval of transmission schemes after taking up implementation need to be avoided. States should intimate all intra state transmission schemes in advance to NRSCT for coordinated development of national grid.
 - 2.4 RRVPNL suggested some corrections in para 2 of the minutes of meeting held on 6.8.2018. The corrections suggested by RRVPNL were agreed and the modified minutes of the meeting held on 06.08.2018 is enclosed at Annexure –II.
 - 2.5 NRLDC raised the issue of constraint in power flow being faced due to single ICT at Chhabra TPS and requested the implementation of adequate strengthening in Chhabra-Kalisindh generation complex. RVPNL stated that they are taking up the augmentation of the ICT.
 - 2.6 CEA stated a sub-committee has already been constituted to deliberate on the issue of single ICT in Chhabra-Anta-Kalisindh generation complex. 1st meeting of the sub-committee was held in April 2018. The 2nd meeting would be convened shortly.
 - 2.7 After deliberations, members concurred the in-principle approval granted for the following three intra state elements of RRVPNL:
 - a) Chhabra – Anta 400 kV S/C line.
 - b) Chittorgarh – Bhilwara 400 kV D/C line.
 - c) 1x50 MVAR Bus Reactor at 400 kV Bhilwara S/s.
 - 2.8 CEA stated that in the meeting held on 06.08.2018, RRVPNL has agreed to include new/planned intra state transmission schemes, which involve reconfiguration of ISTS elements, inter-connection with ISTS elements and all 400 kV Intra – State schemes as agenda of NRSCT. Accordingly, RRVPNL has intimated following transmission schemes, which are under implementation:

400 kV schemes:

S. NO.	Transmission scheme	Remarks/ Justification
1	1x125 MVAR, 400 kV Bus Reactor at 400kV GSS Akal by RRVPNL	About 1,985 MW Wind projects had already been commissioned at 400kV Akal GSS and 400 kV Akal GSS is connected to intra state grid as under: a) Akal-Jodhpur 400kV D/C line – 230 km Twin

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		<p>Moose</p> <p>b) Akal-Ramgarh 400kV D/C lines – 100 km Twin Moose</p> <p>c) Akal-Jodhpur-New (U/C) 400kV D/C line – 240 km Twin Moose</p> <p>The interconnecting transmission lines generate MVAR resulting in high voltage during low wind period, hence bus reactor required to control overvoltage.</p>
2	1x50 MVAR, 400 kV line reactor to be charged as bus reactor till commissioning of associated line (associated with Bhadla-Jodhpur 400kV D/C line at Bhadla 400kV GSS) by RRVPNL	There is high Solar injection at Bhadla 400kV GSS from Bhadla Solar Park (1430 MW capacity) and nearby 220/132 kV GSSs namely Kanasar, Khetusar, PS-2, PS-3 etc. During night hours no solar power is available, hence reactor is required to control voltage rise.
3	1x80 MVAR, 400kV Bus Reactor at Chittorgarh 400kV GSS by RRVPNL	The transformer capacity at 400kV GSS is 2x315MVA and peak load (2017-18) of the GSS is 334MVA. 3 nos 400kV lines are being connected at Chittorgarh 400kV GSS. Therefore, 80MVAR Reactor is required to control the voltage
4	2x50 MVAR, 400 kV switchable Line Reactor at Chhabra Thermal Power Plant by RVUNL	The two reactors are a part of 2x250 MW CTPP, phase-II stage-I, which could not be charged till date due dispute with contractors. One reactor would be connected at 400kV CTPP-Hindaun line (Line length-305 km) at bay no. 417 and second reactor will be charged as bus reactor at bay no. 414. The existing 2x50 MVAR bus reactors at CTPP is not sufficient to overcome high voltage problems.
5	Connectivity lines for (1x500+1x315) MVA, 400/220kV Kakani (Jodhpur new)	<p>i) (1x500+1x315) MVA, 400/220kV Power Transformer (Approved in 40th meeting of Standing Committee for Power System Planning of NR).</p> <p>ii) (LILO of circuit-I of 400kV D/C Jodhpur-Merta (Twin Moose) line along with 2 nos 400kV bays at 400kV GSS Kakani. It is to submit that previously the LILO section is charged up to dead end tower outside 400kV GSS Kakani. Now the line is to be charged for commissioning of 400kV Jodhpur-Kakani and 400kV Kakani -Merta section.</p> <p>iii) LILO of circuit-I of 400kV D/C Jodhpur-Rajwest LTPS (Twin Moose) along with 2 nos bays at 400kV GSS Kakani.</p> <p>iv) 400kV D/C Akal-Kakani (Quad Moose) line with 2x50MVAR line reactors at Kakani along with 400kV bays at both ends (Approved in 40th meeting of Standing Committee for Power System Planning of NR).</p> <p>v) 1x80MVAR reactor along with associated 400kV</p>

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		bay at 400kV GSS Kakani.
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220 kV schemes:

Up-coming 220kV GSS and lines, which are under construction and shall be commissioned in due course of time are indicated at Annexure-III.

- 2.9** POSOCO suggested that at Akal 400 kV substation low voltage was also experienced therefore, RVPNL also needs to plan for providing reactive power support in these areas.
- 2.10** CTU pointed out that under ISTS bus reactors of 125 MVAR were normally planned but RVPNL has planned bus reactor of 80/50 MVAR ratings, which would not be effective in controlling high voltage.
- 2.11** CEA stated that the appropriate ratings could have been suggested, if RVPNL had intimated about these schemes at planning stage itself.
- 2.12** After deliberations members agreed and the noted the proposal intimated by RVPNL at item 2.8.

3.0 Connectivity of Railways' Traction Sub Stations (TSSs) with ISTS Network for Ludhiana-Delhi-Sonnagar route:

- 3.1** CEA stated that the issue of providing connectivity to Railways' TSS with ISTS network (Abdullapur S/s and Meerut S/s in NR) for Ludhiana-Delhi-Sonnagar route was discussed in 39th meeting of SCPSNR held on 29-30th May 2017 wherein, it was agreed that Railways would utilize existing two number of 220 kV bays at Abdullapur substation (presently used for 220 kV supply to Jagadhari TSS) to meet their additional traction load requirement. The required technical up gradation of the 220 kV line (presently only two phases has been strung) would be carried out by Railways subject for fulfilment of all the existing agreements with HVPNL.

In the 40th meeting of SCPSNR held on 22.06.2018 Railway had informed that at present two phases of Abdullapur - Jagadhari 220 kV D/C lines were strung and there was some space constraint / safety clearance related issue for stringing of 3rd phase at Abdullapur sub-station. It was decided in the meeting that a joint visit may be done by CEA, HVPNL, Railways and POWERGRID and necessary modifications required at Abdullapur sub-station for providing 2 no. 220 kV bays for Abdullapur - Jagadhari 220 kV D/C line may be done by Railways at their cost.

Accordingly, a joint visit to Abdullapur S/S was carried out on 25.8.2018 by a team consisting of CEA, POWERGRID, Railways and HVPNL. The observation of the team is enclosed at Annexure-IV.

- 3.2** Railways representative made the following observations:

i) Conversion of existing Two Phase Transmission Line to Three Phase (feeding the existing Traction Sub-Station of Indian Railways at Jagadhari Workshop) :

Provision of 3rd phase can be done by providing bottom cross arms on the existing towers. But it was not possible to maintain the requisite minimum Electrical Clearance, as per statutory requirement for 220 kV overhead line at five locations. It requires raising the tower height (with modification in foundation) for 9 (out of 23) towers. *Since the Transmission Line is feeding the Railway Traction Sub-Station (having a single source of supply), it is practically not possible to take frequent and/or prolonged shut down for this line.*

ii) Modification of existing 220 kV, Two phase Bays to Three phase Bays at Abdullapur:

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It requires casting of foundations, erection of equipment for 3rd phase, dismantling and re-erection of Bay Marshalling Kiosks and CB Marshalling Boxes. It also requires modification in the protection scheme. It will require dismantling of all cables pertaining to Bay Marshalling Kiosks and CBs. Bay Marshalling Kiosks consists of all cabling for isolators. It will be difficult to carry out this work. *Since the existing 220kV bays are feeding the Railway Traction Sub-Station (having a single source of supply), it is not practically possible to take frequent and/or prolonged shut down for these bays.*

iii) Progress Status of ongoing works:

The work for new 220 kV, two numbers bays was in progress. All the 06 nos gantry foundations & 01 no lightning mast tower foundation has been completed & towers along with beam have been erected. Out of 94 nos equipment foundation, 86 nos have been completed and only 08 nos are balance. 80 meters cable trench has been constructed. 60% earth mat work is also completed.

In addition, partial construction of new 220kV/ three phase, Double Circuit Line has been carried out. Out of 35 tower foundations, 23 have been cast.

- 3.3** Railway representative stated that the proposed new 220 kV bays were on the extreme end of the Abdullapur sub-station (Towards Yamuna-Nagar) and the ROW of new transmission line was on the outskirts of a village. The existing Railway bays, if released, including ROW of the existing two phase Railway transmission line could be used for a future project.

Railway requested the members to agree for new two nos. of 220 kV bays at Abdullapur 400/220 kV substation for providing connectivity to Railways. The existing 2 no. 220 kV bays, may be surrendered after completion of work of new transmission line. The RoW of the existing 220 kV line to Railways could be used by HVPNL / any other agency to meet their future requirements.

- 3.4** CEA stated that as per the observations made by the team that visited Abdullapur 400/220 kV substation on 25.08.2018 and also as per the information provided by Railways it is seen that two nos. of 220 kV bays at Abdullapur 400/220 kV substation was already under implementation by POWERGRID on deposit work basis for Railways, which has not been agreed by SCPSPNR. In fact SCPSPNR have agreed for providing connectivity to Railways at Abdullapur by utilizing the existing two number of 220 kV bays at Abdullapur substation (presently used for 220 kV supply to Jagadhari TSS). POWERGRID has gone ahead with the implementation of the 220 kV bays without any approval.

CEA further stated that any works in ISTS has to be taken up only after approval of the SCPSP/RSCT.

- 3.5** Implementation of 220 kV line bays at Abdullapur 400/220 kV by POWERGRID without approval of SCPSPNR / NRSCT was taken seriously by the members. Members advised POWERGRID to avoid such instances in future.
- 3.6** HVPNL raised the query about reservation of space for 2 no. 220kV bays to provide connectivity to Rajokheri S/s. POWERGRID clarified that the space for bays had already been reserved at Abdullapur for connectivity to Rajokheri S/s and the same had been shown to the team visited the substation on 25.8.2018.
- 3.7** After further deliberation members agreed to the following:

- i) Two number of new 220kV line bays for providing connectivity to Railways' Traction Sub Stations (TSSs) with ISTS Network for Ludhiana-Delhi-Sonnagar route.

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- ii) Indian Railway would surrender the existing 2 no. 220 kV line bays (with 2 phase) after completion of work of new 2 no of 220kV bays and connectivity line. The existing ROW of 220 kV D/C transmission line (with two phase) could be utilised by HVPNL to meet their future requirements, if any, after approval of NRSCT.

4.0 DTL Agenda for Enhancement of transformation capacity at 400/220kV Maharani Bagh S/Stn.

- 4.1 CEA stated that DTL vide their letter F.DTL/202/Opr(Plg)/DGM(Plg)/2018-19/F-20/72 dated 11.07.2018 had informed that 400/220 kV Maharani Bagh ISTS was presently having the capacity of 1630 MVA (2x315MVA + 2x500MVA) and the loading on the sub-station is above the contingency limit (N-1) for last few years. Peak load met in July 2018 at Maharani Bagh was 1287 MW. Therefore, DTL had proposed augmentation of transformation capacity at Maharani Bagh from 1630 MVA to 2000MVA.
- 4.2 CEA informed that 400/220kV 4x500MVA Tuglakabad S/s is under construction and likely to be completed by October 2018. This S/s would provide feed to South Delhi area and would be sharing the load of Maharani Bagh S/s, thereby reducing the loading at Maharani Bagh S/s. CEA enquired from POWERGRID about the status of Tuaglakabad S/s.
- 4.3 POWERGRID informed that there were some RoW issues related to the incoming lines at Tuglakabad S/s and the same has been resolved. Stringing of only about 5km length was left. The substation is expected to be commissioned by 15th Oct 2018.
- 4.4 As no representative from DTL was present in the meeting, the issue of augmentation of transformation capacity at Maharani Bagh S/s from 1630 MVA to 2000MVA was deferred for deliberation in the next meeting.

5.0 Strengthening of Intra-state and Inter-State Transmission system of Punjab:

- 5.1 CEA stated that PSTCL vide their letter 254/P-I/dated 20.6.2018 had proposed augmentations at following 400/220 kV substations, as a part of Intra-State transmission system of Punjab to meet n-1 contingency criteria:
- i) 1x500 MVA, 400/220kV additional ICT (3rd) at 400kV Muktsar
 - ii) 1x500 MVA, 400/220kV additional ICT (3rd) at 400kV Makhu
 - iii) 1x500 MVA, 400/220kV additional ICT (3rd) at 400kV Dhuri
- 5.2 PSTCL stated that the above augmentations had been planned as per the anticipated loading condition in 13th Plan. He further stated that an additional 1x500MVA, 400/220kV ICT shall be required at 400kV Balachak S/s of POWERGRID under ISTS to meet n-1 contingency.
- 5.3 NRLDC informed that existing loading on the Muktsar, Makhu and Dhuri substations indicate that existing transformation capacities at these sub-stations do not meet 'n-1' contingency criterion. Further, PSTCL needs to plan more 220 kV outlets from these substations as the existing 220 lines from these sub-stations are highly loaded.
- 5.4 CTU suggested stated 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. PSTCL agreed for the same.
- 5.5 Regarding the progress of augmentation works at the above substations, PSTCL informed that civil works for 3rd ICT at Makhu were completed and the transformer is

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expected to be installed by March 2019. For Dhuri S/S the augmentation works would be completed by September 2018.

5.6 After deliberations, members agreed to the augmentation of the transformation capacities at these sub-stations by PSTCL.

6.0 Oscillations observed in the grid due to tripping of one of the evacuation line from 220kV Dhauliganga HEP:

6.1 CEA stated that NRLDC vide their letter no NRLDC\TS-15\1251-1258 dated 30.7.2018 has informed that oscillations have been observed in the grid repeatedly during outage of any one circuit from Dhauliganga HEP (4x70 MW). Most of the time these oscillations were observed, when there was fault on Dhauliganga – Pithoragarh line and entire power was to be evacuated through Dhauliganga (HEP)-Bareilly 220kV S/C line. During these events, entire power plant has tripped and the impact of these oscillations was widespread in the grid and oscillation were also observed on Inter Regional lines from NR. At present, the power from Dhauliganga HEP is being evacuated through:

a. Dhauliganga (HEP)-Bareilly (Twin Moose) 400 kV D/c line (presently charged at 220kV) (235km) with one circuit LILO at Pithoragarh (59 km from Dhauliganga).

6.2 CEA further stated that 400/220kV, 2x315 MVA GIS Baram / Jauljivi sub-station was agreed in 36th meeting of SCPSPNR held on 13.7.2015 with following scope of works:

Phase I: By PTCUL under Uttarakhand Intra-State system

(i) Creation of 220/33kV Jauljivi (PTCUL) substation by LILO of one circuit of Dhauliganga-Pithoragarh (PG) 220 kV line at Jauljivi (PTCUL) 220kV substation.

Phase II: Part by POWERGRID under ISTS as “NRSS XXXVII”

(i) Creation of 400/220kV, 7x105MVA GIS in Jauljivi area under ISTS by LILO of both ckts. of Dhauliganga-Bareilly 400kV D/c (presently charged at 220kV) at 400/220kV Jauljivi (PG) (line from Dhauliganga to Jauljivi shall remain charged at 220kV and from Jauljivi to Bareilly shall be charged at 400kV)

The 400/220 kV Jauljivi substation to have the following provision:

400 kV side

- a. 7*105 MVA Single Phase ICTs along with ICT bays
- b. Line bays - 2 nos.
- c. 2x63MVAr switchable line reactors in Bareilly-Jauljivi 400kV D/C at Jauljivi end for providing voltage control under various operating conditions. These 63MVAr line reactors shall be taken up as single phase units, if required.
- d. Space provision for 2 future bays

220 kV side

- a. 2 nos. of ICT bays
- b. 8 nos. of line bays (Pithoragarh-2, Almora-2, Jauljivi-2 and Dhauliganga-2)
- c. One no. of 220kV sectionaliser

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- d. Shifting of 25 MVAR line reactor already available in 220kV Dhauliganga–Bareilly line at Dhauliganga end to 400/220kV Jauljivi S/s as a bus reactor at 220kV
- e. Disconnection of 220 kV LILO of Dhauliganga-Bareilly at Pithoragarh and connection of Pithoragarh line to Jauljivi 400/220 kV S/s at 220kV.
- (ii) Diversion of Dhauliganga-Bareilly 400kV D/C line (operated at 220kV) at Bareilly end from Bareilly(UP) to Bareilly(PG) along with 2 nos. of 400 kV bays at Bareilly

Phase II: By PTCUL under Uttarakhand intra State system

- (iii) 220kV GIS substation at Almora and associated 220kV Almora–Jauljivi (PG) D/C line
- (iv) Existing LILO line of Dhauliganga-Pithoragarh (PG) at 220/33kV Jauljivi (PTCUL) Substation would be disconnected and 220/33kV Jauljivi (PTCUL) would be connected to Jauljivi (ISTS) 400/220kV substation through 220kV D/C line.

CEA enquired about the present status of implementation of above transmission works from POWERGRID and PTCUL.

- 6.3 POWERGRID stated that levelling and civil works had been completed for the 400/220 kV Jauljivi substation. The substation would be completed by December 2019.
- 6.4 PTCUL stated that Jauljivi (PTCUL) 220/33kV substation along with LILO of one circuit of 220kV Dhauliganga-Pithoragarh (PG) line at 220kV Jauljivi (PTCUL) substation would likely to be completed by March-April 2019. The LILO length was about 10km. PTCUL also informed that they would be using zebra conductor for the LILO section.
- 6.5 CEA stated that Dhauliganga-Bareilly line has already been implemented with Twin Moose conductor and LILO of this line with zebra conductor would reduce its capacity. Dhauliganga HEP has an installed capacity of 280 (4x70) MW and with 10% overload provision, loading on Dhauliganga HEP- Jauljivi (PTCUL) – Jauljivi (PG) 220 kV line would be of the order of 300 MW in case of outage of Dhauliganga HEP – Bareilly 220 kV line. For a zebra conductor loading of 300 MW is higher than its thermal rating therefore, the evacuation system for Dhauliganga HEP would not be ‘n-1’ compliant with establishment of the LILO at Jauljivi (PTCUL).
- 6.6 CEA further stated that as per the planned system, 220/33kV Jauljivi (PTCUL) substation would be connected to Jauljivi (ISTS) 400/220kV substation through 220kV D/C line therefore, instead of going for LILO as an interim arrangement PTCUL may implement direct line from Jauljivi (PTCUL) to Jauljivi PG), as the time gap in implementation between two substation is of 8-9 months only as per the status indicated by POWERGRID and PTCUL.
- 6.7 Regarding the downstream system from 400/220 kV Jauljivi (PG) substation, PTCUL informed that the DPR for Almora substation had been completed. No updates were furnished by PTCUL for Almora-Jauljivi 220kV D/c line. PTCUL was requested to furnish the implementation schedule at the earliest.
- 6.8 NRLDC stated that SPS may be implemented to control the oscillation and member opined that the same may be put up in OCC meetings of NRPC.
- 6.9 After deliberations, following was agreed:

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- i) The implementation of Jauljivi 400/220kV S/s along with its 220 kV interconnection with Pithoragarh and 400 kV charging of Jauljivi – Bareilly line may be expedited by POWERGRID.
- ii) PTCUL to expedite implementation of 220 kV outlets in matching time frame of implementation of Jauljivi (PG) 400/220kV substation. PTCUL to intimate the implementation schedules.
- iii) PTCUL to explore the option of creating 220kV Jauljivi (PTCUL)-Jauljivi (PG) D/c line instead of LILO of one circuit of 220kV Dhauliganga-Pithoragarh (PG) line at 220kV Jauljivi (PTCUL). The routing of the LILO section may be taken up in such a way that on commissioning of Jauljivi 400/220kV S/s, LILO of one circuit of Dhauliganga-Pithoragarh (PG) 220kV line at 220kV Jauljivi (PTCUL) may be disconnected and 220/33kV Jauljivi (PTCUL) may be connected to Jauljivi (ISTS) 400/220kV substation through 220kV D/C line.
- iv) SPS at Dhauliganga HEP to control the oscillations may be deliberated and finalized in NRPC.

Agenda items received from UPPTCL:

7.0 UPPTCL's proposal regarding augmentation of transformation capacity at 400/220kV Sarojininagar, Lucknow and Moradabad sub-stations:

7.1 CEA stated that UPPTCL vide letter dated 03.08.2018 and 29.8.2018 had informed that they had under taken augmentation of transformation capacity at following substations, in order to meet the growing load demand and for n-1 contingency criterion compliance:

- i) 400/220kV Sarojininagar, Lucknow S/s from 2x315 MVA to 2x500MVA
- ii) 400/220kV Moradabad S/s from 2x500 MVA to 2x500+1x240 MVA
- iii) 400/220kV Muzaffarnagar S/s from 3x315 MVA to 3x315+1x500 MVA

7.2 NRLDC stated that the augmentation at above mentioned substations has become necessary in order to meet 'n-1' contingency criterion.

7.3 Members agreed for augmentation of above sub-stations by UPPTCL.

8.0 UPPTCL proposal regarding modification in connectivity lines of 400kV Basti (UPPTCL):

8.1 CEA stated that UPPTCL vide their letter dated 29.8.2018 had submitted that in 40th meeting of SCSPNR, construction of 400/220/132 kV 2x500, 2x220MVA Basti substation through LILO of both ckts of Gorakhpur PG – Lucknow PG 400 kV DC (Quad) existing PGCIL line at Basti (400) substation was approved and UPPTCL had informed that Gorakhpur-Lucknow (PG) 400 kV line is a Twin Moose line. The LILO line to Basti S/S would also be constructed with Twin Moose conductor. The changes proposed by UPPTCL vis-à-vis agreed transmission scheme are tabulated below:-

Sl. No.	Agreed Transmission System	Modification suggested by UPPTCL
i.	Construction of 400/220/132kV, 2x500, 2x200 MVA GIS substation at Basti along with 1x125 MVAR bus reactor.	No change
ii.	LILO of both ckts of Gorakhpur (PG)	LILO of two ckts (ckt no. 3 rd & 4 th) of

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	– Lucknow (PG) 400 kV D/C (Quad) existing PGCIL line at Basti (400) substation – 25km. (LILO point distance from Lucknow PG – 200km and from Gorakhpur PG 60km)	Gorakhpur (PG)-Lucknow (PG) 400kV D/C (twin) existing PGCIL line at Basti (400) substation – 28 & 30 km (<i>LILO point apprx. distance from Lucknow (PG)-200km. and from Gorakhpur (PG) – 60km.</i>)
iii.	50 MVAR line reactors in both circuit of Lucknow (PG)-Basti 400 kV D/C Quad line at Basti end.	50 MVAR line reactors in both circuit of Lucknow (PG)-Basti (400) 400kV D/C Twin Moose line at Basti end.
iv.	LILO of Gonda (220)-Basti (220) (UPPTCL) 220kV S/C line at Basti (400) substation-20km.	No Change
v.	Basti (400)-Bansi (220) 220kV D/C line-50km.	Basti (400)–Dulhipar/Khalilabad (Sant Kabirnagar) (220) 220 kV D/C line - 60 km. (<i>Basti 400-Bansi 220kV line is not feasible due to severe ROW</i>)
vi.	LILO OF Gorakhpur PG (400)-Bansi (220) 220 kV S/C existing line at Khalilabad -20km	LILO of Gorakhpur PG (400)-Bansi 220kV S/C existing line at Dulhipar/Khalilabad (Sant Kabirnagar) (220) - 15 km <i>Khalilabad S/S named as Dulhipar</i>
vii.	Khalilabad–Pharenda (Anandnagar) 220kV DC line – 40km	Dulhipar/Khalilabad (220)–Pharenda (Anandnagar) 220kV D/C (Moose) line – 58km.
viii	<ul style="list-style-type: none"> • Basti (400)-Haraiya 132kV D/C line • Basti (400)-Nathnagar 132kV D/C line • Basti (400)-Mehdawal 132kV D/C line 	<ul style="list-style-type: none"> • Basti (400)-Kalwari (Basti) 132kV D/C line - 45km • Basti (400)-Rudauli (Basti) 132kV D/C line - 35km • LILO of Harraiya (Basti)–Darshannagar (Faizabad) existing 132kV S/C line at Basti (400) - 15km
ix.		Creation of 220/132/33kV, 2x160, 2x40 MVA) Dulhipar/Khalilabad (Sant Kabirnagar)

8.2 Members agreed to the modifications proposed by UPPTCL.

9.0 **Downstream 220 kV network from Shahjahanpur 400/220kV PGCIL Substation :-**

9.1.1 **Construction of 220/132/33kV, 2x160, 2x40MVA Mallawan, Sandila (Hardoi) substation.**

CEA stated that UPPTCL vide their letter dated 29.8.2018 had submitted that Shahjahanpur PG (400) was connected to existing Hardoi 220kV substation through 220 kV S/C line. A new 220/132/33 kV substation Mallawan (Hardoi) had been planned by UPPTCL, as a part of 13th plan already noted by SCPSPNR. The load center connectivity proposed and downstream network from the POWERGRID S/S at Shahjahanpur (PG) would change as under:-

- i. Creation of 220/132/33 kV 2x160, 2x40MVA substation at Mallawan (Hardoi).

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- ii. Jehta (Kursi road) (Lucknow) (400kV)–Mallawan (Hardoi) 220kV D/C (Moose) line – 85km.
(Jehta (Kursi road) (Lucknow) (400kV) substation is under construction and already approved by SCSPNR).
- iii. Mallawan (Hardoi)-Hardoi (220kV) 220kV D/C line - 55km. (only one line termination at Hardoi 220)
- iv. Since space for 220kV bays are not available at 220kV substation Hardoi, Shahjahanpur (PG)–Hardoi 220kV S/C line from Hardoi end will be disconnected and will be terminated at Mallawan (Hardoi) 220 Substation thus system after reorientation will be Shahjahanpur (PG)–Mallawan 220kV S/C line (110km) and Mallawan (Hardoi)-Hardoi (220kV) 220kV S/C line.

Members noted the same.

9.1.2 Construction of 220/132/33kV, 2x160, 2x40MVA Lakhimpur (Gola) substation.

UPPTCL informed that Shahjahanpur (PG) 400kV Substation has 6 no. 220kV line bays, while 1 no. line bay had already been utilized for Shahjahanpur (PG) – Hardoi / Mallawan (Hardoi) 220kV S/C line. 2 no. line bays would be utilized for 220 kV D/C line to Azizpur (Shahjahanpur) substation and 2 no. line bays would be used for 220kV D/C line to Lakhimpur Substation. The scope of works at details for Lakhimpur (Gola):

- i) Creation of 220/132/33 kV 2x160, 2x40MVA substation at Lakhimpur (Gola).
- ii) Shahjahanpur (PG) (400 kV)–Lakhimpur (Gola) 220kV D/C (Moose) line – 55km.
- iii) LILO of Shahjahanpur (UPPTCL)–Nighasan (Lakhimpur) 220kV existing UPPTCL line at 220kV substation Lakhimpur (Gola) - 15km. (LILO point from Shahjahanpur (UPPTCL) – 55km. and from Nighasan (220 kV) – 102km)
- iv) Lakhimpur (Gola) (220 kV)–Palia (Lakhimpur) 132kV D/C (Zebra) Line – 60km.
- v) Lakhimpur (Gola) (220 kV)–Puwayan (Shahjahanpur) 132kV D/C (Zebra) Line – 40km.
- vi) LILO of Bandaa (Shahjahanpur) – Gola (Lakhimpur) 132kV existing S/C line at Lakhimpur (Gola) (220) – 13Km.

Members noted the above proposal of UPPTCL.

Agenda items received from CTU:

10.0 Additional 1x500 MVA, 400/220kV ICT at Bhadla Pooling Station

- 10.1 CTU stated that for evacuation of 1500MW of power from solar parks near Bhadla, 3 nos. of 500 MVA ICTs are being implemented at Bhadla Pooling Station. Further, in addition to this, 4th ICT of 500 MVA was agreed in 39th meeting of SCSPNR held on 29-30th May, 2017. Subsequently, 830MW LTA (details given in Table-3) has been agreed for grant in 14th Connectivity / LTA meeting of NR held on 17/08/2018. Thus total LTA from Bhadla including evacuation of power from solar parks along with these applications shall become 2330 MW (Earlier-1500 MW + Present 830 MW) against already planned transformation capacity of 2000 MW.

Further, as per Transmission Planning Criteria, the “N-1” criteria may not be applied to the immediate connectivity of wind/solar farms with the ISTS/Intra-STG i.e.

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the line connecting the farm to the grid and the step-up transformers at the grid station.

Therefore, to evacuate power from solar parks / generators, for which LTA has been received, additional (5th) ICT of 500MVA was required at Bhadla. Accordingly, CTU proposed additional (5th) ICT of 1x500MVA at Bhadla Pooling Station.

10.2 Members agreed for the additional (5th) ICT of 1x500MVA at Bhadla pooling station.

11.0 50 MVAr line reactor (New) for Allahabad-Singrauli 400kV line at Allahabad.

11.1 CTU stated that considering the requirement of transmission system in Rihand / Anpara / Obra complex as well as for transfer of power beyond Allahabad, Singrauli-Allahabad 400kV S/c line was discussed and agreed in 31st meeting of SCPSNR held on 02/01/2013 under NRSS-XXX. The scheme has also been agreed in the 28th Meeting of Northern Regional Power Committee held on 26/04/2013. The length of line was about 230 km. Hence, to compensate the reactive power generation and to control voltage along the line, line reactor of 50 MVAr was planned at Allahabad end. As per earlier practice, only main elements of transmission scheme i.e. lines and substation were discussed and agreed in the meetings of the Standing Committee on Power System Planning. Generally, the reactive compensation was finalized by CTU at the DPR stage, when more accurate details about line lengths and voltage profile were available. Accordingly, 50MVAr line reactor along with associated bay at Allahabad, which is a part of “Northern Regional System Strengthening Scheme-NRSS XXX”, was incorporated in the DPR. Subsequently, after investment approval the scope of work including the reactors has been also circulated to the constituents.

11.2 POSOCO stated that the 50MVAr Line reactor at Allahabad had been charged as bus reactor in August 2018 as the Allahabad-Singrauli 400kV line is under construction and likely to be completed by January 2019.

11.3 CEA pointed out that 50MVAr reactor at Allahabad had been charged as bus reactor however, it was planned as line reactor. For charging of line reactor as bus reactor no approval has been taken from NR constituents and CEA. Further, charging of the line reactor as bus reactor has also been allowed by NRLDC without any approval.

11.4 After deliberations, it was agreed that CoD of 50 MVAr line reactor should be considered along with the CoD of the Allahabad-Singrauli 400kV line.

12.0 Various Connectivity / LTA Applications received from Renewable energy based generation projects

12.1 CEA stated that CERC had notified the Detailed Procedure for Grant of connectivity to projects based on renewable sources to ISTS on 15.05.2018 in the petition no. 145/MP/2017. As per the procedure, the connectivity applications shall be processed for grant of Connectivity in two stages i.e. Stage-I & Stage-II. Stage-I Connectivity shall be granted by indicating two locations- one Primary and other alternate location. The grantee shall be allocated bay in either primary or indicated alternate location, which shall be specified at the time of grant of Stage-II Connectivity based on the availability of bay at that time. The Stage-I Connectivity grantee was required to apply for Stage-II Connectivity within 24 months from grant of Stage-I Connectivity for physical connectivity with the ISTS grid, failing which the same shall be ceased.

Stage-I Connectivity Applications

The details of Stage-I Connectivity granted to various IPPs in 11th, 13th and 14th LTA/Connectivity meeting of NR held on 07-06-2018, 11-07-2018 and 17-08-2018 respectively are attached at Annexure-V.

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Further, as per Clause 5.3.1 of the RE Connectivity Procedure, terminal bays at the ISTS sub-station shall be under the scope of transmission licensee owning the ISTS sub-station subject to compliance of relevant provision of tariff policy. Under Para 5.3.2, an option has been provided to wind power generators/developers, who have emerged successful in the bidding conducted by Central/State Government designated agency before RE Connectivity Procedure coming into force (i.e. 15.05.2018) to implement the terminal bays on their own.

In the 13th & 14th Northern Region Constituents Meeting regarding Connectivity/LTA Applications in NR held on 11.07.2018 and 17.08.2018 respectively at POWERGRID, Gurgaon, various RE connectivity applicants expressed their concern regarding mismatch in the commissioning of the generation project and the terminal bays at ISTS, if terminal bays were to be implemented under ISTS. Thus, RE connectivity applicants had requested that they may be allowed to implement the terminal bays at the ISTS connectivity sub-station to meet the tight commissioning schedule.

Keeping in view the matching of terminal bays at ISTS substation for RE generators and based on the confirmation to implement the bays by the applicants at their own cost, Renewable generators have been granted Stage-II Connectivity with the implementation of respective bays in their scope at ISTS substations. The same has also been informed to Hon'ble CERC by CTU vide letter dated 08-08-2018 for inclusion of option of implementation of terminal bays at ISTS substation by RE generators in the Detailed Procedure.

Stage-II Connectivity Applications

The Connectivity transmission system for grant of Stage-II Connectivity was agreed in the 13th & 14th Connectivity/LTA meeting of NR held on 11-07-2018 and 17-08-2018 respectively, the same is attached as **Annexure VI**.

LTA Applications:

The LTA applications that were agreed for grant of LTA in 14th Connectivity/LTA meeting of NR held on 17-08-2018:

Table: 3

S I. N o	Applicati on No./ (Online Date)/ (Physical Receipt Date)	Applica nt	Connectivi ty/ Injection Point	Drawl Point	LTA (MW)/ Start & End Date (Sought)	Remarks
	12000015 80 (25/07/18) / (26/07/18)	Suryakan ta Hydro Energies Private Limited	66kV Switchyard of Ghanvi II HEP of HPSEBL	Tata Power Delhi Distributi on Ltd., Delhi	14 (Start : 01/10/18 End : 22/05/37)	For transfer of 14 MW loading on existing transmission system is in order. Accordingly, it was agreed to grant LTA to M/s Suryakanta Hydro Energies Private Limited for 14 MW from Suryakanta Hydro Energies Private Limited to Tata Power Delhi Distribution Ltd with existing transmission system from 01/10/2018 to 22/05/2037.
	12000014 74 (29/06/18) / (12/07/18)	Tata Power Renewab le Energy Ltd	Rajasthan, NR	WR (Target)	150 (Start : 16/08/20 19 End : 15/08/20)	Stage-II application is received for grant of connectivity at 220kV Switchyard of Bhadla & as per confirmation by applicant during the meeting, the same has been considered for processing of LTA application. During the meeting applicant requested for change in start date of LTA. Further, applicant, vide letter dated 21/08/18

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S I. N o	Applicati on No./ (Online Date)/ (Physical Receipt Date)	Applica nt	Connectivi ty/ Injection Point	Drawl Point	LTA (MW)/ Start & End Date (Sought)	Remarks
					44)	requested to change the start date from 01/05/2019 to 16/08/2019. Applicant vide letter dated 29/08/2018 requested to change the end date from 15/04/2019 to 15/08/2044. For transfer of 150 MW, loading on existing transmission system from NR to WR is in order. Accordingly, it was agreed to grant LTA to Tata Power Renewable Energy Ltd for 150 MW from Rajasthan to WR on Target basis with existing & under implementation transmission system alongwith 5th 400/220 kV, 500 MVA ICT at Bhadla from 16/08/2019 to 30/04/2044.
	12000015 23 (13/07/18) (16/07/18)	Azure Power India Pvt. Ltd.	Rajasthan, NR	WR (Target)	130 (Start : 30/08/20 19 End : 31/08/20 44)	Stage-II application is received for grant of connectivity at 220kV Switchyard of Bhadla & as per confirmation by applicant during the meeting, the same has been considered for processing of LTA application. During the meeting applicant requested for change in start date of LTA. Further, applicant, vide letter dated 20/08/18 requested to change the start date from 31/08/2019 to 30/08/2019. For transfer of 130 MW, loading on existing transmission system from NR to WR is in order. Accordingly, it was agreed to grant LTA to Azure Power India Pvt. Ltd. for 130 MW from Rajasthan to WR on Target basis with existing & under implementation transmission system alongwith 5th 400/220 kV, 500 MVA ICT at Bhadla from 30/08/2019 to 31/08/2044.
	12000015 65 (23/07/18) (24/07/18)	Azure Power India Pvt. Ltd.	Rajasthan, NR	NR (Target)	200 (Start : 15/10/20 20 End : 15/10/20 45)	Stage-II application is received for grant of connectivity at 220kV Switchyard of Bhadla & as per confirmation by applicant during the meeting, the same has been considered for processing of LTA application. For transfer of 200 MW, loading on existing transmission system within NR is in order. Accordingly, it was agreed to grant LTA to Azure Power India Pvt. Ltd. for 200 MW from Rajasthan to NR on Target basis with existing & under implementation transmission system alongwith 5th 400/220 kV, 500 MVA ICT at Bhadla from 15/10/2020 to 15/10/2045.
	12000015 74 (24/07/18) / (27/07/18)	Azure Power India Pvt. Ltd.	Rajasthan, NR	WR (Target)	50 (Start : 15/10/20 20 End : 15/10/20 45)	Stage-II application is received for grant of connectivity at 220kV Switchyard of Bhadla & as per confirmation by applicant during the meeting, the same has been considered for processing of LTA application. For transfer of 50 MW, loading on existing transmission system from NR to WR is in order. Accordingly, it was agreed to grant LTA to Azure Power India Pvt. Ltd. for 50 MW from Rajasthan to WR on Target basis with existing &

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S l. N o	Applicati on No./ (Online Date)/ (Physical Receipt Date)	Applica nt	Connectivi ty/ Injection Point	Drawl Point	LTA (MW)/ Start & End Date (Sought)	Remarks
						under implementation transmission system alongwith 5th 400/220 kV, 500 MVA ICT at Bhadla from 15/10/2020 to 15/10/2045.
	12000015 62 (23/07/18) (24/07/18)	Azure Power India Pvt. Ltd.	Rajasthan, NR	ER (Target)	300 (Start : 15/10/20 20 End : 15/10/20 45)	Stage-II application is received for grant of connectivity at 220kV Switchyard of Bhadla & as per confirmation by applicant during the meeting, the same has been considered for processing of LTA application. For transfer of 300 MW, loading on existing transmission system from NR to WR is in order. Accordingly, it was agreed to grant LTA to Azure Power India Pvt. Ltd. for 300 MW from Rajasthan to ER on Target basis with existing & under implementation transmission system alongwith 5th 400/220 kV, 500 MVA ICT at Bhadla from 15/10/2020 to 15/10/2045.

Application no. (2) to (6) are for evacuation of power from Bhadla. At present 3 nos. of 400/220 kV 500 MVA ICTs are being implemented. In addition to this, 4th 400/220 kV ICT of 1x500 MVA is being taken up for implementation. The total LTA from Bhadla including evacuation of power from solar parks along with these applications has become 2330 MW (Earlier-1500 MW + Present 830 MW) against already planned transformation capacity of 2000 MW.

Regarding, injection of power by solar generators, the applicants informed they shall be setting up higher capacities on DC side, so as to ensure full injection of LTA quantum on AC side. After detailed deliberations, it was agreed that the "N-1" criteria may not be applied to the immediate connectivity of wind/solar farms with the ISTS/Intra-STS grid i.e. the line connecting the solar / wind farm to the grid and the step-up transformers at the grid station as mentioned in Transmission Planning Criteria.

It was agreed that implementation of additional (5th) 400/220 kV, 500 MVA ICT at Bhadla was required for grant of above LTAs. Since application from sl. no (2) to (6) are physically received in the same month, i.e. July, 2018 (sl. no.2 physically received after 7th day), all the applications shall have the same priority as per the CERC Regulations/Detailed Procedure. Accordingly, it was agreed to grant LTA to applications from sl. no. (2) to (6) with 5th 400/220 kV, 500 MVA ICT at Bhadla under ISTS along with existing & under implementation transmission system.

Members noted the same.

13.0 Evolution of transmission scheme for integration of envisaged RE generation capacity in Solar & Wind Energy Zones and Transmission Schemes for Solar Energy Zones (REZs) in Rajasthan.

13.1 CEA stated that Govt. of India had set a target for establishing 175 GW renewable capacity by 2022, which interalia, includes 100 GW Solar, 60 GW Wind generation capacity. To identify ISTS connectivity of renewable energy projects from potential

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solar energy zones (SEZs) and potential wind energy zones (WEZs) of about 50 GW and 16.5 GW respectively, MNRE vide its order dated 08.06.2018 had constituted a sub-Committee. The report of sub-committee is enclosed as **Annexure-VII**. Solar Energy Corporation of India (SECI) in association with MNRE and in consultation with RE power developers has identified SEZs and WEZs in seven RE rich states (Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh).

Further to ease the implementation of transmission infrastructure, it has been proposed to bifurcate the requirements in two phases. A total of 20GW solar & 9 GW wind projects has been planned in Phase-I (up to December 2020) and 30 GW solar & 7.5 GW wind projects has been planned for Phase-II (December 2021). The state wise and phase wise details of SEZ and WEZ are given below:

Solar Energy Zone (SEZ)					Wind Energy Zone (WEZ)				
State / District	Taluk / Tehsil	Ph-1	Ph-2	Total	State/ District		Ph-1	Ph-2	Total
		2020	2021				2020	2021	
		GW	GW	GW			GW	GW	GW
Rajasthan					Tamil Nadu				
Jaisalmer	Ramgarh	2.5	1.5	4	Karur		1.5	1	2.5
	Fatehgarh	2.5	1.5	4	Tirunelveli		0	0.5	0.5
Jodhpur	Phalodi	2	1	3					
Bikaner	Koyalat/ Pugal	3	1	4					
Barmer	Barmer	0	5	5					
Subtotal		10	10	20	Subtotal		1.5	1.5	3
Andhra Pradesh					Andhra Pradesh				
Kurnool	Gooty	2.5	0	2.5	Kurnool		2	1	3
Ananthpuram	Urvakonda	0	2.5	2.5					
Subtotal		2.5	2.5	5	Subtotal		2	1	3
Karnataka					Karnataka				
Gadag		0	2.5	2.5	Koppal		2.5	0	2.5
Bidar		0	2.5	2.5					
Subtotal		0	5	5	Subtotal		2.5	0	2.5
Gujarat					Gujarat				
Kutch	Rapar	3	2	5	Kutch	Bhuj	0	2	2
Banaskantha	Vav/ Tharad	0	2.5	2.5		Laka- diya	2	0	2
Jamnagar	Lalpur	1	1.5	2.5	Dwarka		1	1	2
Subtotal		4	6	10	Subtotal		3	3	6
Maharashtra					Maharashtra				
Solapur		1	1.5	2.5	Osmanabad		0	2	2
Wardha		0	2.5	2.5					
Subtotal		1	4	5	Subtotal		0	2	2
Madhya Pradesh									
Raigarh		2.5	0	2.5					
Khandwa		0	2.5	2.5					

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Solar Energy Zone (SEZ)					Wind Energy Zone (WEZ)				
Subtotal		2.5	2.5	5					
Total		20	30	50	Total		9	7.5	16.5

The estimated cost of the transmission scheme for evacuation of 66.5 GW RE generations projects is about 43,235 Cr. For arriving at tentative transmission tariff implications, it has been assumed that the identified solar (50 GW) & wind (16.5 GW) generation capacity would generate about 115 billion units of renewable energy per annum (wind CUF @ 25%, Solar CUF @ 18%). Various options like no Government grant/upfront payment from RE generation developers and with upfront payment of Rs 25 lakh/MW, 35 lakh/MW, 50 lakh/MW from RE generation developers for development of proposed transmission system indicates the following tariff implications

S. No	Attribute	Option 1	Option 2 (25 lakh/MW Bid incl.)	Option 3 (35 lakh/MW Bid incl.)	Option 4 (50 lakh/MW Bid incl.)
1	Envisaged RE Capacity	66,500 MW			
2	Units Generated (Wind CUF@25%, Solar CUF @18%)	115 Billion units/Year			
3	Transmission Cost	Rs 43,235 Cr	Rs 26,610 Cr	Rs 19,960 Cr	Rs 9,985 Cr
4	Annual transmission charges (@18%)	Rs 7782 Cr	Rs 4790 Cr	Rs 3593 Cr	Rs 1797 Cr
5	Tentative Transmission Tariff	Rs 0.67/Unit	Rs 0.42/Unit@	Rs 0.31/Unit	Rs 0.16/Unit

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@ Generation tariff increase by 14-18 (25 lakh/MW Bid incl.) , 21-25 paise/unit (35 lakh/MW Bid incl.) & 32-36 paise/unit (50 lakh/MW Bid incl.)

13.2 CEA, further stated that the sub-committee constituted by MNRE, in its meeting held on 18.07.2018, to facilitate development of the transmission system had solicited decisions on the following aspects from the competent authority:

- i) Amount of upfront payment from RE generation developers at the time of bidding and grant from Government.
- ii) Finalization of transmission system implementation mode and transmission implementing agency i.e. TBCB or RTM.
- iii) Site specific bidding for RE generation addition in accordance to the transmission plan.
- iv) CERC to expedite enabling provision in connectivity regulation so that SECI can apply for Connectivity & LTA.

13.3 SECI stated that CERC has already issued draft Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-State Transmission and related matters) (Seventh Amendment) Regulations, 2018. The last date for comments by stakeholders is 14.09.2018. In the 7th amendment, it has been proposed to include any company or entity designated by the Central Government or State Government as Implementing Agency on behalf of the Renewable Power Developers who are eligible for grant of connectivity, as an

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applicant. This provision would enable SECI to apply for connectivity and LTA on behalf of the RE developers.

- 13.4** SECI further stated that GOI initiative of 175 GW installed capacity of RE by 2021-22 also includes State plans of RE capacity addition. Towards fulfilment of this, Ultra Mega Solar parks of about 20 GW were undertaken, but out of that only 4-5 solar parks have been successful. In implementation of these large solar parks, development of the common facilities like land, roads, connectivity is being carried out by Solar Park Project Developers (SPPDs) / State Nodal Agencies (SNAs). Many of these solar parks are delayed due to land related issues, thus increasing the development costs. To overcome this, pan-India bids has been successfully carried out for 6 GW wind RE generations and connectivity has been granted to these RE developers in the system planned by CEA and CTU. And further all future bids are also proposed to be carried out on pan-India basis.
- 13.5** CEA stated that the RE potential zones in Western Region is spread out in 3 states (namely Gujarat, Maharashtra and Madhya Pradesh). Similarly, in Southern Region also, it is spread out in three states (namely Tamil Nadu, Andhra Pradesh and Karnataka) but in Northern Region, it is concentrated in Rajasthan only (that too mainly solar potential). Therefore, for SECI solar bids, developers would establish solar parks / generating projects in the Western part of Rajasthan. In Rajasthan, Ramgarh/Kuchheri (Jaisalmer distt), Fatehgarh (Jaisalmer distt), Phalodi (Jodhpur distt), Koyalat /Pugal (Bikaner distt) and Barmer has been identified as Solar Potential zones. The quantum of solar potential is indicated below:

State/District	Potential identified by SECI				Potential indicated by RRECL
	Taluk/Tehsil	Ph-1(GW)	Ph-2(GW)	Total	(in GW)
		2020	2021		
Rajasthan					
Jaisalmer	Ramgarh	2.5	1.5	4	3 (Kuchheri)
	Fatehgarh	2.5	1.5	4	2
Jodhpur	Phalodi	2	1	3	4.4 (Bhadla)
Bikaner	Koyalat /Pugal	3	1	4	1.5/1.5 (3)
Barmer	Barmer	0	5	5	
Total		10	10	20	12.4

- 13.6** CEA further stated that RVPNL vide their letter dated 29.08.18 addressed to CTU have furnished the status of 9,438 MW of sanctioned capacity of Wind and Solar Power generation by Rajasthan, scheduled for commissioning by 2021-22. In their letter, they have indicated that out of the sanctioned capacity as indicated above, 6,560 MW has already been commissioned. In their letter, they have also requested to furnish the load flow study of transmission system for integration of 10GW of solar power under Phase-I in Rajasthan and details of PPAs for the 10 GW solar power projects.

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13.7 CEA added that SECI vide their letter dated 31.08.18 had informed that solar bid of 2,600 MW had been already concluded and majority of PPA/PSA has been signed and balance shall be completed in a fortnight. In addition, a tender of 10 GW solar is going to be closed in Sep. 2018, for which PPA / PSA shall be concluded in next 3 months. In addition, NTPC has also concluded bids for 2 GW solar recently. SECI also stated that as per their bid trajectory approx. 18 GW Solar and 10 GW wind projects were proposed to be bid out in this financial year.

13.8 CEA, further added that CTU was in receipt of applications for connectivity (Stage-II) as well as LTA in some of the common pockets out of above indicated SEZ viz. Bhadla near Phalodi (Stage-II: 3,130 MW, LTA:4,110 MW)), Fatehgarh (Stage-II: 2,200 MW, LTA-1,600 MW) and Bikaner (Stage-II: 850 MW, LTA: 850 MW). Some of the applicants have been/are being granted LTA with scheme already under implementation viz. 765kV Bhadla-Bikaner-Moga/Ajmer corridors, while others shall require additional transmission in case above Stage-II applications are converted to LTA. In addition, Stage-I applications for connectivity was also concentrated near Fatehgarh (8,900 MW), Bhadla (7,900 MW) and Bikaner (5,000 MW) in Rajasthan.

The connectivity applications (Stage I & II) and LTA applications received from RE developers, solar RE potential (includes stage-II applications received and excludes the LTA granted) considered in the studies is summarized below:

S. No.	Complex/pooling station	St-I Connectivity received (MW)	St-II Connectivity received (MW)	LTA received (MW)	Solar potential considered in studies (MW)
1	Fatehgarh (Jaisalmer)	8,900	2,200 (1,000MW deemed St-II, + 1,200 MW under grant)	1,600 (1,000MW granted)	4,000 (St-II applications:1,200MW (2,200-1,000) + SEZ Potential : 2,800MW)
2	Bhadla (Jodhpur)	7,914	3,130 (1,500MW deemed St-II, + 1630 MW under grant)	4,110 (2,330MW granted)	3,000 (St-II applications:800MW (3,130-2,330) + SEZ Potential : 2,200MW)
3	Bikaner	5000	850 (250 granted, 600 under grant)	850	1850 (St-II applications:850MW + SEZ Potential : 1000MW @)
4	Ramgarh/ Kuchheri (Jaisalmer)	-	-	-	1150 (SEZ potential)
	Total (MW)	21,814	6,180	6,560	10,000 (St-II applications: 2,850MW + SEZ Potential : 7,150MW)

@ Injection Capacity limitation at 220kV due to space available for 400/220kV ICTs

13.9 CEA added that based on above solar potential quantum and locations indicated by SECI, connectivity/LTA applications as well as inputs from RRVPN on their intra RE generation in Western Rajasthan, studies have been carried out. Based on the

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studies, the following two alternatives have been evolved and the same has been proposed for evacuation of power from RE projects for various Solar Energy Zones (10 GW) in Western part of Rajasthan.

Alternative -I

Part A: Transmission system for evacuation of power from Fatehgarh (4 GW), Phalodi / Bhadla (3 GW), Bikaner (1.85GW)

- i) Establishment of 400/220kV, 5x500 MVA pooling station at suitable location near Phalodi / Bhadla in Jodhpur (Bhadla-2)
- ii) Establishment of 765/400kV, 2x1500 MVA S/s near Khetri
- iii) Augmentation of transformation capacity at Bhadla (PG) by 2x500MVA, 400/220kV (6th & 7th) transformers
- iv) Creation of 220 kV level at Bikaner (PG) with transformation capacity of 2x500MVA, 400/220kV transformers
- v) Bhadla-2 – Bhadla (PG) 400kV D/c Line (Twin HTLS) - 30 km
- vi) Bhadla (PG) – Bikaner (PG) 765kV D/c line (2nd) - 175 km
- vii) Bikaner(PG) – Khetri S/s 765kV D/c line -220 km
- viii) LILO of both ckts of 765kV Phagi – Bhiwani D/c line at Khetri S/s- 10 km
- ix) Khetri – Sikar (PG) 400 kV D/c line (twin HTLS) – 70 km
- x) Augmentation of 1x1500MVA,765/400kV transformer (4th) at Bhadla (PG)
- xi) Augmentation of 1x1500MVA,765/400kV transformer (3rd) at Moga S/s
- xii) Augmentation of 1x1000MVA,765/400kV transformer (3rd) at Bhiwani (PG)
- xiii) Establishment of Transformation capacity at Fatehgarh (TBCB) with 3x500MVA, 400/220kV transformers@
- xiv) Establishment of 765/400/220kV, 4x1500MVA, 6x500 MVA pooling station at suitable location near Fatehgarh in Jaisalmer Distt (Fatehgarh-2)
- xv) Establishment of 400/220kV, 2x500 MVA S/s near Jodhpur**
- xvi) LILO of 400kV Fatehgarh (TBCB) – Bhadla (PG) D/c line at Fatehgarh-2 – 20 km
- xvii) Charging of 400kV Fatehgarh-2 –Bhadla section at 765kV level
- xviii) Fatehgarh-2 – Jodhpur S/s 400 kV 2xD/c Line (Twin HTLS on M/c tower) -150 km
- xix) Bhadla-2 – Jodhpur S/s 400 kV D/c Line (Twin HTLS) -120 km
- xx) Jodhpur – Ajmer (PG) 400 kV 2xD/c Line (Twin HTLS on M/c tower) -225 km
- xxi) Jodhpur – Jodhpur (New) (RVPN) 400 kV D/c Line (Twin HTLS) -55 km
- xxii) Ajmer (PG)– Jhatikara 765kV D/c line -360 km
- xxiii) 2x125 MVAr Bus Reactors each at Jodhpur & Bhadla-2 Substations
- xxiv) 1x125 MVAr (420kV), 1x240 MVAr Bus Reactor each at Khetri & Fatehgarh-2 Substation
- xxv) 1x63 MVAr switchable Line reactors at both end for Ajmer- Jodhpur 2xD/c line
- xxvi) 1x240 MVAr Switchable line reactor at each end of Bhadla – Bikaner 765kV D/c (2nd) line
- xxvii) 1x330 MVAR Switchable Line reactors each at Ajmer & Jhatikara end for Ajmer – Jhatikara 765kV D/c line
- xxviii) 1x240 MVAr Switchable line reactor at each end of Bikaner – Khetri 765kV D/c line
- xxix) 220kV line bays for interconnection of solar projects at Fatehgarh-2, Fatehgarh, Bhadla, Bhadla-2 and Bikaner S/s- to be discussed in view of CERC regulation

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xxx) Provision of 220kV Bus couplers etc. and common facilities at pooling/substation i.e. Fatehgarh, Fatehgarh-2, Khetri, Bhadla-2, Jodhpur, Bikaner, Bhadla under ISTS as per regulation – under the scope of ISTS

Part B: Transmission system for evacuation of power from Ramgarh/Kuchcheri in Fatehgarh (1.15 GW*)

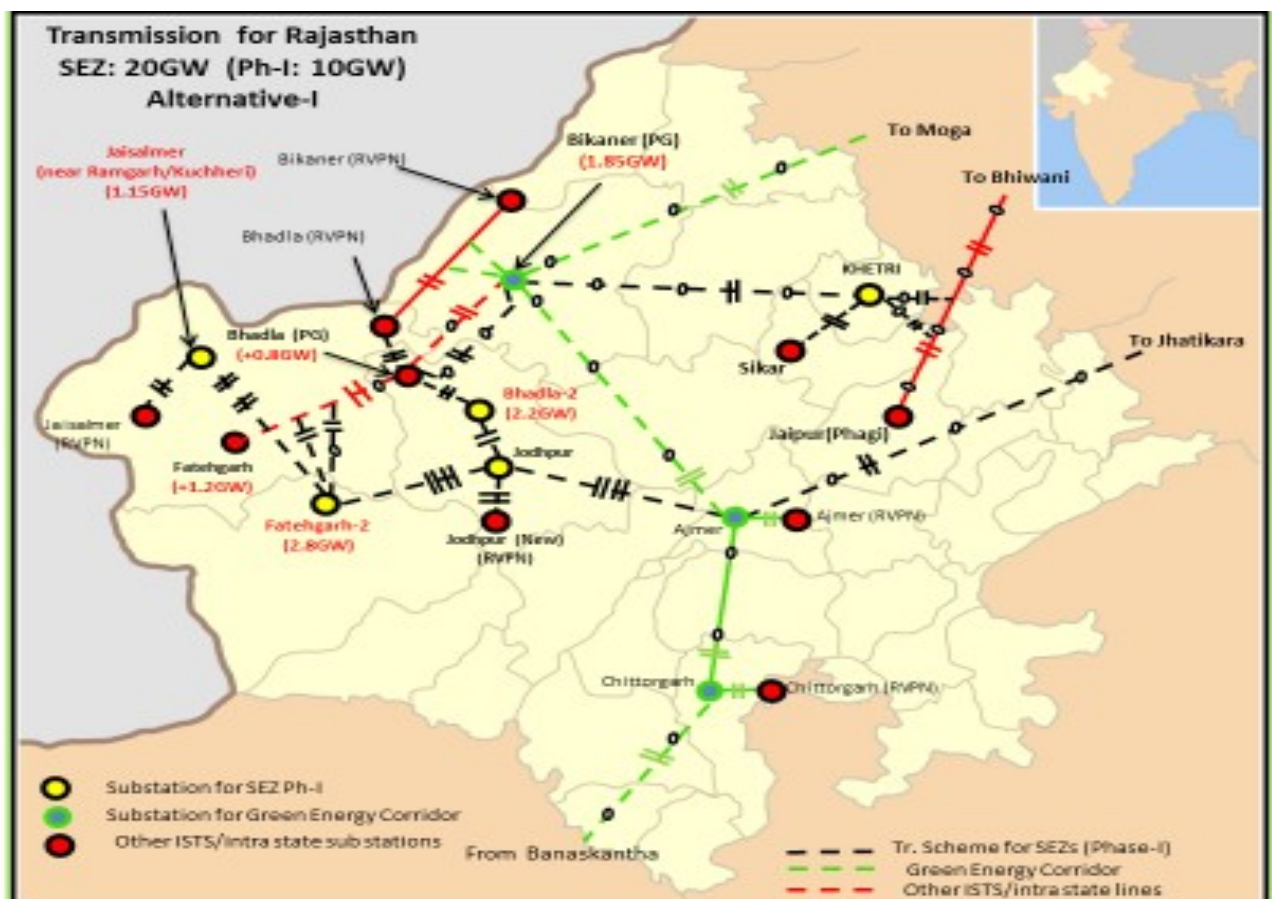
- i) Establishment of 400/220kV 3x500 MVA pooling station at suitable location in Jaisalmer Distt (near Ramgarh/Kuchheri)
- ii) Ramgarh/Kuchheri pooling station –Fatehgarh-2 400 kV 2xD/c Line (Twin HTLS on M/c tower) -150 km
- iii) Ramgarh/Kuchheri pooling station – Jaisalmer -2 (RVPN) 400 kV D/c Line (Twin HTLS)- 60 km
- iv) 220kV line bays for interconnection of solar projects at Ramgarh/Kuchheri pooling station-- to be discussed in view of CERC regulation
- v) Provision of 220kV Bus couplers +TBC & common facilities at Ramgarh/Kuchheri PS

*It may be mentioned that out of 2.5 GW potential in Ramgarh/Kuchcheri, about 1.5 GW potential can be evacuated through transmission corridor identified above at Part (B). Additional transmission requirement for balance 1 GW (balance Ph-1), if any may be evolved based on the requirement subsequently.

** Only in case of drawl required by RVPN, else 400kV switching station at Jodhpur may be considered.

@ Based on the requirement of stage-II connectivity at 220 kV level only. May be reviewed.

Estimated Cost (Alternate-1): Rs 9,400 Cr



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Alternative -II

Part A: Transmission system for evacuation of power from Fatehgarh (4 GW), Phalodi/Bhadla (3 GW), Bikaner (1.85GW)

- i) Establishment of 765/400/220kV, 3x1500MVA, 5x500 MVA pooling station at suitable location near Phalodi / Bhadla in Jodhpur (Bhadla-2)
- ii) Establishment of 765/400kV, 2x1500 MVA S/s at suitable location near Khetri
- iii) Augmentation of transformation capacity at Bhadla (PG) by 2x500MVA (6th & 7th), 400/220kV transformers
- iv) Creation of 220 kV level at Bikaner (PG) with transformation capacity of 2x500MVA, 400/220kV transformers
- v) LILO of 765kV Ajmer – Bikaner D/c line (both ckts) at Bhadla-2 - 135km
- vi) Bhadla-2 – Bhadla (PG) 400kV D/c Line (Twin HTLS) - 30 km
- vii) Bikaner(PG) – Khetri S/s 765kV D/c line - 220 km
- viii) LILO of both ckts of 765kV Phagi – Bhiwani D/c line at Khetri S/s - 10 km
- ix) Khetri – Sikar (PG) 400 kV D/c line (twin HTLS) – 70 km
- x) Augmentation of 1x1500MVA,765/400kV transformer (3rd) at Moga S/s
- xi) Augmentation of 1x1000MVA,765/400kV transformer (3rd) at Bhiwani (PG)
- xii) Establishment of Transformation capacity at Fatehgarh (TBCB) with 3x500MVA, 400/220kV transformers[@]
- xiii) Establishment of 765/400/220kV, 5X1500MVA, 6x500 MVA pooling station at suitable location near Fatehgarh in Jaisalmer Distt (Fatehgarh-2)
- xiv) Fatehgarh-2 – Bhadla -2 765kV D/c line -130km
- xv) LILO of 400kV Fatehgarh (TBCB) – Bhadla (PG) D/c line at Fatehgarh-2 – 20km
- xvi) Charging of 400kV Fatehgarh-2 –Bhadla section at 765kV level
- xvii) Ajmer (PG)– Jhatikara 765kV D/c line -360 km
- xviii) 1x125 MVAR (420kV), 1x240 MVAR Bus Reactor each at Fatehgarh-2, Bhadla-2 & Khetri Substation
- xix) 1x330 MVAR Switchable Line reactors each at Ajmer & Jhatikara end for Ajmer – Jhatikara 765kV D/c line
- xx) 1x240 MVAR Switchable line reactor at each end of Bikaner – Khetri 765kV D/c line
- xxi) 1x330 MVAR Switchable line reactor at Bhadla-2 end for Ajmer-Bhadla-2 765kV line (after LILO)
- xxii) 220kV line bays for interconnection of solar projects at Fatehgarh-2, Fatehgarh, Bhadla, Bhadla-2 and Bikaner S/s- to be discussed in view of CERC regulation
- xxiii) Provision of 220kV Bus couplers etc. and common facilities at pooling/substation i.e. Fatehgarh, Fatehgarh-2, Khetri, Bhadla-2, Bikaner, Bhadla under ISTS as per regulation – under the scope of ISTS

Part B: Transmission system for evacuation of power from Ramgarh/Kuchcheri in Fatehgarh (1.15 GW*)

- i) Establishment of 400/220kV 3x500 MVA pooling station at suitable location in Jaisalmer Distt (near Ramgarh/Kuchheri)
- ii) Ramgarh/Kuchheri pooling station –Fatehgarh-2 400 kV 2xD/c Line (Twin HTLS on M/c tower) -150 km
- iii) Ramgarh/Kuchheri pooling sttation – Jaisalmer -2 (RVPN) 400 kV D/c Line (Twin HTLS)- 60 km
- iv) 220kV line bays for interconnection of solar projects at Ramgarh/Kuchheri pooling station-- to be discussed in view of CERC regulation

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- v) Provision of 220kV Bus couplers +TBC & common facilities at Ramgarh/Kuchheri PS

*It may be mentioned that out of 2.5 GW potential in Ramgarh/Kuchcheri, about 1.5 GW potential can be evacuated through transmission corridor identified above at Part(B). Additional transmission requirement for balance 1 GW (balance Ph-1), if any may be evolved based on the requirement subsequently.

@ Based on the requirement of stage-II connectivity at 220 kV level only may be reviewed

Estimated Cost (Alternate-2): Rs. 9,000 Cr



- 13.10** To discuss the above proposed scheme, CEA has convened a meeting with RVPNL and CTU on 07.09.2018. RVPNL vide their letter dated 06.09.2018 addressed to MNRE has stated that Rajasthan has surplus power and 7 GW of solar power for which transmission scheme has been proposed was not required for catering the load of Rajasthan. 7 GW of solar power was to be exported via 765 kV ISTS lines and grid sub-stations outside Rajasthan. The proposed transmission schemes included interconnections with RVPNL GSS, which would result in flow of power through RVPNL 400 kV GSS and lines and subsequently exported outside Rajasthan by displacement. The PoC charges of Rajasthan shall increase on account of this Renewable energy integration. In view of above, the transmission scheme proposed for evacuation of power from SEZs in Rajasthan was not agreeable to RVPNL, as it would unnecessarily increase the financial burden on Rajasthan Discoms. In their letter, RVPNL has requested to review the integration of Renewable energy in the RE potential states in such a manner that it do not have any financial implications on the home states.
- 13.11** RVPNL representative reiterated their views already conveyed vide their letter dated 06.09.2018. RVPNL further stated that the grant by Government / upfront payment

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by RE developers suggested by the sub-committee constituted by MNRE was indeed a good suggestion and needs to be considered.

- 13.12** SECI stated that upfront payments by RE project developers for development of transmission system would increase the generation tariff of RE projects. The potential solar and wind energy zones have been arrived at after consultation with the RE project developers. It has been planned to bid about 18 GW solar capacities this year. Tender of 10,000 MW solar RE capacity was going to be closed in Sep. 2018. Further, this tender for 10 GW RE generation was linked with manufacturing of solar panels in India. The Solar Park Developers (SPDs) would be allowed PPAs for about 3.3 times of the capacity of solar manufacturing plants that would be set up by them in India. This is an important initiative for Make in India programme. Therefore, this 10 GW of tendering would also create solar panels manufacturing plants of about 3 GW capacity. Apart from these initiatives, new schemes like RTC (round the clock) RE power, which was basically a combination of Solar / Wind / Pumped Storage / Battery Storage / other technologies, which would provide RE power on continuous basis was also under consideration by MNRE.
- 13.13** SECI added that as far as Rajasthan was concerned, they have already been carrying out bidding process for 750 MW of solar power. In addition to this, request for bidding another 750 MW has also been received from Rajasthan. Therefore, renewables are going to come in future either for meeting RPO obligations, improving energy security, providing power on sustained basis etc. For providing ISTS connectivity to these RE projects, the transmission system proposed above was very much required. Therefore, SECI requested the constituents to concur the schemes so that its implementation process could be initiated. Moreover, these schemes are required to be taken up on urgent basis as the gestation period for implementation of RE projects is shorter as compared to that of transmission.
- 13.14** RVPNL stated that the generation tariff of the RE projects may be low but Discoms have to pay for the backing down of thermal generation during RE generation. The waiver of ISTS transmission charges for RE projects also increase the cost of energy.
- 13.15** Haryana representative enquired about the backing down capacity of thermal plants considered in the studies. He stated that the transmission system proposed would result in power flow towards Bhiwani area. Haryana Government was already coming with the policy to harness solar power in Bhiwani area. He further stated that the impact of the proposed transmission schemes on the PoC charges for the Haryana State has to be seen. Already slab rates of PoC charges for Haryana is highest.
- 13.16** CTU stated that the global focus was to bring more RE based generation sources into the system to reduce carbon emission, improve energy security and reduce dependence on fossil fuels based generations. These RE generations need to be integrated with existing grid. Normally the transmission system is planned and implemented to cater to the peak demand conditions. These RE based sources would be there in other than peak demand condition scenarios. In such scenario, generation from other sources like thermal power plant, gas based power plants needs to be backed down or shut down. CERC is already working on regulatory aspects of these requirements. Consultation process is also going on for ancillary services.
- 13.17** CTU said that the investment requirement in transmission for integration of RE in Southern region was less as compared to the transmission investment requirement in Northern Region. This is because the entire solar RE potential is in Western part of Rajasthan, where ISTS infrastructure is non-existent. The commitment for implementation of 175 GW RE by 2021-22 has been made by India on International forums. The balance period left is less than 3 years and if no decision is taken today on the transmission scheme proposed for evacuation of 10GW RE projects, then there would be further delay in achieving the target.

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- 13.18** CTU added that the quantum of RE integration envisaged is huge, therefore, the balancing area has to be enlarged to maintain the grid security. The transmission system proposed for evacuation of RE generation would get connected with 765kV high capacity inter-regional corridors and would facilitate balancing on pan India basis. Apart from balancing requirement, renewable energy management centres to forecast the variability of RE generation in advance are also required to be planned. The addition of RE projects, doesn't contribute to any increase in system inertia. In fact, the system inertia would get reduced to the extent of backing down of conventional generation. Therefore, we need to think ways and means to increase the system inertia by provision of solutions like synchronous condensers.
- 13.19** CEA stated that Standing Committee on Power System Planning/Regional Standing Committee on Transmission is basically a technical forum for discussion and finalisation of transmission schemes. Accordingly, the transmission schemes for potential RE zones in Rajasthan has been evolved and has been put up for deliberation and finalisation by the regional constituents. In case of any technical suggestions in the proposed scheme, it could be discussed and necessary modifications could be incorporated. Further, CERC has constituted a task force to review the PoC mechanism on request of various stake holders.
- 13.20** Constituents stated that commercial and technical aspects of any scheme cannot be separated. Once the scheme is technically agreed, it goes into implementation and its commercial implications follows subsequently in form of PoC charges.
- 13.21** RVPNL stated that their management do not want to have any commercial implications on Rajasthan with the proposed RE integration scheme, as slab rates of PoC charges for Rajasthan is second highest. Also, Rajasthan would not be taking any power from these RE projects and part of ISTS power would be wheeled through intra state network of Rajasthan. Further, they are already surplus in power generation and are fulfilling their RPO obligations.
- 13.22** RVPNL added that prima facie, it is observed that 40 % (of Installed Capacity) despatch has been considered in the studies from thermal generating stations in Rajasthan, which would not be practically possible as 60% is the technical minimum operating point of their Thermal plants. The Alternative-I of the proposed scheme includes new 400 kV interconnections at Jaisalmer-2, Jodhpur, Khetri in addition to agreed/under implementation 400 kV interconnections at Bhadla and Bikaner. These interconnections may overload RVPNL intra-state system and therefore is not agreeable.
- 13.23** CEA stated that keeping in view the apprehension of RVPNL with regard to impact of PoC on state utility with the proposed RE addition / potential SEZ, Alternative-II of the proposed transmission scheme (excluding part-B) has been evolved / designed to have no / bare minimum inter-connection with intra-state network. Therefore, Alternative-II (excluding part B) may be agreed as the transmission scheme associated with 8.85 GW of Solar potential energy Zones which, interalia, includes stage-II / LTA applications in Rajasthan. The transmission scheme associated with 1.15 GW proposed at Ramgarh/Kutcheri may be taken up subsequently after the receipt of connectivity / LTA applications.
- 13.24** SECI informed that as per their plan about 18 GW of solar capacity is to be bid out this year and tender for 10 GW solar RE capacity is going to be closed in Sep. 2018. In view of above, SECI emphasized the need to finalize transmission schemes at the earliest.
- 13.25** After further deliberations, it was agreed that a separate meeting of CEA, CTU, RVPNL and HVPNL would be called on 20th September, 2018 to further deliberate and study the technical aspects of the proposed scheme.

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14.0 Downstream network by State Utilities from ISTS Stations

14.1 CEA stated that 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 were 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.

14.2 Status as furnished by STUs is as given below:

S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status	Status as per 1 st NRSCT
1	400/220kV, 3x315 MVA Samba	2 nos. bays utilized under ISTS. Balance 4 nos to be utilized	Commissioned	LILLO of 220kV Bishnha– Hiranagar D/c line: Under Tendering (PMDP) LoA has been issued and Material has reached the site.	Targeted Completion – Nov 2019
				Samba (PG) – Samba (JKPDD) 220 kV D/C line.	Approved in 1 st NRSCT.
2	400/220kV, 2x315 MVA New Wanpoh	6 nos. of 220 kV bays to be utilized	Commissioned	220kV New Wanpoh – Mirbazar D/c line: Under Tendering (PMDP)	Anticipated-March -2019
				220kV Alusteng – New Wanpoh line Targeted Completion – Dec 2018	Anticipated-March -2019
3	400/220kV, 2x315 MVA Parbati PS (Banala)	2 nos. of 220 kV bays to be utilized.	Commissioned	220kV Charor-Banala D/c line (18km): Under Construction	Targeted Completion-Dec-2018
4	400/220kV, 2x500 MVA Kurukshetra (GIS)	8 nos. of 220 kV bays to be utilized	Commissioned	LILLO of one circuit of Kaul-Pehowa 220kV D/c line at Bhadson (Kurukshetra)	Work awarded on 12.03.2018. Contractual completion period up to 31.10.2019.
				LILLO of one circuit of Kaul-Bastara 220kV D/c line at Bhadson (Kurukshetra)	Likely date of completion by 31.12.2018.
				220 kV D/C Bhadson (Kurukshetra) – Salempur with HTLS conductor equivalent to twin Moose.	Price bid opened and likely to be awarded by 30.09.2018. Likely completion by 31.03.2020.
5	400/220kV, 2x500 MVA Bagpat GIS	3 nos. of 220 kV downstream lines to Shamli, Muradnagar and Bagpat	Commissioned	Bagpat-Baraut 220kV S/c Line- Severe RoW LILLO of 220kV Muradnagar II -Baghat (PG) at Baghat UP-Severe Row	5 No 220 kV Bays utilized of as under :- i. Baghat (PG) – Baraut 220 kV DC

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S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status	Status as per 1 st NRSCT
		commissioned. Balance 5 Nos. of 220 kV bays to be utilized		Bagpat(PG)-Modipuram New 220kV D/c-exp. by Oct.18	<p>line- 2 bays</p> <p>ii. LILO of Moradnagar (II) – Shamli 220 kV SC line at Bagpat (PG) – 2 bays</p> <p>iii. Bagpat (PG)– Bagpat 220 kV S/C line- 1bay</p> <p>2 No 220 kV Bays to be utilized as under :-</p> <ul style="list-style-type: none"> • Bagpat (PG)– Modipuram (II) 220 kV D/C line (To be completed by Jan, 20) - 2 bays • 220 kV Modipuram (II) S/S is under construction. <p>Revision in connectivity :-</p> <ul style="list-style-type: none"> • LILO of Bagpat (PG)- Moradnagar (II) 220kV S/C line at Bagpat (220) ss -Delayed due to RoW issues & to be completed by March,19.
6	400/220 kV, 2x315 MVA Saharanpur	2 nos. 220 kV downstream lines commissioned. (Saharanpur (UP) and Nanauta) Balance 4 Nos. of 220 kV bays to be utilized	Commissioned	LILO of 220 kV Khara-Shamli at Saharanpur PG- Commissioned Saharanpur(PG)-Sarsawa (new) 220kV D/c- Commissioned	<p>6 No 220 kV Bays utilized as under :-</p> <p>i. LILO of Khara-Shamli 220 kV SC line at Saharanpur (PG).</p> <p>ii. Saharanpur (PG)– Sarsawan, saharanpur 220 kV DC line.</p> <p>iii. LILO of Saharanpur – Nanauta 220 kV SC line at Saharanpur (PG).</p>
7	400/220kV, 2x315 MVA Dehradun	Out of 6 bays, only two bays used. Balance 4 bays to be utilized.	Commissioned	2 bays for 220 kV Dehradun – Jhajra line One bay for proposed Naugaon S/s	Status not furnished by PTCUL.

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S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status	Status as per 1 st NRSCT
				2 bays for proposed S/s at Selakui	
8	400/220 kV, 2x315 MVA Sohawal	4 nos 220 kV bays utilized balance 2 nos 220 kV bays to be utilized.	Commissioned	2 nos of bays utilized for Sohawal 220kV UP-Commissioned 2 nos for Barabanki 220 kV s/s- Commissioned 2 nos of bay utilized for 220kV New Tanda-Sohawal line Severe RoW	4 No 220 kV Bays utilized as under :- i. Sohawal PG (400) –Sohawal 220 kV DC line - 2 no bays ii. Sohawal PG (400) – Barabanki 220 kV DC line – 2 no bays 4 No Bays to be utilized as under :- • Sohawal PG (400) – Tanda (New) 220 kV D/C line - By Dec,18.- 2no bays • Sohawal PG (400) –Gonda-Behraich 220kV D/C line -2no bays By Dec, 18. (deposit work by UPPTCL)
9	Shahjahanpur 2x315 MVA 400/220 kV	Partially utilized. Balance 5 Nos. of 220 kV bays to be utilized.	Commissioned	One bay used for 220 kV Shahjahnpur-Hardoi line commissioned. 2 no of bays for 220kV Shahjahnpur - Azimpur D/c line- Planned	1 no 220kV Bay utilized as under :- i. Shahjahanpur (PG) – Hardoi 220kV SC line.- 1no bay 4 No 220 kV Bays to be utilized as under :- • Shahjanpur PG (400) – Azizpur, Shahjahanpur 220kV D/C line -By Sep19.- 2no bays • Shahjahanpur PG (400)– Gola,Lakhimpur 220kV D/C line - By Dec19- 2 no bays
1	02 nos.	Partially	Commissioned	PSTCL informed that	Targeted Completion-

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S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status	Status as per 1 st NRSCT
0	bays at Moga	utilized. Balance 2 nos. of 220kV bays to be utilized.	d	Moga-Mehalkalan 220kV D/c line- Works Completed but Commissioning Pending.	SEP-18
11	Hamirpur 400/220 kV 2x 315 MVA Sub-station (Augmentati on by 3x105 MVA ICT)	04 nos. 220 kV downstream lines commissioned under ISTS. Balance two bays to be utilised by HPSEBL	Sep'18	Dehan-Hamirpur 220 kV D/c line	Targeted Completion - April - 2020
12	Kaithal 400/220 kV 1x 315 MVA Sub-station	2 Nos. of 220kV bays to be utilized	Commissioned	220kV Kaithal (PG)- 220 kV D/C line to Neemwala D/c line - Neemwala - Work awarded on 25.10.2016. Tentative completion date is 23.05.2018. Contract Cancelled, retendering, under 220 kV Neemwala - process Work awarded on 220kV S/s Neemwala- 06.09.2018. Tenders opened for NIT dated 23.05.2016. completion period upto Tender enquiry under process	awarded on 08.06.2018 Contractual date completion upto 31.01.2020.
13	Sikar 400/220kV, 1x 315 MVA S/s	2 Nos. of 220 kV bays	Commissioned	RRVPNL representative stated that studies would be conducted to formulate how bays could be utilized.	No update given by RRVPNL.
14	400/220kV Kota Sub-Bay station (1 No. of 400 kV Bay)	1 No. of 400 kV	Commissioned	Line ready for charging	Anta – Kota 400 kV Line commissioned on 08/2018.
15	Bhiwani 400/220kV S/s	6 nos. of 220kV bays	Commissioned	220kV D/c line from Bhiwani (PG) to 220kV Isherwal (HVPNL) S/s – Likely to br completed by 31.2.2019	220kV D/C line from 765kV S/stn. PGCIL Bhiwani to 220kV S/stn. HVPNL Bhiwani & 220kV D/C line from 765kV S/stn. PGCIL Bhiwani to 220kV S/stn. Isherwal –
16	Jind 400/220kV S/s	6 nos. of 220kV bays	Commissioned	LILO of both circuits of 220kV D/c Narwana – Mund line at Jind (PG)	NIT floated on 20.08.2018 with due date of submission on 4.10.2018. Likely completion by 30.06.2020
					NIT floated on 20.08.2018 with due date of submission on 4.10.2018.

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S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status	Status as per 1 st NRSCT
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Likely completion by 30.06.2020

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

S. No.	Name of Substation	MVA Capacity	Expected Schedule	Downstream connectivity furnished by States in 40 th SCSPNR	Status as per 1 st NRSCT
1	400/220kV Dwarka-I GIS (8 nos. of 220kV bays)	4x500	Dec.-2018	2x160MVA, 220/66kV ICTs – expected by 2021-22 2x160MVA, 220/66kV ICTs – Future LILO of 220kV Papankalan-III – Naraina & Papankalan-I Line at Dwarka-I – expected along with charging of 400kV S/s.	No representative of DTL was present in 1 st NRSCT Meeting.
2	400/220kV Tughlakabad GIS (8 nos. of 220kV bays)	4x500	Oct'18	LILO of Badarpur-Mehrauli 220kV D/c line at Tughlakabad	Targeted Completion- Oct-18
				Okhla-Tughlakabad 220kV D/c line	Targeted Completion- Oct-18
				Masjidmoth-Tughlakabad 220kV D/c line- Expected by 2020-21	No status furnished by DTL
				R.K.Puram-Tughlakabad (U/G cable) 220kV D/c line- Expected by 2020-21	Targeted Completion - MAR-20
3	220/66kV Chandigarh GIS (8 nos. of 66kV bays)	2x160	Feb'19	Chandigarh to update.	Details not furnished by UT of Chandigarh..
4	400/220kV Jauljivi GIS (6 nos. of 220kV bays)	2x315	Dec'2019	2 bays for 220kV Almora-Jauljibi line 2 bays for 220kV Brammah-Jauljibi line	No status furnished by PTCUL
5	400/220kV Sohna Road Sub-station (TBCB)	2x500	May'19	LILO of both circuits of 220kV D/c Sector-69 - Roj Ka Meo line at 400kV Sohna Road –	Under survey.

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S I. N o.	Name of Substation	MVA Capacit y	Expecte d Schedul e	Downstream connectivity furnished by States in 40 th SCSPNR	Status as per 1 st NRSCT
	(8 nos. of 220kV bays)			Under Survey LILO of both circuits of 220kV D/c Badshahpur- Sec77 line at 400kV Sohna Road – Under Survey	
6	400/220kV Prithla Sub- station (TBCB) (8 nos. of 220kV bays)	2x500	May'19	LILO of both ckt of 220kV D/c Ranga Rajpur – Palwal line – Expected by Mar'20 220kV D/C for Sector78, Faridabad – Expected by Sep'19	LILO of both ckt of 220 kV D/C Ranga Rajpur- Palwal line - NIT floated on 21.05.2018. Likely date of award by Oct., 2018. Likely completion by March, 2020. 220 kV D/C for Sector-78, Faridabad - NIT floated on Aug 29, 2018. Likely completion by July. 2020.
7	400/220kV Kadarpur Sub- station (TBCB) (8 nos. of 220kV bays)	2x500	May'19	HVPNL informed that downstream line of 400kV S/stn. Kadarpur could not be envisaged by TS wing due to non- finalization of Kadarpur sub-station site by M/s Sterlite.	Land details submitted by M/s Sterlite recently. M/s Sterlite has been asked to change the orientation of GELO in order to ensure proper emanation of 220 kV line. The survey of line to evacuate power is in process and downline of 400 kV substation Kadarpur will be finalized shortly.
8	400/220kV Kala Amb GIS (TBCB) (6 nos. of 220kV bays)	2x315	Commis sd	HPSEBL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Kala Amb S/s. HPSEBL informed that they have planned 220kV Kala Amb- Trilokpur 220kV D/c line. The site for the substation has been identified	Status not furnished by HPPTCL
9	400/220kV Amargarh	2x315	Oct'18	LILO of both circuits of Zainkote – Delina	Status not furnished by HPPTCL

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S I. N o.	Name of Substation	MVA Capacit y	Expecte d Schedul e	Downstream connectivity furnished by States in 40 th SCPSPNR	Status as per 1 st NRSCT
	GIS (TBCB) (6 nos. of 220kV bays)			220kV D/c line at Amargarh Works Completed but line yet to be charged	

15.0 Review of Evacuation arrangement for Shongtong Karcham (450 MW) in Satluj Basin –Agenda by HPPTCL

15.1 CEA stated that as per Master Plan for Satluj basin, Power of Shongtong Karcham (450 MW) HEP has been planned through 400 kV D/C (Quad HTLS) line up to 400/220/66 kV substation of HPPTCL under construction at Wangtoo. This line was to be developed as ISTS through TBCB route, as per CERC regulations at that time which stipulated that for a single hydro project of 250 MW and above, CTU shall plan and implement the dedicated line as ISTS. This line had capacity of 3000 MW considering (n-1) contingency sufficient to evacuate power of projects located upstream of Shongtong Karcham HEP. In the petition filed by CTU in CERC on 11.8.2017 for regulatory approval of the above line, CERC issued the order on 19.3.2018 stating: *“the scheme was envisaged in the year 2011 i.e. 7 years back. A considerable time has lapsed since the inception of the complete scheme and there may be changes in the commissioning schedules of projects in the Satluj Basin. Therefore, there is a need to review the scheme in the Standing Committee. In the light of this, we are not inclined to grant regulatory approval at this stage. We direct CTU to discuss the scheme in the Standing Committee Meeting of the Northern Region again in consultation with CEA and may approach Commission for regulatory approval, if required.”*

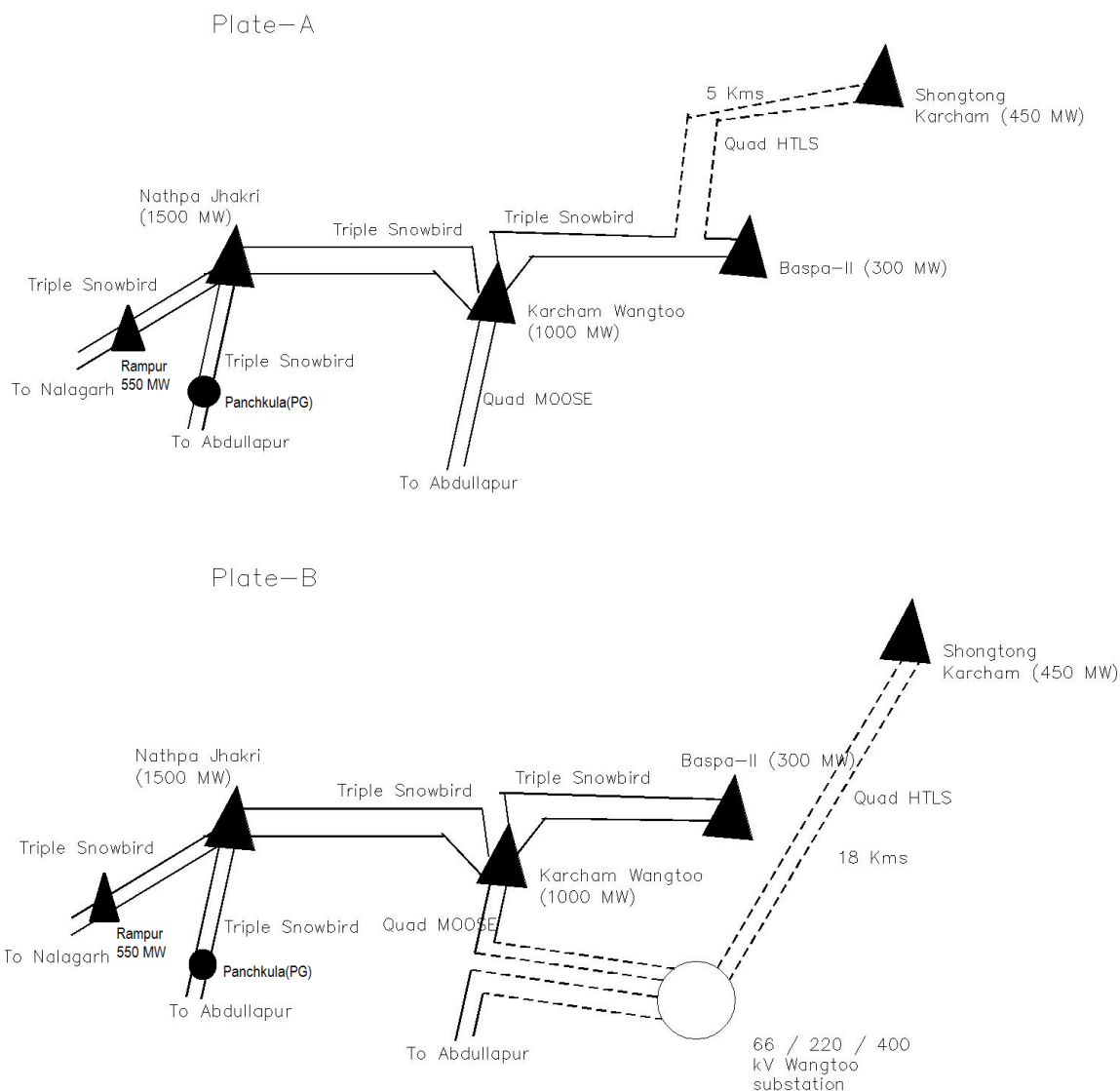
During the discussions in 40th meeting of Standing Committee on Power System Planning-NR held on 22.6.2018, it was decided that this line shall be developed as dedicated line of Shongtong Karcham by HPPCL.

15.2 CEA said that HPPTCL vide their letter dated 31.8.2018 had proposed the following after taking into consideration the uncertainty of upstream projects:

- i) LILO of one circuit of 400 kV Baspa-II-Karcham Wangtoo-Nathpa Jhakri D/C line of M/S JSW (Triple Snow bird) at Shongtong Karcham HEP. LILO (about 5 Kms) to be done on Quad HTLS configuration.
- ii) As per agreement dated 1.10.1992 entered between Government of Himachal Pradesh and JIL, the line could also be utilized for evacuation of power from any other generation project established or to be established in the area. In Hon’ble CERC order dated 7.5.2015 on the petition No. 37/TT/2011 for approval of transmission tariff for transmission system associated with evacuation of power of Karcham Wangtoo HEP for tariff block 2009-14 period, it had been recorded that Baspa-II-Jhakri 400 kV D/C line was established, operated and maintained by JHPL as main transmission line and not as a dedicated line.
- iii) This would be an interim arrangement till the upstream generation is available. In due course of time, when upstream generation progresses, LILO would be opened and extended to 220/400 kV Wangtoo substation of HPPTCL. Thus, there would not be any change in the firmed up evacuation arrangement for Shongtong

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Karcham HEP and other upstream projects. Plate-A and Plate-B show the interim and final evacuation arrangements for Shongtong Karcham HEP.



15.3 This high capacity line proposed to be built from Shongtong, shall be a dedicated line and conversion of this line from dedicated line to ISTS line shall be difficult considering that CERC has not given the license for the same. Further, the cost of the line to be constructed by HPPCL shall be very high. Agreement from the developer of Baspa HEP shall be required for utilizing their line. Issue of transmission losses and charges for Baspa –Karcham Wangtoo line needs to be addressed.

15.4 Keeping above in view, it was agreed that a separate meeting with participation from CEA, HPPCL, HPPTCL, CTU, NRLDC and Baspa HEP may be convened.

16.0 Two number of 220kV Bays at Jatwal 400/220kV, 3x315 MVA S/s by JKPDD:

16.1 CEA stated that under PMDP -2015 for Jammu & Kashmir, the following 220kV lines providing 220kV outlets from 400/220kV ISTS substation viz Sambha (Jatwal), Amargarh and New Wanpoh were included:

Jammu Region:

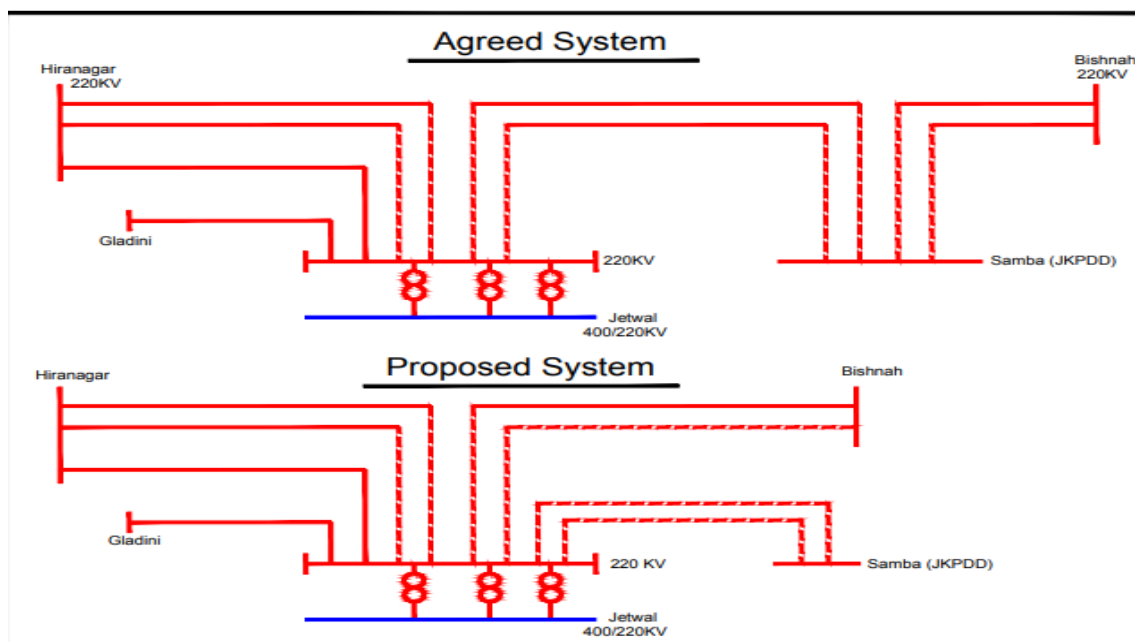
1. LILO of Hiranagar-Bishnah 220kV D/C line at 400/220kV Sambha (PG)(Jatwal) S/s.

Kashmir Region:

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1. New Wanpoh (PG) (400/220kV)-Mirbazar 220kV D/C line
2. Extension of Mirbazar-Alusteng 220kV D/C line up to 400/220kV New Wanpoh Sub-station (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)

16.2 CEA further stated that LILO of both circuits of Jatwal-Bishnah 220kV D/c line at Sambha (JKPDD) along with establishment of Sambha 220kV S/s was also included under PMDP 2015. JKPDC had proposed direct interconnection of Sambha with Jatwal 400/220kV through a 220kV D/c line instead of LILO arrangement and the direct interconnection would require 220kV bays at Jatwal 400/220kV S/s.



16.3 CEA added that at Jatwal 400/220kV S/s, there are 6 nos. of 220kV equipped bays, out of which 2 nos. has already been utilized for LILO of Hiranagar-Gladini 220 kV S/C line at Jatwal. Balance 4 nos. would be utilized for LILO of Hiranagar-Bishnah 220kV D/C line at 400/220kV Sambha (PG)(Jatwal) S/s. Therefore, for establishment of direct link between Sambha and Jatwal, 2 nos. of bays would be required at Jatwal s/s.

16.4 After deliberations, members agreed for providing two number of 220kV Bays at Jatwal 400/220kV, 3x315 MVA S/s for Jatwal (PG) –Sambha(JKPDD) 220kV D/c line. The bays would be implemented as ISTS scheme.

Agenda by PTCUL:

17.0 Renaming of Srinagar-Kashipur 400kV D/c (Quad) line:

17.1 PTCUL stated they have taken up the implementation of various transmission elements of UITP scheme in Alaknanda Valley, which inter-alia includes Srinagar-Kashipur 400 kV D/c line. This line is being implemented with financial assistance from ADB and PTCUL had renamed the line as '400kV Khandukhal-Rampura D/c line'.

17.2 PTCUL further stated that Srinagar-Kashipur 400 kV D/C (Quad) line has been renamed as "400kV Khandukhal-Rampura transmission line" on Quad Bersimis Conductor, with new line design and new route alignment to reflect the updated route alignment and location. The tentative line length of the said line has been revised to approximately 181 km in place of earlier 152.8 km. The new line design and route

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alignment has been done to cater to the evacuation needs of the generators in a timely manner. The same has been appraised to Ministry of Power, Govt. of India.

17.3 Members noted the same.

18.0 Issue related to signing of Transmission Agreement/LTA Agreements for implementation of UITP Scheme (deemed ISTS) by PTCUL for evacuation of power from various Generators:

18.1 CEA stated that to deliberate on the issue related to signing of Transmission Agreement/LTA Agreements for implementation of UITP Scheme (deemed ISTS) by PTCUL for evacuation of power from various Generators, a meeting had been scheduled to be held on 12.9.2018 in CEA involving NTPC, THDC, L&T, Lanco, SJVNL, PTCUL, CTU and POSOCO. The outcome of the meeting would be appraised to NRSCT in the next meeting.

19.0 Common facilities at 765/400 kV Bhadla Substation for Connectivity of Solar Power plants under Stage-II Connectivity.

19.1 CTU informed that for providing ISTS connectivity to different solar power plants at 220 kV bus of 765/400/220 kV Bhadla substation, following is proposed to be developed under ISTS at Bhadla S/s.

1. 220 kV Bus work including bus sectionaliser and bus coupler
2. Substation Automation system
3. LT switchgear, ACDB & DCDB (220V & 48V) panel, Battery, Battery charger(220V & 48V), Visual monitoring system, Illumination system, DG Set, augmentation of fire annunciation panel for switchyard panel room,
4. Auxiliary building to house ACDB, DCDB panels
5. Earth mat and DSLP (LMs).
6. Main cable trench, Main Switchyard roads
7. Bus Bar protection system.
8. LT transformer and LT Switchgear.

19.2 Members agreed for the same.

20.0 Various LTA/ Connectivity applications discussed in 15th Connectivity/Long-Term Access meeting of Northern Region held along with 1st NRSCT.

20.1 Connectivity and Long Term Access (LTA) applications from various applicants were discussed and agreed during 15th Connectivity / Long-Term Access meeting of Northern Region held along with 1st NRSCT. The detailed minutes for the same are being issued by CTU separately.

Meeting ended with thanks to chair.

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Annexure-I

**List of Participants of Northern Region Standing Committee on Transmission
Held on 11.09.2018 (Tuesday) at NRPC, N. Delhi**

Sl. No.	Name	Designation
CEA		
1.	P.S. Mhaske	Member (Power System)
2.	Ravinder Gupta	Chief Engineer
3.	Awdhesh K. Yadav	Director
4.	Manjari Chaturvedi	Deputy Director
5.	Priyam Srivastava	Assistant Director
6.	Jitesh Srivas	Assistant Director
SECI		
7.	S.K. Mishra	Director (PS)
POWERGRID		
8.	Subir Sen	COO (CTU-Plg. & SG)
9.	Ashok Pal	GM(CTU-Plg.)
10.	Subhash C. Taneja	AGM (CMG)
11.	Manju Gupta	AGM
12.	Rajesh Verma	Chief Manager
13.	Sandeep Kumawat	Dy. Mgr.
14.	Narendra Sathvik	Sr. Engr.
15.	Yatin Sharma	Engineer
NRPC		
16.	M.A.K.P. Singh	MS
17.	R.P. Pradhan	SE
NRLDC		
18.	H.K. Chawla	DGM
19.	Rajeev Porwal	Deputy Manager
20.	Rahul Chakravarty	Deputy Manager
HVPNL		
21.	Anjum Chugh	CE/Plg
22.	J.K. Juneja	Consultant Planning
23.	M.M. Matta	SE/Plg
24.	Neeraj Ahuja	SE/STU
HPPTCL		
25.	Kaushalesh Kapoor	GM
26.	Sandeep Sharma	AGM (Planning)
PSTCL		
27.	Paramjit Singh	SE/Planning & Comm.
JKPDD		
28.	Avinash Dubey	C.E. (S & O Wing) Jammu
PTCUL		
29.	A.G. Agarwal	CE Project
30.	Deep Shah	Chief (Project Engineer)

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| 31. | Ashok Kumar | Plannning |
| 32. | S.P. Arya | SE(PI) |
| 33. | Himanshu Baliyan | Ex. En (C&R) |

UPPTCL

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| 34. | Neeraj Swaroop | SE TP&PSS |
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RVPN

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| 35. | B.P. Sharma | CE (PP&D) |
| 36. | Anjana Agrawal | XEN (Plan) |

DFCCIL

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| 37. | S.K. Gupta | GM/Elect. |
| 38. | P.K. Bhatt | Manager |

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Annexure-II**Minutes of meeting regarding in-principle approval of 400 kV transmission lines and reactors of RRVPNL held on 06.08.2018 in CEA**

RRVPNL vide their letter no. RVPN/SE(P&P)/XEN-2(P&P)/AE-2/F./D 689 dated 02.08.2018 had requested CEA to grant in-principal approval for following transmission elements which were ready for commissioning:

1. 400 kV Chhabra – Anta S/C line.
2. 400 kV Chittorgarh – Bhilwara D/C line.
3. 1 x 50 MVAR Bus Reactor at 400 kV Bhilwara S/s.

To discuss the issue, a meeting was scheduled in CEA with CTU, POSOCO and RRVPNL. List of participants are enclosed at Annex –I. There was no participation from CTU. Following deliberations were made in the meeting:

1. RVPNL representative stated that initially for evacuation of Chhabra TPS Stage-I Phase –I (2x250MW), Chhabra TPS-Bhilwara 400kV S/C line (130kMs 400kV D/C line from Chhabra TPS to a location at Dahra/Anta and one circuit extended upto Bhilwara) of approx.290 kms was planned. Subsequently the 765 kV GSS at Anta was approved and for composite evacuation system of Chhabra TPS Stage-I Phase –II (2x250MW), Chhabra Super Critical TPS (2x660 MW) and Kalisindh TPS (2x600 MW) the second circuit of above 400kV D/C Chhabra TPS- Dahra /Anta line was planned to be extended upto 765kV GSS Anta. Further inter-connection of 765/400 kV Anta and 400 kV Kota S/s (PG) through Anta (765kV GSS)-Kota (400kV PGCIL GSS) 400 kV S/C line , for enhancing the reliability of operation, was approved in the 29th Standing Committee Meeting held on 29th December, 2010 as an intra-state line. Chhabra TPS- 765kV GSS Anta 400kV S/C line has been completed and its in-principle approval is being sought now.

Further, 400 kV Chittorgarh – Bhilwara D/C line was planned for evacuation of power from upcoming solar generation in and around that area and 1x50 MVAR 400kV reactor at Bhilwara S/s has been shifted from Merta 400 kV S/s. At Merta S/s a new reactor of 125 MVAR has been installed.

All the above elements viz Chhabra - Anta 400 kV S/C line, Chittorgarh – Bhilwara 400 kV D/C line and 1x50 MVAR 400kV reactor at Bhilwara have been completed and for charging these elements, their SLDC has requested charging code from RLDC. RLDC has sought Standing Committee approval for these elements. Accordingly, in-principle approval has been sought from CEA for these three elements.

2. CEA stated that load flow studies done on June 2018 file shows no considerable change in power flow pattern and short circuit levels with and without these elements. Further, the progress of 400kv lines (viz Chhabra - Anta 400 kV S/C line and Chittorgarh – Bhilwara 400 kV D/C line), are already figuring in monitoring reports of PSPM Division, CEA.
3. DGM, POSOCO stated that all Intra - State transmission schemes which involve reconfiguration of ISTS elements, Inter-Connection with ISTS elements and all 400 kV Intra – State schemes planned by state has impact on the grid, therefore these schemes/elements need to be specifically deliberated in the meeting of Northern Region Standing Committee on Transmission" (NRSCT). Also, other Intra- State schemes planned by the state may also be intimated to NRSCT.

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4. After deliberation, the following was agreed:

iv) The following intra-state transmission elements of RRVPNL were noted and agreed in – principle:

- d) 400 kV Chhabra – Anta S/C line.
- e) 400 kV Chittorgarh – Bhilwara D/C line.
- f) 1 x 50 MVAR Bus Reactor at 400 kV Bhilwara S/s.

The same would be formalized / brought to the notice of members of NRSCT.

v) RRVPNL to intimate NRSCT all Intra - State transmission schemes which involve reconfiguration of ISTS elements, inter-connection with ISTS elements and all 400 kV Intra – State schemes which are already under implementation and has not been intimated earlier in Standing Committee on Power System Planning.

vi) RRVPNL to include new/planned Intra - State transmission schemes which involve reconfiguration of ISTS elements, inter-connection with ISTS elements and all 400 kV Intra – State schemes as agenda of NRSCT for deliberation.

The meeting ended with thanks to the chair.

Annex-I

List of Participants of the meeting held on 06.08.2018 regarding charging of 400 kV transmission lines and reactors under construction by RRVPNL held on 06.08.2018 in CEA.

Sl. No.	Name Shri/Smt CEA	Designation
1.	Awdhesh Kumar Yadav	Director
2.	Manjari Chaturvedi	Dy. Director
3.	Kanhaiya Singh Kushwaha	Asstt. Director
II	POSOCO	
4.	H K Chawla	DGM
5.	Kamaldeep	Dy. Manager
II	RRVPNL	
6.	Anjana Agrawal	EE(Planning)

Upcoming Transmission System of RVPN**220 KV GSS :**

1. Aklera Transformer Capacity 1*160=160MVA
2. Navalgarh (PPP) Transformer Capacity 1*160=160MVA
3. Bherunda (Upgraded) Transformer Capacity 1*160=160MVA
4. NPH Transformer Capacity 1*160=160MVA
5. Halasar Transformer Capacity 1*160=160MVA
6. Chhatargarh Transformer Capacity 1*160=160MVA
7. Rawatsar Transformer Capacity 1*160=160MVA

220KV LINE :

1. LILO of 220 kV S/C Jhalawar-Chhabra line (80 CkM) for 220KV GSS Aklera
2. 220 KV LILO line from Existing 220 KV Ajmer- KSG for 400 KV GSS Ajmer.
3. 220 KV S/C Dhod- Danta Ramgarh line (31.080kM)
4. 220 Kv D/C from 400 KV GSS Ajmer to Bherunda (60kM)._
5. 220Kv D/C Jodhpur(New) Kakani -Jhalamand.
6. 220Kv D/C Jodhpur(New) Kakani -Barli.
7. 220KV S/C Sirohi-Pindwara line (25 km).
8. LILO of one circuit of 220KV D/C STPS -Ratangarh line at proposed 220KV GSS, Halasar 3.8 KM.
9. 220KV D/C line from Gajner-Chhatargarh (200 Ckt Km).
10. 220KV D/C Akal-Jaisalmer-2 line 75Km.
11. 220KV LILO of one circuit of 220KV D/C STPS-RATANGARH LINE (30KM) at 220kV GSS Rawatsar.

**Minutes of Meeting for 220 KV under construction DFCC bays on 25.08.2018 at
POWERGRID Abdullapur s/s**

Following were present:-

- 1) Sh Faraz, Dy Director, CEA
- 2) Sh Kanhaiya Singh Kushwaha, Assistant Director, CEA
- 3) Sh Chanky Garg, Project Manager Electrical, DFCCIL, Ambala
- 4) Sh K.Singh, Assistant Project Manager/DFCC
- 5) Sh P.K.Panchal, Executive Engineer, TS Division, HVPNL, Ambala
- 6) Sh Mahesh kumar, SDO Construction, HVPNL, Ambala
- 7) Sh R.S.Meena, ADEE/TND/Railway
- 8) Sh Yuvraj Singh, SSE/TRD/N.Rly
- 9) Sh G.K.Verma, DGM, PGCIL Abdullapur
- 10) Sh Virendra Singh, Chief Manager S/S, Abdullapur

Committee constituted by 40th Standing Committee on Power System Planning for Northern Region visited 400/220 KV POWERGRID, Abdullapur s/s on 25.08.2018 for deliberations on under construction 220 KV DFCC bays.

Following issues were discussed:-

- 1) Area demarcated for 02 nos, 220 KV Rajokheri bays for HVPNL was seen. There are 02 nos towers for 400 KV Abdullapur-Baḡwana line & 400 KV Abdullapur-Kurukshetra line erected, in line of transfer bus at Abdullapur sub-station POWERGRID. Therefore 02 no, 220 KV bays for 220 KV D/C Abdullapur-Rajokheri line will be placed adjacent to terminal tower of 400 KV Abdullapur-Kurukshetra line. HVPNL has no objection for this area as the line entry for the Abdullapur-Rajokheri line is convenient for HVPNL at this point.
- 2) Existing bays (Bay 203 & 206) for Abdullapur-Jagadhri 220 KV D/C (Indian Railways) 2-phase railway line were seen. There is no space constraint for incorporating 3rd phase. However it requires casting of foundation, erection of equipments for 3rd phase, dismantling & re-erection of bay marshalling kiosk & circuit breaker marshalling box, additional cable laying works, required modifications in protection scheme.
- 3) Partially constructed 220 KV bays for DFCC were seen. POWERGRID informed that all the 06 nos gantry foundations & 01 no lightning mast tower foundations were completed

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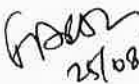
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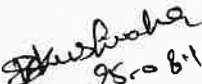
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& towers have been erected along with beam. Out of 94 nos equipment foundation, only 08 nos are balance. 80 mtrs cable trench is constructed. 60% earth mat work is also completed (Progress report is attached).

- 4) POWERGRID clarified that partial construction of new 220 KV, 3-phase D/C line for DFCC sub-station has been carried out. Out of 35 towers foundation, already 23 are constructed.
- 5) As per POWERGRID survey of existing, 2-phase, 220 KV line (report attached), there are 5 spans, wherein sufficient clearance for bottom conductor is not available. Out of these 5 locations, 3 locations were jointly checked and vertical ground clearances appeared insufficient.

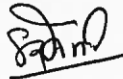
For CEA


25/08/18
(Faraz)


25-08-18
(Kanhaiya Singh)

For DFCC


(Chanky Garg)



(K Singh)

For HVPNL


(P.K.Panchal)

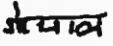

(Mahesh Kumar)

For Railways


(R.S.Meena)


(Yuvraj Singh)

For POWERGRID


(G.K.Verma)


(Virendra Singh)

1. Stage-I Applications granted as per 11th LTA/Connectivity meeting of NR:

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
Connectivity Applications at Bhadla										
1	1200000804	Orange Jagat Wing Power Pvt. Ltd. (Kanasar Wind Farm)	30.06.17	Jaisalmer, Rajasthan	250	Wind	Bhadla (Under Implementation)	Kanasar Wind Farm - Bhadla Pooling Station 220kV S/c line	Fatehgarh <ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level) Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay Fatehgarh-Bhadla765kV D/c line to be 	Kanasar Wind Farm - Fatehgarh Pooling Station 220kV S/c line
2	1200000803	Kintech (Rajasthan) Windpark Pvt. Ltd. (Akhadhana Wind Farm)	03.07.17	Jodhpur, Rajasthan	300	Wind		Akhadhana Wind Farm - Bhadla Pooling Station 220kV S/c line		Akhadhana Wind Farm - Fatehgarh Pooling Station 220kV S/c line
3	1200000896	Greenko Solar Energy Pvt. Ltd. (Badla Solar Farm)	20.11.17	Jodhpur, Rajasthan	500 (Sought at 400kV)	Solar		Badla Solar Farm - Bhadla Pooling Station 400kV S/c line		Badla Solar Farm - Fatehgarh Pooling Station 400kV S/c line
4	1200000918	Nandikeshwar Renewable Energy Pvt. Ltd. (Shira Wind Farm)	24.11.17	Jodhpur, Rajasthan	250	Wind		Shira Wind Farm - Bhadla Pooling Station 220kV S/c line		Shira Wind Farm - Fatehgarh Pooling Station 220kV S/c line

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
5	1200000910	Rajasthan Solarpark Development Company Ltd. (Nokh Solar Park)	5.12.17	Jaisalmer, Rajasthan	980	Solar Park Developer		Nokh Solar Park - Bhadla Pooling Station 220kV 2xD/c line	operated at 400kV	Nokh Solar Park - Fatehgarh Pooling Station 220kV 2xD/c line
6	1200001163	Azure Power India Private Ltd.	15.05.18	Jodhpur, Rajasthan	500	Solar		Azure Power GS - Bhadla Pooling Station 220kV D/c line		Azure Power GS - Fatehgarh Pooling Station 220kV D/c line
7	1200001165	Azure Power India Private Ltd.	15.05.18	Jodhpur, Rajasthan	500	Solar		Azure Power GS - Bhadla Pooling Station 220kV D/c line		Azure Power GS - Fatehgarh Pooling Station 220kV D/c line
8	1200001166	Azure Power India Private Ltd.	15.05.18	Jodhpur, Rajasthan	500	Solar		Azure Power GS - Bhadla Pooling Station 220kV D/c line		Azure Power GS - Fatehgarh Pooling Station 220kV D/c line
Connectivity Applications at Fatehgarh :										

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
9	1200000740	Distinguished Consultancy Solutions Pvt. Ltd. (Fatehgarh Wind Farm)	26.05.17	Jaisalmer, Rajasthan	300	Wind	Fatehgarh <ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level) Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay Fatehgarh-Bhadla 765kV D/c line to be operated at 400kV 	Fatehgarh Wind Farm - Fatehgarh Pooling Station 220kV S/c line	Bhadla (Under Implementation)	Fatehgarh Wind Farm - Bhadla Pooling Station 220kV S/c line
10	1200000919	Maski Renewable Energy Pvt. Ltd. (Madhopura Wind Farm)	24.11.17	Jaisalmer, Rajasthan	200	Wind		Madhopura Wind Farm - Fatehgarh Pooling Station 220kV S/c line		Madhopura Wind Farm - Bhadla Pooling Station 220kV S/c line
11	1200001123	Adani Renewable Energy Park Rajasthan Ltd.	17.04.18	Jaisalmer, Rajasthan	500 (Sought at 400kV)	Solar Park Developer	Fatehgarh	AREPL Solar Farm - Fatehgarh Pooling	Bhadla	AREPL Solar Farm - Bhadla Pooling Station 400kV S/c line

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
							<ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh 	Station 400kV S/c line	(Under Implementation)	
12	1200000751	Greenko Solar Energy Pvt. Ltd. (Parewar solar Farm)	30.05.17	Jaisalmer, Rajasthan	500 (Sought at 400kV)	Solar	<ul style="list-style-type: none"> Fatehgarh-Bhadla 765kV D/c line to be operated at 400kV 	Parewar Solar Farm - Fatehgarh Pooling Station 400kV S/c line		Parewar Solar Farm - Bhadla Pooling Station 400kV S/c line
Connectivity Applications at Bhinmal										
13	1200000859	Azure Power India Pvt. Ltd. (Khanpur Solar Park)	20.09.17	Jalore, Rajasthan	100	Solar	Bhinmal	Khanpur Solar Park – Bhinmal Substation 220kV S/c line	Bhinmal (New) <ul style="list-style-type: none"> Establishment of 400/220 kV, 1x 500 MVA Pooling Station at Bhinmal (New) 	Khanpur Solar Park – Bhinmal (New) Substation 220kV S/c line
14	1200000865	Orange Saundatti Wind Power Pvt. Ltd.	05.10.17	Jalore, Rajasthan	300	Wind		Orange Saundatti GS – Bhinmal Substation 220kV S/c line		Orange Saundatti GS – Bhinmal (New) Substation 220kV S/c line

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
15	1200000874	Azure Power India Pvt. Ltd. (Khanpur Solar Park)	20.10.17	Jalore, Rajasthan	50	Solar		Khanpur Solar Park – Bhinmal Substation 220kV S/c line	<ul style="list-style-type: none"> LILO of Kankroli – Zerda 400kV S/c at Bhinmal (New) 	Khanpur Solar Park – Bhinmal (New) Substation 220kV S/c line
Connectivity Applications at Jaisalmer										
16	1200000781	Clean Wind Power (Jaisalmer) Pvt. Ltd. (Sadrasar Wind Farm)	20.06.17	Jaisalmer, Rajasthan	300	Wind	Fatehgarh <ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level) Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay Fatehgarh-Bhadla765kV 	Sadrasar Wind Farm.- Fatehgarh 220 kV S/c line	Parewar (New) <ul style="list-style-type: none"> Establishment of 400/220 kV, 1x 500 MVA Pooling Station at Parewar Fatehgarh-Parewar 765 kV D/c(Initially charged at 400 kV) 	Sadrasar Wind Farm - Parewar 220 kV S/c line

Sl. No	Application No.	Applicant	Date of Application	Location	Connectivity Sought (MW)	Nature of Applicant	Proposed Primary location for Connectivity/Tr. System under ISTS	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
							D/c line to be operated at 400kV			
Connectivity Applications at Jalandhar										
17	1200000838	Azure Power India Pvt. Ltd.	08.09.17	Kartarpur, Punjab	100	Solar	Jalandhar	Azure Power GS – Jalandhar S/s 220kV S/c	Amritsar	Azure Power GS Amritsar 220 kV S/c
Connectivity Applications at Kankroli										
18	1200000861	Azure Power India Private Limited (Solar Park)	22.09.17	Kankroli, Rajasthan	100	Solar	Kankroli	Azure Power GS – Kankroli S/s 220kV S/c	Chittorgarh(PG) <ul style="list-style-type: none"> Installation of 1x500MVA, 400/220kV ICT at Chittorgarh (PG) 	Azure Power GS – Chittorgarh(PG) S/s 220kV S/c

2. Stage-I Applications agreed for grant in 13th LTA/Connectivity meeting of NR:

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
Connectivity applications near Bhadla										
1.	1200001306	Acme Solar Holdings Ltd. (Acme Bhadla Solar Power Plant)	Jodhpur, Rajasthan	25.05.2018	250	Solar	Bhadla (Under Implementation)	Acme Bhadla Solar Power Plant – Bhadla 220kV S/c line	Fatehgarh <ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level) Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay 	Acme Bhadla Solar Power Plant – Fatehgarh 220kV S/c line
2.	1200001312	Eden Renewable Cite Pvt. Ltd.	Jodhpur, Rajasthan	28.05.2018	250	Solar		Eden Renewable – Bhadla 220kV S/c line		Eden Renewable – Fatehgarh 220kV S/c line
3.	1200001370	Mahoba Solar (UP) Pvt. Ltd.	Jodhpur, Rajasthan	02.06.2018	300	Solar		Mahoba Solar – Bhadla 220kV S/c line		Mahoba Solar – Fatehgarh 220kV S/c line

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
4.	1200001471	Tata Power Renewable Energy Ltd. (TPREL)	Jaisalmer, Rajasthan	28.06.2018	500	Solar		TPREL 500MW Solar Power Project – Bhadla 220kV D/c line	<ul style="list-style-type: none"> Fatehgarh-Bhadla765kV D/c line to be operated at 400kV 	TPREL 500MW Solar Power Project – Fatehgarh 220kV D/c line
Connectivity applications near Bikaner										
5.	1200001308	Acme Solar Holdings Ltd.	Bikaner, Rajasthan	25.05.2018	250 (Sought at 400kV)	Solar	Bikaner (Under Implementation)	Acme Noorsar & Lalsar Solar Power Plant – Bikaner 400kV S/c line	Bikaner-II (New) Bikaner-II(New)-Bikaner(Existing) 400 kV D/c	Acme Noorsar & Lalsar Solar Power Plant – Bikaner-II(New) 400 kV S/c line
6.	1200001309	Acme Solar Holdings Ltd.	Bikaner, Rajasthan	25.05.2018	250 (Sought at 400kV)	Solar		ReNew Solar – Bikaner 400kV S/c line		ReNew Solar – Bikaner-II(New) 400 kV S/c line
7.	1200001431	ReNew Solar Power Pvt. Ltd.	Bikaner, Rajasthan	09.06.2018	500 (Sought at 400kV)	Solar				

3. Stage-I Applications agreed for grant in 14th LTA/Connectivity meeting of NR:

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity	
Connectivity applications near Bhadla											
1.	1200001516	Hero Solar Energy Pvt. Ltd.	Jodhpur, Rajasthan	11.07.2018	250	Solar		Hero Solar Energy Pvt. Ltd. – Bhadla 220kV S/c line	Fatehgarh • 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level)	Hero Solar Energy Pvt. Ltd. – Fatehgarh 220kV S/c line	
2.	1200001519	Mahindra Susten Pvt. Ltd.	Jodhpur, Rajasthan	13.07.2018	250	Solar	Bhadla (Under Implementation)	Mahindra Susten Pvt. Ltd. 250 MW Solar Project – Bhadla 220kV S/c line	• Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay	Mahindra Susten Pvt. Ltd. 250 MW Solar Project – Fatehgarh 220kV S/c line	
3.	1200001533	Giriraj Renewables Pvt. Ltd.	Jodhpur, Rajasthan	17.07.2018	600	Solar		Giriraj Renewables Pvt. Ltd Solar PV Project– Bhadla 220kV D/c line		• Fatehgarh-Bhadla765kV D/c line initially to be operated at 400kV	Giriraj Renewables Pvt. Ltd Solar PV Project – Fatehgarh 220kV D/c line
Connectivity applications near Bikaner											

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
4.	1200001528	Hero Solar Energy Pvt. Ltd.	Bikaner, Rajasthan	13.07.2018	500 (Sought at 400 KV)	Solar	Bikaner (Under Implementation)	Hero Solar Energy Pvt. Ltd. – Bikaner 400kV S/c line	Bikaner-II (New) 400 kV Bikaner-II(New) S/s	Hero Solar Energy Pvt. Ltd. – Bikaner-II(New) 400 kV S/c line
5.	1200001536	SBE Renewables Ten Private Limited	Bikaner, Rajasthan	20.07.2018	1100 (Sought at 400 KV)	Solar		SB Bikaner Rajasthan Power Project - Bikaner 400kV S/c line (suitable to carry at least 1100 MW at nominal voltage)		Bikaner-II(New)-Bikaner(Under Implementation) 400 kV D/c(Quad Moose) line
6.	1200001550	Azure Power India Private Limited	Bikaner, Rajasthan	23.07.2018	500	Solar		Common pooling point of Azure Bikaner 500 MW Power Project and Azure Bikaner 500 MW Solar Park – Bikaner 400kV S/c line(suitable to carry atleast 1000 MW at nominal voltage)	Bikaner-II (New) 400 kV S/c line(suitable to carry atleast 1000 MW at nominal voltage)	Common pooling point of Azure Bikaner 500 MW Power Project and Azure Bikaner 500 MW Solar Park – Bikaner-II(New)
7.	1200001570	Azure Power India Private Limited	Bikaner, Rajasthan	24.07.2018	500	Solar		(It was agreed to pool power at common pooling station by Azure and connect it with Bikaner S/s through 400kV S/c line)		(It was agreed to pool power at common pooling station by Azure and connect it with Bikaner-II(New) S/s through 400kV S/c line)

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
Connectivity applications near Fatehgarh										
8.	1200001495	Giriraj Renewables Pvt. Ltd.	Jaisalmer, Rajasthan	09.07.2018	600	Solar	Fatehgarh <ul style="list-style-type: none"> 400kV Pooling Station at Fatehgarh (with a provision to include 220kV level) Installation of 1x500MVA, 400/220kV transformer at Fatehgarh Pooling Station along with Bus Coupler and transformer bay Fatehgarh-Bhadla 765kV D/c line initially to be operated at 400kV 	Giriraj Renewables Pvt. Ltd. Solar PV Project – Fatehgarh 220kV D/c line	Fatehgarh – II (New) <ul style="list-style-type: none"> Establishment of 400/220 kV, 1x 500 MVA Pooling Station at Fatehgarh – II (New) Fatehgarh – Fatehgarh – II(New) 400kV D/c(Quad) line 	Giriraj Renewables Pvt. Ltd. Solar PV Project – Fatehgarh – II (New) 220kV D/c line
9.	1200001543	ACME Solar Holdings Limited	Jaisalmer, Rajasthan	19.07.2018	300	Solar		Common pooling point of ACME Fatehgarh-I Solar Power Plant and ACME Fatehgarh-II Solar Power Plant - Fatehgarh 400 kV S/c line (It was agreed to pool power at common pooling station by ACME and connect it with Fatehgarh S/s)		Common pooling point of ACME Fatehgarh-I Solar Power Plant and ACME Fatehgarh-II Solar Power Plant - Fatehgarh – II (New) 400 kV S/c line (It was agreed to pool power at common pooling station by ACME and connect it with Fatehgarh S/s)
10.	1200001546	ACME Solar Holdings Limited	Jaisalmer, Rajasthan	19.07.2018	300	Solar		through 400kV S/c line, which has also been confirmed by applicant vide letter no.ACME/BUS/2008 18/1315 dated 20/08/18)		through 400kV S/c line, which has also been confirmed by applicant vide letter no.ACME/BUS/200818/ 1315 dated 20/08/18)

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
11.	1200001581	SB Energy Six Private Limited	Jaisalmer, Rajasthan	30.07.2018	2000 (Sought at 400 kV)	Solar		SB Fatehgarh Rajasthan Power Project – Fatehgarh 400 kV D/c line (suitable to carry at least 2000 MW at nominal voltage)		SB Fatehgarh Rajasthan Power Project – Fatehgarh – II (New) 400 kV D/c line (suitable to carry at least 2000 MW at nominal voltage)
12.	1200001612	Tata Power Renewable Energy Limited(TPREL)	Jaisalmer, Rajasthan	31.07.2018	500	Solar		TPREL 500 MW Solar Power Project Pokhran – Fatehgarh 220kV D/c line		TPREL 500 MW Solar Power Project Pokhran – Fatehgarh – II (New) 220kV D/c line
Connectivity applications near Bhinmal										
13.	1200001489	AT Capital Advisory India Private Limited	Bhinmal, Rajasthan	06.07.2018	300	Solar		Bhinmal Solar Project – Bhinmal 220kV S/c line	Bhinmal (New) • Establishment of 400/220 kV, 1x 500 MVA Pooling Station at Bhinmal (New)	Bhinmal Solar Project – Bhinmal (New) Substation 220kV S/c
14.	1200001527	Hero Solar Energy Private Limited	Jalore, Rajasthan	13.07.2018	300 (revised from 200)	Solar	Bhinmal	Hero Solar Energy Private limited – Bhinmal 220kV S/c line		Hero Solar Energy Private Limited – Bhinmal (New) Substation 220kV S/c line

Sl. No.	Application No.	Applicant	Location	Date of Application	Connectivity Sought (MW)	Nature of Applicant	Proposed primary location for Connectivity	Dedicated Tr. System	Proposed Alternative location for Connectivity / Tr. System under ISTS	Dedicated Tr. System for alternative connectivity
15.	1200001591	Aditya Birla Renewables Limited	Jalore, Rajasthan	27.07.2018	200	Solar		Aditya Birla Renewables Limited (Bhinmal) – Bhinmal 220kV S/c line	<ul style="list-style-type: none"> LILO of Kankroli – Zerda 400kV S/c at Bhinmal (New) 	Aditya Birla Renewables Limited (Bhinmal) – Bhinmal (New) Substation 220kV S/c line

Annexure-VI**Connectivity transmission system for grant of Stage-II Connectivity agreed for grant in the 13th Connectivity/LTA meeting of NR held on 11/07/2018:****Table: 1**

Sl. No.	Application No.	Applicant	Location	Start Date	Quantum of Stage-I Sought (MW)	Stage-II Connectivity Sought (MW)/ Start date	Quantum won in SECI/State bids (MW)	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
Connectivity applications near Bikaner									
1.	1200001432	ReNew Solar Power Pvt. Ltd.	Bikaner, Rajasthan	30.11.2019	500	250	MSEDCL 250	Bikaner	ReNew Solar – Bikaner 400kV S/c line
Connectivity applications near Bhadla									
2.	1200001443	Mahoba Solar (UP) Pvt. Ltd.	Jodhpur, Rajasthan	01.07.2019	300	200	MSEDCL 200	Bhadla	Mahoba Solar – Bhadla 220kV S/c line

Connectivity transmission system for grant of Stage-II Connectivity agreed for grant in the 14th Connectivity/LTA meeting of NR held on 17/08/2018:**Table: 2**

Sl. No.	Application No.	Applicant	Location	Start Date	Quantum of Stage-I Sought/Granted (MW)	Stage-II Connectivity Sought (MW)/Start date	Quantum won in SECI/State bids (MW)	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
Connectivity applications near Bhadla									
1.	1200001494	ACME Solar Holdings Limited	Jodhpur, Rajasthan	16.09.19	250	250 (16/09/19)	MSEDCL 250	Bhadla	ACME Bhadla Solar Power Plant– Bhadla 220kV S/c line
2.	1200001498	Tata Power Renewable Energy Limited	Jodhpur, Rajasthan	01.08.19	500	150 (revised to 01/08/19 from 01/04/19)	MSEDCL 150	Bhadla	TPREL 500 MW Solar Power Project Chhayana – Bhadla 220kV S/c line
3.	1200001551	Azure Power India Private Limited	Jodhpur, Rajasthan	30.08.19	500	130 (revised to 30/08/19 from 31/08/18)	MSEDCL 130	Bhadla	Azure Power India Private Limited – Bhadla 220kV S/c line

Sl. No.	Application No.	Applicant	Location	Start Date	Quantum of Stage-I Sought/Granted (MW)	Stage-II Connectivity Sought (MW)/Start date	Quantum won in SECI/ State bids (MW)	Proposed location for Grant of Stage-II Connectivity	Dedicated Tr. System
4.	1200001600	Azure Power India Private Limited	Bhadla, Rajasthan	15.10.20	500	250 (revised to 15/10/20 from 01/09/18)	Land & Auditor Certificate basis	Bhadla	AZURE Solar PV Plant Bhadla 2 – Bhadla 220 kV S/c line.
5.	1200001601	Azure Power India Private Limited	Bhadla, Rajasthan	15.10.20	500	300 (revised to 15/10/20 from 01/09/18)	Land & Auditor Certificate basis	Bhadla	AZURE Solar PV Plant Bhadla – Bhadla 220 kV S/c line.
6.	1200001575	Hero Solar Energy Private Limited	Jodhpur, Rajasthan	30.06.20	250	250 (30/06/20)	SECI 250	Bhadla	Hero Solar Energy Private Limited – Bhadla 220kV S/c line
Connectivity applications near Fatehgarh									
7.	1200001602	ACME Solar Holdings Limited	Jaisalmer, Rajasthan	19.10.20	300	300 (19/10/20)	SECI 300	Fatehgarh	Common pooling point of ACME Fatehgarh I Solar Power Plant & ACME Fatehgarh II Solar Power Plant – Fatehgarh 400 kV S/c line(It was agreed to pool power at common pooling station by ACME and connect it with Fatehgarh S/s through 400kV S/c line)
8.	1200001603	ACME Solar Holdings Limited	Jaisalmer, Rajasthan	19.10.20	300	300 (19/10/20)	SECI 300	Fatehgarh	
Connectivity applications near Bikaner									
9.	1200001572	Azure Power India Private Limited	Bikaner, Rajasthan	15.10.20	500	300 (revised to 15/10/20 from 01/09/18)	SECI 300	Bikaner	Common pooling point of both Azure Bikaner 500 MW projects - Bikaner 400kV S/c line (It is agreed to pool power at common pooling station and connect it with Bikaner S/s through 400kV S/c line)
10.	1200001573	Azure Power India Private Limited	Bikaner, Rajasthan	15.10.20	500	300 (revised to 15/10/20 from 01/09/18)	SECI 300	Bikaner	

Minutes of the meeting of the Sub-committee for providing ISTS connectivity to Renewable Energy (Solar/wind) Power Plants held in POWERGRID office, Sec-29 Gurgaon on 18.07.18.

A meeting of the sub-committee formed by MNRE to identify ISTS connectivity to Renewable Energy (Wind/Solar) Power Plants was held in POWERGRID office, Sec-29 Gurgaon on 18.07.18 at 3:00 PM. The list of participants is at Annexure-A.

Earlier, in the meeting chaired by Hon'ble MOS (Power & NRE) held on 16.07.18 at MNRE, a presentation was made for integration of additional 50 GW solar capacity as well as 16.5 GW wind capacity by POWERGRID & CEA. The estimated cost for transmission system for Solar Capacity (50 GW) & wind capacity (16.5 GW) is about Rs 36,100 Cr and Rs 8,500 Cr respectively. For Solar capacity addition of 50 GW, transmission tariff for the evolved system is about 82 paise/unit. However for Wind Capacity addition plan of 16.5 GW, transmission tariff for the evolved system is about 43 paise/unit. It was also mentioned that as Solar capacity is being planned to be enhanced mainly in Rajasthan & Gujarat, where new ISTS needs to be developed, therefore cost of transmission for Solar is relatively higher in these zones.

It was also informed that transmission system development takes around 3-4 years time therefore to match with gestation period of RE, it is prudent to finalise and take up implementation of the transmission system in advance.

Further, it was decided that transmission plan for 50 GW Solar Capacity may be bifurcated in two phases based on best locations, land feasibility, economics etc. Accordingly, as per the direction of Hon'ble MOSP, this meeting of the sub-committee was convened.

SECI vide letter dated 17.07.18 (copy enclosed at Annex-I) has provided dist/taluk wise Solar capacity addition plan in ISTS in two phases i.e. Ph-I 20 GW by Dec'20 & Ph-II 30 GW by Dec'21. SECI also shared modified dist. wise Solar & Wind capacity addition plan by Ph-I (2020) i.e. 20 GW Solar & 9 GW Wind, whereas Ph-2 (2021) included 30 GW Solar & 7.5 GW Wind (Copy enclosed at Annex-II). The above RE capacity addition plan by SECI was also evolved in consultation by MNRE & developers. It was also decided that above information shall be formally submitted by SECI.

Based on the inputs, a consolidated transmission system was identified both for Solar & wind energy zones for Ph-I & 2 time frames, which may undergo changes depending upon the change in the location/quantum of RE generation addition, location of pooling stations, stakeholders discussion in SCM etc.

In the meeting held, following action points had emerged.

1. Considering Phase-I capacity addition plan for 20 GW of Solar Generation & 9 GW wind generation by 2020, total estimated Cost for consolidated transmission scheme is about Rs 19,200 Cr, there is an immediate need to undertake implementation of commensurate transmission system in next 2 years. Accordingly, the committee suggested

implementation of associated transmission system in a compressed time schedule on an urgent basis. Further, for Phase-II capacity addition plan for 30 GW of Solar Generation & 7.5 GW wind generation by 2021, total estimated Cost for consolidated transmission scheme is about Rs 24,100 Cr

2. As per the CERC regulations, in order to take up implementation of ISTS transmission system, applicant need to apply for connectivity & LTA in ISTS. Accordingly, it was suggested that to enable SECI to apply for Connectivity & LTA, CERC may provide enabling provision in the prevailing regulations.
3. Transmission investment in ISTS is recovered through POC mechanism as per CERC tariff regulation. As per the recent discussion in regional Standing committee, LTA/connectivity meetings, DICs have expressed their concerns in sharing of transmission charges on account of transmission addition for RE capacity in ISTS. Accordingly, it was suggested that suitable financing mechanism through grant/funding for transmission may be facilitated by MNRE.
4. In order to reduce burden of transmission tariff on DICs, it was suggested that suitable mode of financing may be evolved. Accordingly, funding mechanism proposed is as under: :
 - a. Entire quantum say 65 lakhs/MW may be taken from the generation developer as upfront payment towards transmission investment. In that case, transmission O&M charges may be included in the POC pool for which CERC regulatory approval is required
 - b. Some % of fund say Rs 50 lakhs/MW may be taken from the RE generation developer as upfront payment towards transmission investment. For balance investment say Rs 15 Lakh/MW as well as O&M charges for entire investment through POC pool, CERC regulatory approval is required to be obtained.
5. It was discussed that Transmission is a lumpy element. For example if a 765kV corridor is being developed which can facilitate transfer of 3500-4000 MW power and bidding is carried out only for 2000 MW, how to ensure amount of upfront payment is realized for total power transfer requirement for development by transmission implementation agency. Therefore bidding strategy must take care of above aspect as well.
6. It was also suggested that site specific RE generation bidding may be carried out in accordance with the transmission plan instead of anywhere in India basis. Accordingly, to facilitate development of the transmission system, decisions are solicited on following aspects from the competent authority:

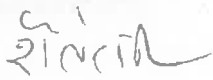
- a. Amount of upfront payment from the RE generation developers at the time of bidding and grant from Government
- b. Finalization of transmission system implementation mode & transmission implementation agency i.e. TBCB or RTM
- c. Site specific bidding for RE generation addition in accordance to the above transmission plan
- d. CERC to expedite enabling provision in connectivity regulations so that SECI can apply for Connectivity & LTA



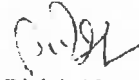
(Sh. Ravinder Gupta)



(Dr. Subir Sen)



(Sh. S.K. Mishra)



(Sh. Girish Kumar)

Annexure-A

List of Participants

S. No.	Name	Designation	Organization
1	Sh. Ravinder Gupta	Chief Engineer (PSP&A-I)	CEA
2	Dr. Subir Sen	COO (CTU-Plg & SG)	POWERGRID
3	Sh. S.K. Mishra	Director	SECI
4	Sh. Girish Kumar	Director/Coordinator	MNRE
5	Sh. Kashish Bhambhani	Chief Manager (SG)	POWERGRID



सोलर एनर्जी कॉर्पोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
Solar Energy Corporation of India Ltd.
(A Government of India Enterprise)

स्वच्छ भारत - स्वच्छ ऊर्जा

SECI/PS/CTU/ 23180

Dated: 17.07.2018

To,

Dr. Subir Sen,
Chief Operating Officer, Central Transmission Utility
Powergrid Corporation of India Limited
Saudamini, Plot No.2, Sector 29, Near IFFCO Chowk,
Gurgaon (Haryana) – 122001

Sub: Regarding details of evacuation infrastructure at CTU substations for ISTS-connected Solar PV projects

Ref: SECI/PS/CTU/CEA/SPD/2305 dated 06/07/2018

Dear Sir,

With reference to the state-wise list of pockets with cumulative capacity of 50 GW envisaged for Phase-I of evacuation infrastructure plan provided vide Ref 1., please find enclosed proposed tentative phasing of the same in line with the tendering plan of SECI Schemes for Solar and Hybrid projects over the planning period till year 2021. It is estimated that the cost of erecting transmission line shall be in the range of 90 lakhs per MW in case of Rajasthan and Gujarat while it is approx. 30-40 lakhs per MW in the case of other states. In order that the project costs are averaged out in the tariffs, the proposed evacuation capacity has been distributed over the states in proportion to the planned tendering capacities. However, the CTU may alter the same with an overall objective to keeping the average evacuation costs in the range of 60-70 lakhs per MW so as to deter significant variations in tariffs over the different tendering processes. It is further reiterated that the proposed locations have been shared with the respective SNAs and changes, if any, shall be communicated.

Additional 5 GW evacuation capacity for Wind Power is proposed to come up in High priority Wind zones for ISTS as identified in the Powergrid's Green Energy Corridor Report for Transmission Scheme for Wind Energy Zones and are enclosed herewith.

Thanking you,

Yours faithfully,


(S. K. Mishra)

Director (Power System)

Copy to:

(i) Sh. Girish Kumar, Scientist E, MNRE, Block 14, CGO Complex, Lodhi Road, New Delhi- 110003

Identified Solar Energy Zones & envisaged capacity (SECI Tendering Plan) by 2021

District	Taluk	Capacity (GW)	Envisaged in Phase-I	Phase I Breakup	
				2020	2021
Rajasthan					
Bikaner	Bikaner	10	4	1.5	2.5
Barmer	Barmer	15	5	2	3
Jaisalmer	Jaisalmer	15	8	3	5
Jodhpur	Phalodi	5	3	1.5	1.5
Churu	Sujangarh, Ratangarh	5	0	0	0
Total		50	20	8	12
					0
Gujarat					
Banaskantha	between Vav and Tharad	5	2.5	1	1.5
Patan	Santhalpur	5	0	0	0
Kacchh	Rapar	10	5	2	3
Jamnagar	Lalpur	5	2.5	1	1.5
Total		25	10	4	6
					0
Karnataka					
Gadag	Sirhatti	5	2.5	1	1.5
Bidar		5	2.5	1	1.5
Total		10	5	2	3
					0
Telangana					
Narayankhed		5	0	0	0
Total		5	0	0	0
				0	0
Andhra Pradesh					
Ananthapuram	Uravakonda	5	2.5	1	1.5
Kurnool	Gooty	5	2.5	1	1.5
Total		10	5	2	3
					0
Tamil Nadu					
Tutthokodi	Kovilpatti	5	0	0	0
Karur	Kulittalai	5	0	0	0
Total		10	0	0	0
					0
Maharashtra					
Solapur	Mohol	5	2.5	1	1.5
Wardha		5	2.5	1	1.5
Yavatmal		5	0	0	0
Total		15	5	2	3
					0
Madhya Pradesh					
Bina		5	0	0	0
Rajgarh		5	2.5	1	1.5
Dhar		5	0	0	0
Khandwa		5	2.5	1	1.5
Total		20	5	2	3
					0
Himachal Pradesh					
Kaza		1	0	0	0
Total		1	0	0	0
					0
Total		146	50	20	30

Identified Wind Energy Zones & envisaged capacity by 2022 (Green Energy Corridor Report, Powergrid)			
District	Envisaged in Phase-I	Phase I Break up	
		2020	2021
Andhra Pradesh			
Kurnool	3	1.5	1.5
Total	3	1.5	1.5
Gujarat			
Devabhumi Dwarka	2	1	1
Total	2	1	1
Total	5	2.5	2.5

Solar Energy Zone(SEZ)					Wind Energy Zone(WEZ)				
State/District	Taluk/Tehsil	Ph-1 2020 (GW)	Ph-2 2021 (GW)	Total (GW)	State/District	Ph-1 2020 (GW)	Ph-2 2021 (GW)	Total (GW)	
Rajasthan					Tamil Nadu				
Jaisalmer	Banigarh	2.5	1.5	4	Karur	1.5	1	2.5	
	Fatehgadh	2.5	1.5	4	Tirunelveli	0	0.5	0.5	
Jodhpur	Phalodi	2	1	3					
Bikaner	Kovalat / Pugal	3	1	4					
Barmer	Barmer	0	5	5					
Subtotal		10	10	20	Subtotal	1.5	1.5	3	
Andhra Pradesh					Andhra Pradesh				
Kurnoor	Goity	2.5	0	2.5	Kurnoor	2	1	3	
Anantapuram	Urvakonda	0	2.5	2.5					
Subtotal		2.5	2.5	5	Subtotal	2	1	3	
Karnataka					Karnataka				
Gadag		0	2.5	2.5	Koppal	2.5	0	2.5	
Bidar		0	2.5	2.5					
Subtotal		0	5	5	Subtotal	2.5	0	2.5	
Gujarat					Gujarat				
Kutch	Rapar	3	2	5	Kutch	Bhuj	0	2	2
Banaskantha	Vav / Tharad	0	2.5	2.5		Lakshya	2	0	2
Jamnagar	Lalpur	1	1.5	2.5	Dwarka		1	1	2
Subtotal		4	6	10	Subtotal	3	3	6	
Maharashtra					Maharashtra				
Solapur		1	1.5	2.5	Osmanabad	0	2	2	
Wardha		0	2.5	2.5					
Subtotal		1	4	5	Subtotal	0	2	2	
Madhya Pradesh					Madhya Pradesh				
Rajgarh		2.5	0	2.5					
Khandwa		0	2.5	2.5					
Subtotal		2.5	2.5	5					
Total		20	30	50	Total	9	7.5	16.5	

Transmission scheme for Renewable Energy Zones (REZs)

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. Recently Govt. of India scaled up its renewable target to 227GW by 2022 comprising 113.5GW Solar, 66.6 GW Wind, 31GW from floating solar & off shore wind and balance is from SHP & Biomass (Out of which, 49.5GW solar & 46.6GW wind is already commissioned/pipeline in different stages).

To plan transmission scheme for envisaged Renewable (wind/Solar) energy zones (REZs) comprising Wind, Solar or both the resources, pockets/ complexes are identified based on inputs from various state agencies in consultation with MNRE. Based on inputs, solar (50GW) and wind (16.5GW) generation is envisaged in seven (7) RE rich states i.e. Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Maharashtra, Rajasthan and Madhya Pradesh.

Most of the wind and solar pockets are located in different complexes in above states. However, some of complexes/ pockets are common for both Wind & Solar (Hybrid) resources say for Kurnool in Andhra Pradesh, Kutch & Dwarka/Jamnagar in Gujarat for which common transmission scheme is identified.

Gestation period of RE project is short in comparison to development of its transmission facilities, therefore transmission implementation need to be taken up in advance so that it can match with renewable generation.

A) Transmission system to facilitate evacuation from potential Solar Energy Zones: 50,000 MW

To plan transmission scheme for envisaged solar generation, Solar potential zones in various districts of six (6) RE rich states were identified by SECI in association with MNRE for 50 GW quantum. The information was finalized by SECI in consultation with Solar Power developers & MNRE.

Details of prioritized SEZs (50,000 MW) in two phases i.e. 2020 & 2021 as under:

State/District	Taluk/Tehsil	Ph-1(GW)	Ph-2(GW)	Total
		2020	2021	
Rajasthan				
Jaisalmer	Ramgarh	2.5	1.5	4
	Fatehgarh	2.5	1.5	4
Jodhpur	Phalodi	2	1	3
Bikaner	Koyalat /Pugal	3	1	4
Barmer	Barmer	0	5	5
Subtotal		10	10	20
Andhra Pradesh				
Kurnool	Gooty	2.5	0	2.5

State/District	Taluk/Tehsil	Ph-1(GW)		Total
		2020	2021	
Ananthpuram	Urvakonda	0	2.5	2.5
Subtotal		2.5	2.5	5
Karnataka				
Gadag		0	2.5	2.5
Bidar		0	2.5	2.5
Subtotal		0	5	5
Gujarat				
Kutch	Rapar	3	2	5
Banaskantha	Vav /Tharad	0	2.5	2.5
Jamnagar	Lalpur	1	1.5	2.5
Subtotal		4	6	10
Maharashtra				
Solapur		1	1.5	2.5
Wardha		0	2.5	2.5
Subtotal		1	4	5
Madhya Pradesh				
Rajgarh		2.5	0	2.5
Khandwa		0	2.5	2.5
Subtotal		2.5	2.5	5
Total		20	30	50

B) Transmission system to facilitate evacuation from potential Wind Energy Zones: 16,500 MW

In order to identify wind potential rich pockets, an exercise was conducted with MNRE, National institute of Wind Energy (NIWE), STUs, State Nodal Agency of wind resource rich states, POWERGRID and wind developers/IPPs.

Based on various inputs like district wise NIWE potential, SNA developable potential, pooling station wise wind capacity sanctioned by STU, RE applications received in ISTS by CTU & detailed discussion with MNRE, wind IPPs/developers, prioritized wind energy zones (WEZ) along with its quantum were identified, which may come up by 2022 in wind resource rich states. Subsequently, based on bidding timeline, SECI provided phasing details of prioritized WEZs (16,500 MW) in two phases i.e. 2020 & 2021 as under:

State/District	Taluk/Tehsil	Ph-1 GW (2020)	Ph-2 GW (2021)	Total(GW)
Tamil Nadu				
Karur		1.5	1	2.5
Tirunelveli		-	0.5	0.5
Subtotal		1.5	1.5	3
Andhra Pradesh				
Kurnool		2	1	3
Subtotal		2	1	3
Karnataka				
Koppal		2.5	-	2.5
Subtotal		2.5	-	2.5
Gujarat				
Kutch	Bhuj	-	2	2
	Lakadiya	2	-	2
Dwarka		1	1	2
Subtotal		3	3	6
Maharashtra				
Osmanabad		-	2	2
Subtotal		-	2	2
Total		9	7.5	16.5

C) Study Assumptions

1. Considering envisaged RE (wind & solar) capacity addition and to achieve Load-generation balance, Thermal generation dispatch is reduced upto 50% of total Installed capacity. At some of the locations, thermal generation is even needed to be backed down.
2. Solar & wind generation dispatch is considered as 80% & 70% (except for Rajasthan wind dispatch as 40% due to complementary pattern)
3. All India Demand is considered as per the 19th EPS of CEA
4. Long term RPO trajectory for Solar & non-solar for 2021-22 is considered as per MOP order dated 14.06.18
5. Transmission system is proposed considering forming a ring for RE complexes

D) Proposed Inter State Transmission Scheme for Wind & Solar Energy Zones

Comprehensive transmission system for Solar & Wind Energy Zones in two phases (2020 & 2021) is evolved as under:

Phase-I Solar & Wind Energy Zone Transmission Schemes:

1. Composite transmission scheme for Solar Energy Zone in Rajasthan(10,000 MW)

Jaisalmer 5GW (Ramgarh 2.5GW, Fatehgarh 2.5GW), Jodhpur (2GW) & Bikaner (3GW)

- Establishment of 400/220kV 5x500 MVA pooling station (RE PP1) at suitable location in Jaisalmer Distt (near Ramgarh/Kuchheri)
- Establishment of 765/400/220kV 4x1500 MVA, 5x500 MVA pooling station (RE PP2) at suitable location in Jaisalmer Distt (near Fatehgarh)
- Establishment of 765/400/220kV 2x1500 MVA, 4x500 MVA pooling station (RE PP3) at suitable location in Jodhpur Distt (between Phalodi & Osian)
- Establishment of 400/220kV, 6x500 MVA pooling station (RE PP4) at suitable location in Bikaner Distt (between Pugal & Kolayat)
- Establishment of 765/400kV, 2x1500 MVA substation at suitable location near Sikar (new)
- Sikar (New)– Jhatikara 765 kV D/c Line
- Sikar (New)– Sikar (PG) 400 kV D/c Line
- RE PP1 (near Ramgarh) – RE PP2 (near Fatehgarh) 400 kV D/c Line (Twin HTLS on M/c tower)
- LILO of both ckts of 765 kV Fatehgarh (TBCB) – Bhadla (PG) D/c line at RE PP2 (near Fatehgarh) (Charged at 400kV)
- Charging of Fatehgarh PP2 to Bhadla section at 765kV level
- RE PP1 (near Ramgarh) – Jaisalmer -2 (RVPN) 400 kV D/c Line (Twin HTLS)
- RE PP2 (near Fatehgarh) – RE PP3 (near Osian) 765 kV D/c Line
- RE PP3 (near Osian) – Ajmer (PG) 765 kV D/c Line
- RE PP3 (near Osian) –Jodhpur (new) [RVPN] 400 kV D/c Line (Twin HTLS)
- Ajmer – Bhiwani 765kV D/c line
- RE PP4 (near Bikaner) - Sikar (New) 400 kV 2xD/c Line (Twin HTLS on M/c tower)
- LILO of one ckt of 400kV Bikaner (RVPN) – Sikar(PG) D/c line at RE PP4 (near Bikaner)
- 220kV line bays for interconnection of solar projects (35 nos)
- Augmentation of 765/400KV & 400/220kV Transformation capacity at various substations
- Associated Reactive compensation

Estimated Cost : Rs 9180 Cr.

2. Composite scheme for Solar & Wind Energy Zone in Andhra Pradesh(4500 MW)

Kurnool HEZ (4500MW:2500 MW Solar & 2000 MW Wind), AP

- Establishment of 765/400/220kV 3x1500 MVA, 9x500 MVA Pooling station at suitable location in Kurnool Distt
- Kurnool PS - Kurnool(new) 765 kV D/c Line-100km
- Kurnool PS-Maheshwaram(PG) 765 kV D/c Line-250km
- 220kV line bays for interconnection of wind projects (15 nos)
- 1x330 MVAr (765kV) & 1x125MVAr (400kV) bus reactor at Kurnool PS

- 240 MVar Switchable line reactors at both ends of Kurnool PS – Maheshwaram(PG) 765 kV D/c Line

Estimated Cost: Rs 2730 Cr

3. Wind Energy Zone in Karnataka (2500 MW)

Koppal WEZ (2500MW), Karnataka

- Establishment of 400/220 kV 5x500 MVA pooling Substation in a suitable location in Koppal distt.
- Koppal PS - Munirabad 400 kV D/c (HTLS) Line-50 km
- Koppal PS - Narendra (New) 400 kV D/c (HTLS) Line-125 km
- 220kV line bays for interconnection of wind projects (8 nos)
- 1x125 MVar bus reactor at Koppal PS

Estimated Cost: Rs 730 Cr

4. Wind Energy Zone in Tamil Nadu(1500 MW)

Karur WEZ (1500MW), Tamil Nadu

- Establishment of 3x500 MVA, 400/230 kV Karur Pooling Station
- LILO of Pugalur - Pugalur(HVDC) 400 kV D/c (Quad) line at Karur PS(50 km)
- 230kV line bays for interconnection of wind projects (5 nos)
- 1x125 MVar Bus reactor at Karur PS

Estimated Cost: Rs 450 Cr

5. Composite scheme for Solar & Wind Energy Zone in Gujarat (7000 MW)

(a) Kutch 5000 MW (Rapar SEZ 3000 MW and Lakadiya WEZ 2000 GW)

- Establishment of 4x1500MVA & 10x500MVA, 765/400kV/220kV at Lakadia PS
- Lakadia – Vadodara 765kV D/c line ~350km
- Lakadia PS – Banaskantha PS 765kV D/c line - 200 km
- LILO of Bhachau – EPGL 400kV D/c (triple) line (both ckt) at Lakadia PS - 2X50 km
- 220kV line bays for interconnection of wind & solar projects (17 nos)
- 1x330MVar, 765kV Bus reactor & 1x125MVar, 420kV Bus reactor at Lakadia PS & line reactive compensation

Estimated Cost: 4465 Cr

(b) Jamnagar SEZ 1000 MW & Dwarka WEZ 1000 MW

- Establishment of 4x500MVA, 400/220kV Jam Khambhaliya PS (GIS) (near Jamnagar and Dwarka district border)

- Extension of Essar – Lakadia/Bhachau 400kV D/c (triple) line upto Jam Khambhaliya PS -40 km
- 220kV line bays for interconnection of wind & solar projects - 7 nos
- 1X125 MVAR, 420 kV Bus Reactor at Jam Khambhaliya PS (GIS) & line reactive compensation

Estimated Cost: 480 Cr

6. Solar Energy Zone in Maharashtra (1000 MW)

Solapur 1000 MW

- Establishment of 400/220 kV, 2X500 MVA at Solapur PP (near Mohol)
- Solapur pooling point - Solapur PS 400 kV D/c line (twin HTLS) -50 km
- 220 kV line bays for interconnection of wind & solar projects(3 nos)
- 1X125 MVAR, 420 kV Bus Reactor at Solapur PP

Estimated Cost: 335 Cr

7. Solar Energy Zone in Madhya Pradesh (2500 MW)

Rajgarh 2500 MW

- Establishment of 400/220 kV, 5X500 MVA at Rajgarh PS
- Rajgarh PS -Bhopal 400 kV D/c line (HTLS) -150 km
- Rajgarh PS –Shujalpur 400 kV D/c line (HTLS) -80 km
- 220 kV line bays for interconnection of solar & wind projects (8 nos)
- 1X125 MVAR, 420 kV Bus Reactor at Rajgarh PP

Estimated Cost: 790 Cr

Total Estimated Cost for Ph-1 (29 GW): about Rs.19160 Cr.

Phase-II Solar & Wind Energy Zone Transmission Schemes:

1. Composite transmission scheme for Solar Energy Zone in Rajasthan (10,000 MW)

Jaisalmer (3 GW i.e. Ramgarh 1.5 GW, Fatehgarh- 1.5 GW), Jodhpur (1GW), Barmer (5GW) & Bikaner (1 GW) complex

- Augmentation of transformation capacity at 400/220kV 3x500 MVA pooling station (RE PP1) at suitable location in Jaisalmer Distt (near Ramgarh)
- Augmentation of transformation capacity 400/220kV, 3x500 MVA pooling station (RE PP2) at suitable location in Jaisalmer Distt (near Fatehgarh)
- Augmentation of transformation capacity 400/220kV, 2x500 MVA pooling station (RE PP3) at suitable location in Jodhpur Distt (between Phalodi & Osian)
- Augmentation of transformation capacity 400/220kV, 2x500 MVA pooling station (RE PP4) at suitable location in Bikaner Distt (between Pugal & Kolayat)
- Establishment of 765/400/220kV 4x1500 MVA, 10x500 MVA pooling station (RE PP5) at suitable location in Barmer Distt

- Establishment of 400/220kV, 2x500 MVA pooling station at suitable location near Bhinmal (new)
- RE PP1 (near Ramgarh) – RE PP2 (near Fatehgarh) 400 kV D/c Line (2nd Twin HTLS on M/c tower)
- RE PP5 (suitable location Barmer Distt) – RE PP3 (near Osian) 765kV D/c line
- RE PP5 (suitable location Barmer Distt) – Barmer (RVPN) 400 kV D/c Line
- RE PP5 (suitable location Barmer Distt) – Bhinmal (new) 400kV D/c line (Twin HTLS)
- Bhinmal (new) – Chittorgarh (PG) 400kV D/c line (Twin HTLS)
- Bhinmal (new) – Bhinmal 400kV D/c line
- Bhadla – Bikaner 765kV D/c (2nd) line
- RE PP3 (near Osian/Phalodi) – Sikar (New) 765 kV D/c Line
- Sikar (New)– Meerut 765 kV D/c Line
- 220kV line bays for interconnection of solar projects (35 nos)
- Augmentation of 400/220kV Transformation capacity at various substations
- Associated Reactive compensation

Estimated Cost : Rs 8265 Cr.

2. Wind Energy Zones in Tamil Nadu (1500 MW)

(a) Tirunelveli WEZ (500 MW), Tamil Nadu

- Augmentation of transformation capacity with 400/230kV, 1x500MVA (4th) ICT at Tirunelveli Pool
- 220kV line bays (GIS) for interconnection of wind projects (2 nos.)

Estimated Cost: Rs 60 Cr

(b) Karur WEZ (1000MW), Tamil Nadu

- Augmentation of transformation capacity with 400/230kV , 2x500 MVA(4th & 5th) ICT at Karur PS
- 230kV line bays for interconnection of wind projects (3 nos)

Estimated Cost: Rs 90 Cr

3. Composite scheme for Solar & Wind Energy Zone in Andhra Pradesh(3500 MW)

- Establishment of 765/400/220kV 3x1500 MVA, 7x500 MVA Pooling station at suitable border location between Anantapur & Kurnool Distt
- LILO of Kurnool PS - Kurnool(new) 765 kV D/c Line at Anantapur PS-100km
- Anantapur PS-Pavagada(PG) 400 kV D/c Line(HTLS) -100km
- 220kV line bays for interconnection of wind projects (12 nos)
- 1x330 MVA (765kV) & 1x125MVA (400kV) bus reactor at Anantapur PS

Estimated Cost: Rs 1540 Cr

4. Solar Energy Zone in Karnataka (5000 MW)

(a) Gadag SEZ (2500 MW)

- Establishment of 400/220kV 5x500 MVA Gadag Pooling Station(with provisions to upgrade to 765 kV)
- Gadag PS-Koppal PS 400kV D/c Line(HTLS)-50 km
- LILO of Tumkur (Vasantnarsapura)-Narendra (New) 765 kV D/c Line(Ch. At 400 kV) at Gadag PS-50 km
- 220kV line bays for interconnection of solar projects (8 nos)
- 1x125MVA (400kV) bus reactor at Gadag PS

Estimated Cost: Rs 780 Cr.

(b) Bidar SEZ (2500 MW)

- Establishment of 400/220kV 5x500 MVA Bidar Pooling Station
- Bidar PS- Nizamabad(PG) 400 kV D/c Line(HTLS) -150 km
- Bidar PS-Gulbarga(KPTCL) 400 kV D/c Line(HTLS)-100km
- 220kV line bays for interconnection of solar projects (8 nos)
- 1x125MVA (400kV) bus reactor at Bidar PS

Estimated Cost: Rs 850 Cr.

5. Composite scheme for Solar & Wind Energy Zone in Gujarat (9000 MW)

(a) Bhuj WEZ 2000 MW

- Establishment of 2x1500MVA (765/400kV), 4x500MVA (400/220kV) Bhuj-II PS (GIS)
- Interconnection of 765kV Bhuj S/s with the proposed Bhuj-II (GIS) S/s through bus extension or 765kV D/c line - 30 km
- Bhuj-II PS – Lakadia PS 765kV D/c line -150 km
- 220kV bays for interconnection of wind projects (7 nos)
- 1x330MVA, 765kV Bus reactor at Bhuj-II PS & 1x125MVA, 420kV Bus reactor each at Bhuj-II PS

Estimated Cost: Rs. 1845 Cr

(b) Kutch (Rapar) SEZ 2000 MW & Banskantha SEZ 2500 MW

- Establishment of 400/220 kV 4X500 MVA Kutch Pooling Point (near Rapar)
- Establishment of 400/220 kV, 5X500 MVA Banaskantha Pooling Point
- Establishment of 400 kV switching station at Patan
- Establishment of 765/400/220 kV, 3X1500 MVA & 3X500 MVA at suitable location near Ahmedabad
- Kutch PP- Lakadiya 400 KV D/c line (Twin HTLS) -40 km
- Kutch PP- Patan 400 kV 2xD/c line (Twin HTLS-multi circuit) -120 km
- Banaskantha PP - Patan 400 kV D/c line (Twin HTLS) -100 km
- Banaskantha PP - Sankhari 400 kV D/c line (Twin HTLS) -50 km
- Patan - Sami 400 kV D/c line (Twin HTLS) -40 km
- Patan - Ahmedabad 400 kV 2xD/c line-Twin HTLS M/c -140 km
- Ahmedabad – Pirana 400 kV D/c line (Twin HTLS) -50 km
- Ahmedabad – Indore 765 kV D/c line -360 km
- Ahmedabad – Vadodara 400 kV D/c line –Twin HTLS -130 km

- Vadodra - Dhule 765 kV D/c line -330 km
- 220 kV line bays for interconnection of solar projects(15 nos)
- Associated Reactive Compensation (Line + Bus)

Estimated Cost: Rs 6865 Cr

(c) Jamnagar SEZ 1500 MW & Dwarka WEZ 1000 MW

- Establishment of 400/220 kV, 5X500 MVA at Lalpur (Jamnagar) PS
- Establishment of 400/220 kV, 2X500 MVA at Jasdan
- Lalpur (Jamnagar) Pooling station - Jasdan PS 400 kV D/c line (Twin HTLS) -180 km
- Lalpur (Jamnagar) Pooling station – Kalavad (GETCO) 400 kV D/c line (Twin HTLS) - 50 km
- Lalpur (Jamnagar) Pooling station – Jam Khmabliya 400 kV D/c line (Twin HTLS) - 50 km
- Jasdan- Hadala (GETCO) 400kV D/c (Twin HTLS) - 100 km
- Jasdan – Vadodara 400 kV D/c line (Twin HTLS) - 300 km
- 220 kV line bays for interconnection of solar projects (8 nos)
- Associated Reactive Compensation (Line + Bus)

Estimated Cost: Rs 1875 Cr

6. Solar and Wind Energy Zone in Maharashtra (6000 MW)

(a) Solapur SEZ 1500 MW

- Solapur pooling point - Solapur (MSETCL) 400 kV D/c line (twin HTLS) -50 km
- Augmentation of transformation capacity by 400/220kV, 3X500 MVA transformer at Solapur PP
- 220 kV line bays for interconnection of solar projects(5 nos)

Estimated Cost: Rs 240 Cr

(b) Wardha SEZ 2500 MW

- Establishment of 400/220 kV, 5X500 MVA at Wardha PS
- Wardha PS - Warora Pool 400 kV D/c line (Twin HTLS) -70 km
- Wardha PS - Warora (MSETCL) 400 kV D/c line (Twin HTLS) -60 km
- 220 kV line bays for interconnection of Solar projects (8 nos)
- 1x125MVAr bus reactor at Wardha PS

Estimated Cost: Rs 620 Cr

(c) Osmanabad and Beed WEZ 2000 MW

- Establishment of 4x500MVA, 400/220kV near Kallam PS
- LILO of both circuits of Parli(PG) – Pune(GIS) 400kV D/c line at Kallam PS
- 220 kV line bays for interconnection of solar projects (7 nos)
- 1x125MVAr bus reactor at Kallam PS

Estimated Cost: Rs 425 Cr

7. Solar Energy Zone in Madhya Pradesh (2500 MW)

Khandwa SEZ: 2500 MW

- Establishment of 400/220 kV, 5X500 MVA at Khandwa PS
- Khandwa PS - Khandwa Pool D/c line (Twin HTLS) -50 km
- Khandwa PS - Chehgaon (MPPTCL) D/c line (Twin HTLS) -80 km
- 220 kV line bays for interconnection of solar projects (8 nos)
- Associated Reactive Compensation

Estimated Cost: Rs 620 Cr

Total Estimated Cost for Ph-2 (37.5 GW) : about Rs.24075 Cr.

E) Summary of Abstract Cost Estimate

S.No.	Region	Capacity (GW)	Ph-1		Ph-2		Total (Ph-1 +Ph-2)	
			Cost	Capacity	Cost	Capacity	Cost	Capacity
			(Cr.)	(GW)	(Cr.)	(GW)	(Cr.)	(GW)
1	Western Region							
A	Gujarat	16	4945	7	10585	9	15530	16
B	Maharashtra	7	335	1	1285	6	1620	7
C	Madhya Pradesh	5	790	2.5	620	2.5	1065	5
	Sub Total (WR)	28	6070	10.5	12490	17.5	18560	28
2	Northern Region							
A	Rajasthan	20	9180	10	8265	10	17445	20
3	Southern Region							
A	Tamil Nadu	3	450	1.5	150	1.5	600	3
B	Andhra Pradesh	8	2730	4.5	1540	3.5	4270	8
C	Karnataka	7.5	730	2.5	1630	5	2360	7.5
	Sub Total (SR)	18.5	3910	8.5	3320	10	7230	18.5
	Total	66.5	19160	29	24075	37.5	43235	66.5

F) Funding Requirements & Bidding Strategy

- a. Transmission investment in ISTS is recovered through POC mechanism as per CERC sharing of Inter-state transmission charges regulation. As per the recent discussion in regional Standing committee, LTA/connectivity meetings, STU/DICs have expressed their concerns in sharing of transmission charges on account of transmission addition for RE capacity in ISTS. Accordingly, it was suggested that suitable financing mechanism through grant/funding for transmission may be facilitated by MNRE.
- b. In order to reduce burden of transmission tariff on DICs, it was suggested that suitable mode of financing such as upfront payment ranging from Rs 35 to 50 lakhs/MW from the RE generation developer at the time of bidding and/or grant from MNRE/Govt of India may be considered which can be utilized for the development of transmission system.
- c. In case of part funding through upfront payment as proposed above, for sharing of balance transmission charges, scheme shall have to be concurred by the stakeholders. In case of 100% grant provided by the MNRE/Gol, for recovery of O&M charges, regulatory approval shall have to be taken from the CERC.
- d. Transmission is a lumpy element, e.g. if a 765kV corridor is being developed which can facilitate transfer of 3500-4000 MW power and bidding is carried out only for 2000 MW, upfront payment needs to be realized for total power transfer requirement for its development by transmission implementation agency. Therefore generation bidding strategy must take care of above aspect.
- e. Site specific RE generation bidding may be carried out in accordance with the transmission plan instead of anywhere in India basis. Accordingly, to facilitate development of the commensurate transmission system, which generally has high gestation period than RE generation, finalization of transmission system implementation mode & transmission implementation agency i.e. TBCB or RTM must be expeditiously decided.

G) Annual Transmission Charges

Envisaged solar (50 GW) & wind (16.5 GW) generation capacity is expected to generate about 115 billion units of renewable energy per annum. Considering estimated cost of Rs 43,235 Cr for proposed transmission scheme, annual transmission charges is expected to be about Rs 7782 Cr.

Accordingly total normative transmission charges for Ph-1 & Ph-2 are estimated as under:

S.No	Attribute	Option 1	Option 2 (25 lakh/MW Bid incl.)	Option 3 (35 lakh/MW Bid incl.)	Option 4 (50 lakh/MW Bid incl.)
1	Envisaged RE Capacity	66500 MW			
2	Units Generated (Wind CUF@25%, Solar CUF @18%)	115 Billion units/Year			
3	Transmission Cost	Rs 43,235 Cr	Rs 26,610 Cr	Rs 19,960 Cr	Rs 9,985 Cr
4	Annual transmission charges (@18%)	Rs 7782 Cr	Rs 4790 Cr	Rs 3593 Cr	Rs 1797 Cr
5	Tentative Transmission Tariff	Rs 0.67/Unit	Rs 0.42/Unit@	Rs 0.31/Unit	Rs 0.16/Unit

** D: E- 70:30

@ Generation tariff increase by 14-18 (25 lakh/MW Bid incl.) , 21-25 paise/unit (35 lakh/MW Bid incl.) & 32-36 paise/unit (50 lakh/MW Bid incl.)

Further normative transmission charges for Ph-1 & Ph-2 separately are estimated as under:

Phase-I

S.No	Attribute	Option 1	Option 2 (25 lakh/MW Bid incl.)	Option 3 (35 lakh/MW Bid incl.)	Option 4 (50 lakh/MW Bid incl.)
1	Envisaged RE Capacity (in MW)	29000			
2	Units Generated (Wind CUF@25%, Solar CUF @18%)(in BU/year)	51 BU/annum			
3	Transmission Cost (Rs. Cr)	19,160	11,910	9,010	4,660
4	Annual transmission charges (@18%)	3449	2144	1622	839
5	Tentative Transmission Tariff (Rs/Unit)	0.68	0.42	0.32	0.16

** D: E- 70:30

@ Generation tariff increase by 14-18 (25 lakh/MW Bid incl.) , 21-25 paise/unit (35 lakh/MW Bid incl.) & 32-36 paise/unit (50 lakh/MW Bid incl.)

Phase-2

S.No	Attribute	Option 1	Option 2 (25 lakh/MW Bid incl.)	Option 3 (35 lakh/MW Bid incl.)	Option 4 (50 lakh/MW Bid incl.)
1	Envisaged RE Capacity (in MW)	37500			
2	Units Generated (Wind CUF@25%, Solar CUF @18%)(in BU/year)	64 BU/annum			
3	Transmission Cost (Rs. Cr)	24,075	14,700	10,950	5,325
4	Annual transmission charges (@18%)	4334	2646	1971	959
5	Tentative Transmission Tariff (Rs/Unit)	0.68	0.41	0.31	0.15

** D: E- 70:30

@ Generation tariff increase by 14-18 (25 lakh/MW Bid incl.) , 21-25 paise/unit (35 lakh/MW Bid incl.) & 32-36 paise/unit (50 lakh/MW Bid incl.)

H) Other Requirements

- **Solar Generation shifting**

Envisaged solar generation capacity shall significantly impact the net load curve with deeper belly in noon hours. This will also impact requirement of quick ramp up generation (Thermal/Hydro) in the later afternoon when solar generation tends to decline. Therefore to mitigate above, energy storage in form of Pumped storage hydro or Battery energy storage system can be very useful. These resource shall store solar generation during their peak generation hours (noon time) and will be dispatched at the time of low or no solar generation such as evening/night or early morning.

- **Requirement of other Infrastructure**

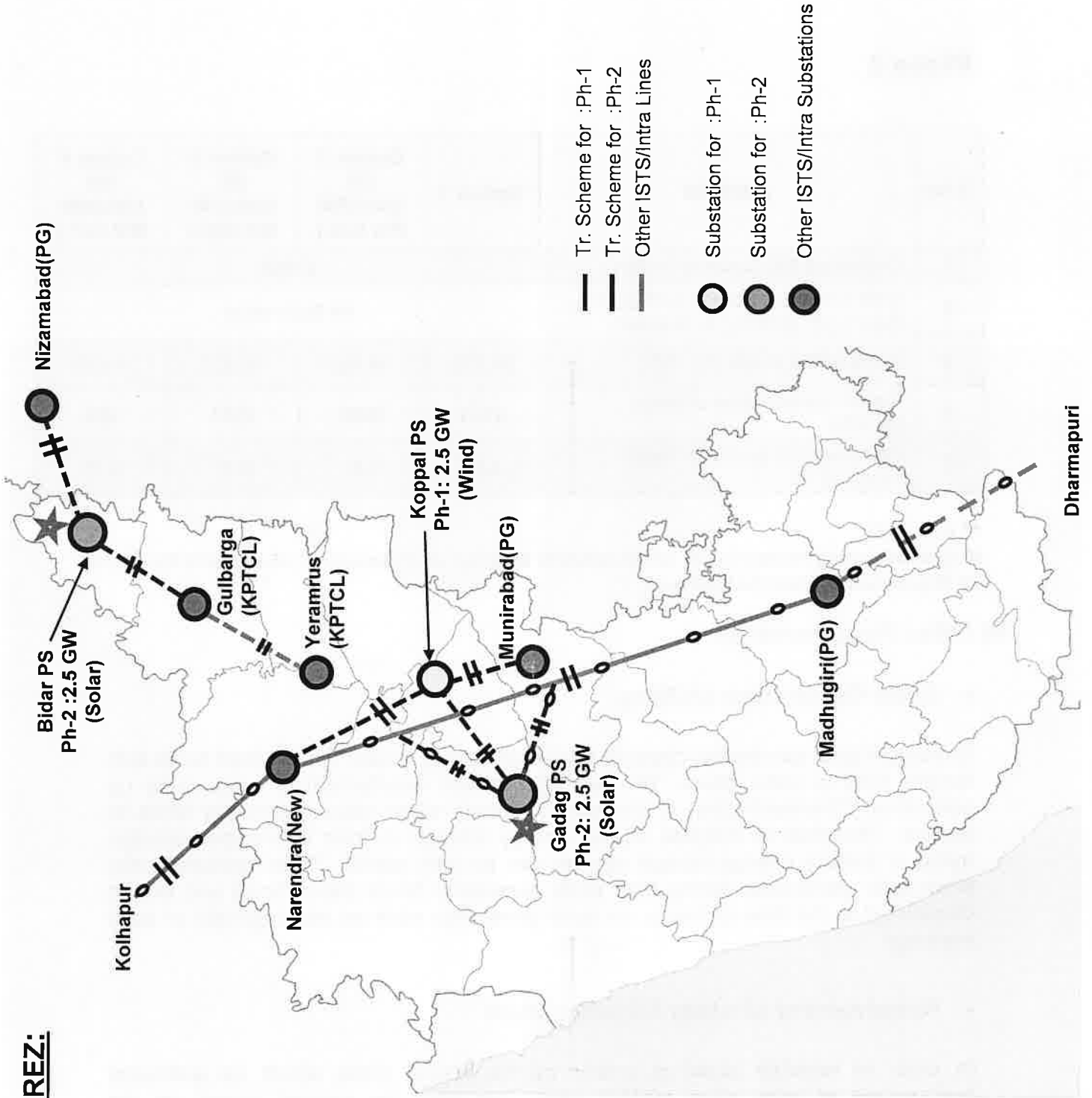
In order to facilitate drawl of power by the states, there would be additional requirement of Intra state system also. This shall be evolved based on the identification of the beneficiaries at the subsequent stage. Further, control infrastructure in form of dynamic compensation, storage etc shall also be required at strategic locations.

- **Inverter Control Feature**

SECI to explore requirement of including state-of-the-art controller/inverter features in specification so that Solar PV form can be used as STATCOM for reactive support to the grid in night time.

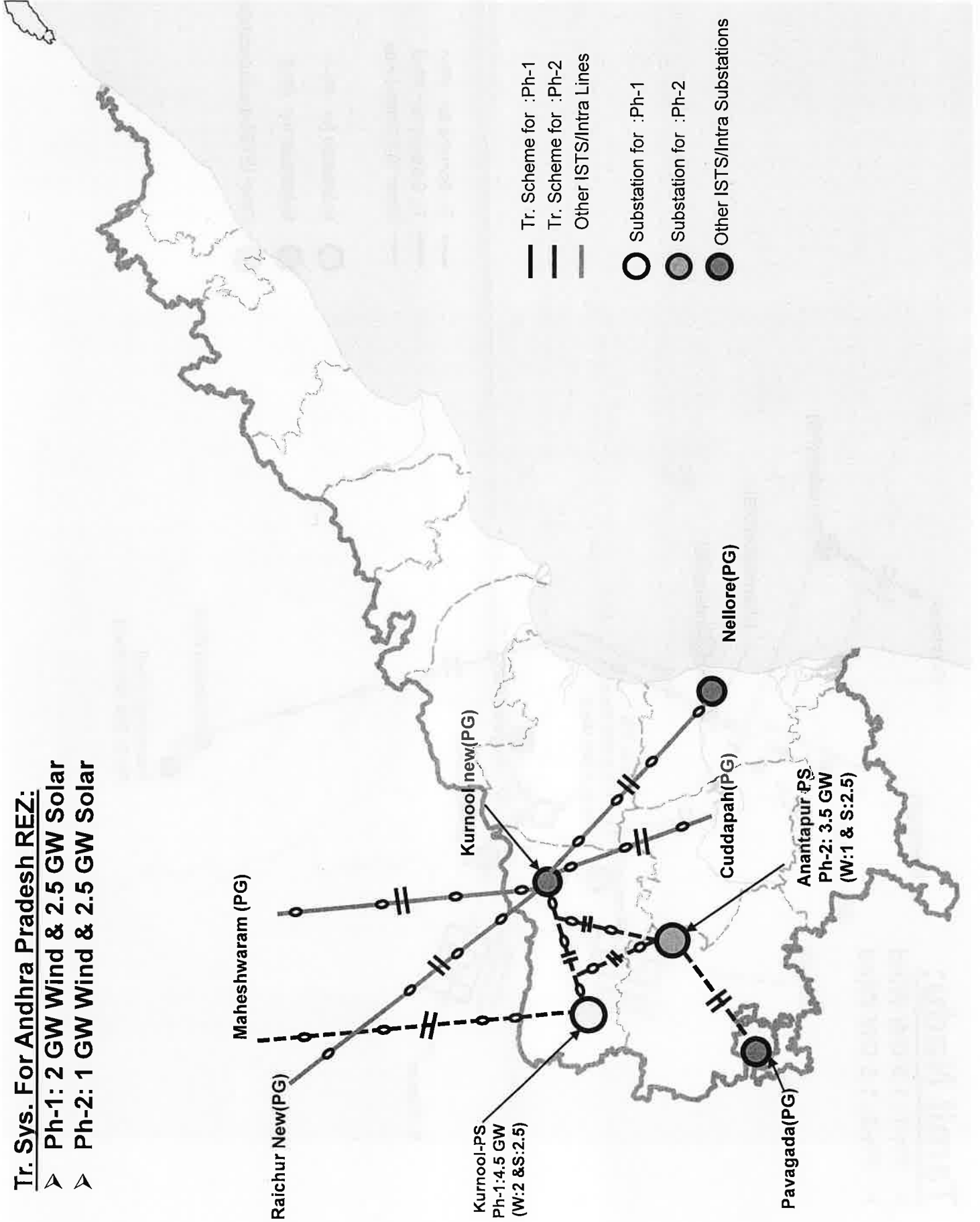
Tr. Sys. For Karnataka REZ:

- Ph-1: 2.5 GW Wind
- Ph-2: 5 GW Solar



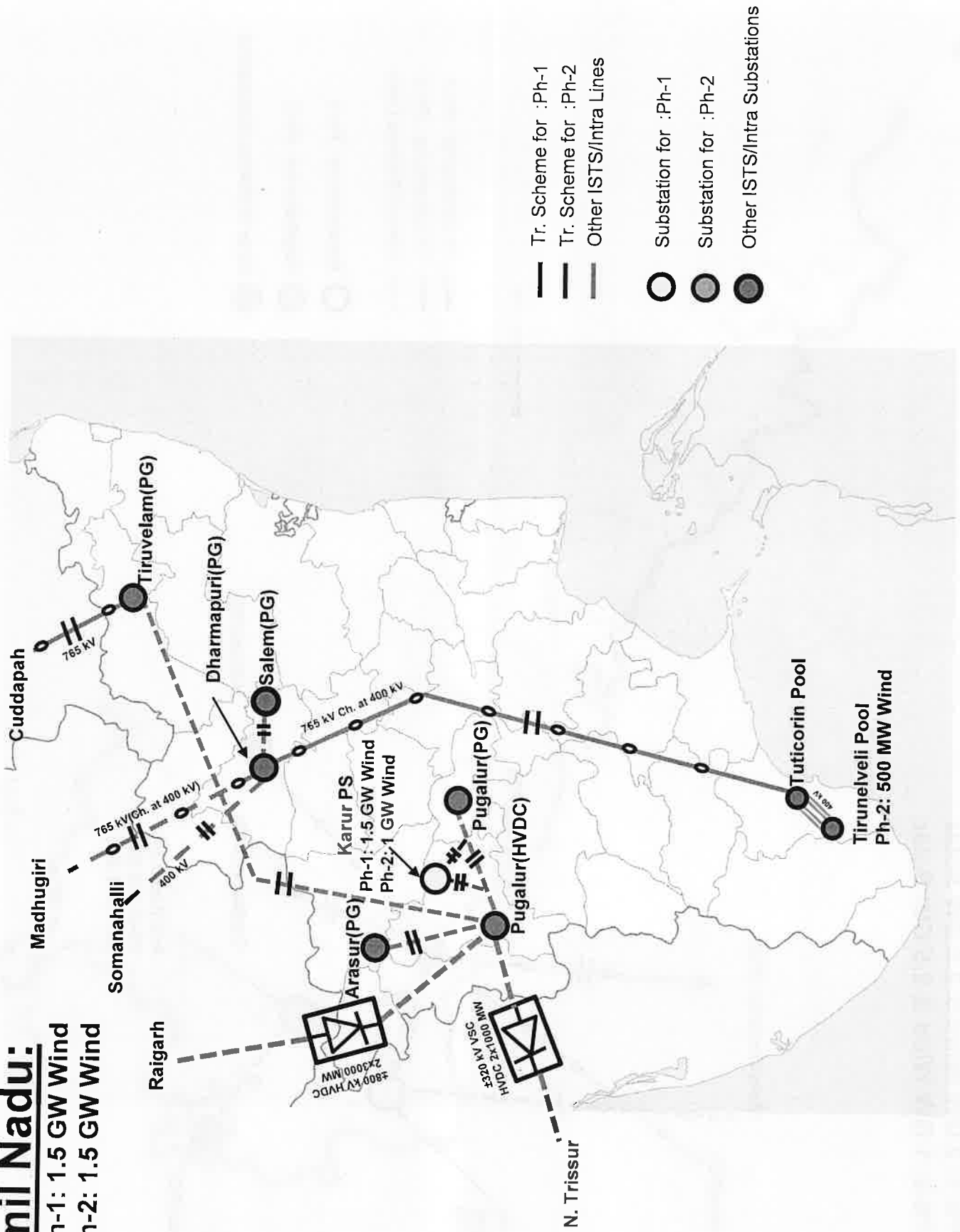
Tr. Sys. For Andhra Pradesh REZ:

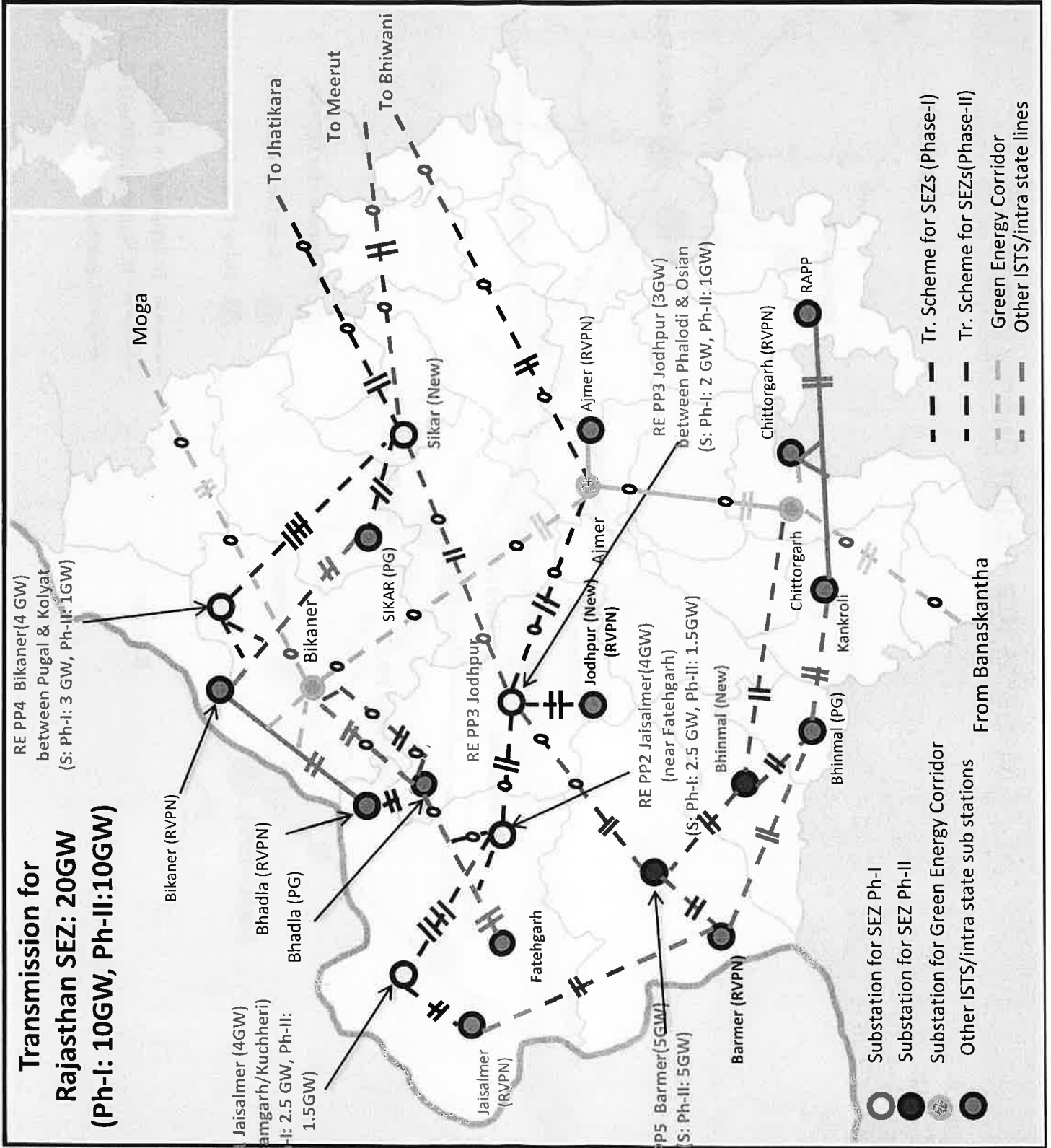
- Ph-1: 2 GW Wind & 2.5 GW Solar
- Ph-2: 1 GW Wind & 2.5 GW Solar



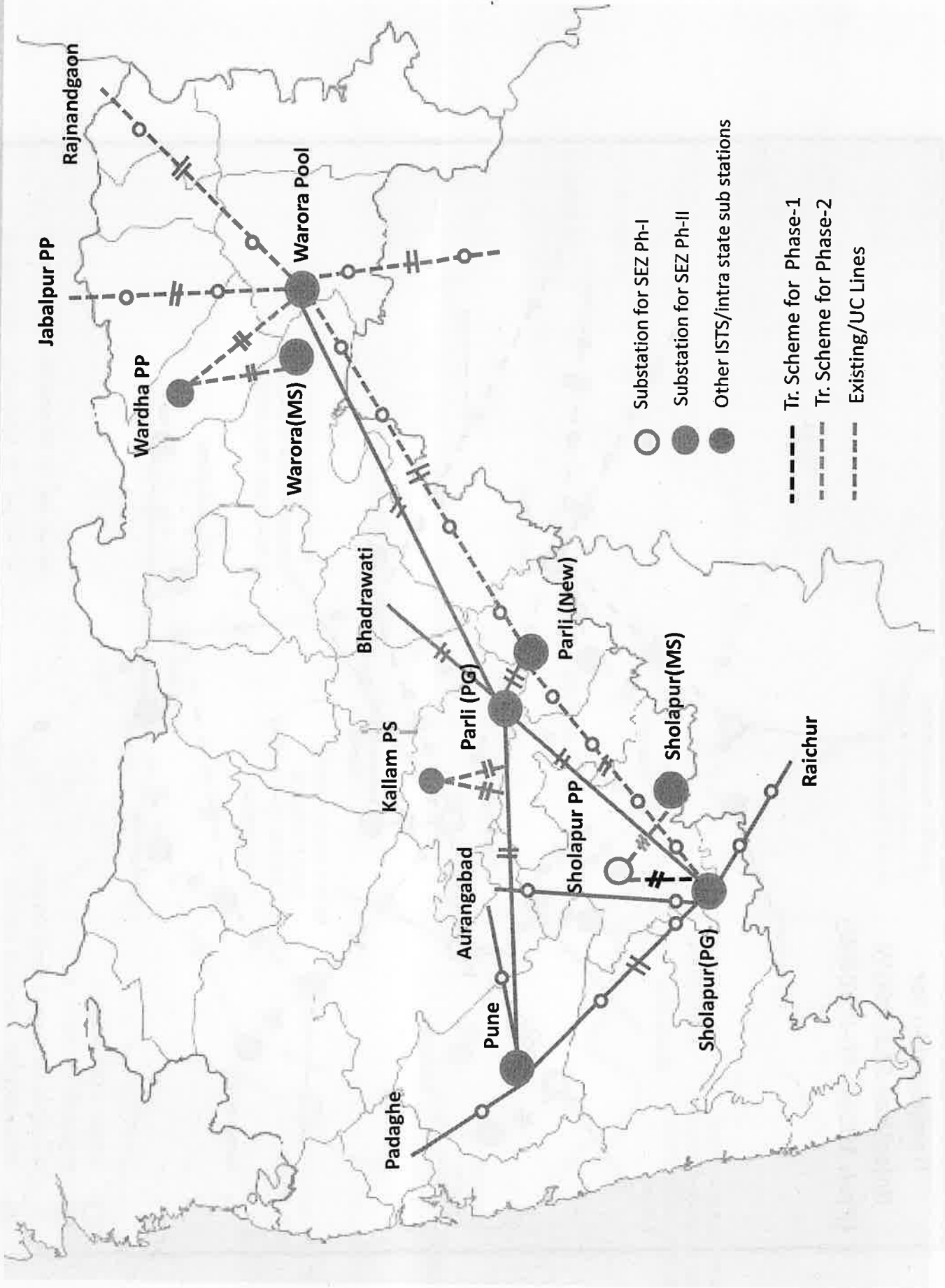
Tamil Nadu:

- Ph-1: 1.5 GW Wind
- Ph-2: 1.5 GW Wind

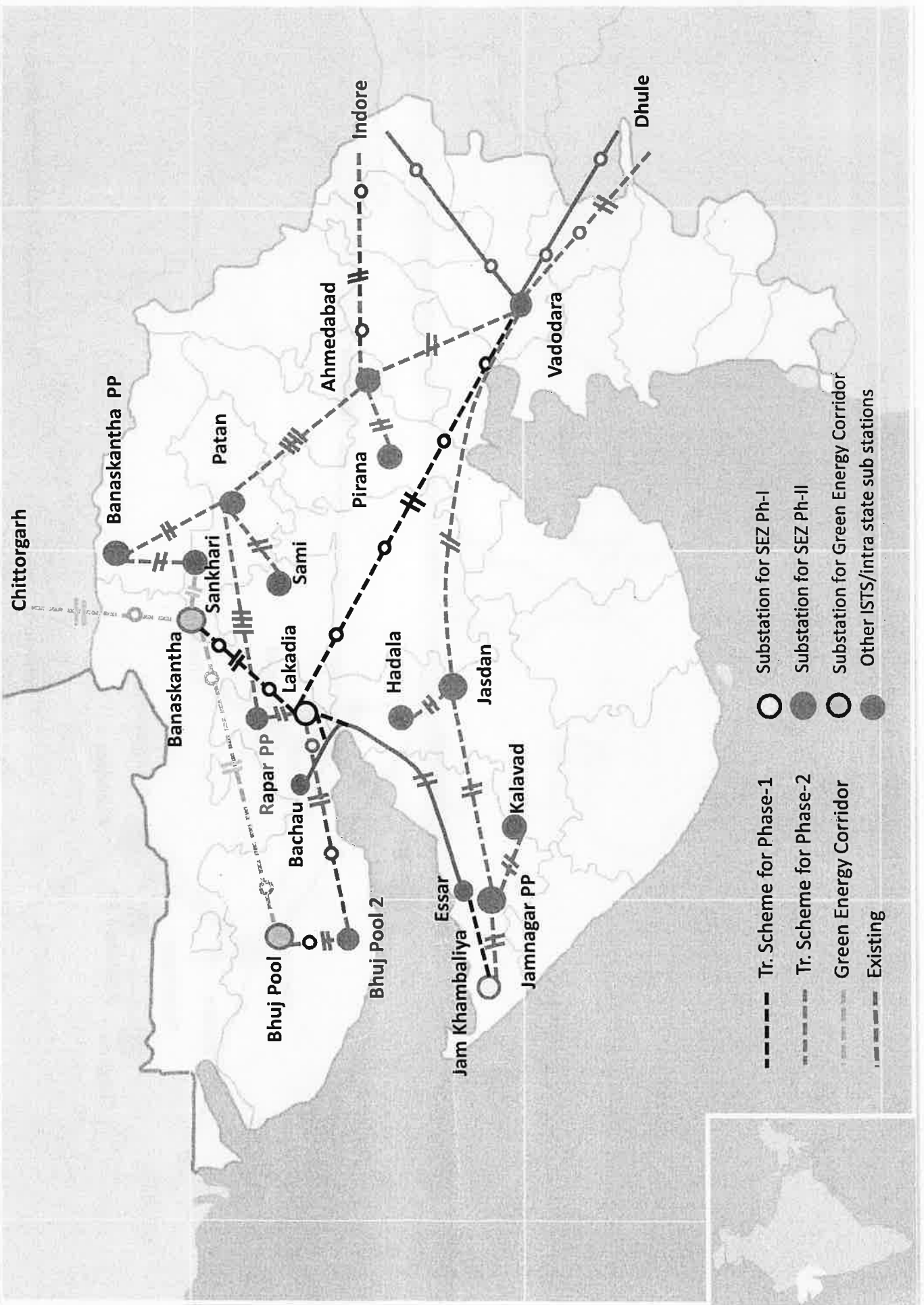




Maharashtra – Solar Energy Zones

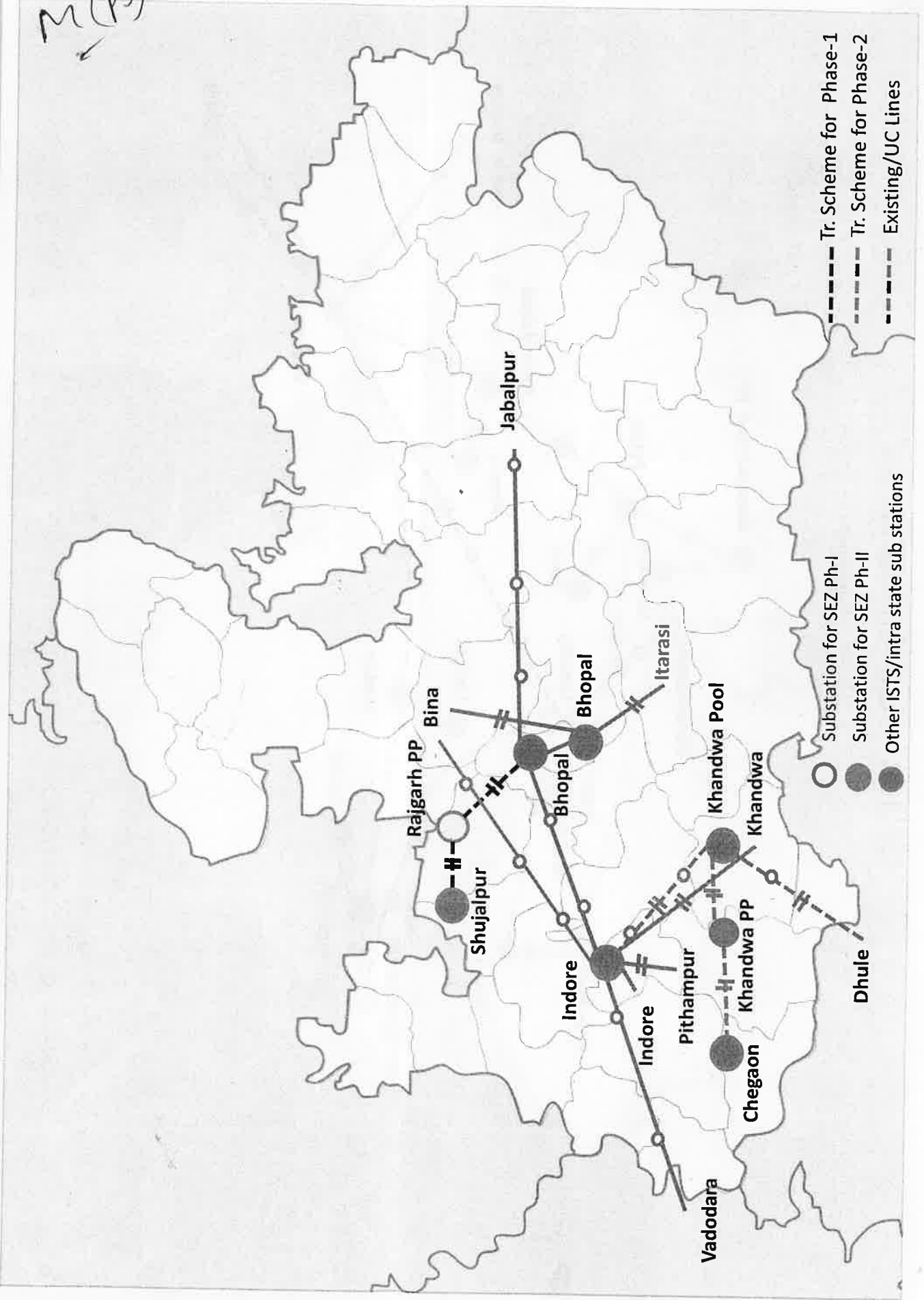


Gujarat - Solar Energy Zones



Madhya Pradesh – Solar Energy Zones

M (PS)



- - - - - Tr. Scheme for Phase-1
 - . - . - Tr. Scheme for Phase-2
 - - - - - Existing/UC Lines

○ Substation for SEZ Ph-I
 ● Substation for SEZ Ph-II
 ● Other ISTS/intra state sub stations