भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

केंद्रीय विद्युत प्राधिकरण

Central Electricity Authority

विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग- II

Power System Planning and Appraisal Division-II

सेवा में/To

As per list of Addresses

विषय : ट्रांसमिशन पर राष्ट्रीय समिति (एनसीटी) की बारहवीं बैठक का कार्यवृत – के सम्बन्ध में।

Subject: Minutes of the 12th Meeting of National Committee on Transmission (NCT) – regarding.

महोदया (Madam) / महोदय (Sir),

The 12th meeting of the "National Committee on Transmission" (NCT) was held on 24th March, 2023. Minutes of the meeting are enclosed herewith.

भवदीय/Yours faithfully,

12.04.2023

(ईशान शरण / Ishan Sharan)

मुख्य अभियंता एवं सदस्य सचिव (एनसीटी)

/Chief Engineer and Member Secretary (NCT)

प्रतिलिपि / Copy to:

संयुक्त सचिव (पारेषण), विद्युत मंत्रालय, नई दिल्ली /

Joint Secretary (Trans), Ministry of Power, New Delhi

List of Addresses:

1.	Chairperson, Central Electricity Authority Sewa Bhawan, R.K. Puram, New Delhi – 110 066.	2.	Member (Power Systems), Central Electricity Authority Sewa Bhawan, R.K. Puram, New Delhi – 110 066.
3.	Member (Economic and Commercial), Central Electricity Authority Sewa Bhawan, R.K. Puram, New Delhi – 110 066.	4.	Director (Trans), Ministry of Power Shram Shakti Bhawan, New Delhi-110001.
5.	Sh. Dilip Nigam, Scientist 'G', MNRE, Block No. 14, CGO Complex, Lodhi Road, New Delhi – 110003	6.	Chief Operating Officer, CTUIL, Saudamini, Plot No. 2, Sector-29, Gurgaon – 122 001.
7.	Sh. Rajnath Ram, Adviser (Energy), NITI Aayog, Parliament Street, New Delhi – 110 001.	8.	CMD, Grid Controller of India, B-9, Qutub, Institutional Area, Katwaria Sarai, New Delhi – 110010
9.	Dr. Radheshyam Saha, Ex. Chief Engineer, Central Electricity Authority	9.	Ms. Seema Gupta, Ex. Director (Operations), POWERGRID

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Minutes of the 12th meeting of National Committee on Transmission

List of participants is enclosed at Annex-I.

Chairperson, CEA & Chairman, NCT, welcomed the participants and requested Member Secretary, NCT, to take up the agenda items for discussion.

1 Confirmation of the minutes of the 11th meeting of National Committee on Transmission.

1.1 The minutes of the 11th meeting of NCT held on 28/12/2022 (1st Sitting) and 17/01/2023 (2nd sitting) were issued vide CEA letter No. CEA-PS-12-13/3/2019-PSPA-II dated 01/02/2023.

1.2 Following amendments were suggested in the minutes:

1.2.1 CTUIL vide email dated 10th February, 2023 informed that there is provision of 2 Bus Couplers (BC) and Transfer Bus Couplers (TBC) in future and one BC and TBC is already under present scope in the scheme "Western Region Expansion Scheme XXXIII (WRES-XXXIII): Part C". Accordingly, only 2 Nos. of BC and TBC are required in future. The same is given below:

Sl. No.	Scope of the Transmission Scheme	Scope of the Transmission Scheme (Revised)
1.	Future provisions: Space for ➢ 220 kV BC and TBC: 3 Nos.	Future provisions: Space for ➢ 220 kV BC and TBC: 2 Nos.

1.2.2 In Summary, the cost of Western Region Expansion Scheme XXXIII (WRESXXXIII): Part B had been mentioned as Rs 1200 crores in place of Rs 1181 crores, which needs to be corrected.

1.2.3 In item No. 3.15.11, in the table at Sl. No.2, conductor of Banaskantha- Sankhari section of Banaskantha – Prantij 400 kV D/c line had been mentioned as Quad ACSR/AAAC/AL59 moose equivalent. The same has to be replaced with Twin AL59 Moose equivalent.

1.2.4 At Item No. 3.10.7 B 2, in the scheme "Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)", following revision is suggested:

As per 11th NCT Minutes		**Revision**	
Scope	Capacity/km	Scope	Capacity/km
Wangtoo (HPPTCL) - Panchkula (PG) 400	Route length-	Wangtoo (HPPTCL) -	Route length- 210 km

kV D/c (Twin HTLS*) line along with 80 MVAr Switchable line reactor at Panchkula end on each circuit	210 km	Panchkula (PG) 400 kV D/c (Twin HTLS*) line along with 80 MVAr Switchable line reactor at Panchkula end on each circuit	**420 kV 80 MVAr SLR alongwith switching equipments – 2 Nos.**

Note: Sl No. (iv) "POWERGRID to provide space for 2 Nos. of 400 kV bays at Panchkula S/s for termination of Wangtoo (HPPTCL) - Panchkula (PG) D/c line.	**Note:** Sl. No. (iv) "POWERGRID to provide space for 2 Nos. of 400 kV bays **alongwith SLR** at Panchkula S/s for termination of Wangtoo (HPPTCL) - Panchkula (PG) D/c line.

1.3 Members confirmed the minutes with the proposed amendments.

2 Status of the transmission schemes noted/approved/recommended to MoP in the 11th meeting of NCT:

2.1 The status of the transmission schemes noted/approved/recommended in the 11th meeting of NCT is tabulated below

Sl. No	Name of the Transmission Scheme	Noted/ Recommended/ Approved	Survey Agency	Remarks
1.	ICT Augmentation associated with integration of additional 7 GW RE power from Khavda RE park under Phase-III	Approved for implementation through RTM route	Not Applicable	RTM
2.	Western Region Expansion Scheme XXXIII (WRESXXXIII): Part B1	Approved for implementation through RTM route	Not Applicable	RTM
3.	Western Region Expansion Scheme XXXIII (WRESXXXIII): Part C1	Approved for implementation through RTM route	Not Applicable	RTM
4.	Western Region Expansion Scheme XXXIII (WRESXXXIII): Part A	Approved for implementation through RTM route	Not Applicable	RTM
5.	Transmission system for evacuation of additional 7 GW RE power from Khavda RE park under Phase-III Part A	Recommended to MoP for implementation through TBCB route	RECPDCL	TBCB
6.	Transmission system for evacuation	Recommended to	PFCCL	TBCB

Sl. No	Name of the Transmission Scheme	Noted/ Recommended/ Approved	Survey Agency	Remarks
	of additional 7 GW RE power from Khavda RE park under Phase-III Part B	MoP for implementation through TBCB route		
7.	Transmission scheme for evacuation of power from Dhule 2 GW REZ	Recommended to MoP for implementation through TBCB route	PFCCL	TBCB
8.	Western Region Expansion Scheme XXXIII (WRESXXXIII): Part B	Recommended to MoP for implementation through TBCB	RECPDCL	TBCB
9.	Western Region Expansion Scheme XXXIII (WRESXXXIII): Part C	Recommended to MoP for implementation through TBCB route	RECPDCL	TBCB
10.	Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)	Recommended to MoP for implementation through TBCB route	CTUIL	TBCB
11.	Transmission scheme for drawal of 4000 MW power by MPSEZ Utilities Limited (MUL)	Recommended to MoP for implementation through TBCB route	CTUIL	Scheme is proposed to be deferred. Details in para 6.3 of these minutes.
12.	Supply and Installation of OPGW on existing 400 kV Jallandhar (PG) – Kurukshetra (PG) line which is to be LILOed at 400 kV Dhanansu (PSTCL) (229 km)	Approved for implementation through RTM route	-NA-	RTM
13.	Supply and Installation of OPGW on existing 400 kV Koldam (Indigrid) – Ludhiana (PG) line which is to be LILOed at 400 kV Ropar (PSTCL) (150 km)	Approved for implementation through RTM route	-NA-	RTM
14.	Supply and Installation of OPGW on existing 400 kV Agra – Ballabhgarh line (181 km) - Replacement	Approved for implementation through RTM route	-NA-	RTM
15.	Supply and Installation of OPGW on existing 400 kV Kishenpur – Wagoora line (183 km) - Replacement	Approved for implementation through RTM route	-NA-	RTM
16.	Redundant communication System for Bhinmal (PG) and Kankroli (PG) ISTS stations	Approved for implementation through RTM route	-NA-	RTM
17.	Redundant communication Path for Anta (NTPC) in view of AGC operation (Supply and Installation of OPGW on existing 220 kV Anta (NTPC) – Bhilwara line (187 km)	Approved for implementation through RTM route	-NA-	RTM

3 Implementation timeframe for Inter State Transmission System (ISTS) projects:

3.1 In the 9th meeting of NCT, Chairperson, CEA, had directed to assess the realistic implementation timeline of transmission schemes considering the voltage level, terrain and other factors.

3.2 Accordingly, CEA held discussions on 25.11.2022 with CTUIL, POWERGID, Adani Transmission and Sterlite Power. Based on the discussions, following were agreed:

i. Implementation timeframe for ISTS projects may be considered as 24 months in general. For special cases like tough terrain, hilly areas etc like the states/UTs of J&K, Ladakh, Himachal Pradesh and North Eastern region etc, the timeframe may be extended to 30 to 36 months on a case to case basis in consultation with stakeholders.

ii. Implementation timelines for the projects already under bidding may not be changed as the RE generation developers might have fixed their commissioning schedule in matching timeframe of the transmission system and changing the implementation timeframe of associated transmission system at this stage may lead to stranded RE generation.

3.3 Further, in a meeting held on 11.01.2023 under the chairmanship of Secretary, Ministry of Power, it was decided that default time for construction of ISTS should be considered as 24 months, instead of earlier 18 months, and any need w.r.t. increase/decrease in scheduled completion time may be proposed by CTUIL/CEA/NCT based on voltage level, length of the line, topography, clearances required for construction of the the line etc.

3.4 Chief Engineer (PSPA-II), CEA, stated that the above suggestions are being followed in all the new transmission schemes.

3.5 NCT noted the same.

4 Implementation Modalities for Reconductoring works

4.1 In the 10th meeting of NCT, Chairperson, CEA, directed that a base paper needs to be prepared for identification of Implementation Modalities for Reconductoring works in order to standardize / simplify decisions in this regard in future.

4.2 Accordingly, a base paper was prepared by CEA in consultation with CTUIL. Following is concluded in the paper:

(i) In the period of useful life of transmission system, to avoid technical, commercial and operational issues in reconductoring of transmission line, it would be prudent to allocate the scheme to existing transmission system owner (TSP) through RTM route.

(ii) The transmission system implemented under TBCB would be handed over to CTUIL or its successors or an agency as decided by the Central Government after 35 years [as per Standard Bidding Document (SBD)] and the asset would be again bid out. At this stage fresh bidding may include reconductoring, if required.

4.3 Chairman, NCT, opined that in case the reconductoring works are allotted under RTM, then also it needs to be ensured that the work is implemented by the TSP through competitive bidding process. He also suggested that for the projects executed under TBCB, assessment of healthiness of the transmission system and requirement of reconductoring needs to be assessed at 32nd year.

4.4 Representative from CTUIL stated that in case the reconductoring of transmission line is carried out before 35th year, there would be situations wherein, only towers would have lived their life and not the conductor. Further, the cost of conductors and associated bay equipment, if any, would not have been recovered when the tower completes 35 years. It was suggested that tariff recovery of reconductoring to be made coincidental with other equipment.

4.5 After deliberations, it was decided that members of NCT would submit comments on the base paper within two weeks. Incorporating the comments, the base paper for reconductoring works would be taken up for stakeholders' consultation.

5 New Transmission Schemes:

5.1 **Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 7.5 GW) (Jaisalmer/Barmer Complex)**

5.1.1 CTUIL proposed the following scheme (Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-2: 7.5 GW; Fatehgarh-IV: 4 GW; Barmer-3.5 GW) to facilitate evacuation of about 7.5 GW power from Rajasthan REZ Ph-IV (Part-2) envisaged in Jaisalmer/Barmer Complex.

A. Fatehgarh-IV: 4 GW (4 GW Solar + 4 GW Wind + 2 GW BESS)

- Establishment of 4x1500 MVA, 765/400 kV and 5x500 MVA, 400/220 kV Fatehgarh- IV (Section-2) Pooling Station along with 2x240 MVAr (765 kV) Bus Reactor and 2x125 MVAr (400 kV) Bus Reactor
- Fatehgarh-IV (Section-2) PS – Bhinmal (PG) 400 kV D/c line (Twin HTLS) along with 50 MVAr switchable line reactor on each ckt at each end (~200 km)
- LILO of both ckts of 765 kV Fatehgarh-III-Beawar D/c line (2nd) at Fatehgarh-IV (Section-2) PS along with 330 MVAr switchable line reactors at Fatehgarh-IV PS end of each ckt of 765 kV Fatehgarh-IV-Beawar D/c line (formed after LILO) (~15 km)
- Beawar- Mandsaur PS 765 kV D/c line along with 240 MVAr switchable line reactor on each circuit at each end (~250 km)
- Augmentation by 1x1500 MVA, 765/400 kV ICT at Fatehgarh-II PS (7th)
- 6 Nos. of 220 kV line bays at Fatehgarh-IV PS (for RE connectivity)
- 400 kV Sectionalization bay (1 set)
- 220 kV Sectionalization bay (1 set) along with BC (2 Nos.) and TBC (2 Nos.) at Fatehgarh- IV (Section-2) Pooling Station

B. Barmer-I: 3.5 GW (3 GW Solar + 3 GW Wind + 1 GW BESS)

- Establishment of 4x1500 MVA, 765/400 kV and 5x500 MVA, 400/220 kV Barmer-I Pooling Station along with 2x240 MVAr (765 kV) Bus Reactor and 2x125 MVAr (400 kV) Bus Reactor

  Future provisions at Barmer-I S/s: Space for:
  - 765/400 kV ICT along with bays- 2 No.
  - 765 kV line bays along with switchable line reactors – 4 Nos.
  - 765 kV Bus Reactor along with bay: 1 No.
  - 400 kV line bays –4 Nos.
  - 400 kV line bays along with switchable line reactor –4 Nos.
  - 400/220 kV ICT along with bays -5 Nos.
  - 400 kV Bus Reactor along with bay: 1 No.
  - 400 kV Sectionalization bays: 2 sets
  - 220 kV line bays for connectivity of RE Applications -8 Nos.
  - 220 kV Sectionalization bay: 2 sets
  - 220 kV BC (2 Nos.) and TBC (2 Nos.)
  - STATCOM (2x±300 MVAr) along with MSC (4x125 MVAr) and MSR (2x125 MVAr)
- Fatehgarh-III (Section-2) PS – Barmer-I PS 400 kV D/c line (Quad) (~50 km)
- 6 Nos. of 220 kV line bays at Barmer-I PS (for RE connectivity)
- 220 kV Sectionalization bay (1 set) along with BC (2 Nos.) and TBC (2 Nos.) at Barmer-I PS

C. Common Transmission System for Fatehgarh-IV and Barmer-I in NR

- Establishment of 2x1500 MVA, 765/400 kV Substation at suitable location near Jalore along with 2x240 MVAr (765 kV) and 2x125 MVAr (400 kV) Bus Reactor

  Future provisions at Jalore S/s: Space for:
  - 765/400 kV ICT along with bays- 4 Nos.
  - 765 kV line bays along with switchable line reactors – 4 Nos.
  - 765 kV Bus Reactor along with bay: 1 No.
  - 400 kV line bays along with switchable line reactor –4 Nos.
  - 400 kV line bays –4 Nos.
  - 400 kV Bus Reactor along with bay: 1 No.
  - 400 kV Sectionalization bay: 2 sets
  - 400/220 kV ICT along with bay - 6 Nos.
  - 220 kV line bays -10 Nos.
  - 220 kV Sectionalization bay: 2 sets
  - BC (3 Nos.) and TBC (3 Nos.)
  - STATCOM (2x±300 MVAr) along with MSC (4x125 MVAr) and MSR (2x125 MVAr)
- Fatehgarh-IV (Section-2) PS – Jalore PS 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end (~200 km)
- Barmer-I PS–Jalore PS 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at Jalore PS end (~165 km)
- Jalore PS-Chittorgarh (PG) 400 kV D/c line along with 50 MVAr switchable line reactor for each circuit at each end (Quad) (~200 km)
- Jalore PS-Mandsaur PS 765 kV D/c line along with 330 MVAr switchable line reactor for each circuit at each end (~320 km)

D. Common Transmission System for Fatehgarh-IV (4 GW) and Barmer-I (3.5 GW) in Western Region

- Establishment of 765 kV Mandsaur Pooling Station along with 2x330 MVAr (765 kV) Bus Reactors (with 1x110 MVAr and 1x80 MVAr, 765 kV spare single-phase reactor unit for line/bus reactor)

  Future Provisions at Mandsaur S/s: **Space for:**
  - 765/400 kV ICT along with bays- 6 No.
  - 765 kV line bays along with switchable line reactors – 12 Nos.
  - 765 kV Bus Reactor along with bay: 2 No.
  - 765 kV Sectionaliser bay: 1 -set
  - 400 kV line bays along with switchable line reactor – 12 Nos.
  - 400/220 kV ICT along with bays -8 Nos.
  - 400 kV Bus Reactor along with bay: 2 No.
  - 400 kV Sectionalization bay: 1 set
  - 220 kV line bays: 16 Nos.
  - 220 kV Sectionalization bay: 2 sets
  - 220 kV BC and TBC: 3 Nos.
  - STATCOM (±300 MVAr) along with MSR (2x125 MVAr) and MSC (1x125 MVAr): 1 No.
  - Space for spare 765/400 kV, 500 MVA unit single phase spare unit.
- Mandsaur PS–Indore (PG) 765 kV D/c line (200 km) along with 1x330 MVAr switchable line reactor (SLR) on each ckt at Mandsaur end (with NGR Bypassing arrangement)
- Establishment of 765/400 kV (2x1500 MVA), 400/220 kV (2x500 MVA) and 220/132 kV (3x200 MVA) Kurawar S/s (with 1x500 MVA spare single-phase transformer unit) with 2x330 MVAr, 765 kV bus reactor and 1x125 MVAr, 420 kV bus reactor (with 1x110 MVAr and 1x80 MVAr, 765 kV spare single-phase reactor unit for line/bus reactor)

  Future Provisions at Kurawar S/s: **Space for:**
  - 765/400 kV ICT along with bays- 4 Nos.
  - 765 kV line bays along with switchable line reactors – 8 Nos.
  - 765 kV Bus Reactor along with bay: 2 No.
  - 765 kV Sectionaliser bay: 1 -set
  - 400 kV line bays along with switchable line reactor – 10 Nos.
  - 400/220 kV ICT along with bays -6 Nos.
  - 400 kV Bus Reactor along with bay: 2 No.
  - 400 kV Sectionalization bay: 1- set
  - 220 kV line bays: 12 Nos.
  - 220 kV Sectionalization bay: 2 sets
  - 220 kV BC and TBC: 2 Nos.
  - 220/132 kV ICT along with bays: 5 Nos.
  - 132 kV line bays: 16 Nos.
  - 132 kV Sectionalization bay: 1 set
  - 132 kV TBC– 1 No.
  - STATCOM (±300 MVAr) along with MSR (2x125 MVAr) and MSC (1x125 MVAr): 1 No.

- Mandsaur – Kurawar 765 kV D/c line (~235 km) with 240 MVAr switchable line reactors at both ends (with NGR bypass arrangement)
- LILO of Indore – Bhopal 765 kV S/c line at Kurawar (LILO route length ~15 km)
- Provision of NGR bypass arrangement and inter tripping scheme on 240 MVAr SW LR at Bhopal end of Kurawar – Bhopal 765 kV S/c line (~60 km)
- Kurawar – Ashtha 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~65 km)

- LILO of one circuit of Indore – Itarsi 400 kV D/c line at Astha (LILO route length ~ 30 km)
- Shujalpur – Kurawar 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line (~40 km)

5.1.2 It was also stated that as part of Rajasthan REZ Phase-III (20 GW) transmission system, 400/220 kV Fatehgarh-IV Pooling Station (PS) (Section-I) and associated transmission system is already under bidding. The evacuation system planned earlier in Ph-III from 400/220 kV Fatehgarh-IV PS is adequate for evacuation of about 2 GW RE capacity. Space provision for separate 765/400/220 kV (Section-2) at Fatehgarh-IV PS was already approved in 8th NCT meeting held on 25.03.2022.

5.1.3 On a query from Chairman, NCT, representative of CTUIL stated that at present, Stage-II Connectivity for about 4.2 GW RE capacity, against the potential of 2.1 GW (under Phase-III), has already been received at Fatehgarh-IV PS and thus Stage-II connectivity granted/received has already exceeded the envisaged potential of Fathegrah-IV PS (Phase-III potential: 2.1 GW). However, no connectivity application has been received at Barmer-I PS. Considering grant of connectivity to new RE generators at Fatehgarh-IV PS (beyond 2 GW) as well as for its evacuation of power from envisaged RE potential in Fatehgarh complex i.e. 4 GW as well as from envisaged potential of 3.5 GW from Barmer complex, 765 kV high capacity corridor(s) will be required from above pooling stations.

5.1.4 NCT Forum enquired for requirement of Barmer-I PS and associated transmission system for evacuation of Fatehgarh-IV PS RE generation (4 GW). Representative of CTUIL stated that Fatehgarh-III-Beawar D/c line is proposed to be LILOed at Fatehgarh PS-IV (Section-2) for transfer through available margins in Fatehgarh-III-Beawar corridor. However, with increased drawl from Western Region (WR) in some scenarios (Winter), loading on 765 kV Fatehgath-III- Fatehgarh-IV section (after LILO) is very high. Therefore, there is a need of another parallel corridor from Fatehgarh-III onwards so as to divert loading of 765 kV Fatehgath-III-Fatehgarh -IV section for which Fatehgarh-III- Barmer-I- Jalore corridor is proposed.

5.1.5 CMD, Grid-India stated that the issue of low Short Circuit Ratio (SCR) in Rajasthan RE complex has been highlighted by Grid-India since 2019-20. He stated that the low grid strength in the complex is one of the contributing factors in variable renewable energy (VRE) related grid events during the last one year. He expressed concern on the Short Circuit Ratio of less than 5 at several pooling stations such as Fatehgarh-IV and Barmer-I in the transmission system proposed for Phase-IV (Part-II). He stated that provision of STATCOM at several envisaged substations was being kept. He suggested that the available technological alternatives to address the reliability concerns associated with low grid strength needs to be examined and suitable solutions must be proposed for implementation.

5.1.6 CMD, Grid-India further opined that the traditional SCR metric does not account sufficiently for the presence of nearby inverter-based resources (IBR) or power electronic-based equipment. He suggested the need to arrive at common understanding of the methodology to compute the system strength of the Point of Interconnection (POI) in presence of multiple inverter-based resources or power electronic based equipment. He further stated that considering the low fault level and low SCR in Rajasthan RE complex, planning for installation of Synchronous Condensers should be taken up on priority.

5.1.7 Dy COO (CTUIL) stated that studies along with proposal were discussed and agreed in Joint study meeting held on 05.12.2022 and 14th Consultation meeting (CMETS-NR) held on 23.12.2022, wherein comments from all stakeholders were incorporated before finalization of proposal. However, detailed deliberation is required regarding SCR as well as methodology to calculate the SCR.

5.1.8 Dr. R. Saha, Expert Member, stated that while examining requirement of a transmission proposal, along with load flow studies, detailed dynamic studies also needs to be carried out.

5.1.9 CMD, Grid-India highlighted the high angular separation in the proposed 765 kV Jalore-Mandsaur D/C (length 320 kms) inter-regional transmission line. In February solar max scenario, the line is carrying 2200 MW on each ckt. Under N-1 contingency, loading would be nearly 3000 MW with angular difference around 25 degrees. This line may be terminated at 765 kV Chittorgarh stations or at any other suitable location and further 400 kV / 765 kV outlets may be planned from Chittorgarh to Mandsaur /Neemuch. He suggested that multiple Voltage Source Converter (VSC) based HVDC system could also be considered.

5.1.10 The above issue was also highlighted in 62nd NRPC meeting held on 31.01.2023, in which CTUIL had informed that in case of N-1 contingency, the angular difference is around 25 degrees which is as stipulated in the planning criteria. In case both lines trip, the angular difference would further increase to 37 degrees. Therefore, in future, in case both lines trip and need to be revived during peak solar generation time, the system may not be stable. New intermediate substation in between may also be proposed and the transmission line length may be reduced as switching of 320 km long inter-regional transmission line may lead to issues in future.

5.1.11 CTUIL mentioned that ‘N-1-1’ is a rare contingency and this too may not occur simultaneously during peak solar generation hours. In the NRPC meeting, CTUIL had also informed NRPC forum regarding possibility of LILO of the above line in future which will reduce the line length. Secondly, CTUIL representative further informed that an additional corridor is being planned from Jalore S/s. So, in that condition, angular control will be much better in future.

5.1.12 On a query from Chairperson, CEA, representative of CTUIL stated that Fathegarh-IV, Barmer-I and Fatehgarh-III S/s are located in the potential Great Indian Bustard (GIB) area of Rajasthan. Therefore, the lines emanating from these sub-stations would pass through the potential GIB area. It was suggested that location of new sub-stations should be planned to avoid GIB area, as far as possible.

5.1.13 After detailed deliberations, it was decided that CTUIL would review the transmission scheme in consultation with CEA and GRID-India and the scheme would be discussed in the next NCT meeting.

5.1.14 Further, it was decided that a small group comprising of officers from CEA, CTUIL and GRID-India be constituted to suggest a methodology to compute the system strength (SCR). The group should submit its findings to NCT within a month.

5.2 **Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW)**

5.2.1 CTUIL stated that transmission system for evacuation of upto 15 GW power from Khavda RE Park has already been evolved in 3 phases (Ph-I: 3 GW, Ph-II: 5 GW and Ph-III: 7 GW). Against the planned system of 15 GW in Khavda area, Stage-II connectivity applications for 18.605 GW (KPS-I: 9 GW, KPS-II: 3.755 GW and KPS-III: 5.85 GW) have already been received till January, 2023. Considering the rapid pace of applications being received in Khavda area and e-mail dated 23.12.2022 from GPCL to consider 30 GW RE potential at Khavda for planning the power evacuation system, transmission system for balance 15 GW Khavda REZ has now been planned (Ph-IV: 7 GW and Ph-V: 8 GW) and details of transmission system under Phase-IV are given as under:

Part – A:

- Creation of 765 kV bus section-II at KPS3 (GIS) along with 765 kV Bus Sectionaliser and 1x330 MVAr, 765 kV Bus Reactors on Bus Section-II (Bus section – II shall be created at 765 kV and 400 kV level both with 2x1500 MVA, 765/400 kV ICTs at Bus Section-II).
- Creation of 400 kV bus section-II at KPS3 (GIS) along with 400 kV Bus Sectionaliser and 1x125MVAr, 400 kV Bus Reactors on Bus Section-II.
- KPS3 (GIS) – KPS2 (GIS) 765 kV 2nd D/C line.
- 2 Nos. of 765 kV line bays each at KPS3 (GIS) and KPS2 (GIS) for KPS3 – KPS2, 765 kV 2nd D/c line.
- ±300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-2.
- KPS1 (GIS)– Bhuj PS 765 kV, 2nd D/C line.
- 2 Nos. of 765 kV line bays each at KPS1 (GIS) and Bhuj PS for KPS1 (GIS) – Bhuj PS 765 kV D/C line.
- KPS2 (GIS) – Lakadia 765 kV, 2nd D/C line.
- 330 MVAR switchable line reactors at KPS2 end of KPS2 (GIS) – Lakadia 765 kV, 2nd D/C line (with NGR bypass arrangement),

- 2 Nos. of 765 kV line bays each at Lakadia PS and KPS2 (GIS) for Khavda PS2 (GIS) – Lakadia PS 765 kV, 2nd D/c line,
- Vadodara (GIS) – Navsari (New)(GIS) 765 kV D/C line,
- 240 MVAR switchable line reactors at Vadodara (GIS) end of Vadodara (GIS) – Navsari (New)(GIS) 765 kV D/C line (with NGR bypass arrangement).
- 2 Nos. of 765 kV line bays each at Vadodara (GIS) and Navsari (New) (GIS) for Vadodara (GIS) – Navsari (New)(GIS) 765 kV D/C line.

Part – B:

- Establishment of 3x1500 MVA 765/400 kV & 2x500 MVA 400/220 kV Boisar-II (GIS) with 2x330 MVAR 765 kV bus reactor and 2x125 MVAR 420 kV bus reactor.

  Future Provisions at Boisar-II : Space for

  - 765/400 kV ICT along with bays- 3 Nos.
  - 765 kV line bays along with switchable line reactors – 8 Nos.
  - 765 kV Bus Reactor along with bay: 2 Nos.
  - 765 kV Sectionaliser bay: 1 set
  - 400 kV line bays along with switchable line reactor – 8 Nos.
  - 400/220 kV ICT along with bays -4 Nos.
  - 400 kV Bus Reactor along with bay: 2 Nos.
  - 400 kV Sectionalization bay: 1- set
  - 220 kV line bays: 12 Nos.
  - 220 kV Sectionalization bay: 1 set
  - 220 kV BC: 1 No.
  - STATCOM (±300 MVAr) along with MSC (3x125 MVAr) and MSR (1x125 MVAr) alongwith 1 No. 400 kV bay: 1 No.
- Navsari (New)(GIS)– Boisar-II (GIS) 765 kV D/c line.
- 2 Nos. of 765 kV line bays at Navsari (New) for termination of Navsari (New)(GIS) – Boisar-II(GIS) 765 kV D/c line.
- 330 MVAR switchable line reactors at Navsari (New) end of Navsari (New)– Boisar-II 765 kV D/c line (with NGR bypass arrangement).
- LILO of Navsari (New) – Padghe (PG) 765 kV D/c line at Boisar-II.
- Boisar-II – Velgaon (MH) 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line.
- 2 Nos. of 400 kV line bays at Velgaon (MH) for termination of Boisar-II – Velgaon (MH) 400 kV D/c (Quad ACSR/AAAC/AL59 moose equivalent) line.
- LILO of Babhaleswar– Padghe (M) 400 kV D/c line at Boisar-II using twin HTLS conductor with minimum capacity of 1700 MVA per ckt at nominal voltage.
- 80 MVAR switchable line reactors at Boisar-II end of Boisar-II – Babhaleswar 400 kV D/c line (with NGR bypass arrangement) formed after above LILO arrangement.
- ± 300 MVAr STATCOM with 3x125 MVAr MSC, 1x125 MVAr MSR at 400 kV level of Boisar-II.

Part – C:

- Establishment of 2x1500 MVA, 765/400 kV and 3x500 MVA, 400/220 kV Pune-III (GIS) with 2x330 MVAR, 765 kV bus reactor and 2x125 MVAR, 420 kV bus reactor.

  Future Provisions at Pune-III: Space for:

- 765/400 kV ICT along with bays- 4 Nos.
- 765 kV line bays along with switchable line reactors – 8 Nos.
- 765 kV Bus Reactor along with bays: 2 Nos.
- 765 kV Sectionaliser bay: 1 -set
- 400 kV line bays along with switchable line reactor – 12 Nos.
- 400/220 kV ICT along with bays -3 Nos.
- 400 kV Bus Reactor along with bays: 2 Nos.
- 400 kV Sectionalization bay: 1- set
- 220 kV line bays: 12 Nos.
- 220 kV Sectionalization bay: 1 set
- 220 kV BC: 1 No.
- STATCOM (±300 MVAr) along with MSC (3x125 MVAr) and MSR (1x125 MVAr): alongwith 1 No. 400 kV bay: 1 No.

- Boisar-II – Pune-III 765 kV D/c line.
- 330 MVAR switchable line reactors at Pune-III end of Boisar-II – Pune-III 765 kV D/c line.
- 2 Nos. of 765 kV line bays at Boisar-II for termination of Boisar-II – Pune-III 765 kV D/c line.
- LILO of Narendra (New) – Pune (GIS) 765 kV D/c line at Pune-III.
- 330 MVAR switchable line reactors at Pune-III end of Narendra (New) – Pune-III (GIS) 765 kV D/c line.
- LILO of Hinjewadi - Koyna 400 kV line at Pune-III(GIS) S/s.
- 80 MVAr, 420 kV switchable Line Reactors on each ckt at Pune-III (GIS) end of Pune-III (GIS)– Koyna 400 kV line formed after above LILO arrangement.

Part D1:

- Augmentation of transformation capacity at KPS1 (GIS) by 1x1500 MVA, 765/400 kV ICT (8^{th}).

Part D2:

- Augmentation of transformation capacity at KPS2 (GIS) by 1x1500 MVA, 765/400 kV ICT (8^{th}) on Bus section-II.

Part D3:

- Augmentation of transformation capacity at KPS3 (GIS) by 1x1500 MVA, 765/400 kV ICT (4^{th}) on Bus Section-I.

5.2.2 CMD, Grid-India stated that MUL load (~4000 MW) had been considered in the transmission planning studies for Khavda Phase–IV and Phase–V transmission schemes. Now, as the plan of MUL is proposed to be dropped, the scheme may be reviewed for assessing the adequacy of proposed scheme. Representative of CTUIL stated that the same has been taken care of in the studies.

5.2.3 CMD, Grid-India highlighted that large quantum of power is getting pooled at Navsari S/s (about 14,000 MW). This pooling of large quantum of power at a single station poses threat of large generation loss in case of complete outage of the sub-station. He suggested planning of alternate/parallel transmission corridor to avoid single point of failure.

5.2.4 Chairperson, CEA directed CTUIL to assess the possibility of 2nd S/s in proximity to the proposed Navsari S/s.

5.2.5 After detailed deliberations, it was decided that CTUIL would study the scheme again in consultation with CEA and Grid-India, considering possibility of 2nd S/s at Navasri including measures to relieve high injection of power at Navsari, examination of Vadodra-Boisar-II, 765 kV D/c line etc. The scheme would be discussed in the next meeting of NCT.

5.3 **Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW)**

5.3.1 Representative of CTUIL stated that the following scheme has been planned to enable evacuation of additional 8 GW RE power from Khavda RE Park under Phase-V:

Part-A:

- Establishment of 8000 MW, ± 800 kV KPS2 (HVDC) [LCC] terminal station (4x2000 MW) along with associated interconnections with 400 kV HVAC Switchyard*.
- Establishment of 8000 MW, ± 800 kV Akola-III (HVDC) [LCC] terminal station (4x2000 MW) along with associated interconnections with 400 kV HVAC Switchyard*
- ±800 kV HVDC Bipole line between KPS2 (HVDC) and Akola-III (HVDC) (1000 km) (with Dedicated Metallic Return) (capable to evacuate 8000 MW with overload capacity as specified).
- Establishment of 8x1500 MVA, 765/400 kV ICTs at Akola-III S/s along with 2x330 MVAr (765kV) and 2x125 MVAr, 420 kV bus reactors along with associated interconnections with HVDC Switchyard*. The 765 kV and 400 kV bus shall be established in two (2) sections through one (1) set of 765 kV and 400 kV bus sectionaliser respectively so that 4x1500 MVA ICTs are placed in each section.

  <u>Future Provisions at Akola-III: Space for:</u>
  - 765 kV line bays along with switchable line reactors – 6 Nos.
  - 765 kV Bus Reactor along with bays: 2 Nos.
  - 400 kV line bays along with switchable line reactor – 10 Nos.
  - 400/220 kV ICT along with bays -6 Nos.
  - 400 kV Bus Reactor along with bays: 2 Nos.
  - 220 kV line bays: 12 Nos.
  - 220 kV Sectionalization bay: 1 set
  - 220 kV BC and TBC: 2 Nos.
- LILO of Wardha – Aurangabad 765 kV 2xD/c line at Akola-III.
- Installation of 240 MVAr switchable line reactor at Akola-III end on each ckt of Akola-III – Aurangabad 765 kV 2xD/c line.

* *The 400 kV interconnections (along with all associated equipment/ bus extension, etc.) between HVDC and HVAC switchyards shall be implemented by the TSP.*

Part-B:

- Augmentation of transformation capacity at KPS2 (GIS) by 1x1500 MVA, 765/400 kV ICT (9^{th}) on Bus Section-I.

Part – C:

- Augmentation of transformation capacity at KPS3 (GIS) by 1x1500MVA, 765/400 kV ICT (7^{th}) on Bus section-II.

5.3.2 CMD, Grid-India, stated that low SCR issue has also been observed in Khavda area and therefore, planning of Synchronous Condenser and/or other solutions may be explored in place of STATCOM. He further stated that in place of a single +/-800 kV LCC HVDC from KPS-II to Akola-III, a couple of VSC based HVDCs (50% capacity each) may be planned from KPS–II to different load centres. In addition to reliable operation in low system strength areas, the VSCs will also provide benefits in terms of Reactive Power Support, Black-start capability etc. The planning of HVDCs to different load centres will also address the uncertainty regarding optimal termination of HVDCs.

5.3.3 In response, representative of CTUIL stated that the SCR in Khavda is relatively high (with 400 kV bus sectionalizer at each of KPS1, KPS2 and KPS3 in open condition). Further, termination of HVDC system at Akola-III is an optimal solution as Akola-III S/s is being proposed through LILO of Wardha–Aurangabad 765 kV 2xD/c line, which shall be sufficient for further dispersal of power to load centres considering that both Wardha and Aurangabad are strongly interconnected with ISTS Grid and closely located near WR-SR and WR-ER boundaries. This shall facilitate dispersal of power to WR / SR / ER as per requirement in various load generation scenarios. He further stated that the scheme had been discussed in the 46^{th} WRPC meeting held on 03.02.2023 and the scheme had been found to be in order and was agreed by the WR constituents.

5.3.4 After detailed deliberations, the Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-V (8 GW) was agreed to be reviewed and would be discussed again in the next meeting.

5.3.5 Further, it was also deliberated that the Phase-V: Part B and Phase-V: Part C schemes involve ICT augmentation works at KPS2/KPS3 S/s, which shall be deliberated in the next NCT meeting along with Khavda Phase-IV and Phase-V transmission system.

5.4 Provision of Dynamic Reactive Compensation at KPS1, KPS3 and Navsari (New) Substations

5.4.1 Representative of CTUIL stated that RE potential in Western Region (ISTS) is concentrated heavily in a few pockets (viz. Khavda / Bhuj / Dwarka areas of Gujarat) and power is to be dispatched over long distances to load centres, thereby necessitating long EHV AC systems whose loading shall vary from very low to very high at different times of the day. This shall result in high voltage variations in the Grid and

may even result in line tripping under overvoltage/undervoltage conditions in case the line / bus reactors are not managed in synchronism with the voltage variation.

In particular, the voltage variations will be most pronounced at injection end (i.e. KPS1, KPS2 and KPS3 S/s) as well as at drawal end [i.e. Navsari (New) and Boisar-II S/s, where low voltages were observed in system studies]. Therefore, it was found prudent to provide STATCOMs with different combinations of MSCs/MSRs at KPS1, KPS3, Navsari (New) and Boisar-II Substations.

Accordingly, the following transmission scheme was proposed:

Part A (Rs 167.03 crores)

1. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1, 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS).

Part B (Rs 167.03 crores)

2. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1, 400 kV Bus section-2 with 1 No. of 400 kV bay (GIS.)

Part C (Rs 167.03 crores)

3. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3, 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS).

Part D (Rs 179.73 crores)

4. ± 300 MVAr STATCOM with 3x125 MVAr MSC, 1x125 MVAr MSR at 400 kV level of Navsari (New)(PG) S/s with 1 No. of 400 kV bay (GIS)

Note:

- TSP of Navsari (New) shall provide space for establishment of STATCOMs as per above scope.
- The TSP of subject scheme shall arrange for additional land for installation of STATCOM (with MSC/MSR) as specified above at KPS1 and KPS3 and TSPs of KPS1 and KPS3 shall provide space for one (1) No. 400 kV bay (each) for termination of STATCOM

Implementation timeframe: 24 months from date of allocation to implementing agency.

5.4.2 The transmission scheme was discussed and agreed in 46th WRPC meeting held on 03.02.2023

5.4.3 Chairperson, CEA, stated that Package A, B and C, consists of implementation of STATCOMs at KPS1, KPS3 and the same may be combined in a single package.

As capacity of Navsari (New) sub-station is to be reviewed, the package D needs to be deferred at present.

5.4.4 After detailed deliberations, it was decided that provision of STATCOMs at KPS1 and KPS3 is to be implemented under TBCB.

5.4.5 Summary of the scheme is as given below:

Sl.	Name of the scheme and	Estimated	Remarks

No.	implementation timeframe	Cost (Rs crores)	
1.	**Provision of Dynamic Reactive Compensation at KPS1 and KPS3** Implementation timeframe: 24 months	501.09	Recommended to MoP for implementation through TBCB route

5.4.6 Detailed scope of the scheme is as given below:

1. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1, 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS)- Cost Rs 167.03 crores.
2. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1, 400 kV Bus section-2 with 1 No. of 400 kV bay (GIS) - Cost Rs 167.03 crores.
3. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS)- Cost Rs 167.03 crores.

Note:

- TSPs of KPS1 and KPS3 shall provide space for 1 No. 400 kV bay (each) for termination of STATCOM.
- Land for installation of STATCOM (with MSC/MSR) as specified above has to be arranged by TSP implementing the STATCOM.

5.5 **Transmission scheme for evacuation of power from Neemuch/Mandsaur 2 GW WEZ**

5.5.1 Representative of CTUIL stated that SECI vide letter dated 23.06.2022 has informed that in order to provide round the clock (RTC) Power (with wind, solar and storage components), they have identified certain locations with high solar and wind potential where work on RE evacuation system may be taken up immediately. 2 GW Wind Potential at Neemuch/Mandsaur is one such prioritized RE Zone. The scheme shall cater to evacuation of power from Neemuch/Mandsaur 2 GW WEZ.

5.5.2 As establishment of 765 kV Mandsaur Pooling Station has to be reviewed, it was decided that the proposal of creation of 400 kV and 220 kV levels at Mandsaur PS, would also be reviewed along with 765 the kV pooling station.

5.5.3 After detailed deliberations, it was decided that the scheme would be reviewed alongwith creation of 765 kV Mandsaur substation proposed for evacuation of RE power from Rajasthan.

5.6 **Transmission System for Evacuation of Power from RE Projects in Rajgarh 1000 MW SEZ in Madhya Pradesh - Phase-II**

5.6.1 Representative of CTUIL stated that transmission System for 2.5 GW REZ at Rajgarh (MP) has been evolved as part of 66.5 GW REZ in two phases:

Phase-I of 1.5 GW: The scheme involves establishment of Pachora PS 3x500 MVA, 400/220 kV ICTs and Pachora–Bhopal 400 kV D/c line (under implementation with SCoD of 30.11.2023) (out of which generation of 1 GW at Agar / Shajapur Solar Parks has been identified).

Phase-II of 1 GW: As agreed in 4th NCT, the scheme involved augmentation of transformation capacity at Pachora PS by 2x500 MVA, 400/220 kV ICTs (4th and 5th and Pachora – Shujalpur 400 kV D/c line and was required to be implemented with RE capacity beyond 1.5 GW at Pachora PS.

5.6.2 On the request of SECI to expedite Phase-II of the scheme irrespective of connectivity applications, it was decided to review Phase-II scheme as ICTs at Shujlapur and downstream network were found to be overloaded due to interconnection of Pachora - Shujalpur 400 kV D/c line for evacuation of power from RE Projects in Rajgarh.

5.6.3 Accordingly, a meeting was held on 01.12.2022 amongst CEA, CTUIL, MPPTCL and GRID-INDIA for finalizing above scheme, wherein, augmentation of transformation capacity at Pachora PS by 2x500 MVA, 400/220 kV ICTs (4th and 5th) and Pachora – Ujjain 400 kV D/c line was agreed for evacuation of 1 GW power from Pachora PS under Phase-II (beyond 1.5 GW). It was subsequently decided to incorporate an additional 6th ICT for ensuring reliability under N-1 contingency conditions in the 14th CMETS-WR meeting held on 30.12.2022.

5.6.4 WRPC in its 46th meeting held on 03.02.2023 approved the scheme.

5.6.5 After detailed deliberations, the transmission scheme was recommended to be implemented under TBCB route.

5.6.6 Summary of the scheme is given below:

Sl. No.	Name of the scheme and implementation timeframe	Estimated Cost (Rs crores)	Remarks
1.	**Transmission System for Evacuation of Power from RE Projects in Rajgarh (1000 MW) SEZ in Madhya Pradesh - Phase-II** Implementation timeframe: 24 months	540	Recommended to MoP for implementation through TBCB route

5.6.7 Detailed scope of the transmission scheme is given below:

Name of the scheme: Transmission System for Evacuation of Power from RE Projects in Rajgarh (1000 MW) SEZ in Madhya Pradesh - Phase-II

Estimated Cost: Rs 540 crores

Sl. No.	Scope of the Transmission Scheme	Capacity/km
1.	400/220 kV, 3x500 MVA ICT augmentation (4th 5th and 6th) at Pachora PS	400/220 kV, 500 MVA ICT – 3 Nos. 400 kV ICT bays – 3 Nos. 220 kV ICT bays – 3 Nos. 400 kV line bays – 2 Nos. 220 kV line bays – 4 Nos. 400 kV Bus Sectionaliser – 1 set 220 kV Bus Sectionaliser – 1 set 220 kV TBC bay – 1 No. 220 kV BC bay – 1 No.
2.	Pachora PS – Ujjain (MPPTCL) 400 kV D/c line (Quad ACSR/AAAC/AL59 Moose equivalent)	Route length – 60 km
3.	2 No. of 400 kV line bays at Ujjain (MPPTCL) for Pachora – Ujjain 400 kV D/c line	400 kV line bays – 2

Note:
(i) MPPTCL to provide space for 2 Nos. of 400 kV line bays at Ujjain for termination of Pachora PS – Ujjain 400 kV D/c line.

Implementation timeframe: 24 months from date of allocation to implementing agency.

5.7 Transmission System for Evacuation of Power from RE Projects in Solapur (1500 MW) SEZ in Maharashtra

5.7.1 Representative of CTUIL stated that about 3.5 GW RE potential has been identified at Solapur out of which 2 GW has been planned for direct injection at Solapur (PG) through 1 No. 400 kV bay and the balance 1.5 GW has been planned for injection at a new substation near Solapur (Solapur Pooling Point). Further, till date, connectivity application of 773 MW has been received in Solapur area.

The present scheme at an estimated cost of Rs 471.24 crores has been planned for evacuation of power from RE projects in Solapur (1500 MW) SEZ in Maharashtra.

5.7.2 CMD, Grid-India stated that, at present, the loading of 400 kV Solapur–Kolhapur, Solapur–Alkud, Solapur–Karad lines are already on the higher side. With further infeed from the Solapur PS, the loading is observed to further increase and these lines are found to be 'N-1' non-compliant in study cases.

5.7.3 Representative of CTUIL stated that in the studies, loading on Solapur–Alkud 400 kV line and Solapur–Bale 220 kV D/c line is seen to be on the higher side and injection at Solapur (PG) S/s has low sensitivity on the loading of above lines (7% and 4% respectively). Nevertheless, the matter is being discussed with MSETCL and any additional ISTS / Intra-state scheme for mitigating the above issue shall be planned in coordination with MSETCL.

5.7.4 After detailed deliberations, the scheme was agreed to be implemented under TBCB route.

5.7.5 Summary of the scheme is as given below:

Sl. No.	Name of the scheme and implementation timeframe	Estimated Cost (Rs crores)	Remarks
1.	Transmission System for Evacuation of Power from RE Projects in Solapur (1500 MW) SEZ in Maharashtra Implementation timeframe: 24 months	471.24	Approved for implementation through TBCB route.

5.7.6 Detailed scope of the transmission scheme is given below:

Name of the scheme: Transmission system for evacuation of power from RE projects in Solapur (1500 MW) SEZ in Maharashtra

Estimated Cost: Rs 471.24 crores

Sl. No.	Scope of the Transmission Scheme	Capacity/km
1.	Establishment of 400/220 kV, 4x500 MVA ICTs at Solapur PS alongwith 2x125 MVAR, 420 kV Bus Reactors Future provisions: Space to accommodate: • 400/220 kV, 500 MVA ICT along with associated bays – 6 Nos. • 400 kV line bays along with switchable line reactors: 12 Nos. • 420 kV, 2x125 MVAr Bus Reactor with Bays • 15 Nos. of 220 kV line bays • Sectionalizer arrangement at 220 kV level (3 Sets) and 400 kV level (1 Set) • 220 kV TBC bay – 3 Nos. • 220 kV BC bay – 3 Nos.	400/220 kV, 500 MVA ICT – 4 Nos. 400 kV ICT bays – 4 Nos. 220 kV ICT bays – 4 Nos. 400 kV line bays – 2 Nos. 220 kV line bays for solar park interconnection – 5 Nos. 125 MVAr, 420 kV Bus reactor – 2 Nos 400 kV Bus reactor bay: 2 Nos. 220 kV TBC bay – 1 No. 220 kV BC bay – 1 No.
2.	Solapur PS – Solapur (PG) 400 kV D/c line (Quad ACSR/AAAC/AL59 moose equivalent)	Route length ~30 km
3.	2 Nos. of 400 kV line bays at Solapur (PG) S/s for termination of Solapur PS –	400 kV line bays – 2 Nos. [for Solapur (PG) end]

Sl. No.	Scope of the Transmission Scheme	Capacity/km
	Solapur (PG) 400 kV D/c line	

Note: POWERGRID to provide space for 2 Nos. of 400 kV bays at Solapur (PG) for termination of Solapur PS Solapur (PG) 400 kV D/c line.

Implementation timeframe: 24 months from date of allocation to implementing agency.

~~5.7.7~~ It was highlighted that the location of Solapur PS needs to be chosen carefully towards the eastern side of Solapur (PG) S/s considering that the proposed Solapur PS–Solapur (PG) 400 kV D/c line may pass through GIB area (Priority or Potential) in the state of Maharashtra if Solapur PS substation is planned towards North, West and South West direction from Solapur (PG). It was decided that this consideration should be kept in view while carrying out the Survey work.

5.8 Transmission scheme for injection beyond 3 GW RE power at Khavda PS2 (KPS2)

5.8.1 In the 11th meeting of NCT, CTUIL had proposed augmentation by three (3) Nos. 765/400 kV, 1500 MVA ICTs at KPS2 (3rd and 4th on Bus Section-I and 3rd on Bus Section-II) at an estimated cost of Rs 352.06 Crore to cater RE injection requirement at Khavda Pooling Station-2 (KPS2), with implementation timeframe of 21 months from date of allocation/SPV transfer.

In the meeting, it was informed that the transmission scheme “Establishment of KPS2 in Khavda RE Park” was under bidding and bid submission was scheduled on 16th January 2023. As the scheme involved ICT augmentation at a S/stn which has not yet been awarded, NCT decided to defer the scheme at present and the same would be discussed for implementation after award of the work of establishment of KPS2.

5.8.2 CTUIL vide mail dated 13.03.2023 informed that bid submission of "Establishment of Khavda Pooling Station-2 (KPS2) in Khavda RE Park" scheme has been concluded on 20.01.2023 and SPV transfer is expected shortly. As such, the proposal may be taken up for discussion.

5.8.3 Chairperson, CEA, stated that the proposed scheme can be merged with Transmission System for Evacuation of Power from potential renewable energy zone in Khavda area of Gujarat under Phase-IV (7 GW) with implementation timeframe of 21 months.

5.8.4 After detailed deliberations, it was decided that the scheme would be reviewed along with Khavda: Phase IV (7 GW) transmission scheme, once the Phase IV (7 GW) transmission scheme is finalized.

5.9 Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV):

5.9.1 CTUIL proposed to establish a new 765 kV ISTS substation at Paradeep in Odisha with two different sources viz. Angul and Medinipur in phased manner, to cater to

large industrial demand expected in the area and the industries requiring large amount of RE power from outside Odisha for production of Green Hydrogen and Green Ammonia.

In the initial phase, electricity demand of about 1400-1500 MW is likely at Paradeep from industrial consumers. The total demand at Paradeep S/s is likely to be about 5500-6000 MW, as per inputs provided by Odisha Government. Hence, in the initial phase, Paradeep S/s along with Angul–Paradeep, 765 kV D/c transmission line and Paradeep–Paradeep (OPTCL) 400 kV D/c (Quad) line are planned to be established. Gradually, the capacity of sub-station would be expanded in phased manner based on the demand growth.

5.9.2 On a query from Chairman, NCT, regarding establishment of new Paradeep 765 kV (GIS) S/s instead of establishing 765 kV level at Paradeep (OPTCL) 400/220 kV S/s, representative of CTUIL stated that as per OPTCL, sufficient space is not available at the under construction 400/220 kV Paradeep (OPTCL) S/s.

5.9.3 The scheme was discussed in 48th meeting of ERPC held on 20th February 2023. ERPC observed the following :

6 The requirement of 220 kV level in first phase of the scheme may be reviewed at CTU/NCT level as majority of the green hydrogen industry is going to be connected at 400 kV level and at present there is no firm demand for drawal of power from 220 kV level of ISTS system.

7 The observation of JBVNL on analysis of financial implication due to above project and observations of JUSNL on implementation of the scheme in phased manner based on the load requirement instead of at a one go may be taken into consideration.

8 As Paradip is a coastal town very near to Bay of Bengal, the substation/transmission infrastructure has to be robust and cyclone/flood resilient. The relevant guidelines of CEA in this regard shall be followed while designing the scheme. The substation may be implemented as GIS system.

9 The projected load growth has to be realistic and the implementation of scheme may be planned matching with the load projection.

9.1.1 After detailed deliberations, NCT recommended the implementation of the transmission scheme under TBCB.

9.1.2 Summary of the transmission scheme is given below:

Sl. No.	Name of the scheme and implementation timeframe	Estimated Cost (Rs crores)	Remarks
~~1.~~	Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV) Implementation timeframe: 24	2564.24	Recommended to MoP for implementation through TBCB route.

	months		

9.1.3 Detailed scope of the transmission scheme is given below:

Sl. No.	Scope of the transmission scheme	Capacity (MVA) / line length (km)/ Nos
i.	Establishment of Paradeep 765/400 kV, 2x1500 MVA GIS substation **<u>Future Provisions: Space for:</u>** • 765/400 kV, 4x1500 MVA ICTs (13x500 MVA single phase units including one spare) along with associated ICT bays at both voltage levels • 400/220 kV, 5x500 MVA ICTs along with associated ICT bays at both voltage levels • 765 kV, 2x330MVAr (7x110MVAr single phase units including one spare) bus reactor along with associated bays • 420 kV, 2x125MVAr bus reactor along with associated bays • 10 Nos. of 765kV line bays (along with space for switchable line reactor) for future lines • 12 Nos. of 400 kV line bays (along with space for switchable line reactor) for future lines • 12 Nos. of 220kV line bays for future lines • 765 kV bus sectionaliser bay: 1 set • 400 kV bus sectionaliser bay: 1 set • 220 kV Bus sectionalizer bay :1 set • 220 kV Bus coupler bay: 2 No. • 220 kV Transfer bus coupler bay: 2 No.	765/400 kV, 1500 MVA ICTs: 2 Nos. (7x500 MVA single phase units including one spare) 765 kV ICT bays: 2 Nos. 400 kV ICT bays: 2 Nos. 765 kV, 330 MVAr Bus reactor: 2 Nos. (7x110 MVAr single phase units including one spare unit for both bus and line reactors) 420 kV, 125 MVAr Bus reactor: 2 Nos. 765 kV Bus reactor bays: 2 Nos. 400 kV Bus reactor bays: 2 Nos. 765 kV line bays: 2 Nos. *[for termination of Angul (POWERGRID)–Paradeep 765 kV D/c line along with 765 kV, 1x330 MVAr switchable line reactor at Paradeep end in both circuits]* 765 kV, 330 MVAr (3x110 MVAr single phase units) switchable line reactor along with associated bay and 500-ohm NGR (with NGR bypass arrangement): 2 Nos. *[at Paradeep end in both circuits of Angul (POWERGRID)–Paradeep 765 kV D/c line]* 400 kV line bays: 2 Nos. *[for termination of Paradeep – Paradeep (OPTCL) 400 kV D/c (Quad) line]*

Sl. No.	Scope of the transmission scheme	Capacity (MVA) / line length (km)/ Nos
ii.	Angul (POWERGRID) – Paradeep 765 kV D/c line along with 765kV, 1x330 MVAr switchable line reactor with 500ohm NGR (with NGR bypass arrangement) at Paradeep end in both circuits	Route length: 190 km
iii.	Paradeep–Paradeep (OPTCL) 400 kV D/c (Quad) line	Route length: 10 km
iv.	Extension at Angul (POWERGRID) S/s	765 kV line bays (along with space for future switchable line reactor): 2 Nos. *[for termination of Angul (POWERGRID)–Paradeep 765 kV D/c line along with 765 kV, 1x330 MVAr switchable line reactor at Paradeep end in both circuits]*
v.	#Extension at Paradeep (OPTCL) GIS S/s	400 kV GIS line bays: 2 Nos. *[for termination of Paradeep–Paradeep(OPTCL) 400 kV D/c (Quad) line]*

#As the bus scheme of Paradeep (OPTCL) GIS S/s is one and half breaker scheme, 2 Nos. full diameter i.e. 4 Nos. of GIS bays needs to be implemented in the scheme for requirement of 2 Nos. GIS bays for termination of Paradeep (OPTCL) – Paradeep 400 kV D/c (Quad) line in two different diameters. Utilisation of other 2 Nos. GIS bays of these diameters shall be identified in future.

Note:

a) POWERGRID shall provide space at Angul (POWERGRID) 765/400 kV S/s for implementation of 2 Nos. of 765 kV line bays (along with space for future switchable line reactor) for termination of Angul (POWERGRID)–Paradeep 765 kV D/c line.

b) OPTCL shall provide space at under implementation Paradeep (OPTCL) 400/220 kV GIS S/s (expected by December 2024) for implementation of 2 Nos. of 400 kV GIS line bays for termination of Paradeep–Paradeep (OPTCL) 400 kV D/c (Quad) line. 2 Nos. full diameter i.e. 4 Nos. GIS bays shall be established.

10 Modifications in the Schemes approved/recommended in the earlier meetings of NCT:

10.1 MoP vide letter dated 22nd March 2023, delegated some Power to National Committee on Transmission (NCT) for approving minor changes in the scope of ISTS schemes allotted by MoP for implementation under TBCB/RTM mode in following cases:

(i) Addition/ deletion in the future scope (space provisions) at a substation.
(ii) Phasing of transmission scheme i.e. implementation of transmission elements in different time-frames.

(iii) Change in the type/ capacity of conductor of transmission line and change in quantum of reactive power compensation.
(iv) Change in technology of substation viz. AIS to GIS/hybrid or vice-versa.
(v) Cases in which final scheme is required to be implemented instead of interim arrangement.
(vi) Addition/ deletion of transmission element(s) in the notified transmission scheme.

The delegation of powers is subject to following conditions:

i) The overall cost impact due to these modifications in scope shall not exceed 5% of the original estimated cost of the scheme, with an upper cap of Rs 500 crores.

ii) Change in implementation timelines would continue to be submitted to Ministry of Power as it may have implications for evacuation from RE projects.

NCT noted the same.

10.2 **Modifications in Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part I**

10.2.1 The scheme "Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III: Part I" was recommended to MoP for implementation through TBCB route in the 9th meeting of NCT.

10.2.2 Representative of CTUIL proposed to incorporate future provisions at Bhadla (HVDC) [LCC] S/s as detailed below:

Future space provision at Bhadla (HVDC) [LCC]: Space for:

- 400 kV line bays along with switchable line reactor: 4 Nos.
- 400 kV Bus Reactor along with bay: 1 No.
- 400 kV Sectionalisation bay: 1 set

10.2.3 As per MoP Order dated 22nd March, 2023, delegating some Power to National Committee on Transmission (NCT) for approving minor changes in the scope of ISTS schemes, the proposed change comes under clause (i) of the order viz. *Addition/ deletion in the future scope (space provisions) at a substation*. Estimated cost of "Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III: Part I" is Rs 12,700 Crore. The Future Space Provisions suggested above would be well within the 5% limit (i.e. Rs 635 crores)

10.2.4 After detailed deliberations, the proposed change was agreed by NCT.

10.3 **Transmission scheme for drawal of 4000 MW power by MPSEZ Utilities Limited (MUL)**

10.3.1 In the 11th meeting of NCT, the transmission scheme "Transmission scheme for drawal of 4000 MW power by MPSEZ Utilities Limited (MUL)", at an estimated cost

of Rs 2200 crores with implementation timeframe of 21 months from date of SPV transfer was recommended to be implemented through TBCB.

10.3.2 MUL vide letters dated 04.03.2023 has requested to keep the LTA applications on hold and defer their further processing. In the absence of any firm commitment from MUL, the scheme needs to be deferred.

10.3.3 After deliberations, NCT agreed to defer the scheme.

10.4 **ERES-XXIX - variation in NCT cost and DPR cost estimate**

10.4.1 Member Secretary, NCT stated that NCT has approved implementation of ISTS scheme "Eastern Region Expansion scheme – XXIX (ERES-XXIX)" (costing greater than Rs 100 Cr and less than Rs 500 crores) in its 9th meeting held on 28.09.2022 and awarded to CTUIL for implementation under RTM mode by POWERGRID.

The estimated cost mentioned in the said communication was Rs 422.23 crores with implementation time frame of 36 months. Since, unit cost for reconductoring is not available in the NCT Cost matrix, CTUIL estimated the cost based on award of similar nature of works which includes IDC of 6% and project completion factor of 1.23 for 36 months in line with methodology adopted by NCT cost committee. The substation equipment cost was based on September 2021 price level.

10.4.2 However, the cost estimate as per Detailed Project Report (DPR) prepared by POWERGRID for the said scheme is about Rs 524.04 crores which includes IEDC@10.75% plus IDC @9.70% plus 3% contingency and the cost is based on September, 2022 price level. On a query from Chairperson, CEA, representative of CTUIL stated that while estimating the cost, POWERGRID has taken IEDC and contingency over the base cost, while the methodology of costing by the NCT cost committee is based on IDC and project completion factor over the base cost for estimating the cost of transmission schemes.

10.4.3 Chairman, NCT, opined that as CTUIL is estimating the cost of transmission schemes while submitting agenda to NCT, a standard methodology should be followed by CTUIL for estimating the cost of transmission schemes.

10.4.4 CTUIL was requested to examine the different factors being considered by CTUIL vs the different factors considered by POWERGRID (IEDC, IDC etc.) while estimating the cost of transmission schemes and present the same in the next NCT meeting. Decision on the agenda item would be taken subsequently.

10.5 **Updation/Modification in the transmission scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part-C1"**

10.5.1 The transmission scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part-C1", which inter-alia includes the establishment of 2x1500 MVA, 765/400 kV and 2x500 MVA, 400/220, 2 Nos. of 400 kV line bays and 4 Nos. of 220 kV line bays at Ramgarh PS, is under bidding stage with RECPDCL as the Bid Process Coordinator (BPC).

10.5.2 CTUIL vide emails dated 22.2.2023 and 1.3.2023 informed that 400 kV (1 No.) and 220 kV (2 Nos.) connectivity bays for Adani project (1500 MW) at Ramgarh PS may be deleted from the present scope of Ph-III Part-C1 package and may be considered under the future scope of Ramgarh PS as M/s Adani is not implementing its RE generation project for which these connectivity bays have been planned.

10.5.3 Considering the transmission scheme in the advance stage of bidding, CEA vide email dated 09.03.2023 had requested the BPC to delete the implementation of 400 kV (1 No.) and 220 kV (2 Nos.) connectivity bays at Ramgarh PS from the present scope of the scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part-C1" and consider them under the future scope of Ramgarh PS.

10.5.4 NCT noted the same.

10.6 **Updation/Modification in the transmission scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part-C1, Part F"**

10.6.1 The transmission schemes are under bidding with implementation timeframe of 18 months. In the 11th NCT meeting, STATCOM had been included in the packages. Considering the time taken for Design, Engineering, supply etc of STATCOM, bidders have requested the following:

- POWERGRID has requested for implementation timeframe of 30 months
- ReNew Transmission Ventures has requested for implementation timeframe of 24 months
- Aparaava Energy Private Ltd has requested for implementation timeframe of 24 months

10.6.2 It was also opined that implementation timeframe of transmission system could be kept as 18 months and for STATCOM as 24 months.

10.6.3 Chairperson, CEA, opined that if the implementation timeframe of STATCOM is increased to 24 months, then initially the transmission lines would have to be operated without STATCOM. Hence, SECI should write to RE Generators/Developers at these places to bring adequate reactive compensation at the time of First-time charging (FTC).

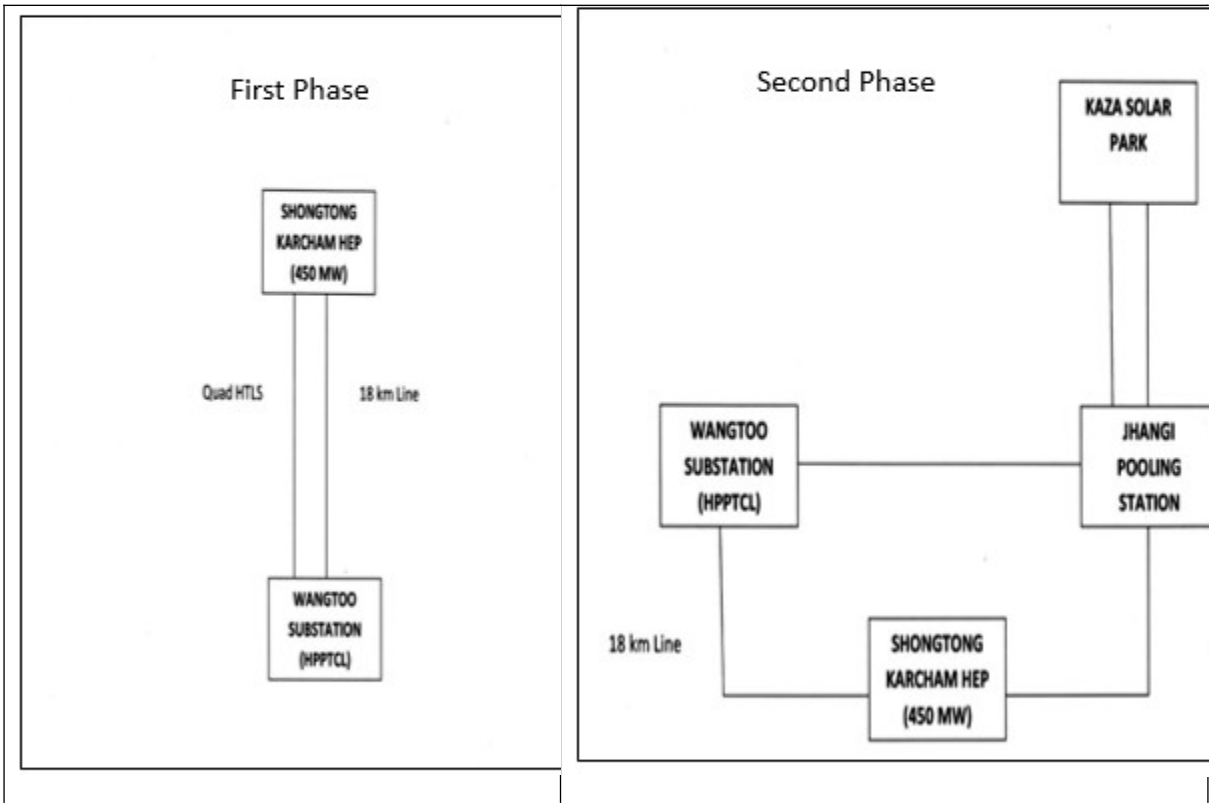
10.6.4 After detailed deliberations, implementation timeframe for STATCOM was agreed to be 24 months. Implementation timeframe of remaining transmission scheme would be 18 months. It was also decided that, SECI would write to RE Generators regarding provision of adequate reactive compensation at the time of FTC and no relaxation would be allowed.

10.7 **Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)**

10.7.1 Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) was agreed to be implemented through TBCB route in the 11th meeting of NCT.

10.7.2 The scheme includes Creation of Jhangi Pooling station, LILO of one circuit of Jhangi PS-Wangtoo (HPPTCL) 400 kV D/c (Quad) line at generation switchyard of Shongtong HEP, with the commissioning schedule of 31st July, 2026.

10.7.3 HPPCL vide letter dated 21.03.2023 addressed to CTUIL has intimated that the commissioning date of Shongtong Karcham HEP has been revised to July, 2025. HPPCL has requested to prepone the implementation timeframe of the transmission system for the HEP, i.e. section of line from Wangtoo to Shongtong HEP (around 18 km) in matching timeframe of the Shongtong HEP i.e. July, 2025 as 1st phase. The section from Shontong to Jhangi pooling station may be constructed in 2nd phase as per original schedule of upstream project



10.7.4 It was deliberated that as the proposal pertains to change in implementation timeframe as well as re-configuration of scheme, the proposal needs to be sent to MoP for their approval.

10.7.5 Subsequently, HPPCL vide letter dated 05.04.2023 addressed to CEA, has proposed some more alternatives for evacuation of power from Shongtong Karcham HEP. Hence, the proposals would be studied and would be put up in the next NCT meeting for deliberations.

11 Evaluation of functioning of National Grid.

GRID-INDIA had made a presentation apprising NCT of the performance of National Grid in Q3 (October-December, 2022) in the meeting held in January 2023. Performance of National Grid in Q4 (January-March, 2023) would be presented to NCT in the next meeting.

12 Comprehensive presentation by CTU apprising NCT of measures taken for ensuring development of an efficient, co-ordinated and economical ISTS for smooth flow of electricity.

13 Five-year rolling plan for ISTS capacity addition.

- CTUIL had already made a detailed presentation on the above in the NCT meeting held in January, 2023. As the rolling plan is updated every six months, there is no change in the Plan.

Summary of the deliberations in the 12th meeting of NCT

1. ISTS Transmission schemes, costing between Rs 100 Crore to Rs 500 Crore, approved by NCT:

Sl. No.	Name of the transmission scheme	Implementation Mode	Implementation timeframe	Allocated to	Estimated Cost (Rs crores)
1.	Transmission system for evacuation of power from RE projects in Solapur (1500 MW) SEZ in Maharashtra	TBCB	24 months	PFCCL	471.24

2. ISTS Transmission schemes costing greater than Rs 500 crores, recommended by NCT to MoP:

a) The ISTS transmission schemes recommended by NCT to MoP are given below:

Sl. No.	Name of the transmission scheme	Implementation Mode	Implementation timeframe	Survey Agency	Estimated Cost (Rs crores)
1.	Provision of Dynamic Reactive Compensation at KPS1 and KPS3	TBCB	24 months	NA	501.09
2.	Transmission System for Evacuation of Power from RE Projects in Rajgarh 1000 MW SEZ in Madhya Pradesh - Phase-II	TBCB	24 months	RECPDCL	540
3.	Eastern Region Expansion	TBCB	24 months	CTUIL	2564.24

	Scheme-XXXIV (ERES-XXXIV)				

14 The broad scope of ISTS schemes recommended by NCT to MoP for implementation through TBCB mode, to be notified in Gazette of India is as given below:

S.No.	Name of the scheme and implementation timeframe	Broad Scope	Bid Process Coordinator
1.	Provision of Dynamic Reactive Compensation at KPS1 and KPS3 Implementation timeframe: 24 months	1. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS)- Estimated Cost Rs 167.03 crores. 2. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS1 400 kV Bus section-2 with 1 No. of 400 kV bay (GIS)-Estimated Cost Rs 167.03 crores. 3. ± 300 MVAr STATCOM with 1x125 MVAr MSC, 2x125 MVAr MSR at KPS3 400 kV Bus section-1 with 1 No. of 400 kV bay (GIS)- Cost Rs 167.03 crores. **(Detailed scope as approved by 12th NCT and subsequent amendments, if any)**	To be decided by MoP
2.	Transmission System for Evacuation of Power from RE Projects in Rajgarh 1000 MW SEZ in Madhya Pradesh - Phase-II Implementation timeframe: 24 months	1. 400/220 kV, 3x500 MVA ICT augmentation (4th 5th and 6th) at Pachora PS 2. Pachora PS – Ujjain (MPPTCL) 400 kV D/c line (Quad ACSR/AAAC/AL59 Moose equivalent) 3. 2 Nos. of 400 kV line bays at Ujjain (MPPTCL) for Pachora – Ujjain 400 kV D/c line **(Detailed scope as approved by 12th NCT and subsequent**	To be decided by MoP

		amendments, if any)	
3.	Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV) Implementation timeframe: 24 months	1. Establishment of Paradeep 765/400 kV, 2x1500 MVA GIS substation 2. Angul (POWERGRID) – Paradeep 765 kV D/c line along with 765 kV, 1x330 MVAr switchable line reactor with 500 ohm NGR (with NGR bypass arrangement) at Paradeep end in both circuits 3. Paradeep – Paradeep (OPTCL) 400 kV D/c (Quad) line 4. Extension at Angul (POWERGRID) S/s 5. Extension at Paradeep (OPTCL) GIS S/s **(Detailed scope as approved by 12th NCT and subsequent amendments, if any)**	To be decided by MoP

3. Modification in the scope of works of Transmission Scheme approved/ recommended in previous meetings of NCT:

3.1 Modifications in Transmission system for evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part I

The following future space provisions at Bhadla (HVDC) [LCC] S/s are incorporated in the original scheme:

Future space provision at Bhadla (HVDC) [LCC]: Space for:

- 400 kV line bays along with switchable line reactor: 4 Nos.
- 400 kV Bus Reactor along with bay: 1 .No.
- 400 kV Sectionalisation bay: 1 set

The revised scheme is given below:

Detailed scope of the scheme is as follows:

a) Establishment of 6000 MW, ± 800 kV Bhadla (HVDC) [LCC] terminal station (4x1500 MW) at a suitable location near Bhadla-3 substation
   - 400/33 kV, 2x50 MVA transformers for exclusively supplying auxiliary power to HVDC terminal.

- 400 kV bus sectionaliser -2 Nos. (1 Set) at Bhadla (HVDC) station.

Future provisions at Bhadla (HVDC): Space for:

- **400 kV line bays along with switchable line reactor: 4 Nos.**
- **400 kV Bus Reactor along with bay: 1 No.**
- **400 kV Sectionalisation bay: 1 set**

b) Establishment of 6000 MW, ±800 kV Fatehpur (HVDC) [LCC] terminal station (4x1500 MW) at suitable location near Fatehpur (UP)

c) Bhadla-3 – Bhadla (HVDC) 400 kV 2xD/c quad moose line along with the line bays at both substations
   - Line length- 2 km
   - 400 kV line bays -8 Nos.

d) ±800 kV HVDC line (Hexa lapwing) between Bhadla (HVDC) and Fatehpur (HVDC) (with Dedicated Metallic Return)
   - Line length- 950 km

e) Establishment of 5x1500 MVA, 765/400 kV ICTs at Fatehpur (HVDC) along with 2x330 MVAr (765kV) bus reactor.
   - 765/400 kV 1500 MVA ICTs: 5 Nos. (16x500 MVA, including one spare unit)
   - 765 kV ICT bays – 5 Nos.
   - 400 kV ICT bays – 5 Nos.
   - 400 kV Bus sectionaliser-2 Nos. [1 Set]
   - 765 kV line bays – 4 Nos.
   - 330 MVAr, 765 kV Bus Reactors -2 Nos. (7x110 MVAr, including one spare unit)
   - 765 kV reactor bays- 2 Nos.

   <u>Future provisions: Space for:</u>
   - 765/400 kV ICT along with bay: 1 No.
   - 765 kV line bay along with switchable line reactor: 4 Nos.
   - 765 kV Bus Reactor along with bays: 2 Nos.
   - 400/220 kV ICTs along with bays: 4 Nos.
   - 400 kV line bays along with switchable line reactor: 4 Nos.
   - 400 kV Bus Reactor along with bay: 1 No.
   - 220 kV line bays: 6 Nos.

f) LILO of both ckts of 765 kV Varanasi – Kanpur (GIS) D/c line at Fatehpur - (30 km)

3.2 Transmission Scheme for drawal of 4000 MW power by MPSEZ Utilities Limited (MUL):

The transmission scheme "Transmission scheme for drawal of 4000 MW power by MPSEZ Utilities Limited (MUL)", at an estimated cost of Rs 2200 crores with implementation timeframe of 21 months from date of SPV transfer was agreed to be deferred.

3.3 Updation/Modification in the transmission scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20GW) under Phase-III Part-C1"

400 kV (1 No.) and 220 kV (2 Nos.) connectivity bays at Ramgarh PS have been deleted from the present scope of scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part-C1" and the same have been considered under the future scope of Ramgarh PS. Details are given below:

Sl. No.	Original Scope	Revised Scope
1.	Establishment of 2x1500 MVA, 765/400 kV and 2x500 MVA 400/220 kV pooling station at Ramgarh along with 2x240 MVAr (765 kV) Bus Reactor and 2x125 MVAr (420kV) Bus Reactor**,** ± 2x300MVAr STATCOM along with MSC+MSR Capacity 765/400 kV 1500 MVA ICTs: 2 Nos. (7x500 MVA including one spare unit) 765 kV ICT bays - 2 Nos. 400/220 kV, 500 MVA ICT – 2 Nos. 400 kV ICT bays – 4 Nos. 220 kV ICT bays - 2 Nos. **400 kV line bays - 2 Nos.** **220 kV line bays: 4 Nos.** 765 kV line bays -2 Nos. 240 MVAr Bus Reactor-2 Nos. (7x80 MVAr considering one spare unit) 240 MVAr Bus Reactor-2 Nos. (7x80 MVAr, including one spare unit) 765kV reactor bay- 2 Nos. 125 MVAr, 420kV bus reactor - 2 Nos. 420 kV reactor bay - 2 Nos. 400 kV Sectionalization bay: 1 set. ** ± 2x300MVAr STATCOM, 4x125 MVAr MSC, 2x125 MVAr MSR along with 2 Nos. of 400 kV bays	Establishment of 2x1500 MVA, 765/400 kV and 2x500 MVA 400/220 kV pooling station at Ramgarh along with 2x240 MVAr (765 kV) Bus Reactor and 2x125 MVAr (420 kV) Bus Reactor, ± 2x300 MVAr STATCOM along with MSC+MSR Capacity 765/400 kV 1500 MVA ICTs: 2 Nos. (7x500 MVA including one spare unit) 765 kV ICT bays - 2 Nos. 400/220 kV, 500 MVA ICT – 2 Nos. 400 kV ICT bays – 4 Nos. 220 kV ICT bays - 2 Nos. **400 kV line bays - 1 Nos.** **220 kV line bays: 2 Nos.** 765 kV line bays -2 Nos. 240 MVAr Bus Reactor-2 Nos. (7x80 MVAr, including one spare unit) 765 kV reactor bay- 2 Nos. 125 MVAr, 420 kV bus reactor - 2 Nos. 420 kV reactor bay - 2 Nos. 400 kV Sectionalization bay: 1 set. ** ± 2x300 MVAr STATCOM, 4x125 MVAr MSC, 2x125 MVAr MSR along with 2 Nos. of 400 kV bays

	Future provisions: Space for 765/400 kV ICTs along with bays: 5 Nos. 765kV line bay along with switchable line reactor: 2Nos. 765kV Bus Reactor along with bays: 2 Nos. 400/220 kV ICTs along with bays: 8 Nos. 400 kV line bays along with switchable line reactor: 4 Nos. 400 kV line bays: 2 Nos. 400 kV Bus Reactor along with bays: 2 Nos. 400 kV Sectionalization bay: 2 sets ** 220 kV line bays: 11 Nos. 220 kV Sectionalization bay: 2 Nos. **	Future provisions: Space for: 765/400 kV ICTs along with bays: 5 Nos. 765 kV line bay along with switchable line reactor: 2 Nos. 765 kV Bus Reactor along with bays: 2 Nos. 400/220 kV ICTs along with bays: 8 Nos. 400 kV line bays along with switchable line reactor: 4 Nos. **400 kV line bays: 3 Nos.** 400 kV Bus Reactor along with bays: 2 Nos. 400 kV Sectionalization bay: 2 sets ** **220 kV line bays: 13 Nos.** 220 kV Sectionalization bay: 2 Nos. **
2.	Ramgarh – Bhadla-3 765 kV D/c line (180 km) along with 240 MVAr switchable line reactor at each circuit at Ramgarh end of Ramgarh – Bhadla-3 765 kV D/c line 765 kV, 240 MVAr switchable line reactor- 2 Nos. Switching equipment for 765 kV 240 MVAR switchable line reactor –2 Nos.	Ramgarh – Bhadla-3, 765 kV D/c line (180 km) along with 240 MVAr switchable line reactor on each circuit at Ramgarh end of Ramgarh – Bhadla-3, 765 kV D/c line 765 kV, 240 MVAr switchable line reactor- 2 Nos. Switching equipment for 765 kV, 240 MVAR switchable line reactor –2 Nos.
3.	2 Nos. of 765 kV line bays at Bhadla-3 765 kV line bays:- 2 Nos.	2 Nos. of 765 kV line bays at Bhadla-3 765 kV line bays:- 2 Nos.

Implementation timeframe: 18 months for transmission scheme and 24 months for STATCOM along with associated bays (from date of SPV acquisition)

Note:

i. Implementation schedule of Phase III –Part C1 package is to match with package Phase III –Part B1 (establishment of Bhadla-3 PS, 765 kV Bhadla-3 PS-Sikar-2 D/c line, 400 kV Bhadla-3 PS-Fatehgarh-2 D/c line)
ii. Developer of Bhadla-3 S/s to provide space for 2 Nos. of 765 kV line bays at Bhadla-3 S/s for termination of 765 kV Ramgarh – Bhadla-3 D/c line
iii. The line lengths mentioned above are approximate as the exact length shall be obtained after detailed survey
iv. Provision of suitable sectionalization shall be kept at Ramgarh at 400 kV and 220 kV level to limit short circuit level
v. ±300 MVAr STATCOM should be placed in each 400 kV bus section of Ramgarh PS
vi. Implementation of the scheme to be taken up upon receipt of LTA from RE generation developers at Ramgarh PS/Bhadla-3 PS

** *Bus Sectionalization bay shall comprise of bus sectionalization of both Main Bus-I and Main Bus-II.*

3.4 Updation/Modification in the transmission scheme "Transmission system for Evacuation of power from REZ in Rajasthan (20 GW) under Phase-III Part-C1, Part F": Implementation timeframe for transmission system to be 18 months and implementation timeframe of STATCOM to be 24 months.

***

Annex-I

List of Participants of the 12th meeting of NCT

CEA:

1. Sh. Ghanshyam Prasad, Chairperson, CEA and Chairman, NCT
2. Sh. A. K. Rajput, Member (PS)
3. Sh. Ishan Sharan, Chief Engineer (PSPA-I)
4. Sh. Goutam Gosh, Chief Engineer (F&CA)
5. Sh. B.S. Bairwa, Director (PSPA-II)
6. Smt. Manjari Chaturvedi, Director (PSPA-I)
7. Sh. Deepanshu Rastogi, Deputy Director (PSPA-II)
8. Sh. Vikas Sachan, Deputy Director (PSPA-I)
9. Sh. Manish Maurya, Deputy Director (PSPA-II)
10. Sh. Pranay Garg, Deputy Director (PSPA-II)
11. Sh. Kanhaiya Singh Kushwaha, Assistant Director (PSPA-I)
12. Sh. Ajay Malav, Assistant Director (PSPA-II)
13. Sh. Prateek Jadaun, Assistant Director (PSPA-II)

MoP:

1. Om Kant Shukla, Director (Trans.)

MNRE:

1. Sh. Dilip Nigam, Adviser

SECI:

1. Sh. Sanjay Sharma, Director
2. Sh. R.K. Agarwal, Consultant

CTUIL:

1. Sh. Ashok Pal, Deputy COO
2. Sh. P.S Das, Senior GM
3. Sh. Sandeep Kumawat, Chief manager
4. Sh. Pratyush Singh, Manager
5. Sh. Manish Ranjan Keshari, Manager

GRID India:

1. Sh. S.R. Narasimhan, CMD
2. Sh. Vivek Pandey, GM
3. Sh. Priyam Jain, Manager
4. Sh. Gaurab Dash, AM

Expert Member:

1. Dr. R. Saha

NITI Aayog:

1. Sh. Manoj Kr. Upadhyay, Deputy Adviser