सत्यमेव जयते
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 & Appraisal Division-II

सेवा में /To

As per list of Addresses

विषय: ट्रांसमिशन पर राष्ट्रीय समिति (एनसीटी) की अठारहवीं बैठक **के कार्यवृत्त** – के सम्बन्ध में ।

Subject: Minutes of the 18th Meeting of National Committee on Transmission (NCT) – regarding.

महोदया (Madam) / महोदय (Sir),

The 18th meeting of the "National Committee on Transmission" (NCT) was held on 05th March, 2024 at CEA, New Delhi. Minutes of the meeting are enclosed herewith.

भवदीय/Yours faithfully,

11.3.2024
(बी.एस.बैरवा/ B.S.Bairwa)
निदेशक/ Director

प्रतिलिपि / **Copy to:**

Joint Secretary (Trans), Ministry of Power, New Delhi-110001

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 & 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. Lalit Bohra, Joint Secretary Room no 602, Atal Akshay Urja Bhawan Opposite CGO Complex gate No. 2, 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 – 110016
9.	Sh. Ravinder Gupta Ex. Chief Engineer CEA		

Special Invitee

Chief Engineer (PCD), CEA

Table of Agenda

Minutes of the 18th meeting of National Committee on Transmission

The 18th meeting of NCT was held on 5th March, 2024 at CEA, New Delhi. List of participants is enclosed at **Annexure**.

1 Confirmation of the minutes of the 17th meeting of National Committee on Transmission.

1.1 The minutes of the 17th meeting of NCT held on 31.01.2024 were issued vide CEA letter no CEA-PS-12-13/3/2019-PSPA-II dated 16.02.2024. No comments were received on the minutes.

1.2 Members confirmed the minutes.

2 Status of the transmission schemes noted/approved/recommended to MoP in the 17th meeting of NCT:

2.1 Status of new transmission schemes approved/recommended:

Sl. No	Name of the Transmission Scheme	Noted/ Recommended/ Approved	BPC	Award/ Gazette notification
1.	Augmentation of transformation capacity by 2x500 MVA (7th & 8th), 400/220 kV ICTs at Tumkur (Pavagada) 400/220 kV Pooling Station.	Approved (RTM)	POWERGRID	Letter issued by CEA to CTU on 16.02.2024. CTU issued letter to concerned TSPs on 16.02.2024.
2.	Augmentation of transformation capacity at Jam Khambhaliya PS (JKTL)	Approved (RTM)	JKTL Adani Energy Solutions Ltd.	
3.	Augmentation of transformation capacity at 765/400 kV Lakadia S/s (WRSS XXI(A) Transco Ltd) in Gujarat-Part A	Approved (RTM)	WRSS XXI(A) Transco Ltd Adani Energy Solutions Ltd.	
4.	Additional transmission system for evacuation of power from Bhadla-III PS as part of Rajasthan REZ Phase-III scheme (20 GW)	Approved (TBCB)	RECPDCL	Gazette notification by CEA under process

2.2 Status of transmission schemes where modifications was suggested:

S. No.	Scheme where modifications was suggested	Status
1.	Network Expansion Scheme in Navinal (Mundra) area of Gujarat for drawal of power in the area	Informed to BPCs vide letter dated 16.02.2024
2.	Transmission system for evacuation of power from Shongtong Karcham HEP (450 MW) and Tidong HEP (150 MW)	

3.	Timeline for 1500 MVA, 765/400 kV ICT Augmentation at Jhatikara S/s	Informed to CTU vide letter dated 16.02.2024
4.	Change in Scope of the transmission scheme "Transmission Scheme for North Eastern Region Expansion Scheme-XVI (NERES-XVI)"	Informed to BPCs vide letter dated 16.02.2024
5.	Change in Scope of transmission scheme "Eastern Region Expansion Scheme-XXXIV (ERES-XXXIV)"	
6.	Change in implementation timeframe for Augmentation of transformation capacity at Bhuj-II PS	
7.	Change in Completion Schedule of transmission scheme North Eastern Region Generation Scheme-I (NERGS-I)	

2.3 Members noted the status.

3 Modifications in the earlier approved/notified transmission schemes:

3.1 Modification in scope of work of Eastern Region Expansion Scheme-XXXIX (ERES-XXXIX)

3.1.1 Representative of CTUIL informed that ERES-XXXIX scheme was agreed in 16th meeting of NCT held on 30.11.2023 wherein extension at 765kV level at Angul S/s including bus extension in GIS for 2 Nos. line bays for termination of Angul – Gopalpur 765kV D/c line was agreed as GIS/Hybrid line bays. However, after detailed engineering, it was observed that the above two line bays at Angul S/s can be implemented in AIS along with bus extension in GIS. Accordingly, 2 Nos. of 765kV line bays at Angul need to be modified from GIS/Hybrid to AIS with bus extension in GIS. Accordingly, following changes are required in the scope of scheme.

	As agreed in the 16th meeting of NCT		**Modified scope**	
Sl. No.	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**
i.	Establishment of new 765/400kV, 2x1500MVA GIS substation at Gopalpur in Odisha **Additional space for future expansion**: - 765/400kV, 4x1500MVA ICTs (12x500MVA single phase units) along with associated ICT	765/400kV, 1500MVA ICTs: 2 nos. (7x500MVA single phase units including one spare) 765kV ICT bays: 2 nos. 400kV ICT bays: 2 nos. 765kV, 330MVAr Bus reactor: 2 nos. (7x110MVAr single phase units including one spare unit for	No change.	No change.

	As agreed in the 16th meeting of NCT		Modified scope	
Sl. No.	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**
	bays at both voltage levels - 400/220kV, 4x500MVA ICTs along with associated ICT bays at both voltage levels - 765kV, 2x330MVAr (6x110MVAr single phase units) bus reactor along with associated bays - 420kV, 2x125MVAr bus reactor along with associated bays - 8 nos. of 765kV line bays (along with space for switchable line reactor) for future lines - 10 nos. of 400kV line bays (along with space for switchable line reactor) for future lines - 12 nos. of 220kV line bays for future lines - 765kV bus sectionaliser bay: 1 set - 400kV bus sectionaliser bay: 1 set - 220kV bus sectionaliser bay :1 set - 220kV bus coupler bay: 2 no.	both bus and line reactors) 765kV Bus reactor bays: 2 nos. 420kV, 125MVAr Bus reactor: 2 nos. 400kV Bus reactor bays: 2 nos. 765kV line bays: 2 nos. *[for termination of Angul (POWERGRID) – Gopalpur 765kV D/c line along with 765kV, 1x330MVAr switchable line reactor at Gopalpur end in both circuits]* 400kV line bays: 2 nos. *[for termination of Gopalpur – Gopalpur (OPTCL) 400kV D/c (Quad) line]* 765kV, 330MVAr (3x110MVAr single phase units) switchable line reactor along with associated bay and 500ohm NGR (with NGR bypass arrangement) *[at Gopalpur end in both circuits of Angul (POWERGRID) – Gopalpur 765kV D/c line]*: 2 nos.		
ii.	Angul – Gopalpur	205km	No change.	No change.

	As agreed in the 16th meeting of NCT		Modified scope	
Sl. No.	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**
	765kV D/c line			
iii.	Extension at 765kV level at Angul (POWERGRID) S/s including bus extension in GIS	765kV GIS/Hybrid line bays (along with space for future switchable line reactor): 2 nos. *[for termination of Angul (POWERGRID) – Gopalpur 765kV D/c line]* including bus extension in GIS of about 3000m	No change.	765kV **AIS** line bays (along with space for future switchable line reactor): 2 nos. *[for termination of Angul (POWERGRID) – Gopalpur 765kV D/c line]* including bus extension in GIS of about 3000m
iv.	Gopalpur – Gopalpur (OPTCL) 400kV D/c (Quad) line[@]	[@]20km	No change.	No change.
v.	Extension at 400kV level at [#]Gopalpur (OPTCL) GIS S/s	400kV GIS line bays: 2 nos. *[for termination of Gopalpur – Gopalpur (OPTCL) 400kV D/c (Quad) line]* + [#]2 nos. for diameter completion	No change.	No change.
	Note: *(a) [@]Gopalpur (OPTCL) is being taken up for implementation and is expected to be awarded by Mar 2024. As per OPTCL's input 20km line has been considered between 765/400kV (ISTS) and 400/220kV (Intra-state) substations at Gopalpur.* *(b) [#]The bus scheme of 400kV level at Gopalpur (OPTCL) GIS S/s shall be 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 Gopalpur (OPTCL) – Gopalpur 400kV D/c (Quad) line in two*		No change.	

	As agreed in the 16th meeting of NCT		Modified scope	
Sl. No.	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**	**Scope of the Transmission Scheme**	**Capacity (MVA) / Line length (km)/ Nos.**
	different diameters. Utilisation of other 2 nos. GIS bays of these diameters shall be identified in future. *(c) OPTCL shall provide space at under implementation Gopalpur (OPTCL) 400/220kV GIS S/s for implementation of 2 nos. of 400kV GIS line bays for termination of Gopalpur (ISTS) – Gopalpur (OPTCL) 400kV D/c (Quad) line. 2 nos. full diameter i.e. 4 nos. GIS bays shall be established.* *(d) POWERGRID shall provide space at Angul (POWERGRID) 765/400kV S/s for implementation of 2 nos. of 765kV line bays (along with space for future switchable line reactor) along with bus extension in GIS for termination Angul (POWERGRID) – Gopalpur 765kV D/c line.* *(e) The line lengths mentioned above are approximate, as the exact length shall be obtained after detailed survey.*			

3.1.2 After deliberations, NCT approved the above modifications.

4 New Transmission Schemes:

4.1 **Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-3:6 GW) [Bikaner complex]**

4.1.1 Representative of CTUIL stated that considering grant of connectivity to RE generators in Bikaner complex as well as for evacuation of power beyond this complex, transmission scheme from Bikaner Complex as part of Rajasthan REZ Ph-IV (Part-3 : 6 GW) is required.

4.1.2 He further stated that, the transmission scheme was discussed and agreed in the 71st NRPC meeting held on 29.01.24. Total cost of the scheme is approx. Rs 11325.86 Crs

4.1.3 NCT recommended the Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part-3:6GW) [Bikaner complex] to be implemented in two packages through TBCB mode.

4.1.4 Summary of the scheme is given below:

SI	Name of the scheme and tentative implementation	Estimated Cost	Remarks

No.	timeframe	(₹ Crores)	
1.	REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part A Tentative Implementation timeframe: 24 months	5968.5	Recommended under TBCB route with RECPDCL as the BPC.
2.	REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part B Tentative Implementation timeframe: 24 months	5357.36	Recommended under TBCB route with RECPDCL as the BPC.

4.1.5 Detailed scope of the scheme is given below:

A. REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part A (Estimated Cost: Rs 5968.5 Cr)

Sl. No.	Description of Transmission Element	Scope of work (Type of Substation/Conductor capacity/km/No. of bays etc.)
1	➢ Establishment of 6x1500 MVA, 765/400 kV & 6x500 MVA, 400/220 kV Bikaner-IV Pooling Station along with 2x240 MVAr (765kV) & 2x125 MVAr (420kV) Bus Reactors at a suitable location near Bikaner **Future provisions at Bikaner-IV PS: Space for** ▪ *765 kV line bays along with switchable line reactors – 8 nos.* ▪ *765kV Bus Reactor along with bay: 1 no.* ▪ *400 kV line bays along with switchable line reactor –4 nos.* ▪ *400 kV line bays–2 nos.* ▪ *400/220kV ICT along with bays -4 nos.* ▪ *400 kV Bus Reactor along with bay: 1 no.* ▪ *400kV Sectionalizer bay: 1 set* ▪ *220 kV line bays for connectivity of RE Applications -5 nos.* ▪ *220kV Sectionalizer bay: 2 sets* ▪ *220 kV BC (2 nos.) bays and 220 kV TBC (2 nos.) bays*	**Bikaner-IV PS -AIS** • 765/400 kV 1500 MVA ICTs- 6 Nos. (19x500 MVA including one spare unit) • 400/220 kV 500 MVA ICTs -6 Nos. • 765 kV line bays – 2 nos. (for 765 kV interconnection with Siwani S/s) • 400 kV line bays - 4 Nos.(For LILO of both ckts of Bikaner II PS- Bikaner III PS) • 765 kV ICT bays-6 Nos. • 400 kV ICT bays- 12 Nos. • 220 kV ICT bays- 6 Nos. • 240 MVAr Bus Reactor-2 Nos. (7x80 MVAr, including one spare unit) • 765 kV Bus reactor bays-2 Nos. • 125 MVAr Bus Reactor-2 Nos. • 400 kV Bus reactor bays- 2 Nos. • 220 kV line bays: 6 nos. (for RE connectivity) • 400kV line bays (for RE connectivity) - 3 nos. • 400kV Sectionalizer bay: 1 set • 220 kV Sectionalizer bay: 1 set • 220 kV BC (2 nos.) bays and 220 kV TBC (2 nos.) bays • 400 kV bays: 2 Nos. (for STATCOM)

2	STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) at Bikaner-IV PS	• STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr)
3	LILO of both ckts of Bikaner II PS-Bikaner III PS (Quad) direct line at Bikaner-IV PS	Length -20 km (Quad) (LILO length)
4	Bikaner-IV PS – Siwani 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end	Line Length -260 km • 765 kV, 240 MVAr switchable line reactors at Bikaner-IV PS end– 2 Nos. • 765 kV, 240 MVAr switchable line reactors at Siwani S/s end– 2 Nos. • Switching equipment for 765kV, 240 MVAr switchable line reactors at Bikaner-IV PS end – 2 Nos. • Switching equipment for 765kV, 240 MVAr switchable line reactors at Siwani S/s end – 2 Nos.
5	Siwani– Fatehabad (PG) 400 kV D/c line (Quad)	Line Length ~80 km (Quad)
6	Siwani – Patran (Indi Grid) 400 kV D/c line (Quad) along with 80 MVAr switchable line reactor for each circuit at Siwani S/s end	Line Length -160 km (Quad) • 420 kV, 80 MVAr switchable line reactors at Siwani S/s end– 2 Nos. • Switching equipment for 420kV, 80 MVAr switchable line reactors at Siwani S/s end – 2 Nos. • 400 kV GIS duct :700 m at Patran S/s
7	2nos. 400 kV line bays each at Fatehabad (PG) & Patran (Indi Grid) S/s	• 400 kV line bays at Fatehabad (PG) S/s – 2 Nos. • 400 kV line bays at Patran (Indi Grid) S/s – 2 nos.
8	2nos. 765 kV line bays at Siwani S/s	• 765 kV line bays at Siwani S/s – 2 Nos.
9	4 nos. 400 kV line bays at Siwani S/s	• 400 kV line bays at Siwani S/s – 4 Nos. (for 400kV interconnections)

B. REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part B (Estimated Cost: Rs 5357.36 Cr)

Sl. No.	**Description of Transmission Element**	**Scope of work (Type of Substation/Conductor capacity/km/no. of bays etc.)**
1	➢ Establishment of 765/400kV, 6x1500 MVA S/s at suitable location near Siwani (Distt. Bhiwani) along with 2x240 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor **Future provisions at Siwani S/s:** **Space for**	**Siwani S/s- AIS** • 765/400 kV 1500 MVA ICTs- 6 nos. (19x500 MVA including one spare unit) • 765 kV ICT bays-6 no. • 400 kV ICT bays- 6 no. • 765 kV line bays – 2 nos. (for 765kV interconnection with

	▪ *765 kV line bays along with switchable line reactors – 8* ▪ *765kV Bus Reactor along with bay: 1 nos.* ▪ *400 kV line bays along with switchable line reactor –8 nos.* ▪ *400 kV Bus Reactor along with bays: 1 no.* ▪ *400kV Sectionalizer bay: 1 set*	Bikaner-IV PS) • 400 kV line bays – 4 nos. (for 400kV interconnections) • 240 MVAr Bus Reactor-2 no. (7x80 MVAr, including one spare unit) • 765 kV Bus reactor bays-2 no. • 125 MVAr Bus Reactor-2 nos. • 400 kV Bus reactor bays- 2 nos. • 400kV Sectionalizer bay: 1 set • 400kV bays : 2 nos. (for STATCOM)
2	Bikaner-IV PS – Siwani 765 kV D/c (2^{nd}) line along with 240 MVAr switchable line reactor for each circuit at each end	Line Length -260 km • 765 kV, 240 MVAr switchable line reactors at Bikaner-IV PS end– 2 nos. • 765 kV, 240 MVAr switchable line reactors at Siwani S/s end– 2 nos. • Switching equipment for 765kV, 240 MVAr switchable line reactors at Bikaner-IV PS end – 2 nos. • Switching equipment for 765kV, 240 MVAr switchable line reactors at Siwani S/s end – 2 nos.
3	STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) at Siwani S/s	• STATCOM (2x±300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr)
4	Siwani – Sonipat (PG) 400 kV D/c line (Quad) along with 63 MVAr switchable line reactor for each circuit at Siwani S/s end	Line Length -150 km (Quad) • 420 kV, 63 MVAr switchable line reactors at Siwani S/s end– 2 nos. • Switching equipment for 420kV, 63 MVAr switchable line reactors at Siwani S/s end – 2 nos.
5	Siwani – Jind (PG) 400 kV D/c line (Quad)	Line Length -110 km (Quad)
6	2 nos. 400 kV line bays each at Jind(PG) & Sonipat (PG) S/s	• 400 kV line bays at Jind (PG) S/s – 2 nos. • 400 kV line bays at Sonipat (PG) S/s – 2 nos.
7	2 nos. 765 kV line bays at Bikaner-IV PS	• 765 kV line bays at Bikaner-IV PS – 2 nos.

4.1.6 GRID-INDIA requested to assign unique name for envisaged RE pooling stations. As a number of pooling substations with identical names but different numerical suffixes

have been planned in the same district along with multiple interconnections, there is a chance of miscommunication during real-time operation among multiple constituents. For clarity of operation and ensuring that names of different substations are easily distinguished from each other, it was suggested that after finalization of the exact location, the ISTS substations are uniquely named as per the geographical name of the nearest location like village or taluk. Chairperson NCT advised the concerned to bring this as an agenda item in the next NCT meeting.

4.2 **Transmission Scheme for integration of Davanagere / Chitradurga REZ and Bellary REZ in Karnataka**

4.2.1 Representative of CTUIL stated that Davanagere / Chitradurga PS, Bellary PS and Bijapur PS were initially proposed to be integrated with Koppal-II PS for onward evacuation of power from these REZs. However, large number of applications have been received from various RE developers seeking connectivity at Koppal-II PS / Gadag-II PS beyond the planned evacuation capacity and without BESS. Accordingly, the transmission system beyond Koppal-II PS may not be able to cater to the requirement of Davanagere / Chitradurga REZ, Bellary REZ and Bijapur REZ. Accordingly, the interconnection of Davanagere/Chitradurga, Bijapur and Bellary REZs was reviewed and separate transmission system for evacuation of power is identified.

4.2.2 Chairperson, NCT directed that in future, battery storage should also be considered as candidate while planning transmission system in renewable energy zones.

4.2.3 CTUIL mentioned that the transmission scheme was discussed in the 49th SRPC meeting held on 08.12.2023 and SRPC vide letter dated 12.01.2024 has forwarded the views on the scheme. However, APTRANSCO have made certain observations on the reactive compensation at Davanagere/Chitradurga, Bijapur and Bellary REZs schemes and have also suggested that the HTLS conductor may be used in place of Quad conductor. APTRANSCO opined that

- 240 MVAr SLR at both ends on 765 kV Narendra New – Davanagere section (~280 km) may be dropped.
- 765kV Madhugiri Bus Reactor 1x330 MVar may be considered instead of 2x330MVar Bus Reactors.

4.2.4 765 kV Narendra New-Madhugiri operated at 400 kV having 420 kV rated 2x80 Line Reactors at Narendra end and 2x80 Line Reactors at Madugiri end. With the charging of the above line at 765 kV Potential, the 80 The 2x80 MVAr Line reactors at Narendra end may be utilised at 400 kV Bellary PS as Bus Reactor in place of the proposed 125 MVAr Bus Reactors. GRID-INDIA opined that 2x80 MVAr line reactors at Narendra New and Madhugiri end may be utilized as bus reactors at respective 400 kV substations based on availability of bays for controlling the voltage of the buses.

4.2.5 Regarding 765 kV SLR & Bus reactors, it was deliberated that adequate reactive compensation may be provided to ensure reliable operation of grid. Therefore, it was decided that reactive compensation proposed by CTU to be retained.

4.2.6 The Bellary REZ is being integrated with Davanagere PS through Bellary PS – Davanagere PS 400 kV (Quad Moose) D/c line and Bellary REZ evacuation is dependent on Davanagare PS. Accordingly, it was opined that the schemes "Transmission Scheme for integration of Davanagere / Chitradurga REZ" and "Transmission Scheme for integration of Bellary REZ" may be clubbed together for implementation as a single transmission scheme.

4.2.7 It was also deliberated that margins for grant of connectivity to RE generators at Koppal-II PS & Gadag-II PS has already been exhausted and both Koppal-II PS & Gadag-II PS have been closed for further grant of connectivity. Presently, connectivity of about 450 MW have been granted / agreed for grant at Davanagere. Further, after closure of Koppal-II PS & Gadag-II PS for grant of connectivity, RE developers are seeking connectivity at Davanagere PS and Bijapur PS. Further, more applications for connectivity at Davanagere, Bellary and Bijapur are expected. In view of above, it was decided that Phase-A and Phase-B transmission scheme of Davanagere PS may be taken up for implementation in same time frame of 24 months. Similarly, Phase-A and Phase-B transmission scheme of Bellary PS may be taken up for implementation in same time frame of 30 months.

4.2.8 After detailed deliberations, NCT recommended implementation of Transmission Scheme for integration of Davanagere / Chitradurga REZ and Bellary REZ in Karnataka through TBCB mode.

4.2.9 Summary of the scheme is given below:

Sl No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Transmission Scheme for integration of Davanagere / Chitradurga and Bellary REZ in Karnataka A. Transmission system for integration of Davanagere / Chitradurga REZ - Tentative Implementation timeframe: 24 months B. Transmission system for integration of Bellary REZ - Tentative Implementation timeframe: 30 months	3453	Recommended under TBCB route with PFCCL as the BPC.

4.2.10 Detailed scope of the scheme is given below:

A. Transmission system for integration of Davanagere / Chitradurga REZ

Sl. No.	*Scope of the Transmission Scheme*	*Capacity /km*
1.	Establishment of 765/400kV 4x1500 MVA, 400/220kV 4x500 MVA Pooling Station near Davanagere / Chitradurga, Karnataka with provision of two (2) sections of 4500 MVA each at 400kV level and provision of four (4) sections of 2500 MVA each at 220kV level **Future Space Provisions:** • 765/400kV, 1500 MVA, ICTs – 2 nos. • 765kV ICT bays – 2 nos. • 400kV ICT bays – 2 nos. • 400/220kV, 500 MVA, ICTs – 6 nos. • 400kV ICT bays – 6 nos. • 220kV ICT bays – 6 nos. • 765kV line bays – 8 nos. (with provision for SLR) • 400kV line bays – 10 nos. (with provision for SLR) • 220kV line bays – 12 nos. • 220kV Bus Sectionalizer : 2 sets • 220 kV Bus Coupler (BC) Bay – 3 nos. • 220 kV Transfer Bus Coupler (TBC) Bay – 3 nos. • 400kV Bus Sectionalizer : 1 set	• 765/400kV, 1500 MVA, ICTs – 4 Nos. (13x500 MVA incl. 1 spare unit) • 765 kV ICT bays – 4 Nos. • 400 kV ICT bays – 4 Nos. • 400/220 kV, 500 MVA, ICTs – 4 Nos. • 400 kV ICT bays – 4 Nos. • 220 kV ICT bays – 4 Nos. • 765 kV line bays – 4 Nos. (at Davanagere / Chitradurga PS for termination of LILO of Narendra (New) – Madhugiri 765kV D/c line) • 220kV line bays – 6 Nos. • 220kV Bus Sectionalizer : 1 set • 220 kV Bus Coupler (BC) Bay – 1 No. • 220 kV Transfer Bus Coupler (TBC) Bay – 1 no.
2.	LILO of Narendra New – Madhugiri 765kV D/c line at Davanagere / Chitradurga 765/400kV PS (~40 km) {with 240 MVAr SLR at both ends on Narendra New – Davanagere section (~280 km) and 330 MVAr SLR at Davanagere end on Davanagere – Madhugiri section (~200 km)}	~40 km • 765 kV, 240 MVAr SLR at Davanagere / Chitradurga PS – 2 Nos. (7x80 MVAr inc. 1 switchable spare unit) • 765 kV, 240 MVAr SLR at Narendra New – 2 Nos. (7x80 MVAr inc. 1 switchable spare unit) • 765 kV, 330 MVAr SLR at Davanagere / Chitradurga PS – 2 Nos. (6x110 MVAr switchable units)
3.	2x330 MVAr (765kV) bus reactors at Davanagere/ Chitradurga PS	• 765 kV, 330 MVAr Bus Reactor – 2 Nos. (7x110 MVAr inc. 1 switchable spare unit for both bus reactor and line reactor) • 765 kV Bus Reactor bays – 2 nos.
4.	Upgradation of Narendra New – Madhugiri 765kV D/c line (presently charged at 400kV level) at its rated 765kV voltage level	• 765 kV line bays – 2 Nos. (at Narendra New) • 765 kV line bays – 2 Nos. (at Madhugiri)
5.	Upgradation of Madhugiri {Tumkur(Vasantnarsapura)} to its rated voltage of 765kV level alongwith 3x1500 MVA, 765/400kV ICTs and 2x330	• 765/400 kV, 1500 MVA, ICTs – 3 nos. (10x500 MVA incl. 1 spare unit) • 765kV ICT bays – 3 nos. • 400kV ICT bays – 3 nos. • 765 kV, 330 MVAr Bus Reactor – 2 nos.

Sl. No.	*Scope of the Transmission Scheme*	*Capacity /km*
	MVAr, 765kV bus reactors (Upgradation of Madhugiri {Tumkur(Vasantnarsapura)} to its rated 765kv level was earlier allocated to POWERGRID for implementation through RTM route vide MOP OM No.15/3/2018-Trans-Pt(1) dated 23.01.2020)	{7x110 MVAr including 1 spare unit} • 765 kV Bus Reactor bays – 2 nos.

B. Transmission system for integration of Bellary REZ

Sl. No.	*Scope of the Transmission Scheme*	*Capacity /km*
1.	Establishment of 4x500 MVA, 400/220kV Pooling Station near Bellary area (Bellary PS), Karnataka **Future Space Provisions:** • 400/220kV, 500 MVA, ICTs – 6 nos. • 400kV ICT bays – 6 nos. • 220kV ICT bays – 6 nos. • 400kV line bays – 6 nos. (with provision for SLR) • 220kV line bays – 12 nos. • 220kV Sectionalizer : 3 sets • 220 kV Bus Coupler (BC) Bay – 3 nos. • 220 kV Transfer Bus Coupler (TBC) Bay – 3 nos.	• 400/220 kV, 500 MVA, ICTs – 4 nos. • 400 kV ICT bays – 4 nos. • 220 kV ICT bays – 4 nos. • 400 kV line bays – 2 nos. (at Bellary PS for termination of Bellary PS – Davanagere / Chitradurga line)) • 220 kV line bays – 6 nos. • 220 kV Bus Coupler (BC) Bay – 1 no. • 220 kV Transfer Bus Coupler (TBC) Bay – 1 no. •
2.	Bellary PS – Davanagere / Chitradurga 400kV (Quad ACSR moose) D/c line	~100 km • 400 kV line bays – 2 nos. (at Davanagere / Chitradurga)
3.	2x125MVAr 420kV bus reactors at Bellary PS	• 420 kV, 125 MVAr bus reactors – 2 nos. • 420 kV, 125 MVAr bus reactor bays – 2 nos.

4.3 Transmission Scheme for integration of Bijapur REZ in Karnataka

4.3.1 Representative of CTUIL stated that about 1450 MW capacity applications from various RE developers have been received for connectivity near Bijapur REZ. He added that Bijapur pooling station 400/220 kV, 2x500 MVA ICTs has been planned.

4.3.2 The transmission scheme was discussed in the 49th SRPC meeting held on 08.12.2023 and SRPC vide letter dated 12.01.2024 has forwarded the views on the scheme.

4.3.3 CTUIL requested that the pooling station may be implemented with more number of ICTs as the applications have already crossed the planned limit.

4.3.4 After detailed deliberations, NCT recommended the Transmission Scheme for integration of Bijapur REZ in Karnataka through TBCB mode.

4.3.5 Summary of the scheme is given below:

Sl No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Transmission Scheme for integration of Bijapur REZ in Karnataka Tentative Implementation timeframe: 24 months	1113	Recommended under TBCB route with PFCCL as the BPC.

4.3.6 Detailed scope of the scheme is given below:

Sl. No.	***Scope of the Transmission Scheme***	***Capacity /km***
1.	Establishment of 400/220 kV, 5x500 MVA Pooling Station near Bijapur (Vijayapura), Karnataka **Future Space Provisions:** • 400/220kV, 500 MVA, ICTs – 5 nos. • 400kV ICT bays – 5 nos. • 220kV ICT bays – 5 nos. • 400kV line bays – 6 nos. (with provision for SLR) • 220kV line bays – 14 nos. • 220kV Sectionalizer : 2 sets • 220 kV Bus Coupler (BC) Bay – 2 nos. • 220 kV Transfer Bus Coupler (TBC) Bay – 2 nos.	• 400/220 kV, 500 MVA, ICTs – 5 nos. • 400 kV ICT bays – 5 nos. • 220 kV ICT bays – 5 nos. • 400 kV line bays – 2 nos. (at Bijapur PS for termination of Bijapur PS – Raichur New line)) • 220 kV line bays – 10 nos. • 220 kV Sectionalizer : 1 sets • 220 kV Bus Coupler (BC) Bay – 2 nos. • 220 kV Transfer Bus Coupler (TBC) Bay – 2 nos.
2.	Bijapur PS – Raichur New 400kV (Quad ACSR moose) D/c line	~150 km • 400 kV line bays – 2 nos. (at Raichur New)
3.	2x125MVAr 420kV bus reactors at Bijapur PS	• 420 kV, 125 MVAr bus reactors – 2 nos. • 420 kV, 125 MVAr bus reactor bays – 2 nos.

Note :

POWERGRID shall provide space for 2 nos. of 400 kV line bays at Raichur New for termination of Bijapur PS – Raichur New 400 kV (Quad ACSR moose) D/c line

4.4 Transmission System under ISTS for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW)

4.4.1 Representative of CTUIL stated that transmission system for KNPP Unit - 3&4 has been identified under the scope of ISTS and TANTRANSCO. The transmission system under the scope of TANTRANSCO shall facilitate in drawl of its share of allocation from Kudankulam Unit-3&4. The transmission system under the scope of ISTS shall facilitate in evacuation and transfer of power to other beneficiaries in Southern Region from Kudankulam Unit-3&4 generation project. The identified transmission system under ISTS shall be implemented with the time frame of Kudankulam Unit-3 as sought under the GNA.

4.4.2 The transmission scheme was discussed and agreed in the 49th SRPC meeting held on 08.12.2023 and SRPC vide letter dated 12.01.2024 has forwarded the views on the scheme.

4.4.3 After detailed deliberations, NCT recommended the Transmission System under ISTS for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW) through TBCB mode.

4.4.4 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Transmission System under ISTS for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW) Tentative Implementation timeframe: 30 months (December 2026)	548	Recommended under TBCB route with PFCCL as the BPC.

4.4.5 Detailed scope of the scheme is given below:

Sl. No.	***Scope of the Transmission Scheme***	***Capacity /km***
1.	KNPP 3&4 – Tuticorin-II GIS PS 400 kV (quad) D/c line (~120 km) {Line & bays at Tuticorin-II GIS under ISTS scope and bays at KNPP under NPCIL scope}	~120 km • 400 kV GIS line bays at Tuticorin-II GIS – 2 nos.

4.5 **Augmentation of 2x500 MVA, 400/230 kV transformation capacity (3rd & 4th ICTs) at Karur PS**

4.5.1 Representative of CTUIL stated Karur PS was established with 2x500 MVA, 400/230 kV ICTs. Due to new applications for connectivity, total connectivity required for 1100 MW, therefore, 3rd ICT is required. Further, to cater N-1 contingency criteria, 4th ICT is also required. The estimated cost of the scheme is about INR 115 Cr. Accordingly, concurrence of SRPC is not required.

4.5.2 After detailed deliberations, NCT approved the augmentation of transformation capacity by 2x500 MVA (3rd & 4th), 400/230 kV ICTs at Karur PS through RTM mode with tentative implementation timeframe of 18 months.

4.5.3 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Augmentation of 2x500 MVA, 400/230 kV transformation capacity (3rd & 4th ICTs) at Karur PS Tentative implementation timeframe : 18 months	115	Approved under RTM by owner of existing substation

4.5.4 Detailed scope of the scheme is given below:

Sl. No.	***Scope of the Transmission Scheme***	***Capacity /km***
1.	Augmentation of 2x500 MVA, 400/230 kV transformation capacity (3rd & 4th ICTs) at Karur PS	i. 500 MVA, 400/230 kV ICTs – 2 Nos. ii. 400 kV ICT bay – 2 Nos. iii. 230 kV ICT bay – 2 Nos.

4.6 Augmentation of transformation capacity at Jam Khambhaliya PS (JKTL) – Part B

4.6.1 Chief Engineer (PSPA-II), CEA stated that in the 17th meeting of NCT Augmentation of transformation capacity at Jam Khambhaliya PS (JKTL) with following scope was agreed to be implemented under RTM.

SI No.	**Scope of the Transmission Scheme**	**Capacity /km**
1.	Creation of New 220 kV Bus Section-II at Jam Khambhaliya PS Space to be kept for 1 no. 220 kV line bay and 1 no. 220kV ICT bay in the same GIS Hall for RE Interconnection being implemented by the RE developer & 7th ICT (i.e 3rd ICT on Sec-II) (in addition to 2 nos. bays at Sl. 3)	220 kV Bus sectionaliser bay - 1 Set (to be kept normally CLOSED and may be opened based on system requirement) 220 kV BC – 1 No.
2.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 2x500MVA, 400/220 kV ICT (5th & 6th) terminated on New	500 MVA, 400/220 kV ICTs: 2 Nos. 400 kV ICT bays: NIL* 220 kV ICT bays: 2 Nos.

	220 kV bus section-II	
3.	Implementation of 220kV GIS line bays at Jam Khambhaliya PS for RE Projects on New 220kV bus section-II	220 kV line bay – 2 No. (GIS) (1 for ACME Sun Power Pvt Ltd and 1 for Juniper Green Energy Pvt Ltd.)

**Note: Termination of the 2x500 MVA ICTs under present scope shall be in the '2' separate dia's which are being developed by POWERGRID for RIL for termination of 400 kV Jam Khambaliya - Jamnagar D/c line. TSP shall implement 400 kV side GIS Duct required for interconnection of ICT-5 & 6 at 400 kV Jam Khambaliya PS [length is approx. 350 m. (Actual length shall be finalized based upon final layout)] along with associated equipment as required.*

Tentative Implementation timeframe: For scope at Sl. No.1 & 2 above: 21 months. For 2 Nos 220 kV bays at Sl. No. 3 above: 30.03.2026 and 30.06.3027 respectively (subject to minimum schedule of 21 months from date of award of balance works).

4.6.2 He added that CTU has further proposed additional new 220 kV bus section, 3x500 MVA ICTs and 2 Nos. of 220 kV bays.

4.6.3 Representative of CTUIL stated that 7th 400/220kV, 1x500 MVA ICT shall enable evacuation of RE power from various generation projects in Jam Khambhaliya area who have applied for connectivity under GNA at Jam Khambhaliya PS at 220 kV level. Further, the 8th & 9th 400/220 kV, 2x500 MVA ICTs shall enable drawal of power by GETCO from Jam Khambhaliya PS. He added that the estimated cost of the scheme is less than INR 500 Cr and accordingly, same was not sent to WRPC for deliberations.

4.6.4 It was opined that considering both the parts of the scheme are required in the similar time frame, the same may be clubbed. Further, creation of new 220 kV Bus Section-II at Jam Khambhaliya PS may be expedited with a time schedule of 18 months so as to facilitate interconnection of RE Project of M/s Mounting Renewable (250 MW), which is implementing the 220 kV bay by themselves at an early date and which requires the bus extension on urgent basis.

4.6.5 After detailed deliberations, NCT decided to withdraw the augmentation of transformation capacity at Jam Khambhaliya PS (JKTL) agreed in the 17th meeting of NCT and revoke the allocation letter to JKTL in this regard. Further, NCT decided to implement the entire augmentation work at Jam Khambhaliya PS (JKTL) under TBCB.

4.6.6 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks

1.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) Tentative implementation timeframe : • For scope at Sl. No. 1: 18 months • For scope at Sl. No. 4: 30.03.2026 and 30.06.2027 respectively (subject to minimum schedule of 21 months from date of award of balance works). • For balance scope: 21 months	310	Recommended under TBCB route with RECPDCL as the BPC.

4.6.7 Detailed scope of the scheme is given below:

Sl. No.	Scope of the Transmission Scheme	Capacity /km
1.	Creation of New 220 kV Bus Section-II at Jam Khambhaliya PS Space to be kept for 1 No. 220 kV line bay in the same GIS Hall for RE Interconnection being implemented by the RE developer (in addition to 2 nos. bays at Sl. 4)	220 kV Bus sectionaliser bay - 1 Set (to be kept normally CLOSED and may be opened based on system requirement) 220 kV BC – 1 No.
2.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 2x500MVA, 400/220 kV ICT (5th & 6th) (terminated on New 220 kV bus section-II)	500 MVA, 400/220 kV ICTs: 2 Nos. 400 kV ICT bays: NIL* 220 kV ICT bays: 2 Nos.
3.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV ICT (7th) (terminated on New 220kV bus section-II)	500MVA, 400/220kV ICTs: 1 No. 400kV ICT bay: NIL (bay being implemented under Jamnagar scheme, which is currently under tendering, with schedule of Apr/May-26). Bus duct outside GIS hall along with termination equipment shall be provided. 220kV ICT bay: 1 No.
4.	Implementation of 220 kV GIS line bays at Jam Khambhaliya PS for RE Projects on New 220kV bus section-II	220 kV line bay – 2 No. (GIS) (1 for ACME Sun Power Pvt Ltd and 1 for Juniper Green Energy Pvt Ltd.)
5.	Creation of New 220 kV Bus Section at Jam Khambhaliya PS (Section III) (with space for 4 nos. 220 kV line bays:	220 kV Bus sectionaliser bay - 1 Set *(to be kept normally OPEN and may be closed based on*

Sl. No.	Scope of the Transmission Scheme	Capacity /km
	in same GIS hall. Implementation of 2 Nos. GIS bays to be taken up as per Sl.No.9 and space to be kept for future 2 Nos.)	*system requirement)* 220 kV BC – 1 No.
6.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV ICT (8th) (terminated on New 220kV bus section-III)	500 MVA, 400/220 kV ICT: 1 Nos. 400 kV ICT bay: NIL (bay being implemented under Jamnagar scheme, which is currently under tendering, with schedule of Apr/May-26). Bus duct outside GIS hall along with termination equipment shall be provided. 220 kV ICT bay: 1 No.
7.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV (9^{th}) ICT terminated on New 220kV bus section-III	500 MVA, 400/220 kV ICTs: 1 No. 400 kV ICT bays: 1 No. (TSP to implement complete dia. in all respect with the other 400kV bay to be utilized by EETFEL (Bulk consumer)) 220 kV ICT bays: 1 No.
8.	Implementation of 220kV GIS line bays at Jam Khambhaliya PS for Kuvadia 220kV D/c line	220 kV line bay – 2 Nos. (GIS) (on Bus Section-III)
Note: *1. JKTL to provide space for above scope of work.* *2. GETCO shall implement Jam Khambhaliya PS - Kuvadia 220 kV D/c line in matching time-frame*		

**Note: Termination of the 2x500MVA ICTs under present scope shall be in the '2' separate dia's which are being developed by POWERGRID for RIL for termination of 400 kV Jam Khambaliya - Jamnagar D/c line. TSP shall implement 400 kV side GIS Duct required for interconnection of ICT-5 & 6 at 400 kV Jam Khambaliya PS [length is approx. 350m. (Actual length shall be finalized based upon final layout)] along with associated equipment as required.*

4.7 Transmission Scheme for integration of Tumkur-II REZ in Karnataka

4.7.1 In the 15th meeting of NCT, the transmission scheme "Transmission Scheme for integration of Tumkur-II REZ in Karnataka" was recommended for implementation

through TBCB mode at an estimated cost of Rs. 792.77 Cr. with the approximate line length from Tumkur-II – Tumkur (Pavagada) 400 kV (Quad ACSR moose) D/c line as 100 km. The line length had been arrived at considering the location of potential zone as per SECI.

4.7.2 RECPDCL had been appointed as the survey agency to carry out the survey works for "Transmission Scheme for integration of Tumkur-II REZ in Karnataka". Ministry of Power had directed RECPDCL to carry out survey before notification of the Transmission scheme

4.7.3 Subsequently, connectivity applications had been received by CTUIL from RE Generation Developers close to the existing Tumkur (Pavagada) sub-station. KREDL/KSPDCL has also informed that they are setting up solar park close to the existing Tumkur (Pavagada) sub-station.

4.7.4 The transmission scheme was again deliberated in the 17th NCT meeting, wherein it was opined that as the location of RE Generators from whom connectivity application has been received, is close to the existing Tumkur (Pavagada) sub-station, the location of sub-station and associated transmission line may be further optimised. As suggested by NCT, BPC has re-worked the route of transmission line. The revised cost of the transmission scheme as furnished by CTUIL is Rs. 465 Crs.

4.7.5 After detailed deliberations, NCT decided that implementation of the Transmission Scheme for integration of Tumkur-II REZ in Karnataka be undertaken under TBCB.

4.7.6 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Transmission Scheme for integration of Tumkur-II REZ in Karnataka Tentative implementation timeframe : 24 months	465	Recommended under TBCB route with PFCCL as the BPC.

4.7.7 Detailed scope of the scheme is given below:

Sl. No.	**Scope of the Transmission Scheme**	**Capacity /km**
1.	Establishment of 400/220 kV 4x500 MVA Pooling Station near Tumkur, Karnataka Future provisions: Space for • 400/220 kV, 500 MVA, ICTs – 7 Nos. • 400 kV ICT bays – 7 Nos. • 220 kV ICT bays – 7 Nos.	• 400/220 kV, 500 MVA, ICTs – 4 Nos. • 400 kV ICT bays – 4 Nos. • 220 kV ICT bays – 4 Nos. • 400 kV line bays – 2 Nos. (at Tumkur-II PS for termination of Tumkur-II – Tumkur (Pavagada) line))

	• 400 kV line bays – 6 Nos. (with provision for SLR) • 220 kV line bays – 14 Nos. • 220 kV Sectionalizer: 3 sets • 220 kV Bus Coupler (BC) Bay – 3 Nos. • 220 kV Transfer Bus Coupler (TBC) Bay – 3 Nos.	• 220 kV line bays – 4 Nos. • 220 kV Bus Coupler (BC) Bay – 1 No. • 220 kV Transfer Bus Coupler (TBC) Bay – 1 No.
2.	Tumkur-II – Tumkur(Pavagada) 400 kV (Quad ACSR moose) D/c line	Route length ~27 km • 400 kV line bays – 2 Nos. (at Tumkur (Pavagada))
3.	2x125 MVAr, 420 kV bus reactors at Tumkur-II PS	• 420 kV, 125 MVAr bus reactors – 2 Nos. • 420 kV, 125 MVAr bus reactor bays – 2 Nos.

4.8 **Requirement of Additional FOTE for redundancy at AGC locations in ER**

4.8.1 Additional FOTE at all AGC operated generating stations in Eastern region are required in view of resource disjoint and criticality of AGC operation for grid operation purpose as failure of single equipment may lead to disruption in AGC operation. Further, at many locations redundant ethernet port are not available as per NLDC requirement. This scheme was reviewed in 51st ERPC meeting, wherein ERPC approved the scheme.

4.8.2 After deliberations, scheme for additional FOTE for redundancy at AGC locations in ER was approved.

4.8.3 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	Additional FOTE for redundancy at AGC locations in ER Tentative implementation timeframe : 6 months	2.4	Approved under RTM route to be implemented by POWERGRID

4.8.4 Detailed scope of the scheme is given below:

Sl. No.	**Scope of the Transmission Scheme**	**Locations**	
1.	Eight numbers of FOTE STM-16 at AGC locations of Eastern Region for redundancy.	Talcher STPS Stage I	1
		Talcher STPS Stage II	
		Barh STPS Stage I	1
		Barh STPS Stage II	

		KBUNL Stage II	1
		Nabinagar STPP Stage I	1
		Darlipali STPP	1
		Northkaranpura STPP	1
		Teesta V	1
		Rangit	1

4.9 **OPGW laying work on 400 kV Bokaro(A)-Kodarma line**

4.9.1 Bokaro(A)-Koderma link (105 km) is an ISTS link owned by POWERGRID and it does not have OPGW. In the 51st meeting of ERPC held on 12.01.2024, scheme for OPGW laying work on 400 kV Bokaro(A)-Kodarma line was approved.

4.9.2 NCT approved OPGW laying work on 400 kV Bokaro(A)-Kodarma line under RTM.

4.9.3 Summary of the scheme is given below:

SI No.	Name of the scheme and tentative implementation timeframe	Estimated Cost (₹ Crores)	Remarks
1.	OPGW laying work on 400kV BokaroA-Kodarma line Tentative implementation timeframe : 18 months	6.83	Approved under RTM route to be implemented by POWERGRID

4.9.4 Detailed scope of the scheme is given below:

Sl. No.	Scope of the Transmission Scheme
1.	OPGW laying work on 400 kV Bokaro A-Kodarma line (105 km) with required terminal equipment.

5 Modification in SCOD of under construction schemes

5.1 **Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) under Phase-III Part-G**

5.1.1 Representative of CTUIL stated that CERC vide Order dated 01.02.2024 in Petition 253/TL/2023 (Fatehgarh-III Beawar Transmission Limited) has directed CTUIL to align the SCODs of Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) under Phase-III Part-G [Fatehgarh-III-Beawar 765 kV (2nd D/c) line] and Phase-III Part-F [Fatehgarh-III-Beawar 765 kV (1st D/c) line, Beawar S/s & its interconnections along with STATCOM] schemes, as per para 7 mentioned below:

"*Keeping in view of the above submissions, we proceed to consider the grant of the transmission licence to the Petitioner Company. With regard to the revision of the TSA with*

modified/aligned schedules, CTUIL, Nodal Agency is directed to resolve the issue on or before 15.2.2024 and to file an affidavit in this regard before the next date of the hearing. PFCCL is also directed to file its response on an affidavit regarding mismatches in the transfer of the SPV for both schemes in the instant case within ten days."

5.1.2 Both schemes under Part-F and Part-G were recommended in the 5th meeting of National Committee on Transmission (NCT) held on 25.08.2021 & 02.09.2021 with matching timeframe and Gazette was notified on 06.12.2021.

5.1.3 Further, prior to SPV transfer for both the schemes, a meeting was held on 11.07.2023 amongst CEA, CTUIL, PFCCL and RECPDCL for discussion on the issue of SPV transfer of Phase-III transmission schemes in Rajasthan wherein, it was deliberated that Rajasthan REZ Ph-III Part G (Fatehgarh-III-Beawar 765 kV D/c line) is interlinked with Phase-III Part F (Beawar S/s and its interconnections). However, both SPVs were on transferred different dates (Part-G on 01.08.2023) and (Part-F on 20.09.2023) resulting into mismatch in commissioning schedules of both the schemes as follows:

Sl. No.	**Project/Scheme Name**	**BPC**	**Date of SPV transfer/ TSA signing**	**Name of TSP**	**SCOD**
1	Transmission System for Evacuation of Power from REZ In Rajasthan (20 GW) Under Phase-III Part G	PFCCL	01.08.2023	Fatehgarh III Beawar Transmission Limited (Subsidiary of M/s Sterlite Grid 19 Ltd.)	**31.01.2025** (18 months from effective date)
2	Transmission System for Evacuation of Power from REZ In Rajasthan (20GW) Under Phase-III Part F	RECPDCL	20.09.2023	Beawar Transmission Limited (Subsidiary of M/s Sterlite Grid 27 Ltd.)	**Line & S/s: 19.03.2025** (18 months from the effective date). **STATCOM:** **19.09.2025** (24 months from the effective date)

From the above, it was observed that there is a mismatch of 47 days in schedule commissioning dates of both schemes due to different signing date of TSA/date of transfer of SPV.

5.1.4 In compliance to CERC directions, a meeting was convened by CTUIL on 16.02.2024 amongst CEA, CTUIL, PFCCL, RECPDCL, Sterlite Grid 19 Limited and Sterlite Grid 27 Limited to resolve the issue of mismatch in aforesaid projects, wherein M/s Sterlite Grid 19 Ltd. (implementing Rajasthan Phase-III Part-G) has agreed to align its SCOD with Rajasthan Phase-III Part-F scheme. i.e. 19.03.2025.

5.1.5 NCT approved modification in SCOD of the scheme (Sl. No. 1) as under and recommended CTUIL to suitably amend the TSA:

Sl. No.	Project/Scheme Name	Name of TSP	Original SCOD	Revised SCOD
1	Transmission System for Evacuation of Power from REZ In Rajasthan (20 GW) Under Phase-III Part G	Fatehgarh III Beawar Transmission Limited (Subsidiary of M/s Sterlite Grid 19 Ltd.)	**31.01.2025**	**19.03.2025**
2	Transmission System for Evacuation of Power from REZ In Rajasthan (20GW) Under Phase-III Part F	Beawar Transmission Limited (Subsidiary of M/s Sterlite Grid 27 Ltd.)	Line & S/s: 19.03.2025 STATCOM: 19.09.2025	No change

5.2 Transmission scheme for evacuation of 4.5 GW RE injection at Khavda PS under Phase II Part A

5.2.1 Representative of CTUIL stated that CERC vide order dated 31.07.2023 in petition no. 128/TL/2023 (Khavda II C Transmission Limited) has directed CTUIL to amend the TSAs for Part A to part D to align the SCOD of all interlinked packages as per para 7 mentioned below:

"7. As per the Transmission Service Agreement, all four parts are interlinked and are to be taken up in a similar time frame. However, from the above information submitted by CTUIL, there is a mismatch in the SCOD of Part A which is 28.3.2025, and the SCOD of Part-B, Part- C & Part-D is 21.3.2025, with each part being implemented by a different

entity. In case Part B, Part-C & Part-D are declared COD on the SCOD date, there shall be commercial liabilities in the absence of Part-A, whose SCOD is on 21.3.2023. Accordingly, CTUIL is directed to amend the TSAs for Parts-A to D to align the SCOD of all the interlinked packages. CTUIL is also directed to finalize the SCOD dates without creating mismatches in the interlinked schemes."

5.2.2 Another transmission scheme namely "Transmission Network Expansion in Gujarat Associated with Integration of RE Projects from Khavda Potential RE Zone" is also required to be implemented in matching timeframe of Khavda Phase-II (Part A to Part D) schemes. These schemes were progressively approved in 3rd National Committee on Transmission (NCT) meeting held on 26.05.2020 & 28.05.2020 and 5th meeting of NCT held on 25.08.2021 & 02.09.2021 with implementation in matching timeframe. Transmission system under Part-A, Part-B, Part-C and Khavda RE zone were approved to be implemented under TBCB mode whereas, transmission system under Part-D was approved in 11th NCT meeting dated 28.12.2022 & 17.01.2023 under RTM mode. The details are as follows:

Sl. No.	**Project Name**	**Broad Scope of works**	**BPC**	**Date of SPV transfer (TSA signing) award under RTM**	**Name of TSP**	**SCOD**
1	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part B	• Lakadia PS-Ahmedabad 765k V D/c line	RECPDCL	21.03.2023	POWERGRID	**21.03.2025** (24 months from effective date)
2	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part C	• Establishment of 3x1500 MVA, 765/400 kV Ahmedabad S/s • Ahmedabad-South Gujarat/ Navsari (new) 765 kV D/c line with 240 MVAr switchable line reactor at both ends. • 400 kV line bays – 04 (LILO of Pirana (PG) - Pirana (T)		21.03.2023	POWERGRID	**21.03.2025** (24 months from effective date)

Sl. No.	Project Name	Broad Scope of works	BPC	Date of SPV transfer (TSA signing) award under RTM	Name of TSP	SCOD
		400kV D/c line at Ahmedabad S/s				
3	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part A	• KPS2 (GIS)-Lakadia 765 kV D/C line		28.03.2023	Adani	**28.03.2025** (24 months from effective date)
4	Transmission Network Expansion in Gujarat Associated with Integration of RE Projects from Khavda Potential RE Zone	• Banaskantha – Ahmedabad 765kV D/c line		21.03.2023	POWERGRID	**21.03.2025** (24 months from effective date)
5	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part D	• LILO of Pirana (PG)- Pirana (T) 400 kV D/c line at Ahmedabad S/s	**RTM**	**RTM** (16.02.2023)	Torrent Power	**21.03.2025** (matching with aforesaid schemes)

5.2.3 It was observed that there is a mismatch of 07 days in SCODs of above schemes due to different date of SPV transfer (TSA signing date) of Part A scheme. The utilization of transmission system under Khavda Phase-II Part B, Part C, Part D and Khavda RE Zone may not be possible till the commissioning of Khavda Phase II Part A scheme.

5.2.4 In compliance to CERC directions, a meeting was convened by CTUIL on 23.02.2024 amongst CEA, CTUIL, RECPDCL, Khavda II A Transmission Limited, Khavda II B Transmission Limited, Khavda II C Transmission Limited, Khavda RE Transmission Limited and Torrent Power Grid Limited to align the SCOD of aforesaid projects

wherein it was agreed to revise the SCOD of Khavda Part A from 28.03.2025 to 21.03.2025 matching with other interlinked schemes.

5.2.5 NCT approved modification in SCOD of the scheme (Sl. No. 3) as under and recommended CTUIL to suitably amend the TSA:

Sl. No.	Project Name	Date of SPV transfer (TSA signing) award under RTM	Name of TSP	Original SCOD	Revised SCOD
1	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part B	21.03.2023	POWERGRID	21.03.2025	No Change
2	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part C	21.03.2023	POWERGRID	21.03.2025	No Change
3	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part A	28.03.2023	Adani	**28.03.2025**	**21.03.2025**
4	Transmission Network Expansion in Gujarat Associated with Integration of RE Projects from Khavda Potential RE Zone	21.03.2023	POWERGRID	21.03.2025	No Change
5	Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part D	**RTM** (16.02.2023)	Torrent Power	21.03.2025 (matching with aforesaid schemes)	No Change

In future, to address the issue of mismatch amongst SCODs of the interlinked schemes, both BPCs (RECPDCL & PFCCL) were advised to coordinate with respect to transfer of SPVs on the same date. It was also decided that a letter would also be sent in this regard to the BPCs.

6 Evaluation of functioning of National Grid.

6.1 Grid-India made a presentation on performance of national grid during past six months (Copy of presentation enclosed at Annexure-II).

6.2 Salient points of the presentation were as under:

a. **High Import by Southern Region:** Continuous high import by the Southern Region and actual import breaching ATC limits in year 2023-24 due to high demand coupled with low hydro generation in the region. Limiting constraints are 765/400 kV Maheshwaram ICT. 765 kV Angul-Srikakulum is also critically loaded in some scenarios.

GRID-INDIA and CTUIL to make a presentation on the matter in the next SRPC/TCC meeting highlighting the requirement of further transmission

strengthening via inter-regional links involving Southern Region to cater to the rising import of power by the Southern Region.

b. **Recent Disturbances in NR RE Complex**: Occurrence of oscillations and Fault Ride Through (FRT) non-compliance were flagged. Need for controller setting coordination by RE developers was emphasized. Corrective measures being taken by GRID-INDIA were shared.

   Chairman, NCT advised Grid India to convene monthly meetings with RE developers for tuning of controllers and O&M.

c. Reliability Issues (Low voltage, ICT overloading and repeated tripping of intra-state lines) in Rajasthan Intra-state Network:

   Transmission inadequacy and O&M issues were explained. Chairman, NCT suggested to issue communication from his end to Rajasthan, Maharashtra, Karnataka and Tamil Nadu to strengthen the intra-state network. He advised CTUIL to study the ICT augmentation required at ISTS in Rajasthan and expedite further.

d. High Impact Low Frequency Events (Water logging and floods):

   Member were apprised of events of substations/generating station flooding and transmission tower collapse during cloud burst, cyclone, rains. NCT opined that construction standards are strictly to be adhered to during implementation of transmission system.

e. **Constraint in SR Export Corridor**: The intra-state constraints in the Maharashtra network around Mumbai and Pune area were explained. It would limit the export capability from the Southern Region until the approved schemes in Western Maharashtra are commissioned.

f. HVDC Vindhyachal inflexibility during high NR import due to high loading of 400 kV Anpara-Obra-S/C:

   Constraints in operation of HVDC BtB towards NR and critical loading of 765 kV Vindhyachal-Varanasi were presented. Chairman, NCT advised CTUIL that the constraints likely to arise in the inter-regional transmission corridors in the next three-four years must be studied regularly and remedial measures like strengthening of the transmission links must be taken up in a timely manner to ensure seamless flow of power.

Summary of the deliberations of the 18th meeting of NCT held on 05th March, 2024

I. Modification in the earlier approved/notified transmission schemes:

1. Modification in scope of work of Eastern Region Expansion Scheme-XXXIX (ERES-XXXIX)

Change in original scope from 765 kV GIS/Hybrid line bays to AIS line bays was agreed to be implemented

II. Modification in SCOD of under construction schemes

1. Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) under Phase-III Part-G

NCT approved modification in SCOD of the scheme 'Transmission System for Evacuation of Power from REZ in Rajasthan (20 GW) Under Phase-III Part G' from 31.01.2025 to 19.03.2025.

2. Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part A

NCT approved modification in SCOD of the scheme 'Transmission scheme for evacuation of 4.5GW RE injection at Khavda PS under Phase II Part A' from 28.03.2025 to 21.03.2025

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

a) The transmission schemes approved by NCT under RTM route is given below:

Sl. No.	Name of Transmission Scheme	Implementation Mode	Tentative Implementation timeframe	Allocated to	Estimated Cost (Rs. Crs)
1.	Augmentation of 2x500 MVA, 400/230 kV transformation capacity (3rd & 4th ICTs) at Karur PS	RTM	18 months	POWERGRID	115

b) The transmission schemes approved by NCT under TBCB route is given below:

Sl. No.	Name of Transmission Scheme	Implementation Mode	Implementation timeframe	BPC	Estimated Cost (Rs. Crs)
1.	Augmentation of transformation capacity at Jam Khambhaliya PS	TBCB	Tentative implementation timeframe :	RECPDCL	310

	(GIS)		• For scope at Sl. No. 1: 18 months • For scope at Sl. No. 4: 30.03.2026 and 30.06.2027 respectively (subject to minimum schedule of 21 months from date of award of balance works). • For balance scope: 21 months		
2.	Transmission scheme for integration of Tumkur-II REZ in Karnataka	TBCB	24 months	PFCCL	465

The broad scope of above ISTS scheme, approved by NCT for implementation through TBCB route to be notified in Gazette of India is as given below:

Sl. No.	Name of Scheme & implementation timeframe	Broad Scope	Bid Process Coordinator
1.	Augmentation of transformation capacity at Jam Khambhaliya PS (GIS)	i. Creation of New 220 kV Bus Section-II at Jam Khambhaliya PS Space to be kept for 1 no. 220 kV line bay in the same GIS Hall for RE Interconnection being implemented by the RE developer (in addition to 2 nos. bays at Sl. 4) ii. Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 2x500MVA, 400/220 kV ICT (5th & 6th) (terminated on New 220 kV bus section-II) iii. Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV ICT (7th) (terminated on New 220kV bus section-II) iv. Implementation of 220kV GIS line bays at Jam Khambhaliya PS for RE Projects on New 220kV bus section-II v. Creation of New 220kV Bus Section at Jam Khambhaliya PS (Section III) (with space for 4 nos. 220kV line bays: in same GIS hall. Implementation of 2 Nos. GIS bays to be taken up as per Sl.No.9 and space	RECPDCL

		to be kept for future 2 Nos.) *vi.* Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV ICT (8th) (terminated on New 220kV bus section-III) *vii.* Augmentation of transformation capacity at Jam Khambhaliya PS (GIS) by 1x500MVA, 400/220kV (9th) ICT terminated on New 220kV bus section-III *viii.* Implementation of 220kV GIS line bays at Jam Khambhaliya PS for Kuvadia 220kV D/c line **(Detailed scope as approved by 18th NCT and subsequent amendments thereof)**	
2.	Transmission scheme for integration of Tumkur-II REZ in Karnataka	i. Establishment of 400/220 kV 4x500 MVA Pooling Station near Tumkur, Karnataka ii. Tumkur-II – Tumkur(Pavagada) 400 kV (Quad ACSR moose) D/c line iii. 2x125 MVAr, 420 kV bus reactors at Tumkur-II PS **(Detailed scope as approved by 18th NCT and subsequent amendments thereof)**	PFCCL

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

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

Sl. No.	Name of Transmission Scheme	Implementation Mode	Tentative Implementation timeframe	BPC	Estimated Cost (Rs. Crs)
1.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part 3: 6GW) (Bikaner Complex): Part A	TBCB	24 months	RECPDCL	5968.5
2.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part 3: 6GW) (Bikaner Complex): Part B	TBCB	24 months	RECPDCL	5357.36
3.	Transmission Scheme for integration of Davanagere / Chitradurga and Bellary REZ in Karnataka	TBCB	A. Transmission system for integration of Davanagere / Chitradurga REZ -Tentative Implementation timeframe: 24 months B. Transmission system for integration of Bellary REZ - Tentative Implementation timeframe: 30 months	PFCCL	3453
4.	Transmission Scheme for integration of Bijapur REZ in Karnataka	TBCB	24 months	PFCCL	1113
5.	Transmission System under ISTS for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW)	TBCB	30 months (December 2026)	PFCCL	548

The broad scope of the above ISTS schemes to be notified in Gazette of India is as given below:

Sl. No.	Name of Scheme & Tentative implementation timeframe	Broad Scope	Bid Process Coordinator
1.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part A **Implementation Timeframe:** **24 months**	i. Establishment of 6x1500 MVA, 765/400 kV & 6x500 MVA, 400/220 kV Bikaner-IV Pooling Station along with 2x240 MVAr (765kV) & 2x125 MVAr (420kV) Bus Reactors at a suitable location near Bikaner ii. STATCOM (2x+300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) at Bikaner-IV PS iii. LILO of both ckts of Bikaner II PS- Bikaner III PS (Quad) direct line at Bikaner-IV PS iv. Bikaner-IV PS – Siwani 765 kV D/c line along with 240 MVAr switchable line reactor for each circuit at each end v. Siwani– Fatehabad (PG) 400 kV D/c line (Quad) vi. Siwani – Patran (Indi Grid) 400 kV D/c line (Quad) along with 80 MVAr switchable line reactor for each circuit at Siwani S/s end vii. 2nos. 400 kV line bays each at Fatehabad (PG) & Patran (Indi Grid) S/s viii. 2nos. 765 kV line bays at Siwani S/s ix. 4 nos. 400 kV line bays at Siwani S/s **(Detailed scope as approved by 18th NCT and subsequent amendments**	RECPDCL

		thereof)	
2.	Transmission system for evacuation of power from Rajasthan REZ Ph-IV (Part 3: 6GW) (Bikaner Complex) :Part B **Implementation Timeframe:** **24 months**	i. Establishment of 765/400kV, 6x1500 MVA S/s at suitable location near Siwani (Distt. Bhiwani) along with 2x240 MVAr (765kV) Bus Reactor & 2x125 MVAr (420kV) Bus Reactor ii. Bikaner-IV PS – Siwani 765 kV D/c (2^{nd}) line along with 240 MVAr switchable line reactor for each circuit at each end iii. STATCOM (2x+300MVAr) along with MSC (4x125 MVAr) & MSR (2x125 MVAr) at Siwani S/s iv. Siwani – Sonipat (PG) 400 kV D/c line (Quad) along with 63 MVAr switchable line reactor for each circuit at Siwani S/s end v. Siwani – Jind (PG) 400 kV D/c line (Quad) vi. 2 nos. 400 kV line bays each at Jind(PG) & Sonipat (PG) S/s vii. 2 nos. 765 kV line bays at Bikaner-IV PS **(Detailed scope as approved by 18^{th} NCT and subsequent amendments thereof)**	RECPDCL

3.	Transmission Scheme for integration of Davanagere / Chitradurga and Bellary REZ in Karnataka **Implementation Timeframe:** A. Transmission system for integration of Davanagere / Chitradurga REZ - Tentative Implementation timeframe: **24 months** B. Transmission system for integration of Bellary REZ – Tentative Implementation timeframe: **30 months**	**A. Transmission system for integration of Davanagere / Chitradurga REZ** i. Establishment of 765/400kV 4x1500 MVA, 400/220kV 4x500 MVA Pooling Station near Davanagere / Chitradurga, Karnataka with provision of two (2) sections of 4500 MVA each at 400kV level and provision of four (4) sections of 2500 MVA each at 220kV level ii. LILO of Narendra New – Madhugiri 765kV D/c line at Davanagere / Chitradurga 765/400kV PS (~40 km) {with 240 MVAr SLR at both ends on Narendra New – Davanagere section (~280 km) and 330 MVAr SLR at Davanagere end on Davanagere – Madhugiri section (~200 km)} iii. 2x330 MVAr (765kV) bus reactors at Davanagere/ Chitradurga PS iv. Upgradation of Narendra New – Madhugiri 765kV D/c line (presently charged at 400kV level) at its rated 765kV voltage level v. Upgradation of Madhugiri {Tumkur(Vasantnarsapura)} to its rated voltage of 765kV level alongwith 3x1500 MVA, 765/400kV ICTs and 2x330 MVAr, 765kV bus reactors	PFCCL

		(Upgradation of Madhugiri {Tumkur(Vasantnarsapura)} to its rated 765kv level was earlier allocated to POWERGRID for implementation through RTM route vide MOP OM No.15/3/2018-Trans-Pt(1) dated 23.01.2020) **B. Transmission system for integration of Bellary REZ** i. Establishment of 4x500 MVA, 400/220kV Pooling Station near Bellary area (Bellary PS), Karnataka ii. Bellary PS – Davanagere / Chitradurga 400kV (Quad ACSR moose) D/c line iii. 2x125MVAr 420kV bus reactors at Bellary PS **(Detailed scope as approved by 18th NCT and subsequent amendments thereof)**	
4.	Transmission Scheme for integration of Bijapur REZ in Karnataka **Implementation Timeframe: 24 months**	i. Establishment of 400/220kV 5x500 MVA Pooling Station near Bijapur (Vijayapura), Karnataka ii. Bijapur PS – Raichur New 400kV (Quad ACSR moose) D/c line iii. 2x125MVAr 420kV bus reactors at Bijapur PS **(Detailed scope as approved by 18th NCT and subsequent amendments thereof)**	PFCCL

5.	Transmission System under ISTS for evacuation of power from Kudankulam Unit - 3 & 4 (2x1000 MW) **Implementation Timeframe: 30 months (December 2026)**	i. KNPP 3&4 – Tuticorin-II GIS PS 400kV (quad) D/c line (~120 km) {Line & bays at Tuticorin-II GIS under ISTS scope and bays at KNPP under NPCIL scope} **(Detailed scope as approved by 18th NCT and subsequent amendments thereof)**	PFCCL

V. ISTS communication schemes approved by NCT:

Sl. No.	Name of Transmission Scheme	Implementation Mode	Tentative Implementation timeframe	Implementing Agency	Estimated Cost (Rs. Crs)
1.	Additional FOTE for redundancy at AGC locations in ER	RTM	06 months	POWERGRID	2.4
2.	OPGW laying work on 400kV BokaroA-Kodarma line	RTM	18 months	POWERGRID	6.83

Annexure

List of participants of the 18th meeting of NCT

CEA:

1. Sh. Ghanshyam Prasad, Chairperson, CEA & Chairman, NCT
2. Sh. Ajay Talegaonkar, Member (E&C)
3. Sh. A.K. Rajput, Member (P.S.)
4. Sh. Rakesh Goyal, Chief Engineer (PSPA-II)
5. Sh. Ishan Sharan, Chief Engineer (PSPA-I)
6. Sh. B.S. Bairwa, Director (PSPA-II)
7. Ms. Priyam Shrivastav, Deputy Director (PCD)
8. Sh. Pranay Garg, Deputy Director (PSPA-II)
9. Sh. Prateek Jadaun, Assistant Director (PSPA-II)

MoP:

1. Om Kant Shukla, Director (Trans.)

MNRE:

1. Sh. Rohit Kumar, Scientist

SECI:

1. Sh. Prashant K. Upadhyay, Sr Manager
2. Sh. R.K. Agarwal, Consultant

NITI Aayog:

1. Sh. Manoj Kr. Upadhyay, Deputy Adviser

CTUIL:

1. Sh. P C Garg, COO
2. Sh. Ashok Pal, Deputy COO
3. Sh. P S Das, Sr GM
4. Sh. K K Sarkar, Sr GM
5. Sh. Anil Kr. Meena, GM
6. Sh. Kashish Bhambhani, GM
7. Sh. Rajesh Verma, GM
8. Sh. Pratyush Singh, Chief Manager
9. Sh. Abhijit Jha, Chief manager
10. Sh. Bhaskar Wagh, Chief Manager
11. Sh. Venkatesh Gorli, Engineer

GRID India:

1. Sh. S.R. Narasimhan, CMD
2. Sh. Rajiv Porwal, Director
3. Sh. Surajit Banarjee, CGM
4. Sh. Vivek Pandey, GM
5. Sh. Rahul Shukla, CM

6. Sh. Gaurab Dash, AM
7. Sh. Raj Kishan, AM

RECPDCL

1. Sh. Sayaban Sahu, GM (Tech)
2. Sh. Amit Chatterjee, Executive (Tech)

***

18th Meeting of National Committee on Transmission

Grid Performance – 2nd and 3rd Quarter (2023-24)

Grid Controller of India Limited

formerly Power System Operation Corporation Ltd. (POSOCO)

National Load Despatch Center

CONTENTS

- **Overview of Grid Operation**
  - All India Maximum & Minimum Demand Met
  - All India Demand met, Energy consumption
  - Percentage growth in Demand Met & Energy Consumption
  - All India Demand Diversity Factor
  - Frequency profile
  - GD-GI Summary
- **Reliability issues experienced in NR RE Complexes**
  - RE Generation Loss Events and Performance of RE Plants
  - Intra-state Constraints in Rajasthan Network
  - Oscillations observed in NR RE Complexes
  - First Time Charging & Operation of STATCOMs
- **Major Grid Disturbances leading to transmission constraints**
- **Major Constraints in Inter-regional Network**
  - Constraints in Inter-regional Corridors
  - Commissioning of Elements Eagerly Awaited
  - Constraint in HVDC flexible operation
  - Augmentation in Maharashtra System to Mitigate Operational Constraints
- **Major Constraints in Intra-regional Network**

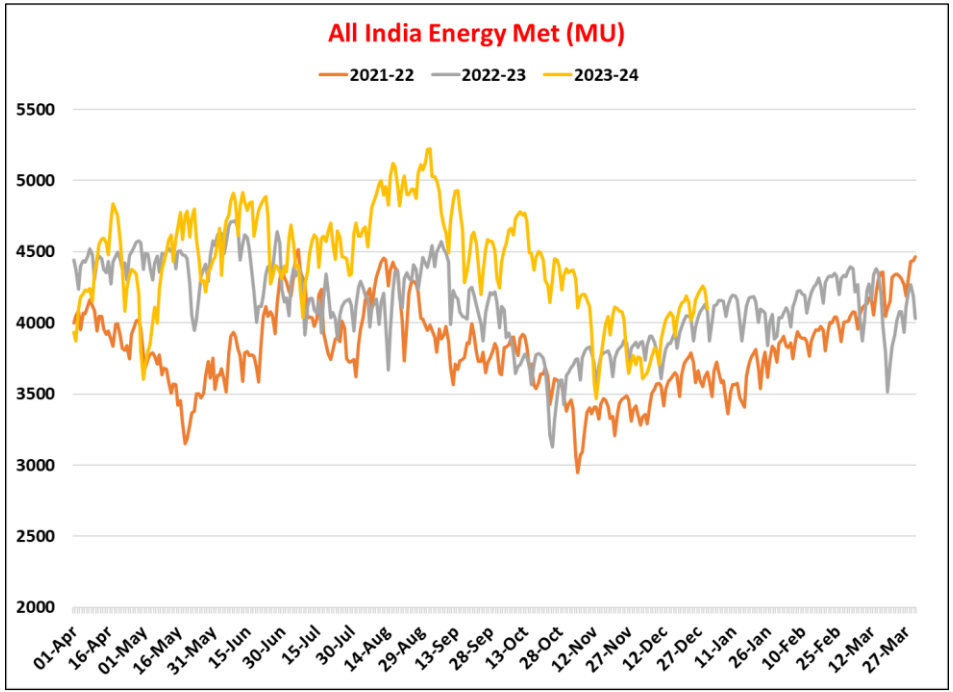
Overview of Grid Operation – Q2 & Q3 - FY 2023-24

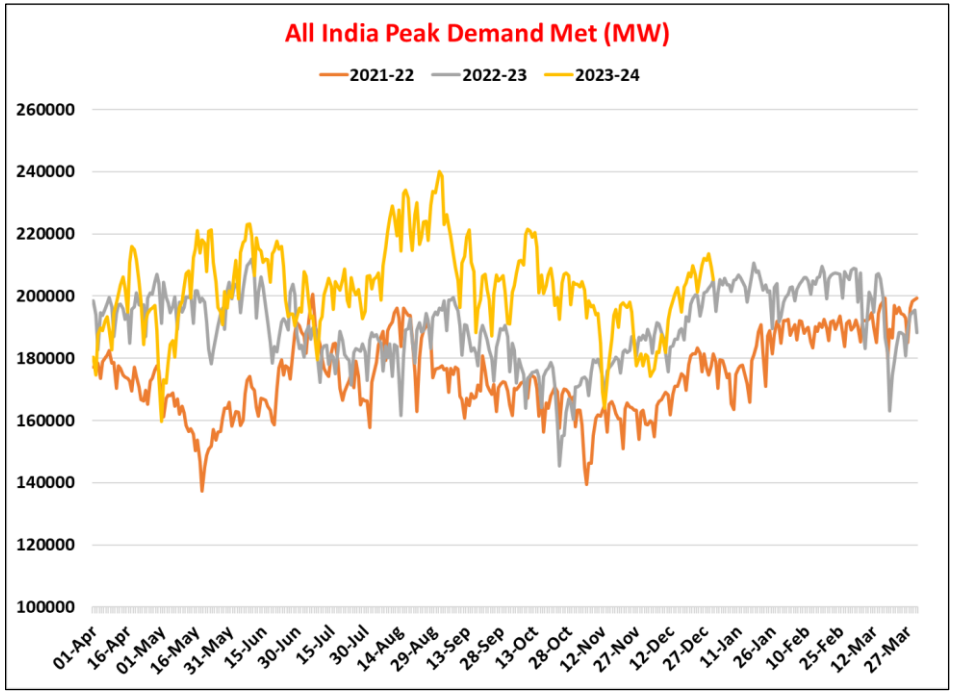
All India Demand met	Q2 (July-Sep)	Q3 (Oct-Dec)	Q4 (Jan-Mar)*
Maximum (MW)	**239978 (01-Sep-2023)**	**221627 (10-Oct-2023)**	**222327 (25-Jan-2024)**
Minimum	**158080 (07-Jul-2023)**	**119321 (13-Nov-2023)**	**134394 (08-Jan-2024)**

*Upto 29th February 2024

Projections as per 20th EPS for 2023-24	
All India Peak Demand	**230144 MW**

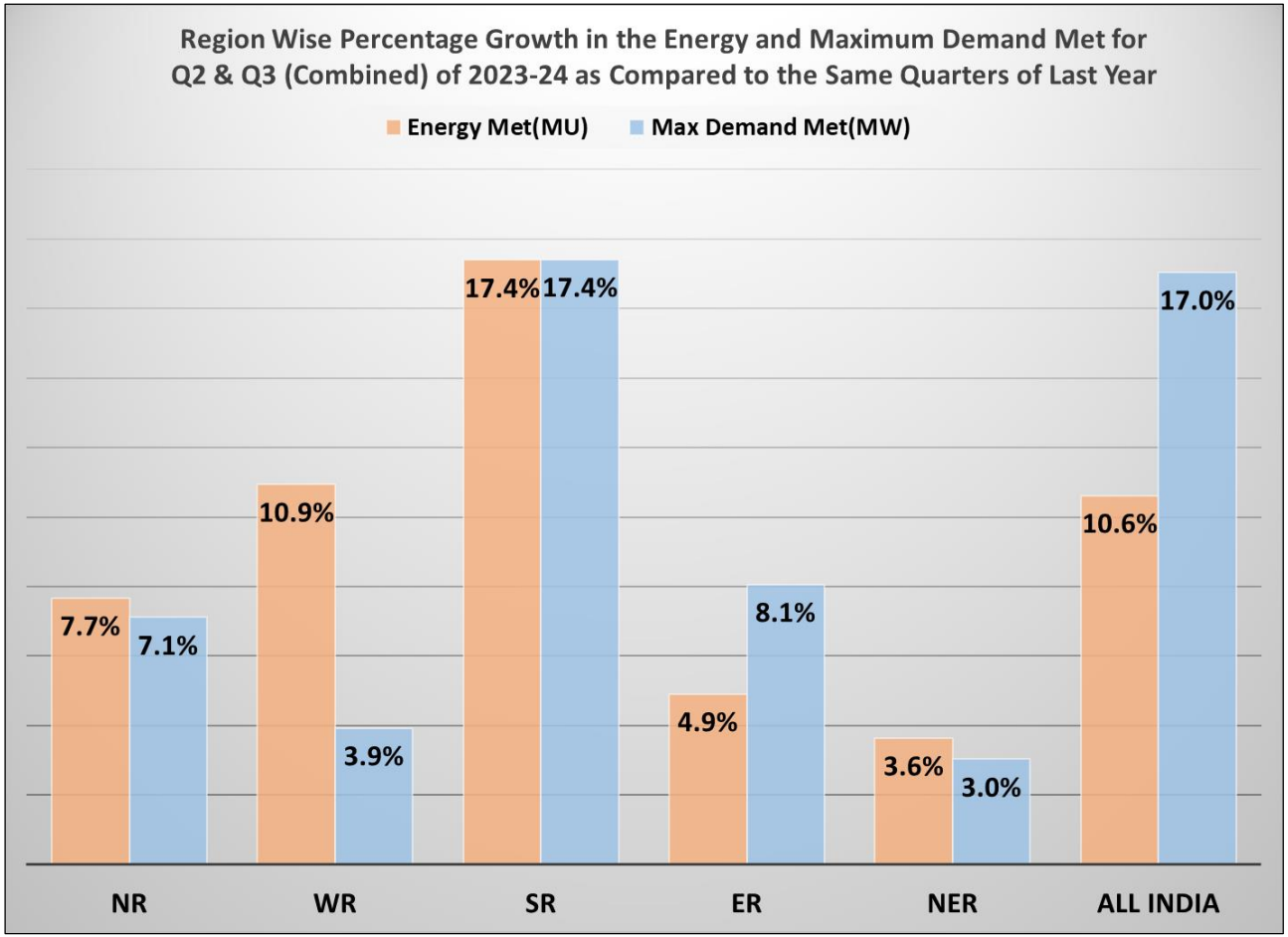
All India Daily Energy Met and Peak Demand of FY 2023-24, 2022-23 & 2021-22



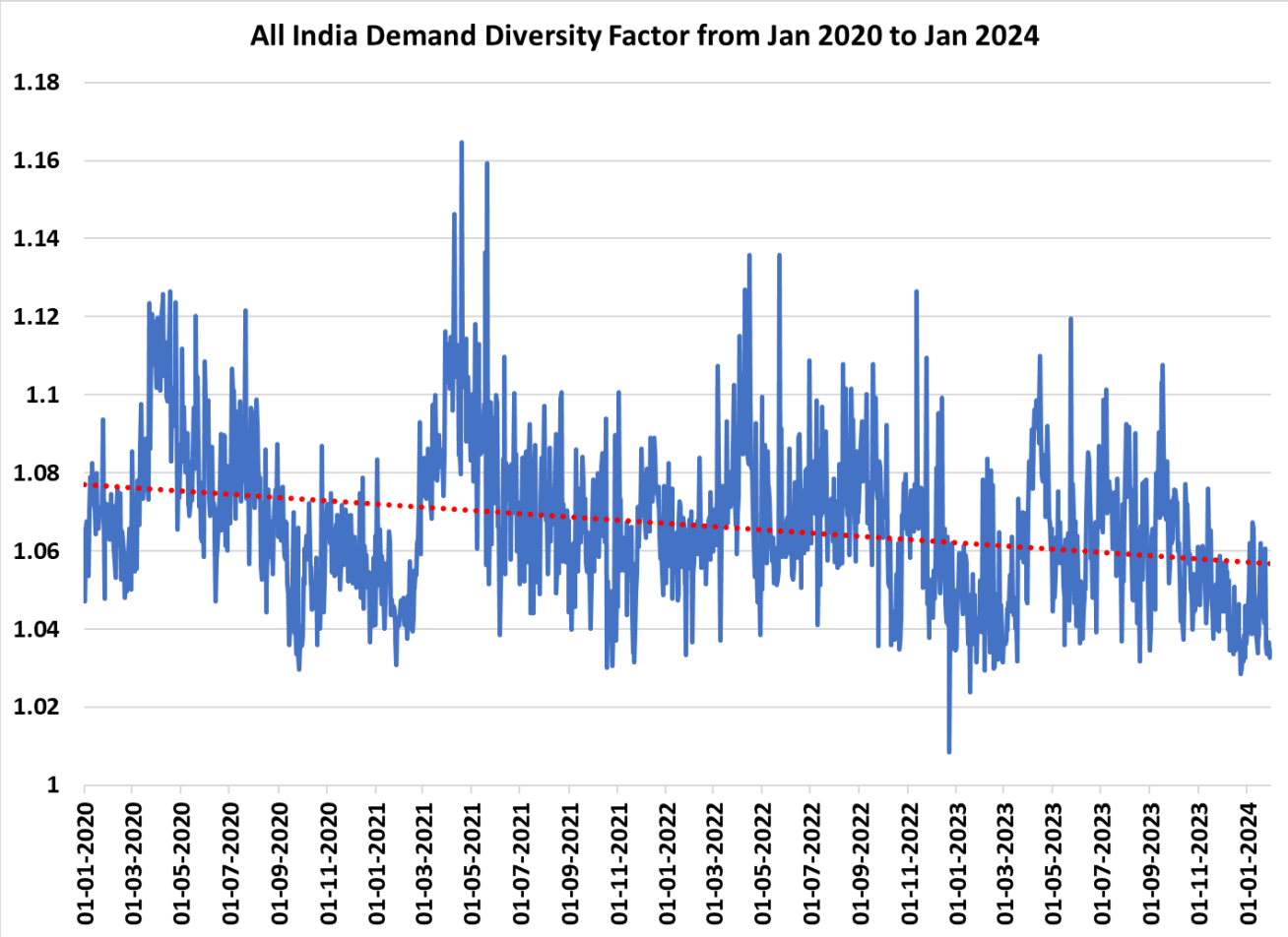


Significant increase in both Maximum Demand and Energy Met in FY 2023-24

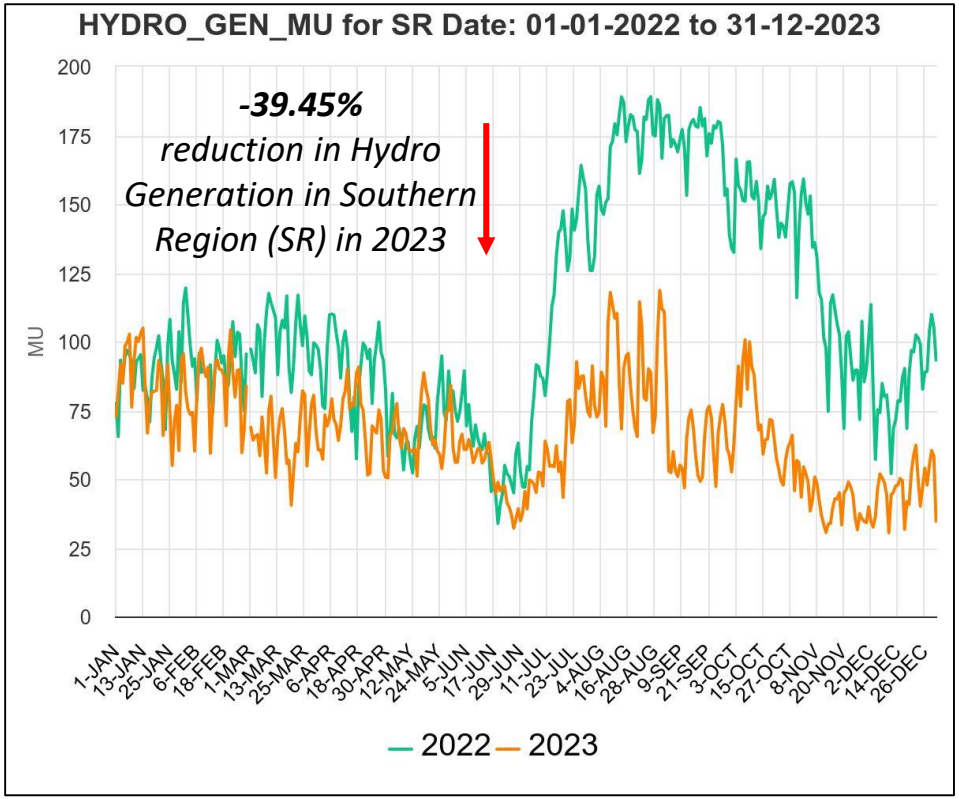
All India Percentage Growth in the Energy Consumption and Maximum Demand Met



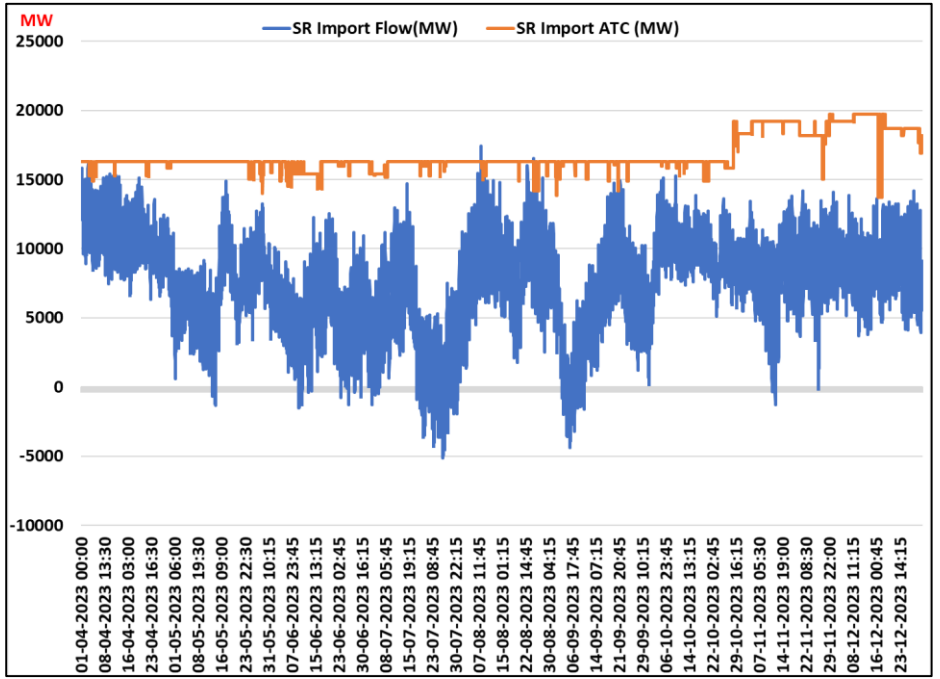
All India Maximum Demand Diversity Factor From Jan'20 to Jan'24



High Import of Southern Region



- High demand and low hydro generation in Southern Region resulted in continuous import by SR from NEW grid in 2023-24



- Southern Region exported for very limited period during this time

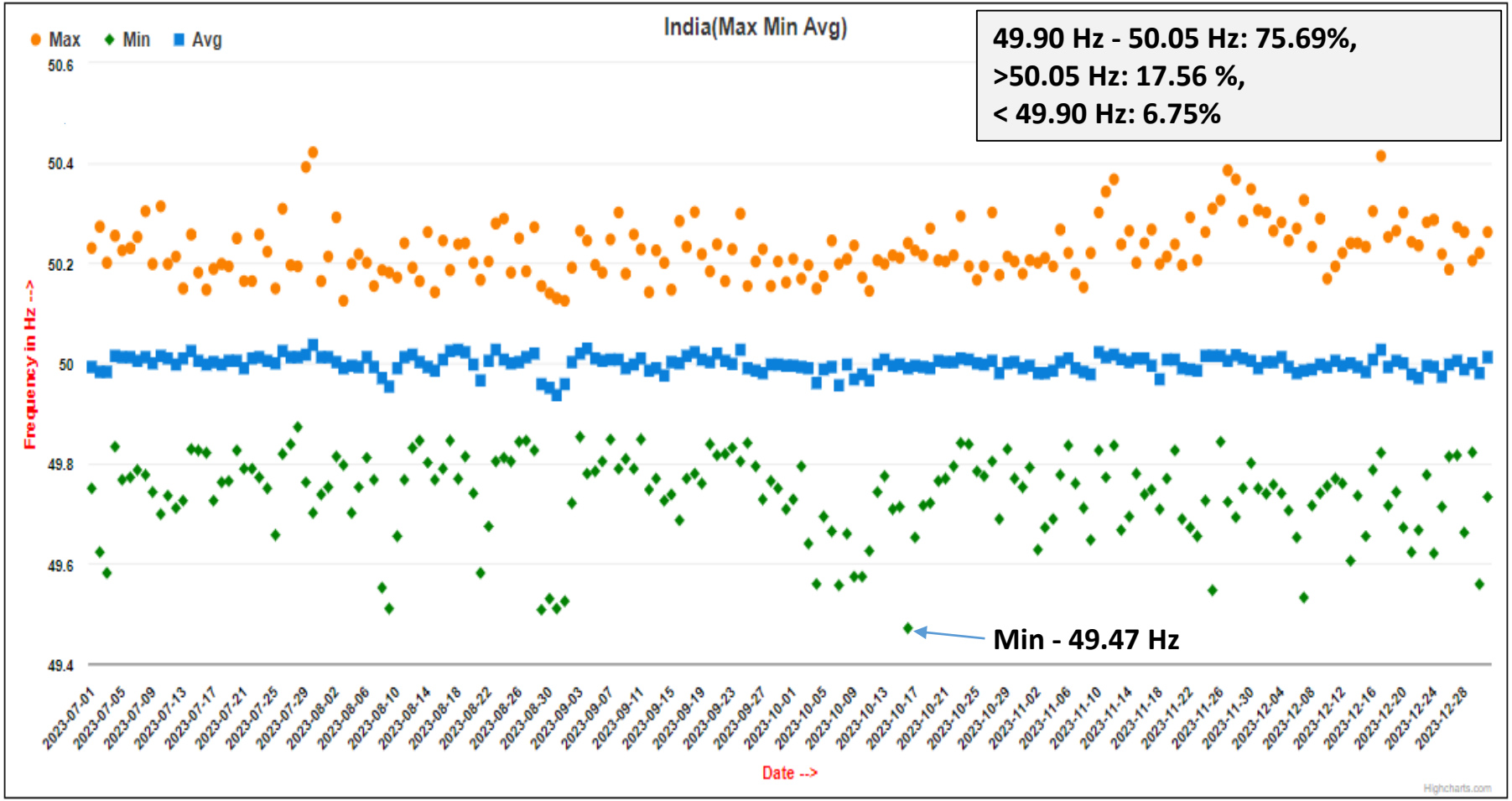
All Time Highest Figures (In – 2023-24)

Regions	Maximum Demand Met during the day(MW)	Demand Met During Evening Peak hrs(MW)	Energy Met(MU)	Hydro Gen(MU)	Wind Gen(MU)	Solar Gen(MU)
NR	81220 04-09-2023	76274 04-09-2023	1796 04-09-2023	442.6 01-08-2023	85.7 07-08-2023	147.3 10-05-2023
WR	74356 17-01-2024	65518 13-10-2023	1617.6 02-09-2023	167 18-12-2014	272.6 07-08-2023	70.7 12-05-2023
SR	64314 15-03-2023	52366 18-04-2023	1328.9 19-04-2023	208 31-08-2018	298.4 21-07-2023	142.7 21-03-2023
ER	29641 28-07-2023	28579 18-04-2023	639.4 08-06-2023	157.4 14-09-2022	-	7 23-03-2023
NER	3712 04-09-2023	3510 12-08-2022	71.9 15-09-2023	40.7 29-08-2023	-	2.4 22-06-2022
All India	239978 01-09-2023	215592 28-08-2023	5223.9 02-09-2023	877.5 30-08-2022	610.5 02-08-2023	351.1 10-05-2023

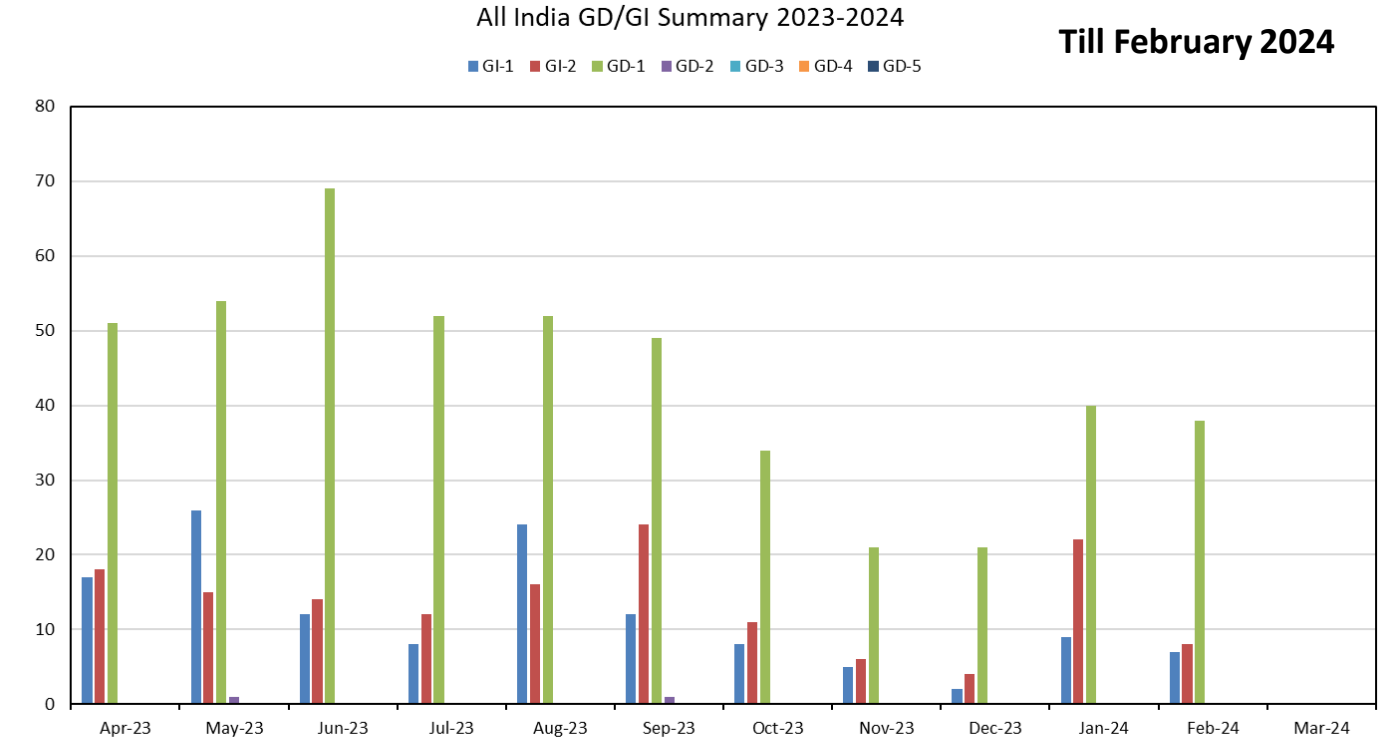
Maximum Figures in Q1, Q2 & Q3 of 2022-23		
All India Peak Demand	211856	10-06-2022
All India Energy Met	4722	10-06-2022

Previous All-Time Highest Figures		
All India Peak Demand	236598	31-08-2023
All India Energy Met	5125	31-08-2023

Frequency Profile for Q2 & Q3 of FY – 2023-24



All India Grid Incidents/Disturbances in FY 2023-24



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
GI-1	17	26	12	8	24	12	8	5	2	9	7	0
GI-2	18	15	14	12	16	24	11	6	4	22	8	0
GD-1	51	54	69	52	52	49	34	21	21	40	38	0
GD-2	0	1	0	0	0	1	0	0	0	0	0	0
GD-3	0	0	0	0	0	0	0	0	0	0	0	0
GD-4	0	0	0	0	0	0	0	0	0	0	0	0
GD-5	0	0	0	0	0	0	0	0	0	0	0	0

Reliability Issues Experienced in NR RE Complexes

Reliability issues experienced in NR RE Complexes

1. Grid Events leading to loss of Gen in NR RE Complex
2. **Low-Frequency Oscillations in NR RE Complex (Range of 3 to 5 Hz)**
3. Over voltage during switching operations
4. Fault in the vicinity of RE complex

RE Contingencies in 2023-24

S. No	Date	Time	Event
1	01-May-23	13:23 hrs	765 KV AJMER(PG)-PHAGI(RS) CKT-1, 765 KV FATEHGARH_II(PG)-BHADLA(PG) CKT-1 & 765 KV AJMER-BHADLA_2 (PG) CKT-1 tripped on over-voltage at 13:23 Hrs resulting in a momentary dip of **1100 MW** in NR Solar generation.
2	09-May-23	12:57 hrs	220KV ACME-Bhadla-1 tripped at 12.57 hrs due to R-N fault. As per PMU graph of Bhadla-1 & 2 the sudden rise in bus voltage from 773 KV to 855 KV observed at 12:57hrs. 3 nos. of 765 kV lines from Bhadla – I & Bhadla – II tripped on over-voltage. A momentary dip of **1678 MW** observed in Solar Generation
3	15-May-23	11:51 hrs	At 11:51 hrs, 765kV Bhadla-Bikaner ckt-1 tripped on Y-B phase to phase fault during inclement weather condition. With sudden RE generation dip, multiple (16 nos) 400 kV & 765 kV lines tripped on over voltage. Total RE generation loss was around **7120 MW.**
4	31-Jul-23	10:36 hrs	At 10:36 hrs, B-ph jumper at RSUPL end of 220kV Fatehgarh2-RSUPL ckt snapped. 220kV Bhadla2(PG)-Nokhra ckt also tripped on SOTF over current protection. Total loss in RE generation was approx. **1620MW.**
5	28-Aug-23	11:52 hrs	At 11:52hrs **400kV Bhadla(RS)-Bikaner(RS) Ckt-1** tripped on R-Y fault & at at 12:05hrs, **400kV Bhadla(RS)-Bikaner(RS) Ckt-2** tripped on Y-B fault. 400kV Bhadla(RS)-Ramgarh(RS) ckt-1 also tripped during the same time. **1880MW** solar generation loss observed.
6	17-Dec-23	13:01 hrs	At 13:01 Hrs, **400kV Bhadla(RS)-Bikaner(RS) Ckt-1** tripped on Y-B fault. Due to the voltage dip, a solar generation loss of around **1600 MW** was observed in the complex.
7	17-Dec-23	13:14 hrs	At 13:14 Hrs on the same day, **400kV Bhadla(RS)-Bikaner(RS) Ckt-2**tripped due to Y-B fault while charging **400kV Bhadla(RS)-Bikaner(RS) Ckt-1** (Was tripped at 13:02hrs). Due to this tripping, solar generation loss of around **2100 MW** was observed as per PMU.
8	10-Jan-24	12:19 hrs	At 12:19 hrs, **400kV Bhadla(RS)-Bikaner(RS) Ckt-2** tripped due to a phase-to-phase fault. In the event approx. **1900 MW** solar generation dip was observed as per PMU data, out of which 1000MW Solar generation was restored within one second.
9	15-Jan-24	13:59 hrs	400 kV Bhadla (Raj)- Bikaner (Raj) -1 tripped at 14:03 Hrs and around **2000MW** reduction in NR Solar generation reported at 13:59hrs and **almost fully recovered** by 14:03hrs
10	15-Jan-24	14:06 hrs	**400kV Bhadla(RS)-Bikaner(RS) Ckt-2** tripped at 14:06 and around **1800MW** solar generation loss observed.
11	24-Jan-24	10:44 Hrs	220 KV FATEHGARH_II(PG)-AHEJ3L PSS HB_FGRAH_PG (AHEJ3L) (AHEJ3L) CKT-1 tripped at 10:44 hrs due Fault Y-N Jumper broken. Approx**. 258 MW** solar generation loss was observed
12	24-Jan-24	12:16 Hrs	As reported by SLDC Rajasthan, **400kV Bhadla(RS)-Bikaner(RS) Ckt-1** tripped at 12:16 hrs (Y-B fault). Approx. **1200 MW** solar generation momentarily dip was observed. Solar generation restored within 2-3 minutes.
13	25-Feb-24	12:55 Hrs	ICT 1 at 400kV Bhadla (RS) tripped due to burning of isolator as reported. It led to tripping of of ICT-2 and ICT-3 due to overloading. At the same time, **3566 MW** generation was affected in Rajasthan ISTS pooling stations, out which apprx 1900 MW generation was recovered back within 1 second.
14	03-Mar-24	14:01 Hrs	**400 KV Kankani-Jaisalmer (RS) Ckt-2** tripped due to due to phase to phase fault . At the same time, **2800 MW** generation was affected in Rajasthan ISTS pooling stations, out which apprx 1000 MW generation was recovered back within 1 second.

RE Contingencies in 2023-24

Major Observations:

- Plants entering into LVRT mode even when POI Voltage is > 0.9 pu
- Opposite/insignificant reactive power injection by Plants during faults
- Delayed recovery of active power post fault clearance
- Partial recovery of active power after clearance of fault in the system
- **No issues observed in the submitted dynamic models of the RE plants. Real-time behavior completely in variance with the models submitted during FTC.**

Frequent Outage of 400kV Bhadla(RS)-Bikaner(RS) Ckt-1 & 2 in 2023-24:

- After charging of 400kV Bikaner(PG) - Bikaner-II(PBTSL) D/C line, 400kV Bikaner(RS) got disconnected from 400kV Bikaner(PG) and got directly connected to 400 kV Bhadla (RS). Both lines were charged on 18th August 2023.
- There have been multiple instances of planned (for attending defects – hotspots/jumper tightening etc.) and forced outages of 400kV Bhadla(RS)-Bikaner(RS) Ckt-1 & 2
- Faults related to conductor snapping/broken have taken place which have led to large generation outages in the RE complex.
- There have been **9 nos** of planned and emergency outages and **7 fault related trippings** 400kV Bhadla(RS)-Bikaner(RS) Ckt-1 .
- There have been **6 nos** of planned and emergency outages and **5 fault related trippings** for 400kV Bhadla(RS)-Bikaner(RS) Ckt-2.

Intra-state Constraints in Rajasthan Network

- N-1 Constraints in several ICTs
- Severe low voltage & huge MVAR drawl at RVPN during winter months (even below 0.8 at number of 400/220kV ICTs)
- **37 Nos.** of Grid disturbances/incidents in 2023 in Rajasthan (intra-state) network
- **23 Nos. of load loss events & 12 Nos. of generation loss events in 2023.**

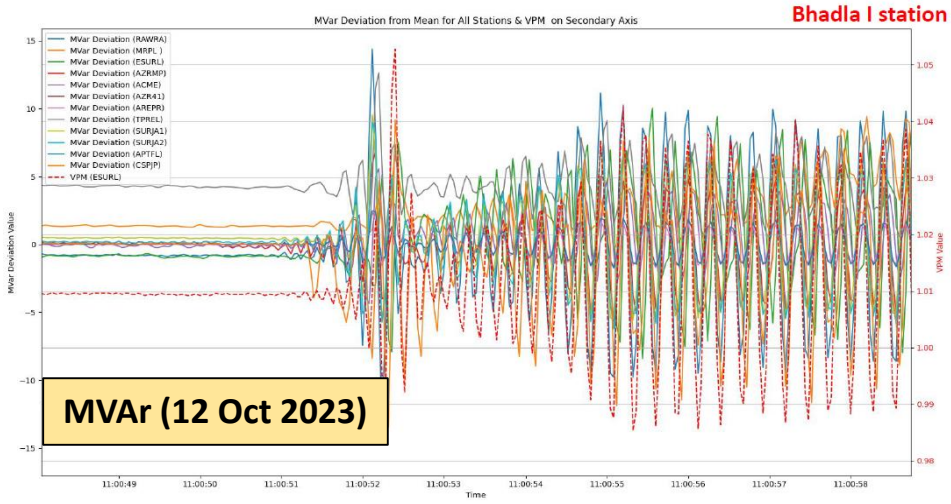
ICT Constraints

N-1 Contingency of 3*315 MVA ICT at Chittorgarh	3rd 315MVA ICT at Chittorgarh first time charged on 06.01.2024. Even after capacity augmentation at Chittorgarh, 3*315MVA ICTs are near to N-1 non-compliance. Rajasthan STU has planned and implemented SPS at these locations. (except Bhilwara) New 1*500MVA ICT under bidding at these S/s by RVPNL. As per latest information shared by RVPN, bids for new 500MVA transformers at Ajmer, Bikaner, Hindaun, Merta, Babai and Jaisalmer-2 substations will be opened on 22.01.2024.
N-1 Contingency of 2*315+1*500 MVA ICT at Bassi	
N-1 Contingency of 2*315 MVA ICT at Jodhpur	
N-1 Contingency of 2*315 MVA ICT at Bhinmal	
N-1 Contingency of 2*315 MVA ICT at Ajmer	
N-1 Contingency of 2*315 MVA ICT at Bikaner	
N-1 Contingency of 2*315 MVA ICT at Merta	
N-1 Contingency of 2*315 MVA ICT at Hindaun	
N-1 Contingency of 1*315+1*500 MVA ICT at Bhilwara	

Low Voltage Issues

Low voltage issues at Hindaun , Alwar, Bhinmal Voltages reaching 310kV at Alwar (400kV), 360 KV(Bhinmal) and 325kV at Hindaun (400kV). Similar poor profile at 220kV side also.	New 400/220kV Dholpur S/s likely to provide some relief, however approved by CEA on 27th Jan 2023, so issue likely to persist for next 1-2 winter seasons.
	Other immediate measures required by RVPN. 400kV Bharatpur is under internal approval with LILO of 400kV Agra-Sikar.
	Severe issues observed during Dec 2022-Jan 2023 months. As discussed in 70 NRPC meeting, RVPN is being asked to run Dholpur generation, however, same is not being done by RVPN. Communications sent from NRLDC side in this regard.
Low voltage issues in RE generation pockets	Additional reactive power support devices for maintaining grid voltages within IEGC prescribed limits to be expedited (STATCOMs approved in intrastate network). Intrastate RE generators to support the grid by operating in voltage control mode.

Oscillations Observed in NR RE Complex



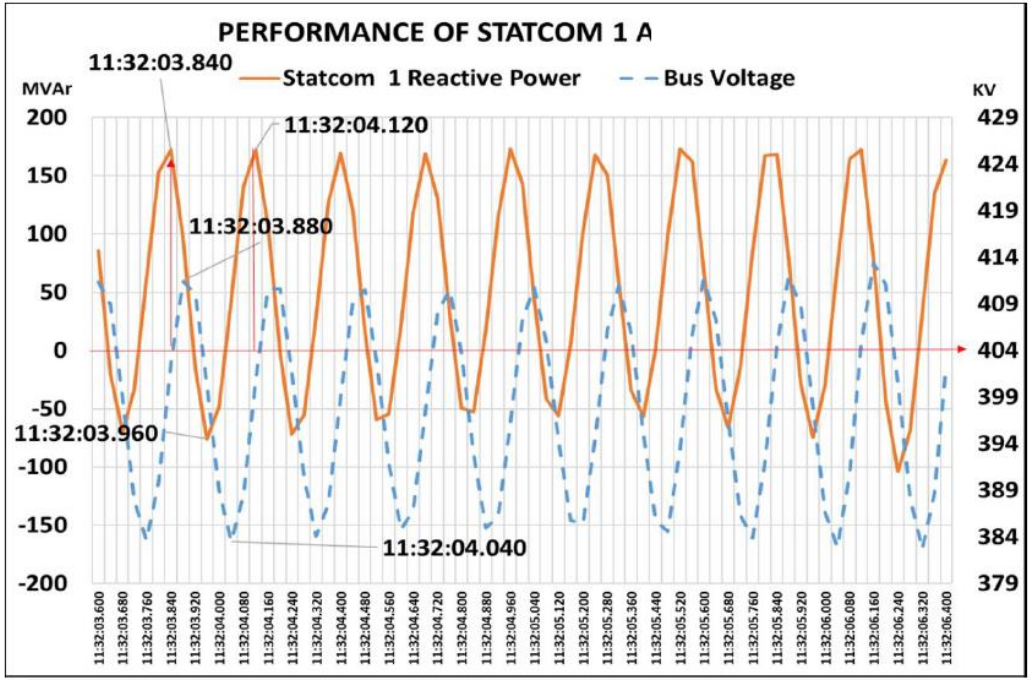
- Frequency of oscillation observed was in the range of 3 to 5 Hz.
- These are dominantly high frequency oscillations. Further, various modes of oscillations have been observed in the system.
- **Recently, oscillations with frequency ranging from 3 – 8 Hz are being observed during solar hours.**
- **In these oscillations, the common point is that frequency is above the IEGC band at the just starting point of oscillations**

Actions taken to minimize the issue of voltage oscillation in RE pocket of NR (Rajasthan RE complex):

1. Detection of source and sink of oscillation, their modes and damping factor through OSLp tool in real-time operation
2. The observations and possible measures were communicated to plant having issue of oscillatory response and momentarily sharp reduction in voltage
3. Changing the mode of control for a few RE plants from Voltage control to Fixed PF and Fixed Q
4. Tuning of few parameters of their PPCs like Proportional gain (Kp), Integral time constant (Ti) and change in Voltage dead-band (Vdb) (changed from 1% to 2%) for identified RE Plants connected at Fatehgarh-II(PG) and Fatehgarh-I

Oscillations Observed in NR RE Complex (STATCOM Behaviour)

- STATCOMs at Bikaner – II, Bhadla – II & Fatehgarh – II have been commissioned.
- Feedback has been given for tuning of the control parameters of STATCOMs in the NR RE Complex
- A detailed study on prevailing system conditions may be carried out by the respective TSP/OEM (before interconnection of the STATCOM) to assess the performance of the STATCOM.
- Parameter tuning to avoid any adverse impact on the grid with integration of the STATCOM shall also be identified and implemented at this stage.
- Tuning of POD along with an interaction study with nearby HVDC/FACTS controllers.



In one of the cases, the response time of a STATCOM at Bhadla – II during oscillations has been observed to be on the higher side 80 ms – 120 ms which may be resulting in enhancing the oscillations

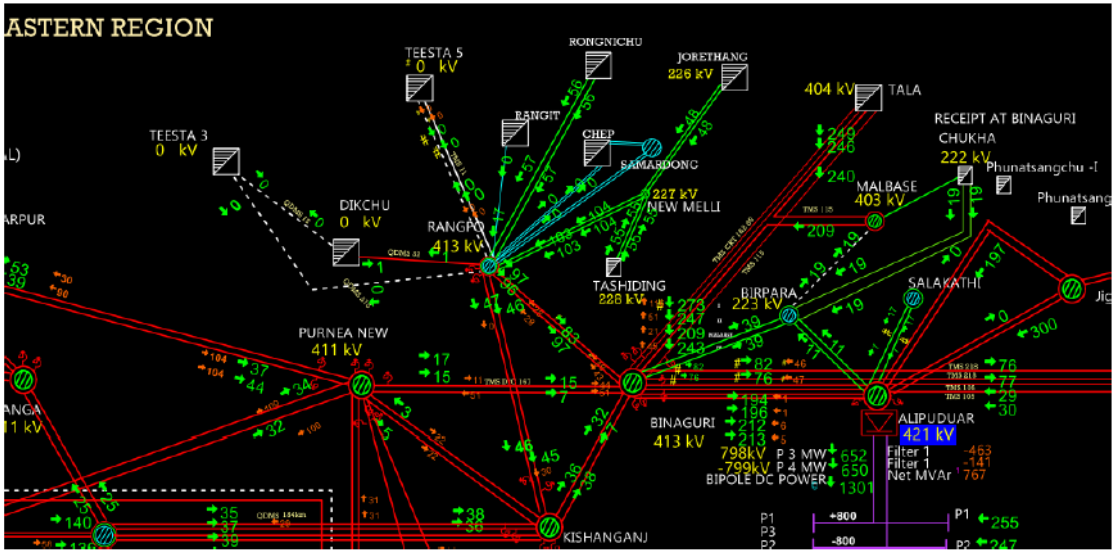
Recent Disturbances and Resulting Transmission Constraints

Cloudburst and Damage of Teesta Dam – 04th October 2023

- Due to continuous high silt and rise in inflow due to cloud burst in the upstream area of the reservoir, **Teesta-III all units (6*200 MW)** (On bar gen around 1300 MW) taken out of bar at 00:50 Hrs on 04-10-2023.
- **Dikchu both units (2*48 MW)** taken out of bar at 01:49 hrs due to flash flood
- All 3 units of **Teesta V (3*170 MW)** (generating around 504 MW) taken out of bar at 02:37 hrs due continuous high silt
- **Entire ~1900 MW** of Hydro Generation is yet to be revived

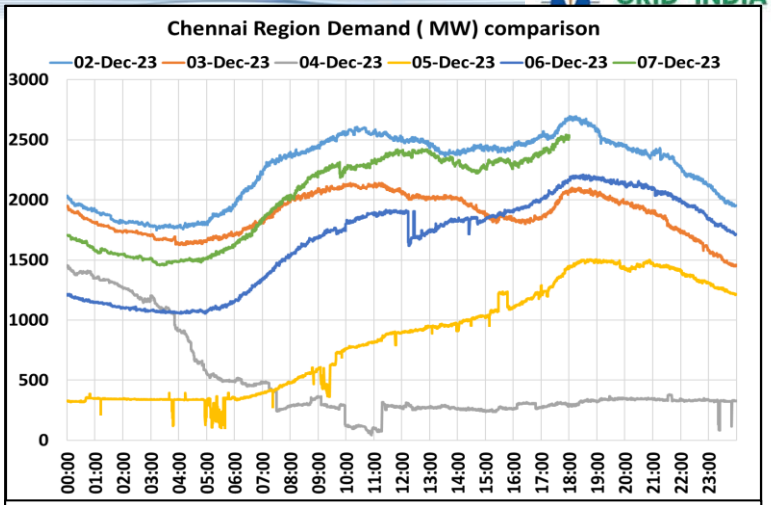
Lines Under Forced Outage	Remarks
400KV-RANGPO-TEESTA-V-1	Tower collapsed at loc. 1
400KV-RANGPO-TEESTA-V-2	
400KV-TEESTA-III-RANGPO-1	Hand-tripped as a precautionary measure
400KV-TEESTA-III-DIKCHU-1	
400KV-RANGPO-DIKCHU-1	

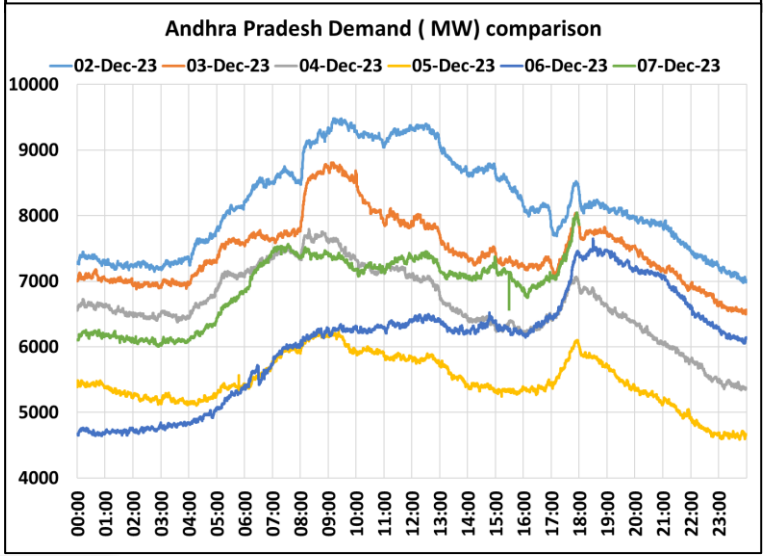
High impact Low frequency event in Teesta Valley



Severe Cyclonic Storm “MICHAUNG” – December’23

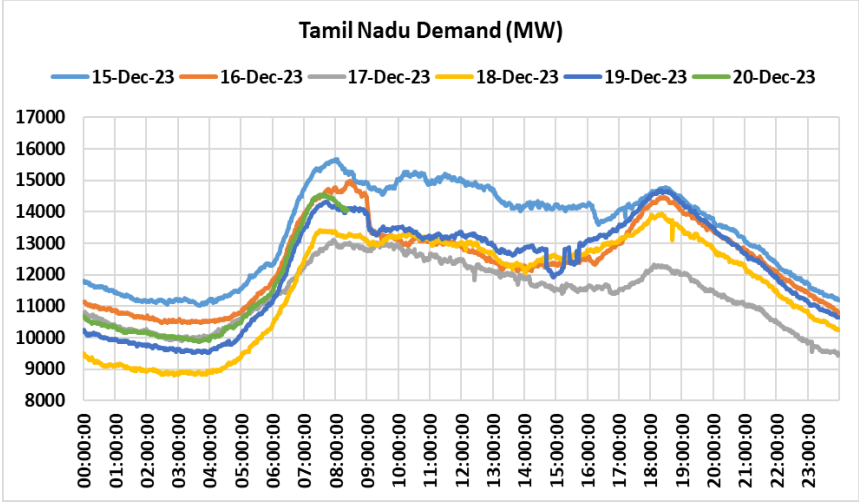
- Severe Cyclonic Storm “MICHAUNG” made its landfall near Bapatla in Andhra Pradesh on 05th Dec 2023.
- Impact on System:
  - **Tamil Nadu**
    - ~4000 MW Demand Reduction
    - 60 :- 110 kV & above lines tripped
    - 840 MW: Capacity taken under RSD
  - **Andhra Pradesh**
    - ~3000 MW Demand Reduction
    - 32 :- 132 kV & above lines tripped
  - **Chennai**
    - Demand reduction from almost 2500 MW to 300 MW
  - Tower Collapse in four lines
- Demand Restored by 07th Dec 23.

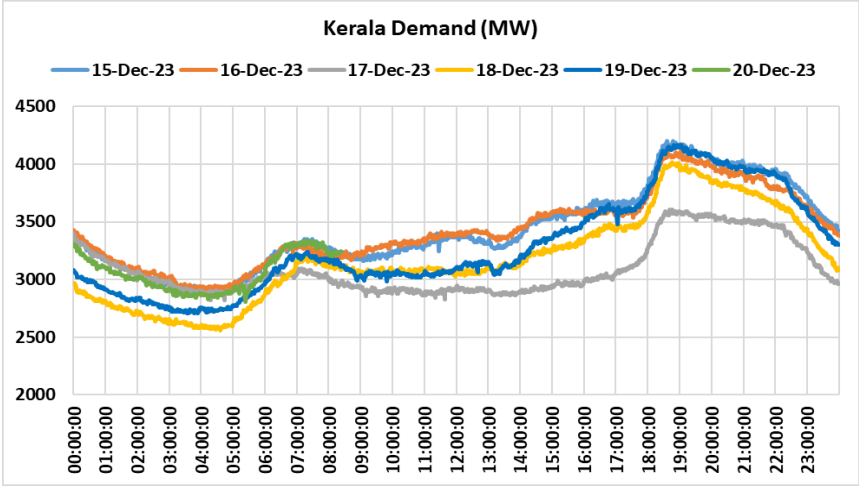




Heavy Rainfall Activity Over South Tamil Nadu & Kerala - December'23

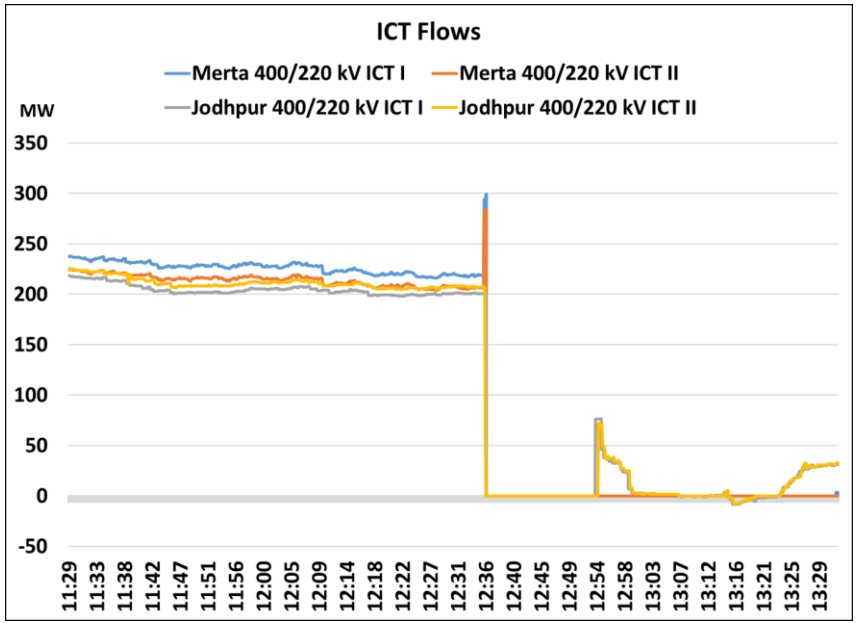
- On 19th December 23, heavy rain fall occurred at many places very likely over south Tamil Nadu and Kerala state.
- Impact on System:
  - **Following Units hand tripped due to Water Logging:**
    - Coastal Energen unit-2: 600 MW
    - Tuticorin units 1 to 5 : 5*210 (1050 MW)
    - NTPL Unit-1 and Unit-2 : 2*500 (1000 MW)
    - Tuticorin_GRT Jewellers 150MW solar plant.
  - **Following Stations hand tripped due to Water Logging:**
    - 400kV Ottapidaram S/s
    - 230kV Tuticorin S/s
  - **Demand Reduction:**
    - Tamil Nadu: ~1000 MW
    - Kerala: ~400 MW

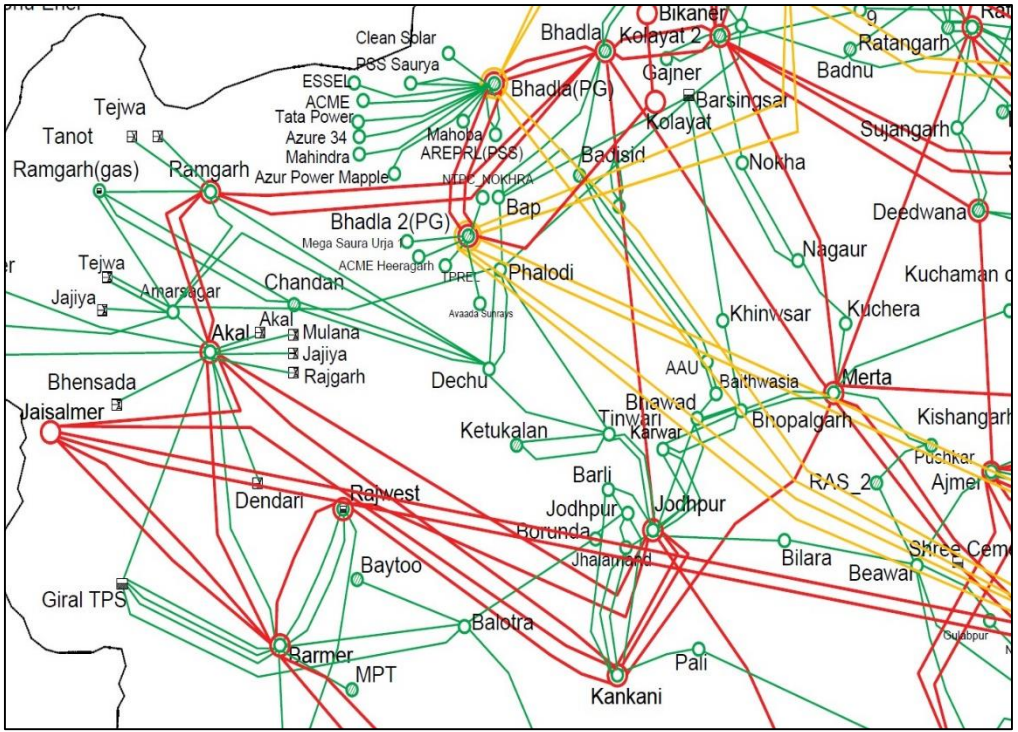




Load Loss Event in Rajasthan – 31st December 2023

- At 12:35Hrs 220 kV lines connected at Bhawad (Raj) & Jodhpur (Raj) tripped due to fault in the 220kV network. This led to off-loading of ICTs at Jodhpur(Raj).
- **Further, the 400/220 KV 315 MVA ICT-1 and 500 MVA ICT-2 at Kankani tripped on overloading**
- **At 12:37Hrs, 400/220 KV 315 MVA ICT 1 & 2 at Merta tripped on overloading (Cascade tripping as** SPS is effective till 460MW)
- **This resulted in a load-loss of ~1500 MW**

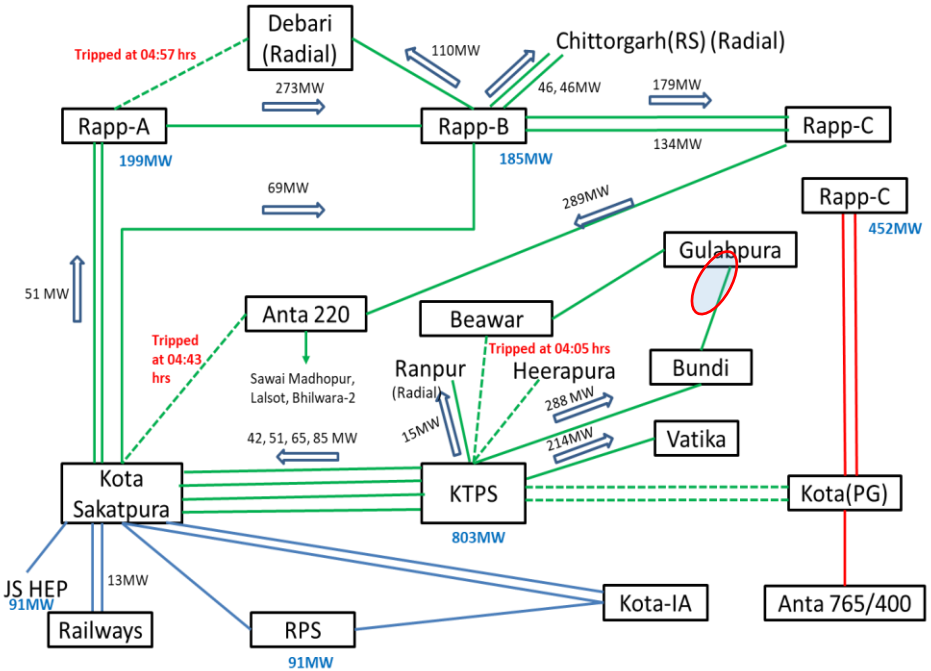




Generation Loss Event in Rajasthan – 5th January 2024

- **KTPS: 220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 & 2** were **out of service, 220kV KTPS-Heerapura ckt** was under **shutdown, 220kV KTPS-Beawar ckt** tripped at **~04:05hrs** on fault
- **220 KV Anta(NT)-Sakatpura(RS) (RS) Ckt tripped at 04:43hrs on B-N fault**
- **At RAPS-A: 220 KV Debari(RS)-RAPS_A(NP) (RS) Ckt** tripped at **04:57 hrs** on B-N fault
- **220kV Bundi - Gulabpura (RS)** ckt was manually opened on SLDC instruction to avoid line tripping on overloading.

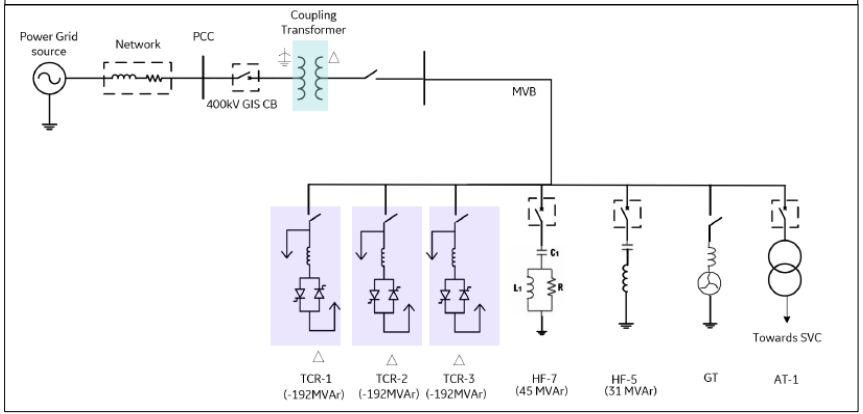
- Over-loading led to cascaded tripping of other lines
- Due to tripping of lines, connectivity to main load centre was cut off and only radial load were available for RAPS-A, RAPS-B and KTPS system got isolated from main Grid
- **Units at RAPS – B, RAPS-A, RAPS-C & KTPS tripped due to over frequency/ over-speed/loss of auxiliary supply**
- **Generation loss of approx ~1500 (700MW in Thermal & 800MW in Nuclear) occured**

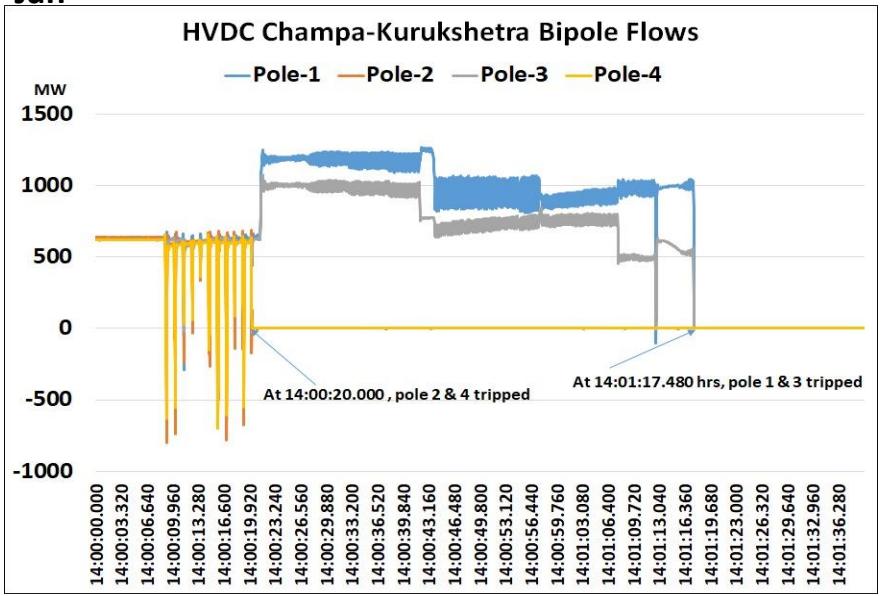


Outage of HVDC Champa – Kurukshetra and Oscillations

- **On 9th January 2024**, all four poles of HVDC Champa – Kurukshetra tripped at around 14:01 hrs. Wide-spread oscillations were observed in all the nodes of the country. During the event.
- As per the information from the site, Pole–4 tripped due to some issue in the control card and the other three poles tripped due to instability protection.
- From PMU analysis, it was observed that just before oscillations, there was variation in power order
- Subsequently, oscillations were reflected at all the nodes.
- After the tripping of poles, there were no oscillations observed.
- HVDC Champa – Kurukshetra Poles 1 & 3 also tripped on **10th Jan**

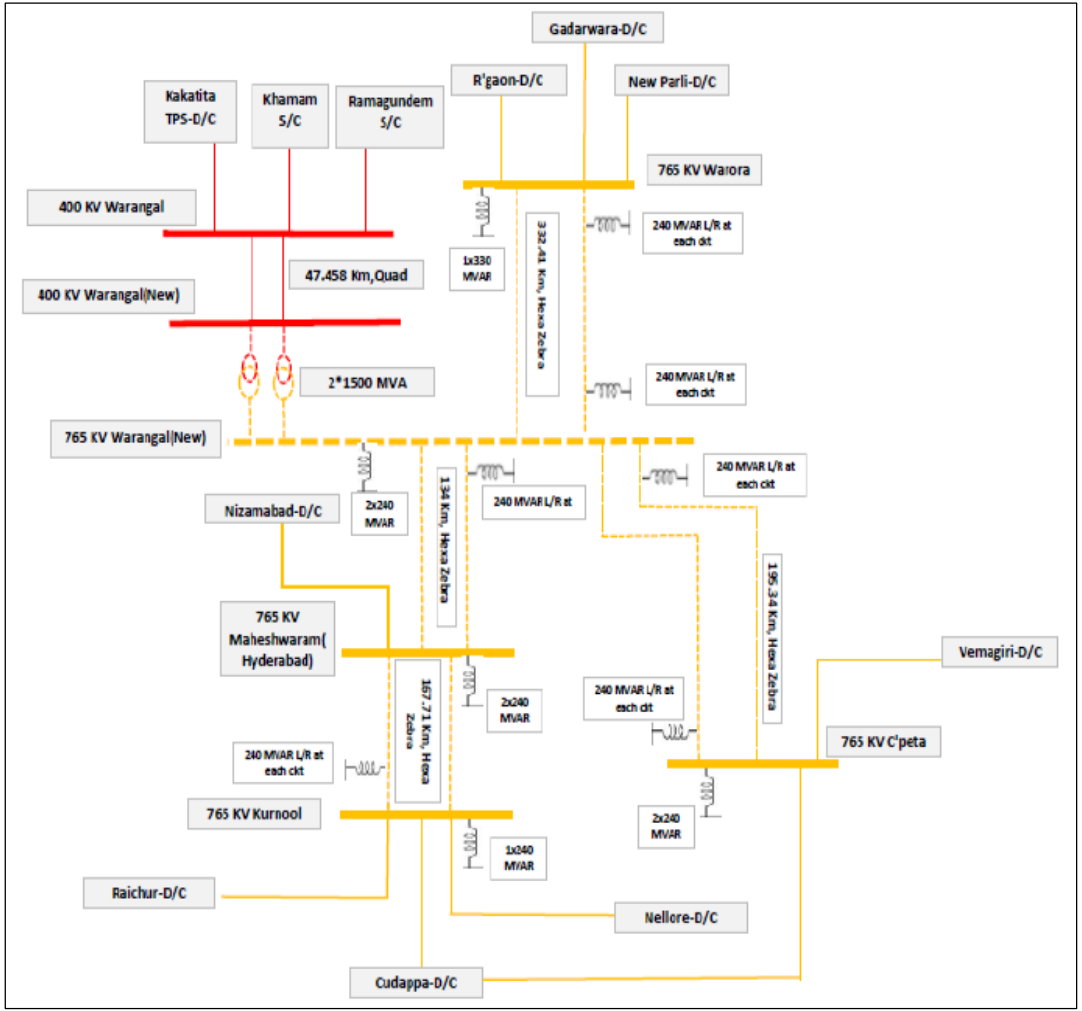
Performance of recently installed TCR at Kurukshetra could not be assessed due to unavailability of dedicated PMU





Major Constraints in Inter-regional Network

TTC/ATC Revisions in NEW-SR Corridor



Charging of 765 kV Warora – Warangal D/C and associated transmission elements:

1. 765 KV Warora-Warangal-D/C **(Inter-regional Line)**
2. Warangal (Existing) –Warangal New 400kV D/C.
3. 2x1500 MVA, 765/400kV ICTs at Warangal New.
4. 765 KV Chilakaluripeta – Warangal New -D/C
5. 765 kV Warangal New – Hyderabad (Maheshwaram) D/C
6. 765 KV Kurnool-Maheshwaram-D/C.

(NEW-SR TTC Increased by +3400 MW)

Charging of Nizamabad ICT – 3

1. 765/400 kV, 1500 MVA ICT – 3 at Nizamabad has been energized. (Trial Run Certificate to be issued)

(NEW-SR TTC Increased by +1600 MW)

TTC/ATC Revisions in NEW-SR Corridor

Reason for Revision: With the first time energization of

- 765 kV Warora (Pool) – Warangal (New) D/C inter-regional link between Western Region (WR) and Southern Region (SR) and other related transmission elements
- 765/400 kV ICT – 3 at Nizamabad

Corridor	TTC (MW)	RM (MW)	ATC (MW)	Increment from Current TTC/ATC (MW)	Limiting Constraint
WR-SR	16100	650	15450	+4500	1. The outage of any one of the 2x1500 MVA, 765/400 kV ICTs at Maheswaram overloads the other ICT
ER-SR	6200	350	5850	+500	1.Low voltage observed at 400 kV Gazuwaka – East bus
SR Import	22300	1000	21300	+5000	1. The outage of any one of the 2x1500 MVA, 765/400 kV ICTs at Maheswaram overloads the other ICT 2. Low voltage observed at 400 kV Gazuwaka – East bus

- Post charging of the 3rd ICT at Nizamabad, the constraint for SR import TTC has shifted to 765/400 kV, 2x1500 MVA ICTs at Maheswaram.
- **Also, under the limiting conditions, the angular stability issue is observed for 765 kV Angul – Srikakulam D/C lines. Under N-1 of one line, the voltage angle separation between the two buses becomes more than 20 degrees. (53 degrees under N-2)**
- Periodic assessment & declaration of Transfer Capability in other corridors i.e. NR Import/Export, SR Export, NER Import/Export based on change in network topology and change in LGB.

Commissioning of Elements Eagerly Awaited

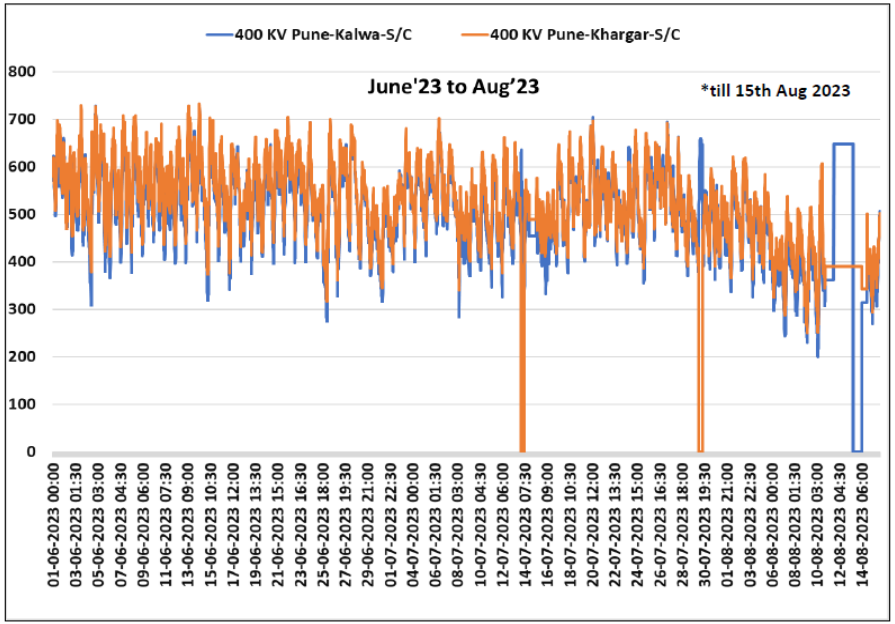
➢ For Enhancement in SR Export

- 765/400 kV ICTs at Kotra S/S (approved in 8th NCT meeting)
  - Section – A (1 No of ICT)
  - Section – B (2 No of ICTs)
- Till the commissioning of ICTs, maximum flow on HVDC will depend upon the generation that is being pooled at Raigarh PS.
- Enhancement of Reverse Capability of HVDC Raigarh – Pugalur in SR to WR direction from 3000 to 6000 MW: Will help in export of power from SR to NEW grid. **A high-level meeting held on 12th January 2024** among senior officials from POWERGRID, CTU, GRID-INDIA, SRPC, TANGEDCO, APTRANSCO, KSEBL, TSNDPL, TANGEDCO and TANTRANSCO. Study results awaited from POWERGRID/ HITACHI regarding the feasibility of enhancement of reverse capability. Further transmission upgradation to be planned by CTUIL for power evacuation at Raigarh (Kotra) end.
- **765 kV Narendra – Pune D/C** (Will Enhance SR Export Transfer Capability & limit the constraint of 400 kV Kudgi – Kolhapur D/C) – (SCOD: July'2024)
- Mumbai system (400/220 kV Navi Mumbai & 400/220 kV Vikhroli) also as without commissioning of additional feeding to Mumbai system, high export from SR to WR may aggravate the present constraints (i.e., Mumbai/Pune feeding lines from Pune (GIS)/Pune(PG).

➢ For Enhancement in NR Export

- Bypassing of 400 KV Kankroli – Bhinmal - Zerda lines at Bhinmal to form 400 kV Kankroli - Zerda (direct line) and reconductoring of 400 KV Jodhpur (RVPN)-Kankroli-S/C line with twin HTLS conductor approved under 9th NCT.
- **Reconductoring work completed, The planned bypassing of 400 kV Kankroli - Bhinmal-Zerda line at Bhinmal to form 400 kV Kankroli – Zerda (direct) line as per modified arrangement *(till completion of bay works at 400kV Bhinmal)* as a temporary measure will be implemented by POWERGRID.**

Constraint in SR Export Corridor



Sl No	Corridor	TTC (MW)
1	SR-WR	6000 (Non-Solar)
		7650 (Solar)
2	SR Export	5150 (Non-Solar)
		6600 (Solar)

1. CTUIL has shared study reports for facilitating export of power from SR - NEW grid for in case of **delay in Narendra – Pune 765 kV D/c line**
2. Grid-India has suggested that the **commissioning of SPS** would be required for evacuation of green power from SR in case of delay in the Narendra – Pune 765 kV D/c line
3. Further, even with Narendra – Pune 765 kV line, **downstream constraints in Maharashtra** would limit the power flow from SR to NEW grid until upgradation.

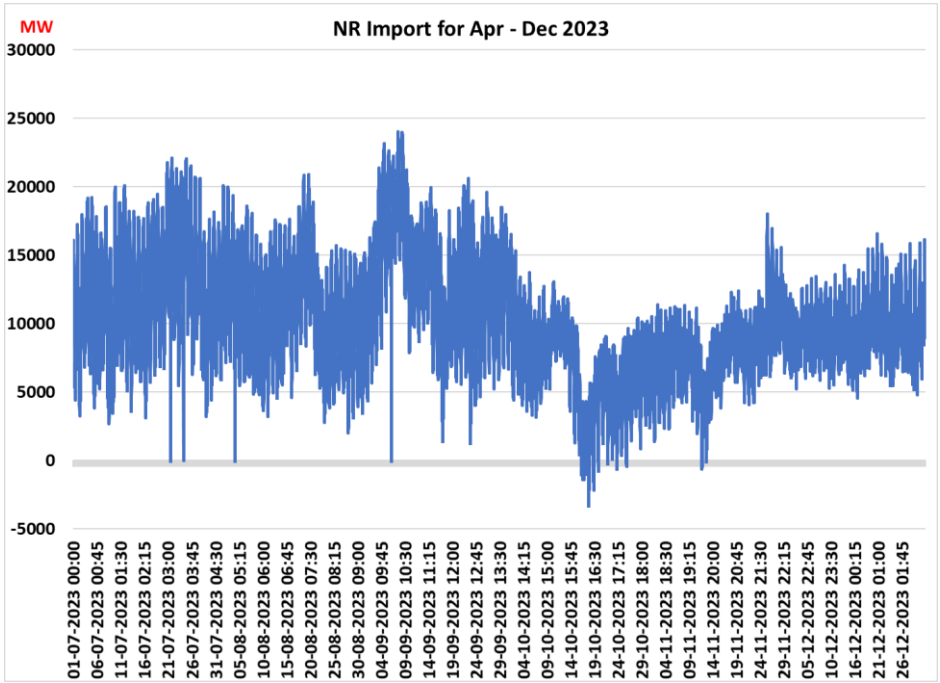
Limiting Constraints in SR – WR Corridor

- Angular separation between Kudgi & Kolhapur (PG) under N-1 touches 30 deg.
- N-1 Contingency of 400 kV Pune – Kalwa will overload 400 kV Pune -Khargar & and vice-versa.
- Low voltage at 400 kV Chakan, Jejuri, Lonikhand etc
- N-1 non-compliance of 2*1500 MVA, 765/400 kV ICTs at Section– A at Raigarh - PS (Kotra) with the increase in HVDC Raigarh – Pugalur Bipole – II power order beyond 950 MW (Solar Hours)
- N-1 non-compliance of 2*1500 MVA, 765/400 kV ICTs at Section– B at Raigarh – PS (Kotra) with the increase in HVDC Raigarh – Pugalur Bipole – I power order beyond 450 MW (Solar Hours)

Augmentation in Maharashtra System to Mitigate Operational Constraints

- High loading is observed near the Mumbai area during peak demand periods
- During those periods, any constraint in HVDC Pagdhe power order have also created alarming situations in real time as it leads to further increase in the line loadings.
- N-1 violation observed in,
  - 400 kV Parli(PG)- Parli(MS) D/C line **(Bypassing of 400 kV Parli(PG)- Parli(MH)-D/c and 400 kV Parli(New)-Parli(PG)_D/c at outskirts Parli(PG) S/s completed, Reconductoring of Ckt – 1 completed & Ckt – 2 completed)**
  - 2x1500 MVA, 765/400 kV Ektuni ICTs **(Inter trip scheme implemented. Installation of 1x1500MVA ICT-III at Ektuni to be expedited)**
  - 400 kV Pune (GIS)-Pune (PG)-Q/c lines
    - **220kV level at Pune (PG)(GIS) and Installation of 2x500MVA, 400/220kV ICTs at Pune (PG)(GIS) & LILO of both ckts of 220kV Khed City – Ranjangaon D/c line at Pune GIS with high capacity conductor**
    - **LILO of one ckt of Lonikand-I–Jejuri 400 kV D/c line at Pune (PG)(GIS) with high capacity conductor along with reconductoring of Lonikand-I –Jejuri line section**
  - 400kV Pune(PG)-Kharghar & 400kV Pune(PG)-Kalwa S/C line & 400 kV Padghe- Kalwa D/C
    - **3x500 MVA, 400/220kV ICTs, 400 kV Kharghar-Vikhroli-D/c & LILO of 220 kV Trombay - Salsette-D/c at Vikhroli completed**
    - **Commissioning of remaining planned system at 400/220 kV Navi Mumbai & Vikhroli are yet to be done**
  - 400 kV Pune(PG)-Chakan S/C

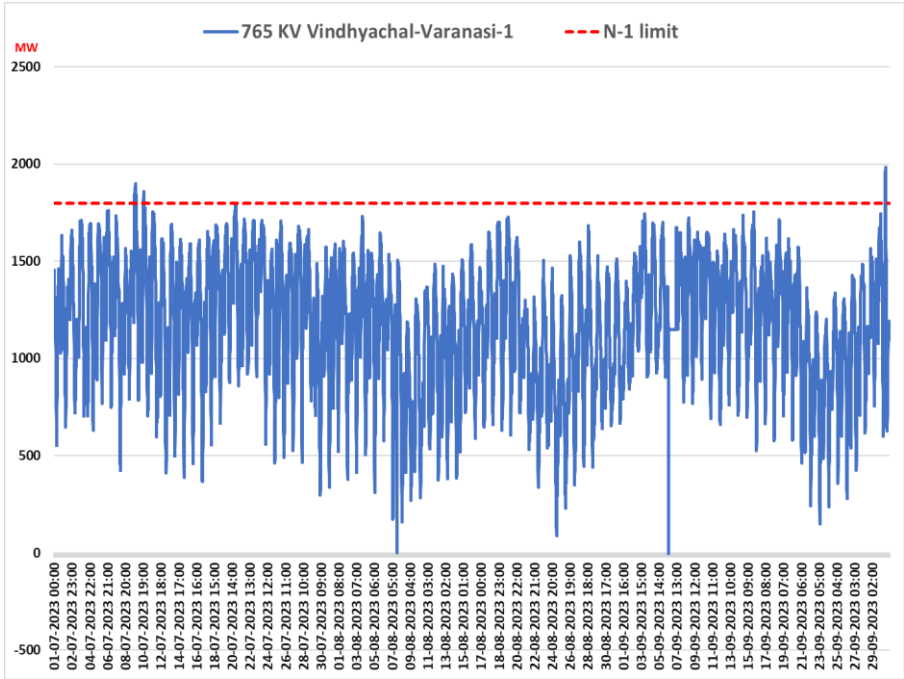
NR Import Constraints



1. HVDC Vindhyachal could not be operated from WR to NR direction for considerable period of time due to high loading of 400 KV Anpara-Obra-S/C.

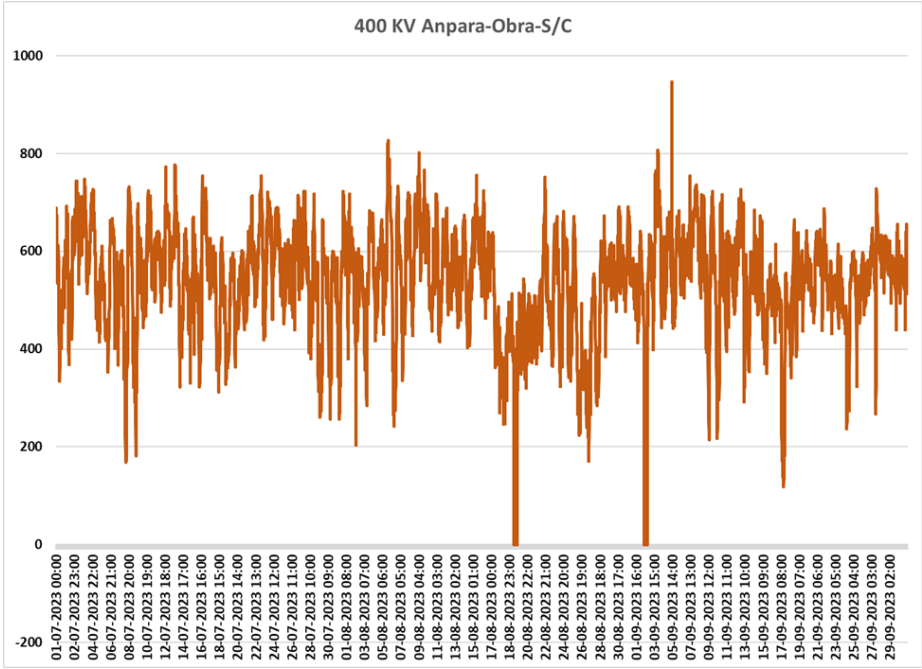
1. High WR-NR/NR Import flow has been observed in 2023-24 specially in the month of July and September

2. The loading on 765 KV Varanasi-Vindhyachal also remained high (also exceeded its N-1 limit) during high NR Import period



Constraint in HVDC Vindhyachal B2B

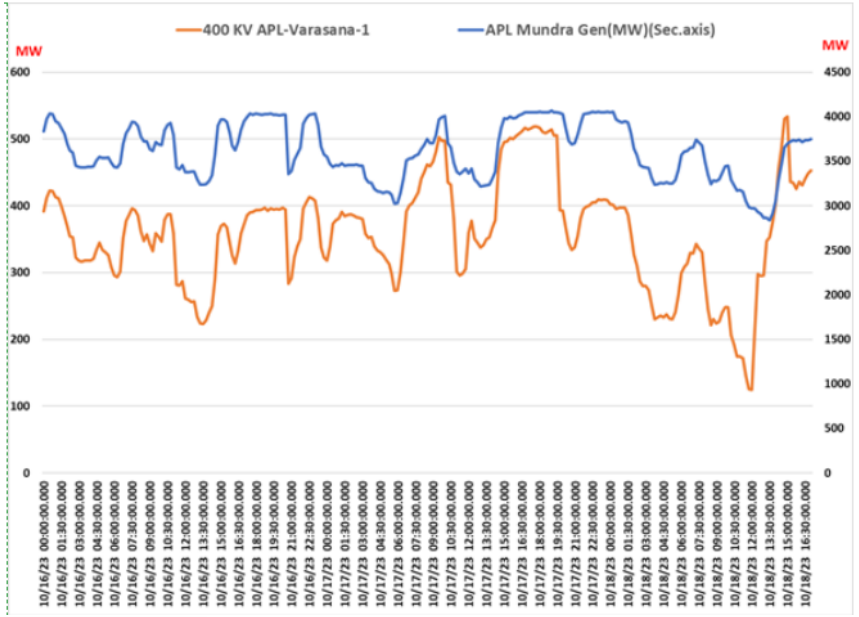
- It is observed that due to high loading of lines in Anpara complex, particularly 400 kV Anpara – Obra S/C (loading more than 700 MW), real-time constraint is faced in increasing the power order of HVDC B2B V'chal in WR to NR direction.
- UPPTCL needs to explore the possibility by shifting some load, keeping generation at 220kV Obra or by reconfiguration of existing network to mitigate this constraint.
- Also, as per the recommendations of the 1st Meeting of Northern Regional Power Committee (Transmission Planning) (NRPCTP), 400 kV Singrauli – Anpara shall be opened to control the high fault levels in Anpara – Singrauli – Rihand complex.
- Opening of this line will relieve the loading of 400 kV Anpara – Obra and provide flexibility in the operation of HVDC back-to-Back Vindhyanchal in both directions.
- **400 kV Anpara-Singrauli line should remain in service till commissioning of 2X1000 MVA ICTs at Obra C and revised SPS for Anpara Complex is commissioned. The line shall be opened after discussion in OCC.**



400 kV Anpara – Obra loading for Q2 2023-24

Constraint in HVDC Mundra - Mahendragarh

- NR – WR flow remains high during the peak solar hours and the outage of 400 kV Jodhpur – Kankroli has led to further loading of 400 kV Bhinmal – Zerda.
- HVDC Mundra – Mahendragarh is helpful in controlling the loading of lines in the NR – WR corridor including that of 400 kV Bhinmal – Zerda.
- However, high generation at APL Mundra and high loading of lines emanating from APL i.e. 400 kV APL – Versana D/C posed constraints in the reduction of HVDC Power Order.
- Further, 400 kV APL-Sami-2 FSC at Sami is under forced outage from 14th Jan'23 and high loading on the following elements is being observed during full generation at APL
  - 400 kV APL-Varsana-D/c
  - 400 kV APL-Mansar-S/c
  - 2x315 MVA, 400/220 kV APL ICTs
- Considering the line loadings and SPS settings at APL Mundra, Mundra HVDC can be kept in the NR to WR path when the **APL generation is less than 3500 MW.**

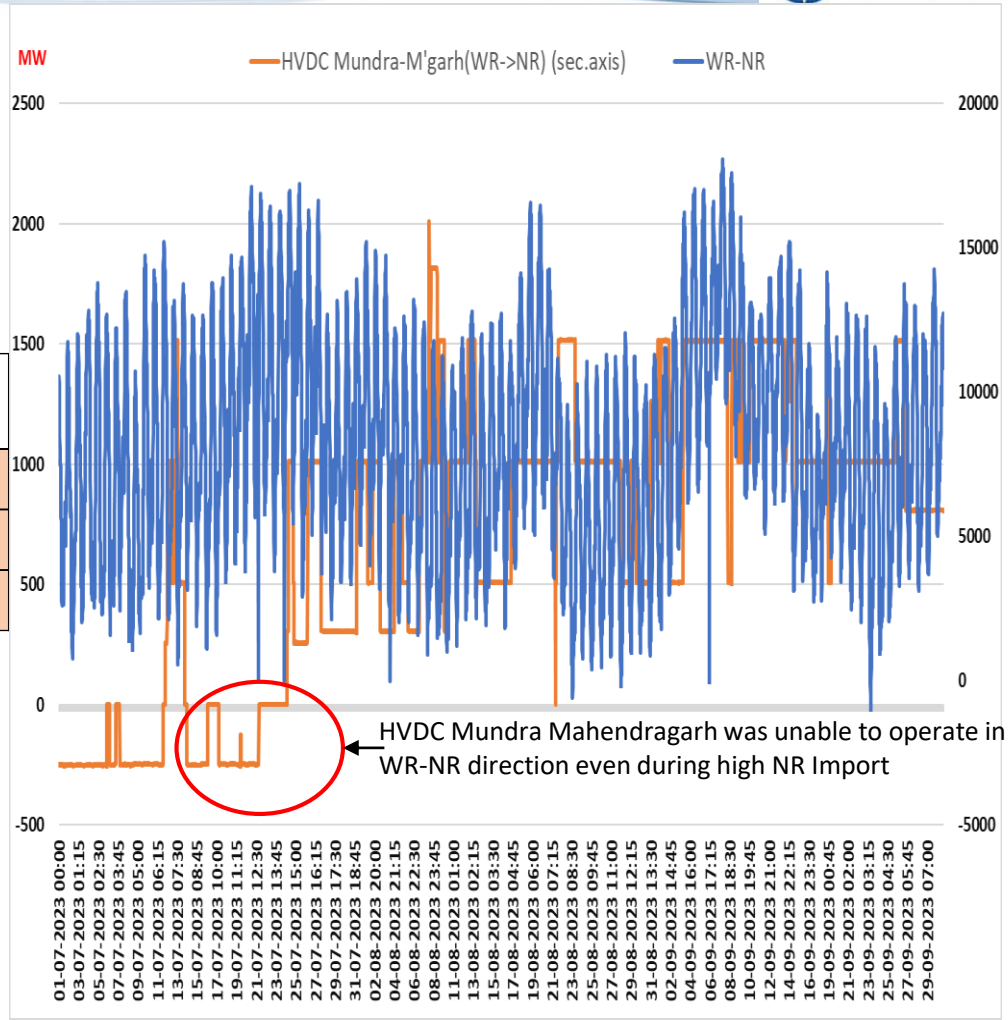


Constraint in HVDC Mundra - Mahendragarh

- HVDC Mundra-Mohendergarh is needed to operate in both the directions in WR to NR direction during high NR Import period and NR to WR direction during high NR Export periods.
- HVDC power order reversal requires 6-8 hours of cooling time and therefore poses a constraint in flexibility of HVDC operation during high NR period lead to high flow in AC lines from WR to NR.

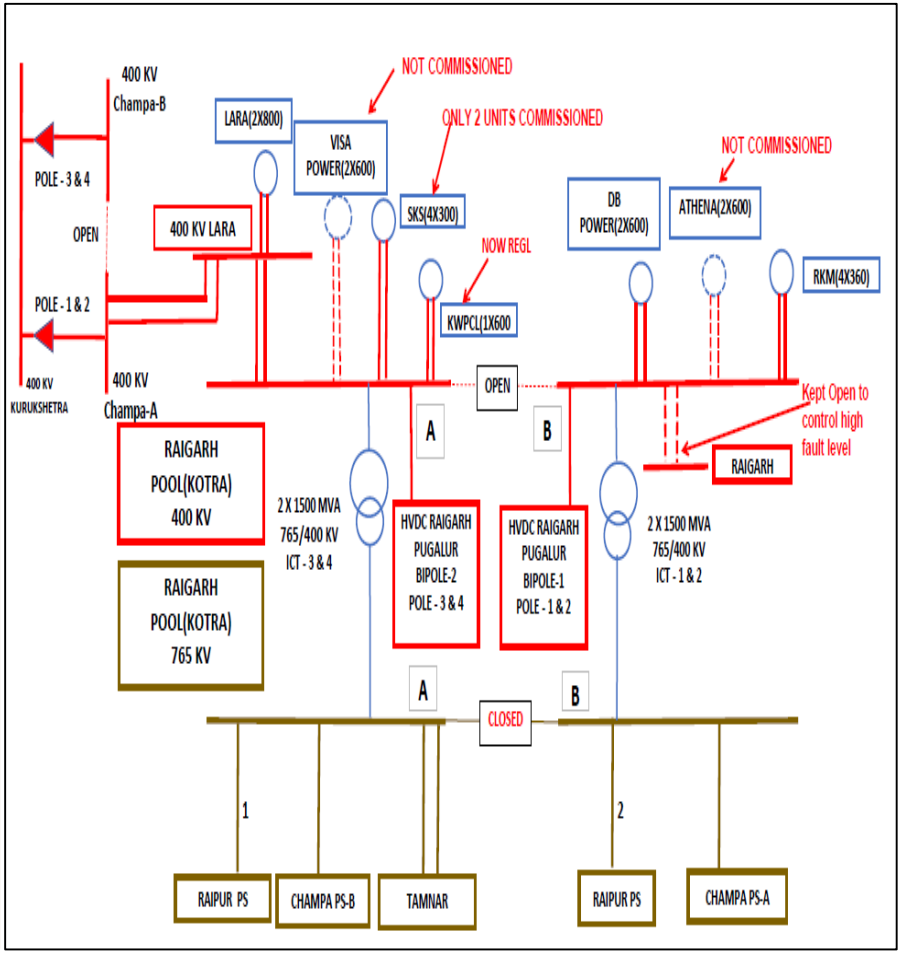
Pre-Operation Status	Operation	NLDC Code issued Date & Time	Actual Date & Time of operation	Time taken for the Implementation of NLDC Code
Blocked (WR-NR)	Deblocking (NR-WR)	12:51 hrs of 30/01/2023	22:41 hrs of 30/01/2023	9 hr 50 min
Blocked (NR-WR)	Deblocking (WR-NR)	08:33 hrs of 20/02/2023	16:45 hrs of 20/02/2023	8 hrs 18 min
Blocked (WR-NR)	Deblocking (NR-WR)	11:47 hrs of 11/03/2023	20:02 hrs of 11/03/2023	8 hr 15 min

- Meeting held under the chairmanship of Member (GO&D) at CEA on 26.07.2023 on concerns raised by ATIL regarding Bi-directional Operation of HVDC Mundra-Mahendragarh.
- **APL Mundra is yet to respond to several communications from Grid-India regarding the capacity and time taken for operation for bidirectional power flow.**



Inadequate reactive compensation: Constraint in utilization of HVDC

- High SR Import during morning hours necessitates the operation of HVDC Raigarh – Pugalur at a high power order in WR – SR direction
- **The loading on 400 KV Lara-Kotra-D/C is restricting further increase in power order of HVDC Raigarh - Pugalur(WR-SR). (1st WRPC(TP): Reconductoring with quad moose ampacity conductor is agreed with connectivity of Lara Stage-II)**
- Due to the bus split at Champa, sensitivity of HVDC Champa - KKR Bipole - II has negligible sensitivity on 400 kV Lara - Kotra loading. However, 100 MW increase in HVDC Champa - KKR Bipole – I (i.e Pole-1 & 2 connected to 400 KV Champa PS_A bus) power order will reduce the loading of Lara – Kotra(each ckt) by 12 MW
- However, **the voltages at 765kV & 400 kV buses of Champa - A remain above 780 kV & 412 kV for all the time and this prevents the deblocking of HVDC Champa – Kurukshetra Bipole- 1 inspite of VAR absorption by Units at Champa & Raigarh (Kotra).**
- This creates issue in the flexible operation of both the HVDCs
- Additional reactive compensation to be planned at Champa-PS



Thank you !!