सत्यमेव जयते

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
उत्तर क्षेत्रीय विद्युत समिति
Northern Regional Power Committee

सं: उ.क्षे.वि.स./प्रचालन/106/01/2023/6608-6649 दिनांक: 13.09.2023

विषय: प्रचालन समन्वय उप-समितिकी 211वीं बैठक की कार्यसूची।

Subject: Agenda of the 211th OCC meeting.

प्रचालन समन्वय उप-समिति की 211वीं बैठक का आयोजन वीडियो कॉन्फ्रेंसिंग के माध्यम से दिनांक19.09.2023 को 10:30बजे से किया जायेगा । उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट http//164.100.60.165पर उपलब्ध है।

बैठक मेंसम्मिलित होने के लिए लिंक व पासवर्डसभीसदस्यों को ई-मेल द्वाराप्रदान किया जाएगा।

कृपया बैठक में उपस्थित होने की सुविधा प्रदान करें।

The **211th**meeting of the Operation Co-ordination sub-committee will be conducted through Video Conferencing on **19.09.2023** from **10:30 Hrs**. The agenda of this meeting has been uploaded on the NRPC web-site http://164.100.60.165.

The link and password for joining the meeting will be e-mailed to respective e-mail IDs in due course.

Kindly make it convenient to attend the meeting.

ओमकिशोर 13/09/23

(ओमकिशोर)
कार्यपालक अभियंता (प्रचालन)

सेवामें : प्रचालन समन्वय उप-समिति के सभी सदस्य।
To : All Members of OCC

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खण्ड-क: उ.क्षे.वि.स. Part-A: NRPC

1. Confirmation of Minutes

The minutes of the 210th OCC meeting were issued vide letter of even number dated 12.09.2023.

Sub-committee may kindly confirm the Minutes.

2. Review of Grid operations

2.1 Power Supply Position (Provisional) for August 2023

Anticipated Power Supply Position v/s Actual Power Supply Position (Provisional) of Northern Region during the month of August-2023 is as under:

State / UT	Req. / Avl.	Energy (MU)			Peak (MW)		
		Anticipated	Actual	% Variation	Anticipated	Actual	% Variation
CHANDIGARH	(Avl)	220	213	-3.1%	350	411	17.4%
	(Req)	220	213	-3.1%	420	411	-2.1%
DELHI	(Avl)	4923	4104	-16.6%	6800	7437	9.4%
	(Req)	3860	4104	6.3%	6800	7437	9.4%
HARYANA	(Avl)	9435	7569	-19.8%	12132	12844	5.9%
	(Req)	7085	7658	8.1%	12742	12844	0.8%
HIMACHAL PRADESH	(Avl)	1145	1084	-5.3%	1725	1724	-0.1%
	(Req)	1102	1087	-1.4%	1744	1724	-1.1%
J&K and LADAKH	(Avl)	2340	1585	-32.2%	3490	2570	-26.4%
	(Req)	1690	1606	-5.0%	2920	2570	-12.0%
PUNJAB	(Avl)	6700	9694	44.7%	12320	15220	23.5%
	(Req)	9500	9694	2.0%	15280	15220	-0.4%
RAJASTHAN	(Avl)	9570	10156	6.1%	18080	17266	-4.5%
	(Req)	8000	10278	28.5%	14200	17420	22.7%
UTTAR PRADESH	(Avl)	14880	15671	5.3%	27000	27689	2.6%
	(Req)	15624	15783	1.0%	27000	27689	2.6%
UTTARAKHAND	(Avl)	1440	1392	-3.4%	2830	2228	-21.3%
	(Req)	1510	1411	-6.6%	2460	2303	-6.4%
NORTHERN REGION	(Avl)	50653	51468	1.6%	77800	80500	3.5%
	(Req)	48591	51834	6.7%	77800	81000	4.1%

As per above, negative / significant variation (≥5%) in Actual Power Supply Position(Provisional) vis-à-vis Anticipated figures is observed for the month of August-2023 in terms of Energy Requirement for Chandigarh, Delhi, Haryana, HP, UTs of J&K and Ladakh, Rajasthan, and Uttarakhand and in terms of Peak Demand similar variation is noted for Chandigarh, Delhi, HP, UTs of J&K and Ladakh, Punjab, Rajasthan, and Uttarakhand. These states/UTs are requested to submit reason for such variations so that the same can be deliberated in the meeting.

All SLDCs are requested to furnish provisional and revised power supply position in prescribed formats on NRPC website portal by 2nd and 15th day of the month respectively for the compliance of Central Electricity Authority (Furnishing of Statistics, Returns and Information) Regulations, 2007.

3. Maintenance Programme of Generating Units and Transmission Lines

3.1. Maintenance Programme for Generating Units

The meeting on proposed maintenance programme for Generating Units for the month of October-2023 is scheduled on 18-September-2023 via Video Conferencing

3.2. Outage Programme for Transmission Elements

The meeting on proposed outage programme of Transmission elements for the month of October-2023 is scheduled on 18-September-2023 via Video conferencing.

4. Planning of Grid Operation

4.1. Anticipated Power Supply Position in Northern Region for October2023

The Anticipated Power Supply Position in Northern Region for October 2023is as under:

State / UT	Availability / Requirement	Revised Energy (MU)	Revised Peak (MW)	Date of revision
CHANDIGARH	Availability	130	280	No Revision submitted
	Requirement	130	290	
	Surplus / Shortfall	0	-10	
	% Surplus / Shortfall	0.0%	-3.4%	
DELHI	Availability	2130	5600	No Revision submitted
	Requirement	2610	5670	
	Surplus / Shortfall	-480	-70	
	% Surplus / Shortfall	-18.4%	-1.2%	
HARYANA	Availability	6975	8625	11-Sep-23
	Requirement	4497	9730	
	Surplus / Shortfall	2478	-1105	
	% Surplus / Shortfall	55.1%	-11.4%	
HIMACHAL PRADESH	Availability	1097	1777	12-Sep-23
	Requirement	1061	1840	
	Surplus / Shortfall	37	-63	
	% Surplus / Shortfall	3.4%	-3.4%	
J&K and LADAKH	Availability	1520	4120	No Revision submitted
	Requirement	1770	2960	
	Surplus / Shortfall	-250	1160	
	% Surplus / Shortfall	-14.1%	39.2%	

State / UT	Availability / Requirement	Revised Energy (MU)	Revised Peak (MW)	Date of revision
PUNJAB	Availability	5090	11320	No Revision submitted
	Requirement	5880	12050	
	Surplus / Shortfall	-790	-730	
	% Surplus / Shortfall	-13.4%	-6.1%	
RAJASTHAN	Availability	8650	18260	No Revision submitted
	Requirement	8230	14780	
	Surplus / Shortfall	420	3480	
	% Surplus / Shortfall	5.1%	23.5%	
UTTAR PRADESH	Availability	11160	23300	12-Sep-23
	Requirement	10540	23300	
	Surplus / Shortfall	620	0	
	% Surplus / Shortfall	5.9%	0.0%	
UTTARAKHAND	Availability	1209	2180	12-Sep-23
	Requirement	1240	2250	
	Surplus / Shortfall	-31	-70	
	% Surplus / Shortfall	-2.5%	-3.1%	
NORTHERN REGION	Availability	37961	70800	
	Requirement	35958	68400	
	Surplus / Shortfall	2004	2400	
	% Surplus / Shortfall	5.6%	3.5%	

SLDCs are requested to update the anticipated power supply position of their respective state / UT for the month of October-2023 and submit the measures proposed to be taken to bridge the gap between demand & availability, as well to dispose-off the surplus, if any, in the prescribed format.

5. Follow-up of issues from previous OCC Meetings- Status update.

The updated status of agenda items is enclosed at ***Annexure-A.I***.

All utilities are requested to update the status.

6. NR Islanding scheme

Latest status of Islanding Scheme of NR is attached as **Annexure-A.II.**

Members may kindly deliberate.

7. Coal Supply Position of Thermal Plants in Northern Region

7.1 In the 186th OCC meeting, it was agreed that coal stock position of generating stations in northern region may be reviewed in the OCC meetings on the monthly basis.

7.2 Accordingly, coal stock position of generating stations in northern region during current month (till 10th September 2023) is as follows:

Station	Capacity (MW)	PLF % (prev. months)	Normative Stock Reqd (Days)	Actual Stock (Days)

Station	Capacity (MW)	PLF % (prev. months)	Normative Stock Reqd (Days)	Actual Stock (Days)
ANPARA C TPS	1200	84.40	12	**2.4**
ANPARA TPS	2630	83.47	12	8.5
BARKHERA TPS	90	50.92	20	7.5
DADRI (NCTPP)	1820	57.35	20	10.7
GH TPS (LEH.MOH.)	920	57.84	20	16.4
GOINDWAL SAHIB TPP	540	54.12	20	**2.4**
HARDUAGANJ TPS	1265	64.92	20	7.3
INDIRA GANDHI STPP	1500	61.95	20	14.3
KAWAI TPS	1320	55.27	20	**2.9**
KHAMBARKHERA TPS	90	56.85	20	8.8
KOTA TPS	1240	78.10	20	7.6
KUNDARKI TPS	90	51.95	20	7.8
LALITPUR TPS	1980	63.65	20	12.2
MAHATMA GANDHI TPS	1320	74.15	20	17.7
MAQSOODPUR TPS	90	57.22	20	11.9
MEJA STPP	1320	76.96	20	12.6
OBRA TPS	1094	56.12	20	6.4
PANIPAT TPS	710	81.46	20	7.3
PARICHHA TPS	1140	58.12	20	10.5
PRAYAGRAJ TPP	1980	76.67	20	10.9
RAJIV GANDHI TPS	1200	31.36	20	20.6
RAJPURA TPP	1400	81.12	20	13.0
RIHAND STPS	3000	94.19	12	26.0
ROPAR TPS	840	52.22	20	28.5
ROSA TPP Ph-I	1200	76.36	20	9.5
SINGRAULI STPS	2000	93.18	12	9.7
SURATGARH TPS	1500	71.15	20	8.3
TALWANDI SABO TPP	1980	60.41	20	**3.7**
TANDA TPS	1760	63.65	20	11.3
UNCHAHAR TPS	1550	69.53	20	10.3
UTRAULA TPS	90	50.41	20	5.8
YAMUNA NAGAR TPS	600	67.27	20	14.9
CHHABRA-I PH-1 TPP	500	84.32	20	9.7
KALISINDH TPS	1200	51.12	20	4.1
SURATGARH STPS	1320	59.94	20	4.2
CHHABRA-I PH-2 TPP	500	30.11	20	7.5
CHHABRA-II TPP	1320	25.09	20	5.1

8. Furnishing of Data for finalization of Generation programme 2024-25 (Agenda by OPM Division CEA)

8.1 OPM division, CEA vide mail dated 12.09.2023 has intimated that 24 generating station of NR has not submitted Data for finalization of Generation programme 2024-25.

8.2 List of generating stations of NR that have not submitted data for finalization of Generation programme 2024-25is attached as **Annexure-A.III**.

8.3 Aforesaid Generating Stations in the cited list are requested to kindly send the requisite data of their station for finalization of Electricity Generation programme 2024-25 to OPM division CEA at **targetopmcea@gmail.com**.

Members may kindly deliberate.

9. Phaser Measurement Unit (PMU) for Naitwar Mori HEP (Agenda by SJVN)

9.1 The transmission system (interim arrangement) for evacuation of power from 60 MW Naitwar Mori HEP (NMHEP) of SJVNL had been finalized in the 3rd NRPC(TP) meeting held on 19.02.2021 (Figure 1).

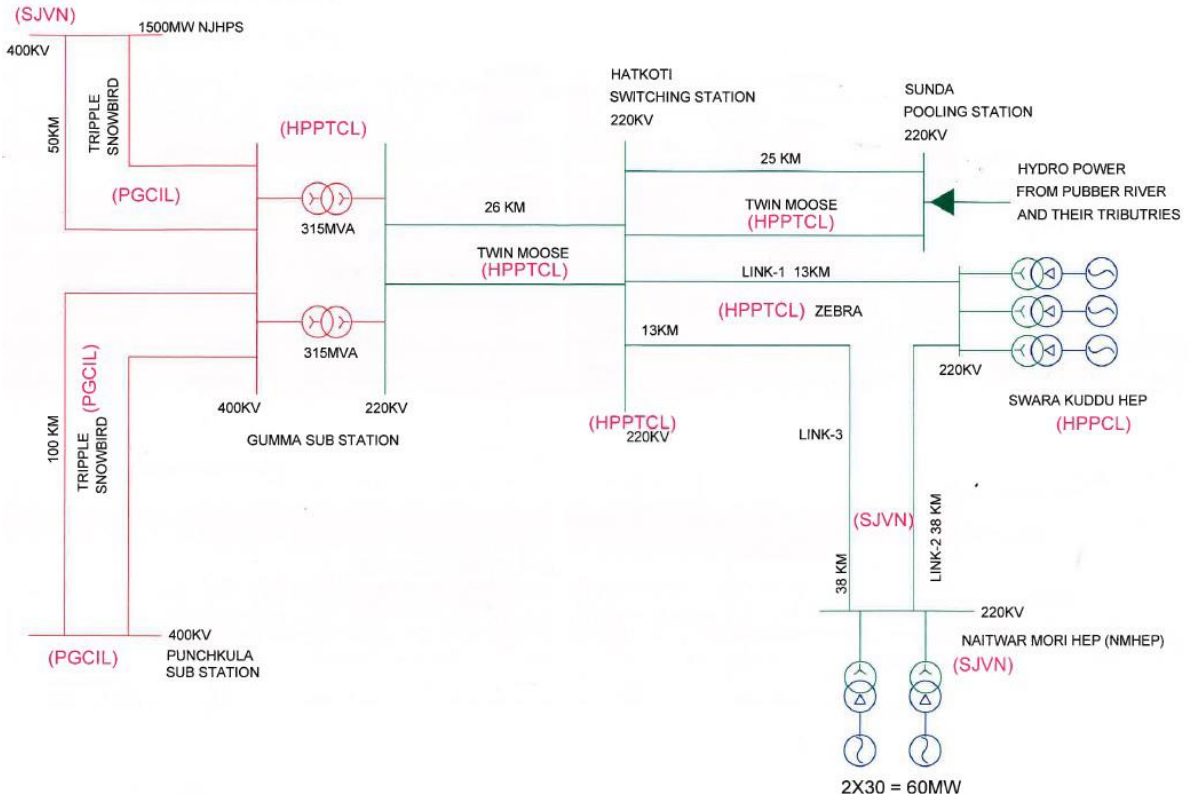


Figure1: The power evacuation system for Naitwar Mori HEP

9.2 Reference is invited to the 64th NRPC MoM dated 24.04.2023 at item no. A20 (PMU installation on all new sub-station) vide which it has been agreed for installation of PMU during First Time Charging (FTC) of Sub stations/Generating stations.

9.3 The Regulation 48 (6) (Chapter-IV, Part-A) of CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022 is applicable for Naitwar Mori HEP.

9.4 It is to submit that the PMU has not been envisaged in original contract of EM package awarded to M/s Voith Hydro on 11.06.2018 for Naitwar Mori HEP. During the awarding of EM package of Naitwar Mori in 2018, such requirement of PMU was not there in the applicable CEA regulation, 2010.

9.5 Presently, in view of 64th NRPC minutes, the planning including procurement, supply, erection, testing and commissioning action i.r.o of installation of PMU along with all associated item has been taken up with M/s Voith Hydro (EM contractor) under variation clause of existing EM contract. Additionally, we are exploring the above item through tendering process in open market as well. After exploration of market, it has been observed that lead time for same is around 6-8 month.

9.6 However, it is pertinent to mention here that project pre-commissioning work is in full swing and water filling & subsequent commissioning thereof is scheduled in next 15-20 days.

9.7 The compliance in term of FTC (as per standard procedure by Grid) are in place and in process except the PMU installation at Naitwar Mori HEP.

9.8 In view of above, PMU installation during FTC may not be feasible at Naitwar Mori HEP.

9.9 Accordingly, it is submitted that “A relaxation/Wavier i.r.o installation of PMU during FTC at Naitwar Mori may be accorded for 6-8 Month”.

9.10 Further, if feasible, it is requested the Forum that PMU may be supplied to SJVN on payment basis from existing LoA’s of any Utilities in NR Control Area.

Members may kindly deliberate.

खण्ड-ख: उ.क्षे.भा.प्रे.के. Part-B: NRLDC

10. NR Grid Highlights for August2023

Following are major grid highlights of August 2023:

- Maximum energy consumption of Northern Region was **1773 MUs** on 18th Aug’23 and it was 9.5 % higher than Aug’22 (1619 MUs 31st Aug’22)
- Average energy consumption per day of Northern Region was **1661 MUs** and it was 12.7 % higher than Aug’22 (1474 Mus per day)
- Maximum Demand met of Northern Region was **80548 MW** on 18th Aug’23 @14:00 hours (*based on data submitted by Constituents)* as compared to 72045 MW on 31st Aug’22 @13:00 hours.

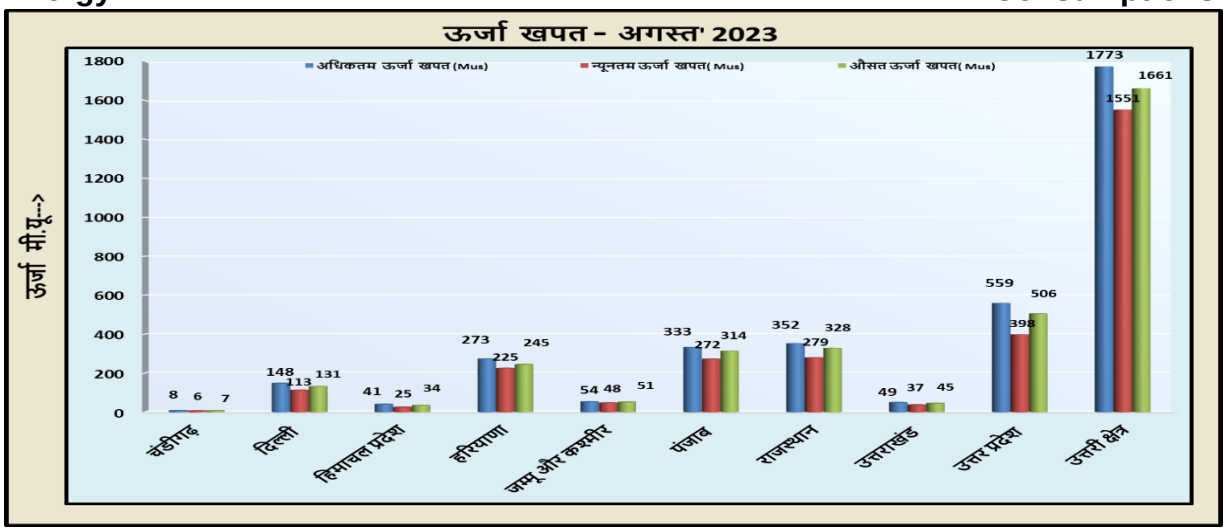
Northern Region all time high value recorded in Aug’23:

States	Max. Demand Met during the day (MW)		Energy Consumption (MU)	
	As per Format28/hourly data Submitted by	As on date	As per	As on date

	States (MW)		PSP (Mus)	
Haryana	12844	18-08-2023 14:45 hrs	273	18.08.2023
Rajasthan	17266	18-08-2023 14.45 hrs	351	18.08.2023

All Time High Record		
Generation	**Value (MU)**	**Achieved on**
Hydro Generation	442.6	01.08.2023
Wind Generation	85.7	07.08.2023

Energy Consumptions



- **Comparison of Average Energy Consumption (MUs/Day) of NR States for the Aug'22 vs Aug'23**

क्षेत्र/राज्य	अगस्त- 2022	अगस्त- 2023	%अंतर
चंडीगढ़	6.6	6.9	4.4%
दिल्ली	119.1	131.5	10.4%
हिमाचलप्रदेश	31.6	34.1	7.7%
हरियाणा	216.7	244.9	13.0%
जम्मूऔरकश्मीर	51.2	51.1	-0.2%
पंजाब	290.8	313.5	7.8%

राजस्थान	236.5	328.1	38.8%
उत्तराखंड	46.2	45.2	-2.1%
उत्तरप्रदेश	475.0	505.6	6.4%
उत्तरीक्षेत्र	**1473.6**	**1660.8**	**12.7%**

Frequency Data

Month	Avg. Freq. (Hz)	Max. Freq. (Hz)	Min. Freq. (Hz)	<49.90 (% time)	49.90 – 50.05 (% time)	>50.05 (% time)
Aug'23	50.00	50.29 On 02.08.23 at 13:18:10 hrs	49.51 on 31.08.23 at 22:25:00 hrs	7.08	**77.28**	15.63
Aug'22	50.00	50.31 on 14.07.22 at 13:14:10 hrs	49.47 on 18.07.22 at 19:20:00 hrs	8.77	**75.77**	15.45

Detailed presentation on grid highlights of Aug'2023 will be shared by NRLDC in OCC meeting.

11. SPS in Western Rajasthan ISTS RE Complex

In 209 OCC meeting, NRLDC representative shared concerning information about the significant number of grid events (over 30 incidents) involving RE generation loss that occurred between January 2022 and May 2023. The most severe event resulted in a maximum RE generation loss of 7120 MW, which took place on 15th May 2023. Such substantial losses in RE generation pose a serious threat to grid security, as they have the potential to trigger cascade tripping and lead to electricity supply disruptions over wide areas.

To evacuate the mentioned ~12.4 GW of ISGS RE generation, the Northern region relies on 16 number of 765kV lines. These transmission lines play a critical role in transferring the renewable energy from the generating sources to the consumption centers. Ensuring the reliability and proper functioning of these lines is of utmost importance to maintain grid stability and meet the increasing demand for renewable energy in the region.

NRLDC representative addressed the recent outage of 400kV and above transmission lines due to tower collapses and proposed several measures to enhance the reliability and resilience of the grid, especially in the context of the Rajasthan RE complex. The proposed suggestions are as follows:

1. Review of Wind Zones:

2. Single Circuit Lines in Critical Corridors:

3. n-2 Reliability Criteria for Prone Areas:

However, while these long-term suggestions are being implemented on the field, the NRLDC representative proposed a SPS Scheme logic for the ISTS RE complex to ensure n-1-1/n-2 compliance during events like tower collapse. NRLDC representative also briefed the forum about the basecase assumptions considered while doing the study for SPS requirement. Proposed SPS logic is attached as Annexure-B.I.

CTUIL representative requested NRLDC to share the basecase used for conducting the SPS study. CTUIL wanted to re-verify the study and provide their inputs to ensure its accuracy and effectiveness. NRLDC agreed to share the basecase for review and incorporation of additional insights. CTUIL recommended that designing the SPS logic may be done based on the loading of lines rather than the combined RE generation quantum.

In 210 OCC meeting,

- NRLDC representative reiterated that since large amount of RE is being commissioned in the complex at rapid pace whereas the associated transmission system is slightly delayed, so lot of power is also being evacuated under short term open access. Since large number of lines are on D/C tower, in case of tower collapse or any other event it may become a bottleneck for safe evacuation of power. Therefore, SPS was proposed in the complex and was also discussed in detail in the last OCC meeting.
- NRLDC representative further displayed the base case and updated SPS logic after implementation of inputs given by CTUIL i.e inclusion of line loading in SPS logic.

Assessment of Generation backdown of n-2 SPS requirement for 765kV lines of Rajasthan RE pocket

Basecase assumption

400kV Bhadla(RS)-Bikaner(RS) D/C	in service
400kV Bikaner(PG)-Bikaner_2(PG) D/C	in service
STATCOM -1 and 2 @ Bhadla_2	in service
STATCOM-1 @ Bikaner_2	in service
All 400kV lines presently out in Rajasthan	in service
Rajasthan demand	15500 MW
Raj Solar	3400 MW
Raj Wind	1500 MW

Result :

Contingency / Line Loading	Loading of 765kV Fatehgarh2-Bhadla2 D/C > 2000 MW and < 2200 MW	[Loading of 765 kV Fatehgarh2-Bhadla D/C > 1350 and < 1450] or [Loading of 765kV Fatehgarh2_Bhadla2 D/C > 2200 And < 2400]	[Loading of 765 kV Fatehgarh_2-Bhadla D/C > 1450] or [Loading of 765kV Fatehgarh2_Bhadla2 D/C > 2400] or [Loading of 765kV Bhadla2-Ajmer D/C > 3200]
765kV Fatehgarh2-Bhadla D/C	no SPS required	200 MW generation backdown at Fatehgarh-1/2	500 MW backing at Fatehgarh-1/2
765kV Fatehgarh2-Bhadla2 D/C	100 MW backing at Fatehgarh_1	500 MW backing at Fatehgarh-1/2	800 MW backing at Fatehgarh-1/2
765kV Bhadla-Bikaner D/C	no SPS required	no SPS required	no SPS required
765kV Bhadla2-Bikaner D/C	no SPS required	no SPS required	no SPS required
765kV Bhadla2-Ajmer D/C	no SPS required	400 MW backing at Bhadla_2 (due to overloading of Jodhpur-Kankroli/ Bhadla-Jodhpur)	500 MW backing at Bhadla_2 (due to overloading of Jodhpur-Kankroli/ Bhadla-Jodhpur)
765kV Bikaner- Moga D/C	no SPS required	no SPS required	no SPS required
765kV Bikaner- Khetri D/C	no SPS required	no SPS required	no SPS required

- CTUIL representative stated that they are still examining the previous file shared with them and agreed to give comments on the latest logic discussed in this meeting. CTUIL representative further informed that inputs from their side will be shared by 1st week of September.
- Powergrid representative stated that implementation of logic can be done without any issues
- OCC asked all members to submit their comments by first week of Sep.

Members may please discuss.

12. Opening of 400 KV Singrauli(NT)-Anpara(UP) to control fault level

As per the recommendations of the 1st Meeting of Northern Regional Power Committee (Transmission Planning) (NRPCTP), 400 kV Singrauli – Anpara has to be opened to control the high fault levels in Anpara – Singrauli – Rihand complex.

6.13. After deliberations, following was agreed:

(i) The transmission system for evacuation of power from Singrauli III:

I. LILO of both circuits of Tie line (Vindhyachal Stage-IV to Vindhyachal Stage-V 400kV D/C Twin Moose line) at Singrauli Stage-III- under the scope of NTPC.

II. Reconductoring of Singrauli Stage-III - Vindhyachal stage-IV 400 kV D/C TM line (formed after above proposed LILO) with HTLS conductor - under the scope of NTPC

III. Singrauli-III–Rihand-III 400kV D/c line- under ISTS scope

IV. 2x125 MVAR Bus Reactor at Singrauli-III generation switchyard- under scope of NTPC

(ii) Singrauli- Anpara 400 kV line will be kept normally open (can be closed in emergency conditions) after commissioning of Anpara D –Unnao 765kV line to restrict high short circuit level in Singrauli-Anpara complex.

(iii) The short circuit level in Singrauli will again be studied by CEA and CTU and accordingly, would be discussed in the next NRPCTP meeting.

The above scheme may also be rectified in next NRPCTP meeting.

Extract from the meeting are shown below:

In 210 OCC meeting, NRLDC representative informed the forum that a meeting was organized on 10.07.2023 among NLDC, NRLDC & SLDC – UP to discuss on the constraints faced in the operation of HVDC back-to-Back Vindhyanchal in WR to NR direction due to high loading of 400 kV Anpara – Obra. In the meeting it was discussed & agreed that:

- As per the recommendations of the 1st Meeting of Northern Regional Power Committee (Transmission Planning) (NRPCTP), 400 kV Singrauli – Anpara will be opened to control the high fault levels in Anpara – Singrauli – Rihand complex. NRLDC & SLDC - UP shall conduct a study to observe the impact of opening 400 kV Singrauli – Anpara on the fault level of the complex.
- Also, the opening of 400 kV Singrauli – Anpara will relieve the loading of 400 kV Anpara – Obra and provide flexibility in the operation of HVDC back-to-Back Vindhyanchal in both directions. The same shall be studied by NRLDC & UP – SLDC to identify operational issues with 400 kV Singrauli – Anpara in open condition. The contingencies/planned outages which may require closing of the line will also be identified.
- For due consultation with all the stakeholders i.e. POWERGRID, NTPC & UP, the matter shall be taken up in the OCC forum before implementation.

NRLDC representative further shared the observations of the study conducted to assess the effects resulting from the opening of the 400 KV Singrauli(NT)-Anpara(UP) (PG) transmission line on the system, and the fault level of the Anpara-Singrauli generation complex, along with the potential contingencies that could occur.

Singrauli	1850 MW
Rihand	1856 MW
Anpara A&B	1546 MW
Anpara C	1100 MW
Anpara D	944 MW
Vindhyanchal BTB	500 MW towards NR
Obra	903 MW
Bara	1760 MW
NR Demand	73200 MW
UP Demand	27000 MW

HVDC Rihand Dadri : 1400 MW towards Dadri
HVDC Balia Bhiwadi : 250 MW towards Bhiwadi

Sl. No	Bus number	Substation	Voltage level	Case: Maximum Generation		After opening 400kV Anpara-Singrauli		Relief
				Fault MVA	Fault current	Fault MVA	Fault current	
1	154056	SINGRL4	400	33.32166	48095.7	22.17586218	32008.1	16087.6
2	154014	ANPARA4	400	37.90139	54705.9	28.11090748	40574.6	14131.3
3	154016	ANPARAC	400	37.11426	53569.8	27.78389629	40102.6	13467.2
4	154015	ANPARA-D	400	33.37294	48169.7	25.77984422	37210	10959.7
5	154057	RIHAND-G	400	22.57143	32579	19.22666463	27751.3	4827.7
6	157000	ANPARAC	765	35.06184	26461.4	32.26407693	24349.9	2111.5
7	157001	ANPARA-D	765	35.23052	26588.7	32.45792719	24496.2	2092.5
8	154018	OBRA4	400	18.54675	26769.9	17.59133154	25390.9	1379
9	157027	OBRA_C_TPS	765	21.62366	16319.5	20.69268716	15616.9	702.6

From the study results, it is clear that the fault level in the Singrauli-Anpara complex

has significantly decreased. Maximum relief is observed at Singrauli (16kA), Anpara TPS (14kA), Anpara C (13kA) and Anpara D (11kA)

NRLDC representative stated that as per the study conducted for various contingencies the system was seen to be N-1 Compliant and stable.

Other major findings of the study:

i. The system is compliant w.r.t to N-2 contingency of HVDC Rihand Dadri D/c.

ii. However, Singrauli complex would be N-1 non-compliant w.r.t further tripping of any one ckt of 400kV Singrauli-Allahabad, 400kV Singrauli-Lucknow, 400kV Rihand-Allahabad. By shifting Vindhyachal towards WR (Western Region) with a minimum of 200 MW, the system becomes N-1 compliant

Action: *Therefore, in case of tripping on any one ckt in Singrauli complex power flow in HVDC Vindhyachal may be shifted towards WR with a minimum of 200 MW*

iii. The system is compliant w.r.t to N-1 contingency of 765 kV Anpara_C – Unnao and 765 kV Anpara D – Obra_C. No major contingency was observed

iv. However, if the generation at Obra is below 400 MW before the tripping incident, it would result in an overload on the 400 kV Anpara-Obra line after the tripping of any one of the 765 kV line.

v. In order to maintain N-1 compliance, the safe limit for HVDC Balia-Bhiwadi power transfer should be **300 MW** from Bhiwadi to Balia which was **400 MW** prior to opening of 400 KV Singrauli(NT)-Anpara(UP) (PG).

The study results and basecase were shared with UP SLDC on 02.08.2023.

In 210 OCC meeting,

- NRLDC representative requested SLDC UP to provide the results of the study carried out on their part and requested CTUIL to provide their comments as the above was approved in NR-PCTP meeting**.**
- SLDC UP representative stated that they received similar results from the study conducted at their end and will share the observations with NRLDC shortly.
- NTPC and POWERGRID were also requested to provide any comments from their side.
- OCC asked all members to submit their comments by first week of September 2023.
- No comments have been received at NRLDC end.

Members may please discuss and accord their approval for Opening of 400 KV Singrauli(NT)-Anpara(UP) to control fault level.

13. Transmission related issues observed during high demand season

As discussed in previous OCC meetings, most of the NR states except J&K, Ladakh and Chandigarh U/Ts are sharing basecase and ATC/TTC assessment with NRLDC. OCC has advised all states to timely declare TTC/ATC for prospective months and revise the figures as per requirement.

Latest state wise issues are listed below:

Haryana:

TTC: 9100MW

ATC: 8800MW

In 210 OCC meeting, NRLDC representative requested HVPN to share the status of new elements to be commissioned.

HVPN representative stated that :

- As intimated by powergrid 500 MVA ICT at Kurushetra is delayed due to system constraints as shutdown of ICTs was not possible and is likely to be commissioned by Oct 2023.
- FTC documents for 220kV Jajji –Rai D/C line has already been submitted.
- Revised timeline for the commissioning of the 220kV Sec 32 Panchkula and 220kV lines to Panchkula (PG) is set for September 2023 as of now.
- No definite timeline was given for Deepalpur ICT.

NRLDC representative stated that enhanced ATC-TTC of Haryana will be implemented once Kurukshetra ICT comes into service and requested HVPN to expedite work of Kurukshetra ICT.

Punjab:

TTC: 9500MW

ATC: 9000MW

In 210 OCC meeting, NRLDC representative requested Punjab SLDC to share update regarding 400/220kV Dhanansu S/s. Punjab representative stated that the revised timeline for Dhanansu S/S is September end and ATC for this season shall remain unchanged.

Delhi:

TTC: 7300MW

ATC: 7000MW

In 210 OCC meeting, NRLDC representative stated that ATC of Delhi has been updated to 7100 MW as per reassessed figures after mock testing of SPS at Bawana and report submission.

Rajasthan:

Raj SLDC is requested to share ATC/TTC limits for summer/ monsoon 2023 at the earliest. NRLDC has shared comments on limits and base case submitted by RVPN

In 210 OCC meeting, NRLDC representative once again requested Rajasthan SLDC to share ATC/TTC limits for summer/ monsoon 2023 at the earliest. Update could not be provided from SLDC Rajasthan regarding the same.

At number of substations across different states, loading of major 400/220kV ICTs were observed to be beyond their N-1 contingencies. Plots attached as Annexure-B.II.

Constraints observed at major 400/220kV ICTs of different states for the last 30 days are listed below:

- For Punjab – Ludhiana ICT loadings were near N-1 limit during early week of the month, Nakodar ICTS were N-1 non-compliant, SLDC Punjab is requested to expedite augmentation of 2nd ICT at Nakodar.
- For Delhi – ICT loadings were well within range.
- For UP – Azamgarh, sarnath, obra, Allahabad and lucknow ICT loadings were near N-1 limit, However, in Gorakhpur N-1 violations has been observed, augmentation at Gorakhpur needs to be expedited for resolution.
- For Haryana – Deepalpur ICTs are N-1 non-compliant at many incidents. Panipat and Kurushetra ICT loadings are also N-1 non-compliant at the time of high demand of Haryana state
- For Rajasthan – Majority of 400/220kV RVPN substations are N-1 non-compliant. 400/220kV ICTs at RVPN substations such as Ajmer, Chittorgarh, Bikaner, Hindaun are N-1 non-compliant most of the time whereas other 400/220kV ICTs at Merta, Jodhpur, Bhilwara and Bhinmal(PG) are alsol N-1 non-compliant for some duration in last 30 days.

It is again requested that SLDCs may ensure that loading of ICTs and lines are below their N-1 contingency limits. While requisitioning power from various sources, states should take care to limit their scheduled drawl as well as actual drawl in real time within the Available Transfer Capability (ATC) limits assessed by SLDC and NRLDC. NRLDC is continuously sending emails in real-time for ensuring N-1 compliances as well as restricting schedule till ATC limit and maximizing internal generation. SLDCs need to ensure this during real-time operation.

As discussed in last several OCC meetings, all SLDCs need to furnish ATC/TTC details of their control area at respective SLDC websites. Now, it is being observed that most of the SLDCs except J&K are uploading ATC/TTC limits on their websites.

SLDC	Link for ATC on website
UP	https://www.upsldc.org/documents/20182/0/ttc_atc_24-11-16/4c79978e-35f2-4aef-8c0f-7f30d878dbde
Punjab	https://www.punjabsldc.org/downloads/ATC-TTC0321.pdf
Haryana	https://hvpn.org.in/#/atcttc

Delhi	https://www.delhisldc.org/resources/atcttcreport.pdf
Rajasthan	https://sldc.rajasthan.gov.in/rrvpnl/scheduling/downloads
HP	https://hpsldc.com/mrm_category/ttc-atc-report/
Uttarakhand	https://uksldc.in/ttc-atc
J&K and Ladakh U/T	**NA**

All SLDCs are requested to regularly update ATC/TTC limits after mutually agreement between SLDC and NRLDC.

Members may please discuss

14. Grid Operation related issues

a. Progress of transmission augmentation in RVPN control area

i. ICT capacity augmentation at 400/220kV Chittorgarh is expected by Nov'2023.

ii. New 500MVA ICT approved at 400/220kV Hindaun, Ajmer, Merta, Bikaner & Jodhpur station

iii. Status of ICT augmentation at 400/220kV Bhilwara & Babai S/s not available.

NRLDC letter for expeditious actions to ensure reliability and security of Rajasthan regional grid is attached as Annexure-B.III

b. ERS availability related issues

Issues arising due to tower collapse events have been deliberated in recent NRPC meetings. The issue was also discussed in 68th NRPC meeting held on 18.08.2023. In the meeting it was discussed that :

i. Outage of lines on tower collapse has led to major issues in grid operation as well as for safe evacuation of generation.

ii. Shutdown of 400kV Bikaner(PG)-Bikaner(RJ) D/C lines were also availed by POWERGRID for commissioning of 400kV Bikaner-II S/s (appreciable work helped to minimize curtailment). First time in Northern Region, ERS line of Quadmoose conductor was implemented, high current carrying capacity of Quadmoose ERS reduced the quantum of RE curtailment significantly.

iii. All other utilities were requested to ensure that they have availability of ERS, trained manpower and also gangs which can complete such tasks swiftly, in case of requirement.

iv. MoP, Govt. of India had already issued instructions for procurement of ERS (also discussed in 150th OCC meeting).

v. CEA (Grid Standards) Regulations, 2010 also suggests keeping necessary arrangement for ERS.

vi. In view of increase in line length under jurisdiction of different utilities over the years, it is suggested that the nos. of ERS requirement may be reviewed and regularly monitored at OCC level.

vii. As agreed in 63rd NRPC meeting (held on 24.02.2023), ERS availability monitoring may be included in follow up agenda in monthly OCC meetings.

MS, NRPC stated that ERS availability monitoring shall be included as rolling/followup agenda in OCC meeting. Chairperson, NRPC stated that availability of suitable ERS is compulsion for all the utilities to ensure reliability of electricity supply, to avoid any power outage in case of long outage of line on tower collapse, to harness the generation in case of long outage of any evacuating line.

Finally it was concluded that:

I. ERS availability monitoring shall be taken as rolling/follow-up agenda in OCC meetings for regular monitoring of ERS under different utilities in Northern region.

II. NRPC Sectt. in coordination with NRLDC, PGCIL and other stake holders (having expertise in ERS) shall prepare a guideline on requirement of ERS for any utility based on its total ckt kms in line with CEA (Grid Standards) Regulations, 2010. Requirement, availability and procurement of ERS may also be included in the guidelines.

Brief writeup on ERS related benefits and issues is attached as Annexure-B.IV.

Members may please discuss further course of action.

c. Submission of grid operation related data by Railways

Indian railways is connected to number of 220kV ISTS nodes such as Dadri NTPC, Auraiya NTPC, Allahabad (PG) and Abdullapur (PG). In future also, Indian railways may get connected at other ISTS stations.It is to be noted that the drawl pattern by Indian railways is significantly different from other drawees such as state DISCOMs.

The MW and MVAR drawl by Indian Railways has significant impact on the loading as well as voltage profile of connected ISTS node. Recently, issue related to high voltage at 220kV Auraiya NTPC was being reported which lead to tripping of 220kV feeders from Auraiya NTPC supplying power to Railways. This disruption of power proves to be a hindrance in providing regular traction supply impacting the major railway routes. Similar issue has also been reported at 220kV Allahabad (PG) supplying power to Indian Railways in the past.

In view of above, it is suggested that Indian Railways provides information about MW, MVAR drawl and expected voltage profile in their network so as to assess its impact on the nearest ISTS node. This would help to suggest appropriate measures in advance and avoid any possible disruption of traction supply.

Members may please discuss.

15. J&K and Ladakh (UT) related pending issues

a. J&K Telemetry Issues

Reliability and accuracy of SCADA data and its associated communication system is essential for monitoring and coordinating operations of a large electricity grid. It helps in visualization and management of the critical grid element failure/grid incident in real time and minimizes the possibility of any untoward incidences/disturbances. Network applications in Energy management system (EMS) such as State Estimator (SE), Real Time Contingency Analysis (RTCA) also necessitate reliable and accurate real time analog and digital data. Data communication has to be made through redundant and alternate path communication channel.

Real-Time data availability from Jammu and Kashmir is very poor. There is zero visibility of data in J&K stations. With poor monitoring of data, it is very difficult to monitor grid in efficient manner.

The matter has been discussed in various TCC and TeST Meetings but there is no improvement of the same.

Brief details are as follows:

- Under SCADA upgrade project 66 RTUs were installed by M/s Siemens at all 400KV / 220 KV and 132 KV sub-stations/generating Stations of J&K PDD.
- RTUs were not integrated with Control centre due to non-availability of communication network.
- RTUs were tested locally and commissioned without data availability at Control Centre.
- **Due to Non availability of data, JK PDD is not able to monitor its drawal from grid and its generation**. It is dependent of Central sector data for monitoring of drawal.
- *Matter was also discussed in Special Meeting with J&K on 28.07.2020 where in Representative of J&K informed that they have given consultancy work to POWERGRID for installation of OPGW in J&K. However, due to funding issue OPGW work has been stalled by POWERGRID. According to J&K almost 95% of the work is complete and once funding issue is resolved Non-availability of telemetry issue will be resolved.*
- *Matter was also discussed in 47th TCC-49th NRPC Meeting dated 27.12.2021,* J&K confirmed that they will resolve the issues mutually with POWERGRID so that data starts reporting to SLDC/ NRLDC.
- During 19th TeST Meeting dated 07.03.2022 J & K representative informed that by 31st December 2022 all 70 RTUs will be integrated with SLDC.
- During 20th TeST Meeting dated 09.09.2022, it was discussed that J&K informed that they are in process of rectification of RTU issues and joint visit is planned with M/s Siemens.

- NRLDC has also written to Principal Secretary (PDD), vide letter NRLDC/SCADA/Telemetry/2022 dated 03.10.2022 regarding reliable telemetry from J &K Sub-stations
- Issue was also discussed in 21st TeST Meeting held on **13.12.2022**
- During 64th NRPC held on 24th March 2023 Representative from Jammu & Kashmir informed that 47 OPGW links out of 73 links have been commissioned by POWERGRID and remaining links are expected to be completed by June 2023. He further informed that 68 crores funds for OPGW installation has already been given to POWERGRID and they are in process of approval of additional 21 crores fund.
- Further, Representative from POWERGRID informed that RTU were commissioned in 2015 by M/s Siemens without communication link. Now when the links are available there are issues in RTU reporting which needs to be addressed. Also at some of the location during 64thNRPC Meeting (24th March 2023)–Minutes of Meeting 33 Sub-station, retrofitting CT& PT cables were disconnected and new cabling needs to be done.

MS NRPC expressed serious concern and requested that a joint meeting may be conducted including members from POWERGRID, NRLDC, J&K and M/s Siemens to finalise the work needed to integrate the RTUs and for further action by J&K.

J & K is requested to please take up for restoration of data at the earliest.

J&K to update the status.

b. UFR and df/dt status:

- As per the agreed quantum relief for NR, total target in respect of J&K for UFR and df/dt are 336 MW and 270 MW respectively. Confirmation on relief quantum is yet to be received from J&K. Moreover, in compliance of NPC decision, NR states/constituents agreed to raise the AUFR settings by 0.2 Hz in 47th TCC/49th NRPC meetings held on 20.07.2020. However, no update received from J&K and Ladakh (UT).
- Same issue was again deliberated in 198th OCC meeting held on 17.08.2022 and 57th NRPC meeting held on 31.08.2022.
- Issue was again deliberated in 68th NRPC meeting held on 18.08.23.

Status furnished by J&K and Ladakh (UT) in 68th NRPC meeting:

"List of feeders along with their load parameters where the under frequency relays and df/dt relays are installed in Jammu province was also attached". **However, no such updated feeders list received yet at NRPC/NRLDC.**

"Meanwhile 132kV feeders identified and details also shared with NRLDC which are curtailed manually in case of over-drawl / low frequency". **It may be noted that these are the feeders list which can be opened manually to control the over drawl and does not have any automatic relay (UFR or df/dt) to address the low frequency without any manual intervention.**

J&K may update the status on following;

i. Status/confirmation on raising the AUFR settings by 0.2 Hz as agreed in 47th TCC/49th NRPC meetings held on 20.07.2020.

ii. Share the List of feeders and load wise breakup of the feeders in which UFR and df/dt relays are installed to trip 336 MW (UFR) and 270 MW (df/dt) respectively.

iii. Tentative timeline to resolve the above issue as it has been under discussion since last ~3 years as mentioned above.

J&K to update the status.

c. Long outage of 220kV Kishenpur-Mirbazar line

- 220kV Kishenpur-Mirbazar line is under long outage since 19.02.2022 due to tower collapse. It is to be noted that significant time (much higher than time specified in CEA regulations) has passed since line outage and still the line has not been revived yet.
- In 57th NRPC meeting held on 31.08.22, J&K representative stated that revival of 220kV Kishenpur-Mirbazar line would be completed in nearly 2-3 months. However, it is still pending.
- Same was again deliberated in 68th NRPC meeting held on 18.08.23.

Status furnished by J&K and Ladakh (UT) in 68th NRPC meeting:

"Foundation work of 1 no. out of total 2 nos. of tower has been laid down and foundation work on 2nd tower is in progress and shall be completed by 15th Sept'2023 subject to fair weather condition. Work got delayed due to inclement weather condition".

It may be noted that it has been **18 months 12 days** as on 31.08.23 since this 220kV line is under outage and impacting the reliability of the J&K control area grid.

J&K should put best efforts for earliest revival of line.

J&K to update the status.

d. Mock black start exercise of URI-I & URI-II HEP, Lower Jhelum HEP:

- Mock black start exercises are necessary to make sure that generating units are able to start in case of requirement/ blackout of grid. Mock black start exercise of URI-I & URI-II HEP, Lower Jhelum HEP is yet to be conducted. In 198th OCC meeting, JKPTCL representative agreed that the issue is well known and important and the same would be taken up with SLDC.
- As per latest discussion held with J&K & NHPC officers on 27.07.2023, the blackstart exercise for Uri-I & Uri-II are planned in Oct-Nov this year. As the blackstart exercise has not been carried out since number of years, it is requested to plan and adhere to the dates for black start exercise as number of agencies are involved in the exercise.

i. **Representative from NHPC stated that mock black start exercise of URI hydro plant shall be conducted in 1st week of Nov'23.**

ii. **J&K is requested to do the needful preparation and coordinate to carry out the mock black start exercise of URI HEP in 1st week of Nov'23 with 70-100MW of load.**

J&K to update the status.

e. Reactive compensation details:

- J&K grid being weakly connected from the rest of the grid and due to its isolated location suffers from issues of severe low voltage. During winter months when hydro generation is not available and demand in J&K control area is high due to heating load requirements, the issue of low voltage gets aggravated. J&K also has to pay large amounts as reactive energy charges to pool due to high MVAr drawl from ISTS grid at the time of low voltage.
- It has been discussed and suggested to J&K to plan & expedite commissioning of reactive power devices especially capacitors at lower voltage level to improve the voltage profile in valley area and also avoid large sums payable as reactive energy charges. J&K is requested to furnish latest status of their reactive energy management plan.
- Low voltage issues of J&K and Ladakh (UT) has been regularly informed through quarterly operational feedback report of Grid-India, issue was deliberated in 57th NRPC meeting held on 31st Aug'22, but no appreciable work is done to mitigate the issue.
- Issue was again deliberated in 68th NRPC meeting held on 18.08.23.

Status furnished by J&K and Ladakh (UT) in 68th NRPC meeting:

"The distribution wing of Jammu, i.e. JPDCL Jammu has already taken up the work of the installation of Capacitor banks at 11KV level in approximately 90 receiving stations in Jammu province with approx. 350MVAr capacity. However, JKPTCL has kept a provision in its CAPEX budget itself to get the damaged capacitors banks rectified such as 220/132/66/33KV GSS's i.e. Hiranagar, Bishnah, Gladni etc. and to install new capacitor banks wherever required to improve the voltage profile/power factor at 220/132/33KV OR 66KV level and 132/33KV or 66kV level grid Substation of Jammu province".

J&K and Ladakh (UT) may share the following;

i. List of nodes and node wise capacitor bank requirement (in MVAr) as finalized by JPDCL & JKPTCL.

ii. Tentative timeline for tendering and commissioning of capacitor bank.

iii. List of nodes (Sub-stations) in J&K and Ladakh (UT) facing the low voltage along with their voltage profile.

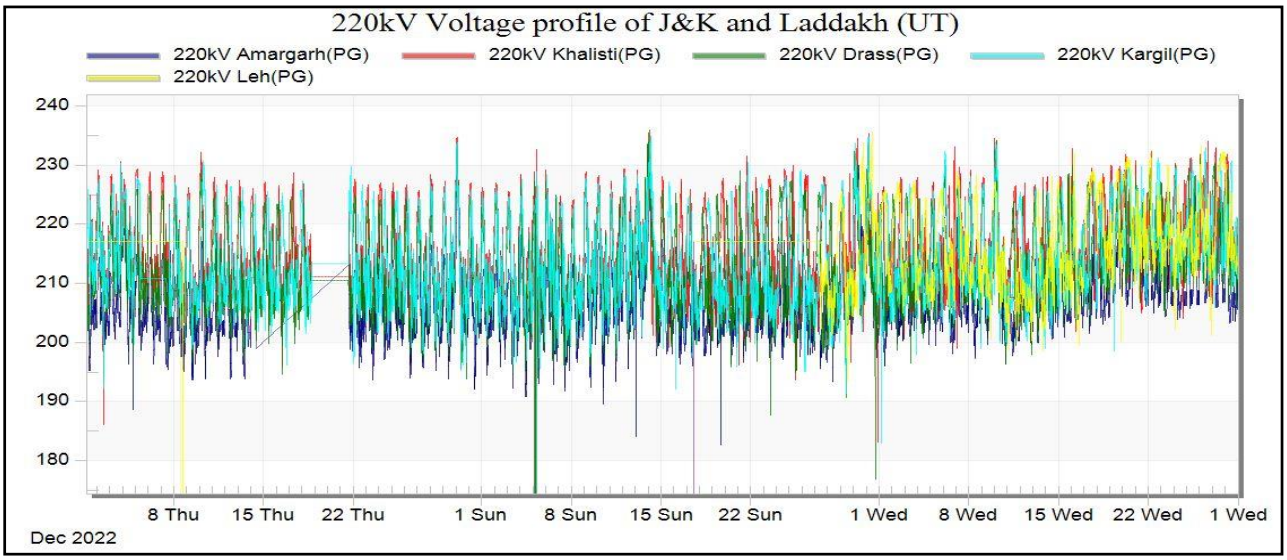
iv. Status of 350MVAr capacitor bank at 11kV may be furnished by JPDCL.

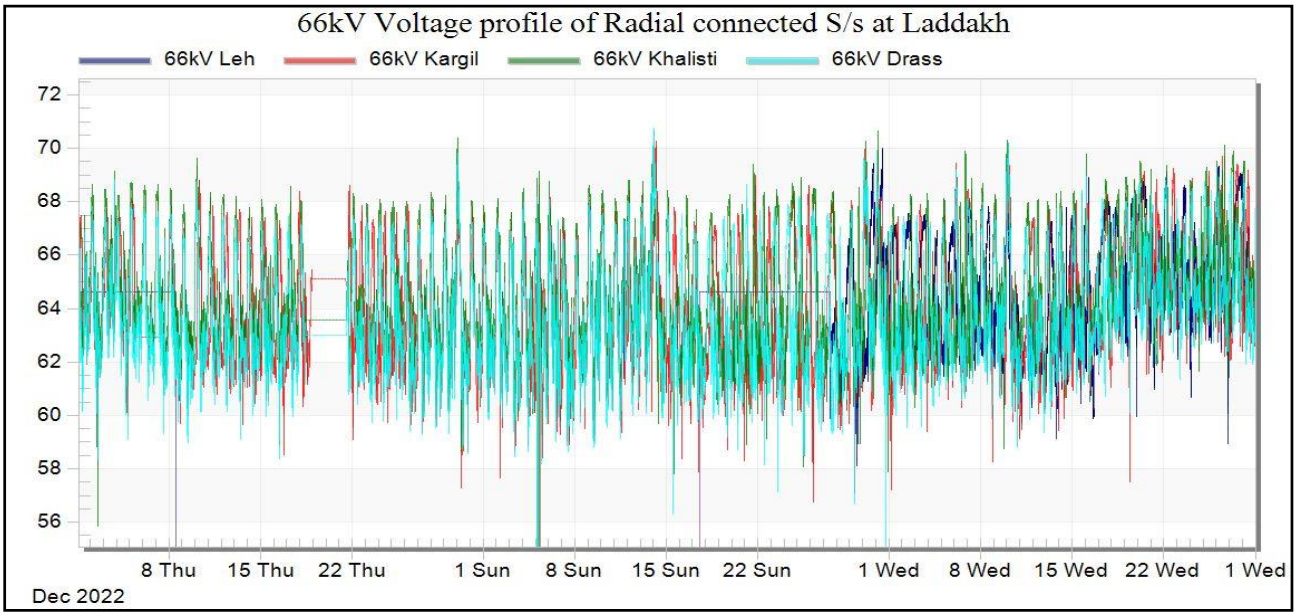
J&K and Ladakh (UT) to update the status.

f. Low Voltage issues:

Followings nodes experienced significant low voltage during last winter (low generation period and high demand of J&K).

- 400kV URI-I, 220kV Amargarh, 220kV Wagoora, and 220kV Alusteng.
- 220kV/ 66kV Drass, Kargil, Khalsti and Leh.
- 220kV Bus voltage at Amargarh, Kargil, Khalsti and Drass and Leh S/s were in the range of **195kV-205kV** during Dec'22 to Jan'23. (Voltage profile shown below).
- 66kV Bus voltage at Drass, Kargil, Khalsti and Leh were in the range of **58kV-62kV** during Dec'22 to Jan'23. (Voltage profile shown below).
- **As the Leh-Khalsti-Kargil-Drass-Aulsteng being the radially connected stations to Ziankot**. Ziankot is connected to Wagoora, Wagoora is connected to Amargarh and Amargarh is connected to URI-I, low voltage at URI-I, Amargarh and Wagoora results in significantly low voltage during high demand in J&K an Ladakh(UT) at Drass, Kargil, Khalsti and Leh as system is connected radially.
- During winter, majority of the time generation at Chutak and Nimoo Bazgo HEP remains under outage, results significant low voltage at 66kV Leh, 66kV Khalisti etc. due to drawl from radial network.

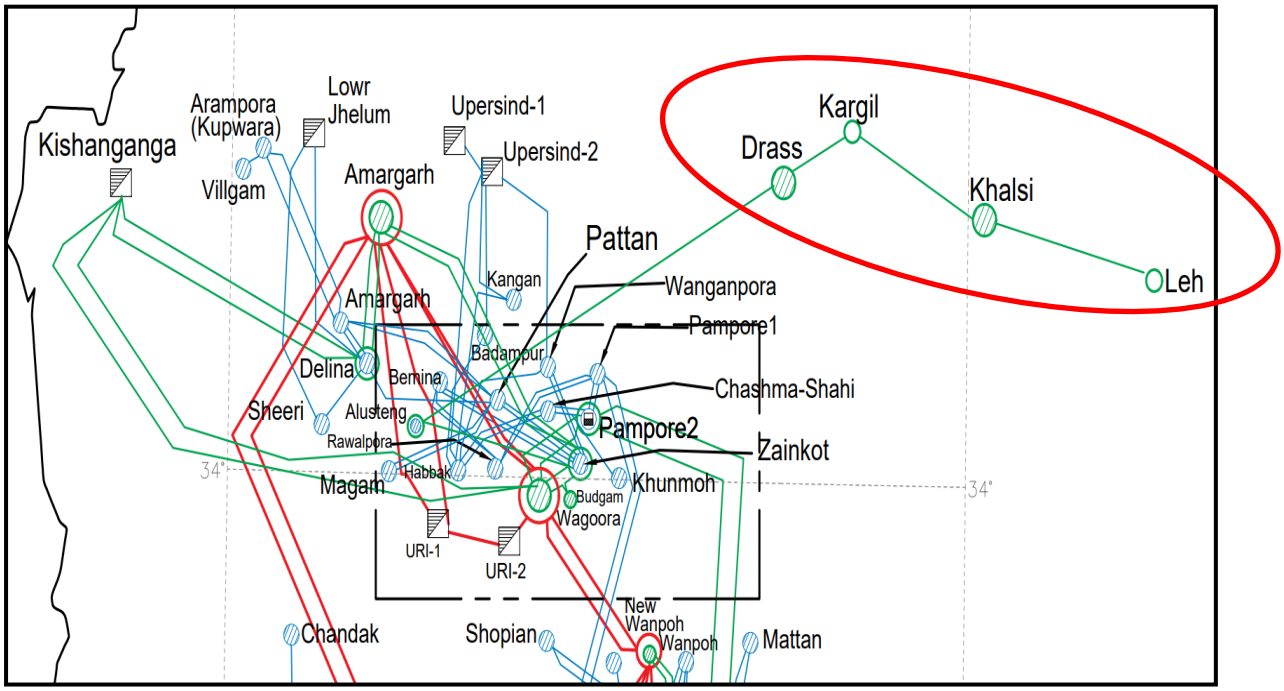




J&K and Ladakh (UT) to update the status on what action has been taken to mitigate this low voltage issue at Ladakh(UT).

g. Ladakh (UT) radial connection issues:

Leh-Khalsti-Kargil-Drass is the radially connected stations to Alusteng through S/C 220kV line.



- In any case, if 220kV Alusteng-Drass S/C goes under outage it would lead to power outage at 220kV Drass, 220kV Kargil, 220kV Khalsti and 220kV Leh.
- Similarly, Outage of 220kV Drass-Kargil would lead to power outage at 220kV Kargil, 220kV Khalsti and 220kV Leh.

- Outage of 220kV Kargil-Khalsti would lead to power outage at 220kV Khalsti and 220kV Leh.
- Outage of 220kV Khalsti-Leh would lead to power outage at 220kV Leh.

Table 1: Outage of 220kV Alusteng-Drass S/C line from Sept'22 to Aug'23

Sl. No	Element Name	Outage		Revival		Reason / Remarks
		Date	Time	Date	Time	
1	220 kV Alusteng-Drass (PG) Ckt-1	10-09-2022	13:21	10-09-2022	21:59	To attend melted aluminium dead end jumper cone and loose nuts and bolts of Y-phase jumper at Tower no. 327.
2		10-09-2022	23:06	11-09-2022	20:56	Y-N fault, Dist. 55.38km, Fault current Iy 537A from Drass (PG) & Fault current Iy 2.2kA from Alusteng.
1		20-10-2022	11:42	20-10-2022	18:14	For rectification of critical defects of line.
2		25-11-2022	10:33	25-11-2022	17:48	NHIDCL diversion work of 220kV DRASS-AULSTANG line near Sonamarg due to construction of a connecting road across ZOJILA pass on SONAMARG-KARGIL section of NH-01.
3		27-11-2022	08:43	27-11-2022	15:36	
4		28-11-2022	08:51	28-11-2022	17:11	
5		29-11-2022	08:58	29-11-2022	18:35	
1		05-01-2023	06:13	06-01-2023	06:59	Phase to earth fault Y-N, Zone-1 from Alusteng end. Line tripped from Alusteng and auto-reclosed from Drass end.
1		02-05-2023	15:19	02-05-2023	16:08	Line tripped during the maintenance work that was being done in DC supply panel at Alusteng (JKPDD) end. Line has no fault, as Drass end CB remained in closed position.
2		15-06-2023	12:20	15-06-2023	15:44	Hotspot observed on Y-phase jumper at Loc. no. 425 (nearby Drass).

i. Due to outage of 220kV Alusteng-Drass, power outage/ load impact occurred at 220kV Drass, 220kV Kargil, 220kV Khalsti and 220kV Leh.

ii. Additional connectivity or feeding from other S/s or D/C lines need to be planned for these radially connected system (Leh, Khalsti, Kargil, Drass, Alusteng) of Ladakh (UT).

J&K and Ladakh (UT) to update the status.

h. High loading lines & ICTs and N-1 Non-compliance of system:

- Due to high demand of J&K and Ladakh (UT) in winter'22-23, line loading of following lines were observed high for considerable duration of time in Q-4 2022-23. Line loading observed in Q-4 2022-23 are as follows;

  i. 220kV Wagoora-Zainkot ckt-1&2 (160-210MW in each line).

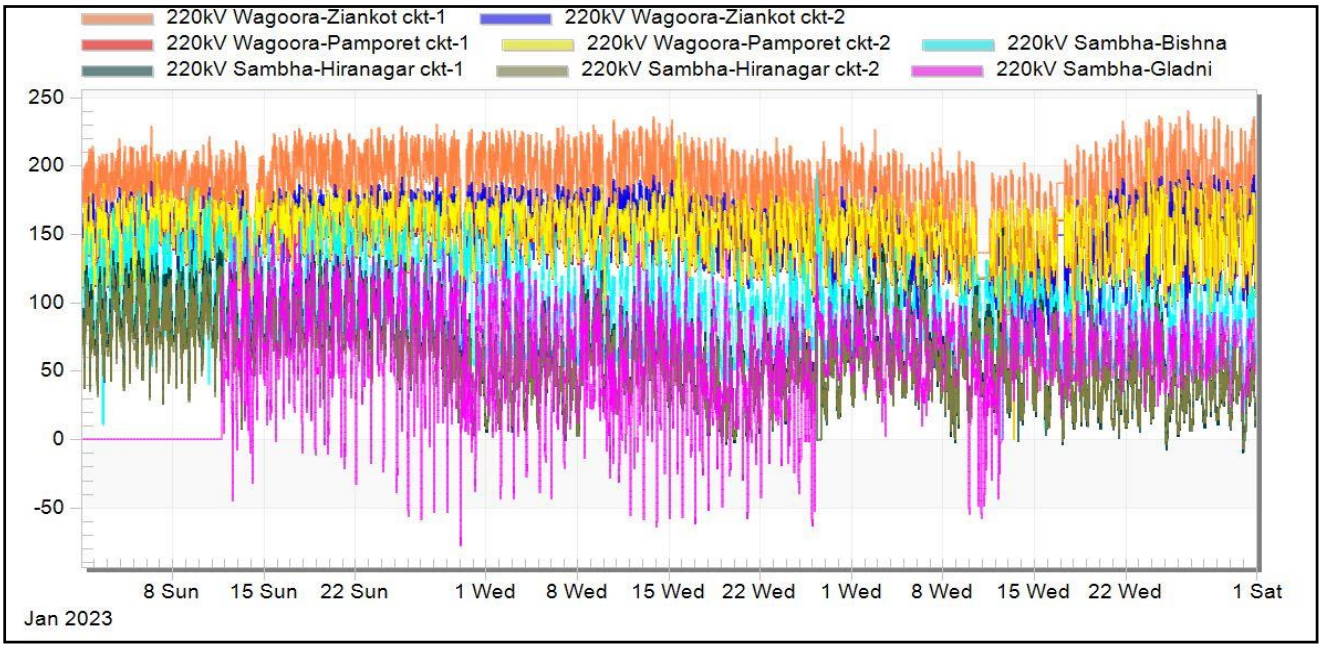
  ii. 220kV Wagoora-Pampore Ckt-1&2 (150-200MW in each line).

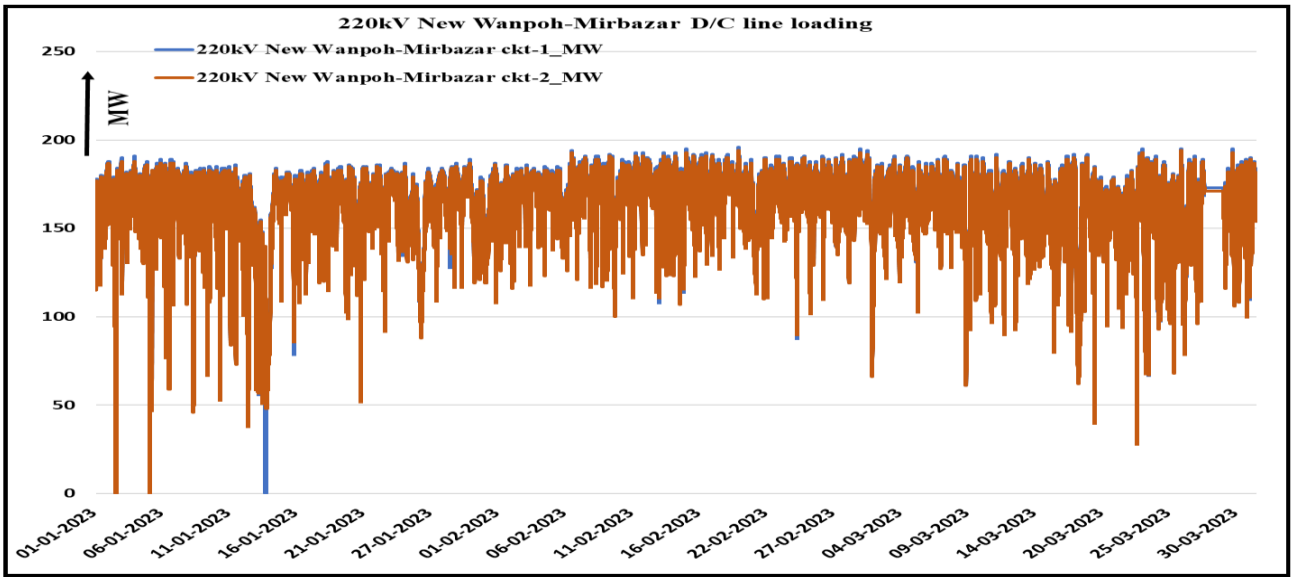
  iii. 220kV Sambha-Bishna (100-150MW).

  iv. 220kV Sambha-Hiranagar ckt-1&2 (100-120MW in each line).

  v. 220kV Sambha-Glandni (100-140MW).

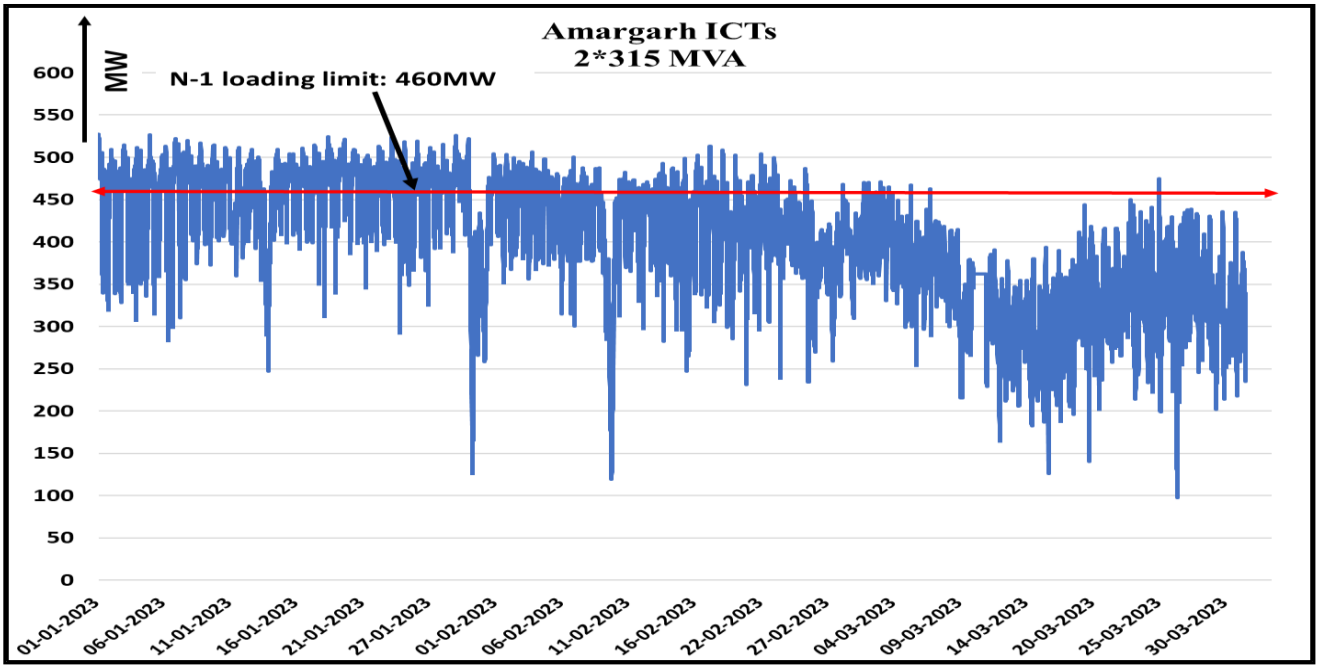
- During winter due to heating load, demand of J&K increases significantly, in Q-4'22-23 J&K peak demand was reaching 2800-3000MW.





i. 220kV Wagoora-Ziankot ckt-1&2 and 220kV Wagoora-Pampore Ckt-1&2 lines were N-1 Non-compliant for considerable duration in this Q-4 2022-23. (N-1 loading limit for each Ckt is 155MW).

ii. High line loading observed mainly in Jan'23 and Feb'23 months, same is anticipated between Dec'23-Feb'24.



i. Amargarh (PG) has 2*315MVA ICTs. The ICTs are N-1 non-compliant above 460MW loading of ICTs.

ii. Loadings above N-1 contingency limits were observed in Jan'23 and Feb'23 during high demand of J&K.

iii. Additional connectivity in line with growing demand of J&K and Ladakh UT may be planned by J&K and Ladakh (UT).

iv. ICT augmentation at Amargarh (PG) may be expedited by CTUIL./NRSS XXIX.

J&K to update the status on what actions has been taken and proposed transmission line & ICT to mitigate this high loading and N-1 non-compliance issue in the control area. Status of implementation of additional lines/ICT in line with demand growth of J&K and Ladakh (UT) control area.

16. Frequent forced outages of transmission elements in the month of August'23:

The following transmission elements were frequently under forced outages during the month of **August'23**:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	220 KV Ganguwal(BB)-Gobindgarh(PS) (BB) Ckt-2	5	BBMB/Punjab
2	220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1	4	UP/UK
3	220 KV New Tanda (UP)-Sohawal(PG) (UP) Ckt-1	4	UP
4	220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1	4	PG/UP
5	220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1	4	Singoli/UK
6	400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1	4	UP/GVK
7	400 KV Bareilly-Unnao (UP) Ckt-1	6	UP
8	400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) Ckt-1	5	UP/JP
9	400 KV Talwandi Saboo(PSG)-Muktsar(PS) (PS) Ckt-2	4	Punjab

The complete details are attached at **Annexure-B.V**.

It may be noted that frequent outages of such elements affect the reliability and security of the grid. Hence, utilities are requested to analyze the root cause of the tripping and share the remedial measures taken/being taken in this respect.

Members may like to discuss.

17. Multiple element tripping events in Northern region in the month of August '23:

A total of 37 grid events occurred in the month of Aug'23 of which **17** are of GD-1 category, **08** are of GI-2 Category &**12** is of GI-1 category. The tripping report of all the events have been issued from NRLDC. A list of all these events is attached at **Annexure-B.VI.**

Further, despite persistent discussions/follow-up in various OCC/PCC meetings, it is observed that provisions 5.2(r) and 5.9.4(d) of the IEGC, pertaining to reporting of events / tripping to RLDC, is not being complied with by many utilities.

Maximum delayed clearance of fault observed in event of multiple elements tripping at 220kV Shahjhanpur(UP) on 22nd August, 2023. As per PMU, R-N phase to earth fault which converted to R-Y phase to phase fault with delayed clearance of 2840msec is observed.

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **10** events out of **37** grid events occurred in the month. The major events with delayed clearance of faults are as follows:

1. Multiple elements tripping at 400/220kV Panipat(BBMB) at 11:18hrs on 05th August, 2023, fault clearance time: 1720msec
2. Multiple elements tripping at 220/132kV Amarsagar(RS) at 09:48hrs on 06th August, 2023, fault clearance time: 1560msec
3. Multiple elements tripping at 220kV Pong(BBMB) at 12:29hrs on 18th August, 2023, fault clearance time: 2160msec
4. Multiple elements tripping at 220kV Shahjhanpur(UP) at 12:39hrs on 22th August, 2023, fault clearance time: 2840msec
5. Multiple elements tripping at 220kV Verpal(PS) at 21:51hrs on 22th August, 2023, fault clearance time: 880msec
6. Multiple elements tripping at 220kV Roorkee(PTCUL) at 10:44hrs on 29th August, 2023, fault clearance time: 880msec

Remedial actions taken by constituents to avoid such multiple elements tripping may be shared.

Members may take necessary preventive measures to avoid such grid incidents / disturbances in future and report actions taken by respective utilities in OCC & PSC forum. Moreover, utilities may impress upon all concerned for providing the Preliminary Report, DR/EL & Detailed Report of the events to RLDC in line with the regulations.

Members may like to discuss.

18. Details of tripping of Inter-Regional lines from Northern Region for August' 23:

A total of 13 inter-regional lines tripping occurred in the month of August'23. The list is attached at **Annexure-B.VII.** The status of receipt of preliminary reports, DR/EL within 24hrs of the event and fault clearing time as per PMU data has also been mentioned in the table. The non-receipt of DR/EL & preliminary report within 24hrs of

the event from SLDCs / ISTS licensees / ISGSs is in violation of regulation 5.2(r) of IEGC and regulation 15(3) of CEA Grid Standards. As per regulations, all the utilities shall furnish the DR/EL, flag details & preliminary report to RLDC/RPC within 24hrs of the event. They shall also furnish the detailed investigation report within 7 days of the event if fault clearance time is higher than that mandated by CEA (Grid Standard) Regulations.

Members may please note and advise the concerned for taking corrective action to avoid such tripping as well as timely submission of the information.

Members may like to discuss.

19. Status of submission of DR/EL and tripping report of utilities for the month of August'23.

The status of receipt of DR/EL and tripping report of utilities for the month of August'2023 is attached at **Annexure-B.VIII**. It is to be noted that as per the IEGC provision under clause 5.2 (r), tripping report along with DR/EL has to be furnished within 24 hrs of the occurrence of the event. However, it is evident from the submitted data that reporting status is not satisfactory and needs improvement. Also, it is observed that reporting status of POWERGRID, UP & Uttarakhand was satisfactory, reporting status of Punjab & Delhi has improved in July, 2023 compared to the previous month. However, reporting status from Punjab, Delhi, HP, Rajasthan, Haryana & J&K need further improvement.

Members may please note and advise the concerned for timely submission of the information. It is requested that DR/EL of all the trippings shall be **uploaded on Web Based Tripping Monitoring System "http://103.7.128.184/Account/Login.aspx"** within 24 hours of the events as per IEGC clause 5.2.r and clause 15.3 of CEA grid standard. Apart from prints of DR outputs, the corresponding COMTRADE files may please also be submitted in tripping portal / through email.

20. Status of PSS tuning/ re-tuning and Step Response Test of generator

In last 26 OCC meetings, this point was discussed and Utilities were requested to submit the present status of PSS tuning/re-tuning and Step Response Test of their respective generators as per the below mentioned format.

S. No.	Name of the Generating Station	Date of last PSS tuning / re-tuning performed (in DD/MM/YYYY format)	Date of last Step Response Test performed (in DD/MM/YYYY format)	Report submitted to NRLDC (Yes/ No)	Remarks (if any)

The status of test performed till date is attached at **Annexure-B.IX.**

It is to be noted that as per regulation 5.2(k) of IEGC, Power System Stabilizers (PSS) in AVRs of generating units (wherever provided), shall be got properly tuned

by the respective generating unit owner as per a plan prepared for the purpose by the CTU/RPC from time to time.

Members are requested to update about their future plan for PSS tuning and share the reports of PSS tuning/re-tuning and Step Response Test if conducted in their control area.

Members may like to discuss.

21. Frequency response characteristic:

Two FRC based event occurred in the month of **August-2023**. Description of the event is as given below:

Table:

S. No.	**Event Date**	**Time (In hrs.)**	**Event Description**	**Starting Frequency (in Hz)**	**Nadir Frequency (in Hz)**	**End Frequency (in Hz)**	***Δf***	**NR FRC during the event (%)**
1	06-Aug-23	09:48hrs	As reported by SLDC Rajasthan, at 09:48hrs on 06th August, 2023, Y phase Jumper of 132kV Amarsagar – Ludarva Ckt-2 snapped. (Bus bar protection is not available at 132kV side). On this fault, 132kV Amarsagar-Jaisalmer Ckt-2 tripped at the same time sensing fault in zone-4 (B-N fault) and 220/132kV ICTs tripped from 132kV side on O/C E/F. As per SCADA, change in Rajasthan wind generation of approx. 1600 MW is observed.	50.05	49.91	49.97	0.08	27

			Hence, generation loss of 1600 MW has been considered for FRC calculation.					

Status of Data received till date for 06th Ausgust, 2023 event:

Status of Field Data received of FRC of Grid event occurred at wind generation complex in Rajasthan in Northern Region at 09:48 Hrs on 06.08.2023			
Data Received from		Data Not Received from	
NJPS	Haryana	Uttarakhand	APCPL Jhajjar
UP	HP	Delhi	Rihand NTPC
Tehri HEP	Karcham Wangtoo HPS	Punjab	Unchhahar NTPC
Koteshwar HEP	NHPC	BBMB	Dadri NTPC
Rajasthan	Singrauli NTPC		
Rosa Reliance	TSPL		

FRC of ISGS generators:

Generator	06-Aug-23 event	Generator	06-Aug-23 event
Singrauli TPS	6%	Salal HEP	3%
Rihand-1 TPS	-2%	Tanakpur HEP	125%
Rihand-2 TPS	-23%	Uri-1 HEP	-5%
Rihand-3 TPS	-26%	Uri-2 HEP	0%
Dadri-1 TPS	38%	Dhauliganga HEP	21%
Dadri -2 TPS	1%	Dulhasti HEP	13%
Unchahar TPS	No generation	Sewa-II HEP	No generation
Unchahar stg-4 TPS	No generation	Parbati-3 HEP	No generation
Jhajjar TPS	150%	Jhakri HEP	1%
Dadri GPS	-15%	Rampur HEP	0%
Anta GPS	No generation	Tehri HEP	120%
Auraiya GPS	5%	Koteswar HEP	16%
Narora APS	-3%	Karcham HEP	37%
RAPS-B	21%	Malana-2 HEP	No generation
RAPS-C	18%	Budhil HEP	0%
Chamera-1 HEP	0%	Bhakra HEP	1%
Chamera-2 HEP	3%	Dehar HEP	8%
Chamera-3 HEP	3%	Pong HEP	-10%
Bairasiul HEP	0%	Koldam HEP	44%
		AD Hydro HEP	0%

FRC of State generators:

Generator	06-Aug-23 event	Generator	06-Aug-23 event
PUNJAB		UP	
Ropar TPS	-4%	Obra TPS	19%
L.Mohabbat TPS	5%	Harduaganj TPS	150%
Rajpura TPS	-15%	Paricha TPS	10%
T.Sabo TPS	-43%	Rosa TPS	63%
Goindwal Sahib TPS	189%	Anpara TPS	34%
Ranjit Sagar HEP	221%	Anpara C TPS	86%
Anandpur Sahib HEP	15%	Anpara D TPS	5%
HARYANA		Bara TPS	42%
Panipat TPS	5%	Lalitpur TPS	4%
Khedar TPS	0%	Meja TPS	-1%
Yamuna Nagar TPS	No generation	Vishnuprayag HEP	0%
CLP Jhajjar TPS	52%	Alaknanda HEP	2%
Faridabad GPS	No generation	Rihand HEP	No generation
RAJASTHAN		Obra HEP	No generation
Kota TPS	10%	UTTARAKHAND	
Suratgarh TPS	7%	Gamma Infra GPS	No generation
Kalisindh TPS	-29%	Shravanti GPS	No generation
Chhabra TPS	No generation	Ramganga HEP	No generation
Chhabra stg-2 TPS	527%	Chibra HEP	3%
Kawai TPS	33%	Khodri HEP	4%
Dholpur GPS	No generation	Chilla HEP	-2%
Mahi-1 HEP	-5%	HP	
Mahi-2 HEP	0%	Baspa HEP	0%
RPS HEP	0%	Malana HEP	No generation
JS HEP	13%	Sainj HEP	2%
DELHI		Larji HEP	No generation
Bawana GPS	36%	Bhabha HEP	-3%
Pragati GPS	35%	Giri HEP	0%
		J&K	
		Baglihar-1&2 HEP	No generation
		Lower Jhelum HEP	No generation

Memebers who haven't shared the data yet are requested to share the data and analysis of FRC of their control area.

Members may like to discuss.

22. Status of Bus bar protection:

Clause - 4 in schedule - V of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 reads as

"Bus bar protection and local breaker backup protection shall be provided in 220kV and higher voltage interconnecting sub- stations as well as in all generating station switchyards".

During analysis of many grid incidents/disturbances, it has been found that the Busbar protection at the affected substation was **not present or non-operational** which resulted in considerably increasing both the number of affected elements and fault clearance time. Accordingly, it becomes critical to monitor and keep Busbar protection at all the 220 kV and above voltage level substations healthy and operational.

Constituents were requested vide NRLDC letter dated 28th Dec 2022 to furnish status of Busbar protection in the following format in your control area**.**

Details are yet to be received from J&K.

Constituent wise status of bus bar protection where bus bar protection is either not installed or installed but not operational along with present status as per detail received from constituents is attached as **Annexure-B.X**.

Constituents are requested to share the status of remedial action taken/to be taken regarding commissioning and healthiness of bus bar protection at 220kV & above substations and also expedite the implementation of bus bar protection.

Members may like to discuss.

23. Replacement of electromechanical relays with numerical relays:

Clause-5.2(r) of IEGC, clause-15(4) of CEA Grid standards and clause-48(4) of CEA Construction Standards 2022 mandates that *''each line or transformer or reactor or any other bay shall be provided with facility for disturbance recording, event logging and time synchronizing equipment''.*

During analysis of grid incidents/disturbances, it has been found that there are few stations where electromechanical relays are still in use and thus disturbance recorder are not available there which accounts for violation of Clause-5.2(r) of IEGC, clause-15(4) of CEA Grid Standards and clause 48(4) CEA Construction Standards 2022.

In addition, clause-3 in part III (Grid Connectivity Standards applicable to Transmission Line and Sub-Station) of Standards for Connectivity to the Grid, 2007 reads as

''*Two main numerical Distance Protection Schemes shall be provided on all the transmission lines of 220 kV and above for all new sub-stations. For existing sub-stations, this shall be implemented in a reasonable time frame''*

It is known that Disturbance recorder (DR) is essential for analysis of grid incidents/disturbances. Its non-availability eventually affects the proper analysis of grid incidents/disturbances and monitoring of protection system.

Deliberation on same subject has also been done during 207 OCC. During the meeting, all the constituents/SLDC/STU were requested to review the same in their control area and take expedite actions to replace electromechanical relays with numerical relays.

Constituent wise details of static/electromechanical type protection relays at their respective substations along with its present status per detail received from constituents is attached as **Annexure-B.XI**.

Constituents are requested to share the status of remedial action taken/to be taken regarding replacement of static/electromechanical relay with numerical relays at 220kV & above substations and also expedite the process of replacement of static/electromechanical relay with numerical relays.

Members may like to discuss.

Follow up issues from previous OCC meetings

Annexure-A.I

<table>
<tr><td>1</td><td>Down Stream network by State utilities from ISTS Station</td><td>Augmentation of transformation capacity in various existing substations, addition of new substations along with line bays as well as requirement of line bays by STUs for downstream network are under implementation at various locations in Northern Region. Further, 220kV bays have already been commissioned at various substations in NR. For its utilization, downstream 220kV system needs to be commissioned.</td><td>List of downstream networks is enclosed in Annexure-A.I.I.</td></tr>
<tr><td>2</td><td>Progress of installing new capacitors and repair of defective capacitors</td><td>Information regarding installation of new capacitors and repair of defective capacitors is to be submitted to NRPC Secretariat.</td><td>Data upto following months, received from various states / UTs:
◎ CHANDIGARH — Sep-2019
◎ DELHI — Jun-2023
◎ HARYANA — May-2023
◎ HP — Jul-2023
◎ J&K and LADAKH — Not Available
◎ PUNJAB — May-2023
◎ RAJASTHAN — Aug-2023
◎ UP — Jul-2023
◎ UTTARAKHAND — Aug-2023
All States/UTs are requested to update status on monthly basis.</td></tr>
<tr><td>3</td><td>Healthiness of defence mechanism: Self-certification</td><td>Report of mock exercise for healthiness of UFRs carried out by utilities themselves on quarterly basis is to be submitted to NRPC Secretariat and NRLDC. All utilities were advised to certify specifically, in the report that “All the UFRs are checked and found functional”.</td><td>Data upto following months, received from various states / UTs:
◎ CHANDIGARH — Not Available
◎ DELHI — Jun-2023
◎ HARYANA — Jun-2023
◎ HP — May-2023
◎ J&K and LADAKH — Not Available
◎ PUNJAB — Jun-2023
◎ RAJASTHAN — Jun-2023
◎ UP — Jun-2023
◎ UTTARAKHAND — Jun-2023
◎ BBMB — Jun-2023
All States/UTs are requested to update status for healthiness of UFRs on monthly basis for islanding schemes and on quartely basis for the rest .</td></tr>
<tr><td></td><td></td><td>In compliance of NPC decision, NR states/constituents agreed to raise the AUFR settings by 0.2 Hz in 47th TCC/49th NRPC meetings.</td><td>Status:
◎ CHANDIGARH — Not Available
◎ DELHI — Increased
◎ HARYANA — Increased
◎ HP — Increased
◎ J&K and LADAKH — Not increased
◎ PUNJAB — Increased
◎ RAJASTHAN — Increased
◎ UP — Increased
◎ UTTARAKHAND — Increased
◎ BBMB — Increased
J&K and LADAKH were requested to update status for increasing settings of UFRs.</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Status of FGD installation vis-à-vis installation plan at identified TPS</td><td>List of FGDs to be installed in NR was finalized in the 36th TCC (special) meeting dt. 14.09.2017. All SLDCs were regularly requested since 144th OCC meeting to take up with the concerned generators where FGD was required to be installed.
Further, progress of FGD installation work on monthly
basis is monitored in OCC
meetings.</td><td>Status of the information submission (month) from states / utilities is as under:
<table><tr><td>◎</td><td>HARYANA</td><td>Sep-2022</td></tr><tr><td>◎</td><td>PUNJAB</td><td>Jul-2023</td></tr><tr><td>◎</td><td>RAJASTHAN</td><td>Jul-2023</td></tr><tr><td>◎</td><td>UP</td><td>Jul-2023</td></tr><tr><td>◎</td><td>NTPC</td><td>Feb-2023</td></tr></table>FGD status details are enclosed as Annexure-A.I.II.
All States/utilities are requested to update status of FGD installation progress on monthly basis.</td></tr>
<tr><td>5</td><td>Submission of breakup of Energy Consumption by the states</td><td>All states/UTs are requested to submit the requisite data as per the billed data information in the format given as under:
<table><tr><td>Category→</td><td>Consumption by Domestic Loads</td><td>Consumption by Commercial Loads</td><td>Consumption by Agricultural Loads</td><td>Consumption by Industrial Loads</td><td>Traction supply load</td><td>Miscellaneous / Others</td></tr><tr><td><Month></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td><td>Status of the information submission (month) from states / utilities is as under:
<table><tr><td></td><td>State / UT</td><td>Upto</td></tr><tr><td>◎</td><td>CHANDIGARH</td><td>Not Submitted</td></tr><tr><td>◎</td><td>DELHI</td><td>May-23</td></tr><tr><td>◎</td><td>HARYANA</td><td>Jun-23</td></tr><tr><td>◎</td><td>HP</td><td>Aug-23</td></tr><tr><td>◎</td><td>J&K and LADAKH</td><td>Not Submitted</td></tr><tr><td>◎</td><td>PUNJAB</td><td>Jun-23</td></tr><tr><td>◎</td><td>RAJASTHAN</td><td>Jul-23</td></tr><tr><td>◎</td><td>UP</td><td>Apr-23</td></tr><tr><td>◎</td><td>UTTARAKHAND</td><td>Mar-23</td></tr></table>J&K and Ladakh and Chandigarh are requested to submit the requisite data w.e.f. April 2018 as per the billed data information in the given format</td></tr>
<tr><td>6</td><td>Information about variable charges of all generating units in the Region</td><td>The variable charges detail for different generating units are available on the MERIT Order Portal.</td><td>All states/UTs are requested to submit daily data on MERIT Order Portal timely.</td></tr>
<tr><td>7</td><td>Status of Automatic Demand Management Sysytem in NR states/UT's</td><td>The status of ADMS implementation in NR, which is mandated in clause 5.4.2 (d) of IEGC by SLDC/SEB/DISCOMs is presented in the following table:</td><td>Status:
<table><tr><td>◎</td><td>DELHI</td><td>Fully implemented</td></tr><tr><td>◎</td><td>HARYANA</td><td>Scheme not implemented</td></tr><tr><td>◎</td><td>HP</td><td>Scheme not implemented</td></tr><tr><td>◎</td><td>PUNJAB</td><td>Scheme not implemented</td></tr><tr><td>◎</td><td>RAJASTHAN</td><td>Under implementation. Likely completion schedule is 31.10.2023.</td></tr><tr><td>◎</td><td>UP</td><td>Scheme implemented by NPCIL only</td></tr></table></td></tr>
</table>

8	Reactive compensation at 220 kV/ 400 kV level at 15 substations			
	State / Utility	Substation	Reactor	Status
i	POWERGRID	Kurukshetra	500 MVAr TCR	Anticipated commissioning: Oct'23
ii	DTL	Peeragarhi	1x50 MVAr at 220 kV	Anticipated commissioning: 15.08.2023
iii	DTL	Harsh Vihar	2x50 MVAr at 220 kV	2x50 MVAR Reactor at Harsh Vihar has been commissioned on dated 31th March 2023.
iv	DTL	Mundka	1x125 MVAr at 400 kV & 1x25 MVAr at 220 kV	Bay work completed on 25.03.2023. Reactor part tender is dropped and at present same is under revision.
v	DTL	Bamnauli	2x25 MVAr at 220 kV	Bay work completed on 25.03.2023. Reactor part tender is dropped and at present same is under revision.
vi	DTL	Indraprastha	2x25 MVAr at 220 kV	Bay work completed on 07.11.2023. Reactor part tender is dropped and at present same is under revision.
vii	DTL	Electric Lane	1x50 MVAr at 220 kV	Under Re-tendering due to Single Bid
viii	PUNJAB	Dhuri	1x125 MVAr at 400 kV & 1x25 MVAr at 220 kV	400kV Reactors - 1x125 MVAR Reactor at Dhuri has been commissioned on dated 30th March 2023. 220kV Reactors - 1x25 MVAR Reactor at Dhuri has been commissioned on dated 27th January 2023.
ix	PUNJAB	Nakodar	1x25 MVAr at 220 kV	1x25 MVAR Reactor at Nakodar has been commissioned on dated 13th February 2023.
x	PTCUL	Kashipur	1x125 MVAR at 400 kV	Price bid has been opened and is under evaluation. Retendered in Jan'23
xi	RAJASTHAN	Akal	1x25 MVAr	1x25 MVAR Reactor at Akal has been commissioned on dated 25th July' 2022.

xii	RAJASTHAN	Bikaner	1x25 MVAr	1x25 MVAR Reactor at Bikaner has been commissioned on dated 24th June 2023.
xiii	RAJASTHAN	Suratgarh	1x25 MVAr	1x25 MVAR Reactor at Suratgarh has been commissioned on dated 25th November 2022.
xiv	RAJASTHAN	Barmer & others	13x25 MVAr	Agreement signed on dt. 22.06.2020. Grant of Ist Instalment received on dt.19.02.21 & work order placed on dt. 7.04.2022 to M/s Kanohar Electricals Ltd. Schedule time is 18 months.
xv	RAJASTHAN	Jodhpur	1x125 MVAr	Agreement signed on dt. 22.06.2020. Grant of Ist Instalment received on dt.19.02.21 & work order placed on dt. 7.04.2022 to M/s Kanohar Electricals Ltd. Schedule time is 18 months.

Annexure-A-I.I

1. Down Stream network by State utilities from ISTS Station:

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
1	400/220kV, 3x315 MVA Samba	Commissioned: 8 Total: 8	Utilized: 6 Unutilized: 2	• Network to be planned for 2 bays.	-	02 No. of bays shall be utilized for LILO-II of 220kV Jatwal-Bishnah Transmission Line, the work of which is delayed due to severe ROW problem at Location No. 1 near Grid Substation Jatwal where the Land owner is not allowing erection of Tower. The Deputy Commissioner Samba has been approached for intervention and facilitating the erection of Tower. He is persuading the Land owner to get the work completed. Updated in 210th OCC by JKPTCL.
2	400/220kV, 2x315 MVA New Wanpoh	Commissioned: 6 Total: 6	Utilized: 2 Unutilized: 4	• 220 kV New Wanpoh - Alusteng D/c Line	End of 2023	02 No. of bays are to be utilized for connecting 220kV New Wanpoh-Alusteng D/c Line. The work is in progress and expected to be commission by the end of 2023. Updated in 204th OCC by JKPTCL.
				• 220 kV New Wanpoh - Mattan D/c Line	End of 2024	02 No. of bays are to be utilized for connecting 220kV New Wanpoh-Mattan D/c Line. The funding source for the project is being identified and the project is expected to be completed by ending 2024. Updated in 204th OCC by JKPTCL.
3	400/220kV, 2x315 MVA Amargarh	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• 220kV D/C line from 400/220kV Kunzar - 220/33kV Sheeri	End of 2024	02 No. of bays are proposed to be utilized for connecting 220/132 kV GSS Loolipora. The funding source for the project is being identified and the project is expected to be completed by ending 2024. Updated in 204th OCC by JKPTCL.
4	400/220kV, 2x500 MVA Kurukshetra (GIS)	Commissioned: 8 Total: 8	Utilized: 6 Unutilized: 2	• 220kV Bhadson (Kurukshetra) – Ramana Ramani D/c line	Jul'24	Updated in 205th OCC by HVPNL
5	400/220 kV, 2x315 MVA Dehradun	Commissioned: 6 Total: 6	Utilized: 2 Unutilized: 4	• Network to be planned for 4 bays	-	PTCUL to update the status.
6	Shahjahanpur, 2x315 MVA 400/220 kV	Commissioned: 6 Approved/Under Implementation:1 Total: 7	Utilized: 5 Unutilized: 1 (1 bays to be utilized shortly) Approved/Under Implementation:1	• 220 kV D/C Shahajahanpur (PG) - Gola line	31.08.2023	Updated in 210th OCC by UPPTCL
				• LILO of Sitapur – Shahjahanpur 220 kV SC line at Shahjahanpur (PG)	Commissioned	Energization date: 25.02.2022 updated by UPPTCL in 196th OCC
7	Hamirpur 400/220 kV Sub-station	Commissioned: 8 Total: 8	Utilized: 4 Unutilized: 4 (2 bays to be utilized shortly)	• 220 kV Hamirpur-Dehan D/c line	Commissioned	Commisioned date: 09.06.2022. Updated in 198th OCC by HPPTCL
				• Network to be planned for 4 bays	-	HPPTCL to update the status.
8	Sikar 400/220kV, 1x 315 MVA S/s	Commissioned: 8 Total: 8	Utilized: 6 Unutilized: 2	• LILO of 220 kV Sikar (220 kV GSS)-Dhod S/c line at Sikar (PG)	Commissioned	LILO of 220 kV S/C Sikar-Dhod line at 400 kV GSS PGCIL, Sikar has been charged on dt. 31.03.2022
				• Network to be planned for 2 bays.	-	Against the 3rd ICT at 400 kV GSS Sikar, only 2 bays were constructed and same has been utilized by RVPN by constructing LILO of 220 kV S/C Sikar – Dhod line as updated by RVPNL in 195th OCC
9	Bhiwani 400/220kV S/s	Commissioned: 6 Total: 6	Utilized: 2 Unutilized: 4	• 220 kV D/C line Bhiwani (PG) – Bhiwani (HVPNL) line	Commissioned	Updated in 202nd OCC by HVPNL
				• 220 kV Bhiwani (PG) - Isherwal (HVPNL) D/c line.	Dec'23	Issue related to ROW as intimated in 208th OCC by HVPNL.
				• 220 kV Bhiwani (PG) - Dadhibana (HVPNL) D/c line.	Apr'24	Issue related to ROW as intimated in 192nd OCC by HVPNL.

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
10	Jind 400/220kV S/s	Commissioned: 4 Approved:4 Total: 8	Utilized: 4 Unutilized: 0	• LILO of both circuits of 220 kV Jind HVPNL to PTPS D/C line at 400 kV substation PGCIL Khatkar (Jind) with 0.5 sq inch ACSR conductor	May'24	Tender is under process Updated in 205th OCC by HVPNL.
11	400/220kV Tughlakabad GIS	Commissioned: 6 Under Implementation: 4 Total: 10	Utilized: 6 Unutilized: 0 Under Implementation:4	• RK Puram – Tughlakabad (UG Cable) 220kV D/c line – March 2023.	-	DTL to update the status.
				• Masjid Mor – Tughlakabad 220kV D/c line.	-	DTL to update the status.
12	400/220kV Kala Amb GIS (TBCB)	Commissioned: 6 Total: 6	Utilized: 0 Unutilized: 6	• HPPTCL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Kala Amb S/s	Sep'23	Updated in 208th OCC by HPPTCL
				• HPPTCL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Giri S/s	-	HPPTCL to update the status.
				• Network to be planned for 2 bays	-	HPPTCL to update the status.
13	400/220kV Kadarpur Sub-station	Commissioned: 8 Total: 8	Utilized: 0 Unutilized: 8	• LILO of both circuits of 220 KV Pali - Sector 56 D/C line at Kadarpur along with augmentation of existing conductor from 220 KV Sector-56 to LILO point with 0.4 sq inch AL-59 conductor.	Dec'23	Forest approval is pending for 220 KV Pali - Sector 56 D/C line. Updated in 205th OCC by HVPNL
				• LILO of both circuits of 220KV Sector 65 - Pali D/C line at Kadarpur along with augmentation of balance 0.4 sq. inch ACSR conductor of 220 kV Kadarpur - Sector 65 D/C line with 0.4sq inch AL-59 conductor	Dec'23	Updated in 205th OCC by HVPNL
14	400/220kV Sohna Road Sub-station	Commissioned: 8 Total: 8	Utilized: 4 Unutilized: 4	• LILO of both circuits of 220kV D/c Sohna-Rangla Rajpur at Roj Ka Meo line at 400kV Sohna Road	Jan'24	Updated in 208th OCC by HVPNL
				• LILO of both circuits of 220kV D/c Badshahpur-Sec77 line at 400kV Sohna Road	-	The matter is subjudice in Hon'ble Punjab & Haryana High court, Chandigarh Updated in 205th OCC by HVPNL. **Status:-** Earlier 02 nos 220 kV line bays were to be utilized for the 220 kV GIS S/Stn. Sec-77, Gurugram but due to denotification of land of the 220 kV GIS S/Stn. Sec-77 the said substation is now going to be dismantled and a new substation is proposed at Sec-75A, Gurugram. Now, these 02 no. 220 kV line bays may be utilized at 220 kV GIS S/Stn Sec-75A, Gurugram.
15	400/220kV Prithla Sub-station	Commissioned: 8 Aprroved: 2 Total: 10	Utilized: 4 Unutilized: 4 Under Implementation:2	• 220kV D/C line from Prithla to Harfali with LILO of one circuit at 220kV Meerpur Kurali	31.03.2024	Updated in 205th OCC by HVPNL
				• LILO of both ckt of 220kV D/c Ranga Rajpur – Palwal line	Commissioned	Commisioned date: 31.12.2021. Updated in 198th OCC by HVPNL
				• 220kV D/C for Sector78, Faridabad	31.03.2024	Issue related to ROW and Pending crossing approval from Northern Railways and DFCCIL. as intimated in 205th OCC by HVPNL.
				• Prithla - Sector 89 Faridabad 220kV D/c line	31.03.2024	Updated in 205th OCC by HVPNL
				• LILO of both circuits of 220kV Samalkha - Mohana line at Sonepat	05.10.2023	Updated in 205th OCC by HVPNL

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
16	400/220kV Sonepat Sub-station	Commissioned: 6 Under Implementation:2 Total: 8	Utilized: 2 Unutilized: 4 Under Implementation:2	• Sonepat - HSIISC Rai 220kV D/c line	-	Updated in 205th OCC by HVPNL. **Status:** Due to non-performance of work of 220KV GIS Rai S/Stn, the Contract has been terminated & blacklisted by O/o XEN/WB O/o CE/PD&C, HVPNL, Panchkula vide Ch-100/HDP-2418/REC-254/Xen(WB) Dated 24.02.2023. Now pending work will be caried out by HVPNL/ Departmentely
				• Sonepat - Kharkhoda Pocket A 220kV D/c line	31.07.2024	Updated in 205th OCC by HVPNL. **Status:** The Possession of land for construction of 220KV S/Stn. Pocket-A i.e 6.33 Acres and for Pocket-B is 5.55 Acres has been taken over by HVPNL. Work order yet to be issued by O/o CE/PD&C, Panchkula for construction of 2 no. 220KV GIS S/Stn Pocket-A & Pocket-B.
17	400/220kV Neemrana Sub-station	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• LILO of Bhiwadi - Neemrana 220kV S/c line at Neemrana (PG)	-	Work order is finalized as updated in 201st OCC by RVPNL. 5 months from layout finalization.
18	400/220kV Kotputli Sub-station	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• Kotputli - Pathreda 220kV D/c line	-	Bid documents under approval as updated in 195th OCC by RVPNL.
19	400/220kV Jallandhar Sub-station	Commissioned: 10 Total: 10	Utilized: 8 Unutilized: 2	• Network to be planned for 2 bays	May'24	LILO of 220 kV BBMB Jalandhar - Butari line at 400 kV PGCIL Jalandhar being planned. Work expected to be completed by May 2024. Updated in 198th OCC by PSTCL.
20	400/220kV Roorkee Sub-station	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• Roorkee (PG)-Pirankaliyar 220kV D/c line	Commissioned	Roorkee (PG)-Pirankaliyar 220kV D/c line comiisioned in 2020 as intimated by PTCUL in 197th OCC
21	400/220kV Lucknow Sub-station	Commissioned: 8 Total: 8	Utilized: 4 Unutilized: 4	• Network to be planned for 2 bays	25.08.2023	• Lucknow -Kanduni, 220 kV D/C line expected energization date Aug'23 updated by UPPTCL in 209th OCC due to sub-station commissioning delay _____ • No planning for 2 no. of bays upated by UPPTCL in 196th OCC. The same has been communicated to Powergrid.
22	400/220kV Gorakhpur Sub-station	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• Network to be planned for 2 bays	22.08.2023	• Gorakhpur(PG)- Maharajganj, 220 kV D/C line expected energization date is 22.08.2023 updated by UPPTCL in 210th OCC
23	400/220kV Fatehpur Sub-station	Commissioned: 8 Under Implementation:2 Total: 10	Utilized: 6 Unutilized: 2 Under Implementation:2	• Network to be planned for 2 bays	-	• UPPTCL intimated that 02 no. of bays under finalization stage. In 201st OCC, UPPTCL intimated that it is finalized that Khaga s/s will be connected (tentative time 1.5 years). _____ • No planning for 2 no. of bays updated by UPPTCL in 196th OCC. The same has been communicated to Powergrid.
24	400/220kV Abdullapur Sub-station	Commissioned: 10 Under Implementation:2 Total: 12	Utilized: 10 Unutilized: 0 Under Implementation:2	• Abdullapur – Rajokheri 220kV D/c line	Dec'23	SCDA System & PLCC work pending at 220 KV S/stn. Rajokheri Updated in 209th OCC by HVPNL
	400/220kV Panchkula	Commissioned: 8 Under tender:2 Total: 10	Utilized: 2 Unutilized: 4	• Panchkula – Pinjore 220kV D/c line	Sep'23	Updated in 205th OCC by HVPNL
				• Panchkula – Sector-32 220kV D/c line	Sep'23	Updated in 205th OCC by HVPNL
				• Panchkula – Raiwali 220kV D/c line	Commissioned	Updated in 194th OCC by HVPNL

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
25	400/220kV Panchkula Sub-station	Out of these 10 nos. 220kV Line Bays, 2 bays would be used by the lines being constructed by POWERGRID (Chandigarh-2) and balance 8 nos. bays would be used by HVPNL	Unutilized: 4 Under Implementation:2	• Panchkula – Sadhaura 220kV D/c line: Sep'23	Jul'24	Updated in 205th OCC by HVPNL
26	400/220kV Amritsar S/s	Commissioned:7 Approved in 50th NRPC- 1 no. Total: 8	Utilized: 6 Unutilized: 1 Approved in 50th NRPC- 1 no.	• Amritsar – Patti 220kV S/c line	31.07.2023	Route survey/tender under process. Updated in 209th OCC by PSTCL.
				• Amritsar – Rashiana 220kV S/c line (2 bays shall be required for above lines. However, 1 unutilized bay shall be used for Patti and requirement of one additional bay approved for Rashiana by NRPC)	15.08.2023	Route survey/tender under process. Work expected to be completed by 15th August 2023. Updated in 208th OCC by PSTCL.
27	400/220kV Bagpat S/s	Commissioned: 8 Total: 8	Utilized:6 Unutilized: 2	• Bagpat - Modipuram 220kV D/c line	Commissioned	Updated in 201st OCC by UPPTCL
28	400/220kV Bahardurgarh S/s	Commissioned: 4 Approved: 4 Total: 8	Utilized:2 Unutilized: 2	• LILO of 220 kV Nunamajra-Daultabad S/c line at 400 kV Bahadurgarh PGCIL	31.03.2024	Updated in 205th OCC by HVPNL. **Status:** Tentative route stands submitted by TS wing and accordingly BOQ has been submitted by design wing to contracts wing for award of work.
				• Bahadurgarh - METL 220kV D/c line (Deposit work of M/s METL)	31.03.2024	Updated in 205th OCC by HVPNL. **Status:** Tentative route stands submitted by TS wing and accordingly BOQ has been submitted by design wing to contracts wing for award of work.
				• Bahadurgarh - Kharkhoda Pocket B 220kV D/c line	31.07.2024	
29	400/220kV Jaipur (South) S/s	Commissioned: 4 Total: 4	Utilized:2 Unutilized: 2	• Network to be planned for 2 bays.	-	LILO case of 220 kV Dausa – Sawai Madhopur line at 400 kV GSS Jaipur South (PG) is under WTD approval as updated by RVPNL in 195th OCC
30	400/220kV Sohawal S/s	Commissioned: 8 Total: 8	Utilized: 8	• Sohawal - Barabanki 220kV D/c line	Commissioned	Energization date: 14.04.2018 updated by UPPTCL in 196th OCC
				• Sohawal - New Tanda 220kV D/c line	Commissioned	Energization date: 28.05.2019 updated by UPPTCL in 196th OCC
				• Network to be planned for 2 bays	Commissioned	• Sohawal - Gonda 220kV S/c line (Energization date: 27.04.2020) updated by UPPTCL in 196th OCC _____ • Sohawal - Bahraich 220kV S/c line (Energization date: 15.02.2021) updated by UPPTCL in 196th OCC
31	400/220kV, Kankroli	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• Network to be planned for 2 bays	-	RVPNL to update the status
32	400/220kV, Manesar	Commissioned: 8 Total: 8	Utilized: 4 Unutilized: 4	• Network to be planned for 2 bays	-	Status:- 2nos bays are being utilised for 220 kV D/C Panchgaon (PGCIL)-Panchgaon Ckt-I & 220 kV D/C Panchagon (PGCIL)-Panchgaon Ckt-II, charged on dated 05.09.2022 & 20.10.2022 respectively. The 2nos bays may be utilised by HVPNL in future.
33	400/220kV, Saharanpur	Commissioned: 6 Under Implementation:2 Total: 8	Utilized: 6 Unutilized: 0 Under Implementation:2	• Network to be planned for 2 bays	Commissioned	Saharanpur(PG)-Devband D/c line (Energization date: 20.04.2023) updated by UPPTCL in 207th OCC

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
34	400/220kV, Wagoora	Commissioned: 10 Total: 10	Utilized: 6 Unutilized: 4	• Network to be planned for 4 bays	-	PDD, J&K to update the status.
35	400/220kV, Ludhiana	Commissioned: 9 Total: 9	Utilized: 8 Unutilized: 1	• Network to be planned for 1 bay	Work completed but pending for FTC.	Direct circuit from 220 kV Lalton Kalan to Dhandari Kalan to be diverted to 400 kV PGCIL Ludhiana. Work completed but pending for first time charging.Updated in 209th OCC by PSTCL.
36	400/220kV, Chamba (Chamera Pool)	Commissioned: 3 Under tender:1 Total: 4	Utilized:3 Unutilized: 0 Under tender:1	• Stringing of 2nd ckt of Chamera Pool – Karian 220kV D/c line	-	Stringing of 2nd Circuit of Chamera Pool-Karian Tansmission line has been completed & terminal bay at 400/220 kV chamera pooling substation (PGCIL) is not ready.Updated in 198th OCC by HPPTCL
37	400/220kV, Mainpuri	Commissioned: 6 Under Implementation:2 Total: 8	Utilized: 6 Unutilized: 0 Under Implementation:2	• Network to be planned for 2 bays	-	• 02 no. of bays under finalization stage updated by UPPTCL in 196th OCC. Mainpuri S/s planned. Land is not finalized, therefore timeline not available as intimated by UPPTCL in 201st OCC.
38	400/220kV, Patiala	Commissioned: 8 Total: 8	Utilized: 6 Unutilized: 2	• Network to be planned for 2 bays	May'24	2 Nos. bays for 400 kV PGCIL Patiala - 220 kV Bhadson (D/C) line being planned. Work expected to be completed by May 2024. Updated in 198th OCC by PSTCL.

FGD Status

Updated status of FGD related data submission

NTPC (27.02.2023)
MEJA Stage-I
RIHAND STPS
SINGRAULI STPS
TANDA Stage-I
TANDA Stage-II
UNCHAHAR TPS
UPRVUNL (18.07.2023)
ANPARA TPS
HARDUAGANJ TPS
OBRA TPS
PARICHHA TPS

PSPCL (18.07.2023)
GGSSTP, Ropar
GH TPS (LEH.MOH.)
RRVUNL (09.07.2023)
CHHABRA SCPP
CHHABRA TPP
KALISINDH TPS
KOTA TPS
SURATGARH SCTPS
SURATGARH TPS

Updated status of FGD related data submission

Lalitpur Power Gen. Co. Ltd. (17.10.2022)
Lalitpur TPS
Lanco Anpara Power Ltd. (18.06.2022)
ANPARA-C TPS

HGPCL (14.09.2022)
PANIPAT TPS
RAJIV GANDHI TPS
YAMUNA NAGAR TPS

Adani Power Ltd. (18.02.2022)
KAWAI TPS

Rosa Power Supply Company (18.06.2022)
Rosa TPP Phase-I
Prayagraj Power Generation Company Ltd. (17.10.2022)
Prayagraj TPP
APCPL (25.02.2022)
INDIRA GANDHI STPP

Pending submissions

GVK Power Ltd.
GOINDWAL SAHIB

NTPC
DADRI (NCTPP)
Talwandi Sabo Power Ltd.
TALWANDI SABO TPP
L&T Power Development Ltd.
Nabha TPP (Rajpura TPP)

Target Dates for FGD Commissioning (Utility-wise)

Adani Power Ltd.	KAWAI TPS U#1 (Target: 31-12-2024), KAWAI TPS U#2 (Target: 31-12-2024)
APCPL	INDIRA GANDHI STPP U#1 (Target: 31-01-2022), INDIRA GANDHI STPP U#2 (Target: 30-09-2023), INDIRA GANDHI STPP U#3 (Target: 30-06-2023)
GVK Power Ltd.	GOINDWAL SAHIB U#1 (Target: 30-04-2020), GOINDWAL SAHIB U#2 (Target: 29-02-2020)
HGPCL	PANIPAT TPS U#6 (Target: 31-12-2022), PANIPAT TPS U#7 (Target: 31-12-2022), PANIPAT TPS U#8 (Target: 31-12-2022), RAJIV GANDHI TPS U#1 (Target: 31-12-2024), RAJIV GANDHI TPS U#2 (Target: 31-12-2024), YAMUNA NAGAR TPS U#1 (Target: 31-12-2024), YAMUNA NAGAR TPS U#2 (Target: 31-12-2024)

NTPC	DADRI (NCTPP) U#1 (Target: 31-12-2020), DADRI (NCTPP) U#2 (Target: 31-10-2020), DADRI (NCTPP) U#3 (Target: 31-08-2020), DADRI (NCTPP) U#4 (Target: 30-06-2020), DADRI (NCTPP) U#5 (Target: 30-06-2022), DADRI (NCTPP) U#6 (Target: 31-03-2023), RIHAND STPS U#1 (Target: 31-10-2025), RIHAND STPS U#2 (Target: 30-06-2026), RIHAND STPS U#3 (Target: 31-12-2024), RIHAND STPS U#4 (Target: 31-03-2025), RIHAND STPS U#5 (Target: 30-06-2025), RIHAND STPS U#6 (Target: 31-10-2025), SINGRAULI STPS U#1 (Target: 31-12-2024), SINGRAULI STPS U#2 (Target: 31-12-2024), SINGRAULI STPS U#3 (Target: 31-12-2024), SINGRAULI STPS U#4 (Target: 31-12-2024), SINGRAULI STPS U#5 (Target: 31-03-2025), SINGRAULI STPS U#6 (Target: 31-06-2024), SINGRAULI STPS U#7 (Target: 31-03-2024), UNCHAHAR TPS U#1 (Target: 31-12-2023), UNCHAHAR TPS U#2 (Target: 31-12-2023), UNCHAHAR TPS U#3 (Target: 30-09-2023), UNCHAHAR TPS U#4 (Target: 30-09-2023), UNCHAHAR TPS U#5 (Target: 30-09-2023), UNCHAHAR TPS U#6 (Target: 31-08-2022), MEJA Stage-I U#1 (Target: 31-10-2023), MEJA Stage-I U#2 (Target: 30-06-2023), TANDA Stage-I U#3 (Target:), TANDA Stage-I U#4 (Target:), TANDA Stage-II U#3 (Target: 31-03-2023), TANDA Stage-II U#4 (Target: 30-09-2023)

L&T Power Development Ltd (Nabha)	Nabha TPP (Rajpura TPP) U#1 (Target: 30-04-2021), Nabha TPP (Rajpura TPP) U#2 (Target: 28-02-2021)
Lalitpur Power Gen. Company Ltd.	LALITPUR TPS U#1 (Target: 31-12-2026), LALITPUR TPS U#2 (Target: 30-09-2026), LALITPUR TPS U#3 (Target: 30-06-2026)
Lanco Anpara Power Ltd.	ANPARA C TPS U#1 (Target: 31-12-2023), ANPARA C TPS U#2 (Target: 31-12-2023)
Prayagraj Power Generation Company Ltd.	PRAYAGRAJ TPP U#1 (Target: 31-12-2024), PRAYAGRAJ TPP U#2 (Target: 31-12-2024), PRAYAGRAJ TPP U#3 (Target: 31-12-2024)
PSPCL	GH TPS (LEH.MOH.) U#1 (Target: 31-12-2026), GH TPS (LEH.MOH.) U#2 (Target: 31-12-2026), GH TPS (LEH.MOH.) U#3 (Target: 31-12-2026), GH TPS (LEH.MOH.) U#4 (Target: 31-12-2026), GGSSTP, Ropar U#3 (Target: 31-12-2026), GGSSTP, Ropar U#4 (Target: 31-12-2026), GGSSTP, Ropar U#5 (Target: 31-12-2026), GGSSTP, Ropar U#6 (Target: 30-12-2026)

Rosa Power Supply Company	ROSA TPP Ph-I U#1 (Target: 31-12-2026), ROSA TPP Ph-I U#2 (Target: 31-12-2026), ROSA TPP Ph-I U#3 (Target: 31-12-2026), ROSA TPP Ph-I U#4 (Target: 31-12-2026)
RRVUNL	KOTA TPS U#5 (Target: 31-08-2024), KOTA TPS U#6 (Target: 31-08-2024), KOTA TPS U#7 (Target: 31-08-2024), SURATGARH TPS U#1 (Target: 31-12-2026), SURATGARH TPS U#2 (Target: 31-12-2026), SURATGARH TPS U#3 (Target: 31-12-2026), SURATGARH TPS U#4 (Target: 31-12-2026), SURATGARH TPS U#5 (Target: 31-12-2026), SURATGARH TPS U#6 (Target: 31-12-2026), SURATGARH SCTPS U#7 (Target: 28-02-2025), SURATGARH SCTPS U#8 (Target: 28-02-2025), CHHABRA TPP U#1 (Target: 31-12-2026), CHHABRA TPP U#2 (Target: 31-12-2026), CHHABRA TPP U#3 (Target: 31-12-2026), CHHABRA TPP U#4 (Target: 31-12-2026), CHHABRA SCPP U#5 (Target: 28-02-2025), CHHABRA SCPP U#6 (Target: 28-02-2025), KALISINDH TPS U#1 (Target: 28-02-2025), KALISINDH TPS U#2 (Target: 28-02-2025)
Talwandi Sabo Power Ltd.	TALWANDI SABO TPP U#1 (Target: 28-02-2021), TALWANDI SABO TPP U#2 (Target: 31-12-2020), TALWANDI SABO TPP U#3 (Target: 31-10-2020)
UPRVUNL	ANPARA TPS U#1 (Target: 31-12-2023), ANPARA TPS U#2 (Target: 31-12-2023), ANPARA TPS U#3 (Target: 31-12-2023), ANPARA TPS U#4 (Target: 31-12-2023), ANPARA TPS U#5 (Target: 31-12-2023), ANPARA TPS U#6 (Target: 31-12-2023), ANPARA TPS U#7 (Target: 31-12-2023), HARDUAGANJ TPS U#8 (Target: 31-12-2024), HARDUAGANJ TPS U#9 (Target: 31-12-2024), OBRA TPS U#9 (Target: 31-12-2024), OBRA TPS U#10 (Target: 31-12-2024), OBRA TPS U#11 (Target: 31-12-2024), OBRA TPS U#12 (Target: 31-12-2024), OBRA TPS U#13 (Target: 31-12-2024), PARICHHA TPS U#3 (Target: 30-04-2022), PARICHHA TPS U#4 (Target: 31-12-2024), PARICHHA TPS U#5 (Target: 31-12-2024), PARICHHA TPS U#6 (Target: 31-12-2024)

Annexure-A.II

MIS Report for Status of Islanding Schemes

Implemented Schemes

Sl. No.	Islanding Scheme	SLDC	Status	Submission of Self Certification of Healitheness	SOP	SCADA Display Page	Remarks
1	NAPS IS	UP	Implemented	Yes (08-10-2021)	Yes	Yes	-
2	RAPS IS	Rajasthan	Implemented	16-Aug-21	Yes	Yes	List of officials in-charge, format for generation, islanding scheme sld and relays in RAPP IS submitted by RVPN on 04.12.2021.

Under Implementation/ Newly Proposed/Under Discussion

Sl. No.	Islanding Scheme	SLDC	Status	Details of progress	DPR for PSDF funding (Require	Timelines Status - Proposed/Actual									
						Study		Design		Approval		Procurement		Commissioning	
						Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual
1	Lucknow-Unchahar IS	UP	Under Implementation	Scheme has been approved in 59th NRPC meeting held on 31.10.2022. Relay Procurement is under progress. Scheme Implementation timeline : September,2023		-		-	-	-	-	-	-	-	-
2	Agra IS	UP	Under Study	UP has placed offer to CPRI for dynamic study in July, 2022. The estimated time of study is 5 months from date of acceptance.A meeting was taken up with UP on 02.08.2023. Changes are suggested in Study report of CPRI. Final Study report is pending.		-		-	-	-	-	-	-	-	-
3	Jodhpur-Barmer-Rajwest IS	Rajasthan	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022.Preparation of DPR is under finalization. Scheme implementation timeline: October,2023	-	-		-	-	-	-	-	-	-	-
4	Suratgarh IS	Rajasthan	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. SCADA display implementation timeline: Dec, 2022; Scheme implementation timeline: October,2023	-	-		-	-	-	-	-	-	-	-
5	Patiala-Nabha Power Rajpura IS	Punjab	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. Implementation timeline: December,2023		-		-	-	-	-	-	-	-	-
6	Pathankot-RSD IS	Punjab	Implemented	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. Scheme has been implemented in April 2023 as informed by Punjab in 206th OCC. Testing Reports submitted by Punjab.		-		-	-	-	-	-	-	-	-
7	Kullu-Manali-Mandi IS	HP	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. Timeline to be intimated by HPSLDC		-		-	-	-	-	-	-	-	-
8	Shimla-Solan IS	HP	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. Timeline to be intimated by HPSLDC		-		-	-	-	-	-	-	-	-
9	Delhi IS	Delhi	Under Implementation	Scheme has been approved in 68th NRPC meeting held on 18.08.2023. Timeline to be intimated by DTL		-		-	-	-	-	-	-	-	-

List of stations in Northern Region whose data for Gen. Prg. 2024-25 not received (Status As on 12-9-23)

STATIONID	STATIONNAME	CAP	STN_TYPE_ID	SECTOR_TYPE	REGION_NM	ST_NM	SH_NM	FUEL_NM
100137	ANPARA C TPS	1200	THERMAL	IPP SECTOR	Northern	Uttar Pradesh	LAPPL	COAL
100030	ANPARA TPS	2630	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100663	ANTA CCPP	419.33	THERMAL	CENTRAL SECTOR	Northern	Rajasthan	NTPC Ltd.	NATURAL GAS
100664	AURAIYA CCPP	663.36	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	NATURAL GAS
100313	BARSINGSAR LIGNITE	250	THERMAL	CENTRAL SECTOR	Northern	Rajasthan	NLC	LIGNITE
100778	BETA CCPP	0	THERMAL	IPP SECTOR	Northern	Uttarakhand	BIPL	NATURAL GAS
100726	DADRI CCPP	829.78	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	NATURAL GAS
100152	DADRI (NCTPP)	1820	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	COAL
100669	DAE (RAJASTHAN)	100	NUCLEAR	CENTRAL SECTOR	Northern	Rajasthan	DAE	NUCLEAR
100727	FARIDABAD CCPP	431.59	THERMAL	CENTRAL SECTOR	Northern	Haryana	NTPC Ltd.	NATURAL GAS
100843	GHATAMPUR TPP	0	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NUPPL	COAL
100156	HARDUAGANJ TPS	1265	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100842	JAWAHARPUR STPP	0	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100797	MEJA STPP	1320	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	MUNPL	COAL
100841	OBRA-C STPP	0	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100148	OBRA TPS	1000	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100711	PAMPORE GPS (Liq.)	175	THERMAL	STATE SECTOR	Northern	Jammu and Kashmir	JKSPDC	HIGH SPEED DIESEL
100850	PANKI TPS EXT	0	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100317	PARICHHA TPS	1140	THERMAL	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	COAL
100616	PRAYAGRAJ TPP	1980	THERMAL	IPP SECTOR	Northern	Uttar Pradesh	PPGCL (Jaypee)	COAL
100422	RIHAND STPS	3000	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	COAL
100423	SINGRAULI STPS	2000	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	COAL
100440	TANDA TPS	1760	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	COAL
100441	UNCHAHAR TPS	1550	THERMAL	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	COAL

Annexure-B.I

Assessment of Generation backdown of n-2 SPS requirement for 765kV lines of Rajasthan RE pocket

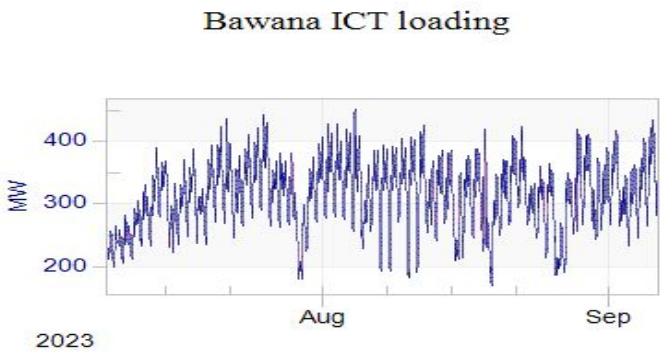
Basecase assumption

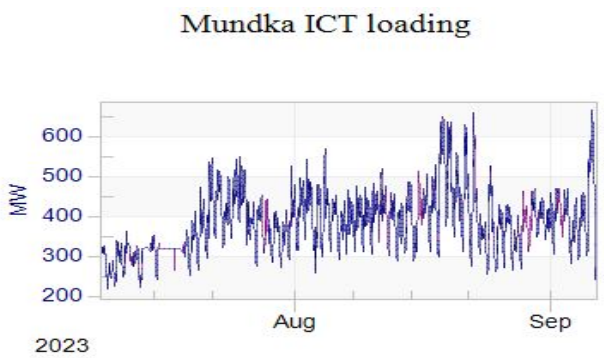
400kV Bhadla(RS)-Bikaner(RS) D/C	in service
400kV Bikaner(PG)-Bikaner_2(PG) D/C	in service
STATCOM -1 and 2 @ Bhadla_2	in service
STATCOM-1 @ Bikaner_2	in service
All 400kV lines presently out in Rajasthan	in service
Rajasthan demand	15500 MW
Raj Solar	3400 MW
Raj Wind	1500 MW

Result :

Contingency / Line Loading	Loading of 765kV Fatehgarh2-Bhadla2 D/C > 2000 MW and < 2200 MW	[Loading of 765 kV Fatehgarh2-Bhadla D/C > 1350 and < 1450] or [Loading of 765kV Fatehgarh2_Bhadla2 D/C > 2200 And < 2400]	[Loading of 765 kV Fatehgarh_2-Bhadla D/C > 1450] or [Loading of 765kV Fatehgarh2_Bhadla2 D/C > 2400] or [Loading of 765kV Bhadla2-Ajmer D/C > 3200]
765kV Fatehgarh2-Bhadla D/C	no SPS required	200 MW generation backdown at Fatehgarh-1/2	500 MW backing at Fatehgarh-1/2
765kV Fatehgarh2-Bhadla2 D/C	100 MW backing at Fatehgarh_1	500 MW backing at Fatehgarh-1/2	800 MW backing at Fatehgarh-1/2
765kV Bhadla-Bikaner D/C	no SPS required	no SPS required	no SPS required
765kV Bhadla2-Bikaner D/C	no SPS required	no SPS required	no SPS required
765kV Bhadla2-Ajmer D/C	no SPS required	400 MW backing at Bhadla_2 (due to overloading of Jodhpur-Kankroli/ Bhadla-Jodhpur)	500 MW backing at Bhadla_2 (due to overloading of Jodhpur-Kankroli/ Bhadla-Jodhpur)
765kV Bikaner- Moga D/C	no SPS required	no SPS required	no SPS required
765kV Bikaner- Khetri D/C	no SPS required	no SPS required	no SPS required

Delhi ICT Loading last 2 months





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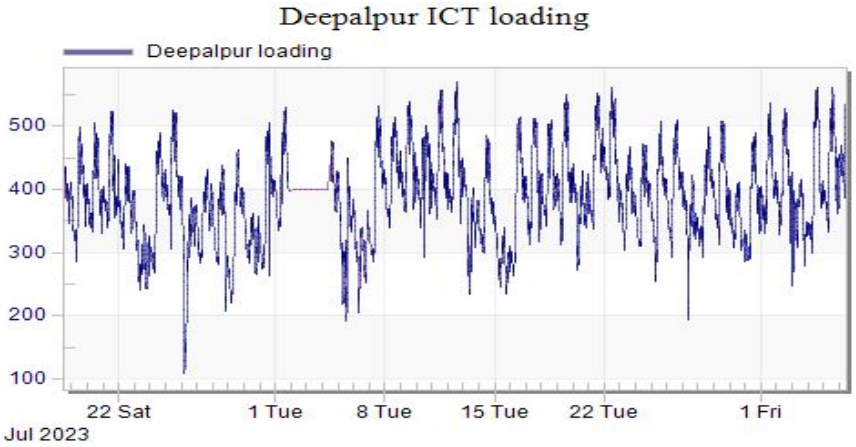

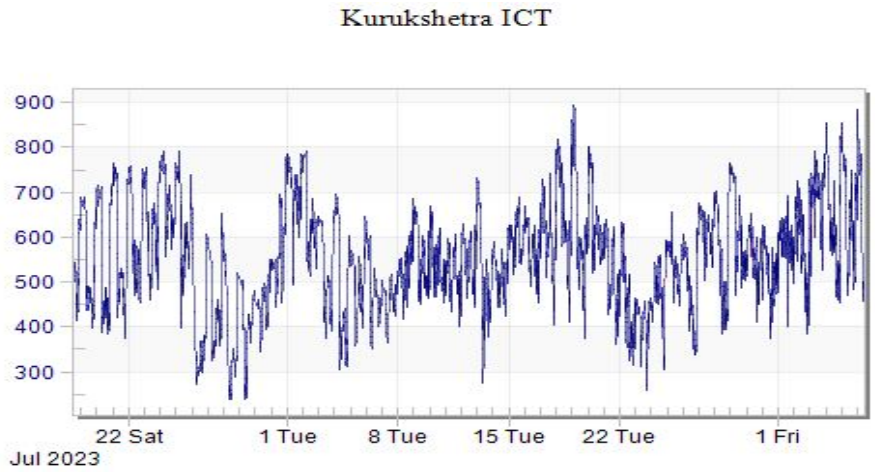

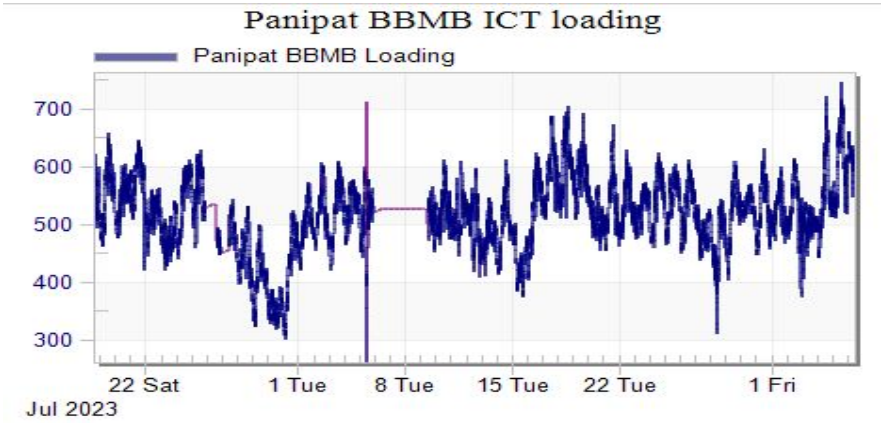
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Panipat BBMB Loading
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300
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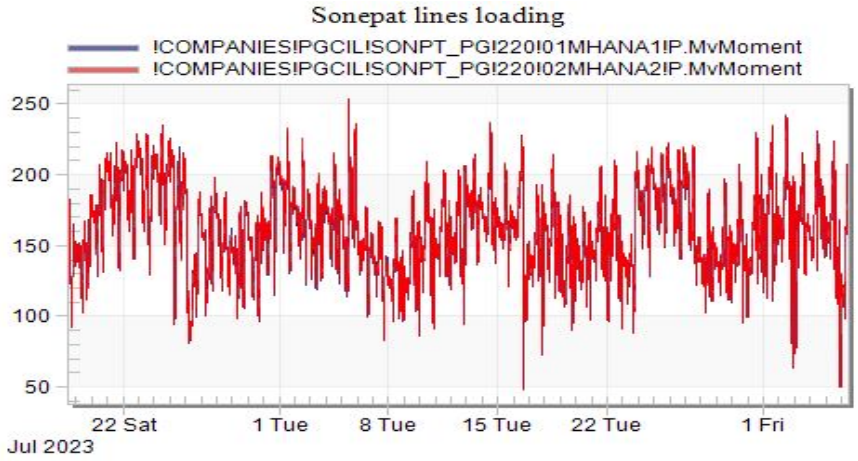
1 Tue
8 Tue
15 Tue
22 Tue
1 Fri
Jul 2023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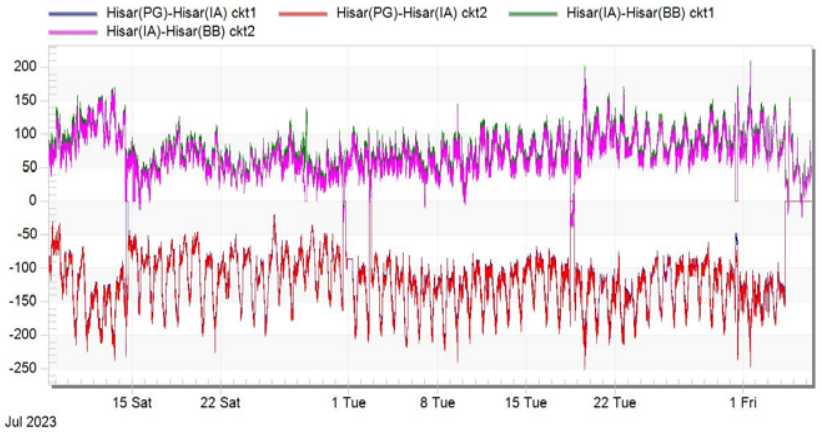
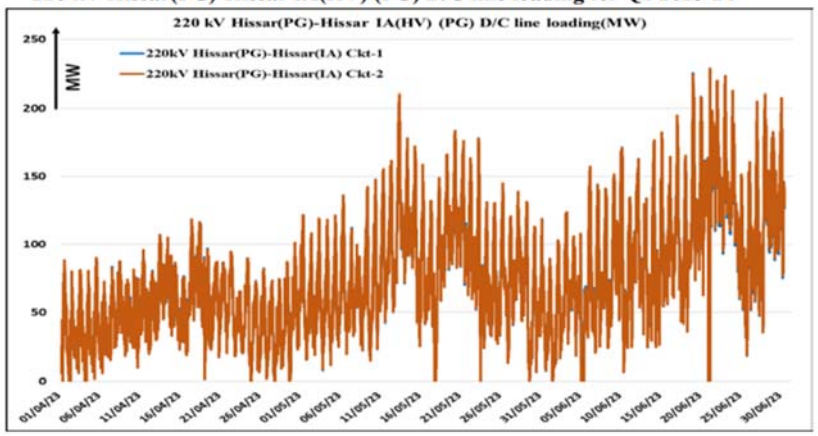
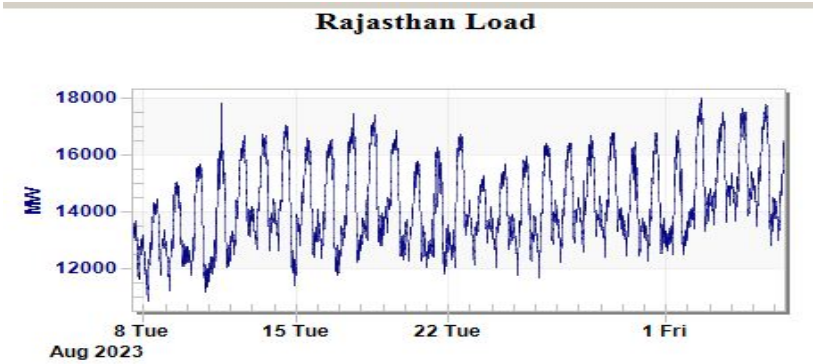
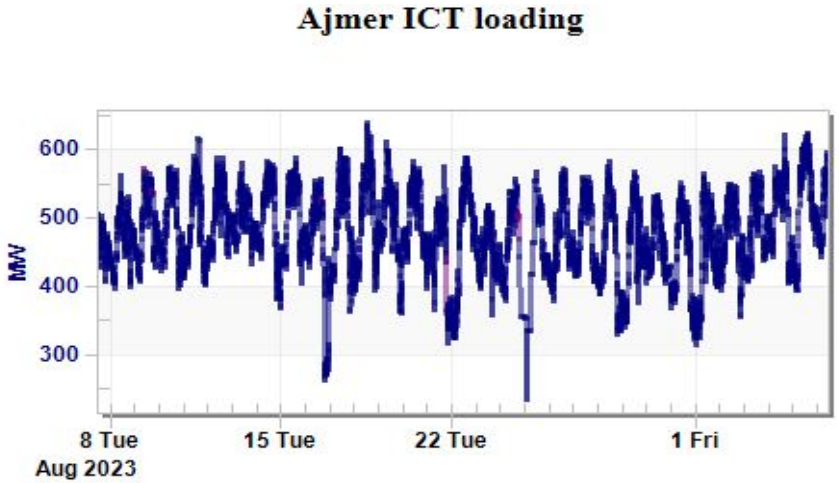


220 kV Hissar(PG)-Hissar IA(HV) (PG) D/C line loading for Q1 2023-24



Rajasthan ICT Loading last 30 days





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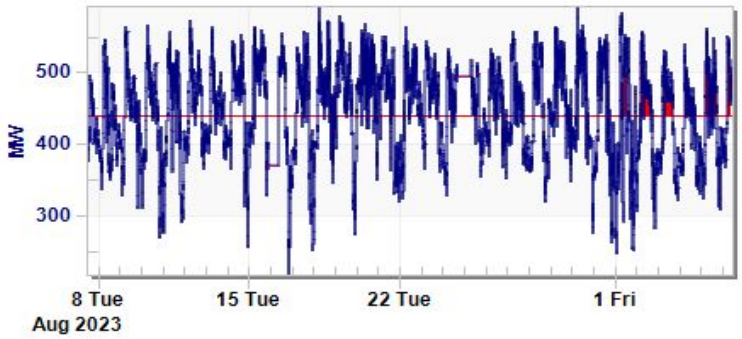

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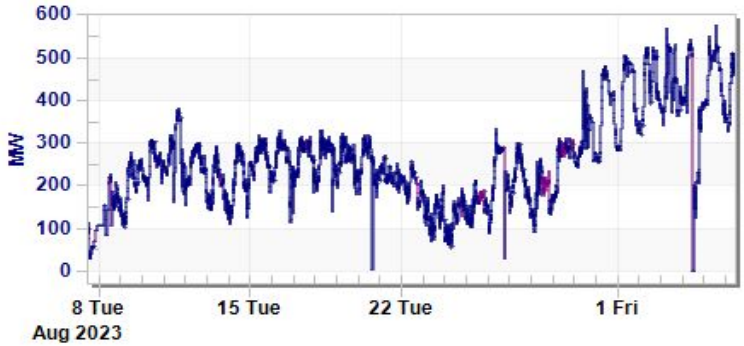

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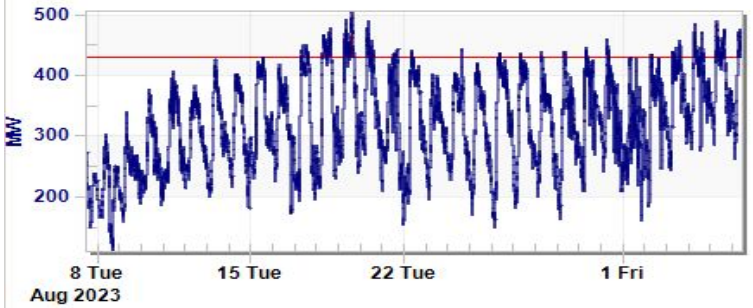

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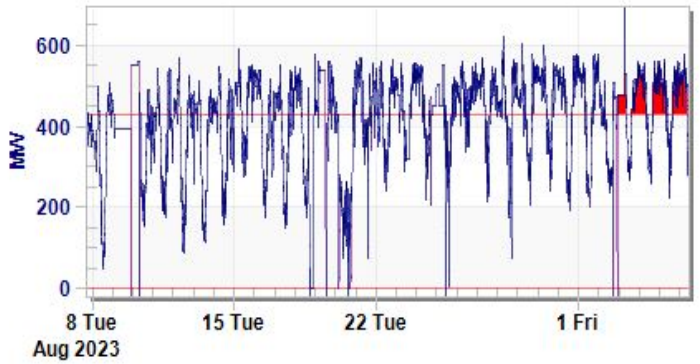
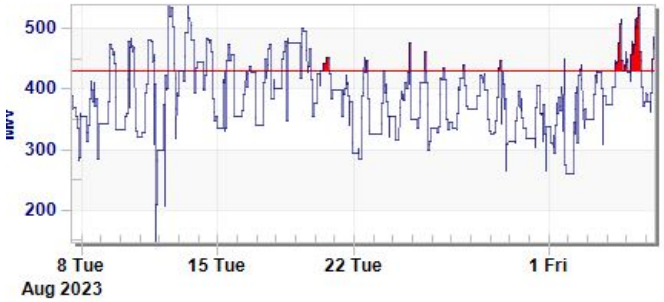
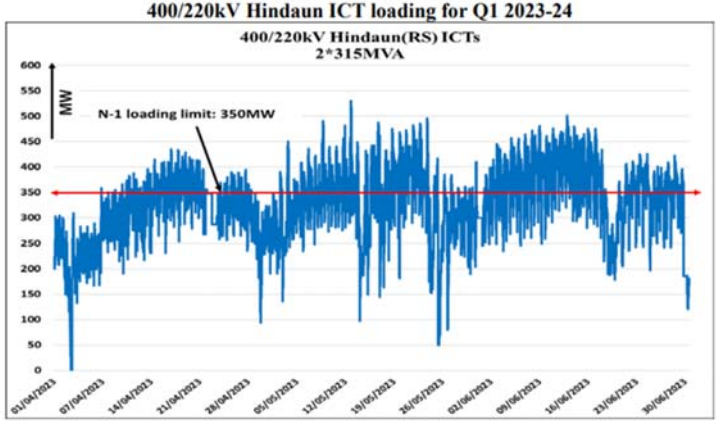
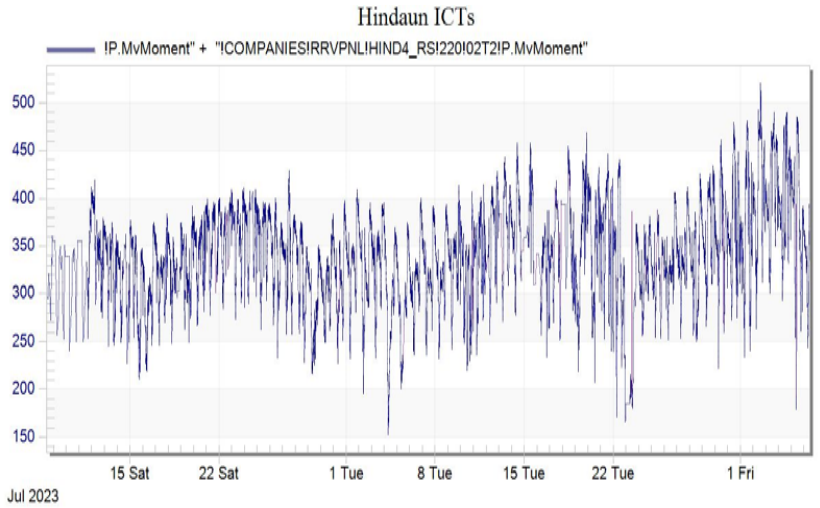


Bhilwara ICT loading



400/220kV Hindaun ICT loading for Q1 2023-24

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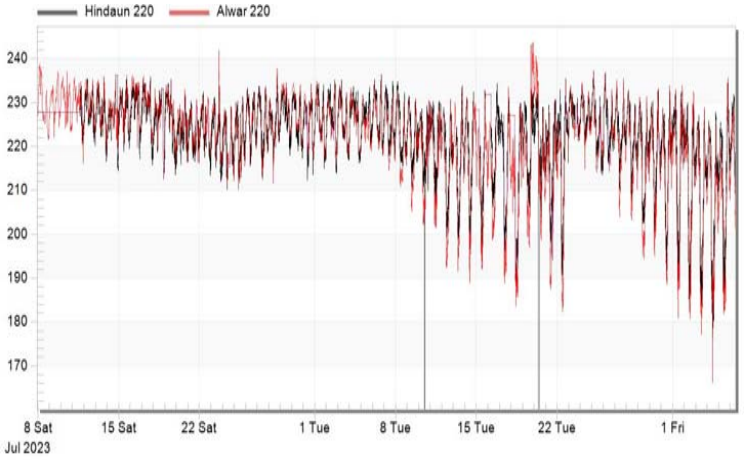
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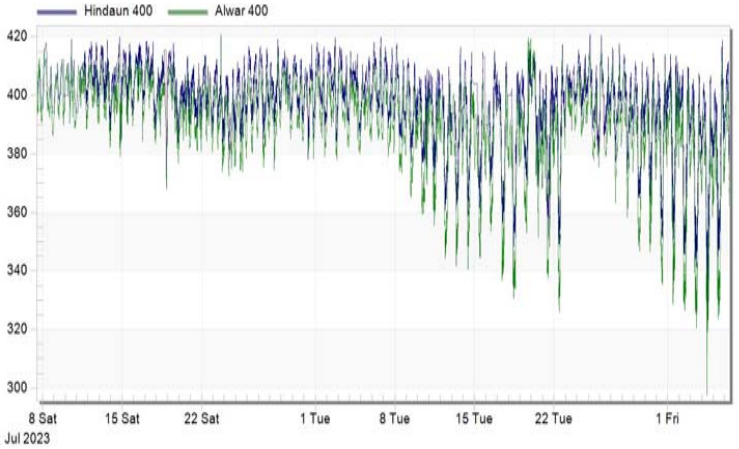
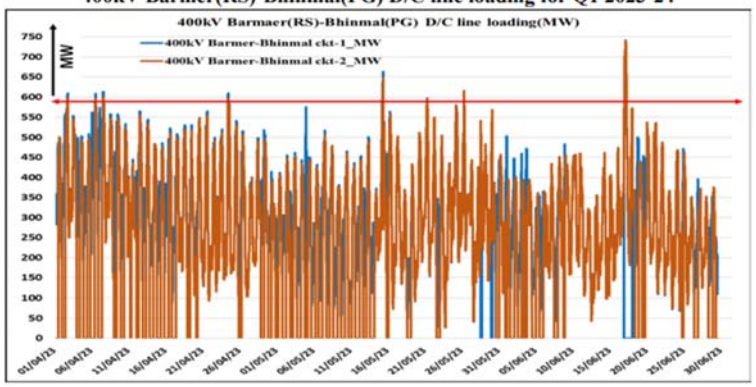


400kV Barmer(RS)-Bhinmal(PG) D/C line loading for Q1 2023-24



Voltage variations at 400kV Hindaun(RS) for Q1 2023-24

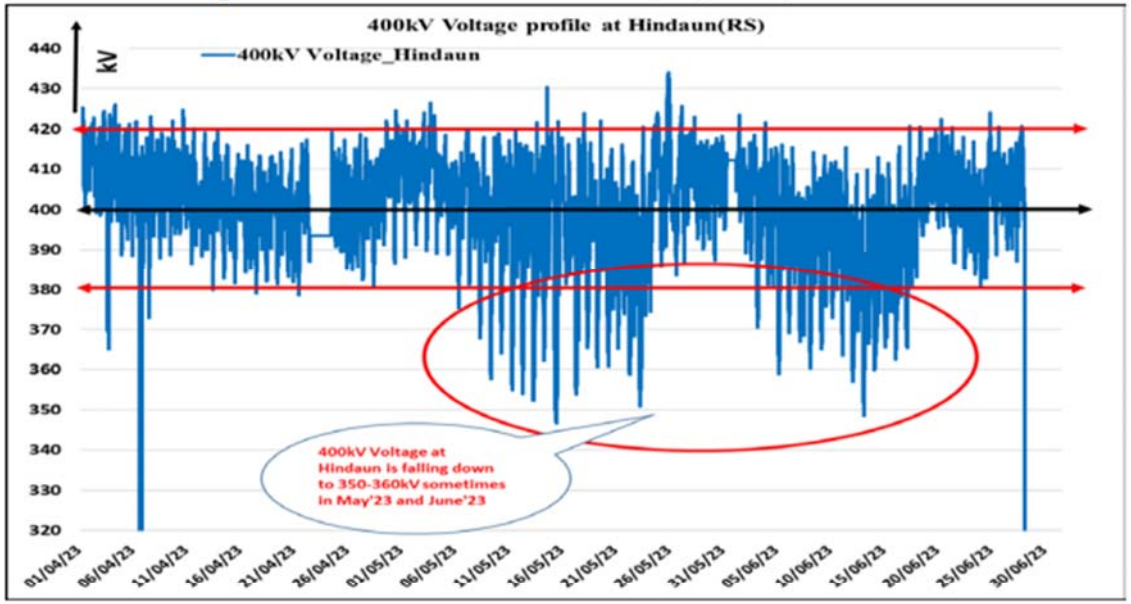
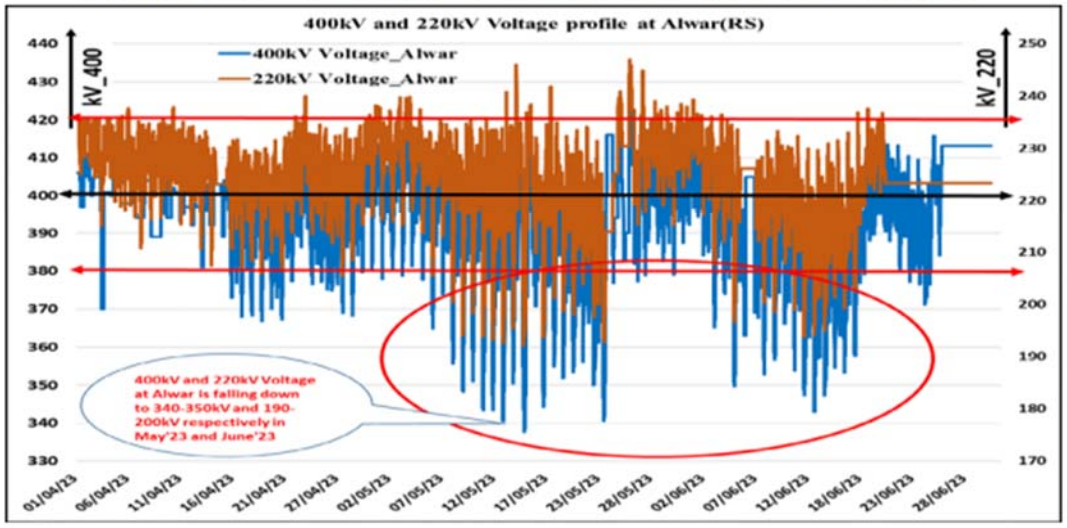


Figure C1

Voltage variations at 400kV and 220kV Alwar(RS) for Q1 2023-24



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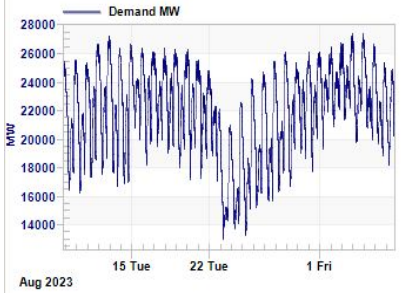

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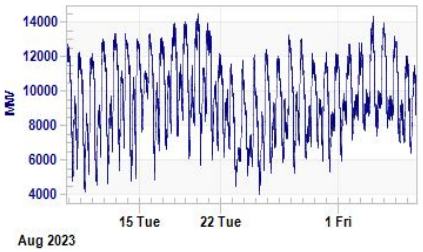
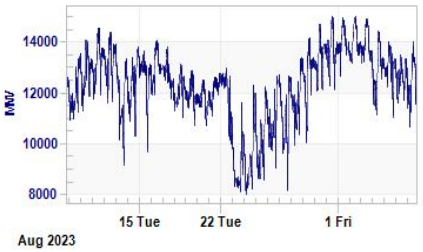
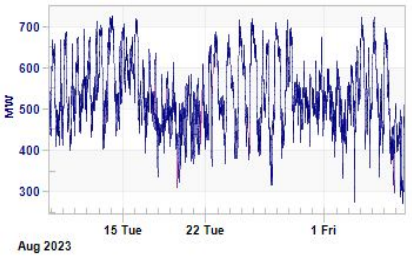


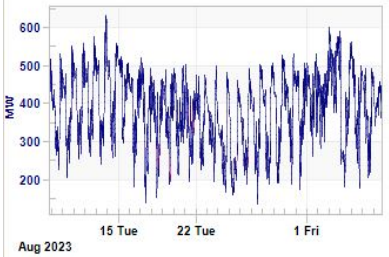
UP own generation



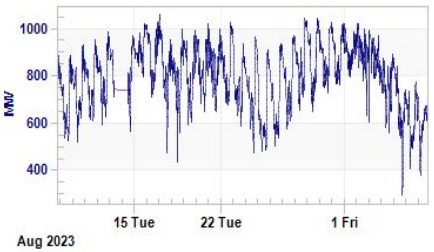
Obra ICT loading



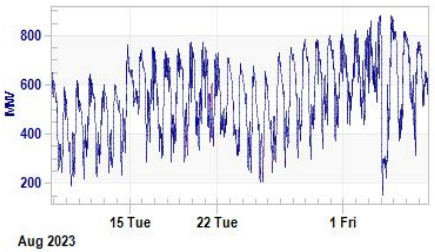
Azamgarh ICT loading



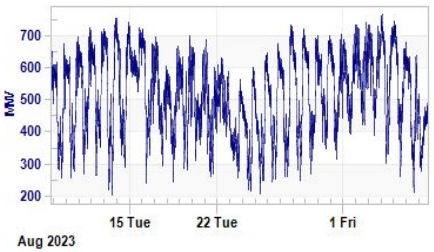
Sarnath ICT loading



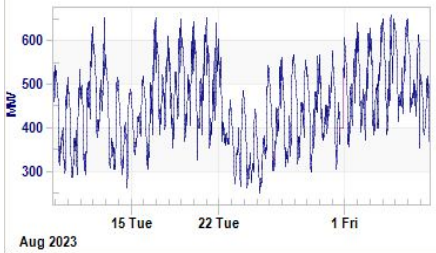
Gorakhpur UP ICT loading



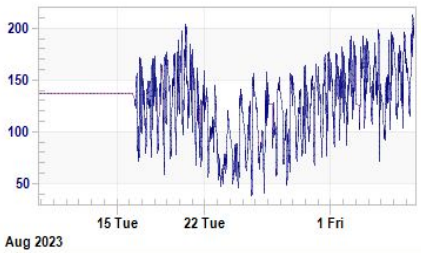
Allahabad ICT loading



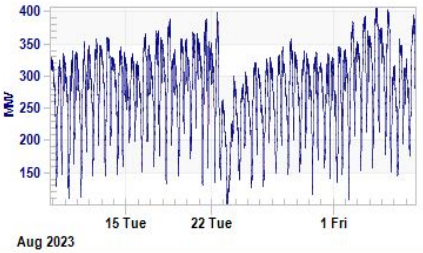
Lucknow(PG) ICT loading



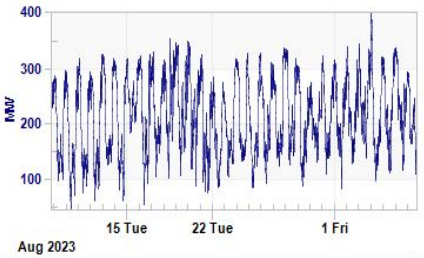
Nehtaur ICT loading



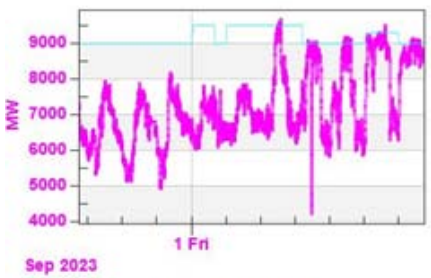
Agra(PG) ICT loading



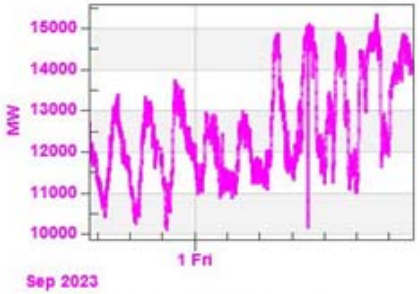
Sohawal ICT loading



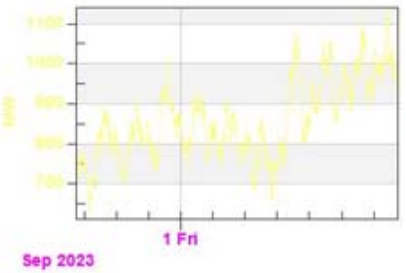
Punjab Import



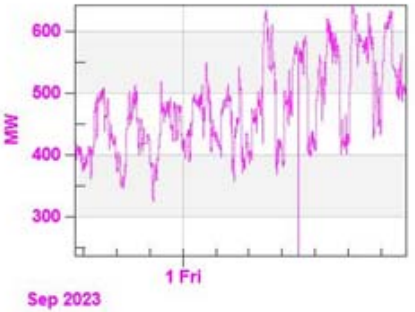
Punjab load



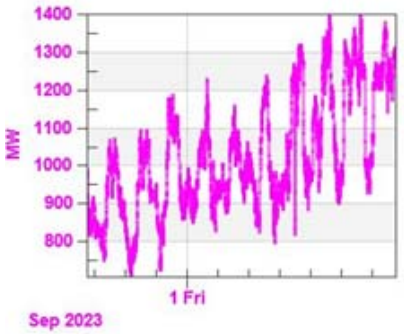
Rajpura ICT load



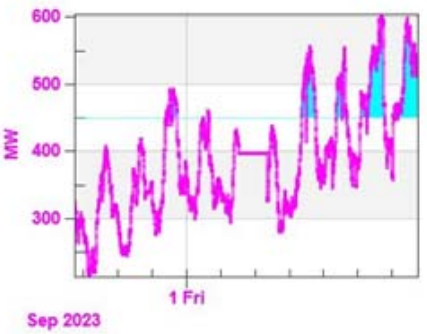
Patiala ICT load



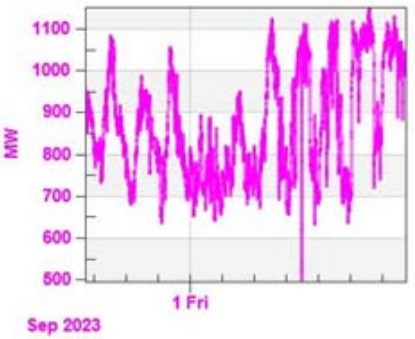
Ludhiana ICT load



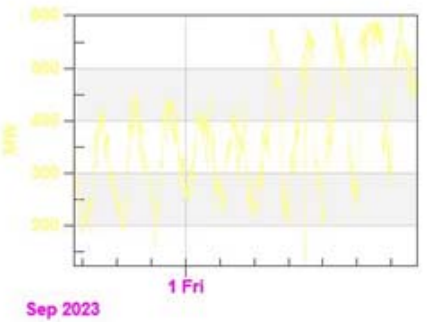
Nakodar ICT load



Moga ICT load



Patran ICT load



ग्रिड-इंडिया GRID-INDIA

ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
GRID CONTROLLER OF INDIA LIMITED
(A Government of India Enterprise)
[formerly Power System Operation Corporation Limited (POSOCO)]
उत्तर क्षेत्रीय भार प्रेषण केन्द्र / Northern Regional Load Despatch Centre

कार्यालय: 18-ए, शहीद जीत सिंह सनसनवाल मार्ग, कटवारिया सराय, नई दिल्ली -110016
Office : 18-A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi-110016
CIN : U40105DL2009GOI188682, Website : www.nrldc.in, E-mail : nrldc@grid-india.in, Tel.: 011- 26854015, 40224603

संदर्भ संख्या: NRLDC\TS-24\1171 दिनांक: 25 अगस्त 2023
25/8/2023

सेवा में,

Chairman & Managing Director,
Rajasthan Rajya Vidyut Prasaran Nigam Limited
Vidyut Bhawan, Janpath,
Jaipur-302005

विषय: Expeditious actions to ensure reliability and security of Rajasthan regional grid

References: **1. NRLDC letter (Ref no. NRLDC/TS-24/11-17/ dated 04.01.2023)**
2. NRLDC letter (Ref no. NRLDC/TS-24/42-45 dated 13.01.2023)
3. NRLDC letter (Ref no. NRLDC/ TS-24/1348 dated 23.11.2022)

महोदय,

Since last few years demand trend of Rajasthan is remaining high even during Jun-Sep months apart from the traditional Nov-Feb months. As you are aware, the grid operation related constraints that persisted during last winter season (which were highlighted vide above NRLDC communications) have resurfaced now during the month of August also. Most critical among these issues, as seen from the regional power system operator's view-point are brought out below (details attached as Annexure):

1) Continuous N-1 non-compliance issues at ICT level in most of the RVPN substations are often leading to major trippings (sometimes cascade trippings) resulting in substantial load loss in major load centres. Recent cases of tripping event at 400/220kV Bikaner (load loss of 500MW on 20.08.2023), at Heerapura/Babai/Sawai Madhopur (load loss of 1750MW on 21.08.2023) are consequence of N-1 non-compliance.
2) Sustained low voltage operations in several Rajasthan system pockets, like voltage dropping to 340 & 330 kV level at the 400kV Hindaun & Alwar substations respectively, are leading to risky & vulnerable grid operation, apart from the more serious concerns in the down-stream distribution sector.
3) Huge MVar drawl by RVPN network leading to very poor power factor at number of substations like Bikaner, Merta, Bhinmal(PG) etc. have resulted in the Rajasthan grid (in pockets) operating without any margin or reliability. These days, very often the reactive energy drawal from 400/220kV ICTs at some stations such as Bikaner (RVPN) in Rajasthan is equal or more than the corresponding active energy drawal, leading to grid reliability issue in EHV transmission system.

Even if the on-going crisis situation eases out in coming weeks without any mishap, the systemic shortcomings are likely to impair the grid operations during the coming winter season, when the severe transmission related constraints in state grid would compromise safe & reliable operations. In the above backdrop, we are of the opinion that following corrective measures by RVPN may moderate the looming crisis situation in grid operations to a large extent until more long term corrective measures come into action:

पंजीकृत कार्यालय : प्रथम तल, बी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016
Registered Office : First Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016

1) Expediting commissioning of new ICTs at 400/220kV substations having serious N-1 violations, in line with the decision in the 62nd & 64th NRPC meetings held on 31.01.23 & 24.03.23 respectively, as the present SPS (Special protection schemes) in operation on 400/220kV ICTs in Rajasthan seem to be feeble. Prioritising transformation capacities augmentation in critical stations like 400/220kV Chittorgarh, Hindaun, Ajmer, Jodhpur and Bikaner may be a prudent approach to face the challenge.
2) Expediting commissioning of capacitor banks at various substations of RVPN and DISCOMs, in line with the decision in the 68th NRPC meeting held on 18.08.2023. The Hindaun/Alwar/Gangapur City/ Dholpur pocket loads (in Jaipur Discom area) fed from 400/220kV Hindaun & Alwar EHV Stations may be considered on priority to safeguard the transmission system reliability.
3) In line with the discussion in the 64th NRPC meeting held on 24.03.2023, expediting the commissioning of planned STATCOMs at RVPN substations (for improvement in voltage in Western Rajasthan) & 400/220kV Dholpur GSS(for improvement in voltage in Hindaun/Alwar area)
4) Enforcing the CEA technical standards on the intra-state RE generators in respect of their participation in reactive energy management at point-of-connection level, as is being practised in case of ISGS RE generators. Their participation is expected to bolster the voltage profile in Bikaner/Bhadla areas.
5) More meticulous planning for & close monitoring of the load management & voltage profile management in the Rajasthan grid till above long term measures are implemented.

Therefore it is requested that appropriate actions for meeting the challenge at hand and for the upcoming winter season may please be taken up on priority in order to ensure that the state grid continue to operate without compromising on the system safety & reliability.

धन्यवाद,

भवदीय

25/8/2023

(नबारून रॉय)
कार्यकारी निदेशक

प्रतिलिपि विनम्र सूचनार्थ:

1. सदस्य (ग्रिड संचालन एवं वितरण), केंद्रीय विद्युत प्राधिकरण, सेवा भवन, आर.के.पुरम, सेक्टर-1, नई दिल्ली-110 066
2. अध्यक्ष एवं प्रबंध निदेशक, ग्रिड-इंडिया, बी-9 कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016
3. निदेशक (प्रणाली प्रचालन) ग्रिड-इंडिया, बी-9 कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016
4. सदस्य सचिव, एन°आर°पी°सी°, 18 ए, SJSS मार्ग, कटवारिया सराय, नई दिल्ली- 110 016
5. मुख्य अभियंता (एलडी), राजस्थान राज्य विद्युत प्रसारण निगम लिमिटेड, विद्युत भवन, जनपथ, जयपुर -302005

Annexure

Issues related to Rajasthan State control area

N-1 non-compliance of 400/220kV ICTs:

Loading of 400/220kV Inter ConnectedTransformers (ICTs) across major RVPN substations is observed to be beyond the N-1 contingency limits at the time when demand is slightly on the higher side (>14500MW). Based on data of August 2023, N-1 non-compliance is observed at following 400/220kV ICTs:

Name of Substation	MVA Capacity	Total Loading (MW) (variations throughout day)	SPS Status*	ICT Capacity Augmentation status*
Chittorgarh	2*315 =630	150-320#	Implemented	Augmentation expected by Nov'23
Hindaun	2*315 =630	250-450	Not implemented	New 500MVA ICT approved at each station.
Ajmer	2*315 =630	400-600	Implemented	
Merta	2*315 =630	300-550	Implemented	
Bikaner	2*315 =630	200-550	Approved but implementation pending	
Jodhpur	2*315 =630	180-280#	Implemented	
Bhilwara	1*500+1*315 =815	350-550	Not implemented	Status not available
Babai	2*315 =630	250-500	Not implemented	
Bhinmal (PG)	2*315 =630	270-500	Not implemented	

*Above data is as per status available with NRLDC.

#one ICT is under outage

- In August 2023 there have been two events of load loss due to cascade tripping at 400/220kV Bikaner (20.08.2023) & 400/220kV Heerapura & Babai (21.08.2023).

Actions are required for expeditious commissioning of new ICTs/ capacity augmentation at these substations to ensure N-1 compliance. Similar high loading and N-1 related issues are also observed during winter months when demand of Rajasthan is slightly higher.

Huge Reactive power drawl at 400/220kV Substations and poor voltage regulation:

Typical Active/Reactive power loading at 400/220kVsubstations in Rajasthan during high demand period of the day are tabulated below:

ICTs MW drawl, MVAr drawl, Power factor and S/s voltage for Solar hours (10:00-14:00hrs) for Rajasthan Control area (Aug 2023)					
400/220 Sub-Station_ICTs	ICTs Capacity (MVA)	MW Drawl	MVAr Drawl	Power factor	Voltage(kV)
Bikaner(RVPN)	2*315	300-370	200-500	0.71-0.75	370-385
Jodhpur	315	170-290	$	$	380-410
Kankani	(315+500)	390-570	180-270	0.91-0.95	370-380
Merta	2*315	450-500	260-300	0.85-0.89	380-390
Bhinmal(Powergrid)	2*315	400-430	160-250	0.88-0.92	375-385

$=Data not available

Poor power factor is resulting in low voltages in the system and therefore expeditious commissioning of network elements and shunt capacitor both at transmission and distribution level is required.

It is also essential that load MVAR drawl management including identification of nodes at 220kV and 132kV level which are drawing huge MVAR from the grid and remedial actions for the same is carried out on priority.

Issue of low voltage at 400/220kV Hindaun & Alwar:

The issue of low voltage at 400/220kV Hindaun and Alwar substation was discussed in detail in 44th Technical Coordination Sub-committee (TCC) & 47th Northern Regional Power Committee (NRPC) meetings held on 10th and 11th December, 2019 wherein it was highlighted that voltages at 400kV Hindaun and Alwar vary by 50-60kV (400kV level) in single day with voltages falling below 360kV at these substations. The issue has been subsequently highlighted on number of occasions in Operation Coordination Committee (OCC)/ NRPC meetings and through written communication. In the last four years voltage profile at Hindaun and Alwar has worsened and now it is falling upto 340kV & 330kV respectively.

ERS Towers: Requirement, Advantages, Govt. Guidelines, Present situation, and Way forward.

High-voltage electric transmission lines carry electrical energy from power-generating complexes to the load-serving substations. The overhead transmission lines particularly perform a very significant role in the reliable delivery of bulk power to consumers. These transmission lines function in a wide range of terrains, climates, and physical environments and are always at risk of experiencing catastrophic events, both weather-related and man-made. Weather-related events include high winds, ice buildup, ice storms, flash floods, rock or mudslides, erosion of foundations, and much more. Sudden power blackouts caused by nature are very common; however, non-climatic events are just as likely. These include human error, vehicle accidents, vandalism/sabotage, terrorism, design defects, and poor maintenance protocols.

All high-voltage transmission lines are exposed to a certain level of damage risk, threatening to disrupt or impair critical power supply infrastructure and affect public safety. Transmission licensees face these emergencies and take remedial actions for restoration; therefore, it is important to know their cause and quickly, and efficiently respond to the problem at hand. Emergency situations may include failure of structural systems and foundations (including guy wires and anchors), failure of conductor splices, and damage to conductor strands leading to conductor failure. Structural damage may also occur due to degradation of conductors due to wildfires, snapped conductors from falling trees, insulator breakage, failure of cross-arms and buckling of tower angle members, or connection failures. Apart from above in recent times transmission lines are being taken under long shutdowns to facilitate construction of National/State Highways, Rapid Metro, Railways etc.

In all these cases, the demand is to restore the system to normalcy rapidly. The primary concern in Emergency Restoration is to revive the transmission network, get the line back into operation as quickly as possible, and restore electricity supply to the affected consumers. The other important concern is to minimize the economic impact of the costs associated with the devastation and rebuilding. The total losses are directly proportional to the outage time. Therefore, one can view any Emergency Restoration Plan as a combination of technical or engineering processes and financial planning. Quick restoration through ERS towers saves generation loss by safely evacuating the power from Generating stations/Pooling stations in case of RE to the load centres.

A. Requirement of ERS, recent experience in Northern Region:

Following lines were out due to tower collapse during last few months:

Sl. No.	Transmission Line	Owner	Outage Time	Impact on Grid
			Days	
1	765 KV Phagi(RS)-Bhiwani(PG) (PG) Ckt-1	PGCIL	7	Loss of one evacuation line from Phagi, feed from Kawai-Kalisindh-Chhabra complex via 765kV Anta and RE complex via 765kV Ajmer
2	400 kV Jhajjar(APCL)-Daulatabad(HV) (HV) Ckt-2	HVPNL	18	Issue of Jhajjar evacuation under contingency of remaining lines, generation restriction during high de season
3	400 KV Bikaner-Bhadla (RS) Ckt-1	RRVPNL	93	Constraints in interstate & intrastate connected RE generation evacuation. Issues observed when high solar generation and high wind generation occurring at the same time. During such times, RE curtailment had been done in the past. Major issues in facilitating shutdown of 400kV Bikaner(PG)-Bikaner(RS)lines for commissioning of 400kV Bikaner-II.
4	400 KV Bikaner-Bhadla (RS) Ckt-2	RRVPNL	93	
5	400 KV Bhadla-Merta (RS) Ckt-1	RRVPNL	18, 30	
6	400 KV Bhadla-Jodhpur (RS) Ckt-1	RRVPNL	72	
7	765 kV Bikaner(PG)-Khetri (PKTSL) (BKTL) Ckt-1	BKTL	1	
8	400 kV Jaisalmer-Barmer (RS) Ckt-2	RRVPNL	43	
9	400 kV Jaisalmer-Barmer (RS) Ckt-1	RRVPNL	43	
10	400 kV Akal-Jodhpur (RS) ckt-1	RRVPNL	40	
11	400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) Ckt-1	UPPTCL	7	Evacuation of Vishnuprayag Generation through only single 400 kV line (400kV Vishnuprayag- Alaknanda)
12	220 KV Chamera_3(NH)-Chamba(PG) Ckt-1	PGCIL	39*	Generation evacuation issues from Chamera-III and Budhil HEP. Interim arrangement worked out to generation loss
13	220 KV Chamera_3(NH)-Chamba(PG) Ckt-2	PGCIL	39*	
* these lines are still under outage				

Table 1: List of Transmission lines under long outage due to tower collapse

- Due to the non-availability of ERS towers, the outage of lines on tower collapse had led to major issues in grid operation as well as the safe evacuation of generation. The must-run RE plants in Rajasthan had to be curtailed in the interest of grid security by SLDC Rajasthan due to tower collapse leading to transmission constraints in the evacuation of low-cost renewable generation.

- However, during the shutdown of 400kV Bikaner (PG)-Bikaner (RJ) D/C lines by POWERGRID for the commissioning of 400kV Bikaner-II S/s, for first time in the Northern Region, the ERS tower with Quad-moose conductor was implemented, the high current carrying capacity of Quad-moose ERS reduced the quantum of RE curtailment significantly.

The above 02 scenarios amply substantiate the utility of ERS towers in power evacuation. All other utilities, therefore, need to ensure the availability of ERS towers, trained manpower, and gangs that can complete such tasks swiftly as and when required to facilitate in maintaining continuity of power supply, avoiding any Generation curtailment including the low-cost RE generation . In view of the ever-increasing transmission line length under the jurisdiction of different utilities over the years, it is desirable that sufficient number of ERS is made available to avoid any curtailment of generation and to provide reliable supply to consumers.

B. CEA REGULATION ON ERS:

(i) As per CEA (Grid Standards), Regulations 2010 "Emergency Restoration System" means a system comprising of transmission towers or structures of modular construction, complete with associated components such as insulators, hardware fittings, accessories, foundation plates, guys, anchors, or installation tools and they like to facilitate the quick restoration of damaged or failed transmission line towers or sections.

*Also, as per the above Regulation for **Emergency Restoration System**- Each transmission licensee shall have an arrangement for the restoration of transmission lines of 400 kV and above and strategic 220 kV lines through the use of the Emergency Restoration System in order to minimize the outage time of the transmission lines in case of tower failures.*

(ii) ***"DISASTER MANAGEMENT PLAN FOR POWER SECTOR"*** Prepared by Central Electricity Authority in fulfilment of provisions of DM Act 2005), January 2021

Relevant excerpts pertaining to ERS tower is reproduced below:

8.2.5.1.2… "Restoration of Transmission Lines *"Emergency Restoration Systems (ERS) In the case of damage to the transmission line, temporary arrangements for the restoration of power supply can be made with the help of ERS, which consists of a special type of light weight modular structures, with light weight polymer insulators and number of stays**. It is, however, suggested that based upon the past experience of disaster-prone areas, one set of ERS for each such area should be procured and kept in store at strategic locations**. CEA has issued guidelines for requisition of ERS and advisory has been issued by Ministry of Power to all state utilities. As per Central Electricity Authority (grid standards) regulations, 2010, each transmission licensee shall have an arrangement for the restoration of transmission lines of 400 kV and above and strategic 220 kV lines through the use of Emergency Restoration System in order to minimise the outage time of the transmission lines in case of tower failures."*

8.3.2… Cyclone/Tsunamis When cyclone/tsunamis alerts and warnings are on, the following action plan is suggested to minimize the damage: a) Continuous vigil shall be kept on movement of cyclone/tsunami. b) Inventories at places near to likely cyclone/tsunami affected areas shall be checked and additional inventories shall be arranged, if required. ***c) The ERS towers shall be moved to the nearest Substation of likely affected area to save transportation time.***

In view of the above requirements, challenges faced due to tower damages, compliances of Govt. norms including disaster preparedness and to restore the affected power system through ERS towers quickly all stakeholders/transmission licensees are to put in place sufficient number of ERS towers as per their network/ckt. Km.

Procurement status, actual inventory available and bottlenecks if any is to be shared with the forum to assess the situation and to be regularly monitored in OCC meetings.

C. Direction from Government of India on ERS

Secretary (Power), MOP vide letter dated D.O. No. 20/6/2014-OM dated 5.12.2014 (Annex-5.1) addressed to Chief Secretaries of all States had desired that in case of disasters, immediate and temporary restoration of transmission networks is possible by deploying the "Emergency Restoration System (ERS)".

As per above letter Strategy for ERS and guidelines for planning, procurement and deployment are as follows:

Strategy adopted for ERS

1. The primary criteria for deciding number of ERS to be arranged by a transmission utility has to be the length of transmission line (ckt-kms) at different voltage levels (e.g. 220 kV, 400 KV 765 KV and + - 500 kV HVDC). Other factors to be taken into account while deciding the number of ERS are :

- Importance of the line considering security of Grid
- Areas prone to tower failure and failure pattern in different areas
- Command area of the transmission utility and transportability across the command area

2. For any transmission utility, one set of ERS has been planned to cater to failure of towers for transmission line lengths of up to 5000 Ckt. Kms. Accordingly, two (2) to sets of ERS have been planned for transmission line lengths of about 5000 to 10,000 Ckt. Kms. and three (3) sets for more than 10,000 Ckt. Kms and so on.

3. The transmission Utility with line length less than 500 ckt kms (of 400 KV lines) may be given option either to procure ERS or have agreement with other transmission utilities for providing ERS on mutually agreed terms, when need arises.

Guideline for planning, procurement and deployment of ERS

In the recent past, there have been various instances of tower collapse, especially during the summer and monsoon season and accordingly, all utilities were requested to take necessary actions. The impact on the Grid due to the outage of transmission lines owing tower collapse is summarized below:

1. One set of ERS should include all accessories [structures (Aluminum Alloy), polymer insulators & hardware, anchor assembly, guy wires, foundation plates, guy plate, other equipment & fittings, special Tools & Plants required for erection and stringing of ERS and trailer mounted detachable containers (without engine) for storage & transportation of ERS hardware/ material etc.] extra and associated software.

2. One set of ERS shall be capable of restoring few numbers of suspension towers and tension towers of the transmission line corresponding to the highest transmission voltage in operation in the utility with required type of conductors. The same ERS can be used for lower voltage line as well. The number of suspension, tension towers, insulators and associated hardware etc., to be included under one set of ERS, may be decided by the utilities and the time of procurement depending on their requirement.

3. Proper management of ERS and training of personnel for erection of towers on ERS and use of associated software is essential. A dedicated and specialized erection & commissioning gang, which is properly trend to execute such work, would be required.

4. ERS should be utilized only for emergency purposes and the line should be restored on normal towers as early as possible. It should not be a practice to run transmission line on ERS for a long time instead of shifting to normal towers. Moreover, ERS should not be used in new lines under construction. Otherwise, the very purpose of ERS will be defeated.

5. The deployment of ERS by any transmission utility/ licensee should be reported to concerned RLDC and RPC.

6. The transmission utilities may approach Appropriate Commission for approval and initiate procurement process on urgent basis to comply with Grid Standards. Utilities may also approach State Disaster Management Authorities for funding.

7. The funding for procurement of ERS could be considered from PSDF for North Eastern States and a proposal be submitted by Member Secretary-NERPC.

D.1 765 KV Transmission line(ckt kms) in Northern Region as on 30.04.2023 and ERS status:

Sl. No.	Transmission Utility	Ckt. Km	ERS Set(towers)require as per the Govt. norms	ERS Towers available	Deficit of ERS Towers
1	POWERGRID	13120	3	Not known	
2	PKTSL	774	1	14	
3	PFTL	372	1*	24	
4	UPPTCL	2631	1	Not known	
5	RRVPNL	426	1*	Not known	
6	FBTL	350	1	Not known	

D.2 400 KV Transmission line(ckt kms) in Northern Region as on 30.04.2023 and ERS status:

Sl. No.	Transmission Utility	Ckt. Km	ERS set (towers) requir as per the Govt. norms	ERS Towers available	Deficit of ERS Towers
1	POWERGRID	36265	8	Not known	
2	POWERLINK	1224	1	14	
3	UPPTCL	8215	2	24	
4	RRVPNL	7169	2	Not known	
5	PSTCL	1865	1	Not known	
6	BBMB	622	1	Not known	
7	HVPNL	905	1	Not known	
8	RTCL	402	1*	Not known	
9	NRSS-31(B)	576	1	Not known	
10	OTHERS	596	1	DTL has 12, ATIL has 2 sets	

**The transmission Utility with line length less than 500 ckt kms (of 400 KV lines) may be given option either to procure ERS or have agreement with other transmission utilities for providing ERS on mutually agreed terms, when need arises.(As per MoP directions).*

E. Availability of ERS suppliers in India:

As informed by POWERGRID, they had procured ERS tower through the following suppliers:

1. M/s Lindsey, USA
2. M/s Tower Solutions, Canada
3. M/s SBB, Canada

As informed by POWERGRID, the ERS made of aluminium alloy was not manufactured in India hence all suppliers were from outside. Further, after ''Make in India'' campaign supported by Govt. of India the procurement of ERS tower was allowed only from the India based manufactures.

F. Training for ERS Tower Erection:

Further as informed by POWERGRID, the ERS towers are kept in the sub-station premises which are geographically located across the length and breadth of the Region. 2-3 executives, 4-5 non-executives plus 20-30 local labourers are associated in carrying out the ERS tower erection work. The opportunity of actual ERS tower erection at site is also utilized to give hands on experience to new staff/ employees to develop a talent pool for future assignments.

G. Indigenous Technology Development:

In view of Govt. of India guidelines for promoting "Make in India", CSIR under ministry of Science and Technology, Govt. of India has developed an indigenous technology for quick restoration through Emergency Restoration System (ERS) for quick restoration of power. Following is the link for technology development of ERS by CSIR:

https://www.csir.res.in/emergency-restoration-system-ers-%E2%80%93-indigenous-technology-quick-restoration-power

Excerpts from the above link of CSIR website is reproduced as below for further information:

"Failure of transmission towers leads to an interruption in power transmission and creates havoc in the power transmission sector of any country. It has significant consequences on population, economy and public services. Natural disasters caused by high-speed wind or cyclones, floods, change in the course of a river, landslides in hilly terrain, earthquakes and man-made calamities may cause the failure of transmission towers. Weather conditions are unfortunately getting more extreme year after year in all parts of the world. Scientists predict cyclones, fires, torrential rains, floods, snowfalls, and ice storms will intensify in the decades to come. This will make electricity grids more vulnerable in developed as well as in developing countries. Permanent restoration of tower failures takes several weeks, resulting in interruption of power supply to the public and substantial monetary losses to the power companies.

Emergency restoration systems (ERS) are modular aluminium towers used to quickly restore power on damaged power transmission lines and facilitate scheduled maintenance work with a minimal power interruption. These are temporary structures that can be deployed typically in 2-3 days, as against several weeks required for permanent restoration of the towers. ERS holds high significance as occurrences of tower failures have increased over the past few years. In the international scenario, the concept of standardizing ERS was started in 1982 in the USA, and the IEEE guidelines were in place by 1995 that many other countries have already adopted. Still, ERS was not indigenously developed in India so far. ERS available in western and developed countries are patented technologies, and their procurement costs are enormous. Also, there is a limited number of manufacturers of ERS products globally.

CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai, has developed an indigenous ERS technology. A large number of ERS structures can be installed at considerably lower costs at the minimum possible time. The indigenous ERS technology developed by CSIR-SERC has a vast potential, which will help India's power transmission & distribution sector in several ways. The ERS developed at CSIR-SERC is unique, which consists of lightweight modules connected with an innovative connection system and supported by a novel two-pin gimbal joint and easy to construct foundation system. The ERS system is designed as a scalable system to 33 to 800 kV class transmission lines with all the salient features and is the first of its kind in India. ***The ERS system developed at CSIR-SERC satisfies the stringent test criteria laid by IEEE standard and consists of the following features:***

- ***The cost of indigenous ERS is about 40% when compared to the imported ERS system***
- ***The ERS modules are structurally more stable, with box sections***
- ***The modules and accessories of ERS are proof tested for the design loads***
- ***The ERS is verified with prototype test***
- ***It is simple to fabricate, requires less hardware with the innovative easy to connect connection and easy to construct a foundations system***
- ***The overall system is compact and yet economically affordable***
- ***The ERS is easy to plan and use at a site***
- ***Usage of lightweight materials makes it easy to transport to remote locations***
- ***This modular system is easy to assemble and flexible enough to develop various configurations for different voltage class TL systems***

The indigenous ERS technology developed by CSIR-SERC was recently transferred to M/s Advait Infratech, Ahmedabad, setting up an ERS manufacturing plant from where the indigenously developed

ERS will be supplied to the Indian power transmission industry and the rest of the world. This is a patented technology and is available for technology transfer for other players in the market."

Further, as per the press release of PIB, Delhi posted on 14th Nov, 2020 pertaining to Ministry of Science and Technology for ERS towers, (https://pib.gov.in/PressReleasePage.aspx?PRID=1672868):

"CSIR-SERC, Chennai Develops Indigenous Emergency Retrieval System (ERS) for Power Lines"

Council of Scientific and Industrial Research (CSIR) constituent laboratory Structural Engineering Research Centre (SERC) based in Chennai has developed an indigenous technology, Emergency Retrieval System (ERS), for quick retrieval of power transmission in the event of failure of transmission line towers. CSIR-SERC has signed an agreement for licensing of the ERS technology with M/s Advait Infratech, Ahmedabad.

CSIR-SERC has signed an agreement for licensing of the ERS technology with M/s Advait Infratech, Ahmedabad in the presence of Prof. Santosh Kapuria, Director, CSIR-SERC, Chennai and Shri S.K. Ray Mohapatra, Chief Engineer (PSE & TD), Central Electricity Authority, New Delhi.

(Source: Press Information Bureau, Government of India, Ministry of Science & Technology)

Sr No	Element Name	Outage Date	Outage Time	Reason
1	220 KV Ganguwal(BB)-Gobindgarh(PS) (BB) Ckt-2	04-Aug-23	13:48	Phase to earth fault R-N. As per PMU, R-N fault occured, no auto-reclosing is observed.
		16-Aug-23	13:09	Phase to earth fault R-N. As per PMU, R-N fault occured, no auto-reclosing is observed.
		17-Aug-23	22:41	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		21-Aug-23	23:24	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		24-Aug-23	12:35	Phase to earth fault R-N. As per PMU, no fault is observed.
2	220 KV Nara(UP)-Roorkee(UK) (UP) Ckt-1	21-Aug-23	10:58	Transient fault. As per PMU, R-N fault occured, no auto-reclosing is observed.
		28-Aug-23	11:44	Phase to earth fault B-N. As per PMU, multiple faults are observed.
		28-Aug-23	13:15	Earth fault. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		29-Aug-23	08:53	Phase to Ground Fault B-N. As per PMU, Y-N fault and unsuccessful auto-reclosing observed.
3	220 KV New Tanda (UP)-Sohawal(PG) (UP) Ckt-1	15-Aug-23	07:48	Phase to earth fault B-N. As per PMU, no fault is observed.
		16-Aug-23	13:06	Phase to Ground Fault B-N. As per PMU, no fault is observed.
		29-Aug-23	17:29	Phase to Phase Fault Y-B. As per PMU, Y-B fault is observed.
		30-Aug-23	01:31	Phase to Phase Fault Y-B. As per PMU, Y-B fault is observed.
4	220 KV Saharanpur(PG)-Shamli(UP) (UP) Ckt-1	14-Aug-23	01:48	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		16-Aug-23	13:19	Phase to Ground Fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		23-Aug-23	17:06	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		24-Aug-23	01:29	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		26-Aug-23	07:58	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
5	220 KV Singoli Bhatwari(Singoli(LTUHP))-Srinagar(UK) (PTCUL) Ckt-1	01-Aug-23	12:47	Phase to earth fault B-N. As per PMU, no fault is observed.
		02-Aug-23	10:40	Phase to Phase Fault R-Y. As per PMU, R-Y fault is observed.
		04-Aug-23	03:10	Over Voltage. As per PMU, B-N fault occured, no auto-reclosing is observed.
		10-Aug-23	03:50	Loss of evacuation path. As per PMU, no fault is observed.
6	400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) Ckt-1	04-Aug-23	03:10	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		10-Aug-23	03:50	Phase to Ground Fault R-N. As per PMU, no fault is observed.
		10-Aug-23	06:24	Earth fault. As per PMU, no fault is observed.
		14-Aug-23	09:17	Maloperation of Relay. As per PMU, no fault is observed.
7	400 KV Bareilly-Unnao (UP) Ckt-1	12-Aug-23	15:51	Tripping caused by REF relay of 63 MVAr line reactor at Bareilly. As per PMU, B-N fault occured, no auto-reclosing is observed.
		22-Aug-23	12:39	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		25-Aug-23	17:23	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
		27-Aug-23	05:26	Phase to earth fault R-N. As per PMU, R-N fault occured, no auto-reclosing is observed.
		28-Aug-23	00:08	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		28-Aug-23	04:09	Phase to earth fault Y-N. As per PMU, Y-N fault occured, no auto-reclosing is observed.
8	400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) Ckt-1	04-Aug-23	03:10	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		10-Aug-23	03:50	Phase to Ground Fault R-N. As per PMU, no fault is observed.
		22-Aug-23	07:15	Auto reclosed. As per PMU, Y-N fault occured, unsuccessful auto-reclosing observed.

		22-Aug-23	18:35	PLCC maloperation. As per PMU, no fault is observed.
		23-Aug-23	09:31	Transient fault. As per PMU, no fault is observed.
9	400 KV Talwandi Saboo(PSG)-Muktsar(PS) (PS) Ckt-2	07-Aug-23	08:53	Phase to Ground Fault R-N. As per PMU, no fault is observed.
		24-Aug-23	12:48	Phase to earth fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		25-Aug-23	11:35	Phase to Ground Fault B-N. As per PMU, B-N fault occured, no auto-reclosing is observed.
		26-Aug-23	12:51	Phase to earth fault R-N. As per PMU, R-N fault occured, no auto-reclosing is observed.

Grid Event summary for August 2023

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
1	GI-2	1) 800 KV HVDC Kurukshetra(PG) Pole-02 2) 800 KV HVDC Kurukshetra(PG) Pole-04	Haryana	POWERGRID	1-Aug-23	07:51	1-Aug-23	08:29	00:38	i) During antecedent condition, 800 KV HVDC Kurukshetra(PG) Pole-1, 2, 3 & 4 were carrying 1187 MW, 1198 MW, 1191 MW and 1195 MW respectively from Champa to Kurukshetra. Total power order was approx. 5000MW. ii) As reported, at 07:51:06hrs, 800 KV HVDC Kurukshetra(PG) Pole-02 & 04 got blocked. "Pole 2 T-zone" protection latched at Kurukshetra end. Due to T-zone protection Pole 2 blocked and generated CAT B sequence as per protection philosophy to isolate Parallel Pole also. Due to this, Pole 4 got blocked on CAT B protection initiated by Pole 2. iii) As per protection philosophy, T-zone protection in Pole 2 compare following three currents – Pole 2 Idl current, Pole 2 Ihl current & Parallel Pole 4 Idl current. The parallel Pole 4 Idl current signal is received by Pole 2 through Bipole cubicle. iv) As reported by POWERGRID, Pole 2 T-zone protection got latched due to faulty Pole 4 Idl current measurement in Bipole 2 lane 1. The probable cause of faulty measurement was suspected to be failure of 5008 card. v) As per PMU at Kurukshetra(PG), no fault is observed in the system, but fluctuation in voltage is observed. vi) As per SCADA, no load loss is observed in Haryana control area.	0	0	0	0	0.000	0.000	54742	62652	NA
2	GI-2	1) 220KV Bus 1 at Baghpat(PG) 2) 400/220 kV 500 MVA ICT 1 at Baghpat(PG) 3) 220 KV Baghpat(PG)-Shamli(UP) (UP) Ckt 4) 220 KV Baghpat(PG)-Modipuram_2 (UP) (UP) Ckt-1 5) 220 KV Baghpat(PG)-Baghpat(UP) (UP) Ckt-1 6) 220 KV Baghpat(PG)-Barot(UP) (UP) Ckt-1	Uttar Pradesh	UPPTCL, POWERGRID	3-Aug-23	05:07	3-Aug-23	08:10	03:03	i) Both 400 & 220 kV side of 400/220kV Baghpat(PG) has double main bus scheme. 220 KV Baghpat(PG)-Shamli(UP) (UP) Ckt, 220 KV Baghpat(PG)-Modipuram_2 (UP) (UP) Ckt-1, 220 KV Baghpat(PG)-Baghpat(UP) (UP) Ckt-1, 220 KV Baghpat(PG)-Barot(UP) (UP) Ckt-1 and 400/220 kV 500 MVA ICT 1 at Baghpat(PG) are connected to 220KV Bus 1 at Baghpat(PG) and 220 KV Baghpat(PG)-Mandola Vihar(UP) (UP) Ckt, 220 KV Baghpat(PG)-Modipuram_2 (UP) (UP) Ckt-2, 220 KV Baghpat(PG)-Baghpat(UP) (UP) Ckt-2, 220 KV Baghpat(PG)-Barot(UP) (UP) Ckt-2 and 400/220 kV 500 MVA ICT 2 at Baghpat(PG) are connected to 220KV Bus 2 at Baghpat(PG). ii) As reported, at 05:07 hrs, B-N phase to earth fault occurred on 220 KV Baghpat(PG)-Shamli(UP) (UP) Ckt, fault distance was 9.1km & fault current was 11.6kA from Baghpat end, fault was in zone-1 from Baghpat end (as per DR of Baghpat end). iii) On this fault, distance protection at Bhagpat end intitated tripping command however, B-ph CB didn't open on time which led to the LBB protection operation after ~120msec(as per DR). This resulted into tripping of all the elements connected at 220KV Bus 1 at Baghpat(PG) Bus 1 became dead. iv) As per PMU at Meerut(PG), B-N phase to earth fault with delayed fault clearance time of 360 ms is observed. v) As per SCADA, no change in demand is observed in UP control area.	0	0	0	0	0.000	0.000	48238	61353	360
3	GD-1	1) 400 KV Alakhnanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt 2) 400 KV Vishnuprayag(UP)-Muzaffarnagar (UP) (UP) Ckt 3) 400 KV Alakhnanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt 4) 110 MW Vishnuprayag HPS - UNIT 1 5) 110 MW Vishnuprayag HPS - UNIT 2 6) 110 MW Vishnuprayag HPS - UNIT 3 7) 110 MW Vishnuprayag HPS - UNIT 4 8) 220 KV Singoli Bhatwari (Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 9) 220 KV Singoli Bhatwari (Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-2 10) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 1 11) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 2 12) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 3 13) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-1 14) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-2 15) 82.5 MW Alaknanda HEP - UNIT 1 16) 82.5 MW Alaknanda HEP - UNIT 2 17) 82.5 MW Alaknanda HEP - UNIT 3 18) 82.5 MW Alaknanda HEP - UNIT 4	Uttar Pradesh & Uttarakhand	UPPTCL, PTCUL, Singoli HEP	4-Aug-23	03:09	4-Aug-23	04:42	01:33	i) Power of 82.5*4 MW Alaknanda HEP, 100*4MW Vishnuprayag HEP and 33*3MW Singoli Bhatwari HEP evacuates through 400 KV Alaknanda GVK (UPC)-Muzaffarnagar(UP) ckt and 400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) ckt. ii) As reported, at 03:09 hrs, 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (end) Ckt tripped on B-N phase to earth fault. As per PMU, fault current was approx. 2.4kA from Muzaffarnagar end. As per DR, fault was sensed in zone-1 at Muzaffarnagar end and in zone-2 at Alaknanda end. A/R started in B-ph at both the ends and three phase opening occurred after ~400ms. iii) With the tripping of , 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (end) Ckt, loading of 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt and 400 KV Alakhnanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt shifted to 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt. The load of Srinagar Substation (evacuating Singoli Bhatwari HEP generation), which is connected to Muzaffarnagar(UP) through 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt, also shifted to 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt. At this time, more than 873 MW (~1260A line current) load was catterd by 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt (Vishnuprayag HPS-441 MW, Alaknanda HEP-343 MW, Srinagar- 89 MW). iv) After further 13sec, 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt tripped on over current protection operation (~1260A line current). v) With the tripping of 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt, all the generation of Alaknanda HEP & Vishnuparyag HEP tripped due to unavailability of power evacuating path. vi) During the same time, 220 KV Singoli Bhatwari(Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 & 2 also tripped. As per DR, DT received at Singoli Bhatwari end. Unbalance in voltage is also observed. vii) Due to tripping of 220 KV Singoli Bhatwari(Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 & 2, 33 MW Singoli Bhatwari(Singoli(LTUHP)) HPS - UNIT 1, 2 & 3 tripped due to unavailability of power evacuating path. viii) At the same time, 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-1 & 2 also tripped (exact reason yet to be shared). As per DR, over-voltage stage-1 operation started at Srinagar(UK) end, however voltage was in operational limit. As per SCADA SOE, 400 KV Alaknanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt-1 also tripped during the same time (reason yet to be shared). ix) Due to this event, complete blackout occurred at 400kV Alaknanda HEP(UP), 400kV Vishnuparyag HPS(UP), 220kV Singoli Bhatwari HEP(Singoli(LTUHP)) and 400/220/132kV Srinagar(UK) S/s. i) As per PMU at Meerut(PG), B-N phase to earth fault with fault clearance time of 120 ms is observed. ii) As per SCADA, no change in demand in UP control area and change in demand of approx. 65MW in Uttarakhand control area are observed. Generation loss of approx. 343MW, 441MW and 108MW are also observed at Alaknanda, Vishnuprayag and Singoli Bhatwari HEP respectively.	0	0.1	892	65	1.839	0.101	48512	64451	120
4	GD-1	1) 220 kV Patiala(PG)-Nabha(PS) (PSTCL) Ckt-1 2) 220 kV Patiala(PG)-Nabha(PS) (PSTCL) Ckt-2	Punjab	PSTCL, POWERGRID	5-Aug-23	20:15	5-Aug-23	22:13	01:58	i) During antecedent condition, 220 KV Dhuri4-Nabha(PS) Ckt-1 & 2 were already under shutdown. ii) As reported, at 20:15hrs, B-N phase to earth fault occurred in 220 kV Patiala(PG)-Nabha(PS) (PSTCL) Ckt-1, fault sensed in zone-1 at Nabha(PS) end and in zone-2 at Patiala(PG) end; flashover in insulator disc was observed. Fault distance was 42.3km from Patiala(PG) end. As per DR, fault current in 220 kV Patiala(PG)-Nabha(PS) (PSTCL) Ckt-1 was approx. 5.469kA from Nabha(PS) end and 6.121kA from Patiala(PG) end. On this fault, A/R operation started at Nabha(PS) end and as the fault was of permanent nature A/R operation was unsuccessful and line tripped from Patiala(PG) end without A/R operation. However 3-ph tripping after A/R operation was delayed by almost 225ms due to some issue in breaker. iii) At the same time, 220 KV Patiala(PG)-Nabha(PS) (PSTCL) Ckt-2 tripped from Patiala(PG) end only with fault distance of 32km from Patiala(PG) end; fault was sensed in zone-2 from Patiala(PG) end. Time delay setting of zone-2 at Patiala(PG) end need to be reviewed. iv) Due to this tripping, complete blackout occurred at 220/66kV Nabha(PS) S/s. v) As per PMU at Patiala(PG), B-N phase to earth fault with delayed clearance of 240msec and unsuccessful A/R operation is observed. vi) As per SCADA, change in demand of approx. 125MW is observed in Punjab control area.	0	0.246	0	125	0.000	0.176	54875	70983	240
5	GI-2	1) 400/220 kV 450 MVA ICT 1 at Panipat(BB) 2) 400/220 kV 500 MVA ICT 2 at Panipat(BB) 3) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-3 4) 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-4	Haryana	HVPNL, BBMB	5-Aug-23	11:18	5-Aug-23	12:45	01:27	i) During antecedent condition, active power loading on 400/220 kV 450 MVA ICT 1 and 400/220 kV 500 MVA ICT 2 at Panipat(BB) were 282 MW and 302 MW respectively. ii) As reported by BBMB, at 11:18hrs, 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-3 tripped on R-N phase to earth fault with fault current of 2.341 kA and fault distance of 45.98 km from Panipat(BB) end; fault sensed in zone-3 at Panipat(BB) end. As reported by PanipatTH(HV), no relay operated at Panipat TPS end. iii) As reported by BBMB, 220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-4 also tripped at the same time on R-N phase to earth fault with fault current of 2.793 kA and fault distance of 30.92 km from Panipat(BB) end; fault sensed in zone-3 at Panipat(BB) end. As reported by PanipatTH(HV), no relay operated at Panipat TPS end. iv) During the same time, 400/220 kV 450 MVA ICT 1 and 400/220 kV 500 MVA ICT 2 at Panipat(BB) also tripped from both 400 and 220 kV sides. (exact reason yet to be shared) v) As per PMU at Panipat(BB), B-N phase to earth fault with delayed clearance of 1720msec is observed. vi) As per SCADA, change in demand of approx. 290MW is observed in Haryana control area.	0	0.42	0	290	0.000	0.428	61500	67733	1720
6	GI-1	1) 132 kV Ludarva-Amarsagar (RS) Ckt-2 2) 132kV Amarsagar-Jaisalmer (RS) Ckt-2 3) 220/132 kV 100 MVA ICT-1 at Amarsagar(RS) 4) 220/132 kV 160 MVA ICT-2 at Amarsagar(RS) 5) 220/132 kV 100 MVA ICT-3 at Amarsagar(RS) 6) 220kV Amarsagar-Akal (RS) Ckt 7) 220kV Amarsagar-Ramgarh (RS) Ckt	Rajasthan	RVPNL	6-Aug-23	09:48	6-Aug-23	10:24	00:36	i) As reported by SLDC Rajasthan, at 09:48hrs on 06th August, 2023, Y phase Jumper of 132kV Amarsagar – Ludarva Ckt-2 snapped. (Bus bar protection is not available at 132kV side). ii) On this fault, 132kV Amarsagar-Jaisalmer Ckt-2 tripped at the same time sensing fault in zone-4 (B-N fault) and 220/132 kV 100 MVA ICT-1 & 3 and 220/132 kV 160 MVA ICT-2 at Amarsagar(RS) tripped from 132kV side on over-current earth fault protection operation. iii) At the same time, 220kV Amarsagar-Akal (RS) Ckt also tripped from Akal end only on R-Y phase to phase fault with fault distance of 216.6km from Akal end; fault sensed in zone-3 at Akal end. iv) During the same time, 220kV Amarsagar-Ramgarh (RS) Ckt also tripped from Ramgarh end only on R-N phase to ground fault with fault distance of 227km from Ramgarh end; fault sensed in zone-3 at Ramgarh end. v) As per PMU at Jodhpur(RS), R-Y phase to phase fault is observed with delayed fault clearance time of 1560 ms. vi) As per SCADA, change in Rajasthan wind generation of approx. 1740MW is observed.	0	0	0	1740	0.000	2.824	55398	61622	1560
7	GD-1	1) 220 kV Amarsagar-Phalodi (RS) Ckt 2) 220 kV Amarsagar-Akal (RS) Ckt 3) 220 kV Amarsagar-Dechu (RS) Ckt 4) 220 kV Amarsagar-Mada (RS) Ckt 5) 220 kV Amarsagar-RGTPP (RS) Ckt 6) 220 kV Tejuwa-Amarsagar (RS) Ckt-1 7) 220 kV Tejuwa-Amarsagar (RS) Ckt-2 8) 220kV Amarsagar-Ramgarh (RS) Ckt 9) 220/132 kV 100 MVA ICT-1 at Amarsagar(RS) 10) 220/132 kV 160 MVA ICT-2 at Amarsagar(RS) 11) 220/132 kV 100 MVA ICT-3 at Amarsagar(RS) 12) 220 kV Bus-1 at Amarsagar(RS) 13) 220 kV Bus-2 at Amarsagar(RS)	Rajasthan	RVPNL	7-Aug-23	05:29	7-Aug-23	06:20	00:51	i) As reported by SLDC Rajasthan, at 05:29hrs on 07th August, 2023, B phase jumper of 220 kV Amarsagar-Phalodi (RS) Ckt snapped and created bus fault at 220kV level of Amarsagar(RS). ii) On this fault, bus bar protection operated at 220kV level of Amarsagar(RS). 220 kV Bus-1 & 2 at Amarsagar(RS) was directly coupled through isolator and bus coupler CB was not present between the buses. Hence all the elements connected to both Bus-1 & 2 tripped and both the buses became dead. iii) Due to loss of supply in 132kV and 33kV level, blackout occurred at 220/132/33kV Amarsagar(RS). iv) As per DR, B-N phase to earth fault (I_B=~915A) is observed in 220 kV Amarsagar-Phalodi (RS) Ckt; fault sensed in zone-4 at Amarsagar(RS) end. Line tripped after ~350msec from Amargarh end. v) As per SCADA, change in Rajasthan wind generation of approx. 550MW is observed. vi) As per PMU at Jodhpur(RS), Y-N phase to earth fault is observed with delayed fault clearance time of 360 ms. Phase sequence at Amarsagar(RS) and Jodhpur(RS) may be reviewed.			550	0	1.162	0.000	47351	58675	360
8	GD-1	1) 130.19 MW Dadri GPS - UNIT 1 2) 130.19 MW Dadri GPS - UNIT 2 3) 130.19 MW Dadri GPS - UNIT 3 4) 130.19 MW Dadri GPS - UNIT 4 5) 154.51 MW Dadri GPS - UNIT 6	Uttar Pradesh	NTPC	8-Aug-23	20:54	9-Aug-23	04:30	07:36	i) 220kV Dadri Gas(NTPC) has 4*130.19MW units (Gas turbine driven) and 2*154.51MW units (Steam turbine driven). During antecedent condition, GT-1, GT-2, GT-3, GT-4 and ST-2 were running. ST-1 main breaker was out of order due to oil leakage in Y phase, hence ST-1 synchronization with transfer bus breaker activities were in progress. ii) As reported, at 20:54hrs on 08th August, 2023, interposing relay panel control supply tripped due to earth fault in both positive and negative supply. Relay panel gives the status of all 220 KV breakers and isolators and excitation gets trip when excitation current is 0.48 pu and unit is off grid. iii) As supply of panel was dead "ON" status of 220 KV breakers going in control circuit got "OFF "and machine came in speed control mode from load control mode and came on minimum load of 0.9 MW only . Due to this, GT-2 and GT-4 got tripped on failure of DC excitation system. iv) GT-1, running in speed control mode at 0.9 MW, was taken back in load control mode and loaded to 25 MW and then load was increased to 60 MW but it tripped on excitation failure due to operation of over excitation limiter. v) GT-3 was tripped manually as it was running at low load of 0.9 MW and ST-2 was running with GT-3 (exhaust of GT-3 and GT-4 are used to feed into the boiler to produce steam which drives the steam turbine) and steam parameters started deteriorating. With this, ST-2 also tripped and 220kV Dadri Gas(NTPC) S/s became dead. vi) As per SCADA, generation loss of approx. 580MW is observed at Dadri Gas (NTPC). vii) As per PMU at Panipat(BB), no fault is observed in the system.	0	0	580	0	1.022	0.000	56779	73852	NA
9	GD-1	1) 132 KV Kotla(BB)-Ropar(PS) Ckt-1 2) 132 KV Kotla(BB)-Ropar(PS) Ckt-2 3) 132 KV Kotla(BB)-Ropar(PS) Ckt-3 4) 132 KV Kotla(BB)-Ganguwal (PS) Ckt -1 5) 132 KV Kotla(BB)-Ganguwal (PS) Ckt -2 6) 28.93 MW Unit-1 at Kotla(BB) 7) 24.2 MW Unit-2 at Kotla(BB) 8) 24.2 MW Unit-3 at Kotla(BB)	Punjab	BBMB, PSTCL	9-Aug-23	09:54	9-Aug-23	10:58	01:04	i) During antecedent condition, 28.93 MW Unit-1 at Kotla(BB) and 24.2 MW Unit-2 & 3 at Kotla(BB) were generating at their full capacity. ii) As reported by BBMB, at 09:54hrs, bus bar protection operated due to snapping of Y-phase conductor of bus coupler at Kotla(BB). This led to tripping of both 132kV Bus 1 & 2 at Kotla(BB) along with all the lines and generating units connected at 132kV Kotla(BB) end which resulted in blackout of 132kV Kotla(BB) S/s. iii) As per PMU at Panipat(BB), no fault is observed in the system. iv) As per SCADA, no change in demand is observed in Punjab control area. v) As per SCADA, generation loss of approx. 77MW is observed at Kotla(BB). vi) As reported, generation at Kotla(BB) revived by 11:10hrs.	0	0	77	0	0.125	0.000	61496	67911	NA

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
10	GD-1	1) 400 KV Alakhnanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt 2) 400 KV Vishnuprayag(UP)-Muzaffarnagar (UP) (UP) Ckt 3) 400 KV Alakhnanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt 4) 110 MW Vishnuparyag HPS - UNIT 1 5) 110 MW Vishnuparyag HPS - UNIT 2 6) 110 MW Vishnuparyag HPS - UNIT 3 7) 110 MW Vishnuparyag HPS - UNIT 4 8) 220 KV Singoli Bhatwari (Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 9) 220 KV Singoli Bhatwari (Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-2 10) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 1 11) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 2 12) 33 MW Singoli Bhatwari (Singoli(LTUHP)) HPS - UNIT 3 13) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-1 14) 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-2 15) 82.5 MW Alaknanda HEP - UNIT 1 16) 82.5 MW Alaknanda HEP - UNIT 2 17) 82.5 MW Alaknanda HEP - UNIT 3 18) 82.5 MW Alaknanda HEP - UNIT 4	Uttar Pradesh & Uttarakhand	UPPTCL, PTCUL, Singoli HEP	10-Aug-23	03:50	10-Aug-23	05:23	01:33	i) Power of 82.5*4 MW Alaknanda HEP, 100*4MW Vishnuprayag HEP and 33*3MW Singoli Bhatwari HEP evacuates through 400 KV Alaknanda GVK (UPC)-Muzaffarnagar(UP) ckt and 400 KV Muzaffarnagar(UP)-Vishnuprayag(JP) (UP) ckt. ii) As reported, at 03:50 hrs, 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (end) Ckt tripped from Muzaffarnagar(UP) end only as DT received at Muzaffarnagar end. It was reported that there was problem in DT sent circuit at Alaknanda end. iii) With the tripping of , 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (end) Ckt, loading of 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt and 400 KV Alakhnanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt shifted to 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt. The load of Srinagar Substation (evacuating Singoli Bhatwari HEP generation), which is connected to Muzaffarnagar(UP) through 400 KV Alaknanda GVK(UPC)-Muzaffarnagar (UP) (UP) Ckt, also shifted to 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt. iv) After this, 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt tripped on over current protection operation. v) With the tripping of 400 KV Vishnuprayag(UP)-Muzaffarnagar(UP) (UP) Ckt, all the generation of Alaknanda HEP & Vishnuparyag HEP tripped due to unavailability of power evacuating path. vi) During the same time, 220 KV Singoli Bhatwari(Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 & 2 also tripped. As per DR, DT received at Singoli Bhatwari end. Unbalance in voltage is also observed. vii) Due to tripping of 220 KV Singoli Bhatwari(Singoli(LTUHP)) (end)-Srinagar(UK) (PTCUL) Ckt-1 & 2, 33 MW Singoli Bhatwari(Singoli(LTUHP)) HPS - UNIT 1, 2 & 3 tripped due to unavailability of power evacuating path. viii) At the same time, 400 KV Alaknanda GVK(UPC)-Srinagar(UK) (end) (UK) Ckt-1 & 2 also tripped (exact reason yet to be shared). As per DR, over-voltage stage-1 operation started at Srinagar(UK) end, maximum transient voltage=~385kA. As per SCADA SOE, 400 KV Alaknanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt-1 also tripped during the same time (reason yet to be shared). ix) Due to this event, complete blackout occurred at 400kV Alaknanda HEP(UP), 400kV Vishnuparyag HPS(UP), 220kV Singoli Bhatwari HEP(Singoli(LTUHP)) and 400/220/132kV Srinagar(UK) S/s. i) As per PMU at Muzaffarnagar(UP), no fault is observed in the system. ii) As per SCADA, no change in demand in UP control area and change in demand of approx. 60MW in Uttarakhand control area are observed. Generation loss of approx. 342MW, 442MW and 108MW are also observed at Alaknanda, Vishnuprayag and Singoli Bhatwari HEP respectively.	0	0.093	892	60	2.029	0.091	43955	65920	NA
11	GI-1	1) 220/33 KV 150 MVA ICT 1 at ASEJOL_HB FTGH2 (ASEJOL)	Rajasthan	ASEJOL, POWERGRID	13-Aug-23	09:35	13-Aug-23	11:08	01:33	i) Total MW generation of ASEJOL are pooled through 220/33 KV 150 MVA ICT 1, 2 & 3 at ASEJOL_HB FTGH2 (ASEJOL) and total generation is evacuated through 220 KV ASEJOL_HB FTGH2 (ASEJOL)-Fatehgarh2(PG) Ckt 1& 2. ii) As reported, at 09:35hrs, 220/33 KV 150 MVA ICT 1 at ASEJOL_HB FTGH2 (ASEJOL) tripped due to false PRV signal. iii) As per PMU at Fatehgarh2(PG), no fault is observed in the system. iv) As per SCADA, generation loss of approx. 45MW at ASEJOL is observed.	0	0	45	0	0.072	0.000	62125	67296	NA
12	GD-1	1) 220 KV Bhadla(PG)-Azure Maple (APMPL) Ckt	Rajasthan	ASEJOL, POWERGRID	13-Aug-23	09:55	13-Aug-23	11:24	01:29	i) During antecedent condition, total MW generation of Azure Maple was approx. 200MW and it was evacuated through 220 KV Bhadla(PG)-Azure Maple (APMPL) Ckt. ii) As reported, at 09:55hrs, 220 KV Bhadla(PG)-Azure Maple (APMPL) Ckt tripped due to sparking at the CT terminal box of the line CRP panel. iii) As per PMU at Azure Maple (IP), no fault is observed in the system. iv) As per PMU, generation loss of approx. 195MW at Azure Maple is observed.	0	0	195	0	0.309	0.000	63195	68977	NA
13	GI-1	1) 220 KV Kishenpur(PG)-Salal(NH) (PG) Ckt-1 2) 115 MW Salal HPS - UNIT 1	Jammu & Kashmir	PGCIL, NHPC	14-Aug-23	18:34	14-Aug-23	19:51	01:17	i) During antecedent condition, total MW generation of Salal(NH) was approx. 735MW (each of the six units was generating approx. 123 MW). ii) As reported, at 18:34hrs, transient Y-N phase to earth fault occurred on 220 KV Kishenpur(PG)-Salal(NH) (PG) Ckt-1. Line successfully auto-reclosed from Kishenpur(PG) end, but tripped from Salal(NH) end due to non-operation of A/R at Salal(NH) end. As per DR at Kishenpur(PG), fault current was ~2.18kA; fault sensed in zone-2. iii) At the same time, 115 MW Salal HPS - UNIT 1 also tripped. (exact reason yet to be shared) iv) As per PMU, Y-N phase to earth fault is observed with fault clearing time of 80 ms. v) As per SCADA, generation loss of approx. 120MW is observed at Salal(NH).	0	0	120	0	0.212	0.000	56595	66402	80
14	GI-2	1) 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-2 2) 250 MW Nathpa-Jhakri HPS - UNIT 3 3) 250 MW Karcham Wangtoo HPS - UNIT 2 4) 68.67 MW Rampur HEP - UNIT 5 5) 40MW Sawra Kuddu HPS- UNIT 1	Himachal Pradesh	PGCIL, HPPTCL, NJPS, Karcham HEP, Rampur HEP	18-Aug-23	10:59	18-Aug-23	11:05	00:06	i) During antecedent condition, total MW loading of 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-1 & 2 were approx. 57SMW each. ii) As reported, at 10:59hrs, 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-2 tripped as DT received at Panchkula(PG) end due to mal-operation of relay. Due to tripping of 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-2, MW loading of 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-1 increased and eventually exceeded 850MW (max. MW loading reached was 853MW as per PMU), hence SPS operated for reliable evacuation of power. iii) Due to SPS operation, 250 MW Nathpa-Jhakri HPS - UNIT 3, 250 MW Karcham Wangtoo HPS - UNIT 2, 68.67 MW Rampur HEP - UNIT 5 and 40MW Sawra Kuddu HPS- UNIT 1 tripped. iv) As per DR of 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-2, no fault is observed at Gumma(HP) and DT received at Panchkula(PG) which clearly indicates mal-operation of relay. v) As per DR of 400 KV Panchkula(PG)-Gumma(HP) (PG) Ckt-1, currents in R , Y and B phase are respectively ~1222A, ~1291A and ~1228A. Current loading required for SPS operation is [850/(1.732*400)]=~1227A. This indicates correct operation of SPS. vi) As per PMU at Panchkula(PG), no fault is observed in the system. vii) As per SCADA, generation loss of approx. 260MW at Naptha Jhakri, 80MW at Rampur, 290MW at Karcham and 40MW at Sawra Kuddu is observed.	0	0	670	0	0.993	0.000	67496	77328	NA
15	GD-1	1) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 2) 220KV Bus 1 at Pong(BB) 3) 220KV Bus 2 at Pong(BB) 4) 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 5) 220 KV Jalandhar-Pong (BB) Ckt-1 6) 220 KV Jalandhar-Pong (BB) Ckt-2 7) 220 KV Jessore(HP)-Pong(BB) (PG) Ckt 8) 220 KV Bairasiul(NH)-Pong(BB) (PG) Ckt 9) 66 MW Pong HPS - UNIT 1 10) 66 MW Pong HPS - UNIT 2 11) 66 MW Pong HPS - UNIT 3 12) 66 MW Pong HPS - UNIT 4 13) 66 MW Pong HPS - UNIT 5 14) 66 MW Pong HPS - UNIT 6	Himachal Pradesh	BBMB, PSTCL, HPPTCL, NHPC	18-Aug-23	12:29	18-Aug-23	14:07	01:38	i) During antecedent condition, all 6*66MW units were running and generating approx. 364 MW in total. Unit-1, 3 & 5, 220/66kV 40MVA Transformer and 220kV feeders to Bairasul, Jalandhar ckt-1 and Dasuya ckt-1 were connected at 220kV Bus-1 and Unit-2, 4 & 6 & 220kV feeders to Jalandhar ckt-2, Jessore ckt-1 and Dasuya ckt-2 were connected at 220kV Bus-2. ii) As reported, at 12:29 hrs, 220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 tripped on Y-B phase to phase fault with fault current of 5.895kA and 5.21kA in Y and B phase respectively and fault distance of 17.09 km from Dasuya(PS) end; zone-1 distance protection operated at Dasuya(PS) end. Line tripped from Dasuya(PS) end due to disc flashover at Dasuya(PS) end, but did not trip from Pong(BB) end as relay did not operate at Pong(BB) end (relay was not healthy). iii) As per protection logic at Pong(BB), if earth fault is picked up and CB is open (auxiliary contact of CB closed), tripping to bus bar is initiated detecting CB flashover condition. As reported, on the above fault, back up earth fault protection of 66MW Pong HPS – Unit 5 picked up and auxiliary contact of the CB got closed. However due to inherent delay in CB opening, earth fault protection did not get reset immediately and thus as per CB flashover protection logic tripping initiated to bus bar and all the elements connected to 220kV Bus-1 at Pong(BB) tripped. BBMB has already been communicated to share the exact protection logic of the tripping. iv) At the same time, all the elements connected to 220kV Bus-2 at Pong(BB) also tripped. (Exact reason of bus bar protection operation yet to be shared) v) Due to tripping of both 220kV Bus-1 & 2 at Pong(BB), 220kV Pong(BB) S/s became dead. vi) As per PMU at Jalandhar(PG), Y-B phase to phase fault is observed with fault clearing time of 2160 ms. vii) As per SCADA, total generation loss of approx. 364MW is observed at Pong HEP(BBMB).	0	0	364	0	0.528	0.000	68967	79716	2160
16	GD-1	1) 400 KV Alakhnanda GVK(UPC)-Vishnuprayag(UP) (UP) Ckt 2) 110 MW Vishnuparyag HPS - UNIT 1 3) 110 MW Vishnuparyag HPS - UNIT 2 4) 110 MW Vishnuparyag HPS - UNIT 3 5) 110 MW Vishnuparyag HPS - UNIT 4	Uttar Pradesh	UPPTCL	18-Aug-23	16:33	18-Aug-23	17:53	01:20	i) Power of 4*110MW Vishnuprayag HEP evacuates through 400 KV Alaknanda GVK (UPC)- Vishnuprayag(UP) (UP) ckt and 400 KV Muzaffarnagar(UP)-Vishnuprayag(UP) (UP) ckt. During antecedent condition, 400 KV Muzaffarnagar(UP)-Vishnuprayag(UP) (UP) ckt was under emergency shutdown. ii) As reported, at 16:33 hrs, 400 KV Alaknanda GVK (UPC)- Vishnuprayag(UP) (UP) ckt tripped on Y-B phase to phase fault with fault distance of 56.6km from Vishnuprayag(UP) and 38.2km from Alaknanda(UP) end. As further reported, fault was sensed in zone-1 at Vishnuprayag(UP) end and fault current was 1.83kA nad 1.19kA in Y and B phase respectively from Vishnuprayag(UP) end. As per DR at Alaknanda(UP) end, fault was sensed in zone-1 at Alaknanda(UP) end and fault current was 3.27kA nad 3.89kA in Y and B phase respectively from Alaknanda(UP) end; fault clearing time was ~35ms. iii) With the tripping of , 400 KV Alaknanda GVK (UPC)- Vishnuprayag(UP) (UP) ckt, all the generation of Vishnuparyag HEP, i.e., 110 MW Vishnuparyag HPS - UNIT 1, 2, 3 and 4 tripped due to unavailability of power evacuating path. iv) As per PMU at Muzaffarnagar(UP), Y-B phase to phase fault with fault clearance time of 80 ms is observed. v) As per SCADA, no change in demand in UP control area is observed. Generation loss of approx. 440MW is also observed at Vishnuprayag HEP.	0	0	440	0	0.907	0.000	48512	64451	80
17	GI-1	1) 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 2) 220 KV Barn(JK)-Kishenpur(PG) Ckt-1	Jammu & Kashmir	PGCIL, JKPTCL	19-Aug-23	11:25	19-Aug-23	12:21	00:56	i) As reported, at 11:25hrs, 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 tripped on R-N phase to earth fault with fault distance of 12 km from Barn(JK) end. ii) Due to tripping of 220 KV Barn(JK)-Kishenpur(PG) Ckt-2, loading on 220 KV Barn(JK)-Kishenpur(PG) Ckt-1 increased and line CB at 220kV Barn(PDD JK) end of 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 opened due to over-loading, but line remain charged from Kishenpur(PG) end. iii) As per PMU at Kishenpur(PG), R-N phase to earth fault is observed in system with fault clearance time of 80 ms. iv) As per SCADA, load loss of approx. 285MW occurred in J&K control area.	0	0.266	0	285	0.000	0.383	65971	74490	80
18	GI-2	1) 400/220 kV 315 MVA ICT 1 at Jaunpur (UP)	Uttar Pradesh	UPPTCL	19-Aug-23	09:26	19-Aug-23	09:53	00:27	i) During antecedent condition, only 400/220 kV 315 MVA ICT 1 at Jaunpur (UP) was in service and MVA loading of ICT 1 was 329 MVA (MW: 317MW and MVAr: 88MVAr). It was feeding the 220kV and 132kV level of Jaunpur(UP). ii) As reported, at 09:26 hrs, 400/220 kV 315 MVA ICT 1 at Jaunpur (UP) tripped due to over-loading; over-current protection operated; currents in R, Y and B-phase are 0.462kA, 0.472kA and 0.76kA respectively. iii) Due to tripping of 400/220 kV 315 MVA ICT 1 at Jaunpur (UP), 220kV Bus 1 & 2 and 132kV Bus 1 & 2 of Jaunpur(UP) became dead due to loss of supply to 220kV and 132kV level of Jaunpur(UP). iv) As per PMU at Varanasi(PG), no fault is observed in the system. v) As per SCADA, change in demand of approx. 215 MW in UP control area is observed.	0	0.097	0	215	0.000	0.304	61240	70678	NA
19	GD-1	1) 220 kV Wangtoo –Bhabha-Kunihar(HP) ckt (T-connection) 2) 220 kV Jeori-Kunihar(HP) Ckt 3) 220 kV Bhaba-Jeori(HP) Ckt 4) 220 kV Baddi –Pinjore(HP) Ckt 2 5) 220 kV Baddi-Kunihar(HP) Ckt 6) 220/66kV 31.5 MVA ICT-4 at Jeori(HP) 7) 132 kV Kunihar-Shimla(HP) Ckt 1 8) 132 kV Kunihar-Shimla(HP) Ckt 2 9) 132 kV Kunihar Barotiwala Ckt-1 10) 40MW Unit-1 at Bhaba(HP) 11) 40MW Unit-2 at Bhaba(HP) 12) 40MW Unit-3 at Bhaba(HP)	Himachal Pradesh	HPPTCL	19-Aug-23	08:49	19-Aug-23	09:16	00:27	i) As reported, at 08:49 hrs, 220 KV Wangtoo-Bhabha-Kunihar ckt (T-connection) got tripped on R-N phase to ground fault. (Exact reason and location of fault yet to be shared) ii) At the same time, 220 kV Jeori-Kunihar(HP) Ckt, 220 kV Bhaba-Jeori(HP) Ckt, 220 kV Baddi-Kunihar(HP) Ckt and 220 kV Baddi-Pinjore Ckt-2 also tripped due to overloading. iii) With the tripping of both 220 KV Wangtoo-Bhabha-Kunihar ckt (T-connection) and 220 kV Bhaba-Jeori(HP) Ckt, 40MW Unit-1, 2 & 3 at Bhaba(HP) tripped due to loss of evacuiation path and 220kV Bhaba(HP) S/s became dead. iv) As per SCADA SOE, 220/66kV 31.5 MVA ICT-4 at Jeori(HP) tripped during the same time. (Exact reason yet to be shared) v) As per PMU at Panchkula(PG), R-N phase to ground fault with fault clearance time of 80 ms is observed. vi) As per SCADA, change in demand of approx. 150MW in HP control area is observed (affected load areas are Kunihar ,Shimla ,Kotla and Solan as reported by SLDC-HP). vii) As reported by SLDC-HP, generation loss of approx. 300MW occurred (MW generation affected at Bhaba(130MW), Giri(60MW), Surya Kanta(14MW), Nanti(13MW), Goodwill(27MW), Ghanvi(23MW), Ghanvi-2(10MW) and other IPPs(30MW)). But as per SCADA, HP hydro generation loss of approx. 140MW is observed.	0	0.068	300	150	0.503	0.217	59590	69018	80
20	GI-1	1) 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 2) 220 KV Barn(JK)-Kishenpur(PG) Ckt-1	Jammu & Kashmir	PGCIL, JKPTCL	20-Aug-23	19:52	20-Aug-23	21:16	01:24	i) As reported, at 19:52hrs, 220 KV Barn(JK)-Kishenpur(PG) Ckt-1 tripped from Barn(JK) end only due to damage of R-phase CB clamp at Barn(JK) end. ii) Due to tripping of 220 KV Barn(JK)-Kishenpur(PG) Ckt-1, loading on 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 increased and line CB at 220kV Barn(PDD JK) end of 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 opened due to over-loading, but line remain charged from Kishenpur(PG) end. iii) As per PMU at Kishenpur(PG), no fault is observed in the system. iv) As per SCADA, load loss of approx. 375MW occurred in J&K control area.	0	0	0	375	0.000	0.519	55019	72313	NA
21	GI-2	1) 400/220kV 315MVA ICT-1 at Bikaner(RS) 2) 400/220kV 315MVA ICT-2 at Bikaner(RS)	Rajasthan	RVPNL	20-Aug-23	03:18	20-Aug-23	04:11	00:53	i) During antecedent condition, MW loading on 400/220kV 315MVA ICT-1 & 2 at Bikaner(RS) were 200MW and 205MW respectively. ii) As reported, at 03:18hrs, 400/220kV 315MVA ICT-2 at Bikaner(RS) tripped due to heavy sparking of B phase isolator at 220kV side of ICT-2. As per DR, differential protection operated (Differential current in R, Y and B phase of approx. 2.67A, 2.64A and 5.31A respectively); current observed in B-phase was ~3.16kA. iii) With tripping of 400/220kV 315MVA ICT-2 at Bikaner(RS), 400/220kV 315MVA ICT-1 at Bikaner(RS) also tripped due to over-loading. As per DR, over-current earth-fault protection operated. iv) As per SCADA SOE, 220/132kV 100MVA ICT 3 at Bikaner(RS) also tripped during the same time. (Exact reason yet to be shared) v) As per PMU at Bikaner(PG), no fault is observed in the system, but fluctuation in voltage is observed. vi) As per SCADA, change in demand of approx. 465MW is observed in Rajasthan control area.	0	0.41	0	465	0.000	0.644	52928	72256	NA
22	GI-1	1) 220 kV Baghapurana(PS)-Mogan(PS) Ckt-1	Punjab	PSTCL	21-Aug-23	22:53	22-Aug-23	17:35	18:42	i) During antecedent condition, MW loading of 220 kV Baghapurana(PS)-Mogan(PS) Ckt-1 & 2 were approx. 72MW and 62MW respectively. ii) As reported, at 22:53hrs, 220 kV Baghapurana(PS)-Mogan(PS) Ckt-1 tripped due to R-phase CT damage at Moga(PS) end, fault observed in zone-1 from Moga(PS) end. Due to tripping of 220 kV Baghapurana(PS)-Mogan(PS) Ckt-1, load was shifted to 220 kV Baghapurana(PS)-Mogan(PS) Ckt-2 and no load loss occurred. iii) As per PMU at Moga(PG), R-N phase to earth fault with fault clearance time of 120msec is observed. iv) As per SCADA, change in demand of approx. 670MW is observed in Punjab control area. But as reported by SLDC Punjab no other major tripping occurred during the same time and no load loss occurred during the event.	0	0	0	0	0.000	0.000	58971	72894	120

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
23	GD-1	1) 220 kV Vatika-Sanganer(RS) Ckt 2) 400/220 kV 250 MVA ICT 1 at Heerapura400(RS) 3) 400/220 kV 250 MVA ICT 2 at Heerapura400(RS) 4) 400/220 kV 315 MVA ICT 1 at Babai(RS) 5) 400/220 kV 315 MVA ICT 3 at Babai(RS) 6) 220/132kV 160MVA ICT 1 at Heerapura220(RS) 7) 220/132kV 160MVA ICT 2 at Heerapura220(RS) 8) 220/132kV 100MVA ICT 3 at Heerapura220(RS) 9) 220/132kV 160MVA ICT 4 at Heerapura220(RS) 10) 220/132kV 100MVA ICT 1 at Sanganer(RS) 11) 220/132kV 100MVA ICT 2 at Sanganer(RS) 12) 220/132kV 160MVA ICT 1 at Sawai Madhopur(RS) 13) 220/132kV 100MVA ICT 2 at Sawai Madhopur(RS)	Rajasthan	RVVPNL	21-Aug-23	12:11	21-Aug-23	12:24	00:13	i) During antecedent condition, 220 kV F-G Bus between 400 kV & 220 KV GSS Heerapura were under shutdown due to which the load of 220 kV GSS Chomu, Niwana, NPH and VKI were shifted to parallely connected 220 KV D-A & E-C Bus between 400 kV & 220 KV GSS Heerapura. 2. The above load management was managed through 400/220 kV 250 MVA ICT 1 & 2 connected at 220 KV D-A & E-C Bus between 400 kV & 220 KV GSS Heerapura, and the load was around 210 MW on each ICT. ii) On the other hand, the 220 kV GSS Niwana is connected in ring from 400 kV GSS Heerapura and 400 KV GSS, Babai. 220 KV GSS Niwana was drawing power around 130MW from 400 KV GSS Heerapura and around 30 MW power was drawing from 400 KV GSS, Babai. The load on 400/220 kV 315 MVA ICT – 1 & 2 at 400 KV GSS Babai were 270 MW. iii) As reported, the details of event is as follows: a. At 12:11hrs, 220 kV Vatika – Sanganer line which was carrying around 170 MW towards 220 KV Sanganer, tripped due to jumper snapping. As a result of this, Sanganer started drawing load from 220 kV GSS Mansarovar and Mansarovar from 400 kV GSS Heerapura. b. Due to tripping of 220 kV Vatika-Sanganer line the extra loading of around 170 MW was put on 400/220 kV 250 MVA ICT 1 & 2 at Heerapura400(RS), resulting tripping of both the ICTs on overload. c. Due to the failure of both ICTs at 400 KV GSS, Heerapura, 220 KV GSS Niwana started to draw around 130 MW power from 400 KV GSS Babai resulting in overloading of 400/220 kV 315 MVA ICT – 1 & 3 at 400 KV GSS Babai (ICT-2 was out during the event) and eventually both the ICTs also tripped on overload. iv) As per SCADA data and SOE, at the same time, 220/132kV 160MVA ICT 1, 2 & 4 and 100MVA ICT 3 at Heerapura220(RS), 220/132kV 100MVA ICT 1 & 2 at Sanganer(RS) and 220/132kV 160MVA ICT 1 & 100MVA ICT 2 at Sawai Madhopur(RS) tripped during the same time. (Exact reason yet to be shared) v) As per PMU at Bassi(PG), R-N phase to earth fault is observed with fault clearing time of 80ms. vi) As per SCADA, change in demand of approx. 1750MW is observed in Rajasthan control area.	0	0.379	0	1750	0.000	2.276	69275	76900	80
24	GI-1	1) 220 kV Kunihar-Bhaba (HP) Ckt 2) 220 kV Baddi-Kunihar(HP) Ckt 2 3) 132 kV Kunihar-Barotiwala Ckt 1 4) 132 kV Kunihar-Solan(HP) Ckt 1 5) 132 kV Kunihar-Solan(HP) Ckt 2 6) 132 kV Kunihar-Shimla(HP) Ckt 1 7) 132 kV Kunihar-Malyana(HP) Ckt 2 8) 220/132kV 160/200MVA ICT-1 at Kunihar(HP) 9) 220/132kV 160/200MVA ICT-2 at Kunihar(HP)	Himachal Pradesh	HPPTCL	21-Aug-23	11:27	21-Aug-23	11:34	00:07	i) As reported, at 11:27 hrs, bus-bar protection operated at 220 kV Bus 2 at Kunihar(HP). (Exact reason yet to be shared) ii) Due to this, all the elements connected to 220 kV Bus 2 at Kunihar(HP) got tripped and Bus-2 became dead. iii) At the same time, as reported by SLDC HP, 132 kV Kunihar-Barotiwala Ckt 1, 132 kV Kunihar-Solan(HP) Ckt 1 & 2, 132 kV Kunihar-Shimla(HP) Ckt 1 and 132 kV Kunihar-Malyana(HP) Ckt 2 also tripped. (Exact reason yet to be shared) iv) As per SCADA SOE, 30MW Unit-1 at Giri(HP) and 132 kV Kunihar-Jutog (HP) Ckt-2 also tripped during the same time. As per communication with SLDC HP, 30MW Unit-1 & 2 at Giri(HP) (connected at 132kV level) tripped during the same time. (Exact reason yet to be shared) v) As per PMU at Panchkula(PG), no fault is observed in the system, but fluctuation in voltage is observed. vi) As per SCADA, change in demand of approx. 330MW in HP control area is observed. But as reported by SLDC-HP, load loss of approx. 250MW occurred during the event. vii) As per SCADA, generation loss of approx. 60MW is observed in HP hydro generation.	0	0.029	60	250	0.083	0.318	72329	78601	NA
25	GD-1	1) 220kV Shahjahanpur(UP)-Shahjahanpur(PG) Ckt 2) 220kV Shahjahanpur(UP)-Bareilly(UP) Ckt 3) 220kV Shahjahanpur(UP)-Rosa TPS(UP) Ckt-1 4) 220kV Shahjahanpur(UP)-Rosa TPS(UP) Ckt-2 5) 220kV Shahjahanpur(UP)-Azizpur(UP) Ckt 6) 220kV Shahjahanpur(UP)-Gola-lakhimpur(UP) Ckt 7) 220kV Shahjahanpur(UP)-Hardoi(UP) Ckt 8) 220/132kV 160MVA ICT-1 at Shahjahanpur(UP) 9) 220/132kV 200MVA ICT-2 at Shahjahanpur(UP) 10) 220/132kV 160MVA ICT-3 at Shahjahanpur(UP) 11) 300MW Rosa TPS(UP) Unit-1 12) 300MW Rosa TPS(UP) Unit-2	Uttar Pradesh	UPPTCL, PGCIL	22-Aug-23	12:39	22-Aug-23	13:05	00:26	i) During antecedent condition, 300MW Rosa TPS(UP) Unit-1 and 2 were generating 274MW and 278MW respectively. Rosa TPS is connected with 220kV Shahjhanpur thorugh 220kV Rosa-Shahjhanur ckt-1&2. ii) As reported, at 12:39 hrs, R-N phase to earth fault occurred in 220kV Shahjahanpur(UP)-Azizpur(UP) Ckt; fault sensed in zone-1 at both the ends. Fault distance was 12.92km from Azizpur(UP) end and 22.125km from Shahjahanpur(UP) end. As per DR, fault current was approx. 6.56kA from Shahjahanpur(UP) end. Line tripped only from Azizpur(UP) end, line didn't trip from Shahjhanpur end. iii) As fault didn't clear from Shahjhanpur end, all other lines connected at 220kV Shahjanpur(UP) tripped from remote end on zone-3 distance protection operation. iv) Due to this tripping, 220/132/33kV Shahjahanpur(UP) S/s became dead. v) During the same time, 300MW Rosa TPS(UP) Unit-1 & 2 tripped on standby earth fault protection operation. As per DR of 300MW Rosa TPS(UP) Unit-1, fault current was approx. 3.37kA. vi) As per SCADA SOE, 132kV Jalalbad-Azizpur (UP) Ckt and 400kV Bareilly -Unnao (UP) Ckt-1 tripped during the same time. (Exact reason yet to be shared) vii) As per PMU at Lucknow(PG), R-N phase to earth fault converted to R-Y phase to phase fault is observed in the system with delayed fault clearance time of 2840ms. viii) As reported by SLDC-UP, load loss of ~55MW and generation loss of approx. 550MW occurred in UP control area.	0	0.024	550	55	0.781	0.071	70464	77308	2840
26	GD-1	1) 220 kV Verpal(PS) –Amritsar(PG) ckt-1 2) 220 kV Verpal(PS) –Amritsar(PG) ckt-2 3) 220kV Verpal(PS)-Rashiana(PS) Ckt 4) 220kV Verpal(PS)-Patti(PS) Ckt 5) 220kV Verpal(PS)-Butri(PS) Ckt	Punjab	PSTCL	22-Aug-23	21:51	23-Aug-23	00:20	02:29	i) 220/132/66kV Verpal(PS) has double main bus scheme at 220kV level. ii) As reported, at 21:51 hrs, R-N phase to earth fault occurred in 220kV Verpal(PS)-Rashiana(PS) Ckt; fault sensed in zone-1 at Rashiana(PS) end. Line tripped only from Rashiana(PS) end. iii) As CB at Verpal(PS) end of 220kV Verpal(PS)-Rashiana(PS) Ckt failed to operate, all other lines connected at 220kV Verpal(PS) tripped from remote end on zone-3 distance protection operation. iv) Due to this tripping, 220/132/66kV Verpal(PS) S/s became dead. v) As per DR at Amritsar(PG) end, 220 kV Verpal(PS) –Amritsar(PG) ckt-1&2 tripped on R-N phase to earth fault with fault current of ~3.2kA from Amritsar(PG) end with fault clearance time of ~830ms; fault was sensed in zone-3. vi) As per PMU at Lucknow(PG), R-N phase to earth fault is observed in the system with delayed fault clearance time of 880ms. vii) As per SCADA, change in demand of approx. 590 MW is observed in Punjab control area.	0	1.465	0	590	0.000	0.835	58294	70663	880
27	GI-1	1) 220 KV Barn(JK)-Kishenpur(PG) Ckt-2	Jammu & Kashmir	PGCIL, JKPTCL	23-Aug-23	14:55	23-Aug-23	17:14	02:19	i) 220/132kV Barn(J&K) have feeding from 220kV Kishenpur-Barn ckt-1&2 only. There are 3*160MVA 220/132kV ICTs at Barn S/s and 132kV feeders to Kala Kotla, Jauria, Katra & Barn Canal. ii) During antecedent condition, 220kV Kishnepur-Barn ckt-1&2 were carrying 167MW & 170MW respectively. iii) As reported, at 14:55hrs, 220 KV Barn(JK)-Kishenpur(PG) Ckt-2 tripped on B-N phase to earth fault with fault distance of ~6.9km from Kishenpur(PG) end. At the same time, 132kV feeders to Kala Kotla, Barn Canal & Jauria tripped. iv) Due to tripping of aforementioned elements, load of Kala Kotla, Barn Canal & Jauria affected. Load of Katra was remained intact through 220kV Kishenpur-Barn ckt-1. v) As per DR at Kishenpur(PG) end of 220 KV Barn(JK)-Kishenpur(PG) Ckt-2, zone-1 distance protection operated; fault current was approx. 10.52kA from Kishenpur(PG) end. vi) As per PMU at Kishenpur(PG), B-N phase to earth fault with no A/R operation and cleared within 80msec is observed. vii) As per SCADA, load loss of approx. 245MW occurred in J&K control area.	0	0.567	0	245	0.000	0.366	62178	66986	80
28	GI-1	1) 220kV Geeta Colony - South wazirabad (DTL) ckt-2	Delhi	DTL	23-Aug-23	17:07	23-Aug-23	17:28	00:21	i) During antecedent condition, 220kV Geeta Colony-Patparganj (DTL) Ckt-1 was connected to 220kV Bus-1 at Geeta Colony(DTL) and 220kV Geeta Colony-Patparganj (DTL) Ckt-2, 220kV Geeta Colony - South wazirabad (DTL) Ckt-2 and 220/33kV 100MVA ICT-1& 2 were connected to 220kV Bus-2 at Geeta Colony(DTL) and 220kV bus coupler was in closed position. 220kV Geeta Colony - South wazirabad (DTL) Ckt-1 was under shutdown and entire load of 220kV Geeta Colony and Patparganj was catered by 220kV Geeta Colony - South wazirabad (DTL) Ckt-2. ii) As reported, at 17:07 hrs, 220kV Geeta Colony - South wazirabad (DTL) ckt-2 tripped on Y-B phase to phase fault, fault sensed in zone-1 from Wazirabad end. iii) Due to tripping of the line, load of Shakarpur, Jhilmil, Kanti nagar, Akshardham, CBD-I, Dallupura, Geeta Colony, Guru Angad Nagar, Kailash Nagar, Khichripur, Krishna Nagar, Mayur Vihar-I & II, GH-I, Preet Vihar and Patparganj were affected. iv) As per PMU at Mandaula(PG), Y-N phase to earth fault followed by Y-B phase to phase fault is observed with fault clearing time of 80 ms. v) As per SCADA, load loss of approx. 300MW is observed in Delhi control area. But as reported by SLDC Delhi, load loss of approx. 206MW occurred in Delhi control area.	0	0.072	0	206	0.000	0.330	55558	62466	80
29	GI-1	1) 220 KV Wagoora(PG)-Ziankote(JK) (PDD JK) Ckt-2	Jammu & Kashmir	PGCIL, JKPTCL	23-Aug-23	15:17	23-Aug-23	17:33	02:16	i) 220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. ii) During antecedent condition, 220kV Ziankote was operating in bus split mode viz. 220kV Amargarh(INDIGRID) –Ziankote(JK) D/C (carrying 95MW each) was feeding Ziankote load. 220kV Wagoora-Ziankote(JK) Ckt-2 (carrying 118MW) was connected at other bus and feeding Alusteng. 220kV Wagoora-Ziankote(JK) Ckt-1 was not in service. iii) As reported, 220 KV Wagoora(PG)-Ziankote(JK) (PDD JK) Ckt-2 tripped on B-N phase to earth fault with distance of 21.32km from Wagoora(PG) end. iv) As per DR, fault was sensed in zone-1. Fault current was approx. 5.16kA from Wagoora(PG) end. v) As per PMU at Amargarh(PG), B-N phase to earth fault is observed with fault clearing time of 160ms. vi) As per SCADA, change in demand of approx. 100MW is observed in J&K control area. But as reported by SLDC J&K, load loss of 60MW occurred in J&K control area.	0	0.136	0	60	0.000	0.091	61147	66251	160
30	GI-1	1) 220 KV Amargarh(Indigrid)-Ziankote(JK) (PDD JK) Ckt-1 2) 220 KV Amargarh(Indigrid)-Ziankote(JK) (PDD JK) Ckt-2	Jammu & Kashmir	PGCIL, JKPTCL	25-Aug-23	13:19	25-Aug-23	15:02	01:43	i) 220/132kV Ziankote S/s have two bus at 220kV side i.e., main bus & reserve bus. ii) During antecedent condition, 220kV Ziankote was operating in bus split mode viz. 220kV Amargarh(INDIGRID) –Ziankote(JK) D/C was feeding Ziankote load. 220 KV Amargarh(Indigrid)-Ziankote(JK) (PDD JK) Ckt-1 & 2 were 145MW each. iii) As reported, 220kV Amargarh(INDIGRID) –Ziankote(JK) ckt-1 tripped on B-N phase to earth fault with distance of 11.94km from Amargarh end; fault sensed in zone-1. iv) At the same time, 220kV Amargarh(INDIGRID) –Ziankote(JK) ckt-2 also tripped due to overloading occurred. Hence, load of Ziankote affected due to tripping. v) As per PMU at Amargarh, B-N phase to earth fault is observed with fault clearing time of 80ms. vi) As per SCADA, change in demand of approx. 260MW is observed in J&K control area.	0	0.446	0	260	0.000	0.373	63215	69747	80
31	GD-1	1) 220 kV Akal-Mada (RS) Ckt	Rajasthan	RVVPNL	28-Aug-23	05:17	28-Aug-23	10:23	05:06	i) During antecedent condition, Rajasthan state wind generation was approx. 2888MW and 220kV Akal-Mada ckt was carrying approx. 240MW wind generation. ii) As reported, at 05:17hrs, 220kV Akal-Mada ckt tripped. Y-phase Jumper found broken in yard at 220 kV GSS Mada. iii) As per PMU at Jodhpur(RS), Y-B phase to phase fault with delayed clearance of ~360msec is observed. iv) With the tripping of 220kV Akal-Mada ckt, complete wind generation at Mada lost (220kV Mada S/s blackout). At the same time, wind generation at other connected wind plants (Bhu, Jajijya, Tejwa, Mulana etc,) also dropped to zero. No line tripping except 220kV Akal-Mada ckt reported and recorded in SOE during the event. v) As per SCADA, total drop in Rajasthan wind generation was approx. 1610MW. Almost ~1200MW RE generation recovered within 5min.	0	0	1610	0	2.948	0.000	54613	63723	360
32	GD-1	1) 400 KV Baglihar(JK)-Kishenpur(PG) (PDD JK) Ckt-1 2) 400 KV Baglihar(JK)-Kishenpur(PG) (PDD JK) Ckt-2	Jammu & Kashmir	PGCIL, JKPTCL	28-Aug-23	06:09	28-Aug-23	09:20	03:11	i) Baglihar HEP comprises of Baglihar Stage-1 (150MW Unit-1,2&3) and Baglihar Stage-2 (150MW Unit-4,5&6). Power of Baglihar stage-1 HEP evacuates through 400kV Baglihar-Kishenpur ckt-1 & 2 and power of Baglihar stage-2 HEP evacuates through 400kV Baglihar-Wanpoh ckt & 400kV Baglihar-Kishenpur ckt-3. ii) During antecedent condition, 400kV Baglihar-Kishenpur ckt-1,2&3 and 400kV Baglihar-Wanpoh ckt were carrying 223MW, 221MW, 235MW & 210MW respectively. iii) As reported, at 06:09hrs, 400 KV Baglihar(JK)-Kishenpur(PG) (PDD JK) Ckt-2 tripped on Y-N phase to earth fault after unsuccessful A/R operation as fault was of permanent nature. Fault was in Z-1(~4.5km) from Kishenpur end and fault current was IY=~17kA. iv) As per PMU at Kishenpur(PG), Y-N phase to earth fault with unsuccessful A/R operation and delayed clearance of fault in 200msec is observed. At the same time, 400 KV Baglihar(JK)-Kishenpur(PG) (PDD JK) Ckt-1 also tripped from Baglihar end only. v) With the tripping of 400 KV Baglihar(JK)-Kishenpur(PG) (PDD JK) Ckt-1&2, all three running unit, 150MW Unit-1,2&3 (carrying total ~450MW) tripped due to loss of evacuation path leading to complete blackout of Baglihar Stage-1(J&K). vi) As per SCADA, change in demand of approx. 100MW is observed in J&K control area and loss in generation of approx. 450MW at Baglihar HEP.	0	0.318	450	100	0.829	0.160	54261	62391	200
33	GI-2	1) 400kV Bhadla(RS)-Bikaner(RS) Ckt-1	Rajasthan	RVVPNL	28-Aug-23	11:52	1-Sep-23	18:38	06:46	i) As reported, at 11:52hrs on 28th August, 2023, 400kV Bhadla(RS)-Bikaner(RS) Ckt-1 tripped on R-Y phase to phase fault with fault distance of 157.6km from Bikaner(RS). As per information received from SLDC Rajasthan, conductor snapped in line near 400kV level of Bhadla(RS). (Exact location of conductor snapping need to be shared) ii) As per DR at Bikaner(RS) end of 400kV Bhadla(RS)-Bikaner(RS) Ckt-1, fault was sensed in zone-2; fault current was 3.299kA and 3.723kA in R and Y phase respectively from Bikaner(RS) end and fault clearing time was ~70ms. iii) As per SCADA, change in NR total solar generation of approx. 2095MW is observed at 11:52hrs. iv) As per PMU at Bhadla(PG), R-Y phase to phase fault is observed with fault clearance time of 80 ms at 11:52hrs.	0	0	2095	0	3.294	0.000	63608	66398	80
34	GI-2	1) 400kV Bhadla(RS)-Bikaner(RS) Ckt-2	Rajasthan	RVVPNL	28-Aug-23	12:05	1-Sep-23	18:38	06:33	i) As reported, at 12:05hrs, 400kV Bhadla(RS)-Bikaner(RS) Ckt-2 tripped on Y-B phase to phase fault with fault distance of 148.9km from Bikaner(RS). As per information received from SLDC Rajasthan, conductor snapped in line near 400kV level of Bhadla(RS). (Exact location of conductor snapping need to be shared) ii) As per DR at Bikaner(RS) end of 400kV Bhadla(RS)-Bikaner(RS) Ckt-2, fault was sensed in zone-1; fault current was 3.472kA and 4.467kA in Y and B phase respectively from Bikaner(RS) end and fault clearing time was ~50ms. iii) As per SCADA SOE, 400kV Bhadla(RS)-Ramgarh(RS) ckt-1 also tripped during the same time. (Exact reason yet to be shared) iv) As per SCADA, change in NR total solar generation of approx. 1880MW is observed at 12:05hrs. v) As per PMU at Bhadla(PG), Y-B phase to phase fault is observed with fault clearance time of 80 ms at 12:05hrs.	0	0	1880	0	3.000	0.000	62663	66556	80
35	GD-1	1) 220 KV Roorkee(PG)-Roorkee(UK) (PTCUL) Ckt-1	Uttarakhand	PGCIL, PTCUL	29-Aug-23	10:44	29-Aug-23	11:36	00:52	i) 220kV Roorkee(PTCUL) is connected with 400/220kV Roorkee(PG) through 220 KV Roorkee(PG)-Roorkee(UK) (PTCUL) Ckt. ii) During antecedent condition, 220 KV Roorkee(PG)-Roorkee(UK) (PTCUL) Ckt was carrying ~181MW. This was the only source available for 220kV Roorkee(PTCUL). iii) At reported, at 10:43:36hrs, 220 KV Roorkee(PG)-Roorkee(UK) (PTCUL) Ckt tripped on R-Y fault from Roorkee(PG) end only leading to complete blackout at 220kV Roorkee(PTCUL). Distance protection relay at Roorkee(PG) end sensed fault in Z-3 with distance approx. 19.3km (219.3%), fault currents were IR=4.2kA and IY=3.9kA. iv) As per PMU at Roorkee(PG) and DR of the line at Roorkee(PG) end, R-N fault which late converted into R-Y-N fault with delayed clearance of ~1240msec is observed. v) With the tripping of 220 KV Roorkee(PG)-Roorkee(UK) (PTCUL) Ckt, supply to 220kV Roorkee(PTCUL) lost. vi) As per SLDC-Uttarakhand, laod loss of approx. 181MW occurred in Uttarakhand control area.	0	0.157	0	181	0.000	0.258	65934	70185	1240

S.No.	Category of Grid Disturbance (GD-I to GD-V)	Name of Elements (Tripped/Manually opened)	Affected Area	Owner/ Agency	Outage		Revival		Duration (hh:mm)	Event (As reported)	Energy Unserved due to Generation loss (MU)	Energy Unserved due to Load loss (MU)	Loss of generation / loss of load during the Grid Disturbance		% Loss of generation / loss of load w.r.t Antecedent Generation/Load in the Regional Grid during the Grid Disturbance		Antecedent Generation/Load in the Regional Grid		Fault Clearance time (in ms)
					Date	Time	Date	Time					Generation Loss(MW)	Load Loss (MW)	% Generation Loss(MW)	% Load Loss (MW)	Antecedent Generation (MW)	Antecedent Load (MW)	
36	GI-1	1) 220 kV Bamnauli-Pappankalan(Dwarka2) ckt-2	Delhi	DTL	30-Aug-23	12:50	30-Aug-23	12:53	00:03	i) 220kV Pappankalan(Dwarka2) have feeding from 400/220kV Bamnauli(DTL) and 400/220kV Dwarka(DTL). ii) During antecedent condition, 220kV Pappankalan(Dwarka2) was running in split mode. 220 kV Bamnauli-Pappankalan(Dwarka2) ckt-1 was under emergency shutdown, 220 kV Bamnauli-Pappankalan(Dwarka2) ckt-2 was carrying approx. 155MW, feeding load through 220/66kV 100MVA ICT-2 & 160MVA ICT-4 and 220kV Dwarka-Pappankalan ckt-1&2 was feeding through 220/66kV 100MVA ICT-1 & 160MVA ICT-3. iii) As reported, at 12:50 hrs, 220 kV Bamnauli-Pappankalan(Dwarka2) ckt-2 tripped on Y-B phase to phase fault. Line tripped on differential protection operation. iv) Approx. 160MW load affected due to tripping of 220 kV Bamnauli-Pappankalan(Dwarka2) ckt-2. At 12:53hrs, load was restored by closing bus coupler at 220kV Pappankalan. v) As per PMU at Bamnauli(PG), Y-B phase to phase fault is observed with fault clearing time of 120 ms. vi) As reported by SLDC-Delhi, load loss of approx. 160MW is occurred in Delhi control area.	0	0.008	0	160	0.000	0.218	68910	73548	120
37	GD-1	1) 220 kV Tuglakabad-Masjid Moth (DTL) Ckt-1 2) 220 kV Tuglakabad-Okhla (DTL) Ckt-1	Delhi	DTL	30-Aug-23	11:52	30-Aug-23	11:55	00:03	i) 220kV Masjid Moth(DTL) have feeding from 400/220kV Tuglakabad and 400/220kV Maharanibagh and 220kV Okhla(DTL) have feeding from 400/220kV Tuglakabad and 220kV Badarpur. ii) During antecedent condition, 220kV Maharanibagh-Masjid Moth ckt-1&2 were not in service and 220kV Tuglakabad-Masij Moth ckt-1 (carrying 34MW) & ckt-2 (carrying 81MW) were running in split mode. 220kV Okhla was connected to Tuglakabad and Badarpur. iii) As reported, at 11:52 hrs, 220 kV Tuglakabad-Okhla ckt-1 tripped on B-N phase to earth fault, fault distance was ~3.3km from Tuglakabad end. At the same time, 220kV Tuglakabad-Masjid Moth ckt-1 also tripped leading to complete blackout of 220kV Masjid Moth(DTL) S/s. iv) Approx. 80MW load affected at 220kV Masjid Moth. At 11:55hrs, bus coupler was closed and load was restored through 220kV Tuglakabad-Masjid Moth ckt-2. Further at 12:15hrs, 220kV Tuglakabad-Masjid Moth ckt-1 also restored. No load affected at 220kV Okhla. v) As per PMU at Ballabhgarh(PG), B-N phase to earth fault is observed with fault clearing time of 120 ms. vi) As reported by SLDC-Delhi, load loss of approx. 90MW is occurred in Delhi control area.	0	0.004	0	80	0.000	0.108	69396	74057	120

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Load Loss/ Gen. Loss	Brief Reason (As reported)	Category as per CEA Grid standards	# Fault Clearance Time (>100 ms for 400 kV and 160 ms for 220 kV)	*FIR Furnished (YES/NO)	DR/EL provided in 24 hrs (YES/NO)	Other Protection Issues and Non Compliance (inference from PMU, utility details)	Suggestive Remedial Measures	Remarks
			Date	Time									
1	800 KV HVDC Kurukshetra(PG) Pole-2	POWERGRID	1-Aug-23	07:51		Maloperation of Relay	NA	NA	YES	YES (after 24hrs)			As per PMU, fluctuation in voltage is observed.
2	800 KV HVDC Kurukshetra(PG) Pole-4	POWERGRID	1-Aug-23	07:51		Maloperation of Relay	NA	NA	YES	YES (after 24hrs)			As per PMU, fluctuation in voltage is observed.
3	220 KV Auraiya(NT)-Malanpur(MP) (PG) Ckt-1	POWERGRID	5-Aug-23	05:15		Phase to earth fault R-N	NA	NA	YES	YES			As per PMU, no fault is observed.
4	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	6-Aug-23	17:01		Phase to earth fault B-N	NA	NA	YES	YES (after 24hrs)			As per PMU, B-N fault with no A/R operation is observed.
5	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	9-Aug-23	19:03		Transient fault	NA	NA	NO	NO			As per PMU, fluctuation in voltage is observed.
6	500 KV HVDC Mahindergarh(APL)-Adani Mundra(APL) (ATIL) Ckt-2	APL	11-Aug-23	13:51		Earth fault	NA	NA	YES	YES			As per PMU, fluctuation in voltage is observed.
7	765 KV Orai-Satna (PG) Ckt-1	POWERGRID	15-Aug-23	13:33		Phase to earth fault B-N	NA	NA	YES	YES			As per PMU, B-N fault with unsuccessful A/R operation is observed.
8	220 KV Auraiya(NT)-Mehgaon(MP) (MPSEB) Ckt-1	POWERGRID	22-Aug-23	19:24		Phase to earth fault R-N	NA	NA	YES	YES (after 24hrs)			As per PMU, R-N fault with no A/R operation is observed.
9	800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-2	POWERGRID	24-Aug-23	13:47		Maloperation of Relay	NA	NA	NO	NO			As per PMU, fluctuation in voltage is observed.
10	800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-4	POWERGRID	24-Aug-23	13:47		Maloperation of Relay	NA	NA	YES	YES (after 24hrs)			As per PMU, fluctuation in voltage is observed.
11	800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-1	POWERGRID	24-Aug-23	17:47		Maloperation of Relay	NA	NA	NO	NO			As per PMU, fluctuation in voltage is observed.

12	400 KV Balia-Patna (PG) Ckt-2	POWERGRID	28-Aug-23	17:46		Phase to Phase Fault Y-B	NA	NA	YES	YES (after 24hrs)			As per PMU, Y-B fault is observed.
13	500 KV HVDC Mahindergarh(APL)-Adani Mundra(APL) (ATIL) Ckt-2	APL	29-Aug-23	11:28		Snapping of Earth wire	NA	NA	NO	NO			As per PMU, fluctuation in voltage is observed.

 # Fault Clearance time has been computed using PMU Data from nearest node available and/or DR provided by respective utilities (*Annexure-* ***II)***

****Yes, if written Preliminary report furnished by constituent(s)***

R-Y-B phase sequencing (Red, Yellow, Blue) is used in the list content.All information is as per Northern Region unless specified.

^^ tripping seems to be in order as per PMU data, reported information. However, further details may be awaited.

Reporting of Violation of Regulation for various issues for above tripping

1	Fault Clearance time(>100ms for 400kV and >160ms for 220kV)	1. CEA Grid Standard-3.e 2. CEA Transmission Planning Criteria
2	DR/EL Not provided in 24hrs	1. IEGC 5.2(r) 2. CEA Grid Standard 15.3
3	FIR Not Furnished	1. IEGC 5.9.6.a 2. CEA Grid Standard 12.2 (Applicable for SLDC, ALDC only)
4	Protection System Mal/Non Operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.A 2. CEA (Technical Standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1. (6.1, 6.2, 6.3)
5	A/R non operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.C 2. CEA Technical Planning Criteria

Status of submission of FIR/DR/EL/Tripping Report on NR Tripping Portal

Time Period: 1st August 2023 - 31st August 2023

S. No.	Utility	Total No. of tripping	First Information Report (Not Received)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)	Remark
			Value	%	Value		%	Value		%	Value		%	
1	AHEJ4L	4	4	100	4	0	100	4	0	100	4	0	100	DR, EL & Tripping report need to be submitted
2	ANTA-NT	1	0	0	0	0	0	0	0	0	0	0	0	
3	APL	3	2	67	2	0	67	2	0	67	2	0	67	DR, EL & Tripping report need to be submitted
4	APMPL	1	1	100	1	0	100	1	0	100	1	0	100	
5	ASEJOL	1	1	100	1	0	100	1	0	100	1	0	100	
6	AURAIYA-NT	2	0	0	0	0	0	0	0	0	0	0	0	
7	AVAADA_SUNRAYS	2	2	100	2	0	100	2	0	100	2	0	100	DR, EL & Tripping report need to be submitted
8	BAIRASUIL-NH	2	2	100	2	0	100	2	0	100	2	0	100	
9	BBMB	78	23	29	23	25	43	23	38	58	23	3	31	
10	CHAMERA-III-NH	1	1	100	1	0	100	1	0	100	1	0	100	
11	CHAMERA-II-NH	2	2	100	2	0	100	2	0	100	2	0	100	
12	CHAMERA-I-NH	1	1	100	1	0	100	1	0	100	1	0	100	
13	CPCC1	71	7	10	12	1	17	9	2	13	9	0	13	
14	CPCC2	43	0	0	0	7	0	1	7	3	1	0	2	
15	CPCC3	35	3	9	3	5	10	4	6	14	3	1	9	
16	DADRIGAS-NT	5	5	100	5	0	100	5	0	100	5	0	100	
17	DADRI-NT	2	1	50	1	0	50	1	0	50	1	0	50	
18	DULHASTI-NH	3	3	100	3	0	100	3	0	100	3	0	100	
19	ESUCRL	1	1	100	1	0	100	1	0	100	1	0	100	
20	JHAJJAR	1	0	0	0	0	0	0	0	0	0	1	0	Details received
21	KARCHAM	1	0	0	0	0	0	1	0	100	0	0	0	
22	KISHENGANGA-NH	1	1	100	1	0	100	1	0	100	1	0	100	DR, EL & Tripping report need to be submitted
23	KOTESHWAR	1	1	100	1	0	100	1	0	100	1	0	100	
24	NAPP	3	0	0	0	0	0	0	0	0	0	0	0	Details received
25	NJPC	1	0	0	0	1	0	0	0	0	0	0	0	
26	RAMPUR	1	0	0	0	0	0	0	0	0	0	0	0	
27	RAPPA	6	0	0	6	0	100	6	0	100	6	0	100	DR, EL & Tripping report need to be submitted
28	RENEW SOLARURJA (RSUPL)	1	1	100	1	0	100	1	0	100	1	0	100	
29	RIHAND-NT	1	1	100	1	0	100	1	0	100	1	0	100	
30	SALAL-NH	3	3	100	3	0	100	3	0	100	3	0	100	

Status of submission of FIR/DR/EL/Tripping Report on NR Tripping Portal

Time Period: 1st August 2023 - 31st August 2023

S. No.	Utility	Total No. of tripping	First Information Report (Not Received)		Disturbance Recorder (Not Received)	Disturbance Recorder (NA) as informed by utility	Disturbance Recorder (Not Received)	Event Logger (Not Received)	Event Logger (NA) as informed by utility	Event Logger (Not Received)	Tripping Report (Not Received)	Tripping Report (NA) as informed by utility	Tripping Report (Not Received)	Remark
			Value	%	Value		%	Value		%	Value		%	
31	SHREE CEMENT	1	1	100	1	0	100	1	0	100	1	0	100	
32	SINGOLI	6	0	0	0	0	0	0	0	0	0	0	0	Details received
33	SLDC-CHD	2	2	100	2	0	100	2	0	100	2	0	100	DR, EL & Tripping report need to be submitted
34	SLDC-DV	24	2	8	6	12	50	8	10	57	13	1	57	
35	SLDC-HP	14	0	0	6	8	0	3	8	50	0	0	0	Details received
36	SLDC-HR	17	1	6	1	4	8	1	4	8	1	0	6	DR, EL & Tripping report need to be submitted
37	SLDC-JK	18	11	61	18	0	100	18	0	100	15	0	83	
38	SLDC-PS	59	8	14	31	12	66	31	14	69	36	1	62	
39	SLDC-RS	86	12	14	16	14	22	16	14	22	44	1	52	
40	SLDC-UK	19	0	0	3	7	25	3	2	18	0	1	0	Details received
41	SLDC-UP	172	17	10	16	55	14	17	66	16	14	7	8	DR, EL & Tripping report need to be submitted
42	STERLITE	5	1	20	0	0	0	1	0	20	4	0	80	
43	TANAKPUR-NH	2	1	50	1	0	50	1	0	50	1	0	50	
44	TANDA-NT	4	1	25	1	1	33	1	1	33	1	1	33	
45	UNCHAHAR-NT	1	1	100	0	0	0	0	0	0	0	0	0	Details received
Total in NR Region		**708**	**124**	**18**	**179**	**152**	**32**	**180**	**172**	**34**	**207**	**17**	**30**	

As per the IEGC provision under clause 5.2 (r), detailed tripping report along with DR & EL has to be furnished within 24 hrs of the occurrence of the event

S. No.	Name of the Generatng Station (Capacity in MW)	Date of last PSS tuning / re-tuning performed (in DD/MM/YYYY format)	Date of last Step Response Test performed (in DD/MM/YYYY format)	Report submitted to NRLDC/NRPC (Yes/ No)	Remarks (if any)	Tentative schedule for PSS tuning / re-tuning
1	**THDC**					
	TEHRI HPS(4 * 250)	15.12.2021 to 20.12.2021	15.12.2021 to 20.12.2021	Yes	(Report shared vide email dt.19.01.2019)	
	KOTESHWAR HPS(4 * 100)	17/03/2019 to 19/03/2019	17/03/2019 to 19/03/2019	Yes	(Report shared vide email dt.11.02.2021)	
2	**SJVNL**					
	NATHPA-JHAKRI HPS(Unit1 #250)	10.03.2020	-	No	Excitation system upgraded in 2020	
	NATHPA-JHAKRI HPS(Unit2 #250)	14.03.2013	-	No	The upgradation of old excitation system of Unit No.#2&4 will be carried out during Annual Plant Maintenance of FY 20222-23, therefore PSS tuning shall be carried out at the time of upgradation of unit. It is also submitted that step response test of other Units shall also be carried out during upgradation work of Unit # 2 &4 by the OEM, being a system and software specific job.	
	NATHPA-JHAKRI HPS(Unit3 #250)	03.03.2020	-	No	Excitation system upgraded in 2020	
	NATHPA-JHAKRI HPS(Unit4 #250)	14.03.2013	-	NO	The upgradation of old excitation system of Unit No.#2&4 will be carried out during Annual Plant Maintenance of FY 20222-23, therefore PSS tuning shall be carried out at the time of upgradation of unit. It is also submitted that step response test of other Units shall also be carried out during upgradation work of Unit # 2 &4 by the OEM, being a system and software specific job.	
	NATHPA-JHAKRI HPS(Unit5 #250)	14.05.2016	14.05.2016	NO	Excitation system upgraded in 2013	
	NATHPA-JHAKRI HPS(Unit6 #250)	14.05.2017	14.05.2017	NO	Excitation system upgraded in 2013	
	RAMPUR HEP(6 * 68.67)	29.11.2014	27.10.2020,10.02.2021	YES	PSS Response and Step Test response was checked in February, 2021 by Rampur HPS and report of the same was submitted to NRLDC. Now the work of PSS tuning and step response testing has been awarded to BHEL, Bengaluru. Testing shall be carried out in November, 2022.	
3	**HVPNL**					
	PANIPAT TPS(unit1# 250)	29.03.2016	29.03.2016	YES	--	
	PANIPAT TPS(unit2# 250)	15.01.2018	15.01.2018	YES	--	
	DCRTPP (YAMUNA NAGAR)(unit1#300)	19-12-2018	19-12-2018	YES	(Report attached)	
	DCRTPP (YAMUNA NAGAR)(unit1#300)	Will be carried out shortly				
	RGTPP(KHEDAR) (2*600)	5th to 6th July 2013	5th to 6th July 2013	Report attached. Previous record being looked into	No MW capacity addition after 2013 at RGTPP Khedar. No new line addition in vicinity of station	
	JHAJJAR(CLP) (2*660)	20-05-2017	20-05-2017	YES	--	
4	**NTPC**					
	Rihand (Unit1#500)	03-03-2017	03-03-2017	YES	Next test will be done during re-commissioning of unit after O/H	
	Rihand (Unit2#500)	02-07-2016	02-07-2016	YES	Next test will be done during re-commissioning of unit after O/H	
	Rihand (Unit3#500)	15-08-2015	15-08-2015	YES	Next test will be done during re-commissioning of unit after O/H	
	Rihand (Unit4#500)	25-05-2017	25-05-2017	YES	Next test will be done during re-commissioning of unit after O/H	
	Rihand (Unit4#500)	11-12-2014	11-12-2014	YES	Next test will be done during re-commissioning of unit after O/H	
	Rihand (Unit5#500)	11-12-2014	11-12-2014	YES	Next test will be done during re-commissioning of unit after O/H	
	SINGRAULI STPS(Unit1#200)	-	-	-	Not done in last three years	
	SINGRAULI STPS(Unit2#200)	-	-	-	Not done in last three years	
	SINGRAULI STPS(Unit3#200)	-	-	-	Not done in last three years	
	SINGRAULI STPS(Unit4#200)	-	-	-	Not done in last three years	
	SINGRAULI STPS(Unit5#200)	-	-	-	Not done in last three years	
	SINGRAULI STPS(Unit6#500)	02.05.2018	02.05.2018	NO	--	
	SINGRAULI STPS(Unit7#500)	15.07.2018	15.07.2018	NO	--	

	UNCHAHAR I(2 * 210)	29-03-2016	29-03-2016	YES	--	
	UNCHAHAR II TPS(unit1# 210)	13-07-2019	13-07-2019	YES	--	
	UNCHAHAR II TPS(unit2# 210)	10-08-2018	10-08-2018	YES	--	
	UNCHAHAR UNIT6#500	-	31.03.2017	YES	--	
	KOLDAM HPS(4 * 200)	01-07-2015	01-07-2015	YES	--	
	DADRI GPS(2 * 154.51) (ST-Steam Turbine)	-	18-11-2015	YES	Next test will be done during re-commissioning of unit after O/H	
	DADRI GPS(2 * 154.51) (GT-Steam Turbine)	2017-18	2017 & 2018	YES	Next test will be done during re-commissioning of unit after O/H	
	ANTA GPS GT-1 (88.71)(GT- Gas Turbine)	10-10-2021	10-10-2021	YES		
	ANTA GPS GT-2 (88.71)(GT- Gas Turbine)	10-10-2021	10-10-2021	YES		
	ANTA GPS GT-3 (88.71)(GT- Gas Turbine)	08-08-2014	08-08-2014	YES	Next test will be done when Station will get opprtunity to have shcedule to run on full load.	
	ANTA GPS(1 * 153.2)(ST- Steam Turbine)	08-08-2014	08-08-2014	YES	Next test will be done when Station will get opprtunity to have shcedule to run on full load.	
5	**Aravali Power Company Private Ltd**					
	ISTPP (JHAJJAR)(3 * 500)	-	25-08-2015	YES	--	
6	**NHPC**					
	CHAMERA HPS (3*180)	06-08-2020	27-12-2019	YES	--	
	CHAMERA II HPS(3 * 100)	11-10-2015	11-10-2015	NO	Replacement of Excitation system in two units	
	CHAMERA III HPS(Unit1#77)	29-10-2015	07-01-2012	YES	--	
	CHAMERA III HPS(Unit2,3#77)	29-10-2015	19-06-2012	YES	--	
	PARBATI III HEP (Unit1# 130)	21-01-2016	21-01-2016	YES	Have been done recetly. The report on PSS turning shall be submitted seperately.	
	DULHASTI HPS(Unit2#130)	21-01-2020	21-01-2020	YES	--	
	DULHASTI HPS(Unit1#130)	29-12-2019	29-12-2019	YES	--	
	URI HPS(Unit3# 120)	10-01-2021	10-01-2021	YES	--	
	URI HPS(Unit4# 120)	15-02-2021	15-02-2021	YES	--	
	URI HPS(Unit2# 120)	07-03-2016	07-03-2016	YES	--	
	URI-II HPS(4 * 60)	Mar-14	Mar-14		2021-22	
	SALAL HPS (Unit-3,4,5,6 # 115)	16-12-2014	16-12-2014	YES	--	
	KISHANGANGA(3 * 110)	18-05-20 18	18-05-20 18	YES	--	
	BAIRASIUL HPS(3 * 60)	30-07-2015	30-07-2016	YES	--	
	SEWA-II HPS(3 * 40)	09-07-2016	09-07-2016	YES	--	
	PARBATI III HEP(4 * 130)	16-12-2016	16-12-2016	YES	--	
	TANAKPUR HPS(Unit1# 31.42)	09-01-2015	09-01-2015	YES	--	
	TANAKPUR HPS(Unit2,3#31.4)	24-05-2014	24-05-2014	YES	--	
	DHAULIGANGA HPS(Unit1 ,2# 70)	04-05-2014	17-04-2018	YES	--	
	DHAULIGANGA HPS(Unit3,4# 70)	26-06-2014	17-04-2018	YES	--	
7	**PUNJAB**					
	RAJPURA(NPL) TPS(2 * 700)	22-04-2014	22-04-2014	YES	--	
8	**Rajasthan**					
	KAWAI TPS(Unt1# 660)	03-02-2023	03-02-2023	YES	--	
	KAWAI TPS(Unt2# 660)	03-02-2023	03-02-2023	YES	--	
	CHHABRA TPS(Unit 1#250)	28-02-2023	28-02-2023	NO	--	
	CHHABRA TPS(Unit 2,3,4#250)	28-02-2023	28-02-2023	NO	--	
	CHHABRA TPS(Unit5# 660)	10-02-2016	10-02-2016	YES	--	
	CHHABRA TPS(Unit6# 660)	7/28/2018	7/28/2018	YES	--	
	KALISINDH TPS(Unit1# 600)	03-02-2023	03-02-2023	YES	--	
	KALISINDH TPS(Unit2# 600)	03-02-2023	03-02-2023	YES	--	
	KOTA TPS(Unit1#110)	PSS tuning and step response test of Unit#1,2,3,4,6&7 conducted sucessfully during 02.03.22 to 04.03.22		YES		
	KOTA TPS(Unit2#110)				--	
	KOTA TPS(Unit3#195)				--	
	KOTA TPS(Unit4#195)				--	
	KOTA TPS(Unit6#110)				--	
	KOTA TPS(Unit7#110)				--	
	SURATGARH TPS (Unit5#250)	14-03-2022	14-03-2022	Yes	--	
	SURATGARH TPS (Unit2,4#250)	06-06-2022		Yes	--	
	SURATGARH TPS (Unit1,3,,6#250)	05.02.22 & 06.02.22		Yes	--	
	SURATGARH SSCTPS (Unit 7&8)	PSS tuning and step response test of Unit#7&8 were carried out on 28.11.20 & 30.03.21.				
	RAJWEST (IPP) LTPS(Unit1# 135)	26-04-2016	26-04-2016	No	--	
	RAJWEST (IPP) LTPS(Unit2# 135)	14-07-2016	14-07-2016	No	--	
	RAJWEST (IPP) LTPS(Unit3# 135)	03-01-2014	03-01-2014	No	--	
	RAJWEST (IPP) LTPS(Unit4# 135)	03-11-2015	03-11-2015	No	--	
	RAJWEST (IPP) LTPS(Unit5# 135)	21-09-2014	21-09-2014	No	--	
	RAJWEST (IPP) LTPS(Unit6# 135)	14-08-2014	14-08-2014	No	--	
	RAJWEST (IPP) LTPS(Unit7# 135)	20-02-2016	20-02-2016	No	--	
	RAJWEST (IPP) LTPS(Unit8# 135)	11-06-2014	11-06-2014	No		
9	**UTTAR PRADESH**					
	ANPARA-C TPS(Unit1# 600)	22-08-2015	22-08-2015	Yes	--	

	ANPARA-C TPS(Unit2# 600)	08-03-2016	08-03-2016	Yes	--	
	ROSA TPS(Unit1 #300)	05-10-2021	05-10-2021	Yes	--	
	ROSA TPS(Unit2# 300)	15-01-2022	15-01-2022	Yes	--	
	ROSA TPS(Unit3 # 300)	03-02-2017	03-02-2017	Yes	--	
	ROSA TPS(Unit4# 300)	05-10-2021	05-10-2021	Yes	--	
	Anpara-A (Unit1#210)	27.09.2021	27.09.2021	Yes	--	
	Anpara-A(Unit2#210)	27.09.2021	27.09.2021	Yes	--	
	Anpara-A(Unit3#210)	25.09.2020	25.09.2020	Yes	--	
	Anpara-B(Unit4#500)	07.12.2014	07.12.2014	Yes		
	Anpara-B (Unit5#500)	17.08.2014	Dec., 2019	Yes	--	
	Anpara-D(Unit6#500)	15.11.2016	15.11.2016	No	--	
	Anpara-D (Unit7#500)	15.04.2017	15.04.2017	No	--	
	Obra-B(Unit9#200)	22.03.2016	22.03.2016	Yes	Report enclosed.	
	Obra-B(Unit10#200)	28.06.2016	20.06.2016	Yes	Report enclosed.	
	Obra-B (Unit11#200)	21.01.2017	21.01.2017	Yes	Report enclosed.	
	Obra-B (Unit12#200)	Unit taken on load after R&M on 22		-	PSS tuning and SRT scheduled in April, 2021.	
	Obra-B(Unit13#200)	Unit closed under R&M.		-	PSS tuning and SRT scheduled in April, 2021.	
	Parichha-B(Unit3#210)	08.01.2016	08.01.2016	Yes	--	
	Parichha-B (Unit4#210)	08.01.2016	08.01.2016	Yes	--	
	Parichha-C (Unit5#250)	08.02.2020	08.02.2020	No	--	
	Parichha-C(Unit3#250)	09.01.2016	09.01.2016	No	--	
	Harduaganj (Unit8#250)	20.08.2015	20.08.2015	No	--	
	Harduaganj (Unit3#250)	13.04.2016	13.04.2016	No	--	
	Harduaganj(Unit7#105)	16.07.2021	16.07.2021	yes	--	
	Harduaganj(Unit9#250)	16.07.2021	16.07.2021	yes	--	
	LALITPUR TPS(Unit1# 660)	23.02.2022	23.02.2022	yes	--	
	LALITPUR TPS(Unit2# 660)	30.03.2021	30.03.2021	yes	--	
	LALITPUR TPS(Unit3# 660)	15.01.2022	15.01.2022	yes	--	
	ALAKNANDA HEP(Unit1# 82.5)	12.072017	12.072017	No	--	
	ALAKNANDA HEP(Unit2# 82.5)	12.072017	12.072017	No	--	
	ALAKNANDA HEP(Unit3# 82.5)	12.072017	12.072017	No	--	
	ALAKNANDA HEP(Unit4# 82.5)	12.072017	12.072017	No	--	
	MEJA TPS(Unit1#660)	16.10.2018	05.09.2017	yes	--	
	MEJA TPS(Unit2#660)	16.01.2021	18.05.2020	yes	--	
	Bara Unit#1				Step test for PSS checking was not performed since commissioning by erstwhile owner as per information available. PSS tuning along with step test will be performed in next AOH (May 2022 or planned shutdown)	
	Bara Unit#2	01.02.2022	01.02.2022	Yes		
	Bara Unit#3				Step test for PSS checking was not performed since commissioning by erstwhile owner as per information available. PSS tuning along with step test will be performed in next AOH (May 2022 or planned shutdown)	
	Vishnuprayag Unit#1	06/02/2021	06/02/2021	Submitted in the prescribed format provided by NRLDC to SE (R&A)		
	Vishnuprayag Unit#2	06/04/2021	06/04/2021			
	Vishnuprayag Unit#3	06/04/2021	06/04/2021			
	Vishnuprayag Unit#4	05/02/2021	05/02/2021			
10	**BBMB**					
	BHAKRA HPS(Unit1#108)	--	--	No	PSS is not provided ,shall be provided in ongoing RM&U	
	BHAKRA HPS(Unit1#108)	24.07.2015	24.07.2015	No	--	
	BHAKRA HPS(Unit3#126)	--	--	No	PSS is not provided ,shall be provided in ongoing RM&U	
	BHAKRA HPS(Unit4#126)	--	--	No	--	
	BHAKRA HPS(Unit5#126)	--	--	No	--	
	BHAKRA HPS(Unit6#157)	--	--	No	The original Rusian excitation system is under replacement PO issued Hence,PSS not got tuned.	
	BHAKRA HPS(Unit7#157)	--	--	No	The original Rusian excitation system is under replacement PO issued Hence,PSS not got tuned.	
	BHAKRA HPS(Unit7#157)	--	--	No	The original Rusian excitation system is under replacement PO issued Hence,PSS not got tuned.	
	BHAKRA HPS(Unit7#157)	18.02.2016	18.02.2016	No	--	
	BHAKRA HPS(Unit7#157)	18.02.2017	18.02.2017	No	--	
	DEHAR HPS(Unit#1 165)	08.08.2017	08.08.2017	No	--	
	DEHAR HPS(Unit#2 165)	08.08.2018	08.08.2018	No	--	
	DEHAR HPS(Unit#3 165)	08.08.2019	08.08.2019	No	--	
	DEHAR HPS(Unit#4 165)	02.07.2017	02.07.2017	No	--	
	DEHAR HPS(Unit#5 165)	08.08.2019	08.08.2019	No	--	
	DEHAR HPS(Unit#6 165)	02.07.2017	02.07.2017	No	--	
	PONG HPS(6 * 66)	--	--	--	PSS not provided.RM&U agenda under considration.	

Status of Bus bar protection				
Constituent Name	**Name of Station**	**Status of Bus bar protection(as reported)**	**Expected date of revival(as reported)**	**Present Status**
Uttarakhand	220 KV Substation, Ramnagar, Roorkee	Blocked due to more elements added at 220 KV Voltage level.		
	220 KV Sub Station, SIDCUL, Haridwar			
	220kV Jhajhra, Dehradun	Not commissioned yet		
	400KV Kashipur (220kV side)	Available but Non operational	31 December 2023	Work is under Tendering process.
	220kv Haldwani	Not Available	31 December 2024	It has been Taken in Budget for FY 2023-24.
	220kv Pantnagar	Available but Non operational	31 December 2023	Proposal has been made and submitted for
	220kV Rishikesh	Available but Non operational	31 December 2024	It has been Taken in Budget for FY 2023-24.
	220kV Chamba	Not commissioned yet	31 December 2024	It has been Taken in Budget for FY 2023-24.
Haryana	220kV S/Stn Badshahpur	Not Installed	15.01.2023	**Commissioned on 20.02.2023**
	220kV S/Stn Sec-52A, Gurgaon	Not Installed	31.07.2023	Panel has been installed. Commissioning pending due to non- availability of shutdown.
	220kV S/Stn Sec-1 Manesar	Installed, Non-Operational		**Commissioned on 26.02.2023**
	220kV S/Stn Panchgaon	Not Installed	31.08.2023	Work order has been placed to Siemens.
	220kV S/Stn Rewari	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.
	220kV S/Stn Narnaul	Not Installed	30.09.2023	Panel has been installed. Work in progress on turnkey basis. Isolators of 220 kV TF have to be replaced thereafter the work shall be completed.
	220kV S/Stn Mohinder Garh	Not Installed	31.08.2023	Panel has been installed. Commissioning is pending.
	220 KV S/Stn Palwal	Not Installed	31.08.2023	Panel has been installed. Commissioning is pending.
	220 KV S/Stn Rangala Rajpur	Installed but Non-Operational	31.08.2023	Relay/wiring issue is to be addressed by the Firm Engineer.
	220 kV Unispur	Installed but Non-Operational	Mar-24	5 Nos. Peripheral relay of bus bar protection are defective.
	220 kV Mund	Installed but Non-Operational		Bus bar protection is operational at 220KV Mund.
	220 kV Nissing	Installed but Non-Operational	Mar-24	Existing Bus bar panel is of old and obsolete design. New Bus Bar protection scheme panel has been drawn from the store, Commissioning pending.
	220KV Pehowa	Installed but Non-Operational	Mar-24	Old & Obsolete, Allocation of New BBP and allied material awaited.
	220kV Kaithal	Not Installed	Mar-24	Control Cable for Bus-Bar Protection Scheme has been drawn from DD Stores, 220kV Bus-Bar Protection panel awaited.
	220 KV Sonepat	Not Installed	Mar-24	Allocation of Busbar Protection panel is awaited.
	220 KV REGC, Sonepat	Not Installed	Jul-23	Busbar protection panel has been drawn from DD store and erection work is under progress.
	220KV Jind	Installed but Non-Operational	30.06.2023	New panel has been installed and commissioning is pending.
	220 KV Fatehabad	Installed but Non-Operational	Jul-23	Visit of Firm Engineer M/s Schneider is awaited for commissioning.
	220 KV Bhuna	Installed but Non-Operational	Dec-23	Repairing is pending on the part of firm M/s Siemens.
	220 KV Sirsa	Not Installed		Not required being radial.
	220 KV Rania	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.
	220 KV Bhiwani	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.

	220kV Madanpur	Not Installed	31.03.2024	Material is not allocated so far. Installation will be carried out after allocation of material.
	220kV Tepla	Installed but Non-Operational	31.03.2024	The existing BBP is out being old and obsolete and needs replacement for which material allocation is awaited.
	220kV Rajokheri	Installed but Non-Operational	31.10.2024	The S/Stn. Is being constructed on turnkey, BBP has been installed. Commissioning is yet to be completed by the firm.
BBMB	220kV Charkhi Dadri	Installed, under commissioing yet	15.01.2023	**commissioned on 31.01.2023**
	220kV Samaypur	Installed but Non-Operational	30.04.2023	
	220kV Barnala	Not Installed		
	220kV Dhulkote	Not Installed		
	220kV Jagadhari	Not Installed		
	220kV Narela	Not Installed		
UP	220kV Parichha	Installed but Non-Operational	30.06.2023	
	220kV Partapur	Installed but Non-Operational	Jan-23	
	220kV Bareilly (400/220kV Bareilly)	Installed but Non-Operational	Dec-23	Old panel capacity exhausted. New relay
	220kV Pilibhit	Not Installed	Dec-23	New Relay panel supplied & need to be
	220kV Amariya	Installed but Non-Operational	Dec-23	Wiring not completed
	220kV Sultanpur	Installed but Non-Operational		Isolator contact status are not received due
	220kV New Tanda	Not Installed		Busbar protection panel available on
	220kV Shahjhanpur	Installed but Non-Operational		NC/No switch status of bus isolator were
	220kV Ajijpur	Installed but Non-Operational		1. HV side 220kV CT of 160MVA T/F-I & II has
	220kV Nirpura	Installed but Non-Operational	Jan-23	
	220kV IITGNL	Installed but Non-Operational	Mar-23	
	220kV Rampur	Installed but Non-Operational		
	220kV Barahua	Installed but Non-Operational		As Per Ex-En Transmission Approvel is Pending at HQ Level As Per Ex-En
	220kV Bansi	Not Installed	to be declared by transmission wing	Relay Commissioning is yet to be done
	220 KV S/S Azamgarh-2(Bargahan)	Installed but Non-Operational		
	220kV Chandausi	Not Installed	to be declared by transmission wing	Relay Commissioning is yet to be done
	220kV Rampur	Installed but Non-Operational	Jul-23	Main relay of bus bar protection is not working.
	220kV Sec. - 148, Noida	Installed but Non-Operational	Jan-23	
	220kV sec. 38A, Botanicla Garden	Not Installed	Jul-23	Bus Bar protection panel not alloted
	220kV sec.-62, Noida	Not Installed	Aug-23	Relay and wiring Work Pending
	220kV Dadri	Not Installed	Sep-23	Relay and wiring Work Pending
	400kV S/S Agra	Installed but Non-Operational		**Operational on 30.06.2023**
	220kV S/S Bah	Not Installed		
	220kV Sirsaganj	Not Installed		
	220kV S/S Farrukhabad (New)	Not Installed		WAITING FOR NELUMBO SERVICE ENG.
	220kV Boner	Not Installed		SINGLE BUS
	220kV Kasganj (Soron)	Installed but Non-Operational		
	220kV Khair	Installed but Non-Operational		
	220kV Kidwainagar	Installed but Non-Operational		
	220kV Chhata	Installed but Non-Operational		
	220kV Harduaganj	Installed but Non-Operational	31.12.2023	
	220kV Lalitpur	Not Installed	23-Apr	INSTALLATION IS NOT DONE DUE TO UNAVAILABLE OF CABLES. CABLE REQUEST HAS BEEN SENT TO LUCKONW HQ.
	220kV Sarnath	Installed but Non-Operational	Nov-23	
	220kV Sirathu, Kaushambi	Not Installed	Mar-23	
	220kV substation Fatehpur	Installed but Non-Operational	Mar-23	
	220kV S/S Bhelupur	Not Installed	Mar-23	
	220kV Hardoi Road, Lucknow	Installed but Non-Operational	30.09.2023	Relay configuration is required for addtitional
	220kV CG City, Lucknow	Installed but Non-Operational	31.08.2023	Configurational error
	220kV Barabanki	Installed but Non-Operational	30.09.2023	Relay configuration is required for addtitional
	220kV Kursi Road, Lucknow	Installed but Non-Operational	30.09.2023	1- 87BB Auxilliary busbar relay at 160MVA T/F
	220kV BKT, Lucknow	Installed but Non-Operational	31.08.2023	Mian bus bar relay defective
	220kV Gomti Nagar, Lucknow	Installed but Non-Operational		Mal opoerating
	400 KV Substation Sarnath	Installed but Non-Operational		Now operational
	220kV S/S Raja Talab	Installed but Non-Operational	15.11.2023	RELAY DEFECTIVE
	20kV S/S Harahua	Installed but Non-Operational	31.11.2023	NOT COMMISSIONED
	220kV S/S Sahupuri	Installed but Non-Operational	Requirement for panel has	Defective
	220kV S/S Mirzapur	Not Installed	3 Month	-
HP	220kV Chamba	Main-2 non operational	Sep-23	relay has been sent to OEM for repair
	220kV MattaSidh	Installed but Non-Operational		ABB has started the review work and within 02 months all the bus bar protection will be made operational
	220kV kangoo	Installed but Non-Operational		
	220kV Nangal	Installed but Non-Operational		
	220kV Katha Baddi	Installed but Non-Operational		
Punjab	220 KV S/S Kotlisurat Malhi	Not Installed		within next 06 months (by Dec 2023) bus bar protection will be commissioned at these 09 substations
	220 KV S/S Maur	Not Installed		
	220 KV S/S Science city	Not Installed		
	220 KV S/S Banga	Not Installed		
	220 KV S/S Hoshiarpur	Not Installed		
	220 KV S/S Goraya	Not Installed		
	220 KV S/S Badhni kalan	Not Installed		

220 KV S/S Bhari	Not Installed	
220 KV S/S Bhawanigarh	Not Installed	

Status of protection relay type				
Constituent Name	**Name of Station**	**Element Name**	**Present Status**	**Remark**
Uttarakhand	220kV Rishikesh	SIDCUL line	Main-II is not installed	
		Chamba line		
		Dharasu line-2		
	220kV Chamba	Rishikesh line		
HP	220kV MattaSidh	220kV transformer bank-1 & 2	Static relay	
Rajasthan	220 kV GSS Sanganer	220 kV HEERAPURA	Static	
	220 kV GSS Phulera	220 KV HEERAPURA	Static	
		220 kV Makrana	Static	
	220 KV GSS CHOMU	220 kV Heerapura	Static	
		220 kV Reengus Line	Static	
	220 kV GSS Kukas	220 kV Manoharpur Line	Static	
		220 kV Alwar Line	Static	
	220kV GSS Dausa	220 kV SawaiMadhopur Line	Static	
		220 kV Bassi-I Line	Static	
		220 kV Bassi-II Line	Static	
		220 kV Alwar Line	Static	
		220 kV Mandawar Line	Static	
	220KV BHARATPUR GSS	220 KV DHOLPUR	Static	
	220 KV GSS SAKATPURA	220 kV ANTA(NTPC)	Static	
	220 KV DAHRA	220 kV BARAN	Static	
		220 kV SAKATPURA	Static	
	220KV GSS MODAK	220 kV RANPUR	Static	
		220 kV Jhalawar	Static	
	220 KV GSS JHALAWAR	220 kV Modak	Static	
	220KV GSS HINDAUN	220KV Sikrai Line	Static	relay defective
	220KV GSS DHOLPUR	220 kV DCPP	Static	
	220 KV GSS Reengus	220 KV Laxmangarh	Static	
	220 KV GSS Nagour	220KV NOKHA	Static	
		220KV KUCHERA	Static	
	220KV GSS Kankroli	220 KV PGCIL-I	Static	
	220 KV GSS SIROHI	220 KV (400) KV PGCIL Bhinmal	Static	
	220 KV GSS SIROHI	220 KV Jalore	Static	
	220 KV GSS BHINMAL	220 KV (400) KV PGCIL Bhinmal-I	Static	
	220 KV GSS BALI	220kV Sirohi	Static	
	220 KV GSS Suratgarh	220 KV STPS-I	Static	
		220 KV STPS-II	Static	
		220 KV Hanumangarh Line	Static	
	220 KV GSS Sri Ganganagar	220 KV Hanumangarh Line	Static	
	220 KV GSS Hanumangarh	220 KV Suratgarh	Static	
	220KV GSS Ratangarh	220KV Rawatsar	Static	
	220KV GSS Ratangarh	220KV Halasar	Static	
	220KV GSS Ratangarh	220KV InterConnector-I	Static	
	220KV GSS Ratangarh	220KV InterConnector-II	Static	
	220KV GSS Sujangarh	220KV Ratangarh	Static	
	220 KV GSS Bikaner	220 KV Badnu Line	Static	
	220 KV GSS Bikaner	220 KV Interconnector-I Line	Static	
	220 KV GSS Bikaner	220 KV Spare Line	Static	
	220kV Madanpur	220/66kV 100 MVA PTF T-1	Electromechanical	Working properly, need to be replace with numerical relay
		220/66kV 100 MVA PTF T-1 A	Electromechanical	Working properly, need to be replace with numerical relay
		220kV Bus-Coupler	Backup relay -Numerical all other relays are Electromechanical	Working properly, need to be replace with numerical relay
		220/66kV 100 MVA PTF T-1 A	Electromechanical Execept Differential relay (Numerical)	Working properly, need to be replace with numerical relay
	220 KV S/Stn Shahbad	100 MVA 220/66 KV T/F T-1	Electrostatic	Working properly, need to be replace with numerical relay
		220 KV Bus Coupler	Electrostatic	Working properly, need to be replace with numerical relay
		Incomer of 220/66 KV T/F T-1	Electrostatic	Working properly, need to be replace with numerical relay
		Incomer of 220/66 KV T/F T-2	Electrostatic	Working properly, need to be replace with numerical relay
	220 KV S/STnTepla	220KV Bus Coupler	Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -DCRTPP Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -DCRTPP Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Shahbad Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Shahbad Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay

Haryana	220KV S/Stn Jorian	220KV Jorian -Abdullapur Ckt-1	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220KV Jorian -Abdullapur Ckt-2	Main-1 & Main-2 = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 160MVA T/F T-1	Defferntial Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 100MVA T/F T-2	All Electromechanical	Working properly, need to be replace with numerical relay
		220/66, 100MVA T/F T-3	Defferntial & REF Relay = Numerical all other Electromechanical	Working properly, need to be replace with numerical relay
	220 kv Salempur	220 KV BAKANA–SALEMPUR CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV BAKANA–SALEMPUR CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV SALEMPUR-NISSING CKT-I	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV SALEMPUR-NISSING CKT-II	All electromechanical type,except DPR relays	Working properly, need to be replace with numerical relay
		220 KV BUS-COUPLER	All electromechanical type	Working properly, need to be replace with numerical relay
		220/66 KV 100MVA T/F T-I	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
		220/66 KV 100MVA T/F T-2	All electromechanical type,except Differential relays	Working properly, need to be replace with numerical relay
	TS Division Karnal	220kV Nissing-PTPS Ckt-I	All electromechanical type,except DPR relays	
		100 MVA 220/132kV T-8	All electromechanical type,except Differential relay	Differential relay replcaed with Numerical type
		220 kV Bus-coupler	All electromechanical type	C&R panel will be replaced soon
		220 KV DCRTPP–UNISPUR CKT-I	All electromechanical type,except DPR relays	
		220 KV DCRTPP–UNISPUR CKT-II	All electromechanical type,except DPR relays	
		220 KV KARNAL–UNISPUR LINE	All electromechanical type,except DPR relays	
		220/132 KV 100 MVA T/F T-1	All electromechanical type,except R.E.F & Differential relay	
		220/132 KV 100 MVA T/F T-2	All electromechanical type,except R.E.F & Differential relay	
		220/132 KV 160 MVA T/F T-4	All electromechanical type,except R.E.F & Differential relay	
	220kV S/Stn Palla	100MVA 220/66kV T-1	REF & backup Electromechnical	
		100MVA 220/66kV T-2	REF & backup Electromechnical	
		100MVA 220/66kV T-7	Diff & Backup lectromechnical and REF static	
		220kV Palla - Sector 78	backup Electromechnical	
		220kV Palla - FGPP ckt-II	backup Electromechnical	
	220 kV S/Stn. Pali	100 MVA 220/66 kV T-1	REF & backup Electromechnical	
		100 MVA 220/66 kV T-3	REF & backup Electromechnical	
		220 kV Pali-BBMB Samaypur Ckt 1	backup Electromechnical	
		220 kV Pali-BBMB Samaypur Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 46 Ckt 1	backup Electromechnical	
		220 kV Pali-Sector 46 Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 65 Ckt 1	backup Electromechnical	
		220 kV Pali-Badshahpur Ckt 2	backup Electromechnical	
		220 kV Pali-Sector 56 Ckt 1	backup Electromechnical	
		220 kV Pali-Sector 56 Ckt 2	backup Electromechnical	
	220kV S/Stn Palwal	220/66kV 160MVA T-1 T/F	REF & backup Electromechnical	
		220/66kV 100MVA T-2 T/F	Diff, REF & Backup Electromechnical	
		220kV Prithala Palwal Ckt I	backup Electromechnical	
		220kV Prithala Palwal Ckt II	backup Electromechnical	
	220kv S/Stn. Sector 52A GGM	Sec 56-Sec 52A ckt 1	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 56-Sec 52A ckt 2	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 72-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
		Sec 57-Sec 52A	NUMERICAL RELAY qty 02 and electromechanical qty 01 (backup)	LINE IS PROVIDED WITH 2 MAIN NUMERICAL DPR AND 01 ELECTROMECHANICAL FOR BACKUP
	220KV S/Stn. Sonepat		(Diff.-3 , REF-3, O/C/E/F-4 , Electromechnical Relays	The electromechanical differential and DPR are not available in the store. However, the same shall be replaced after availability in the store.
	220kV Rohtak		(REF-2, O/C/E/F-12) Electromechnical Relays	
	400 KV S/S Moradabad	400 KV MORADABAD - RAMPUR LINE	LBB- ABB(RAICA) / STATIC	UNDER PGCIL
		400 KV MORADABAD - KASHIPUR LINE	LBB- English Electric(CTIG) / Electromechnical	
		400 KV, TRANSFER BUS	LBB- English Electric(CTIG) / Electromechnical	
		400 KV, BUS COUPLER	LBB- English Electric(CTIG) / Electromechnical	
	220kV S/S BARAUT	220/132kV 200MVA TRANSFORMER-1	REF Protection - Electromechanical	
	220kV S/S BAGHPAT	220/132kV 160MVA TRANSORMER-1	Backup (L.V. Side) - Electromechanical	Electromechanical (Back-up) relay commissioned on 05/03/2023 on LV side of 160MVA T/F-I as temporary measure as Numerical Back-up (Make-ZIV) relay failed to issue tripping command during testing.
	220 kV KHURJA	220/132Kv 200MVA Transformer-I	REF-Static	
	220 kV DEBAI	220/132Kv 100MVA Transformer-I	Numerical	LV BackUp relay is faulty

UP	220 kV Jahangirabad	220/132Kv 160MVA Transformer-I	REF-Static	
	400KV S/S MURAD NAGAR	220KV LONI LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV FARID NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV INTER CONNECTOR-I MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV INTER CONNECTOR-II MURAD NAGAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV SAHIBABAD LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV PRATAP VIHAR LINE	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		220KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		400KV TBC	O/C & E/F RELAY IS ELECTROMECHANICAL.	
		400KV ALIGARH LINE	LBB RELAY IS ELECTROMECHANICAL.	
		400KV ATOUR LINE	LBB RELAY IS ELECTROMECHANICAL.	
	220KV S/S MURAD NAGAR	220KV BUS COUPLER	O/C RELAY IS ELECTROMECHANICAL	
	400KV S/S Gorakhpur	400KV TBC	Electromechanical	
		220KV TBC	Electromechanical	
	220KV S/S Barahua	220KV PGCIL	Back up relay electromechenical	
	220KV S/S Basti	220 KV Basti Tanda line	67N(2TJM12)(Electromechanical)	
		63MVA Transformer-II	HV Side directional o/c&e/f(Electromechanical)	
	400 KV SS Kasara,Mau	200MVA, 400/132KV ICT-1st	REF & Over flux relay Electromechanical	
		200MVA, 400/132KV ICT-2nd	REF & Over flux relay Electromechanical	
	220 KV SS Substation Hafizpur Azamgarh	160 MVA ICT -1	Electromechanical(EE Make)	Tendering is under process
	220kV Khara		Electromechanical	process of replacing electrochemical relay with numerical relay has been started, it will be completed within 2-3 months.
	400kV S/S Sultanpur	240 MVA ICT-II	Non Numerical	
		50 MVAR Obra Line Reactor	Non Numerical	
	220kV S/S Sultanpur	220kV B/C	Non Numerical	
		160 MVA T/F-I	Non Numerical	
NPCIL	220kV RAPPC	220KV Anta line	Backup relay: Static relay(RAPDK3)	Procurement of Numerical relay is in progress for replacement of Static relay (Backup protection).
	220kV NAPP	NAPP-SAMBHAL		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-SIBHOLI		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-DIBAI		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-KHURJA		Main-2 distance protection is under procurement. ECD- June2024
		NAPP-ATRAULI		