सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

विषय: प्रचालन समन्वय उप-समिति की 221वीं बैठक की कार्यसूची।

Subject: Agenda of the 221th OCC meeting.

प्रचालन समन्वय उप-समिति की 221वीं बैठक का आयोजन वीडियो कॉन्फ्रेंसिंग के माध्यम से दिनांक 19.07.2024 को 10:30 बजे से किया जायेगा । उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत् समिति की वेबसाइट http://164.100.60.165 पर उपलब्ध है ।

बैठक में सम्मिलित होने के लिए लिंक व पासवर्ड सभी सदस्यों को ई-मेल द्वाराप्रदान किया जाएगा।

कृपया बैठक में उपस्थित होने की सुविधा प्रदान करें।

The **221st** meeting of the Operation Co-ordination sub-committee will be conducted through Video Conferencing on **19.07.2024** 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.

Signed by Dharmendra Kumar Meena
Date: 12-07-2024 18:10:57

(डी. के. मीना)
अधीक्षण अभियंता (प्रचालन)

सेवा में : 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

A.1. Confirmation of Minutes

220th OCC meeting was held on 19.06.2024. Minutes of the meeting were issued vide letter dt. 10.07.2024.

Decision required from Forum:

Forum may approve the minutes of 220th OCC meeting.

A.2. Status of action taken on decisions of 220th OCC meeting of NRPC

A.2.1. Status of action taken on decisions of 220th OCC meeting is attached as **Annexure- 0**.

A.3. Review of Grid operations

A.3.1. Power Supply Position (Provisional) for June 2024

Anticipated Power Supply Position v/s Actual Power Supply Position (Provisional) of Northern Region during the month of June-2024 is as under:

State / UT	Req. / Avl.	Energy (MU)			Peak (MW)		
		Anticipated	Actual	% Variation	Anticipated	Actual	% Variation
CHANDIGARH	(Avl)	190	237	25.0%	380	443	16.6%
	(Req)	189	237	25.6%	428	443	3.4%
DELHI	(Avl)	4963	4541	-8.5%	7900	8656	9.6%
	(Req)	4000	4546	13.7%	7900	8713	10.3%
HARYANA	(Avl)	7671	7790	1.6%	11918	14469	21.4%
	(Req)	6477	7801	20.4%	14287	14469	1.3%
HIMACHAL PRADESH	(Avl)	1178	1149	-2.5%	1787	1919	7.4%
	(Req)	1158	1154	-0.3%	1824	1919	5.2%
J&K and LADAKH	(Avl)	2040	1638	-19.7%	3310	2902	-12.3%
	(Req)	1842	1648	-10.5%	3121	2902	-7.0%
PUNJAB	(Avl)	8100	8756	8.1%	16050	16089	0.2%
	(Req)	8100	8756	8.1%	16050	16089	0.2%
RAJASTHAN	(Avl)	9830	10347	5.3%	18340	17774	-3.1%
	(Req)	9000	10470	16.3%	16500	17774	7.7%
UTTAR PRADESH	(Avl)	15900	18038	13.4%	29130	30618	5.1%
	(Req)	15900	18088	13.8%	29130	30618	5.1%
UTTARAKHAND	(Avl)	1482	1708	15.2%	2560	2863	11.8%
	(Req	1500	1717	14.4%	2600	2863	10.1%

	)						
NORTHERN REGION	(Avl)	51354	54203	5.5%	83000	90700	9.3%
	(Req)	48166	54416	13.0%	86600	91600	5.8%

As per above, negative / significant variation (≥5%) in Actual Power Supply Position (Provisional) vis-à-vis Anticipated figures is observed for the month of June-2024 in terms of Energy Requirement for Chandigarh, Delhi, Haryana, HP, UTs of J&K and Ladakh, Punjab, Rajasthan, UP, and Uttarakhand and in terms of Peak Demand similar variation is noted for Delhi, HP, UTs of J&K and Ladakh, Rajasthan, UP, 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.

A.4. Maintenance Programme of Generating Units and Transmission Lines

A.4.1. Maintenance Programme for Generating Units

The meeting on proposed maintenance programme for Generating Units for the month of August-2024 is scheduled on 15-July-2024 via Video Conferencing

A.4.2. Outage Programme for Transmission Elements

The meeting on proposed outage programme of Transmission elements for the month of August-2024 is scheduled on 15-July-2024 via Video conferencing.

A.5. Planning of Grid Operation

A.5.1. Anticipated Power Supply Position in Northern Region for August 2024

The Anticipated Power Supply Position in Northern Region for August 2024 is as under:

State / UT	Availability / Requirement	Revised Energy (MU)	Revised Peak (MW)	Date of revision
CHANDIGARH	Availability	240	400	No Revision submitted
	Requirement	231	457	
	Surplus / Shortfall	9	-57	
	% Surplus / Shortfall	4.0%	-12.5%	
DELHI	Availability	4420	7330	No Revision submitted
	Requirement	3962	7475	
	Surplus / Shortfall	458	-145	

State / UT	Availability / Requirement	Revised Energy (MU)	Revised Peak (MW)	Date of revision
	% Surplus / Shortfall	11.6%	-1.9%	
HARYANA	Availability	7829	13811	12-July-24
	Requirement	8123	13124	
	Surplus / Shortfall	-294	687	
	% Surplus / Shortfall	-3.6%	5.2%	
HIMACHAL PRADESH	Availability	1374	1848	09-July-24
	Requirement	1139	1800	
	Surplus / Shortfall	235	48	
	% Surplus / Shortfall	20.7%	2.7%	
J&K and LADAKH	Availability	2190	3270	No Revision submitted
	Requirement	1747	3269	
	Surplus / Shortfall	443	1	
	% Surplus / Shortfall	25.4%	0.0%	
PUNJAB	Availability	8240	12340	No Revision submitted
	Requirement	10221	16686	
	Surplus / Shortfall	-1981	-4346	
	% Surplus / Shortfall	-19.4%	-26.0%	
RAJASTHAN	Availability	10560	17790	No Revision submitted
	Requirement	9824	19341.75	
	Surplus / Shortfall	736	-1552	
	% Surplus / Shortfall	7.5%	-8.0%	
UTTAR PRADESH	Availability	17670	30500	09-July-24
	Requirement	17360	30500	
	Surplus / Shortfall	310	0	
	% Surplus / Shortfall	1.8%	0.0%	
UTTARAKHAND	Availability	1463	2300	03-July-24
	Requirement	1476	2400	
	Surplus / Shortfall	-12	-100	
	% Surplus / Shortfall	-0.8%	-4.2%	
NORTHERN REGION	Availability	53986	83000	
	Requirement	54082	88100	
	Surplus / Shortfall	-96	-5100	
	% Surplus / Shortfall	-0.2%	-5.8%	

SLDCs are requested to update the anticipated power supply position of their

respective state / UT for the month of August-2024 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.

A.6. 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.

A.7. NR Islanding scheme

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

Members may kindly deliberate.

A.8. Coal Supply Position of Thermal Plants in Northern Region

A.8.1 In 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.

A.8.2 Accordingly, coal stock position of generating stations in northern region during current month (till 09th July 2024) is as follows:

Station	Capacity (MW)	PLF % (prev. months)	Normative Stock Reqd (Days)	Actual Stock (Days)
ANPARA C TPS	1200	0.48	14	11.1
ANPARA TPS	2630	0.83	14	11.9
BARKHERA TPS	90	0.58	22	34.3
DADRI (NCTPP)	1820	0.64	22	31.1
GH TPS (LEH.MOH.)	920	0.65	22	20.7
GOINDWAL SAHIB TPP	540	0.75	22	9.1
HARDUAGANJ TPS	1265	0.43	22	33.7
INDIRA GANDHI STPP	1500	0.67	22	39.2
KAWAI TPS	1320	0.58	22	18.2
KHAMBARKHERA TPS	90	0.55	22	42.8
KOTA TPS	1240	0.80	22	5.4
KUNDARKI TPS	90	0.55	22	32.8
LALITPUR TPS	1980	0.68	22	20.1
MAHATMA GANDHI TPS	1320	0.67	22	30.9
MAQSOODPUR TPS	90	0.58	22	27.2
MEJA STPP	1320	0.76	22	22.8
OBRA TPS	1094	0.45	22	10.8
PANIPAT TPS	710	0.81	22	26.3
PARICHHA TPS	1140	0.57	22	18.9

Station	Capacity (MW)	PLF % (prev. months)	Normative Stock Reqd (Days)	Actual Stock (Days)
PRAYAGRAJ TPP	1980	0.57	22	29.7
RAJIV GANDHI TPS	1200	0.72	22	22.4
RAJPURA TPP	1400	0.88	22	26.8
RIHAND STPS	3000	0.91	14	23.1
ROPAR TPS	840	0.78	22	17.5
ROSA TPP Ph-I	1200	0.64	22	24.2
SINGRAULI STPS	2000	0.96	14	12.8
SURATGARH TPS	1500	0.69	22	3.8
TALWANDI SABO TPP	1980	0.62	22	4.7
TANDA TPS	1760	0.71	22	28.1
UNCHAHAR TPS	1550	0.68	22	20.7
UTRAULA TPS	90	0.55	22	31.9
YAMUNA NAGAR TPS	600	0.68	22	22.8
CHHABRA-I PH-1 TPP	500	0.50	22	4.8
KALISINDH TPS	1200	0.76	22	6.4
SURATGARH STPS	1320	0.56	22	7.1
CHHABRA-I PH-2 TPP	500	0.82	22	5.7
CHHABRA-II TPP	1320	0.32	22	12.0

A.9. Status of availability of ERS towers in Northern Region (Agenda by NRPC Sectt.)

A.9.1 In the 68th meeting of NRPC issues arising due to non-availability of sufficient ERS were discussed and it was decided that 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.

A.9.2 Subsequently matter was deliberated in 211th OCC meeting wherein NRLDC representative briefed about the Requirement of ERS, recent experience in Northern Region, CEA Regulation on ERS, Govt. Guidelines and Present situation on ERS.

A.9.3 NRPC Sectt. vide letter dated 26.09.2023 requested all transmission utilities of NR to furnish the length of transmission line (ckt-kms) and number of ERS towers available with them at different voltage levels (e.g. 220 kV, 400 KV 765 KV and + -500 kV HVDC via email at **seo-nrpc@nic.in**.

A.9.4 In this regard, inputs received from utilities are attached as **Annexure-A.III.**

Transmission utilities of NR to update status.

A.10. Implementation of AUFLS and df/dt Scheme in Northern Region (Agenda by NRPC Sectt.)

A.10.1 As per the decision of the 13th NPC meeting, NPC Secretariat had constituted a Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme with the representatives from RPCs, NPC and GRID-INDIA.

A.10.2 The report of Task Force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme was approved by the NPC in 14th NPC meeting. (Report is attached at **Annexure-A.IV**)

A.10.3 The Recommendation of the report as below:

i. NPC Secretariat will communicate region wise relief quantum (based on Regional Peak Demand Met during the previous FY) by 31st of May to RPCs for implementation in the next Financial Year (FY).
ii. Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY by RPCs.
iii. Guidelines for identification of AUFLS feeders: Stage-1 & Stage-2 for downstream network at 11/22/33 kV level and Stage-3 & Satge-4 for upstream network at EHV (66/110/132 kV) level.
iv. Prioritization of the loads under the AUFLS and df/dt scheme: Feeders catering to critical loads are to be avoided. VIP areas, Airport, Metro, Railways, Defence etc. has been prioritized.
v. Quantum Identification for AUFLS by States/UT and monthly vetting: Each SLDC shall carry out month-wise Stage-wise analysis and furnish to RPC/RLDC. Actual Relief for the month and recommended Relief for the month for each Stage. The data would be vetted by RLDC and discussed in OCC Meetings of RPC. As a general Guideline Actual Relief for the month should be 10% more than the recommended Relief for the month considering the Relay/breaker issues and a resilient safety net.
vi. Analysis of AUFLS Event and discussion in OCC Meetings of RPC.
vii. Mapping of AUFLS feeder at SLDC and RLDC level.
viii. SLDCs shall download the data and store it for two years. The Data should be made available to RPCs/RLDCs/CEA/CERC for further studies or analysis.
ix. Settings of UFR for Pumping load/Energy Storage Systems: All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped. Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz.
x. All the relays procured in future to have a sampling period ranging from three (03) cycles to five (05) Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.
xi. Testing/Inspection of UFR: SLDCs responsible for testing and chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC. The periodicity of testing of relays shall be twice in a year at 110 / 132 kV level and above Substations and once in a year at 66 kV level and below Substations.

xii. RPC would carry UFR inspection randomly on sample basis by the RPC Secretariat or through RLDC.

xiii. df/dt Scheme: It is specific to regions and therefore, the quantum of load shedding may be discussed at regional levels in the RPCs in consultation with the stakeholders.

A.10.4 In the 14th NPC Meeting, the following decisions were taken:

- The report of Task Force on Automatic under Frequency Load Shedding (AUFLS) and df/dt scheme was approved by the Committee. The same needed to be taken up for implementation by RPCs. In order to address the views of Director SLDC (Odisha) and suggestions of GRID-India, a meeting may be convened by NPC Secretariat with stakeholders and if any further changes are suggested it shall be brought to next meeting of NPC.
- The monitoring of feeders under AUFLS may be prioritized by SLDC/RLDC/ NLDC and it may be made part of regular agenda in the appropriate RPC forum to assess the performance.
- W.r.t the settings of AUFLS schemes, it was decided that if any change is recommended in the meeting by NPC secretariat to look into the suggestion of Director SLDC (Odisha), for new stage of AUFLS at 49.5 Hz with 1- 2% of Load relief, the same will be put upto to NPC and after approval of NPC the same would be communicated to RPCs for implementation.

A.10.5 Subsequently a Special Meeting was convened by NPC on 06.03.2024 and after detailed deliberations it was decided that the starting frequency/first stage of AUFLS may be considered and implemented at 49.4 Hz as per the Report of Task Force on AUFLS and df/dt. However, stages of AUFLS and quantum of relief may be reviewed based on the feedback received from the States/utilities after implementation of the AUFLS scheme, as and when required. The MoM is at **Annexure-A.V**

Members may kindly deliberate.

A.11. Updating outage Details by Generating Station/utilities (Agenda by CEA)

A.11.1. To enhance the monitoring of approved Planned Maintenance schedules, Member (GO&D), CEA has directed that actual maintenance availed against approved planned maintenance is to be updated on priority by respective RPCs regularly on monthly basis.

A.11.2. In this regard, list of Planned Maintenance schedules versus actual maintenance availed for the year 2024-25 for the month of April, May & June-2024 is attached as **Annexure-A.VI.**

A.11.3. In this, regard, Generating Station/utilities of NR are requested to submit each month the details of the maintenance activities that transpired against the originally planned schedule. Further, any deviations from the planned schedule shall be explained by the concerned generating entities.

Generating utilities of NR to update status.

A.12. Increasing capacity of ICT's at 400 KV Agra,400 KV Lucknow, Gorakhpur & Mainpuri Sub-Station (Agenda by Powergrid NR-3)

A.12.1 Powergrid NR-3 have intimated that loading on 400/200 KV ,315 MVA ICTs at Agra, 400 KV Lucknow, Gorakhpur and Mainpuri sub-stations have increased substantially in past few years and margins for increase in further loading of ICTs has reduced. It is also observed that in case of peak load conditions, tripping / shutdown of one ICT in above mentioned Substations will lead to violation of N-1 contingency.

A.12.2 Thus, ICTs at Agra, Gorakhpur, Lucknow and & Mainpuri Sub-Station under the peak loading are not complying N-1 contingency criteria. Load pattern of ICT for last one year is tabulated below:-

Sr. No.	Name of S/S	Voltage Level	ICT's	Capacity of ICT's (in MVA)	Peak load of ICTs (in MW)	% Loading of Individual ICTs
1.	Mainpuri	400 KV	ICT-1	315	209	66%
			ICT-2	315	216	68%
			ICT-3	500	314	62%
2.	Agra	400 KV	ICT-1	315	257	81%
			ICT-2	315	284	89%
3.	Gorakhpur	400 KV	ICT-1	315	238	75%
			ICT-2	315	218	69%
			ICT-3	315	223	70%
4.	Lucknow	400 KV	ICT-1	500	385	76%
			ICT-2	500	408	81%

A.12.3 NRLDC has also expressed their concern regarding N-1 non-compliant and likely Non-compliant ICTs at 400/200 KV, 315 MVA Agra, 400 KV Lucknow and Gorakhpur Sub-Station of Northern Region-3.

A.12.4 Regarding addition of new ICTs at above Substations, space requirement was identified and observed that space for new ICT is available at all Substations i.e. Agra (with provision of outdoor GIS bays), at 400kV Lucknow (with provision of outdoor GIS bays), at 400kV Gorakhpur (with provision of outdoor GIS bays) and at Mainpuri S/S.

A.12.5 In view of the above, Powergrid NR-3 has requested forum to take up the matter with CTU for system studies based on present and future forecasted load to review the need for additional transformation capacity at 400 KV Agra, Gorakhpur, Lucknow and Mainpuri sub-stations.

A.12.6 Further, for contingency measure due to overloading of ICTs, System Protection Scheme (SPS) may also be considered and advised till implementation of capacity augmentation.

Members may kindly deliberate.

A.13. Requirement of additional 400/132/33 KV,200 MVA ICT at HVDC Ballia Sub-Station. (Agenda by Powergrid NR-3)

A.13.1. Powergrid NR-3 has mentioned that as on date no spare ICT of 200MVA, 400/132kV rating is available in Northern Region-3.

A.13.2. Presently one ICT of 200MVA, 400/132kV is commissioned at Ballia Substation and it is the only reliable source of auxiliary supply for critical Ballia HVDC station.

A.13.3. In 50th TCC and 74th NRPC meeting, NRPC Board agreed with the Powergrid proposal of additional source of Auxiliary Power connectivity from tertiary of 765/400/33 KV ICT-2 for reliable auxiliary supply to HVDC Ballai Sub-Station.

A.13.4. The above mentioned 200MVA, 400/132kV ICT commissioned at Ballia Substation, is feeding 02 nos 132 KV Transmission Lines of UPPTCL connected to UPPTCL Sub-Station.The lines are as below: -.

- 132kV Ballia (PG)-Sikandarpur (UPPTCL) Transmission Line
- 132kV Ballia (PG)-Bansdih (UPPTCL) Transmission Line

Above lines are connected as radial feeder from Ballia (PG) Substation.

A.13.5. In past, approx. 673 no. of faults were detected in UPPTCL lines from August'23 to Oct'23. Considering large number of faults fed by this Transformer in past, the life of this ICT and it's reliability and service life has been seriously affected.

A.13.6. Thus, in case of any failure of 200MVA ICT, it will lead to complete outage of 132kV load of UPPTCL Further, it will also lead to long outage of Ballia-Bhiwadi HVDC link due to non-availability of auxiliary supply, as UPPTCL auxiliary source is not reliable.

A.13.7. Considering the above aspects, following are proposed for reliability of HVDC Ballia-Bhiwadi link and of 132kV Lines of UPPTCL:

a) Approval of one additional 200MVA, 400/132/33kV ICT along with bays at Ballia (PG) substation on priority basis, for which space is available at Ballia Substation.

b) Allowing procurement of one spare 200MVA, 400/132/33kV ICT to meet out contingency requirement, as there is no spare available with POWERGRID in UP & Uttarakhand states of this rating.

Members may kindly deliberate.

A.14. Controlling overloading of 400kV Jhatikra –Bamnauli Line (Agenda by Powergrid DTL)

A.14.1. The issue of limited CT rating at Bamnauli end for Jhatikara-Bamnauli Ckt was discussed in the 220th OCC meeting where it was apprised by Delhi SLDC/DTL that the CT rating is 3150 Amp and not 2000 Amp. In the meeting, Powergrid representative confirmed that rating of CTs at Jhatikara end is 3150 Amp.

A.14.2. Hence, forum in 220th OCC was of view that there is no constraint on loading of line as per Quad Bersimis limits. CT rating at Bamnauli end as well as at Jhatikara (PGCIL) end is 3150 Amp which is adequate for 1900MW load which can very well cater to 1400 MW load. In the meeting, NRLDC CGM asked DTL representative to have a physical meeting in NRLDC in case there are any more concerns regarding the line loading.

A.14.3. In this connection, it is worth mentioning that earlier there was a double Ckt line from Jhatikra to Bamnuali but PGCIL has done LILO of one Ckt at its Dwarka Substation. The original Bawana - Bamnauli line (Mundka-Bamnauli after construction of Mundka Substation in 2010) line was on Quad Bersimis as part of the Delhi ring. After LILO of the line at Jhatikra LILO portion was constructed by PGCIL with Quad Moose conductor. Now, Now PGCIL has done LILO of one of the Bamnauli Jhatikara Ckts at its Dwarka Sub-station and this has led to unequal length of the lines from Jhatikara – Bamnauli (one ckt is Jhatikara – Bamnauli and the other ckt is Jhatikara – Dwarka – Bamnauli). The unequal impedance of ckts between Jhatikara and Bamnauli has resulted in unequal distribution of load on the lines. The loading of elements at Bamnauli on peak loading on dated 19.06.2024 was as under:-

Bamnauli - Jhatikara Line	(-)1475 MW
Bamnauli – Dwarka Line	(-) 75 MW
Bamnauli – Tuglakabad Ckt-1	(+) 550MW
Bamnauli – Tuglakabad Ckt-2	(+) 550MW
All 3 nos ICT Load	(+) 450 MW

The maximum loading of Jhatikara – Dwarka line on 19th June 2024 was 882 MW (PGCIL may confirm).

A.14.4. From the above loading pattern, DTL has mentioned that the load which was earlier distributed equally has now being taken on only on Jhatikara –Bamnauli ckt and the other ckt is taking only 75MW which is almost like open ckt when seen from Delhi ring angle.

A.14.5. To address the issue DTL has submitted two proposals. One is immediate interim arrangement and the other is permanent solution of the problem.

A. **Interim proposal of bus split element at Bamnauli.**

- **400kv Bus -1**

  400kV Jhatikara – Bamnauli line

  400kV Tuglakabad Ckt – 1

  All 3 ICTs

- **400KV Bus-2**

  400kV Dwarka – Bamnauli line

  400kV Tuglakabad Ckt-2

  (220kV side bus will run in parallel)

- In this case the loading of Bamnauli – Dwarka ckt will be around 500MW and Dwarka – Jhatikara line and Jhatikra – Bamnauli line will be around 1000MW each. SLD for the above arrangement is attached as **Annexure-A.VII.**

B. <u>Permanent solution of restoring Delhi Ring Main and terminating Dwarka Lines at Bamnauli Sub-Station</u>

- Since the reason for the high loading of Bamnauli – Jhatikara ckt is the LILO of one of the Bamnauli –Jhatikara Ckts at Dwarka which has resulted in reducing the capacity of the Delhi ring corridor. It is very much essential to restore the original Delhi ring by restoring the Bamnauli – Jhatikara ckts and the Dwarka line should emanate from Bamnauli.

- It is learnt that PGCIL is planning double ckt line from Jhatikara to Dwarka under evacuation renewable energy from Rajasthan which includes construction of 765 KV Narela Sub-station and associated transmission lines.

- Restoring of both Jhatikara – Bamnauli ckts will result in flow of 1900 MW on each of the ckts as originally planned for Delhi Ring Main. It is worth mentioning that LILO for Dwarka has been done near Bamnauli Sub-Station.

A.14.6. The following work is involved for implementing the above arrangement: -

1. Erection of Towers for terminating Dwarka Lines at Bamnauli Sub Station towards the portion of the Sub Station where the Dwarka Lines are passing.
2. Construction of 400kV Bays at Bamnauli Sub Station. The last portion of the layout of the sub-station is for ICT-I and ICT-IV. The Bays involve are designed for one and a half breaker scheme.The Bays involved in Dia meant for ICT-1 are Bay No. 419,420 and 421 and the Bays involved in Dia meant for ICT-4 are Bay No. 422,423 and 424.The Bay no. 419 and 422 are having only Bus Isolators and ICTs are effectively running of double breaker scheme in the absence of CB and associated equipments meant for Future lines. As these bays are meant for future bays so using them for Dwarka Ckts will be their best utilization. It is also worth mentioning that the required gantry structure and jack bus for the future lines is already constructed and only Circuit Breakers, Current Transformers, CVT, LA, Isolators and associated civil works and appropriate Protection scheme & wiring work will be required to be

executed. The relevant SLD and photographs of Future Bay gantry structure is attached as **Annexure-A.VIII.**

Members may kindly deliberate.

A.15. Revised SPS for 2X315 MVA, 400/220kV ILTs at 400kV GSS Jodhpur (Agenda by RVPN)

A.15.1 SPS for 2X315 MVA, 400/220 kV ILTs at 400kV GSS Jodhpur (Surpura) was approved in 197th OCC meeting.

A.15.2 RVPN vide letter dated 28.06.2024 has submitted that due to increased loading in the Bilara, Jodhpur and Bhawad region, operational arrangement of lines and transformers has been changed at 400kV GSS Jodhpur. This has necessitated the revision of the approved and implemented SPS.

A.15.3 In this regard, RVPN has submitted the revised SPS for for 2X315 MVA, 400/220kV ILTs at 400kV GSS Jodhpur (Surpura). (Copy attached as **Annexure-A.IX)**

Members may kindly deliberate.

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

B.1. NR Grid Highlights for June 2024

Major grid highlights of Northern region grid for June 2024 are shown below:

Demand met details of NR

S.No.	Constituents	Max Demand met (in MW)	Date & Time of Max Demand met	Max Consumption (in MUs)	Date of Max Consumption	Average Demand met (in Mus)
1	Chandigarh	443	13.06.24 at 14:00	9.1	18.06.24	7.9
2	Delhi	8656	19.06.24 at 15:06	177.7	18.06.24	151.8
3	Haryana	14469	19.06.24 at 15:00	293.4	19.06.24	259.6
4	H.P.	1919	26.06.24 at 11:45	41.2	26.06.24	38.3
5	J&K	2902	17.06.24 at 05:00	58.7	17.06.24	54.6

6	Punjab	16089	29.06.24 at 12:45	357.2	26.06.24	293.2
7	Rajasthan	17774	18.06.24 at 11:45	378.8	19.06.24	344.8
8	U.P	30618	13.06.24 at 22:00	658.8	17.06.24	601.9
9	Uttarakhand	2863	14.06.24 at 22:00	62.1	14.06.24	56.8
10	**Northern Region**	**91234***	**19.06.24 at 14:37**	**1986.1**	**18.06.24**	**1809.0**

***As per SCADA**

- In June'24, the Maximum energy consumption of Northern Region was **1986.1 MUs** on 18th June'24 and it was 16 % higher than June'23 (1714 MU 23rd June'23)

- In June'24, the Average energy consumption per day of Northern Region was **1809 MUs** and it was 23% higher than June'23 (1477 MUs/day)

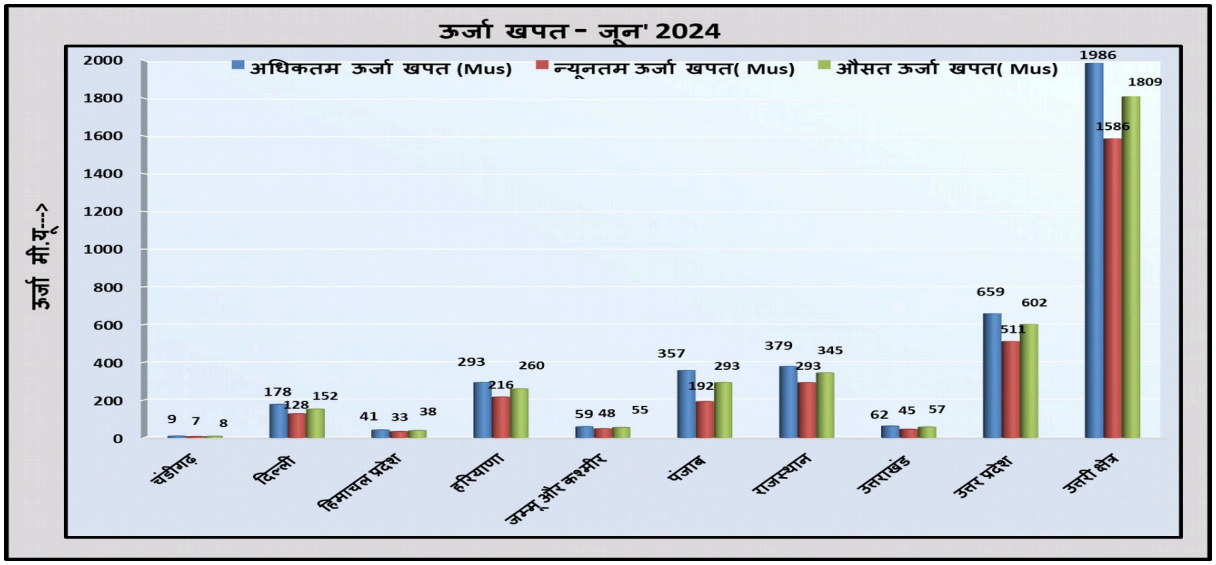
- In June'24, the Maximum Demand met of Northern Region was **91234 MW** on 19th June'24 @14:37 hours (*as per scada data)* as compared to **77898 MW** on 23rd June'23 @22:00 hours.

- **Comparison of Average Energy Consumption (MUs/Day) of NR States for the June'23 vs June'24**

क्षेत्र/राज्य	जून- 2023	जून- 2024	% अंतर
चंडीगढ़	6.1	7.9	30.2%
दिल्ली	122.2	151.8	24.2%
हिमाचल प्रदेश	31.1	38.3	23.1%
हरियाणा	204.6	259.6	26.9%
जम्मू और कश्मीर	52.0	54.6	5.0%
पंजाब	235.9	293.2	24.3%
राजस्थान	271.1	344.8	27.2%
उत्तराखंड	49.7	56.8	14.3%

उत्तर प्रदेश	503.9	601.9	19.5%
उत्तरी क्षेत्र	**1476.6**	**1809.0**	**22.5%**

Energy Consumptions



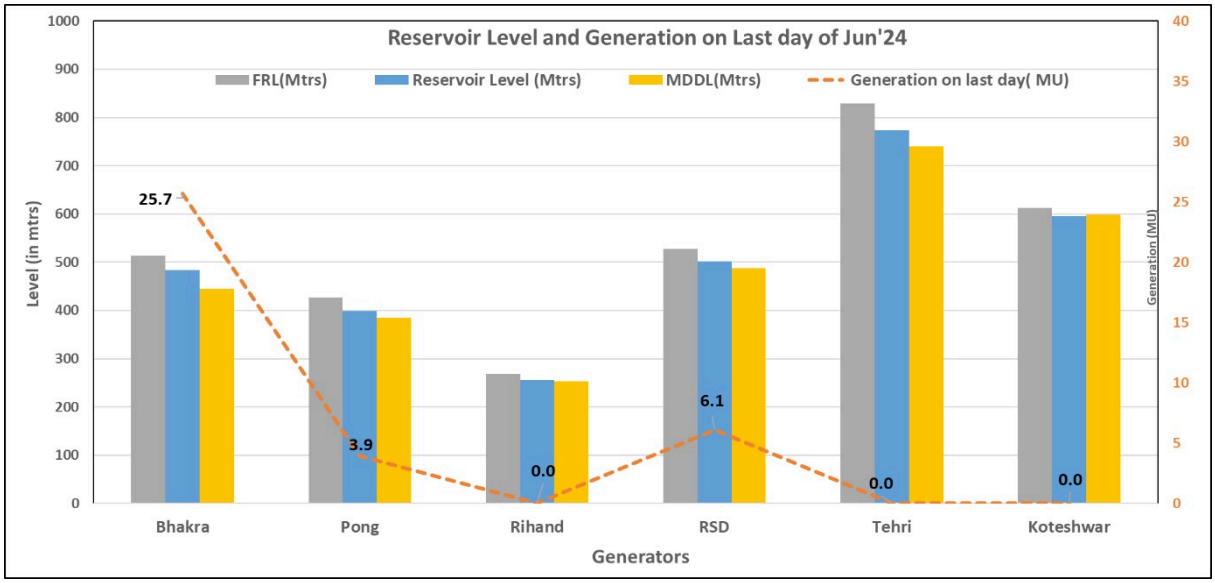
Northern Region all-time high value recorded in June'24:

States	Max. Demand Met during the day (MW)		Energy Consumption (MU)	
	As per Format28/hourly data Submitted by States (MW)	As on date	As per PSP (Mus)	As on date
Chandigarh	443	13.06.24 at 14:00	9.1	18.06.24
Delhi	8656	19.06.24 at 15:06	177.7	18.06.24
Haryana	14469	19.06.24 at 15:00	293.4	19.06.24
Punjab	16089	29.06.24 at 12:45	357.2	26.06.24
U.P	30618	13.06.24 at 22:00	658.8	17.06.24
Uttarakhand	2863	14.06.24 at 22:00	62.1	14.06.24
Northern Region	**91234**	19.06.24 at 14:37	**1986.1**	**18.06.24**

Frequency profile

Month	Avg. Freq. (Hz)	Max. Freq. (Hz)	Min. Freq. (Hz)	<49.90 (% time)	49.90 – 50.05 (% time)	>50.05 (% time)
June'24	50.00	50.67 (07.06.24 at 18:02:40 hrs)	49.63 (11.06.24 at 00:02:40 hrs)	4.50	79.18	16.32
June'23	50.01	50.41 on 14.06.23 at 08:00:10 hrs	49.51 on 14.06.23 at 22:33:50 hrs	6.5	67.8	25.7

Reservoir Level and Generation on Last Day of Month



Detailed presentation on grid highlights of June'2024 will be shared by NRLDC in OCC meeting.

B.2. Sharing of ATC/TTC assessment and basecase with NRLDC

All NR states except Chandigarh UT 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.

CERC vide their order dated 29.09.2023 has granted approval of "'Detailed Procedure for Allocation of Transmission Corridor for Scheduling of General Network Access and Temporary General Network Access under Central Electricity Regulatory Commission (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022".

Detailed roles and responsibilities for State Load Dispatch Centers in various timelines of the approved procedure are provided in the table below.

Purpose	***S No***	***Action of Stakeholder***	***Responsibility***	***Submission to***	***Data/ Information Submission Time line***

1. Revision 0 TTC/ATC Declaration for Month 'M'	*1(a)*	*Submission of node wise Load and generation data along with envisaged scenarios for assessment of transfer capability Assessment of TTC/ATC of the import/export capability of the state and intra-state system and sharing of updated network simulation models*	*SLDC*	*RLDC*	*10th Day of 'M-12' month*
	1(b)	*Declaration of TTC/ATC of the intra- state system by SLDC in consultation with RLDC*			*26th Day of 'M-12' month*
2. Interconnection Studies for elements to be integrated in the month 'M'	*2(a)*	*Submission of node-wise load and generation data & sharing of network simulation models for intra-state elements coming in the next six months*	*SLDC*	*RLDC*	*8th Day of 'M- 6' month*
	2(b)	*Sharing of inter-connection study results*			*21st Day of 'M-6' month*
3. Month Ahead TTC/ ATC Declaration & Base case for Operational Studies for Month 'M'	*3(a)*	*Submission of node wise Load and generation data along with envisaged scenarios for assessment of transfer capability Assessment of TTC/ATC of the intra- state system and sharing of updated network simulation models*	*SLDC*	*RLDC*	*8th Day of 'M- 1' month*
	3(b)	*Declaration of TTC/ATC of the intra- state system in consultation with RLDC*	*SLDC*	*RLDC*	*22nd Day of 'M-1' month*

To encourage participation from SLDCs regarding basecase preparation and ATC/TTC assessment, two workshops have been conducted from Grid-India/NRLDC side. One workshop was conducted 31.08.2023 before the finalization of the procedure and another on 10.01.2024 recently to involve further participation from SLDCs.

Although all SLDCs are now involved in preparation of basecase & ATC/TTC assessment, it is seen that the timelines as per CERC approved procedure are not being followed and number of times basecases are not received from SLDC side.

B.2.1 ATC/TTC assessment sharing 11 months in advance

The procedure mentions that:

"SLDCs in consultation with RLDCs shall declare the import and export TTC, ATC, and TRM of the individual control/bid areas within the region in accordance with Regulation 44 (3) of the Grid Code 2023. RLDCs shall assess the import and export TTC, TRM and ATC for the group of control/bid areas within the region (if required). The computed TTC, TRM and ATC figures shall be published on the website of respective SLDCs and RLDCs, along with the details of the basis of calculations, including assumptions, if any, **at least eleven (11) months in advance**. The specific constraints indicated in the system study shall also be published on the website."

Accordingly, SLDCs are requested to send the PSSE cases for four scenarios for July'25 i.e. Afternoon Peak, Solar Peak, Evening Peak & Off-Peak hours as given below

S. No.	Scenario	Time of Scenario
1	Off-Peak	06:00 Hrs
2	Afternoon Peak	15:00 Hrs
3	Evening Peak	22:30 Hrs
4	Solar Peak	12:00 Hrs

It is requested that the basecases as well as ATC/TTC assessments may be shared with NRLDC as per CERC approved procedure. Further, the above exercise needs to be carried out regularly monthly.

It was discussed in last several OCC meetings & all states were requested to share basecase as well as ATC/TTC assessments for M-11 scenarios on monthly basis with NRLDC as per CERC approved procedure. Accordingly, it is requested to submit the basecase as well as ATC/TTC assessments.

B.2.2 Sharing of Data and study results for interconnection studies

As per **Regulation 33 of IEGC 2023,**

(9) Each SLDC shall undertake a study on the impact of new elements to be commissioned in the intra-state system in the next six (6) months on the TTC and ATC for the State and share the results of the studies with RLDC.
(10) Each RLDC shall undertake a study on the impact of new elements to be commissioned in the next six (6) months in (a) the ISTS of the region and (b) the intra-state system on the inter-state system and share the results of the studies with NLDC.
(11) NLDC shall undertake study on the impact of new elements to be commissioned in the next six (6) months in (a) inter-regional system, (b) cross-border link and (c) intra-regional system on the inter-regional system.

In line with above, utilities are requested to share the list of elements/LGB data/interconnection study results etc as per the approved procedure which are expected to be commissioned within next six months. This needs to be practised as monthly exercise on regular basis.

The agenda was discussed in last several OCC meetings & all utilities were requested to share list of elements/LGB data/interconnection study results etc as per the approved procedure on monthly basis.

B.2.3 TTC/ATC of state control areas for monsoon 2024 (M-1)

As discussed in previous OCC meetings, most of the NR states except Ladakh and Chandigarh U/Ts are sharing basecase and ATC/TTC assessment with NRLDC.

Based on simulation studies and discussions between SLDCs and NRLDC, ATC/TTC limits for NR states for the month of Aug'2024 are attached as **Annexure-B.I.**

OCC has advised all states to timely declare TTC/ATC for prospective months and revise the figures as per requirement.

January 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (Feb-24)		M-11 (Jan-25)		M-6 (July-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh	No	No	No	No	No	No
Delhi	No	No	No	No	No	No
Haryana	No	No	No	No	No	No
Himachal Pradesh	No	No	No	No	No	No
Jammu and Kashmir	Yes	No	Yes	No	No	No
Ladakh	No	No	No	No	No	No
Punjab	No	No	Yes	No	Yes	Yes
Rajasthan	No	No	No	No	No	No
Uttar Pradesh	No	No	No	No	Yes	Yes
Uttarakhand	No	No	No	No	No	No

February 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (Mar-24)		M-11 (Feb-25)		M-6 (August-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh	No	No	No	No	No	No
Delhi	No	No	No	No	No	No
Haryana	No	No	No	Yes	No	No
Himachal Pradesh	No	No	No	No	No	No
Jammu and Kashmir	Yes	No	Yes	No	Yes	No
Ladakh	No	No	No	No	No	No
Punjab	No	No	Yes	No	Yes	No
Rajasthan	No	No	No	No	No	No
Uttar Pradesh	No	No	Yes	Yes	Yes	Yes
Uttarakhand	No	No	No	No	No	No

March 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (Apr-24)		M-11 (Mar-25)		M-6 (Sep-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh	No	No	No	No	No	No
Delhi	No	No	Yes	Yes	No	No
Haryana	Yes	Yes	Yes	Yes	Yes	Yes
Himachal Pradesh	No	No	No	No	No	No
Jammu and Kashmir	Yes	No	Yes	No	Yes	No
Ladakh	No	No	No	No	No	No
Punjab	No	No	No	No	No	No
Rajasthan	No	No	No	No	No	No
Uttar Pradesh	Yes	Yes	Yes	Yes	Yes	Yes
Uttarakhand	No	No	No	No	No	No

April 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (May-24)		M-11 (Apr-25)		M-6 (Oct-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh	No	No	No	No	No	No
Delhi	No	No	Yes	Yes	No	No
Haryana	No	No	No	No	No	No
Himachal Pradesh	No	No	No	No	No	No
Jammu and Kashmir	Yes	No	Yes	No	Yes	No
Ladakh	No	No	No	No	No	No
Punjab	No	No	No	No	No	No
Rajasthan	No	No	No	No	No	No
Uttar Pradesh	Yes	Yes	Yes	Yes	Yes	No
Uttarakhand	No	No	No	No	No	No

May 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (June-24)		M-11 (May-25)		M-6 (Nov-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh	No	No	No	No	No	No
Delhi	No	No	Yes	Yes	No	No
Haryana	No	No	No	No	No	No
Himachal Pradesh	No	No	No	No	No	No
Jammu and Kashmir	Yes	No	Yes	No	Yes	No
Ladakh	No	No	No	No	No	No
Punjab	No	No	No	No	No	No
Rajasthan	No	No	No	No	No	No
Uttar Pradesh	Yes	Yes	No	No	Yes	Yes
Uttarakhand	No	No	No	No	No	No

June 2024 Mails						
	ATC/TTC Declaration				Interconnection Studies	
	M-1 (July-24)		M-11 (June-25)		M-6 (Dec-24)	
	Data Values	Basecases	Data Values	Basecases	Data Values	Basecases
Chandigarh						
Delhi			Yes	Yes		
Haryana						
Himachal Pradesh						
Jammu and Kashmir	Yes		Yes		Yes	
Ladakh						
Punjab						
Rajasthan						
Uttar Pradesh	Yes	Yes	Yes	Yes		
Uttarakhand						

The agenda was also discussed in 220 OCC meeting wherein all states agreed to send the data as well as PSSE basecases on time for all three (M-1, M-6, M-11) scenarios. NRLDC CGM had asked states to get help from NRLDC in case of any difficulty and emphasized on the need for regularity in sharing the data.

All SLDCs to provide update. Members may please discuss.

B.3. Grid Operation related issues in Northern region

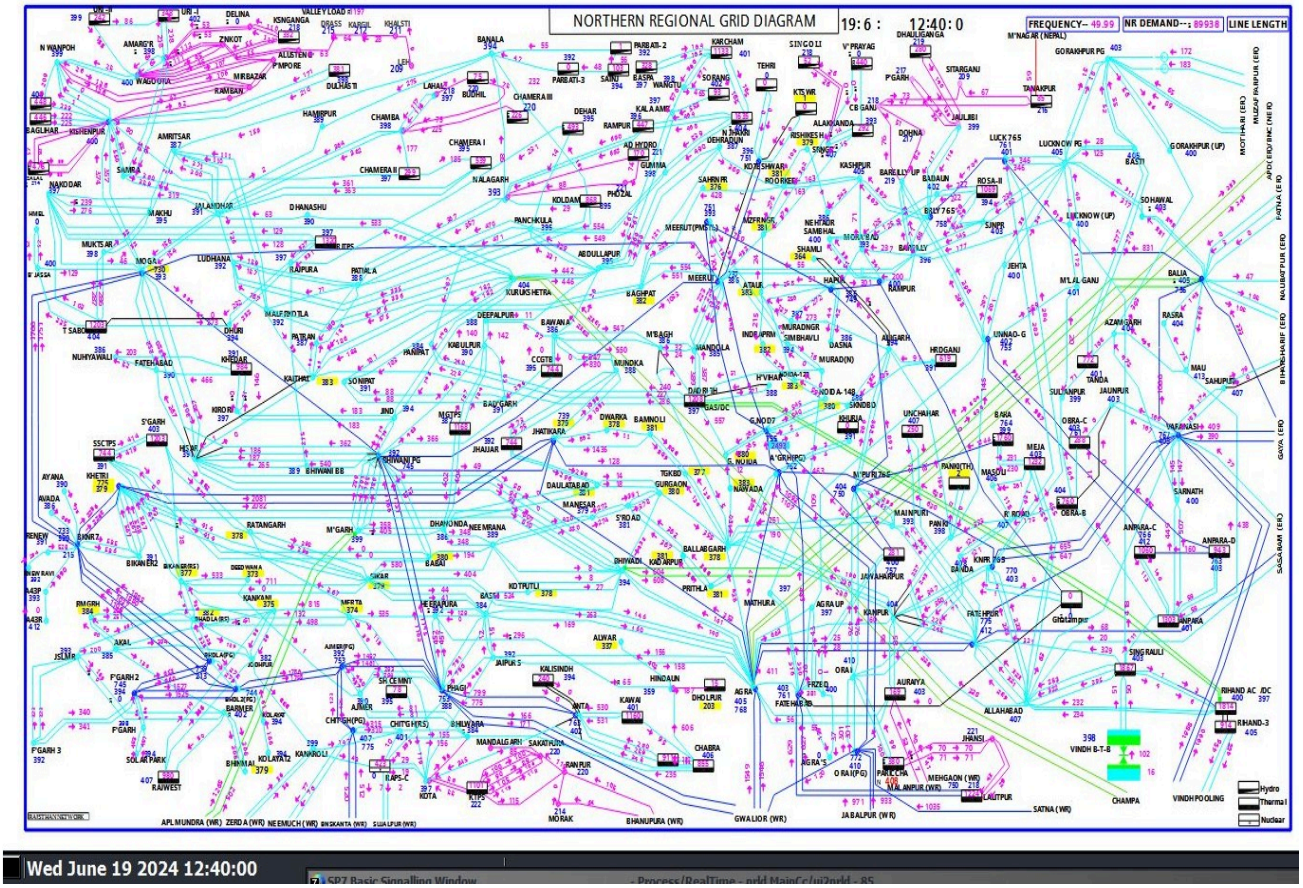
a) Voltage stability studies carried out by NRLDC

In view of the high demand season of NR and event witnessed on 17.06.2024, NRLDC has carried out voltage stability analysis for Northern region as well as individual states

Following are results from simulation studies carried out on latest All India basecase prepared in consultation with all stakeholders.

- It is observed that with NR Demand of ~92.25 GW and high IR import during peak solar, voltage stability limits are being reached particularly in Western Raj area.
- Further in case of outage of both bipoles of HVDC Champa - Kurukshetra corresponding NR Demand limit comes as 90.5 GW.

Low voltage scenario of the grid dated 19.06.2024, without any contingency is shown below:



Accordingly, it is requested that:

- All control room operators are extra alert when demand crosses 85GW
- In the event on 17th June 2024, it is suspected that as the grid voltages were not that low (0.8-0.85 p.u.), so either the stalling of motors has taken place at very high voltages (~0.8 - 0.9 p.u. voltage), or the voltages at distribution level were very low. Accordingly, matter may be taken up with DISCOMs
- All generators to provide maximum reactive power support by injecting MVAR (30-40% of MW generation) in real-time to avoid issues of low voltage in the grid especially during solar hours.
- SLDCs/DISCOMs to ensure that available capacitor banks in their control area are healthy and in service as per requirement
- Till the availability of adequate dynamic reactive power support, the voltages in the system may be kept slightly on the higher side (not below 390 kV) so as to prevent similar incidents as seen on 17th June 2024 in future

Members may please discuss.

b) Crossing of EHVAC lines with other EHVAC/HVAC/HVDC lines

It has come to notice of NRLDC that emergency shutdowns have been applied by constituents/Transmission licensees related to the power line crossings. The

shutdowns were taken as either there was clearance issue with other EHV power lines or as a safety measure due to imminent tower collapse of lower voltage transmission lines (220 KV) which are crossing over the higher voltage lines (400 KV lines).

In view of the above issues observed following is requested:

1. Wherever there is likelihood of clearances with the other power line crossings during high wind/stormy weather conditions, preventive measures like putting counterweights etc. is to be carried. Shutdown for the same during low demand period be facilitated as per the approved outage planning procedure.
2. For the upcoming projects utilities to explore all possibilities for avoiding high voltage power lines undercrossing the low voltage lines. This would help in preventing multiple outages due to unforeseen circumstances like tower collapse conditions of the lower voltage transmission lines which may fall on the high voltage lines carrying larger amounts of power. Instant Case: Shutdown of 400 KV Baglihar(JK)-Kishenpur(PG) (JKSPDCL) Ckt-3 & 400 KV New Wanpoh(PG)-Baglihar(JK) (JKSPDCL) Ckt-1 due to these lines crossing below 220kV Kishenpur – Mirbazar.

Members may please discuss.

c) Baglihar bus coupling

The agenda related to only single 400 kV outgoing line from both Baglihar stage-I (3X150MW) and stage-II (3X150MW) to Kishenpur was discussed in special meeting called by NRPC on 28.07.2020 via video conferencing to deliberate on issues related to UT of J&K and Ladakh. Tripping of one line can lead to outage of entire corresponding generating plant. JKPDD had been requested in the past to expedite coupling of two buses of Baghlihar stage-I & II to minimize the chances of generation losses.

During the meeting, J&K representative informed that both these stages are coupled with cables and we will explore the further possibility for healthiness of bus coupler between both these stages. J&K agreed to take action on this front in upcoming lean hydro period i.e.in winter months.

Subsequently, on 21.06.2024, JKPDD and Baglihar HEP requested for emergency Shutdown of BHEP-I and II generating units (900 MW) along with 400 KV Baglihar-Kishenpur-I, 400 KV Baglihar- Kishenpur-III and 400 KV Baglihar- New Wanpoh-I.

During the shutdown, Baglihar Stage-I and Stage-II were coupled together and are since then getting evacuated through 400kV Baglihar-Kishenpur ckt1 and ckt2 lines while 400 KV Baglihar(JK)-Kishenpur(PG) (JKSPDCL) Ckt-3 & 400 KV New Wanpoh(PG)-Baglihar(JK) continue to remain out of service.

Further, due to absence of bus coupler in Stage-I, 3*150MW generating units of each stage are still getting evacuated separately through individual 400kV lines.

Accordingly, Baglihar HEP (JKSPDCL) is requested to provide update regarding operation of Stage-I and Stage-II units coupled together and also explore for coupling of two buses of Stage-I section.

Members may please discuss.

d) Update of Operating Procedure document in line with IEGC:

In compliance with Regulation 28.4 of Indian Electricity Grid Code-2023, Operating Procedure document would be updated by NRLDC in mid-July 2024.

NRLDC has revised the operating procedure document and same is available at

https://nrldc.in/download/draft_operatingprocedures_nr_rev0/?wpdmdl=13575&lang=en

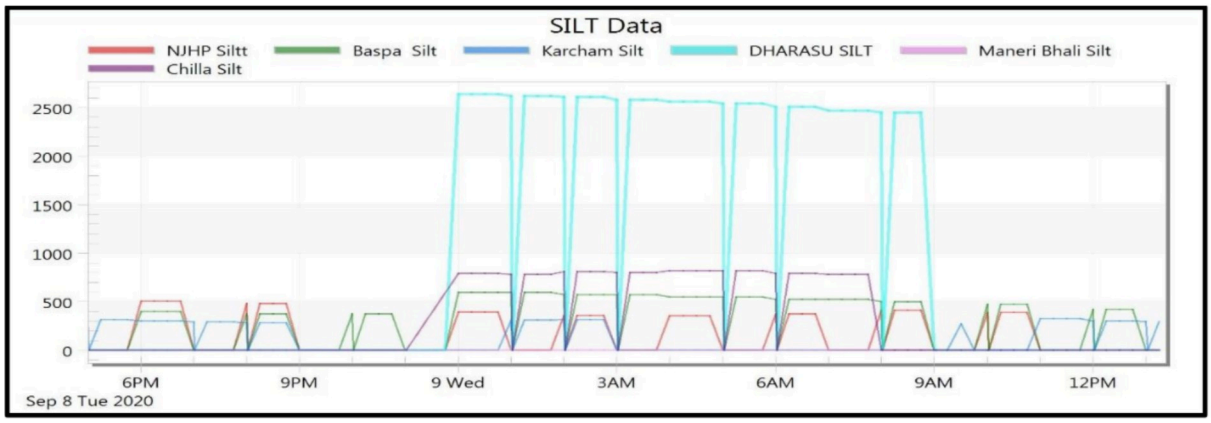
In 220 OCC meeting, all utilities were requested to provide their inputs/comments for any suggested changes in the document.

It is requested that inputs/comments may be provided by 18th July 2024. Thereafter, the document would be uploaded by NRLDC based on comments received.

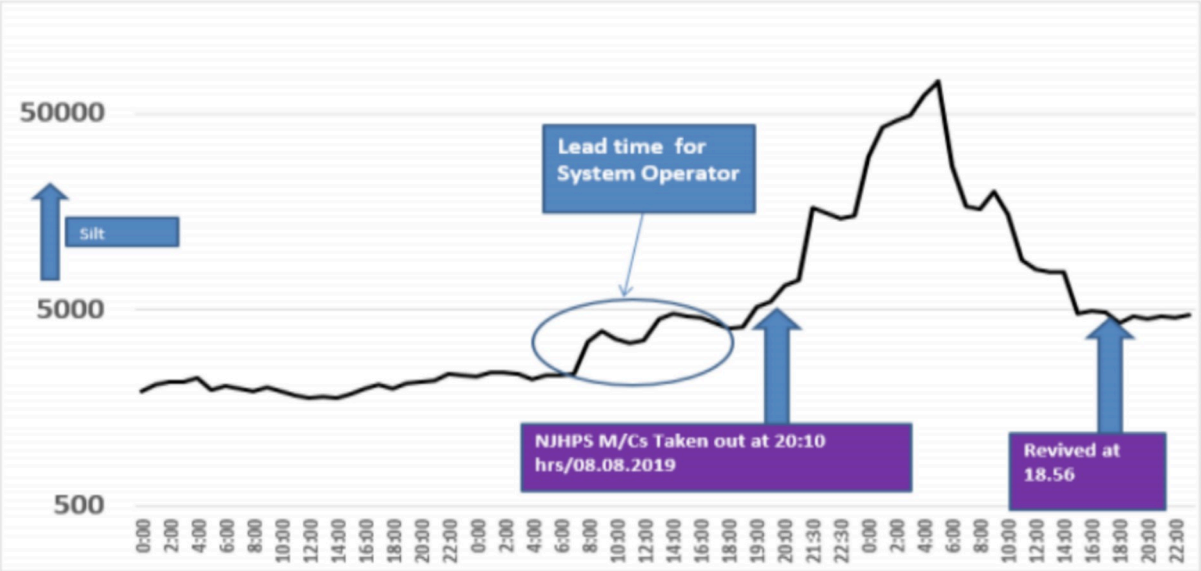
Members may kindly note and share their comments/observations by 16th July 2024.

e) Near Real Time Silt Monitoring of hydro stations

Availability of near real time silt measurement data to NRLDC/ SLDCs will be helpful for real time system operation in view of frequent hydro generation outage due to silt. PPM numbers are being punched directly from the site/control room at NRLDC server providing silt measurement at NRLDC control room. During previous years also, for Nathpa Jhakri, Baspa, Karcham and other small HEPs of Uttarakhand, trends of silt data were made available at NRLDC & being monitored by system operators in real-time.



Sample available data of silt shown below suggests that there is some lead-time (varying from few hours to several hours) available with system operators to accommodate outage of hydro generators on account of high silt level.



All hydro stations are requested to take actions to provide this near-real time silt measurement to control centers (RLDCs/SLDCs) as this would help them gain some lead-time for better tackling of hydro generator outage on silt.

In 220 OCC meeting, members agreed to share the data on real-time basis with NRLDC control room and perform coordinated operations of hydro generators during monsoon season.

As per the latest status available at NRLDC, real-time silt monitoring data is being received from most of the hydro plants. All other hydro generators such as Bairasuil, Chamera-1, Chamera-3, Kishenganga, Salal, Sainj, Maneri Bhali, Chilla, Baspa, Khodri, Chibro are also requested to regularly share data.

Members may please discuss.

f) Restoration of lines outage on tower collapse

Following lines are under long outage due to tower collapse in Rajasthan state control area:

1. 400kV Bhadla-Jodhpur
2. 400kV Bhadla-Merta

Further, as per information shared by Rajasthan, tower collapse has been reported at loc no 476-480. Due to the unavailability of these two lines, issues are being observed in evacuation of RE power from Western Rajasthan.

The non-availability of these lines also leads to critical loading of other transmission elements including high loading of 400kV Bhadla(RJ)-Bikaner(RJ) which is not well maintained and reservations have been made from RVPN/Rajasthan SLDC side for this line.

Moreover, at the time of high solar and high wind generation in Western Rajasthan, voltage oscillations have also been observed due to the degraded short circuit ratio.

Further, following lines are under long outage due to tower collapse in J&K state control area:

1. 220 KV Kishenpur(PG)-Mir Bazar(PDD)

2. 220 KV Kishenpur(PG)-Ramban(PDD)

Outage of these lines has impact on reliability of J&K control area as redundancy of supply to 220kV Mir Bazar and 220kV Ramban substations will not be there.

RVPN/JKPDD is requested to expedite restoration of these two lines and also intimate the latest status to OCC forum.

Further, committee under chairmanship of SE(O), NRPC, also visited site for issues observed in 400kV Bhadla-Bikaner D/C lines of RVPN. The committee had also submitted its report to OCC/NRPC forum and listed out number of actions to be taken from RVPN side.

RVPN is requested to provide update on the works being carried out from their side on 400kV Bhadla-Bikaner D/C lines based on committee recommendation.

g) Sharing of data for event analysis of 17th June 2024 load loss event

A Committee under Chairmanship of Member (GO&D), CEA has been constituted to analyse the issues of multiple tripping incidents occurred in the National grid at 13:53 hours of 17th June 2024 during which about 16.5 GW of consumer load in Northern Region got interrupted for a brief period.

The committee has proposed analysis on following areas:

- Detailed analysis of cause of outage of HVDC Champa-Kurukshetra bipole
- Detailed analysis of cause of Load Drop and its impact and estimation of ATC/TTC in view of the grid event
- Detailed analysis of behaviour of Renewable Plants in Rajasthan RE complex during incident and STATCOM/SVC/TCR of NR
- Detailed analysis of Primary Response & Reactive power support of conventional plants
- Detailed review of Over Voltage Protection Settings and suggesting optimum voltage grading philosophy
- Simulation of the load reduction and estimation of dynamic reactive reserve required near affected load centres

The committee has already conducted two meetings and planning to prepare the final report by 20th July 2024. For carrying out thorough analysis of the events, the committee requires extensive granular data from all utilities which has also been requested through email from NRLDC/NRPC side.

All utilities are requested to cooperate and share data as requested through email at the earliest for analysis by the committee.

Members may please discuss.

h) Long outage of transmission elements

It is requested to expedite restoration of the Grid elements under long outage at the earliest and also provide an update regarding their expected restoration date/time in the meeting/ NRLDC outage portal.

Some of the key elements that need to be revived at the earliest are listed below:

S. No.	Element Name	Outage Date
1	400/220 kV 315 MVA ICT 2 at Mundka(DV)	20-09-2019
2	400/220 kV 315 MVA ICT 1 at Muradnagar_1(UP)	13-03-2020
3	50 MVAR Bus Reactor No 1 at 400KV Moradabad(UP)	03-12-2021
4	400/220 kV 240 MVA ICT 3 at Moradabad(UP)	13-12-2021
5	220 KV Gazipur(DTL)-Noida Sec62(UP) (UP) Ckt-1	30-04-2022
6	220 KV Gazipur(DTL)-Shahibabad(UP) (UP) Ckt-2	30-04-2022
7	400 KV Noida Sec 148-Noida Sec 123 (UP) Ckt-2	09-03-2023
8	400/220 KV 500 MVA ICT 1 AT RAMGARH(RS)	26-04-2023
9	400/220 kV 240 MVA ICT 1 at Muradnagar_2(UP)	05-06-2023
10	400/220 kV 500 MVA ICT 1 at Rasra (UP)	26-10-2023
11	225 MVAR Bus Series Reactor No 1 at 400 KV Ballabhgarh(PG)	02-02-2024

Apart from this, other number of grid elements are also under long outage. These details are available in NRLDC website. Utilities are requested to expedite their restoration as well as regularly update the likely revival time of these elements on NRLDC OMS portal.

Member may like to discuss.

B.4. Frequent tripping of transmission elements in the month of June'24:

The following transmission elements were frequently tripping during the month of **June'24**:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	400 KV Kala Amb(PKTL)-Wangto_GIS(HP) (HPPTCL) Ckt-1	3	POWERGRID/HP
2	400 KV Kala Amb(PKTL)-Sorang(Greenko) (Greenko) Ckt-1	3	POWERGRID/ Sorang
3	400 KV Abdullapur(PG)-Bawana(DV) (PG) Ckt-1	4	POWERGRID/Delhi
4	220 KV RAPS_A(NP)-Sakatpura(RS)	3	RAPS/Rajasthan

	(RS) Ckt-2		
5	220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1	5	POWERGRID/UP
6	220 KV Delhi RR(BB)-Narela(DV) (BBMB) Ckt-1	5	BBMB/Delhi

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

It may be noted that frequent tripping of such elements affects 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.

B.5. Multiple element tripping events in Northern region in the month of June '24:

A total of 36 grid events occurred in the month of June'24 of which **01** is of GD-2 category, **14** are of GD-1 category, **10** are of GI-2 Category and **11** are 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.III.**

Maximum delayed clearance of fault observed in event of multiple elements tripping at 400/220kV Mandaula(PG) on 11th June, 2024 (As per PMU at Mandaula(PG), B-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 2320ms is observed).

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **12** events out of **36** grid events occurred in the month. In 07 (no.) of grid events, there was no fault in the grid.

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

As per IEGC clause 37.2 (c), Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) shall be submitted within 24 hrs of the event and as per IEGC clause 37.2 (e), the user shall submit a detailed report in the case of grid disturbance or grid incidence within one (1) week of the occurrence of event to RLDC and RPC.

DR/EL of the following grid events not received till date:

a) 220kV Pong(BBMB) on 03rd Jun'24
b) 220kV Jalandhar(BBMB) on 07th Jun'24
c) 220kV Hiranagar(J&K) on 13th Jun'24
d) 400/220kV Kankani(RS) on 16th Jun'24
e) Load loss event on 17th Jun'24
f) 400kV Rajwest(RS) on 19th Jun'24
g) 220kV Mund(HV) on 19th Jun'24
h) 400kV Bikaner2(PG) and Banderwala(TATA) RE station on 20th Jun'24
i) 220kV Mohali(PSTCL) on 21st Jun'24
j) 220kV Tughlakabad(DTL) on 23rd Jun'24

Detail report of majority of the grid events not received yet.

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.

B.6. Review and uniformity of df/dt (ROCOF) protection philosophy in Northern Region

Multiple incidents of load shedding on df/dt (ROCOF) protection operation have been reported during recent past. Major operations were reported from Punjab control area. Delhi, Rajasthan & UP have also reported load shedding on df/dt operation during some of the incidents. Incidents during which df/dt operation reported is attached as **Annexure B.IV.**

In view of frequent incidents of tripping of distribution feeders on df/dt operation, analysis and review of df/dt operation is necessary. Communication has already been sent to SLDCs via mail to provide details of stage wise quantum of load relief on df/dt operation and protection setting adopted (average cycle, time delay etc.)

Name of State	df/dt settings (average cycles considered, time delay etc)	Maximum quantum of relief (MW)		
		Stage-1	Stage-2	Stage-3

Details received from Haryana only. Details received from Haryana are attached in **Annexure B.V.**

SLDCs are requested to share the adopted philosophy of df/dt protection and confirm whether uniform philosophy has been adopted throughout the state or not. Kindly share the details at the earliest so that analysis and review of df/dt operation and its philosophy may be done.

Further review of df/dt protection setting also need to be done to ensure its uniformity and to avoid undesired operation and load loss.

Members may like to discuss.

B.7. Details of tripping of Inter-Regional lines from Northern Region for June' 24:

A total of 13 inter-regional lines tripping occurred in the month of June'24. The list is attached at **Annexure-B.VI.** 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 37.2(c) 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.

B.8. Status of submission of DR/EL and tripping report of utilities for the month of June'24.

The status of receipt of DR/EL and tripping report of utilities for the month of June'24 is attached at **Annexure-B.VII**. It is to be noted that as per the IEGC provision under clause 37.2 (c), 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.

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 37.2(c) 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.

Members may like to discuss.

B.9. Frequency response characteristic:

The FRC based event occurred in the month of **June-2024**. 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 FRP during the event
1	04-Jun-24	10:26hrs	On 4th June 2024 at 10:26 hrs, dip in RE generation in Rajasthan RE generation complex (NR) was observed. The net					

			generation loss of approx. 1090 MW occurred in this event. Therefore generation loss of 1090MW has been considered for FRC computation.	50.07	49.954	49.995	-0.08	0.38
2	04-Jun-24	10:34hrs	On 4th June 2024 at 10:34 hrs, dip in RE generation in Rajasthan RE generation complex (NR) was observed. The net generation loss of approx. 1295 MW occurred in this event. Therefore, generation loss of 1295 MW has been considered for FRC computation.	50.073	49.965	50.021	-0.05	1.80
3	11-Jun-24	14:10hrs	As reported, at 14:10 hrs on 11th June 2024, 400/220 kV 500 MVA ICT-3 at Mandola s/s tripped due to fire in isolator of ICT-3 (Transfer Bus					

			side). ICT-3 was charged from transfer bus, as Main Bay (212) was under planned shutdown. At the same time, remaining 03 Nos 400/220 kV 500 MVA ICTs also tripped. As reported by SLDC Delhi, 1601 MW load loss and generation loss of 279 MW at Pragati (Units-10,11 and 12) were observed. Hence net load loss of (1601-279=) 1322 MW is considered for FRC/FRP Calculation.	49.929	50.027	50.006	0.08	1.33
4.	11-Jun-24	14:10hrs	As reported, at 13:53 Hrs of 17th June 2024, NR demand experienced a reduction in load of the order of 16.5 GW. The incident occurred immediately after tripping of both bipoles of +/-800 kV HVDC Champa (WR)-Kurukshetra (NR) which was carrying 4,500 MW from the WR to NR. Aft er tripping of the HVDC link, low voltages were observed across the Northern region and multi ple lines and	50.034	50.681	50.629	0.59	0.62

			generation tripping occurred. Parti al outage of the765/400kV Aligarh (PGCIL) station occurred due to reported tripping of five (5) nos 765 kV lines.In the Northern Region hydro generating units tripped at Bhakra, Karcham, Sainj, Ranjit Sagar Dam. Thermal generating units in NR tripped at Lalitpur, Rajwest and Panipat. NR Renewable Generation (Solar) of 2,870 MW approx. (majorly in Rajasthan) was also affected. Moreover, tripping of generation units at Mahan Energen (MEL) in WR and two modules of OTPC Palatana in the North Eastern Region were reported. Hence net load loss of 9725 MW [16500 (Change in NR demand) - 5240 (NR generation loss)– 1117 (MEL generation loss) – 418 (OTPC Palatana generation loss)] is considered for FRC/FRP Calculation.					

5.	19-Jun-24	12:42hrs	At 12:42 hrs on 19th June 2024, dip in solar, wind generation and load loss in Punjab, Rajasthan and UP was observed. At the same time as per SCADA and data received from SLDCs around 3893 MW dip in solar generation, 597 MW dip in wind generation was observed. Rajwest IPP Units-2,4,5,6 & 8 also tripped at the same time reportedly due to grid voltage fluctuations. Further, load throw-off (1050 MW) occurred in Punjab, UP and Rajasthan control area due to df/dt relay operation. Hence net generation loss of 4480 MW [=3490 MW (Rajasthan ISTS connected RE) + 843 MW (Rajasthan Solar) + 597 MW (Rajasthan wind) + 600 MW (Rajwest IPP)-1050 MW (df/dt load throw off)] is considered for FRC/FRP Calculation.	50.060	49.653	49.873	-0.19	1.72

As per IEGC 2023 Clause 30.10.(n), "Each control area shall assess its frequency response characteristics and share the assessment with the concerned RLDC along

with high resolution data of at least 1 (one) second for regional entity generating stations and energy storage systems and 10 (ten) seconds for the state control area."

As per sub-clause (a(v)) of clause (9) of IEGC 2023 Annexure-2, "All the SLDCs shall work out FRC for all the intra-state entities (for events indicated by the Regional Load Despatch Centres) based on the HDR available at their respective SLDCs and submit the same to respective RLDC within six (6) working days after the event. (Format as per Table-B)."

As per sub-clause (a(vi)) of clause (9) of IEGC 2023 Annexure-2, "All regional entity generating stations shall also assess the FRC for their respective stations and submit the same to respective RLDC within six (6) working days. (Format as per Table-B). The high-resolution data (1 second or better resolution) of active power generation and frequency shall also be shared with RLDC."

Status of details received from constituents is:

FRC computation and data submission status						
S. No	Control Area	Event Date				
		04-06-2024_10:26 hrs	04-06-2024_10:34hrs	11-06-2024	17-06-2024	19-06-2024
1	Punjab	Not Received	Not Received	Not Received	Not Received	Not Received
2	Haryana	Not Received	Not Received	Not Received	Not Received	Not Received
3	Rajasthan	Not Received	Not Received	Not Received	Not Received	Not Received
4	Delhi	Not Received	Received*	Not Received	Received *	Not Received
5	Uttar Pradesh	Received	Received	Not Received	Received	Received
6	Uttarakhand	Not Received	Not Received	Not Received	Not Received	Not Received
7	Chandigarh*	NA	NA	NA	NA	NA
8	Himachal Pradesh	Received	Received	Received	Received	Received
9	J&K(UT) and Ladakh(UT)	Not Received	Not Received	Not Received	Not Received	Not Received
10	Dadri -1 (TH)	Received	Received	Not Received	Not Received	Not Received
11	Dadri -2 (TH)	Received	Received	Not Received	Not Received	Not Received
12	Jhajjar (TH)	Not Received	Not Received	Not Received	Not Received	Not Received
13	Rihand-1 (TH)	Received	Received	Received	Received	Not Received
14	Rihand-2 (TH)	Received	Received	Received	Received	Not Received
15	Rihand-3 (TH)	Received	Received	Received	Received	Not Received
16	Shree Cement (TH)	Not Received	Not Received	Not Received	Not Received	Not Received

17	Singrauli (TH)	Received	Received	Received	Received	Received
18	Tanda-2 (TH)	Not Received	Not Received	Not Received	Received	Not Received
19	Unchahar stg-4 (TH)	Received	Received	Received	Received	Not Received
20	Unchahar (TH)	Received	Received	Received	Received	Not Received
21	Anta (G)	Received	Received	Not Received	Not Received	Not Received
22	Auraiya (G)	Not Received	Not Received	Not Received	Not Received	Not Received
23	Dadri (G)	Not Received	Not Received	Not Received	Not Received	Not Received
24	AD Hydro (H)	Received	Received	Received	Received	Received
25	Bairasiul (H)	Not Received	Not Received	Not Received	Not Received	Not Received
26	Bhakra (H)	Not Received	Not Received	Not Received	Not Received	Not Received
27	Budhil (H)	Received	Received	Not Received	Not Received	Not Received
28	Chamera-1 (H)	Not Received	Not Received	Not Received	Not Received	Not Received
29	Chamera-2 (H)	Not Received	Not Received	Not Received	Not Received	Not Received
30	Chamera-3 (H)	Not Received	Not Received	Not Received	Not Received	Not Received
31	Dehar (H)	Not Received	Not Received	Not Received	Not Received	Not Received
32	Dhauliganga (H)	Not Received	Not Received	Not Received	Not Received	Not Received
33	Dulhasti (H)	Not Received	Not Received	Not Received	Not Received	Not Received
34	Karcham (H)	Received	Received	Received	Received	Received
35	Kishanganga	Not Received	Not Received	Not Received	Not Received	Not Received
36	Koldam (H)	Received	Received	No Gen	Received	Received
37	Koteshwar (H)	No Gen	No Gen	No Gen	No Gen	No Gen
38	Malana-2 (H)	NA	NA	NA	NA	NA
39	Nathpa Jhakri (H)	Received	Received	Received	Received	Received
40	Parbati-2 (H)	No Gen	No Gen	No Gen	No Gen	No Gen
41	Parbati-3 (H)	No Gen	No Gen	No Gen	No Gen	No Gen
42	Pong (H)	Not Received	Not Received	Not Received	Not Received	Not Received
43	Rampur (H)	Received	Received	Not Received	Received	Received
44	Sainj (H)	Not Received	Not Received	Not Received	Not Received	Not Received
45	Salal (H)	Not	Not	Not	Not	Not Received

		Received	Received	Received	Received	
46	Sewa-II (H)	No Gen	No Gen	No Gen	No Gen	No Gen
47	Singoli Bhatwari (H)	Not Received	Not Received	Not Received	Not Received	Not Received
48	Sorang (H)	Not Received	Not Received	Not Received	Not Received	Not Received
49	Tanakpur (H)	Not Received	Not Received	Not Received	Not Received	Not Received
50	Tehri (H)	No Gen	No Gen	No Gen	No Gen	No Gen
51	Uri-1 (H)	Not Received	Not Received	Not Received	Not Received	Not Received
52	Uri-2 (H)	Not Received	Not Received	Not Received	Not Received	Not Received

FRC/FRP as per SCADA data at NRLDC is as follows:

Frequency response Performance						
S. No	Control Area	Event Date				
		04-06-2024_10:26 hrs	04-06-2024_10:34 hrs	11-06-2024	17-06-2024	19-06-2024
1	Punjab	0.71	0.96	0.72	-0.04	-0.10
2	Haryana	0.18	0.31	0.41	-0.18	1.29
3	Rajasthan	-2.31	0.29	-0.48	0.89	1.79
4	Delhi	0.62	-1.30	1.28	-2.13	-0.23
5	Uttar Pradesh	-0.13	0.84	-0.22	0.51	0.58
6	Uttarakhand	-0.64	0.47	0.10	-0.12	0.45
7	Chandigarh*	NA	NA	NA	NA	NA
8	Himachal Pradesh	-1.88	0.11	-1.25	1.22	-1.04
9	J&K(UT) and Ladakh(UT)	0.68	-0.12	0.52	-3.24	0.18
10	Dadri -1 (TH)	1.33	2.97	0.28	1.58	3.60
11	Dadri -2 (TH)	-0.50	-1.55	0.58	1.34	6.17
12	Jhajjar (TH)	-1.62	3.05	-0.23	1.33	5.18
13	Rihand-1 (TH)	-6.33	-0.26	1.42	1.62	3.31
14	Rihand-2 (TH)	1.24	2.41	-0.16	1.67	2.55
15	Rihand-3 (TH)	0.00	1.05	0.00	0.06	-0.29
16	Shree Cement (TH)	1.01	1.47	0.00	0.00	2.05
17	Singrauli (TH)	0.78	-3.24	0.03	0.45	1.76
18	Tanda-2 (TH)	0.08	0.38	1.11	2.48	3.00
19	Unchahar stg-4 (TH)	2.52	10.39	0.92	1.90	6.16
20	Unchahar (TH)	-0.05	0.01	0.16	-0.01	-0.02
21	Anta (G)	0.36	1.26	1.23	-0.59	2.95
22	Auraiya (G)	0.78	0.41	-0.39	6.73	0.23
23	Dadri (G)	3.92	5.51	2.49	6.12	4.85
24	AD Hydro (H)	14.79	24.32	-1.82	5.19	8.26

25	Bairasiul (H)	0.00	0.00	0.00	-0.02	0.00
26	Bhakra (H)	0.11	0.10	-0.15	38.81	0.01
27	Budhil (H)	0.19	0.82	0.18	0.12	-0.30
28	Chamera-1 (H)	0.07	-1.46	0.21	5.13	6.55
29	Chamera-2 (H)	-0.63	2.58	0.76	2.89	0.37
30	Chamera-3 (H)	0.00	0.00	-0.19	2.16	0.01
31	Dehar (H)	1.24	1.60	0.17	0.26	0.09
32	Dhauliganga (H)	-6.99	6.81	2.30	5.21	0.47
33	Dulhasti (H)	-1.03	1.70	0.15	4.32	0.29
34	Karcham (H)	8.49	13.28	8.28	57.64	2.92
35	Kishenganga	-0.27	0.49	0.12	-0.03	-0.02
36	Koldam (H)	2.56	6.55	No Gen	7.57	0.00
37	Koteshwar (H)	No Gen	No Gen	No Gen	No Gen	No Gen
38	Malana-2 (H)	NA	NA	NA	NA	NA
39	Nathpa Jhakri (H)	8.46	8.38	7.04	7.84	2.10
40	Parbati-2 (H)	No Gen	No Gen	No Gen	No Gen	No Gen
41	Parbati-3 (H)	No Gen	No Gen	No Gen	No Gen	No Gen
42	Pong (H)	0.78	-0.72	-0.31	0.05	-0.02
43	Rampur (H)	2.59	7.57	0.85	8.38	-0.35
44	Sainj (H)	0.00	0.00	-0.22	87.21	0.36
45	Salal (H)	0.31	0.67	0.05	8.00	-0.08
46	Sewa-II (H)	No Gen	No Gen	No Gen	No Gen	No Gen
47	Singoli Bhatwari (H)	0.02	0.04	0.08	-0.04	-0.17
48	Sorang (H)	-0.08	0.19	0.15	-0.04	-0.13
49	Tanakpur (H)	21.01	-0.85	-2.86	-0.36	0.40
50	Tehri (H)	No Gen	No Gen	No Gen	No Gen	No Gen
51	Uri-1 (H)	0.35	0.58	0.14	2.90	0.55
52	Uri-2 (H)	0.00	0.00	-1.18	0.00	-0.48

Memebers are requested to analyse the frequency response of their respective control area and share the FRC/FRP analysis of generating stations along with unit wise 01 sec data of for the aforementioned event.

ISGS were requested to confirm	Entity	Capacity(MW)	Governor Mode (FGMO as per IEGC 2023) Yes or No	Drrop setting (%)	Remarks (if any)

whether FGMO as per IEGC 2023 has been implemented at their respective stations or not. Updated sheet on the basis of details received is as follows :Sl. No.					
1	Dadri-1 (TH)	4*200			
2	Dadri -2 (TH)	2*490			
3	Jhajjar (TH)	3*500			
4	Rihand-1 (TH)	2*500	Yes	5.0	Under

					Implementation
5	Rihand-2 (TH)	2*500	Yes	5.0	Under Implementation
6	Rihand-3 (TH)	2*500	Yes	5.0	Under Implementation
7	Shree Cement (TH)	(2 * 150)			
8	Singrauli (TH)	2*500+5*200			
9	Tanda-2 (TH)	2*660			
10	Unchahar stg-4 (TH)	1*500			
11	Unchahar (TH)	2*210			
12	Anta (G)	(1 * 153.2 + 3 * 88.71)			
13	Auraiya (G)	(2 * 109.3 + 4 * 111.19)			
14	Dadri (G)	(2 * 154.51 + 4 * 130.19)			
15	AD Hydro (H)	(2 * 96)	YES	4.0	-
16	Bairasiul (H)	(3 * 60)	Yes	4.0	
17	Bhakra (H)	(5 * 126 + 5 * 157)			
18	Budhil (H)	(2 * 35)			
19	Chamera-1 (H)	(3 * 180)	Yes	5.0	
20	Chamera-2 (H)	(3 * 100)	Yes	5.0	
21	Chamera-3 (H)	(3 * 77)	Yes	4.0	
22	Dehar (H)	(6 * 165)			
23	Dhauliganga (H)	(4 * 70)	Yes	5.0	
24	Dulhasti (H)	(3 * 130)	Yes	5.0	
25	Karcham (H)	(4 * 261.25)	Yes	5.0	
26	Kishenganga	(3 * 110)	Yes	4.0	
27	Koldam (H)	(4 * 200)	Yes	4.0	
28	Koteswar (H)	(4 * 100)	Yes	4.0	
29	Malana-2 (H)	(2 * 50)			
30	Nathpa Jhakri (H)	(6 * 250)	Yes	5.5	
31	Parbati-2 (H)	(4 * 200)			
32	Parbati-3 (H)	(4 * 130)	Yes	4.0	
33	Pong (H)	(6 * 66)			
34	Rampur (H)	(6 * 68.67)			
35	Sainj (H)	(2 * 50)			
36	Salal (H)	(6 * 115)	Yes	3.0	
37	Sewa-II (H)	(3 * 40)	Yes	4.0	
38	Singoli Bhatwari (H)	(3 * 33)			
39	Sorang (H)	(2 * 50)			
40	Tanakpur (H)	(1 * 31.42 + 2 * 31.4)	Yes	4.0	

41	Tehri (H)	(4 * 250)	Yes	4.0	
42	Uri-1 (H)	(4 * 120)	Yes	6.0	
43	Uri-2 (H)	(4 * 60)	Yes	5.0	

Constituents are requested to share the details at the earliest.

Members may like to discuss.

B.10. Mock trial run and testing of black start facilities at generating stations in Northern Region

As per Indian Electricity Grid Code (IEGC) clause 34.3

"*Detailed procedures for restoration post partial and total blackout of each user system within a region shall be prepared by the concerned user in coordination with the concerned SLDC, RLDC or NLDC, as the case may be. The concerned user shall review the procedure every year and update the same. The user shall carry out a mock trial run of the procedure for different sub-systems including black-start of generating units along with grid forming capability of inverter based generating station and VSC based HVDC black-start support at least once a year under intimation to the concerned SLDC and RLDC. Diesel generator sets and other standalone auxiliary supply source to be used for black start shall be tested on a weekly basis and the user shall send the test reports to the concerned SLDC, RLDC and NLDC on a quarterly basis*".

Hydro and gas-based plants are capable of self-black-start. Conducting periodic mock black start exercises are extremely important to ensure the healthiness of black start facilities and also to build awareness as well as confidence among the system operators.

In view of above, regional entity generating stations shall conduct the dead bus charging of their units on rotation basis as per availability of schedule under intimation to the NRLDC. Testing of Diesel generator sets and other standalone auxiliary supply source to be used for black start shall also be done on a weekly basis. SLDC shall also ensure the same in their respective control area. This will ensure the healthiness of blackstart facility at generating stations. Further, NRLDC shall coordinate with the ISGS and states to conduct the mock black start exercise of subsystems.

Therefore, regional entity generating stations and SLDCs are requested to share the annual schedule plan for conducting dead bus charging / mock black start exercise of generating stations / sub-systems during 2024-25 in the format attached as **Annexure-B.VIII**. Constituents are also requested to share the test report of diesel generators / auxiliary supply on a quarterly basis. In this regard, a communication has already been sent to constituents through NRLDC letter dated 24.04.2024.

Details received from AD Hydro HEP, Tehri HEP, Karcham Wangtoo HEP, Koteshwar HEP, SJVN, Budhil, Chamera-III, Auraiya GPS, Singoli Bhatwari HEP, Koldam HEP, Dadri GPS, Delhi, Punjab and Uttarakhand.

Members are requested to share the tentative schedule of mock black start exercise of generating stations in their respective control area. SLDCs are also requested to share the tentative schedule plan of mock black start exercise of generating stations in their respective control area and share the report of the same.

Members may like to discuss.

B.11. Mock testing of System Protection Schemes (SPS) in Northern Region

There are 53 numbers of System Protection Scheme (SPS) approved in Northern Region out of which 05 number of SPS are under implementation stage. These SPS are implemented at major generation complexes, important evacuating transmission lines and ICTs which are N-1 non complaint. Details of SPS in Northern Region is available on NRLDC website at link https://nrldc.in/download/nr-sps-2024/?wpdmdl=13255&lang=en .

SPS is designed to detect abnormal system conditions and take predetermined, corrective action to preserve system integrity and provide acceptable system performance. Therefore, correct operation of SPS as per designed logic is important to serve its purpose. To ensure this, mock testing of SPS needs to be conducted at a regular period. Clause 16.2 of IEGC 2023 also mandates the mock testing of SPS for reviewing SPS parameters & functions, at least once a year.

In view of the above, concerned constituents / utility are requested to share the tentative schedule plan for conducting mock testing of SPS in their respective control area during 2024-25 in format attached as **Annexure-B.IX.** In this regard, a communication has already been sent to constituents through NRLDC letter dated 01.05.2024.

Details only received from Uttarakhand & UP.

Members are requested to share the tentative schedule of mock testing of SPS implemented on their control area and share the report of the same. Members may like to discuss.

B.12. Availability and Standardization of recording instrument (Disturbance recorder and Station Event Logger):

As per IEGC clause 17

1) *All users shall keep the recording instruments (disturbance recorder and event logger) in proper working condition.*
2) *The disturbance recorders shall have time synchronization and a standard format for recording analogue and digital signals.*

IEGC clause 37.2 (c) also mandates the submission of Disturbance Recorder (DR), station Event Logger (EL), Data Acquisition System (DAS) within 24 hrs of the event.

Data of recording instruments (DR/EL) are very helpful in grid event analysis and also is being used in availability verification of transmission lines. Complete and conclusive analysis of any grid event is not possible without these recording instruments and thus their standardization is very important.

Therefore, availability of disturbance recorder with standardization, time sync and correct nomenclature and station event logger need to be ensured by users at the station of their respective control area.

In view of the above, all the constituents are requested to share the details w.r.t. availability and standardization of disturbance recorder and event logger at the station of their respective control area in format attached as **Annexure-B.X.**

Details only received from Haryana & UP.

Members are requested to share the share the details w.r.t. availability and standardization of disturbance recorder and event logger at the station of their respective control area.

Members may like to discuss.

Status of action taken on decision in 220th OCC meeting of NRPC

S.N.	Agenda	Decision of 220th OCC meeting of NRPC	Status of action taken
1	A.11 Requirement of additional 500 MVA, 400/220/33kV ICT at Samba (PG) Substation to meet increasing load demand of Jammu city (Agenda by JKPTCL)	Forum asked JKPTCL that since it is an ISTS network they may approach CTU along with details regarding the timeframe the downstream network is expected.	JKPTCL to update status.
2	A.12 Construction of 320MVA, 220/66 KV, Grid Sub-Station, Bhaathall Kathua (Agenda by JKPTCL)	Forum asked JKPTCL to approach CEA on the cited matter.	JKPTCL to update status.
3	A.13 Revised System Protection Scheme (SPS) scheme for Anpara Complex (Agenda by UPSLDC)	Forum directed that a separate meeting among constituents may be held next week to review the SPS scheme for Anpara Complex.	A separate meeting was conducted on 09.07.2024 discuss opening of 400 kV Singrauli-Anpara line and Shifting of NTPC Rihand stage-III generating station to NR as per decision of 50th TCC and 74th NRPC. Further, UPSLDC was asked to submit agenda for revised SPS for Anpara Complex in next PSC meeting scheduled in July.

4	A.14 N-1 contingency violation in 400/220/33KV 315MVA ICT-I at BBMB Dehar (Agenda by Powergrid NR-2)	Forum asked Powergrid, PSTCL, HPPTCL and BBMB to internally have a discussion/study on the SPS as temporary relief for Transformer overloading at BBMB Dehar and submit accordingly. Further, for installation of new transformer at BBMB Dehar S/s, proposal may be submitted by Powergrid to CTU for study.	BBMB to update status.
5	A.16 Tapping Tertiary of 765/400/33 kV ICT - 2 for Reliable Auxiliary Power Supply to ±500kV HVDC Ballia Sub-Station (Agenda by POWERGRID, NR3)	Forum agreed with the Powergrid proposal of Additional source of Auxiliary Power connectivity from tertiary of 765/400/33 KV ICT-2 for reliable auxiliary supply to HVDC Ballai Sub-Station and asked POWERGRID that since they have submitted that cost estimate may be considered under ADD-Cap therefore the same may be brought up as Agenda by POWERGRID in the NRPC board meeting for approval of NRPC Forum.	Approval accorded by NRPC forum to Powergrid proposal of Additional source of Auxiliary Power connectivity from tertiary of 765/400/33 KV ICT-2 for reliable auxiliary supply to HVDC Ballai Sub-Station.
6	A.19 Restoration of damaged tower No.4 (C-Type) of double circuit line connecting Noida Sector-62 and Sahibabad to DTL 220kV Gazipur S/Stn. [Delhi-UP Corridor]. (Agenda by DTL)	Forum asked DTL to take up the matter with the higher officials of MCD for reimbursement of cost of repair of this tower.	DTL to update status.

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 — May-2024
◎ HARYANA — Mar-2024
◎ HP — Feb-2024
◎ J&K and LADAKH — Not Available
◎ PUNJAB — May-2024
◎ RAJASTHAN — Apr-2024
◎ UP — Jun-2024
◎ UTTARAKHAND — Jun-2024
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 — Mar-2024
◎ HARYANA — Jun-2024
◎ HP — Jun-2024
◎ J&K and LADAKH — Not Available
◎ PUNJAB — Mar-2024
◎ RAJASTHAN — Mar-2024
◎ UP — Mar-2024
◎ UTTARAKHAND — Mar-2024
◎ BBMB — Jun-2024
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 — Increased
◎ PUNJAB — Increased
◎ RAJASTHAN — Increased
◎ UP — Increased
◎ UTTARAKHAND — Increased
◎ BBMB — Increased</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-2023</td></tr><tr><td>◎</td><td>PUNJAB</td><td>Mar-2024</td></tr><tr><td>◎</td><td>RAJASTHAN</td><td>Jul-2023</td></tr><tr><td>◎</td><td>UP</td><td>Jan-2024</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>Apr-24</td></tr><tr><td>◎</td><td>HARYANA</td><td>May-24</td></tr><tr><td>◎</td><td>HP</td><td>Jun-24</td></tr><tr><td>◎</td><td>J&K and LADAKH</td><td>Not Submitted</td></tr><tr><td>◎</td><td>PUNJAB</td><td>Mar-24</td></tr><tr><td>◎</td><td>RAJASTHAN</td><td>Apr-24</td></tr><tr><td>◎</td><td>UP</td><td>Mar-24</td></tr><tr><td>◎</td><td>UTTARAKHAND</td><td>Feb-24</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 System 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>The status of ADMS implementation in NR is enclosed in Annexure-A.I.II.
<table><tr><td>◎</td><td>DELHI</td><td>Scheme Implemented but operated in manual mode.</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.</td></tr><tr><td>◎</td><td>UP</td><td>Scheme implemented by NPCIL only</td></tr><tr><td>◎</td><td>UTTARAKHAND</td><td>Scheme not implemented</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	500 MVAr TCR at Kurukshetra has been commissioned on dated 15th December 2023
ii	DTL	Peeragarhi	1x50 MVAr at 220 kV	1x50 MVAr Reactor at Peeragarhi has been commissioned on dated 18.09.2023
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	SLDC informed that PTCUL has intimated that bid extension has been done till 30.05.2024.
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. Out of 13 Nos. of reactors, 07 Nos. have been commissioned and rest are under progress. Tentative charging plan is to be intimated by Rajasthan SLDC.
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. 01 No. of 125 MVAR reactor is under testing which is expected to done by end of May 2024. Tentaive charging plan is to be

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.	Mar'25	02 No. of bays shall be utilized for LILO-II of 220kV Jatwal-Bishnah Transmission Line, the work of which is delayed due to persisting RoW issues. expected date of completion is Mar 2025 subject to availability of funds and resolving of RoW issues), Updated in 220th 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	Mar'25	02 No. of bays are to be utilized for connecting 220kV New Wanpoh-Alusteng D/c Line. RoW issues persisting; At present new-wampoh-mirbazar 5km and harwan-alstung 16km have been completed, expected date of completion is Mar 2025 subject to availability of funds and resolving of RoW issues), Updated in 214th 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	Utilized: 7	• 220 kV D/C Shahajahanpur (PG) - Gola line	Commissioned	Energization date: 26.10.2023 updated by UPPTCL in 215th OCC
				• 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	• 220 kV Hamirpur-Dehan D/c line	Commissioned	HPPTCL has commissioned the Planned 220kV Dehan-Hamirpur TL utilizing 2 No. 220kV Bays.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'24	Issue related to ROW as intimated in 218th OCC by HVPNL. **Status:** Work was stalled since 29.07.2021 due to ROW issues and farmers agitation and further restarted on 9.10.2023 with the help of district administration. Now, work was again stalled since30.11.2023 due to severe ROW issues. Expected to be completed by 31.12.2024. Foundation 209/212. Erection 193/212. Stinging 37.8/50.3 km
				• 220 kV Bhiwani (PG) - Dadhibana (HVPNL) D/c line.	Oct'25	Line work awarded to M/s R S Infra Projects Pvt. Ltd. Noida, Uttar Pardesh on dated 09.03.2024. Work of route plan and route alignment has been started by the firm as intimated in 218th OCC by HVPNL.
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	Dec'24	Work in progress. Updated in 220th OCC by HVPNL.
11	400/220kV Tughlakabad GIS	Commissioned: 6 Under Implementation: 4	Utilized: 6 Unutilized: 0	• RK Puram – Tughlakabad (UG Cable) 220kV D/c line – March 2023.	Commissioned	Updated in 216th OCC by DTL
				• Masjid Mor – Tughlakabad 220kV D/c line.	Commissioned	Updated in 216th OCC by DTL

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
12	400/220kV Kala Amb GIS (TBCB)	Commissioned: 6 Total: 6	Utilized: 2 Unutilized: 2 Under Implementation:2	• HPPTCL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Kala Amb S/s	Commissioned	Energization date: 31.05.2024 updated by HPPTCL in 220th OCC
				• HPPTCL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Giri S/s	-	Tendering process is yet to be started.Updated in 219th OCC by HPPTCL
				• 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	• D/C line Kadarpur - Sec-56 Gurugram.	Jul'24	Initial proposal of LILO of 220kV Pali-Sector 56 Line and Pali-Sector 52 line was descoped due to forest issue. Proposl to evacuate power from 220kV D/C Pali-Sector 56 line to Sector 56 and 52 with bunching of lines is under consideration. Updated in 218th OCC by HVPNL
				• S/C line Kadarpur - Sec-52 Gurugram	Jul'24	Initial proposal of LILO of 220kV Pali-Sector 56 Line and Pali-Sector 52 line was descoped due to forest issue. Proposl to evacuate power from 220kV D/C Pali-Sector 56 line to Sector 56 and 52 with bunching of lines is under consideration. Updated in 218th OCC by HVPNL
				• S/C line Kadarpur - Pali	Jul'24	Initial proposal of LILO of 220kV Pali-Sector 56 Line and Pali-Sector 52 line was descoped due to forest issue. Proposl to evacuate power from 220kV D/C Pali-Sector 56 line to Sector 56 and 52 with bunching of lines is under consideration. Updated in 218th 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	Dec'24	Updated in 216th 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	Mar'25	Contract awarded on 8.08.23 to M/s Skipper with completion in March 25.Updated in 218th OCC by HVPNL
				• LILO of both ckt of 220kV D/c Ranga Rajpur – Palwal line	Commissioned	Energization date: 31.12.2021. Updated in 198th OCC by HVPNL
				• 220kV D/C for Sector78, Faridabad	30.09.2024	Issue related to ROW and Pending crossing approval from Northern Railways and DFCCIL. as intimated in 218th OCC by HVPNL.
				• Prithla - Sector 89 Faridabad 220kV D/c line	Jul'25	Work awarded to M/s Man Structurals Pvt Ltd. JV M/s Aquarian Enterprises on 09.01.2024. Contractual date: 06.05.2025 and Tentative date of completion :06.05.2025 Route has been approved and further work is in progress.Updated in 218th OCC by HVPNL
16	400/220kV Sonepat Sub-station	Commissioned: 6 Under Implementation:2 Total: 8	Utilized: 2 Unutilized: 4 Under Implementation:2	• LILO of both circuits of 220kV Samalkha - Mohana line at Sonepat	15.07.2024	Updated in 220th OCC by HVPNL. **Status:** Work was held up due to ROW at T.L. No. 7,8,11,12 & 13 by the farmers of Jajji villagers during July'23 and now the matter has been resolve and work under progress from 01.08.2023. The erection work of T.no. 1 is pending due to non availability of shut down at 220KV Mohana-Smk line and 220KV Jajji-Mohana line. • PLCC protection coupler and Forest approval is also pending.
				• Sonepat - HSIISC Rai 220kV D/c line	Commissioned	Energization date: 31.05.2024 updated by HVPNL in 220th OCC
				• Sonepat - Kharkhoda Pocket A 220kV D/c line	08.03.2025	Updated in 212th OCC by HVPNL. **Status:** Work order has been issued to M/s R.S Infra on dated 09.08.2023 by O/o CE/PD&C, Panchkula for construction of line. Both bays are under construction and erection of electrical equipment is under progress. Tetative date of completion of both bays at PGCIL end is end of July 2024.
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 is under progres. Stub Setting: 14/2017. Permission for Highway is awaited from concerned department as updated in 218th OCC by RVPNL.
18	400/220kV Kotputli Sub-station	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• Kotputli - Pathreda 220kV D/c line	-	Date of bid opening has been extended up to 30.04.2024 as updated in 218th OCC by RVPNL.

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
19	400/220kV Jallandhar Sub-station	Commissioned: 10 Total: 10	Utilized: 8 Unutilized: 2	• Network to be planned for 2 bays	Nov'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. 6 months more are needed due to ROW issues as updated by PSTCL in 220th OCC
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 commissioned 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	Commissioned	• Lucknow -Kanduni, 220 kV D/C line work energized on 05.10.2023. Updated in 212th OCC by UPPTCL. _____ • 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	Commissioned	• Gorakhpur(PG)- Maharajganj, 220 kV D/C line energized on 27.09.2023 updated by UPPTCL in 212th 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	Sep'24	Line charged from Rajokheri end on 09.02.2020. The work of construction was awarded to M/s IKE ltd but due to non completion of work firm is blacklisted, Now the pending work of SCADA , Telemetry and Data Integration is being carried out departmentally through OeM M/s ZIV . After completion of these statutory requirement of NRLDC the load will be taken from the Abdullapur. Tentative date of completion of work will be 30.09.2024. Updated in 218th OCC by HVPNL
25	400/220kV Pachkula Sub-station	Commissioned: 8 Under tender:2 Total: 10 Out of these 10 nos. 220kV	Utilized: 2 Unutilized: 4 Under Implementation:2	• Panchkula – Pinjore 220kV D/c line	Commissioned	Updated in 218th OCC by HVPNL
				• Panchkula – Sector-32 220kV D/c line	Commissioned	Energization date: 24.05.2024 updated by HVPNL in 220th OCC
				• Panchkula – Raiwali 220kV D/c line	Commissioned	Updated in 194th OCC by HVPNL
				• 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 Under Implementation:2	• Amritsar – Patti 220kV S/c line	31.07.2024	One bay is ready and another bay from Powergrid is pending it would be completed by 31.07.2024. Updated in 220th 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)	31.07.2024	One bay is ready and another bay from Powergrid is pending it would be completed by 31.07.2024. Updated in 220th 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	Mar'25	Updated in 220th OCC by HVPNL. **Status:** NIT has been floated vide NIT No. EPC-D-96 dated 15.10.23 to be opened on 22.12.23. • Now, the tender has been dropped and likely to be refloated by 31.07.2024.
				• Bahadurgarh - METL 220kV D/c line (Deposit work of M/s METL)	Mar'25	Updated in 220th OCC by HVPNL. **Status:** • Revised BOQ forwarded from Design wing to contract wing. • Tender has floated vide NIT No. EPC-D-100 dated 04.01.2024 with tender opening date of 26.02.2024. • Tender has been opened on 26.03.24 and 03 nos. bids has been received. The work is likely to be awarded by the 31.07.2024.
				• Bahadurgarh - Kharkhoda Pocket B 220kV D/c line	08.03.2025	Updated in 220th OCC by HVPNL. **Status:** Contract awarded on 09.08.23 to M/s R S Infra Noida. Work has been started.
29	400/220kV Jaipur (South) S/s	Commissioned: 4 Total: 4	Utilized:2 Unutilized: 2	• LILO of 220 kV S/C Dausa – Sawai Madhopur line at 400 kV GSS Jaipur South (PG)	06.10.2025	Work order has been issued on 06.10.2023, work under progress as updated by RVPNL in 215th 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

Sl. No.	Substation	Downstream network bays	Status of bays	Planned 220 kV system and Implementation status	Revised Target	Remarks
31	400/220kV, Kankroli	Commissioned: 6 Total: 6	Utilized: 4 Unutilized: 2	• 220 kV D/C Kankroli(PG) - Nathdwara line	Jul'24	Price bid opened on 29.01.2024, tender dropped due to price variation. Retendering would be done after general election as updated by RVPN in 218th OCC.
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
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	Commissioned	Direct circuit from 220 kV Lalton Kalan to Dhandari Kalan to be diverted to 400 kV PGCIL Ludhiana. Work completed , final agrrement is expected to be signed by May'24. Updated in 218th 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	Commissioned	Stringing of 2nd Circuit of Chamera Pool-Karian Tansmission line has been completed & terminal bay at 400/220 kV chamera pooling substation (PGCIL) is commissioned on 20.01.2024. Updated in 217th 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'25	2 Nos. bays for 400 kV PGCIL Patiala - 220 kV Bhadson (D/C) line being planned. Tender is yet to be awarded. Timeline one year communicated by PSTCL in 220th OCC meeting

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

Sl. No.	Name of Substation	MVA Capacity	Expected Schedule		Downstream connectivity by States
1	400/220kV Dwarka-I GIS (8 nos. of 220kV bays)	4x 500	Mar'22		DTL to update the status
2	220/66kV Chandigarh GIS (8 nos. of 66kV bays)	2x 160	Apr'22		Chandigarh to update the status.
3	400/220kV Jauljivi GIS Out of these 8 nos. 220kV Line Bays, 4 nos. (Pithoragath-2, & Dhauliganga-2) would be used by the lines being constructed by POWERGRID and balance 4 nos. bays would be used by the lines being constructed by PTCUL.	2x315	Feb'22		• 220kV Almora-Jauljibi line • 220kV Brammah-Jauljibi line PTCUL to update the status of lines.

Status of ADMS implementation in NR:

Sl. No.	State / UT	Status	Remarks
1	DELHI	Scheme Implemented but operated in manual mode.	A committee has been constituted under the chairmanship of GM, SLDC Delhi to formulate the logic for implementation of ADMS. Delhi SLDC informed that two meetings have been held by the committee and based on the delibration in those meetings, SoP has been formed by the committee. MS, NRPC asked Delhi SLDC to share the logic for implementation of ADMS with NRLDC for their observation.
2	HARYANA	Scheme not implemented	An internal Committee of HVPNL officers has been constituted for preparation of the Detailed Project Report and Tender Documents for implementation of ADMS. The DPR is under preparation.
3	HP	Scheme not implemented	HP SLDC imentioned that HPSEB had intimated that initially 142 Nos. of feeders were identified for operation under ADMS functionality but most of these feeders were from same sub-station. Therefore, now they have increased the no. of sub-station and identified the non-critical feeders. Load relief to be given through these feeders is under finalization. The revised feeder list would be shared by HPSEBL with the SLDC upon finalization of same.
4	PUNJAB	Scheme not implemented	i. A committee comprising of following officers of PSPCL & PSTCL has been constituted to finalize the logic regarding implementation of Automatic Demand Management System in Punjab Control Area. A meeting in this regard was held on dated 26-02-2024 at PSLDC Complex, Patiala. The committee deliberated various loading scenarios and proposed the following logic for the management of demand: 1. If the frequency sustains below 49.90 Hz for duration of 3 minutes, the Automatic Demand Management System will initiate a 50% reduction in the Over Drawl. 2. In case the frequency falls further below 49.85 Hz, the Over Drawl will be reduced to zero.
5	RAJASTHAN	Under implementation. Likely completion schedule is 31.03.2024	RVPN informed that the issue of cyber security of link between SATNAM centre and SLDC control room has been resolved. Final testing is rescheduled for 02.07.2024.
6	UP	Scheme implemented by NPCIL only	i. A meeting regarding ADMS was held on 15.01.2023 with the UPPCL under the chairmanship of MD UPPTCL ii. A committee formed for identification of load at 33 kV level under the chairmanship of Director (Distribution), UPPCL. iii. Another committee under the chairmanship of Director UPSLDC shall identify the technical and operational requirement for ADMS implementation iv. The software at the SLDC end for ADMS shall be available with ULDC phase –III SCADA system which is under implementation and likely to be commissioned by March 2025. v. In order to operate identified 33 kV feeders under ADMS scheme, integration of 132 kV substations with SCADA system is under implementation in the Reliable Communication Scheme and expected date of completion of the scheme is October 2024.
7	UTTARAKHAND	Scheme not implemented	i. UPCL has prepared a system architecture in which all the non-monitored sub-stions have been selected and 11kV feeders have been considered for ADMS operation. For the scheme, discom has also done group-wise selection of feeders and quantum of MW relief to be given for automatic demand response at 11kV level has also been decided. UPCL has awarded the tender for implementation of the aforementioned scheme to M/s Metergy Pvt.Ltd. ii. As per the status report submitted by M/s Metergy Pvt.Ltd, the survey work of 30 nos. incomer sites have been completed and order has been placed by UPCL for hardware equipments. iii. Uttarakhand SLDC informed that feeder list at 11kV level has been finalized and logic of ADMS implementation is under finalization.

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 (10.01.2024)
ANPARA TPS
HARDUAGANJ TPS
OBRA TPS
PARICHHA TPS

PSPCL (18.06.2024)
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. (10.01.2024)
Lalitpur TPS
Lanco Anpara Power Ltd. (01.01.2024)
ANPARA-C TPS

HGPCL (14.06.2024)
PANIPAT TPS
RAJIV GANDHI TPS
YAMUNA NAGAR TPS

Adani Power Ltd. (18.02.2022)
KAWAI TPS

Rosa Power Supply Company (01.01.2024)
Rosa TPP Phase-I
Prayagraj Power Generation Company Ltd. (05.01.2024)
Prayagraj TPP
APCPL (01.05.2024)
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#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: 31-12-2026), PANIPAT TPS U#7 (Target: 31-12-2026), PANIPAT TPS U#8 (Target: 31-12-2026), 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: 31-12-2025), ANPARA C TPS U#2 (Target: 31-12-2025)
Prayagraj Power Generation Company Ltd.	PRAYAGRAJ TPP U#1 (Target: 31-12-2026), PRAYAGRAJ TPP U#2 (Target: 31-12-2026), PRAYAGRAJ TPP U#3 (Target: 31-12-2026)
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: 31-12-2025), ANPARA TPS U#2 (Target: 31-12-2025), ANPARA TPS U#3 (Target: 31-12-2025), ANPARA TPS U#4 (Target: 31-12-2025), ANPARA TPS U#5 (Target: 31-12-2025), ANPARA TPS U#6 (Target: 31-12-2025), ANPARA TPS U#7 (Target: 31-12-2025), HARDUAGANJ TPS U#8 (Target: 31-12-2026), HARDUAGANJ TPS U#9 (Target: 31-12-2026), OBRA TPS U#9 (Target: 31-12-2026), OBRA TPS U#10 (Target: 31-12-2026), OBRA TPS U#11 (Target: 31-12-2026), OBRA TPS U#12 (Target: 31-12-2026), OBRA TPS U#13 (Target: 31-12-2026), PARICHHA TPS U#3 (Target: 31-12-2026), PARICHHA TPS U#4 (Target: 31-12-2026), PARICHHA TPS U#5 (Target: 31-12-2026), PARICHHA TPS U#6 (Target: 31-12-2026)

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.
3	Delhi IS	Delhi	Implemented				
4	Pathankot-RSD IS	Punjab	Implemented				

Under Implementation/ Newly Proposed/Under Discussion

Sl. No.	Islanding Scheme	SLDC	Status	Details of progress	DPR for PSDF funding (Required / Not Required)	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. Installation of Ufrs is completed as informed by NTPC. In the 220th OCC meeting, UPPTCL representative mentioned that telemetry for few stations for Islanding scheme is pending.		-		-	-	-	-	-	-	-	-
2	Agra IS	UP	Under Implementation	Scheme has been approved in 71th NRPC meeting held on 29.01.2024. In 220th OCC, UPPTCL representative stated that procurement of UFR is under process and tender would be floated within a week.		-		-	-	-	-	-	-	-	-
3	Jodhpur-Barmer-Rajwest IS	Rajasthan	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. DPR for Jodhpur-Barmer-Rajwest IS has been prepared. In 220th OCC, RRVPNL representative mentioned that logic for islanding scheme is being reviewed.	-	-		-	-	-	-	-	-	-	-
4	Suratgarh IS	Rajasthan	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. In 220th OCC, RRVPNL representative mentioned DPR for the implementation of Islanding scheme is under finalisation.	-	-		-	-	-	-	-	-	-	-
5	Patiala-Nabha Power Rajpura IS	Punjab	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. Punjab SLDC informed that DPR for PSDF funding has been approved from their management and it has been submitted to PSDF Secretariat.		-		-	-	-	-	-	-	-	-
6	Kullu-Manali-Mandi IS	HP	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. HPSLDC representative apprised forum that the Scheme is submitted to HPSLDC by HPSEBL on 14.05.2024 for scrutiny & further approval from appraisal committee of State Commission for funding from State PSDF.		-		-	-	-	-	-	-	-	-
7	Shimla-Solan IS	HP	Under Implementation	Scheme has been approved in 60th NRPC meeting held on 30.11.2022. HPSLDC intimated forum HPSEB has been taken up the matter with M/s GE and they have given clearance to enable the UFR setting of Bhaba HEP at 47.5 Hz. M/s GE has submitted a performa invoice for 100% advance payment regarding the same.											

Status of availability of ERS towers in NR

Sl. No.	Transmission Utility	Voltage Level (220kV/400kV/765kV/ 500 kV HVDC etc.)	Length of the transmission lines owned by the Utility (Ckt. Kms.)	Number of ERS Sets (towers) available (Nos.)	ERS Set (towers) required as per the Govt. norms.	Location	Remarks
1	PTCUL	400kV	418.394	NIL	1		DPR Under preparation.
		220kV	1045.135	NIL	1		DPR Under preparation.
2	Powergrid NR-1	220 KV	1842.88	NIL	1		
		400 KV	11074.26	12 Towers	3	All 400kV ERS at Ballabhgarh	make-Lindsey
		765 KV	4721.85	15 Towers	1	All 765kV ERS at Meerut	Make-SBB
		500 KV HVDC	653.88	NIL	1		
		800 KV HVDC	416.58	NIL	1		
3	Powergrid NR-2	66 KV	37.56	Nil	1		ERS tower available for 400KV rating can be used in place of lower as well as higher voltage Towers. In case used for 765KV Line, No of towers can be erected will reduce due to increase in Tower Hight.
		132 KV	262.7	Nil	1		
		220 KV	2152	Nil	1		
		400 KV	8097.3	02 Set (32 Towers)	2	Kishenpur & Jalandhar	
		765 KV	337.5	Nil	1		
4	Powergrid NR-3	800KV HVDC	2205	NIL	1		400KV ERS will be also be used in other voltage level lines
		500KV HVDC	2566	NIL	1		
		765KV	4396	NIL	1		
		400KV	12254	26 Towers	3	Kanpur	
		220KV	1541	NIL	1		
		132KV	207	NIL	1		
5	PARBATI KOLDAM TRANSMISSION COMPANY LIMITED	400kV	457	NIL	1		Procurement under process.
6	PATRAN TRANSMISSION COMPANY LTD	400kV	0.4	NIL	1	It is kept in Bhopal and on need basis is moved across region	Not available, will tie up based on the requirements in future. However the parent company IndiGrid owns one set of ERS for all five regions.
7	NRSS-XXIX TRANSMISSION LTD	400kV	853	NIL	1		
8	GURGAON PALWAL TRANSMISSION LTD	400kV	272	NIL	1		
9	RAPP Transmission Company Limited.	400kV	402	NIL	1		
10	NRSS XXXVI Transmission Limited	400kV	301.924	NIL	1		Element I - Operational comprising of 3 kms. Element II - Work Under Progress comprising of 221.924 kms. Element II - Work Under Progress comprising of 77 kms.
11	HPPTCL	220 kV	659	NIL	1		
		400 kV	75.7	NIL	1		
12	RVPN	132 kV	18969.958	1	4	01 No. ERS available at 220 kV GSS Heerapura, Jaipur	ERS proposed : 01 Set at 400 kV GSS, Jodhpur. 01 set at 400 kV GSS Bikaner
		220 kV	16227.979		3		
		400 kV	6899.386		2		
		765 kV	425.498		1		
13	DTL	220kV	915.498	NIL	1	400kV Bamnauli Sub station	ERS tower available for 400KV rating can also be used for lower voltage lines as well
		400kV	249.19	02 Sets (32 towers)	1		

Sl. No.	Transmission Utility	Voltage Level (220kV/400kV/765kV/ 500 kV HVDC etc.)	Length of the transmission lines owned by the Utility (Ckt. Kms.)	Number of ERS Sets (towers) available (Nos.)	ERS Set (towers) required as per the Govt. norms.	Location	Remarks
14	JKPTCL			10			JKPTCL, Kashmir:10 procured (out of which 3 on loan to JKPTCL, Jammu)
15	HVPN						HVPN does not have ERS Set. Technical Specifications have been finalized
16	PSTCL	400 kV	1666.43	2	2		
		220 kV	7921.991				
17	UPPTCL 1- Meerut	132KV	27508.321	24 Nos(15 Running+9 Angle)		400 kV S/s Gr. Noida	ERS will be also be used in other voltage level lines.
		220KV	14973.453				
		400KV	6922.828				
	UPPTCL 2-Prayagraj	765KV	839.37	24 Towers		220 kv S/s phulpur	ERS will also be used in other voltage lines.
		400KV	1804.257				
		220KV	2578.932				
		132KV	4714.768				
18	POWERLINK						
19	POWERGRID HIMACHAL TRANSMISSION LTD						
20	Powergrid Ajmer Phagi Transmission Limited						
21	Powergrid Fatehgarh Transmission Limited						
22	POWERGRID KALA AMB TRANSMISSION LTD						
23	Powergrid Unchahar Transmission Ltd						
24	Powergrid Khetri Transmission Limited						
25	POWERGRID VARANASI TRANSMISSION SYSTEM LTD						
26	ADANI TRANSMISSION INDIA LIMITED		2090	1 Set (12 towers)	1 set (12 towers)	Sami (Gujarat)	Make-Lindsey ERS set available for 400KV & 500KV rating can be used for lower as well as higher voltage Towers. In case used for 765KV Line, No of towers can reduce due to increase in Tower Height & nos of conductors.
27	BIKANER KHETRI TRANSMISSION LIMITED		482				
28	FATEHGARH BHADLA TRANSMISSION LIMITED	500 kV HVDC 400 kV HVAC	291				
29	NRSS-XXXI(B) TRANSMISSION LTD	400 kV	577.74	Not Available	Not Available		In the advance stage of process of finalising arrangement for providing ERS on need basis with other transmission utility (M/s INDIGRID).
30	ARAVALI POWER COMPANY PVT LTD	765 kv HVAC					

*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)

भारत सरकार केंद्रीय विद्युत प्राधिकरण दक्षिण क्षेत्रीय विद्युत समिति 29, रेसकोर्स क्रास रोड बेंगलूर- 560 009	सत्यमेव जयते	Government of India Central Electricity Authority **Southern Regional Power Committee** 29, Race Course Cross Road Bengaluru-560 009
Email:mssrpc-ka@nic.in	Web site: www.srpc.kar.nic.in	Phone: 080-22282516

सं/No.	SRPC/SE(O)/TF-AUFLS_dfdt/2023-24/ 4495-45	दिनांक/ Date	29th September 2023

सेवा में / To

Member Secretary
National Power Committee (NPC)
Central Electricity Authority
New Dlehi-110 066

विषय/ Subject:Report of the "Task Force on Implementation AUFLS & df/dt Scheme" -reg.

Ref: NPC letter No. CEA/GO-15-14/1/2021-NPC Division/280-295 dated 25th August 2023

महोदय/महोदया/ Sir/ Madam,

Enclosed, please find the final Report of the "**Task Force** on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme".

Submitted for kind needful please.

भवदीय /Yours faithfully,

29/09/2023

(के पी मधु / K P Madhu)
अधीक्षक अभियंता/सदस्य सांयोजक
Superintending Engineer/Member Convener

Copy to:

1. Smt. Rishika Sharan, Chief Engineer & Member Secretary, NPC, New Delhi
2. Shri Chandra Prakash, Chief Engineer GM, CEA, New Delhi
3. Shri P.D.Lone, Superintending Engineer, WRPC, WRPC, Mumbai
4. Shri Shyam Kejriwal, Superintending Engineer, ERPC, Kolkata
5. Shri Santosh Kumar, Superintending Engineer, NRPC, New Delhi
6. Shri S M Aimol, Superintending Engineer NERPC, Shillong.
7. Shri Satyendra Kumar Dotan, Director, NPC, CEA, New Delhi
8. Shri Vivek Pandey, General Manager, NLDC, New Delhi

Copy for kind information to:

1. SA to Chairperson, CEA, New Delhi.
2. SA to Member GO&D, CEA, New Delhi.
3. Chairman & Managing Director, GRID-INDIA, New Delhi.
4. Member Secretary, NRPC, New Delhi.
5. Member Secretary, ERPC, Kolkata.
6. Member Secretary, WRPC, Mumbai.
7. Member Secretary, NERPC, Shillong.

Report
on
Implementation of AUFLS and df/dt Scheme

Task Force Constituted by National Power Committee, CEA
Under Chairmanship of Member Secretary, SRPC

Report No. NPC/CEA/TF-AUFLS-001 September 2023

REPORT

OF

TASK FORCE

ON

IMPLEMENTATION OF

AUFLS AND df/dt SCHEME

EXECUTIVE SUMMARY

REPORT OF THE TASK FORCE ON

IMPLEMENTATION OF AUFLS AND df/dt SCHEME

EXECUTIVE SUMMARY

National Power Committee (NPC), vide letter No. CEA/GO-15-14/1/2021-NPC Division/250 dated 18th August 2023 and vide letter No. CEA/GO-15-14/1/2021-NPC Division/280-295 dated 25th August 2023 constituted a Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme with the following Terms of Reference:

i. Review the recommendations of the Report as per directions by the 13th NPC Meeting within two months.

ii. Prioritization of the loads under the AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

The Task Force comprised of the following Members:

1	Member Secretary, SRPC	Shri Asit Singh	**Chairperson**
2	Chief Engineer NPC,CEA	Smt Rishika Sharan	Member
3	Chief Engineer GM,CEA	Shri Chandra Prakash	Member
4	Superintending Engineer, WRPC	Shri P D Lone	Member
5	Superintending Engineer, ERPC	Shri Shyam Kejriwal	Member
6	Superintending Engineer, NRPC	Shri Santhosh Kumar*	Member
7	Superintending Engineer, NERPC	Shri S M Aimol	Member
8	Director, NPC,CEA	Shri Satyendra Kumar Dotan	Member
9	General Manager, NLDC	Shri Vivek Panday	Member
10	Superintending Engineer, SRPC	Shri K P Madhu	**Member Convener**

* NRPC replaced Shri Anzum Parwej.

The Task Force reviewed report of the Sub-Committee to review the AUFLS and df/dt scheme in line with the decisions of NPC in its 13th Meeting and relevant Regulations in Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 and identified the following:

- Total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz.
- Pumping load will be tripped before first stage (> 49.50 Hz). Battery energy system in charging mode will go in discharging mode (> 49.50 Hz), no storage will be in storage/charging mode at frequency < 49.50 Hz.
- All distribution licensees, STUs and bulk consumers shall provide automatic under frequency relays (UFR) and df/dt relays for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the RPCs from time to time. The default UFR settings shall be as follows:

Sr. No.	***Stage of UFR Operation***	***Frequency (Hz)***
1	***Stage-1***	*49.40*
2	***Stage-2***	*49.20*
3	***Stage-3***	*49.00*
4	***Stage-4***	*48.80*
Note 1: All states (or STUs) shall plan UFR settings and df/dt load shedding schemes depending on their local load generation balance in coordination with and approval of the concerned RPC. *Note 2: Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR*		

- The following shall be factored in while designing and implementing the UFR and df/dt relay schemes:

  (a) The under-frequency and df/dt load shedding relays are always functional.

  (b) Demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

  (c) There shall be a uniform spatial spread of feeders selected for UFR and df/dt disconnection.

  (d) SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and df/dt relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective RLDC in real time and submit a monthly exception report to the respective RPC. RLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC. SLDC shall take corrective measures within a reasonable period and inform the respective RLDC and RPC, failing which suitable action may be initiated by the respective RPC.

(e) RPC shall undertake a monthly review of the UFR and df/dt scheme and also carry out random inspection of the under-frequency relays. RPC shall publish such a monthly review along with an exception report on its website.

(f) SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the concerned RLDCs and RPCs and publish the monthly report on its website.

Through detailed deliberations, the Task Force finalized the methodology for identification quantum of relief at each stages of AUFLS, distribution among Regions by NPC, distribution of relief quantum among State/UT in Regions by respective RPCs for implementation in the Region, guidelines for identification of feeders, Mapping of feeders, Reporting by SLDCs/RLDCs, Testing/inspection of UFRs, setting of UFR for Pumps & Energy Storage Systems (ESS).The observations and recommendations are elaborated in the Task Force Report,

Salient observations & conclusion by the Task Force are summarized below:

- **AUFLS Set Points and Quantum of Relief**

  Total 25% relief would be planned in four stages: Stage-1 at 49.4 Hz, Stage-2 at 49.2 Hz, Stage-3 at 49.0 Hz & Stage-4 at 48.8 Hz. The 25% total relief distribution in four stages would be in such a way that 5% in Stage-1, 6% in Stage-2 and 7% each in Stage 3 & 4.

- **Identification of AUFLS Quantum by NPC and RPCs**

  NPC Division to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by **31st of May** to RPCs for implementation in the next Financial Year (FY). Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY.

- **Quantum Identification for AUFLS by States/UT and monthly vetting**

  Each SLDC shall carry out month-wise Stage-wise analysis and furnish to RPC/RLDC in the following manner:

  AUFLS Stage -1:

  Actual Relief for the month = Average actual load (for the month) of all the feeders identified in the stage**.** For this Feeders are to be mapped at SLDC. The mapping would be extended to RLDC. If feeders are not mapped then values are to be collected from field. (Any outage would not be excluded).

  Desired Relief for the month = (Recommended AUFLS quantum in the stage x Average demand for the month of State/UT)/Demand Contribution of the State/UT

  The same exercise would be repeated for each Stage.

As a general guideline Actual Relief for the month should be 10% more than the Desired Relief for the month considering the Relay/breaker issues and a resilient safety net.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

- **Analysis of AUFLS Event**

AUFLS Stage-1:

Actual Relief during incident = (Actual relief (during incident) of all the feeders identified in the stage)

Desired Relief during incident= (Recommended AUFLS quantum in the stage x demand of State/UT at time of incident)/Demand Contribution of the State.

The same exercise would be repeated for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

- **Guidelines for identification of AUFLS feeders**

AUFLS relays under Stage-1 & Stage-2 should be implemented preferably on downstream network at 11/22/33 kV level and AUFLS relays under Stage-3 & Satge-4 should be implemented on upstream network at EHV (66/110/132 kV) level so that load relief obtained is fast and reliable.

- **Mapping of AUFLS feeders**

SLDCs in coordination with STU/Discoms, map the feeders for loading, breaker status etc. and create display for monitoring of all the stages. The SLDC would extend the mutually agreed displays to RLDC. SLDCs also develop the SCADA Displays Discom-wise/Sub SLDC wise as applicable as well as feeder wise for all the stages.

Mapping verification between SLDC and Discom/STU to be carried out at least once in three (3) months and between RLDC and SLDCs at least once in six (6) months.

SLDCs shall download the data and store it for two years. The Data should be made available to RPCs/RLDCs/CEA/CERC for further studies or analysis.

- **Settings of UFR for Pumping load/Energy Storage Systems**

All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz

All the relays procured in future to have a sampling period ranging from three (03) cycles to five (05) Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.

- **Testing/Inspection of UFR**

SLDCs shall in consultation with the Utilities responsible for testing should chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC. The periodicity of testing of relays shall be twice in a year at 110 / 132 kV level and above Substations and once in a year at 66 kV level and below Substations.

RPC would carry UFR inspection randomly on sample basis by the RPC Secretariat or through RLDC.

- **df/dt Scheme**

The df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme may be discussed at regional levels in the RPCs. The RPCs in consultation with the stakeholders can decide the set points and quantum of Load shedding required under df/dt scheme.

Various aspects as brought out above have been deliberated by the Task Force and action by the agencies have been finalized. However, SLDCs and concerned utilities to ensure proper setting of relays considering sluggishness to achieve the desired load relief at all the stages of AUFLS and df/dt.

REPORT

OF

TASK FORCE

ON

IMPLEMENTATION

OF

AUFLS & df/dt SCHEME

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REPORT OF THE TASK FORCE ON

IMPLEMENTATION OF AUFLS AND df/dt SCHEME

1.0 INTRODUCTION

National Power Committee (NPC) in its 13th Meeting held on 05.07.2023 had accepted the report of the Sub-Committee (constituted as per the decision in 10th meeting of NPC) to review the AUFLS and df/dt scheme with the following observations:

a) The first stage will be set at 49.4 Hz.

b) Total 25% relief will be planned in 4 stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz.

c) Pumping load will be tripped before first stage (> 49.4 Hz). Battery energy system in charging mode will go in discharging mode (> 49.4 Hz), no storage will be in storage/charging mode at frequency < 49.4 Hz.

d) A Task Force under chairmanship of MS, SRPC with Members from Grid India, RPCs/NPC may be formed. The task force will also oversee the implementation of the report.

Keeping this in view, MS NPC, vide letters dated 18.08.2023 & 25.08.2023 constituted Task Force on Implementation of Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme with the following Terms of Reference:

i. Review the recommendations of the Report as per directions by the 13th NPC Meeting within two months.

ii. Prioritization of the loads under the AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

A copy of the letters is at **Annexure-I**.

The Task Force committee was constituted with the following Members:

1.	**Shri Asit Singh,** Member Secretary, SRPC ……**Chairperson**	2.	Smt. Rishika Sharan, Chief Engineer NPC,CEA ……. Member
3.	Shri Chandra Prakash, Chief Engineer GM,CEA …… Member	4.	Shri P D Lone Superintending Engineer, WRPC …… Member
5.	Shri Shyam Kejriwal Superintending Engineer, ERPC ..…….. Member	6.	Shri Santhosh Kumar* Superintending Engineer,NRPC …….. Member
7.	Shri S M Aimol Superintending Engineer, NERPC …….. Member	8.	Shri Satyendra Kumar Dotan Director, NPC,CEA …….. Member
9.	Shri Vivek Pandey General Manager, NLDC …….. Member	10.	**Shri K P Madhu** Superintending Engineer, SRPC ……. **Member Convener**

* NRPC replaced Shri Anzum Parwej.

The Task Force had its Meeting on 11.09.2023 through Video Conferencing (VC) and deliberated various aspects in the implementation of AUFLS & df/dt scheme. During the deliberations, it was observed that the frequency setting adopted by all the Regions for the four stages of AUFLS are uniform and same as mandated in CERC (IEGC) Regulations, 2023. It emerged that the load relief to obtained shall be reviewed yearly based on the actual peak met during the previous Financial Year and implemented in the next Financial Year. Mapping of identified feeders at SLDC/RLDC needed to be ensured by the utilities and monitoring of the feeders at real time by control rooms.

2.0 PROVISIONS IN CERC REGULATIONS

Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 effective from 01st October 2023 provides the following in respect of AUFLS and df/dt:

Regulation No.29: ***SYSTEM SECURITY***

……..

(12) All distribution licensees, STUs and bulk consumers shall provide automatic under frequency relays (UFR) and df/dt relays for load shedding in their respective systems to arrest frequency decline that could result in grid failure as per the plan given by the RPCs from time to time. The default UFR settings shall be as specified in Table-2 below:

Sr. No.	*Stage of UFR Operation*	*Frequency (Hz)*
1	*Stage-1*	*49.4*
2	*Stage-2*	*49.2*
3	*Stage-3*	*49.0*
4	*Stage-4*	*48.8*
Note 1: All states (or STUs) shall plan UFR settings and df/dt load shedding schemes depending on their local load generation balance in coordination with and approval of the concerned RPC. *Note 2: Pumped storage hydro plants operating in pumping mode or ESS operating in charging mode shall be automatically disconnected before the first stage of UFR.*		

(13) The following shall be factored in while designing and implementing the UFR and df/dt relay schemes:

(a) The under-frequency and df/dt load shedding relays are always functional.

(b) Demand disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

(c) There shall be a uniform spatial spread of feeders selected for UFR and df/dt disconnection.

(d) SLDC shall ensure that telemetered data of feeders (MW power flow in real time and circuit breaker status) on which UFR and df/dt relays are installed is available at its control centre. SLDC shall monitor the combined load in MW of these feeders at all times. SLDC shall share the above data with the respective RLDC in real time and submit a monthly exception report to the respective RPC. RLDC shall inform SLDCs as well as the concerned RPC on a quarterly basis, durations during the quarter when the combined load in MW of these feeders was below the level considered while designing the UFR scheme by the RPC. SLDC shall take corrective measures within a reasonable period and inform the respective RLDC and RPC, failing which suitable action may be initiated by the respective RPC.

(e) RPC shall undertake a monthly review of the UFR and df/dt scheme and also carry out random inspection of the under-frequency relays. RPC shall publish such a monthly review along with an exception report on its website.

(f) SLDC shall report the actual operation of UFR and df/dt schemes and load relief to the concerned RLDCs and RPCs and publish the monthly report on its website.

3.0 AUFLS SET POINTS AND QUANTUM OF RELIEF

The AUFLS setting with %age of quantum of load shedding concluded in the Report is given below (Table 10.1 in the Report):

Sr. No.	*Stage*	*Frequency*	*Demand Disconnection*	*Total Quantum of LS*
Stage-I Defense plan- Load Shedding				
1	I-A	49.2 Hz	3.50%	
2	I-B	49.0 Hz	3.50%	
3	I-C	48.8 Hz	4.00%	
4	I-D	48.7 Hz	4.50%	
5	I-E	48.6 Hz	4.50%	**20%**
Stage-II Desperate plan- Load Shedding				
6	II-F	48.4 Hz	6.00%	
7	II-G	48.2 Hz	6.00%	
8	II-H	48.0 Hz	6.00%	**18%**
Grand Total (Stage-I + II)				**36%**

In the 13th Meeting of NPC, it had been observed that the first stage will be set at 49.4 Hz and total 25% relief will be planned in four stages-49.4 Hz, 49.2 Hz, 49.0 Hz & 48.8 Hz. The AUFLS settings to be adopted for total relief of 25% of previous year peak demand met for implementation in the subsequent year.

The percentage relief from Stage-1 may be kept as 5 % since it is better to check the falling frequency and get sufficient quantum of relief at initial level itself and there may not arise the occasion for further reduction of frequency leading to more load shedding at other stages. In the Report of Expert Committee on IEGC also equal quantum of Load Relief was proposed for all stages. Keeping lower quantum of relief at higher level may lead to activation of lower stages since in most of the real time conditions the desired relief may not be achieved.

The Task Force recommended the following AUFLS Set Points and Percentage Quantum of Relief for implementation:

Table 1: AUFLS Set Points and Percentage Quantum of Relief

Sl No	Stage	UFR set points in Hz	Quantum of Relief
1	**Stage-1**	**49.4**	**5%**
2	**Stage-2**	**49.2**	**6%**
3	**Stage-3**	**49.0**	**7%**
4	**Stage-4**	**48.8**	**7%**
		Total	**25%**

4.0 IDENTIFICATION OF AUFLS QUANTUM BY NPC AND RPCs

NPC Division to communicate the Region wise relief quantum (based on Regional Peak Demand Met during the previous year) by **30th of June** to RPCs.

If the peak demand is lower than the previous year peak demand, the same settings should be continued (settings remain unchanged).

4.1. Methodology for AUFLS Quantum (MW) Distribution among Regions:

Let All India Peak Demand in Previous Year in MW= **AP**

Sum of Regional Peak in MW = (RP_{NR}+ RP_{WR} + RP_{SR} + RP_{ER} +RP_{NER})**= RP**

Table 2: Methodology for AUFLS Quantum (MW) Distribution among Regions

Region	Regional Peak Demand (MW)	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total (MW)
	(1)	(2)	(3)	(4)	(5)	(6)
Northern Region	RP_{NR}	0.05* RP_{NR}*AP/RP	0.06* RP_{NR}*AP/RP	0.07* RP_{NR}*AP/RP	0.07* RP_{NR}*AP/RP	Sum Clmn. (2) to (5)
Western Region	RP_{WR}	0.05* RP_{WR}*AP/RP	0.06* RP_{WR}*AP/RP	0.07* RP_{WR}*AP/RP	0.07* RP_{WR}*AP/RP	Sum Clmn. (2) to (5)
Southern Region	RP_{SR}	0.05* RP_{SR}*AP/RP	0.06* RP_{SR}*AP/RP	0.07* RP_{SR}*AP/RP	0.07* RP_{SR}*AP/RP	Sum Clmn. (2) to (5)
Eastern Region	RP_{ER}	0.05* RP_{ER}*AP/RP	0.06* RP_{ER}*AP/RP	0.07* RP_{ER}*AP/RP	0.07* RP_{ER}*AP/RP	Sum Clmn. (2) to (5)
North Eastern Region	RP_{NER}	0.05* RP_{NER}*AP/RP	0.06* RP_{NER}*AP/RP	0.07* RP_{NER}*AP/RP	0.07* RP_{NER}*AP/RP	Sum Clmn. (2) to (5)
All India	AP	Sum above	Sum above	Sum above	Sum above	25% OF AP

Sample calculation for AUFLS Quantum (MW) for 2023-24 is given below:

All India Peak Demand in 2022-23: 2,07,231 MW

Table 2A: Computation of AUFLS Quantum (MW) Distribution among Regions

Region	Regional Peak Demand (MW)	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total (MW)
	(1)	(2)	(3)	(4)	(5)	(6)
Northern Region	76,561	3270	3924	4577	4577	**16,348**

Western Region	71,677	3061	3673	4285	4285	**15,305**
Southern Region	64,337	2748	3297	3847	3847	**13,738**
Eastern Region	27,218	1162	1395	1627	1627	**5,812**
North Eastern Region	3,603	154	185	215	215	**769**
All India	**2,07,231**	**10394**	**12473**	**14552**	**14552**	**51,972**

4.2. Three options were considered by the Task Force for distribution of relief among State/UT. The Task Force recommended that Distribution of relief among State/UT to be carried out based on Regional relief and demand contribution in the average of Peak demand met ratio and demand met (consumption) ratio of State/UT in the previous FY.

4.3. After the receipt of the allocated load shedding quantum of the Region from NPC, AUFLS relief quantum should be distributed among the State/UT in the region by the RPCs by **July /August** in consultation with the stakeholders (in OCC Meeting).

Sample calculation for Northern Region is given below:

Table 3: State/UT contribution ratio for AUFLS Relief Quantum

State/UT	Actual Consumption in MU for 2022-23	Consumption Ratio	Actual Demand Met in 2022-23	Demand Met Ratio	State/ UT Contribution
	(1)	(2)=(1)/(A)	(3)	(4)=(3)/(B)	(5)=[(2)+(4)]/2
Chandigarh	1788	0.004	407	0.005	**0.004**
Delhi	35143	0.077	7695	0.089	**0.083**
Haryana	60945	0.133	12768	0.147	**0.140**
Himachal Pradesh	12542	0.027	2071	0.024	**0.026**
UT J&K & Ladhak	19322	0.042	2967	0.034	**0.038**
Punjab	69220	0.151	14311	0.165	**0.158**
Rajasthan	100057	0.219	17206	0.199	**0.209**
Uttar Pradesh	143050	0.313	26589	0.307	**0.310**
Uttarakhand	15386	0.034	2599	0.030	**0.032**
Total	457453 **(A)**	1.000	**86613 (B)**	**1.000**	1.000

4.4. Each State/UT relief quantum would be computed by RPC by distributing the NPC communicated Regional relief quantum based on ratio at 4.2. This quantum would become the base for monthly analysis of visible relief and also the analysis during any event.

Sample calculation of Demand Distribution for Northern Region:

Table 4: State/UT Demand Distribution in MW

State/UT	State/ UT Contribution	Load Relief in MW
	(a)=Column (5) of Table 3	(b)=a* B in Column (3) of Table 3
Chandigarh	0.004	330
Delhi	0.083	6342
Haryana	0.140	10743
Himachal Pradesh	0.026	1965
UT J&K & Ladhak	0.038	2928
Punjab	0.158	12118
Rajasthan	0.209	15978
Uttar Pradesh	0.310	23722
Uttarakhand	0.032	2436
Total	1.000	76561 **(C)**

4.5. Each State/UT Stage-wise AUFLS quantum would be computed by RPC. This Stage-wise recommended AUFLS quantum shall become the base for monthly analysis of visible relief and also the analysis during any tripping.

Sample calculation for NR is as follows:

Table 5: State/UT Stage-wise AUFLS in MW

State/UT	State/ UT Contribution	Stage-1 49.4 Hz (5%)	Stage-2 49.2 Hz (6%)	Stage-3 49.0 Hz (7%)	Stage-4 48.8 Hz (7%)	Total
	(c)=Column (5) of Table 3	NR in Column (2) of Table 2A* (c)	NR in Column (3) of Table 2A* (c	NR in Column (4) of Table 2A* (c	NR in Column (5) of Table 2A* (c	
Chandigarh	0.004	14	17	20	20	70

Delhi	0.083	271	325	379	379	1354
Haryana	0.140	459	551	642	642	2294
Himachal Pradesh	0.026	84	101	117	117	420
UT J&K & Ladhak	0.038	125	150	175	175	625
Punjab	0.158	517	621	724	724	2587
Rajasthan	0.209	682	819	955	955	3412
Uttar Pradesh	0.310	1013	1216	1418	1418	5065
Uttarakhand	0.032	104	125	146	146	520
Total	1.000	3270	3924	4577	4577	16348

5.0 QUANTUM IDENTIFICATION FOR AUFLS BY STATES/UT AND MONTHLY VETTING

5.1. States/UT shall identify the load relief for each stage considering the Quantum of relief and their demand contribution considering the intra-day, seasonality etc. 10% additional relief would be finalised considering the demand growth of the year, planned and forced outages, UFR and breaker issues etc. SLDC would communicate feeder-wise, Stage-wise details etc. to RPC/RLDC.

5.2. Each SLDC shall carry out month-wise Stage-wise analysis and furnish to OCC in the following manner:

AUFLS Stage -1:

Actual Relief for the month = Average actual load (for the month) of all the feeders identified in the stage**.** For this Feeders are to be mapped at SLDC. The mapping would be extended to RLDC. If feeders are not mapped then values are to be collected from field. (Any outage would not be excluded).

Desired Relief for the month = (Recommended AUFLS quantum in the stage x Average demand for the month of State/UT)/Demand Contribution of the State/UT

Similar exercise for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

5.3. Self-checking scheme: If Actual Relief for the month is **less the Desired Relief** for the month, **SLDC** would carry out feeder –wise analysis and in consultation with Discoms/STU take **corrective action** (like identifying new feeder, additional feeder, modifying the declared relief of feeders, verifying the mapped figures etc.). The same

would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

5.4. A**s a general guideline Actual Relief for the month should be 10% more than the Desired Relief for the month considering the Relay/breaker issues and a resilient safety net.**

Table 6: AUFLS – Monthly Report - …….(Month)

State/UT:……..

	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	**STATE TOTAL**
Recommended (A)					
Implemented (B)					
SCADA monitored (C)					
Actual flow on SCADA monitored (D)					
Balance implemented (E) = (B) – (C)					
Actual flow on balance implemented (F)					
Desired relief (G)= (B)x Average State Demand for the month/(State Demand Contribution)					
Actual relief (H) = (D+F)					
Deficit (-)/Surplus (+) H-G					

6.0 ANALYSIS OF AUFLS EVENTS

6.1. The following methodology to be adopted for AUFLS analysis during event:

AUFLS Stage-1:

Actual Relief during incident = (Actual relief (during incident) of all the feeders identified in the stage)

Desired Relief during incident= (Recommended AUFLS quantum in the stage x demand of State/UT at time of incident)/Demand Contribution of the State.

Similar exercise for each Stage.

The data would be vetted by RLDC and discussed in OCC Meetings of RPC.

6.2. If Actual Relief during incident is less the Desired Relief during incident, SLDC would carry out feeder –wise analysis and in consultation with Discoms/STU take corrective action. Necessary directions will be issued to Discoms/STU by SLDC. The same would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

6.3. The relief realization to be analyzed based on the demand at the time of incident. The data needed to be vetted by RLDC and discussed in OCC Meetings of RPC. Reason for non-tripping of the relays during the incident needed to be mentioned. If Actual Relief during incident is less than the Desired Relief during incident, SLDC would carry out feeder –wise analysis and in consultation with Discoms/STU take corrective action. Necessary directions shall be issued to Discoms/STU by SLDC. The same would be implemented by SLDC/STU/Discoms before next OCC by submitting a compliance Report.

6.4. SLDCs shall issue directions to state utilities to carry out self-testing of the relays and where ever tripping is not observed (due to discrepancy in measured frequency), such relays are recommended to retune to set the points accordingly at 49.41 Hz. or 49.42 Hz. etc. The implementation of the same is being monitored in OCC.

Table 7: AUFLS – Tripping Report at ….. hrs on ……..

State/UT:……..

Description	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	STATE TOTAL
Recommended (A)					
Implemented (B)					
SCADA monitored (C)					
Actual flow on SCADA monitored (D)					
Balance implemented (E) = (B) – (C)					
Actual flow on balance implemented (F)					
Desired relief (G)= (B)x State Demand at the time of tripping/(State Demand Contribution)					
Actual relief (H) = (D+F)					
Deficit (-)/Surplus (+) H-G					

Further feeder wise and Stage-wise details will also be furnished as per the Table given below:

Table 8: AUFLS – Feeder-wise Tripping Report at ….. hrs on ……..

AUTOMATIC UNDER FREQUENCY LOAD SHEDDING STAGE-1 (49.4)						
Sl No	Sub Station	Feeder Description	Average load per year (In MW)	Tripped (Y/N)	Reason if not tripped	Actual flow in MW
1						
2						
3						
4						
TOTAL MW RELIEF						

7.0 GUIDELINES FOR IDENTIFICATION OF AUFLS FEEDERS

The following to be considered for identification of feeders:

i. AUFLS relays under Stage-1 & Stage-2 should be implemented preferably on downstream network at 11/22/33 kV level.

ii. AUFLS relays under Stage-3 & Satge-4 should be implemented on upstream network at EHV (66/110/132 kV) level so that load relief obtained is fast and reliable as it is a desperate measure for areas that have disintegrated.

iii. As far as possible the feeders/transformers are feeding radial loads shall be identified.

iv. Telemetry availability would be considered as important factor so that the feeders/transformer loading can be extended to SLDC/RLDC for mapping

v. Feeders catering to critical loads are to be avoided. VIP areas, Airport, Metro, Railways, Defence, Govt Hospitals, Government Offices, continuous process industries etc. needs to be prioritized

vi. No mixed feeders with RE/Distributed generations should be identified. If identified the feeder should be never in injecting mode. Steps to segregate the feeder (load/RE/Distributed generation) would be taken.

vii. If Grid feeder is identified the other side breakers should be in normally open condition. If they are to be closed frequently then UFR with same set points to be provided at other ends.

viii. The feeders identified for AUFLS would be as far as possible not common for df/dt, scheduled power cuts, load shedding, SPS, ADMS etc. In case of difficulty to

identify dedicated feeders the same is to be approved in OCC/PCSC. Adequate care is to be taken if round robin scheme is adopted for ADMS, SPS etc.

ix. The Islanding loads/feeders which are to be retained would not be enabled for AUFLS. However loads in the Island can be identified for AUFLS but same has to be factored while designing the Island.

Chairperson, Task Force observed that the sampling rate is configured by the OEM and cannot be changed by S/S officials. There are relays with 3 cycle sampling rate and also with 6-10 cycle sampling rate. The only way to achieve the tripping at desired frequency is to set the relay set points based on the behaviour of each relay. 3-5 cycle sampling time is advisable since if response time is below 3 cycles, during some transients also unwanted tripping may happen.

NERPC mentioned that in their system most of the 33 kV feeders are radially loaded and 132 kV feeders are grid connected and difficult to get desired relief in tripping of 132 kV grid connected feeder since if relay trip at one S/s the load may be fed from other end. Requested that NER may be given some relaxation such that the feeders at 33 kV also may be identified at lower stages.

It was clarified that these are General Guidelines in which some changes may be carried according to specific constraints. However, if Grid feeder is identified the other side breakers should be in normally open condition. If they are to be closed frequently then UFR with same set points to be provided at other end also.

8.0 MAPPING OF AUFLS FEEDERS

SLDC in coordination with STU/Discoms map the feeders for loading, breaker status etc. and create display for monitoring. The SLDC would extend the mutually agreed display to RLDC. Display to be implemented at SLDC which would be extended to RLDC.

Table 9: AUFLS Monitoring in MW

Description	Stage-1 49.4 Hz	Stage-2 49.2 Hz	Stage-3 49.0 Hz	Stage-4 48.8 Hz	TOTAL (all the Stages)
Recommended (A)					
Implemented (B)					
Unmapped quantum (C)					
SCADA monitored (D)					
Actual flow (E)					
Desired relief (F)= (D)x State Demand/(State Demand Contribution)					
Deficit (-)/Surplus (+) E-F					

SLDC would further develop the SCADA Displays Discom-wise/Sub SLDC wise as applicable as given below:

Table 10: AUFLS Monitoring in MW STAGE-1 (49.4)

Description	DISCOM / SUB SLDC -1	DISCOM / SUB SLDC -2	DISCOM / SUB SLDC -3	.....	STATE TOTAL
Recommended (A)					
Implemented (B)					
Unmapped quantum (C)					
SCADA monitored (D)					
Actual flow (E)					
Desired relief (F)= (D)x Discom Demand/(Discom Demand Contribution)					
Deficit (-)/Surplus (+) E-F					

Similar display for all stages.

SLDC would further develop the SCADA Displays feeder wise as given below:

Table 11: Feeder wise AUFLS monitoring in MW

AUTOMATIC UNDER FREQUENCY LOAD SHEDDING STAGE-1 (49.4)											
Sl.No	Discom/ SUB-LDC	Voltage level	Substation / Feeder Name (A-B)	Average load (MW)	Relay function enabled (Y/N)	SCADA Visibility (Y/N)	Radial feeder (Y/N)	RE injection feeder (Y/N)	CB Status Both ends	Actual flow in MW(A)	Actual flow in MW (B)
1											
2											
3											
TOTAL (MW)											

Similar display for all Stages.

SLDCs would download the data and store it for two years. SLDCs would collect feeder loading details of unmapped feeders.

Concrete action plan with definitive timelines would be made by SLDC/STU/Discom to achieve 100% mapping. This would be followed up in OCC.

Mapping verification between SLDC and Discom/STU would carried out at least once in three (3) months. Mapping verification between RLDC and SLDC would be carried at least once in six (6) months.

Any change in feeder would be informed to RPC & RLDC and mapping would be ensured.

SE(P) WRPC informed that 85-90% of AUFLS relays installed in WR are at the voltage level of 11kV/22kV/33kV and also these relays are installed in many switching distribution level remotely located substations of the States. The implementation of the AUFLS display on SCADA system was deliberate in various forum of WRPC. However the States have expressed inability to implement the display in SCADA due to communication issues in remotely located S/Ss. However, efforts are still being made to improve the visibility of these feeders in SCADA.

9.0 SETTINGS OF UFR/PUMP LOADS/ESS

All Energy Storage Systems would change from charging mode to discharging mode at 49.45 Hz. If it is not possible then they would be tripped at 49.45 Hz. If ESS is injecting active power at 49.45 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.45 Hz.

Load disconnection shall not be set with any time delay in addition to the operating time of the relays and circuit breakers.

During Testing if delay is observed (> 75 msec) in Relay Pick up and sending the command to breaker then set points to be enhanced to 49.41 Hz, 49.21 Hz, 49.01 Hz and 48.81 Hz as applicable or any higher value to ensure tripping 49.40 Hz, 49.20 Hz, 49.00 Hz and 48.80 Hz

All the relays to be procured in future to have a sampling period ranging from three cycles to five Cycles. No additional time delay to be incorporated in the relay other than the inherent measuring time.

With reference to the discussions regarding the trip setting of storage device operating in charging/pumping mode it is requested to consider the following inputs from NLDC.

(A) CEA Technical Standards of connectivity to the grid Regulations (2019 amendment), Connectivity standards mandate the wind generating stations, generating stations using inverters, wind - solar photo voltaic hybrid systems and energy storage systems as under

Quote

" The generating unit shall be capable of operating in the frequency range 47.5 to 52 Hz and be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz"

Unquote

In future several storage systems (BESS, PSP) are expected to be commissioned. Few hybrid RE stations with BESS/PSP are also envisaged. Considering the possible derating of inverter based resources at frequency below 49.5 Hz, it is desirable to take measures to arrest the frequency decline below 49.5 Hz. It is therefore desirable that the storage device operating in charging/pumping mode are tripped in a graded manner before the frequency dips below 49.5 Hz.

(B) Grid India vide its letter dated 2nd Jul 2018 had suggested to raise the UFR stage-I setting to 49.6 Hz and consider 49.8 Hz for initiating the tripping of pump storage/BESS operating in charging pumping mode. Thus keeping a margin of 0.2 Hz between tripping of storage and AUFLS stage-I.

(C) The Expert Group on IEGC considered 49.50 Hz as the nadir frequency for working out the AUFLS setting. Relevant extracts are quote below:

Under Frequency Relay (UFR) Settings: (a) Considering the All India electricity grid operating as a synchronous grid and being one of the largest grids in the world, the defence plans now need to be looked at from a national level rather than regional level. The same needs to be mandated in the IEGC itself rather than any discussion at the RPC level. As indicated in the section on primary response, for the reference contingency of 4500 MW generating station outage, the frequency would dip to 49.50 Hz and quickly recover to 49.70 Hz. So, the chances of the frequency falling below 49.50 Hz in an integrated large power system like India would be rare. The frequency would fall below this value only in case of part separation of systems leading to a generation deficit in one system

(D) The IEGC-2023 has mandated UFR stage-I as 49.4 Hz

It is suggested that the tripping of storage system (in charging pumping mode) may be initiated in a graded manner from 49.6 Hz onwards and to be complete by 49.5 Hz.

In view of NLDC observations the following is recommended:

All Energy Storage Systems would change from charging mode to discharging mode at 49.50 Hz. If it is not possible then they would be tripped at 49.50 Hz. If ESS is injecting active power at 49.50 Hz not to be tripped.

Pumping load will be tripped before AUFLS first stage. Irrigation Pumps would be tripped at 49.50 Hz.

10.0 TESTING/INSPECTION OF UFR

Testing Procedure SLDC for UFR by Discoms/STU:

i. Wherever relays are installed at 110 / 132 kV level and above S/s: The periodicity of testing shall be Twice in a year.

ii. Wherever relays are installed at 66 kV level and below S/s: The periodicity of testing shall be once in a year.

iii. SLDCs shall in consultation with the Utilities responsible for testing should chalk out a plan of relays testing schedule before 1st of December and submit the same to RPC/RLDC.

iv. Test shall be carried out by the State testing teams and report of the test carried out should be submitted to SLDC. SLDC shall submit a compiled progressive report of the same to RPC/RLDC every month. The format for testing of AUFLS relays is at **Annexure-II.**

v. SLDC should monitor the periodicity of test and ensure that the relays are tested as per the schedule. Deviation if any shall be intimated to RPC/RLDC with proper justification.

vi. If possible, relays through test up to breakers may be carried out. If this is not possible the continuity of trip circuit of UFR up to the trip coil of breaker should be checked during the testing.

vii. SLDC's shall ensure that at least 10% of the total relay testing be witnessed/carried out by other Circle Testing Engineer/RLDC/RPC.

Inspection of UFR Relays by RPC:

RPC would carry UFR inspection randomly on sample basis by the **RPC Secretariat or through RLDC.** The Sample Inspection Report is at **Annexure-III.**

Based on Inspection Report necessary directions would be issued by RPC which would be complied within six months.

11.0 df/dt SCHEME

In the Report it is mentioned that enabling frequency should be set at 49.9 Hz. i.e., the relay should always be enabled when the system frequency is below 49.9Hz. The following given in the Report:

Stage	'X' in MW = Largest generating station or peak import in the region whichever is higher			
	Enabling Frequency 'Hz'	df/dt setting 'Hz/sec'		Quantum of Load Shedding 'MW'
		RE rich	RE low	
Stage-1	49.9	0.10	0.05	30% of 'X'
Stage-2	49.9	0.15	0.10	40% of 'X'
Stage-3	49.9	0.20	0.25	50% of 'X'
The quantum is for a region as whole, and the RPCs shall decide how to further distribute the quantum amongst the States.				

The df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme be discussed at regional levels in the RPCs.

The RPCs in consultation with the stakeholders can decide on the quantum of Load shedding required to be wired up in Stage-1, 2 & 3 of the df/dt schemes.

In the Report, df/dt suggested for largest generating station/peak import in the region. Further the set point is suggested at 49.9 Hz which is lower most operating range of IEGC. The set point should be away from the operating range. **df/dt may be for credible contingency of each Region.**

The Task Force observed that df/dt load shedding is specific to regions and therefore, the quantum of load shedding required to be wired up under the df/dt scheme may be discussed at regional levels in the RPCs. The RPCs in consultation with the stakeholders can decide on the quantum of Load shedding required to be wired up in Stage-1, 2 & 3 of the df/dt schemes.

General Observations:

CE (GM), CEA opined that a comprehensive study needed to be carried out at National Leve l on the implementation of df/dt relays in the States. A common umbrella is needed at National Level (integrated grid) even though the issue is region specific.

NLDC suggested that it is very important that there should be a common methodology for df/dt relays at National Level. The settings/quantum may be Region Specific based on the LGB of each region taking care of most credible contingencies. He observed that in Rajasthan, there is concentrated RE and in case of trippings, the rate of fall of frequency may be high where as in WR where distributed RE generation are there the rate of fall in frequency may be less for the same quantum of trippings of generation. However it is pertinent to note that the same relay operation methodology (time duration for the operation of relay) should be identified for tripping of relays also.

MS SRPC informed that df/dt relays are implemented only in three regions (WR, NR and SR). Further studies needed to be carried out on the settings/quantum of df/dt relays and its implementation. In SR there are seven Islanding schemes in place, many SPSs, and other protection schemes and it is very difficult to get feeders for further protection schemes.

WRPC observed that the set points may be close to operating frequency.

MS SRPC informed that on other hand there was some recommendation that all protection settings should be away from operating range and accordingly df/dt settings in SR was kept at 49.5 Hz **& (0.2Hz/sec fall of frequency) and 49.3 Hz& & (0.3Hz/sec fall of frequency).** He opined that at present the concentration may be on implementation of AUFR relays. Subsequently df/dt relay issues may be discussed at NPC level and

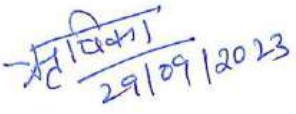
accordingly decision may be taken. At present df/dt relay implementation may be discussed and finalised at Regional Level.

GM, NLDC informed that it is appreciable to note that the recommendations are in line with New IEGC. He added that the df/dt relays are also equally important and need to take up seriously. It is not compulsory that all the regions need to have same set points since the contingencies will be different w.r.t different states. Monitoring certainly will help in getting confidence on safety net. Unfortunately most of the feeders are at lower voltage levels. For SLDCs it will be a challenge to acquire 100 % visibility but effort to be put to achieve the same. In Islanding visibility takes a significant role.

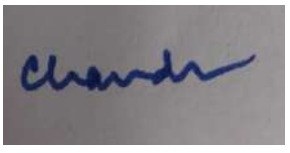
Acknowledgement

The Task Force is thankful to SRPC Secretariat for their assistance and support in preparation of the Report.

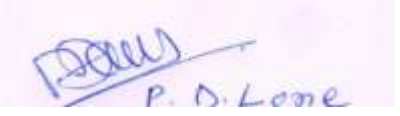
1. Superintending Engineer (O)
   SRPC
   - Convener of the Task Force



2. Chief Engineer (NPC)
   CEA

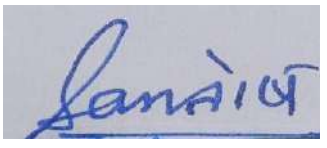


3. Chief Engineer (GM)
   CEA



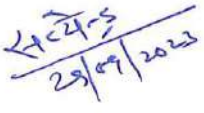
4. Superintending Engineer
   WRPC

5. Superintending Engineer
   ERPC

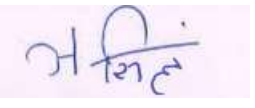


6. Superintending Engineer
   NRPC

7. Superintending Engineer
   NERPC



8. Director (NPC)
   CEA



9. General Manager
   NLDC

10. Member Secretary
    SRPC
    - Chairperson Task Force

ANNEXURE-I

Copy of letters dated 18th & 25th August 2023 from NPC

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
राष्ट्रीय विद्युत समिति प्रभाग/NPC Division
1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-66

No. CEA-GO-15-14/1/2021-NPC Division/250 Date: 18 .08.2023

To,

(As per distribution list)

विषय:- आटोमेटिक अंडर फ्रीक्वेंसी लोड शेडिंग (एयूएफएलएस) और डीएफ/डीटी योजना पर टास्क फोर्स के गठन के संबंध में।

Subject: - Constitution of task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme-reg.

It was decided in the 13th NPC meeting held on 05.07.2023 at Kolkata that a task force under chairmanship of MS, SRPC with Members from GRID-INDIA, RPCs/NPC may be formed.

Accordingly, the Constitution of the task force is as follows:-

1	Member Secretary, SRPC	Chairperson
2	Chief Engineer NPC,CEA	Member
3	Chief Engineer GM,CEA	Member
4	Representative from WRPC	Member
5	Representative from NRPC	Member
6	Representative from, ERPC	Member
7	Representative from NERPC	Member
8	Representative from NPC, CEA	Member
9	Representative from GRID-INDIA	Member
10	K.P Madhu, SE, SRPC	Member Convener

Taskforce may opt other members from any organization, if required.

2. Terms of Reference of the Taskforce is as follows:-
   i. Review of the recommendations of the report as per directions by the 13th NPC meeting within 2 months.
   ii. Prioritization of the loads under AUFLS and df/dt scheme.
   iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.
   iv. Any other suggestions/recommendations on related matters.

3. In this regard, it is requested that RPCs and GRID-INDIA may send their nominations (of the Rank not below SE from RPCs and GM from GRID-INDIA) to cenpccea@gmail.com by 22.08.2023.

This letter is issued with the approval of the competent authority.

भवदीय/Yours faithfully

18/8/2023

(ऋषिका शरण/Rishika Sharan)
मुख्य अभियन्ता एवं सदस्य सचिव,रा.वि.स /
Chief Engineer & Member Secretary, NPC

Distribution list:

1. CMD, GRID-INDIA, B-9 (1st Floor), Qutab Institutional Area, Katwaria Sarai, New Delhi 110016.
2. Member secretary, SRPC
3. Member secretary, ERPC
4. Member secretary, WRPC
5. Member secretary, NRPC
6. Member secretary, NERPC
7. Chief Engineer GM,CEA

Copy for kind information to:

1. SA to Chairprson,CEA
2. SA to Member GO&D, CEA

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सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
राष्ट्रीय विद्युत समिति प्रभाग/NPC Division
1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-66

No. CEA-GO-15-14/1/2021-NPC Division/289-295 Date: 25.08.2023

To,

(As per distribution list)

विषयः- आटोमेटिक अंडर फ्रीक्वेंसी लोड शेडिंग (एयूएफएलएस) और डीएफ/डीटी योजना पर टास्क फोर्स के गठन के संबंध में।

Subject: - Constitution of task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme-reg.

It was decided in the 13th NPC meeting held on 05.07.2023 at Kolkata that a task force under chairmanship of MS, SRPC with Members from GRID-INDIA, RPCs/NPC may be formed.

In this regards, NPC division vide letter No- CEA-GO-15-14/1/2021-NPC Division/250 dated 18.08.2023 requested RPCs and GRID-INDIA to send nomination for task force on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

Accordingly, based on the nomination received from RPCs and GRID-INDIA the Constitution of the task force is as follows:-

1	Member Secretary, SRPC	Shri Asit Singh	**Chairperson**
2	Chief Engineer NPC,CEA	Smt. Rishika Sharan	Member
3	Chief Engineer GM,CEA	Shri Chandra Prakash	Member
4	Superintending Engineer,WRPC	Shri P.D.Lone	Member
5	Superintending Engineer,ERPC	Shri Shyam Kejriwal	Member
6	Superintending Engineer, NRPC	Shri Anzum Parwej	Member
7	Superintending Engineer NERPC	Shri S M Aimol	Member
8	Director,NPC,CEA	Shri Satyendra Kumar Dotan	Member
9	General Manager, NLDC	Shri Vivek Panday	Member
10	Superintending Engineer, SRPC	Shri K.P Madhu	**Member Convener**

2. Terms of Reference of the Taskforce is as follows:-

i. Review of the recommendations of the report as per directions by the 13th NPC meeting within 2 months.

ii. Prioritization of the loads under AUFLS and df/dt scheme.

iii. To oversee the implementation of the report on Automatic Under Frequency Load Shedding (AUFLS) and df/dt scheme.

iv. Any other suggestions/recommendations on related matters.

Task force can co-opt any member, if required.

भवदीय/Yours faithfully

ऋषिका 21(2)
25/8/23

(ऋषिका शरण/Rishika Sharan)
मुख्य अभियन्ता एवं सदस्य सचिव,रा.वि.स /
Chief Engineer & Member Secretary, NPC

Distribution list:

1. Shri Asit Singh, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: mssrpc-ka@nic.in]
2. Shri Chandra Prakash, Chief Engineer GM, CEA, Sewa Bhawan, RK Puram. New Delhi. [Email: cp_cea@nic.in]
3. Shri P.D.Lone, Superintending Engineer,WRPC, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-400093.[Email: pramod.lone@gmail.com]
4. Shyam Kejriwal, Superintending Engineer,ERPC, 14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033.[Email: shyam.kejriwal@gov.in]
5. Shri Anzum Parwej, Superintending Engineer, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: anjum.parwej@nic.in]
6. Shri S M Aimol, Superintending Engineer NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006.[Email: smaimol@gmail.com]
7. Shri Satyendra Kumar Dotan, Director, NPC, CEA,1st Floor, Wing-5, West Block-II, R.K. Puram, New Delhi-110066.[Email: skdotancea@nic.in]
8. Shri Vivek Panday, General Manager, NLDC, , B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016.[Email: vivek.pandey@grid-india.in]
9. Shri K.P Madhu, Superintending Engineer, SRPC, No.29, Race Course Cross Road, Bengaluru-560009.[Email: kp.madhu@gov.in]

Copy for kind information to:

1. SA to Chairperson, CEA, Sewa Bhawan, RK Puram. New Delhi.
2. SA to Member GO&D, CEA, Sewa Bhawan, RK Puram. New Delhi.
3. Shri S. R. Narasimhan, Chairman & Managing Director, GRID-INDIA , B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016. [Email: cmd@posoco.in]
4. Shri N.S. Mondal, Member Secretary, ERPC,14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033. [Email: mserpc-power@nic.in]
5. Shri K B Jagtap, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: ms-nerpc@gov.in]
6. Shri V.K.Singh, Member Secretary, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: ms-nrpc@nic.in]
7. Shri Deepak Kumar., Member Secretary, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-400093.[email: ms-wrpc@nic.in]

******

ANNEXURE-II

Format for testing of AUFLS Relays

Annexure - II

REGION:

Inspection of AUFLS Relays at Site: **Date & Time:**

Details of Relay: **System frequency:**

Make of Relay	Serial no.	Stage	Date of Inspection

State/Name of Power Utilities:

Name of Sub-station:

Sr. No.	Name of feeder	Normal load relief envisaged in MW	UFR setting 49.2/49.0/ 48.8/48.7/ 48.6/48.4/ 48.2/48.0 Hz	Actual load at the time of inspection	Whether the feeder included in any other load shedding (such as SPS, Islanding, manual /ADMS etc)	Frequency Testing equipment used		Relay pick up frequency, Hz	Pick up time, sec	Relay drop off frequency, Hz	Relay drop off time, sec	Relay through trip test carried out Breaker Tripped or not	If Realy trip test is not carried out then continuity of Trip circuit upto Breaker trip coil checked
						Make	Sr. No.						

Name, Designation & Signature of the Site Engineer present at that time of inspection

Name & designation & sign of 3rd party inspecting officer

Note: 1. The functional testing has to be carried out by readjusting the relay setting to the present grid frequency.

2. Details of UFR operational & load relief obtained may be furnished in separate annexures.

ANNEXURE-III

Sample RPC Inspection Report Format

Annexure-III

UFR and df/dt Relay Inspection Report

Name of Substation:

Owned by (Licensee):

Date of Inspection/Testing by RPC:

Sl. No.	Name of the feeder/PTR	Setting Details of UFR & df/dt Relay	Expected Load Relief (declared) MW)	Maximum load (MW) *	Average load (MW)*	Status of SCADA Mapping	Type of Feeder (Radial/Ring)	Observations (Including make of Relay)	Action to be taken

*** Load during previous six months**

Annexure-A.V

सत्यमेव जयते

भारत सरकार/Government of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
एन.पी.सी. प्रभाग/National Power Committee Division
Ist Floor, Wing-5 ,West Block-II, RK Puram, New Delhi-66

No. CEA-GO-15-14/2/2021-NPC Division 120 - 128 Date: 12.03.2024

To
(As per distribution list)

विषय: एयूएफएलएस और डीएफ/डीटी पर टास्क फोर्स की रिपोर्ट पर निदेशक, एसएलडीसी (ओडिशा) के विचारों और ग्रिड-इंडिया के सुझावों पर चर्चा करने के लिए 06.03.2024 को आयोजित बैठक का कार्यवृत्त - के संबंध में।

Subject: Minutes of the Meeting held on 06.03.2024 to discuss the views of Director, SLDC (Odisha) and suggestions of GRID-India on Report of Task Force on AUFLS and df/dt -reg.

Sir/Madam,

The Minutes of the Meeting held on 06.03.2024 through Video Conference (V.C.) to discuss the views of Director, SLDC (Odisha) and suggestions of GRID-India on Report of Task Force on AUFLS and df/dt is enclosed herewith for your kind information and necessary action, please.

भवदीय/Yours faithfully

12/03/2024

Encl: As above

(ऋषिका शरण/Rishika Sharan)
मुख्य अभियन्ता एवं सदस्य सचिव,रा.वि.स /
Chief Engineer & Member Secretary, NPC

Distribution List: (Through mail)

1. Shri N.S. Mondal, Member Secretary, ERPC,14,Golf Club Road, ERPC Building, Tollygunje,Kolkata-700033. [Email: mserpc-power@nic.in]
2. Shri V.K.Singh, Member Secretary, NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110066.[Email: ms-nrpc@nic.in]
3. Shri Asit Singh, Member Secretary, SRPC, No.29, Race Course Cross Road, Bengaluru-560009. [Email: mssrpc-ka@nic.in]
4. Shri Deepak Kumar, Member Secretary, WRPC, Plot No- F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East), Mumbai-40093.[email: ms-wrpc@nic.in]
5. Shri K B Jagtap, Member Secretary, NERPC, NERPC Complex, Dong Parmaw, Lapalang, Shillong-793006. [Email: ms-nerpc@gov.in]
6. Shri S. R. Narasimhan, Chairman & Managing Director, GRID-INDIA , B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016. [Email: cmd@posoco.in]
7. Shri. B. B. Mehta, Director (SLDC), OPTCL Odisha [Email: celd@gebmail.com]

Copy for kind information to:-

1. SA to Chairperson, CEA, New Delhi
2. SA to Member(Go&D),CEA, New Delhi

******

Minutes of the Meeting held on 06.03.2024 to discuss the views of Director, SLDC (Odisha) and suggestions of GRID-India on Report of Task Force on AUFLS and df/dt.

List of Participants is at **Annexure-I**

2. The meeting to discuss the views of Director, SLDC (Odisha) and suggestions of GRID-INDIA on Report of Task Force on AUFLS and df/dt was held on 06.03.2024 through video conferencing. At the outset, **Chief Engineer, NPC** welcomed all the participants and briefed that the meeting had been convened to discuss the views of Director, SLDC (Odisha) and suggestions of GRID-INDIA on Report of Task Force on AUFLS and df/dt. She informed that in the recent 14th NPC meeting, Director, SLDC (Odisha) had opined for the starting frequency/first stage of AUFLS may be considered at 49.5 Hz instead of 49.4 Hz keeping in view the operation of automatic demand side management at 49.9 Hz. Further, GRID-India had vide email dated 19.02.2024 submitted following suggestions on implementation of AUFLS:

i. The Distribution connected RE (DRE) rich areas shall not be included as loads for shedding under AUFLS;

ii. AUFLS relay operation may also be standardized for measurement, delay and operation time.

iii. The mapping of feeders need to be carried out at all RLDCs also.

3. The deliberations held and the decisions taken in the meeting were as follows:-

3.1 **Agenda Item I: View of SLDC, Odisha - The starting frequency/first stage of AUFLS may be considered at 49.5 Hz instead of 49.4 Hz keeping in view the operation of automatic demand side management at 49.9 Hz.**

3.1.1 **Chief Engineer NPC,** informed that as per the report of Task Force under Member Secretary, SRPC, the starting frequency/first stage of AUFLS is set at 49.4 Hz. AUFLS serves as a defense mechanism that operates after all the measure of frequency restoration like primary response, AGC, ADMS etc. have already been utilised. She also opined that generally, UFLS frequency thresholds are set below the expected occurrence of large contingency and they are set to coordinate with generator's under-frequency protection to avoid the generator tripping when they are required the most. She mentioned that the setting of 49.5 Hz of AUFLS scheme as first stage may also lead to the over correction in the grid frequency.

3.1.2 **Director, SLDC (Odisha)** clarified his view for considering the starting frequency of AUFLS at 49.5 Hz. He mentioned that there are certain tools available at the disposal of grid operator like operating AGC, operating Ancillary Up signal and ADMS as per CERC Regulations for maintaining the frequency as per load demand. However, even if operating all such tools, frequency continues to fall due to more load demand than the generation, it is not advisable to wait till the frequency reaches 49.4 Hz. Therefore, he opined that there is need of some automatic defense mechanism at 49.5 Hz at the disposal of grid operator to maintain the frequency nearer to 49.9 Hz which will provide more stability to the grid.

3.1.3 Member Secretary, SRPC, stated that the starting frequency of AUFLS has been finalized to be set at 49.4 Hz after detailed deliberations with members of the Task Force both in the meetings of Task Force and NPC. He informed that in the 13th NPC meeting, CMD GRID-India had suggested for considering 49.4 Hz as the starting frequency of AUFLS because the operating frequency range of RE generators is 49.5 Hz to 50.2 Hz. Therefore, it was better for grid stability not to interfere in this operating zone of RE generators. He further stated that the starting point of AUFLS at 49.4 Hz has been worked out by the Task Force as per the reference contingency and translated into frequency drop which was coming around 49.5 Hz. Therefore, to keep the small gap between reference contingency and first stage of UFR, it was recommended by the Task Force to consider first stage of UFR at 49.4 Hz. Representatives of other RPCs also endorsed the view of Member Secretary, SRPC.

3.1.4 Representative of GRID-India informed that the starting point of AUFLS at 49.4 Hz has been calculated based on the power number of 9000-10000 MW/Hz which has been observed from the recent load-generation imbalance events at RE generation sites at Rajasthan. It is considered that a contingency involving tripping of largest generation plant (reference contingency) of around 4500 MW may cause frequency fall to 49.50 Hz from 50 Hz. Therefore, the trigger frequency/starting frequency has been set to 0.10 Hz below the Nadir frequency (i.e. 49.50 Hz) which comes out to be 49.40 Hz to cater to any operational uncertainty and subsequent stages can be triggered with a 0.20 Hz difference.

Chief Engineer NPC also opined that the state entity need to focus on implementation of primary response, AGC, ADMS etc. to ensure the stability of grid frequency.

Decision: After detailed deliberations, it was decided that the starting frequency/first stage of AUFLS may be considered and implemented at 49.4 Hz as per the Report of Task Force on AUFLS and df/dt. However, stages of AUFLS and quantum of relief may be reviewed based on the feedback received from the States/utilities after implementation of the AUFLS scheme, as and when required.

3.2 **Agenda Item II: GRID-India** had vide email dated 19.02.2024 submitted following suggestions on implementation of AUFLS:

i. The Distribution connected RE (DRE) rich areas shall not be included as loads for shedding under AUFLS.

ii. AUFLS relay operation may also be standardized such as measurement, delay and operation time.

iii. The mapping of feeders need to be carried out at all RLDCs also.

Decision: After detailed deliberations, the following has been decided:

1. **Regarding suggestion (i) of GRID-India, it was decided that the DRE rich areas for load shedding under AUFLS may be decided by monitoring of average load of feeders by SLDC.**
2. **Suggestions (ii) and (iii) of GRID-India have already been covered in the Report of Task Force on AUFLS and df/dt.**

****

Annexure- I

Meeting to discuss the views of Director SLDC (Odisha) and suggestions of GRID-India on report of Task Force of AUFLS and df/dt held on 06.03.2024 in Online Mode

Central Electricity Authority (CEA)

1. Smt. Rishika Sharan, Chief Engineer, NPC
2. Sh. Satyendra Kumar Dotan, Director, NPC
3. Sh. Himanshu Lal, Dy. Director, NPC
4. Sh. Ravi Shankar Singh, Dy. Director, NPC
5. Sh. Nikul Rohin, Asstt Director, NPC
6. Sh. Saurabh Raj, Asstt Director, NPC

Southern Regional Power Committee (SRPC)

1. Sh. Asit Singh, Member Secretary, SRPC

North Eastern Regional Power Committee (NERPC).

1. Sh. Kishor B. Jagtap, Member Secretary, NERPC

Northern Regional Power Committee (NRPC)

1. Sh. D K Meena, Superintending Engineer, NRPC
2. Sh. Om Kishor, Executive Engineer, NRPC

Western Regional Power Committee (WRPC)

1. Shri P. D. Lone, Superintending Engineer, WRPC
2. Sh. Deepak Sharma, Executive Engineer, WRPC
3. Sh. Hareesh, Asstt Executive Engineer, WRPC

Eastern Regional Power Committee (ERPC)

1. Sh. Pranay Jena, Executive Engineer, ERPC

National Load Despatch Centre, Grid-India (NLDC)

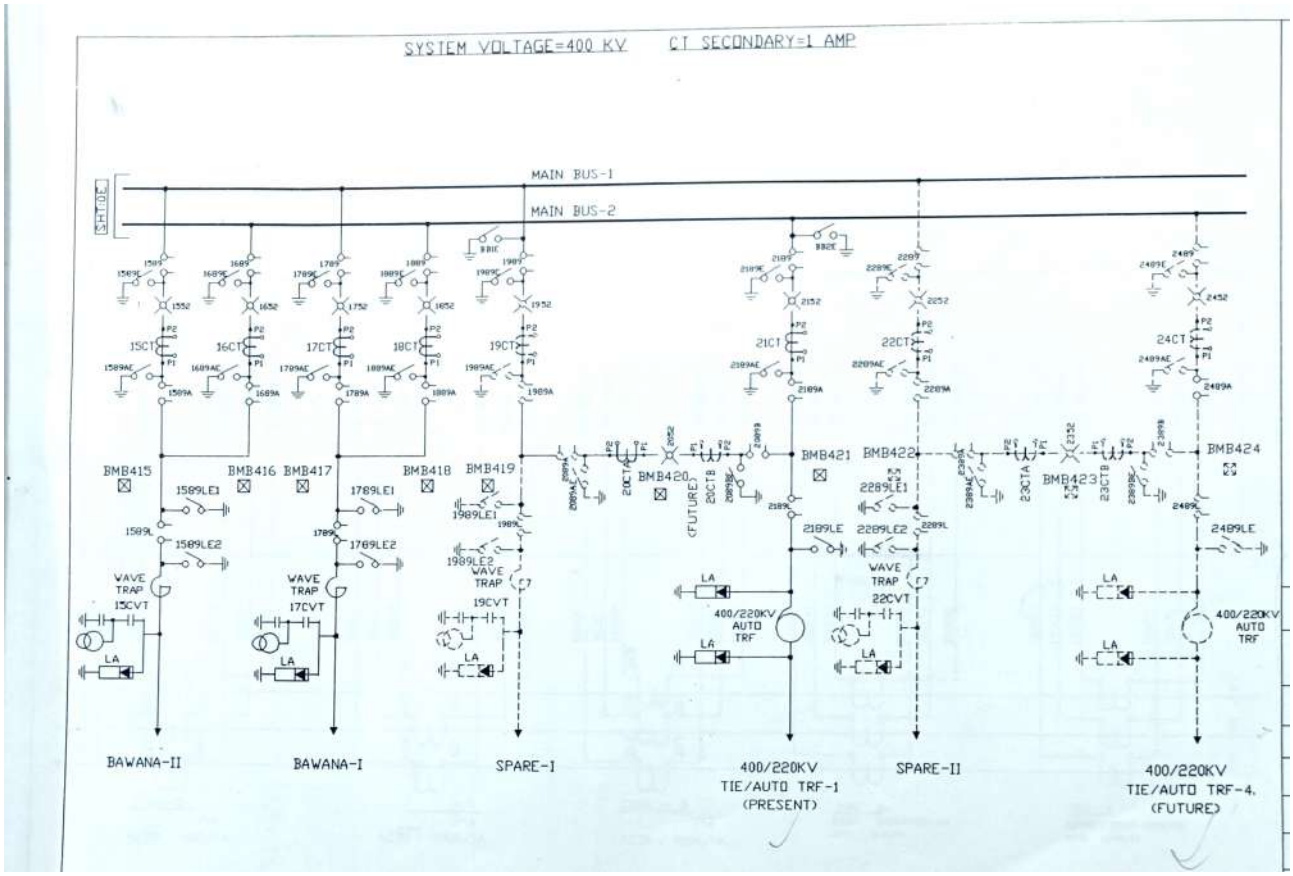
1. Sh. Surajit Banerjee, HOD (System Operations), NLDC (Grid-India)
2. Sh. Naveen, Chief General Manager, NLDC (Grid-India)
3. Sh. Rahul Shukla, Chief Manager, NLDC (Grid-India)

State Load Dispatch Centre (SLDC), ODISHA

1. Sh. B. B. Mehta, Director (SLDC), OPTCL Odisha

											Approved Planned Outage-1			Actual Planned Outage-1		
Capacity (MW) 30-11-2023	Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2025	Start Date	End Date	Reason	Start Date	End Date	Reason for any deviation
220	RAJASTHAN A.P.S.	3	N	CENTRAL SECTOR	Northern	Rajasthan	NPCIL	FALSE	NUCLEAR	220	1-Apr-24	24-May-24	EMCCR			
250	CHHABRA TPP	4	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	250	1-Apr-24	14-Apr-24	COH			
0	OBRA-C STPP	2	T	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	FALSE	COAL	660	1-Apr-24	30-Jun-24	After Unit Commissioning/COD			
0	JAWAHARPUR STPP	2	T	STATE SECTOR	Northern	Uttar Pradesh	UPRVUNL	FALSE	COAL	660	1-Apr-24	30-Apr-24	After Unit Commissioning/COD			
0	GHATAMPUR TPP	2	T	CENTRAL SECTOR	Northern	Uttar Pradesh	NUPPL	FALSE	COAL	660	1-Apr-24	31-May-24	After Unit Commissioning/COD			
130.19	DADRI CCPP	2	T	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	FALSE	NATURAL GAS	130.19	1-Apr-24	8-May-24	Major Overhauling			
154.51	DADRI CCPP	5	T	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	FALSE	NATURAL GAS	154.51	1-Apr-24	2-Apr-24	Major Overhauling			
0	KHURJA TPP	1	T	CENTRAL SECTOR	Northern	Uttar Pradesh	THDC	FALSE	COAL	660	1-Apr-24	30-Jun-24	After Unit Commissioning/COD			
250	SURATGARH TPS	3	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	250	15-Apr-24	5-May-24	AOH			
200	RAJASTHAN A.P.S.	2	N	CENTRAL SECTOR	Northern	Rajasthan	NPCIL	FALSE	NUCLEAR	200	1-May-24	31-May-24	Binennial Shutdown			
220	NARORA A.P.S.	1	N	CENTRAL SECTOR	Northern	Uttar Pradesh	NPCIL	FALSE	NUCLEAR	220	1-May-24	4-Jul-24	Binennial Shutdown			
250	SURATGARH TPS	4	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	250	11-May-24	31-May-24	AOH			
111.19	AURAIYA CCPP	2	T	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	FALSE	NATURAL GAS	111.19	31-May-24	31-May-24	Boiler License Renewal			
225	KASHIPUR CCPP	1	T	IPP SECTOR	Northern	Uttarakhand	SrEPL	FALSE	NATURAL GAS	225	1-Jun-24	3-Jun-24	Offline Waterwash			
111.19	AURAIYA CCPP	3	T	CENTRAL SECTOR	Northern	Uttar Pradesh	NTPC Ltd.	FALSE	NATURAL GAS	111.19	4-Jun-24	18-Jun-24	Filter Replacement			
250	SURATGARH TPS	1	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	250	5-Jun-24	25-Jun-24	AOH			
195	KOTA TPS	6	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	195	10-Jun-24	30-Jun-24	AOH			
660	CHHABRA TPP	5	T	STATE SECTOR	Northern	Rajasthan	RRVUNL	FALSE	COAL	660	27-Jun-24	31-Jul-24	AOH			


ICT-4
ICT-1
Dwarka
Jhatikra



RAJASTHAN RAJYA VIDYUT PRASARAN NIGAM LIMITED.
[Corporate Identity Number (CIN):U40109RJ2000SGC016485]
(Regd. Office: Vidyut Bhawan, Jan Path, Jyoti Nagar, Jaipur - 302 005)
OFFICE OF THE SUPERINTENDING ENGINEER (PROJECT & PLANNING)
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RVPN
An ISO 9001:2000 Certified Company

No. RVPN/SE(P&P)/XEN-3(P&P)/AE-2/ F. /D 144 Jaipur, Dt. 28/06/24

To
The General Manager (NRLDC)
Grid Controller of India Limited,
18-A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai
New Delhi-110016.

Sub:- Revised SPS for 2x315 MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur.
Ref:- MOM of 197th OCC meeting held on dated 22.07.2022.

On the above captioned subject, it is submitted that SPS for 2x315 MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura) was approved in the 197th OCC meeting held on dated 22.07.2022. Due to increased loading in the Bilara, Jodhpur and Bhawad region, operational arrangement of lines and transformers has been changed at 400 kV GSS Jodhpur. This has necessitated the revisison of the approved and implemented SPS. In this regard, please find attached the Revised SPS for 2x315 MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura) with request to please include in the next meeting of OCC for discussion and to accord necessary approval of the OCC forum. This SPS has been finalized after detailed deliberations with the officers of RVPN and Rajasthan SLDC in a meeting held on dated 07.06.2024.

Encl: As above

(S.C. Meena)
Chief Engineer (PP&D)
RVPNL, Jaipur.

Copy to the following for information and necessary action please-

1. The Member Secretary (NRPC), 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016
2. The Chief Engineer (LD/T&C/MPT&S), RVPN, Jaipur/Jodhpur.
3. The Chief Engineer, Power System Planning & Appraisal-I Division, CEA, Sewa Bhawan, RK Puram-I, New Delhi-110066
4. The Superintending Engineer (Operation), NRPC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016.
5. The System Operator-2, NRLDC, 18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016

Encl: As above

10/7/24
Chief Engineer (PP&D)
RVPNL, Jaipur

SE(O) 08/07/24 EE(O) 09/7/24

उ.क्षे.वि.स. जोधपुर
सं./No. 697
दिनांक/Date 8/7/2024

RajKaj Ref 8413407

Document certified by SURESH CHAND MEENA <mhi4371@gmail.com>.
Digitally Signed by SURESH CHAND MEENA
Designation: Chief Engineer
Date :27-06-2024 07:24:49

Proposed Revised SPS for 2x315 MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur

A. Transmission Network Associated with 400 kV GSS Jodhpur (Surpura)

- There are two 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura) each having capacity of 315 MVA.
- Percentage impedance of 315 MVA, 400/220 kV ILT-I is 12.50% (HV to IV) & 45% (HV to LV) & 30% (IV to LV) and Percentage impedance of 315 MVA, 400/220 kV ILT-II is 12.50% (HV to IV) & 60% (HV to LV) & 45% (IV to LV).
- 400 kV GSS Jodhpur is connected to 400 kV GSS Kankani, 400 kV GSS Bhadla, 400 kV GSS Kankroli, 400 kV GSS Akal, and Rajwest LTPS through 400 kV lines. There are following 220 kV lines emanating from 400 kV GSS Jodhpur:-
  - 220 kV D/C Jodhpur-Bhawad line
  - 220 kV D/C Jodhpur-Tinwari line
  - 220 kV S/C Jodhpur-Barli line
  - 220 kV S/C Jodhpur-Jhalamand line
  - 220 kV S/C Jodhpur-Bilara line
  - 100MVA, 220/132 kV Transformer at Surpura.
- 220 kV GSS Bhawad is connected to the 220 kV GSS Bhaithwasia through 220 kV D/C line and 220 kV GSS Bhaithwasia is further connected to the 220 kV GSS Aau through 220 kV D/C line.
- 132 kV GSS Mandore is fed from the 100MVA, 220/132 kV Transformer at Surpura and connected to 132 kV GSS Banar, and 132 kV GSS Mathania through 132 kV S/C lines. There are (20/25 MVA+10/12.5MVA) 132/33 kV transformers at 132 kV GSS Mandore.
- There is split bus arrangement at 220 kV GSS Banar for 132/33 kV Transformers on the 132 kV side and on 33 kV bus is coupled.
- Power Map of Transmission System at 400kV GSS Jodhpur is shown in Fig. 1.

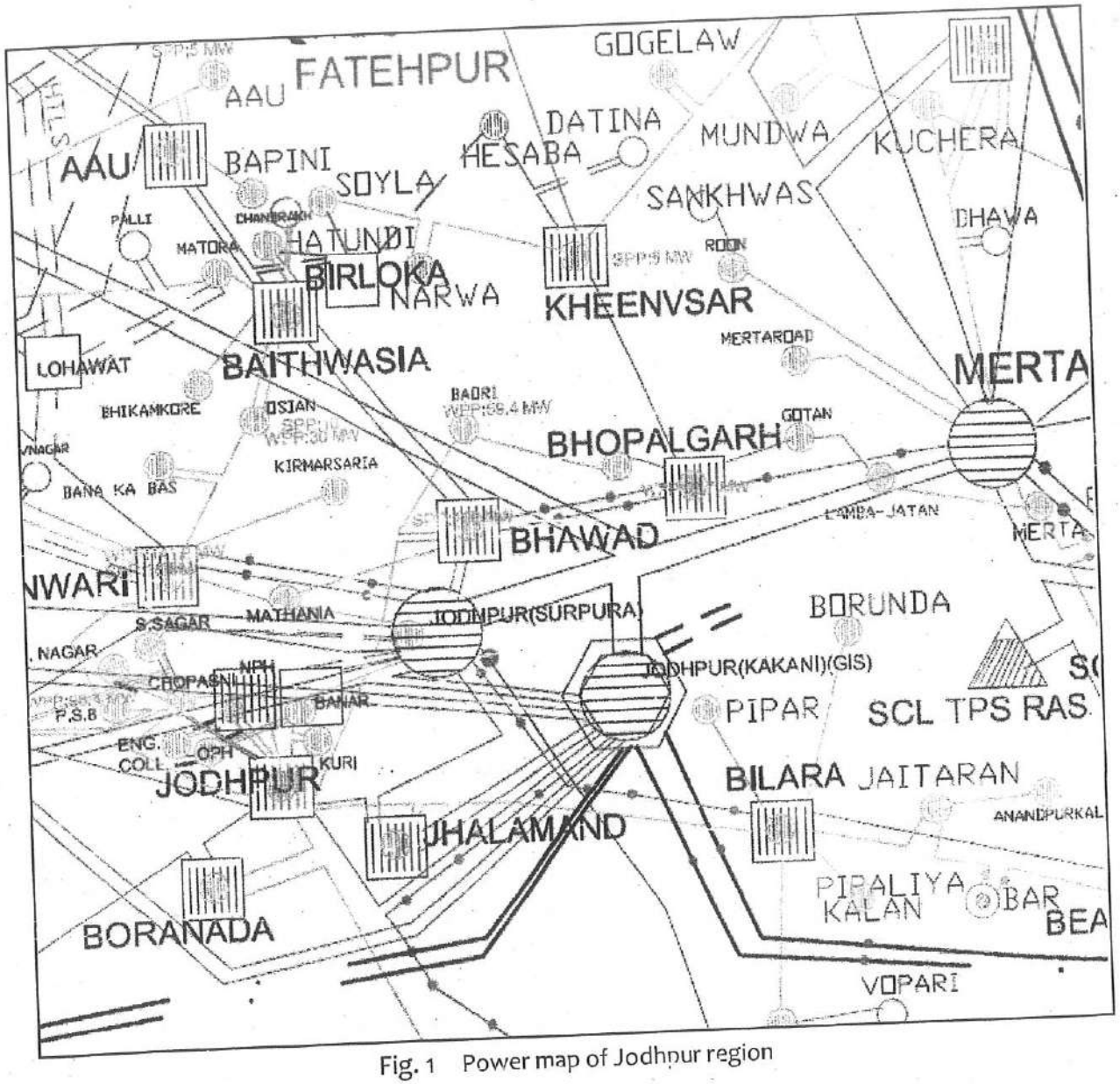

Fig. 1 Power map of Jodhpur region

B. Recorded Loads on the Transmission Elements

Recorded peak loads on the transmission lines and transformers are included in Table 1. Critical remarks are also included in the Table 1.

Table 1: Load Details of Peak and Average Loads on Transformers and Transmission Lines Associated with 400 kV GSS Jodhpur (Surpura) and Associated 220 kV GSS Considered for SPS

S. No.	Name of 220 kV line/ICTs	Peak Load	Average Load	Bus to Which connected	SPS Group/Remark
1	315 MVA, 400/220 kV ILT-I	262MVA	240 MVA	Bus-A	
2	315 MVA, 400/220 kV ILT-II	264 MVA	244 MVA	Bus-A	
3	100MVA, 220/132 kV Transformer	85 MVA	78 MVA	Bus-A	
4	220 kV Jodhpur-Bilara line	157 MVA	133 MVA	Bus-A	220 kV GSS Bilara is also connected with 220 kV GSS Beawer. There is DFCC feeder on 220 kV voltage level.

5	220 kV Jodhpur-Bhawad Ckt-I line	210 MVA	190 MVA	Bus-A	These circuits feed power to 220 kV GSS Bhawad, Bhoplagarh, Aau, Baithwasia, Badisid and Bhadla. Tripping of these lines will create load shedding in large area. Further, tripping of these lines will also increase loading on the 2x315 MVA, 400/220 kV ILTs at 400 kV GSS Merta during off RE hours. Further, during high RE scenario, RE power is evacuated to Jodhpur from the Bhadla, Badisid and Bap through 220 kV GSS at Aau , Baithwasia and Bhawad. Considering these lines in the SPS may impact the RE evacuation. There is 106 MW SPP at 220 kV GSS Bhawad connected on 132 kV voltage level and 59.40 MW WPP connected at 132 kV GSS Baori which is evacuated through 220 kV GSS Bhawad. In the event of tripping of (1x160+1x100) MVA, 220/132 kV Transformer at Bhawad, this RE will not be evacuated. Hence, ripping of transformers cannot be considered.
6	220 kV Jodhpur- Bhawad Ckt-II line	210 MVA	190 MVA	Bus-A	
7	220 kV Jodhpur-Tinwari Ckt-I line	174 MVA	95 MVA	Bus-B	These circuits feed power to 220 kV GSS Tinwari, Dechu, Phalodi, Bap, Amarsagar and Bhadla.
8	220 kV Jodhpur- Tinwari Ckt-II line	155 MVA	115 MVA	Bus-B	
9	220 kV Jodhpur- Barli line	176 MVA	110 MVA	Bus-B	
10	220 kV Jodhpur- Jhalamand line	185 MVA	123 MVA	Bus-B	
11	100 MVA, 220/132 kV Transformer-I at 220 kV GSS Bilara	95 MVA	75 MVA		
12	100 MVA, 220/132 kV Transformer-I at 220 kV GSS Bilara	95 MVA	75 MVA		
13	220 kV S/C Bilara-Beawer line	166 MVA	140 MVA		Generally, this line is kept

					opened from 220 kV GSS Beawer end.
14	220 kV S/C Bilara-DFCC line-I	10MVA	10MVA		Only one feeder takes load at a time
15	220 kV S/C Bilara-DFCC line-II	10 MVA	10 MVA		
16	220 kV Bhawad-Baithwasia line-I	240.21 MVA	134.19 MVA		
17	220 kV Bhawad-Baithwasia line-II	221.76 MVA	133.44 MVA		
18	220 kV Baithwasia-Aau line-I	226.33MVA	99.48 MVA		SPS Group-2
19	220 kV Baithwasia-Aau line-II	194.57MVA	98.48 MVA		SPS Group-2
20	160MVA, 220/132 kV Transformer-I at 220 kV GSS Baithwasia	132.37 MVA	95.80 MVA		SPS Group-1
21	160MVA, 220/132 kV Transformer-II at 220 kV GSS Baithwasia	128.60 MVA	95.80 MVA		SPS Group-1
22	132 kV S/C Mandore-Banar line	72.93 MVA	55.59 MVA		SPS Group-4
23	132 kV S/C Mandore-Mathania line	46.86 MVA	32.035 MVA		SPS Group-3
24	20/25 MVA, 132/33 kV Transformer at 132 kV GSS Mandore	20.24 MVA	19.83 MVA		SPS Group-3
25	10/12.5 MVA, 132/33 kV Transformer at 132 kV GSS Mandore	10.12 MVA	9.93 MVA		SPS Group-3
26	40/50 MVA, 132/33 kV Transformer-I at 132 kV GSS Banar	41.70 MVA	32.51 MVA		
27	40/50 MVA, 132/33 kV Transformer-II at 132 kV GSS Banar	43.69 MVA	32.67 MVA		
28	132 kV S/C Banar-Kuri Bhagtasani line	74.95 MVA	51.52 MVA		
29	132 kV S/C Banar-OPH line	64.21 MVA	42.25 MVA		

C. Approved SPS

The SPS for 2x315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura) was approved in the 197th OCC meeting held on dated 22.07.2022. Approved SPS is placed at Annexure-A.

D. Operational Arrangements at 400 kV GSS Jodhpur

There are two main Bus-A & B at 400 kV GSS Jodhpur. Following 220 kV feeders and transformers are connected to Main Bus-A:-

- 315 MVA, 400/220 kV ILT-I
- 315 MVA, 400/220 kV ILT-II
- 100MVA, 220/132 kV Transformer
- 220 kV Jodhpur-Bhawad line-I
- 220 kV Jodhpur-Bhawad line-II
- 220 kV Jodhpur-Bilara line

Following 220 kV feeders and transformers are connected to Main Bus-B:-

- 220 kV Jodhpur-Barli line
- 200 kV Jodhpur-Jhalamand line
- 200 kV Jodhpur-Tinwari line-I
- 200 kV Jodhpur- Tinwari line-II

Generally, power in taken from 400 kV GSS Kankani to Main Bus-B through 220 kV GSS Jhalamand and 220 kV GSS Barli which is transmitted to 220 kV GSS Tinwari.

E. Need of Revision in the Approved SPS

- After implementation of the SPS for 2x315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura), 315MVA, 400/220 kV ILT-II burnt on dated 29.05.2023. Subsequently the configuration of lines were changed to manage the power supply from the healthy ILT and ILTs at 400 kV GSS Kankani. Burnt ILT was replaced by the healthy 315MVA, 400/220 kV ILT on dated 11.12.2023.

- Due to increased loading in the Bilara, Jodhpur and Bhawad region, operational arrangement of lines and transformers as detailed in Section-D is used at 400 kV GSS Jodhpur (Surpura).

F. Revised SPS for 2x315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura)

- Communication channel is available on the 220 kV D/C Jodhpur-Bhawad transmission line and 220 kV D/C Bhawad-Baithwasia line which can be used to communicate the trip command from 400 kV GSS Jodhpur (Surpura) to trip the transformers installed on the 220 kV GSS Baithwasia. A looping arrangement at 220 kV GSS Bhawad will be made to transfer trip command from the 400 kV GSS Jodhpur (Surpura) to the 220 kV GSS Baithwasia.

- 220 kV D/C Jodhpur-Bhawad line is used to feed power to 220 kV GSS Bhawad, Bhopalgarh, Aau, Baithwasia, Badisid and Bhadla. Tripping of these lines will create load shedding in large area.

- Tripping of 220 kV D/C Jodhpur-Bhawad line will also increase loading on the 2x315 MVA, 400/220 kV ICTs at 400 kV GSS Merta during off RE hours.

- During high RE scenario, RE power is evacuated to Jodhpur from the Bhadla, Badisid and Bap through 220 kV GSS at Aau, Baithwasia and Bhawad. Considering 220 kV D/C Jodhpur-Bhawad line in the SPS may impact the RE evacuation.

- There is dedicated 220kV feeder from 220 kV GSS Bilara to cater load of DFCC and TSS load is also connected on the 132 kV GSS Piparcity which is fed from the 220 kV GSS Bilara.

- The 1x40/50MVA, 132/33 kV Transformer at 132 kV GSS Banar is fed from the 132 kV GSS Mandore and another 1x40/50MVA, 132/33 kV Transformer at 132 kV GSS Banar is fed from the 132 kV GSS Kuri. LV side bus of these transformers is combined.

- There are 2x160MVA, 220/132 kV Transformers at 220 kV GSS Baithwasia which are operated in parallel.

- After detailed analysis of loading conditions, power injection, available communication channels, RE evacuation & grid interconnection issues, following universal logics are proposed for the 2x315MVA, 400/220 kV ICTs at 400 kV GSS Jodhpur (Surpura) which will work for all the operating scenarios:-

1. **SPS Group-1:** Trip commands are generated at time delay of 1.0 second to trip the following transformers when 105% loading [105% current in all the three phases] on any one of the 2x315MVA, 220/132 kV Transformers at 400 kV GSS Jodhpur (Surpura) is reached due to tripping of one of the transformer or any of the 220 kV lines associated with 400 kV GSS Jodhpur or the overloading of transformers:-
   - 160 MVA, 220/132 kV Transformer-I at 220 kV GSS Baithwasia
   - 160MVA, 220/132 kV Transformer-II at 220 kV GSS Baithwasia

   Implementation of SPS Logic-1: This logic will be implemented by taking reference from overcurrent relays of both 315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura). Trip

command will be initiated at time delay of 1.0 second when current reached the 105% loading of the ILTs [105% current in all three phases]. This trip command will be communicated to the 220 kV GSS Baithwasia when status of any of one of the Circuit Breaker of 220 kV Jodhpur-Bhawad Ckt-I & II line is closed at 400 kV GSS Jodhpur end and trip command will not be communicated when the status of both of the Circuit Breaker of 220 kV Jodhpur-Bhawad Ckt-I & II line is open at 400 kV GSS Jodhpur end.

At 220 kV GSS Bhawad:-

- Trip command received from 400 kV GSS Jodhpur (Surpura) will be communicated to the 220 kV GSS Baithwasia by looping at 220 kV GSS Bhawad in such a manner that trip command (through carrier) received from 400 kV GSS Jodhpur is reached at 220 kV GSS Bhaithwasia in all conditions.

At 220 kV GSS Baithwasia:-

- Trip command along with status of both the Circuit breakers of 220 kV D/C Baithwasia-Bhawad line at 220 kV GSS Baithwasia end will be used to trip the 02X160 MVA, 220/132 KV Transformers at 220 KV GSS Baithwasia when any of one of CB status of 220 kV D/C Bhawad-Baithwasia line Ckt-I & II is closed at 220 KV Baithwsaia. When CB status of both lines i.e. 220 kV Bhawad-Baithwasia line Ckt-I & II are open then no action will be taken.

2. **SPS Group-2:** Trip command is generated at time delay of 1.2 second to trip the following transmission line at 220 kV GSS Baithwasia when 105% loading [105% current is all the three phases] on any one of the 2x315MVA, 400/220 kV Transformers at 400 kV GSS Jodhpur (Surpura) is reached due to tripping of one of the transformer or any of the 220 kV lines associated with 400 kV GSS Jodhpur or the overloading of transformers:-

   - 220 KV D/C Baithwasia- Aau Line

   Implementation of SPS Logic-2: This logic will be implemented by taking reference from overcurrent relays of both 315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura). Trip command will be initiated at time delay of 1.2 second when current reached the 105% loading of the ILTs [105% current in all the three phases]. This trip command will be communicated to the 220 kV GSS Baithwasia when status of any of one of the Circuit Breaker of 220 kV Jodhpur-Bhawad Ckt-I & II line is closed at 400 kV GSS Jodhpur end and trip command will not be communicated when the status of both of the Circuit Breaker of 220 kV Jodhpur-Bhawad Ckt-I & II line is open at 400 kV GSS Jodhpur end.

   At 220 kV GSS Bhawad:-

   - Trip command received from 400 kV GSS Jodhpur (Surpura) will be communicated to the 220 kV GSS Baithwasia by looping at 220 kV GSS Bhawad in such a manner that trip command (through carrier) received from 400 kV GSS Jodhpur is reached at 220 kV GSS Bhaithwasia in all conditions.

   At 220 kV GSS Bhaithwasia:-

   - Trip command along with status of any one of the Circuit breakers of 220 kV D/C Baithwsaia- Bhawad line at 220 kV GSS Baithwsaia end will be used to trip both the circuits of 220 KV Baithwasia –Aau line from 220 kV GSS Baithwasia. When circuit breakers of 220 kV D/C Baithwsaia- Bhawad line are open then no action will be

initiated at 220 kV GSS Aau. When circuit breakers of 220 kV D/C Baithwsaia-Bhawad line are closed then then trip command will used to trip the both circuits of 220 KV Baithwasia–Aau line.

3. **SPS Group-3:** Trip command is generated at time delay of 1.4 second to trip the following transmission elements at 132 kV GSS Manore when 105% loading [105% current in all the three phases] on any one of the 2x315MVA, 400/220 kV Transformers at 400 kV GSS Jodhpur (Surpura) is reached due to tripping of one of the transformer or any of the 220 kV lines associated with 400 kV GSS Jodhpur or the overloading of transformers:-

   - 10/12.5 MVA, 132/33 kV Transformer-I at 132 kV GSS Mandore
   - 20/25 MVA, 132/33 kV Transformer-II at 132 kV GSS Mandore
   - 132 KV S/C Mandore –Mathania Line

   Implementation of SPS Logic-3:-This logic will be implemented by taking reference from overcurrent relays of both 315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura). Trip command will be initiated at time delay of 1.4 second when current reached the 105% loading of the ILTs [105% current in all the three phases]. This trip command will be communicated to the 132 kV GSS Mandore when status of LV side Circuit Breaker of 100MVA, 220/132 kV Transformer at 400 kV GSS Jodhpur (Surpura) is closed at 400 kV GSS Jodhpur and trip command will not be communicated when the status of LV side Circuit Breaker of 100MVA, 220/132 kV Transformer at 400 kV GSS Jodhpur (Surpura) is open.

   At 132 kV GSS Mandore:-

   - Trip command will used to trip both transformers at 132 KV GSS Mandore and 132 KV S/C Mandore –Mathania Line.

4. **SPS Group-4:**-Trip command is generated at time delay of 1.6 second to trip the following transmission line at 132 kV GSS Mandore when 105% loading [105% current in all the three phases] on any one of the 2x315MVA, 400/220 kV Transformers at 400 kV GSS Jodhpur (Surpura) is reached due to tripping of one of the transformer or any one of the 220 kV lines associated with 400 kV GSS Jodhpur or the overloading of transformers

   - 132 KV S/C Mandore- Banar Line

   Implementation of SPS Logic-4: This logic will be implemented by taking reference from overcurrent relays of both 315MVA, 400/220 kV ILTs at 400 kV GSS Jodhpur (Surpura). Trip command will be initiated at time delay of 1.6 second when current exceeds the 105% loading of the ILTs [105% current in all the three phases]. This trip command will be communicated to the 132 kV GSS Mandore when status of LV side Circuit Breaker of 100MVA, 220/132 kV Transformer at 400 kV GSS Jodhpur (Surpura) is closed at 400 kV GSS Jodhpur and trip command will not be communicated when the status of LV side Circuit Breaker of 100MVA, 220/132 kV Transformer at 400 kV GSS Jodhpur (Surpura) is open.

   At 132 kV GSS Mandore:-

   - Trip command will used to trip 132 KV S/C Mandore –Banar Line

- Schematic diagram of proposed SPS is shown in Fig. 2.

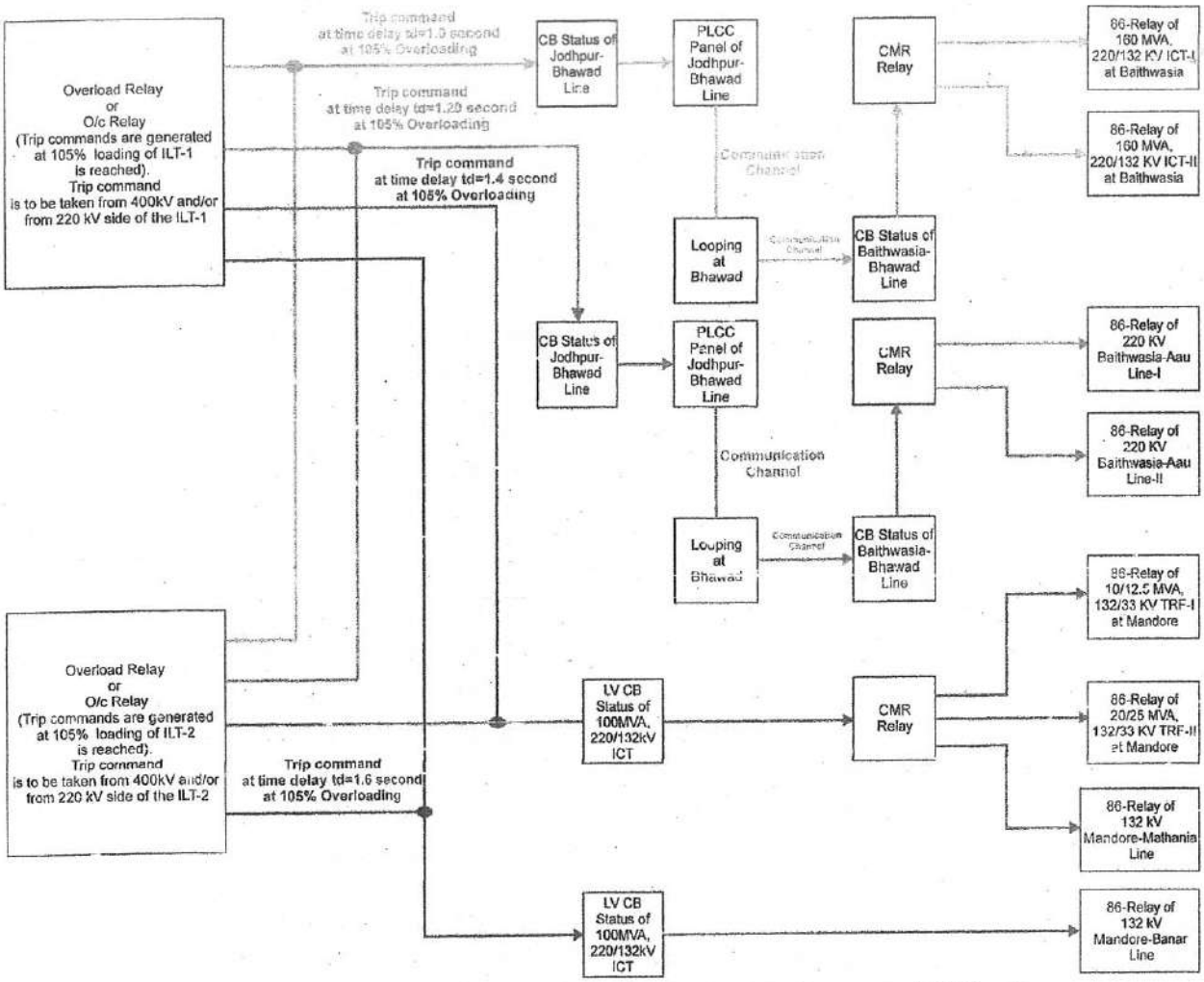

Fig. 2 Schematic diagram for implementation of proposed SPS Logics

- To maintain supply of critical loads connected to all the GSS in the region, tripped transformers and lines may be re-connected after applying load shedding on all the GSS in the region in such a quantum to maintain loadings on the both the 315MVA, 400/220 kV ILTs or the healthy 315MVA, 400/220 kV ILT at 400 kV GSS Jodhpur (Suprura) within permissible limits.

G. Requirement of Healthiness of the SPS

This SPS will function only if both the transformers and 220 kV transmission lines connected on Bus-A at 400 kV GSS Jodhpur as indicated in Table 1 are remain intact. Any change in configuration of lines and transformers connected on Bus-A will lead to mal-operation of the SPS. Further, LD Control room and SE(T&C), RVPN, Jodhpur may ensure to take prior approval of NRLDC if any change is required in the configuration for which SPS is designed. Any change in configuration may be restored after the loading conditions are normalized.

National Load Despatch Centre
Import Capability of Punjab for August 2024

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Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	9500	500	9000	5497	3503		https://www.punjabsldc.org/ATC_TTC.aspx
Limiting Constraints		N-1 contigency of 400/220KV ICT at Rajpura, Ludhiana, Jalandhar, Muktsar Loading close to N-1 contingency limits of 400/220kV Patran, Malerkotla and Patiala ICTs 220 kV underlying network at Jalandhar, Ludhiana and Amritsar						

National Load Despatch Centre
Import Capability of Uttar Pradesh for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	16500	600	15900	9779	6121		https://www.upsldc.org/documents/20182/0/ttc_atc_24-11-16/4c79978e-35f2-4aef-8c0f-7f30d878dbde
Limiting Constraints	N-1 contingency of 400/220kV Obra, Allahabad(PG), Gorakhpur (UP), Sarnath, Lucknow (PG) ICTs							

National Load Despatch Centre
Import Capability of Haryana for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	10300	300	10000	5418	4582		https://hvpn.org.in/#/atcttc
Limiting Constraints	N-1 contingency of 400/220kV ICT at Deepalpur, Hisar, Kabulpur and Panipat(BBMB)							

National Load Despatch Centre
Import Capability of Rajasthan for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	7600	600	7000	5689	1311		https://sldc.rajasthan.gov.in/rrvpnl/scheduling/downloads
Limiting Constraints	N-1 contingency of 400/220kV Heerapura, Jodhpur, Bikaner, Ajmer, Merta, Hindaun and Ratangarh ICTs							

National Load Despatch Centre
Import Capability of Delhi for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	7300	300	7000	4810	2190		https://www.delhisldc.org/resources/atcttcreport.pdf
Limiting Constraints	N-1 contingency of 400/220kV Mundka, HarshVihar and Bawana (bus-split) ICTs.							

National Load Despatch Centre
Import Capability of Uttarakhand for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	1800	100	1700	1402	298		https://uksldc.in/ttc-atc
Limiting Constraints		N-1 contingency of 400/220kV Kashipur ICTs. High loading of 220kV Roorkee-Roorkee and 220kV CBGanj-Pantnagar lines						

National Load Despatch Centre
Import Capability of HP for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	850	100	750	1130	-380		https://hpsldc.com/mrm_category/ttc-atc-report/
Limiting Constraints		High loading of 220kV Hamirpur-Hamirpur D/C. Overloading of 2*200MVA Kunihar transformers						

National Load Despatch Centre
Import Capability of J&K for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	2500	100	2400	1977	423		
Limiting Constraints		N-1 contigency of 400/220KV ICTs at Amargarh 220 kV underlying network at Amargarh, Wagoora						

National Load Despatch Centre
Import Capability of Chandigarh for August 2024

Issue Date: - Issue Time: 1600 Revision No. 0

Date	Time Period in IST (hrs)	Total Transfer Capability (TTC) (MW)	Reliability Margin (MW)	Available Transfer Capability (ATC) (MW)	Approved General Network Access (MW)	Margin Available for Temporary General Network Access(MW)	Changes in TTC w.r.t. Last Revision	Comments
1st August 2024 to 31st August 2024	00-24	400	20	380	342	38		
Limiting Constraints		N-1 contigency of 220kV Nallagarh-Kishengarh						

Sr No	Element Name	Outage Date	Outage Time	Reason
1	400 KV Kala Amb(PKTL)-Wangto_GIS(HP) (HPPTCL) Ckt-1	05-Jun-24	16:58	Transient fault. As per PMU and DR (of both ends), R-N fault with unsuccessful A/R operation is observed.
		13-Jun-24	14:50	Phase to earth fault Y-N. As per PMU and DR (of both ends), Y-N fault with unsuccessful A/R operation is observed.
		17-Jun-24	13:15	Phase to Phase Fault R-Y. As per PMU and DR (of both ends), R-Y fault is observed.
2	400 KV Kala Amb(PKTL)-Sorang(Greenko) (Greenko) Ckt-1	01-Jun-24	17:47	Phase to Phase Fault Y-B. As per PMU, Y-B fault is observed. DR not received from both ends.
		01-Jun-24	19:51	Phase to earth fault R-N. As per PMU, no fault is observed.
		03-Jun-24	17:36	Transient fault. As per PMU and DR (of Kala Amb end), Y-B fault is observed. DR not received from Sorang(Greenko) end.
3	400 KV Abdullapur(PG)-Bawana(DV) (PG) Ckt-1	01-Jun-24	14:49	Phase to earth fault R-N. As per PMU and DR of both ends, R-N fault with successful A/R operation from Abdullapur end and no A/R operation at Bawana end is observed.
		03-Jun-24	20:18	AC Supply Fail. As per PMU and DR of both ends, R-N followed by B-N fault (during dead time of R-N fault) is observed.
		04-Jun-24	15:38	Phase to Ground Fault R-N. As per PMU and DR of both ends, R-N fault with unsuccessful A/R operation is observed from both ends.
		14-Jun-24	02:35	R Phase Jumper Broken. As per PMU & DR of both ends, R-N fault with successful A/R operation from Abdullapur end and unsuccessful A/R operation from Bawana end. However, it is suspected that line tripped on pole discrepancy relay operation after 2sec of fault time.
4	220 KV RAPS_A(NP)-Sakatpura(RS) (RS) Ckt-2	26-Jun-24	21:02	Phase to Phase Fault R-B. As per PMU, R-N phase to earth fault is observed. As per DR of both ends, R-Y-N fault from both ends is observed. Time sync issue in DR of both ends.
		26-Jun-24	22:17	Transient fault. As per PMU, R-N fault with no A/R operation is observed. DR not received from both ends.
		27-Jun-24	19:53	Phase to Phase Fault R-Y. As per PMU, R-Y fault is observed. DR not received from both ends.
5	220 KV Khara(UP)-Saharanpur(PG) (UP) Ckt-1	03-Jun-24	00:50	Pole Discrepancy. As per PMU no fault is observed. DR not received from both ends. As reported, Pole Discrepancy Operated.
		04-Jun-24	06:05	Auto-Reclosure Problem. As per PMU no fault is observed. DR not received from both ends. As reported, Pole Discrepancy Operated.
		05-Jun-24	15:13	DC Supply Fail. As per PMU no fault is observed. DR not received from both ends. As reported, Pole Discrepancy Operated.
		09-Jun-24	12:10	Earth fault. As per PMU, fluctuation in voltage is observed and no fault in system is observed. As per DR of Saharanpur end, R-N fault with no A/R operation at Saharanpur end is observed. DR not received from Khara end.
		11-Jun-24	12:36	Phase to Phase Fault R-Y. As per PMU and DR of Saharanpur end, R-Y fault is observed. DR not received from Khara end.
6	220 KV Delhi RR(BB)-Narela(DV) (BBMB) Ckt-1	01-Jun-24	04:13	Phase to earth fault Y-N. As per PMU, R-N fault with no A/R operation is observed. As per DR of Narela end, Y-N fault with no A/R operation is observed. PMU fault time is not same as repported and DR time. DR not received from Delhi RR end.
		01-Jun-24	13:22	Phase to Phase Fault R-B. As per PMU, Y-B fault is observed. As per DR of Narela end, R-B fault is observed. DR not received from Delhi RR end.
		03-Jun-24	18:50	Phase to Phase Fault Y-B. As per PMU, R-Y fault is observed with delayed fault clearing time of 400msec. DR not received from both ends.
		05-Jun-24	22:06	Phase to Ground Fault Y-N. As per PMU, R-N fault with no A/R operation is observed. As per DR of Narela end, Y-N fault with no A/R operation is observed. DR not received from Delhi RR end.
		19-Jun-24	22:44	Phase to earth fault Y-N. As per PMU, Y-B fault is observed. As per DR of Narela end, Y-N fault with no A/R operation is observed. DR not received from Delhi RR end.

Grid Event summary for June 2024

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	GD-1	1) 220 kV DSIDC-Bawana (DV) ckt-1 2) 220 kV DSIDC-Bawana (DV) ckt-2	Delhi	DTL	1-Jun-24	15:40	1-Jun-24	18:05	02:25	i)220/66kV DSIDC(DV) has double main Bus arrangement at 220kV side. ii)During antecedent condition, incoming power at DSIDC(DV) through 220 kV DSIDC-Bawana (DV) ckt-1 & ckt-2 was approx. 44MW & 58MW respectively (as per SCADA). 220 kV DSIDC-Bawana (DV) ckt-1, 220/66kV 160MVA ICT-1 & 100MVA ICT-2 at DSIDC(DV) were on 220kV Bus-1 at DSIDC(DV) and 220 kV DSIDC-Bawana (DV) ckt-2, 220/66kV 100MVA ICT-3 & 160MVA ICT-4 at DSIDC(DV) were on 220kV Bus-2 at DSIDC(DV). Bus coupler of 220kV Bus-1 & Bus-2 was in open condition. 220kV DSIDC-Narela(DV) ckt-1 & ckt-2 were not in service. iii)As reported, at 15:40 hrs, 220 kV DSIDC-Bawana (DV) ckt-1 & ckt-2 tripped on R-Y phase to phase fault and 3-phase fault respectively. For both the faults, fault distance was 3.9 km from Bawana(DV) and zone-1 distance protection operated at Bawana(DV). iv)But, as per PMU and SCADA SOE, at 15:40 hrs, 220 kV DSIDC-Bawana (DV) ckt-2 tripped on Y-B phase to phase fault. Further at 15:41 hrs, 220 kV DSIDC-Bawana (DV) ckt-1 tripped on R-Y phase to phase fault. v)As 220kV DSIDC-Narela(DV) ckt-1 & ckt-2 were not in service and 220 kV DSIDC-Bawana (DV) ckt-1 & ckt-2 also tripped, complete blackout occurred at 220/66kV DSIDC(DV). vi)As per PMU at Abdullapur(PG), Y-B followed by R-Y phase to phase fault is observed with fault clearing time of 160ms & 120msec respectively. vii)As per SCADA, change in demand of approx. 308MW is observed in Delhi control area. But as reported, by SLDC-Delhi, load loss of approx. 98 MW occurred. viii)As reported, at 18:05hrs, power supply restored at 220/66kV DSIDC(DV) using 66kV Bawana-I sector ckt-1 & 2 from TPDDL.	0	0.237	0	98	0.000	0.131	64982	74546	160
2	GI-2	1) 765 KV Meerut-Bhiwani (PG) Ckt-1	Haryana, Punjab, Uttar Pradesh and Rajasthan	PGCIL	1-Jun-24	13:26	1-Jun-24	13:52	00:26	i)As reported, at 13:26 hrs, 765 kV Meerut-Bhiwani (PG) Ckt-1 tripped from Bhiwani(PG) end only on R-N phase to earth fault with fault current of 4.679 kA and fault distance of 148.715 km from Bhiwani(PG) end. Line was successfully auto-reclosed from Meerut(PG) end. ii)As per PMU at Bhiwani(PG), R-N phase to earth fault with fault clearing time of 80ms is observed. Voltage dipped upto 0.779 p.u. at Bhiwani(PG). iii)As per SCADA, change in NR total solar generation of approx. 1695 MW (ISTS Solar: ~1695 MW) was observed which almost revived within 05 minutes. Change in Rajasthan wind generation of approx. 140 MW is also observed. iv)Due to a significant dip in RE generation, frequency dropped by 0.121 Hz (from 49.976 Hz to 49.855 Hz). v)As per SCADA, total change in Northern region demand of approx. 545 MW (Punjab: ~445 MW, UP: ~100 MW) is observed. Demand dipped in Punjab area due to df/dt operation as informed by Punjab SLDC. As reported by SLDC Punjab, load loss of ~427 MW occurred due to df/dt operation in Punjab.	0	0	1835	545	2.627	0.664	69862	82023	80
3	GI-2	1) 400 KV Bawana-Mundka (DV) Ckt-1 2) 400 KV Bawana-Mundka (DV) Ckt-2	Delhi, Haryana, Punjab, Uttar Pradesh and Rajasthan	DTL	1-Jun-24	13:43	1-Jun-24	14:35	00:52	i)As reported, at 13:43 hrs, 400 KV Bawana-Mundka (DV) Ckt-1 & 2 tripped from Mundka(DV) end only on R-B phase to phase fault (phase sequence issue observed) (exact reason, nature and location of fault yet to be shared); no tripping reported at Bawana(DV) end. Fault was sensed in zone-4 at Bawana(DV), but zone-4 got reset as fault got cleared before zone-4 time delay. ii)As per PMU at Abdullapur(PG), R-Y phase to phase fault with fault clearing time of 80ms is observed. Voltage dipped upto 0.859 p.u. at Abdullapur(PG). iii)As per SCADA, change in NR total solar generation of approx. 3120 MW (ISTS Solar: ~2710 MW, Rajasthan Solar: ~410 MW) was observed which almost revived within 05 minutes. Change in Rajasthan wind generation of approx. 60 MW is also observed. iv)Due to a significant dip in RE generation, frequency dropped by 0.171Hz (from 49.948 Hz to 49.777 Hz). v)As per SCADA, total change in Northern region demand of approx. 1300 MW (Delhi: ~270 MW, Haryana: ~225 MW, Punjab: ~585 MW, UP: ~220 MW) is observed. Demand dipped in UP and Punjab area due to df/dt operation as informed by UP and Punjab SLDC. As reported by SLDC Punjab, load loss of ~533 MW occurred due to df/dt operation in Punjab.	0	0	3180	1300	4.567	1.570	69630	82782	80
4	GD-1	1) 220 KV Neemrana(PG)-Kushkhera(RS) (RS) Ckt 2) 220 KV Bhiwadi(PG)-Kushkhera(RS) (RS) Ckt 3) 220/132kV 160MVA ICT-1 at Kushkhera(RS) 4) 220/132kV 160MVA ICT-2 at Kushkhera(RS)	Rajasthan	PGCIL, RVPNL	2-Jun-24	01:04	2-Jun-24	02:18	01:14	i)220/132kV Kushkhera(RS) has double main Bus arrangement at 220kV side. ii)During antecedent condition, incoming power at Kushkhera(RS) S/s through 220 KV Neemrana(PG)-Kushkhera(RS) (RS) Ckt & 220 KV Bhiwadi(PG)-Kushkhera(RS) (RS) Ckt was approx. 91MW & 142MW respectively (as per SCADA). 220kV lines from Kushkhera to Alwar(RS), Kishangarh(RS) were not in service. Two buses are connected only through isolator. iii)As reported, at 01:04hrs, Y-phase CT of 220 KV Neemrana(PG)-Kushkhera(RS) (RS) Ckt at Kushkhera(RS) S/s blasted which resulted in Bus bar fault and bus bar protection operated. iv)As the two buses are connected only through isolator, all the 220kV lines from Kushkhera(RS) and 220/132kV 160MVA ICT-1 & 2 at Kushkhera(RS) tripped which led to total blackout at 220/132kV Kushkhera(RS) S/s. v)As further reported, 220 KV Neemrana(PG)-Kushkhera(RS) (RS) Ckt tripped from both ends, but 220 KV Bhiwadi(PG)-Kushkhera(RS) (RS) Ckt tripped only from Kushkhera(RS) end. vi)As per PMU at Bhiwadi(PG), at 01:04 hrs, Y-N followed by B-N phase to earth fault is observed with fault clearing time of 120ms. vii)As per SCADA, change in demand of approx. 247MW in Rajasthan control area is observed. viii) As reported, at 02:18 hrs, 220kV Kushkhera-Alwar(RS) line charged and at the same time 220/132kV 160MVA ICT-1 at Kushkhera(RS) also charged.	0	0.304	0	247	0.000	0.335	53813	73790	120
5	GD-1	1)220 kV Barn(JK)-Kishenpur(PG) Ckt-1 2)220 kV Barn(JK)-Kishenpur(PG) Ckt-2	Jammu and Kashmir	PDD JK, PGCIL	3-Jun-24	17:33	3-Jun-24	20:20	02:47	i)As reported, at 17:33hrs, 220 kV Barn(JK)-Kishenpur(PG) Ckt-1 tripped on R-N phase to earth fault with fault current of 5.094kA from Kishepur(PG) end (as per DR). As per DR, zone-1 distance protection operated at Kishepur(PG) end (exact reason and location of fault yet to be shared). ii)During the same time, 220 kV Barn(JK)-Kishenpur(PG) Ckt-2 also tripped from Barn(JK) end only on R-N phase to earth fault with fault current of 3.9kA from Kishepur(PG) end (as per DR). As per DR, fault sensed in zone-2 at Kishenpur(PG) and line remained charged from Kishenpur (PG) end. iii)Due to tripping of both 220 kV Barn(JK)-Kishenpur(PG) Ckt-1 & 2, complete blackout occurred at 220/132kV Barn(J&K) S/s. iv)As per PMU at Kishenpur(PG), R-N phase to earth fault with fault clearing time of 120ms is observed. v)As per SCADA, load loss of approx. 120MW occurred in J&K control area.	0	0.334	0	120	0.000	0.163	57513	73807	120
6	GI-1	1)220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-1 2)220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-2 3)220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-3 4)220 KV PanipatTH(HV)-Panipat(BB) (HVPNL) Ckt-4 5)220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-1 6)220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-2 7)220 KV Panipat(BB)-Narela(DV) (BBMB) Ckt-3 8)220 KV Panipat(BB)-Chajpur(HV) (HVPNL) Ckt-1 9)220 KV Panipat(BB)-Chajpur(HV) (HVPNL) Ckt-2 10)220 KV Panipat-Dhulkote (BB) Ckt-1 11)220 KV Panipat-Dhulkote (BB) Ckt-2 12)220 KV Panipat-Charkhi Dadri (BB) Ckt 13)220 KV Panipat(BB)-Pipli Ckt 14)400/220kV 450 MVA ICT-1 at Panipat(BB) 15)400/220kV 500 MVA ICT-2 at Panipat(BB) 16)220/132kV 100 MVA ICT-1 at Panipat(BB) 17)220/132kV 100 MVA ICT-2 at Panipat(BB) 18)220/33kV 60 MVA ICT-1 at Panipat(BB) 19)220/33kV 60 MVA ICT-2 at Panipat(BB)	Haryana	BBMB, HVPNL, DTL	3-Jun-24	00:38	3-Jun-24	01:26	00:48	i)As reported, at 00:38 hrs, bursting of B-ph CT of 220kV bus coupler-2 at Panipat(BB) end occurred which created B-N phase to earth fault in busbar differential zone. The reason of bursting of the B-ph CT was observed to be some internal fault in Heptacare make CT installed on the bay on 29th November 2018. ii)The Numerical low Impedance type MiCom P741 Bus-Bar Differential Protection Scheme (ALSTOM make) sensed the fault and operated tripping all the elements on either side of bus coupler i.e. 220kV Bus-1 & Bus-2 at Panipat(BB). iii)As per PMU at Panipat(BBMB), Y-N phase to earth fault is observed with fault clearing time of 120ms. (phase sequence issue observed) iv)As per SCADA, load loss of approx. 565 MW (~445 MW in Haryana and ~120 MW in Delhi control area) is observed. v)As reported by BBMB, 220kV Bus-1 at Panipat(BB) was charged by closing A-17 Breaker of 220 KV Panipat-Dhulkote (BB) Ckt-1 at 01:26 hrs and 220kV Bus-2 at Panipat(BB) was charged by closing A-18 Breaker of 220 KV Panipat-Dhulkote (BB) Ckt-2 at 01:36 hrs. vi)As remedial action taken, on 03rd June 2024 an old and used Rade Koncar make CT of same ratio i.e. 1200/1-1-1-1-1A was tested thoroughly and installed in place of bursted CT and bus coupler-2 was charged at 17:38 hrs on 03rd June 2024.	0	0.452	0	565	0.000	0.763	53147	74075	120
7	GD-1	1)66 MW Pong HPS - UNIT 2 2)66 MW Pong HPS - UNIT 3 3)66 MW Pong HPS - UNIT 6 4)220 KV Jessore(HP)-Pong(BB) (PG) Ckt 5)220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-1 6)220 KV Pong(BB)-Dasuya(PS) (BBMB) Ckt-2 7)220 KV Jalandhar-Pong (BB) Ckt-1 8)220 KV Jalandhar-Pong (BB) Ckt-2 9)220 KV Bairasiul(NH)-Pong(BB) (PG) Ckt	Himachal Pradesh	HPPTCL, BBMB, PSTCL, PGCIL	3-Jun-24	22:47	4-Jun-24	00:14	01:27	i)During antecedent condition, 66MW Unit-1, 2, 3 & 6 at Pong HEP were running and generating approx. 58MW, 60MW, 60MW and 60MW respectively (as per SCADA). 66MW Unit-4 & 5 at Pong HEP were not in service. ii)As reported, at 22:47 hrs, while stopping 66MW Unit-1 at Pong(BB) B-ph limb failed to open due to failure of operating mechanism of CB. Generator Circuit Breaker did not open. Abnormal sound was observed from TG Unit 1 and smoke was also observed from Field Discharge Cubicle of Excitation System of Unit 1. LBB protection didn't operate in this case in CB failure condition. iii)During the same time, all other running units, i.e., 66MW Unit-2, 3 & 6 at Pong HEP tripped Generator Transformer Back up Earth Fault Protection operation due to system imbalance. iv)Further, at 22:58 hrs, 220kV Bus 1 & 2 at Pong(BB) were de-energized manually by opening all CBs of 220kV feeders to save Unit 1 as the B-ph limb of machine CB was stuck in closed position. v)As per PMU at Jalandhar(PG), no fault is observed in the system. However, fluctuation in voltage is observed. vi)As per SCADA, generation loss of approx. 238 MW at Pong HEP (BB) and no load loss is observed in HP control area.	0	0	238	0	0.430	0.000	55406	71913	NA
8	GD-1	1) 220 KV Alusteng-Drass (PG) Ckt	Jammu and Kashmir	PGCIL	4-Jun-24	19:31	4-Jun-24	20:26	00:55	i)Power flows from Alusteng(PG) to Drass(PG) to Kargil to Khalsti to Leh (radial connection). Generation of Chutak is connected to Kargil and generation of Nimoo bazgo is connected to Leh. ii)As reported, at 19:31 hrs, 220 KV Alusteng-Drass (PG) Ckt tripped on B-N phase to earth fault with fault distance of 115km from Alusteng(PG). iii)With the tripping of 220 KV Alusteng-Drass (PG) Ckt, complete blackout occurred at 220/66kV Drass(PG) and supply to Kargil, Khalsti and Leh also failed. iv)Generation of Chutak and Nimoo Bazgo tripped due to loss of evacuation path resulting in generation loss of approx. 37MW & 24MW at Chutak and Nimoo Bazgo respectively (as per SCADA). v)As per PMU at Amargarh(INDIGRID), B-N phase to earth fault is observed with fault clearing time of 80ms. vi)As per SCADA, no change in demand is observed in J&K control area.	0	0	61	0	0.111	0.000	54929	71784	80
9	GI-2	1)400 KV Dulhasti(NH)-Kishenpur(PG) (PG) Ckt-1 2)130MW Unit-1 at Dulhasti HEP 3)130MW Unit-2 at Dulhasti HEP	Jammu and Kashmir	NHPC, PGCIL	4-Jun-24	13:05	4-Jun-24	13:25	00:20	i)During antecedent condition, 130MW Unit-1, 2 & 3 at Dulhasti HEP were running and generating 127MW, 121MW and 126MW respectively (as per SCADA). Total generated power of 374MW was evacuating through 400 kV Dulhasti(NH)-Kishenpur(PG) (PG) Ckt-1 & 2. ii)As reported, at 13:05hrs, 400 kV Dulhasti(NH)-Kishenpur(PG) (PG) Ckt-1 tripped on R-Y phase to phase fault (exact reason and location of fault yet to be shared). As per DR at Dulhasti(NH), fault current was approx. Ir=~2.906kA and Iy=~2.539kA from Dulhasti(NH) and voltage dipped upto ~0.54 p.u. As per PMU at Kishepur(PG), fault current was approx. 5.5kA from Kishenpur(PG) and voltage dipped upto ~0.779 p.u. iii)At Dulhsti HEP(NHPC), there is a scheme which identifies a dead bus situation and issues trip command to running units connected to that bus to minimize the over-speed of unit due to a load throw off. iv)Due to this fault, undervoltage was sensed which was identified as dead bus condition by this scheme and it sent command to unit-controller to trip the connected units, i.e. unit-1 & 2. v)Due to this, 130MW Unit-1 and 2 at Dulhasti HEP tripped. vi)As per PMU at Kishenpur (PG), R-Y phase to phase fault is observed with fault clearing time of 80ms. vii)As per SCADA, generation loss of approx. 230MW is observed at Dulhasti HEP.	0	0	230	0	0.324	0.000	70947	82825	80
10	GI-1	1)220/132kV 160MVA ICT 2 at Barn(J&K) 2)220/132kV 160MVA ICT 1 at Barn(J&K) 3)220/132kV 160MVA ICT 3 at Barn(J&K)	Jammu and Kashmir	PDD JK	7-Jun-24	16:29	7-Jun-24	16:45	00:16	i)As reported, at 16:29hrs, 220/132kV 160MVA ICT 2 at Barn(J&K) tripped on over current earth fault protection operation (exact reason, location and type of fault yet to be shared). ii)Due to shifting of loading of 220/132kV 160MVA ICT 2 to 220/132kV 160MVA ICT 1 & 3, both ICTs also tripped on overloading. iii)As per PMU at Kishenpur(PG), R-B phase to phase fault with delayed fault clearing time of 2160 ms is observed. iv)As per SCADA, load loss of approx. 363MW occurred in J&K control area.	0	0.097	0	363	0.000	0.479	60503	75810	2160
11	GI-1	1)220 KV Jalandhar-Pong (BB) Ckt-2 2)220 KV Jalandhar-Jamalpur (BB) Ckt-2 3)220 KV Jalandhar(BB)-Jamsher(PS) (BB) Ckt-1 4)220KV Bus 2 at Jalandhar(BB) 5)220 KV Jalandhar(BB)-Alawalpur(PS) (PSTCL) Ckt 6)220/132kV 100MVA ICT-4 at Jalandhar(BB) 7)220/66kV 100MVA ICT-2 at Jalandhar(BB) 8)220/66kV 100MVA ICT-1 at Jalandhar(BB)	Punjab	PSTCL, BBMB	7-Jun-24	08:56	7-Jun-24	09:12	00:16	i)During antecedent condition, 220 kV lines from Jalandhar(BB) to Alawalpur, Pong ckt-2, Jamalpur ckt-2, Jamsher ckt-1, 220/66kV 100MVA ICT-2, 220/132kV 100MVA ICT-4 & 220/132kV 90MVA ICT-2 were connected to 220kV Bus-2 and Butari, Pong ckt-1, Jamalpur ckt-1, Jamsher ckt-2, 220/66kV 100MVA ICT-1 and 220/132kV 100MVA ICT-1 & 3 were connected to 220kV Bus-1 at Jalandhar(BB) S/s. 220/132kV 90MVA ICT 2 was not in service. ii)As reported, at 08:56 hrs, R-N phase to earth fault occurred on 220 KV Jalandhar(BB)-Jamsher(PS) (BB) Ckt-1 with fault distance of 1.039km from Jalandhar(BB) end. As per DR, fault current was ~16.2kA from Jalandhar(BB) end and fault was sensed in zone-1 at Jalandhar(BB) end. iii)During fault clearance from Jalandhar(BB) end, CB did not open due to air leakage in its tripping block assembly. iv)Due to failure of CB opening of 220 KV Jalandhar(BB)-Jamsher(PS) (BB) Ckt-1 from Jalandhar(BB) end, LBB protection operated which led to tripping of all 220 kV lines (Alawalpur, Pong ckt-2, Jamalpur ckt-2 & Jamsher ckt-1), 220/66kV 100MVA ICT-2, 220/132kV 100MVA ICT-4 and Bus coupler between 220kV Bus-1 & Bus-2 connected to 220kV Bus-2 and 220kV Bus-2 became dead at Jalandhar(BB). v)As further reported, during the same time, 220/66kV 100MVA ICT-1 at Jalandhar(BB) (connected to Bus-1) also tripped on backup protection due overloading as the load of 220/66kV 100MVA ICT-2 shifted on ICT-1. vi)As per PMU at Jalandhar(PG), R-N phase to earth fault is observed with delayed fault clearing time of 240ms. vii)As per SCADA, change in demand of approx. 168 MW is observed in Punjab control area.	0	0.045	0	168	0.000	0.248	58735	67824	240

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)	
12	GD-1	1) 220 KV Adani RenewPark_SL_FGARH_FBTL (AREPRL)-AHEJ4L PSS 4 HB_FGRAH_FBTL (AHEJ4L) (AREPRL) Ckt	Rajasthan	AHEJ4L PSS4	8-Jun-24	21:03	8-Jun-24	21:41	00:38	i)Generation of 220kV AHEJ4L PSS4(IP) station evacuates through 220 KV Adani RenewPark_SL_FGARH_FBTL (AREPRL)-AHEJ4L PSS 4 HB_FGRAH_FBTL (AHEJ4L) (AREPRL) Ckt. During antecedent condition, AHEJ4L PSS4(IP) station was generating approx. 125MW (as per PMU). ii)As reported, at 21:03hrs, 220 KV Adani RenewPark_SL_FGARH_FBTL (AREPRL)-AHEJ4L PSS 4 HB_FGRAH_FBTL (AHEJ4L) (AREPRL) Ckt tripped due to R-N phase to earth fault (exact reason, location and nature of protection operated yet to be shared). iii)Due to tripping of 220 KV Adani RenewPark_SL_FGARH_FBTL (AREPRL)-AHEJ4L PSS 4 HB_FGRAH_FBTL (AHEJ4L) (AREPRL) Ckt, AHEJ4L PSS4(IP) S/s lost its connectivity from grid and blackout occurred at 220kV AHEJ4L PSS4(IP) S/s. iv)As per PMU at Adani Fatehgarh Solar Park(IP), R-N phase to earth fault is observed with fault clearing time of 80ms. v)As per PMU, wind generation loss of approx. 125 MW is observed at AHEJ4L PSS4(IP).	0	0	125	0	0.225	0.000	55520	75925	80
13	GI-2	1)400 KV Akal-Jodhpur (RS) Ckt 2)400/220 kV 315 MVA ICT 3 at Akal(RS) 3)400/220 kV 500 MVA ICT 4 at Akal(RS) 4)220kV Akal-Lala (RS) ckt 5)220kV Akal-Mulana (RS) ckt 6)220kV Akal- Rajgarh (RS) ckt 7)220kV Akal- Amarsagar (RS) ckt 8)220kV Akal- Giral (RS) ckt 9)220kV Akal- Bhensara(RS) ckt-1 10)220kV Akal- Dangri (RS) ckt-1 11)220kV Akal- Dangri (RS) ckt-2 12)400 KV Akal-Kankani (RS) Ckt 13)400 KV Akal-Jaisalmer2(Bhainsra) (RS) Ckt 14)400 KV Akal-Barmer (RS) Ckt	Rajasthan	RVPNL	8-Jun-24	19:53	8-Jun-24	23:29	03:36	i)As reported, at 19:53hrs, due to heavy thunderstorm weather condition, B-ph jumper of dead end tower of 220 kV Akal-Lala (RS) line got earthed at distance of 46.77 meter from Akal(RS) S/s which caused B-N phase to earth fault on 220 kV Akal-Lala (RS) ckt with fault current of Ib=~25kA from Akal(RS) end. As per DR at Akal(RS) end of 220 kV Akal-Lala (RS) ckt, R-N phase to earth fault in zone-1 with fault current of Ir=~25.4kA is observed (phase sequence issue). ii)As reported, during the same time, due to very high fault current, 400/220 kV 315 MVA ICT-3 and 400/220 kV 500 MVA ICT-4 tripped instantaneously on High Set overcurrent protection operation at Akal (RS) S/s. 400 KV Akal-Jodhpur (RS) Ckt also tripped from Akal(RS) end on zone-5 (reverse) distance protection operation (not tripped from the remote end). Tie CB of 400/220kV 315MVA ICT-3 also opened along with tripping of 400/220kV 315MVA ICT-3 which separated 400kV Bus-1 & Bus-2. iii)As reported, at the same time, Bus coupler of 220kV Bus-1 & Bus-2 and all 220kV lines (Mulana, Rajgarh, Amarsagar, Giral, Bhensara(RS) ckt-1, Dangri ckt-1 & ckt-2) connected to 220kV Bus-2 at Akal(RS) S/s also tripped (exact reason of tripping yet to be shared). Due to tripping of Bus coupler, 220kV Bus-1 and Bus-2 separated at Akal(RS). iv)As reported, further at 19:55 hrs, due to bad weather conditions, Y-N phase to earth fault occurred on 400 KV Akal-Kankani (RS) ckt & 400 KV Akal- Jaisalmer2(Bhainsra) (RS) ckt (D/C lines on same tower) at a distance of approx. 3km from Akal(RS) S/s which led to tripping of both the mentioned lines (exact operation of protection yet to be shared). v)As reported, due to tripping of 400 KV Akal-Kankani (RS) ckt & 400 KV Akal- Jaisalmer2(Bhainsra) (RS) ckt, high voltage was observed on the 400 KV Akal-Barmer (RS) Ckt and line voltage reached up to 436kV on the same line and 400 KV Akal-Barmer (RS) Ckt tripped from Barmer(RS) end on over-voltage protection operation and also from Akal(RS) end on receiving DT from Barmer(RS) end. vi)Due to tripping of 400 KV Akal-Barmer (RS) Ckt, 400kV Bus-1 lost its connectivity from grid and 400kV Bus-1 and elements connected to 400kV Bus-1 (400/220 kV 500 MVA ICT-1 & 2, 220kV Bus-1 and 220kV lines connected to 220kV Bus-1) became dead at Akal(RS) S/s. vii)After all the above mentioned tripping events, only 400kV Bus-2 remain charged through 400kV Akal-Ramgarh (RS) D/C. viii)As per PMU at Jodhpur(RS), B-N phase to earth fault with delayed fault clearance time of 1080ms @19:53hrs and Y-B phase to phase fault followed by Y-N phase to earth fault with fault clearance time of 80msec and 240msec (delayed) respectively are observed. ix)As per SCADA, change in Rajasthan wind generation of approx. 168MW is observed	0	0	168	0	0.310	0.000	54212	72136	1080
14	GI-2	1) 400 KV Barmer(RS)-Jaisalmer2(Bhainsra) (RS) Ckt 2) 400 KV Barmer(RS)-Rajwest(RW) (RS) Ckt 3) 400 KV Akal-Jaisalmer2 (Bhainsra) (RS) Ckt 4) 220kV Akal-Bhensra(Suzlon) ckt	Rajasthan	RVPNL	9-Jun-24	11:21	9-Jun-24	13:05	01:44	i)As reported, at 11:21 hrs, R-phase conductor of 400 KV Akal-Jaisalmer2(Bhainsra) (RS) Ckt broke at location no. 134 which caused R-B phase to phase fault on 400 KV Akal-Jaisalmer2(Bhainsra) (RS) Ckt. Line tripped from Akal(RS) end on zone-1 distance protection operation with fault current of Ir=~5.52kA & Ib=~5.57kA and fault distance of 44.86km from Akal(RS) end. Line tripped from Jaisalmer2(Bhainsra)(RS) end on zone-1 distance protection operation with fault distance of 9.6km from Jaisalmer2(Bhainsra)(RS) end. ii)Again, broken conductor of 400 KV Akal-Jaisalmer2(Bhainsra) (RS) Ckt fell on Suzlon 33kV feeder which is emanating from 220kV Bhensara (M/s Suzlon) S/s, which caused R-B phase to phase fault on the same feeder. On this fault, 220kV Akal-Bhensra(Suzlon) ckt tripped on zone-1 distance protection operation from Akal(RS) end. iii)During the same time, 400 KV Barmer(RS)-Rajwest(RW) (RS) Ckt tripped on R-B phase to phase fault (Ir=~2.0kA & Ib=~2.4kA) at a distance of 127.6 meters from Barmer(RS) end on zone-1 distance protection operation. Line didn't open from Rajwest(RS) end (Reason and location of fault yet to be shared). iv)During the same time, 400 KV Barmer(RS)-Jaisalmer2(Bhainsra) (RS) Ckt tripped on R-B phase to phase fault (Ir=~1.3kA & Ib=~1.1kA) from Barmer(RS) end on distance protection operation. As per DR, fault sensed in zone-3 from Barmer end. Line didn't open from Jaisalmer2(Bhainsra)(RS) end (Reason and location of fault yet to be shared). v)As per PMU at Jodhpur(RS), R-B phase to phase fault with fault clearing time of 80ms is observed. Voltage dipped upto 0.777 p.u. at Jodhpur(RS). vi)As per SCADA, change in total RE generation of approx. 2625 MW (ISTS Solar: ~1910 MW, Rajasthan Solar: ~715 MW) among which almost 97% generation revived within 3.5 minutes. vii)Due to a significant dip in RE generation, frequency dropped by 0.203 Hz (from 49.879 Hz to 49.676 Hz). viii)As per SCADA, change in Punjab demand of approx. 435 MW is observed (load loss details due to df/dt operation in Punjab yet to be shared by Punjab SLDC).	0	0	2625	435	4.177	0.603	62838	72177	80
15	GD-1	1)400/220 kV 500 MVA ICT 1 at Mandaula(PG) 2)400/220 kV 500 MVA ICT 2 at Mandaula(PG) 3)400/220 kV 500 MVA ICT 3 at Mandaula(PG) 4)400/220 kV 500 MVA ICT 4 at Mandaula(PG)	Delhi	PGCIL	11-Jun-24	14:10	11-Jun-24	14:50	00:40	i)During antecedent condition, 400/220kV 500MVA ICT-1, 2, 3 and 4 at Mandaula(PG) were carrying approx. 337MW, 337MW, 336MW and 337MW respectively with total loading of 1347MW (as reported by CPCC1, Power Grid). 104 MW GTG-1 & 2 and 122 MW STG at Pragati were generating approx. 85MW, 85MW and 109MW respectively with total generation of 279MW (as reported by SLDC Delhi). 212 MAIN BAY - 400/220 kV 500 MVA ICT-3 at Mandaula(PG) was under planned shutdown and ICT-3 was charged from transfer bus through isolator. ii)As reported, at 14:10 hrs, fire was observed in isolator (transfer bus side) of 400/220 kV 500 MVA ICT-3 at Mandaula(PG). As per DR, Ir is reduced upto ~97.2A while Iy and Ib increased upto ~1.092kA and 1.107kA respectively and imbalance occurred in the system. iii)As reported by CPCC1, Power Grid, the sequence of the event is as follows: a.At 14:10:24hrs: 400/220 kV 500 MVA ICT 2 at Mandaula(PG) tripped on back-up earth fault protection operation due to system imbalance. As per DR, Ir=~615.8A, Iy=~488.8A and Ib=~498.3A before tripping of ICT-2. b.Due to tripping of ICT-2, loading of 400/220kV 500MVA ICT-1, 3 and 4 at Mandaula(PG) were increased to 457MW each. c.At 14:10:27hrs: 400/220 kV 500 MVA ICT 1 at Mandaula(PG) also tripped on back-up earth fault protection operation due to system imbalance. As per DR, Ir=~1.668kA, Iy=~1.214kA and Ib=~1.237kA before tripping of ICT-1. d.Due to tripping of both ICT-1 & 2, loading of 400/220kV 500MVA ICT-3 and 4 at Mandaula(PG) were increased to 696MW each. e.At 14:10:29hrs: 400/220 kV 500 MVA ICT 3 at Mandaula(PG) hand-tripped due to melting of isolator which led to heavy sparking. f.Due to unavailability of ICT-1, 2 & 3, loading of 400/220kV 500MVA ICT-4 at Mandaula(PG) was increased to 1454MW. g.At 14:10:30hrs: 400/220 kV 500 MVA ICT 4 at Mandaula(PG) tripped on back-up over-current protection operation due to excess over-loading. As per DR, maximum current recorded was: Ir=~2.09kA, Iy=~2.136kA and Ib=~2.124kA (max MW loading of approx. 1480MW as per DR). iv)As per PMU at Mandaula(PG), B-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 2320ms is observed. v)As per SCADA, change in demand of approx. 1572 MW in Delhi Control area and change in generation of approx. 284 MW at Pragati are observed. vi).As per PMU at Mandaula(PG), B-N phase to earth fault converted to Y-B-N double phase to earth fault with delayed fault clearing time of 2320ms is observed.	0	1.067	279	1601	0.400	1.931	69737	82920	2320
16	GI-1	1)220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 2)220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2	Jammu and Kashmir	PGCIL, PDD JK	13-Jun-24	06:48	14-Jun-24	08:59	26:11:00	i)220/132kV Hiranagar(J&K) has double main Bus arrangement at 220kV voltage side. ii)As reported, at 06:28hrs, 220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 tripped on Y-N phase to earth fault. Fault sensed in zone-1, fault current Iy=~4.9kA and fault distance was 0.8km from Hiranagar end (Exact reason of fault yet to be recieved). iii)At the same time, 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2 also tripped from Hiranagar(J&K) end on overcurrent protection operation. iv)220 KV Samba(PG)-Hiranagar(PDD) (PG) Ckt-1 tripped from both ends(Samba and Hiranagar) and 220 KV Samba(PG)-Hiranagar(PDD) (PDD JK) Ckt-2 tripped from Hiranagar end only. v)As per PMU at Samba(PG), Y-N phase to earth followed by R-B phase to phase fault with fault clearing time of 80 msec is observed. vi)As per SCADA, load loss of approx. 360MW in J&K control area is observed. However, as per SLDC J&K, approx. 100MW load loss is observed in J&K control area.	0	2.168	0	100	0.000	0.136	55820	73692	80
17	GI-1	1)220/132kV 200MVA ICT-1 at Kunihar(HP) 2)220/132kV 200MVA ICT-2 at Kunihar(HP) 3)220kV Kunihar-Jeori (HP) ckt 4)220 kV Baddi-Upper Nangal(HP) Ckt	Himachal Pradesh	HPPTCL	14-Jun-24	23:16	14-Jun-24	23:32	00:16	i)220/132kV Kunihar(HP) S/s has double main Bus arrangement at 220kV side. ii)During antecedent condition, incoming power at Kunihar S/s was 365 MW through 220kV Kunihar-Jeori (HP) ckt (~192 MW) and 220kV Kunihar-Bhaba (HP) ckt (~173 MW). Outgoing power from Kunihar(HP) was 110MW through 220kV Kunihar-Baddi (HP) D/C and loading on 220/132kV 200MVA transformer bank-1 & 2 at Kunihar(HP) was 272MW (as reported). 220/132kV 100MVA transformer bank-3 was not in service. iii)As reported, at 23:16 hrs, 220/132kV 200MVA transformer bank-1 at Kunihar(HP) tripped on R-N phase to earth fault. Fault occurred due to burst of R-phase CT (Type of proection operated yet to be recieved). iv)As per PMU, R-N phase to earth fault is observed with fault clearing time of 80ms. v)At the same time, due to tripping of 220/132kV 200MVA transformer bank-1, the complete load shifted to 220/132kV 200MVA transformer bank-2 and the transformer-2 tripped due to overloading. vi)As reported, at the same time, 220kV Kunihar-Jeori (HP) ckt tripped on overvoltage protection operation (line voltage shoot upto 270kV). (HP has been communicated to share the voltage protection settings at Kunihar(HP) S/s) vii)During the same time, 220 kV Baddi-Upper Nangal(HP) Ckt also tripped (exact reason of tripping yet to be received). viii)As per SCADA, total change in demand of approx. 296MW in HP control area is observed.	0	0.079	0	296	0.000	0.370	58688	80098	80
18	GI-1	1)220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-1 2)220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-2 3)220 kV Baddi-Upperla Nangal(HP) Ckt 4)220kV Baddi-Kunihar (HP) ckt-2	Himachal Pradesh	HPPTCL, HVPNL	16-Jun-24	15:56	16-Jun-24	16:15	00:19	i)220/66kV Baddi(HP) has double main bus arrangement at 220kV side. ii)As reported, at 15:56 hrs, R-Y phase to phase fault occurred on 220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-2 at a distance of 1.4km from Baddi(HP) end with fault current Ir=~13.5kA & Iy=~ 13.9kA (As per DR). 220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-2 tripped on zone-1 distance protection operation from Baddi(HP) end (As per DR). (Relay flags not received from Pinjore end). iii)As per PMU at Panchkula(PG), R-Y phase to phase fault with fault clearance time of 120msec is observed. iv)At the same time, 220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-1, 220 kV Baddi-Upperla Nangal(HP) Ckt & 220kV Baddi-Kunihar (HP) ckt also tripped. As per DRs from Baddi(HP) end, 220kV Baddi(HP)-Pinjore(HV) (HPPTCL) Ckt-1 & 220 kV Baddi-Upperla Nangal(HP) Ckt tripped on master trip relay operation (exact details of protection operated in these lines yet to be received). v)As per SCADA, change in demand of approx. 240MW in HP control area is observed.	0	0.076	0	240	0.000	0.285	65695	84229	120
19	GI-2	1)400/220 kV 315 MVA ICT 1 at Kankani(RS) 2)400/220 kV 500 MVA ICT 2 at Kankani(RS)	Rajasthan	RVPNL	16-Jun-24	18:20	16-Jun-24	19:38	01:18	i)400/220kV Kankani(RS) has one and half breaker bus arrangement at 400kV side. ii)During antecedent condition, the loading of 400/220 kV 315 MVA ICT-1 and 400/220 kV 500 MVA ICT-2 at Kankani(RS) was approx. 223 MW and 341 MW respectively (As per SCADA). iii)As reported, at 18:20hrs, 400/220 kV 500 MVA ICT-2 at Kankani(RS) tripped on master trip relay maloperation due to issue in control cables (exact reason of tripping yet to be received). iv)Due to tripping of 400/220 kV 500 MVA ICT-2, complete load of ICT-2 shifted to 400/220 kV 315 MVA ICT-1 at Kankani(RS) which led to tripping of 400/220 kV 315 MVA ICT-1 on overloading. v)As per PMU at Jodhpur(RS), voltage fluctuation is observed in the system and no fault is observed. vi)As per SCADA, change in demand of approx. 319 MW in Rajasthan control area is observed.	0	0.415	0	319	0.000	0.433	54344	73690	NA
20	GD-1	1)220 KV Phozal(HP)-Nallagarh(PG) (ADHPL) Ckt 2)220 KV AD hydro(AD)-Nallagarh(PG) (ADHPL) Ckt 3)96MW Unit-1 at AD hydro(AD) 4)96MW Unit-1 at AD hydro(AD)	Himachal Pradesh	PGCIL, ADHPL, HPPTCL	17-Jun-24	18:25	17-Jun-24	18:57	00:32	i)During antecedent condition, 96 MW Unit-1 & 2 at ADHPL(IP) were generating approx. 105 MW and 104 MW respectively as per SCADA. ii)As reported, at 18:25 hrs, due to inclement weather condition, 220KV Phozal(HP)-Nallagarh(PG) (ADHPL) Ckt tripped on Y-B-N double phase to earth fault with fault distance of 86.4km from Nallagarh(PG) end. As per DR, fault sensed in zone-1 with fault current of Iy=~2.2kA & Ib=~3.4kA at Nallagarh(PG) end. iii)As reported, at the same time, due to inclement weather condition, 220KV AD hydro(AD)-Nallagarh(PG) (ADHPL) Ckt tripped on Y-N phase to earth fault with fault distance of 176km and 75.5km from Nallagarh(PG) and AD hydro(IP) end respectively. As per DR, zone-1 distance protection operated from both ends with fault current of Iy=~1.7kA & Iy=~1.6kA at Nallagarh(PG) and AD hydro(IP) end. From Nallagarh(PG) end, line successfully reclosed which shows the transient nature of the fault. A/R didn't operate at AD hydro(IP) end (Proper functioning of A/R at AD hydro(IP) end need to ensured). iv)As per PMU at Nallagarh(PG), Y-B phase to phase fault with fault clearing time of 80ms is observed. v)Due to tripping of 220 KV Phozal(HP)-Nallagarh(PG) (ADHPL) Ckt and 220 KV AD hydro(AD)-Nallagarh(PG) (ADHPL) Ckt, island formed with 96MW Unit-1 & 2 at AD hydro(AD) and 220 KV AD hydro(AD)-Phozal(HP) (ADHPL) Ckt and generation-load imbalance occurred. After this, 96MW Unit-1 & 2 at AD hydro(AD) tripped due to over-speeding. vi)After tripping of 96MW Unit-1 & 2 at AD hydro(AD), 220 KV AD hydro(AD)-Phozal(HP) (ADHPL) Ckt got de-energized and complete blackout occurred at 220kV ADHPL(IP). vii)As per SCADA, no change in demand in Himachal Pradesh control area and generation loss of approx. 208 MW during the event at ADHPL(IP).	0	0	208	0	0.357	0.000	58300	79666	80

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)	
21	GD-2	1)765 KV Hapur(UP)-Rampur_PRSTL (UP) (GTL) Ckt-1 2)765 KV Aligarh(PG)-SIKAR_2 (PASTL) Ckt-1 & 2 3)800 KV HVDC Kurukshetra(PG) Pole-1, 2, 3 & 4 4)132 KV Mahendra Nagar(PG)-Tanakpur(NH) (PG) Ckt-1 5)250 MW Karcham Wangtoo HPS - UNIT 2 & 4 6)765 KV Jhatikara-Aligarh (PG) Ckt-1 7)765 KV Koteshwar-Meerut (PG) Ckt-2 8)765 KV Orai-Aligarh (PG) Ckt-1 & 2 9)400 KV Mahindergarh(APL)-Dhanoda(HV) (ATIL) Ckt-1 & 2 10)400 KV Mahindergarh(APL)-Bhiwani(PG) (PG) Ckt-3 11)765 KV Agra-Aligarh (PG) Ckt-1 12)765 KV Rampur_PRSTL -Ghatampur_TPS (UP) Ckt-1 13)250 MW Panipat TPS - UNIT 8 14)400 KV Koteswar(TH)-Koteshwar(PG) (PG) Ckt-1 15)765 KV Koteshwar-Meerut (PG) Ckt-1 16)400 KV Kishenpur-Moga (PG) Ckt-1 & 2 17)765 KV Kanpur_GIS-Aligarh (PG) Ckt-1 18)135 MW Rajwest (IPP) LTPS - UNIT 1 19)220 KV Baddi(HP)-Pinjore (HV) (HPPTCL) Ckt-2	Haryana, Punjab, UP, Delhi, J&K, HP, Chandigarh, Uttarakhand & Rajasthan	PGCIL, UPPTCL, NHPC, JSW, APL, THDC, HVPNL, HPPTCL	17-Jun-24	13:53	17-Jun-24	14:32	00:39	i)At 13:53 Hrs Northern Region demand experienced a dip of around ~16,500 MW. The incident occurred immediately after tripping of 4 poles of HVDC Champa – Kurukshetra which was carrying ~4500MW from the Western Region to Northern Region. Further 765/400kV Aligarh (PGCIL) station faced major outages and 5 Nos. of 765 kV lines from Aligarh PG tripped. ii)The frequency post event rose to 50.68 Hz from 50.03 Hz. iii)Loads were restored progressively starting 14:30 hrs. Loads were gradually restored considering low voltages and high loading on 765 KV Agra-Gwalior lines. System load was restored to normal levels by 15.00 hrs. iv)In the Northern Region hydro generating units tripped at Bhakra, Karcham, Sainj, RSD (Total-1237 MW). Thermal generating units tripped at Lalitpur, Rajwest, Unchahar, Panipat (Total-1250 MW). v)Northern Region Renewable Generation (Solar) of 2800 MW approx. was also affected, however 1500 MW was generation was restored with 04 minutes. vi)Apart from above, there was no load loss reported from other regions of the country; however, tripping of 02 generation units in the Western Region (Mahan Energen – 2x600 MW) and 02 modules of OLTC Palatana (approx. 700 W) in the North Eastern Region were reported, all of which has since been revived.	0	0	5240	16500	7.089	18.454	73922	89410	NA
22	GI-1	220kV Agra2-Agra1 (UP) Ckt 132KV Agra2-railway TSS (patholi) Ckt 1 220/132kV 160MVA ICT-1 at Agra2(UP) 220/132kV 160MVA ICT-2 at Agra2(UP) 220/132kV 100MVA ICT-3 at Agra2(UP)	Uttar Pradesh	UPPTCL	18-Jun-24	01:04	18-Jun-24	01:40	00:36	i)220kV Agra2(UP) (220kV Sikandra, Agra(UP)) has double main and transfer bus scheme at 220kV level and main and transfer bus scheme at 132kV level. ii)During antecedent condition, loading of 220/132kV 160MVA ICT-1 & 2 and 220/132kV 100MVA ICT-3 at Agra2(UP) were 83 MW, 83 MW and 47 MW respectively. iii)As reported, at 01:04 hrs, 132KV Agra2-railway TSS (patholi) Ckt 1 tripped on B-N phase to earth fault from Agra2(UP) end. Fault distance was 0.4km and zone-1 distance protection operated from Agra2(UP) end. iv)As per PMU at Agra(PG), Y-N phase to earth fault with delayed fault clearance time of 640ms is observed (phase sequence issue). v)As reported, at the same time, due to delayed fault clearance, 220/132kV 160MVA ICT-1 & 2 and 220/132kV 100MVA ICT-3 also tripped on overcurrent protection operation. vi)During the same time 220kV Agra2-Agra1 (UP) ckt also tripped from 400kV Agra1(UP) end (exact reason of tripping yet to be received). vii)Due to tripping of 220/132kV 160MVA ICT-1 & 2 and 220/132kV 100MVA ICT-3, other 132kV feeders and 132/33kV 63MVA ICT-4 & 5 became dead. viii) As per SCADA, change in demand of approx. 196 MW in UP control area. However, SLDC-UP reported 146MW load loss.	0	0.088	0	146	0.000	0.178	59894	81806	640
24	GD-1	1)400 KV Anta-Kalisindh (RS) Ckt-2 2)600 MW Kalisindh TPS - UNIT 1 3)600 MW Kalisindh TPS - UNIT 2	Rajasthan	RVPNL, RVUNL	18-Jun-24	23:03	19-Jun-24	10:09	11:06	i)400/220kV Kalisindh(RS) has one and half breaker scheme at 400kV level and double main transfer bus scheme at 220kV level. ii)During antecedent condition, generation of 600 MW Kalisindh TPS – UNIT-1 & 2 were 551 MW & 568 MW respectively. This total power was evacuating through 400 KV Anta-Kalisindh (RS) Ckt-2 (~869MW) and 400/220kV 315 MVA ICT (~180MW). 220kV Jhalawar D/C was connected from 400/220kV 315 MVA ICT. 400 KV Anta-Kalisindh (RS) Ckt-1 was not in service (forced outage on R-N phase to earth fault from 18:16 hrs (18/06/2024)). iii)As reported, at 23:03hrs, due to heavy rain and stormy weather condition, 400 KV Anta-Kalisindh (RS) Ckt-2 tripped on R-Y phase to phase fault with fault distance of 19.98km and 52.87km from Anta and Kalisindh end respectively. From both ends zone-1 distance protection operated. Faults currents were Ir=~14kA & Iy=~15.3kA (As per DR) and Ir=~4.3kA & Iy=~2.9kA from Anta and Kalisindh end respectively. iv)As per PMU at Ajmer(PG), R-Y phase to phase fault with fault clearing time of 120msec is observed. v)Due to tripping of 400 KV Anta-Kalisindh (RS) Ckt-2, island formed with 600 MW Unit-1 & 2 at Kalisindh TPS(RS) and 220 KV Kalisindh-Jhalawar D/C and generation-load imbalance occurred. After this, 600 MW Unit-1 & 2 at Kalisindh TPS(RS) tripped due to over-speeding. vi)After tripping of 600 MW Unit-1 & 2 at Kalisindh TPS(RS), 400/220kV 315 MVA ICT and 220 KV Kalisindh-Jhalawar D/C got de-energized and complete blackout occurred at 400/220kV Kalisindh(RS). vii)As per SCADA, no change in demand is observed in Rajasthan control area. However, approx. 180 MW load loss is reported by SLDC- Rajasthan. viii) As per SCADA, loss in generation of approx. 1057 MW at Kalisindh TPS is observed. However, SLDC- Rajasthan reported approx. 1119 MW generation loss at Kalisindh TPS(RS).	0	1.998	0	180	0.000	0.219	61172	82109	120
23	GI-2	1.135 MW Rajwest (IPP) LTPS - UNIT 2 2.135 MW Rajwest (IPP) LTPS - UNIT 4 3.135 MW Rajwest (IPP) LTPS - UNIT 5 4.135 MW Rajwest (IPP) LTPS - UNIT 6 5.135 MW Rajwest (IPP) LTPS - UNIT 8	Rajasthan, Uttar Pradesh & Punjab	RVUNL	19-Jun-24	12:42	19-Jun-24	14:20	01:38	i)During antecedent condition, low voltage scenario was prevailing in mainly Rajasthan, Delhi and UP control area. As per SCADA, voltage at 400kV Bikaner(RS), Bhadla(RS), Bhinmal(RS) and Kankani(RS) were 377kV, 382kV, 379kV and 375kV respectively. ii)As per PMU at Bhadla(PG), at 12:42:03:760 hrs, 3-phase to ground fault ia observed with fault clearing time of (exact location of the fault yet to be shared). Voltage dipped upto 0.835 p.u. at Bhadla(PG). iii)As per SCADA, total NR RE generation drop/loss was approx. 4930MW (ISTS Solar: ~3490 MW, Rajasthan Solar: ~843 MW, Rajasthan Wind: ~597 MW). iii)As per SCADA, total change in demand of approx. 1215 MW (Punjab: ~730 MW, UP: ~180 MW, Rajasthan: ~305 MW) is observed in NR control area. iv)As per PMU at Bassi(PG), frequency dropped by 0.409Hz (from 50.062 Hz to 49.653 Hz) due to significant dip in RE generation. Frequency recovered upto 49.865 Hz within 1 minute. v)As per details received from SLDCs, total load relief of approx. 1050 MW observed in NR region (Punjab: ~723 MW, UP: ~220MW, Rajasthan: ~107 MW) on df/dt operation. vi)Due to significant dip in RE generation (as RE generation failed to recover 90% of pre-fault active power within 1 sec and further inverters tripping on OV, LVRT/HVRT Non-compliant), over voltage (1.075pu at 400kV Bhadla(PG)) scenario occured immediately after the fault. vii)At the same time, 135 MW Rajwest (IPP) LTPS - UNIT 2, 4, 5, 6 and 8 also tripped due to "sudden change in speed protection" in turbine operated (protection logic: if 2 out of 3 sensors in turbine senses change in speed more than 20 rpm within 10ms then it sends tripping signal to turbine), as reported (further details yet to be received). viii)As per SCADA, generation loss of approx. 600 MW occurred at Rajwest(RS) LTPS.	0	0	5530	1050	7.440	1.167	74323	89938	80
25	GI-1	1)220 KV Safidon-Jind (HV) Ckt-1 2)220 KV Safidon-Mund (HV) Ckt-1 3)220 KV Safidon-Mund (HV) Ckt-2 4)220 KV Safidon-PTPS (HV) Ckt-1 5)220/132kV 100MVA ICT-2 at Safidon(HV) 6)220 KV Jind(PG)-Mund (HV) (HVPNL) Ckt-1 7)220 KV Jind(PG)-Mund (HV) (HVPNL) Ckt-2 8)220 kV Mund-IOCL (HV) Ckt-1	Haryana	PGCIL,HVPNL	19-Jun-24	22:05	19-Jun-24	22:35	00:30	i)220/132kV Safidon(HV) has double mail bus scheme at 220kV side. ii)During antecedent condition, 220kV lines from Safidon(HV) to Jind(HV) ckt-1, Mund(HV) ckt-1 & 2, PTPS(HV) ckt-1 & 220/132kV 100MVA ICT-2 connected to 220kV Bus-1 and 220kV lines from Safidon(HV) to Jind(HV) ckt-2, PTPS(HV) ckt-2 & 3 and 220kV 160MVA ICT-1 & 3 were connected to 220kV Bus-2 at Safidon(HV). iii)As reported, at 22:05 hrs, due to inclement weather, 220kV Safidon-Mund (HV) ckt-1 & 2 tripped on B-N phase to earth fault (Ib=~4.5kA) and R-Y-B three phase fault (Ir=~4.7kA, Iy=~2.3kA, Ib=~4.5kA) with fault distance of 24.5km and 36.3km respectively from Safidon(HV) end. Zone-2 distance protection operated for the lines from Safidon(HV) end. iv)As per PMU at Jind(PG), R-B phase to phase fault converted into R-Y-B three phase fault with fault clearing time of 680msec is observed. v)At the same time, due to high fault current, sparking occurred in bay (isolator) of 220kV Safidon-Mund (HV) ckt-1 & 2 at Safidon(HV) end due to which bus bar protection operated and all elements connected to 220kV Bus-1 (220kV lines to PTPS ckt-1, Jind ckt-1 and 220/132kV 100MVA ICT-2) tripped at Safidon(HV) S/s. vi)At the same time, due to inclement weather condition, 220 KV Jind(PG)-Mund (HV) (HVPNL) Ckt-1 & 2 also tripped. 220 KV Jind(PG)-Mund (HV) (HVPNL) Ckt-2 tripped on B-N phase earth fault with fault current of 1.9kA from Mund(HV) end. (type of protection operated and reason for tripping of 220 KV Jind(PG)-Mund (HV) (HVPNL) Ckt-1 yet to be received). vii)As per SCADA, 447 MW load loss is observed in Haryana control area. However, 86MW load loss is reported by SLDC-Haryana	0	0.043	0	86	0.000	0.112	58638	76643	680
26	GD-1	1)220 KV BTPSL_SL_BIK2_PG-Bikaner_2 (PBTSL) (BANDERWALA_TPSL) Ckt 2)400/220 kV 500 MVA ICT 1 at Bikaner_2 (PBTSL) 3)400/220 kV 500 MVA ICT 2 at Bikaner_2 (PBTSL)	Rajasthan	PGCIL, TPSL	20-Jun-24	22:59	21-Jun-24	05:54	06:55	i)400/220kV Bikaner-2(PG) one and half breaker bus arrangement at 400kV side and double main & transfer bus arrangement at 220kV side. ii)During antecedent condition, no power generation at 220kV sub-stations connected from 400/220 kV 500 MVA ICT 1 & 2 at Bikaner-2(PG) (Grain Energy, Prerak Green & TP Saurya Banderwala). So loading of ICT-1 & 2 was approx. 0 MW at Bikaner-2(PG). 400/220kV 500 MVA ICT-3 and 220kV line to Serentica at Bikaner-2(PG) were not in service. iii)As reported, at 22:59hrs, due to inclement weather condition, 220 KV BTPSL_SL_BIK2_PG-Bikaner_2 (PBTSL) (BANDERWALA_TPSL) Ckt tripped on Y-N phase to earth fault. Fault distance was 5km and fault current was Iy=~16kA from Bikaner-2(PG) end. Zone-1 distance protection operated from Bikaner-2(PG) end. iv)As per PMU at Bikaner-2(PG), Y-N phase to earth fault is observed with fault clearing time of 80ms. v)As per SCADA SOE, during the dead time period of tripping of 220 KV BTPSL_SL_BIK2_PG-Bikaner_2 (PBTSL) (BANDERWALA_TPSL) Ckt, 400/220 kV 500 MVA ICT-1 & 2 at Bikaner-2(PG) also tripped due to Restricted earth fault protection operation. Through fault current of magnitude ~8kA fed by both the ICTs. Spill current of magnitude ~100mA was observed during the event while REF pickup current setting is 50mA for both the ICTs at Bikaner-2(PG) (As reported). vi)As 400/220 kV 500 MVA ICT-1 & 2 at Bikaner-2(PG) tripped, 220kV lines from Bikaner-2(PG) to Grain Energy, Prerak Green & TP Saurya Banderwala became dead and the respective sub-stations got blackout. vii)As per SCADA, no change in demand in Rajasthan control area and no generation loss is observed. viii) As per remedial action, stabilizing resistor value revised from 600 ohms to 915 ohms.	0	0	0	0	0.000	0.000	57173	77776	80
27	GI-1	1)220/33kV 100MVA ICT-3 at Park Street(DTL) 2)220/33kV 100MVA ICT-4 at Park Street(DTL)	Delhi	DTL	20-Jun-24	12:29	21-Jun-24	14:06	01:37	i)220/66kV Park Street(DTL) has double main Bus arrangement at 220kV side. ii)As reported, at 12:29 hrs, 33kV Park Street-Baird ckt-2 tripped on fault on the same line (nature, reason and location of fault yet to be received). iii)As per PMU at Maharani Bagh(PG), R-Y-B three phase fault is observed with fault clearing time of 120msec respectively. iv)As reported, at the same time, 220/33kV 100MVA ICT-3 & 4 also tripped at Park Street(DTL). ICT-3 tripped on Buchholz relay operation and ICT-4 tripped on opening of incomer due to damage in B-phase pole of ICT-4 CB (exact reason of tripping of both ICTs yet to be received). v)As per SCADA, change in demand of approx. 219 MW is observed in Delhi control area.	0	0.354	0	219	0.000	0.265	71717	82570	120
28	GI-1	1)220 KV KSTPS-Ranpur (RS) ckt 2)220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 3)220 KV KSTPS-Kota Sakatpura (RS) ckt-3 4)110 MW Unit-1 at KTPS(RS) 5)210 MW Unit-3 at KTPS(RS) 6)210 MW Unit-4 at KTPS(RS) 7)210 MW Unit-5 at KTPS(RS) 8)195 MW Unit-7 at KTPS(RS) 9)220 KV Duni(RS)-Kota(PG) (RS) Ckt	Rajasthan	RVPNL, RVUNL, PGCIL	21-Jun-24	11:37	21-Jun-24	13:29	01:52	i)220kV KTPS(RS) has double main Bus arrangement at 220kV side. ii)During antecedent condition, power generation of 110 MW Unit-1 & 2, 210 MW Unit-3, 4 & 5 and 195 MW Unit-6 & 7 were 81MW, 95MW, 174MW, 150MW, 167MW, 171MW & 172MW respectively. 210 MW Unit-5, 220 KV KSTPS-Kota Sakatpura (RS) ckt-3 & station transformer (ST)-3 were connected to 220kV Bus-3 and 195 MW Unit-7 and 220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 were connected to 220kV Bus-5 at KTPS(RS). 220kV Bus-3 and Bus-5 were coupled through isolator only. iii)As reported, at 11:37hrs, due to inclement weather conditions, 220 KV KSTPS-Ranpur (RS) ckt tripped on R-Y phase to phase fault at a distance of 12.49km from KTPS(RS) end. Zone-1 distance protection operated from both ends. As per PMU, R-N followed by Y-N phase to earth fault is observed with fault clearing time of 120ms and 120ms. iv)As reported, at 11:39hrs, due to inclement weather conditions, 220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1 tripped on B-N phase to earth fault (Ib=~ 14.1kA & Ib=~11.7kA from Kota(PG) and KTPS(RS) ends respectively) at a distance of 2.96km from Kota(PG) end. Zone-1 distance protection operated from Kota(PG) end. However, B-phase CB pole lagged in opening while clearing the fault from KTPS(RS) end which led to LBB protection operation at KTPS(RS). As per PMU, B-N phase to earth fault with delayed fault clearing time of 320msec is observed. v)Sine 220kV bus-3 & bus-5 were coupled through isolator only, due to LBB operation all elements connected to 220kV bus-3 & bus-5 tripped (210 MW Unit-5, 220 KV KSTPS-Kota Sakatpura (RS) ckt-3, ST-3, 195 MW Unit-7 and 220 KV Kota(PG)-KTPS(RVUN) (RS) Ckt-1). vi)Due to tripping of ST-3, auxiliary supply of 110 MW Unit-1 and 210 MW Unit-3 & 4 disrupted which led to tripping of Unit-1, 3 & 4 at KTPS(RS) vii)At the same time, 220 KV Duni(RS)-Kota(PG) (RS) Ckt also tripped on R-N phase to earth fault (Ir=~21kA & Ir=~1.3kA from Kota(PG) and Duni(RS) end respectively) with fault distance of 75.2km from Kota(PG) end. Fault sensed in zone-1 from both ends. As per PMU, multiple R-N phase to earth fault with fault clearing time of 120ms, 120ms and 80ms. viii)As per SCADA, no change in demand in Rajasthan control area is observed. ix) As per SCADA, approx. 714 MW generation loss at KTPS(RS). However, 744 MW generation loss at KTPS(RS) is reported by SLDC-Rajasthan. x)As reported, the case for installation of bus coupler CB between 220kV Bus-3 and Bus-5 at KTPS(RS) is under process.	0	0	0	744	0.000	0.912	66360	81554	320
29	GD-1	1)220 KV Nallagarh(PG)-Mohali(PS) (PS) Ckt-1 2)220 KV Nallagarh(PG)-Mohali(PS) (PS) Ckt-2 3)220 KV Ganguwal(BB)-Majra(PS) (PS) Ckt	Punjab	BBMB, PSTCL, PGCIL	21-Jun-24	10:38	21-Jun-24	11:24	00:46	i)220/66kV Mohali(PS) and 220/66kV Majra(PS) S/s have double main bus arrangement at 220kV side. ii)During antecedent condition, 220kV lines from Mohali(PS) to Nallagarh(PG) D/C, Majra(PS), Mohali2(PS), 220/66kV 160 MVA ICT-1 & 220/66kV 100 MVA ICT-2 were connected to 220kV Bus-1 and 220kV lines from Mohali(PS) to Rajpura D/C, GGSTP, Khrah, Derab, Ganguwal & 220/66kV 160MVA ICT-3 were connected to 220kV Bus-2 at 220kV Mohali(PS) S/s. 220kV bus coupler was in open condition at Mohali(PS) S/s. Incoming power at 220kV Bus-1 Mohali(PS) was only through 220 KV Nallagarh(PG)-Mohali(PS) (PS) D/C and 220kV Mohali-Majra (PS) ckt and incoming power at Majra(PS) was only through 220 KV Ganguwal(BB)-Majra(PS) (PS) Ckt. iii)As reported, at 10:38 hrs, 220 KV Nallagarh(PG)-Mohali(PS) (PS) D/C tripped only from Nallagarh(PG) end on receiving DT from Mohali(PS) end (exact reason for DT received at Nallagarh(PG) end yet to be received). iv)As per PMU at Nallagarh(PG), fluctuation in voltage, no fault is observed in the system. v)As 220 KV Nallagarh(PG)-Mohali(PS) (PS) D/C tripped, the complete load which connected to 220kV Bus-1 Mohali(PS) shifted to 220kV Mohali-Majra (PS) ckt due to which 220 KV Ganguwal(BB)-Majra(PS) (PS) Ckt tripped on overcurrent protection operation due to overloading. vi)Due to tripping of 220 KV Nallagarh(PG)-Mohali(PS) (PS) D/C and 220 KV Ganguwal(BB)-Majra(PS) (PS) Ckt, all elements connected to 220kV Bus-1 at Mohali(PS) S/s (220kV lines from Mohali(PS) to Majra(PS), Mohali2(PS), 220/66kV 160 MVA ICT-1 & 220/66kV 100 MVA ICT-2) and complete 220kV Majra(PS) S/s became dead. This resulted into blackout of 220/66kV Majra(PS) S/s. vii)As per SCADA, load loss of approx. 320 MW in Punjab Control area.	0	0.245	0	320	0.000	0.400	63575	80089	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)	
30	GD-1	1)220/33kV 100MVA ICT-1 at Naraina(DTL) 2)220/33kV 100MVA ICT-2 at Naraina(DTL) 3)220/33kV 100MVA ICT-3 at Naraina(DTL)	Delhi	DTL	21-Jun-24	00:54	21-Jun-24	01:34	00:40	i)220/66kV Naraina(DTL) has double main bus arrangement at 220kV side. ii)As reported, at 00:54 hrs, 220/33kV 100MVA ICT-1, 2 and 3 at Naraina(DTL) tripped on O/C protection operation due to B-Ph cable end terminal of 33kV Bus-2 damaged at Naraina(DTL). iii)Due to tripping of all the three ICTs at Naraina(DTL), complete blackout occurred at 220/33kV Naraina(DTL) S/s. iv)As per PMU at Dwarka(PG), B-N phase to earth fault converted to 3-phase to earth fault is observed with delayed fault clearing time of 600 ms. v)As per SCADA, change in demand of approx. 360 MW is observed in Delhi control area. As reported by SLDC-Delhi, load loss of approx. 173 MW occurred.	0	0.115	0	173	0.000	0.227	56253	76070	600
31	GI-2	1)800 kV HVDC Kurukshetra(PG) Pole-01 2)800 kV HVDC Kurukshetra(PG) Pole-03	Haryana and Punjab	PGCIL	23-Jun-24	09:11	23-Jun-24	10:24	01:13	i)During antecedent condition, 800kV HVDC Champa-Kurukshetra was carrying total 5687 MW (approx. 1415 MW, 1425 MW, 1426 MW and 1421 MW by Pole 1, 2, 3 and 4 respectively). ii)As reported at 09:11 hrs, 800 kV HVDC Kurukshetra (PG) Pole-01 blocked on T-zone protection operation at Kurukshetra end. Noise in Ihl current of Pole-1 Lane-1 led to latching of T-zone protection. iii)During the same time, 800 kV HVDC Kurukshetra (PG) Pole-03 also blocked on CAT-B sequence initiated by parallel Pole-01 due to latching of T-zone protection. iv)As further reported, sequence of event is as follows: a.09:11:46:724 hrs –Pole-1 Lane 1 Main 1 & 2 T-zone Latched. b.09:11:46:727 hrs–CAT-B latched in Pole-1 due to T-zone Protection. c.09:11:46:728 hrs– CAT-B latched in Pole-3 due to T-zone Protection in Pole-1. v)Due to tripping of two poles (Pole-01 and Pole-03), power order reduced from 5687 MW to 2683 MW. vi)As per PMU, no fault is observed in the system. However, fluctuation in voltage was observed. vii)At the same time, df/dt protection operated in Punjab which led to load throw-off of approx. 880 MW (details of df/dt operation at Punjab is attached in Annexure). viii)As per SCADA, change in demand of approx. 610MW is observed in Punjab control area.	0	0	0	880	0.000	1.208	58647	72828	NA
32	GI-1	1)220KV Tughlakabad- BTPS (DTL) Ckt-1 2)220KV Tughlakabad- BTPS (DTL) Ckt-2 3)220KV Tughlakabad-Okhla (DTL) Ckt-1 4)220KV Tughlakabad-Okhla (DTL) Ckt-2 5)220KV Tughlakabad-Masjid Moth (DTL) Ckt-1	Delhi	DTL	23-Jun-24	15:35	23-Jun-24	16:15	00:40	i)400/220/66kV Tughlakabad(DTL) has one and half bus arrangement at 400kV side and double main bus arrangement at 220kV side. 220KV Tughlakabad- BTPS (DTL) D/C and 220KV Tughlakabad-Okhla (DTL) D/C have common towers up to some distance. ii)As reported, at 15:35 hrs, 220KV Tughlakabad- BTPS (DTL) D/C and 220KV Tughlakabad-Okhla (DTL) D/C tripped on R-Y-B three phase fault. Optical ground wire (OPGW) broke down and fell on the mentioned lines which caused multiple R-Y-B three phase faults (type of protection operated and location of fault yet to be received). iii)As per PMU at Maharani Bagh(PG), multiple R-Y-B three phase faults are observed with delayed fault clearance time of 400msec. iv)At the same time 220KV Tughlakabad-Masjid Moth (DTL) Ckt-1 also tripped from Masjid Moth(DTL) end (exact reason of tripping and type of protection operated yet to be received). v)As per SCADA, change in demand of approx. 312 MW is observed in Delhi control area.	0	0.208	0	312	0.000	0.395	63584	79056	400
33	GD-1	1.220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-1 2.220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 3.220 KV Subzimandi-Gopalpur(DTL) Ckt-1 4.220 KV Subzimandi-Gopalpur(DTL) Ckt-2 5.220/33kV 100MVA ICT-1 at Gopalpur(DTL) 6.220/66kV 100MVA ICT-2 at Gopalpur(DTL) 7.220/33kV 100MVA ICT-3 at Gopalpur(DTL) 8.220/66kV 160MVA ICT-4 at Gopalpur(DTL)	Delhi	PGCIL, DTL	27-Jun-24	09:48	27-Jun-24	10:39	00:51	i)220kV Gopalpur(DTL) has double main Bus arrangement at 220kV side. ii)During antecedent condition, 220kV lines from Gopalpur(DTL) to Mandaula(PG) ckt-1, South Wazirabad ckt-2, Subzimandi ckt-2 and 220/66kV 100MVA ICT-2 & 220/66kV 160MVA ICT-4 were connected to 220kV Bus-1 and 220kV lines from Gopalpur(DTL) to Mandaula(PG) ckt-2, South Wazirabad ckt-1, Subzimandi ckt-1 and 220/33kV 100MVA ICT-1 & 3 were connected to 220kV Bus-2 at Gopalpur(DTL) S/s. 220kV lines from Gopalpur(DTL) to South Wazirabad D/C and Subzimandi ckt-2 were not in service. 220kV Gopalpur-Mandola Ckt-1 & 2 were feeding the load of 220kV Gopalpur(DTL) S/s and further connected to 220kV Subzimandi(DTL) S/s through 220kV Gopalpur-Subzimandi ckt-1 & 2. iii)As reported, at 09:48 hrs, B-N phase to earth fault occurred on 220kV Bus-2 with fault current of approx. 7kA which caused bus bar protection operation at 220 kV Bus-1 & 2 at Gopalpur(DTL) (exact reason of fault and reason for bus bar protection on 220kV bus-1 yet to be shared). iv)Due to this, all the elements connected to 220kV Bus-1 and Bus-2 tripped along with the 220kV bus coupler at Gopalpur(DTL). But 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 didn't trip from Gopalpur(DTL) end, it tripped from Mandaula(PG) end only. v)As reported, Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 didn't trip from Gopalpur end due to non-availability of bus isolator status in bus bar protection relay. vi)As per DR at Mandaula(PG) end, 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-1 tripped from Gopalpur(DTL) end only with fault current of ~5.9kA from Mandaula(PG) end; fault sensed in zone-3 from Mandaula(PG). vii)As per DR at Mandaula(PG) end, 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 tripped from Mandaula(PG) end only with fault current of ~7.4kA and fault distance of 27.5 km from Mandaula(PG) end (as reported); fault sensed in zone-2 from Mandaula(PG). viii)As 220KV Mandola(PG)-Gopalpur(DTL) (DTL) D/C tripped, Gopalpur(DTL) and Subzimandi(DTL) lost their connectivity from grid which led to blackout of 220kV Gopalpur(DTL) S/s and 220kV Subzimandi(DTL) S/s. ix)As per PMU at Mandaula(PG), B-N phase to earth fault is observed with delayed fault clearing time of 280msec respectively. x)As per SCADA, change in demand of approx. 123 MW is observed in Delhi control area. However, 214 MW load loss is reported by SLDC-Delhi. xi)As per remedial action taken, the bus isolator status of Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 at Gopalpur(DTL) S/s has been set corrected in bus bar protection relay.	0	0.182	0	214	0.000	0.333	57905	64327	280
34	GI-2	1) 800 kV HVDC Kurukshetra(PG) Pole-01 2) 800 kV HVDC Kurukshetra(PG) Pole-02 3) 800 kV HVDC Kurukshetra(PG) Pole-03 4) 800 kV HVDC Kurukshetra(PG) Pole-04	Haryana	PGCIL	27-Jun-24	21:17	27-Jun-24	21:54	00:37	i)During antecedent condition, 800 kV HVDC Kurukshetra(PG) Pole-1, 2, 3 & 4 were carrying 1125 MW each and hence total 4500 MW power was flowing from Champa to Kurukshetra. ii)As reported at 21:17 hrs, 800 kV HVDC Kurukshetra (PG) Pole-2 & 4 blocked on CLD HV Cable Protection and Pole-1 & 3 blocked on latching of SYS Fail in Pole-3. iii)Pole-4 Lane-2 (M1 & M2) went into fault due to latching of major fault without reporting any further alarms. DC Line Fault restart sequence operated once in Pole-4 along with activation of CAT-D Alarm. Simultaneously, CLD Minor Fail alarm latched in Pole-4 Lane-1. As Pole-4 Lane-2 was faulty, the Lane changeover was not successful & controls generated for blocking of Pole-4 along with generation of CAT-B alarm which subsequently blocked its parallel Pole i.e. Pole-2. iv)During the same time, SYS Fail latched onto Pole-3 and as both the Lanes became unavailable, Pole-3 got blocked and generated CAT-B Alarm which subsequently blocked its parallel Pole i.e. Pole-1. v)Due to tripping of all four poles, power order reduced from 4500 MW to 0 MW. vi)As per PMU, no fault is observed in the system. However, fluctuation in voltage was observed. vii)As per SCADA, change in demand of approx. 400 MW and 225 MW in Rajasthan and UP control area are observed. However, Rajasthan and UP reported no df/dt operation during the event.	0	0.385	0	625	0.000	0.800	54726	78141	NA
35	GI-2	1)400/220 kV 500 MVA ICT-1 at Bhadla(RS) 2)220 kV Bhadla- Adani REPRL Ckt-1 3)220 kV Bhadla- Adani REPRL Ckt-2 4)220 kV Bus sectionalizer-II to evacuate power of Saurya Urja-II (300 MW)	Rajasthan	RVPNL, Adani, Saurya Urja-II	30-Jun-24	11:14	30-Jun-24	14:10	02:56	i)400/220kV Bhadla(RS) has double main and transfer bus arrangement at 220kV side. ii)During antecedent condition, loading of 400/220 kV 500 MVA ICT-1, 2 & 3 were approx. 380 MW, 373 MW & 379 MW respectively. 220 kV Bhadla- Adani REPRL D/C & 220 kV Bhadla-Saurya Urja-2 Ckt were carrying approx. 215 MW & 280 MW respectively (reported data). iii)As reported, at 11:14hrs, R-phase jumper of LV bushing of 400/220 kV 500 MVA ICT-1 at Bhadla(RS) snapped which led to tripping of ICT-1 on directional overcurrent earth fault protection operation. iv)As per "SPS for Transformers at 400KV Bhadla (RVPN) substation", overloading of remaining ICTs after tripping of any of the three 400/220kV 500MVA ICTs on fault/protection operation will lead to operation of SPS as per logic described in schematic diagram for SPS at Bhadla(RS) (attached in Annexure). v)As per logic, tripping commands for 220kV lines and/or 220kV Bus-sectionalizer-II are to be taken from overload relay/ over-current back up relay of 400kV and/or 220kV side of ICTs considering 100% loading of the ICTs (500MVA) with appropriate time delay (ICT-1: 4.5 sec, ICT-2: 3.75 sec and ICT-3: 3 sec). vi)As ICT-1 tripped, the load of ICT-1 shifted to ICT-2 & 3 which led to overloading (more than 100%) of ICT-2 & 3 at Bhadla(RS). Due to less time grading of ICT-3 (3 sec), as per SPS logic, group-3 & 4, i.e., 220 kV Bhadla- Adani REPRL Ckt-1 & 2 and 220 kV Bus sectionalizer-II to evacuate power of Saurya Urja-II (300 MW) tripped on 86 master trip relay operation (correct operation of SPS). vii)As per PMU at Bhadla(PG), no fault in system, however fluctuation in voltage is observed. viii) As per SCADA, change in demand of approx. 177MW in Rajasthan control area and loss in NR solar generation of approx. 328MW is observed.	0	0.519	328	177	0.528	0.260	62115	67952	NA
36	GD-1	1)220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-1 2)220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt-2 3)220/33kV 100MVA ICT-1 at Gopalpur(DTL) 4)220/66kV 100MVA ICT-2 at Gopalpur(DTL) 5)220/33kV 100MVA ICT-3 at Gopalpur(DTL) 6)220/66kV 160MVA ICT-4 at Gopalpur(DTL) 7)220/33kV 100MVA ICT-1 at Subzimandi(DTL) 8)220/33kV 100MVA ICT-2 at Subzimandi(DTL)	Delhi	PGCIL, DTL	30-Jun-24	10:12	30-Jun-24	10:22	00:10	i)220kV Gopalpur(DTL) has double main Bus arrangement at 220kV side. ii)During antecedent condition, 220kV lines from Gopalpur(DTL) to Mandaula(PG) ckt-1, South Wazirabad ckt-2, Subzimandi ckt-2 and 220/66kV 100MVA ICT-2 & 220/66kV 160MVA ICT-4 were connected to 220kV Bus-1 and 220kV lines from Gopalpur(DTL) to Mandaula(PG) ckt-2, South Wazirabad ckt-1, Subzimandi ckt-1 and 220/33kV 100MVA ICT-1 & 3 were connected to 220kV Bus-2 at Gopalpur(DTL) S/s. 220kV lines from Gopalpur(DTL) to South Wazirabad D/C and Subzimandi ckt-2 were not in service. 220kV Gopalpur-Mandola Ckt-1 & 2 were feeding the load of 220kV Gopalpur(DTL) S/s and further connected to 220kV Subzimandi(DTL) S/s through 220kV Gopalpur-Subzimandi ckt-1 & 2. iii)As reported, at 10:12 hrs, R-N phase to earth fault occurred at Gopalpur(DTL) (exact location and reason of fault yet to be received). As per PMU at Mandaula(PG), R-N phase to earth fault is observed with delayed fault clearing time of 800msec respectively. iv)As reported, bus bar protection kept off with time delay setting of 160msec for zone-4 distance protection at Gopalpur(DTL) to avoid any maloperation of bus bar protection relay. On R-N phase to earth fault, 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) D/C didn't trip from Gopalpur end (Reason for not tripping of 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) Ckt D/C yet to be received). v)As per DR, 220 KV Mandola(PG)-Gopalpur(DTL) (DTL) D/C tripped from Mandaula(PG) end only. Ckt-1 tripped on zone-3 distance protection operation and ckt-2 tripped on overcurrent earth fault protection. vi)As further reported, 220/33kV 100MVA ICT-1 & 3, 220/66kV 100MVA ICT-2 & 220/66kV 160MVA ICT-4 at Gopalpur(DTL) tripped on overcurrent protection operation and 220/33kV 100MVA ICT-1 & 2 tripped at Subzimandi(DTL) on restricted earth fault protection operation. vii)As 220KV Mandola(PG)-Gopalpur(DTL) (DTL) D/C tripped, Gopalpur(DTL) and Subzimandi(DTL) lost their connectivity from grid which led to blackout of 220kV Gopalpur(DTL) S/s and 220kV Subzimandi(DTL) S/s. viii)As per SCADA, change in demand of approx. 171 MW in Delhi control area (as per SCADA). However, 177 MW load loss is reported by SLDC-Delhi.	0	0.03	0	177	0.000	0.271	59280	65322	800

Annexure-B.IV

Summary of df/dt operation during May-June 2024

Date	Time	Load throw-off quantum (State-wise)						Total Load throw-off quantum	Remarks
		Delhi	Punjab	Haryana	Rajasthan	UP	Uttarakhand		
25-05-2024	12:46	82	1375	0	140	172	0	1769	as reported by SLDCs
27-05-2024	14:36	280	0	540	0	140	100	1060	as per SCADA data at NRLDC, SLDCs have not confirmed yet
01-06-2024	13:26	0	440	0	0	100	0	540	as per SCADA data at NRLDC, SLDC-Punjab have confirmed
01-06-2024	13:44	270	580	120	0	220	0	1190	SLDC-Punjab & UP have confirmed
03-06-2024	05:28	0	300	0	0	0	0	300	as reported by SLDC-Punjab
04-06-2024	12:35	0	400	0	0	0	0	400	as per SCADA data at NRLDC, SLDC-Punjab have confirmed
09-06-2024	11:21	0	435	0	0	0	0	435	as per SCADA data at NRLDC, SLDC-Punjab have not confirmed yet
19-06-2024	12:42	0	723	0	107	220	0	1050	as reported by SLDCs
23-06-2024	09:11	0	880	0	0	0	0	0	as reported by SLDC-Punjab

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Tel No: 0171-2540014
Superintending Engineer/M&P-CC Circle
HVPNL, Dhulkote, (Ambala City-134007)

HVPNL

To

The Superintending Engineer,
SLDC 'OP', HVPNL, Panchkula

Memo No.: Ch- 171 /MPA/M-11.B Dated:- 04.07.2024

Subject: To share df/dt proection settings.

Please refer to your office E.mail dated 28.06.2024 on the subject cited above.

The requisite information as received from XEN /M&P-CC Divn., HVPNL, Dhulkote, Karnal and Rohtak on the prescribed preforma are as under:

Sr. No.	Name of S/Stn	df/dt settings (average cycles considered, time delay etc.)	Maximum quantum of relief (MW)		
			Stage-1	Stage-2	Stage-3
XEN/ M&P-CC Divn., HVPNL, Dhulkote					
1	220kV Jorian (Haryana)	0.1Hz/Second Time Delay=0.13Sec Trend= Decreasing Min. frequency=	8.91MW	NA	NA
XEN/ M&P-CC Divn., HVPNL, Karnal					
1.	220KV Unispur (Haryana)	0.2Hz/Second, Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	46.8MW	NA
2.	220KV Nissing (Haryana)	0.3Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	NA	77.4MW
		0.3Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	NA	73.8MW
		0.3Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	NA	81.9MW
3.	132KV Karnal (Haryana)	0.2Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	65MW	NA
4.	220KV Pehowa (Haryana)	0.2Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	55.8MW	NA
		0.3Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	NA	33.75MW
		0.2Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	NA	61.2MW	NA
		0.1Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	73.8MW	NA	NA
5.	220KV BBMB Kurukshetra (Haryana)	0.2Hz/Second Time Delay=0.12Sec Trend= Decreasing Min. frequency=49.9Hz	104.4MW	NA	NA

Contd/-2

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Superintending Engineer/M&P-CC Circle
HVPNL, Dhulkote, (Ambala City-134007)

Sr. No.	Name of S/Stn	df/dt settings (average cycles considered, time delay etc.)	Maximum quantum of relief (MW)		
			Stage-1	Stage-2	Stage-3
XEN/ M&P-CC Divn., HVPNL, Rohtak					
1	400KV BBMB	0.2 hz/sec time delay 0.160s	NA	10	NA
			NA	20	NA
			NA	8	NA
2	132KV PTPS	0.2 hz/sec time delay 0.160s	NA	14	NA
3	220 KV BBMB Narela	0.2 hz/sec time delay 0.160s	NA	33	NA
4	132 KV Fazilpur	0.2 hz/sec time delay 0.160s	NA	18	NA
5	220 KV Rohtak	0.2 hz/sec time delay 0.160s	NA	67.4	NA
			NA	34	NA

This is for your kind information and taking further necessary action please.

04/07/24

Superintending Engineer
M&P-CC Circle, HVPNL,
Dhulkote

CC:

1. CE/SO & Comml., HVPNL, Panchkula for kind information please.
2. CE/TS, HVPNL, Panchkula for kind information please.
3. XEN / M&P-CC Divn., HVPNL, Dhulkote, Karnal & Rohtak.
4. SPS to Director/ Technical, HVPNL, Panchkula for the kind information of Director / Technical, HVPNL, Panchkula please.
5. SPS to Director/ Projects, HVPNL, Panchkula for the kind information of Director / Projects, HVPNL, Panchkula please.

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-03	POWERGRID	01-Jun-24	02:45	Nil	Earth fault	NA	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU, B-N fault observed. As reported, Pole-3 blocked on DC Overcurrent protection operated at Kurukshetra end. CAT A 1 sequence generated as per protection philosophy.
2	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	01-Jun-24	05:07	Nil	Earth fault	NA	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU, B-N fault observed. As reported, Pole-3 blocked on DC Overcurrent protection operated at Kurukshetra end. CAT A 1 sequence generated as per protection philosophy.
3	400 KV Rihand(NT)-VindhyachalPool(PG) (PG) Ckt-2	POWERGRID	02-Jun-24	15:01	Nil	Earth fault		NA	NO	NO			As per PMU, multiple Y-B faults observed. DR/EL and tripping details not received.
4	765 KV Orai-Satna (PG) Ckt-1	POWERGRID	06-Jun-24	18:33	Nil	Phase to earth fault Y-N	NA	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU and DR(of Orai end), Y-N fault in system is observed with unsuccessful A/R operation from both ends.
5	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	08-Jun-24	18:04	Nil	Operation of transformer protection	NA	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU, R-Y-B three fault observed. As operated, pole DC Differential Protection pertaining to Lane 2 at Champa end due to erroneous readings from DCCT-INBS DC current.
6	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	14-Jun-24	23:16	Nil	Earth fault	NA	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU, R-Y-B three fault observed. As operated, Pole-3 blocked on DC Overcurrent protection operated at Kurukshetra end. CAT A 1 sequence initiated due to latching of DC Overcurrent protection in order to isolate healthy parallel Pole from Pole-3 and Pole-3 blocked after successful isolation from Parallel Pole.
7	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	17-Jun-24	13:53		Transient fault	GI-2	NA	YES (After 24 hrs)	YES (After 24 hrs)			Tripped on NBGS overcurrent protection operation
8	800 KV HVDC Kurukshetra(PG) Pole-1	POWERGRID	17-Jun-24	13:53		Over Voltage		NA	YES (After 24 hrs)	YES (After 24 hrs)			
9	800 KV HVDC Kurukshetra(PG) Pole-4	POWERGRID	17-Jun-24	13:53		Transient fault		NA	YES (After 24 hrs)	YES (After 24 hrs)			Tripped on fault in DC line
10	800 KV HVDC Kurukshetra(PG) Pole-2	POWERGRID	17-Jun-24	13:53		Transient fault		NA	YES (After 24 hrs)	YES (After 24 hrs)			
11	765 KV Orai-Gwalior (PG) Ckt-1	POWERGRID	19-Jun-24	18:15	Nil	Phase to earth fault R-N		NA	YES	YES (After 24 hrs)			As per PMU and DR (of Orai end), R-N phase to earth fault with unsuccessful A/R operation is observed.
12	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	19-Jun-24	18:41	Nil	Phase to earth fault R-N		NA	YES	YES			As per DR(of Rihand end), R-N phase to earth fault is observed. DR (.dat/.cfg file) not received.
13	800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-1	POWERGRID	23-Jun-24	09:11	Nil	Earth fault	GI-2	NA	YES (After 24 hrs)	YES			As per PMU, fluctuation in voltage and no fault is observed in the system. As reported, Pole-01 blocked on T-zone protection operation at Kurukshetra end. Noise in Ihl current of Pole-1 Lane-1 led to latching of T-zone protection.
14	800 KV HVDC Kurukshetra(PG)-Champa(PG) (PG) Ckt-3	POWERGRID	23-Jun-24	09:11	Nil	Earth fault		NA	YES (After 24 hrs)	YES			As per PMU, fluctuation in voltage and no fault is observed in the system. As reported, Pole-03 blocked on CAT-B sequence initiated by parallel Pole-01 due to latching of T-zone protection.
15	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	23-Jun-24	18:40	Nil	Phase to Ground Fault Y-N		NA	YES	YES			As per DR(of Rihand end), Y-N phase to earth fault is observed. DR (.dat/.cfg file) not received.
16	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	24-Jun-24	14:27	Nil	Phase to earth fault R-N		NA	YES	YES			As per DR(of Rihand end), R-N phase to earth fault is observed. DR (.dat/.cfg file) not received.
17	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	25-Jun-24	20:17	Nil	Phase to earth fault B-N		NA	YES	YES			As per DR(of Rihand end), B-N phase to earth fault is observed. DR (.dat/.cfg file) not received.
18	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	26-Jun-24	18:39	Nil	Phase to earth fault B-N		NA	YES	YES			As per DR(of Rihand end), B-N phase to earth fault is observed. DR (.dat/.cfg file) not received.
19	220 KV Auraiya(NT)-Malanpur(MP) (PG) Ckt-1	POWERGRID	27-Jun-24	03:49	Nil	Earth fault		NA	NO	YES			As per PMU, Y-N fault with no A/R operation is observed. As per DR(of Auraiya end), Y-N phase to earth fault with unsuccessful A/R operation is observed and Y & B phase CB poles didn't open from Malanpur end.
20	800 KV HVDC Kurukshetra(PG) Pole-03	POWERGRID	27-Jun-24	21:17	Nil	Transient fault	GI-2	NA	YES (After 24 hrs)	YES (After 24 hrs)			As per PMU, fluctuation in voltage is observed. As reported, 800 kV HVDC Kurukshetra (PG) Pole-2 & 4 blocked on CLD HV Cable Protection and Pole-1 & 3 blocked on latching of SYS Fail in Pole-3
21	800 KV HVDC Kurukshetra(PG) Pole-2	POWERGRID	27-Jun-24	21:17	Nil	Transient fault		NA	YES (After 24 hrs)	YES (After 24 hrs)			
22	800 KV HVDC Kurukshetra(PG) Pole-1	POWERGRID	27-Jun-24	21:17	Nil	Transient fault		NA	YES (After 24 hrs)	YES (After 24 hrs)			
23	800 KV HVDC Kurukshetra(PG) Pole-4	POWERGRID	27-Jun-24	21:17	Nil	Transient fault		NA	YES (After 24 hrs)	YES (After 24 hrs)			
24	132 KV Rihand(UP)-Garwa(JS) (UP) Ckt-1	UPPTCL	29-Jun-24	22:39	Nil	Phase to earth fault B-N		NA	YES (After 24 hrs)	YES			As per DR(of Rihand end), B-N phase to earth fault is observed. DR (.dat/.cfg file) not received.

 # 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 37.2(c) 2. CEA Grid Standard 15.3
3	FIR Not Furnished	1. IEGC 37.2(b) 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 June 2024 - 30th June 2024

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	AD HYDRO	1	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
2	ADANI SOLAR ENRGY RJ TWO PRIVATE LIMITED	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	DR, EL & Tripping report not submitted
3	AHEJ4L	1	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
4	ANTA-NT	3	3	**100**	3	0	**100**	3	0	**100**	3	0	**100**	DR, EL & Tripping report not submitted
5	APL	3	0	**0**	2	0	**67**	0	0	**0**	1	1	**50**	
6	APMPL	2	2	**100**	2	0	**100**	2	0	**100**	2	0	**100**	
7	APTFL	2	2	**100**	2	0	**100**	2	0	**100**	2	0	**100**	
8	AREPRL	1	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
9	AURAIYA-NT	2	2	**100**	0	0	**0**	1	0	**50**	1	0	**50**	DR, EL & Tripping report not submitted
10	BAIRASUIL-NH	8	0	**0**	0	4	**0**	0	2	**0**	0	0	**0**	Details received
11	BBMB	124	26	**21**	28	42	**34**	28	49	**37**	26	16	**24**	DR, EL & Tripping report not submitted
12	CHAMERA-II-NH	3	0	**0**	0	2	**0**	0	2	**0**	0	0	**0**	Details received
13	CHAMERA-I-NH	4	0	**0**	0	2	**0**	0	2	**0**	0	0	**0**	Details received
14	CLEANSOLAR_JODHPUR	2	2	**100**	2	0	**100**	2	0	**100**	2	0	**100**	DR, EL & Tripping report not submitted
15	CPCC1	94	9	**10**	13	15	**16**	25	13	**31**	17	5	**19**	
16	CPCC2	98	8	**8**	9	5	**10**	8	5	**9**	9	0	**9**	
17	CPCC3	53	2	**4**	2	5	**4**	1	5	**2**	2	0	**4**	
18	DADRIGAS-NT	3	3	**100**	3	0	**100**	3	0	**100**	3	0	**100**	
19	DADRI-NT	2	0	**0**	2	0	**100**	2	0	**100**	2	0	**100**	
20	DHAULIGANGA-NH	1	0	**0**	0	1	**0**	0	0	**0**	0	0	**0**	Details received
21	DULHASTI-NH	4	0	**0**	0	2	**0**	0	0	**0**	0	0	**0**	Details received
22	ESUCRL	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	DR, EL & Tripping report not submitted
23	GRIAN ENERGY PRIVATE LIMITED	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	
24	INDIGRID	2	2	**100**	2	0	**100**	2	0	**100**	2	0	**100**	
25	JHAJJAR	2	0	**0**	0	2	**0**	0	2	**0**	0	1	**0**	Details received
26	KARCHAM	3	2	**67**	2	0	**67**	2	0	**67**	3	0	**100**	DR, EL & Tripping report not submitted
27	KISHENGANGA-NH	3	0	**0**	0	3	**0**	0	2	**0**	0	0	**0**	Details received
28	KOTESHWAR	1	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
29	NAPP	3	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received

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

Time Period: 1st June 2024 - 30th June 2024

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		%	
30	NJPC	2	1	**50**	1	0	**50**	1	0	**50**	1	0	**50**	DR, EL & Tripping report not submitted
31	PARBATI-III-NH	1	0	**0**	0	1	**0**	0	1	**0**	0	0	**0**	Details received
32	RAILWAYS	2	2	**100**	2	0	**100**	2	0	**100**	2	0	**100**	DR, EL & Tripping report not submitted
33	RAMPUR	1	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
34	RAPPA	6	6	**100**	6	0	**100**	6	0	**100**	1	0	**17**	DR, EL & Tripping report not submitted
35	RAPPB	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	
36	RENEW SURYA VIHAAN PRIVATE LIMITED	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	
37	RIHAND-NT	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	
38	SALAL-NH	5	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
39	SEWA-2-NH	5	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
40	SLDC-CHD	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	DR, EL & Tripping report not submitted
41	SLDC-DV	45	4	**9**	1	14	**3**	1	13	**3**	5	1	**11**	
42	SLDC-HP	26	4	**15**	15	0	**58**	20	0	**77**	4	0	**15**	
43	SLDC-HR	47	13	**28**	13	7	**33**	13	6	**32**	13	0	**28**	
44	SLDC-JK	29	2	**7**	28	0	**97**	28	0	**97**	12	0	**41**	
45	SLDC-PS	28	2	**7**	16	7	**76**	16	7	**76**	20	0	**71**	
46	SLDC-RS	99	9	**9**	11	20	**14**	12	20	**15**	23	0	**23**	
47	SLDC-UK	17	0	**0**	0	9	**0**	0	7	**0**	1	2	**7**	
48	SLDC-UP	130	17	**13**	19	30	**19**	18	31	**18**	18	7	**15**	
49	SORANG	3	3	**100**	3	0	**100**	3	0	**100**	3	0	**100**	
50	STERLITE	2	0	**0**	0	0	**0**	0	0	**0**	2	0	**100**	
51	TANAKPUR-NH	5	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	Details received
52	TANDA-NT	3	3	**100**	3	0	**100**	3	0	**100**	3	0	**100**	DR, EL & Tripping report not submitted
53	TATAPOWER	1	1	**100**	1	0	**100**	1	0	**100**	1	0	**100**	
54	TEHRI	2	0	**0**	0	0	**0**	0	0	**0**	0	1	**0**	Details received
55	UNCHAHAR-NT	3	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	
Total in NR Region		**894**	**137**	**15**	**198**	**171**	**27**	**212**	**167**	**29**	**191**	**34**	**22**	

As per the IEGC provision under clause 37.2 (c), detailed tripping report along with DR & EL has to be furnished within 24 hrs of the occurrence of the event

Mock trial run/black start schedule plan for 2024-25

S.No.	Name of Generatiing Station	Fuel Type	Installed Capacity (in MW)	Whether Generating station has black start capability (Yes/ No)	Type of Black Start Source (DG set etc.)	Capacity of DG Set / Small Generator / Battery	Source of power supply to Communication and Telemetry during black start.	Compliance to 34.3 of IEGC for mock trial runs (Last date on which mock drill carried out)	Tentaive schedule plan for mock trial run	
									Black start exercise of generating unit (dead bus charging)	Mock black start of subsytem (black start of generating unit / island operation / synchronidation)
NTPC										
1	Dadri GPS	Gas	4*130.19 + 2*154.51	Yes				16-Dec-23		
2	Anta GPS	Gas	3*88.71 + 1*153.2	Yes				29-Feb-24		
3	Auraiya GPS	Gas	4*111.19 + 2*109.3	Yes					09-07-2024	09-07-2024
4	Faridabad GPS	Gas	2*137.75 + 1* 156.07	Yes						
5	Koldam HEP	Hydro	4*200	Yes				14-Mar-24		
NHPC										
6	Bairasuil	Hydro	3*60	Yes				30-Nov-22		
7	Salal Stage-I	Hydro	3*115	Yes				02-Nov-18		
8	Salal Stage-II	Hydro	3*115	Yes						
9	Tanakpur HPS	Hydro	3*31.4	Yes						
10	Chamera HPS-I	Hydro	3*180	Yes				02-Dec-22		
11	Chamera HPS-II	Hydro	3*100	Yes				02-Dec-22		
12	Chamera HPS-III	Hydro	3*77	Yes				04-Dec-17		
13	URI-I	Hydro	4*120	Yes				20-Dec-16		
14	URI-II	Hydro	4*60	Yes				20-Dec-16		
15	Dhauliganga	Hydro	4*70	Yes				28-Dec-21		
16	Dulhasti	Hydro	3*130							
17	Sewa-II	Hydro	3*40	Yes				29-May-22		
18	Parbati-3	Hydro	4*130	Yes				22-Dec-20		
19	Kishanganga	Hydro	3*110	Yes						
SJVNL										
20	Nathpa-Jhakri	Hydro	6*250	Yes	DG Sets	2x750 kVA	DC Battery Bank/DG sets	09-Dec-22	20.11.2024	20.11.2024
21	Rampur	Hydro	6*68.67	Yes	DG Sets	2x1010 kVA	DC Battery Bank/DG sets	09-Dec-22	20.11.2024	20.11.2024
THDC										
22	Tehri	Hydro	4*250	Yes				07-Nov-23		
23	Koteshwar	Hydro	4*100	Yes	DG Set	2*1010 kVA	UPS	14-Mar-24	Dec-24	Dec-24
BBMB										
24	Bhakra (L)	Hydro	3*108 + 2*126	Yes				31-Dec-22		
25	Bhakra (**R**)	Hydro	5*157	Yes				26-Dec-22		
26	Ganguwal	Hydro	1*27.99 + 2*24.2							
27	Kotla	Hydro	1*28.94 + 2*24.2							
28	Dehar	Hydro	6*165							
29	Pong	Hydro	6*66					08-Jun-14		
*: Rampur can be black started only after starting of Nathpa Jhakri units due to Tandem operation										
IPPGCL(Indraprashta power generating Corporation Ltd.)/ Delhi Gencos										
30	I.P. Gas Turbine (IPGCL G.T.)	Gas	6*30+ 3*30	Yes				20-Feb-19	10-04-2024	10-04-2024
31	Pragati Gas Turbine (PPCL)	Gas	2*104.6 + 1*121.2							
32	Bawana GT	Gas	2*253+4*216							
33	Rithala(TPPDL)	Gas	3*36							
Haryana										
34	Western Yamuna Canal (WYC-I & II)	Hydro	6*8+ 2*7.2							
Himachal Pradesh										
35	Bhabha	Hydro	3*40							
36	Bassi	Hydro	4*16.5							
37	Ghanvi	Hydro	2*11.25							
38	Giri	Hydro	2*30							
39	Larji	Hydro	3*42							
40	Phojal	Hydro	24							
41	Sainj HEP	Hydro	2*50							
42	Swara Kuddu HEP	Hydro	3*37							
43	Bajoli Holi HEP	Hydro	3*60							
Malana Power Company Ltd.										
44	Malana-I	Hydro	2*43	Yes				12-Mar-24		
Everest Power Company Ltd.										
45	Malana-II	Hydro	2*50	Yes				03-Jan-19		
AD Hydro Power Ltd.										
46	AD Hydro	Hydro	2*96	Yes				27-Jan-23	**24-02-2025**	**24-02-2025**
JSW										
47	Karcham Wangtoo	Hydro	4*250	Yes				29-Dec-21		
48	Baspa	Hydro	3*100	Yes						
Greenco										

Mock trial run/black start schedule plan for 2024-25

S.No	Name of Generatiing	Fuel	Installed Capacity (in	Whether Generating station has black	Type of Black Start Source	Capacity of DG Set / Small	Source of power supply to Communication	Compliance to 34.3 of IEGC for mock trial runs (Last date on	Tentaive schedule plan for mock trial run	
49	Budhil	Hydro	2*35	Yes						
50	Sorang HEP	Hydro	2*50							
Jammu & Kashmir										
51	Baghlihar-I	Hydro	3*150							
52	Baghlihar-II	Hydro	3*150							
53	Lower Jhelum	Hydro	3*35					20-Dec-16		
54	Upper Sindh	Hydro	2*11.3+ 3*35	Yes				20-Dec-16		
Punjab										
55	Jogendernagar/ Shanan	Hydro	4*15+ 1*50							
56	UBDC	Hydro	3*15+ 3*15.45							
57	Mukerian	Hydro	6*15+ 6*19.5							
58	Anandpur Sahib (APS)	Hydro	4*33.5							
59	Ranjit Sagar (Thein Dam)	Hydro	4*150	Yes					04-05-2024	04-05-2024
Rajasthan										
60	Ramgarh GT Extn.	Gas	1*3+1*35.5+2 *37.5+1*110+ 1*50							
61	Dholpur CCPP	Gas	3*110							
62	Rana Pratap Sagar (RPS)	Hydro	4*43	Yes				16-Jan-11		
63	Jawahar Sagar	Hydro	3*33							
64	Mahi Bajaj Sagar I	Hydro	2*25	Yes				21-Jul-15		
65	Mahi Bajaj Sagar II	Hydro	2*45	Yes				24-Mar-16		
Uttar Pradesh										
66	Rihand (H) or Pipri	Hydro	6*50	Yes				16-Feb-24		
67	Obra(H)	Hydro	3*33	Yes				16-Feb-24		
68	Khara	Hydro	3*24							
69	Matatila	Hydro	3*10.2	Yes						
GVK										
70	Alaknanda HEP	Hydro	4*82.5							
Jaiprakash power Venture Ltd.										
71	Vishnu Prayag IPP	Hydro	4*100							
Uttrakhand										
72	Ramganga	Hydro	3*66							
73	Chibro	Hydro	4*60	Yes						
74	Dhalipur	Hydro	3*17							
75	Khodri	Hydro	4*30							
76	Khatima	Hydro	3*13.8							
77	Chilla	Hydro	4*36							
78	Maneri Bhali-I	Hydro	3*30							
79	Maneri Bhali-II	Hydro	4*76							
80	Vyasi HEP	Hydro	2*60							
81	Dhakrani HEP	Hydro	3*11.25							
82	Kulhal HEP	Hydro	3*10							
83	Gamma GPS	Gas	3*75							
84	Sravanti GPS	Gas	3*75	No	NA	NA	NA	NA	NA	NA
L&T										
85	Singoli Bhatwari	Hydro	3*33							

Sr. No.	Scheme Name	State Control Area	Last date on which Mock testing carried out	Tentaitve schedule of SPS Mock testing during 2024-25	Remarks
1	SPS for WR-NR corridor - 765kV Agra-Gwalior D/C	POWERGRID	12-03-2024		
2	SPS for contingency due to tripping of HVDC Mundra-Mahendergarh	ADANI			
3	SPS for high capacity 400 kV Muzaffarpur-Gorakhpur D/C Inter-regional tie-line related contingency	POWERGRID			
4	SPS for 1500 MW HVDC Rihand-Dadri Bipole related contingency	POWERGRID			
5	System Protection Scheme (SPS) for HVDC Balia-Bhiwadi Bipole	POWERGRID			
6	SPS for contingency due to tripping of multiple lines at Dadri(NTPC)	NTPC			
7	SPS for reliable evacuation of power from NJPS, Rampur, Sawra Kuddu, Baspa Sorang and Karcham Wangtoo HEP	SJVN/HPPTCL/JSW			
8	SPS for Reliable Evacuation of Ropar Generation	Punjab			
9	SPS for Reliable Evacuation of Rosa Generation	Uttar Pradesh	07-05-2022	counducted on 20-04-2024	
10	SPS for contingency due to tripping of evacuating lines from Narora Atomic Power Station	NAPS			
11	SPS for evacuation of Kawai TPS, Kalisindh TPS generation complex	Rajasthan			
12	SPS for evacuation of Anpara Generation Complex	Uttar Pradesh	06-07-2020		
13	SPS for evacuation of Lalitpur TPS Generation	Uttar Pradesh	14-07-2018		
14	SPS for Reliable Evacuation of Bara TPS Generation	Uttar Pradesh			
15	SPS for Lahal Generation	Himachal Pradesh	08-07-2020		
16	SPS for Transformers at Ballabhgarh (PG) substation	POWERGRID			
17	SPS for Transformers at Maharanibagh (PG) substation	POWERGRID			
18	SPS for Transformers at Mandola (PG) substation	POWERGRID			
19	SPS for Transformers at Bamnauli (DTL) Substation	Delhi			
20	SPS for Transformers at Moradabad (UPPTCL) Substation	Uttar Pradesh		counducted on 20-04-2024	
21	SPS for Transformers at Muradnagar (UPPTCL) Substation	Uttar Pradesh	07-02-2023	counducted on 20-04-2024	
22	SPS for Transformers at Muzaffarnagar(UPPTCL) Substation	Uttar Pradesh		counducted on 20-04-2024	
23	SPS for Transformers at Greater Noida(UPPTCL) Substation	Uttar Pradesh			
24	SPS for Transformers at Agra (UPPTCL) Substation	Uttar Pradesh	12-07-2023		
25	SPS for Transformers at 400kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh	17-05-2023		
26	SPS for Transformers at 220kV Sarojininagar (UPPTCL) Substation	Uttar Pradesh	18-05-2022		
27	SPS for Transformers at 400kV Unnao (UPPTCL) Substation	Uttar Pradesh	19-05-2023		
28	SPS for Transformers at 220kV Unnao (UPPTCL) Substation	Uttar Pradesh			
29	SPS for Transformers at 400kV Sultanpur (UPPTCL) Substation	Uttar Pradesh			
30	SPS for Transformers at 400kV Bareilly (UPPTCL) Substation	Uttar Pradesh			
31	SPS for Transformers at 400kV Azamgarh (UPPTCL) Substation	Uttar Pradesh	14-05-2023		
32	SPS for Transformers at 400kV Mau (UPPTCL) Substation	Uttar Pradesh	17-01-2019		
33	SPS for Transformers at 400kV Gorakhpur (UPPTCL) Substation	Uttar Pradesh	14-05-2023		
34	SPS for Transformers at 400kV Sarnath (UPPTCL) Substation	Uttar Pradesh	19-05-2023		
35	SPS for Transformer at 400kV Rajpura (PSTCL) Substation	Punjab			
36	SPS for Transformers at 400kV Mundka (DTL) Substation	Delhi	19-06-2023		
37	SPS for Transformers at 400kV Deepalpur (JKTPL) Substation	Haryana			
38	SPS for Transformers at 400kV Ajmer (RVPN) Substation	Rajasthan			
39	SPS for Transformers at 400kV Merta (RVPN) Substation	Rajasthan			
40	SPS for Transformers at 400kV Chittorgarh (RVPN) Substation	Rajasthan			
41	SPS for Transformers at 400kV Jodhpur (RVPN) Substation	Rajasthan			
42	SPS for Transformers at 400kV Bhadla (RVPN) Substation	Rajasthan			
43	SPS for Transformers at 400kV Ratangarh (RVPN) Substation	Rajasthan			
44	SPS for Transformers at 400kV Nehtaur(UPPTCL) Substation	Uttar Pradesh	05-07-2022		
45	SPS for Transformers at Obra TPS	Uttar Pradesh			
46	SPS for Transformers at 400KV Kashipur (PTCUL) substation	Uttarakhand	03-09-2023	Septemeber 2024	
47	SPS for Transformers at 400KV Fatehgarh Solar Park (AREPRL)	ADANI			
48	SPS to relive transmission congestion in RE complex (Bhadla2)	POWERGRID			
49	SPS for Transformers at 400kV Bikaner (RVPN) Substation	Rajasthan			
50	SPS for Transformers at 400kV Bawana (DTL) Substation	Delhi	06-09-2023		
51	SPS for Transformers at 400kV Bhilwara (RVPN) Substation	Rajasthan			
52	SPS for Transformers at 400kV Hinduan (RVPN) Substation	Rajasthan			
53	SPS for Transformers at 400kV Suratgarh (RVPN) Substation	Rajasthan			

Annexure-B.X

Annex-V

Status of Recording Instruments (220kV & above stations)						
Sr. No	**Station Name**	**Voltage Level**	**Disturbance Recorder/Station Event logger healthy (Yes or No)**	**Standardisation (Yes or No)**	**Time Sync (Yes or No)**	**Remarks**