



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

सं: उ.क्षे.वि.स./प्रचालन/106/01/2020/439-480

दिनांक: 14/01/2020

विषय: प्रचालन समन्वय उप-समिति की 167^{वीं} बैठक का कार्यसूची ।
Subject: Agenda of 167th OCC meeting.

प्रचालन समन्वय उप-समिति की 167^{वीं} बैठक दिनांक 17.01.2020 को 10:00 बजे से उ.क्षे.वि.स. सचिवालय, नयी दिल्ली में आयोजित की जाएगी। उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है।

167th meeting of the Operation Co-ordination sub-committee will be held on 17.01.2020 (10:00 AM onwards) at NRPC Secretariat, New Delhi. The agenda of this meeting has been uploaded on the NRPC web-site <http://www.nrpc.gov.in>.

It is requested that the updated status of various points under follow-up action points of previous OCC meeting may kindly be furnished prior to the meeting.

Kindly make it convenient to attend the meeting.

(सौमित्र मजूमदार)

अधीक्षण अभियंता (प्रचालन)

सेवा में : प्रचालन समन्वय उप समिति के सभी सदस्य।

To : All Members of OCC

1. Confirmation of Minutes

The minutes of the 166th OCC meeting which was held on 16.12.2019 and 17.12.2019 at NRPC Secretariat, New Delhi were issued vide letter of even number dated 07.01.2020.

No comment on the minutes has been received from any of the members till date.

The sub-committee may kindly confirm the Minutes.

2. Review of Grid operations of December 2019**2.1 Supply Position (Provisional) for December 2019**

Anticipated Power Supply Position v/s Actual Power Supply Position (Provisional) of Northern Region during the month of December 2019 is as given below:

State	Req. / Avl.	(MU)			(MW)		
		Anticipated	Actual	Variation	Anticipated	Actual	Variation
Chandigarh	Avl.	115	115	0.0%	300	306	2.0%
	Req.	115	115	0.0%	265	306	15.5%
Delhi	Avl.	3010	2151	-28.5%	5400	5245	-2.9%
	Req.	2060	2151	4.4%	4500	5261	16.9%
Haryana	Avl.	5330	3691	-30.8%	9640	7049	-26.9%
	Req.	3980	3691	-7.3%	7100	7049	-0.7%
Himachal Pradesh	Avl.	920	913	-0.8%	1595	1729	8.4%
	Req.	920	920	0.0%	1630	1729	6.1%
UTs of J&K and Ladakh	Avl.	720	1492	107.2%	1730	2484	43.6%
	Req.	1890	1864	-1.4%	3230	3104	-3.9%
Punjab	Avl.	5300	3446	-35.0%	6420	6720	4.7%
	Req.	3750	3446	-8.1%	6220	6720	8.0%
Rajasthan	Avl.	9020	6967	-22.8%	14860	13464	-9.4%
	Req.	7640	6976	-8.7%	13300	13464	1.2%
Uttar Pradesh	Avl.	9350	8069	-13.7%	15500	17412	12.3%
	Req.	8350	8069	-3.4%	15000	17412	16.1%
Uttarakhand	Avl.	1040	1134	9.0%	1850	2233	20.7%
	Req.	1050	1134	8.0%	1900	2233	17.5%
NR	Avl.	34805	27977	-19.6%	57300	51159	-10.7%
	Req.	29755	28365	-4.7%	45600	52234	14.5%

As per above, negative / significant variation ($\geq 5\%$) in Actual Power Supply Position (Provisional) vis-à-vis Anticipated figures is observed for the month of December 2019 in terms of Energy Requirement for Haryana, UTs of J&K and Ladakh, Punjab, Rajasthan, UP and Uttarakhand and in terms of Peak Demand similar variation is noted in all states/UTs except Rajasthan. **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.

2.2 Power Supply Position of NCR

NCR Planning Board (NCRPB) is closely monitoring the power supply position of National Capital Region. Monthly power supply position for NCR till the month of December 2019 is placed on NRPC website. (<http://nrpc.gov.in/operation-category/power-supply-position/>).

3. Maintenance Programme of Generating Units and Transmission Lines

3.1. Maintenance Programme for Generating Units

The meeting on proposed maintenance programme for Generating Units for the month of February 2020 is scheduled on 16.01.2020 at NRPC Secretariat, New Delhi.

3.2. Outage Programme for Transmission Elements.

The meeting on proposed outage programme of Transmission lines for the month of February 2020 is scheduled on 16.01.2020 at NRPC Secretariat, New Delhi.

4. Planning of Grid Operation

4.1. Anticipated Power Supply Position in Northern Region for February 2020

The Anticipated Power Supply Position in Northern Region for February 2020 is enclosed at **Annexure-A.I.**

SLDCs are requested to update their estimated power supply position for February 2020 and measures proposed to be taken to bridge the gap between demand & availability, as well to dispose of the surplus, if any, in the prescribed format.

5. Submission of breakup of Energy Consumption by the states

In the 166th OCC meeting all the SLDCs were requested to provide the breakup of energy consumption by the states by segregating the same from the billed data from DISCOMs in the format as prescribed below:

Category→	Consumption by Domestic Loads	Consumption by Commercial Loads	Consumption by Agricultural Loads	Consumption by Industrial Loads	Traction supply load	Miscellaneous / Others
<Month>						

All the SLDCs were advised to submit the data for the duration April 2018 to November 2019 initially and thereafter make it a monthly exercise. On the request of SLDCs the monthly information was agreed to be submitted with a delay of 02 months as the billed data information needs to be collected from DISCOMs and

submitted to NRPC.

Apart from Rajasthan, no information has been received from any of the SLDC in this regard.

SLDCs (except Rajasthan) may update.

6. System Study for Capacitor Requirement in NR for the year 2019-20

- 6.1 The study for Haryana state was taken initially based on the decision taken in the meeting held on 01.11.2019. All the necessary inputs for advancing with the study was shared with Haryana in the month November itself.
- 6.2 While modelling the DISCOM level network of Haryana, CPRI representative has brought out certain missing data in the file provided by Haryana and has also sought certain clarifications. The issue is regularly being followed-up with Haryana SLDC but there has not been any significant progress in the same which is causing delay in the study.
- 6.3 In the 166th OCC meeting, it was informed that the details of nodal officers has been received from UP, Punjab, HP and Rajasthan and other states were asked to submit the details of nodal officer by 1st week of January 2020, so that CPRI can directly co-ordinate with nodal officer and resolve the issues, if any, while modelling their respective networks. However, available details of nodal officers with NRPC Sectt., received on email, is as under:

Sl. No	State	Name	Designation	E-mail ID	Contact No.
1.	Himachal Pradesh	Er. Gagan	Sr. Executive Engineer (Power Controller)	Gagankaura85@gmail.com Pcshimla2003@gmail.com	94180-65073
		Er. Shashi Kumar	AEE	Thakyal.shashi13@gmail.com	97368-26582
2.	Uttar Pradesh	Sh. Pankaj Saxena	EE	Smart.saxena@gmail.com	94159-02780
3.	Rajasthan	Smt. Sonia Shishodia	EE	xen2.pp@rvpn.co.in	94140-30303
4.	Haryana	-	XEN/ LD&PC	-	93502-78204
		-	XEN/ works, Panchkula	-	93164-67248
		-	XEN/ works, Hisar	-	93554-21122

The details of nodal officers from other states is not available with NRPC Sectt. and may kindly be furnished at the earliest.

- 6.4 Further, as per the decision taken in the 44th TCC and 47th NRPC, NRLDC representative was requested to provide the PSSE data file with respect to the date and time of states other than Haryana so that CPRI could take up the work simultaneously for all the states. NRLDC may kindly submit the same at the earliest to expedite the simultaneous conduct of the study by CPRI.
- 6.5 Also, it may be brought out that Uttarakhand has neither submitted the data for conducting the study nor the details of nodal officers as was claimed in the previous meetings.

Haryana, Uttarakhand and NRLDC may update.

7. Phase nomenclature mismatch issue with interconnected stations

- 7.1. In a separate meeting held in NRPC Sectt. on 13.08.2019 to deliberate on the issue of phase nomenclature mismatch of BBMB with interconnected substations, it was brought out that there might be such phase nomenclature mismatch issue in other utilities also.
- 7.2. In view of the above, it was decided that all the concerned STUs/SLDCs shall certify about phase nomenclature mismatch of their system considering PGCIL phase nomenclature as reference. Format in this regard was attached at Annexure-III of the minutes of 162nd OCC meeting.
- 7.3. In the 164th OCC meeting, all utilities were advised to submit the desired information in the prescribed format duly signed by the respective Chief Engineer, SLDC by 31.10.2019.
- 7.4. The information duly signed has been obtained from Rajasthan, BBMB, Punjab and UP. Other utilities are once again requested to furnish the information so that the future course of action for remedying the phase nomenclature mismatch can be worked out.

Members may deliberate.

8. Follow up of issues from previous OCC Meetings – Status update

The updated status of Agenda items is enclosed at **Annexure-All**.

All utilities are requested to update the status.

9. SPS for ICTs at 765 kV Unnao sub-station

In the 166th OCC meeting, UP has informed that testing of the finalized logic for SPS was completed. OCC had advised UP to submit the report of the mock testing to NRLDC/ NRPC. However, submission of report is still pending.

UPSLDC / UPRVUNL may update.

10. Automatic Demand Management System

- 10.1. The status of implementation of ADMS which is mandated in Clause 5.4.2 (d) of IEGC by SLDCs/SEB/DISCOMs is presented below:

State/ Utility	Status
Punjab	Not fully implemented.

State/ Utility	Status
	At SLDC level, remote tripping of 100 feeders at 66 kV is possible. At 11 kV feeder level, ADMS is to be implemented by Distribution Company. As per the information available with SLDC, for 50 feeders of 11 kV at Amritsar and Ludhiana, scheme was under finalization.
Delhi	Fully implemented by TPDDL, BRPL and BYPL. NDMC will be implementing by December 2019.
Rajasthan	Under implementation. LoA placed on 12.12.2018 with an execution period of 18 months for ADMS at the level of 33 kV feeders at EHV Substation of RVPN under SCADA / EMS part of project. ADMS functionality at 11 kV feeders from 33/11 kV substation is under the jurisdiction of the DISCOMs and matter is being perused with DISCOMs authorities
UP	Not fully implemented. Remote operation of 50 feeders at 132 kV level being operated from SLDC. For the down below network, issue taken up with the DISCOMs.
Haryana	Not implemented.
HP	02 feeders could be operated from SLDC through manual intervention. Letter has been sent by HPSEB to HP-SLDC for making its operation automatic.

- 10.2. Punjab SLDC has informed in 166th OCC meeting that in a meeting with M/s Siemens it was informed that separate Hardware/software/applications would be required for implementing ADMS on 66 kV feeders where remote control (through SCADA) facility was available. M/s Siemens was requested to submit detailed project report/tentative cost and the same was still awaited.
- 10.3. Punjab representative was requested to share the details with UP so that necessary steps may be taken by UP SLDC.

Members may update the status of implementation of scheme.

11. Mapping of UFR, df/dt relay details in SCADA

- 11.1 As per the deliberations held in 164th OCC meeting, NRLDC conducted video conferencing meeting with SLDC of UP, Haryana, Punjab and Rajasthan and sent out general and state specific recommendations for its compliance.
- 11.2 In the 166th OCC meeting, NRLDC representative had informed that based on the recommendations, most of the SLDCs (Haryana, UP, Punjab) has updated their SCADA displays. It was also informed that Punjab has submitted a detailed reply updating on the action taken based on the recommendations.

- 11.3 UPSLDC has also stated that based on the outcome of the meeting with NRLDC, SCADA mapping has been revised with actual feeder name along with the average load relief.
- 11.4 NRLDC representative had stated that the submissions made by Punjab and UP would be looked into and shortcomings, if any would be brought forward in the 167th OCC meeting.

SLDCs and NRLDC to update.

12. Non-compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015 and New Element Charging Procedure

- 12.1 The issue of non-compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015 and New Element Charging Procedure was deliberated in the 163rd, 164th & 165th OCC meetings wherein members had expressed their concerns and were of the opinion that clearances by Electrical Inspector for every element replaced as per Regulations may not be practical as it can lead to delay in restoration of healthy grid element, thereby, compromising with grid security.
- 12.2 Thereafter, OCC forum in its 165th meeting opined that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator and LA may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission and generating utilities and a copy of application along with undertaking to the concerned authority for safety clearance may be submitted.
- 12.3 Based on the deliberations, a letter (copy enclosed at **Annexure-A.III**) was sent to Chief Engineer, CEI, CEA informing about the decision of OCC forum to adopt the aforementioned practice pending amendment to the Principle safety regulations.
- 12.4 Chief Engineer, CEI, CEA vide letter dated 26.12.2019 (**Annexure-A.IV**) has replied that according to the safety regulation, replacement and upgradation work of substation equipment need to be approved by Electrical Inspector.

This is for the information of the members and compliance of the same.

13. Certification of Non-ISTS lines for inclusion

- 13.1 Central Electricity Regulatory Commission (Sharing of Inter State Transmission Charges and Losses) (Third Amendment) Regulations, 2015 provides as under:

“Certification of non-ISTS lines carrying inter-State power, which were not approved by the RPCs on the date of notification of the Central Electricity Regulatory Commission (Sharing of Transmission Charges and Losses) Regulations, 2009, shall be done on the basis of load flow studies. For this purpose, STU shall put up proposal to the respective RPC Secretariat for approval. RPC Secretariat, in consultation with RLDC, using WebNet Software would examine the proposal. The results of the load flow studies and participation factor indicating flow of Inter State power on these lines shall be used to compute the

percentage of usage of these lines as inter State transmission. The software in the considered scenario will give percentage of usage of these lines by home State and other than home State. For testing the usage, tariff of similar ISTS line may be used. The tariff of the line will also be allocated by software to the home State and other than home State. Based on percentage usage of ISTS in base case, RPC will approve whether the particular State line is being used as ISTS or not. Concerned STU will submit asset-wise tariff. If asset wise tariff is not available, STU will file petition before the Commission for approval of tariff of such lines. The tariff in respect of these lines shall be computed based on Approved ARR and it shall be allocated to lines of different voltage levels and configurations on the basis of methodology which is being done for ISTS lines.”

- 13.2 Based on the methodology suggested by a group formulated based on the decision of 31st TCC and 35th NRPC meeting for carrying out the certification of the non-ISTS lines carrying inter-State power, the study was carried out for certification of non-ISTS lines submitted by HP, Rajasthan, Uttarakhand and Punjab for FY 2019-20.
- 13.3 The transmission lines, which fulfil the criteria recommended by the group and are recommended for certification as ISTS for the current Financial Year (2019-20) by NRPC Secretariat are listed below:

S. No.	Name of Transmission Line	Owner STU
1.	220 kV Karian-Rajera	HP
2.	400kV S/C Merta - Heerapura Line	RVPN
3.	400 kV D/C Chhitorgarh-Bhilwara line	RVPN
4.	400 kV D/C Bhilwara-Ajmer line	RVPN
5.	132 kV Mahuakheraganj-Thakurdwara Line	PTCUL

- 13.4 The complete list of transmission lines submitted by STU can be sub-divided in following categories:
- Transmission lines, which fulfil the criteria recommended by the Group and hence are recommended to be certified as ISTS.
 - Transmission lines, which do not fulfil the criteria recommended by the Group and hence may not be certified as ISTS.
 - The transmission lines which are natural inter-state lines and hence need not be certified as ISTS.

The complete category wise list of transmission lines submitted by STUs is enclosed at **Annexure-A.V**.

Members may recommend the aforementioned lines for approval of NRPC.

14. Detailed guidelines for assessment of ramping capability of thermal Inter-state generating stations (ISGS) (Agenda by NLDC)

CERC (Terms and Conditions of Tariff) regulations, 2019 specify that rate of RoE of thermal ISGS shall be reduced by 0.25% for failure to achieve minimum ramp rate of

1%/minute and additional RoE shall be allowed for achieving ramp rate greater than 1%/minute.

Detailed guidelines for operationalization of this provision have been prepared by NLDC and as per directions of Hon'ble commission, these have been published on POSOCO website seeking feedback from stakeholders. The draft detailed guidelines (**Annexure-A.VI**) is available at the following link https://posoco.in/wp-content/uploads/2020/01/Ramp_Assessment_detailed-guidelines_6Jan2020.pdf.

Members are requested to submit their comments by 21st January 2020.

15. Regarding energizing of AMR Meters installed on State Boundary points falling in the jurisdiction of BBMB authorities — Obtaining permission for shutdown from POWERGRID Authorities (Agenda by UHBVN/ DHBVN)

Haryana Discoms are in the process of installing AMT type SEM meters on the State boundary points, for the purpose of redundancy. Out of approximately 103 such locations, 27 no. meters are already installed and communicating. Another 31 no. meters have been installed in DHBVN in the BBMB areas of jurisdiction but are still un-energized due to want of consent for shutdown from BBMB authorities. The SLDC authorities were requested to help provide the same but they have reverted vide their communication dated 9.12.2019 (F/A), and have instead asked the Discoms to confirm the permission from BBMB and POWERGRID authorities, (being Nodal Agency) for metering system at Inter-State locations.

The Discoms have been suffering due to non-availability of real time SEM data and on account of mismatch in SEM and SCADA drawl readings, due to which unjust levy of DSM charges have to be paid by them from time to time. The Discoms had then decided to install on their own, AMR meters on State boundary points for the purpose of redundancy, but the work is now held up due to want of consent of BBMB authorities for energizing these 31 no. meters.

Accordingly, POWERGRID/ BBMB representatives may kindly provide in-principle consent/permission for energizing the 31 no. AMR meters already installed by Haryana Discoms in BBMB premises in DHBVN.

Part-B NRLDC

1. Analysis of 26th December Solar eclipse on Indian power system

Recently, India faced an annular solar eclipse on 26th December 2019. In this case, annularity was visible mainly in Southern India i.e. in the states of Kerala, Tamil Nadu and Karnataka while the rest of the country witnessed only partial eclipse of the sun. In order to assess likely impact of solar eclipse on Indian power system, a report was published by Power System Operation Corporation Ltd (POSOCO) before the eclipse. The report is available at <https://posoco.in/wp-content/uploads/2019/12/Solar-Eclipse-26th-December-2019-Indian-Power-System-likely-impacts-and-preparedness-A-report.pdf>.

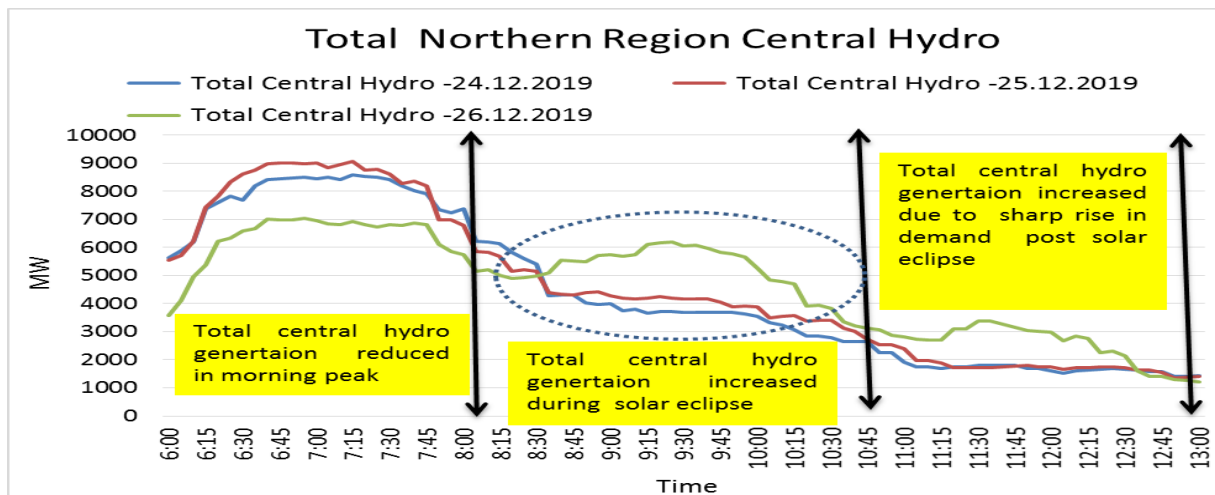
To mitigate the variation in Solar generation due to eclipse, advisories were issued by respective Regional load despatch centres where in, all states were requested to vary their hydro/gas generation based on the real time solar generation reduction as per

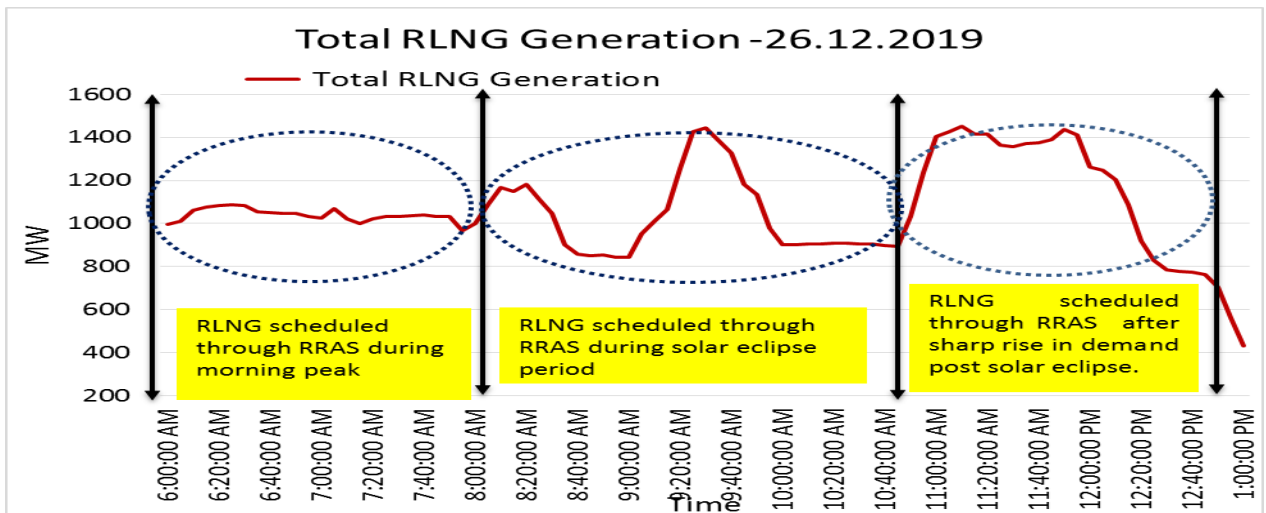
the proposed ramp rates. Since maximum impact was estimated in Southern region, two units of Kudgi (on RRAS) and one unit of Vallur was brought on bar at 0000hrs of 26.12.19. Gas generation in Western region and Northern region were kept on bar from 0500 AM of 26th December 2019 to cater ramp issues during morning demand as well as solar eclipse period. Thermal Inter State Generating Stations (ISGS) in Southern region were excluded from Security Constrained Economic Despatch (SCED) by 0300 hrs to mitigate congestion in inter-regional corridors towards Southern region.

All India estimated solar generation ramp up and ramp down rates observed were close to the predicted values. Average ramp down rate was predicted as 13 MW/minute (from 0803hrs to 0930hrs.) while average ramp up rate was predicted as 122 MW/minute (from 0930hrs to 1120hrs). During the eclipse, average ramp down rate was 12.6 MW/minute from 08:03 hrs to 09:30 hrs and average ramp up rate was 121.3 MW/minute from 09:30 hrs to 11:20 hrs.

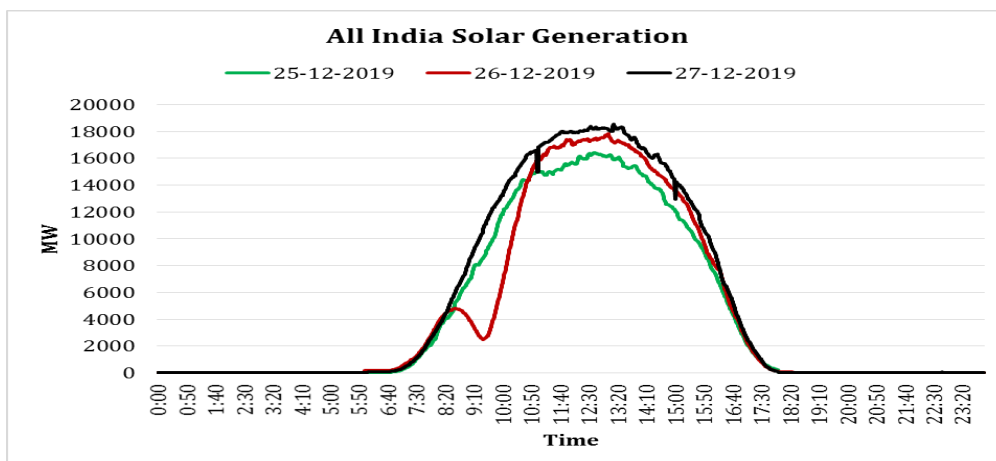
It was observed that All India demand started to decline from 07:30 onwards with maximum dip observed as 6800MW at 08:30hrs compared to previous day. After end of eclipse (i.e., 11:00 Hrs) demand started to increase, and at 11:40 hrs. the demand was higher by 8300 MW w.r.t previous day. It is to be noted that the previous day i.e. 25th December 2019 was a holiday (Christmas). There was not much change in demand of Northern region, however, a very small increase in demand after the end of eclipse was observed. Rajasthan purchased additional power from IEX to mitigate the effect of reduced solar generation due to solar eclipse.

Northern Region hydro and gas generation for 26.12.2019 during 06:00 hrs to 13:00 hrs are shown below:

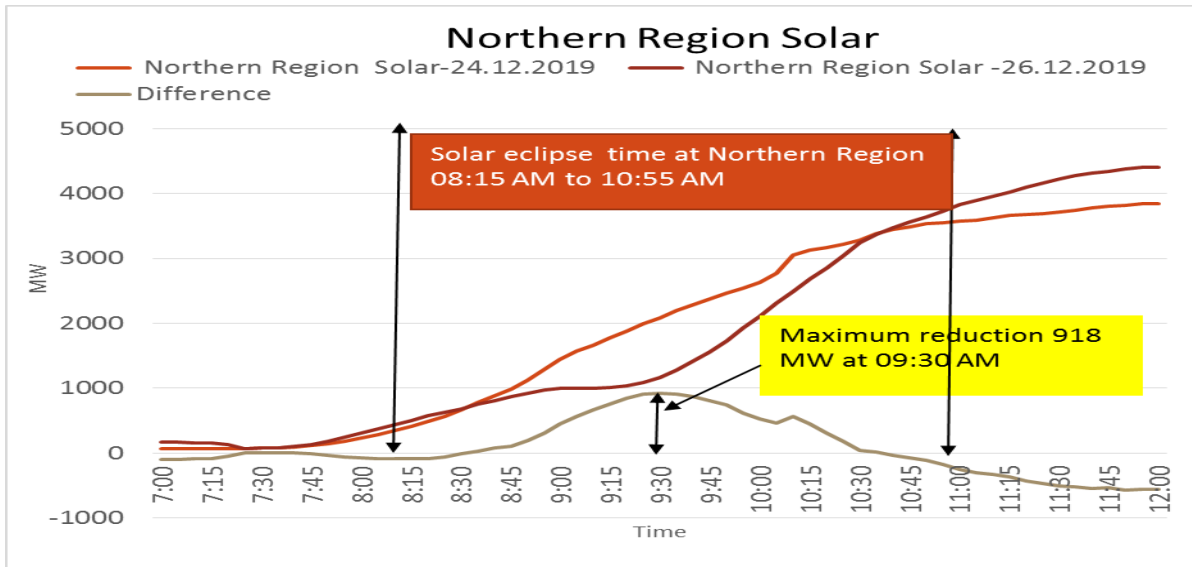




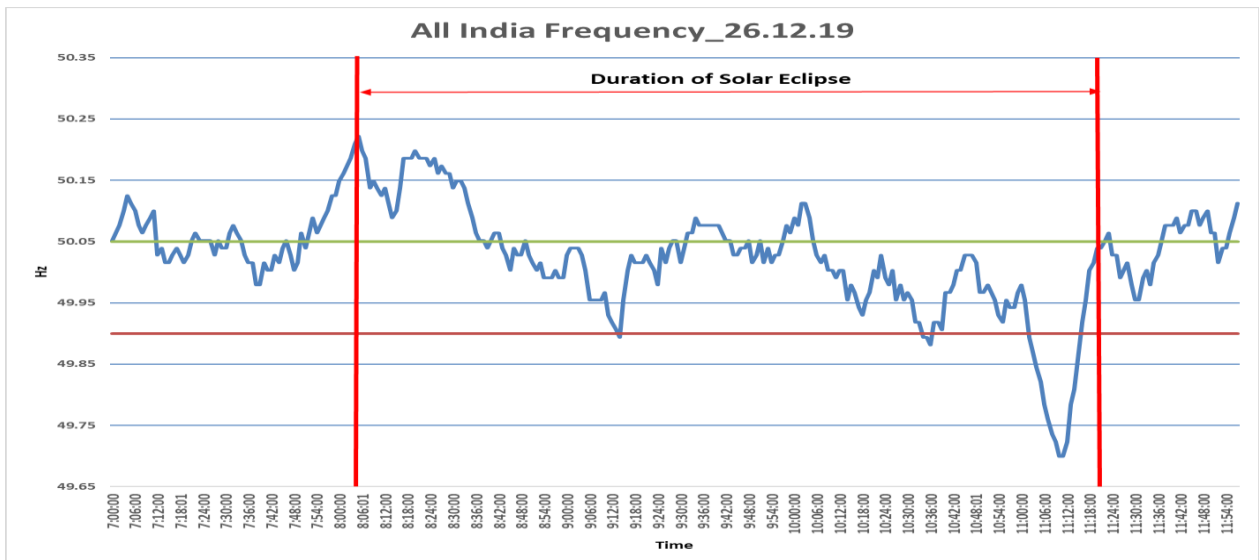
There were cloudy conditions in Southern and Western region and Fog in Northern region on 26th December 2019. Due to this condition, the maximum reduction in solar generation was 6.5 GW against estimated reduction of 7.8 GW considering clear sky conditions. If solar reduction is compared with clear sky day (27.12.2019), the difference comes out to be 8.2 GW.



During solar eclipse, in Northern region reduction in solar generation started at 08:30 AM and maximum reduction of 918 MW was observed at 09:30 AM



Frequency was observed outside IEGC band before and after the eclipse.



Further, NRLDC will apprise the house about the brief highlights and findings. State utilities can also share their valuable feedback for further improvement.

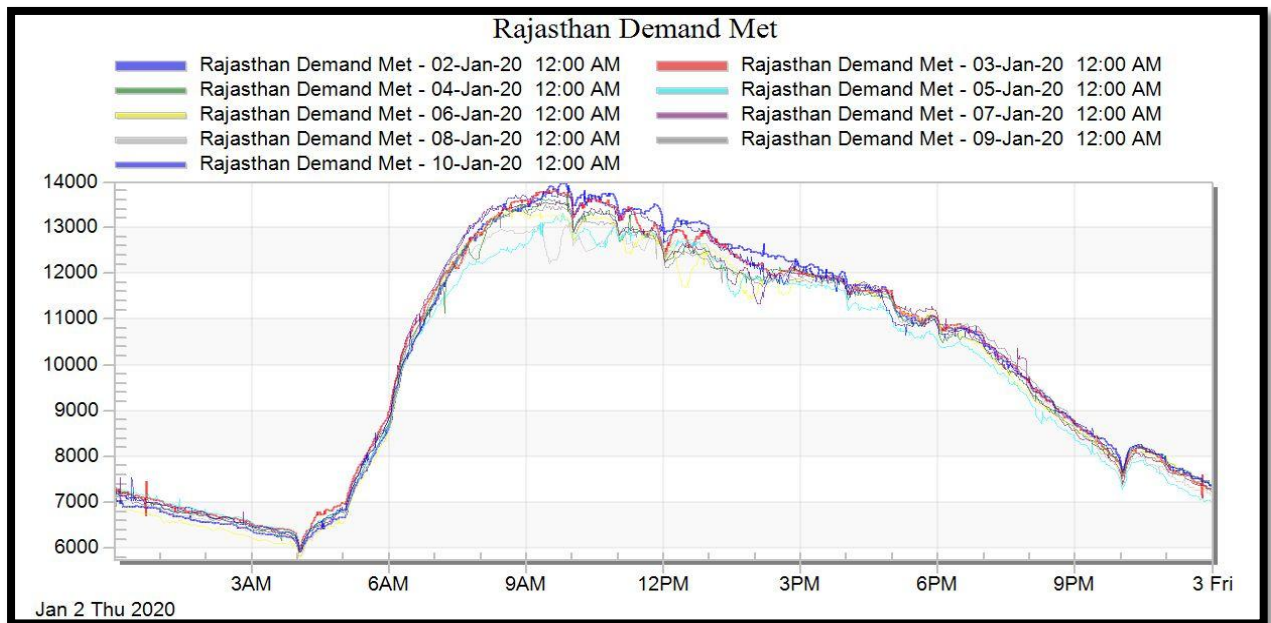
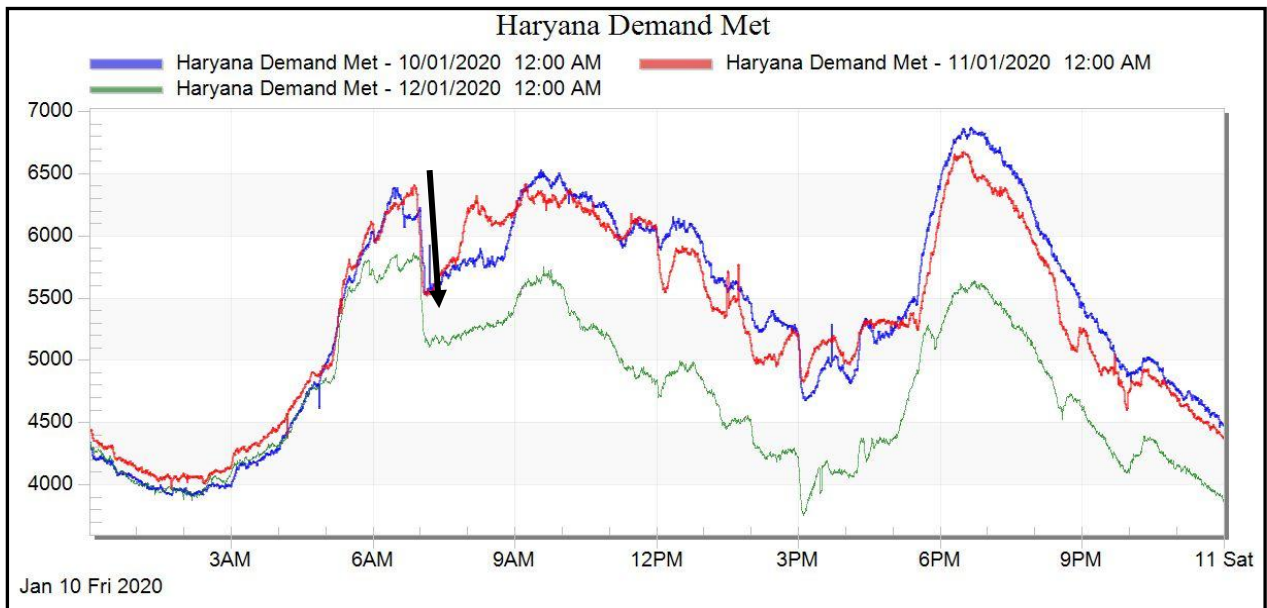
Members may like to discuss.

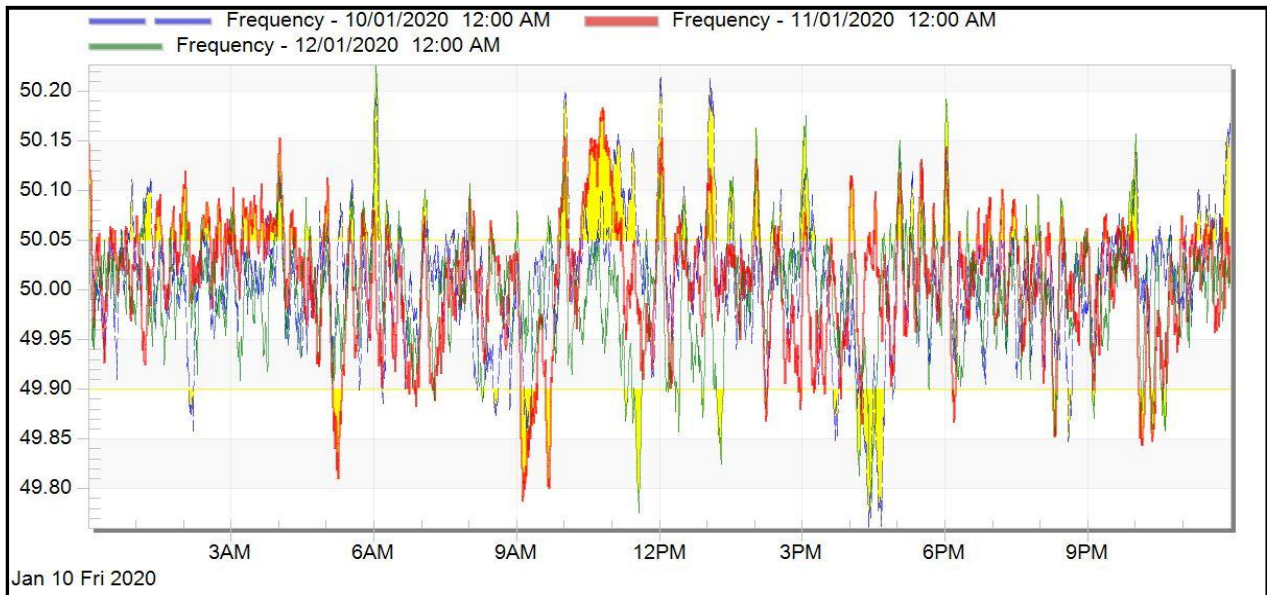
2. Need for load staggering by Haryana & Rajasthan

From the demand pattern of Haryana & Rajasthan, it could be observed that still there are instances where there is sudden connection/ disconnection of load groups. As is visible from the plots shown below, there is sudden reduction in demand by 700-800MW around 7 AM in Haryana and 04AM & 10 PM in Rajasthan. As has been deliberated in numerous TCC/ NRPC meetings, OCC meetings and written communications etc., utilities need to try and make sure that sudden connection or disconnection of load is avoided as it results in frequency excursions in the grid. Haryana is requested to take care in this regard. Apart from Haryana & Rajasthan,

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other states are also requested to try and minimize sudden connection and disconnection of load as mentioned in IEGC 5.2(j).





Members may like to discuss.

3. Reactive power performance of generators

Following was agreed in 44th TCC / 47th NRPC meeting and 165th and 166th OCC meetings:

- All generators (including intrastate) shall absorb MVAR as per capability curve
- Reactive power support performance and MVAR telemetry issues will be reviewed in monthly OCC meetings.
- Reactive power capability testing will be carried out after discussion in OCC meeting.

Reactive power response of generating stations is being regularly discussed in OCC meetings.

Based on available data, it is observed that there are margins available as per capability curves for most of the generating stations. In addition, telemetry (sign and magnitude of MVAR) of various state generating station is yet to be corrected. The matter has been discussed in many of the previous OCC/TCC meetings. Reactive power response in respect of MVAR vs Voltage for **past 30 days (14.12.19 - 13.01.20)** as per NRLDC SCADA data is enclosed in **Annexure-B.I.**

It was agreed in previous OCC meetings that states shall also develop MVAR vs voltage plots for generators under their jurisdiction. This would also help to improve telemetry of MVAR data and eventually, more reliable MVAR vs voltage plots will be available. Therefore, it is requested that states and generators shall also develop MW vs MVAR and Voltage vs MVAR plots at their end so that their operation based on capability curve be also assessed. **Moreover, generators which are not having adequate response and telemetry issues may like to provide the reasons and actions being undertaken to overcome this.**

Members may like to discuss.

4. RE curtailment in Rajasthan control area

As we all know that RE (Renewable Energy) resources accorded the must run status from MNRE and any curtailment of these resources is against the national interest.

It can be seen that there is large wind generation curtailment in Rajasthan control area, particularly during night hours, which even crosses 800 to 1000 MW at some instances. Trend of wind generation curtailment for last from 22nd Dec 2019 to 07th Jan 2020

DATE	Wind Energy Curtailed (MUs)	Wind Curtailed (Max. MW)
22/12/2019	0.48	489
23/12/2019	6.77	489
24/12/2019	2.73	273
26/12/2019	5.27	439
29/12/2019	2.31	596
30/12/2019	2.01	596
31/12/2019	4.08	837
1/1/2020	4.05	920
2/1/2020	2.08	911
3/1/2020	4.01	892
6/1/2020	0.42	369
7/1/2020	2.40	624

In this regard NRLDC already wrote a letter to Rajasthan to take corrective measures, however RE curtailment is still persisting in Rajasthan.

Rajasthan may please apprise.

5. Frequent forced outages of transmission elements in the month of Dec'19:

The following transmission elements were frequently under forced outages during the month of **Dec'19**:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	220 KV Bairasiul(NH)-Jessore(HP) (PG) Ckt-1	11	NHPC/POWERGRID/HP
2	400 kv Suratgarh(rvun)-Bikaner(rs) (rs) ckt-1	6	Rajasthan
3	400 kv Kishenpur-Newwanpoh (pg) ckt-1	6	POWERGRID

4	400 KV Aligarh-Sikandrabad (UP) Ckt-2	4	UP
5	220 kv Kuniyar(hp)-Pinjore(hv) (hv) ckt-1	4	HP/Haryana
6	220 KV Agra(PG)-Shamshabad(UP) (UP) Ckt-1	4	UP
7	400/220 kv 240 MVA ICT 3 at obra_b(up)	3	UP
8	400 KV Deepalpur(JHKT)-Bawana(DV) (PG) Ckt-1	3	Delhi
9	400 kv Bawana-Mundka (dv) ckt-1	3	Delhi
10	400 kv Anta-Chhabra sctps (rs) ckt-2	3	Rajasthan
11	400 KV Akal-Kankani (RS) Ckt-2	3	Rajasthan
12	400 kv Agra(pg)-Agra(up) (pg) ckt-1	3	UP
13	220 KV RAPS_A(NP)-Sakatpura(RS) (RS) Ckt-2	3	Rajasthan/NPCIL

The complete details are attached at **Annexure-B.II**. Frequent outages of such elements affect the reliability and security of the grid. Hence, utilities are requested to look into such frequent outages and share the remedial measures taken/being taken in this respect.

Members may like to discuss.

6. Multiple element tripping events in Northern region in the month of Dec'19:

A total of **17** grid events occurred in the month of Dec'19 of which **8** are of GD-1 category. The preliminary report of all the events have been issued from NRLDC. A list of all these events along with the status of details received by 05-Jan-2020 is attached at **Annexure-B.III**.

Further, despite persistent discussions/follow-up in various OCC/PCC meetings, the compliance of the regulations is still much below the desired level.

Maximum Fault Duration is **800ms** in the event of multiple element tripping at 400/220 kV Muradnagar(UP) on 18-Dec-19 at 17:47hrs.

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **4** events out of 17 grid events occurred in the month.

Members may take expeditious actions to avoid such tripping in future and discuss the same. Moreover, utilities may impress upon all concerned for providing the Preliminary Report, DR/EL & Detailed Report of the events in line with the regulations.

Members may like to discuss.

7. Details of tripping of Inter-Regional lines from Northern Region for Dec'19:

A total of **07** inter-regional lines tripping occurred in the month of Dec'19. The list is attached at **Annexure-B.IV**. Out of 07 number of trippings, 3 tripping incidents are related to HVDC system. 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 is in violation of various regulations. 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 mandated by CEA (Grid Standard) Regulations.

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

8. Mock black start exercises in NR:

As per Indian Electricity Grid Code (IEGC) clause 5.8(b) "Mock trial runs of the procedure for different sub-systems shall be carried out by the Users/ CTU/ STU at least once every six months under intimation to the RLDC".

Mock Black-start exercise of power stations therefore needs to be carried out in-order to ensure healthiness of black start facility. The winter months are off peak hydro period and therefore good time to carry out such exercises.

The following is the status and schedule of mock exercises to be carried out:

Scheduled Date	Revised scheduled Date	Name of stations	Comments/Remarks
09-Oct-19		Anta GPS	To be confirmed by Anta. Internal black start reportedly conducted on 18-Oct-19.
22-Oct-19	15 Nov'19	*Dhauliganga	Revised schedule due to load provision in UP. Conducted

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			Successfully on 15 th Nov 2019
25-Oct-19	17-Dec-19	*N. Jhakri and Rampur	Revised schedule due to overhauling activity at Jhakri. Conducted Successfully
31-Oct-19	31-Oct-19	*Bairasiul	Exercise was partial successful. Island created but could not sustain long and unit tripped. Final synchronization of island with the grid could not be successful at Bairasiul due to problem in synchronization at Bairasiul HEP.
05-Nov-19		Sewa-2	Revised schedule due to load provision in J&K.
8-Nov-19	24-Dec-19	*Karcham and Baspa	Exercise deferred by Karcham due to reported internal problem.
15-Nov-19	13, 14-Nov-19	*Uri-I, II HEP, Lower Jhelum HEP, Pampore GT's, Upper Sindh and Kishanganga	NHPC revised dates due to 15 th being Friday. Confirmation yet to be received from J&K.
19-Nov-19		Parbati-3 and *Sainj	
21-Nov-19		Salal	
26-Nov-19		*Chamera-3	
28-Nov-19	28-Nov-19	Koteshwar	Conducted Successfully
04-Dec-19		*Auraiya GPS	
10-Dec-19	10-Dec-19	Chamera-1 and 2	Due to outages of Unit#1 & Unit#2, the mock black start exercise at Chamera-2 Power Station may be avoided. Chamera-1 Black Start completed successfully
12-Dec-19		Malana-2, AD Hydro and Phozal	
19-Dec-19		*Dadri GPS	
27-Dec-19		Tehri	
02-Jan-20		Koldam	

* Mock Black start exercise not carried out during Year 2018-19.

SLDC's were also requested to carryout mock black-start of station in their respective control area & inform the tentative dates to the OCC as well as outcome of these exercises. The proposed Hydro Power Stations to undergo the exercise were as follows:

S. NO.	Utility	Hydro Power Station	Installed Capacity(MW)
1	J&K	Baglihar	3x150
2		Baglihar stage-2	3x150
3		Lower Jhelum	3x35
4		Upper Sindh	2x11+3x35
5		Larji	3x42

6		Bhabha	3x40
7		Malana -I	2x43
8		Baspa	3x100
9	Punjab	Ranjit Sagar	4x150
10		Mahi-I&II	2x25+2x45
11		Rana Pratap Sagar	4x43
12		Jawahar Sagar	3x33
13		Gandhi Sagar	5x23
14		Dholpur GPS	3x110
15		Ramgarh GPS	1x35.5+2x37.5+1x110
16		Rihand	6x50
17		Obra	3x33
18		Vishnuprayag	4x100
19		Srinagar (Alaknanda)	4x82.5
20		Gamma Infra	2x76+1x73
21		Shravanti	6x75
22		Ramganga	3x66
23		Chibro	4x60
24		Khodri	4x30
25		Chilla	4x36
26		Maneri Bhali-I&II	3x30+4x76
27	Delhi	IP Extn GTs	6x30+3x30
28	Haryana	Faridabad GPS	2x137.75+1x156.07

During last winter, SLDCs had been requested to carry out mock drills and share their experiences. However, the report of such exercises was not received.

During 163rd OCC meeting, members agreed to confirm the schedule by the end of September'19. However, details are still awaited from all the utilities. It is once again requested to all the members to kindly confirm the schedule as it would be difficult to change the schedule once finalized.

In 164th OCC meeting the following were informed by states:

- Punjab representative informed that black start facility is not available at Anandpur Sahib.
- UP representative informed that Rihand Hydro black start will be carried out during second week of Nov-2019.
- Delhi representative informed that Pragati and Rithala stations don't have black start capability.

In 165th OCC meeting the following were discussed:

- *Black start of Dhauliganga HEP was rescheduled on 15th Nov 2019 (UPPTCL changed the date to provide the load), it is already running.*
- *Black start of Bairasiul was partially successful in view of stopping of unit due to problem in island synchronization with the main grid at Bairasiul HEP*

- Mock exercise was postponed because of CERC visit. Mock exercise of Karcham/ Baspa can be done in the month of December. NRLDC representative further suggested to Karcham HEP to do the exercise in the month of November itself.
- Tehri & Koteshwar agreed to do mock exercise as per schedule.
- NHPC confirmed all the dates of mock exercises which are to be held before next OCC meeting.
- UP representative informed that black start was successfully occurred at Rihand Hydro on 11th Nov 2019, Obra HEP was also tried to synchronize, obra bus was charged but unit didn't synchronize during this exercise. Black start of Obra HEP will be further expedited after taking input & reason of tripping of Obra unit during recent exercise.
- UP representative further informed that Vishnuprayag & Alaknanda have black start facility but nearby load is available at Srinagar (Uttarakhand). UPPTCL representative will share the procedure in the meantime and will discuss with Uttarakhand for consent in this regard.
- Punjab representative informed that black start facility is not available at Anandpur Sahib.
- Delhi representative informed that they will do the mock exercise for IP-GT in the month of December-2019.
- NRLDC representative requested to Uttarakhand for conducting mock black start exercise of hydro units in Uttarakhand.
- Haryana representative informed that they are taking up the matter with Faridabad GT for mock black start exercise and will be revert soon.
- NTPC Anta agreed to share the black start procedure at the earliest

In 166th OCC meeting the following were discussed:

- Karcham representative agreed to do the testing on 23rd or 24th Dec 2019. Haryana & POWERGRID representative also agreed for the same.
- Black start of Jhakri HEP & Rampur HP was done on 17th Dec 2019.
- NRLDC representative suggested Delhi SLDC to do the mock exercise of Pragati GT in the month of Dec 2019.
- Rajasthan representative informed that they have planned for mock exercise of hydro and gas station. Date will be shared in 10days.
- Haryana representative agreed to take up the matter with NTPC for Faridabad gas and revert back.
- Uttarakhand representative informed that there was no facility available for black start of the units in Uttarakhand control area. NRLDC representative suggested to SLDC-Uttarakhand for further take up the issue in view of non-availability of DG set, setting issue or any other issue and share the exact reason (plant wise) with NRPC/ NRLDC
- NHPC representative requested to explore the possibility to extent the Uri-1 HEP to Delina load.
- Punjab representative informed that they will conduct the mock exercise of RSD in the month of Jan-2020.

Apart from above, BBMB has also conducted mock exercise for Bhakra generation on 19th Dec 2019. Report is still awaited from BBMB.

SLDCs are once again requested to share the information and program for this year's mock black start exercises and submit the reports of black start exercises carried out last season in their respective control area. SLDCs may also further identify further generating stations/unit for black start exercise.

Members may please discuss.

9. Review of SPS at Bhadla (RVPNL) for evacuation of ISTS connected Solar Power:

A meeting was convened by NRPC on 08.07.19 at NRPC secretariat, New Delhi under the chairmanship of Member Secretary (NRPC) to finalize the logic and implementation of SPS at Bhadla (RVPN) S/s and reliable evacuation of ISTS connected Solar Power. Minutes of meeting attached as Annexure-B.6 of 165th OCC Agenda.

SPS logic as approved in the meeting is as below:

Cause: *line loading of either of 220kV Bhadla-Bap S/c line or 220kV Bhadla-Badisid S/c line increases beyond 225 MW*

Action:

- *New ISTS Solar generation (beyond 350 MW] is to be curtailed through 220kV injection feeder (ISTS) disconnection at Bhadla (PG) S/s*
- *Bus sectionaliser to be closed at 220kV Bhadla (RVPN) S/s after above action to relieve loading on 220kV Bhadla- Bap S/c line or 220kV Bhadla-Badisid S/c line.*
- *Action should be achieved within say 200 ms.*

It was also decided that the above arrangement will be in place till availability of 765kV Bhadla (PG)- Bikaner (PG) D/c line by Aug/Sep 2019.

Recently on 12th & 13th Dec 2019, above SPS operated due to over loading of 220 kV Bhadla (Raj)-Bap ckt or 220 kV Bhadla (Raj)-Badisid ckt and further resulted into tripping of ISTS connected Solar Generation. This SPS has been disabled till further review of the scheme.

Following were discussed during 165th OCC meeting:

- *NRLDC representative proposed two separate SPS one for ISTS connected solar generators and one is for intra state connected solar generators in Rajasthan.*
 - *For ISTS connected solar generators SPS will take care about tripping of both 765 kV Bhadla-Bikaner ckt and in case of tripping both the lines, SPS will be triggered and tripped all the ISTS connected Solar Generators wired*

in SPS scheme. For line tripping input for both end of 765 kV lines to be taken for SPS logic like in 765 kV Agra-Gwalior SPS.

- *For intra state connected solar generators, Rajasthan may purpose and share the information in OCC meeting.*
- *Existing SPS scheme needs to be disabled for ISTS connected solar generators.*

- *POWERGRID representative informed that they will discuss internally and revert back for proposed SPS scheme. Tripping for existing SPS scheme will be disabled immediately.*
- *Rajasthan representative agreed to block the tripping communication from Bhadla (Raj) to Bhadla (PG) and also agreed to review and share the SPS scheme in next OCC meeting.*

OCC advised POWERGRID to go through the SPS scheme and share the feedback in 15days. OCC also advised SLDC-Rajasthan to share the SPS scheme details in next OCC meeting.

POWERGRID and Rajasthan may please update.

10. Revision of document for Reactive Power Management for Northern Region:

Reactive Power Management document for Northern region has been revised on 31st Dec 2019 & updated document link is as below:

<https://nrlcdc.in/download/nr-reactive-power-management-2020/>

Document is password protected and password was already informed to all the NR constituents through letter dated 31st Dec 2019. The following is the status of details received as on 10-Jan-20:

Reactive Power Document			
Data Received from		Data Not Received from	
Adani	HP	Rosa-Reliance	J&K
Rajasthan	UP	THDC	APCPL
POWERGRID NR-1	Delhi	Karcham (JSW)	JAYPEE
POWERGRID NR-2	NTPC	AD Hydro	POWERLINK
POWERGRID-NR3	Haryana	Greenko Budhil	PKTCL
NHPC	Uttarakhand	NPCIL	Shree Cement
SJVNL	BBMB	Malana-I	Chandigarh
IGSTPS-Jhajjar		Punjab	Malana-II
		Railway	
		Others...	

All the NR constituent may please go through the document and provide the feedback, suggestion if any.

All the state SLDCs are also requested to kindly prepare the reactive power document for its own control area.

11. Revision of document for System Restoration Procedure (SRP) for Northern Region:

System restoration procedure for Northern region is due for revision. The last updated document link has already been shared with the constituents.

https://nrlcdc.in/wp-content/uploads/2019/01/System_Restoration_NR_2019.pdf

Document is password protected and password was already informed to all the NR constituents through letter dated 31st Jan 2019.

Constituents are requested to go through the document and provide any modification/addition in respect of their system. SLDC/Generating utilities are requested to kindly update and share the restoration procedure in respect of their state/generating station.

Despite of continuous discussion in various OCC meeting and NRLDC letter dated 25th Nov 2019, details are still awaited from most of the NR utilities.

In 165 and 166 OCC meetings, constituents were requested to provide feedback, suggestion and updated information by 15th December 2018.

The following is the status of details received as on 10-Jan-20:

System Restoration Procedure		
Data Received from	Data Not received from	
NHPC	THDC (Tehri)	POWERLINK
Rajasthan	Rosa (Reliance)	PKTCL
AD Hydro	NTPC	Shree Cement
Greenko Budhil	POWERGRID	Karcham (JSW)
Delhi	Railway	Malana-II
Haryana	BBMB	Uttarakhand
HP	Chandigarh	Punjab
UP	APCPL	Others...
	Adani	
	NPCIL	
	SJVN	
	J&K	
	Malana-I	
	JAYPEE	

It is once again requested to all the NR constituents to provide the feedback, suggestion and updated information by 15th Jan 2020.

Member may like to discuss.

Annexure-I**Anticipated Power Supply Position in Northern Region for February 2020**

State / UT		Feb'20 (MU)	Feb'20 (MW)
Chandigarh	Availability	105	295
	Requirement	115	235
	Surplus/Shortfall (MU)	-10	60
	Surplus/Shortfall (%)	-8.7%	25.5%
Delhi	Availability	2780	5880
	Requirement	1870	4400
	Surplus/Shortfall (MU)	910	1480
	Surplus/Shortfall (%)	48.7%	33.6%
Haryana	Availability	5090	9860
	Requirement	3560	6950
	Surplus/Shortfall (MU)	1530	2910
	Surplus/Shortfall (%)	43.0%	41.9%
Himachal Pradesh	Availability	1010	1600
	Requirement	870	1590
	Surplus/Shortfall (MU)	140	10
	Surplus/Shortfall (%)	16.1%	0.6%
UTs of J&K and Ladakh	Availability	670	1860
	Requirement	1620	3190
	Surplus/Shortfall (MU)	-950	-1330
	Surplus/Shortfall (%)	-58.6%	-41.7%
Punjab	Availability	5470	9000
	Requirement	3550	7500
	Surplus/Shortfall (MU)	1920	1500
	Surplus/Shortfall (%)	54.1%	20.0%
Rajasthan	Availability	8220	14940
	Requirement	6860	12700
	Surplus/Shortfall (MU)	1360	2240
	Surplus/Shortfall (%)	19.8%	17.6%
Uttar Pradesh	Availability	8700	15950
	Requirement	7750	16200
	Surplus/Shortfall (MU)	950	-250
	Surplus/Shortfall (%)	12.3%	-1.5%
Uttarakhand	Availability	1040	2150
	Requirement	1060	2210
	Surplus/Shortfall (MU)	-20	-60
	Surplus/Shortfall (%)	-1.9%	-2.7%
Total NR	Availability	33085	61535
	Requirement	27255	48700
	Surplus/Shortfall (MU)	5830	12835
	Surplus/Shortfall (%)	21.4%	26.4%

Follow up issues from previous OCC meetings

Sl. No.	Agenda point	Details	Status
1.	Monitoring of schemes funded from PSDF (<i>Agenda by NPC</i>)	The latest status of the schemes for which grant has been sanctioned from PSDF for the schemes in NR. Utilities are requested to expedite implementation of the schemes and submit information of physical as well as financial progress in the prescribed format by first week of every month on regular basis to Member Convener, PSDF Project Monitoring Group (AGM, NLDC and POSOCO) with a copy to NPC Division.	All states are requested to update the status of the schemes to be funded from PSDF.
2.	Sub-stations likely to be commissioned in next six months.	All the concerned states were requested to submit the details of the downstream network associated specially with POWERGRID substations along with the action plan of their proposed/approved networks.	The updated details of the substations of POWERGRID and their required downstream network is enclosed at Annexure-A.II.1 All states are requested to update the status of remaining downstream networks on regular basis.
3.	Progress of installing new capacitors and repair of defective capacitors	Information regarding installation of new capacitors and repair of defective capacitors is to be submitted to NRPC Secretariat.	Information received from Delhi, UP, Rajasthan, Uttarakhand, HP, Haryana and UT of Chandigarh (for Q2) . All states are requested to furnish updated status up to Q3.
4.	Healthiness of defence mechanism: Self-certification	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 " <i>All the UFRs are checked and found functional</i> ".	Report for the period ending Sep'2019 received from UP, Delhi, Haryana, HP, BBMB and Punjab . Rajasthan have submitted information up to June'2019 . All states were requested to submit details of feeder-wise expected load relief through UFR and df/dt relays in the format enclosed at Annexure-A.2.3 of

Sl. No.	Agenda point	Details	Status
			<p>agenda of 165th OCC.</p> <p>As per the decision in 166th OCC meeting representative of NRPC and NRLDC carried out UFR testing at 220 kV Park Street Sub-station of Delhi.</p>
5.	Recommendations of Enquiry Committee on grid disturbances on 30 & 31.7.2012	Based on the recommendations of the Enquiry Committee on grid disturbances on 30 th & 31 st July 2012, utilities of NR were requested to take necessary action and submit compliance/status report to NRPC.	<p>Updated status awaited from HVPNL, Chandigarh and J&K.</p> <p>HVPNL was advised to to furnish information by 5th January 2020.</p> <p><i>HVPNL may update.</i></p>
6.	Status of FGD installation vis-à-vis installation plan at identified TPS	List of FGDs to be installed in NR was finalized in the 36 th TCC (special) meeting dt. 14.09.2017. All SLDCs were regularly requested since 144 th 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.	<p>Updated status for the month of October 2019 has been received from Punjab, NTPC and UP.</p> <p>All states/utilities are requested to update status on monthly basis.</p>

7. Reactive compensation at 220 kV/ 400 kV level

Sl. No.	Owner	Substation	Reactor	Updated Status
1.	POWERGRID	Kurukshetra	500 MVar TCR	Anticipated commissioning: Jan-Mar'2021
2	DTL	Peeragarhi	1x50 MVar at 220 kV	Tender floated in December 2019. Commissioning expected by March 2021.
		Harsh Vihar	2x50 MVar at 220 kV	
		Mundka	1x125 MVar at 400 kV	Under Tendering. Expected commissioning by March 2021.
			1x25 MVar at 220 kV	
		Electric Lane	1x50 MVar at 220 kV	Under Financial Concurrence
		Bamnauli	2x25 MVar at 220 kV	Under Tendering
Indraprastha	2x25 MVar at 220 kV	Under Tendering		
3.	Punjab	Dhuri	1x125 MVar at 400 kV	Tendering process to be restarted.
			1x25 MVar at 220 kV	
		Nakodar	1x25 MVar at 220 kV	Anticipated commissioning: Mid 2021
4.	PTCUL	Kashipur	1x125 MVar at 400kV	PTCUL advised to submit the proposal for PSDF funding.
5.	Rajasthan	Akal	1x25 MVar	PSDF funding sanctioned. Under tendering
		Bikaner	1x25 MVar	
		Suratgarh	1x25 MVar	
		Barmer	1x25 MVar	Response awaited from TESG of PSDF.
		Jodhpur	1x125 MVar	

Annexure-All.I

Sl. No.	Substation	Downstream network bays	Commissioning status of S/s / Transformer	Planned 220 kV system and Implementation Status
1	400/220kV, 3x315 MVA Samba	2 nos. bays utilized under ISTS. Balance 4 nos. to be utilized	Commissioned (1 st & 2 nd – Mar'13 3 rd – Oct'16) Bays - Mar'13	<ul style="list-style-type: none"> • LILO of 220 kV Bishnha – Hiranagar D/c line. Target completion - Nov, 2019 • 220 kV D/c Samba (PG) – Samba (JKPDD) approved in 1st NRSCT.
2	400/220kV, 2x315 MVA New Wanpoh	6 Nos. of 220 kV bays to be utilized	Commissioned in Jul'14 Bays-Jul'14	<ul style="list-style-type: none"> • 220 kV New Wanpoh - Mirbazar D/c line. • 220 kV Alusteng - New Wanpoh Line.
3	400/220 kV, 2x315 MVA Parbati Pooling Station (Banala)	2 Nos. of 220 kV bays to be utilized.	Commissioned in Dec'17	220 kV Charor- Banala D/c line (18 km). Commissioned on 06.12.2019
4	400/220kV, 2x500 MVA Kurukshetra (GIS)	4 nos. of 220 kV bays to be utilized 4 nos. of bays utilised for LILO of one circuit of Kaul-Pehowa 220 kV D/c line at Bhadson (Kurukshetra). Commissioned on 07.03.2019 LILO of one circuit of Kaul-Bastara 220 kV D/c line Bhadson(Kurukshetra). Commissioned on 27.06.2019	Commissioned in Mar'17.	<ul style="list-style-type: none"> • 220kV D/c Bhadson (Kurukshetra) – Salempur with HTLS conductor equivalent to twin moose. P.O. issued on 15.10.18. Contract agreement signed on 30.11.18. Likely date of completion is 30.04.2020.

Annexure-All.I

Sl. No.	Substation	Downstream network bays	Commissioning status of S/s / Transformer	Planned 220 kV system and Implementation Status
5	400/220 kV, 2x315 MVA Dehradun	Out of 6 bays, only two bays used. Balance 4 bays to be utilised.	Commissioned in Jan'17	<ul style="list-style-type: none"> 220 kV Dehradun-Jhajra line. Target completion: Nov 2021 PTCUL representative to clarify as the said line has not been planned
6	Shahjahanpu, 2x315 MVA 400/220 kV	Partially utilized. Balance 4 Nos. of 220 kV bays to be utilized.	Commissioned in Jun/Sep'14	<ul style="list-style-type: none"> Shajahnapur-Azimpur D/C line is planned, expected by Dec, 2020 220 kV D/C Shajahnapur-Gola line expected by Dec, 2020
7	Hamirpur 400/220 kV 2x 315 MVA Sub-station (Augmentation by 3x105 MVA ICT)	2 nos. bays utilized under ISTS. Balance 6 nos to be utilized	1 st -Dec'13, 2 nd – Mar'14 & 3 rd Mar'19. 4 bays-Dec'13, 2 bays-Mar'14 2 bays-Mar'19	<ul style="list-style-type: none"> 220 kV D/C Hamirpur-Dehan line. Target completion – Dec, 2020
8	Kaithal 400/220 kV 1x 315 MVA Sub-station	July 2017 (Shifting of transformer from Ballabgarh)	Commissioned	<ul style="list-style-type: none"> 220 kV Kaithal(PG)-Neemwala D/c line. Target completion - 30.04.2020.
9	Sikar 400/220kV, 1x 315 MVA S/s	2 Nos. of 220 kV bays	Commissioned	Retendering to be done in December.
10	Bhiwani 400/220kV S/s	6 nos. of 220kV bays	Commissioned	<ul style="list-style-type: none"> 220kV Bhiwani (PG) - Isherwal (HVPNL) D/c line. Target completion – Nov, 2020
11	Jind 400/220kV S/s	6 nos. of 220kV bays	Commissioned	<ul style="list-style-type: none"> LILO of both circuits of 220kV D/c Narwana – Mund line at Jind (PG). Target completion – Nov, 2020

Annexure-All.I

Sl. No.	Substation	Downstream network bays	Commissioning status of S/s / Transformer	Planned 220 kV system and Implementation Status
12	400/220kV Tughlakabad GIS (10 no of 220kV bays)	4x 500	Commissioned	<ul style="list-style-type: none">• RK Puram – Tughlakabad (UG Cable) 220kv D/c line. Scheme will be revised Target completion – March 2023• Okhla – Tughlakabad 220kv D/c line.• Mehrauli – Tughlakabad 220kv D/c line.• BTPS – Tughlakabad 220kv D/c line.• Commissioned.• Masjid Mor – Tughlakabad 220kv D/c line. Target completion – Dec, 2021.
13	400/220kV Kala Amb GIS (TBCB) (6 nos. of 220kV bays)	7x105	Commissioned (Jul'17)	HPPTCL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Kala Amb S/s. Details for remaining 4 nos. of line bays may be provided. Target completion – Dec, 2021



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

विषय: - Mandatory inspection of all elements under CEA (Measures relating to safety and Electric Supply) amendment regulations 2015 – Reg.

Reference is invited to Letter No. उ.क्षे.वि.स./प्रचालन/106/01/2019/10506 dated 18.09.2019 (*copy enclosed*) vide which your esteemed office was intimated about the deliberations held in 163rd OCC meeting of NRPC during which concerns were expressed regarding mandatory inspection of all replacements in the installations by Electrical Inspector.

In continuation to the above, the issue was again deliberated in the 164th OCC and 165th OCC meeting of NRPC (*relevant extracts attached*) wherein the OCC forum opined that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator and LA may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission and generating utilities and a copy of application along with undertaking to the concerned authority for safety clearance may be submitted. Further, during the deliberation in 165th OCC meeting, representative of UPPTCL has informed the forum about an incident, wherein electrical inspector showed reservation to accept inspection request for a Circuit Breaker (CB) on the plea that inspection could not be arranged for a single element.

In view of the above practical difficulties being faced by the utilities, aforementioned practice is being adopted by Northern region pending amendment to the principle Safety Regulations.

This is for your information and necessary action at your end.

नरेश 03/12/19
 (नरेश भंडारी)
 सदस्य सचिव

Chief Engineer, Chief Electrical Inspectorate, CEA

No. उ.क्षे.वि.स./प्रचालन/106/01/2019/114764

Dated: 03.12.2019



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Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

विषय: Mandatory inspection of all elements under CEA (Measures relating to safety and Electric Supply) amendment regulations 2015 – reg.

This is in reference to following sub-clauses of clause 43 of the CEA (Measures relating to safety and Electric Supply) amendment regulations 2015:

(3) *Every electrical installation of voltage above the notified voltage and all the apparatus of the generating stations and above the capacity specified under regulation 32, shall be required to be inspected and tested by the Electrical Inspector before commencement of supply or recommencement after shutdown for six months and above for ensuring observance of safety measures specified under these regulations.*

(7) *The owner of any installation who makes any addition or alteration to his installation shall not connect to the supply his apparatus or electric supply lines, comprising the said alterations or additions, unless and until such alteration or addition has been approved in writing by the Electrical Inspector or self-certified by the owner of the installation, as the case may be.*

2. Regulation 43(3) mandates electrical inspection in case any electrical installation remains out for more than six months. Regulation 43(7) requires approval by Electrical Inspector in case of any addition or alteration of any electrical installation. These regulation pose practical difficulties to transmission licensees, as during normal course of operation, numerous elements like CT, PT, LA, CVT, CB and Isolator in switchyard need replacement and maintenance on real time basis for ensuring safety and security of the complex grid. Electrical inspection in each and every routine case is practically difficult for both transmission licensee as well as electrical inspectors, particularly when the Indian Grid is connected with large number of generating stations and comprises of not less than 7000 substations, 3100 Transformers, 11 HVDC Bi-pole / BtB, 100 Nos. of 765 kV Lines, 1300 Nos. of 400 KV lines, 3200 Nos. of 220 kV lines and downward network.

3. The matter related to mandatory inspection of all replacements in the installations by Electrical Inspector was discussed in 163rd OCC meeting of NRPC held on 17/9/19 and the forum was of the opinion that clearances by Electrical Inspector for every element replaced as per Regulations may not be practical as it can lead to delay in restoration of healthy grid element, thereby, compromising with grid security. The forum opined that for replacement of elements like CT, PT, LA, CVT, CB and Isolator, instead of physical

inspection, self-certification may be sufficient, however, for major equipment like Transformer and Reactor, physical inspection as per regulation may be continued.

It is requested that the above proposal may be considered while finalizing amendment to the principle Safety regulations.

नरेश भंडारी
नरेश भंडारी 18/9/19
सदस्य सचिव

Chief Electrical Inspectorate, CEA

सं: उ.क्षे.वि.स./प्रचालन/106/01/2019/10506

दिनांक: 18/09/2019

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18/9/2019

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उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

संख्या: NRPC/OPR/106/01/2019/14619-14660

दिनांक: 28.11.2019

विषय: उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 165^{वीं} बैठक का कार्यवृत्त ।

Subject: Minutes of 165th OCC meeting of NRPC.

उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 165^{वीं} बैठक 15.11.2019 को आयोजित की गयी थी। उक्त बैठक का कार्यवृत्त उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है। यदि कार्यवृत्त पर कोई टिप्पणी हो तो कार्यवृत्त जारी करने के एक सप्ताह के अन्दर इस कार्यालय को भेजे।

165th meeting of the Operation Co-ordination Sub-Committee of NRPC was held on 15.11.2019. The Minutes of this meeting has been uploaded on the NRPC website <http://www.nrpc.gov.in>. Any comments on the minutes may kindly be submitted within a week of issuance of the minutes.

संलग्नक: यथोपरि

(सौमित्र मजूमदार)

अधीक्षण अभियंता (प्रचालन)

सेवा में,

प्रचालन समन्वय उप-समिति के सभी सदस्य

Minutes of the 165th meeting of the Operation Coordination Sub-Committee (OCC) of NRPC

165th meeting of OCC of NRPC was held on 15.11.2019 at NRPC Secretariat, New Delhi. The list of participants of the meeting is attached at **Annexure-A.I.**

PART-A: NRPC

1. Confirmation of Minutes

Comments from **PSPCL**:

In agenda point No. 3 of Part B the statement “*Order has been placed and will be delivered till **March-2019.***” shall be replaced with “*Order has been placed and will be delivered till **April-2020.***”

Comments from **PGCIL**:

In agenda point No. 2 (b) of Part B the statement “*After the deliberation and consensus of OCC forum, Member Secretary advised that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator, LA etc. may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission licensees **and a copy of application to the concerned authority for safety clearance.***” shall be replaced with the following

“*After the deliberation and consensus of OCC forum, Member Secretary advised that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator, LA etc. may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission licensees **and a copy of same shall be sent to CEA with details of make & Sl.No. of the replaced equipment for their information and records.***”

- i. After due deliberation the forum accepted the amendments as sought by PSPCL, therefore, statement in agenda point No. 3 of Part B was amended as “*Order has been placed and will be delivered till **April-2020.***”
- ii. In agenda point No. 2 (B) of Part B the amended statement after due deliberation reads as follows:

“*After the deliberation OCC forum opined that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator and LA may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission and generating utilities and a copy of application along with undertaking to the concerned authority for safety clearance may be submitted.*”

- iii. The following statement before Part-A of the minutes “*164th meeting of OCC of NRPC was held on 15.10.2019 at **NRPC Secretariat, New Delhi.***” was also

replaced with "164th meeting of OCC of NRPC was held on 15.10.2019 at NTPC, Dadri, UP."

OCC confirmed the minutes along with the above three (03) amendments.

It was also decided that CEI Division, CEA will be intimated about the deliberation at sl. no. ii above.

2. Review of Grid operations of October 2019

2.1. Anticipated vis-à-vis Actual Power Supply Position (Provisional) October 2019.

Sub Committee was informed that the data of Haryana & Himachal Pradesh were inadvertently got exchanged with each other and similarly, the data of Uttar Pradesh and Uttarakhand were also inadvertently exchanged with each other in the agenda. Further, it was informed that there were variations (i.e. > 5.0%) in the Anticipated Vis-à-vis Actual Power Supply Position (Provisional) for the month of October, 2019 in terms of Energy Requirement for all states and UTs of Northern region and in terms of Peak Demand for all states and UT except Haryana and J&K.

Reasons for variation and comments submitted by the states are as under:

Delhi - There is no load shedding due to shortage of power. Due to change in weather condition, there is negative growth in energy demand.

Haryana - The consumption and load decrease is because of weather parameters in the month of October.

Punjab - Due to festive season in the last week of October 19. Due to early sowing of paddy, which was advanced by a week, lesser AP supply hours was given in October 19 on account of early maturity of crop. The south west monsoon retreat was delayed this year thus resulting into lesser demand. The paddy crop in about four-five districts of Punjab was damaged in the month of August 19 due to continuous opening of Bhakra flood gates. This caused reduced demand in later months due to permanent crop damage.

Rajasthan - Due to delay in end of monsoon. Due to fall of avg. temperature in night (16.5°C) as compared to last years (20°C)

Uttarakhand - Due to extended monsoon during Oct'19.

UP - Due to mild weather in Oct'19 and better demand side management by DISCOMs

2.2. Power Supply Position for NCR:

2.2.1. The Sub-Committee was informed that the NCR Planning Board (NCRPB) is closely monitoring the power supply position of National Capital Region. Monthly power supply position for NCR till the month of October 2019 is placed on NRPC website (<http://nrpc.gov.in/operation-category/power-supply-position>).

2.3. The highlights of grid operation during October 2019 are as follows:

2.3.1. Frequency remained within the IEGC band for **77.05%** of the time during



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Northern Regional Power Committee

संख्या: NRPC/OPR/106/01/2019/13103-13144

दिनांक: 25.10.2019

विषय: उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 164^{वीं} बैठक का कार्यवृत्त ।

Subject: Minutes of 164th OCC meeting of NRPC.

उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 164^{वीं} बैठक 15.10.2019 को आयोजित की गयी थी। उक्त बैठक का कार्यवृत्त उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है। यदि कार्यवृत्त पर कोई टिप्पणी हो तो कार्यवृत्त जारी करने के एक सप्ताह के अन्दर इस कार्यालय को भेजें।

164th meeting of the Operation Co-ordination Sub-Committee of NRPC was held on 15.10.2019. The Minutes of this meeting has been uploaded on the NRPC website <http://www.nrpc.gov.in>. Any comments on the minutes may kindly be submitted within a week of issuance of the minutes.

संलग्नक: यथोपरि

(सौमित्र मजूमदार)

अधीक्षण अभियंता (प्रचालन)

सेवा में,

प्रचालन समन्वय उप-समिति के सभी सदस्य

- ***NTPC shall confirm the status of switchgear upgradation at 400 kV Dadri (NTPC) and in case of no change in the rating, tentative timeline for equipment rating upgradation to be informed within 7days.***

b) **Non-compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015 and New Element Charging Procedure:** Recently, NRLDC received the charging request for 400kV Singrauli-Allahabad-3 and 200 MVA ICT, 132kV bays at Balia substation. In both the cases it was observed that there was no compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015. Despite repetitive discussions in OCC meetings and other forums, utilities are not complying the regulation.

As per new element charging procedure, documents need to be submitted 10 days (A1-A6) in advance generally and (Formats B1-B5)03 days before final charging once all the formalities have been completed.

However, it has been observed that some transmission licensees are not following the procedure. Some recent cases are such as charging of 765kV double circuit Bhadla (PG)-Bikaner and 200 MVA ICT, 132kV bays at Balia.

Discussion during the meeting:

- *NRLDC expressed the concern that transmission licensees sought the approval of charging without compliance of clause 43(7) CEA (Measure relating to Safety and Electric Supply) Amendment regulations – 2015.*
- *Transmission licensees express their difficulties to obtain safety clearance from electrical inspector in routine replacement of defective apparatus under regular maintenance or upgradation work. Similar issue has been raised by POWERGRID in 163th OCC. After the deliberation in 163th OCC, a letter has been sent to CEI division of CEA for consideration of appropriate amendment.*

After the deliberation and consensus of OCC forum, Member Secretary advised that routine replacement and upgradation work of substation equipment like CT, PT, CVT, CB, Isolator, LA etc. may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission licensees and a copy of application to the concerned authority for safety clearance.

c) **Long shutdown of transmission element at Chamera-3:** 220 kV Chamera 3-Chamba(PG) # 2 and Bus-1 at Chamera-3 are out since 14.05.2019. These elements tripped during shifting of Chamera Pool-2 Line from 220 kV Bus-2 to Bus-1 at Chamera 3. Line Isolator and Circuit Breaker of Line 2 were damaged at Chamera3.



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Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

सं: उ.क्षे.वि.स./प्रचालन/106/01/201912309-12350

दिनांक:10/10/2019

विषय: प्रचालन समन्वय उप-समिति की 164^{वीं} बैठक का कार्यसूची ।

Subject: Agenda of 164rd OCC meeting.

प्रचालन समन्वय उप-समिति की 164^{वीं} बैठक दिनांक 15-10-2019 को 14:30 बजे एन.टी.पी.सी. दादरी में आयोजित की जाएगी। उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है।

164th meeting of the Operation Co-ordination sub-committee will be held on 15-10-2019 (14:30 PM onwards) at NTPC Dadri. The agenda of this meeting has been uploaded on the NRPC web-site <http://www.nrpc.gov.in>.

It is requested that the updated status of various points under follow-up action points of previous OCC meeting may kindly be furnished prior to the meeting.

Kindly make it convenient to attend the meeting.

(सौमित्र मजूमदार)

अधीक्षण अभियंता (प्रचालन)

सेवा में : प्रचालन समन्वय उप समिति के सभी सदस्य।

To: All Members of OCC

capacity is thus limiting the power order of ± 500 kV Mundra-Mohindergarh HVDC Bipole transmission line.

NRLDC had raised the issue in 3rd Meeting of Northern Region Standing Committee on Transmission (NRSCT) and after due deliberations, member agreed with proposal of switchgear upgradation works at Dadri, Greater Noida, Mohindergarh, Dhanonda and Nawada.

In line with CERC Order in Petition No. 118/TL/2019 dated 07.10.2019, utilities may confirm the status as mentioned above.

b) **Non-compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015 and New Element Charging Procedure:** Recently, NRLDC received the charging request for 400kV Singrauli-Allahabad-3 and 200 MVA ICT, 132kV bays at Ballia substation. In both the cases it was observed that there was no compliance of Central Electricity Authority (Measures relating to Safety and Electric Supply) Amendment Regulations, 2015. Despite repetitive discussions in OCC meetings and other forums, utilities are not complying the regulation.

As per new element charging procedure, documents need to be submitted 10 days (A1-A6) in advance generally and (Formats B1-B5)03 days before final charging once all the formalities have been completed.

However, it has been observed that some transmission licensees are not following the procedure. Some recent cases are such as charging of 765kV double circuit Bhadla (PG)-Bikaner and 200 MVA ICT, 132kV bays at Ballia.

c) **Long shutdown of transmission element at Chamera-3:** 220 KV Chamera 3-Chamba(PG) # 2 and Bus-1 at Chamera-3 are out since 14.05.2019. These elements tripped during shifting Of Chamera Pool-2 Line from 220 kV Bus-2 to Bus-1 at Chamera 3. Line Isolator and Circuit Breaker of Line 2 were damaged at Chamera3.

NHPC to confirm the status of charging of 220kV Bus-1 and PGCIL to confirm the status of 220 KV Chamera 3-Chamba(PG) # 2.

d) **Charging of 80 MVAR Bus Reactor at Koldam:** Koldam 80 MVAR bus reactor is out since 07.06.2019 due to voltage regulation. On 29.09.2019, Koldam was asked to take reactor in service, as voltage was 422kV. However, Koldam informed that reactor could not be taken into service due to heavy rain and some test has to be done. Bus Reactor is yet to be charged at Koldam.

NTPC Koldam may clarify the reason for not taking reactor into service.

e) **LILO of 400kV Karcham Wangtoo-Kala Amb double circuit at Wangtu:** Shutdown of 400kV Karcham Wangtoo-Kala Amb double circuit was taken on



भारत सरकार/Govt. of India
विद्युत मंत्रालय/Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/Central Electricity Authority
मुख्य विद्युत निरीक्षणालय प्रभाग/Chief Electrical Inspectorate Division

Sub: Mandatory inspections of all elements under CEA (Measures relating to Safety and Electric Supply) amendment Regulations, 2015-Reg.

Please refer to letter no. NRPC/Operation/106/01/2019/14764 dated 03.12.2019 on the above subject, wherein it is mentioned that matter regarding mandatory inspection of replacement of sub-station equipment like CT, PT, CVT, Isolator, CB and LA was deliberated in 163rd, 164th and 165th OCC meetings of NRPC and OCC forum opined that such routine replacement and upgradation work may be allowed on the basis of undertaking stating that all the safety measures have been taken care by respective transmission and generating utilities and a copy of the application along with undertaking to the concerned authority for safety clearance may be submitted.

In this regard, it is submitted that sub-regulation 43 (2) of CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 (as amended) states that

"Before making an application to the Electrical Inspector for permission to commence or recommence supply after an installation has been disconnected for six months and above at voltage exceeding 650 V to any person, the supplier shall ensure that electric supply lines or apparatus of voltage exceeding 650 V belonging to him are placed in position, properly joined and duly completed and examined and the supply of electricity shall not be commenced by the supplier for installations of voltage needing inspection under these regulations unless the provisions of regulations 12 to 29, 33 to 35, 44 to 51 and 55 to 77 have been complied with and the approval in writing of the Electrical Inspector has been obtained by him:

Provided that the supplier may energise the aforesaid electric supply lines or apparatus for the purpose of tests specified in regulation 46."

Also the Regulation 43(4) states that

"The owner of any installation of voltage exceeding 650 V who makes any addition or alteration to his installation shall not connect to the supply his apparatus or electric supply lines, comprising the said alterations or additions unless and until such alteration or addition has been approved in writing by the Electrical Inspector."

Further, the regulation 29(1) of CEA (Measures relating to Safety and Electric Supply) Regulations, 2010 states that

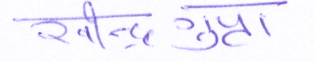
"No electrical installation work, including additions, alterations, repairs and adjustments to existing installations, except such replacement of lamps, fans, fuses, switches, domestic appliances of voltage not exceeding 250V and fittings as in no way alters its capacity or character, shall be carried out upon the premises of or on behalf of any consumer, supplier, owner or occupier for the purpose of supply to such consumer, supplier, owner or occupier except by an electrical contractor licensed in this behalf by the State Government and under

the direct supervision of a person holding a certificate of competency and by a person holding a permit issued or recognized by the State Government.

Provided that in the case of works executed for or on behalf of the Central Government and in case of installation in mines, oil fields and railways, the Central Government and in other cases the State Government, may by notification in the Official Gazette, exempt on such conditions as it may impose, any such work described therein either generally or in case of any specified class of consumers, suppliers, owners or occupiers."

Therefore, according to the safety regulation, replacement and upgradation work of substation equipment need to be approved by Electrical Inspector.

This issues with the approval of Chairman, CEA.


(Ravinder Gupta)
Chief Engineer

Member Secretary, NRPC Bhawan, New Delhi-110016

CEI/1/4/2019/ 1191

Dated: 26.12.2019

1. Transmission Lines which are recommended to be certified as ISTS

S. No.	Name of Transmission Line	Owner STU	Average % Utilization (of 2nd and 4th Qtr of 2018-19) by states other than the home state of owner STU
1.	220 kV Karian-Rajera	HPPTCL	98.25
2.	400kV S/C Merta - Heerapura Line	RVPN	53.25
3.	400 kV D/C Chhitorgarh-Bhilwara line	RVPN	55.1
4.	400 kV D/C Bhilwara-Ajmer line	RVPN	50.3
5.	132 kV Mahuakheraganj-Thakurdwara Line	PTCUL	99.3

2. Transmission Lines which do not fulfil the criteria (as finalized by the Group) to be certified as ISTS

S. No.	Name of Transmission Line	Owner STU	Average % Utilization (of 2nd and 4th Qtr of 2018-19) by states other than the home state of owner STU
1.	220 kV Patlikul-Phozal	HPPTCL	45.5
2.	220 kV S/C Anta- Kota line	RVPN	21.5
3.	220 kV RAPP(B)- Kota	RVPN	15.95
4.	220 kV RAPP(B)- RAPP(A)	RVPN	13.35
5.	220 kV S/C Anta GTPS- Dahra line	RVPN	20.55
6.	220 kV Dahra- Kota line	RVPN	12.95
7.	132 kV S/C Swaimadhpur-Khandar line	RVPN	0.85
8.	220 kV D/C RAPP(A)- Sakatpura Line	RVPN	16.1
9.	220 kV S/C RAPP(A)- Debari Line	RVPN	8.95
10.	400kV S/C Jodhpur - Kankani Line – I	RVPN	44.75
11.	400kV S/C Kankani - Merta Line – II	RVPN	37.6
12.	400kV S/C Merta - Ratangarh	RVPN	46.3

Annexure-A.V

	Line		
13.	400 kV Jodhpur-Bhadla Line	RVPN	44.35
14.	400 kV Merta-Bhadla Line	RVPN	20.5
15.	220kV D/C Ratangarh(400kV)- Ratangarh(220kV) line	RVPN	17.6
16.	220kV D/C Ratangarh(400kV)- Khetri(220kV) line	RVPN	46.15
17.	132kV S/C Ratangarh(220kV)- Ratangarh(132kV) line	RVPN	0.9
18.	132kV S/C Ratangarh(132kV)- Churu line	RVPN	7.9
19.	132kV S/C Churu- Sadulpur(Rajagarh) line	RVPN	3.4
20.	220KV D/C Badisid-Aau line	RVPN	8.4
21.	220KV D/C Aau-Baithwasia line	RVPN	9.6
22.	220KV D/C Baithwasia- Bhawad line	RVPN	8.2
23.	220kV S/C Bhadla - Badisid Line	RVPN	14.1
24.	220kV S/C Bhadla - Bap Line	RVPN	25.1
25.	220KV S/C Phalodi -Bap line	RVPN	25.95
26.	220KV S/C Bap-Badisid line	RVPN	3.4
27.	132 KV S/C Bap-Phalodi line	RVPN	10.65
28.	220KV S/C Bap-Barsingsar line	RVPN	26.85
29.	220 kV S/C Barsingsar - Bikaner line	RVPN	24.95
30.	220 KV S/C Nagaur - Nokha line	RVPN	19.7
31.	220 KV S/C Nagaur- Kuchera line	RVPN	22.9
32.	220 KV S/C Kuchera-Merta line	RVPN	15.4
33.	220 KV S/C Nokha-Bikaner line	RVPN	10.75
34.	220 KV D/C Jodhpur (400 KV GSS) -Bhawad line	RVPN	19.4
35.	220 KV D/C Bhawad - Bhopalgarh line	RVPN	21.45
36.	220 KV S/C Bhopalgarh-Merta line	RVPN	15.65
37.	220 KV S/C Bhopalgarh- Kheenvsar line	RVPN	23
38.	220KV S/C Dechu-Tinwari line	RVPN	4.65
39.	220KV D/C Dechu-Phalodi line	RVPN	27.45

Annexure-A.V

40.	220 KV D/C Gajner-Bikaner line	RVPN	2.6
41.	132 KV S/C Gajner-Pugal Road line	RVPN	5.1
42.	132KV S/C Pugal Road - Bikaner line	RVPN	3.7
43.	132 KV S/C Gajner-Bhinasar line	RVPN	5.05
44.	132 KV S/C Bhinasar -Bikaner line	RVPN	3.8
45.	220 KV D/C Kanasar-Bhadla line	RVPN	3.35
46.	132 KV S/C Pokaran-Dechu line	RVPN	10.9
47.	132 KV S/C Pokaran-Chandan line	RVPN	7.9
48.	132 KV S/C PS(2) - PS(1) line	RVPN	13.25
49.	132 KV S/C PS(1)- Bajju line	RVPN	14.35
50.	132 KV S/C Bajju-Kolayat line	RVPN	17.8
51.	132 KV S/C PS(2)-PS(3) line	RVPN	17.45
52.	132 kV S/C PS(2)-Kanasar line	RVPN	12.3
53.	132 KV S/C PS3 - PS4 line	RVPN	13.85
54.	132 KV S/C PS4 -PS5 line	RVPN	18.95
55.	132 KV S/C PS5-220kV GSS Phalodi line	RVPN	16.45
56.	132 kV D/C PS(3)-Kanasar line	RVPN	12.7
57.	132 KV S/C Sanwreej- Dechu line	RVPN	0.95
58.	132 KV S/C Khetusar-Bhadla line	RVPN	0.9
59.	132 KV S/C Kolayat -Gajner line	RVPN	10.4
60.	400 kV D/C Bhadla- Bikaner line (Quad Moose)	RVPN	36.95
61.	220 KV D/C Bikaner(220kV)-Bikaner (400kV) line	RVPN	12.25
62.	400 kV S/C Deedwana-Ajmer line	RVPN	32.95
63.	400 kV S/C Bikaner-Deedwana line	RVPN	12.1
64.	400 kV D/C Bikaner-Sikar (PG) line	RVPN	48.1
65.	400 kV D/C Phagi-Ajmer line	RVPN	44.1
66.	400 kV D/C Phagi-Heerapura line	RVPN	24.05

Annexure-A.V

67.	765 kV S/C Anta-Phagi line (Ckt-I)	RVPN	22.75
68.	765 kV S/C Anta-Phagi line (Ckt-II)	RVPN	22.75
69.	220kV S/C Bhiwadi (PG)-Khushkhera Line – I	RVPN	13.6
70.	220kV S/C Bhiwadi (PG) - Neemrana Line	RVPN	12.4
71.	132 kV Kalagarh-Ram Nagar Line	PTCUL	10.95
72.	132 kV Jaspur-Kalagarh Line	PTCUL	10.1
73.	132 kV Kichha-Richha Line	PTCUL	15.3
74.	132KV Kotla-Ropar Ckt 1 No. Bay	PSTCL	19.15

3. Transmission Lines which are natural interstate lines and hence need not be certified as ISTS

S. No.	Name of Transmission Line	Owner STU
1.	220kV S/C MIA(Alwar)-Badarpur line	RVPN
2.	220kV S/C Agra–Bharatpur line (Raj-UP)	RVPN
3.	220kV S/C Kota (Sakatpura)- Badod (Rajasthan-MP)	RVPN
4.	220 kV S/C Modak-Badod (Raj.-MP)	RVPN
5.	220kV S/C Khetri- Dadri line-1 (Raj.-Haryana)	RVPN
6.	220kV S/C Khetri- Dadri line-II(Raj-Haryana)	RVPN
7.	220kV S/C Chirawa- Hissar line	RVPN
8.	132kV S/C Sadulpur(Rajagarh) -Hissar line	RVPN
9.	132 kV S/C Sheopur - Khandar line	RVPN
10.	132 kV S/C Amrapura- Sirsa line	RVPN
11.	132 kV Rookee-Saharanpur Line (1 ckt)	PTCUL
12.	132 kVBhagwanpur-Sahranpur Line (Pilibhni)	PTCUL
13.	132 kV Kotdwar-Nazibabad Line	PTCUL
14.	132 kV Chilla-Nazibabad Line	PTCUL
15.	400 kV Nehtaur-Rishikesh Line (Rishikesh to LILO point at location no.233)	PTCUL
16.	400 kV Kashipur-Nehtaur Line (Kashipur to LILO point at location no.233)	PTCUL
17.	132 kV Pilibhit-Sitarganj Line	PTCUL
18.	132 kV Pilibhit-Khatima Line	PTCUL
19.	66KV Chandigarh-1	PSTCL

Annexure-A.V

20.	66KV Chandigarh-2	PSTCL
21.	66KV Chandigarh-3	PSTCL
22.	66KV Chandigarh-4	PSTCL
23.	132 KV Roper - Pinjore Ckt2 No. Bays	PSTCL
24.	220KV Sarna - Udhampur	PSTCL
25.	132 KV HPSEB Tap (Kangra-Kangra PS)	PSTCL
26.	66KVPathankot Kathua	PSTCL
27.	Hamirpur Chohal	PSTCL

POWER SYSTEM OPERATION CORPORATION LIMITED**New Delhi**

Date: 06-01-2020

Subject: Detailed guidelines for assessment of ramping capability of thermal Inter-state generating stations (ISGS)

Sir / Madam,

Proviso (iii) to regulation 30(2) of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019 states that

“in case of thermal generating stations with effect from 1.4.2020:

- a) Rate of return on equity shall be reduced by 0.25% in case of failure to achieve the ramp rate of 1% per minute;
- b) An additional rate of return in equity of 0.25% shall be allowed for every incremental ramp rate of 1% per minute achieved over and above the ramp rate of 1% per minute, subject to ceiling of additional rate of return on equity of 1.00%

Provided that the detailed guidelines in this regard shall be issued by National Load Dispatch Centre by 30.6.2019.”

Detailed guidelines were formulated by NLDC in compliance with the regulation and were submitted to Hon'ble CERC. The Commission advised POSOCO to issue the detailed procedure, after following due process. Letter from CERC in this regard is enclosed. Accordingly, the draft guidelines are being published on POSOCO website for comments from stakeholders.

Suggestions/feedback on these draft guidelines for assessment of ramping capability of thermal inter-state generating stations **may kindly be forwarded to feedback-ramp@posoco.in by 21st January 2020**. Considering the suggestions and feedback received, the guidelines would be finalized and issued.

Sd/-
(Debasis De)
Executive Director
NLDC, POSOCO



सत्यमेव जयते

केन्द्रीय विद्युत विनियामक आयोग
CENTRAL ELECTRICITY REGULATORY COMMISSION



S.C. Shrivastava
Chief (Engineering)

Ref No: CERC/Engg/2020/RPEP-01

Date: 02 Jan 2020

To

The Executive Director (NLDC),
Power System Operation Corporation Ltd (POSOCO),
B-9 Qutab Institutional Area , Katwaria Sarai,
New Delhi -110016.

Dear Sir,

Sub: Ramping Performance Evaluation Procedure for ISGS Stations as per CERC 19-24 Tariff Regulations clause 30(2)(iii) – Regarding.

Ref: 1. Your Letter no: POSOCO/NLDC/2020 dated 01 Jan 2020 attaching Revised Draft of above

Reference is invited to above referred letter enclosing Revised Ramping Performance Evaluation Procedure for ISGS stations.

You are advised to issue the detailed procedure in terms of clause 30(2)(iii) of CERC 2019-24 Tariff Regulations, after following due process of law.

Yours faithfully,

(S C Shrivastava)

Power System Operation Corporation Limited
National Load Despatch Centre



**“Detailed Guidelines for Assessment of
Ramping Capability”**
of
Inter State Generating Stations

Prepared in Compliance

to

CERC (Terms and Conditions of Tariff) Regulations, 2019

6th January 2020

“Detailed Guidelines for Assessment of Ramping Capability” of Inter State Generating Stations (ISGS)

1. Introduction

- 1) These guidelines are being issued in compliance with the regulation 30(2)(iii) of Central Electricity Regulatory Commission (Terms and Conditions of Tariff), Regulations, 2019.
- 2) The objective of this document is to lay down detailed procedure for assessment /evaluation of ramping capability for
 - Reducing rate of return on equity (RoE) by 0.25% in case of failure to achieve the mandatory ramp rate of 1% per minute and
 - Providing an additional rate of return on equity of 0.25% for every incremental ramp rate of 1% per minute achieved over and above the ramp rate of 1% per minute, subject to ceiling of additional rate of return on equity of 1.00%.
- 3) These guidelines shall be applicable to all the regional entity coal/lignite based generators whose tariff is being determined by Central Electricity Regulatory Commission (CERC).

2. Background

With increasing penetration of renewable energy sources in the Indian power system, real-time system operation is faced with the challenge of balancing variable renewable energy. The solution requires harnessing the flexibility attributes in generation. Flexible generation, in which conventional power plants can ramp up and down quickly and efficiently and run at low output levels, is an important part of the solution.

It has been observed that wind and solar generation can create the need for more flexibility as they lead to steeper ramps, deeper turn downs, and shorter peaks in system operation. Even in the present scenario, such demands are being placed on the generation portfolio with high ramps in net load are being witnessed. With increase in RE penetration, flexibility demands are going to increase. Figure 1 shows the trend of net demand on a sample day.

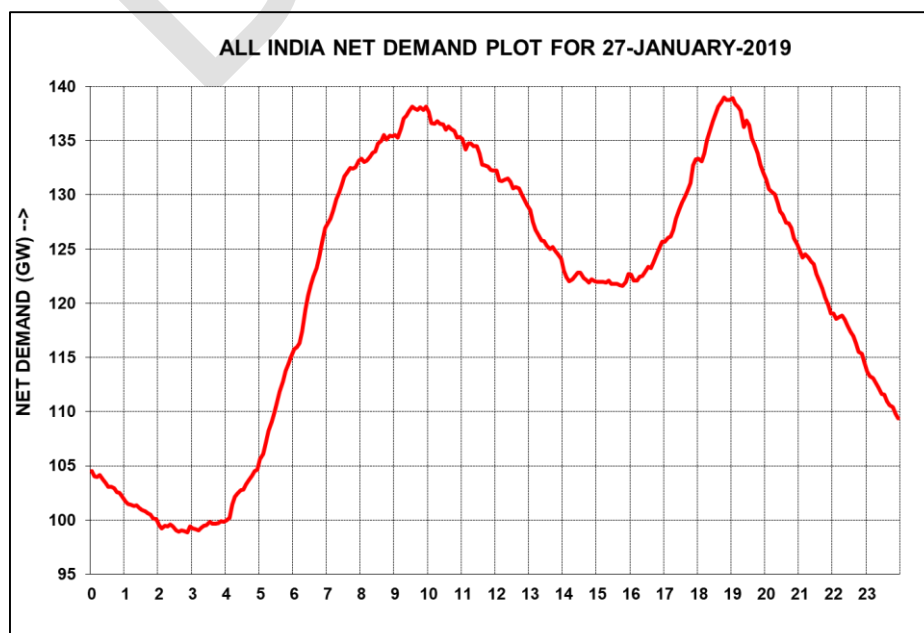


Figure 1: Plot of net demand for 27th January 2019

In this context, the role of thermal generating stations in providing the requisite flexibility in the form of ramping capability becomes highly essential. Various standards and guidelines of CEA for thermal power plants prescribe ramp capability of 3-5%/minute. Indian Electricity Grid Code (IEGC), cl 5.2 (i) stipulates that *“The recommended rate for changing the governor setting i.e., supplementary control for increasing or decreasing the output (generation level) for all generating units, irrespective of their type and size, would be one (1.0) per cent per minute or as per manufacturer’s limits”*

This aspect has been recognized in CERC (Terms and Conditions of Tariff) Regulations, 2019. Proviso (iii) to clause 30 (2) in the regulations states that:

“iii. in case of a thermal generating station, with effect from 1.4.2020:

a) rate of return on equity shall be reduced by 0.25% in case of failure to achieve the ramp rate of 1% per minute;

b) an additional rate of return on equity of 0.25% shall be allowed for every incremental ramp rate of 1% per minute achieved over and above the ramp rate of 1% per minute, subject to ceiling of additional rate of return on equity of 1.00%:

Provided that the detailed guidelines in this regard shall be issued by National Load Dispatch Centre by 30.6.2019.”

The primary objective of these guidelines is to determine the ramping capability of coal fired generation so that they can perform load following duties well as the system wide ramp requirements increase. Once a generator exhibits reasonable ramp rates during load following on day to day basis, it would also be able to effectively participate in secondary regulation through Automatic Generation Control (AGC) as well as tertiary control and thus help in frequency control. This procedure excludes combined cycle gas power stations as they can exhibit much higher ramp rates than 1% as per the CEA Standards and considering the emphasis of the Commission’s orders on coal fired stations.

3. Assessment procedure to be followed by RLDCs/NLDC

- 1) Generators furnish block-wise up and down ramp rates in RLDC Web Based Energy Scheduling (WBES) software in MW (up/down)/time block along with capability declaration. Figure 2 shows a sample capability declaration form where ISGS can enter the DC, On bar capacity and Ramp up/down rate.

Time Block	Time Desc	DC[n-1]	DC[n]	RampUp	RampDn	TechMin	Onbar Norm	DC onBar	DC offBar	P Max	P Min
1	00:00-00:15	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
2	00:15-00:30	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
3	00:30-00:45	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
4	00:45-01:00	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
5	01:00-01:15	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
6	01:15-01:30	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
7	01:30-01:45	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
8	01:45-02:00	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
9	02:00-02:15	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
10	02:15-02:30	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
11	02:30-02:45	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
12	02:45-03:00	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73
13	03:00-03:15	791.66	791.66	80	80	422.73	768.6	791.66	0	768.6	422.73

Figure 2: ISGS Capability Declaration form in WBES

- 2) Ramp rates furnished by the generators are considered by the RLDCs and NLDC while preparing the injection schedule. The ramp rate in injection schedule is less than or equal to the declared ramp capability. The requisitions given by the beneficiary states are summed up to get the net injection schedule for the power plant. For many power plants which are cheaper and at the bottom of the merit order stack, the requisitions could be the same and at maximum value throughout the day and even if the power plant has given a higher ramping rate, it might be rarely scheduled or utilised by the system. Likewise, whenever the requisition is such that summing up leads to a violation of the declared ramp rate by the plant, the RLDC would have to step in and revise the schedule honouring the ramp rate.
- 3) Actual injection is measured by interface meters or special energy meters (SEMs¹) for each of the 15-minute time blocks. As scheduling and metering are being done on 15-minute basis at present, assessment of ramping performance shall also be on 15-minute basis. In the future, when scheduling and metering move to a shorter dispatch period such as 5 minutes, assessment of ramping performance can be carried out on such shorter period.
- 4) Assessment of overall ramp performance shall have the following factors:
 - Proportion of blocks (**Td**) out of total (**Tm**) in a period, in which the ramp up/down rate declared by ISGS is 1% per minute or more i.e., (**Td/Tm**)
 - No of Blocks (**D**) out of declared blocks (Td), in which ISGS is scheduled by RLDC with ramp up/down rate of ≥ 1 % /min
 - Proportion of blocks (**E**) out of scheduled blocks (**D**), where ISGS has achieved actual ramp up/down rate \geq scheduled ramp rate (when it is $\geq 1\%/min$) i.e., (**E/D**)
 - Proportion of blocks (**F**) out of scheduled blocks (**D**), where ISGS has achieved actual ramp up/down of $\geq 1\%/min$ when scheduled ramp rate is $\geq 1\%/min$ i.e., (**F/D**)
 - Actual Average Ramp Rate (**AARR**) in the blocks when scheduled ramp rate is 1%/min or more
- 5) Calculation of the ramping performance of each thermal ISGS shall be carried out at the end of each month of the financial year on cumulative basis, and shall be posted on respective RLDC websites.

4. Ramping Performance Evaluation Methodology – Detailed Procedure

- 1) Generator shall declare its ramp up rate (MW/Block) and ramp down rate (MW/Block) for each of the 96 time blocks to the concerned RLDCs for the purpose of scheduling on day ahead basis, and with subsequent revisions during the course of the day. This will be referred as “Declared Ramp Up Rate” and “Declared Ramp Down Rate”. The number of blocks in which declared ramp up rate and declared ramp down rate are 1%/minute or greater (i.e. 15% of ex-bus generation corresponding to MCR per time block) shall be counted as “**Td**” while the total number of time blocks in the period of computation shall be counted as “**Tm**”.
- 2) These ramp rates shall be considered while providing final schedules to the generator. The change in injection schedule for each time block shall be referred as *Scheduled Ramp Rate (SRR)*.

$$\text{Scheduled Ramp Rate}_t = (\text{Injection Schedule}_t - \text{Injection Schedule}_{t-1})$$

¹ Assessment of actual ramp performance can be done based on SCADA data as well. However, reliance on SCADA data has several issues – latency, non-simultaneity and data communication issues. As SEM data has universal acceptance for accounting and settlement, the injection recorded by SEMs will be considered for assessment of actual ramp performance

Where t is the time block

- 3) The actual ramp rate achieved by the generator shall be assessed based on 15 minute SEM Data. Actual ramp rate provided in MW / block, is the difference in recorded average injection (AG) between successive time blocks.

$$\text{Actual Ramp Rate}_t = (\text{Actual ex bus Avg Gen}_t - \text{Actual ex bus Avg Gen}_{t-1})$$

Where t is the time block

- 4) Proportion (**Td/Tm**) signifies the readiness of the generator to support the grid in terms of ramping performance and it caters to the inability to ramp up or down during times of exigencies , breakdowns , startups /shutdowns and other conditions.
- 5) Proportion (**E/D**) signifies the percentage in terms of number of blocks in which the ISGS has achieved its scheduled ramp rate, out of the total blocks when it is scheduled to ramp at more than 1%/min by RLDC. Here, **D** is the number of time blocks when the scheduled ramp rate is greater than or equal to 1%/min, while **E** is the number of blocks out of **D** in which the ISGS has achieved ramp rate greater than or equal to scheduled ramp rate. As the actual generation is unlikely to exactly match the scheduled generation in each block, because of inherent randomness of physical systems, tolerance of 5% in ramp rate is allowed while measuring the actual generation and counting each of the blocks **E** (out of **D**). This proportion is used, while qualifying for the admissibility of additional RoE as per Tariff Regulations.
- 6) Proportion (**F/D**) signifies the percentage in terms of number of blocks in which the ISGS has achieved ramp rate of at least 1%/min , out of the total blocks when it is scheduled to ramp at more than 1%/min by RLDC. Here, **F** is the number of blocks out of **D** in which the ISGS has achieved ramp rate greater than or equal to 1%/min. As the actual generation is unlikely to exactly match the scheduled generation in each block, because of inherent randomness of physical systems, tolerance of 5% in ramp rate is allowed while measuring the actual generation and counting each of the blocks **F** (out of **D**). This proportion is used to check for failure to meet mandatory 1% ramp rate, while imposing reduction of RoE by 0.25% as per Tariff Regulations.
- 7) **Actual Average Ramp Rate (AARR)** is the average of actual ramp rate in the blocks when the scheduled ramp rate is 1%/min or greater (i.e. D), expressed in %/min.
- 8) Flowchart indicating the steps involved in the calculation is enclosed at Annexure-I.

5. Determination of additional RoE/reduction in RoE

- 1) These calculations shall be done at the end of each month of the financial year on cumulative basis (with period of calculation "**M**" taken suitably in the methodology), by RLDCs. Here, "**M**" is the number of months in the period of calculation.
- 2) A statement of summary of calculations shall be prepared by respective RLDCs, at the end of each month of the financial year on cumulative basis, which shall indicate the ramping performance evaluation of each coal/lignite ISGS based on the metrics specified in these guidelines along with recommendation for change in rate of return of equity. The statement shall be posted on RLDCs' websites for information of all stakeholders.
- 3) Determination of change in percentage of RoE shall be done as below:
 - (i) If the proportion **Td/Tm** < **0.85** → **reduction in RoE by 0.25%**
 - (ii) If **Td/Tm** ≥ **0.85**

(a) Check for additional RoE

If number of blocks **D** < **60*M** → **no additional RoE.**

If $D \geq 60 * M$ and proportion $E/D < 0.75 \rightarrow$ no additional RoE.

If $D \geq 60 * M$ and proportion $E/D \geq 0.75$, then

Additional RoE (%) = (Integer (AARR) – 1)*0.25%,

Subject to ceiling of additional rate of RoE of 1.00%

(b) Check for reduction in RoE

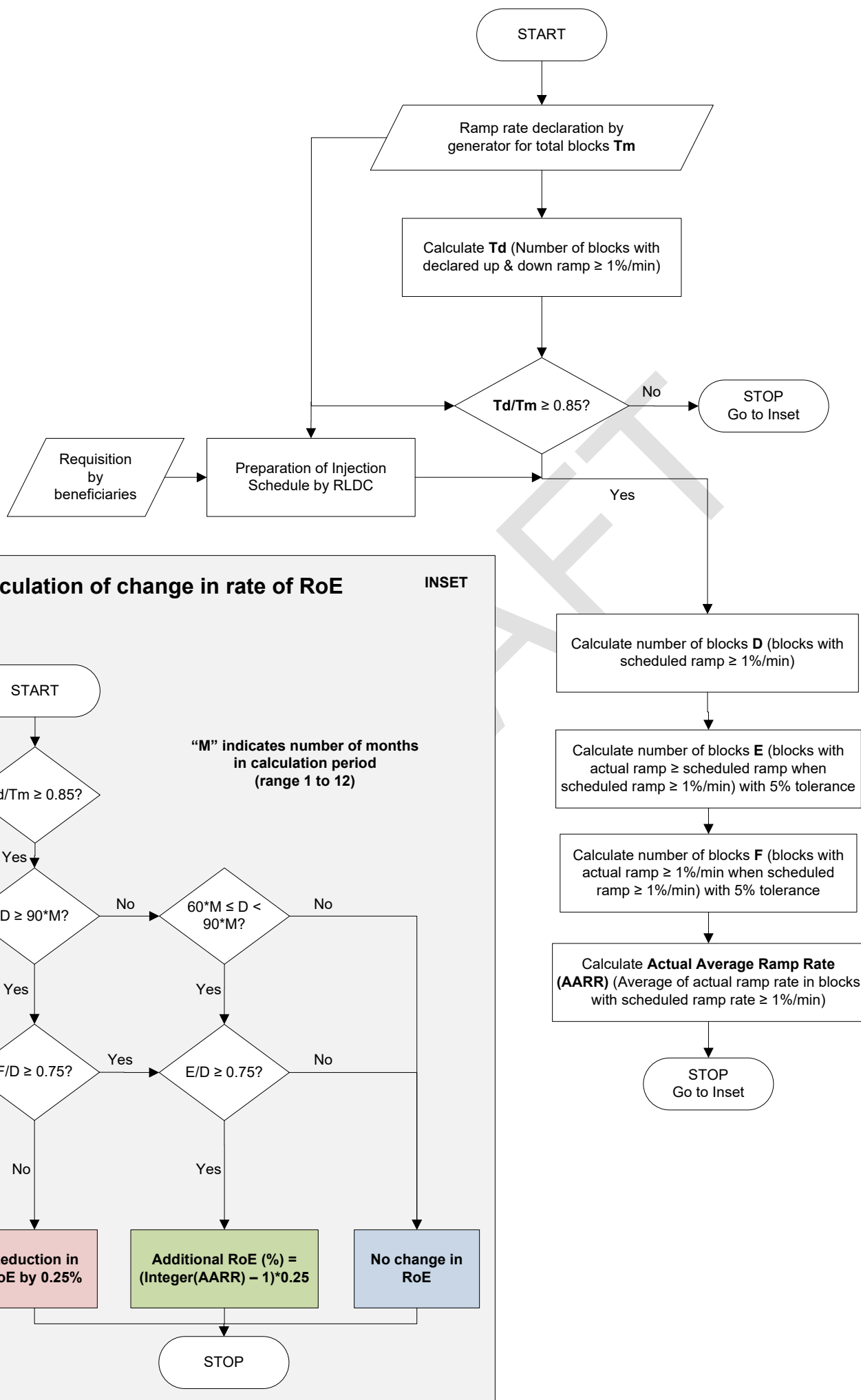
If number of blocks $D < 90 * M \rightarrow$ no reduction in RoE.

If $D \geq 90 * M$ and proportion $F/D \geq 0.75 \rightarrow$ no reduction in RoE.

If $D \geq 90 * M$ and proportion $F/D < 0.75 \rightarrow$ reduction in RoE by 0.25%

- 4) Based on the above statement of ramping performance evaluation, each ISGS shall bill or adjust the RoE % separately on monthly basis from beneficiaries according to the revised rate of return of equity.
- 5) Sample calculation sheet for illustrative purposes is enclosed at Annexure-II.

PROCEDURE FOR ASSESSMENT OF RAMPING CAPABILITY



Ramp Performance of Thermal Power Stations for <Month>

Number of months in computation (M): 1

Station	Total no. of Time Blocks (Tm)	No. of Time Blocks Where Declared Ramp Up & Down rate $\geq 1\%$ (Td)	Td/Tm	No. of time blocks where scheduled ramp $\geq 1\%/min$ (D)	Out of (D), no. of time blocks where actual ramp \geq scheduled ramp (E)	Out of (D), no. of time blocks where actual ramp $\geq 1\%/min$ (F)	Average actual ramp rate during blocks when scheduled ramp $\geq 1\%/min$ (%/min) (AARR)	E/D	F/D	Recommended change in RoE (%)
Station-A	2880	2600	0.90	100	85	95	2.20	0.85	0.95	0.25
Station-B	2880	1500	0.52	100	80	85	1.10	0.80	0.85	-0.25
Station-C	2880	2880	1.00	100	70	76	1.10	0.70	0.76	0
Station-D	2880	2880	1.00	100	65	72	1.00	0.65	0.72	-0.25
Station-E	2880	2880	1.00	80	52	58	0.90	0.65	0.73	0
Station-F	2880	2880	1.00	30	15	17	0.90	0.50	0.57	0

Remarks on sample cases

Station-A: $Td/Tm \geq 0.85$, $F/D \geq 0.75$. Therefore no reduction in RoE. Additional RoE of 0.25 % due to $AARR \geq 2\%/min$ and $E/D \geq 0.75$

Station-B: $Td/Tm < 0.85$, therefore reduction of RoE by 0.25%

Station-C: $Td/Tm \geq 0.85$, $F/D \geq 0.75$ - therefore no reduction in RoE. $E/D < 0.75$ - therefore no additional RoE

Station-D: $Td/Tm \geq 0.85$, $F/D < 0.75$ - therefore reduction in RoE by 0.25%

Station-E: $Td/Tm \geq 0.85$, $D < 90 \cdot M$ - therefore no reduction in RoE. $E/D < 0.75$ - therefore no additional RoE

Station-F: $Td/Tm \geq 0.85$, $D < 60 \cdot M$ - therefore no reduction in RoE and no additional RoE

MVAR performance of generators

S.No.	Station	Unit No.	Fuel Type	Installed Capacity (MW)	Effective Capacity (MW)	Geographical location	MVAR performance (-) Absorption (+) Generation	Voltage absorption above (in KV)	Remarks
A. NTPC Ltd									
1	Dadri NCTPS	1	Thermal	210	210	Delhi-NCR	-	235	High voltage set point
		2		210	210		-		
		3		210	210		-50 to 60		
		4		210	210		-		
2	Dadri NCTPP	1	Thermal	490	490	Delhi-NCR	-	420	
		2		490	490		-150 to 150		
3	Koldam	1	Hydro	200	200	Himachal Pradesh	-60 to 20		
		2		200	200		-60 to 20		
		3		200	200		-50 to 30		
		4		200	200		-50to 20		
4	Rihand TPS	1	Thermal	500	500	Uttar Pradesh	-100 to 20	405	Different response from different units
		2		500	500		-		
		3		500	500		-150 to 60		
		4		500	500		-100 to 0		
5	Singrauli STPS	1	Thermal	200	200	Uttar Pradesh	-40 to 0	405	
		2		200	200		-20 to 15		
		3		200	200		-30 to 5		
		4		200	200		-50 to -10		
		5		200	200		-60 to 10		
		6		500	500		-100 to 0		
		7		500	500		-100 to 0		
6	Unchahar -I,II & II TPS	1	Thermal	210	210	Uttar Pradesh	-15 to 25		Different response from different units
		2		210	210		-10 to 40		
		1	Thermal	210	210	Uttar Pradesh	-20 to 30		
		2		210	210		-30 to 20		
		1	Thermal	210	210	Uttar Pradesh	-20 to 30		
B. NHPC Ltd									
1	Chamera HPS-I	1	Hydro	180	180	Himachal Pradesh	-60 to 20	415	High voltage set point
		2	Hydro	180	180	Himachal Pradesh	-70 to 20		
		3	Hydro	180	180	Himachal Pradesh	-		
2	Chamera HPS-II	1	Hydro	100	100	Himachal Pradesh	-	405	
		2	Hydro	100	100	Himachal Pradesh	-		
		3	Hydro	100	100	Himachal Pradesh	-50 to -10		
3	Dulhasti	1	Hydro	130	130	Jammu & Kashmir	-	410	
		2	Hydro	130	130		-60 to 0		
		3	Hydro	130	130		-50 to 10		
4	Parbati-3	1	Hydro	130	130	Himachal Pradesh	-50 to 0		
		2		130	130		-50 to 20		
		3		130	130		-		
		4		130	130		-30 to 0		
5	URI-I	1	Hydro	120	120	Jammu & Kashmir	-15 to 25	400	
		2	Hydro	120	120	Jammu & Kashmir	-		
		3	Hydro	120	120	Jammu & Kashmir	-20 to 30		
		4	Hydro	120	120	Jammu & Kashmir	-20 to 30		

C. Adani Power									
1	Kawai	1	Thermal	660	660	Rajasthan	-100 to 40	417	
		2		660	660		-120 to 0	412	
D. ARAVALI POWER COMPANY PVT. LTD. (APCPL-A joint venture of NTPC,IPGCL & HPGCL)									
1	Jhajjar (IGSTPS)	1	Thermal	500	500	Haryana	-		
		2		500	500		-		
		3		500	500		-		
E. Lalitpur Thermal Power Generation (Bajaj Hindustan Limited)									
1	Lalitpur TPS	1	Thermal	660	660	Uttar Pradesh	-	773	
		2		660	660		-30 to 130		
		3		660	660		-130 to 130		
F. BBMB									
1	Dehar	1	Hydro	165	165	Himachal Pradesh			
		2		165	165				
		3		165	165		-30 to 10		
		4		165	165		-40 to 40		
		5		165	165		-		
		6		165	165		-		
G. Haryana									
1	Mahatama Gandhi STPS	1	Thermal	660	660	Haryana	-140 to 0	410	High voltage set point
		2		660	660		-140 to 0		
2	Kheddar (Rajiv Gandhi STPS)	1	Thermal	600	600	Haryana	-	415	
		2		600	600		-180 to 120		
H. Indraprastha Power Generation Corporation Ltd (IPPGCL)/ Pragati Power Corporation Ltd (PPCL)									
1	Bawana CCGT	GT#1	Gas	216	216	Delhi-NCR	-20 to 50	420	High voltage set point
		GT#2		216	216		-50 to 50		
		GT#3		216	216		-40 to 40		
		GT#4		216	216		-20 to 40		
		ST#1		253.6	253.6		-40 to 70		
		ST#2		253.6	253.6		-20 to 60		
I. Jindal South West Energy (JSW Energy)									
1	Karcham Wangtoo	1	Hydro	250	250	Himachal Pradesh	-80 to 80	415	High voltage set point
		2		250	250		-80 to 50		
		3		250	250		-80 to 60		
		4		250	250		-70 to 40		
J. M/S Lanco Anpara Power Private Ltd (A SPV formed by M/s Lanco Kondapalli Power Private Ltd)									
1	Anpara-C	1	Thermal	600	600	Uttar Pradesh	-70 to 70	765	
		2		600	600		-70 to 40		
K. L&T Power Development Limited (A wholly owned subsidiary of L&T)									
1	Rajpura TPS	1	Thermal	700	700	Punjab	100 to 270	405 (if MVAR sign reversal considered)	Data needs check
		2	Thermal	700	700		100 to 270		
L. Prayagraj Power Generation (JAYPEE group)									
1	Bara	1	Thermal	660	660	Uttar Pradesh	-150 to 50	772	Data needs check
2	Bara	2	Thermal	660	660	Uttar Pradesh	-		
3	Bara	3	Thermal	660	660	Uttar Pradesh	0 to 120		

M. Rajasthan Raja Vidyut Utapadan Nigam Ltd (RRVUNL)									
1	Chhabra Stage-1	1	Thermal	250	250	Rajasthan, Baran	-50 to 20	404	
		2		250	250		-80 to -30		
2	Chhabra Stage-2	3	Thermal	250	250	Rajasthan, Baran	-90 to 40		
		4		250	250		-50 to 20		
3	Chhabra Supercritical	1	Thermal	660	660	Rajasthan, Baran	-40 to 140	412	Data needs check
		2	Thermal	660	660		-40 to 140		
7	Kalisindh	1	Thermal	600	600	Rajasthan	-100 to 100	420	High voltage set point
		2		600	600		-150 to 0		
N. SJVN Ltd									
1	Nathpa-Jhakri	1	Hydro	250	250	Himachal Pradesh	-80 to 20	-	Data needs check
		2		250	250		100 to 150		
		3		250	250		-60 to 0		
		4		250	250		-70 to 0		
		5		250	250		-60 to 0		
		6		250	250		-70 to 10		
O. Talwandi Sabo Power Limited (TSPL) (Sterlite Energy Limited)									
1	Talwandi Saboo	1	Thermal	660	660	Punjab	0 to 200		Data needs check
		2		660	660		60 to 220		
		3		660	660		-		
P. THDC									
1	Tehri	1	Hydro	250	250	Uttarakhand	-40 to 60	412	High voltage set point
		2		250	250		-20 to 40		
		3		250	250		-40 to 63		
		4		250	250		-30 to 60		
2	Koteshwar	1	Hydro	100	100	Uttarakhand	20 to 60		Data needs check
		2		100	100		60 to 100		
		3		100	100		-		
		4		100	100		-		

Annexure-B.II

S. NO.	Element Name	Outage Date	Outage Time	Reason/Remarks
1	220 KV Bairasiul(NH)-Jessore(HP) (PG) Ckt-1	12-Dec-19	15:00:00	Over voltage. As per PMU, No fault observed.
		12-Dec-19	23:48:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	3:01:00	Over voltage. As per PMU, No fault observed.
		20-Dec-19	1:58:00	Over voltage. As per PMU, No fault observed.
		21-Dec-19	1:14:00	Over voltage. As per PMU, No fault observed.
		22-Dec-19	3:56:00	Over voltage. As per PMU, B-N fault and no auto-reclosing observed.
		22-Dec-19	14:55:00	Over voltage. As per PMU, No fault observed.
		25-Dec-19	5:14:00	Over voltage. As per PMU, No fault observed.
		26-Dec-19	2:23:00	Over voltage. As per PMU, No fault observed.
		30-Dec-19	5:20:00	Over voltage. As per PMU, No fault observed.
		31-Dec-19	2:32:00	Over voltage. As per PMU, B-N fault and no auto-reclosing observed.
2	400 kv Suratgarh(rvun)-Bikaner(rs) (rs) ckt-1	03-Dec-19	0:36:00	R-N fault. As per PMU, B-N fault and no auto-reclosing observed.
		03-Dec-19	23:07:00	m1-z1-42.75 km fault current 6.158 ka.As per PMU, R-N fault and no auto-reclosing observed.
		11-Dec-19	21:42:00	R-N fault.As per PMU, No fault observed.
		12-Dec-19	22:46:00	B-N fault, 81.43 km from bikaner end.As per PMU, R-N fault and no auto-reclosing observed.
		19-Dec-19	19:38:00	R-N fault, 79.11 km from bikaner end.As per PMU, Y-N fault and no auto-reclosing observed.
3	400 kv Kishenpur-Newwanpoh (pg) ckt-1	25-Dec-19	0:36:00	B-N fault, 22.79 km from bikaner end. As per PMU, R-N fault and no auto-reclosing observed.
		13-Dec-19	8:23:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	9:07:00	Y-N fault.As per PMU, Y-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	11:00:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	17:05:00	R-N fault. As per PMU, No fault observed.
		13-Dec-19	17:47:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		14-Dec-19	2:35:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
4	400 KV Aligarh-Sikandrabad (UP) Ckt-2	15-Dec-19	11:49:00	B-N fault. As per PMU, No fault observed.
		30-Dec-19	13:15:00	Y-N fault.As per PMU, Y-N fault and no auto-reclosing observed.
		31-Dec-19	7:00:00	B-N fault.As per PMU, B-N fault and no auto-reclosing observed.
		31-Dec-19	8:39:00	DT received.As per PMU, No fault observed.
5	220 kv Kunihar(hp)-Pinjore(hv) (hv) ckt-1	12-Dec-19	1:20:00	Over voltage. As per PMU, No fault observed.
		12-Dec-19	21:18:00	Over voltage. As per PMU, Y-N fault and no auto-reclosing observed.
		13-Dec-19	22:25:00	Over voltage. As per PMU, No fault observed.
		15-Dec-19	23:15:00	Over voltage. As per PMU, No fault observed.
6	220 KV Agra(PG)-Shamshabad(UP) (UP) Ckt-1	23-Dec-19	0:34:00	Directional earth fault.As per PMU, B-N fault and delayed clearance, NO autoreclosing observed.
		25-Dec-19	0:25:00	R-N fault.As per PMU, B-N fault and delayed clearance, NO autoreclosing observed.
		27-Dec-19	3:36:00	Over voltage. As per PMU, No fault observed.
		30-Dec-19	4:02:00	Over voltage. As per PMU, No fault observed.
7	400/220 kv 240 MVA ICT 3 at obra_b(up)	12-Dec-19	22:40:00	REF trip.
		13-Dec-19	3:03:00	REF trip.
		28-Dec-19	1:07:00	REF trip.
8	400 KV Deepalpur(JHKT)-Bawana(DV) (PG) Ckt-1	12-Dec-19	16:30:00	Over voltage. As per PMU, No fault observed.
		14-Dec-19	1:59:00	Over voltage. As per PMU, No fault observed.
		28-Dec-19	2:47:00	Over voltage. As per PMU, No fault observed.
9	400 kv Bawana-Mundka (dv) ckt-1	12-Dec-19	21:48:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	0:48:00	Over voltage. As per PMU, No fault observed.
		28-Dec-19	0:24:00	Tripped due to tripping of Bus Sectionalizer-2 at Bawana during charging of STG2. As per PMU, No fault observed.
10	400 kv Anta-Chhabra sctps (rs) ckt-2	14-Dec-19	7:08:00	B-N fault, 0.8km from Chhabra sctps end.As per PMU, B-N fault and no auto-reclosing observed.
		15-Dec-19	4:27:00	R-N fault, 5km from Chhabra sctps end.As per PMU, R-N fault and no auto-reclosing observed.
		17-Dec-19	4:51:00	Y-N fault, 3.7km from Chhabra sctps end. As per PMU, Y-N fault and no auto-reclosing observed.
11	400 KV Akal-Kankani (RS) Ckt-2	06-Dec-19	19:23:00	Over voltage. As per PMU, No fault observed.
		09-Dec-19	8:24:00	DT received. As per PMU, No fault observed.
		31-Dec-19	8:13:00	B-N fault, 91.69km from Akal end. As per PMU, No fault observed.
12	400 kv Agra(pg)-Agra(up) (pg) ckt-1	13-Dec-19	2:31:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	22:00:00	Over voltage. As per PMU, No fault observed.
		19-Dec-19	8:53:00	Failure of cvt.As per PMU, No fault observed.
13	220 KV RAPS_A(NP)-Sakatpura(RS) (RS) Ckt-2	06-Dec-19	2:36:00	R-N fault, 7.6km from sakatpura end. As per PMU, R-N fault and no auto-reclosing observed.
		26-Dec-19	5:35:00	R-N fault, 3.4km from sakatpura end.
		29-Dec-19	4:32:00	R-N fault. As per PMU no fault.

Annexure-B.III

S.No.	Region	Name of Elements (Tripped/Manually opened)	Owner/ Agency	Outage		Event (As reported)	Generation Loss (MW)	Load Loss (MW)	Category as per CEA Grid	Energy Unreserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt		Fault Clearance time (in ms)
				Date	Time						within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
1	NR	1) 400 kv koteswar(th)-koteswar(pg) (pg) ckt-2 2) 400kv bus 2 at koteswar(th) 3) 400kv bus 1 at koteswar(th) 4) 100 mw koteswar hps - unit 2 5) 400 kv koteswar(th)-koteswar(pg) (pg) ckt-1 6) 125 mvar bus reactor no 1 at 400kv koteswar(th)	POWERGRID, THDC	1-Dec-19	14:58	Due to failure of B-phase insulator string of 400KV Bus II at KHEP, Bus Bar protection of Bus-II of 400KV Koteswar Power House operated at about 14:58Hrs. It resulted in tripping of following elements: (a) Unit 2 of 100MW capacity resulting in generation loss of 90MW. (b) Tripping of 400 KV KOTESWAR(TH)-KOTESHWAR(PG) (PG) CKT-1 & 2 (c) 400KV Bus 1 and BUS 2 AT KOTESWAR(TH) (d) 125 MVAR BUS REACTOR NO 1 AT 400KV KOTESWAR(TH)	90	0	GD-1	0.00		Y(PG), Y(THDC)		Y(PG), Y(THDC)		Y(THDC)		80ms	
2	NR	1) 400 kv bareilly_2(pg)-kashipur(uk) (pg) ckt-2 2) 400 kv bareilly_2(pg)-kashipur(uk) (pg) ckt-1	POWERGRID	3-Dec-19	9:21	400 kv Bareilly (PG) - Kashipur(UK) (PG) both circuit tripped at Bareilly end. DT received at Kashipur(UK) end.	0	0	GI-2	0.00		Y(PG)	Y(UTT)		Y(PG)	Y(UTT)	Y(PG)	NA	
3	NR	1) 220 kv moga(pg)-mehal- kalan(ps) (pstcl) ckt-2 2) 220 kv moga(pg)-mehal- kalan(ps) (pstcl) ckt-1 3) 220 KV MEHAL- KALAN(PS) - Bus 1 4) 220 KV MEHAL- KALAN(PS) - Bus 2	PUNJAB	3-Dec-19	16:02	Due to mal-operation of 220kV Bus bar protection at 220 kv Mehal Kalan (PS). 220kV Bus 1 at Mehal Kalan and 220 kv Moga(PG) - Mehal Kalan(PS) (PSTCL) circuit 1 & 2 got tripped.	0	32	GD-1	0.05			Y(PG), Y(PUN)			Y(PG), Y(PUN)	Y(PUN)	NA	
4	NR	1) 400 kv panki-aligarh (up) ckt-1 2) 400 kv rewa road-panki (up) ckt-1	UP	5-Dec-19	6:03	During fault in 400 kv Aligarh-Panki ckt, 400 kv Rewa Road-Panki ckt also tripped from Rewa Road end. As per PMU data, it seems fault was transient in nature and 400 kv Aligarh-Panki line A/R from Panki end. Further it also seems A/R function is not working at 400 kv Aligarh end.	0	0	GI-2	0.00	Y(UP)				Y(UP)		Y(UP)	80ms	
5	NR	1) 125 mvar bus reactor no 1 at 400kv manesar(pg) 2) 400 kv gurgaon-manesar (pg) ckt-1 3) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-1 4) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-2 5) 400 kv neemrana-manesar (pg) ckt-1 6) 125 mvar bus reactor no 2 at 400kv manesar(pg) 7) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-1 8) 400 kv neemrana-manesar (pg) ckt-2 9) 400 kv gurgaon-manesar (pg) ckt-2 10) 400/220 kv 500 mva ict 1 at manesar(pg) 11) 400/220 kv 500 mva ict 2 at manesar(pg) 12) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-2 13) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-2 14) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-1 15) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-1	HVPNL, POWERGRID	5-Dec-19	12:34	At 12:29hrs all 400kv lines tripped at Manesar(PG) due to mal-operation of contactor of SF6 gas zone trip of bus isolator of 400 kv Neemrana-Manesar (pg) ckt 1. Consecutively at 12:34hrs, all 220 kv lines also tripped at Manesar(PG)	0	200	GD-1	0.07	Y(PG)		Y(Har)	Y(PG)		Y(Har)	Y(PG)	NA	
6	NR	1) 400kv bus 1 at manesar(pg) 2) 400 kv gurgaon-manesar (pg) ckt-1 3) 125 mvar bus reactor no 2 at 400kv manesar(pg) 4) 400/220 kv 500 mva ict 2 at manesar(pg) 5) 400KV Neemrana-Manesar (PG) Ckt-1	POWERGRID	6-Dec-19	17:44	400kv Bus bar -1 at 400/220kv Manesar(PG) hand tripped due to sudden SF6 gas leakage observed in bus bar-I VT compartment leading to tripping of 400kv Gurgaon-Manesar(pg) ckt-1, 400KV Neemrana-Manesar (PG) Ckt-1, 500 MVA ICT 2 at Manesar(pg) & 125 MVAR bus reactor no 2 at 400kv Manesar(pg). As per PMU, No fault is observed in the system. In antecedent conditions, 500 MVA ICT 2 carrying 94MW.	0	0	GI-2	0.00		Y(PG)			Y(PG)		Y(PG)	NA	
7	NR	1) 220 kv bairasiul(nh)-jessore(hp) (pg) ckt-1 2) 220 kv bairasiul(nh)-pong(bb) (pg) ckt-1	POWERGRID	12-Dec-19	15:00	220 kv bairasiul(nh)-jessore(hp) (pg) & 220 kv bairasiul(nh)-pong(bb) (pg) tripped on overvoltage. As per PMU, No fault is observed in the system. In antecedent conditions, 220 kv bairasiul(nh)-jessore(hp) (pg) & 220 kv bairasiul(nh)-pong(bb) carrying 8MW & 11MW respectively. Generation at 220kv Bairasiul(NHPC) was zero at the time of tripping.	0	0	GI-2	0.00	Y(BBMB)		Y(NHPC), Y(HP), Y(PG)		Y(NHPC), Y(HP), Y(PG), Y(BBMB)		Y(NHPC)	NA	
8	NR	1) 400 kv kishenpur-newwanpoh (pg) ckt-1 2) 400 kv kishenpur-newwanpoh (pg) ckt-2	POWERGRID	13-Dec-19	11:00	400 kv kishenpur-newwanpoh (pg) ckt-1 tripped on R-N fault & 400 kv kishenpur-newwanpoh (pg) ckt-2 tripped on B-N fault. As per PMU, R-N & B-N fault with unsuccessful autoreclosing is observed in the system. In antecedent conditions, 400 kv kishenpur-newwanpoh (pg) ckt-1 & 2 carrying 18MW & 9MW respectively.	0	0	GI-2	0.00			Y(PG)			Y(PG)	Y(PG)	80ms	
9	NR	1) 220 kv unchahar(nt)-fatehpur(up) (up) ckt-1 2) 220 kv unchahar(nt)-fatehpur(up) (up) ckt-2 3) 220 kv fatehpur(pg)-fatehpur(up) (up) ckt-1 4) 220 kv fatehpur(pg)-fatehpur(up) (up) ckt-2	UP	16-Dec-19	12:30	220kv unchahar(nt)-fatehpur(up) (up) ckt-2 tripped on Z1 distance protection. Along with aforesaid line, all 220kv lines at Fatehpur(UP) tripped. As per PMU, R-Y fault with delayed clearance of 760ms is observed in the system. In antecedent conditions, 220kv fatehpur(pg)-fatehpur(up) (up) ckt-1 & 2, 220kv unchahar(nt)-fatehpur(up) (up) ckt-1 & 2 carrying 27MW, 27MW, 80MW & 80MW respectively.	0	140	GD-1	0.03	Y(PG)	Y(UP)	Y(NTPC)	Y(PG)		Y(NTPC), Y(UP)	Y(UP)	760ms	

Annexure-B.III

S.No.	Region	Name of Elements (Tripped/Manually opened)	Owner/ Agency	Outage		Event (As reported)	Generation Loss (MW)	Load Loss (MW)	Category as per CEA Grid	Energy Unreserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt		Fault Clearance time (in ms)
				Date	Time						within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
10	NR	1) 400kv bus 1 at chhabra(rvun) 2) 400 kv chhabra-chhabra sctps (rs) ckt-1 3) 660 mw chhabra sctps - unit 5 4) 660 mw chhabra sctps - unit 6	RRVPLN	17-Dec-19	18:14	Y-phase jumper of 400kv Chabra-Chabra SCTPS inter connector (between bus-1 at Chabra & bus-3 at Chabra SCTPS) snapped and created bus fault of Bus-1 at Chabra TPS. This resulted in tripping of all CBs connected to bus-1. As, Chabra SCTPS-Anta D/C was already out, running generation at Chabra SCTPS (Unit #5, #6) tripped due to loss of evacuation. As per PMU, Y-N fault is observed in the system. In antecedent conditions, Chabra SCTPS Unit5 & Unit6 carrying 322MW & 303MW respectively.	625	0	GD-1	0.00			Y(Raj)			Y(Raj)	Y(Raj)	80ms	
11	NR	1) 220 kv tanakpur(nh)-sitarganj(pg) (pg) ckt-1 2) 220 kv tanakpur(nh)-cbganj(up) (pg) ckt-1	POWERGRID	18-Dec-19	4:00	220kv Tanakpur(NHPC)-Sitarganj(PG) (pg) ckt-1 & 220kv Tanakpur(NHPC)-Cbganj(UP) (pg) ckt-1 tripped on heavy jerk. Unit#2 and Unit#3 at 220kv Tanakpur(NHPC) also tripped due to loss of evacuation path. As per PMU, Fluctuations in Y-phase voltages is observed. In antecedent conditions, Unit#2 and Unit#3 at 220kv Tanakpur(NHPC) generating 10MW & 32MW respectively.	40	0	GD-1	0.00	Y(NHPC)		Y(UP), Y(PG)	Y(NHPC)		Y(UP), Y(PG)	Y(NHPC)	NA	
12	NR	1) 400/220 kv 315 mva ict 2 at muradnagar_2(up) 2) 400/220 kv 240 mva ict 1 at muradnagar_2(up)	UP	18-Dec-19	17:47	240MVA ICT 1 & 315MVA ICT 2 at 400/220KV Muradnagar New(UP) tripped due to earth fault. As per PMU, B-N fault followed by R-N fault is observed in the system. In antecedent conditions, 240MVA ICT 1 & 315MVA ICT 2 carrying 7MW & 10MW respectively.	0	0	GI-2	0.00		Y(UP)			Y(UP)	Y(UP)	800ms		
13	NR	1) 400 kv banda-orai (up) ckt-2 2) 400 kv orai-mainpuri (up) ckt-1	UP	20-Dec-19	6:37	400kv Orai-Mainpuri (up) ckt-1 tripped on Y-N fault, fault current - 18.26 kA. At the same time, 400kv Banda-Orai (up) ckt-2 tripped on Y-N fault from orai end only. As per PMU, Y-N fault with unsuccessful autoreclosing is observed in the system. In antecedent conditions, 400kv Orai-Mainpuri (up) ckt-1 & 400kv Banda-Orai (up) ckt-2 carrying 163MW & 18MW respectively.	0	0	GI-2	0.00		Y(UP)			Y(UP)	Y(UP)	80ms		
14	NR	1) 400/220 kv 315 mva ict 3 at sultanpur(up) 2) 400 kv sultanpur(up)-lucknow_1(pg) (up) ckt-1 3) 400 kv tanda(nt)-sultanpur(up) (up) ckt-1 4) 400kv bus 1 at sultanpur(up) 5) 400/220 kv 240 mva ict 2 at sultanpur(up) 6) 400KV Obra_B-Sultanpur (UP) Ckt-1 7) 400/220 kv 315 MVA ICT 1 at Sultanpur(UP)	UP	22-Dec-19	2:54	Bus bar protection of 400kv Bus 1 at 400/220kv Sultanpur(UP) operated resulting in tripping of all connected elements. As per PMU, Multiple R-N faults are observed in the system. In antecedent conditions, 315MVA ICT 1, 240MVA ICT 2 & 315MVA ICT 3 at 400/220kv Sultanpur(UP) carrying 60MW, 40MW & 55MW respectively.	0	40	GD-1	0.06		Y(UP), Y(PG)	Y(NTPC)		Y(UP), Y(PG)	Y(NTPC)	Y(UP)	80ms	
15	NR	1) 400 KV Bawana CCGTB(DTL) - Bus 2 2) 400 KV Bawana-Mundka (DV) Ckt-1 3) 400 KV Bawana-Mundka (DV) Ckt-2	DTL	28-Dec-19	0:24	During charging of STG1 at 00.24Hrs, Bus sectionalizer-2 at Bawana tripped due to snapping of jumper resulted 400kv Bawana-Mundka 1 and 2 tripped. No load loss occurred at Delhi. As per PMU, Y-N fault is observed in the system. In antecedent conditions, 400KV Bawana-Mundka 1 and 2 carrying 219MW & 212MW respectively.	0	0	GI-2	0.00		Y(DTL)			Y(DTL)	Y(DTL)	320ms		
16	NR	1) 660 MW Chhabra SCTPS - UNIT 6 2) 660 MW Chhabra SCTPS - UNIT 5 3) 400 KV Anta(RS)-Kawai SCTPS(APR) (RS) Ckt-2	RRVPLN	29-Dec-19	7:53	400 KV Anta(RS)-Kawai SCTPS(APR) (RS) Ckt-2 tripped on R-N fault. At the same time, 660 MW Chhabra SCTPS - UNIT 5 & UNIT 6 tripped due to operation of Generator differential Protection. As per PMU, R-N fault with unsuccessful autoreclosing is observed. In antecedent conditions, Chhabra SCTPS - UNIT 5 & UNIT 6 generating 408MW & 361MW respectively.	780	0	GD-1	0.00		Y(Raj)			Y(Raj)	Y(Raj)	240ms		
17	NR	1) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-1 2) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-2 3) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-3	POWERGRID	30-Dec-19	10:26	800KV HVDC Champa-Kurukshehra pole 1, pole 2 & pole 3 tripped at 1026Hrs due to CNAP(Common Neutral Area Protection) protection alarm present at champa end. 800kv HVDC Champa-Kurukshehra pole 2 & pole 3 charged at 1132Hrs & 1145Hrs respectively and again got tripped at 1151Hrs due to same reason. As per PMU, Fluctuations observed in the phase voltages. In antecedent conditions, 800KV HVDC Champa-Kurukshehra pole 1, pole 2 & pole 3 carrying 1050MW, 250MW & 200MW respectively.	0	0	GI-2	0.00			Y(PG)			Y(PG)	Y(PG)	NA	

Northern Regional inter regional lines tripping for Nov-19

Annexure-I

Annexure-B.IV

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Load Loss/ Gen. Loss	Brief Reason (As reported)	Category as per CEA Grid standards	Restoration		# 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				Date	Time						
1	765 kv chittorgarh-banaskantha (pg) ckt-1	POWERGRID/WR	5-Dec-19	9:18	Nil	Dt recieve at chittor while opening ckt-2 from banaskantha end as per approved s/d.	NA	5-Dec-19	9:56	NA	No	No		Details of tripping yet to be received.	From PMU, Fluctuations observed in the phase voltages.
2	765 kv balia-gaya (pg) ckt-1	POWERGRID/ER	13-Dec-19	1:11	Nil	B-N fault.	NA	13-Dec-19	1:49	No	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, B-N fault and unsuccessful autoreclosing is observed.
3	765 kv orai-jabalpur (pg) ckt-2	POWERGRID/WR	15-Dec-19	0:03	Nil	DT received at Orai(PG) end.	NA	15-Dec-19	3:19	NA	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, No fault observed.
4	400 KV Balia-Patna (PG) Ckt-4	POWERGRID/ER	26-Dec-19	0:02	Nil	Tripped only from Patna end due to R-N fault.	NA	26-Dec-19	0:42	No	Yes(After 24Hrs)	Yes(After 24Hrs)		Auto-reclosing feature of the line at patna end needs to be checked.	Information received from NR end. From PMU, B-N fault and successful autoreclosing from one end is observed.
5	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	6-Dec-19	12:33	Nil	DC filter protection .	NA	6-Dec-19	13:01	NA	Yes	YES			Information received from NR end. From PMU, No AC system fault observed.
6	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	15-Dec-19	15:26	Nil	No rpc AC filter.	NA	15-Dec-19	17:51	NA	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, No AC system fault observed.
7	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	27-Dec-19	23:16	Nil	Commutation fault.	NA	27-Dec-19	23:58	NA	Yes	YES			Information received from NR end. From PMU, No AC system fault observed.

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

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

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

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

Reporting of Violation of Regulation for various issues for above tripping

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

Northern Regional inter regional lines tripping for Nov-19

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Load Loss/ Gen. Loss	Brief Reason (As reported)	Category as per CEA Grid standards	Restoration		# 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				Date	Time						
5	A/R non operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.C 2. CEA Technical Planning Criteria													

MVAR performance of generators

S.No.	Station	Unit No.	Fuel Type	Installed Capacity (MW)	Effective Capacity (MW)	Geographical location	MVAR performance (-) Absorption (+) Generation	Voltage absorption above (in KV)	Remarks
A. NTPC Ltd									
1	Dadri NCTPS	1	Thermal	210	210	Delhi-NCR	-	235	High voltage set point
		2		210	210		-		
		3		210	210		-50 to 60		
		4		210	210		-		
2	Dadri NCTPP	1	Thermal	490	490	Delhi-NCR	-	420	
		2		490	490		-150 to 150		
3	Koldam	1	Hydro	200	200	Himachal Pradesh	-60 to 20		
		2		200	200		-60 to 20		
		3		200	200		-50 to 30		
		4		200	200		-50to 20		
4	Rihand TPS	1	Thermal	500	500	Uttar Pradesh	-100 to 20	405	Different response from different units
		2		500	500		-		
		3		500	500		-150 to 60		
		4		500	500		-100 to 0		
5	Singrauli STPS	1	Thermal	200	200	Uttar Pradesh	-40 to 0	405	
		2		200	200		-20 to 15		
		3		200	200		-30 to 5		
		4		200	200		-50 to -10		
		5		200	200		-60 to 10		
		6		500	500		-100 to 0		
		7		500	500		-100 to 0		
6	Unchahar -I,II & II TPS	1	Thermal	210	210	Uttar Pradesh	-15 to 25		Different response from different units
		2		210	210		-10 to 40		
		1	Thermal	210	210	Uttar Pradesh	-20 to 30		
		2		210	210		-30 to 20		
		1		210	210		-20 to 30		
B. NHPC Ltd									
1	Chamera HPS-I	1	Hydro	180	180	Himachal Pradesh	-60 to 20	415	High voltage set point
		2	Hydro	180	180	Himachal Pradesh	-70 to 20		
		3	Hydro	180	180	Himachal Pradesh	-		
2	Chamera HPS-II	1	Hydro	100	100	Himachal Pradesh	-	405	
		2	Hydro	100	100	Himachal Pradesh	-		
		3	Hydro	100	100	Himachal Pradesh	-50 to -10		
3	Dulhasti	1	Hydro	130	130	Jammu & Kashmir	-	410	
		2	Hydro	130	130		-60 to 0		
		3	Hydro	130	130		-50 to 10		
4	Parbati-3	1	Hydro	130	130	Himachal Pradesh	-50 to 0		
		2		130	130		-50 to 20		
		3		130	130		-		
		4		130	130		-30 to 0		
5	URI-I	1	Hydro	120	120	Jammu & Kashmir	-15 to 25	400	
		2	Hydro	120	120	Jammu & Kashmir	-		
		3	Hydro	120	120	Jammu & Kashmir	-20 to 30		
		4	Hydro	120	120	Jammu & Kashmir	-20 to 30		

C. Adani Power									
1	Kawai	1	Thermal	660	660	Rajasthan	-100 to 40	417	
		2		660	660		-120 to 0	412	
D. ARAVALI POWER COMPANY PVT. LTD. (APCPL-A joint venture of NTPC,IPGCL & HPGCL)									
1	Jhajjar (IGSTPS)	1	Thermal	500	500	Haryana	-		
		2		500	500		-		
		3		500	500		-		
E. Lalitpur Thermal Power Generation (Bajaj Hindustan Limited)									
1	Lalitpur TPS	1	Thermal	660	660	Uttar Pradesh	-	773	
		2		660	660		-30 to 130		
		3		660	660		-130 to 130		
F. BBMB									
1	Dehar	1	Hydro	165	165	Himachal Pradesh			
		2		165	165				
		3		165	165		-30 to 10		
		4		165	165		-40 to 40		
		5		165	165		-		
		6		165	165		-		
G. Haryana									
1	Mahatama Gandhi STPS	1	Thermal	660	660	Haryana	-140 to 0	410	High voltage set point
		2		660	660		-140 to 0		
2	Kheddar (Rajiv Gandhi STPS)	1	Thermal	600	600	Haryana	-	415	
		2		600	600		-180 to 120		
H. Indraprastha Power Generation Corporation Ltd (IPPGCL)/ Pragati Power Corporation Ltd (PPCL)									
1	Bawana CCGT	GT#1	Gas	216	216	Delhi-NCR	-20 to 50	420	High voltage set point
		GT#2		216	216		-50 to 50		
		GT#3		216	216		-40 to 40		
		GT#4		216	216		-20 to 40		
		ST#1		253.6	253.6		-40 to 70		
		ST#2		253.6	253.6		-20 to 60		
I. Jindal South West Energy (JSW Energy)									
1	Karcham Wangtoo	1	Hydro	250	250	Himachal Pradesh	-80 to 80	415	High voltage set point
		2		250	250		-80 to 50		
		3		250	250		-80 to 60		
		4		250	250		-70 to 40		
J. M/S Lanco Anpara Power Private Ltd (A SPV formed by M/s Lanco Kondapalli Power Private Ltd)									
1	Anpara-C	1	Thermal	600	600	Uttar Pradesh	-70 to 70	765	
		2		600	600		-70 to 40		
K. L&T Power Development Limited (A wholly owned subsidiary of L&T)									
1	Rajpura TPS	1	Thermal	700	700	Punjab	100 to 270	405 (if MVAR sign reversal considered)	Data needs check
		2	Thermal	700	700		100 to 270		
L. Prayagraj Power Generation (JAYPEE group)									
1	Bara	1	Thermal	660	660	Uttar Pradesh	-150 to 50	772	Data needs check
2	Bara	2	Thermal	660	660	Uttar Pradesh	-		
3	Bara	3	Thermal	660	660	Uttar Pradesh	0 to 120		

M. Rajasthan Raja Vidyut Utapadan Nigam Ltd (RRVUNL)									
1	Chhabra Stage-1	1	Thermal	250	250	Rajasthan, Baran	-50 to 20	404	
		2		250	250		-80 to -30		
2	Chhabra Stage-2	3	Thermal	250	250	Rajasthan, Baran	-90 to 40		
		4		250	250		-50 to 20		
3	Chhabra Supercritical	1	Thermal	660	660	Rajasthan, Baran	-40 to 140	412	Data needs check
		2	Thermal	660	660		-40 to 140		
7	Kalisindh	1	Thermal	600	600	Rajasthan	-100 to 100	420	High voltage set point
		2		600	600		-150 to 0		
N. SJVN Ltd									
1	Nathpa-Jhakri	1	Hydro	250	250	Himachal Pradesh	-80 to 20	-	Data needs check
		2		250	250		100 to 150		
		3		250	250		-60 to 0		
		4		250	250		-70 to 0		
		5		250	250		-60 to 0		
		6		250	250		-70 to 10		
O. Talwandi Sabo Power Limited (TSPL) (Sterlite Energy Limited)									
1	Talwandi Saboo	1	Thermal	660	660	Punjab	0 to 200		Data needs check
		2		660	660		60 to 220		
		3		660	660		-		
P. THDC									
1	Tehri	1	Hydro	250	250	Uttarakhand	-40 to 60	412	High voltage set point
		2		250	250		-20 to 40		
		3		250	250		-40 to 63		
		4		250	250		-30 to 60		
2	Koteshwar	1	Hydro	100	100	Uttarakhand	20 to 60		Data needs check
		2		100	100		60 to 100		
		3		100	100		-		
		4		100	100		-		

Annexure-B.II

S. NO.	Element Name	Outage Date	Outage Time	Reason/Remarks
1	220 KV Bairasiul(NH)-Jessore(HP) (PG) Ckt-1	12-Dec-19	15:00:00	Over voltage. As per PMU, No fault observed.
		12-Dec-19	23:48:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	3:01:00	Over voltage. As per PMU, No fault observed.
		20-Dec-19	1:58:00	Over voltage. As per PMU, No fault observed.
		21-Dec-19	1:14:00	Over voltage. As per PMU, No fault observed.
		22-Dec-19	3:56:00	Over voltage. As per PMU, B-N fault and no auto-reclosing observed.
		22-Dec-19	14:55:00	Over voltage. As per PMU, No fault observed.
		25-Dec-19	5:14:00	Over voltage. As per PMU, No fault observed.
		26-Dec-19	2:23:00	Over voltage. As per PMU, No fault observed.
		30-Dec-19	5:20:00	Over voltage. As per PMU, No fault observed.
		31-Dec-19	2:32:00	Over voltage. As per PMU, B-N fault and no auto-reclosing observed.
2	400 kv Suratgarh(rvun)-Bikaner(rs) (rs) ckt-1	03-Dec-19	0:36:00	R-N fault. As per PMU, B-N fault and no auto-reclosing observed.
		03-Dec-19	23:07:00	m1-z1-42.75 km fault current 6.158 ka.As per PMU, R-N fault and no auto-reclosing observed.
		11-Dec-19	21:42:00	R-N fault.As per PMU, No fault observed.
		12-Dec-19	22:46:00	B-N fault, 81.43 km from bikaner end.As per PMU, R-N fault and no auto-reclosing observed.
		19-Dec-19	19:38:00	R-N fault, 79.11 km from bikaner end.As per PMU, Y-N fault and no auto-reclosing observed.
3	400 kv Kishenpur-Newwanpoh (pg) ckt-1	25-Dec-19	0:36:00	B-N fault, 22.79 km from bikaner end. As per PMU, R-N fault and no auto-reclosing observed.
		13-Dec-19	8:23:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	9:07:00	Y-N fault.As per PMU, Y-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	11:00:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		13-Dec-19	17:05:00	R-N fault. As per PMU, No fault observed.
		13-Dec-19	17:47:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
		14-Dec-19	2:35:00	R-N fault.As per PMU, R-N fault and unsuccessful auto-reclosing observed.
4	400 KV Aligarh-Sikandrabad (UP) Ckt-2	15-Dec-19	11:49:00	B-N fault. As per PMU, No fault observed.
		30-Dec-19	13:15:00	Y-N fault.As per PMU, Y-N fault and no auto-reclosing observed.
		31-Dec-19	7:00:00	B-N fault.As per PMU, B-N fault and no auto-reclosing observed.
		31-Dec-19	8:39:00	DT received.As per PMU, No fault observed.
5	220 kv Kunihar(hp)-Pinjore(hv) (hv) ckt-1	12-Dec-19	1:20:00	Over voltage. As per PMU, No fault observed.
		12-Dec-19	21:18:00	Over voltage. As per PMU, Y-N fault and no auto-reclosing observed.
		13-Dec-19	22:25:00	Over voltage. As per PMU, No fault observed.
		15-Dec-19	23:15:00	Over voltage. As per PMU, No fault observed.
6	220 KV Agra(PG)-Shamshabad(UP) (UP) Ckt-1	23-Dec-19	0:34:00	Directional earth fault.As per PMU, B-N fault and delayed clearance, NO autoreclosing observed.
		25-Dec-19	0:25:00	R-N fault.As per PMU, B-N fault and delayed clearance, NO autoreclosing observed.
		27-Dec-19	3:36:00	Over voltage. As per PMU, No fault observed.
		30-Dec-19	4:02:00	Over voltage. As per PMU, No fault observed.
7	400/220 kv 240 MVA ICT 3 at obra_b(up)	12-Dec-19	22:40:00	REF trip.
		13-Dec-19	3:03:00	REF trip.
		28-Dec-19	1:07:00	REF trip.
8	400 KV Deepalpur(JHKT)-Bawana(DV) (PG) Ckt-1	12-Dec-19	16:30:00	Over voltage. As per PMU, No fault observed.
		14-Dec-19	1:59:00	Over voltage. As per PMU, No fault observed.
		28-Dec-19	2:47:00	Over voltage. As per PMU, No fault observed.
9	400 kv Bawana-Mundka (dv) ckt-1	12-Dec-19	21:48:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	0:48:00	Over voltage. As per PMU, No fault observed.
		28-Dec-19	0:24:00	Tripped due to tripping of Bus Sectionalizer-2 at Bawana during charging of STG2. As per PMU, No fault observed.
10	400 kv Anta-Chhabra sctps (rs) ckt-2	14-Dec-19	7:08:00	B-N fault, 0.8km from Chhabra sctps end.As per PMU, B-N fault and no auto-reclosing observed.
		15-Dec-19	4:27:00	R-N fault, 5km from Chhabra sctps end.As per PMU, R-N fault and no auto-reclosing observed.
		17-Dec-19	4:51:00	Y-N fault, 3.7km from Chhabra sctps end. As per PMU, Y-N fault and no auto-reclosing observed.
11	400 KV Akal-Kankani (RS) Ckt-2	06-Dec-19	19:23:00	Over voltage. As per PMU, No fault observed.
		09-Dec-19	8:24:00	DT received. As per PMU, No fault observed.
		31-Dec-19	8:13:00	B-N fault, 91.69km from Akal end. As per PMU, No fault observed.
12	400 kv Agra(pg)-Agra(up) (pg) ckt-1	13-Dec-19	2:31:00	Over voltage. As per PMU, No fault observed.
		16-Dec-19	22:00:00	Over voltage. As per PMU, No fault observed.
		19-Dec-19	8:53:00	Failure of cvt.As per PMU, No fault observed.
13	220 KV RAPS_A(NP)-Sakatpura(RS) (RS) Ckt-2	06-Dec-19	2:36:00	R-N fault, 7.6km from sakatpura end. As per PMU, R-N fault and no auto-reclosing observed.
		26-Dec-19	5:35:00	R-N fault, 3.4km from sakatpura end.
		29-Dec-19	4:32:00	R-N fault. As per PMU no fault.

Annexure-B.III

S.No.	Region	Name of Elements (Tripped/Manually opened)	Owner/ Agency	Outage		Event (As reported)	Generation Loss (MW)	Load Loss (MW)	Category as per CEA Grid	Energy Unreserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt		Fault Clearance time (in ms)
				Date	Time						within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
1	NR	1) 400 kv koteswar(th)-koteswar(pg) (pg) ckt-2 2) 400kv bus 2 at koteswar(th) 3) 400kv bus 1 at koteswar(th) 4) 100 mw koteswar hps - unit 2 5) 400 kv koteswar(th)-koteswar(pg) (pg) ckt-1 6) 125 mvar bus reactor no 1 at 400kv koteswar(th)	POWERGRID, THDC	1-Dec-19	14:58	Due to failure of B-phase insulator string of 400KV Bus II at KHEP, Bus Bar protection of Bus-II of 400KV Koteswar Power House operated at about 14:58Hrs. It resulted in tripping of following elements: (a) Unit 2 of 100MW capacity resulting in generation loss of 90MW. (b) Tripping of 400 KV KOTESWAR(TH)-KOTESHWAR(PG) (PG) CKT-1 & 2 (c) 400KV Bus 1 and BUS 2 AT KOTESWAR(TH) (d) 125 MVAR BUS REACTOR NO 1 AT 400KV KOTESWAR(TH)	90	0	GD-1	0.00		Y(PG), Y(THDC)		Y(PG), Y(THDC)		Y(THDC)		80ms	
2	NR	1) 400 kv bareilly_2(pg)-kashipur(uk) (pg) ckt-2 2) 400 kv bareilly_2(pg)-kashipur(uk) (pg) ckt-1	POWERGRID	3-Dec-19	9:21	400 kv Bareilly (PG) - Kashipur(UK) (PG) both circuit tripped at Bareilly end. DT received at Kashipur(UK) end.	0	0	GI-2	0.00		Y(PG)	Y(UTT)		Y(PG)	Y(UTT)	Y(PG)		NA
3	NR	1) 220 kv moga(pg)-mehal- kalan(ps) (pstcl) ckt-2 2) 220 kv moga(pg)-mehal- kalan(ps) (pstcl) ckt-1 3) 220 KV MEHAL- KALAN(PS) - Bus 1 4) 220 KV MEHAL- KALAN(PS) - Bus 2	PUNJAB	3-Dec-19	16:02	Due to mal-operation of 220kV Bus bar protection at 220 kv Mehal Kalan (PS). 220kV Bus 1 at Mehal Kalan and 220 kv Moga(PG) - Mehal Kalan(PS) (PSTCL) circuit 1 & 2 got tripped.	0	32	GD-1	0.05			Y(PG), Y(PUN)			Y(PG), Y(PUN)		Y(PUN)	NA
4	NR	1) 400 kv panki-aligarh (up) ckt-1 2) 400 kv rewa road-panki (up) ckt-1	UP	5-Dec-19	6:03	During fault in 400 kv Aligarh-Panki ckt, 400 kv Rewa Road-Panki ckt also tripped from Rewa Road end. As per PMU data, it seems fault was transient in nature and 400 kv Aligarh-Panki line A/R from Panki end. Further it also seems A/R function is not working at 400 kv Aligarh end.	0	0	GI-2	0.00	Y(UP)				Y(UP)		Y(UP)		80ms
5	NR	1) 125 mvar bus reactor no 1 at 400kv manesar(pg) 2) 400 kv gurgaon-manesar (pg) ckt-1 3) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-1 4) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-2 5) 400 kv neemrana-manesar (pg) ckt-1 6) 125 mvar bus reactor no 2 at 400kv manesar(pg) 7) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-1 8) 400 kv neemrana-manesar (pg) ckt-2 9) 400 kv gurgaon-manesar (pg) ckt-2 10) 400/220 kv 500 mva ict 1 at manesar(pg) 11) 400/220 kv 500 mva ict 2 at manesar(pg) 12) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-2 13) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-2 14) 220 kv manesar(pg)-badshahpur(hv) (hvpnl) ckt-1 15) 220 kv manesar(pg)-mau(hv) (hvpnl) ckt-1	HVPNL, POWERGRID	5-Dec-19	12:34	At 12:29hrs all 400kv lines tripped at Manesar(PG) due to mal-operation of contactor of SF6 gas zone trip of bus isolator of 400 kv Neemrana-Manesar (pg) ckt 1. Consecutively at 12:34hrs, all 220 kv lines also tripped at Manesar(PG)	0	200	GD-1	0.07	Y(PG)		Y(Har)	Y(PG)		Y(Har)	Y(PG)		NA
6	NR	1) 400kv bus 1 at manesar(pg) 2) 400 kv gurgaon-manesar (pg) ckt-1 3) 125 mvar bus reactor no 2 at 400kv manesar(pg) 4) 400/220 kv 500 mva ict 2 at manesar(pg) 5) 400KV Neemrana-Manesar (PG) Ckt-1	POWERGRID	6-Dec-19	17:44	400kv Bus bar -1 at 400/220kv Manesar(PG) hand tripped due to sudden SF6 gas leakage observed in bus bar-I VT compartment leading to tripping of 400kv Gurgaon-Manesar(pg) ckt-1, 400KV Neemrana-Manesar (PG) Ckt-1, 500 MVA ICT 2 at Manesar(pg) & 125 MVAR bus reactor no 2 at 400kv Manesar(pg). As per PMU, No fault is observed in the system. In antecedent conditions, 500 MVA ICT 2 carrying 94MW.	0	0	GI-2	0.00		Y(PG)			Y(PG)		Y(PG)		NA
7	NR	1) 220 kv bairasiul(nh)-jessore(hp) (pg) ckt-1 2) 220 kv bairasiul(nh)-pong(bb) (pg) ckt-1	POWERGRID	12-Dec-19	15:00	220 kv bairasiul(nh)-jessore(hp) (pg) & 220 kv bairasiul(nh)-pong(bb) (pg) tripped on overvoltage. As per PMU, No fault is observed in the system. In antecedent conditions, 220 kv bairasiul(nh)-jessore(hp) (pg) & 220 kv bairasiul(nh)-pong(bb) carrying 8MW & 11MW respectively. Generation at 220kv Bairasiul(NHPC) was zero at the time of tripping.	0	0	GI-2	0.00	Y(BBMB)		Y(NHPC), Y(HP), Y(PG)		Y(NHPC), Y(HP), Y(PG), Y(BBMB)		Y(NHPC)		NA
8	NR	1) 400 kv kishenpur-newwanpoh (pg) ckt-1 2) 400 kv kishenpur-newwanpoh (pg) ckt-2	POWERGRID	13-Dec-19	11:00	400 kv kishenpur-newwanpoh (pg) ckt-1 tripped on R-N fault & 400 kv kishenpur-newwanpoh (pg) ckt-2 tripped on B-N fault. As per PMU, R-N & B-N fault with unsuccessful autoreclosing is observed in the system. In antecedent conditions, 400 kv kishenpur-newwanpoh (pg) ckt-1 & 2 carrying 18MW & 9MW respectively.	0	0	GI-2	0.00			Y(PG)		Y(PG)		Y(PG)		80ms
9	NR	1) 220 kv unchahar(nt)-fatehpur(up) (up) ckt-1 2) 220 kv unchahar(nt)-fatehpur(up) (up) ckt-2 3) 220 kv fatehpur(pg)-fatehpur(up) (up) ckt-1 4) 220 kv fatehpur(pg)-fatehpur(up) (up) ckt-2	UP	16-Dec-19	12:30	220kv unchahar(nt)-fatehpur(up) (up) ckt-2 tripped on Z1 distance protection. Along with aforesaid line, all 220kv lines at Fatehpur(UP) tripped. As per PMU, R-Y fault with delayed clearance of 760ms is observed in the system. In antecedent conditions, 220kv fatehpur(pg)-fatehpur(up) (up) ckt-1 & 2, 220kv unchahar(nt)-fatehpur(up) (up) ckt-1 & 2 carrying 27MW, 27MW, 80MW & 80MW respectively.	0	140	GD-1	0.03	Y(PG)	Y(UP)	Y(NTPC)	Y(PG)		Y(NTPC), Y(UP)		Y(UP)	760ms

Annexure-B.III

S.No.	Region	Name of Elements (Tripped/Manually opened)	Owner/ Agency	Outage		Event (As reported)	Generation Loss (MW)	Load Loss (MW)	Category as per CEA Grid	Energy Unreserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt		Fault Clearance time (in ms)
				Date	Time						within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
10	NR	1) 400kv bus 1 at chhabra(rvun) 2) 400 kv chhabra-chhabra sctps (rs) ckt-1 3) 660 mw chhabra sctps - unit 5 4) 660 mw chhabra sctps - unit 6	RRVPLN	17-Dec-19	18:14	Y-phase jumper of 400kv Chhabra-Chhabra SCTPS inter connector (between bus-1 at Chhabra & bus-3 at Chhabra SCTPS) snapped and created bus fault of Bus-1 at Chhabra TPS. This resulted in tripping of all CBs connected to bus-1. As, Chhabra SCTPS-Anta D/C was already out, running generation at Chhabra SCTPS (Unit #5, #6) tripped due to loss of evacuation. As per PMU, Y-N fault is observed in the system. In antecedent conditions, Chhabra SCTPS Unit5 & Unit6 carrying 322MW & 303MW respectively.	625	0	GD-1	0.00			Y(Raj)			Y(Raj)		Y(Raj)	80ms
11	NR	1) 220 kv tanakpur(nh)-sitarganj(pg) (pg) ckt-1 2) 220 kv tanakpur(nh)-cbganj(up) (pg) ckt-1	POWERGRID	18-Dec-19	4:00	220kv Tanakpur(NHPC)-Sitarganj(PG) (pg) ckt-1 & 220kv Tanakpur(NHPC)-Cbganj(UP) (pg) ckt-1 tripped on heavy jerk. Unit#2 and Unit#3 at 220kv Tanakpur(NHPC) also tripped due to loss of evacuation path. As per PMU, Fluctuations in Y-phase voltages is observed. In antecedent conditions, Unit#2 and Unit#3 at 220kv Tanakpur(NHPC) generating 10MW & 32MW respectively.	40	0	GD-1	0.00	Y(NHPC)		Y(UP), Y(PG)	Y(NHPC)		Y(UP), Y(PG)		Y(NHPC)	NA
12	NR	1) 400/220 kv 315 mva ict 2 at muradnagar_2(up) 2) 400/220 kv 240 mva ict 1 at muradnagar_2(up)	UP	18-Dec-19	17:47	240MVA ICT 1 & 315MVA ICT 2 at 400/220KV Muradnagar New(UP) tripped due to earth fault. As per PMU, B-N fault followed by R-N fault is observed in the system. In antecedent conditions, 240MVA ICT 1 & 315MVA ICT 2 carrying 7MW & 10MW respectively.	0	0	GI-2	0.00		Y(UP)			Y(UP)		Y(UP)	800ms	
13	NR	1) 400 kv banda-orai (up) ckt-2 2) 400 kv orai-mainpuri (up) ckt-1	UP	20-Dec-19	6:37	400kv Orai-Mainpuri (up) ckt-1 tripped on Y-N fault, fault current - 18.26 kA. At the same time, 400kv Banda-Orai (up) ckt-2 tripped on Y-N fault from orai end only. As per PMU, Y-N fault with unsuccessful autoreclosing is observed in the system. In antecedent conditions, 400kv Orai-Mainpuri (up) ckt-1 & 400kv Banda-Orai (up) ckt-2 carrying 163MW & 18MW respectively.	0	0	GI-2	0.00		Y(UP)			Y(UP)		Y(UP)	80ms	
14	NR	1) 400/220 kv 315 mva ict 3 at sultanpur(up) 2) 400 kv sultanpur(up)-lucknow_1(pg) (up) ckt-1 3) 400 kv tanda(nt)-sultanpur(up) (up) ckt-1 4) 400kv bus 1 at sultanpur(up) 5) 400/220 kv 240 mva ict 2 at sultanpur(up) 6) 400KV Obra_B-Sultanpur (UP) Ckt-1 7) 400/220 kv 315 MVA ICT 1 at Sultanpur(UP)	UP	22-Dec-19	2:54	Bus bar protection of 400kv Bus 1 at 400/220kv Sultanpur(UP) operated resulting in tripping of all connected elements. As per PMU, Multiple R-N faults are observed in the system. In antecedent conditions, 315MVA ICT 1, 240MVA ICT 2 & 315MVA ICT 3 at 400/220kv Sultanpur(UP) carrying 60MW, 40MW & 55MW respectively.	0	40	GD-1	0.06		Y(UP), Y(PG)		Y(NTPC)	Y(UP), Y(PG)	Y(NTPC)	Y(UP)	80ms	
15	NR	1) 400 KV Bawana CCGTB(DTL) - Bus 2 2) 400 KV Bawana-Mundka (DV) Ckt-1 3) 400 KV Bawana-Mundka (DV) Ckt-2	DTL	28-Dec-19	0:24	During charging of STG1 at 00.24Hrs, Bus sectionalizer-2 at Bawana tripped due to snapping of jumper resulted 400kv Bawana-Mundka 1 and 2 tripped. No load loss occurred at Delhi. As per PMU, Y-N fault is observed in the system. In antecedent conditions, 400KV Bawana-Mundka 1 and 2 carrying 219MW & 212MW respectively.	0	0	GI-2	0.00		Y(DTL)			Y(DTL)		Y(DTL)	320ms	
16	NR	1) 660 MW Chhabra SCTPS - UNIT 6 2) 660 MW Chhabra SCTPS - UNIT 5 3) 400 KV Anta(RS)-Kawai SCTPS(APR) (RS) Ckt-2	RRVPLN	29-Dec-19	7:53	400 KV Anta(RS)-Kawai SCTPS(APR) (RS) Ckt-2 tripped on R-N fault. At the same time, 660 MW Chhabra SCTPS - UNIT 5 & UNIT 6 tripped due to operation of Generator differential Protection. As per PMU, R-N fault with unsuccessful autoreclosing is observed. In antecedent conditions, Chhabra SCTPS - UNIT 5 & UNIT 6 generating 408MW & 361MW respectively.	780	0	GD-1	0.00		Y(Raj)				Y(Raj)		Y(Raj)	240ms
17	NR	1) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-1 2) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-2 3) 800 KV HVDC Champa(PG)- Kurukshehra(PG) Pole-3	POWERGRID	30-Dec-19	10:26	800KV HVDC Champa-Kurukshehra pole 1, pole 2 & pole 3 tripped at 1026Hrs due to CNAP(Common Neutral Area Protection) protection alarm present at champa end. 800kv HVDC Champa-Kurukshehra pole 2 & pole 3 charged at 1132Hrs & 1145Hrs respectively and again got tripped at 1151Hrs due to same reason. As per PMU, Fluctuations observed in the phase voltages. In antecedent conditions, 800KV HVDC Champa-Kurukshehra pole 1, pole 2 & pole 3 carrying 1050MW, 250MW & 200MW respectively.	0	0	GI-2	0.00			Y(PG)			Y(PG)		Y(PG)	NA

Northern Regional inter regional lines tripping for Nov-19

Annexure-I

Annexure-B.IV

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Load Loss/ Gen. Loss	Brief Reason (As reported)	Category as per CEA Grid standards	Restoration		# 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				Date	Time						
1	765 kv chittorgarh-banaskantha (pg) ckt-1	POWERGRID/WR	5-Dec-19	9:18	Nil	Dt recieve at chittor while opening ckt-2 from banaskantha end as per approved s/d.	NA	5-Dec-19	9:56	NA	No	No		Details of tripping yet to be received.	From PMU, Fluctuations observed in the phase voltages.
2	765 kv balia-gaya (pg) ckt-1	POWERGRID/ER	13-Dec-19	1:11	Nil	B-N fault.	NA	13-Dec-19	1:49	No	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, B-N fault and unsuccessful autoreclosing is observed.
3	765 kv orai-jabalpur (pg) ckt-2	POWERGRID/WR	15-Dec-19	0:03	Nil	DT received at Orai(PG) end.	NA	15-Dec-19	3:19	NA	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, No fault observed.
4	400 KV Balia-Patna (PG) Ckt-4	POWERGRID/ER	26-Dec-19	0:02	Nil	Tripped only from Patna end due to R-N fault.	NA	26-Dec-19	0:42	No	Yes(After 24Hrs)	Yes(After 24Hrs)		Auto-reclosing feature of the line at patna end needs to be checked.	Information received from NR end. From PMU, B-N fault and successful autoreclosing from one end is observed.
5	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	6-Dec-19	12:33	Nil	DC filter protection .	NA	6-Dec-19	13:01	NA	Yes	YES			Information received from NR end. From PMU, No AC system fault observed.
6	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	15-Dec-19	15:26	Nil	No rpc AC filter.	NA	15-Dec-19	17:51	NA	Yes(After 24Hrs)	Yes(After 24Hrs)			Information received from NR end. From PMU, No AC system fault observed.
7	500kV HVDC Mundra-Mohindergarh Pole-1	APL/ATL	27-Dec-19	23:16	Nil	Commutation fault.	NA	27-Dec-19	23:58	NA	Yes	YES			Information received from NR end. From PMU, No AC system fault observed.

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

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

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

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

Reporting of Violation of Regulation for various issues for above tripping

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

Northern Regional inter regional lines tripping for Nov-19

S. No.	Name of Transmission Element Tripped	Owner/ Utility	Outage		Load Loss/ Gen. Loss	Brief Reason (As reported)	Category as per CEA Grid standards	Restoration		# 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				Date	Time						
5	A/R non operation	1. CEA Technical Standard of Electrical Plants and Electric Lines: 43.4.C 2. CEA Technical Planning Criteria													

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RRVUNL	(i) Sh. A.K. Saxena, Addl. Chief Engineer (PPMC & IT), Fax- 0141-2740989/44521
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SJVNL/NJHPS	General Manager (C&SO), Fax- 0177-2673283
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