



सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

सं.-उक्षेविस/प्रचालन/106/01/2018/14013-14054

दिनांक:12 /12/2018

विषय: प्रचालन समन्वय उपसमिति की 154वीं बैठक का कार्यसूची।
Subject: Agenda of 154th OCC meeting.

प्रचालन समन्वय उप-समिति की 154 वीं बैठक 18-12-2018 को 10:30 बजे से उ.क्षे.वि.स.सचिवालय, नई दिल्ली में आयोजित की जाएगी। उक्त बैठक की कार्यसूची उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है।

154th meeting of the Operation Co-ordination sub-committee will be held on 18-12-2018 at 10:30am 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 issues from previous OCC M may please be furnished.

-sd-

(उपेन्द्र कुमार)

अधीक्षण अभियंता(प्रचालन)

सेवा में : प्रचालन समन्वय उपसमिति के सभी सदस्य।

To: All Members of OCC

**Agenda for the 154th Meeting of the Operation Coordination Sub-Committee (OCC) of
NRPC to be held on 18.12.2018.**

Date & time: 18-12-2018 at 10.30 hrs.

Venue: NRPC Secretariat, New Delhi

Part-A NRPC

1. Confirmation of Minutes:

The minutes of the 153rd OCC meeting held on 15.11.2018 and 16.11.2018 at New Delhi were issued vide letter of even number dated 06.12.2018.

The sub-committee may kindly confirm the Minutes.

2. Review of Grid operations of November, 2018:

2.1 Supply Position (Provisional) for November , 2018

Anticipated Power Supply Position v/s Actual Power Supply Position (Provisional) of Northern Region during the month of November, 2018 is as given below:

<u>November</u>							
State	Req/ Avl	Anticipated	Actual	%age Variation	Anticipated	Actual	%age Variation
		(MU)			(MW)		
Chandigarh	Avl	115	93	-19.1	330	199	-39.7
	Req	100	93	-7.0	195	199	2.1
Delhi	Avl	3250	1838	-43.4	5210	3788	-27.3
	Req	1960	1839	-6.2	3800	3788	-0.3
Haryana	Avl	5170	3581	-30.7	8020	6445	-19.6
	Req	3560	3581	0.6	7033	6445	-8.4
H.P.	Avl	1010	774	-23.4	2210	1547	-30.0
	Req	870	790	-9.2	1600	1605	0.3
J&K	Avl	750	1242	65.6	1950	2257	15.7
	Req	1560	1521	-2.5	2590	2821	8.9
Punjab	Avl	4648	3388	-27.1	7547	6196	-17.9
	Req	3310	3388	2.4	6410	6196	-3.3
Rajasthan	Avl	7722	6729	-12.9	11298	11809	4.5
	Req	6711	6730	0.3	11749	11809	0.5
U.P.	Avl	9786	8232	-15.9	16700	15627	-6.4
	Req	9900	8290	-16.3	19000	15627	-17.8
Uttarakhand	Avl	990	1006	1.6	1880	1897	0.9
	Req	1140	1007	-11.7	1960	1897	-3.2

- As per above, it has been observed that there are much variations (i.e. > 5.0%) in the Anticipated vis-à-vis Actual Power Supply Position (Provisional) for the month of November, 2018 in terms of Peak demand for Haryana, J&K, & UP and in terms of Energy requirement for Chandigarh, Delhi, HP & UP. **These states are requested to submit reasons for such variations in writing so that the same can be deliberated in the meeting.**
- All SLDCs are requested to furnish the provisional and revised power supply position in prescribed formats by 2nd and 15th day of the month respectively in compliance to the provision 5.3 of IEGC.

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 October, 2018 is placed on NRPC website. (www.nrpc.gov.in/meetings/occ.html)

2.3 Detailed presentation on grid operation during November, 2018 by NRLDC.

3. Maintenance Programme of Generating Units and Transmission Lines:

3.1. Maintenance Programme for Generating Units.

The proposed maintenance programme for Generating Units for the month of January, 2019 will be discussed on 17.12.2018 at NRPC office, New Delhi.

3.2. Outage Programme for Transmission Elements.

The proposed Outage programme of Transmission lines for the month of January, 2019 will be discussed on 17.12.2018 at NRPC office, New Delhi.

4. Planning of Grid Operation:

4.1. Anticipated Power Supply Position in Northern Region for January, 2019 (As per 15th LGBR Sub-committee meeting)

The Anticipated Power Supply Position in Northern Region for January, 2019 is enclosed at **Annexure -Agenda item no. 4.**

SLDCs are requested to inform their updated estimate of power supply position for January, 2019 and measures proposed to be taken to bridge the gap in availability as well to dispose of the surplus, if any, in the prescribed format.

5. Information about variable charges of all the generating units in the Region.

The variable charges details for different generating units are available on the Merit Order Portal. All SLDCs are requested to update VC on MoD.

They are also requested to confirm if the process of Scheduling is being done as per Merit Order Despatch and in case of variations the reasons may please be furnished.

6. Reactive compensation at 220 kV/400kV level

6.1 In the 38th TCC & 41st NRPC following elements in NR were approved:

- a) 500 MVAR TCR at 400 kV bus at Kurukshetra S/S of Powergrid.
- b) 30 no. 220 kV bus reactors at 220 kV sub-stations and 18 no. 400 kV bus reactors at 400 kV sub-stations subject to the availability of space.

POWERGRID:

Representative of POWERGRID had informed that for the bids for 500 MVAR TCR at Kurukshetra price bids have been opened and the LOA is expected to be placed by **First week of December 2018** with commissioning schedule of 2 years from the issue of LOA.

Regarding the 125 MVAR reactor being installed at Kurukshetra to compensate for the prevailing high voltage conditions until the TCR gets commissioned, it was informed by POWERGRID that the reactor has been charged on 28.09.2018.

Regarding the installation of the bus reactors at 400 kV ISTS substations which is to be done through TBCB route as per the MoP Gazette Notification dated 08.05.2018, POWERGRID representative was requested to update the progress of the same from CTU.

DTL:

DTL has informed that as per the revised approval of SCSPNR held on 22.06.2018, DTL will install 7 no. bus reactors, six 25 MVAR, 220 kV bus reactors at Mundka, Harsh Vihar, Peeragarhi, Electric lane, Bamnauli & Indraprastha substation and 1 no. 125 MVAR, 400 kV bus reactor at Mundka substation. DTL has submitted that these reactors would be commissioned by **December 2020**. Out of the above, scheme for five reactors at 220 kV level are under approval. DTL representative informed that order for the above reactors is expected to be placed by **December 2018**.

PSTCL:

Technical bid for 400 kV bus reactor at Dhuri substation has been opened and Price bid will be opened on 18.10.2018. As regards 220 kV bus reactors at Dhuri and Nakodar substation, tender has been opened on 15-06-2018 (technical bid) & is under evaluation. DPR for installation of 400 kV and 220 kV bus reactors has been submitted for PSDF funding. It was informed that there were certain observations of TESSG of PSDF to which the clarifications have been reverted on 07.09.2018.

Uttarakhand:

PTCUL representative informed that for 125 MVAR reactors at Kashipur tender date has been extended as only 2 bids were received. 80 MVAR reactor at Srinagar has been commissioned.

Rajasthan: Rajasthan representative updated as under:

The DPR for 3 Nos. each of 25 MVAR reactors (Akali, Bikaner & Suratgarh) i.e. total 75 MVAR reactors has been submitted for PSDF funding on 27.04.2018. Further the reply of observations raised by NLDC has been submitted on 28.07.2018 and approval is under

process at their end. The installation process of these 3 reactors shall be started on receipt of approval by PSDF.

The MS NRPC advised that 450 MVAR (13x25+1x125MVAR) agreed in the standing committee should have been got installed even if the locations had changed in revised study / proposal. In this context it is to submit that the revised DPR for 450 MVAR approved Reactor after separating STATCOM has been sent to POSOCO for approval vide letter dtd. 12.10.2018.

Regarding status of 150 MVAR (25 MVAR at Barmer and 125 MVAR at Jodhpur), it is to submit that reactors at these locations are already included in proposal of 450 MVAR reactors of Rajasthan, approved in the 39th SCPSPNR.

All utilities are requested to update.

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

- 7.1 38th TCC & 41st NRPC meeting:** NRPC approved that the capacitor requirement study of NR shall be conducted at 11/33 kV level from CPRI so as to obtain the true requirement of capacitor for FY 2018-19.
- 7.2 39th TCC and 42nd NRPC** approved the Techno Commercial offer of CPRI at **Rs. 32 lakhs (Rs. 20 lakhs for previous study and Rs. 12 lakhs for additional assignment) excluding taxes** for conducting the capacitor study. In the meeting the format for data submission was shared with the members and they were requested to ensure timely submission of the data so that the study may be carried out in the stipulated time frame.
- 7.3** In the **150th OCC meeting**, members expressed concerns on the nature of the format and submitted that the format being lengthy would require some time for better understanding of the format and submission of data accordingly.
- 7.4** To address the concerns of the members of OCC forum, in the **151st OCC meeting**, representative of CPRI made a detailed presentation explaining the format in the meeting and based on the inputs received from the members, the format has been revised and has already been sent to the respective SLDC's through e-mail dated 24.09.2018. CPRI has also shared a video of the presentation explaining the format which can be viewed on Youtube at <https://youtu.be/QTXx7owPF3g>.
- 7.5** Members were also requested to initially fill the data format for any one 220 kV or 132 kV substation and send it to CPRI (manoharsingh@cpri.in) to check its suitability for utilization in carrying out the study and further action.
- 7.6 152nd OCC meeting:** No progress has been made so far for submission of data. All the utilities were again requested to make efforts to do the needful.
- 7.7 40th TCC & 43rd NRPC meeting:** Members were requested to expedite submission of the data to CPRI in the format prescribed for studies to be conducted for Capacitor requirement in NR for the year 2019-20.
- 7.8 153rd OCC meeting:** MS, NRPC expressed his concerns as no data in the specified format has been received from any of the state even for a single substation which was desired to verify its suitability for utilization in carrying out the capacitor study. Representative of Haryana stated that they had submitted data to which the representative of CPRI replied that the data submitted by Haryana was not in the format as decided in the 151st OCC meeting which was forwarded to all the utilities via e-mail dated 24.09.2018. Representative of Rajasthan SLDC stated that the load data at 11 kV substations was not being maintained. Therefore, it was not possible for them to furnish the same.

EE (O), NRPC and representative of JVVNL stated that the load data was maintained at 11 kV sub-station and the same may be made available.

Representative of Rajasthan SLDC stated that the same would be verified and the data shall be submitted at the earliest.

- 7.9 The issue of non-submission of data for system study of capacitor requirement in NR for the year 2019-20 has been taken up with the highest management of DISCOMs, STUs and SLDCs. The letter regarding the same dated 06.11.2018 is enclosed at **Annexure – Agenda item no 7** for reference.

All utilities are requested to update.

8. Phase nomenclature mismatch issue with BBMB and interconnected stations

- 8.1 The Protection Sub-Committee while discussing multiple elements tripping at 400/220/132kV Dehar HEP of BBMB in its 34th meeting held on 21.04.2017 recommended inter-alia that BBMB should modified nomenclature of phase sequencing at Dehar as Y-B-R instead of R-Y-B. The issue was further deliberated in the 138th OCC meeting held on 23.08.2017, wherein it was observed that nomenclature of phases at BBMB end has inadvertently been marked as outlined below:

Phase of the grid	Corresponding nomenclature of the phase at BBMB end
R Phase	B Phase
Y Phase	R Phase
B Phase	Y Phase

The BBMB was asked to rectify the nomenclature issue at their end accordingly.

- 8.2 However, BBMB raised concern that the issue could not be resolved in one go, as coordination would be required from all the concerned utilities to carry out this activity and requested NRPC to form a committee comprising of BBMB and its partner states, utilities with which BBMB has interconnection, NRPC Secretariat and POWERGRID for the same. NRPC in its 41st meeting held on 28th February, 2018 approved the proposed formation of the committee and advised BBMB to resolve the issue within six months.

BBMB drew a draft action plan which was duly deliberated by the Committee in its 1st meeting held on 04.06.18. The action plan was circulated to all the concerned utilities for - their comments and concurrence. The execution of the action plan was tentatively planned during month of November-December, 2018.

- 8.3 HPSEB and PSTCL agreed with action plan, however, PSTCL was of the view that 400kV Dehar-Rajpura line is owned by PGCIL and hence the work is to be executed by them. Comments on the action plan were also received from NTPC and POWERGRID BBMB has agreed with the comments from NTPC and has given their reply on the comments of POWERGRID.

- 8.4 The reply of BBMB vis-à-vis the comments of POWERGRID were deliberated in the 151st OCC meeting wherein members were of the view that reply of BBMB was generally in order. However, POWERGRID representative stated that the matter pertains with NR-I and NR-II region of POWERGRID and final decision regarding the same is to be taken up at the level Executive Directors of respective regions.

- 8.5 Accordingly, the matter was taken up vide letter of even number dated 07.10.2018 for POWERGRID consent to the action plan. However, reply of the same is still awaited.
- 8.6 **152nd OCC meeting:** POWERGRID representative assured that the issue will be resolved with BBMB.
- 8.7 SE (O) requested POWERGRID to give their consent at the earliest so as the BBMB could execute the work in the upcoming months of November & December as per the decision of NRPC.
- 8.8 **40th TCC & 43rd NRPC meeting:** In the meeting POWERGRID stated that they have reservation regarding the action plan submitted by BBMB, as for a single circuit line it may not be optimal plan to change the Jumper configuration in view of requirement for long shut down & material. He further stated that a similar issue was encountered in Rajasthan wherein same problem was mitigated for a Double circuit line. MS NRPC had requested POWERGRID to submit all their reservations in writing, highlighting the issues which may be encountered at the time of implementation of above. In the meeting it was stressed that the work should be completed in the lean period of November-December 2018
- 8.9 **153rd OCC meeting:** POWERGRID updated that the site visit is planned shortly to resolve the issue. As desired in the 43rd NRPC meeting POWERGRID submitted all their reservations in writing (Annexure 8 of MoM of 153rd OCC meeting). Further MS NRPC requested POWERGRID to resolve the matter immediately so that the work can be done by BBMB in the lean period. BBMB representative also requested for the same as once the clearance from POWERGRID is received thereafter also the matter has to be approved by their Protection Committee.
POWERGRID is requested to update.

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

The detail of the updated status of Agenda items is enclosed at **Annexure –Agenda item no 9.**

10. Status of FGD installation vis-à-vis installation plan at identified TPS.

10.1 The list of FGDs to be installed as finalized in the 36th TCC (Special) meeting held on 14.09.2017 was enclosed as Annexure-13 with the Agenda of the 144th OCC meeting. All SLDCs are regularly being requested since 144th OCC meeting to take up with the concerned generators where FGDs is to be installed and submit the progress of FGD installation on monthly basis regularly to NRPC in the available format on the NRPC website.

10.2 151st OCC meeting: MS NRPC stated that in the meeting CEA held a meeting with generators on 28.08.2018 in which CE, TR&M, CEA informed that the FGD installation deadlines have been advanced for stations falling in NCR and also for the stations above 500 MW capacity or in stations located in the area having population density more than 400 persons per square km or are in critically polluted area. He further added that many IPPs like NPL are waiting for guidelines from the SERCs regarding the FGD installation cost adjustment. In this regard, he briefed the sub-committee that Ministry is concerned about the issue and a policy decision is being made about the cost to be adjusted duly and CERC is being directed in this regard to pass an order to the SERCs. He asked all the generators to seriously make efforts to meet the deadline of installation of FGD.

All constituents are again requested to update the desired information in soft copy in excel format on a regular basis. All the utilities (except PSPCL) should give the contact details of the officer who is concerned with FGD installation so that the information can be

expeditiously collected directly from him/her. All SLDCs shall coordinate and submit the information.

- 10.3 152nd OCC meeting:** SE(O) NRPC informed that in June, 2018, MoP in a letter to the CERC stated that investment in the installation of emission control technology like FGDs in TPPs in compliance to MoEF&CC norms will be considered for pass through in tariffs and TPPs can approach appropriate commission for the approval of additional capital expenditure and compensation for the increased cost on account of this change-in-law event.

The Sub-Committee was also informed about revised phasing plan received from TR&M Division of CEA placed at Annexure-10(A) of the MoM of the 152nd OCC meeting. He requested all utilities to look into the same and implement the installation plan accordingly and update.

- 10.4 153rd OCC meeting:** All utilities were requested to review the revised phasing plan that was attached at **Annexure-10(A) of the MoM of the 152nd OCC meeting**. PSPCL intimated that the Work order for carrying out the Detailed Feasibility Study for Installation of FGD at GGSSTP, Rupnagar & GHTP, Lehra Mohabbat has been placed upon M/s NTPC Consultancy Services and work is in progress.

All are requested to update.

11. LVRT compliance by wind generators.

- 11.1** Installation of LVRT needs to be ensured at the time of “connection” of the wind generators. The CEA(Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2013 provide that wind generating station connected at voltage level of 66 kV and above shall remain connected . LVRT is the capability of the electrical device to operate through periods of lower grid voltage. LVRT mechanism boosts the terminal voltage of the point of connection of the wind machine when there is a fault at the remote location to provide transient stability support.

Many wind generation operates without LVRT/FRT feature thereby adversely responding at low voltage either due to high load condition at wind pockets or any fault condition in different parts of the grid and becomes a source for grid incident. The installed capacity having LRVT, their setting are not uniformly matching with the provisions of the Central Electricity Authority (Technical standards for connectivity to the Grid) Regulation, 2007 as amended from time to time (CEA Technical Standards for Connectivity Regulations).

Regulation B2.(3) of the CEA (Technical Standards for Connectivity) Regulations provides that Low Voltage Ride Through (LVRT) is compulsory for machines installed after 15.04.2014, but for existing wind power generating stations, LVRT should be mutually discussed. It does not exempt any station from installing LVRT. STUs/DISCOMs/SLDCs should take up the matter of getting compensation for additional capitalization on account of installing LVRT to be made “pass through “with their concerned State Electricity Regulatory Commissions.

LVRT is technical requirements from the point of view of the safety and security of the grid and its usefulness cannot be overlooked in view of the cost involved in retrofitting of LVRT. CERC has already directed all WTGs of capacity equal to or more than 500kW except Stall Type WTGs to comply with LVRT.

With regard to monitoring of the installation and performance of LVRT installed on existing WTGs, CERC has directed SLDCs to prepare quarterly reports and submit it to RPCs . RPCs are directed to validate the reports submitted by SLDCs in consultation with RLDCs and report any deficiency and non-compliance to the Commission in accordance with law.

As LVRT are not installed in many of the wind turbines in State of Rajasthan, the issue is being regularly raised in the various meetings of NRPC so far without any result.

38th TCC/41st NRPC meeting: LVRT compliance was a pre-requisite according to CEA connectivity standards and these wind generators should not have been provided the connectivity in the first place itself. NRPC directed Rajasthan to issue a notice to all the LVRT non-compliant wind generators specifying a time period within which they need to get the LVRT compliance beyond which they would be constrained to deny scheduling to these generators.

145th OCC meeting: RRVPNL submitted the letter from the Ministry of New & Renewable Energy in this regard in which the following is stated regarding LVRT compliance:

“A Concerned WTG manufactures may apply for LVRT testing to any internationally accredited testing body or NTWE by 15.3.2018, which should include the following:

i An affidavit that the manufacturer would comply with CEA Technical standards for connectivity to the grid.

ii A bank guarantee of Rs 1 crore per model, which would be returned on producing the compliance certificate for LVRT and other technical standards as stipulated by CEA.”

147th OCC meeting: MS, NRPC stated that all the wind generators shall be LVRT complaint for which retro fitment needs to be done & it shall be responsibility of Rajasthan SLDC to get it enforced. Rajasthan should comply with the decision of 38th TCC/41st NRPC meeting & write letters to wind generators communicating the decision of NRPC.

148th OCC meeting: MS, NRPC apprised the Committee that the above reference order facilitates WTG manufactures to obtain statement of compliance/confirmation standard for demonstrating the compliance to applicable CEA Technical standards for connecting to the Grid for their WTG models which were unable to get LVRT compliance certificate from accredited testing agencies. He further stated that the time period for applying for LVRT testing to any internationally accredited testing body or NIWE stands expired on 15.3.2018. He added that notice should be issued to all Wind generators who have not done the needful. Rajasthan SLDC representative has intimated the same has been issued (Copy of the letter was placed at Annexure 11 of the MoM of the 148th OCC meeting).

MS, NRPC added that as per 38th TCC and 41st NRPC decision, SLDC should not schedule the wind generators which are not LVRT complaint. Also he added that due to LVRT non compliance on part of the wind generators has lead to a near voltage collapse instances but luckily the grid survived. NRLDC representative also added that the compliance of the wind generators is mandatory for the safety of the grid as 2-3 incidents have already occurred in the grid which could have resulted in the catastrophe.

11.2 149th OCC meeting:

Rajasthan representative intimated that a meeting of wind turbine manufacturers was held on 05.07.2018 to sort out the issue of LVRT and to get its compliance expeditiously. Further, the assessment of manufacturer wise non complied WTG has been identified and enclosed at Annex- XI of the MOM of the 149th OCC meeting. He informed the Sub-Committee that 638 generators are LVRT complaint & 106 do not require as per regulation. He further added that 2641 generators need to be LVRT complaint. The capacity of generators that are non – complaint is 3019 MW. He also informed that the cost of installing LVRT was 25-40 lakh per generator for which the generators will have to make arrangements. MS, NRPC stated that the cheaper solutions are available and they should be explored cost needs to be reviewed MS NRPC requested that Rajasthan should submit these details to their SERC. He informed additionally that the wind generators had requested for scheduling of power till they review the time line for getting work done.

Rajasthan representative also informed that the next meeting with WTG manufacturers is scheduled for 23.7.2108 for further deliberating the actions in this regard.

Director, GM division, CEA representative added that LVRT compliance is mandatory as per connectivity regulation requirement of CEA. He added that a single LVRT solution can be used on the plant which will be cheaper.

11.3 150th OCC meeting:

Rajasthan representative intimated that in line with the discussions in the last OCC meeting the WTG manufacturers in the meeting on 23.07.2018 has been advised to review the possibility of having a single LVRT for a plant. MS, NRPC requested that the MOM of the meeting may be shared so that the progress in this regard can be monitored.

11.4 151st OCC meeting:

The MOM of the meeting held on 23.07.2018 stands shared (Annexure 11 of the Agenda of the 151st OCC meeting).

MS NRPC briefed the forum that M/S Suzlon and Inox have filed a petition for waiver of installation of LVRT on account of the additional cost involved.

RRVPL representative intimated that the next meeting with the WTG manufacturers is scheduled tentatively for 05.10.2018.

11.5 152nd OCC Meeting:

RRVPL representative intimated that a meeting along with presentation from LVRT solution provider (M/s Enerfra) has been convened on dated 09.10.2018. MOM of said meeting are attached as Annexure-XI of the Minutes of The 152nd OCC meeting.. During the meeting, he informed that it was also decided by MS, NRPC that a meeting of WTG Manufacturers and generators will be convened at NRPC on dated 23.10.2018 to discuss bottlenecks issues in implementation of LVRT in Rajasthan control area.

11.6 In a meeting held on 23.10.2018 at NRPC with the WTGs GSS/PSS level solution like STATCOM was discussed. M/s Siemens would provide voltage relief graph which would be superimposed on the system voltage profile at any S/s, If it matches with that provided by the LVRT device then Siemens would explore further possibility of having LVRT devices.

Siemens was also requested to explore any other alternative for their own WTG to make them LVRT compliant. WTGs were requested to take up for “Pass-through tariff” under “change in law” with SERC.

- 11.7 40th TCC & 43rd NRPC meeting:** In the meeting it was advised to Rajasthan SLDC to enforce the decision of 42nd NRPC of not scheduling LVRT non-compliant WTGs commissioned after the date as mentioned in the CEA (Connectivity Regulation) amendment dated 15.10.2013.

CEA stated that SLDCs may file a petition with respective SERCs indicating problem being faced by the WTGs in installation of LVRTs.

MS, NRPC informed the TCC that NRPC along with Rajasthan SLDC, WTGs, OEMs is in the process of finding economic way to ensure LVRT compliance

- 11.8 153rd OCC meeting:** RRVPNL representative updated that WTGs are in the process of finding economic way to ensure LVRT compliance.
RRVPNL is requested to update.

12. System Protection Scheme (SPS) in NR

12.1 Revised System Protection Scheme (SPS) for 765 kV Agra-Gwalior line:

In 39th TCC and 42nd NRPC meeting: MS, NRPC informed that there were 2 issues involved which needed to be discussed. One was for the utilization of CB signal from both the ends (Gwalior and Agra) in the logic and the other was for incorporating additional 1000 MW load for load shedding in the already approved scheme.

Regarding the additional 1000 MW load, MS stated that the same has been identified and were now pending at POWERGRID’s end for wiring with the logic.

POWERGRID representative informed that the material has been received at the site and for 2 locations viz. Dadri and Bhiwadi the scheme was almost completed. Regarding other locations under the ownership of other utility, POWERGRID requested to provide the details of nodal officers with whom they may coordinate. He further stated that, once the details of the nodal officers were received, additional load of 1000 MW shall be wired within 02 months (tentatively by end of August 2018).

MS, NRPC assured POWERGRID of all possible support by the utilities and to provide them with the list of nodal officers for each substation location identified for additional load shedding.

Regarding the issue of utilizing CB from both the ends (Gwalior & Agra) in the logic of SPS, MS, NRPC stated that even though the decision was already taken in NRPC/TCC forum, the issue of booking the cost of the scheme was again raised in the OCC forum. To this, Members expressed concerns and stated that once a decision has already been taken at NRPC/TCC forum, the issue shall not be raised again in any sub-committee of NRPC.

149th OCC meeting : It was also informed that a report has to be submitted to CERC on the status of implementation of the SPS scheme. Accordingly, CERC has been intimated the current status of implementation and CERC has also informed that a mock testing for the revised 765 kV Agra- Gwalior SPS will be carried out after integration of additional 1000 MW load shedding.

151st OCC meeting: POWERGRID informed that substations in Delhi, UP & Haryana were completed and 7 locations in Punjab & 6 locations in Rajasthan were remaining which are expected to be completed by October 2018. The mock testing for the Revised 765 kV Agra-Gwalior SPS will be carried out in November, 18 as communicated to CERC. (only after integration of additional 1000 MW load shedding that is to be carried)

152nd OCC meeting: POWERGRID updated that the work will be completed in totality by November end. He added that physical installation will be completed within this month and testing of the 21 number of link will start thereafter.

NRLDC representative stated that the mock testing would be planned thereafter in the first week of December, 2018.

In 40th TCC & 43rd NRPC meeting: POWERGRID representative informed the following:

- Physical installation at DTPC completed at all the locations.
- Communication link of all hardware would be done by November, 2018.
- RoW issue on 765kV Gwalior-Satna for stretch of 25km is faced. Expected to be resolved by December, 2018.
- Signal Extension to Sasan over OPGW from Agra has been completed. Repeaters installation is in progress and expected by November, 2018.
- Mock testing would be done in January, 2019.

153rd OCC meeting: POWERGRID updated that the connectivity work has been done on ten stations and the work on the rest of stations of Rajasthan & Punjab would be will be completed by 15.12.2018. He further ensured that as agreed in the 43rd NRPC meeting they will target to go ahead with the mock testing in 01/2019.

POWERGRID is requested to update.

12.2 SPS for ICTs at 765 kV Unnao sub-station:

144th & 145th OCC meeting: UPRVUNL update: “Offer to incorporate the logic of SPS at Anpara “D” is pending with BHEL. The efforts are underway to get the offer from BHEL. The work is expected to be completed by 31.03.2018. The cost of the logic of SPS at Anpara “D” is to be indemnified by UPPTCL”.

150th OCC meeting: It was informed that on continuous pursuance of matter with BHEL, negotiated offer for SPS has been received from BHEL on 16.08.2018 (ANNEXURE 12 of the MOM of the 150th OCC meeting) and the order for the same shall be placed within a week with completion target of September, 2018.

The copy of the LOI placed on BHEL is placed at Annexure 12 of the Agenda of the 151st OCC meeting.

151st OCC meeting:

UPRVUNL updated that order has been placed on M/s BHEL vide letter no 310/C&D-VI /DTPP/T-1 dated 20.08.2018. The work is to be completed in around 40 days. The cost of the work would be 54.20 lac & UPPTCL has been intimated about the same.

152nd OCC meeting: UPRVUNL updated that they will complete the work by November end. UPPTCL representative stated that the work at their end and LANCO is complete and once the UPRVUNL completes the work mock testing will be done. It was further added by representative of UPRVUNL and UPPTCL that only action at Anpara D is pending and therefore with the commissioning of scheme at Anapara D, entire scheme would stand commissioned.

153rd OCC meeting: UPRVUNL updated that the work is under progress. BHEL they intimated has given a list of MAX-DNA Hardware to be procured by department. The offer stands received and procurement process is being done. He further added that BHEL is developing the software logic of the SPS. As on date it is expected that the work would be completed by December 2018

UPRVUNL may update.

12.3 SPS for Kawai – Kalisindh - Chhabra generation complex:

146th OCC meeting: RRVPNL updated as under:

“The communication scheme is being reviewed on PLCC/Optical fiber in place of earlier GPS scheme as tripping time on GPS scheme was higher. Tender is likely to be floated by 5/2018.”

147th OCC meeting: RRVPNL representative intimated that feeder identification has been done & tendering will be done shortly. He added that further communication scheme is being reviewed on PLCC/Optical fiber in place of earlier GPS scheme as tripping time on GPS scheme was higher. Tender is likely to be floated by May-18.

148th OCC meeting: RRVPNL representative intimated that the Technical specification is under preparation & communication link are under review. Tender is likely to be floated in July 2018. MS NRPC expressed concern over inordinate delay & requested RRVPNL to take up the issue with the communication wing expeditiously or else NRPC Secretariat will take up the matter with higher management.

149th OCC meeting: RRVPNL representative intimated that the details from the communication wing stand received. & the tender will be floated positively by next month. He explained that the details of the OPGW involved have been accounted for in the details received from the communication wing.

150th OCC meeting: RRVPNL representative intimated that the Technical Committee has rejected the proposal on the basis that the reliability of the PLCC system proposed for the load shedding at the time of outage of Kawai-Kalisindh units along with Anta-Phagi line is not present. It was added by the Committee that till March 2019 the OPGW will be laid in the entire network (12000 Kms) & the same can be used for the purpose.

MS NRPC requested RRVPNL to submit the written communication from their STU in this regard.

151st OCC meeting: RRVPNL representative submitted the written communication from their STU in this regard is enclosed at Annexure 12A of the MOM of the 151st OCC meeting. It has been intimated that the Technical specification for implementation of Automatic load shedding scheme under SPS for Kawai Kalisindh generation complex is under process of approval and the whole procedure till award of contract may be completed within 4-5 months and complete implementation of above scheme may take further at least 6-7 months.

152nd OCC meeting: RRVPNL representative submitted a letter from SE (Procurement-I), RVPN, Jaipur Annexure-XII of the MOM of the 152nd OCC meeting, vide which it has been intimated that the Technical specification for implementation of Automatic load shedding scheme under SPS for Kawai Kalisindh generation complex is under approval. Further, it was intimated that the contract will be awarded within 4-5 months and complete implementation of above scheme may take further 6-7 months. SLDC Rajasthan representative confirmed that Chabra STPS units have also been wired to the SPS.

153rd OCC meeting: RRVPNL representative stated that the order will be placed in 1/2019 positively for completion of work in 6-7 months thereafter.

RRVPNL is requested to update.

13. Automatic Demand Management System

Since 147th OCC utilities were being requested to update on the action plan & status of implementation of the ADMS in their utility as it is mandatory requirement of IEGC. Statewise status is as follows:

Punjab:

147th OCC meeting :

Punjab representative intimated that at SLDC level they were doing remote tripping for 96 locations. He added that the ADMS at 11 kV feeder level is to be implemented by Distribution Company. He added that the Tender specification had finalized and it has been targeted to be complete by 2020.

148th OCC meeting :

Punjab SLDC representative stated that 26 locations remote tripping from SLDC has been tested. Around 10 percent of the running load can be disconnected through these locations. The latest status regarding implementation of ADMS by PSPCL is as under:
The matter of engaging a consultant for preparation of DPR of ADMS at balance location is under consideration with the higher authorities and work of ADMS would be implemented within stipulated time.

TDDPL: Fully Implemented

TDDPL representative stated that the ADMS system is working well in their organization as per the latest regulations since last more than 5 years. He added that the scheme is also working in Rajadhani & Yamuna Power distribution companies.

Rajasthan:**149th OCC meeting :**

That approval of PSDF for STNAMS (Smart Transmission Network & Assets Management System) project which is consisting of Automatic Demand Management System (ADMS) functionality at the level of 33 feeders at EHV Substation of RVPN under SCADA / EMS part of project has been received. Bid documents prepared and under final approval with the CMD, RVPN. Bidding process will be initiated immediately on approval as above. Tentative timeline is as under:-

1. Issue of NIT – June, 2018
2. Finalization of Tender / Purchase order issued – August, 2018
3. Proposed timeline to complete the work – 18 months from date of issue of LOI/NOA

Further, the Automatic Demand Management System (ADMS) functionality at 11 kV feeders from 33/11 kV substation are under the jurisdiction of the Discoms and matter is being perused with discoms authorities.

152nd OCC meeting :

Rajasthan representative has also added that tender for Smart Transmission Network & Assets Management System having ADMS part has been floated and Techno commercial bid has been opened on 30.08.2018. Financial Bid has also been opened and financial bid analysis is yet to be submitted for approval of WTD. Work order is expected to be placed by December-18 after expiring of model code of conduct for assembly election in Rajasthan.

UP:

The remote operation of 132 kV feeders under ADMS has been done, but for the down below network they have taken up the issue with the DISCOMs.

All utilities are requested to update.

14. Status of implementation of recommendations of Enquiry Committee on grid disturbances on 30 & 31.7.2012

All the utilities were requested to update the information as per the letter enclosed at Annexure 18 with the Agenda of the 146th OCC meeting. The information has been submitted by NTPC(NCR), BBMB, Punjab, Rajasthan, THDC, HPGCL, NPCIL, POWRGRID (NR-2 & NR-1), POSOCO & NHPC has been received.

All utilities other than mentioned above are requested to submit updated status at the earliest.

15. Planning, procurement and the deployment of Emergency Restoration System.

The updated status as per the 153rd OCC meeting is enclosed as Annexure – Agenda item no 15.

The guidelines have been issued vide which the Ministry of Power has directed that for 5000 ckt kms minimum 2 numbers of ERS are required (Annexure 16 of the MOM of the 150th OCC meeting).

HPSEBL, Haryana, PTCUL & Rajasthan are requested to update. All other utilities are again requested to review & update in view of the Annexure 16 of the MOM of the 150th OCC meeting.

16. Cleaning and Replacement of porcelain insulators

16.1 Northern Regional power transmission lines are exposed to the high pollution levels along their routes. Such pollution levels with the onset of the winter season, lead to the frequent trippings and finally to breakdown and long outages of the transmission lines. These outages make the grid weak, thereby endangering the grid reliability and security. Therefore, in order to avoid/mitigate trippings of lines during foggy (smog) weather in winter season, preventive actions like cleaning/washing of insulators, replacement to conventional insulators with polymer insulators has been recommended and are being taken every year.

16.2 It being a regular activity, all the transmission licensees in the Northern Region are being requested in monthly OCCM since the 148th Meeting to plan insulator replacement work from September 2018 onwards.

The meeting for cleaning and replacement work of conventional insulator was held on 15.10.2018. The minutes of the meeting stand issued vide letter dated 12.11.2018.

16.3 All utilities are requested to stick to the timeline as brought out in the meeting to mitigate fog related trippings during winter season and to ensure proper submission of data regarding progress of the cleaning/ replacement work in line with the discussions held in the meeting. It is stressed that the cleaning of porcelain insulators in the polluted/fog prone area also be taken up expeditiously.

The data as per MoM of the meeting stands submitted by POWER GRID (NR3), BBMB, DTL, HVPNL, PSTCL.

All other utilities i.e POWERGRID(NR2&1), RRVPNL & UPPTCL are requested to submit information as per MOM issued, failing which outages for cleaning/replacement of insulator may not be approved. Further, the progress of the cleaning/ replacement work completed may also be intimated.

17. Cyber Security Preparedness Monitoring

In the 37th TCC and 40th NRPC meeting held on 27th and 28th October, Chief Engineer IT, CEA and Chief Information Security Officer, MoP, Sh. Vijay Menghani, gave a detailed presentation on potential cyber threats for power sector, the agencies working on this aspect, recent incidents of cyber attacks on and the action points to prevent the cyber threat. It was stated that in view of increasing incidents of cyber-attacks and threat to the integrated grid operation, all utilities need to monitor action being taken in regard to the following points and report the status to respective Computer Emergency Response Teams (CERTs):

- a. Appointment of organization-wise Chief Information Security Officers and its status.

- b. Identification of organization-wise Critical Infrastructure and its status.
- c. Preparation of organization-wise Crisis Management Plan and its status.
- d. Status of Cyber Security Mock Drill activity in coordination with CERT-In.
- e. Status of Training / Workshops on Cyber Security organized / participated by power sector entities.
- f. Status of action taken on CERT-In / NCIIPC advisories.

The status of the information received from the following utilities: **The information has been received from NTPC, NHPC, Tata Power, THDC, PTCUL, NPCIL RAPS, NAPS, PSTCL, DTL & PTCUL.**

All other utilities (except from those mentioned above) were requested to update.

18. Requirement of Data for the GIS based Energy map being developed by Energy division of NITI Aayog.

Geographical Information System (GIS) based energy map for India (https://vedas.sac.gov.in/powergis_main/index.jsp) is being implemented by NITI Aayog. This would provide true locations of all energy resources including power plants and transmission lines, etc. on a map of India which would be hosted on NITI Aayog's website. CEA is a designated nodal agency for collecting power sector data and accordingly power utilities and DISCOMs were requested to submit the requisite data to CEA for onward transmission to NITI Aayog. The details required are - name, voltage level, capacity, longitude and latitude of all s/s of 33 kV and above; longitude and latitude of origin and terminating points of lines of 33 kV and above. DISCOMs and other power utilities are requested to submit the requisite data to CEA through cedpd-cea@gov.in email id at the earliest. The item is under follow up since the 147th OCC meeting held on 15.05.2018 at NRPC Secretariat, New Delhi.

All SLDCs except Punjab are requested to take note and furnish the details at the earliest.

19. TTC assessment considering temperature dependent rating of lines/terminal equipment

For conducting studies in PSSE for assessment of inter control area transfer capability, POSOCO considers thermal ratings of lines as specified in CEA's 'Manual on Transmission Planning criteria- 2013' considering ambient temp. of 45°C for terminal equipment ratings of both ends of the lines.

As there is a scope for considering temperature adjusted thermal ratings for these lines in the PSSE studies, NRCE has decided to finalise the methodology for computation of TTC/ATC/TRM taking into a/c variation in thermal capability of lines wrt variation of ambient temp.

Therefore, POSOCO is in the process of populating the temp. adjusted thermal ratings in these lines in the PSSE study case.

All STUs and transmission licensees are requested to furnish terminal equipment ratings at all lines at 400kV and above for fully implementing the temp adjusted TTC to ensure that there

is no gap in security assessment. The matter is under regular follow up since 152nd OCC meeting, still no data is received so far.

Members may update.

20. Expediting Construction of 132kV supply for railway traction substation for railway electrification projects in states in NR region.

Ministry of Railways has accorded high priority to railway electrification projects for reducing dependence on imported petroleum based fuel thereby enhancing energy security of nation. However, it is observed progress of ongoing transmission line and substation works being executed by SEBs is not matching with the targets for railway sections planned to be commissioned on electric traction. It is found that the work of transmission line for 31 traction sub stations (UP 19, Haryana 5, Punjab 1, and Rajasthan 5 & J&K 1) is yet to be completed. Further tender for transmission line work for 14 traction sub stations(UP 5,Haryana 2,Punjab 2, Rajasthan 5) is yet to be awarded and estimate for 10 traction sub stations(UP 1,Punjab 2, Rajasthan 7) are yet to be received by Railways from respective SEBs. The details are enclosed at **Annexure – Agenda item no 20. Early commissioning of transmission line works and substation across the nation is required, so as to harness full potential of electrification.**

Members are requested to take up the matter with concerned utilities to expeditious completion of the transmission line works and substation and regularly update the progress of the work in monthly OCC meeting.

21. Problem of excessive vibrations in GTs of Rihand Stage – III and Vindhyachal Stage-IV during operation of Rihand - Dadri HVDC, on monopole mode with ground return.

148th OCC meeting:

NTPC representative highlighted as under:

- Shifting of 2x500MW Rihand Stage-III units (Unit# 5&6) from NR Grid to WR Grid through Vindhyachal Pooling Station was successfully done on 28th Nov' 17 with coordination in real time between POSOCO, NTPC and POWERGRID (WRTS-II).
- With Rihand stage-III units connected to Vindhyachal Pooling Station, problem of excessive vibrations in GTs of Rihand stage III (and Vindhyachal Stage-IV also) has been observed whenever Rh- Dadri HVDC is run on single pole in ground return mode. The observations during the period 27th Nov'17 to 5th March'18 at Rihand is enclosed in the attached sheet (ANNEXURE AA of the Additional Agenda OCC 148th Meeting).
- The issue was briefly discussed in the 142nd OCC Meeting against agenda point no 18 and where it was decided that system study was required to be done to further deal with this problem. Previous experience of NTPC in this regard was also sought which was subsequently provided to NRLDC by Rihand station.

- It is apparent that DC current passes through these GTs during above situation which is detrimental for the GTs and which may lead to their failure.
- It is therefore requested that a solution may kindly be arrived to deal with the above situation at the earliest.

The issue was deliberated in light of the discussions held earlier in the 142nd OCC meeting NTPC was requested to check transducer at Vindhychal end as there was huge mismatch in MVAr and also get assessment of earthing system at Rihand done. Further it was decided that as per decision in the 38th TCC & 41st NRPC meeting the committee will look into resolving the issue.

Nominations from CEA, CTU/ POWERGRID, NTPC, POSOCO were received and the first meeting of the committee (Minutes attached at Annexure -Agenda item no. 21) was held prior to the 152nd OCC meeting .

CTU (POWERGRID) and NTPC are requested to update the progress.

22. Validity of OCC approved Outage for Availing actual Shut down (Agenda from POWERGRID)

As per existing practice the shutdown of planned nature, approved in one OCC are valid to be availed for next two months, depending on the site/ system constraints.

Recently NLDC rejected to consider the s/d approval for some 765kv bays & ICTs requested in early Dec'18, which were approved in 152nd OCC meeting for the month of Nov'18, this resulted in wastage of all the efforts mobilized for essential maintenance of Grid Equipment and loss in time and money as well.

It may please be appreciated that maintenance of grid elements is necessary for the safety and security of the grid network and we are committed for maintaining the healthiness of our grid network accordingly.

Necessary cooperation in facilitation of such shut down should therefore be extended from NRLDC/NLDC in the interest of system healthiness as per existing practice.

Members may deliberate.

23. Islanding scheme of Delhi

Following the massive grid disturbance occurred in the grid on 30th & 31st July 2012, the Islanding Scheme was envisaged to take care of the essential load of Delhi in the event of occurrence of such events. The Islanding Scheme has been revised from time to time depending upon the load generation scenario. Revised Islanding Scheme of Delhi was discussed in detail in 32nd PSC held on 30.11.2016 and was found to be in order. The same was also approved in 35th TCC & 39th NRPC.

153rd OCC:

POWERGRID intimated that the 400/220 kv Tughlakabad Substation stands commissioned and the necessary action can be taken for implementation of the revised islanding scheme. DTL representative stated that as per revised scheme the isolation is to be done now at

Tughlakabad S/s. He added that the matter is being taken up with the OEM for providing the new panel. However, it will take 3-4 Months hence a temporary arrangement is proposed to be done in the relays of POWERGRID at Tughlakabad S/s so that the isolation can be done in case of any problem.

MS NRPC stated that the issue may be resolved at the earliest as December month is very crucial as Grid disturbance are expected in this period. He further added that the time frame in which the arrangement would be made be reported so that GM division can be intimated accordingly.

POWERGRID and DTL may update.

24. Electricity Generation Program FY 2019-20

State wise demand projection and generation outage plan for FY 2019-20 has been forwarded to OPM Division CEA. The same is attached as **Annexure – Agenda item No. 24.**

Members are requested to intimate discrepancy (If Any).

PART B: NRLDC

1. Reliability issues in the grid

Rajasthan: 400kV Anta-Kota having twin moose conductor was synchronized on 09.07.2018. It remains heavily loaded as all remaining 400kV lines connected at Anta are transferring power to Anta. Thus, loading of this line remains in range of 800-900MW and pose serious threat in case of other tripping in this area.

In 153rd OCC meeting, suggestion based on simulation study was presented by NRLDC to lower the loading on this line. It was suggested that the main bays of Anta-Kota and Chhabra-Anta are kept open so that the power flows directly from Chhabra to Kota bypassing Anta substation. As per information available, same was incorporated from 26th Nov'18.

Graph showing the flow on Anta-Kota and Chhabra-Kota is attached as **Annexure-1**. It can be observed from the graph that the flow on Chhabra-Kota was in the range of 300-500 MW whereas, it was 600-1000 MW on Anta-Kota. However, after one week, the main bays of Anta were closed and the flow on Anta-Kota is high again.

It is important to note that 400 kV Kota-RAPP C, 400 kV Kota-Merta and 220 kV Kota-Bhilwara lines have been opened on few occasions to control the loading on Anta-Kota line. It is also important to note that this high loading (>800MW) for the line is generally observed for only 2-3 hours in a day.

This complex already has several reliability issues like N-1-1 non-compliance at 765 kV Anta-Phagi lines, N-1 compliance issue at 765/400 kV Phagi ICTs (graph attached at annex-1) during high loading period. Hence, opening of 400 kV lines for power regulation at the time of high generation in this complex may pose threat to the grid security.

Apart from this, when Chhabra Supercritical would be fully commissioned (2*660MW), loading of 400kV Anta-Kota would rise further. Thus, there is need for more concrete solution to this issue of high loading of 400kV Anta-Kota.

Only single ICT is available at Rajwest, Chhabra and Kalisindh.

UP: In case of N-1 contingency of 765kV Bara-Mainpuri ckt-2 whole generation of Bara TPS (3 × 660 MW) and Meja (2×660MW) (one unit commissioned) is difficult to evacuate through 400kV Meja-Allahabad D/C & 400kV Meja- Rewa Road D/C lines and this poses challenge to evacuation of Bara & Meja TPS. Under full generation scenario at Bara (3*660MW) and Meja (2*660MW), total of nearly 3000MW would be under threat due to evacuation issues. Also, under N-1-1 contingency of 765/400kV Bara ICT and 765kV Bara-Mainpuri S/C, no generation can be evacuated from Bara. Commissioning of **765kV Bara-Mainpuri ckt 1** needs to be expedited. Commissioning of **765kV Hapur-Mainpuri** line would provide additional evacuation path for 765kV Mainpuri (apart from 765kV Mainpuri-G. Noida) under N-1 contingency of 765/400 ICT at Mainpuri and hence needs to be expedited.

Early commissioning of **765kV Anpara D-Unnao S/C** would help to reduce the loading of 400kV Anpara-Sarnath D/C, Anpara-Obra & Anpara-Mau.

N-1 non-compliance at Azamgarh ICTs

2. Deviation by NR states

NRLDC/NRPC has been advocating continuously to state utilities for portfolio management in advance so that deviations remain within permissible limits in real time. It has been discussed in number of previous meeting that load forecast should be carried out accurately and subsequently states shall plan their load generation balance. Deviation of NR utilities is being shown in every OCC meeting to sensitize the issues on regular basis still it has been observed that NR utilities are over/under drawing from the Grid on various instances. Deviation Graph for Nov-Dec'18 (10th Nov-10th Dec'18) is enclosed at **Annexure-2**.

Major observations:

1. *Rajasthan, Himachal Pradesh, J&K and Haryana were seen to be overdrawing most of the time.*
2. *Uttar Pradesh had over drawl for considerable portion of the time.*

This trend was also observed in Aug-Nov'18 when same was presented in OCC meetings. However, more stringent actions are required by states. States are requested to provide reasons for these deviations and actions being taken by them to avoid such deviations in future.

Members may please like to discuss.

3. Requirement of power flow and dynamics data for modelling of units as per various CEA /CERC regulations

At the time of commissioning of units, the details of the dynamic parameter of generator, exciter, stabilizer, and governor should be submitted to NRLDC. The Governor and Power System Stabilizer actions shall be properly tested and tuned and a report on the results of above testing including PSS tuning, frequency response shall be shared with NRLDC/NRPC before the units are declared under commercial operation.

It is well known that many new renewable (solar and wind) generators are being commissioned especially in Rajasthan state control area. Although details about capacity of solar and wind generators connected have been provided by Rajasthan, but for modelling the same, generator parameters are also required. Performance of wind generators during dynamic conditions including low voltage ride-through could also be tested using simulation. Therefore, it is also requested to provide parameters and dynamic details of these generators for power flow as well as dynamic modelling. Format for providing wind generator modelling data is attached as **Annexure-3**.

POSOCO is undertaking dynamic modelling of system for present and future scenarios to understand system behavior under high RE scenario. For development of proper models, complete and accurate dynamic data of all generators is required. Further, dynamic data is required for simulating different scenarios to understand the dynamic response of the system. Status of present data at NRLDC submitted by generators is attached as **Annexure-4**.

Utilities are requested to kindly submit the required data to NRLDC/NRPC as soon as possible for compliance to CEA/CERC regulations. If there are any changes to model parameters for Exciter, Governor & Stabilizer that also may be intimated.

Members may like to discuss.

4. SCADA display for monitoring of temperature and humidity from stations

Weather monitoring has been very significant in assessing the forecasted load in short term / long term period basis and therefore helps in better load portfolio management. During winter, sudden rainfall, snowfall, hailstorm, fog, cold wave etc. is very common phenomena and these directly affect the load pattern. Therefore, weather monitoring is a good indicator for load behavior and helps in forecasting the load. IMD developed dedicated website for Northern region (link: <http://amssdelhi.gov.in/NRLDC/main/MAIN.html>) is highly effective in weather monitoring and can be utilized by utilities. Apart from this, day ahead weather forecast issued by IMD is also helpful to assess the load pattern for upcoming days.

In 151st and 152nd OCC meetings, it was highlighted that SLDCs/ RLDC are having SCADA display for monitoring of temperature and humidity from stations. However, temperature and humidity data from most of the stations is not available or either suspect. The temperature and humidity data is especially useful during winter months to identify fog affected areas. This issue was also highlighted last year during winter months; however, actions are yet to be taken. Telemetry of temperature and humidity available at NRLDC is attached as **Annexure-5**. Utilities are requested to take steps to ensure correct and reliable temperature and humidity data at NRLDC/SLDCs.

Members may like to discuss.

5. Reactive power management in the grid

i. Reactor utilization:

- a. Updated list of bus reactor, its availability and data at control centers.
- b. Update list of lines whose line reactor can be switched as bus reactor on opening of such lines. A list of lines wherein there is a provision of such switching (including those for which confirmation from the respective utility is pending) was attached at Annexure-4 of additional agenda of 153 OCC meeting. As per the current list:

No. of transmission lines having LRs with provision to be used as BR	Total no. of LRs having provision to be used as BR	Total no. of LRs that have the confirmation by utilities for the usage as BR
115	147*	95*

(figures to be revised, data received from NR-1)

Utilities were requested to confirm whether line reactors can be used as bus reactor in 151st, 152nd and 153rd OCC meeting as well; however, information is only received from

POWERGRID NR-1. Respective constituents are requested to confirm the same as soon as possible to utilize it for voltage regulation.

Further, it was discussed that since in winter months high voltages are observed frequently and many lines are opened for voltage regulation. So, utilities shall try to ensure that line reactors which can be charged as bus reactor are taken in service under outage of line. Additionally, list of lines that may be/ are opened to control high voltages where the provision of using line reactor as bus reactor could be extended is attached as **Annexure-6** (prepared based on data available at NRLDC). Utilities are requested to provide their feedback on the list provided.

Apart from this, utilities may provide details of lines wherever provisions can be made to use line reactor as bus reactor on opening of lines so that such reactors can be used for voltage regulation as per grid conditions.

Members may like to discuss.

ii. Reactive power performance of generators

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 more reliable MVAR vs voltage plots would be available. States and generators shall also develop MVAR vs voltage plots at their end so that MVAR data at generation voltage (LV side of GT) is used which would also take care for MVAR absorption in GT.

MS NRPC had suggested that MW vs MVAR plots for generators be developed so that their operation based on capability curve be also assessed. An example for MW vs MVAR and Voltage vs MVAR graph developed for three units of Talwandi Saboo is attached in **Annexure-7**.

Reactive power response in respect of MVAR vs Voltage for past 30 days as per NRLDC SCADA data were presented in the meeting (attached as **Annexure-7**). It has been 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 generating station is yet to be corrected. The matter has been discussed in numbers of OCC/TCC meetings, still actions are to taken. Based on available data, MVAR performance of generators is shown below:

Rihand:	Absorbing up to 250 MVAR
Singrauli:	Absorption up to 170 MVAR and generation up to 50 MVAR
Dadri-Th:	Generating and absorbing in range of 220 to -50 MVAR(although line data suggest units absorbing MVAR)
Jhajjar:	Generating and absorbing in the range of 50 to -230 MVAR
Unchahar:	Absorption and generation -70 to 70 MVAR (MVAR response needs improvement)
Anpara-C:	Generating up to 100 MVAR most of the time (MVAR response needs improvement)
Bara TPS:	Generating up to 100 MVAR most of the time (data needs check)
Lalitpur TPS:	Absorption and generation -100 to 100 MVAR (MVAR response needs improvement)

Anpara-D:	Absorption and generation -50 to 50 MVAR (MVAR response needs improvement)
Anpara TPS:	Absorption and generation -100 to 100 MVAR (MVAR response needs improvement)
CLP Jhajjar:	Absorbing -270 to -100 MVAR
Khedar:	Absorption and generation -200 to 100 MVAR (MVAR response needs improvement)
Kawai:	Absorption upto 200 MVAR
Suratgarh:	Absorption and generation -70 to 100 MVAR (Telemetry not reliable)
Chhabra:	Absorbing up to 200 MVAR
Rajpura:	Absorption up to 450 MVAR

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.

Members may like to discuss.

6. Frequent forced outages of transmission elements

The following transmission elements were frequently under forced outages during the month of Nov'18:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	765 kV Meerut(PG)-Moga(PG)	5	POWERGRID
2	400 kV Aligarh(UP)-Panki(UP)	3	UP
3	400 kV Anpara(UP)-Obra(UP)-Sultanpur(UP)	3	UP
4	400 kV Azamgarh(UP)-Gorakhpur(UP)	3	UP
5	400 kV Bareilly(UP)-Unnao(UP) ckt-1	3	UP
6	400 kV Chamera II(NHPC)-Kishenpur(PG)	3	POWERGRID/NHPC
7	400 kV Kishenpur(PG)-New Wanpoh(PG) ckt-1	3	POWERGRID

The complete details are attached at **Annexure-8**. The 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.

7. Multiple element tripping events in Northern region in the month of Nov'18:

A total of **14** grid events occurred in the month of Nov'18 of which **3** 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 06-Dec-18 is attached at **Annexure-9**.

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 **4000ms** in the event of multiple element tripping at Aligarh(UP) substation on 06th Nov 2018 at 18:13hrs.

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **4** events out of 14 events 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.

8. Details of tripping of Inter-Regional lines from Northern Region for Nov'18:

A total of **3** inter-regional lines tripping occurred in the month of Nov'18. The list is attached at **Annexure-10**. 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.

In 153rd OCC meeting, it was discussed that improvement in DR/EL reporting has been observed mainly due to data sent by constituents in respect of SoPR. It was requested to the constituents that Flash report/Preliminary report along with remedial measure taken may also be accompanied with DR/EL sent by constituents. However, it has been observed that in the trippings occurred in Nov'18 also, though the DR/EL received in two cases, Flash report has not been received for any case of tripping.

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

9. Mock black start exercise 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 are 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 schedule of mock exercise along with current status is as follows:

Hydro Power Stations:

Date	Revised Date	Name of stations	Remarks
18-Oct-18	NA	Kishanganga (new plant)	NHPC reported to intimate date separately. It is proposed to carry out the exercise with Uri, L.Jhelum, Pampore and U. Sindh.
24-Oct-18	NA	Malana-2	Exercise was not successful. It is proposed to carry out the exercise again with AD Hydro.
26-Oct-18	15-Jan-19	Dhauliganga	Revised date by NHPC
2-Nov-18	NA	Salal	Exercise carried out successfully. However, due to less load on account of bad weather, frequency kept on varying and island could not be synchronized with grid.
13-Nov-18	21-Jan-19	Nathpa Jhakri & Rampur	Revised date by SJVNL
16-Nov-18		Uri-I, II HEP, Lower Jhelum HEP, Pampore GT's & Upper Sindh	To be carried out after 15-Dec-18 due to load management by J&K and shutdown of 400kV Amargarh-Uri-1 ckt-2.
19-Nov-18		Budhil	To be carried out after 15-Dec-18.
28-Nov-18		Chamera-3	To be carried out after 15-Dec-18 as per Chamera-3 request.
30-Nov-18	6-Dec-18	Sewa-2	NHPC confirmed. Date revised by J&K. Exercise was partially successful. Unit went under emergency stop twice.
3-Dec-18	NA	Chamera-1 & Chamera-2	Exercise was partially successful. Large variation in frequency observed in islanded operation with Chamera-1. Chamera-2 unit could not be able to synchronize to the island.
11-Dec-18		Parbati-3	NHPC confirmed. HP revised the date. To be carried out after 15-Dec-18.
14-Dec-18		Bairasiul	As reported by NHPC, Power House shall be under complete shutdown since 01/10/2018 for R&M of power house.
19-Dec-18		Koteshwar	Plant revised date. To be carried out in Jan-19.
28-Dec-18		AD Hydro	
4-Jan-19		Tehri	
8-Jan-19		Karcham Wangtoo & Baspa	
11-Jan-19		Koldam	

* *Mock black-Start exercise not carried out during Year 2017-18.*

Mock black-Start procedure circulated during last exercise/ previous year may be used. The unit selection may be changed from the one taken during last year exercise.

Mock black start exercise of Gas power stations viz. Auraiya, Dadri, Anta also to be carried out. In 153rd OCC meeting, NTPC informed that Procedure in line with Dadri GPS needs to be prepared for other gas stations as well. NTPC is requested to provide information on above.

As requested in 152nd OCC meeting, SLDC's may also 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 are 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	HP	Sainj	2x50
6		Larji	3x42
7		Bhabha	3x40
8		Malana -I	2x43
9		Baspa	3x100
10	Punjab	Anandpur Sahib	4x33.5
11		Ranjit Sagar	4x150
12	Rajasthan	Mahi-I&II	2x25+2x45
13		Rana Pratap Sagar	4x43
14		Jawahar Sagar	3x33
15		Gandhi Sagar	5x23
16		Dholpur GPS	3x110
17		Ramgarh GPS	1x35.5+2x37.5+1x110
18	UP	Rihand	6x50
19		Obra	3x33
20		Vishnuprayag	4x100
21		Srinagar (Alaknanda)	4x82.5
22	Uttarakhand	Gamma Infra	2x76+1x73
23		Shravanti	6x75
24		Ramganga	3x66
25		Chibro	4x60
26		Khodri	4x30
27		Chilla	4x36
28		Maneri Bhali-I&II	3x30+4x76
29	Delhi	IP Extn GTs	6x30+3x30
30		Pragati GPS	2x104.6+1x121.2
31		Rithala	3x36
32	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 information was received from HP (Sainj, Baspa) and Rajasthan (only schedule of exercises) only. The information may please be shared by SLDCs and program for this year's mock black start exercises shall also be shared.

SLDCs shall submit the reports of black start exercise in their respective control area. SLDCs may also identify further generating stations/unit for black start exercise.

Members may please discuss.

10. Revision of document for Reactive Power Management and System Restoration Procedure for Northern Region:

Reactive Power Management document and System Restoration Procedure for Northern region is due for revision. The last updated document link has already been shared with the constituents.

In 153rd OCC meeting, constituents were requested to provide feedback, suggestion and updated information by 15th December 2018.

The following is the status of details received as on 06-Dec-18:

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

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

Constituents are requested to provide the updates by 15th December 2018.

Member may discuss.

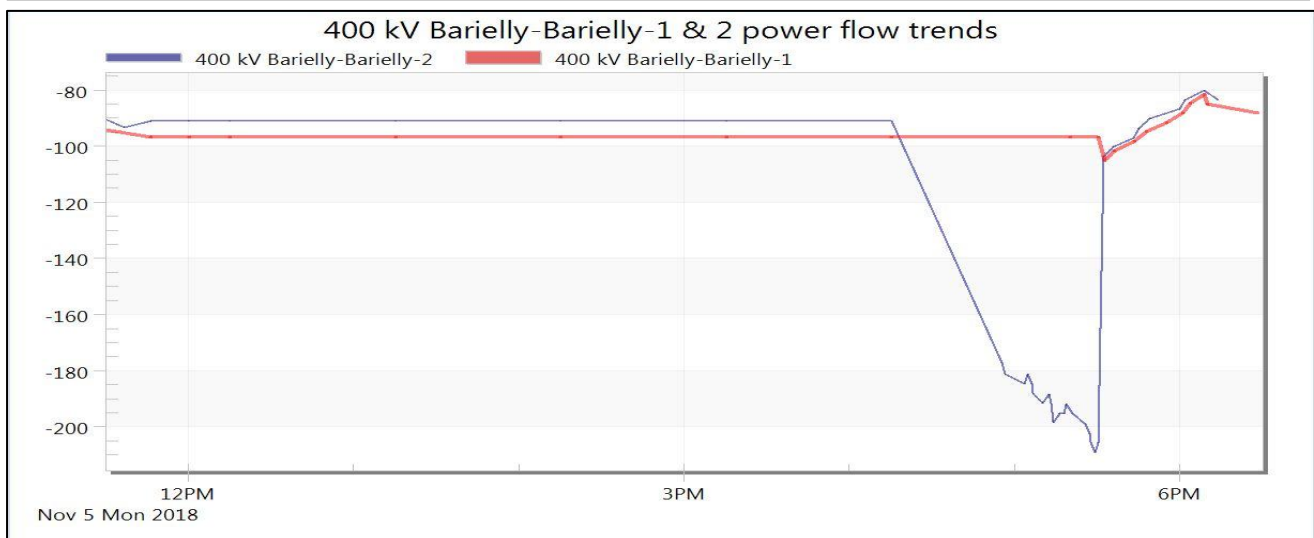
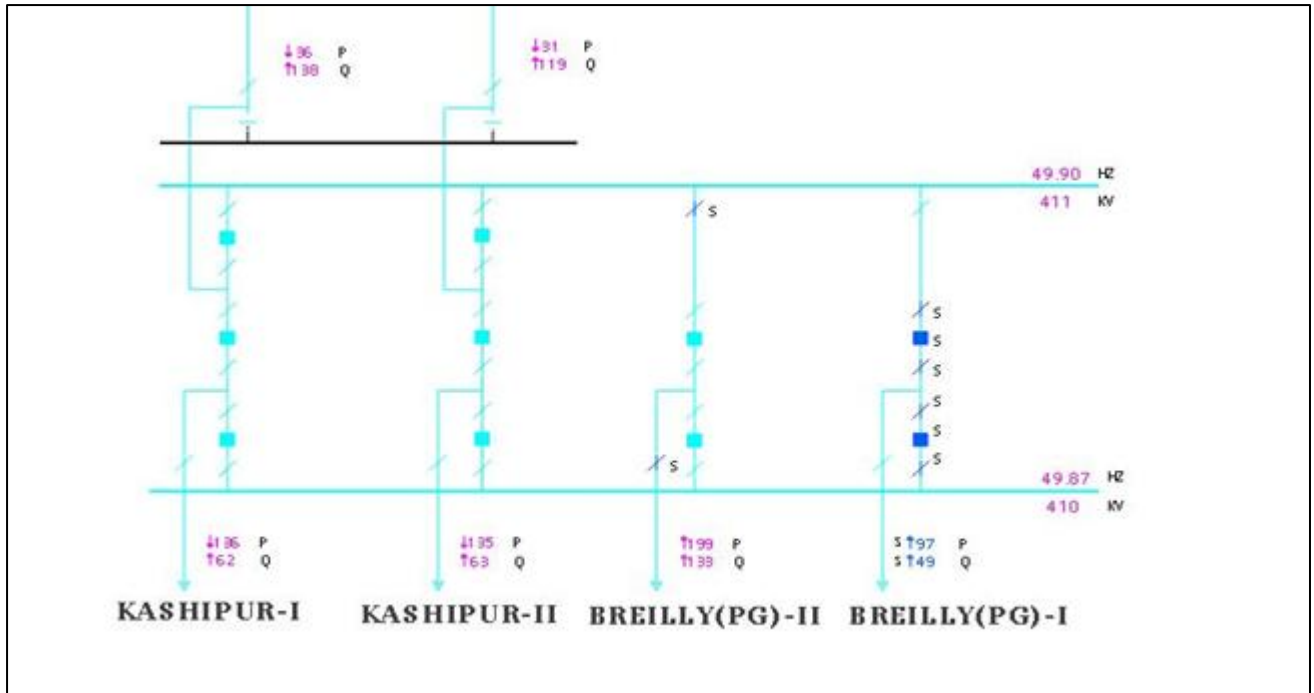
11. Opening of 400kV Bareilly(PG)-Bareilly(UP) line-1 without NRLDC code

400 kV Bareilly PG & 765 kV Bareilly stations RTU data were suspect since 12:00 hrs of 05 Nov 2018 despite healthy communication link. After persuasion from NRLDC, data of Bareilly 765 kV was restored at 16:50 hrs except data of 400kV Bareilly –Bareilly line #1. The screenshot of 400 kV side of 765 kV Bareilly PG station is attached as Annexure-1. From the Annexure 1, using Bus summation methodology, it can be seen that power flow of 400kV Bareilly –Bareilly line #1 is zero and line seems to be out of service. At 17:45 hrs power flow of Bareilly –Bareilly line #2 reduced to half (100 MW) (trend is attached as Annexure-II) and at 17:50 hrs data of 400 kV Bareilly PG & 765 kV Bareilly RTU started reporting to NRLDC.

From above, it can be inferred that RTU data of both the stations was deliberately disabled and the line was kept out of service from 12:00hrs to 17:50 hrs without any intimation to NRLDC. Which is violation of IEGC clause no 5.2(c).

It is requested to furnish the proper reason and details of this incident.

Members may please like to discuss.



12. Opening of 400 kV Bus B at Dadri without NRLDC code on 21-11-2018

Shutdown of HVDC Rihand-Dadri Pole- I along with 400 kV Bus B at Dadri was requested w.e.f 21-11-2018. Consequently, while issuing the code for S/D, it was specifically told that only Pole-I is to be taken under S/D for which CPCC agreed over phone. Further, it was also communicated to CPCC that request for S/D of Bus B is under process and would be given in due course of time based on grid conditions. However, Bus B was taken out of service without taking code from NRLDC. This is a violation of IEGC clause 5.2(C) . Further, it was requested to furnish the proper reason and details of this incident, but the same has not been furnished.

Members may please like to discuss.

Annexure 4

State		MU	MW
		Jan-19	Jan-19
Chandigarh	Availability	115	300
	Requirement	115	260
	Surplus/Shortfall (MU)	0	40
	Surplus/Shortfall (%)	0.0%	15.4%
Delhi	Availability	3540	5660
	Requirement	2150	4540
	Surplus/Shortfall (MU)	1390	1120
	Surplus/Shortfall (%)	64.7%	24.7%
Haryana	Availability	5450	8200
	Requirement	3800	7884
	Surplus/Shortfall (MU)	1650	316
	Surplus/Shortfall (%)	43.4%	4.0%
Himachal Pradesh	Availability	1020	2120
	Requirement	880	1710
	Surplus/Shortfall (MU)	140	410
	Surplus/Shortfall (%)	15.9%	24.0%
Jammu & Kashmir	Availability	760	1760
	Requirement	1710	2980
	Surplus/Shortfall (MU)	-950	-1220
	Surplus/Shortfall (%)	-55.6%	-40.9%
Punjab	Availability	4937	7549
	Requirement	3600	6760
	Surplus/Shortfall (MU)	1337	789
	Surplus/Shortfall (%)	37.2%	11.7%
Rajasthan	Availability	8553	11730
	Requirement	6963	12499
	Surplus/Shortfall (MU)	1589	-769
	Surplus/Shortfall (%)	22.8%	-6.2%

Uttar Pradesh	Availability	10605	16770
	Requirement	11160	17500
	Surplus/Shortfall (MU)	-555	-730
	Surplus/Shortfall (%)	-5.0%	-4.2%
Uttarakhand	Availability	1040	1970
	Requirement	1290	2180
	Surplus/Shortfall (MU)	-250	-210
	Surplus/Shortfall (%)	-19.4%	-9.6%
Total NR	Availability	36020	54088
	Requirement	31668	52100
	Surplus/Shortfall (MU)	4352	1988
	Surplus/Shortfall (%)	13.7%	3.8%



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

No. NRPC/OPR/104/06/2018/12926-60

Dated: 06.11.2018

To,
 As per List attached

**Subject: - System Study for Capacitor Requirement in NR for the year 2019-20-
 Non-submission of data-regarding.**

Sir,

In 38th TCC and 41st NRPC meeting, it was decided to get the capacitor requirement study for Northern Region conducted by CPRI (at 11/33 kV level) so as to obtain the net requirement of capacitor in each state. In the subsequent OCC meetings all Members were requested to ensure timely submission of the data through STU/ SLDC in the format proposed by CPRI so that the study for 2019-20 may be carried out in stipulated time frame.

The Members had certain reservations about the format prepared by CPRI for collection of data which were modified as per the comments of the Members. The steps for compilation of data were also explained (video of the same available on <https://youtu.be/QTxx7owPF3g>) to the Members in the 150th OCC meeting.

However, despite our regular follow-up in the OCC and NRPC meetings, the data in the formats as agreed and explained in the 150th OCC meeting has NOT been received so far in respect of your utility. This matter was again taken up in recently convened TCC/ NRPC meeting of NRPC.

Therefore, it is requested that the matter may be looked into and the officers concerned may kindly be directed to compile and submit the data to NRPC through STU/ SLDC to facilitate System Study for Capacitor Requirement in Northern region for the year 2019-20 at the earliest so as to utilize the PSDF funds for the subject cited scheme of the utilities of Northern region.

Sincerely,

(M A K P Singh)

Member Secretary, NRPC

List of addressee

1. DISCOMs

State	Name	Fax No.	Address
Rajasthan	Discom AVVNL Rajasthan	0145- 2644550 (Director Finance)	Managing Director, Ajmer Vidyut Vitran Nigam Ltd. Vidyut Bhawan, Makarwali Road, Makarwali, Ajmer-305004
	Discom JdVVNL Rajasthan	291- 2517896	Managing Director, Jodhpur Vidyut Vitran Nigam Ltd. New Power House, Industrial Area, Jodhpur-342003
	Discom JVVNL Rajasthan	0141- 2740253	Managing Director, Jaipur Vidyut Vitran Nigam Ltd. 51/256, Tonk Rd, Sanganer, Sector-5, Pratap Nagar, jaipur - 302033
Delhi	Discom BRPL Delhi	011- 29564400	CEO, BSES Rajdhani Power Ltd. BSES Bhawan, Nehru Place, New delhi- 110019
	Discom BYPL Delhi	011- 26419833	CEO, BSES Yamuna Power Ltd. Shakti Kiran Building, Ground floor, Main Road, Karkardooma, Delhi-110092
	Discom TPDDL Delhi	011- 27468042	CEO, Tata Power Delhi Distribution Ltd. NDPL House, Hudson Lines Kingsway Camp Delhi-110009
Uttar Pradesh	Discom DVVNL	0562- 2605465	Managing Director, Dakshinanchal Vidyut Vitran Nigam Ltd. Urja Bhawan, Nh-2 (Agra- Delhi bypass Road), Sikandra, Agra-282002
	Discom MVVNL	0522- 2208769	Managing Director, Madhyanchal Vidyut Vitran Nigam Ltd.

State	Name	Fax No.	Address
	UP		Head Office 4-A,Gokhale Marg, Lucknow, Uttar Pradesh-226001
	Discom PuVVNL UP	0542- 2319439	Managing Director, Purvanchal Vidyut Vitran Nigam Ltd. PuVVNL, DLW Bhikharipur, Varanasi- 221004
	Discom PVVNL UP	0522- 2287827 (Chairman)	Managing Director, Pashchimanchal Vidyut Vitran Nigam Ltd. Urja Bhawan, PVVNL, Victoria Park, Meerut-250001
	Discom KESCL UP	0512- 2530890	CEO, Kanpur Electric Supply Co. Ltd Electricity Vidyut Board, Civil Lines, KESA House, Kanpur... Uttar Pradesh
Haryana	Discom DHBVNL Haryana	2601827/26 05465 (Head Office)	Managing Director, Dakshin Haryana Bijli Vitran Nigam Vidyut Sadan, Vidyut Nagar, Hisar- 125005.... Gurgaon, Faridabad
	Discom UHBVNL Haryana	0172- 2563094	Managing Director, Uttar Haryana Bijli Vitran Nigam Ltd. Vidyut Sadan, Plot No. C16, sector-6 Panchkula, Haryana
J&K	Discom PDD J&K	0191- 2549335	Development Commissioner, Power Development department, Civil Secretariat J&K
Punjab	Discom PSPCL Punjab	0175- 2213244 (Director Finance)	Managing Director, Punjab State Power Corporation Ltd. PSEB Head Office, The Mall, Patiala
Uttarakhand	Discom UPCL Uttrakhand	0135- 2763821	Managing Director, Uttrakhand Power Corporation Ltd. Corporate Head Quarter-Victoria Cross

State	Name	Fax No.	Address
			Vijeyta Gabar Singh Urja Bhawan, Kanwali Road, Balliwala Chowk, Dehradun-248001
Himachal Pradesh	Discom HPSEB HP	0177- 2801675	Managing Director, Vidyut Bhawan, HPSEB Ltd., Shimla- 171004
Chandigarh	Discom U.T. Chandigarh	0172- 2740505	Superintending Engineer, 4th Floor, UT Secretariat, Sector-9, Chandigarh

2. State Transmission Utility

Designation	STU	Fax No.
CMD	PSTCL	0175-2213199
CMD	Delhi Transco Ltd., New Delhi.	011-23234640
Managing Director	Haryana Vidyut Prasaran Nigam Ltd., Panchkula	0172-2560640
Managing Director	H.P. Power Transmission Corporation Ltd., Shimla	0177-2832384
Chairman & Managing Director	Rajasthan Rajya Vidyut Prasaran Nigam Ltd. Jaipur	0141-2740168
Chairman & Managing Director	U.P. Power Transmission Corporation Limited	0522-2287792
Managing Director	Power Transmission Corporation of Uttarakhand Limited (PTCUL), Dehradun	0135-2764496
Chief Engineer	Electricity Department, UT of Chandigarh,	0172-2637880

3. SLDCs of Northern Region

Designation	State SLDC	Fax No.
Chief Engineer, Engg. Deptt. (Electrical),	Chandigarh	0172-2740276
Chief Engineer	PSTCL	0175-2365340
CE (SO & SLDC)	HVPNL	0172-2560622
Chief Engineer	Shimla	0177-2837649
Chief Engineer (SO)	PDD J&K	0191-2476213
Executive Director	Delhi Transco Limited	01123221069/23236462
Chief Engineer	PTCUL	0135-2530336
Chief Engineer	Jaipur	0141-2740920
Director	UPPTCL	0522-2287880,2288736

SNO	Description of Agenda point	Details	STATUS TO BE UPDATED
1	Monitoring of schemes funded from PSDF (Agenda by NPC)	The latest status of the schemes for which grant has been sanctioned from PSDF for the schemes in Northern Region. 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	The updated status available is attached as Annexure 9/1. All states are requested to update.
2	Sub-stations likely to be commissioned in next 6 months.	All the concerned states were requested to submit the details of the downstream network associated SPECIFICALLY with THESE POWERGRID substations along with the action plan of their proposed/approved networks.	The details of the substations of Power Grid and their required downstream network is enclosed as Annexure 9/2. All concerned are again requested to update regularly and ensure that the work is completed expeditiously.
3	Progress of installing new capacitors and repair of defective capacitors	The available up to date status of installation of new capacitors and revival of defective capacitor by the State constituents is enclosed as ANNEXURE 10/30 OF THE AGENDA OF THE 146TH OCC MEETING.	All utilities are requested to update regularly.
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> <i>151st OCC meeting:</i>	Information from for period ending September 2018 has not been received from Punjab, Delhi, BBMB & Rajasthan. They are requested to submit.

		All utilities are requested to submit reports of testing in every quarter in soft copy. All the states were requested that the reports for period ending September 2018 by all the states should be submitted positively by First week of October.	
5	Strengthening of Intra-State transmission system	<p>Also all SLDCs are requested to give half yearly feedback ending 6/2018 in the month of 7/2018 to STU regarding bottlenecks, constraints and overloading in the State transmission network for proper transmission planning</p> <p>153rd OCC meeting:</p> <p>PTCUL, Punjab ,Delhi & Rajasthan have submitted the information that send submitted to concerned office of CEA.</p>	<p>HVPNL & UPPTCL to submit the information.</p> <p>Also all SLDCs are now requested to give half yearly feedback ending 12/2018 in the month of 1/2019 to STU regarding bottlenecks, constraints and overloading in the State transmission network for proper transmission planning</p>
6	Mapping of Feeders in SCADA	<p>In the 141st OCC meeting members were informed about the “Compendium of SPS in NR” (<i>Annexure-9 of the MOM</i>) which was released in the 40th NRPC meeting. All the utilities were requested to go through the compendium and identify feeders concerning their state and map the same in SCADA.</p> <p>150th OCC meeting:</p> <p>MS NRRPC stated that as per the Compendium of SPS in NR” which was released in the 40th NRPC meeting. All the utilities are requested to go through the compendium and identify feeders concerning their state and map the same in SCADA. This document is available on NRLDC & NRPC website. NRLDC representative added that it is very important that the feeders should be mapped in SCADA. It was stated that this issue will be discussed in the Test committee meeting also. The matter under discussion in subsequent meetings but no further update</p>	All states except Punjab & Rajasthan are requested to update.

POWER SYSTEM DEVELOPMENT FUND(PSDF)														
Status of Schemes Submitted by the Entities for funding from PSDF														
Status as on 30-11-2018														
Schemes approved under PSDF														
All figures in Rs Crore														
SLNo	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding Recommended by Appraisal Committee	Grant Approved by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement	Completion schedule (in Month)	Date of release of first Installment	Proposed Completion date as per sanction order	Amount Disbursed as on 31-07-2018
I	II		III	IV	IX	X	XI	XIII	XV	XVI				
1	Rajasthan	NR	RRVNL	Renovation and Upgradation of protection system of substations (003)	159.53	5.1 (c)	90.00	143.58	31-Dec-14	6-Feb-15	24	31-Mar-16	31-Mar-18	14.85
2	Rajasthan	NR	RRVNL	Installation of Bus Reactors (005)	23.87	5.1(b)	90.00	21.48	31-Dec-14	6-Feb-15	18	22-Mar-16	22-Sep-17	19.33
3	Uttar Pradesh	NR	UPPTCL	Installation of Capacitors and FSC. (025)	39.29	5.1(b)	90.00	35.36	11-May-15	26-Nov-15	18	8-Mar-16	8-Sep-17	29.77
4	Uttar Pradesh	NR	UPPTCL	Renovation and Upgradation of protection system of substations. (026)	202.94	5.1 (c)	90.00	182.65	11-May-15	26-Nov-15	18	31-Mar-16	30-Sep-17	89.47
5	NRPC	Central	NRPC	Study Program on the integration of renewable energy resources (054)	6.45	5.1 (e)	100.00	6.45	28-Oct-15	24-Nov-15	3	29-Dec-15	29-Mar-16	4.49
6	Jammu & Kashmir	NR	PDD-J&K	Renovation and Upgradation of protection system of substations in Jammu(023)	140.04	5.1(c)	100.00	140.04	28-Oct-15	5-Apr-16	18	14-Jul-17	14-Jan-19	26.40
7	Himachal Pradesh	NR	HPSEBL	Renovation and Upgradation of Protection System (049)	55.44	5.1(C)	100.00	55.44	5-Jan-16	8-Jun-16	18	31-May-17	30-Nov-18	34.44
8	Jammu & Kashmir	NR	PDD-J&K	Renovation and Upgradation of protection system of substations in Kashmir(024)	146.12	5.1 (c)	100.00	146.12	17-Mar-16	22-Apr-16	18		16-Sep-17	26.40
9	Delhi	NR	DTL	Renovation and Upgradation of Protection System.(049)	125.98	5.1(c)	90.00	113.38	17-Mar-16	4-May-16	27	25-Nov-16	25-Feb-19	20.75
10	Uttarakhand	NR	PTCUL	Renovation and Upgradation of Protection System.(051)	125.05	5.1(c)	100.00	125.05	17-Mar-16	8-Jun-16	18	8-Nov-16	16-Sep-17	101.75
11	Punjab	NR	PSTCL	Bus bar protection (052)	18.21	5.1(c)	90.00	16.39	17-Mar-16	29-Dec-16	18		16-Sep-17	
12	Uttar Pradesh	NR	UPPTCL	Reconductoring of existing line by HTLS conductor for relieving congestion. (027)	80	5.1(d)	75.00	60.00	17-Mar-16	Scheme withdrawn	18	20-Sep-17	16-Sep-17	
13	Haryana	NR	DHVBVN	Renovation and modernisation of distribution system of DHVBVN, Haryana(077)	364.27	5.1(d)	75.00	273.20	2-Jan-17	24-Nov-17	18		18-Feb-18	28.35
14	Punjab	NR	PSTCL	Provision of second DC Source at 220KV & 132KV Grid Sub Station of PSTCL. (70)	15.3	5.1 (c)	90.00	13.77	2-Jan-17	23-Mar-17	18		1-Jul-18	3.01
15	POWERGRID	Central	POWERGRID	Funding of BNC Agra HVDC (94)	5778	4(3)(A)	50.00	2889.00	10-Mar-17	23-May-17	54		9-Sep-21	
16	Uttar Pradesh	NR	UPPTCL	Replacement of existing ACSR conductor by HTLS conductor for relieving cogestion. (89)	63.31	5.1(d)	75.00	47.48	16-May-17	27-Jul-17	18		15-Nov-18	4.74
17	Rajasthan	NR	RRVNL	" Smart Transmission Operation Management System (STOMS) " in Rajasthan Power System. (110)	13.18	5.1(c)	90.00	11.86	19-May-17	10-Oct-17	12		18-May-18	1.186
18	Rajasthan	NR	RRVNL	Communication Backbone "Smart Transmission Network & Asset Management System " Part-B (136)	569.77	5.1(c)	50.00	284.89	22-May-17	10-Oct-17	18		21-Nov-18	56.969
19	BBMB	Central	BBMB(038)	Renovation and Upgradation of protection system of substations. (038)	25.86	5.1 (c)	90.00	23.27	15-Nov-17	19-Feb-18	22			2.33
20	Rajasthan	NR	RRVNL	Real Time Data Acquisition System for Monitoring & Control of Transmission Grid under STNAMS (PART A-1) (153)	185.19	5.1(c)	50.00	92.60	15-Nov-17	23-Feb-18	24			
21	Uttarakhand	NR	PTCUL	Implementation of OPGW based reliable communication at 132 kv and above substations. (129)	37.46	5.1(c)	50.00	18.73	15-Nov-17		36			
22	Punjab	NR	PSTCL	Reliable Communication and data Acquisition System upto 132kV Substation in Punjab. (138)	66.1	5.1(c)	50	33.05	27-Jul-18		36			

Status as on 30-11-2018														
Schemes approved under PSDF					All figures in Rs Crore									
SLNo	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding Recommended by Appraisal Committee	Grant Approved by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement	Completion schedule (in Month)	Date of release of first Installment	Proposed Completion date as per sanction order	Amount Disbursed as on 31-07-2018
I	II		III	IV	IX	X	XI	XIII	XV	XVI				
23	Himachal Pradesh	NR	HPSEBL	Strengthening of Transmission System incidentals to Inter-State-Transmission System in the State of HP (134)	24.38	5.1(d)	100	24.38	27-Jul-18		18			
24	Himachal Pradesh	NR	HPSEBL	Reliable Communication and data Acquisition System upto 132kV Substation in Himachal Pradesh (135)	18.64	5.1(c)	50	9.32	27-Jul-18		18			
25	NRPC	Central	NRPC	Creation and Maintenance of Web based Protection Database Management and PC based Protection Setting Calculation Tool for Northern Region Power System Network. (203)	28.00	5.1(e)	100	28.00	27-Jul-18		18			
				Total	8,312.38			4,795.49						464.24

Status as on 30-11-2018											Schemes approved under PSDF				All figures in Rs Crore			
SLNo	Name of State/Entity	Region	Name of Entity	Name of Scheme and Unique ID No	Project Cost accepted by Appraisal Committee.	Category of Funding	Quantum of Funding Recommended by Appraisal Committee	Grant Approved by Monitoring Committee	Date of Issuance of sanction order by MoP	Date of Signing of Agreement	Completion schedule (in Month)	Date of release of first Installment	Proposed Completion date as per sanction order	Amount Disbursed as on 31-07-2018				
I	II		III	IV	IX	X	XI	XIII	XV	XVI								

Downstream network by State Utilities from ISTS Stations (Agenda by POWERGRID)

Augmentation of transformation capacity in various existing substations as well as addition of new substations along with line bays for downstream network are under implementation at various locations in Northern Region. For utilization of these transformation capacities, implementation of downstream 220kV system needs to be commissioned:

S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status
1	400/220 kV, 3x315 MVA Samba	2 nos. bays utilized under ISTS. Balance 4 Nos to be utilized	Commissioned	LILO of 220 kV Bishnha – Hiranagar D/c line : under tendering (PMDP) (status as available with CEA) LoA has been issued and Material has reached the site. Targeted – Nov, 2019
2	400/220kV, 2x315 MVA New Wanpoh	6 Nos. of 220 kV bays to be utilized	Commissioned	220 kV New Wanpoh-Mirbazar D/c line : under tendering (PMDP) 220 kV Alusteng- New Wanpoh line Targeted Completion – Nov 2018 Anticipated – Nov, 2019
3	400/220kV, 2x315 MVA Parbati Pooling Station	2 Nos. of 220 kV bays to be utilized.	Commissioned	220 kV Charor- Banala D/c line (18 km) : under construction Target completion -December 2018 as intimated by HPPTCL. HPPTCL TO UPDATE
4	400/220kV, 2x500 MVA Kurukshetra (GIS)	8 nos. of 220 kV bays to be utilized	Commissioned	LILO of one circuit of Kaul-Pehowa 220 kV D/c line LILO of one circuit of Kaul-Bastara 220 kV D/c line Work awarded. Contractual Completion period is 31.10.2019. Representative of HVPNL informed that work is expected to be completed by March, 2019 earlier than scheduled completion. HVPNL TO UPDATE PROGRESS
5	400/220kV, 2x500 MVA Bagpat GIS	3 nos. of 220 kV d/s lines to Shamli, Muradnagar and Bagpat commissioned. Balance 5 Nos. of bays to be utilized	Commissioned	220 kV D/C Baghat (PG)- Baraut line-2 bays LILO of 220 kV Muradnagar-Shamli S/C line at Baghat (PG)-2 bays 220 kV S/C Baghat (PG)-Baghat line energised – 1 bay LILO of 220 kV S/C Baghat-Muradnagar(II) at Baghat SS – 2 bays 220 kV Modipuram (II) SS March, 2019 UPPTCL TO UPDATE PROGRESS
6	400/220 kV, 2x315 MVA Saharanpur	2 nos. 220 kV downstream lines commissioned. (Saharanpur (UP) and Nanauta) Balance 4 Nos. of 220 kV bays to be	Commissioned	6 No. 220 kV bays utilised as under: LILO of Khara-Shamli 220 kV S/C line at SRN(PG) 220 kV SRN(PG)-Sarasawa D/C line LILO of SRN-NANauta 220 kV S/C line at SRN(PG) UPPTCL TO UPDATE PROGRESS

S. No.	Substation	Downstream network requirement	Schedule	Planned system and Implementation Status
		utilized		
7	400/220kV, 2x315 MVA Dehradun	Out of 6 bays, only two bays used. Balance 4 bays to be utilised.	Commissioned	220 kV Dehradun-Jhajra line- 02 bays 220 kV Naugaon SS – 1 bay 220 kV Selakui SS – 2 bays Representative of PTCUL informed that lines were associated with NMHEP. Expected to be completed by November, 2021
8	400/220 kV, 2x315 MVA Sohawal	4 Nos 220 kV bays utilised. 4 No. 220 kV bays to be utilized.	Commissioned	220 kV D/C Sohawal (PG)-Sohawal line - 2 bays 220 kV D/C Sohawal (PG)-Barabanki line– 2 bays 4 No. bays to be utilised as: 220 kV D/C Sohawal-Tanda line – 2 bays By November, 2018 220 kV D/C Sohawal-Tanda-Behraich line - 2 bays by May, 2019 as informed by the representative of UPPTCL. UPPTCL TO UPDATE PROGRESS
9	Shahjahanpur , 2x315 MVA 400/220 kV	Partially utilized. Balance 5 Nos. of 220 kV bays to be utilized.	Commissioned	220 kV S/C Shajahnapur-Hardoi commissioned – 1 bay 220 kV D/C Shajahnapur-Azimpur D/C line – 2 bays – Sept, 2019 220 kV D/C Shahajahanpur-Gola Lakhimpur line – 2 bays- December,2019 New S/s at Azimpur by March,2020. UPPTCL TO UPDATE PROGRESS
10	Moga	Partially utilized. Balance 2 nos. of 220kV bays to be utilized.	Commissioned	Moga–Mehalkalan 220kV D/c line Work completed. Commissioning pending. Approval from NGT for tree cutting is awaited for balance work to commission line. Expected to be completed by December, 2018 as informed by PSTCL. PSTCL TO UPDATE
11	Hamirpur 400/220 kV 2x 315 MVA Sub-station (Augmentation by 3x105 MVA ICT)	04 nos. 220 kV downstream lines commissioned under ISTS. Balance two bays to be utilised by HPSEBL	Sep'18	220 kV D/C Hamirpur-Dehan line – June, 2020
12	Kaithal 400/220 kV 1x 315 MVA Sub-station	July 2017 (Shifting of Transformer from Ballabgarh).	Commissioned	220kV Kaithal(PG)- Neemwala D/c line - Work awarded on 08.06.2018. Tentative completion date Dec, 2019. 220kV S/s Neemwala-Work awarded on 06.09.2018. Tentative completion date March, 2020.

State-wise Emergency Restoration system in NR#				Annexure 15
Transmission Licensee	Requirement of Total no of ERS in State	Number of ERS available in state	No of ERS to Be Procured	Remark if Any
POWERGRID		2 set of 400 kV & 2 set 765 kV		
DTL		2 set		
PSTCL		2 set		
UPPTCL		2 set		
PTCUL			2 set	DPR under finalisation.
HVPN			2 set	BOQ under finalisation.
RRVPN			2 set	Under tendering
HPPTCL			2 set	Matter under consideration.
PDD J&K		2 set		
BBMB		0	0	153rd OCC : BBMB representative stated that the issue has been discussed in the Power Sub-Committee meeting of BBMB and it has been decided that the ERS will be obtained as and when required from the partner states only.
Sterlite*				

* Sterlite has an arrangement with M/s Supreme, Kolkota, to provide the ERS services as and when required and are in the process of procurement of their own.

data as availbale with NRPC Sectt.

Annexure

Summary of Transmission line work being executing by various State electricity board				
SN	STATE	Tr. Line work to be expedited (Annexure-I)	Contact yet to Award (Annexure-II)	Estimate awaited (Annexure-III)
1	Madhya Pradesh	13	4	4
2	Odisha	11	2	
3	Andhra Pradesh	5		
4	Karnataka	2	4	5
5	West Bengal	5	2	
6	Assam	1	4	
7	Uttar Pradesh ✓	19	5	1
8	Haryana ✓	5	2	
9	Punjab ✓	1	2	2
10	Rajasthan ✓	5	5	7
11	Bihar	6	11	1
12	Jharkhand	2	3	
13	Gujarat	2	7	4
14	Telangana	1		
15	Tamil Nadu	2	1	3
16	Jammu & Kashmir ✓	1		
17	Maharashtra		7	
18	Chhattisgarh		1	
19	Damodar Valley Corporation Limited		5	
Total		81	65	27

Transmission line for which commissioning to be expedited

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
1	CHHINDWARA-KALUMNA (RVNL)	Chhindwara	Linga	10.5 Kms.	MADHYA PRADESH
2	CHHINDWARA-KALUMNA (RVNL)	Boregaon	Sausar	19Kms.	MADHYA PRADESH
3	Jabalpur- Satna –Rewa (CORE)	Katni	Patwara	20	MADHYA PRADESH
4	Jabalpur- Satna –Rewa (CORE)	Maihar	Bhadanpur	13	MADHYA PRADESH
5	Jabalpur- Satna –Rewa (CORE)	Kotar	Kaima	26	MADHYA PRADESH
6	Manikpur – Shankargarh (CORE)	Sirmour	Dabhaura	56	MADHYA PRADESH
7	Manikpur – Jhansi (CORE)	Naugaon	Harpalpur	51	MADHYA PRADESH
8	Manikpur – Jhansi (CORE)	Prithvipur	Niwari	23	MADHYA PRADESH
9	Jabalpur- Nainpur – Gondia (CORE)	Lalbra	Balaghat	20	MADHYA PRADESH
10	Jabalpur- Nainpur – Gondia (CORE)	Nainpur	Ghansore	38	MADHYA PRADESH
11	Jabalpur- Nainpur – Gondia (CORE)	Nainpur	Nainpur	8	MADHYA PRADESH
12	Ratlam-Nimach (CORE)	Jaora	Jaora	5	MADHYA PRADESH
13	Ratlam-Nimach (CORE)	Mandore	Sindpan	15	MADHYA PRADESH
14	Angul-Sukinda new line (RVNL)	Kamakhya Nagar	Kamakhya Nagar	5.226	ODISHA
15	Angul-Sukinda new line (RVNL)	Jabamayee	Sukinda	3.678	ODISHA
16	Haridaspur-Paradeep (RVNL)	Marshaghai	Kendrapara	13.251	ODISHA
17	Vizianagaram-Rayagada-Titlagarh (CORE)	Munguda	Bissamcullack	13.5	ODISHA
18	Vizianagaram-Rayagada-Titlagarh (CORE)	Bhawanipatna	Lanjigarh	34.5	ODISHA
19	Titlagarh-Sambalpur-Jharsuguda (CORE)	Kanatapali	Godbhaga	13	ODISHA
20	Titlagarh-Sambalpur-Jharsuguda (CORE)	Barapali	Dungripali	8	ODISHA
21	Titlagarh-Sambalpur-Jharsuguda (CORE)	Tusura	Deogaon Road	15	ODISHA
22	Singapur Road-Damanjodi (CORE)	Theruvali	Bhalumaska	31	ODISHA
39	Singapur Road-Damanjodi (CORE)	Lakshmipur	Kakriguma	27	ODISHA
40	Singapur Road-Damanjodi (CORE)	Lakshmipur	Tikri	24	ODISHA
23	Angul-Sambalpur (ECoR)	Boinda	Boinda	3.3	ODISHA
24	Angul-Sambalpur (ECoR)	Maneswar	Maneswar	6.09	ODISHA
25	Diguvametta- Guntakal (CORE)	Nandyal	Nandyal	6.3	ANDHRA PRADESH

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
26	Diguvametta- Guntakal (CORE)	Somayajula-palli	Ramgapuram	2.5	ANDHRA PRADESH
27	Diguvametta- Guntakal (CORE)	Nansurulia	Pendekallu	12	ANDHRA PRADESH
28	Nallapadu- Pigidipalli (CORE)	Rentachintala	Guraj	15	ANDHRA PRADESH
29	Nallapadu- Pigidipalli (CORE)	Sattenapalli	Sattenapalli	5	ANDHRA PRADESH
30	HOSPET-BALLERY-GUNTAKAL (RVNL)	Alipura	Bellary cant	3	KARNATAKA
31	WD-RC-GTL Pkg-2 (RVNL)	Khanapur	Yadgir	12 Km	KARNATAKA
32	Katihar-New Jalpaiguri (CORE)	Dalkhola	Dalkhola	2.5	WEST BENGAL
33	Katihar-New Jalpaiguri (CORE)	Tista Canal fall	Rangapani	7.4	WEST BENGAL
34	RANINAGAR JALPAIGUDI-NEW BONGAIGAON (RVNL)	New Mayanaguri	New Mayanaguri	1.5 km	WEST BENGAL
35	RANINAGAR JALPAIGUDI-NEW BONGAIGAON (RVNL)	New Cooch Behar	Pundibari	10 Km	WEST BENGAL
36	Katwa-Azimganj (CORE)	Raghunathganj	Jangipur	7	WEST BENGAL
37	RANINAGAR-JALPAIGURI-NEW BONGAIGAON (RVNL)	-	Gosangaon	10	ASSAM
73	NEW BONGAIGAON-GUWAHATI (RVNL)	-	Kamakhya	5 km	ASSAM
38	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Chitbara Gaon	Bansdin Road	29.57 Km	UTTAR PRADESH
39	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Ghazipur	Ghazipur	38.52 Km	UTTAR PRADESH
40	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Aurai	Kachhwa Road	15.0 Km	UTTAR PRADESH
41	UTRATI RAIBARELI-AMETHI-JANGHAI (RVNL)	Bachharawan	Harchanapur	18 Km	UTTAR PRADESH
42	UTRATI RAIBARELI-AMETHI-JANGHAI (RVNL)	Gauriganj	Gauriganj	12.5 Km	UTTAR PRADESH
43	UTRATI RAIBARELI-AMETHI-JANGHAI (RVNL)	Ranganj	Pithiganj	7 Km	UTTAR PRADESH
44	Garwa Rd- Remkut (CORE)	Rihand Thermal power station	Remkut	5.5	BIHAR-INDIA
45	Remkut- Singrauli (CORE)	Obra Thermal power station	Obra Dam	7	BIHAR-INDIA
46	Jhansi- Manikpur (CORE)	Allara	Engwai	20	UTTAR PRADESH
47	Jhansi- Manikpur (CORE)	Pahar	Khal	17	UTTAR PRADESH
48	Jhansi- Manikpur (CORE)	Ghatampur	Ghatampur	7	UTTAR PRADESH
49	Gorakhpur-Kaptanganj (CORE)	Metran	Kaptanganj	15	UTTAR PRADESH
50	Shikohabad-Farrukhabad (CORE)	Neevaura	Bhugra	3	UTTAR PRADESH

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SN.	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
51	Kaptanganj-Chhapra Kacheri (CORE)	Rajapakar	Tariyasujan	18	UTTAR PRADESH
52	Mankapur-Katra-Ayodhya (CORE)	Katra	Katra	12	UTTAR PRADESH
53	Mathura-Kasganj-Kalyanpur (IRCON)	Sikandrara	Kasganj	35	UTTAR PRADESH
54	Mathura-Kasganj-Kalyanpur (IRCON)	Kayanganj	Kempil Road	18	UTTAR PRADESH
56	Mathura-Kasganj-Kalyanpur (IRCON)	Chhibramau	Khudaganj	22	UTTAR PRADESH
56	MANHERU-HISAR (RVNL)	Hisar-Hansi LILO arrangement	Satrod	2.5 Km	HARYANA
57	REWARI-MANHERU (RVNL)	Lulaoahir	Jatusana	10.6 Km	HARYANA
58	REWARI-MANHERU (RVNL)	kalanaur	Manheru	30.0 Km	HARYANA
59	Rohtak-Bathinda-Lehra Muhabbat (CORE)	Chander khurd	Jakhhal	18	HARYANA
60	Rohtak-Bathinda-Lehra Muhabbat (CORE)	Talwandi	Maiserkhana	18	Punjab
61	Rohtak-Bhiwani (CORE)	Kalanaur	Kalanaur	4	HARYANA
62	Ajmer-Ajmer-Jaipur (CORE)	Nangal Pyariwas	khanbhakari	30	RAJASTHAN
63	Ajmer-Mavli-Udaipur (CORE)	Nasirabad	Nasirabad	9	RAJASTHAN
64	Ajmer-Mavli-Udaipur (CORE)	Senthi	Ghosunda	10	RAJASTHAN
65	Ajmer-Mavli-Udaipur (CORE)	DakanKotra	Umra	3	RAJASTHAN
66	Ajmer-Rani (CORE)	Kharachi	Marwar	3	RAJASTHAN
67	Barauni- Mansi-Katihar (CORE)	LILO arrangement at 132kV line near to Naugachhia	Naugachhia	5	BIHAR
68	Bakhtiyarpur-Manpur-Tilaiya (CORE)	Nalanda	Nalanda	6	BIHAR
69	Muzaffarpur-Valmikinagar (CORE)	Motipur	Mahwal	3	BIHAR
70	Muzaffarpur-Valmikinagar (CORE)	Motipur	Jivdhara	10	BIHAR
71	Muzaffarpur-Valmikinagar (CORE)	Bettiah	Majhauhya	10	BIHAR
72	Muzaffarpur-Valmikinagar (CORE)	Ramnagar	Harinagar	5	BIHAR
73	Garwa Road- Singrauli (CORE)	LILO arrangement near to Nagaurati	Nagaruntari	10	JHARKHAND

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
74	Ranchi-Lohardaga-Tori (CORE)	LILC arrangement near to Piska	Piska	5	JHARKHAND
75	Ahmedabad-Mahesana-Palanpur (CORE)	Soja	Ambliyasari	43	GUJARAT
76	Ahmedabad-Mahesana-Palanpur (CORE)	Kheralu	Dharawara	53	GUJARAT
77	Nalapadu-Pagdipalli (CORE)	Miryalaguda	Miryalaguda	5	TELANGANA
78	Erode-Karur-TPJ (CORE)	Pagaluru	Pagaluru	1 km UG	TAMIL NADU
79	Erode-Karur-TPJ (CORE)	Pettaivatala	Pettaivatala	2.5	TAMIL NADU
80	Jammu Tawi- Udhampur SVDK (CORE)	Bhattal	Manwal	3.4 km	JAMMU & KASHMIR
81	Noli-Tapri (CORE)	Thanabhawan	Hind	18 Km	UTTAR PRADESH

257342/2018/OFFICE OF MOS(IC) works for which tender finalization to be expedited

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
1	Daund Manmand (RVNL)	Kopergaon	Kopergaon 2 nd feeder	2.95	MAHARASHTRA
2	Bhigwan-Solapur section of (Pune-Wadi-Guntakal) RVNL	Parewadi	Parewadi	5 km	MAHARASHTRA
3	Bhigwan-Solapur section of (Pune-Wadi-Guntakal) RVNL	LILO Kuruwadi-Jeur line	Kurtiwadi	7 km	MAHARASHTRA
4	Bhigwan-Solapur section of (Pune-Wadi-Guntakal) RVNL	Mohol	Mohol	7.5 km	MAHARASHTRA
5	Solapur-Gulberga section of (Pune-Wadi-Guntakal) RVNL	Hotagi	Hotagi	6 km	MAHARASHTRA
6	Solapur-Gulberga section of (Pune-Wadi-Guntakal) RVNL	Godgaon	Godgaon		KARNATAKA
7	CHHINDWARA-KALUMNA (RVNL)	LILO	Patansaongi	3.6	MAHARASHTRA
8	Daund-Baramati (RVNL)	Shirsufal	Shirsai	5 km.	MAHARASHTRA
9	Ratlam-Nimach (CORE)	Nimach	Nimach	11	MADHYA PRADESH
10	RAIPUR-TITLAGARH (RVNL)	Paraswani	Mahasamund	11	CHHATTISGARH
11	Haridaspur-Paradeep (RVNL)	Paradeep	SIJU	5.000	ODISHA
12	Singapur Road-Damanjodi (CORE)	Lakshmiapur	Lakshmiapur	2.5	ODISHA
61	HOSPET-BALLERY-GUNTAKAL (RVNL)	Aipura	Bellary cant	3	KARNATAKA
13	Kengeri - Mysore (CORE)	Tubalkare	Yellur	6	KARNATAKA
14	Kengeri - Mysore (CORE)	Hootabally	Mysore	7	KARNATAKA
15	Calicut-Mangalore (CORE)	Mangalore	Jakotte	5	KARNATAKA
16	Pakur-Malda (CORE)	Malda	Khaltipur	23	WEST BENGAL
17	Katwa-Azimganj (CORE)	Gokarna	Kharghat	16	WEST BENGAL
18	NEW BONGAIGAON-GUWAHATI (RVNL)	-	New Bongaigaon	10 Km	ASSAM
19	NEW BONGAIGAON-GUWAHATI (RVNL)	-	Sarbhog	2 Km	ASSAM
20	NEW BONGAIGAON-GUWAHATI (RVNL)	-	Nalbari	5 Km	ASSAM
21	NEW BONGAIGAON-GUWAHATI (RVNL)	-	Kamakhya	5 Km	ASSAM
22	Bhandai-Udi (CORE)	Bah	Bah	24.6	UTTAR PRADESH
23	Bhandai-Udi (CORE)	Bah	Fathabad	20.6	UTTAR PRADESH
24	Urnao-Unchahar (CORE)	Saran	Raghuraj singh	12	UTTAR PRADESH

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SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
25	Chunar-Chopan (CORE)	Robortganj	Robortganj	6	UTTAR PRADESH
26	Mathura-Achnera	Agra	Achnera	30	UTTAR PRADESH
27	Rohtak-Bathinda-Lehra Muhabbat (CORE)	Chandi	Kharainti	3	HARYANA
28	Rohtak-Bhiwani (CORE)	Kalanaur	Kalanaur	4	HARYANA
28	Delhi-Rewari (CORE)	Garhi-Harsaru	Garhi-Harsaru	4	HARYANA
29	Rewari-Phulera (CORE)	Ringas	Ringas	4	RAJASTHAN
30	Ajmer-Mavli-Udaipur (CORE)	Hamirgarh	Hamirgarh	4	RAJASTHAN
31	Ajmer Rani (CORE)	Jethana	Makrera	7	RAJASTHAN
32	Hanuman-Suratgarh (CORE)	Hanumangarh	Hanumangarh		RAJASTHAN
33	Atwar-Ajmer-Jaipur (CORE)	Nala Power house Jaipur	Jaipur	01 km UG cable	RAJASTHAN
34	JAKHAL-DHURI-LUDHIANA (RVNL)	Chajli	Chajli	1.5 Km	PUNJAB
35	JAKHAL-DHURI-LUDHIANA (RVNL)	Sandhora	KUP	12 Km	PUNJAB
36	Bakhtiyarpur-Manpur-Tilaya (CORE)	Wazirganja	Tilaya	25	BIHAR
37	Bonidanga-Barharwa-sahibganj Kiul (CORE)	Sabaur	Sabaur	5	BIHAR
38	Bonidanga-Barharwa-sahibganj Kiul (CORE)	Jamalpur	Jamalpur	5	BIHAR
39	Kaptanganj-Chhapra Kacheri (CORE)	Rajapatu	Rajapatti	10	BIHAR
40	Biharsharif-Daniawan & Fatuha-Istampur (CORE)	Ekrangar Sarai	Ekrangar Sarai	6	BIHAR
41	Darbhanga-Jaynagar (CORE)	Pandaul	Pandaul	6	BIHAR
42	Samastipur-Khagaria (CORE)	Rosara	Hasanpur	22	BIHAR
43	Raxaul-Sitamarhi-Darbhanga-	Raxaul	Raxaul	5	BIHAR
44	Samastipur	Dhaka	Bargainda	22	BIHAR
45	(CORE)	Runnishaidpur	Bajpatti	25	BIHAR
46	Kiul Tilaya (CORE)	Shekhpura	Shekhpura	10	BIHAR
47	Bonidanga-Sahibganj (CORE)	Sahibganj	Kanacurda	5	BIHAR
48	Bonidanga-Sahibganj (CORE)	Rajmanal	Imphal	2	BIHAR
49	Ranchi-Lehardaga Ton (CORE)	Lehardaga	Lehardaga	7	JHARKHAND
50	Ahmedabad Rajkot (CORE)	Wakode	Wakode	25	GUJARAT
51	Ahmedabad -Rajkot (CORE)	Trudhal	Savaldarnagar	17	GUJARAT
52	Ahmedabad -Rajkot (CORE)	Jakhwari	Jakhwari	4	GUJARAT

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
53	Mahesana-Viramgarm-Samakhiyali (CORE)	Mitha	Katosan	20	GUJARAT
54	Mahesana-Viramgarm-Samakhiyali (CORE)	Sadla	Sadla	44	GUJARAT
55	Mahesana-Viramgarm-Samakhiyali (CORE)	Mansar	Ghansyangarh	7	GUJARAT
56	Mahesana-Viramgarm-Samakhiyali (CORE)	Morvi	Maliya	35	GUJARAT
57	Katni - Singrauli (IRCON)	Beohari	Beohari	10 KM	MADHYA PRADESH
58	Katni - Singrauli (IRCON)	Sidhi	Marwasgram	54 KM	MADHYA PRADESH
59	Katni - Singrauli (IRCON)	Dongarital	Gajara Bahara	30 KM	MADHYA PRADESH
60	Erode-Karur-TPJ (CORE)	Namakkal	Namakkal	10	TAMIL NADU
61	Koderma- Hazaribag-Barkakana-Ranchi (CORE)	Barhi	Barhi	4.7 km	Damodar Valley Corporation limited
62	Koderma- Hazaribag-Barkakana-Ranchi (CORE)	Hazaribagh	Hazaribagh	19 km	Damodar Valley Corporation limited
63	Koderma- Hazaribag-Barkakana-Ranchi (CORE)	Sidhwar	Ramgarh	8 km	Damodar Valley Corporation limited
64	Koderma-Giridih (CORE)	Koderma	Kanweer	15	Damodar Valley Corporation limited
65	Koderma-Giridih (CORE)	Runny Saidpur	Navadih	35	Damodar Valley Corporation limited

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Estimate awaited from various State Electricity Board

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
1	Jabalpur- Nainpur – Gondia (CORE)	Bargi	Jamtara	8	MADHYA PRADESH
2	Ratlam-Fatehabad-Laxmibainagar (CORE)	Fatehabad	Fatehabad	10	MADHYA PRADESH
3	Ratlam-Fatehabad-Laxmibainagar (CORE)	Vadnagar	Vadnagar	5	MADHYA PRADESH
4	Vijapur-Makshi	Rajgarh	Biaora	24	MADHYA PRADESH
5	Gadag-Hotgi (CORE)	Belavanike	Mallapur	3	KARNATAKA
6	Gadag-Hotgi (CORE)	Navanagar	Navanagar	2	KARNATAKA
4	Gadag-Hotgi (CORE)	Mukartihal	Basavana Bagewadi	10	KARNATAKA
8	Gadag-Hotgi (RVNL)	Kiadb	Vjayapura	8	KARNATAKA
9	Gadag-Hotgi (CORE)	Lachyan	Lachyan	2	KARNATAKA
10	Unnao-Balamau-Sitapur (CORE)	Bbangamau	Mallava		UTTAR PRADESH
11	Jaipur- Phulera- Madar	Phulera	Phulera	2	RAJASTHAN
12	Ajmer-Rani (CORE)	Haripur	Bar	13	
13	Ajmer-Rani (CORE)	Falna	Khimal	3	RAJASTHAN
14	Phulera-Madar (CORE)	Kishangarh	Kishangarh		RAJASTHAN
15	Bharatpur-Bandikui (CORE)	Nadawai	Nadawai	8.5	RAJASTHAN
16	Bharatpur-Bandikui (CORE)	Bandikui	Bandikui	10	RAJASTHAN
17	Hanuman-Suratgarh (CORE)	Suratgarh	Suratgarh	5	RAJASTHAN
18	Ara-Sasaram (CORE)	Bikram ganj	Piro	25	BIHAR
19	Samakhiali-Gandhidham-Kandla port (CORE)		Bachhao		GUJARAT
20	Surendarnagar-Pipavav		Kurdali		GUJARAT
21	Surendarnagar-Pipavav		Jalia		GUJARAT
22	Surendarnagar-Pipavav		Padada		GUJARAT
23	Trichirapali-Tanjavaur (CORE)		Tanjavaur		TAMIL NADU
24	Trichirapali-Tanjavaur (CORE)	Location yet to be finalised	Thiruvarur		TAMIL NADU
25	Trichirapali-Tanjavaur (CORE)		Karaikal		TAMIL NADU
26	Hisar-Bhatinda-Suratgarh (CORE)	Bhatinda	Gahri bhagi	7	Punjab
27	Hisar-Bhatinda-Suratgarh (CORE)	Location yet to be finalised	Mandi dabwali		Punjab

Minutes of first meeting of the committee formed for examining the Problem of excessive vibrations in GTs of Rihand Stage – III and Vindhyachal Stage-IV during operation of Rihand - Dadri HVDC on monopole mode with ground return on 16.10.2018

The first meeting of the committee constituted for examining the Problem of excessive vibrations in GTs of Rihand Stage – III and Vindhyachal Stage-IV during operation of Rihand - Dadri HVDC in monopole mode with ground return was held on 16.10.2018 at NRPC Secretariat along with 152nd OCC meeting.

Representative of NTPC briefed the members about the problems being encountered in the GTs of Rihand Stage – III and Vindhyachal Stage-IV during monopole operation of Rihand - Dadri HVDC. He stated that the problem of excessive vibrations was observed since the Unit # 5 & 6 of Rihand Stage - III are connected to the Western Region bus through the Vindhyachal Pooling Station. He further stated that during the monopole operation of HVDC Rihand-Dadri if one of the unit out of two units of Stage III is under shutdown, the intensity of vibrations in the GT of the running increases. Similar problem was also being observed in the GT of Vindhyachal Stage-IV units.

NTPC and POWERGRID has performed some test to simulate the operation of monopole operation in ground return mode on HVDC Rihand – Dadri and observed vibrations in the various GTs of Rihand Stage-III. Based on the study they have reached to a consensus that under monopole operation of HVDC Rihand - Dadri in ground return mode, the power flow should be restricted to 300 MW to restrict the vibrations within limit. At the time of testing, both the units of Vindhyachal Stage-IV were running. Representative of POWERGRID stated that during this test only one unit at Rihand Stage-III was running. In case both the units are under operation, the power flow may go up to 600 MW as the DC current through the GTs will get distributed for the acceptable limits of vibration.

NTPC representative stated that as the testing was done only for a single machine, the power flow limit cannot be commented upon for the situation when both the units are under shutdown and the HVDC is in monopole operation in ground return mode. Similar testing may be done so as to arrive at a figure of power flow which does not lead to significant amount of vibrations in the GTs.

Director, GM Division, CEA shared two instances where SSR has been reported very prominently. The first case was of Manitoba Hydro, Canada. Canada and USA are connected through an HVDC link and because of switching operation in HVDC, the rotor of one of the unit of Manitoba hydro got damaged due to SSR. The other case was of KSK Mahanadi Power Project where also SSR was observed as some line was LILoed in its vicinity. KSK Mahanadi had appointed IIT, Mumbai that has conducted study so as to provide solutions to reduce these SSR vibrations. He stated that such type of study may be required to be conducted by some academicians for the excessive vibrations being encountered at Rihand Stage-III. He, further

stated that it was also the responsibility of PGCIL to get the study conducted, if in the vicinity of their line any such vibrations are reported to them.

MS, NRPC queried that if it was already planned that the Stage-III would be connected to WR bus, whether such vibration analysis was done beforehand by CTU or not.

PGCIL representative stated that the same is to be confirmed from their study group. There would have been some study carried out at the time of connecting Stage-III to NR and thereafter to WR. He stated that it was a strange phenomenon as when Stage-III was connected to NR no such vibrations were observed and now the vibrations are being reported when it is connected to WR bus for which it was actually planned. He stated that the above study report would be shared with the committee for analysis.

Representative of NRLDC stated that if there are some oscillations being observed due to SSR on the mechanical side, the same should reflect on the electrical side also, which was not the case here as no SSR vibrations were observed neither in the PMU data nor in the DR. Thus, he stated that these may not be due to SSR.

PGCIL representative stated that they are planning shutdown of one pole of Rihand-Dadri in the last week of October or first week of November 2018. The vibration measurements could be done during the shutdown period.

NRLDC representative requested PGCIL to share with the committee, the report of any study conducted before shifting Rihand Stage-III to WR either by PGCIL or by the study group of PGCIL regarding the ground return impedance. PGCIL representative stated that such kind of a study/ review may be done as the system (HVDC Rihand – Dadri) is under service since past 30 years and many generator has come into service during this time like Sasan, Singrauli, Anpara, Obra in and around the Rihand complex.

NTPC representative further stated that whenever the ground return operation of an HVDC is planned, such type of study would have been conducted well in advance before they are commissioned.

POWERGRID representative stated that many elements / generator have come around the area later and it was not intended that the ground currents should go in to any of the element. Till now such kind of problem was never observed and now that the same is being reported a study may got conducted to examine the ground return impedance in and around Rihand complex.

NTPC representative stated that ground current in an HVDC monopole operation complete its path through the earth electrode at the two ends. There may have been some deterioration in the earth electrode because of which the ground current is taking some other path or the resistivity of the earth would have also changed.

SE (O) expressed that the resistivity of the earth and the health of earth electrode also needs to be verified and taken into account.

NRLDC representative stated that the reason as to why the DC current was more in the Stage-III GTs and less in stage-I & II also needs to be looked into. Any difference in the resistivity of the two areas should also be verified.

NTPC representative stated that the vibrations were observed not only in Stage-III but also in Stage-IV of Vindhyachal STPS. He stated that such vibrations are being observed in Vindhyachal Stage-IV since past one and a half years. However, its severity has increased since Rihand Stage-III got connected to WR bus. On the query of NRLDC about the data of DC current recorded in Vindhyachal Stage-IV when the vibrations were initially observed, NTPC representative stated that at that instance no such measurement was done as they were not aware of the actual cause of vibrations in the GTs. However, the data has been recorded since vibrations were observed in Rihand Stage-III and were shared with POSOCO.

NTPC was requested to share the data with the committee also.

Director, GM Division, CEA queried NTPC about whether rotor of some of its generators at Rihand had been damaged and replaced in past to which representative of NTPC replied negatively and stated that some problem in the exciter was reported in the past but nothing was reported in the rotor side. MS, NRPC requested NTPC to clarify the same from Rihand station.

PGCIL representative requested NTPC to collect the DC current capability of the GTs installed at Rihand from the OEM and the same be shared with the members of the committee.

NTPC representative stated that restriction of power flow on the HVDC link was the only solution to which members replied negatively stating that it was not an economic solution. On pursuance of NTPC, members suggested NTPC to back down their generation rather than reducing power flow on HVDC. NTPC representative stated that there was sufficient power evacuation corridor available for evacuation of their generation and there was no need for them to back down.

MS, NRPC stated that before inviting any academician to the committee, it was necessary to share all the data with the committee members so that the same may be analyzed. NTPC and PGCIL stated that the same would be submitted within a week.

MS, NRPC queried NTPC, whether they had communicated or had some discussions with the GTs OEM as the vibrations were being observed in the new GTs only. NTPC representative stated that it was not an issue of any defect in GTs as when the Stage-III of Rihand is connected to NR bus, there were no such vibrations observed.

PGCIL representative stated that the limiting values of vibrations in all the GTs and that recorded during monopole operation needs to be submitted by NTPC to the committee.

NTPC representative stated that if the data submitted by them is not found to be sufficient, the test may be conducted again and the data shall be shared with the committee.

PGCIL representative stated that the measurements for vibrations shall be taken at the points on the GTs as specified by the manufacturer and compared accordingly.

MS, NRPC requested PGCIL to share the study carried out by them based on which Dedicated Metallic return was opted in HVDC Champa-Kurukshetra.

Regarding the condition of earth electrodes at the two ends, PGCIL representative informed that there has not been any significant corrosion and it may not be the reason for vibrations due to DC currents in the GTs.

Ms, NRPC queried NTPC that whether such vibrations was also observed at Sasan to which NTPC representative stated that the same would be verified with Sasan and reported to the committee.

NTPC and PGCIL was requested to submit all the information as brought out in the meeting at the earliest to the committee members for study before the next meeting.

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Energy Requirement of JAMMU AND KASHMIR												
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
2011-12	1168	1154	1071	833	1074	1148	1168	1259	1366	1368	1276	1326
2012-13	1195	1252	1184	1176	1196	1151	1289	1365	1482	1502	1299	1319
2013-14	1222	1300	1230	1290	1218	1125	1240	1345	1400	1492	1345	1350
2014-15	1378	1342	1282	1315	1268	955	1340	1445	1616	1604	1328	1341
2015-16	1285	1347	1342	1265	1248	1279	1357	1410	1538	1587	1432	1482
2016-17	1432	1540	1431	1220	1321	1353	1440	1506	1618	1599	1469	1469
2017-18	1507	1597	1493	1518	1490	1504	1532	1501	1665	1798	1531	1673
2018-19	1582	1669	1587	1536	1551	1550	1570	1560	1730	1710	1610	1570
2019-20 NRPC	1672	1763	1677	1676	1659	1644	1639	1606	1794	1798	1677	1673
Growth	5.69%	5.63%	5.67%	9.11%	6.96%	6.06%	4.39%	2.95%	3.70%	5.15%	4.16%	6.56%

Energy Requirement of PUNJAB

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
2011-12	2939	3991	4442	5707	5189	4574	3617	2613	2893	2828	3007	3259
2012-13	3031	3763	5437	6611	5923	4745	3813	2745	2518	3055	2400	2872
2013-14	3101	4084	4933	6401	5528	5211	3686	2690	2967	2884	3400	3200
2014-15	2979	3885	5762	6639	6537	4747	3724	2866	3109	2914	2652	2815
2015-16	3001	4349	5451	6350	6212	5478	3928	2670	3212	3073	3018	2883
2016-17	3381	4734	5997	6598	6389	6226	4341	2842	3223	3013	2985	3369
2017-18	3536	5004	5446	7320	6825	5832	4443	2988	3239	3328	3099	3752
2018-19	3575	4945	5873	7078	7415	6930	4900	3310	3630	3600	3350	3900
State 2019-20	3840	5290	5976	7302	7636	6507	5088	3566	3750	3809	3553	4351
Growth	7.42%	6.98%	1.75%	3.16%	2.98%	-6.10%	3.84%	7.72%	3.31%	5.80%	6.05%	11.57%

Energy Requirement of RAJASTHAN												
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
2011-12	3929	3839	3577	3481	3023	3053	3903	3476	4287	4584	3979	4426
2012-13	3843	4125	3965	3880	3511	3348	4368	4812	4980	4997	4782	4937
2013-14	4277	4316	4919	4638	3927	3881	4931	4818	5261	5417	4369	5218
2014-15	4681	4961	4624	4271	3980	5016	4416	4957	5639	5654	4850	5550
2015-16	4485	5163	5616	5548	5373	5207	5837	5798	6210	6027	5630	4626
2016-17	5328	5366	5144	4793	5230	6197	6005	5802	6348	6568	5862	5620
2017-18	5256	6015	5565	5250	5945	6029	6302	6159	6226	6607	5889	5950
2018-19	5699	6946	6677	6079	6991	6202	6748	6711	7107	6963	6392	6510
State 2019-20	6061	7580	7314	6605	7544	6661	7411	7138	7565	7286	6704	6924
Growth	6.36%	9.13%	9.54%	8.65%	7.91%	7.40%	9.82%	6.37%	6.45%	4.64%	4.89%	6.35%

केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
NTPC						
Singrauli STPS	1	200	01.04.19	15.05.19	45	CHO+DDCMIS
	2	200	22.03.20	25.03.20	4	Boiler License Renewal
	3	200	14.12.19	17.12.19	4	Boiler License Renewal
	4	200				NIL
	5	200	01.07.19	04.08.19	35	CHO+DDCMIS
	6	500	01.12.19	25.12.19	25	Boiler
	7	500				NIL
Rihand-I	1	500	15.12.19	28.01.19	45	CHO:boiler,HP/IP/LP,R&M of Mill APH
	2	500	16.09.19	10.10.19	25	Boiler+APH seal Adjustment
Rihand-II	3	500				NIL
	4	500	01.04.19	30.04.19	30	Boiler+LPT+GEN+TG shaft-2 vibrations
Rihand-III	5	500				NIL
	6	500	08.07.19	06.08.19	30	Boiler+LPT+GEN+HIGH tg bg-5Y vibrations
Unchahar -I	1	210	18.11.19	12.12.19	25	Boiler+RLA Boiler+Gen+MOP
	2	210				NIL
Unchahar -II	3	210	01.04.19	25.04.19	25	Boiler+RLA Boiler+Gen+MOP
	4	210				NIL
Unchahar -III	5	210				NIL
Unchahar IV	6	500				NIL
Tanda-TPS (CSGS Dedicated to UP)	1	110	01.09.19	20.09.19	20	Boiler Inspection
	2	110	01.07.19	30.07.19	30	Boiler Inspection+ TG Brg Inspecton+ LPT O/H+ Gen Brg
	3	110				NIL
	4	110				NIL
Dadri (NCTPS)	1	210	26-Apr-19	2-May-19	7	BLR+DSI
	2	210	15-Oct-19	21-Oct-19	7	BLR+DSI
	3	210	25-Sep-19	1-Oct-19	7	BLR+DSI
	4	210	19-Aug-19	12-Sep-19	25	BLR+DSI
	5	490				NIL
	6	490	4-Nov-19	18-Dec-19	45	Boiler+LPT+Combustion modification
Vindhyanchal TPS	1	210				NIL
	2	210				NIL
	3	210	16.06.19	10.07.19	25	Boiler
	4	210	20.02.20	15.03.20	25	Boiler+GEN
	5	210	10.05.19	13.06.19	35	COH
	6	210	15.01.20	15.02.20	32	Boiler+GEN+BLR Chemical cleaning
	7	500	01.04.19	03.05.19	33	Boiler Global settlement+LPT+GEN+GT Gasket Replacement
	8	500				NIL
	9	500				NIL
	10	500	27.08.19	20.09.19	25	Boiler+LPT+GEN
	11	500	17.07.19	20.08.19	35	COH
	12	500				NIL
	13	500				NIL
Anta GPS	GT 1	88.7	5-Apr-19	8-Apr-19	4	Minor Inspection (12000 VOH)
	GT 2	88.7	1-Apr-19	30-Apr-19	30	Major Inspection
	GT 3	88.7	25-Oct-19	28-Oct-19	4	Major Inspection (4000 VOH)
	GT 3	88.7	26-Jul-19	31-Jul-19	6	Major Inspection (8000 VOH)
	ST G	153.2	1-Apr-19	20-Apr-19	20	ST major O/H & LP blade carrier checking

केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटेज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
Auriya GPS	GT 1	111.19	30-Apr-19	30-Apr-19	1	BLR
			2-Jul-19	16-Jul-19	15	Tie & Filter replacement
			1-Nov-19	2-Nov-19	2	Filter replacement
	GT 2	111.19	15-Jun-19	15-Jun-19	1	BLR
			10-Nov-19	11-Nov-19	2	Filter replacement
	GT 3	111.19	1-Dec-19	1-Dec-19	1	BLR
	GT 4	111.19	18-Feb-20	18-Feb-19	1	BLR
ST 1	109.3	02-Jul-19	31-Jul-19	30	Major overhaul	
ST 2	109.3				NIL	
Dadri GPS	GT 1	130.19	1-Aug-19	30-Aug-19	30	MJ+GEN
			19-Dec-19	20-Dec-19	2	AFR
			19-Jan-20	20-Jan-20	2	BLR
			15-Feb-20	19-Feb-20	5	4000 EOH+CW
	GT 2	130.19	22-Jun-19	28-Jun-19	7	800 EOH+BLR
			24-Nov-19	28-Nov-19	5	4000 EOH+AFR
			2-Jan-20	2-Jan-20	1	CW
	GT 3	130.19	12-Jun-19	18-Jun-19	7	8000 EOH
			9-Dec-19	13-Dec-19	5	4000EOH+AFR
	GT 4	130.19	19-Jan-20	20-Jan-20	2	BLR+CW
			24-May-19	30-May-19	7	8000EOH+AFR
			12-Nov-19	21-Nov-19	10	FTI+AFR
			1-Jan-20	1-Jan-20	1	CW
ST 1	154.51	1-Aug-19	10-Aug-19	10	Annual S/D+ Codenser cleaning	
ST 2	154.51	12-Nov-19	21-Nov-19	10	Annual S/D+ Codenser cleaning	
Faridabad GPS (CSGS Dedicated to	GT 1	137.758				

केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटेज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
Haryana)	GT 2	137.758				NIL
	STG	156.08				
Koldam HEP (NTPC)	1	200	17-Dec-19	21-Dec-19	5	Annual Inspection
	2	200	7-Jan-20	11-Jan-20	5	Annual Inspection
	3	200	4-Feb-20	8-Feb-20	5	Annual Inspection
	4	200	25-Feb-20	29-Feb-20	5	Annual Inspection
IGSTPP,Jhajjar	1	500	1-Nov-19	25-Nov-19	25	Boiler Annual Overhaul + LP Turbine Replacement
	2	500				NIL
	3	500	1-May-19	25-May-19	25	Boiler Annual Overhaul + LP Turbine replacement + Generator Che
NPCIL						
NAPS	1	220				NIL
	2	220	01.02.2020	01.03.2020	30	Biennial Shut Down
RAPS - A(CSGS Dedicated to Raj)	2	200	01.04.2019	30.09.2019	180	Annual Maintenance
RAPS - B	3	220				NIL
	4	220				NIL
RAPS - C	5	220				NIL
	6	220				NIL
NHPC						
Baira Siul(3x60)	1	60	1-Dec-19	20-Dec-19	20	Annual Maintenance
	2	60	1-Jan-20	20-Jan-20	20	Annual Maintenance
	3	60				NIL
Salal(6x115)	1	115	27-Feb-20	17-Mar-20	20	Annual Maintenance
	2	115	6-Feb-20	25-Feb-20	20	Annual Maintenance
	3	115	16-Feb-20	4-Feb-20	20	Annual Maintenance
	4	115	26-Dec-19	14-Jan-20	20	Annual Maintenance
	5	115	5-Dec-19	24-Dec-19	20	Annual Maintenance
	6	115	1-Oct-19	29-Nov-19	60	Capital Maintenance
Chamera - I(3x180)	1	180	5-Dec-19	25-Dec-19	21	Annual Maintenance
	2	180	27-Dec-19	16-Jan-20	21	Annual Maintenance
	3	180	18-Jan-20	7-Feb-20	21	Annual Maintenance
Chamera - II(3x100)	1	100	11-Nov-19	25-Nov-19	15	Annual Maintenance
	2	100	13-Dec-19	16-Jan-20	35	Capital Maintenance
	3	100	27-Nov-19	11-Dec-19	15	Annual Maintenance
Chamera - III(3x77)	1	77	2-Jan-20	16-Jan-20	15	Annual Maintenance
	2	77	17-Jan-20	31-Jan-20	15	Annual Maintenance
	3	77	1-Feb-20	15-Feb-20	15	Annual Maintenance
Uri(4x120)	1	120	27-Nov-19	26-Dec-19	30	Capital Maintenance
	2	120	27-Dec-19	25-Jan-20	30	Capital Maintenance
	3	120	15-Oct-19	3-Nov-19	20	Annual Maintenance
	4	120	5-Nov-19	24-Nov-19	20	Annual Maintenance
Tanakpur(3x31.4)	1	31.4	15-Nov-19	19-Dec-19	35	Annual Maintenance
	2	31.4	21-Dec-19	4-Apr-20	106	Annual Maintenance
	3	31.4	10-Apr-20	14-May-20	35	Annual Maintenance
Uri II(4x60)	1	60	1-Nov-19	20-Nov-19	20	Annual Maintenance
	2	60	24-Nov-19	13-Dec-19	20	Annual Maintenance
	3	60	17-Dec-19	5-Jan-20	20	Annual Maintenance
	4	60	9-Jan-20	28-Jan-20	20	Annual Maintenance
Dhaurinaga(4x70)	1	70	15-Nov-19	6-Dec-19	22	Annual Maintenance
	2	70	9-Dec-19	30-Dec-19	22	Annual Maintenance

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			से / From	तक / To	दिनों की संख्या No of Days	
Dharamganga(का.प.)	3	70	3-Jan-20	24-Jan-20	22	Annual Maintenance
	4	70	28-Jan-20	18-Feb-20	22	Annual Maintenance
Dulhasti(3x130)	1	130	1-Dec-19	20-Dec-19	20	Annual Maintenance
	2	130	22-Dec-19	10-Jan-20	20	Annual Maintenance
	3	130	12-Jan-20	31-Jan-20	20	Annual Maintenance
PARBATH-III(4x130)	1	130	15-Nov-19	9-Dec-19	25	Annual Maintenance
	2	130	11-Dec-19	4-Jan-20	25	Annual Maintenance
	3	130	6-Jan-20	30-Jan-20	25	Annual Maintenance
	4	130	1-Feb-20	25-Feb-20	25	Annual Maintenance
SEWA -- II(3x40)	1	40	15-Nov-19	5-Dec-19	21	Annual Maintenance
	2	40	8-Dec-19	28-Dec-19	21	Annual Maintenance
	3	40	1-Jan-20	21-Jan-20	21	Annual Maintenance
Nimmo Bazgo	1	15	20-Aug-19	09-Oct-19	51	Capital Maintenance
	2	15	15-Oct-19	07-Nov-19	24	Annual Maintenance
	3	15	10-Nov-19	03-Dec-19	24	Annual Maintenance
Chutak	1	11	25-Oct-19	23-Nov-19	30	Annual Maintenance
	2	11	26-Nov-19	25-Dec-19	30	Annual Maintenance
	3	11	27-Dec-19	25-Jan-20	30	Annual Maintenance
	4	11	29-Jan-20	27-Feb-20	30	Annual Maintenance
K' GANGA	1	110	14-Dec-19	28-Dec-19	15	Annual Maintenance
	2	110	30-Dec-19	13-Jan-20	15	Annual Maintenance
	3	110	15-Jan-20	29-Jan-20	15	Annual Maintenance
BBMB						
Bhakra	1	108	11-Oct-19	18-Jun-20	252	RM&U
	2	126	25-Nov-19	24-Dec-19	20	Annual Maintenance
	3	108	1-Feb-19	10-Oct-19	252	RM&U
	3	108	4-Mar-20	23-Mar-20	20	Annual Maintenance
	3	108	25-Mar-20	16-Apr-20	23	Capital Mtc of Penstock Head Gate & Gate Hoist
	4	126	14-Oct-19	2-Nov-19	20	Annual Maintenance
	5	126	20-Jan-20	8-Feb-20	20	Annual Maintenance
	6	157	25-Sep-19	12-Oct-19	18	Annual Maintenance
	7	157	1-Oct-19	28-Feb-20	151	Annual Maintenance
	8	157	16-Dec-19	4-Jan-20	20	Annual Maintenance
	9	157	10-Feb-20	2-Mar-20	22	Annual Maintenance
10	157	4-Nov-19	23-Nov-19	20	Annual Maintenance	
I/L TF	150 MVA	6-Jan-20	17-Jan-20	12	Annual Maintenance	
Ganguwal	1	27.99	15-Apr-19	18-Apr-19	4	Quartely Maintenance
			02-Sep-19	8-Sep-19	7	Half yearly Maintenance
			20-Jan-20	29-Jan-20	10	Annual Maintenance
	2	24.20	27-May-19	2-Jun-19	7	Half yearly Maintenance
			30-Sep-19	9-Oct-19	10	Annual Maintenance
			06-Jan-20	9-Jan-20	4	Quartely Maintenance
	3	24.20	06-May-19	15-May-19	10	Annual Maintenance
			21-Oct-19	27-Oct-19	7	Half yearly Maintenance
1	28.94	3-Feb-20	6-Feb-20	4	Quartely Maintenance	
		2-Apr-19	11-Apr-19	10	Annual Maintenance	
1	28.94	14-Oct-19	20-Oct-19	7	Half yearly Maintenance	
		13-Jan-20	16-Jan-20	4	Quartely Maintenance	

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			से / From	तक / To	दिनों की संख्या No of Days		
Kotla	2	24.20	3-Jun-19	6-Jun-19	4	Quartely Maintenance	
			16-Sep-19	22-Sep-19	7	Half yearly Maintenance	
			16-Mar-20	25-Mar-20	10	Annual Maintenance	
	3	24.20	20-May-19	23-May-19	4	Quartely Maintenance	
			11-Nov-19	20-Nov-19	10	Annual Maintenance	
			17-Feb-20	20-Feb-20	4	Half yearly Maintenance	
Dehar	1	165	18-Jan-19	6-Feb-19	20	Annual Maintenance	
	2	165	2-Jan-20	31-Mar-20	90	Capital Maintenance	
	3	165	1-Oct-19	20-Jan-20	112	R&M of stator winding & capital Mtc.Work	
	4	165	20-Nov-19	9-Dec-19	20	Annual Maintenance	
	5	165	23-Oct-19	11-Nov-19	20	Annual Maintenance	
	6	165	12-Feb-20	2-Mar-20	20	Annual Maintenance	
Pong	1	66	16-Apr-19	5-May-19	20	Annual Maintenance	
			18-Nov-19	24-Nov-19	7	Half yearly Maintenance	
			26-Mar-20	14-Apr-20	20	Annual Maintenance	
	2	66	1-Nov-18	31-Aug-19	304	Capital Maintenance + Replacement of stator	
			21-Sep-19	20-Oct-19	30	Replacement of governor	
	3	66	17-Mar-19	15-Apr-19	30	Annual Mtc+ replacement of governor	
			28-Oct-19	3-Nov-19	7	Half yearly Maintenance	
	4	66	6-Mar-20	25-Mar-20	20	Annual Maintenance	
			26-May-19	14-Jun-19	20	Annual Maintenance	
			21-Oct-19	27-Oct-19	7	Half yearly Maintenance	
			1-Dec-19	3-Mar-20	94	Capital Maintenance	
			4-Nov-19	10-Nov-19	7	Half yearly Maintenance	
	5	66	15-Feb-20	5-Mar-20	20	Annual Maintenance	
			6-May-19	25-May-19	20	Annual Maintenance	
			6-Mar-00	11-Nov-19	17-Nov-19	7	Half yearly Maintenance
	SJVNL						
	Rampur(6x68.67)	1	68.67	1.12.2019	15.3.2020	105	R&M
		2	68.67				
3		68.67					
4		68.67					
5		68.67					
6		68.67					
Nathpa-Jhakri(6x250)	1	250	1.12.2019	28.2.2020	88	R&M	
	2	250					
	3	250					
	4	250					
	5	250					
	6	250					
THDC							
Tehri HPP	1	250	1.4.2019	30.4.2019	30	Annual Maintenance	
	2	250	1.3.2020	30.3.2020	30	Annual Maintenance	
	3	250	1.5.2019	30.5.2019	30	Annual Maintenance	
	4	250	1.6.2019	30.6.2019	30	Annual Maintenance	
Koteshwar HEP	1	100	1.5.2019	14.6.2019	45	Annual Maintenance	
	2	100	1.10.2019	14.11.2019	45	Annual Maintenance	

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			से / From	तक / To	दिनों की संख्या No of Days	
	3	100	16.11.2019	30.12.2019	45	Annual Maintenance
	4	100	17.3.2020	30.4.2020	45	Annual Maintenance
DELHI						
Delhi(GTs)-(6x30+3x34)	1	30	25.03.2019	13.04.2019	20	Hot Gas Path Inspection (HGPI)
	2	30	14.04.2019	23.04.2019	10	Combustion Inspection (CI)
	3	30				
	4	30				
	5	30				
	6	30				NIL
	ST HRSG-1(05.06.2019)					
	ST HRSG-2(06.06.2019)	30	25.03.2019	23.04.2019	30	Major Inspection
	ST HRSG-3					
	ST HRSG-4	30				
ST HRSG-5						
ST HRSG-6	30				NIL	
RTPS-2X67.5	1	67.5				
	2	67.5				NIL
PRAGATI - I	1-GT	104	01.10.2019	10.10.2019	10	Combustion Inspection
				Dec'2019	2	Air inlet filter replacement
	2-GT	104	01.03.2020	20.03.2020	20	Hot Gas Path Inspection (HGPI)
	3-ST	122				NIL
PRAGATI - III(BAWANA)	1-GT (02.11.2019)	216	01.11.2019	03.11.2019	3	Boroscopic Inspection (B.I.)
			15.11.2019	17.11.2019	3	Boroscopic Inspection (B.I.)
	2-GT (02.11.2019)	216	01.03.2020	21.03.2020	21	Hot Gas Path Inspection (HGPI)
	3-GT (03.03.2020)	216	15.06.2019	17.06.2019	3	Boroscopic Inspection (B.I.)
	4-GT (03.03.2020)	216	01.12.2019	03.12.2019	3	Boroscopic Inspection (B.I.)
	1-ST	253.6				
	2-ST	253.6				NIL
RITHALA(NDPL)	1-GT	31.6				
	2-GT	31.6				
	3-ST	31.6				NIL
HARYANA						
Haryana(PTPS)-(4x110+2x210+2x250)	1	110				
	2	110				
	3	110				Retired
	4	110				
	5	210				NIL
	6	210				NIL
	7	250	01.09.2019	30.09.2019	30	Annual Overhauling
	8	250				NIL
DCRTPP Yamuna Nagar (2x300)	1	300				NIL
	2	300	01.04.2019	14.06.2019	75	Capital Overhauling and Repair of ESPs
RGTPP HISSAR(2x600)	1	600	01.10.2019	14.12.2019	75	Capital Overhauling and Rehabilitation of ESPs to meet new Environment norms fixed by MoEF
	2	600				NIL

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			से / From	तक / To	दिनों की संख्या No of Days		
MGTPS CLP Jhhajhar	1	660	20.03.2020	31.03.2020	12	Capital Overhaul(Will extend upto 08th May)	
	2	660	1.04.2019	05.05.2019	35	Annual Maintenance	
RAJASTHAN							
KTPS(2x110+3x210+2x195)	1	110	22.08.19	05.09.19	15	Annual Overhaul	
	2	110	16.06.19	30.06.19	15	Annual Overhaul	
	3	210	01.04.19	27.05.19	57	Annual Capital Overhaul	
	4	210	18.05.19	01.06.19	15	Annual Overhaul	
	5	210	01.06.19	15.06.19	15	Annual Overhaul	
	6	195	01.07.19	06.08.19	37	Annual Overhaul & Inspection of Bearing	
	7	195	07.08.19	21.08.19	15	Annual Overhaul	
RAMGARH GAS CAPP	GT-1	35.5	01.06.19	15.06.19	15	Combustion Inspection (Upgradation of Control system of GT-1&HRSG-1)	
	GT-2	37.5	01.05.19	21.05.19	21	HGPI & Generator Overhaul (Upgradation of Control system of GT-2&HRSG-2)	
	STG-I	37.5	01.05.19	21.05.19	21	Turbine & Generator Overhaul	
	GT-3	110					
	STG-II	50				NIL	
SURATGARH TPS	1	250				NIL	
	2	250				NIL	
	3	250	11.09.19	30.09.19	20	Annual Overhaul	
	4	250				NIL	
	5	250	20.08.19	08.09.19	20	Annual Overhaul	
	6	250	01.07.19	14.08.19	45	Annual Capital Overhaul	
DHOLPUR GAS CAPP	GT-1	110					
	GT-2	110					
	STG	110				NIL	
Kalisindh TPP	1	600	21.07.19	10.08.19	21	Annual Overhaul	
	2	600	16.08.19	5.09.19	21	Annual Overhaul	
GIRAL	1	125				NIL	
	2	125				NIL	
CHHABRA TPS	1	250	12.07.19	31.07.19	20	Annual Overhaul	
	2	250	25.07.19	13.08.19	20	Annual Overhaul	
	3	250	05.04.19	24.04.19	20	Annual Overhaul	
	4	250	01.07.19	20.07.19	20	Annual Overhaul	
	5	660	01.07.19	21.07.19	21	Annual Overhaul	
	6	660	25.07.19	14.08.19	21	Annual Overhaul	
BARSINGSAR LTPS(NLC)	1	125	05.06.19	04.07.19	30	Annual Maintenance of Boiler including statutory inspection.	
	2	125	18.04.19	01.06.19	45	Annual Maintenance of Boiler including statutory inspection.	
Adani-Rajasthan	1	660 MW				NIL	
	2	660 MW	01.01.20	30.01.20	30	Capital Overhaul	
	1	135	15-Apr-19	26-Apr-19	12	Refractory maintenance & Boiler Inspection	
			10-Jun-19	17-Jun-19	8	Annual Overhaul/ Boiler overhaul	
			01-Jan-20	25-Jan-20	25	Capital Overhaul	
	2	135	19-May-19	26-May-19	8	Refractory maintenance & Boiler Inspection	
			24-Jun-19	01-Jul-19	8	Annual Overhaul/ Boiler overhaul	
			03-Sep-19	10-Sep-19	8	Refractory maintenance & Boiler Inspection	
	3	135	02-Jun-19	09-Jun-19	8	Refractory maintenance & Boiler Inspection	
			20-Oct-19	27-Oct-19	8	Refractory maintenance & Boiler Inspection	
			31-Dec-19	07-Jan-20	8	Annual Overhaul/ Boiler overhaul	
				24-Aug-19	31-Aug-19	8	Refractory maintenance & Boiler Inspection

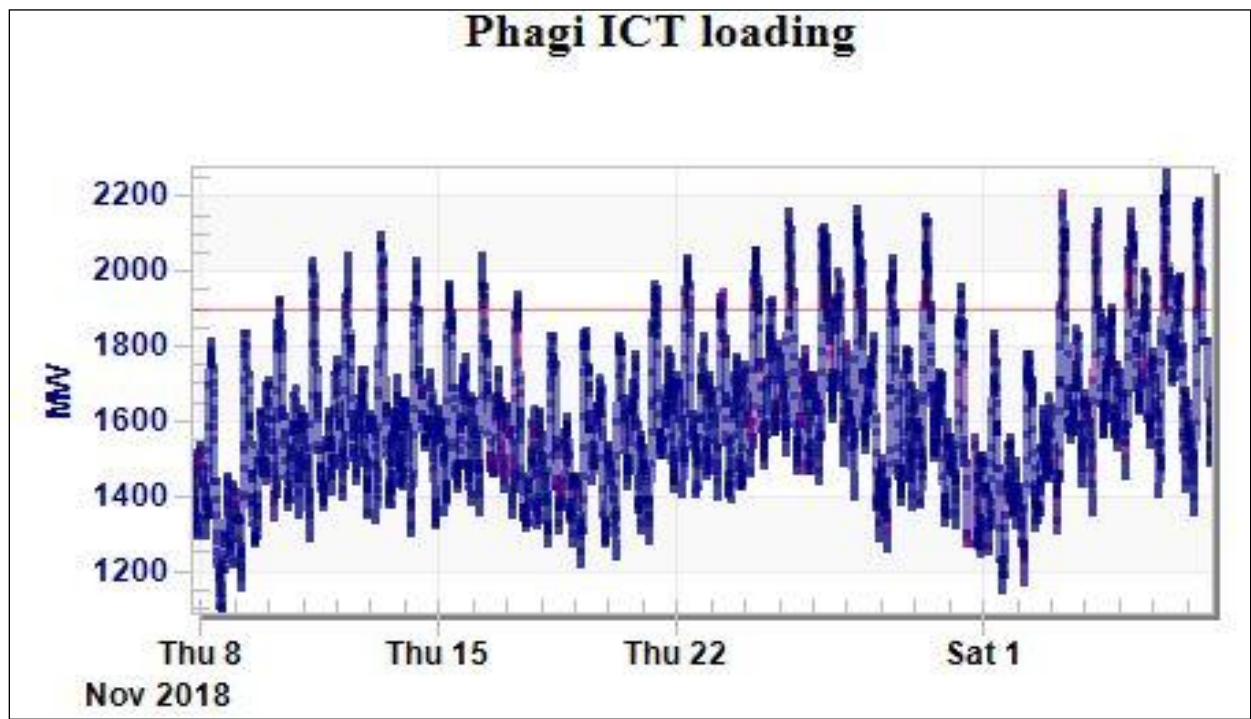
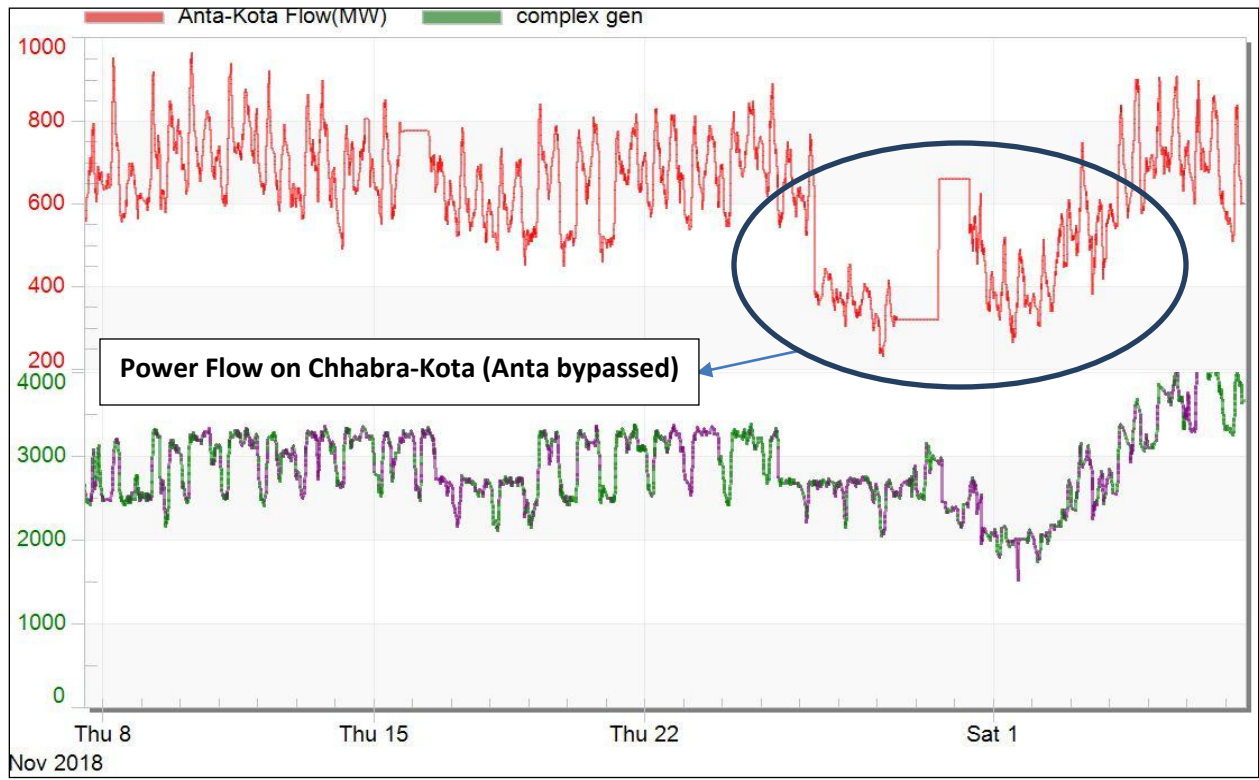
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			से / From	तक / To	दिनों की संख्या No of Days			
RAJWEST Power(8x135)	4	135	01-Dec-19	08-Dec-19	8	Refractory maintenance & Boiler Inspection		
			19-Feb-20	26-Feb-20	8	Annual Overhaul/ Boiler overhaul		
	5	135	28-Apr-19	09-May-19	12	Refractory maintenance & Boiler Inspection		
			01-Jul-19	25-Jul-19	25	Capital Overhaul		
	6	135	06-Oct-19	13-Oct-19	8	Annual Overhaul/ Boiler overhaul		
			11-May-19	18-May-19	8	Refractory maintenance & Boiler Inspection		
	7	135	19-Aug-19	26-Aug-19	8	Refractory maintenance & Boiler Inspection		
			11-Oct-19	18-Oct-19	8	Annual Overhaul/ Boiler overhaul		
	8	135	03-Apr-19	10-Apr-19	8	Annual Overhaul/ Boiler overhaul		
			20-Jul-19	27-Jul-19	8	Refractory maintenance & Boiler Inspection		
	Mahi Hydel, Banswara	PH-1	25	08-Feb-20	15-Feb-20	8	Refractory maintenance & Boiler Inspection	
				05-Apr-19	12-Apr-19	8	Annual Overhaul/ Boiler overhaul	
RANA PRATAP SAGAR HYDEL POWER STATION, RAWATBHATA	PH-2	45	30-Jan-20	06-Feb-20	8	Refractory maintenance & Boiler Inspection		
			12-Mar-20	19-Mar-20	8	Refractory maintenance & Boiler Inspection		
JAWHAR SAGAR HYDEL POWER POWER STATION, JAWAHAR SAGAR	1	33	25.05.19	23.06.19	30	Annual Maintenance		
			01.06.19	30.06.19	30	Annual Maintenance		
			25.05.19	23.06.19	30	Annual Maintenance		
			01.06.19	30.06.19	30	Annual Maintenance		
ANPARA(3x210+2x500)	1	43	01.04.19	15.04.19	15	Annual Checks & Maintenance works		
			2	43	01.05.19	15.05.19	15	Annual Checks & Maintenance works
			3	43	01.06.19	15.06.19	15	Annual Checks & Maintenance works
			4	43	01.07.19	15.07.19	15	Annual Checks & Maintenance works
OBRA(4x40+3x94+5x200)	7	94	Unit# 7 To be Proposed for deletion.					
			9	200	14-Mar-20	31-Mar-20	18	Mini Overhaul
			10	200	14-Jan-20	31-Jan-20	18	Mini Overhaul
PARICHHHA(2x110+2x210)	3	105	01-Feb-20	01-Mar-20	30	Annual Maintenance		
			11	200	NIL			
			12	200	NIL			
			13	200	NIL			
			1	110	Unit# 1 To be Proposed for deletion.			
			2	110	13-Apr-19	30-Apr-19	18	Mini Overhaul
PANKI(1x32+2x105)	4	105	01-Mar-20	01-Mar-20	30	Annual Maintenance		
			3	210	01-Nov-19	18-Nov-19	18	Mini Overhaul
H'GANJ'(2x40+2x55+2x60+1x105+2x250)	5	250	01-Mar-20	30-Mar-20	30	Annual Maintenance		
			6	250	14-Dec-19	31-Dec-19	18	Mini Overhaul
			7	110	14-Oct-19	31-Oct-19	18	Mini Overhaul
H'GANJ'(2x40+2x55+2x60+1x105+2x250)	8	250	01-Dec-19	18-Dec-19	18	Mini Overhaul		
			9	250	01-Jan-20	30-Jan-20	30	Annual Maintenance

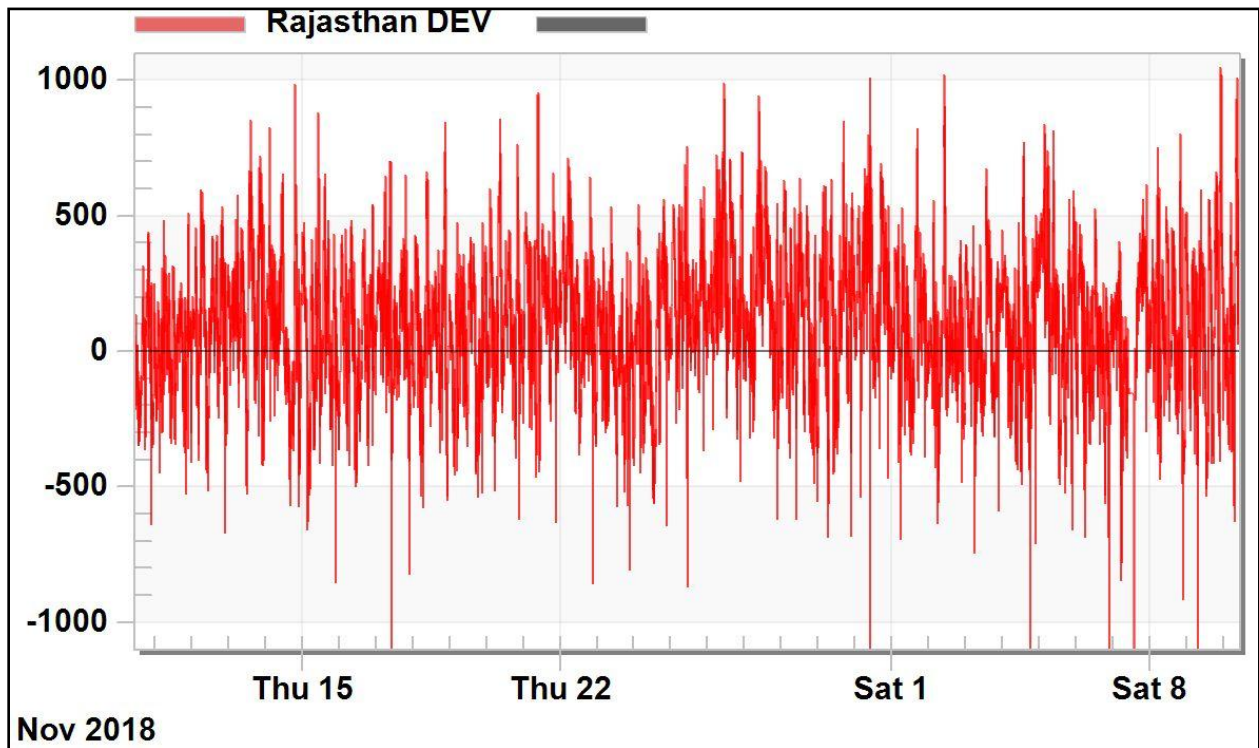
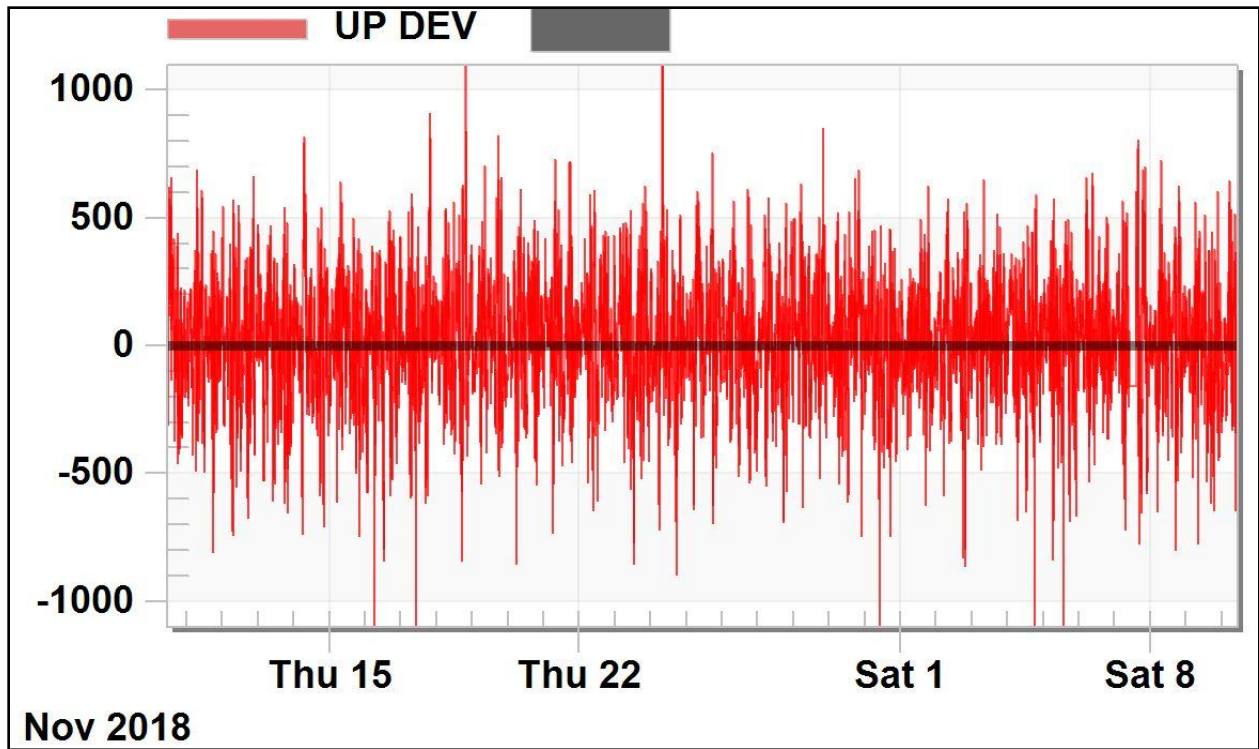
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Rosa(4x300)	1	300				NIL	
	2	300	01-Nov-19	15-Dec-19	45	Annual Overhaul	
	3	300				NIL	
	4	300	01-Feb-20	20-Feb-20	20	Boiler OH	
ANPARA - C(IPP)LANCO	1	600	12-Mar-20	29-Mar-20	18	Annual Overhaul	
	2	600	20-Jul-19	08-Aug-19	20	Annual Overhaul	
Lalitpur	1	660				NIL	
	2	660	04.02.20	28-Feb-20	25	Annual Overhaul	
	3	660	01.03.20	25.03.20	25	Annual Overhaul	
Bara	1	660				NIL	
	2	660	10-Nov-19	30-Nov-19	20	Boiler OH	
	3	660	10-Dec-19	30-Dec-19	20	Annual Maintenance	
IPGCL(GTPS)	GT#1	30	25.03.2019	13.04.2019	20	Hot Gas Path Inspection(HGPI)	
	GT#2	30	14.04.2019	23.04.2019	10	Combustion Inspection(CI)	
	SGT#1	30	25.03.2019	23.04.2019	30	Major Inspection	
PPCL(PPS-I)	GT#1	104	01.10.2019	10.10.2019	10	Combustion Inspection(CI)	
				Dec2019	2	Air inlet filter replacement	
	GT#2	104	01.03.2020	20.03.2020	20	Hot Gas Path Inspection(HGPI)	
				Dec2019	2	Air inlet filter replacement	
	SGT#1	122				NIL	
PPCL(PPS-III)	GT#1	216	01.11.2019	03.11.2019	3	Boroscopic Inspection (B.I)	
		216	15.11.2019	17.11.2019	3	Boroscopic Inspection (B.I)	
	GT#2	216	01.03.2020	21.03.2020	21	Hot Gas Path Inspection(HGPI)	
	GT#3	216	03.30.2019	04.01.2019	3	Boroscopic Inspection (B.I)	
	GT#4	216	01.12.2019	03.12.2019	3	Boroscopic Inspection (B.I)	
UTTARAKHAND							
Gama Infraprop Pvt.Ltd.	GT-1,STG	107	03.03.20	12.03.20	10	Annual Inspection and Overhauling	
	GT-1,STG	107					
	GT-1,STG	107					
	GT-1,STG	107					
	GT-1,STG	107					
	GT-1,STG	107				NIL	
Sravanthi Energy Pvt Ltd Phase-1	GT-1	71.5	04.05.19	05.05.19	1	Offline Water wash and Air intake filter replacement	
	GT-1	71.5	04.08.19	05.08.19	1	Offline Water wash and Air intake filter replacement	
	GT-1	71.5	04.11.19	05.11.19	1	Offline Water wash and Air intake filter replacement	
	GT-1	71.5	05.02.20	07.02.20	2	Offline Water wash and essential corrective maintenance	
	GT-2	71.5	03.01.19	04.01.19	1	Offline Water wash and Air intake filter replacement	
	GT 2	71.5	03.09.19	04.09.19	1	Offline Water wash and Air intake filter replacement	
	GT-2	71.5	03.12.19	04.12.19	1	Offline Water wash and Air intake filter replacement	
	GT-2	71.5	03.03.20	05.03.20	2	Offline Water wash	
	HRSG-1	125	05.02.20	07.02.20	3	Hadro Test & IBR statutory Inspection-License Renewal	
	HRSG-2	125	03.03.20	05.03.20	3	Hadro Test & IBR statutory Inspection-License Renewal	
				04.11.19	05.11.19	1	Offline Water wash and Air intake filter replacement
	GT-3	71.5	07.03.20	08.03.20	1	Offline Water wash and Air intake filter replacement	
	GT-4	71.5	05.12.19	06.12.19	1	Offline Water wash and Air intake filter replacement	
	GTG	71	20.09.19	25.09.19	5	Corrective Maintenance work	
1	60	15.11.19	05.12.19	21	Annual Maintenance		

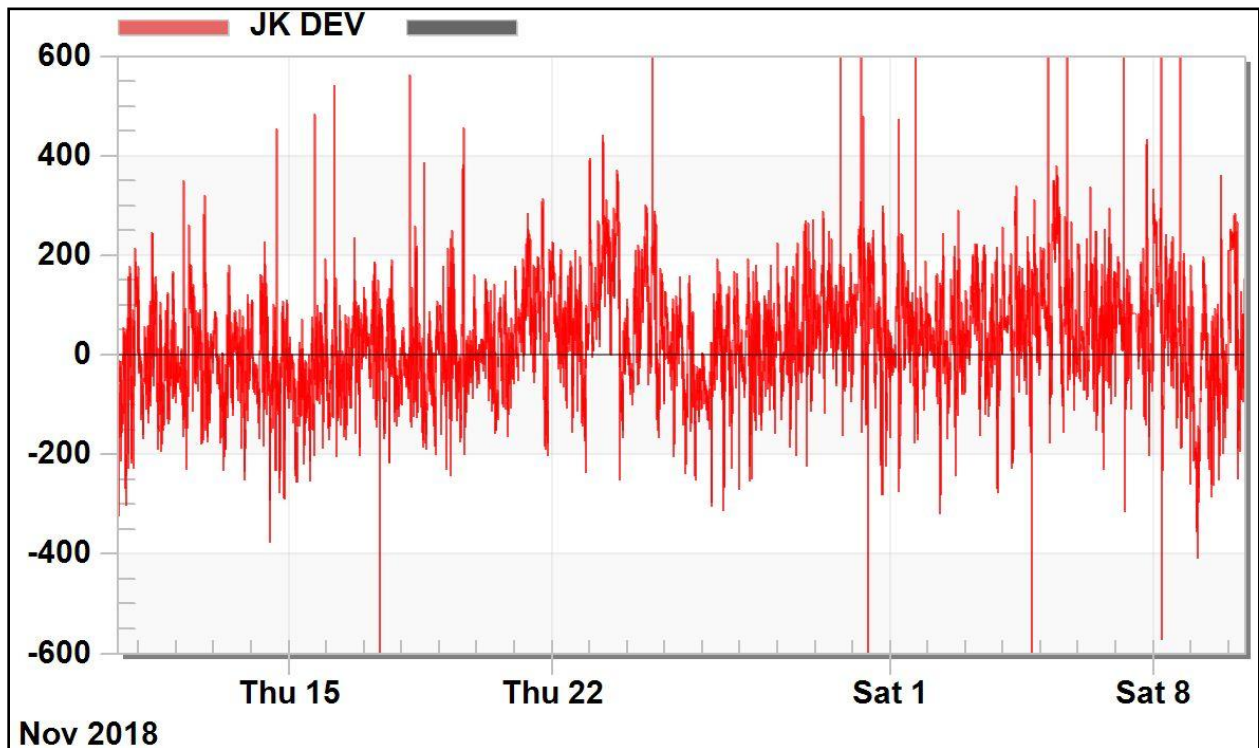
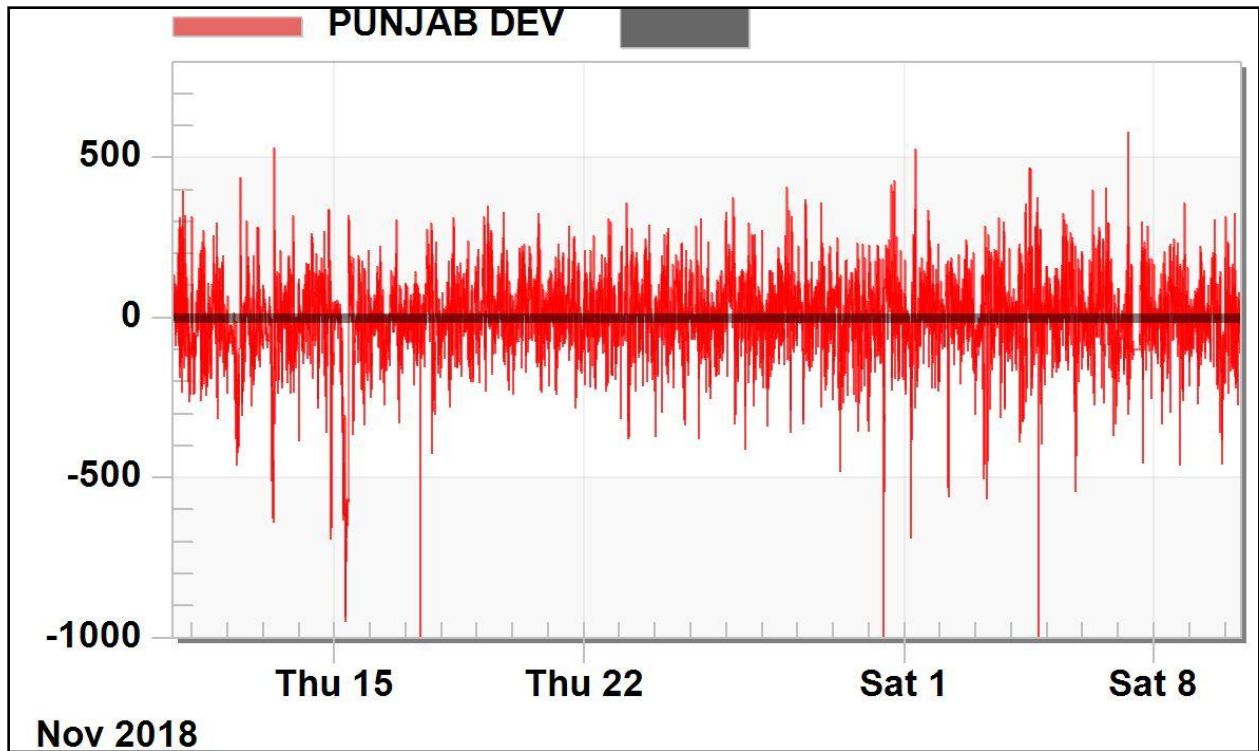
केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटजेज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
Chibro	2	60	11.12.19	31.12.19	21	Annual Maintenance
	3	60	08.01.20	28.01.20	21	Annual Maintenance
	4	60	05.02.20	25.02.20	21	Annual Maintenance
Khodri	1	30	01.11.19	25.11.19	25	Annual Maintenance
	2	30	01.12.19	25.12.19	25	Annual Maintenance
	3	30	01.01.20	25.01.20	25	Annual Maintenance
	4	30	01.02.20	25.02.20	25	Annual Maintenance
Dhakrani	1	11.25	01.04.19	29.05.19	59	Capital Maintenance (shall start from 30-01-2019)
	2	11.25	30.01.20	04.03.20	35	Annual Maintenance
	3	11.25	23.12.19	26.01.20	35	Annual Maintenance
Dhalipur	1	17	09.12.19	31.03.20	114	RMU (shall continue up to 08-08-2020)
	2	17	01.04.19	08.07.19	99	RMU (shall start from 09-12-2018)
	3	17	01.01.20	04.02.20	35	Annual Maintenance
Kulhal	1	10	01.04.19	30.04.19	30	Annual Maintenance
	2	10	15.11.19	14.03.20	121	Capital Maintenance
	3	10				NIL
Tiloth	1	30	01.04.19	12.12.19	256	Comprehensive RMU
	2	30	15.07.19	04.08.19	21	Routine Maintenance During Monsoon
			15.01.20	14.02.20	31	Routine Maintenance During Lean discharge period
	3	30	15.07.19	14.08.19	31	Routine Maintenance During Monsoon
Chilla	1	36	01.12.19	31.03.20	121	RMU of Unit No.1 Proposed and shall continue up to 31-10-2021
	2	36	01.12.19	04.01.20	35	Annual Maintenance of unit No.2
	3	36	07.02.20	13.03.20	36	Annual Maintenance of unit No.3
	4	36	01.04.19	30.11.19	244	Annual Maintenance
Pathri	1	6.8	08.10.19	27.10.19	20	Annual Maintenance
	2	6.8	08.10.19	27.10.19	20	Annual Maintenance
	3	6.8	08.10.19	27.10.19	20	Annual Maintenance
Mohd.pur	1	3.1	08.10.19	27.10.19	20	Annual Maintenance
	2	3.1	08.10.19	27.10.19	20	Annual Maintenance
	3	3.1	08.10.19	27.10.19	20	Annual Maintenance
Ramganga	1	66	15.06.19	09.02.20	240	Capital Overhaul
	2	66	20.07.19	23.08.19	35	Annual Maintenance
	3	66	01.04.19	30.01.19	91	Capital Overhaul
Khatima	1	13.8	22.02.20	27.03.20	35	Annual Maintenance
	2	13.8	10.01.20	13.02.20	35	Annual Maintenance
	3	13.8	22.11.19	31.12.19	40	Annual Maintenance
MB-II	1	76	25.10.19	28.12.19	65	Annual Maintenance
	2	76	15.11.19	18.01.20	65	Annual Maintenance
	3	76	05.01.20	09.03.20	65	Annual Maintenance
	4	76	25.01.20	29.03.20	65	Annual Maintenance
PUNJAB						
GGSSTP Ropar	3	210				NIL
	4	210	15.11.19	19.12.19	35	Capital Maint. Boiler O/H, TG Bearing inspection, Generator O/H
	5	210				NIL

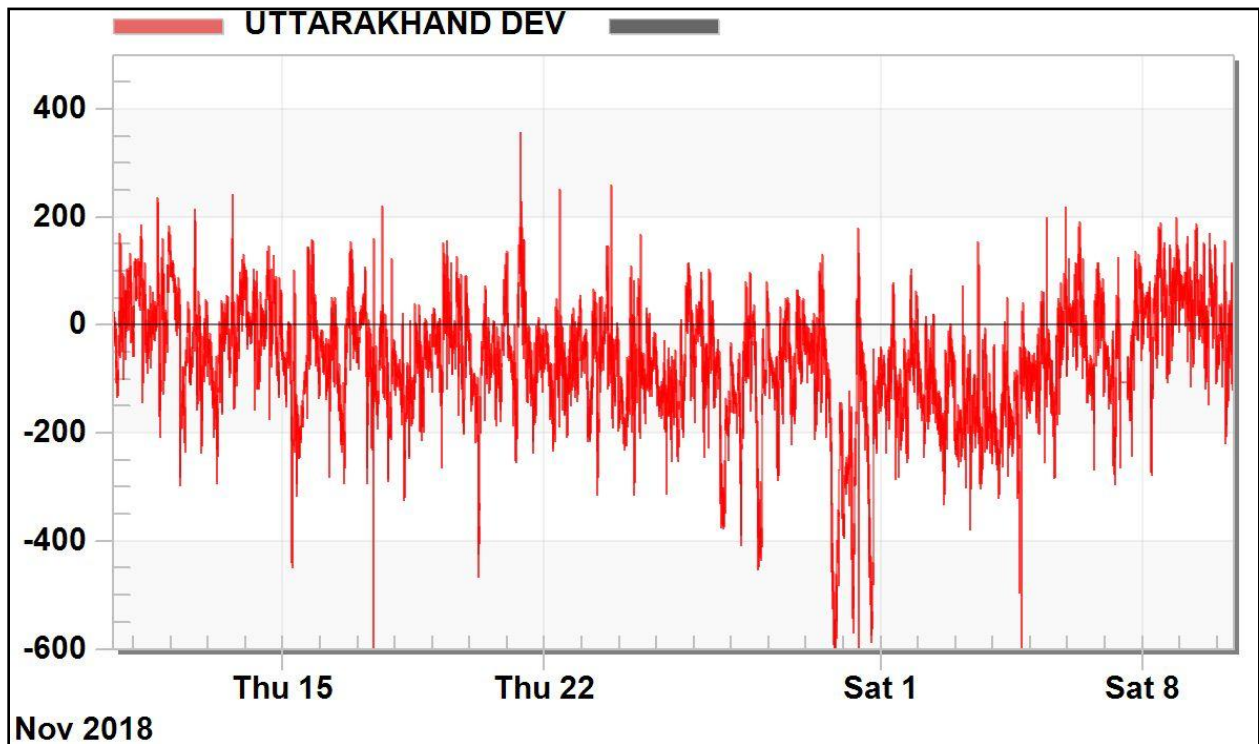
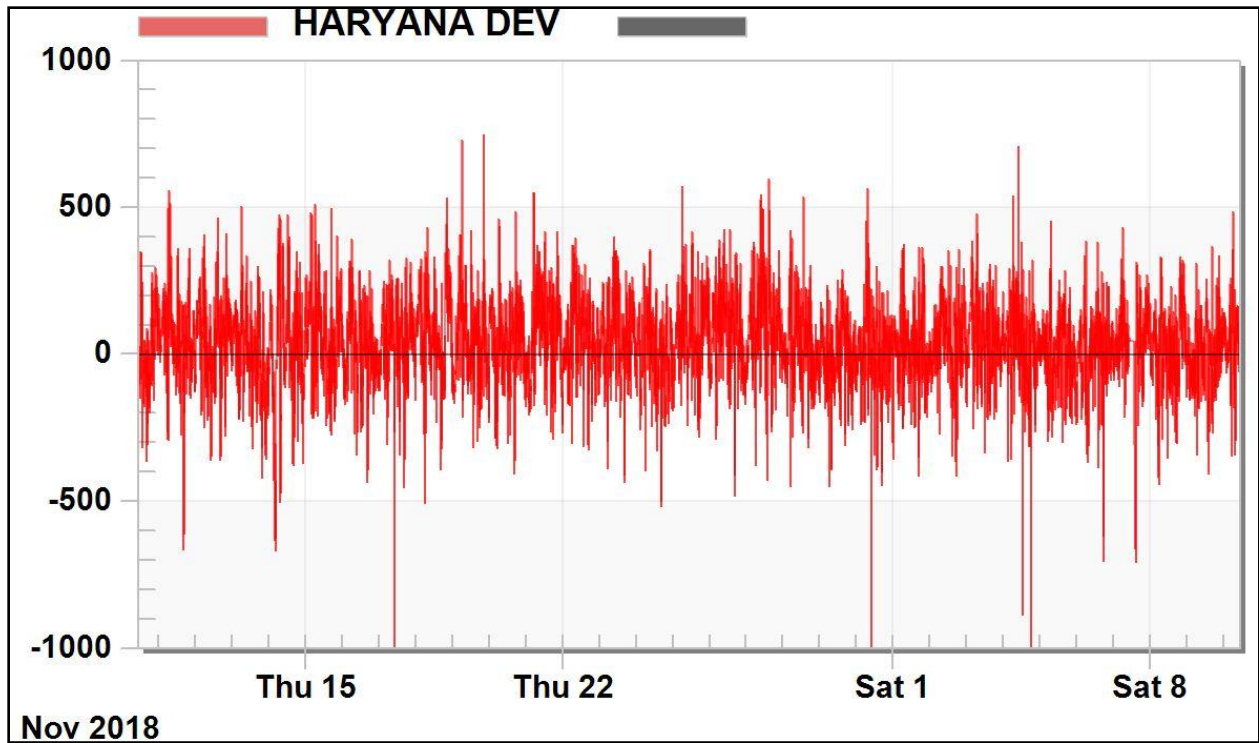
केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटटेज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
	6	210				NIL
GHTP Lehra Mohabbat	1	210	15.01.20	28.02.20	45	Capital Overhauling:HP,IP & LP Turbines/Furnace/Generator
	2	210	01.04.19	20.04.19	20	Annual Overhauling
	3	250				NIL
	4	250				NIL
NPL	1	700	08.11.19	21.01.20	75	Major Overhaul
	2	700	15.03.20	21.03.20	7	Maintenance Shutdown
TSPL	1	660	01.04.19	10.04.19	10	Annual Over Hauling
	2	660				NIL
	3	660	01.11.18	22.11.18	22	Annual Over Hauling
GVK	1	270	25.11.19	15.12.19	21	Maintenance Shutdown
	2	270				NIL
HIMACHAL PRADESH						
Larji (3*42MW)	1	42	15.02.2020	25.03.2020	40 days	Annual Maintenance of M/Cs and associated equipments
	2	42	26.12.2019	08.02.2020	45days	
	3	42	01.11.2019	10.12.2019	40days	
Bhaba (3*40MW)	1	40	05.01.2020	15.02.2020	41 days	Annual Maintenance of M/Cs and associated equipments
	2	40	26.12.2019	08.02.2020	44 days	
	3	40	05.11.2019	31.12.2019	56 days	
Bassi (4*15MW)	1	16.5	15.10.2019	30.11.2019	47 days	To carried out the annual maintenance of machine during lean season
	2	16.5	15.11.2019	27.12.2019	43 days	
	3	16.5	23.01.2019	05.03.2019	42 days	
	4	16.5	02.01.2019	10.02.2019	40days	
Giri (2*30MW)	1	30	15.04.2019	15.05.2019	30 days	Annual Maintenance of M/Cs and associated equipments
	2	30	15.12.2019	15.01.2020	30 days	
Ghanvi (2*11.25MW)	1	11.25	01.12.2019	31.01.2020	60 days	Annual Maintenance of M/Cs and associated equipments
	2	11.25	01.02.2019	31.03.2019	60 days	
Ghanvi II (2*5MW)	1	5	01.12.2018	31.01.2019	60 days	Annual Maintenance of M/Cs and associated equipments
	2	5	01.02.2019	31.03.2019	60 days	
Andhara (3*5.65MW)	1	5.65	20.12.2019	25.01.2020	36 days	Annual Maintenance of M/Cs and associated equipments
	2	5.65	05.11.2019	15.12.2019	40 days	
	3	5.65	15.11.2019	8.12.2019	41 days	
Baner (3*4MW)	1	4	01.11.2018	30.11.2018	30 days	Annual Maintenance of M/Cs and associated equipments
	2	4	01.12.2018	31.12.2018	31 days	
	3	4	01.01.2020	31.01.2020	31 days	
Khaulii (2*6MW)	1	6	07.11.2018	31.12.2018	55 days	Annual Maintenance of M/Cs and associated equipments
	2	6	01.01.2020	28.02.2020	58. days	
Gaj (3*3.5MW)	1	3.5	17.10.2019	19.11.2019	34 days	Annual Maintenance of M/Cs and associated equipments
	2	3.5	21.11.2019	29.12.2019	39 days	
	3	3.5	30.12.2019	03.02.2020	39 days	
Binwa (2*3MW)	1	3	14.11.2019	12.12.2019	29 days	Annual Maintenance of M/Cs and associated equipments
	2	3	13.12.2019	15.01.2020	33 days	
Baspa II (3*100MW)	1	100	15.01.2020	24.01.2020	10 days	Due to lean period the planned annual maintenace of units one basis, does not affect the generation as no spillage takes place due to very less inflow
	2	100	01.02.2020	10.02.2020	10 days	
	3	100	21.02.2020	02.03.2020	10 days	
Malana HEP (2*43MW)	1	43	15.01.2020	03.02.2020	20 days	Annual Maintenance
	2	43	07.02.2020	26.02.2020	21 days	
	1	12	01.012.2019	15.12.2019	15 days	

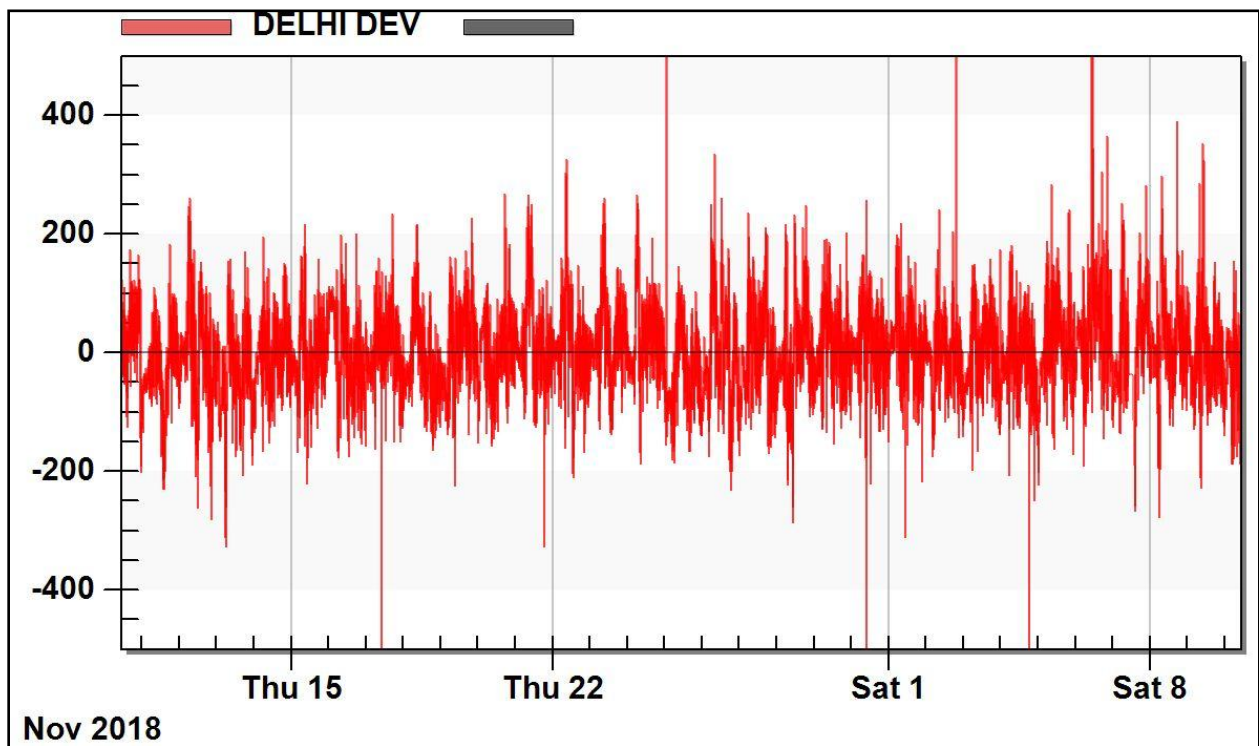
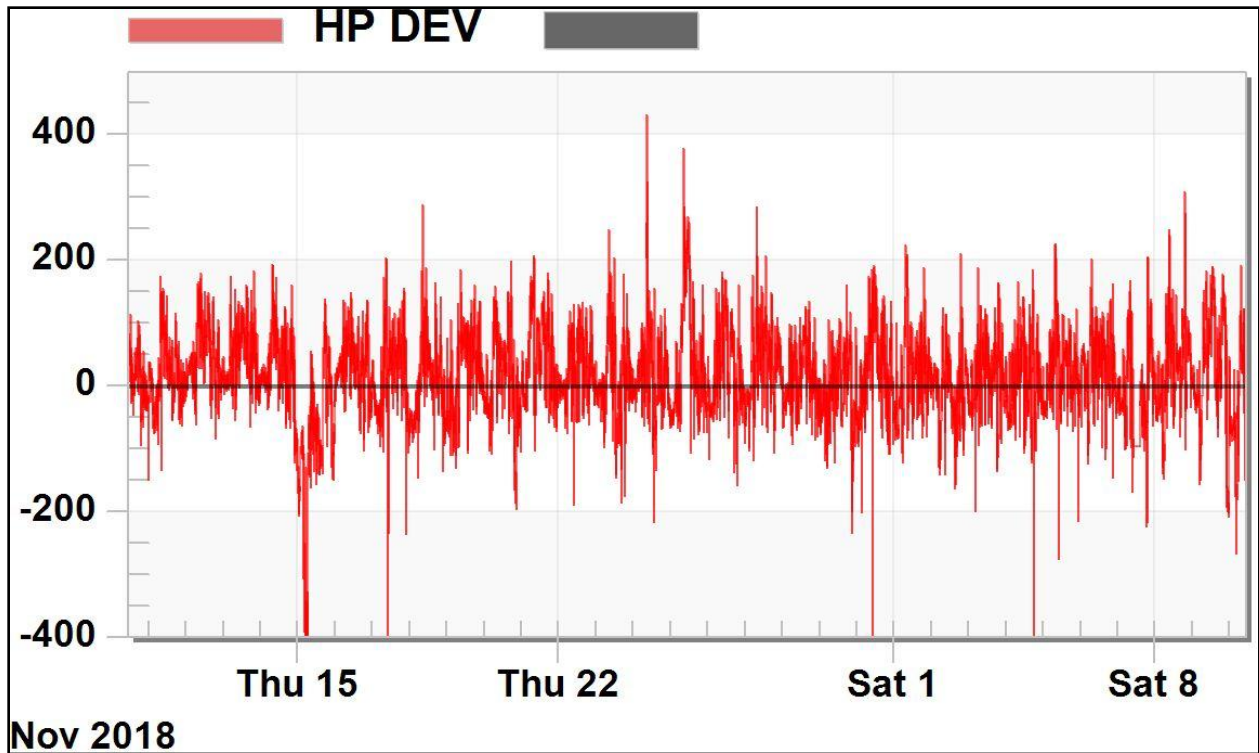
केंद्र / Station	Unit	केंद्र क्षमता Station Capacity (MW)	वार्षिक आउटेज योजना के अनुसार अनुरक्षण शेड्यूल Maintenance Schedule as per Annual Outage Planning			अभ्युक्तियाँ Remarks
			से / From	तक / To	दिनों की संख्या No of Days	
IA Hydo Energy Pvt. Ltd (3*12MW)	2	12	16.12.2019	30.12.2019	15 days	Annual Maintenance
	3	12	02.01.2020	16.01.2020	15 days	
Kashag HEP	1	65	30.04.2019	30.05.2019	30 day	Monthly Maintenance
	2	65	31.05.2019	15.06.2019	15 day	
	3	65	30.06.2019	15.07.2020	15 day	
Sainj HEP (2*50MW)	1	50	15.11.2019	15.12.2019	30 days	Monthly Maintenance
	2	50	16.12.2019	15.01.2020	30 days	
Kanchanjunga Power Company Pvt. Ltd.	1	8	11.11.2019	18.11.2019	7 days	Monthly Maintenance
Nanti Hydro	1	6.5	15.11.2019	30.11.2019	15 days	Annual Maintenance
	2	6.5	01.02.2020	19.01.2020	20 days	
Suryakanta Hydro	2	7	01.02.2020	19.01.2020	20 days	Annual Maintenance

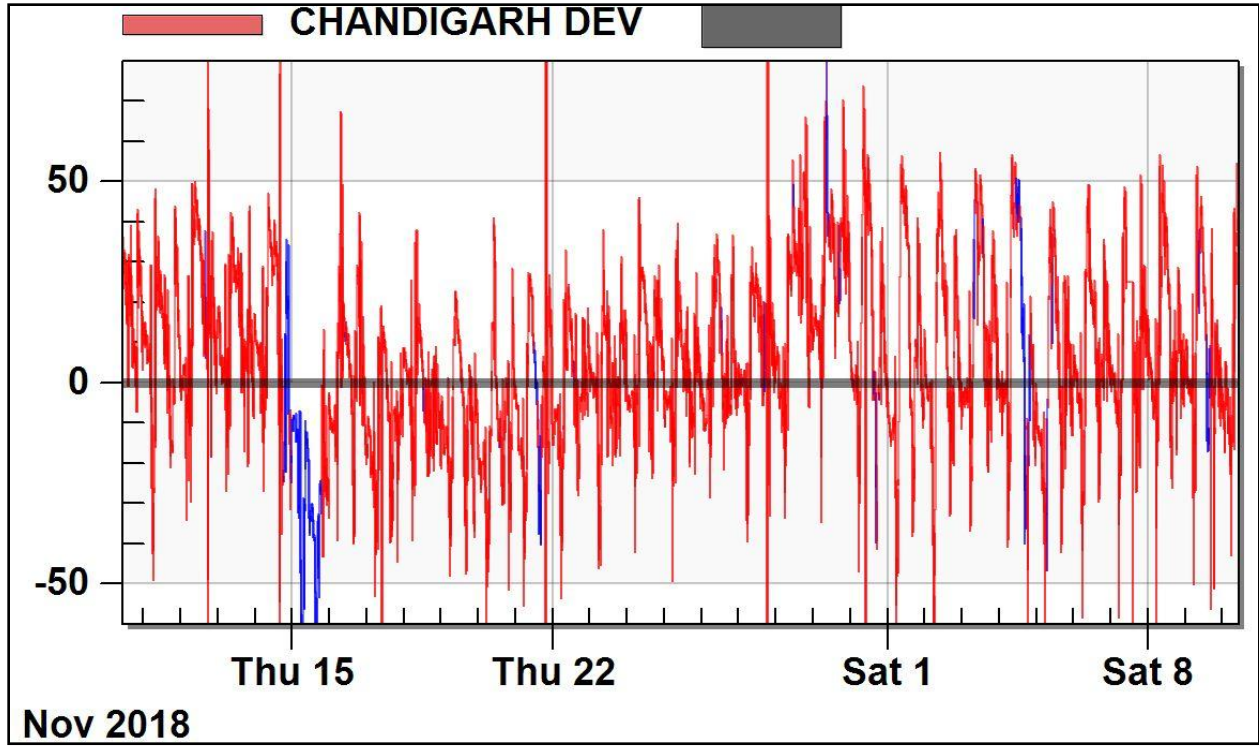












Annexure-3

For POSOCO to develop models of wind farms/ parks connected to Indian grid, the following information are required:

1. Electrical Single Line Diagram of Wind farm /park depicting :
 - For individual WTGs: Type, MW rating, MVAR capability, Manufacturer, Model no.
 - Reticulation system (MV system within the wind farm) : Length of individual branch / twig, Type of conductor, Electrical parameters (R, X, B)
 - Details of MV (690V/33kV) and HV (33kV/220kV) step-up transformers: Rating, Impedance, Tap changers (Type, Tap Steps, Max Ratio and Min Ratio in p.u.)
 - Aggregated steady state model (if available)
2. Encrypted model in PSS/E (*.dll files) for electromechanical transient simulation for components of WTGs / Wind farm
 - User guide for Encrypted models to be provided including instructions on how the model should be set-up
 - Corresponding transfer function block diagrams to be provided
 - Simulation results depicting validation of User-Defined models against actual measurement to be provided
 - The use of black-box type representation is not acceptable
3. Generic models of WTGs / Wind farms (in case of non-availability of item as per Sl.no.2 above).
 - Simulation results depicting validation of Generic models against User-Defined models or against actual measurement to be provided
4. Wind Turbine datasheet
5. Voltage/reactive control strategy of farm, reactive capability curves
6. Settings from a wind turbine (each model in the farm)
7. Settings from the Power plant controller
8. Disturbance recordings – of wind farm response to disturbance together with any associated information about the circumstances of the disturbance

3.1 Generic models in PSS/E for different technologies of Wind Turbines

Wind Turbine type	Technology	Generic model	Model Description
Type-1	Direct connected induction generator (SCIG) a) Fixed Speed Stall Control b) Fixed Speed Active Control	WT1G1	Generator model (conventional induction generator)
		WT2T1	Drive train model (two-mass drive train model)
		wt1p_b	Pitch controller (<i>Use only for Type 1 with active stall</i>)
Type-2	Wound rotor induction generator (WRIG) with a variable resistor in the rotor circuit, and typically employs pitch control	WT2G1	Generator model (induction generator with external rotor resistance)
		WT2E1	External resistance controller
		WT12T1	Drive train model
		wt1p_b (no equivalent in PSS/E)	Pitch controller
Type-3	Doubly fed induction generator (DFIG) wind turbines ; Variable speed with rotor side converter	REGCA1	Renewable energy generator converter model
		REECA1	Renewable energy controls model
		WTDTA1	Drive train model
		WTARA	Wind turbine aerodynamic model
		WTPTA1	Simplified pitch controller model
		WTTQA1	Wind generator torque control
		REPCTA1	Renewable energy plant controller
Type-4	Full converter wind turbine Generator types: a) Synchronous b) Permanent Magnet type	REGCA1	Renewable energy generator converter model
		REECA1	Renewable energy controls model
		WTDTA1	Drive train model
		REPCA1	Renewable energy plant controller

Annexure: Formats for submission of modelling data for wind turbine generators / wind farms

Version History:

Version no.	Release Date	Prepared by*	Checked/Issued by*	Changes

*Mention Designation and Contact Details

Details submitted:

Details pending:

Details of models in PSS/E for modelling Wind plants / farms / parks:

Category	Parameter Description	Data
Generator Nameplate	Connection point voltage (kV)	
	Terminal voltage (kV)	
	Wind Farm - Rated active power (sent out) in MW	
	Turbine – Rated MVA	
	Turbine – Rated active power (P _{MAX}) in MW	
	Number of wind turbines (Type wise)	
Reactive power capability	Capability chart at connection point [If not available, then for each individual wind turbine, and mode of operation of Power Plant Controller]	-
	Q _{MAX}	
	Q _{min}	
Single Line Diagram	Single line diagram of the wind farm showing number and location of turbines, cable run, transformers, feeders (including type of cables and electrical R,X,B parameters), and connection to transmission system Preferable : Electrical Single Line Diagram including details between individual WTGs and b/w WTGs and aggregation points	
Wind Turbine Details	Manufacturer and product details (include Year of Manufacture)	
	Year of commissioning	
	Fixed speed or variable speed	
	Type of turbine: stall control, pitch control, active stall control, limited variable speed, variable speed with partial or full-scale frequency converter	
	Hub height (in metre)	
	Rotor diameter (in metre)	
	Number of blades	
	Rotor speed (in rpm)	
	Gearbox ratio	
Generator	Type of generator: Type 1/ Type 2 / Type 3 / Type 4	
	Number of pole pairs	
	Stator resistance (in Ohms)	
	Rotor resistance (in Ohms)	
Speed control	Details of speed controller in wind turbine	
	Efficiency (C _p) curves	
	Cut-in wind speed	
	Wind speed at which full power is attained Cut-out wind speed	
	Pitch angle at low wind speed	

Category	Parameter Description	Data
Reticulation System	Voltage of the reticulation system	
	Number of feeders	
	Cable schedules (lengths, cable size, conductor material, rating info)	
Turbine Transformer	Details of the turbine transformer, including vector group, impedance, and number of taps, tap position, tap ratio	
	Nameplate details	
Wind-farm Step-up transformer	Details of the main wind farm step up transformer, including vector group, impedance, and tap position	
	Nameplate	
	OLTC?	
	Controlled bus	
	Voltage setpoint	
	Dead band	
	Tap ratio range	
Connection Details	Voltage influence (maximum change etc)	
	Short circuit ratio (SCR)	
	· Min	
	· Max	
	Harmonic filters	
	STATCOM	
Power Plant Controller (PPC) Details	Synchronous condensers	
	Does the wind farm have a PPC? If yes, whether PPC controls all or part of the WTGs in wind farm	
	What is the method of control – voltage regulation, power factor control, reactive power control?	
	Voltage control strategy (operating mode) - Controls MV Bus - Controls HV Bus - PF control - Q control - Voltage control	
	Is there a droop setting? - Voltage control - Frequency Control - Is there line drop compensation?	
	Is reactive power limited?	
	Temperature dependency	
	Active power ramp rate limiters	
FRT protocols and setpoints - LVRT - HVRT		
	Provide settings from controller.	

3.3 Generic Models for Type-1 and Type-2 Wind turbine generators:

Category	Parameter Description	Data
GENERATOR model		
Generator : Type-1 (WT1G1)	Synchronous reactance (ohms or pu) X_s	
	Transient reactance (ohms or pu) X'	
	Wound rotor induction generator (WRIG) with a variable resistor in the rotor circuit, and typically employs pitch control	
	Leakage reactance, X_L	
	Saturation curve (E1, S(E1), E2, S(E2))	
Generator : Type-2 (WT2G1)	X_A , stator reactance (pu)	
	Doubly fed induction generator (DFIG) wind turbines ; Variable speed with rotor side converter	
	X_1 rotor reactance (pu)	
	R_Rot_Max, rotor resistance (pu)	
	R_Rot_Max (sum of R_Rot_Max + total external resistance) in pu	
	Saturation curve (E1, S(E1), E2, S(E2))	
	Power – slip curve (Top 5 points in the T-s curve)	
Electrical Control model		
Rotor Resistance Control : Type-2 (WT2E1)	TsP, rotor speed filter time constant, sec.	
	Tpe, power filter time constant, sec.	
	Ti, PI-controller integrator time constant, sec.	
	Kp, PI-controller proportional gain, pu	
	ROTRV_MAX, Output MAX limit	
	ROTRV_MIN, Output MIN limit	
Drive Train model		
Two-Mass Turbine Model for Type 1 and Type 2 Wind Generators : (WT12T1)	H, Total inertia constant, sec	
	DAMP, Machine damping factor, pu P/pu speed	
	Hfrac, Turbine inertia fraction (H_{turb}/H) ¹	
	Freq1, First shaft torsional resonant frequency, Hz	
	Dshaft, Shaft damping factor (pu)	

3.4 Generic Models for Type-3 and Type-4 Wind turbine generators:

Category	Parameter Description	Data
GENERATOR model		
Type-3 or Type-4 (REGCA1)	Tg, Converter time constant (s)	
	Rrpwr, Low Voltage Power Logic (LVPL) ramp rate limit (pu/s)	
	Wound rotor induction generator (WRIG) with a variable resistor in the rotor circuit, and typically employs pitch control	
	Zerex, LVPL characteristic voltage 1 (pu)	
	Lvpl1, LVPL gain (pu)	
	Volim, Voltage limit (pu) for high voltage reactive current manage-	
	Doubly fed induction generator (DFIG) wind turbines ; Variable speed with rotor side converter	
	Lvpnt1, High voltage point for low voltage active current manage-	
	ment (pu)	
	Lvpnt0, Low voltage point for low voltage active current manage-	
	ment (pu)	
	Iolim, Current limit (pu) for high voltage reactive current manage-	
	ment (specified as a negative value)	
	Tfltr, Voltage filter time constant for low voltage active current man-	
	agement (s)	
	Khv, Overvoltage compensation gain used in the high voltage reac-	
tive current management		
Iqrmax, Upper limit on rate of change for reactive current (pu)		
Iqrmin, Lower limit on rate of change for reactive current (pu)		
Accel, acceleration factor ($0 < \text{Accel} \leq 1$)		
Electrical Control model		
Type-3 and Type-4 Wind turbines : (REECA1) [Refer Block Diagrams]	Vdip (pu), low voltage threshold to activate reactive current injection logic	
	Vup (pu), Voltage above which reactive current injection logic is activated	
	Trv (s), Voltage filter time constant	
	dbd1 (pu), Voltage error dead band lower threshold (≤ 0)	
	dbd2 (pu), Voltage error dead band upper threshold (≥ 0)	
	Kqv (pu), Reactive current injection gain during over and undervoltage conditions	
	Iqh1 (pu), Upper limit on reactive current injection Iqinj	
	Iql1 (pu), Lower limit on reactive current injection Iqinj	
	Vref0 (pu), User defined reference (if 0, model initializes it to initial terminal voltage)	
	Iqfrz (pu), Value at which Iqinj is held for Thld seconds following a voltage dip if Thld > 0	
Category	Parameter Description	Data

Electrical Control model		
Type-3 and Type-4 Wind turbines : (REECA1) [Refer Block Diagrams]	Thld (s), Time for which Iqinj is held at Iqfrz after voltage dip returns to zero (see Note 1)	
	Thld2 (s) (≥ 0), Time for which the active current limit (IPMAX) is held at the faulted value after voltage dip returns to zero	
	Tp (s), Filter time constant for electrical power	
	QMax (pu), limit for reactive power regulator	
	QMin (pu) limit for reactive power regulator	
	VMAX (pu), Max. limit for voltage control	
	VMIN (pu), Min. limit for voltage control	
	Kqp (pu), Reactive power regulator proportional gain	
	Kqi (pu), Reactive power regulator integral gain	
	Kvp (pu), Voltage regulator proportional gain	
	Kvi (pu), Voltage regulator integral gain	
	Vbias (pu), User-defined bias (normally 0)	
	Tiq (s), Time constant on delay s4	
	dPmax (pu/s) (>0) Power reference max. ramp rate	
	dPmin (pu/s) (<0) Power reference min. ramp rate	
	PMAX (pu), Max. power limit	
	PMIN (pu), Min. power limit	
	Imax (pu), Maximum limit on total converter current	
	Tpord (s), Power filter time constant	
	VQ-IQ characteristic (at least two pairs, up to 4 pairs of voltage and current in pu)	
VP-IP characteristic (at least two pairs, up to 4 pairs, of voltage and current in pu)	[Refer Block Diagrams]	
Is turbine in PF control or Q control (including controlled by external signal)?		
Is the turbine controlling voltage (directly, not than through PPC)?		
If controlling voltage directly what bus does it control?		
Is the turbine in P or Q priority mode?		
Drive Train model		
	H, Total inertia constant, sec	
	DAMP, Machine damping factor, pu P/pu speed	
	Htfrac, Turbine inertia fraction (Hturb/H)1	
	Freq1, First shaft torsional resonant frequency, Hz	
	Dshaft, Shaft damping factor (pu)	

Category	Parameter Description	Data
Pitch Control model [for Type-3 only]		
Generic Pitch Control model for Type-3 : (WTPA1)	Kiw, Pitch-control Integral Gain (pu)	
	Kpw, Pitch-control proportional gain (pu)	
	Kic, Pitch-compensation integral gain (pu)	
	Kpc, Pitch-compensation proportional gain (pu)	
	Kcc, Gain (pu)	
	Tp, Blade response time constant (s)	
	TetaMax, Maximum pitch angle (degrees)	
	TetaMin, Minimum pitch angle (degrees)	
	RTetaMax, Maximum pitch angle rate (degrees/s)	
	RTetaMin, Minimum pitch angle rate (degrees/s) (< 0)	
Aerodynamic model [For Type-3 only]		
(WTARA1)	Ka, Aerodynamic gain factor (pu/degrees)	
	Theta 0 Initial pitch angle (degrees)	
Torque Controller model [For Type-3 only]		
Generic Torque Controller for Type-3 wind machines : (WTTQA1)	Kpp, Proportional gain in torque regulator (pu)	
	KIP, Integrator gain in torque regulator (pu)	
	Tp, Electrical power filter time constant (s)	
	Twref, Speed-reference time constant (s)	
	Temax, Max limit in torque regulator (pu)	
	Temin, Min limit in torque regulator (pu)	
	p1, power (pu)	
	spd1, shaft speed for power p1 (pu)	
	p2, power (pu)	
	spd2, shaft speed for power p2 (pu)	
	p3, power (pu)	
	spd3, shaft speed for power p3 (pu)	
	p4, power (pu)	
	spd4, shaft speed for power p3 (pu)	
TRATE, Total turbine rating (MW)		

Category	Parameter Description	Data
Power Plant Controller (PPC) model		
Generic Power Plant Controller (PPC) model for Type-3 and Type-4 wind turbines : REPCTA1 for type 3, and REPCA1 for type 4 turbines	Tfltr, Voltage or reactive power measurement filter time constant (s)	
	Kp, Reactive power PI control proportional gain (pu)	
	Ki, Reactive power PI control integral gain (pu)	
	Tft, Lead time constant (s)	
	Tfv, Lag time constant (s)	
	Vfrz, Voltage below which State s2 is frozen (pu)	
	Rc, Line drop compensation resistance (pu)	
	Xc, Line drop compensation reactance (pu)	
	Kc, Reactive current compensation gain (pu)	
	emax, upper limit on deadband output (pu)	
	emin, lower limit on deadband output (pu)	
	dbd1, lower threshold for reactive power control deadband (≤ 0)	
	dbd2, upper threshold for reactive power control deadband (≥ 0)	
	Qmax, Upper limit on output of V/Q control (pu)	
	Qmin, Lower limit on output of V/Q control (pu)	
	Kpg, Proportional gain for power control (pu)	
	Kig, Proportional gain for power control (pu)	
	Tp, Real power measurement filter time constant (s)	
	fdbd1, Deadband for frequency control, lower threshold (≤ 0)	
	Fdbd2, Deadband for frequency control, upper threshold (≥ 0)	
	femax, frequency error upper limit (pu)	
	femin, frequency error lower limit (pu)	
	Pmax, upper limit on power reference (pu)	
Pmin, lower limit on power reference (pu)		
Tg, Power Controller lag time constant (s)		
Ddn, droop for over-frequency conditions (pu)		
Dup, droop for under-frequency conditions (pu)		

S.No.	Utility	Plant	Generator	Exciter	Governer	Stabilizer	Remarks (data not given)
1	NHPC	Chamera-1	Yes	Yes	No	Yes	
		Chamera-2	Yes	Yes	Yes	No	T"q0,XI & S(1.0)
		Chamera-3	Yes	Yes	Yes	Yes	S(1.0) & S(1.2)
		Dhauliganga	Yes	Yes	Yes	No	
		Bairasuil	Yes	Yes	No	No	
		Uri-1	Yes	Yes	Yes	Yes	
		Uri-2	Yes	No	No	No	
2	NTPC	Rihand	Yes	Yes	No	Yes	Stabilizer data only for Rihand -1 is given
		Dadri Thermal-2	Yes	Yes	No	No	
		Singrauli	Yes	Yes	No	No	
		Unchahar-1	Yes	Yes	No	No	
		Badarpur	Yes	Yes	No	No	Unit # 1,2,3 of 95 MW each
3	SJVNAL	NJPC	Yes	Yes	No	Yes	T"d0, T"q0 & S(1.2)
		Rampur	Yes	No	No	No	
		Tehri	Yes	No	No	No	
		Koteshwar	Yes	Yes	No	No	
4	UPRVUNL	Parichha	Partial	Yes	No	No	Time constants & Unit#7
		Harduaganj	Partial	No	No	No	Unit#2
		Anpara-1,2,3	Yes	Yes	No	Yes	
		Anpara- 4,5	Yes	Yes	No	Yes	
		Obra	Yes	No	No	No	
5	HPGCL	Yamuna nagar	Yes	Yes	No	Yes	Inetia
		Panipat-1,2	Yes	Yes	No	Yes	
		Khedar	Yes	No	No	Yes	
6	PSTCL	Ropar	Yes	Yes	Yes	Yes	
		Rajpura	Yes	Yes	Yes	No	
7	Karcham	Karcham Wangtoo	Yes	No	No	No	
8	Everest	Malana-2	Yes	No	No	No	
9	AD Hydro	AD Hydro	Yes	No	No	No	
10	Shree Cement	Shree Cement	Yes	No	No	No	
11	Roza-IPP	Roza	Yes	No	No	No	
12	Lalitpur-IPP	Lalitpur	Yes	Yes	No	Yes	

S.No.	Utility	Plant	Generator	Exciter	Governer	Stabilizer	Remarks (data not given)
1	NHPC	Chamera-1	Yes	Yes	Partial	Yes	Governor data is not in defined model/format, not able to process that data
		Chamera-2	Yes	Yes	Yes	No	T"q0,XI & S(1.0)
		Chamera-3	Yes	Yes	Yes	Yes	S(1.0) & S(1.2)
		Dhauliganga	Yes	Yes	Yes	Yes	Exhaustive data for excitattion and stabilizer but not in defined model/format
		Bairasuil	Yes	Yes	Partial	Yes	Exciter & stabilizer coupled in excitation system
		Uri-1	Yes	Yes	Yes	Yes	
		Uri-2	Yes	Partial	Yes	Yes	Exhaustive data given for AVR , though not in defined model.
		Dulhasti	Partial	Partial	yes	No	Excitation data is not in defined model
		Parbati-III	Partial	No	Partial	No	Only block diagram given for excitation system, rest data is not in defined format
		Salal	Partial	Partial	No	Partial	Exciation system block diagram with and without PSS is given. Some partial data for excitation system is given only. Data not in format
		Sewa-II	Partial	No	Yes	Yes	Governor and stabilizer block diagram has given and data is also shared. As the data is not defined for any standard model, we are checking the data
2	NTPC	Rihand	Yes	Yes	No	Yes	Stabilizer data only for Rihand -1 is given
		Dadri Thermal-2	Yes	Yes	No	No	
		Singrauli	Yes	Yes	No	No	
		Unchahar-1	Yes	Yes	No	No	
		Badarpur	Yes	Yes	No	No	Unit # 1,2,3 of 95 MW each
		Unchahar-4	Yes	Yes	Yes	No	
3	SJVNL	NJPC	Yes	Yes	No	Yes	T"d0, T"q0 & S(1.2)
		Rampur	Yes	No	No	No	
4	UPRVUNL	Parichha	Partial	Yes	No	No	Time constants & Unit#7
		Harduaganj	Partial	No	No	No	Unit#2
		Anpara-1,2,3	Yes	Yes	No	Yes	
		Anpara- 4,5	Yes	Yes	No	Yes	
		Obra	Yes	No	No	No	
		Harduaganj Unit#7 (120 MW)	Yes	No	No	No	Model name has been given (Transfer function diagram of static excitation system also shared) [Governor model not defined]
5	HPGCL	Yamuna nagar	Yes	Yes	No	Yes	Inertia
		Panipat-1,2	Yes	Yes	No	Yes	
		Khedar	Yes	No	No	Yes	
6	PSTCL	Ropar	Yes	Yes	Yes	Yes	
		Rajpura	Yes	Yes	Yes	No	
		Talwandi Saboo	Yes	No	No	No	Model name has been given for excitation system, governor though data has not submiited
7	Karcham	Karcham Wangtoo	Yes	No	No	No	
8	Everest	Malana-2	Yes	No	No	No	
9	AD Hydro	AD Hydro	Yes	No	No	No	
10	Shree Cement	Shree Cement	Yes	No	No	No	
11	Roza-IPP	Roza	Yes	No	No	No	
12	Lalitpur-IPP	Lalitpur	Yes	Yes	No	Yes	
13	RRVPNL		Partial	yes	Partial	No	XI, S(1.0),S(1.2)
14	DTL	Indra Prastha PPS-I	Partial	No	No	No	
		PPS-III	Partial	Partial	Partial	No	Not in any standard model, exhaustive data has given. Checking the data
15	HPPCL	Sainj HEP	Yes	Partial	Partial	Partial	Proposed settings are not given
16	THDC	Tehri	Yes	No	No	No	
		Koteshwar	Yes	Yes	No	No	

Dyanamic Data is still awaited

Annexure-4

S.No.	Utility	Plant Name	Plant Capacity
1	NTPC	Dadri thermal-1	1820
		Unchahar-2,3	1050
		Dadri GPS	830
		Anta GPS	419
		Auraiya GPS	663
		Faridabad GPS (NTPC)	432
		Koldam	800
2	NHPC	Tanakpur-HPS	690
3	NPC	NAPS	440
		RAPS A (NPC)	300
		RAPS- B	440
		RAPS- C	440
4	BBMB	Bhakra HPS	1379
		Dehar HPS	990
		Pong HPS	396
5	IPP	Budhil HPS(IPP)	70
6	PSTCL	Guru Nanak Dev TPS(Bhatinda)	460
		Guru Hargobind Singh TPS(L.mbt)	920
			1320
7	Haryana	Jhajjar(CLP)	1320
8	J&K	Baglihar HPS (IPP)	1240
9	Uttarakhand	All hydro plants	1500

* Small generations of states less than 100MW are not considered here except Delhi & HP.

S.No.	Utility	Plant Name
10	Rajasthan	kota TPS
		Suratgarh TPS
		Chabra TPS
		Dholpur GPS
		Ramgarh GPS
		Barsingsar (NLC)
		Giral LTPS
		Rajwest LTPS (IPP)
		Kalisindh
11	UPPTCL	Panki TPS
		Tanda TPS (NTPC)
		Anpara-C (IPP)
		Bajaj Energy Pvt.Ltd(IPP) TPS
		Anpara-D
		Bara
12	Delhi	Vishnuparyag HPS (IPP)
		Alaknanda
		Rajghat TPS
13	HPSEB	Delhi Gas Turbine
		Rithala GPS
		Bawana GPS
13	HPSEB	Baspa HPS (IPP)
		Malana HPS (IPP)

TEMPERATURE AND HUMIDITY DISPLAY

NR-2

STATION	TEMP °C	HUMD %	RATIO HUMID/TEMP
ABDULLAPUR	19	89	5
AMRITSAR	s 43	72	s 2
BAHADURGARH	28	0	0
FATEHABAD	18	944	52
HISSAR	20	71	4
JALLANDHAR	s 50	s 102	s 2
KAITHAL	16	80	5
KISHENPUR	16	80	5
MALERKOTLA	s 0	57	0
MOGA	18	61	3
NALAGARH	15	63	4
PATIALA_PG	16	67	4
WAGORA	s 0	s 0	0
SONIPAT	-25	24	

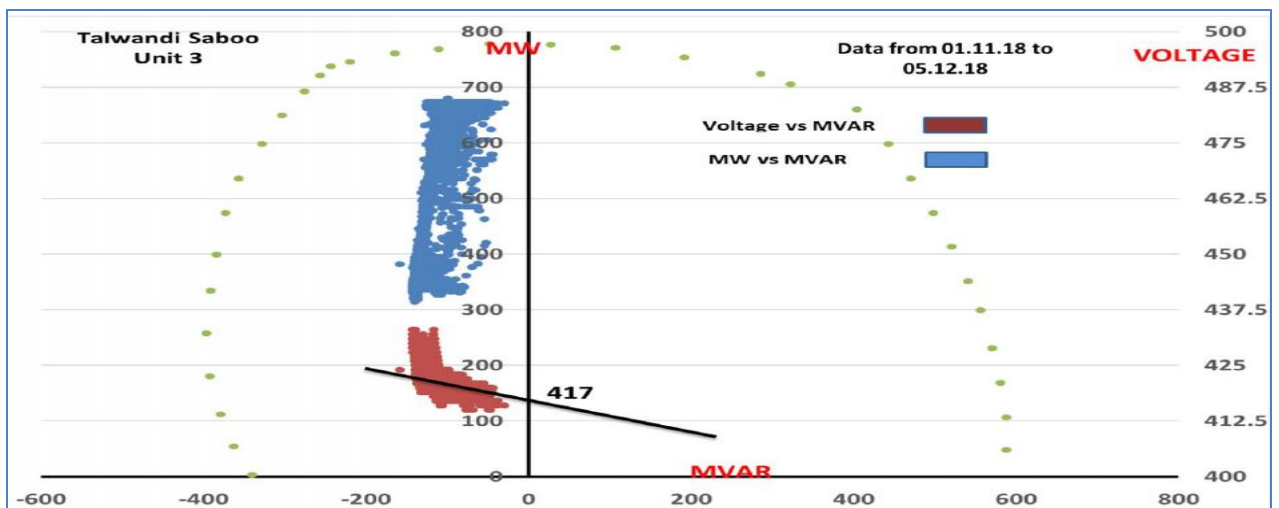
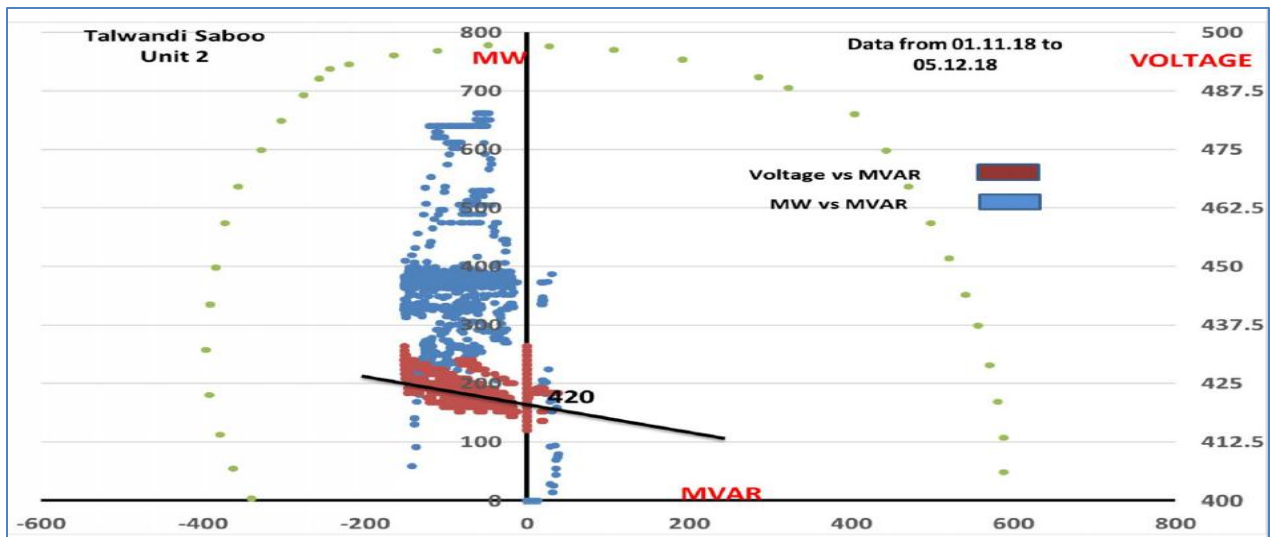
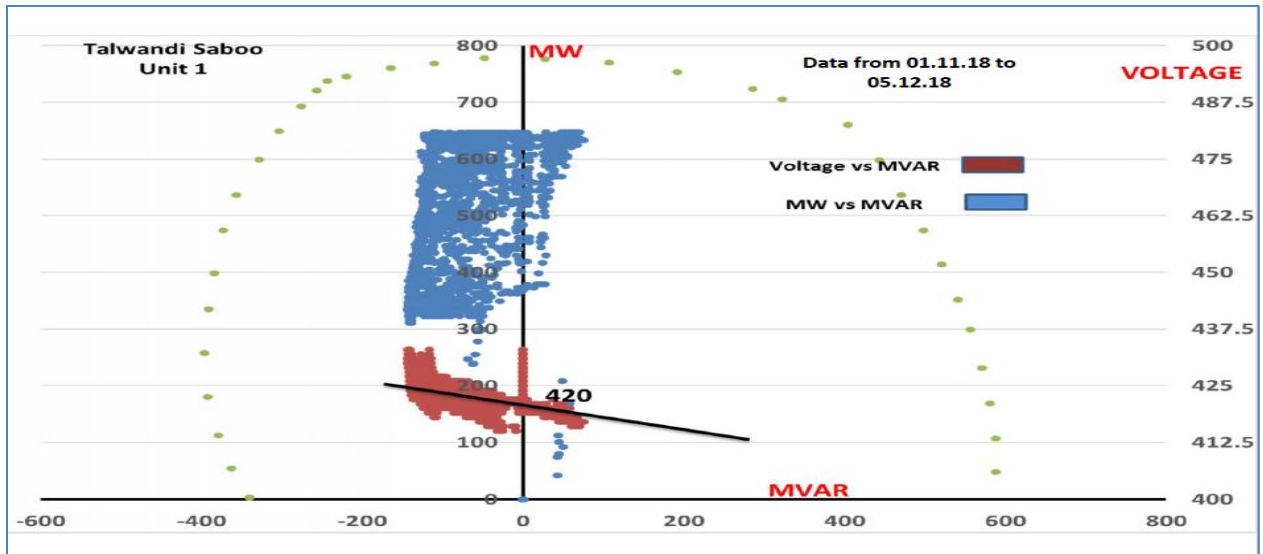
NR-1

STATION	TEMP °C	HUMD %	RATIO HUMID/TEMP
AGRA	17	58	3
ALLAHABAD	15	80	5
ANTA	18	43	2
AURIYA	7	s 0	s 0
BADARPUR	37	49	1
BALIA	9	17	2
BALLABGARH	s 25	s 102	s 4
BASSI	17	43	3
BHIWADI	19	62	3
DADRI HVDC	18	55	3
GORAKHPUR	19	51	3
KANPUR	18	75	4
LUCKNOW_PG	s 6	s 0	s 0
MAINPURI	38	77	2
MANDOLA	19	65	3
M'BAGH	25	51	2
MEERUT	14	77	5
RAIBAREILLY	38	s 0	s 0
RIHAND (HVDC)	s 22	s 94	s 4
RIHAND_NT	18	49	3
SINGRAULI	19	40	2
VINDHYACHAL	18	46	3

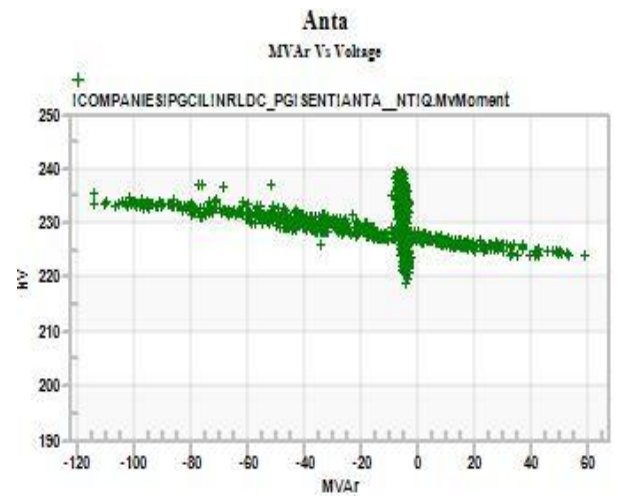
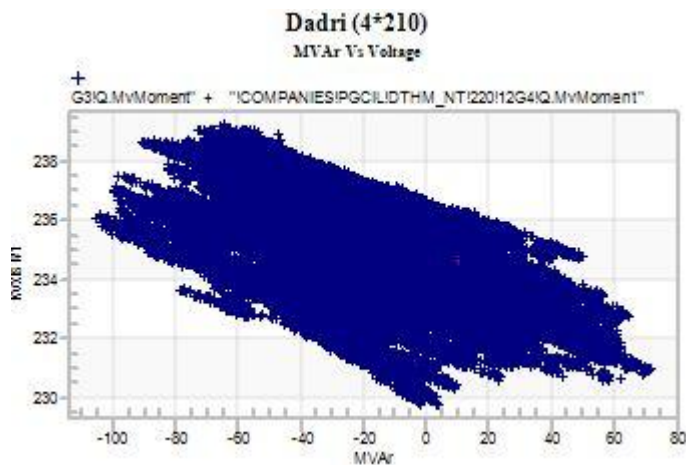
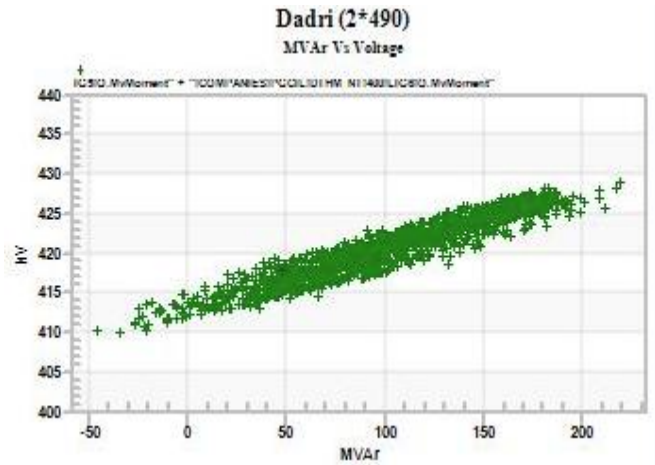
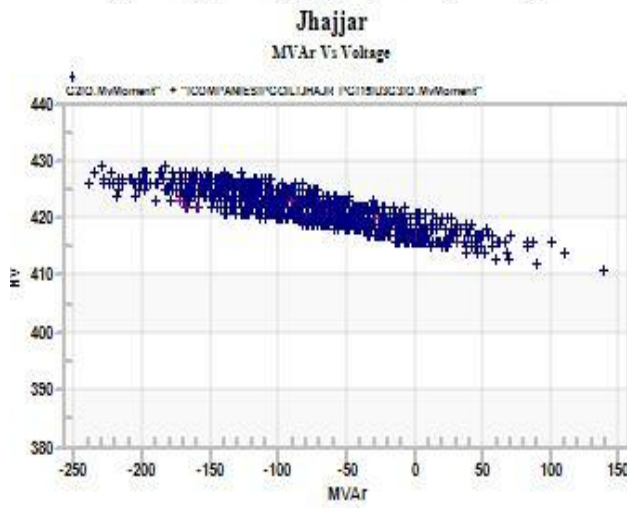
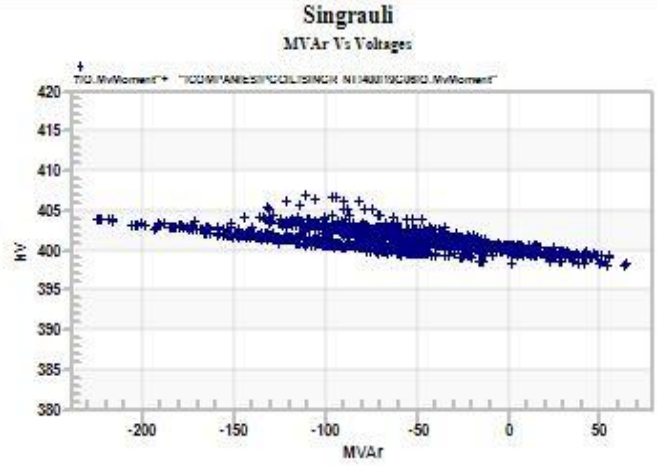
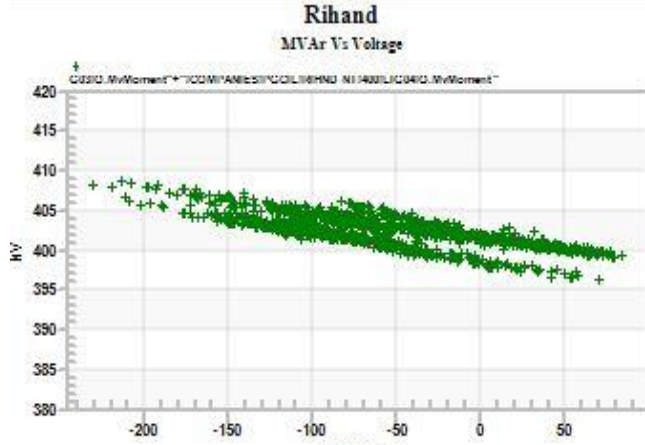
STATES

STATION	TEMP °C	HUMD %	RATIO HUMID/TEMP
ABLOWEL	16	36	
BADDI	x 33	x 0	
BHIWANI	s 5	s 10	
BWANA	s -30	58	s -2
DADRI	s 28	s ***	
GLADNI	s 0	s 0	
HEERAPURA	s 26	s 27	
JUTOGH	10	s 0	
LUCKNOW	s 0	s 7	0
MINTOROAD	20	48	
MORADABAD	x 18	x 70	
NARWANA	s 33	s 0	
PANIPAT	17	69	
RATANGARH	s 11	s 0	
PANIPAT - BB	25	s 99	

S.No	Element Name	Type	Voltage Level	Owner	End-1	MVAR Rating at End-1	Switchable (with additional CB)	Provision to use as Bus Reactor (position of line isolator)	Confirmation by Utility for usage as Bus reactor	End-2	MVAR Rating at End-2	Switchable (with additional CB)	Provision to use as Bus Reactor (position of line isolator)	Confirmation by Utility for usage as Bus reactor
1	Fatehabad 765(UP)-Lalitpur TPS(LPGCL) 1 & 2	Line	765 kV	UPPTCL	Fatehabad	3*80	---	YES	---	Lalitpur	3*110	YES	YES	YES
2	Kurukshetra(PG)-Nakodar(PSEB)	Line	765 kV	PGCIL	Nakodar	50	---	YES	---	Kurukshetra	---	---	---	---
3	Agra(PG)-Auraiya(NTPC) 1 & 2	Line	400 kV	PGCIL	Agra	50	---	---	---	Auraiya	---	---	---	---
4	Agra-Jaipur South-1 & 2	Line	400 kV	PGCIL	Agra	50	---	---	---	Jaipur South	50	---	YES	YES
5	Chamera pool-Jalandhar 1 & 2	Line	400 kV	PGCIL	Chamera-1 HEP	50	---	---	---	Jalandhar	---	---	---	---
6	Kishenpur-Moga	Line	400 kV	PGCIL	Kishenpur	63	---	YES	---	Moga	63	---	YES	---
7	Jalandhar-Hamirpur	Line	400 kV	PGCIL	Jalandhar	---	---	---	---	Hamirpur	50	---	---	---
8	Fatehabad-Moga	Line	400 kV	PGCIL	Fatehabad	63	---	YES	---	Moga	---	---	---	---
9	Agra-Sikar 1 & 2	Line	400 kV	PGCIL	Agra	50	---	---	---	Sikar	50	YES	YES	YES
10	Agra(UP)-Unnao	Line	400 kV	UPPTCL	Agra(UP)	50	---	---	---	Unnao	50	---	---	---
11	Vishnuprayag-Muzaffarnagar	Line	400 kV	UPPTCL	Vishnuprayag	50	---	---	---	Muzaffarnagar	50	---	---	---
12	Srinagar-Muzaffarnagar	Line	400 kV	UPPTCL	Srinagar	---	---	---	---	Muzaffarnagar	50	---	---	---

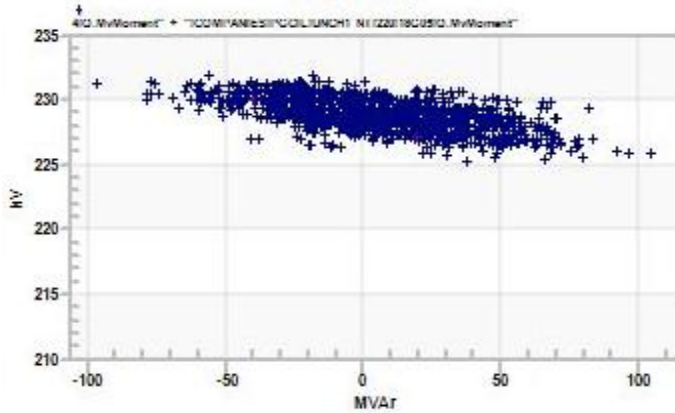


MW Vs MVar plots for Generating Stations



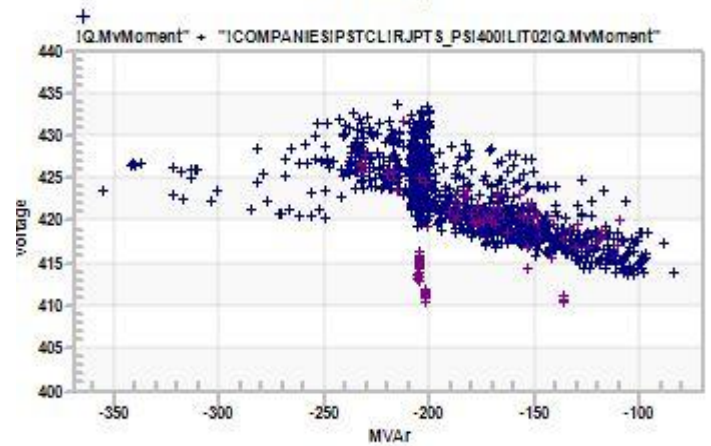
Unchahar

MVAr Vs Voltage



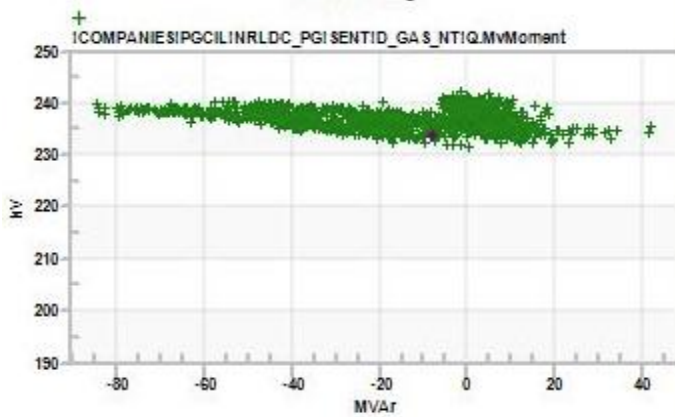
Rajpura

MVAr Vs Voltage



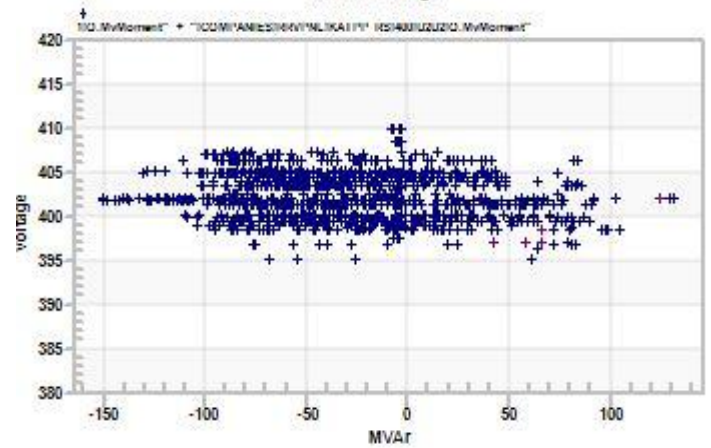
Dadri Gas

MVAr Vs Voltage



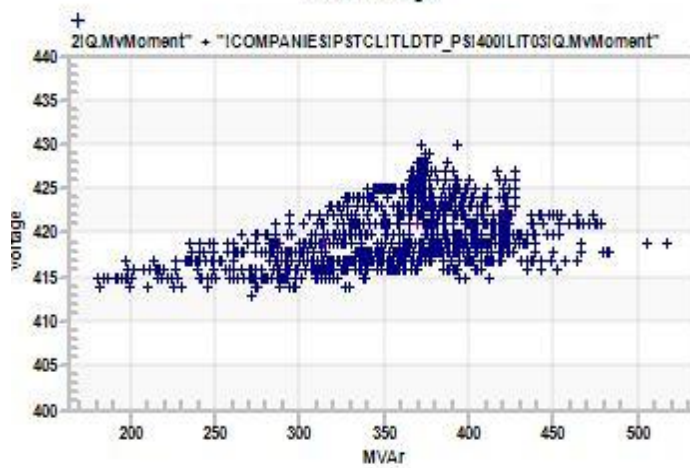
Kalisindh

MVAr Vs Voltage



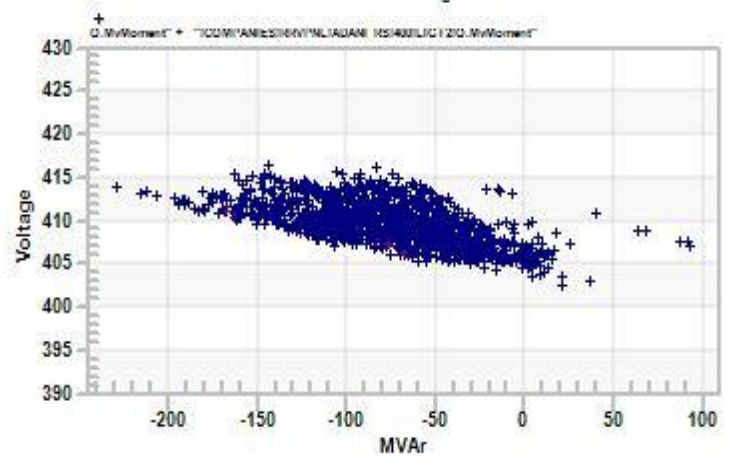
Tahwandi Saboo

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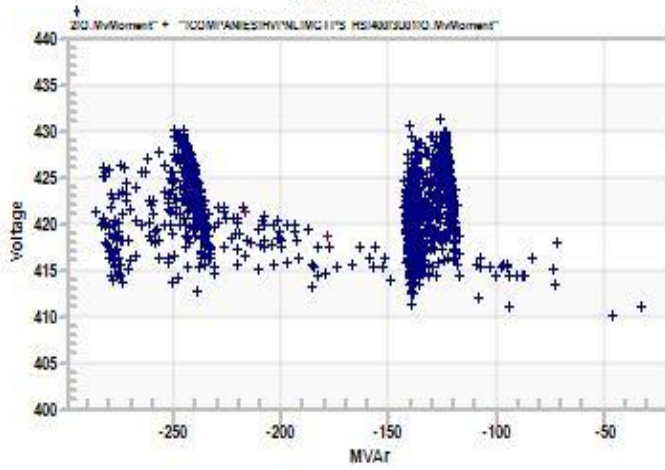
Kawai

MVAr Vs Voltage



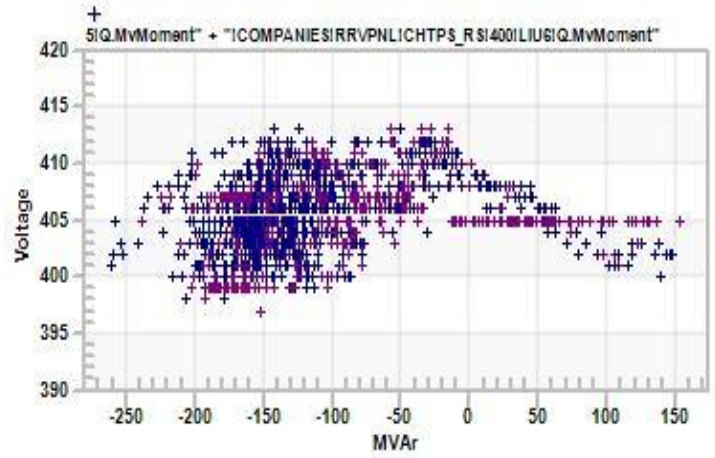
MGTPS

MVAr Vs Voltage



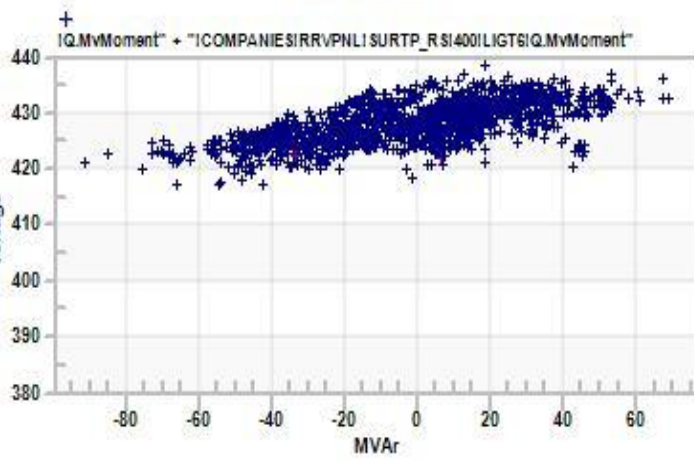
CHhabra

MVAr Vs Voltage



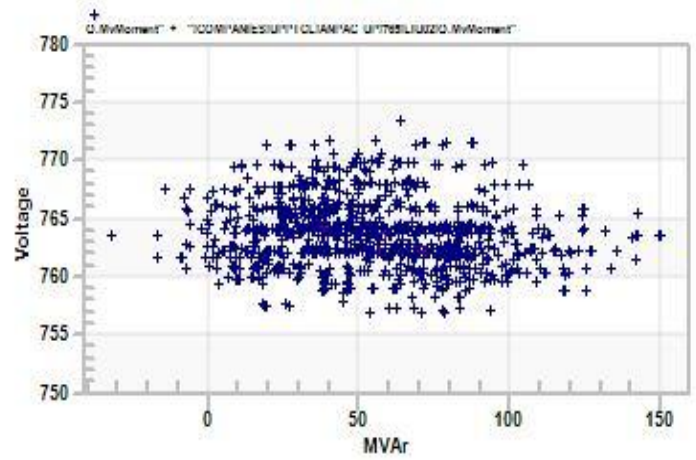
Suratgarh

MVAr Vs Voltage



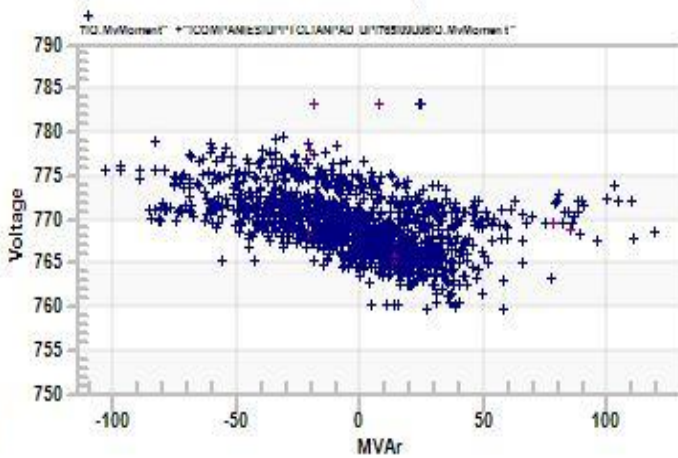
Anpara C

MVAr Vs Voltage



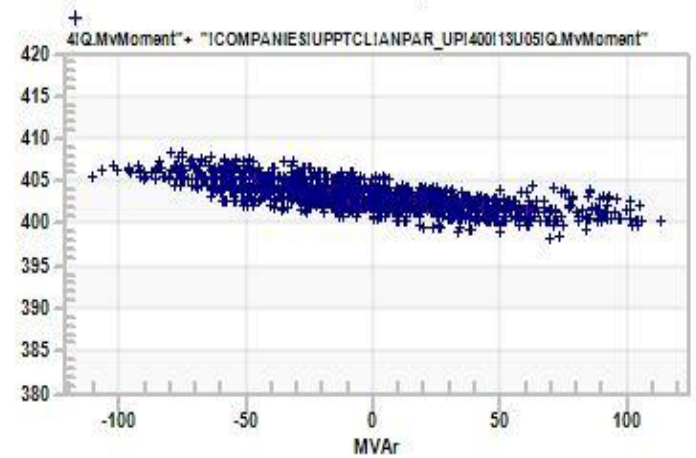
Anpara D

MVAr Vs Voltage



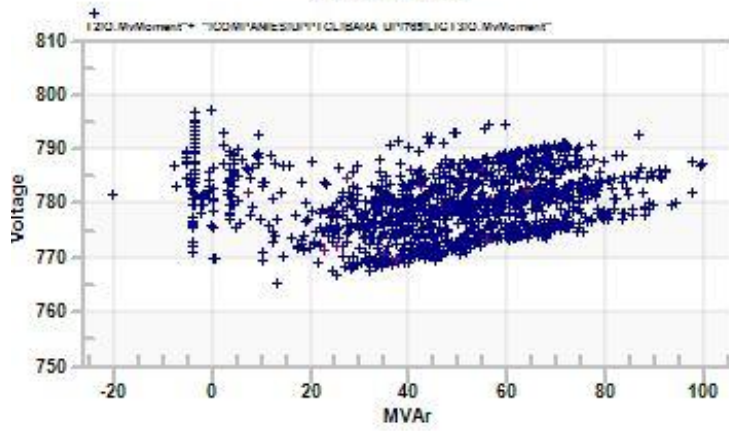
Anpara

MVAr Vs Voltage



Bara

MVar Vs Voltage



Annexure-8

S. NO.	Element Name	Outage Date	Outage Time	Reason/Remarks
1	765 kV Meerut(PG)-Moga(PG)	11-Nov-18	6:51	Problem in line reactor CB at Moga end. As per PMU, No fault observed.
		14-Nov-18	9:11	R-N fault. As per PMU, R-N fault, unsuccessful auto-reclosing observed.
		14-Nov-18	13:29	PLCC maloperation. As per PMU, No fault observed.
		14-Nov-18	14:48	Voltage selection relay of LR mal-operated. As per PMU, No fault observed.
		18-Nov-18	19:50	Details awaited. As per PMU, No fault observed.
2	400 kV Aligarh(UP)-Panki(UP)	6-Nov-18	18:13	B-N fault, 498 km from Panki(UP) end. As per PMU, Y-N fault occurred and cleared in 5000ms.
		20-Nov-18	9:51	DT received at Aligarh(UP) end. As per PMU, No fault observed.
		26-Nov-18	12:45	Tripped on High voltage. As per PMU, No fault observed.
3	400 kV Anpara(UP)-Obra(UP)-Sultanpur(UP)	11-Nov-18	21:39	R-N fault. As per PMU, R-N fault occurred, no auto-reclosing observed.
		21-Nov-18	8:05	R-N Fault ,251km From Anpara(UP) end. As per PMU, R-N fault occurred and delayed clearance with no auto-reclosing observed.
		23-Nov-18	13:38	R-N fault, 128.4KM from Sultanpur(UP) end. As per PMU, R-N fault occurred, no auto-reclosing observed.
4	400 kV Azamgarh(UP)-Gorakhpur(UP)	3-Nov-18	7:49	B-N Fault,50.01km from Gorakhpur(UP) end. As per PMU, B-N fault occurred, no auto-reclosing observed.
		7-Nov-18	13:31	B-N fault, 48.1 KM from Gorakhpur(UP) end. As per PMU, B-N fault occurred, no auto-reclosing observed.
		16-Nov-18	14:45	B-N fault. As per PMU, B-N fault occurred, no auto-reclosing observed.
5	400 kV Bareilly(UP)-Unnao(UP) ckt-1	10-Nov-18	4:01	Over voltage. As per PMU, No fault observed.
		21-Nov-18	0:30	Y-N fault. As per PMU, Y-N fault occurred, no auto-reclosing observed.
		27-Nov-18	10:11	PLCC mal function. As per PMU, No fault observed.
6	400 kV Chamera II(NHPC)-Kishenpur(PG)	2-Nov-18	3:17	Over voltage. As per PMU, line tripped on overvoltage.
		3-Nov-18	12:35	Y-N Fault. As per PMU, Y-N fault occurred, no auto-reclosing observed.
		26-Nov-18	21:07	SF6 gas monitoring system mal-function. Tripped from Chamera-II(NHPC) end only. As per PMU, No fault observed.
7	400 kV Kishenpur(PG)-New Wanpoh(PG) ckt-1	4-Nov-18	9:45	R-B Fault , 132km from Kishenpur(PG) end. As per PMU, R-B fault observed.
		5-Nov-18	22:19	Y-N fault, 95.71km from Kishenpur(PG) end. As per PMU, Y-N fault occurred and cleared in 520ms, another fault observed after 1700ms.
		14-Nov-18	9:14	R-B fault. As per PMU, R-N fault, unsuccessful auto-reclosing observed.

Event (As reported)	Generation Loss(MW)	Load Loss(MW)	Category as per CEA Grid Standards	Energy Unserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt status		Fault Clearance time (in ms)
					within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
A problem occurred in U#1 GIS breaker compartment caused Bus bar protection operation at 220kV Chamera III(NHPC) leading to tripping of 220kV Chamera III(NHPC)-Chamera pool(PG) ckt-2 & 220kV Budhil(Lanco)-Chamera III(NHPC) ckt-1. As per PMU, B-N fault is observed. SCADA data at 220kV Chamera III(NHPC) was suspected during the incident.			GI-2			Y(NHPC)	Y(PG),Y(Greenko)		Y(NHPC)	Y(PG),Y(Greenko)	Y(NHPC)		80ms
400kV Kishenpur(PG) -New Wanpoh(PG) ckt-4 tripped on Phase to earth fault(B-N fault), 111 kms from Kishenpur(PG) end. At the same time, 220kV Salal(NHPC)-Kishenpur(PG) ckt-3 & ckt-4 also tripped. As per PMU, B-N fault is observed. Another B-N fault observed after 1 sec with Delayed clearance of 680ms.			GI-2			Y(NHPC)	Y(PG)		Y(NHPC)	Y(PG)		Y(PG)	80ms
400kV New Wanpoh(PG) -Kishenpur(PG)-ckt-1 & 2, 400kV New Wanpoh(PG) -Wagoora(PG)-ckt-1 & 2 tripped on R-B Fault ,132km from Kisenpur(PG) end. As per PMU, multiple R-B fault observed in the system. In antecedent conditions, 400kV New Wanpoh(PG) -Wagoora(PG)-ckt-1 & 2 carrying 135MW each and 400kV Kishenpur(PG)-New Wanpoh(PG) ckt-1 & 2 carrying 135 MW each.			GI-2		Y(PG)			Y(PG)				Y(PG)	80ms
B-N fault occurred resulted in tripping of all 400kV ckts from Aligarh(UP) along with both 400/220kV ICTs. 400kV Muradnagar-Ataur, 765/400kV ICT #1 at Mainpuri(UP) and 400kV Sikandrabad-G.Noidea also tripped. 400kV Sikandrabad-Aligarh hand tripped.		200	GD-1	0.16		Y(UP)			Y(UP)		Y(UP)		4000ms
400kV Ballabgarh(PG)-Tughlakabad(PG)-2 and Ballabgarh(PG)-Nawada(HVPLN) tripped on over voltage. As per PMU, no fault observed.			GI-2			Y(PG)	Y(Har),Y(Delhi)		Y(PG)	Y(Har),Y(Delhi)		Y(PG)	NA (Over voltage)
Due to fault and subsequent bus bar protection operation at 220kV Sakatpura, cascade tripping occurred at 220kV KTPS and 220kV Dyra and Rana Pratap Sagar. All running units viz. Unit #2, #3, #4, #5, #6 & #7 also tripped at KTPS.	700	250	GD-1	0.06	Y(Raj)		Y(NTPC)		Y(Raj)		Y(Raj)		1000ms
315 MVA ICT 1 at 400/220kV Nalagarh(PG) tripped due to LBB protection operation of 220kV Mohali(Pun)-Nalagarh(PG) ckt-2. As per PMU, R-N fault is observed. In antecedent condition, 315 MVA ICT 1 & 220kV Mohali(Pun)-Nalagarh(PG) carrying 119 MW & 45 MW respectively.			GI-2		Y(PG)		Y(PUN), Y(HP)	Y(PG)		Y(PUN), Y(HP)		Y(PG)	80ms

Event (As reported)	Generation Loss(MW)	Load Loss(MW)	Category as per CEA Grid Standards	Energy Unserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt status		Fault Clearance time (in ms)
					within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
Bus bar protection operated at 220kV Khodri(UTT) due to snake climbed on 220kV R-Ph CT resulting in tripping of 220kV Sarsawa(UPPTCL) -Khodri (UPCL) & 220kV Khodri(UTT)-Saharanpur(UP) ckt-2. As per PMU, R-N fault with delayed clearance is observed. In antecedent conditions, 220kV Khodri(UTT)-Saharanpur(UP) ckt-2 carrying 135 MW.	162		GD-1				Y(UP),Y(Utt)				Y(UP),Y(Utt)	Y(Utt)	400ms
220kV Bhiwadi(PG)-Kushkhara(RVPLN) ckt-2 tripped due to broken jumper at Tower No. 20. At the same time, 220kV Bhiwadi(PG)-Bhiwadi(RVPLN) ckt-2, 220kV Bhiwadi(PG)-Mau(HVPLN) and 315 MVA ICT 1 & ICT 3 also tripped. As per PMU, B-N fault is observed. Voltage drop also observed in R & Y phase. In antecedent conditions, 315 MVA ICT 1 & ICT 3 carrying 150 MW & 140 MW respectively.			GI-2		Y(PG)		Y(Raj),Y(Har)	Y(PG)			Y(Raj),Y(Har)	Y(PG)	80ms
220kV Napp(NPC)-Simbholi(UP) and 220kV Meerut(PG)-Simbholi(UP) tripped at 1123Hrs. As per PMU, B-N fault with delayed clearance is observed. In antecedent conditions, 220kV Napp(NPC)-Simbholi(UP) carrying 101 MW.			GI-2			Y(UP)	Y(PG), Y(NPC)		Y(UP)		Y(PG), Y(NPC)	Y(UP)	1200ms
Due to Y-phase CT blast of Dadri (NTPC) line at 400 kV Greater Noida (UP), 400kV Dadri(NTPC)-400kV Greater Noida(UP) & 400kV Greater Noida(UP)-765kV Greater Noida(UP) ckt-2 tripped along with 500 MVA ICT-5, 315 MVA ICT-1 & 2. At the same time, 800 kV Dadri(NTPC)-Panipat(BMB) ckt-2 also tripped from Dadri(NTPC) end. As per PMU, R-N fault is observed. In antecedent conditions, 500MVA ICT5, 315 MVA ICT1 & 315 MVA ICT2 carrying 101MW, 62MW & 67MW respectively.			GI-2			Y(UP)	Y (PG), Y(NTPC)		Y(UP)		Y (PG), Y(NTPC)	Y(UP)	80ms
500MVA 400/220kV ICT 1 & ICT 2 at 400kV Aaur(UP) tripped due to Bus bar protection maloperation. As per PMU, No fault is observed in the system. In antecedent conditions, 500MVA ICT 2 carrying 72 MW.			GI-2				Y(UP)				Y(UP)	Y(UP)	NA
400kV Rajpura(Pun)-Rajpura(TH)(Pun) ckt-2 and 400kV Rajpura(Pun)-Dhuri(Pun) ckt-1 tripped while doing testing work. As per PMU, No fault observed in the system. In antecedent condition, 400kV Rajpura(Pun)-Rajpura(TH)(Pun) ckt-2 & 400kV Rajpura(Pun)-Dhuri(Pun) ckt-2 carrying 274 MW & 86 MW respectively.			GI-2			Y(Pun)			Y(Pun)			Y(Pun)	NA
400kV Banda(UP)-Orai(UP) ckt-1 tripped on R-N fault. At the same time, 400 kV Bus 2 and 315 MVA ICT 1 at 400/220kV Orai(UP) also tripped. As per PMU, Y-N fault is observed. In antecedent condition, 315 MVA ICT 1 carrying 123 MW and 400kV Banda(UP)-Orai(UP) ckt-1 carrying 75 MW.			GI-2				Y(UP)				Y(UP)	Y(UP)	80ms

Northern Regional inter regional lines tripping for Nov-18

Annexure-10

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	220kV Sakatpura(RRVPNL)-Badod(MPPTCL)	MPPTCL/RRVPNL	21-Nov-18	2:48	Nil	R-N Fault ,27.6km from Sakatpura.Line charged at 03:28 hrs but line didn't hold.	NA	21-Nov-18	16:45	NA	NO	NO		Details of tripping yet to be received.	From PMU, two R-N fault observed within reclaim time.
2	400kV Allahabad(PG)-Sasaram(PG)^A	POWERGRID	27-Nov-18	13:26	Nil	Y-B Fault , 227.2km from Allahabad end.	GI-2	27-Nov-18	17:14	NO	NO	YES (After 24hrs)			Information received from NR end. From PMU, Y-B fault observed. From DR, line tripped on Y-B fault. Time synchronisation of DR to be looked into.
3	400kV Varanasi(PG)-Sasaram(PG)	POWERGRID	27-Nov-18	13:26	Nil	Y-B Fault, 139km from Varanasi end.	GI-2	27-Nov-18	15:33	NO	NO	YES (After 24hrs)			Information received from NR end. From PMU, Y-B fault observed. From DR, it seems line tripped on carrier aided Z-2 tripping.

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.

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

Reporting of Violation of Regulation for various issues for above tripping

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

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