सत्यमेव जयते

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

सं.-उक्षेविस/प्रचालन/106/01/2019/Temp दिनांक: 14/01/2019

विषय: **प्रचालन समन्वय उपसमिति की 155वीं बैठक का कार्यसूची।**
Subject: **Agenda of 155th OCC meeting.**

प्रचालन समन्वय उप-समिति की **155**वीं बैठक **17-01-2019** 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 ।

155th meeting of the Operation Co-ordination sub-committee will be held on **17-01-2019** at **10:30am** at NRPC Secretariat, New Delhi. The agenda of this meeting has been up-loaded 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.

Workshop on System Restoration Procedure will be organized by NRLDC on 16.1.2019(First half) .

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(उपेन्द्र कुमार)
अधीक्षण अभियंता(प्रचालन)

सेवा में : प्रचालन समन्वय उपसमिति के सभी सदस्य ।
To: All Members of OCC

Agenda for the 155th Meeting of the Operation Coordination Sub-Committee (OCC) of NRPC to be held on 17-01-2019

Date & time: 17-01-2019 at **10.30 hrs.**
Venue: NRPC Secretariat, New Delhi

Part-A NRPC

1. Confirmation of Minutes:

The minutes of the 154th OCC meeting held on 17.12.2018 and 18.12.2018 at New Delhi were issued vide letter of even number dated 03.01.2019.
The sub-committee may kindly confirm the Minutes.

2. Review of Grid operations of December, 2018:

2.1 Supply Position (Provisional) for December, 2018

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

December							
State	Req/ Avl	Anticipated (MU)	Actual (MU)	%age Variation	Anticipated (MW)	Actual (MW)	%age Variation
Chandigarh	Avl	120	105	-12.5	315	251	-20.3
	Req	110	105	-4.5	235	251	6.8
Delhi	Avl	3550	1998	-43.7	5750	4417	-23.2
	Req	2020	1998	-1.1	4100	4417	7.7
Haryana	Avl	5460	3972	-27.3	8240	6865	-16.7
	Req	3900	3972	1.8	7282	6865	-5.7
H.P.	Avl	845	857	1.4	1475	1700	15.3
	Req	847	871	2.8	1474	1700	15.3
J&K	Avl	820	1506	83.7	1910	2819	47.6
	Req	1730	1853	7.1	2810	3524	25.4
Punjab	Avl	5114	3761	-26.5	7886	6448	-18.2
	Req	3630	3761	3.6	6460	6448	-0.2
Rajasthan	Avl	8071	7229	-10.4	11326	13276	17.2
	Req	7107	7231	1.7	12371	13276	7.3
U.P.	Avl	9300	8446	-9.2	15800	14706	-6.9
	Req	9300	8502	-8.6	16200	14706	-9.2
Uttarakhand	Avl	1040	1156	11.2	1940	2158	11.2
	Req	1300	1159	-10.8	2130	2158	1.3

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 December, 2018 in terms of Energy Requirement for Uttarakhand, J&K, & UP and in terms of Peak Demand for Chandigarh, Delhi, HP, Haryana, J&K, Rajasthan & 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 November, 2018 is placed on NRPC website. (www.nrpc.gov.in/meetings/occ.html)

2.3 Detailed presentation on grid operation during December, 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 February, 2019 will be discussed on 16.01.2019 at NRPC office, New Delhi.

3.2. Outage Programme for Transmission Elements.

The proposed Outage programme of Transmission lines for the month of February, 2019 will be discussed on 16.01.2019 at NRPC office, New Delhi.

4. Planning of Grid Operation:

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

The Anticipated Power Supply Position in Northern Region for February, 2019 is enclosed at **Annexure 4.**

SLDCs are requested to inform their updated estimate of power supply position for February, 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 utilities are requested to confirm if the process of Scheduling is being done as per Merit Order Despatch and in case of variations the reasons may be highlighted.

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.

6.2 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 last week of December 2018 with commissioning schedule of 2 years from the issue of LOA.

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 is requested to update the progress of the same from CTU**.**

6.3 DTL:

DTL has informed that as per the revised approval of SCPSPNR 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**.**The updated status as submitted in the meeting by DTL is placed at Annexure 6 of the MOM of the 154th OCC meeting.

The information as updated by DTL in 154th OCC meeting is placed at **Annexure 6.**

6.4 PSTCL:

Technical bid for 400 kV bus reactors at Dhuri substation has been opened and Price bid has been put on hold due to pending PSDF approval. As regards 220 kV bus reactors at Dhuri and Nakodar substation, tender has been opened on 15-06-2018 (technical bid) & is Price bid opening has been put on hold due to PSDF approval. DPR for installation of 400 kV and 220 kV bus reactors has been submitted for PSDF funding. Order shall be placed after securing the approval for PSDF funding.

6.5 Uttarakhand:

125 MVAR reactors at Kashipur: Technical bid has been opened and is under evaluation.

6.6 Rajasthan:

The DPR for 3 Nos. each of 25 MVAR reactors (Akal, 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.

Rajasthan representative stated that the PSDF approval was awaited for 25 MVAR reactors (Akal, Bikaner & Suratgarh) i.e. total 75 MVAR reactors. Representative of NPC in the meeting informed that the same has been approved by the Appraisal committee and the minutes of the meeting shall be issued shortly.

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All utilities are requested to update.

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

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.

7.1 **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.

7.2 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.

7.3 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.

7.4 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.

7.5 **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.

7.6 **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.

7.7 **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.

7.8 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 of the Agenda of the 154th OCC meeting, for reference.

7.9 **154th OCC meeting**: SE (O) stated that the matter is being pursued with the top management of the DISCOMs (refer Annexure – Agenda item no 7 of the Agenda of the 154th OCC meeting) & follow-up is also being done. He stated that all SLDCs should take up the issue with their respective DISCOMs for submission of the data as desired at the earliest

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 top 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.

8.10 **154th OCC meeting:** POWERGRID submitted the details (Annexure 8 of the MOM of the 154th OCC meeting) of the issues/ difficulty which would be faced while completing the phase nomenclature mismatch work. POWERGRID intimated that the site visit had been done by their site officials.
MS, NRPC stated that the completion of the phase mismatch issue work is very important and it should be completed during the lean period.

After deliberations it was decided that a joint visit by POWERGRID, BBMB, NRLDC and NRPC would be conducted on 15/01/2019 so as to figure out the difficulties that would be faced in order to rectify the issue as listed out by POWERGRID.

POWERGRID 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 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 were again requested to update the desired information in soft copy in excel format on a regular basis. All the utilities (except PSPCL) were requested to 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 were requested to 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.

10.5 **154th 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.**

NTPC was requested also to intimate the progress of the FGD installation. The updated status as received is enclosed at ANNEXURE 10 of the MOM of the 154th OCC meeting. MS NRPC stated that the issue is being regularly monitored by the TRM division of CEA

NTPC has given the updated status placed at Annexure 10.

All other utilities are requested to update as per the revised phasing plan that was attached at Annexure-10(A) of the MOM of the 152nd OCC meeting.

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.

11.2 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.

11.3 **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."

11.4 **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 it had 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.

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.

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.

11.5 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.

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

152nd OCC Meeting: RRVPNL 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.

11.9 154th OCC meeting: Representative of Rajasthan informed that petition to be filled to SERC was put up for approval but as per Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013 B.3 which states that "The generating company and the licensee of the electricity system to which the generating station is connected shall mutually discuss and agree on the measures which can be taken to meet the standards specified in (B 1) and (B2) subject to technical feasibility", management has intimated that matter would be taken up by STU.

Director (GM), CEA told that compliance of not only CEA regulations but also CERC order needs to be ensured. He requested Rajasthan to refer CERC petition no. 420/MP/2014 for

clarifications, if any.

MS, NRPC told that CERC has directed SLDCs to prepare quarterly reports and submit it to RPCs and 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. Accordingly, he asked SLDCs to submit the quarterly reports and report non-compliance to SERC. He requested SLDC to file to petition at the earliest and implement NRPC's decision of not scheduling non-compliant WTGs.

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:

POWERGRID was assured of all possible support by the utilities and was requested to go ahead with the decision of 41st NRPC of utilizing the CB signals from both the end in the logic of SPS so as to ensure more robust and reliable operation of the scheme.

In 149th OCC, 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.

In 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)

In the **37th TCC and 40th NRPC meeting** recommended for convening a separate meeting comprising members from NRLDC, NRPC Secretariat and POWERGRID for reviewing revised logic of the scheme presented by POWERGRID in 140th OCC meeting. A meeting for reviewing the logic of the scheme was held on 07th November 2017 and scheme was revised and finalized.

Since OPGW has now been laid, POWERGRID agreed for utilizing the signals from circuit breaker (CB Open/ CB close) of both the ends for SPS logic so as to negate the chances of mis-operation/ mal-operation of the SPS.

POWERGRID had informed that the circuit breaker (ON/ OFF) signal was being utilized from Agra end in the logic. However, that from Gwalior end was not being utilized as the purpose of the scheme was being served by utilizing the CB signal from one end.

Representative of NRLDC stated that even if the scheme was functioning properly in normal circumstances there are chances that the scheme may not operate in case of breaker lockout from Agra end and the line getting tripped from Agra end.

NLDC also stressed on utilizing CB signals from both the ends as Agra-Gwalior is an important inter-regional transmission line and its implementation will make the scheme even more reliable.

POWERGRID agreed to implement the logic utilizing the CB signal from both the ends as per the decision of TCC. NRPC had concurred with the deliberations of TCC.

POWERGRID had informed that the work at Agra end was in progress but for the implementation at Gwalior end the issue needs to be taken up and highlighted with WRPC also

147th OCC Meeting:

POWERGRID representative stated that their management has enquired about the recovery of cost that will be incurred on implementation of the scheme. Representative of POWERGRID was informed that a decision regarding the same has already been taken in 129th OCC meeting and thereafter ratified in the 35th TCC and 39th NRPC meeting to book the cost of the implementation of revised SPS in some other ongoing project/work. POWERGRID was advised that the decision of NRPC to be implemented at the earliest as this is an important IR line between NR & WR.

NRLDC informed that average load now prevailing on the feeders approved for SPS might have changed and these feeders might not have remained radial and as such the list of feeders needs to be reviewed.

NRPC Secretariat has written a letter dated 28.5.18 regarding this issue to ED/ NR-III, POWERGRID (was placed at Annexure 12A of the minutes of the 148th OCC meeting). This issue has also been taken up with WRPC for implementation at Gwalior end by deliberating in their OCC/ RPC meetings. A letter in this regard had been written to WRPC & the reply received thereof was placed at Annexure 12A of the minutes of the 148th OCC meeting.

148th OCC Meeting:

POWERGRID representative intimated the Sub-Committee that for implementation of the scheme due coordination with the concerned States was required.

MS, NRPC requested each SLDCs to extend cooperation & provide all required support to Power Grid for early execution of the work.

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.

MS, NRPC requested POWERGRID to go ahead with the decision of 41st NRPC to utilize the CB signals from both the end in the logic of SPS so as to ensure more robust and reliable operation of the scheme. He further requested POWERGRID to not to cause any further delay in the implementation of the scheme as such delay may lead to some unforeseen catastrophic incident for the grid.

Representative of POWERGRID stated that the changed logic for utilizing CB signal from Gwalior end shall be provided to them so that the same may be incorporated in the SPS logic.

Representative of NRLDC informed the committee that the logic had already been provided to POWERGRID and there was no need of again discussing the same. POWERGRID was advised to go ahead as per the decision of NRPC and complete the scheme in time.

149th OCC meeting:

MS NRPC stated that in the last OCC meeting the Name of the nodal officers for coordinating with Power grid was requested which have not been received till date. He added that as per directions of CERC a report has to be submitted within 15 days on the status of implementation of the scheme. Power grid stated that in the last week of July the mock testing can be done.

Further, on it was added by MS, NRPC that representative of CERC should also be called.SE (O) NRPC stated that the actual testing on the revised scheme be planned in the month of November in coordination with WRPC.

150th OCC meeting:

MS, NRPC apprised the Committee that mock testing for the Revised 765 kV Agra- Gwalior SPS is to be carried out after integration of additional 1000 MW load shedding and Hon'ble CERC has been intimated accordingly. He asked POWERGRID to complete the work at the earliest.

Representative of POWERGRID again requested for the Nodal Officers from the states as problems were being faced while working at the substation of state utilities.

It was informed that names of nodal officers have been requested again and again from the states but only U.P. has intimated the coordinator. MS, NRPC further asked representative of the concerned states present in the OCC to be coordinator for resolving any problems encountered by POWERGRID at substations of respective utilities. Accordingly, the following officers were nominated as Nodal officer:

Haryana – Shri. N. K. Makkar, EE, HVPNL
Punjab- Shri. Akshay Garg, ASE, PSTCL
Rajasthan – Shri. Kamal Patidar, EE, Rajasthan (SLDC)
Delhi – Shri. Loveleen Singh, GM, DTL

151st OCC meeting:

POWER GRID representative updated that the work for Delhi, UP & Haryana is completed. He further added that the work at 7 locations in Punjab & 6 locations in Rajasthan is remaining which is targeted to be completed by October 2018.

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.

40th TCC & 42nd NRPC meeting:

In the 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.

154th OCC meeting: POWERGRID representative informed that modifications related to CB ON/OFF status have been completed at both Agra and Gwalior end. He told that DTPC installation has been completed and the end to end testing has also been done for 20 links out of 21. He further stated that end to end testing is remaining only for Bhiwadi-Heerapura-Bhilwara-Chittorgarh link. He further requested the concerned states to terminate the links at the designated feeder on which the load shedding is required to be done. He told that end connections with Trip relay of the feeder to be done States. He assured that as targeted the mock testing will be planned to be carried out in 01/2019. Representative of NRLDC requested POWERGRID to coordinate with states and keep NRPC/NRLDC in loop for early completion of the scheme. MS NRPC requested POWERGRID to coordinate with nodal officers of the concerned states for early termination of the links at their end.

POWERGRID may 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 40days. 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

154th OCC meeting: UPRVUNL updated that all the hardware required has been arranged at site. BHEL Engineer will be available at site from 22/12/2018 to finalize the design of logic in 15 days. Thereafter implementation will be done in next 7-8 days. The implementation of logic is expected to be completed by 1/2019

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 Km) & 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.

154th OCC meeting: RRVPNL representative stated that the tender would be done by the end of the month.

RVPNL 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. State wise 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.

154th OCC meeting: RRVPNL representative stated that the work order for Smart Transmission Network & Assets Management System having ADMS part has been issued on 12/12/2018

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 concerned 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 are requested to update.

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

The updated status as per the 154th OCC meeting is enclosed as Annexure – 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).

All other utilities were 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 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.

16.2 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.POWER GRID NR 1 submitted the data. POWERGRID NR 2 submitted that the replacement of porcelain insulators on all critical stretches stands completed.

154th OCC meeting: RRVPNL & UPPTCL were requested to submit information as per MOM issued vide letter dated 12.11.2018, failing which outages for cleaning/replacement of insulator will not be approved. Further, all the utilities were requested to intimate the progress of the cleaning/ replacement work**.**

RRVPNL& UPPTCL to update. All utilities are requested to update the status of replacement/ cleaning work done.

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:

NTPC, NHPC, Tata Power, THDC, PTCUL, NPCIL RAPS, NAPS, PSTCL, DTL, Rajasthan & PTCUL.

154th OCC meeting: All other utilities (except from those mentioned above) were again requested to update.

POWERGRID was also requested to update regarding the guidelines they have to frame on CERT-In. He added that the guidelines once finalized will be followed by the STUs. SE (O) added that NHPC & NTPC have prepared CERT-In for Hydro & Thermal generators.

All other utilities (except from those mentioned above) are requested to update. POWERGRID is requested to update regarding the guidelines they have to frame on CERT-In

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 above agenda is under discussion since the 147th OCC meeting.

All SLDCs except Punjab are requested to update the status on the same.

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^{o}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 finalize 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.

Till date no information has been received and all STUs and transmission licensees are requested to submit the information at the earliest.

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 for10 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 –20 of the Agenda of the 154th OCC meeting.

154th OCC meeting: SE (O) stated that early commissioning of transmission line works and substation across the nation is required, so as to harness full potential of electrification.

Members were 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.

On deliberations it was observed that for expeditious action, RAILWAY authorities should be requested to present the detail of the pending works.

Members are requested to update as per the Annexure –20.

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 Vindhyachal 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.

154th OCC: NTPC and POWERGRID were again requested to submit all the information as requested during 1st meeting of the committee at the earliest**.**

POWERGRID are requested to update.

22. Display of Open Cycle Schedules at NRLDC web site and Open Cycle Certification by RPC (AGENDA BY NTPC)

As per provisions of CERC Tariff Regulations in respect of Gas Stations, any generation in Open Cycle during the month has to be certified by Member Secretary of the respective RPC so that constituents can be billed by generators on differential Open Cycle Operational norms. According to above provisions, NRPC have been certifying Open Cycle generation from time to time.

Vide its letter Ref No NRPC/OPR/116/01/2018/12996 dated 16.11.2018 (copy attached as **ANNEXURE 22**), NRPC has certified Open Cycle Generation for the period Dec17 to May18 under two categories:
Category-1 : Open cycle generation based on scheduling by beneficiaries &
Category-2 : Open cycle generation based on scheduling under RRAS

In respect of Category-2, NRPC has mentioned that Commercial Settlement for this category may be done as per decision to be taken by NPC/NRPC. Hence billing of MOPA to beneficiaries for Open Cycle generation under RRAS for aforesaid period is still pending.

Presently (from Dec18 onwards), there has been a paradigm shift in modus operandi of Gas Stations which now are called to generate under RRAS by NLDC in Open Cycle. NTPC Gas Stations have been specifically asked to operate in Open Cycle under RRAS for meeting grid demand for short duration of time with quicker ramp rates. As of now also, various NTPC GTs in NCR & WR are being started to meet morning peak in Open Cycle on RLNG under RRAS. It is pertinent to mention that these Gas stations otherwise are remaining under RSD due to non scheduling of power on RLNG by beneficiaries (except GTs scheduled on domestic gas).

In view of above, it is important that NRPC must certify Open Cycle generation under RRAS immediately on weekly basis and incorporate Open Cycle energy in REA also. This is required for raising energy bill to beneficiaries in timely manner. NRPC can get the Open Cycle generation specific instructions verified by NRLDC as instructions to start/stop the machines in O/C are being processed to NTPC Gas Stations through respective RLDCs.

It is also noteworthy NRLDC web based scheduling software does not have any provision to display Open Cycle scheduled energy separately whereas Gas Stations on bar Open Cycle DC is already being declared on NRLDC web separately. Hence, NRLDC needs to incorporate display of O/C schedules separately and the same should also reflect in implemented schedules.

Members are requested to discuss and deliberate.

23. Tripping of important lines in NR during night/ early morning hours

NRLDC vide its letters dated 26.12.2018 and 27.12.2018 has intimated about the fog related tripping in Northern region. Winter preparedness measures so as to avoid the impact of fog related tripping was already intimated in previous OCC and NRPC meetings. Since next few weeks have been forecasted to be severely fog-prone, therefore, for safe, secure and reliable system operation it is requested to ensure;

- Generation in different pockets of state with adequate reserves.
- Adequate manpower in control room during night shift of winter (vigilant and alert).
- Adequate resources at remote centers for fast restoration.
- Availability of telemetry.

All utilities are requested to take a note.

24. Maintenance & support (AMC) renewal of PSS@E licenses supplied under contract no. CC-CS/357-CC/ITSW-1900/3/G2/CA/4394 dated 13.08.2012(Agenda from DTL).

PSS@E software was provided by NRLDC to all NR constituents along with AMC which was expired on 30.11.2018. M/s Siemens has requested for renewal of the same. As the software is used by all NR constituents for load flow studies, so it is requested that the AMC shall be renewed at NRLDC level.

NRLDC is requested to update.

Part B NRLDC

1. Low frequency operation

Load-generation balance in real time operation is a continuous process and all the state utilities has been suggested for portfolio management in advance so that any deviations / imbalances in real time can be minimized. Further, for proper co-ordination of load-generation balance, demand estimation/Load forecast & subsequently generation procurement is also equally important. The above point has been highlighted and discussed in day to day operational meeting/regular OCC/TCC meeting also. In pursuance to above, all the users have been taken various actions and have started load forecasting also on daily basis which has also been mapped with SCADA displays. Even after the continuous effort by all the stakeholders, significant deviations have been experiencing for considerable period of time leading to Grid indiscipline as per IEGC.

The grid frequency has remained below the IEGC for considerable period of time during the past week. On 3rd Jan 2019, the frequency remained below the band for approx. 22% of the time while recording a minimum value of ~ 49.67 Hz. The frequency low trend further continued and touched a minimum value of 49.58 Hz during morning peak hours of 4th Jan 2019. Frequency profile of first week of January is enclosed in Annex-I. This continuous low frequency operation below the IEGC band may be attributed to significant overdrawal by some of the constituents especially during the peak hour's demand. Deviation of NR constituents is enclosed in Annex-II.

It has been observed that despite low frequency operation and over-drawal by the constituents, spare generation capacity is kept out citing less demand e.g. in NR state generation of ~ 4500 MW is out either on reserve shutdown/less demand.

As we all are aware that during winter in NR, though the demand remains low throughout the day, although the peak hour's demand & its ramp used to be very high/steep. Therefore, ramping of generation should be commensurate with ramping of peak hour demand and thus, proper attention should also be taken to ramping of generation also.

Following are the suggestive measures which has also been discussed and shared in various previous meeting and again presented below:

1. States are advised to bring back their thermal units that are out on RSD and maintain adequate reserves.
2. Proper attention on ramp rate while scheduling of thermal generator of ISGS & state generators to match the increase ramping of peak hours' demand.
3. Optimization of Hydro generation
4. All constituents requested to maximize internal generation and strictly adhere to their schedule

2. Reliability issue of Kawai-Kalisindh-Chhabra complex /South-East area of Rajasthan

Reliability under N-1/N-1-1 contingency issues in Kawai-Kalisindh-Chhabra complex of ~ 4850 MW has been continuously flagged in TCC/OCC meetings and quarterly operational feedback also. However, it has been observed that even under normal conditions, the complex and nearby area is operating with less reliability. As per request of Rajasthan SLDC on daily basis, some of the lines in same area is being opened continuously to control the loading of other important lines, for example,

i. for controlling loading of 400 kV Anta- Kota S/C twin conductor line, 400kV Kota-Merta, 400 kV Kota-RAPP-C, 220kV Kota-Bhilwara, 220kV Kota-Duni, 220 kV Bus coupler at KTPS etc are being opened
ii. for controlling loading of 765/400 kV ICTs at Phagi, 400 kV Phagi-Bassi, 400 kV Phagi-Heerapura, 400 kV Phagi-Ajmer, 400 kV Bassi-Sikar, 400 kV Ajmer-Deedwana etc. are being opened. In one of such event at 1254 hrs of 01-Jan-2019, after tripping of one 765/400 kV transformer at Phagi, number of above 400 kV trunk lines are remaining open for more than 30 hrs. Relief obtained through opening of lines is shown at the Annex-III.
iii. Apart from above, at times in order to control loading of 400 kV Chhabra-Bhilwara and Chhabra-Hindaun, number of 400 kV lines are to be opened. Moreover, during winter night, many EHV lines nearby to this area is also being opened to contain High voltage also.

It has been witnessed that by opening trunk 400 kV lines, the relief obtained is only marginal (in view of power shifting to other interconnected lines) but the reliability of entire power supply infrastructure reduced. In view of above, following operational planning /short term suggestions that has already been discussed is again requested:

i. Rajasthan SLDC shall schedule the power of intra-state generators considering security constrained despatch so that security of the grid is maintained. For example, generators in this complex could be backed down and generators without evacuation constraints and having impact of reducing loading in complex may be scheduled higher.
    a. Action plan/Security guidelines for N-0 and for N-1/N-1-1 contingencies in this complex.
ii. Higher level of maintenance and alertness in the area by Rajasthan STU/transmission licensee so that tipping are minimized and restoration is on war footing.

iii. Immediate implementation of the entire SPS scheme for the complex.

iv. Detailed analysis of any tripping (such as Phagi transformer on oil surge relay) along with relevant data & graph and action plan to avoid such tripping in future.

Long term solutions are as:

v. Early commissioning of the already planned transmission system for the complex such as
    a. 765/400 kV 1500 MVA 3rd ICT at Phagi

b. 400/220 kV extension at Anta substation along with commissioning of 220 kV interconnections.

vi. Rajasthan STU shall review the entire evacuation system of the complex and do necessary upgradation/enhancement in the transmission system like more lines from the complex.

3. Requirement of power flow and dynamics data for modeling renewable energy generation in Indian grid

Indian power system is undergoing is a systemic change towards integration of 175 GW of generation from renewable energy (RE) sources. Variability of RE generation, haul of power over large distances through EHV lines, change in pattern of loads connected to the grid, increasing share of power electronic based equipment and a reducing share of rotating mass in the electric grid are likely to pose new challenges in stable operation of power systems.

Section 6.3 and 6.4 of CEA manual on Transmission Planning criteria 2013 lays out considerations for stability studies in the planning horizon. Section 7.1 of CEA manual on Transmission Planning Criteria 2013 states that "The system shall be planned based on one or more of the following power system studies…. Stability Studies (including transient stability and voltage stability)".

To ensure security of the interconnected power grid, it is imperative to conduct stability studies in both operational (short-term) and planning (long-term) horizons in the power grid. To gain confidence in the stability studies that adequately represent system performance, fit-for-purpose models of power system elements are of utmost importance.

Procedure issued by CTU for grant of connectivity to projects based on renewable sources to Inter-state transmission system does not specify any format for collection of modelling data. Although RE generation is being progressively added to both ISTS and Intra-STS, gap exists in terms of availability of necessary data for modelling.

Accordingly, guidelines for collection of data for modelling utility scale wind and solar generation installations in India have been prepared by POSOCO and enclosed in Annex-IV. The same may be adopted as broad guidelines for collection of information for fit-for-purpose models for steady-state and dynamic simulations. The necessary data for modelling need to be furnished prior to interconnection with the grid.

Members may discuss.

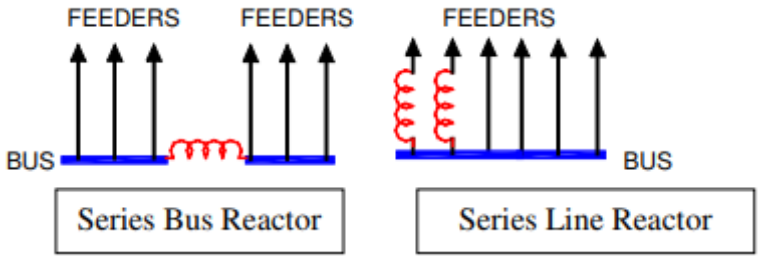
4. Dynamic data & study of Series Bus & Line reactor at Mandola & Ballabhgarh

In 32nd standing committee meeting (SCM) of NR dated 31st Aug 2013, following were approved:

i. Series line reactor at 400kV Dadri-Mandola-I & II each at Mandola end ,
ii. One series bus reactor at Mandola & Ballabhgarh end each

Series line reactor (single phase unit of 75 MVAr, 12 ohms) of 400kV Dadri-Mandola-I & II at Mandola end has been synchronized on 4th & 5th Dec 2018 respectively. Series Bus reactor at Mandola & Ballabhgarh end has also been charged on 2nd Nov 18 & 29th Nov 18 respectively.

As per offline simulation study, three phase short circuit level in kA at Dadri, Mandola & Ballabhgarh would be reduced by ~ 10, 20 & 14kA respectively in April'19 scenarios.



As per 32nd SCM agenda Annex-VII, fault kA would be reduced by ~ 15kA at Dadri with 10 ohm line reactors at four ckt from Dadri i.e. Dadri-Mandola-I & II & Dadri-Maharanibagh and Dadri-Gr.Noida.

However, during charging of this series reactors, charging study & dynamic data for offline modeling was not made available. POWERGRID is requested to submit the steady state & dynamic study along with modeling data for both the series line & bus reactor.

5. Agenda for standing clearances for URS power scheduling

As per CERC order dated 05.10.15 in petition number 310/MP/2014: ISGS shall be permitted to revise its schedule for URS power from one beneficiary to another of the same power station. Consent of the original beneficiary and the new beneficiary shall be submitted by ISGS to NRLDC.

And as per CERC order dated 17.10.2017 in petition no 16/SM/2015: Both the generating station and its beneficiaries (surrendering and requesting beneficiaries) give their standing consents in writing to RLDC that the decision of the concerned RLDC will be binding on them with regard to scheduling and dispatch of URS power. In the absence of their standing clearance, methodology as per CERC order dated 05.10.15 to be followed.

Since, it is long time when standing clearances were given, all the generating station and their beneficiaries (surrendering and requesting beneficiaries) are requested to re affirm their standing consent. (Please read para 20 and 27 CERC order dated 17.10.2017 in petition no 16/SM/2015)

6. Frequent forced outages of transmission elements

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

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	765kV Aligarh(PG)-Kanpur New(PG)	5	POWERGRID
2	400kV Anpara(UP)-Mau(UP)	4	UP
3	400kV Bus 1 at Orai(UP)	4	UP
4	765kV Aligarh(PG)-Orai(PG) ckt-1	3	POWERGRID
5	220kV AD Hydro-Phojal(HP)	3	AD Hydro/HP

The complete details are attached at **Annexure-5.** 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 Dec'18:

A total of **21** grid events occurred in the month of Dec'18 of which **7** 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 09-Jan-19 is attached at **Annexure-6.**

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 **840ms** in the event of multiple element tipping at 220kV Wazirabad(DTL) substation on 20th Dec 2018 at 09:16hrs.

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **4** events out of 21 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 Dec'18:

A total of **3** inter-regional lines tripping occurred in the month of Dec'18. The list is attached at **Annexure-7**. The status of receipt of preliminary reports, DR/EL within 24hrs of the event and fault clearing time as per PMU data has also been mentioned in the table. The non-receipt of DR/EL & preliminary report within 24hrs of the event is in violation of various regulations. As per regulations, all the utilities shall furnish the DR/EL, flag details & preliminary report to RLDC/RPC within 24hrs of the event. They shall also furnish the detailed investigation

report within 7 days of the event if fault clearance time is higher than mandated by CEA (Grid Standard) Regulations.

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

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
24-Oct-18	NA	Malana-2	Exercise was not successful. It is proposed to carry out the exercise again with AD Hydro.
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.
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	19-Dec-18	Parbati-3	Carried out successfully.
19-Dec-18	20-Dec-18	Koteshwar	Carried out successfully. 400kV Koteshwar-Koteshwar(PG)-1 tripped from Koteshwar(PG) end at first attempt during charging of Tehri ckt-1.
28-Dec-18	3-Jan-19	AD Hydro, Malana-2, Phojal (Kanchanjanga)	Exercise was partially successful. Island created and synchronized with AD Hydro. However, during blackstart, the AD Hydro running island collapsed while connecting Phojal (Kanchanjanga). Malana-2 couldn't be synchronized.

11-Jan-19	NA	Koldam	Exercise carried out successfully.
Yet to be carried out			
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.
26-Oct-18	15-Jan-19	Dhauliganga	Revised date by NHPC
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.
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.
4-Jan-19		Tehri	Exercise deferred on request of UP due to load management.
8-Jan-19		Karcham Wangtoo & Baspa	Exercise deferred on request of Haryana due to load management.

** 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, 153rd and 154th OCC meetings, 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 along with status as informed in 154th OCC meeting:

S. NO.	Utility	Hydro Power Station	Installed Capacity(MW)	Tentative Date as reported by SLDC
1	J&K	Baglihar	3x150	
2		Baglihar stage-2	3x150	
3		Lower Jhelum	3x35	
4		Upper Sindh	2x11+3x35	
5	HP	Sainj	2x50	In coordination with NRLDC
6		Larji	3x42	Jan-19
7		Bhabha	3x40	
8		Malana –I	2x43	Jan-19
9		Baspa	3x100	To be clubbed with Karcham
10	Punjab	Anandpur Sahib	4x33.5	
11		Ranjit Sagar	4x150	
12	Rajasthan	Mahi-I&II	2x25+2x45	Mar-19
13		Rana Pratap Sagar	4x43	Mar-19
14		Jawahar Sagar	3x33	
15		Gandhi Sagar	5x23	
16		Dholpur GPS	3x110	Plant under outage
17		Ramgarh GPS	1x35.5+2x37.5+1x110	
18	UP	Rihand	6x50	Carried out in Aug-18. Report to be submitted
19		Obra	3x33	Plant under outage
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	Shared the procedure

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 updated.

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 System Restoration Procedure for Northern Region:

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

In 153rd and 154th OCC meetings, constituents were requested to provide feedback, suggestion and updated information by 15th December 2018.

The following is the status of details received as on 10-Jan-19:

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

Constituents are requested to provide the updates by 15th Jan 2019.
Member may discuss.

Annexure 4

		MU	MW
State		Feb-19	Feb-19
Chandigarh	Availability	110	315
	Requirement	100	230
	Surplus/Shortfall (MU)	10	85
	Surplus/Shortfall (%)	10.0%	37.0%
Delhi	Availability	3220	5770
	Requirement	1790	4110
	Surplus/Shortfall (MU)	1430	1660
	Surplus/Shortfall (%)	79.9%	40.4%
Haryana	Availability	5030	8380
	Requirement	3510	7550
	Surplus/Shortfall (MU)	1520	830
	Surplus/Shortfall (%)	43.3%	11.0%
Himachal Pradesh	Availability	920	2320
	Requirement	790	1650
	Surplus/Shortfall (MU)	130	670
	Surplus/Shortfall (%)	16.5%	40.6%
Jammu & Kashmir	Availability	770	2040
	Requirement	1610	2800
	Surplus/Shortfall (MU)	-840	-760
	Surplus/Shortfall (%)	-52.2%	-27.1%
Punjab	Availability	4782	8144
	Requirement	3350	6890
	Surplus/Shortfall (MU)	1432	1254
	Surplus/Shortfall (%)	42.7%	18.2%
Rajasthan	Availability	8052	12318
	Requirement	6392	12198
	Surplus/Shortfall (MU)	1660	120
	Surplus/Shortfall (%)	26.0%	1.0%
Uttar Pradesh	Availability	9520	16700
	Requirement	9884	17000
	Surplus/Shortfall (MU)	-364	-300
	Surplus/Shortfall (%)	-3.7%	-1.8%
Uttarakhand	Availability	900	1950
	Requirement	1170	2150
	Surplus/Shortfall (MU)	-270	-200
	Surplus/Shortfall (%)	-23.1%	-9.3%
Total NR	Availability	33304	55987
	Requirement	28596	50200
	Surplus/Shortfall (MU)	4708	5787
	Surplus/Shortfall (%)	16.5%	11.5%

Sub: Status of shunt Reactors as on 04.01.2019 **ANNEXURE6**

S.No.	Bus Name	Voltage level (kV)	Reactor (MVAR)	Plg. Status
1	Peeragarhi	220	1x50	PR No 1100002017 Raised.
2	Mundka	400	1x125	Board premble sent for financial vetting & approval. Scheme shall be placed before BOD,DTL.
		220	1x25	
3	Harsh Vihar	220	2x50	Under Finance vetting
4	Electric Lane	220	1x50	Site visit done, space is not feasible for installation. However,GCC in their meeting held in the Nov, 2018 indicated that the 50 MVAR recator be explored in place of 3rd 100 MVA Power Transformer at Electric lane. Accordingly case file has been sent to SS&LM division for space markation and feasibility .
5	Bamnauli	220	2x25	Under cost estimation
6	Indraprastha	220	2x25	Under cost estimation
TOTAL			**450**	

Follow up issues from previous OCCMs **ANNEXURE 9**

SNO	Description of Agenda point	Details	STATUS 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 of the Agenda. All states wee 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 are enclosed *as* Annexure 9/2 of the Agenda.** **All concerned are 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 10/3OF THE AGENDA OF THE 146TH OCC MEETING.*** **Information received from Rajasthan, Uttrakhand & Haryana placed at Annexure9/3 of the154th 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 "*All the UFRs are checked and found functional*".** ***151st OCC meeting:*** **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.**	**Information from for period ending September 2018 has not been received from Punjab, Delhi, Rajasthan the same may please be submitted.** **The information ending 12/2018 is requested to be submitted by all the states**

5	**Strengthening of Intra-State transmission system**	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 **PTCUL, Punjab ,Delhi & Rajasthan have submitted the information ending 6/2018 & that send submitted to concerned office.**	**UPPTCL has submitted the information ending 12/2018.** **ALL other SLDCs are 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**
6	**Mapping of Feeders in SCADA**	In the 141st OCC meeting members were informed about the "Compendium of SPS in NR" (*Annexure-_9 of the MOM_)* 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. **150th OCC meeting:** 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	**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

Schemes approved under PSDF — **All figures in Rs Crore**

Sl.No	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	Dateof Issuanceof 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	RRVPNL	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	RRVPNL	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	Uttrakhand	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	DHVBN	Renovation and modernisation of distribution system of DHBVN, 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	Repleacement of existing ACSR conductor by HTLS conductor for reliving 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	RRVPNL	" Smart Transmission Operation Management Systeem (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	RRVPNL	Communication Backbone "Smart Transmission Network & Asset Management Systeem " 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	RRVPNL	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	Uttrakhand	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			

Schemes approved under PSDF — **All figures in Rs Crore**

Sl.No	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	Dateof Issuanceof 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 incidenatls 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 Maintanance 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**

Schemes approved under PSDF — **All figures in Rs Crore**

Sl.No	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	Dateof Issuanceof 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				

ANNEXURE 9/2				
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 220kV Bishnha – Hiranagar D/c line : under tendering (PMDP) (status as available with CEA) Status as updated by J&KPDD in 38th TCC/ 41st NRPC: LoA has been issued and Material has reached the site. Anticipated – Nov'19 **Targeted Completion is required to be updated by J&KPDD**
2	400/220kV, 2x315 MVA New Wanpoh	6 Nos. of 220 kV bays to be utilized	Commissioned	220kV New Wanpoh –Mirbazar D/c line: under tendering (PMDP) 220 kV Alusteng- New Wanpoh line Anticipated – Nov'19 **Targeted Completion is required to be updated by J&KPDD**
3	400/220kV, 2x315 MVA Parbati Pooling Station	2 Nos. of 220 kV bays to be utilized.	Commissioned	220kV Charor- Banala D/c line (18km) : under construction **Target completion -December 2018 as intimated by HPPTCL** **Update required**
4	400/220kV, 2x500 MVA Kurukshetra (GIS)	8 nos. of 220 kV bays to be utilized	Commissioned	LILO of one circuit of Kaul-Pehowa 220kV D/c line LILO of one circuit of Kaul-Bastara 220kV D/c line Work awarded. Contractual Completion period upto 31.10.2019 **HVPNL requested to update further 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	Bagpat- Baraut - energised(D/C) Bhagpat-Shamli- energised(S/C) LILO of 220kV Muradnagar II - Baghpat (PG) at Baghpat UP **Bagpat(PG)-Modipuram New 220kV D/c-is under planning stage. UPPTCL requested to update.**
6	400/220kV, 2x315 MVA Dehradun	Out of 6 bays, only two bays used. Balance 4 bays to be utilised.	Commissioned	02 bays for Yamuna Basin (Mori substation) 2 bays for proposed S/s at Selakui **PTCUL requested to update**.
7	400/220 kV, 2x315 MVA Sohawal	6 Nos 220 kV bays to be utilized.	Commissioned	Sohawal-Sohawal (UP) D/C line energised Sohawal-Barabanki D/C line

ANNEXURE 9/2				
S. No.	**Substation**	**Downstream network requirement**	**Schedule**	**Planned system and Implementation Status**
				energised. 2 nos of bay of utilized for 220kV New Tanda-Sohawal line .There is a litigation process on & expected to be completed by November 2018 **UPPTCL requested to update.** Sohawal-Behraich and Sohawal-Gonda lines are under construction and expected to be completed by January, 2019. PGCIL requested to provide the estimate for construction of Bays at PGCIL end. **UPPTCL& PGCIL to update requested to update.**
8	Shahjahanpur, 2x315 MVA 400/220 kV	Partially utilized. Balance 5 Nos. of 220 kV bays to be utilized.	Commissioned	Shajahnapur-Hardoi commissioned Shajahnapur-Azimpur D/C line is planned, land of substation identified. **UPPTCL requested to update**.
9	Moga	Partially utilized. Balance 2 nos. of 220kV bays to be utilized.	Commissioned	Moga–Mehalkalan 220kV D/c line Work completed. Approval from NGT for tree cutting is awaited for balance work to commission line. NGT clearance received and by 31.12.2018 work will be completed **PSTCL to update progress**.
10	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	August 2020	2x220 kV bays to be utilized for connecting 220/132kV Kangoo substation of HPSEBL by 220 kV Kangoo-Hamirpur D/c line. **HPPTCL requested to update**.
11	Kaithal 400/220 kV 1x 315 MVA Sub-station	July 2017 (Shifting of Transformer from Ballabhgarh).	Commissioned	220kV Kaithal(PG)- Neemwala D/c line - Work awarded on 13.7.2018. Tentative completion date 31.12.2019. 220kV S/s Neemwala-Tenders opened on 30.3.2018 & awarded on 13.7.2018. **HVPNL requested to update further progress.**

Establishment of new 400/220kV substations of POWERGRID in Northern Region. All concerned utilities are requested to update.

Sl. No.	Name of Substation	MVA Capacity	Expected Schedule	Downstream connectivity furnished by States
1	400/220kV Dwarka-I GIS	4x 500	Oct'18	**DTL may update.**
2	400/220kVTughlakabadGIS	4x 500	Commissioned	
3	220/66kV Chandigarh GIS	2x160	Feb'19	Out of 8 nos. of 66kV bays 6 no. of bays shall be utilized as per the timeline given by POWERGRID.
4	400/220kV Jauljivi GIS	2x315	December 2019	2 bays for 220kV AlmoraJauljibi line 2 bays for 220kV Brammah-Jauljibi line
5	400/220kV Sohna Road GIS	2x500	May'19 (Under TBCB) (8 bays)	-
6	400/220kV Prithla GIS	2x500	May'19 (Under TBCB) (8 bays)	Two nos. of 220kV bays for Prithla(400)-Prithla (HVPNL) 220kV D/c line Four nos. of 220kV bays for LILO of existing 220kV Palwal–RangalaRajpur D/c line at Prithla (400) (FY 2019-20) Two nos. of 220kV bays for 220kV Prithla (400)–Sector-78, Faridabad S/s D/c (FY-2020-21)
7	400/220kV Kadarpur GIS	2x500	May'19 (Under TBCB) (8 bays)	
8	400/220kV Kala Amb GIS	7*105	Commissioned (Jul'17)	HPSEBL has planned one no. of 220kV D/c line from Kala Amb 400/220kV S/s to 220/132kV Kala Amb S/s. Details for remaining 4 nos. of line bays may be provided. .
9	400/220kV Amargarh GIS	7X105	Oct'18 (Under TBCB) (Sterlite Grid planning to prepone)	JKPDD to confirm for LILO of 220kV D/c Zainkote - Delina line at Amargarh. 20 ckm work completed June-18.

Annexure-I

Environmental Action Plan for NTPC Units larger than 500 MW with population density in excess of 400 persons/ sq. KM or are critically polluted area (as per CSE list)

Sr. No.	Name of Project	State	Region	Unit No	Unit Capacity	Date of Commissioning	SPM Compliance Plan/ Status	FGD Award date/ Tender details	SO2 Targeted value mg/Nm3	De-Nox Plan/ tender dates.	Expected Overhauling Period (as planned now)	NOx Targeted value mg/Nm3
1	BARH II	Bihar	ER	4	660	20-11-2013	SPM Compliant	Award on 18.09.18	200	Combustion Modification implemented.	--	400
2	BARH II	Bihar	ER	5	660	04-03-2015	SPM Compliant	Award on 18.09.18	200	Combustion Modification implemented.	--	400
3	KAHALGAON TPS	Bihar	ER	5	500	31-03-2007	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
4	KAHALGAON TPS	Bihar	ER	6	500	16-03-2008	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
5	KAHALGAON TPS	Bihar	ER	7	500	31-07-2009	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
6	TALCHER STPS	Odisha	ER	1	500	19-02-1995	SPM Compliant	NIT on 31.08.18*	200	Combustion tuning after overhaul	22Jul'19-25Aug'19	600
7	TALCHER STPS	Odisha	ER	2	500	27-03-1996	SPM Compliant	NIT on 31.08.18*	200	Combustion tuning after overhaul	22Oct'18-21-Nov'18	600
8	TALCHER STPS	Odisha	ER	3	500	21-02-2003	SPM Compliant	NIT on 31.08.18*	200	Combustion tuning after overhaul	03Sep'19-27 Sep-19	600
9	TALCHER STPS	Odisha	ER	4	500	25-10-2003	Under R&M	NIT on 31.08.18*	200	Combustion tuning after overhaul	21Jun'19-15Jul'19	600
10	TALCHER STPS	Odisha	ER	5	500	13-05-2004	Under R&M	NIT on 31.08.18*	200	NIT done on 06 Sep' 18	--	400
11	TALCHER STPS	Odisha	ER	6	500	06-02-2005	SPM Compliant	NIT on 31.08.18*	200	NIT done on 06 Sep' 18	--	400
12	FARAKKA STPS	West Bengal	ER	4	500	25-09-1992	Under R&M	NIT made on 28.09.18*	200	Combustion tuning after overhaul	11Mar'20-09Apr'20	600
13	FARAKKA STPS	West Bengal	ER	5	500	16-02-1994	Under R&M	NIT made on 28.09.18*	200	Combustion tuning after overhaul	11Mar'19-09Apr'19	600
14	FARAKKA STPS	West Bengal	ER	6	500	07-03-2011	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
15	INDIRA GANDHI STPP	Haryana	NR	1	500	31-10-2010	SPM Compliant	Awarded on 30.01.18	200	Award in October 18	--	400
16	INDIRA GANDHI STPP	Haryana	NR	2	500	05-11-2011	SPM Compliant	Awarded on 30.01.18	200	Award in October 18	--	400
17	INDIRA GANDHI STPP	Haryana	NR	3	500	07-11-2012	SPM Compliant	Awarded on 30.01.18	200	Award in October 18	--	400
18	RIHAND STPS	Uttar Pardesh	NR	1	500	31-03-1988	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	09 Sep'19 - 23 Oct'19	600
19	RIHAND STPS	Uttar Pardesh	NR	2	500	05-07-1989	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	10Aug'19 - 03Sep'19	600
20	RIHAND STPS	Uttar Pardesh	NR	3	500	31-01-2005	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
21	RIHAND STPS	Uttar Pardesh	NR	4	500	24-09-2005	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
22	RIHAND STPS	Uttar Pardesh	NR	5	500	25-05-2012	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
23	RIHAND STPS	Uttar Pardesh	NR	6	500	17-10-2013	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
24	SINGRAULI STPS	Uttar Pardesh	NR	6	500	23-12-1986	Under R&M	NIT made on 28.09.18*	200	Combustion tuning after overhaul	01-25 Sep'19	600
25	SINGRAULI STPS	Uttar Pardesh	NR	7	500	24-11-1987	Under R&M	NIT made on 28.09.18*	200	Combustion tuning after overhaul	01-25 Aug'20	600
26	SIMHADRI	Andhra Pradesh	SR	1	500	22-02-2002	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	01Nov'18 - 14Dec'18	600
27	SIMHADRI	Andhra Pradesh	SR	2	500	24-08-2002	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	15Jun'19 - 14jul'19	600
28	SIMHADRI	Andhra Pradesh	SR	3	500	29-03-2011	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
29	SIMHADRI	Andhra Pradesh	SR	4	500	30-03-2012	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
30	VALLUR TPP	Tamil Nadu	SR	1	500	28-03-2012	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
31	VALLUR TPP	Tamil Nadu	SR	2	500	28-02-2013	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
32	VALLUR TPP	Tamil Nadu	SR	3	500	28-02-2014	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
33	KORBA STPS	Chhatisgarh	WR	4	500	31-05-1987	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	20Aug'20 - 13 sep'20	600
34	KORBA STPS	Chhatisgarh	WR	5	500	25-03-1988	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	05Nov'19-06Dec'19	600
35	KORBA STPS	Chhatisgarh	WR	6	500	26-02-1989	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	15Dec'19-08Jan'19	600
36	KORBA STPS	Chhatisgarh	WR	7	500	25-11-2010	SPM Compliant	NIT made on 28.09.18*	200	NIT done on 06 Sep' 18	--	400
37	VINDHYACHAL STPS	Madhya Pradesh	WR	7	500	03-03-1999	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	20-Mar'19-02May'19	600
38	VINDHYACHAL STPS	Madhya Pradesh	WR	8	500	26-02-2000	SPM Compliant	NIT made on 28.09.18*	200	Combustion tuning after overhaul	20Jul'20-13Aug'20	600
39	VINDHYACHAL STPS	Madhya Pradesh	WR	9	500	27-07-2006	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
40	VINDHYACHAL STPS	Madhya Pradesh	WR	10	500	08-03-2007	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
41	VINDHYACHAL STPS	Madhya Pradesh	WR	11	500	14-06-2012	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
42	VINDHYACHAL STPS	Madhya Pradesh	WR	12	500	22-03-2013	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
43	MOUDA TPS	Maharashtra	WR	1	500	19-04-2012	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
44	MOUDA TPS	Maharashtra	WR	2	500	29-03-2013	SPM Compliant	Award on 18.09.18	200	NIT done on 06 Sep' 18	--	400
45	MOUDA TPS	Maharashtra	WR	3	660	28-03-2016	Under R&M	Awarded on 31.07.18	100	Combustion Modification implemented.	--	400
46	MOUDA TPS	Maharashtra	WR	4	660	18-03-2017	SPM Compliant	Awarded on 31.07.18	100	Combustion Modification implemented.	--	400
47	Dadri	UP	NR	5	490	29-Jan-10	SPM Compliant	Awarded on 30.01.18	200	Awarded on June 18	--	400
48	Dadri	UP	NR	6	490	30-Jul-10	SPM Compliant	Awarded on 30.01.18	200	Awarded on June 18	--	400
		Total		**48 Units**	**24620**							

*Expected award in December 18.

Critically Polluted, Population Density < 400 persons/ sq. Km

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	NIT would floated in 12/2018
HPPTCL			2 set	Matter under consideration regarding funds availability.
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 20

257342/2018/OFFICE OF MOS(IC)

Annexure

Summary of Transmission lline 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

Annexure-I

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)	Muniguda	Bissamcuttack	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)	Lakhsmipur	Kakriguma	27	ODISHA
40	Singapur Road-Damanjodi (CORE)	Lakhsmipur	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	27.5	ANDHRA PRADESH
27	Diguvametta- Guntakal (CORE)	Nansurulla	Pendekallu	12	ANDHRA PRADESH
28	Nallapadu- Pigidipalli (CORE)	Rentachintala	Gurjal	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	9.5	WEST BENGAL
33	Katihar-New Jalpaiguri (CORE)	Tista Canal fall	Rangapani	7.34	WEST BENGAL
34	RANINAGAR JALPAIGUDI-NEW BONGAIGAON (RVNL)	New Mayanaguri	New Mayanagun	1.5 Km	WEST BENGAL
35	RANINAGAR JALPAIGUDI-NEW BONGAIGAON (RVNL)	New Cooch Behar	Punditbari	10 Km	WEST BENGAL
36	Katwa-Azimganj (CORE)	Raghunathganj	Jangipur	2	WEST BENGAL
37	RANINAGAR-JALPAIGURI-NEW BONGAIGAON (RVNL)	-	Gosaingaon	10	ASSAM
73	NEW BONGAIGAON-GUWAHATI (RVNL)	-	Kamakhya	5 Km	ASSAM
38	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Chitbara Gaon	Bansdih Road	29.97 Km	UTTAR PRADESH
39	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Ghazipur	Ghazipur	30.52 Km	UTTAR PRADESH
40	CHHAPRA-BALLIA-GHAZIPUR-VARANASI-ALLAHABAD (RVNL)	Auraí	Kachhwa Road	15.0 Km	UTTAR PRADESH
41	UTRATIA-RAIBARELI-AMETHI-JANGHAI (RVNL)	Bachharawan	Harchandpur	16 Km	UTTAR PRADESH
42	UTRATIA-RAIBARELI-AMETHI-JANGHAI (RVNL)	Gaurigani	Gaurigani	12.5 Km	UTTAR PRADESH
43	UTRATIA-RAIBARELI-AMETHI-JANGHAI (RVNL)	Rahegani	Pichhgani	7 Km	UTTAR PRADESH
44	Gorwa Rd- Renukut (CORE)	Rihand Thermal power station	Renukut	6.0	UTTAR PRADESH
45	Renukut- Singrauli (CORE)	Obra Thermal power station	Obra Dam	7	UTTAR PRADESH
46	Jhansi- Manikpur (CORE)	Attara	Dingwal	20	UTTAR PRADESH
47	Jhansi- Manikpur (CORE)	Pahari	Khiri	17	UTTAR PRADESH
48	Jhansi- Manikpur (CORE)	Ghatampur	Ghatampur	7	UTTAR PRADESH
49	Gorakhpur-Kaptanganj (CORE)	Motiram	Kaptanganj	45	UTTAR PRADESH
50	Shikohabad-Farrukhabad (CORE)	Neevkana	Bhagwan	7	UTTAR PRADESH

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)	Sikandrarau	Kasganj	35	UTTAR PRADESH
54	Mathura-Kasganj-Kalyanpur (IRCON)	Kayamganj	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	Jakhal	18	HARYANA
60	Rohtak-Bathinda-Lehra Muhabbat (CORE)	Talwandi	Maiserkhana	18	Punjab
61	Rohtak-Bhiwani (CORE)	Kalanaur	Kalanaur	4	HARYANA
62	Alwar-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	Majhauliya	10	BIHAR
72	Muzaffarpur-Valmikinagar (CORE)	Ramnagar	Harinagar	5	BIHAR
73	Garwa Road- Singrauli (CORE)	LILO arrangement near to Nagauturi	Nagaruntari	10	JHARKHAND

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SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
74	Ranchi-Lohardaga-Tori (CORE)	LILO arrangement near to Piska	Piska	5	JHARKHAND
75	Ahmedabad-Mahesana-Palanpur (CORE)	Soja	Ambliyasan	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

Annexure-II

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Transmission line 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 2nd 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)	Lakhsmipur	Lakshmipur	2.5	ODISHA
61	HOSPET-BALLERY-GUNTAKAL (RVNL)	Alipura	Bellary cant	3	KARNATAKA
13	Kengeri - Mysore (CORE)	Tubalkare	Yellyur	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	Unnao-Unchahar (CORE)	Saram	Raghuraj singh	12	UTTAR PRADESH

SN	Electrification Project/Agency	Name of Grid Sub Station	Name of Rly TSS	Tr. Line (kms)	STATE
25	Chunar-Chopan (CORE)	Robertganj	Robertganj	6	UTTAR PRADESH
26	Mathura-Achnera	Agra	Achnera	30	UTTAR PRADESH
27	Rohtak-Bathinda-Lehra Muhabbat (CORE)	Chandi	Kharaintu	3	HARYANA
120	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	Alwar-Ajmer-Jaipur (CORE)	Nala Power house Jaipur	Jaipur	01 km UG cable	RAJASTHAN
34	JAKHAL-DHURI-LUDHIANA (RVNL)	Chajli	Chajli	1.6 Km	PUNJAB
35	JAKHAL-DHURI-LUDHIANA (RVNL)	Sandhora	KUP	12 Km	PUNJAB
36	Bakhtiyarpur-Manpur-Tilaiya (CORE)	Wazirganja	Tilaiya	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)	Rajapatti	Rajapatti	10	BIHAR
40	Biharsharif-Daniawan & Fatuha-Islampur (CORE)	Ekrangar Sarai	Ekrangar Sarai	8	BIHAR
41	Darbhanga-Jaynagar (CORE)	Pandaul	Pandaul	6	BIHAR
42	Samastipur-Khagaria (CORE)	Rosara	Hasanpur	22	BIHAR
43	Raxaul-Sitamarhi-Darbhanga-Samastipur (CORE)	Raxaul	Raxaul	5	BIHAR
44		Dhaka	Bargania	22	BIHAR
45		Runnisaidpur	Bajpatti	25	BIHAR
46	Kiul Tilaiya (CORE)	Shekhpura	Shekhpura	16	BIHAR
47	Bonidanga-Sahibganj (CORE)	Sahibganj	Kanaiola	5	JHARKHAND
48	Bonidanga-Sahibganj (CORE)	Rajmahal	Taljahar	9	JHARKHAND
49	Ranchi-Lohardaga Ton (CORE)	Lohardaga	Lohardaga	17	JHARKHAND
50	Ahmedabad -Rajkot (CORE)	Wakaner	Wankaner	23	GUJARAT
51	Ahmedabad –Rajkot (CORE)	Dudhrej	Surendranagar	17	GUJARAT
52	Ahmedabad –Rajkot (CORE)	Jakhawari	Jamwala	9	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	Ghansyamgarh	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	Samakhiyali-Gandhidham-Kandla port (CORE)		Bachhao		GUJARAT
20	Surendarnagar-Pipavav		Kundali		GUJARAT
21	Surendarnagar-Pipavav		Jalia		GUJARAT
22	Surendarnagar-Pipavav		Padada		GUJARAT
23	Trichirapali-Tanjavaur (CORE)	Location yet to be finalised	Tanjavaur		TAMIL NADU
24	Trichirapali-Tanjavaur (CORE)		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

Gmail

Somes Bandyopadhyay <somesbanerjee@gmail.com>

Vibration and Noise readings of Stage III GT

1 message

subodh sudhakar <sudhakar06559@gmail.com> Tue, Oct 16, 2018 at 10:51 AM
To: somesbanerjee@gmail.com

Dear sir,

1.0 Unit 5 is under shutdown from 23.09.2018.
On 24.09.2018 HVDC pole -1 was out from 16.44 hrs to 18:51 hrs. During this period Neutral DC current was measured in Unit 6 GT and it was found 20 Amp .(in case only one unit on bar)

2.0

When both units (5 and 6) are in service , DC current which enters into the HV Neutral is in the range of 11-14 Amp in both GT 5 and 6

Vibration and noise level reading are attached.

3 attachments

Noise level survey of u5,6 GTs.doc
12K

SragelII_GT_Vibration_readings_04.12.17.pdf
30K

SIMULATION_READINGS_27.09.2018.pdf
424K

Noise level survey of unit#5 &6 GTs Dt. 04.12.2017

Noise readings range in dB(A)

Phase	Unit#5(Before/after Pole charging)	Unit#6(Before/after Pole charging)
R	74.2/66.1(8.1)	71,8/66.5 (5.3)
Y	73/67.0 (6)	72.3/66.0 (6.3)
B	75/66.0 (9)	74/67.8 (6.2)

REPORT OF GT NEUTRAL CURRENTS,NOISE & VIBRATION ON 27.09.18 WITH REF TO RIHAND-DADRI HVDC LINK UNBALANCE CURRENTS

HVDC Bipole Flow	Diff in Pole Currents	Equivalent Monopolar Power Flow	DC Currents in GT Neutral (A)			Noise Level (dB)	GT 6 Vibrations-Velocity (mm/s)												GT 6 Vibrations- Displacement (Microns)											
MW	Amp	MW	GT2	GT4	GT6	GT6	H1	V1	A1	H2	V2	A2	H3	V3	A3	H4	V4	A4	H1	V1	A1	H2	V2	A2	H3	V3	A3	H4	V4	A4
1200	0	0	0.1	0.1	1.2	68.0	1.30	0.40	0.40	2.20	0.50	0.50	1.00	0.30	0.30	0.80	0.20	0.30	5.20	1.30	2.30	6.30	1.50	2.10	3.90	1.40	1.10	2.70	1.40	1.30
1200	100	50	0.1	0.1	2.2	70.0	1.20	0.43	0.40	1.75	0.47	0.43	1.60	0.70	0.40	1.20	0.20	0.40												
1200	200	100	0.3	0.2	3.4	72.5	1.40	0.39	0.40	1.80	0.46	0.48	1.70	0.49	0.37	0.87	0.24	0.40												
1200	300	150	0.5	0.3	3.7	75.0	1.80	0.51	0.50	2.50	0.49	0.65	2.10	0.60	0.49	1.10	0.29	0.54	5.50	1.75	2.36	6.52	1.45	2.91	6.45	1.84	1.25	2.79	1.55	2.19
1200	600	300	0.8	0.6	8	81.6	2.20	0.60	0.60	3.90	0.70	0.90	1.90	0.90	0.70	2.20	0.30	0.70	5.64	1.50	2.50	7.20	1.60	2.50	5.20	1.80	1.75	3.20	1.80	2.20

H: Horizontal direction
V: Vertical direction
A: Axial direction

1,2,3,4 are test locations

NTPC-

PGCIL-Rihand

27.9.18

S.K. Sudhakar

27/09/18

27/09/18

27/09/18

Generator Transformer Vibartion									
Description	**Horizontal (mm/s)**	**Horizontal (mm/s) after HDVC pole 2 charging**	**% Diff.**	**Vertical (mm/s)**	**Vertical (mm/s) after HDVC pole 2 charging**	**% Diff.**	**Axial (mm/s)**	**Axial (mm/s) after HDVC pole 2 charging**	**% Diff.**
GT-5R (opposite MK)	1.8	1.92	6.67	0.7	0.34	-51.43	0.4	0.23	-42.50
	1.4	0.72	-48.57	0.3	0.38	26.67	0.3	0.27	-10.00
GT-5R (MK Side)	2	1.69	-15.50	0.5	0.31	-38.00	0.5	0.36	-28.00
	4	1.17	-70.75	0.3	0.25	-16.67	0.6	0.29	-51.67
GT-5Y (opposite MK)	2.4	0.87	-63.75	0.6	0.24	-60.00	0.3	0.17	-43.33
	0.8	1.1	37.50	0.3	0.29	-3.33	0.4	0.23	-42.50
GT-5Y (MK Side)	1.6	1.89	18.13	0.5	0.23	-54.00	0.4	0.3	-25.00
	2.1	1.11	-47.14	0.2	0.21	5.00	0.5	0.29	-42.00
GT-5B (opposite MK)	3.3	0.92	-72.12	0.4	0.12	-70.00	0.3	0.15	-50.00
	1.2	0.6	-50.00	0.3	0.35	16.67	0.6	0.18	-70.00
GT-5B (MK Side)	2.1	1.51	-28.10	0.3	0.14	-53.33	0.6	0.19	-68.33
	2.6	0.39	-85.00	0.3	0.15	-50.00	0.9	0.29	-67.78
GT-6R (opposite MK)	3.5	2.06	-41.14	0.7	0.48	-31.43	0.5	0.36	-28.00
	2.1	1.75	-16.67	0.4	0.43	7.50	0.6	0.47	-21.67
GT-6R (MK Side)	3	2.47	-17.67	0.8	0.4	-50.00	0.6	0.38	-36.67
	2.3	0.79	-65.65	0.3	0.21	-30.00	0.5	0.35	-30.00
GT-6Y (opposite MK)	2.1	1.14	-45.71	0.4	0.22	-45.00	0.3	0.13	-56.67
	1.2	0.91	-24.17	0.2	0.29	45.00	0.4	0.18	-55.00
GT-6Y (MK Side)	1.4	1.85	32.14	0.5	0.36	-28.00	0.5	0.45	-10.00
	2.1	0.67	-68.10	0.2	0.29	45.00	0.5	0.27	-46.00
GT-6B (opposite MK)	4.5	1.16	-74.22	0.6	0.37	-38.33	0.7	0.14	-80.00
	3.1	0.97	-68.71	0.5	0.38	-24.00	0.4	0.19	-52.50
GT-6B (MK Side)	2	1.7	-15.00	0.6	0.33	-45.00	0.6	0.31	-48.33
	2.5	0.55	-78.00	0.3	0.31	3.33	0.6	0.34	-43.33

Annexure-22

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

सं. उक्षेविस/प्रचालन/116/01/2018/ 12996 दिनाँक : 16 नवम्बर, 2018
No. NRPC/OPR/116/01/2018/ Dated: 16th November, 2018

सेवामें/To

महाप्रबंधक (ओ एण्ड एम), एनसीआर एच क्यू
एन टी पी सी लिमिटेड
आर एण्ड डी बिल्डिंग, प्लॉट नं-8ए
सेक्टर-24, नॉएडा (उ.प्र.)
फैक्स:0120-2410064, 2410082

GM (O&M), NCR HQ,
NTPC Limited,
R&D Building, Plot No 8 A,
Sector 24, Noida (UP)
Fax No- 0120 – 2410064, 2410082

विषय: माह दिसम्बर 2017 से मई 2018 के लिए एन टी पी सी लिमिटेड के गैस आधारित उत्पादन संयंत्रों द्वारा खुले चक्र में उत्पादन का प्रमाणीकरण।

Subject: Certification of Open Cycle generation for NTPC Limited's gas based generating stations for the months of December 2017 to May 2018.

महोदय/Sir,

In compliance with Regulation 30(6)(b) of Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014, the certified open cycle generation for the months of December 2017 to May 2018 in terms of MUs as well as in percentage (%) of gross generation for NTPC Limited's gas based generating stations is as under.

Open cycle generation is certified under two categories, first where open cycle generation took place due to schedule given by beneficiaries and second where open cycle generation took place due to schedule under ancillary services. Commercial settlement for the first category may be done as per the existing practice. Commercial settlement for the second category may be done as per the decision to be taken by NPC/NRPC in this regard.

Category 1: Open Cycle Generation due to schedule given by beneficiaries

Month/ Generating Station	Anta GPS	Auraiya GPS	Dadri GPS
Dec-17	-	0.094350 MU (3.4185%)	0.231300 MU (0.1591%)
Jan-18	0.217693 MU (0.3787%)	0.107260 MU (0.1977%)	0.170000 MU (0.5965%)
Feb-18	-	0.063790 MU (1.5750%)	0.170700 MU (0.1703%)
March-18	0.222588 MU (1.0305%)	-	0.249013 MU (0.2803%)
April-18	-	-	0.105000 MU (0.0948%)
May-18	0.597511 MU (6.5214%)	0.508423 MU (1.3526%)	0.896211 MU (0.5552%)

Category 2: Open Cycle Generation due to schedule under ancillary services

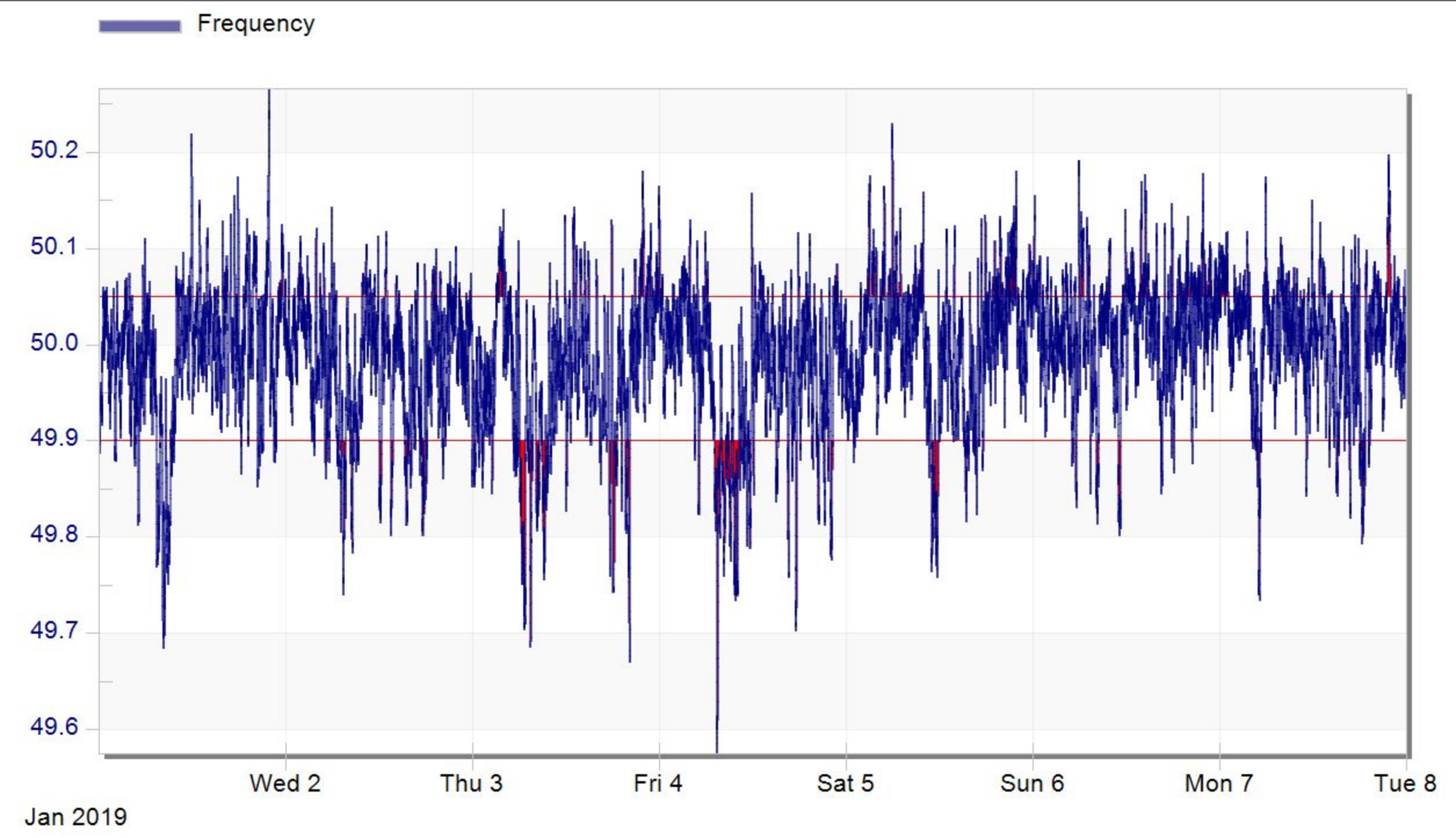
Month/ Generating Station	Anta GPS	Auraiya GPS	Dadri GPS
Dec-17	0.394088 MU (22.529%)	-	-
Jan-18	-	-	-
Feb-18	0.279552 MU (3.023%)	-	-
March-18	-	-	-
April-18	-	-	-
May-18	-	-	-

भवदीय

16/12/18

(एमसिंह .पी.के.ए. / M.A.K.P. Singh)
सदस्य सचिव/Member Secretary

18-ए, शहीद जीत सिंह मार्ग, कटवारिया सराय, नई दिल्ली- 110016 फोन:011-26513265 फैक्स: 011-26865206 ई-मेल: ms-nrpc@nic.in वेबसाईट: www.nrpc.gov.in
18-A, Shaheed Jeet Singh Marg, Katwaria Sarai, New Delhi-110016 Phone: 011-26513265 Fax: 011-26865206 e- mail: ms-nrpc@nic.in Website: www.nrpc.gov.in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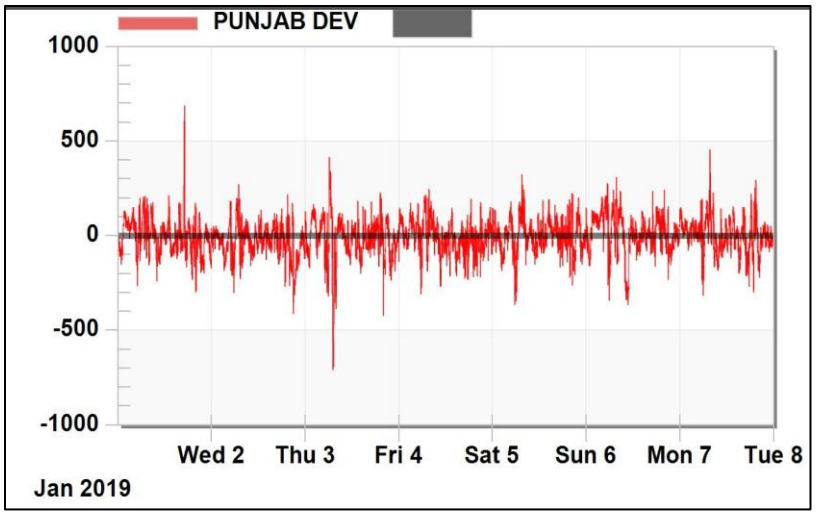
Jan 2019

ANNEXURE-2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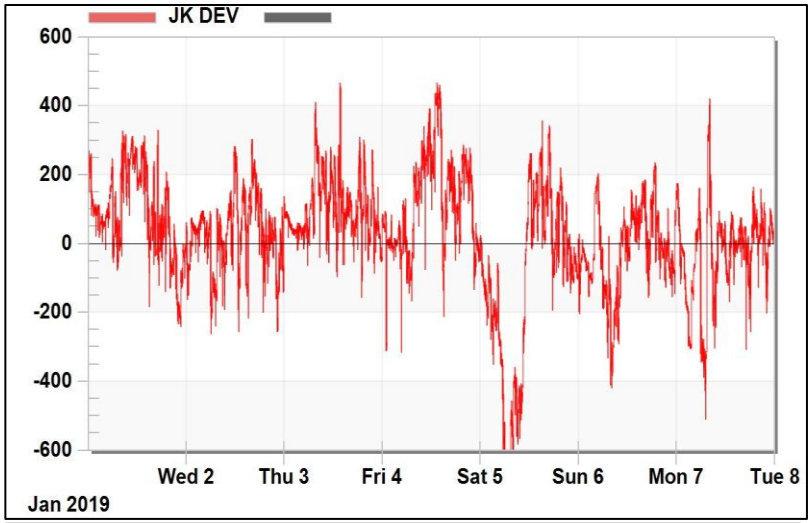
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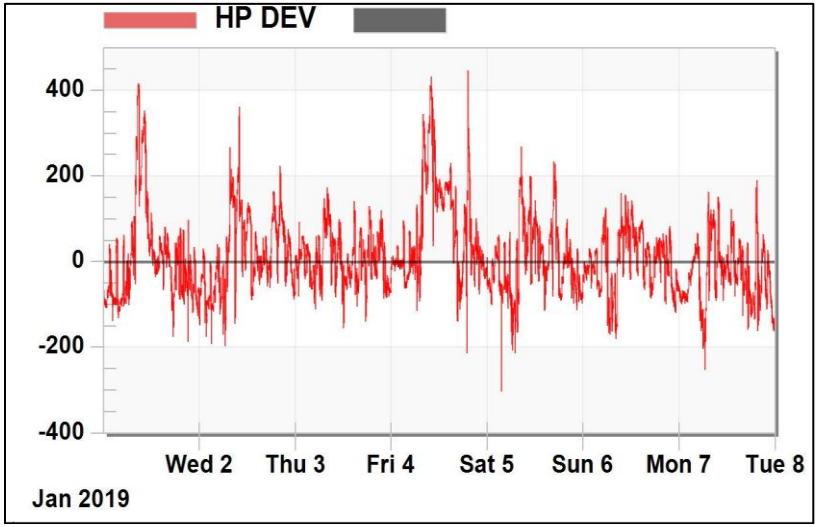
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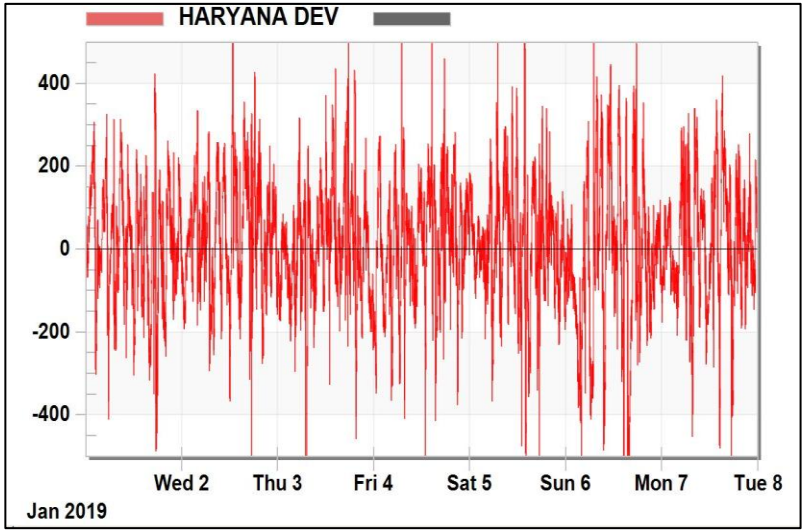
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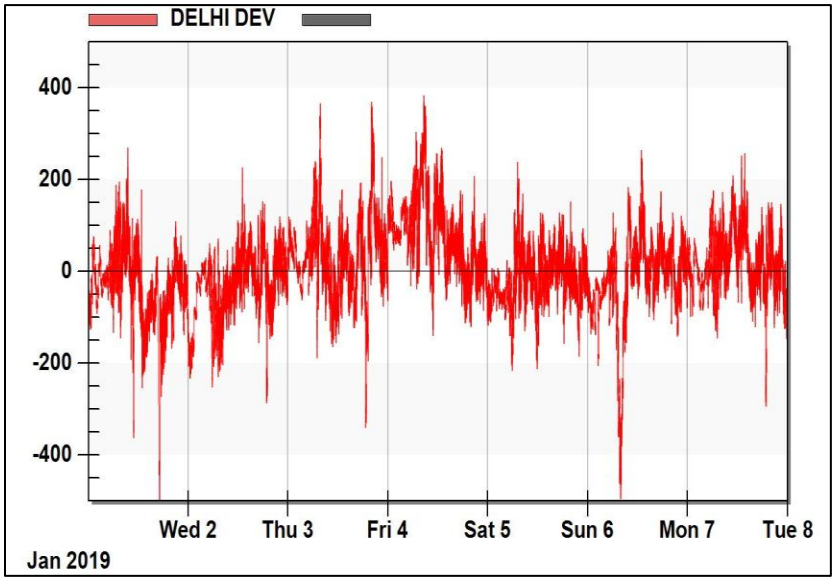
ANNEXURE-2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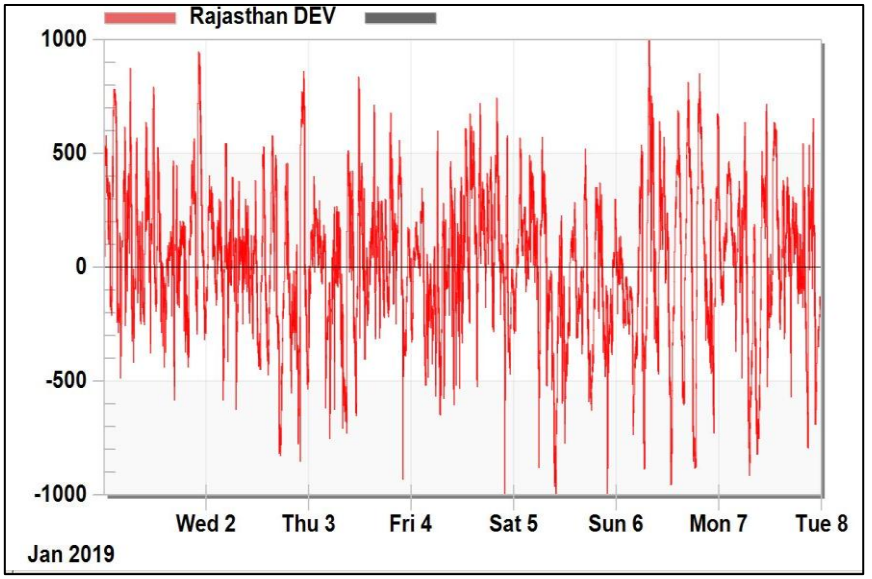
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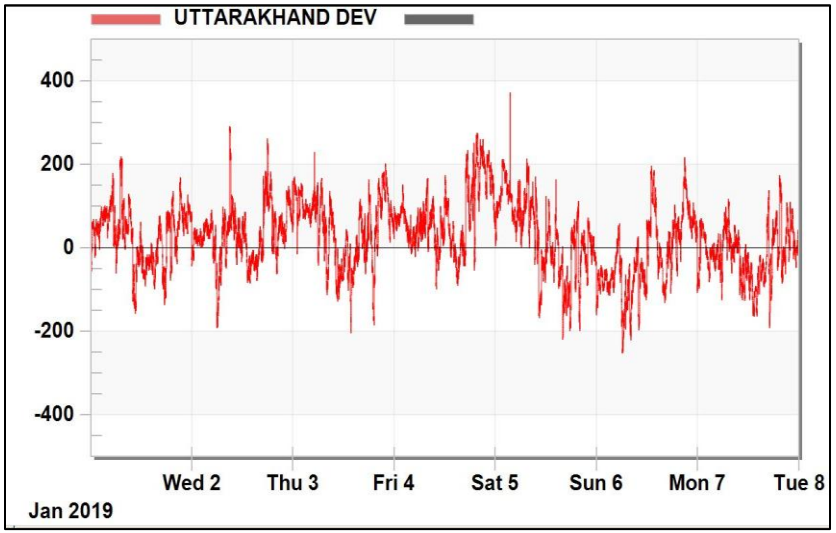
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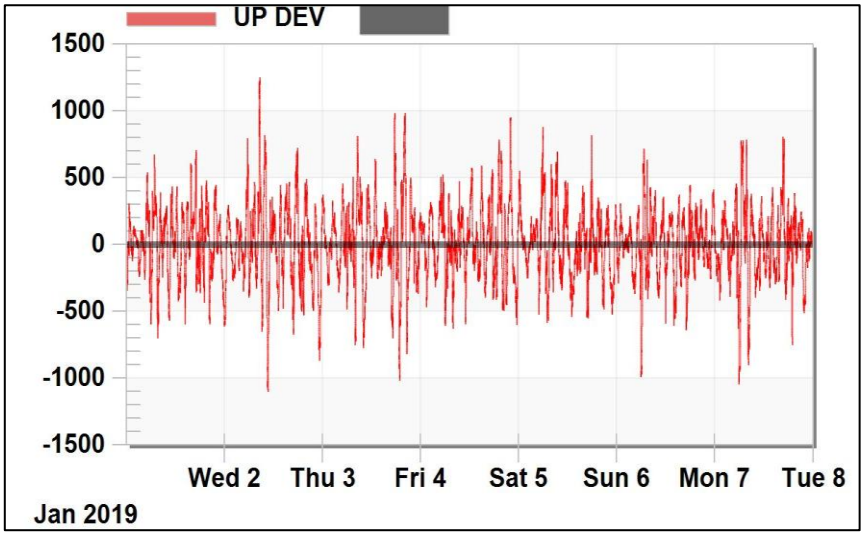
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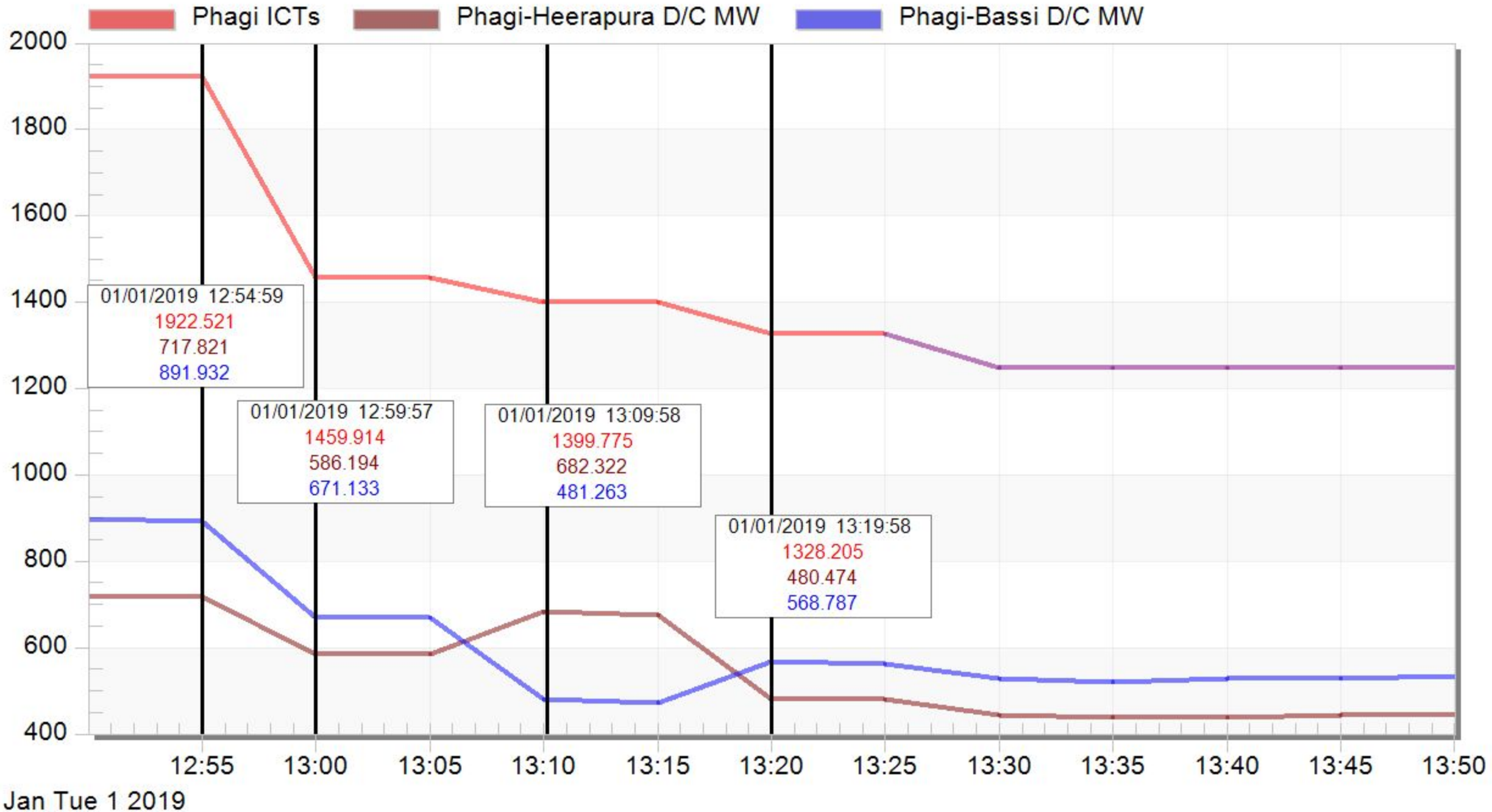
Jan 2019

Phagi ICTs


Phagi ICTs
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Phagi-Bassi D/C MW
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1400
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891.932
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Procedure for furnishing information for modelling Wind generating stations in Indian Grid

1.0 Introduction:

The purpose of this document is to act as a guideline for exchange of information for accurate modelling of wind farms and parks in India. With India poised to integrate more than 60 GW of utility scale wind generation, availability of fit-for-purpose steady state and dynamics models of wind turbine generators and wind parks will enable secure operation of Indian power grid and enable identification of potential weak points in the grid so as to take appropriate remedial actions.

1.1 Applicability:

The guideline shall be applicable to all utility scale wind farms in India that can have an impact on operation of the power grid of India, irrespective of connection at Intra-STS or ISTS (Inter-state Transmission System).

This document presents the desired information for collection of data for modelling of Wind generators / Wind farms or parks in PSS/E software, a software suite being used pan-India at CEA, CTU, SLDCs, RLDCs, and NLDC for modelling of India's power grid. A systematic set of data and basic criteria for furnishing data are presented.

1.2 Need for a fit-for-purpose model:

There is a cost involved in developing and validating dynamic models of power system equipment. But there are much higher benefits for the power system if this leads to a functional, fit-for-purpose model, and arrangements that allow that model to be maintained over time.

A functional fit-for-purpose dynamic model will:

- Facilitate significant power system efficiencies and reliability by allowing power system operations to confidently identify the secure operating envelope and thereby manage security effectively
- Allow assessment of impact on grid elements due to connection of new elements (network elements, generators, or loads) for necessary corrective actions
- Permit power system assets to be run with margins determined on the basis of security assessments
- Facilitate the tuning of control systems, such as power system stabilisers, voltage- and frequency-based special control schemes etc.
- Improve accuracy of online security tools, particularly for unusual operating conditions, which in turn is likely to result in higher reliability of supply to power system users.

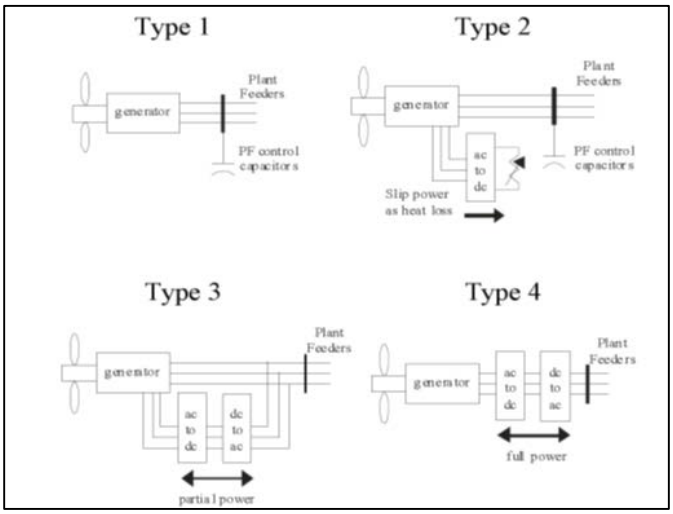
The power system model would enable steady state and electromechanical transient stability simulation studies that deliver reasonably accurate outcomes. Detailed proprietary aerodynamics, electromagnetic

transient studies and proprietary individual inverter controls are out of the scope of the models under consideration. A generic Power Plant Controller (PPC) should be modeled for understanding the interactions with the grid.

2.0 Wind generation technologies:

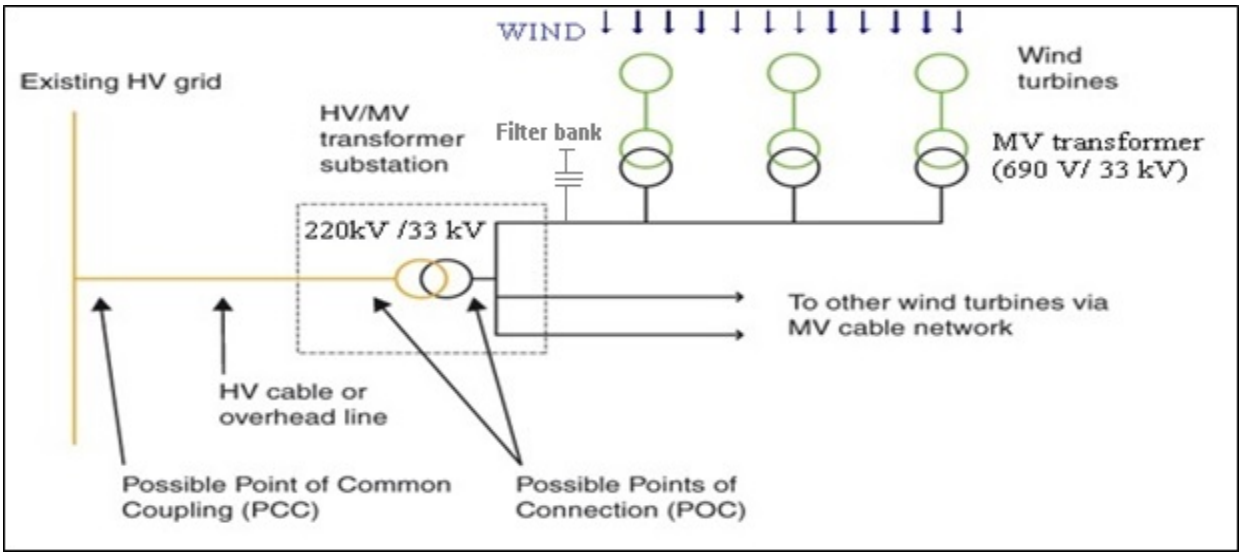
The majority of commercially available wind power plants use one of the wind turbine-generator (WTG) technologies listed below:

- Type-1 : Direct connected (Squirrel cage) induction generator (SCIG)
  - Fixed Speed stall control
  - Fixed Speed Active control
- Type-2 : Wound rotor induction generator (WRIG) with a variable resistor in the rotor circuit
- Type-3 : Doubly fed induction generator (DFIG) wind turbines ; Variable speed with rotor side converter
- Type-4 : Full converter wind turbine
  - Synchronous generator
  - Permanent Magnet Generator (PMG)



Wind energy plants are being increasingly coupled with complimentary Battery Energy Storage Systems (BESS) to reduce the variability of net power output from the renewable energy plant, provide higher output, or provide complimentary grid services such as frequency regulation. Modelling batteries / storage devices assume importance in such cases to capture the net impact of the plant on grid.

3.0 Models for Wind generators:

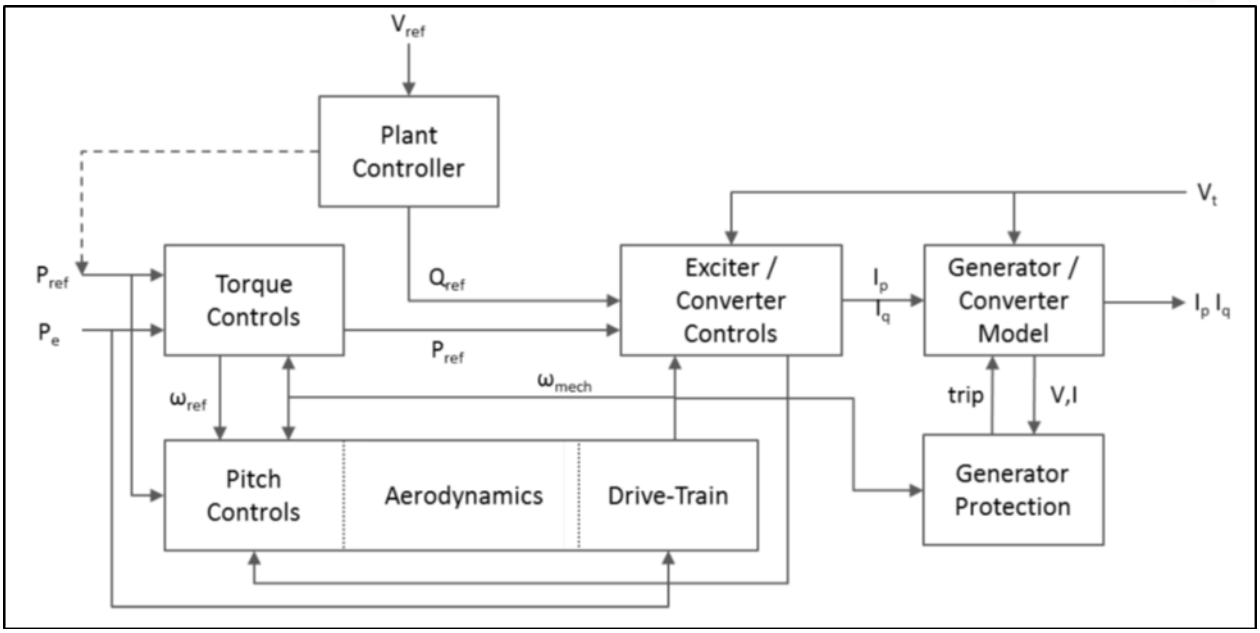


In a typical wind farm / park, individual WTGs (typically rated 3 MW or less) are connected in a system of twigs and feeders. Wind generation at around 660 V / 690 V is stepped up to a MV level of typically 33 kV in Indian system and finally pooled to grid at 220 kV / 400 kV through step-up transformers. A typical wind farm of 300 MW will be spread over an area of 600 acres, and power transmission within the farm is typically at 33 kV through overhead lines or underground cables. A Power Plant controllers (PPC) is usually installed at the point of interconnection to grid or at the reticulation system. The PPC(s) control behavior of wind farms in accordance with mandates as per grid codes.

The dynamic components of a wind farm consists of the following elements (illustrated in picture below):

1. Generator or Converter
2. Electrical control
3. Drive-Train model
4. Aerodynamics
5. Pitch controller
6. Torque controller
7. Power Plant Controller (PPC)
8. Energy storage (As applicable)

The components may or may not be present depending on the nature of technology used for wind power generation (i.e. type of turbine). Depending on the nature of technology, usage/configuration of components at site (‘As built’), the requirements for steady state and dynamic modelling evolves.



For POSOCO to have access to verified fit-for-purpose models of wind farms/ parks connected to Indian grid, the following information are required:

1. Electrical Single Line Diagram (SLD) of as built Wind farm /park depicting:
    - For individual WTGs: Type, MW rating, MVAR capability, Manufacturer, Model no., capability curve
    - Reticulation system (MV system within the wind farm): Length of individual branch / twig, Type of conductor, Electrical parameters (R, X, B)
    - Filters (active or passive) or capacitor banks
    - Details of MV (690V/33kV) and HV (33kV/220kV) step-up transformers: Rating, Impedance, Vector Group, Tap changers (Type, Tap Steps, Max Ratio and Min Ratio in p.u.)
    - Aggregated steady state model validated for P injection and Q injection at the point of interconnection.
2. Generic models of WTGs / Wind farms (Refer sections 3.1 to section 3.4)
    - Models should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 600s.
    - Including a Generic Power Plant Controller (PPC) model which represents the interaction of power plant with the grid. Settings of the Power Plant Controller may be tuned as per the existing setup on field.
    - Simulation results depicting validation of Generic models against User-Defined models (for P, Q, V, I) and against actual measurement (after commissioning) to be provided.
3. Encrypted user defined model (UDM) in a format suitable for latest release PSS/E (*.dll files) for electromechanical transient simulation for components of WTGs / Wind farm (in case non-availability of validated generic model)

- 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 (for P, Q, V, I) to be provided
- The use of black-box type representation is not preferred.
- Models should be suitable for an integration time step between 1ms and 10ms, and suitable for operation up-to and in excess of 100s.

4. Wind Turbine datasheet
5. Voltage/reactive control strategy of farm, reactive capability curves at the point of interconnection (Temperature and Voltage dependence)
6. Settings from a wind turbine (each model in the farm)
   - Mapping of settings from a wind turbine to the corresponding model (both UDM and generic)
7. Settings from the Power plant controller (PPC)
   - Mapping of settings from PPC to the corresponding model (UDM and Generic model)
8. Disturbance recordings – of wind farm response to grid 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 (squirrel cage) 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 *(Use only for Type 1 with active stall*)
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
Storage	Utility Scale Battery Energy Storage System (BESS)	REECCU1	Electrical Control Model (To be used alongwith REGCA1 and REPCA1)

- Detailed block diagrams are enclosed at Annexure

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 (PMAX) 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]	-
	QMAX	
	QMIN	
Single Line Diagram	Single line diagram of the wind farm/park 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 (Cp) 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	
	Number of taps	
	Tap ratio range	
Connection Details	Voltage influence (maximum change etc)	
	Short circuit ratio (SCR)	
	· Min	
	· Max	
	Harmonic filters	
	STATCOM	
	Synchronous condensers	
	Battery Energy Storage System (if applicable)	
Power Plant Controller (PPC) Details	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) Xs	
	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)	XA, stator reactance (pu)	
	Doubly fed induction generator (DFIG) wind turbines ; Variable speed with rotor side converter	
	X1 rotor reactance (put)	
	R_Rot_Mach, rotor resistance (pu)	
	R_Rot_Max (sum of R_Rot_Mach + 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	
	Htfrac, Turbine inertia fraction (Hturb/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	
	Zerox, 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 < Accel <= 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)	

Category	Parameter Description	Data
Electrical Control model : BESS		
Generic Electrical Control model for Utility Scale BESS: (REECCU1)	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)	
	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	
	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 and Iq curve (Reactive Power V-I pair in p.u.) : 4 points	
	Vp and Ip curve (Active Power V-I pair in p.u.) : 4 points	
	T, battery discharge time (s) (<0)	
	SOCini (pu), Initial state of charge	
	SOCmax (pu), Maximum allowable state of charge	
	SOCmin (pu), Minimum allowable state of charge	

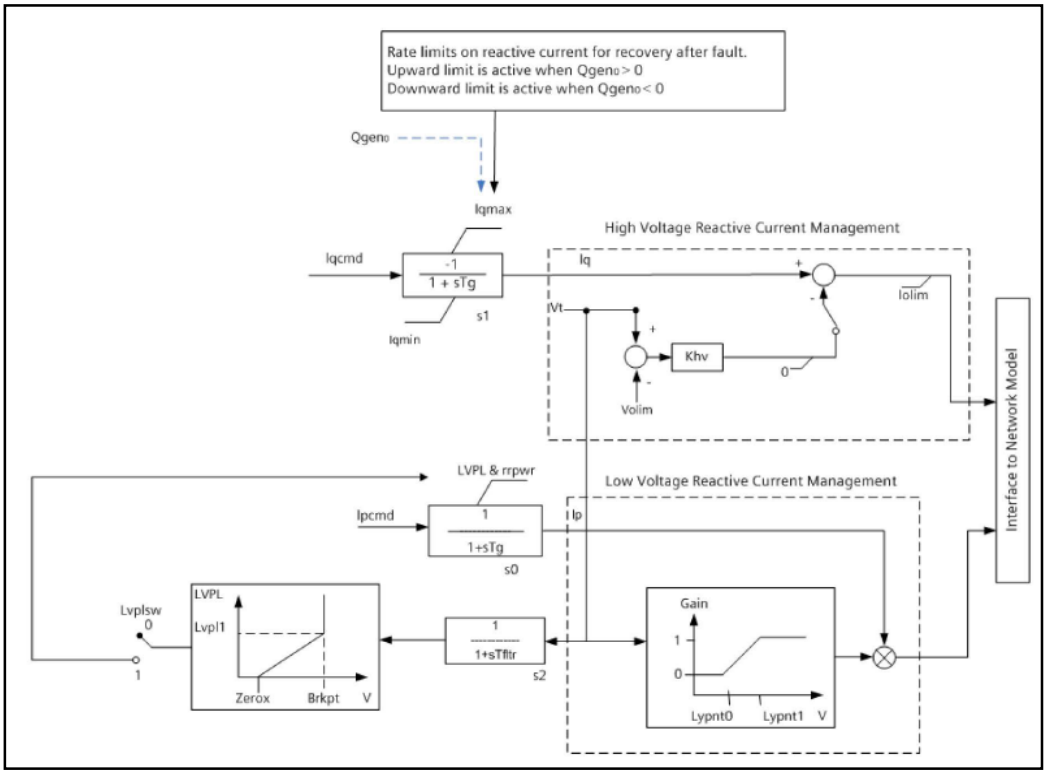
Note: SOCini represents the initial state of charge on the battery and is a user entered value. This is entered in pu; with 1 pu meaning that the batter is fully charged and 0 means the battery is completely discharged

Annexure – I

Block Diagrams

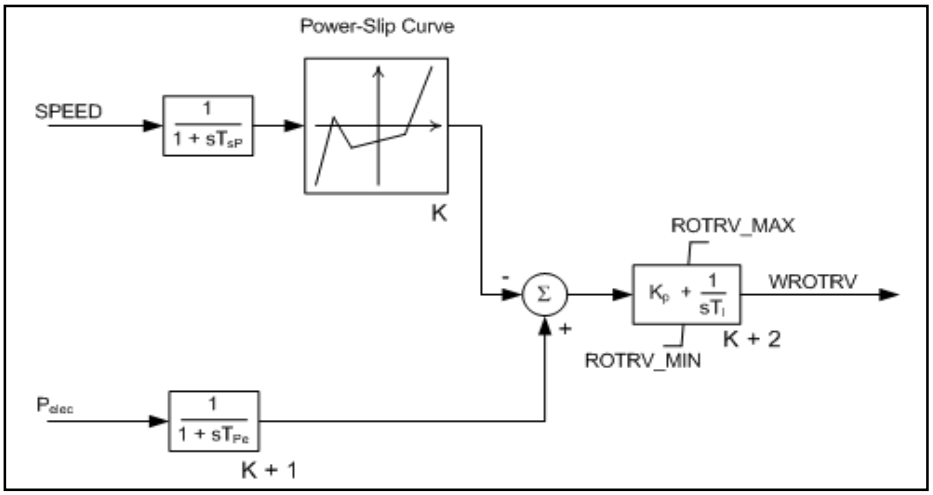
A. Generators:

- REGCA1: Generic Model for Type-3 and Type-4 wind turbines



B. Electrical Control:

- Type-2 (WT2E1) : Rotor Resistance Control



- Type-3 or Type-4 (REECA1) :

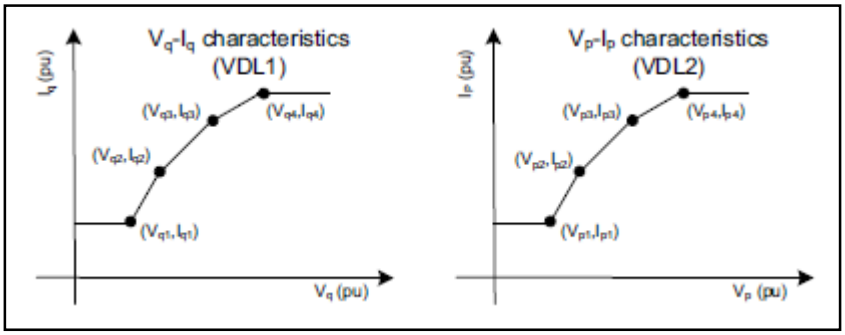
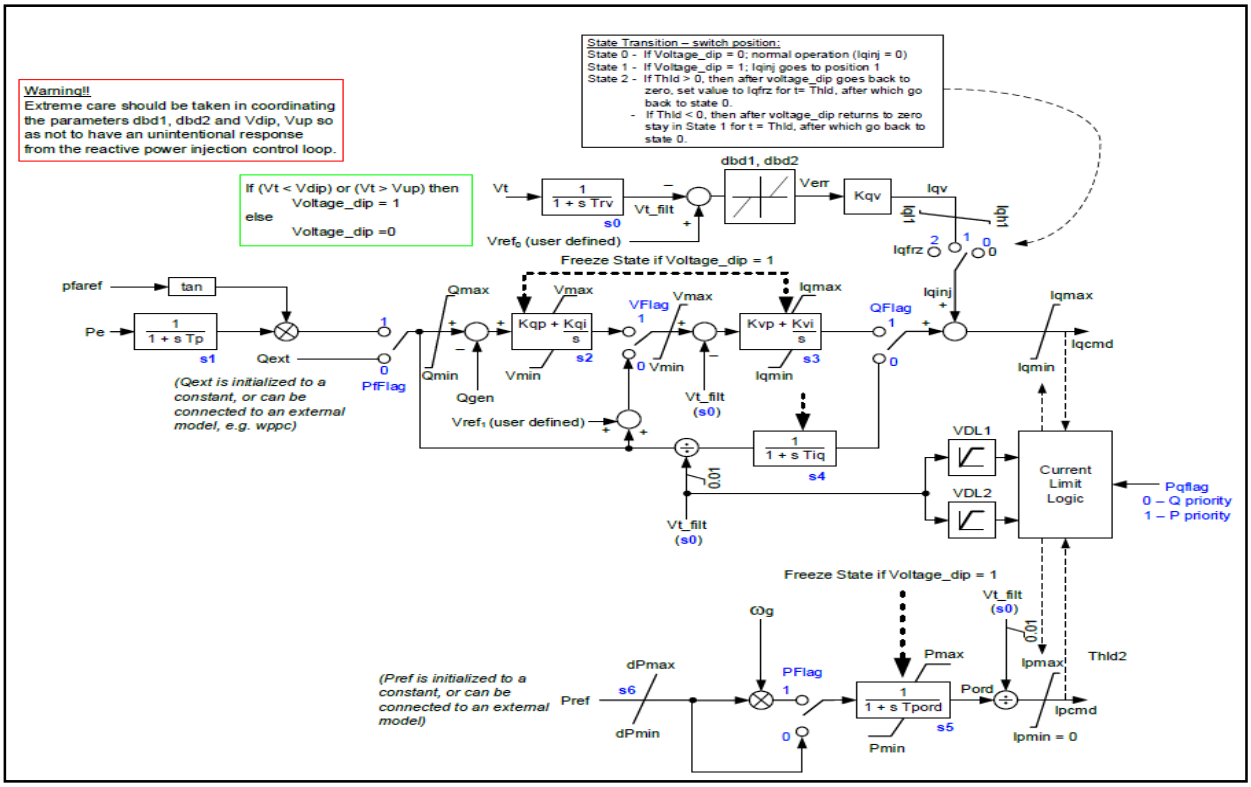
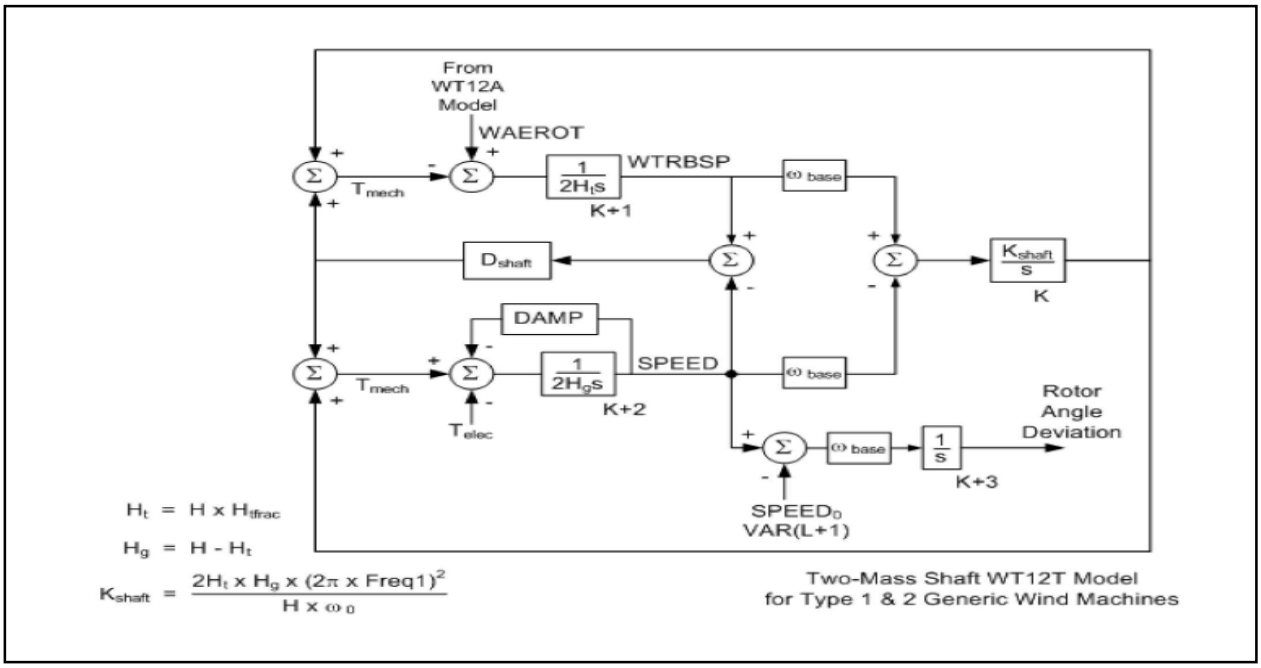


Figure: *Vp-Ip and Vq-Iq curves for REECA1 model*

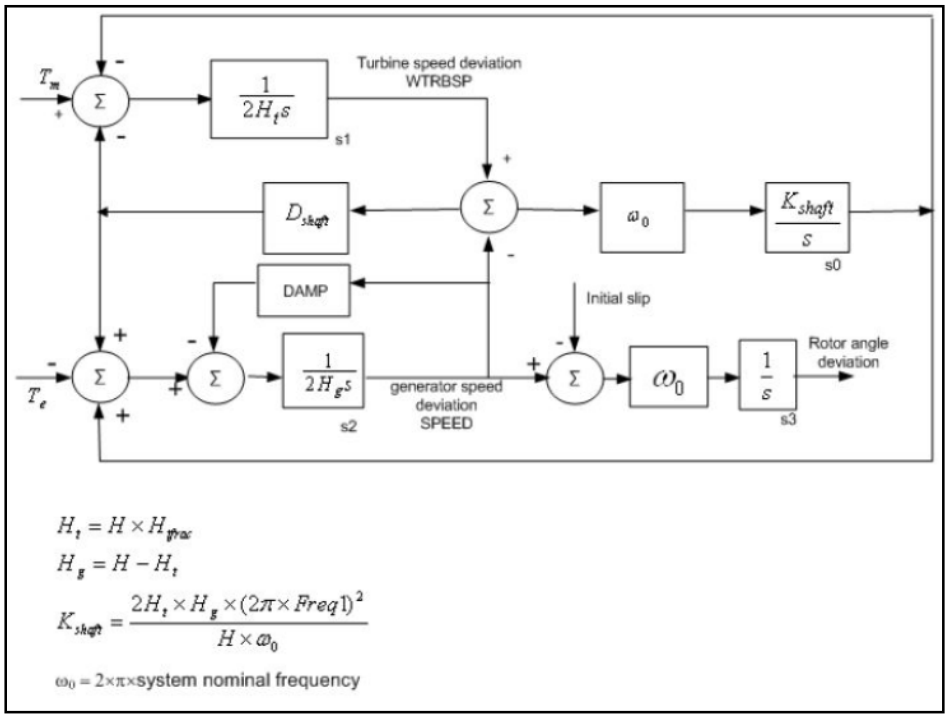


C. Drive Train Model:

- Type-2 (WT12T1) : For Type 1 and Type-2 wind turbines

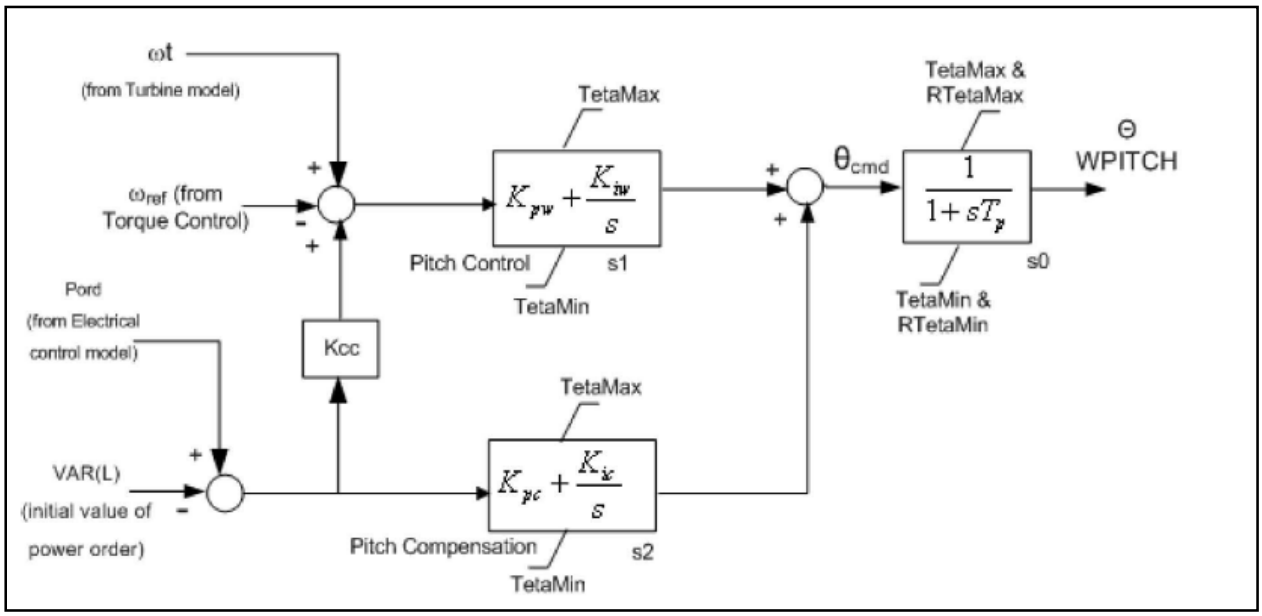


- WTDTA1 : Generic Drive Train model for Type-3 and Type-4 turbines



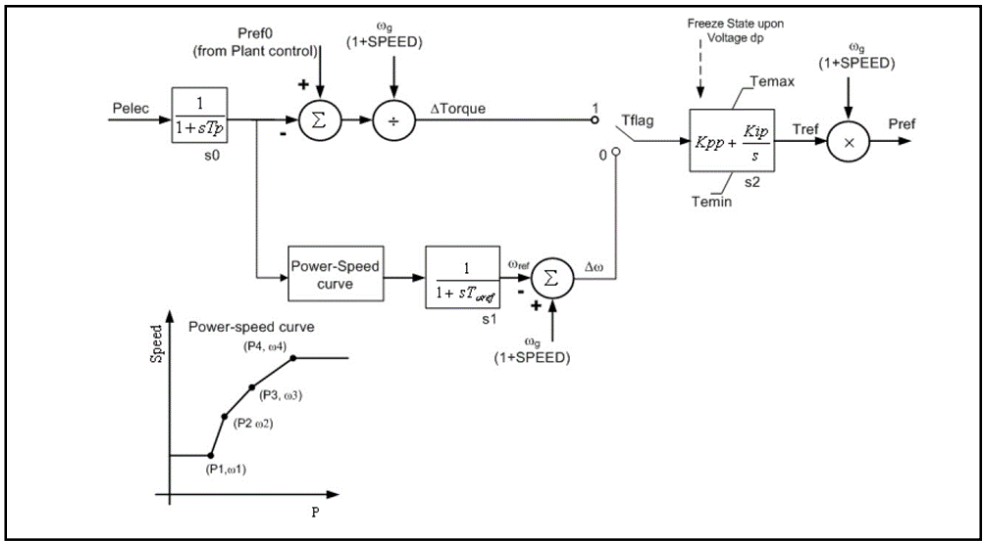
D. Pitch Control:

- Type-3 (WTPTA1) : Generic Pitch Control for Type-3 WTG



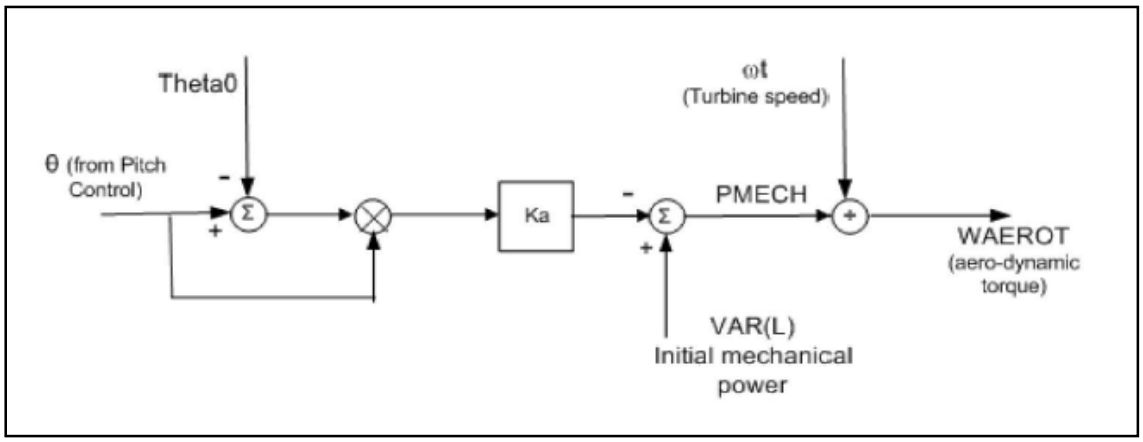
E. Torque Controller Model:

- Type-3 (WTTQA1) : Generic Torque Controller for Type-3 WTG



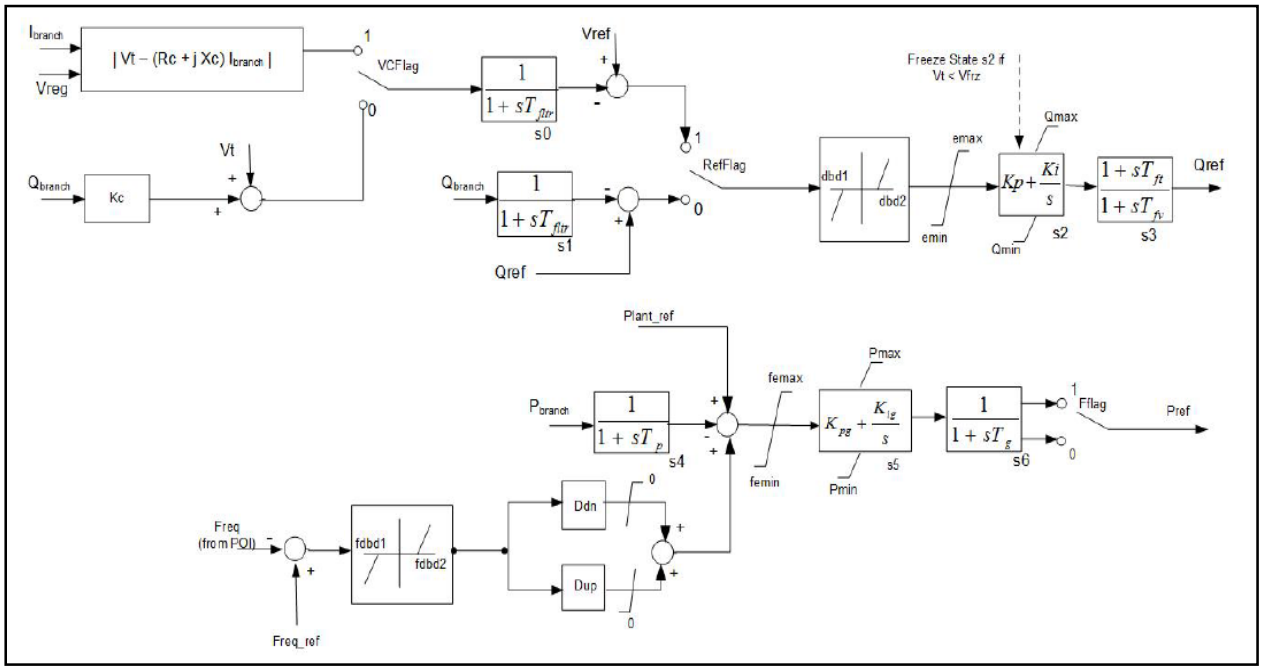
F. Aerodynamic Model:

- Type-3 (WTARA1) : Generic Aerodynamic model Type-3 WTG

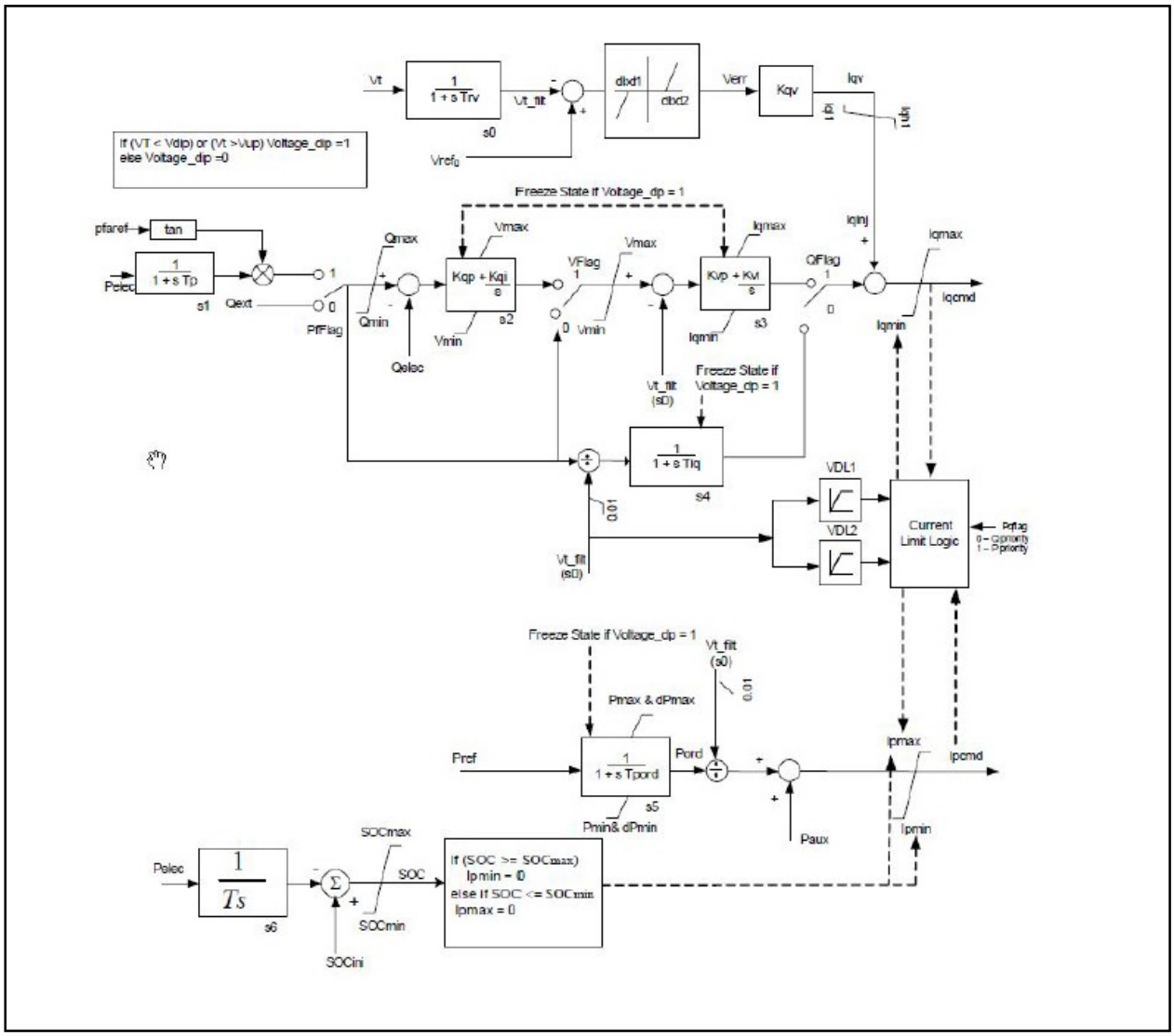


G. Power Plant Controller (PPC) Model:

- REPCTA1 for type 3, and REPCA1 for type 4 turbines



H. Electrical Control Model for Utility Scale Battery Energy Storage System (BESS):



Annexure-5

S. NO.	Element Name	Outage Date	Outage Time	Reason/Remarks
1	765kV Aligarh(PG)-Kanpur New(PG)	9-Dec-18	20:39	Over voltage. As per PMU, No fault observed.
		16-Dec-18	1:40	Over voltage. As per PMU, No fault observed.
		20-Dec-18	20:58	Over voltage. As per PMU, No fault observed.
		22-Dec-18	2:28	Over Voltage, DT received at kanpur end. As per PMU, No fault observed.
		30-Dec-18	2:14	Phase to earth fault. As per PMU, No fault observed.
2	400kV Anpara(UP)-Mau(UP)	2-Dec-18	15:07	B-N fault. As per PMU, B-N fault occured, no auto-reclosing observed.
		24-Dec-18	6:25	B-N fault, 85km from Mau(UP) end. As per PMU, B-N fault occured, no auto-reclosing observed.
		30-Dec-18	6:06	Y-B fault, 221km from Mau(UP) end. As per PMU, Y-B fault occurred.
		30-Dec-18	10:20	B-N fault, 19.5km from Mau(UP) end. As per PMU, B-N fault occured, no auto-reclosing observed.
3	400kV Bus 1 at Orai(UP)	3-Dec-18	2:18	R-N fault. As per PMU, R-N fault, unsuccessful auto-reclosing observed.
		9-Dec-18	4:25	Bus bar protection operated. As per PMU, R-N fault, unsuccessful auto-reclosing observed.
		10-Dec-18	20:35	Bus bar protection operated, tripped along with 400 kV Orai (UP)-Mainpuri 765 (UP) -2 due to R-N fault. As per PMU, R-N fault, unsuccessful auto-reclosing observed.
		25-Dec-18	2:34	Bus bar protection operated. As per PMU, R-N fault, unsuccessful auto-reclosing observed.
4	765kV Aligarh(PG)-Orai(PG) ckt-1	22-Dec-18	1:43	B-N fault. As per PMU, B-N fault, unsuccessful auto-reclosing observed.
		27-Dec-18	7:09	B-N fault. As per PMU, B-N fault, unsuccessful auto-reclosing observed.
		30-Dec-18	5:45	B-N fault, 43.8km from Aligarh(PG) end. As per PMU, B-N fault, unsuccessful auto-reclosing observed.
5	220kV AD Hydro-Phojal(HP)	3-Dec-18	9:25	False tripping of CB at Phozal(HP)side. As per PMU, No fault observed.
		7-Dec-18	15:20	R-N fault. As per PMU, No fault observed.
		25-Dec-18	0:05	Fault indicated on relay was General Trip as per HP SLDC. As per PMU, No fault observed.

Annexure-6

S.No.	Region	Name of Elements (Tripped/Manually opened)	Owner/ Agency	Outage		Event *(As reported)*	Generation Loss(MW)	Load Loss(MW)	Category as per CEA Grid Standards	Energy Unserved (in MU)	Preliminary Report receipt status			DR/EL receipt status			Detailed Report receipt status		Fault Clearance time (in ms)
				Date	Time						within 24hrs	after 24hrs	Not Received	within 24hrs	after 24hrs	Not Received	Received	Not Received	
1	NR	1) 400kV Mainpuri 765(U)-Orai(UP) ckt-2 2) 400 kV Bus 1 at 400/220kV Orai(UP)	UP	3-Dec-18	2:18	400kV Mainpuri 765(UP)-Orai(UP) ckt-2 & 400 kV Bus 1 at 400/220kV Orai(UP) tripped on R-N fault. As per PMU, R-N fault is observed with unsuccessful autoreclosing attempt. In antecedent condition, 400kV Mainpuri 765(U)-Orai(UP) ckt-2 carrying 76 MW.			GI-2		Y(UP)				Y(UP)		Y(UP)		80ms
2	NR	1) 400kV Dadri(NTPC)-Panipat(BBMB) ckt-1 2) 400kV Dadri(NTPC)-Panipat(BBMB) ckt-2	BBMB, NTPC & POWERGRID	4-Dec-18	3:07	400kV Dadri(NTPC)-Panipat(BBMB) ckt-1 tripped on R-N fault. At the same time, 400kV Dadri(NTPC)-Panipat(BBMB) ckt-2 tripped on overvoltage at Dadri(NTPC) end. As per PMU, B-N fault is observed. In antecedent conditions, 400kV Dadri(NTPC)-Panipat(BBMB) ckt-1 & 2 carrying 243 MW & 233 MW respectively.			GI-2				Y(BBMB),Y(NTPC), Y(PG)			Y(BBMB),Y(NTPC),Y(PG)		Y(BBMB),Y(NTPC),Y(PG)	80ms
3	NR	1) 220kV Tanakpur(NHPC)-Sitarganj(PG) 2) 220kV Cbganj(UP)-Sitarganj(PG)	POWERGRID, NHPC & UP	4-Dec-18	15:28	220kV Tanakpur(NHPC)-Sitarganj(PG) & 220kV Cbganj(UP)-Sitarganj(PG) tripped due to internal temporary problem in RTU. As per PMU, no fault is observed in the system. In antecedent conditions, 220kV Tanakpur(NHPC)-Sitarganj(PG) & 220kV Cbganj(UP)-Sitarganj(PG) carrying 50 MW.			GI-2		Y(PG)	Y(NHPC)	Y(UP)	Y(PG)		Y(NHPC), Y(UP)		Y(PG)	NA
4	NR	1) 800kV HVDC (Agra-BNC) Pole-1 at Agra HVDC 2) 800kV HVDC (Agra-BNC) Pole-2 at Agra HVDC 3) 800kV HVDC (Agra-Alipurdwar ER) Pole-3 at Agra HVDC	POWERGRID	5-Dec-18	10:19	800kV HVDC (Agra-BNC) Pole-1, Pole-2 & 800kV HVDC (Agra-Alipurdwar ER) Pole-3 at Agra HVDC tripped due to Bus fault at BNC and Alipurdaur end. HVDC Pole-4(Agra-Alipurdwar ER) was already out for control the loading of 400 KV Purnia-Malda. As per PMU, Variation observed in the phase voltages. In antecedent conditions, Pole-1, 2 & 3 carrying 245 MW, 340 MW & 245 MW respectively.			GI-2		Y(PG)			Y(PG)				Y(PG)	NA
5	NR	1) 400 kV Dadri-G. Noida(UP) ckt 2) 400 kV Dadri-Maharani Bah(PG) ckt 3) 500kV Rihand-Dadri Pole-2 4) 400 kV Dadri-Mandaula(PG) ckt-1 & 2 5) Feeders under C&D load group of Rihand-Dadri SPS	POWERGRID, NTPC, UP	8-Dec-18	17:41	Snapping of OPGW wire created blue phase to earth fault in the system. It resulted into tripping of both 400 kV Dadri-G. Noida (UP) and Dadri-Maharani Bagh (PG) ckt (As 400 kV Dadri-G. Noida and Dadri-Maharani Bagh ckt was on same tower for some distance). As 400 kV Maharani Bagh-Ballabgarh was already under planned outage. Tripping of 400 kV Dadri-Maharani Bagh (PG) ckt resulted into complete outage of 400 kV Maharani Bagh (PG). Rihand-Dadri Pole-2 also tripped reportedly on commutation failure at Rihand end. Case-2 of Rihand-Dadri SPS also operated and it resulted into tripping of feeders in C&D load group (planned load shedding quantum: 520 MW). After 5 second of the incident 400 kV Dadri-Mandault ckt-1 & 2 also tripped. This time fault was in R & Y phase.		960	GD-1	0.56	Y(PG)	Y(NTPC)	Y(UP)	Y(PG)	Y(NTPC)	Y(UP)		Y(PG)	200ms
6	NR	1) 400kV Mainpuri 765(U)-Orai(UP) ckt-2 2) 400 kV Bus 1 at 400/220kV Orai(UP)	UP	9-Dec-18	4:25	400kV Mainpuri 765(UP)-Orai(UP) ckt-2 & 400 kV Bus 1 at 400/220kV Orai(UP) tripped on R-N fault. As per PMU, R-N fault is observed. In antecedent condition, 400kV Mainpuri 765(U)-Orai(UP) ckt-2 carrying 96 MW.			GI-2		Y(UP)				Y(UP)		Y(UP)		80ms
7	NR	1) 400kV Mainpuri 765(U)-Orai(UP) ckt-2 2) 400 kV Bus 1 at 400/220kV Orai(UP)	UP	10-Dec-18	20:35	As reported, 400kV Mainpuri 765(UP)-Orai(UP) ckt-2 & 400 kV Bus 1 at 400/220kV Orai(UP) tripped on R-N fault. As per PMU, R-N fault is observed. In antecedent condition, 400kV Mainpuri 765(U)-Orai(UP) ckt-2 carrying 135 MW.			GI-2			Y(UP)			Y(UP)		Y(UP)		80ms
8	NR	1) 220kV Bus Coupler at 220kV Sarojini Nagar(UP) 2) 315MVA 400/220kV ICT II (220kV side) 3) 160MVA 220/132k ICT I 4) 100MVA 220/132k ICT III 5) 220k Sarojini Nagar(UP)-Hardoi Road line 6) 220k Sarojini Nagar(UP)-Kanpur Road line 7) 220k Sarojini Nagar(UP)-Bachhrawan line Elements tripped due to operation of 50BF (In order of	UP	10-Dec-18	18:57	220kV Bus Bar protection installed at 220 kV Substation Sarojini Nagar(UP) operated on LBB protection at the time of testing of newly commissioned CTs on 220kV Sarojini Nagar(UP)- Unnao(UP) line. As a result of this, all 220kV elements running on B bus got tripped. Also, only one 160 MVA transformer survived in this case which resulted operation of SPS which further tripped 03 nos 132kV lines and 04 nos 33kV lines. As per PMU, No fault is observed. In antecedent conditions, ICT 1 & 3 carrying 70 MW & 76 MW respectively.		250	GD-1	0.04		Y(UP)			Y(UP)		Y(UP)		NA
9	NR	1) 200 MVA ICT1 at 400/220kV Rosa(UP) 2) 200 MVA ICT2 at 400/220kV Rosa(UP)	UP	18-Dec-18	8:42	200 MVA ICT1 & ICT2 at 400/220kV Rosa(UP) tripped on phase to earth fault. As per PMU, B-N fault with delayed clearance is observed. In antecedent condition, 200 MVA ICT 1 & ICT 2 carrying 91 MW & 93 MW respectively..		85	GD-1	0.12		Y(UP)				Y(UP)		Y(UP)	400ms
10	NR	1) 200 MVA ICT1 at 400/220kV Rosa(UP) 2) 200 MVA ICT2 at 400/220kV Rosa(UP)	UP	19-Dec-18	2:10	200 MVA ICT1 & ICT2 at 400/220kV Rosa(UP) tripped due to operation of differential protection on HV side and overcurrent relay operation on LV side. As per PMU, B-N fault is observed. In antecedent condition, 200 MVA ICT 1 & ICT 2 carrying 76 MW & 75 MW respectively.		290	GD-1	0.25			Y(UP)			Y(UP)		Y(UP)	80ms
11	NR	1) 400kV Dhanonda(HVPNL)-Mohindergarh(Adani) ckt-1 2) 400kV Dhanonda(HVPNL)-Mohindergarh(Adani) ckt-2 3) 315MVA ICT 2 at 400/220kV Dhanonda(HVPNL) 4) 315MVA ICT 3 at 400/220kV Dhanonda(HVPNL)	Haryana & ADANI	20-Dec-18	6:37	400kV Dhanonda(HVPNL)-Mohindergarh(Adani) ckt-1 & 2 tripped due to DT received at Mohindergarh(Adani) end. At the same time, 315MVA ICT 2 & ICT 3 at 400/220kV Dhanonda(HVPNL) also tripped. As per PMU, No fault observed in the system. In antecedent conditions, 400kV Dhanonda(HVPNL)-Mohindergarh(Adani) ckt-2 carrying 255 MW each & 315MVA ICT 2 & ICT 3 carrying 153 MW & 152 MW respectively. At 0743 Hrs, 315MVA ICT 1 also tripped on LV instantaneous O/C due to overloading.			GI-2		Y(Adani)	Y(Har)		Y(Adani)		Y(Har)		Y(Har)	NA
12	NR	1) 220kV Mandola(PG)-Wazirabad(DTL) ckt-1 2) 220kV Mandola(PG)-Wazirabad(DTL) ckt-2 3) 220kV Mandola(PG)-Wazirabad(DTL) ckt-3 4) 220kV Mandola(PG)-Wazirabad(DTL) ckt-4 5) 220kV Wazirabad(DTL)-Kashmere Gate(DTL) ckt- 1 & ckt-2 6) 220kV Wazirabad(DTL)-Geeta Colony(DTL) ckt- 1 & ckt-2 7) 220kV Geeta Colony(DTL)-Patparganj(DTL) ckt- 1 & ckt-2	Delhi & POWERGRID	20-Dec-18	9:16	Multiple element tripping at 220kV Wazirabad(DTL) occurred due to R-Y fault. Later, Birdage/wire found near Y phase 220kV Bus-II and dropper jumper of 100 MVA ICT 3 at 220kV Wazirabad(DTL). As per PMU, Y-N fault followed by three phase fault is observed. In antecedent conditions, 220kV Mandola(PG)-Wazirabad(DTL) ckt-1,2,3 & 4 carrying 68 MW each. At Wazirabad(DTL) bus bar protection was out of service.		300	GD-1	0.43	Y(Delhi)		Y(PG)			Y(Delhi),Y(PG)		Y(Delhi)	840ms
13	NR	1) 400kV Ballabgarh(PG)-Nawada(HVPNL)	Haryana & POWERGRID	20-Dec-18	19:14	400kV Ballabgarh(PG)-Nawada(HVPNL) tripped due to DT received at Nawada(HVPNL) end. 400kV Nawada(HVPNL)-Greater Noida(UP) line was under shutdown for diversion work of line due to DFCC, DFCCIL work by POWERGRID. As per PMU, slight voltage rise is observed. Load loss as Nwada load was radially fed from from Ballabhgarh (PG).		250	GD-1	0.16			Y(PG),Y(Har)			Y(PG),Y(Har)		Y(Har)	NA
14	NR	1) 400kV Khedar(HVPNL)-Kirori(HVPNL) ckt-1 2) 400kV Khedar(HVPNL)-Kirori(HVPNL) ckt-2 3) 220 kV Kirori(HVPNL)-Smain ckt-1 4) 220 kV Kirori(HVPNL)-Smain ckt-2 5) 220 kV Kirori(HVPNL)-Masudpur ckt	Haryana	20-Dec-18	1:22	400kV Khedar(HVPNL)-Kirori(HVPNL) ckt-1 & 2 tripped during R-N fault in 220 kV Kirori-Smain ckts. As per PMU, R-N fault followed by Y-N fault is observed. In antecedent conditions, 400kV Khedar(HVPNL)-Kirori(HVPNL) ckt-1 & 2 carrying 54 MW & 56 MW respectively.			GI-2		Y(Har)				Y(Har)		Y(Har)		80ms

Annexure-6

15	NR	1) 400 kV Bus 2 at 400/220kV Panipat(BBMB) 2) 450 MVA ICT 1 at 400/220kV Panipat(BBMB) 3) 400 kV Main BAY/CB (4-352) of Panipat ckt-2 at Dadri TH	BBMB & NTPC	22-Dec-18	10:46	During hot water washing a flash occurred on ICT Blue phase CT of X-5 Circuit breaker resulting in tripping of ICT- I along with operation of Bus bar of 400KV Bus- II at 400/220kV Panipat(BBMB). At the same time, 400 kV Main BAY/CB (4-352) of Panipat ckt-2 at Dadri TH also tripped due to to pole discrepancy at Dadri end. As per PMU, B-N fault is observed. In antecedent conditions, 450 MVA ICT 1 carrying 207 MW.			GI-2				Y(BBMB),Y(NTPC)		Y(BBMB),Y(NTPC)			Y(BBMB)	80ms
16	NR	1) 220kV Ganguwal(BBMB)-Jamalpur(BBMB) ckt-1 2) 220kV Ganguwal(BBMB)-Jamalpur(BBMB) ckt-2 3) 220kV Jamalpur(BBMB)-Sangrur(BBMB) ckt-1 4) 220kV Bhakra-R HPS(BBMB)-Jamalpur (BBMB) ckt-2 5) 220kV Jalandhar(BBMB)-Jamalpur(BBMB) ckt-1 6) 220kV Dandhari Kalan I(PSEB)-Jamalpur(BBMB) ckt-1	BBMB & Punjab	22-Dec-18	23:50	220 kV Bus bar 1 protection operated caused tripping of multiple feeder of 220 kV at BBMB Jamalpur. As per PMU, R-N fault is observed. In antecedent conditions, 220kV Ganguwal(BBMB)-Jamalpur(BBMB) ckt-1 & 2, 220kV Jamalpur(BBMB)-Sangrur(BBMB) ckt-1, 220kV Bhakra-R HPS(BBMB)-Jamalpur (BBMB) ckt-2, 220kV Jalandhar(BBMB)-Jamalpur(BBMB) ckt-1 & 220kV Dandhari Kalan I(PSEB)-Jamalpur(BBMB) ckt-1 carrying 46MW, 45MW, 21MW, 42 MW, 14MW & 51 MW respectively.		60	GD-1	0.15			Y(BBMB),Y(Pun)		Y(BBMB),Y(Pun)			Y(BBMB)	80ms
17	NR	1) 400kV Amritsar(PG)-Makhu(PSTCL) ckt-2 2) 400kV Makhu(PSTCL) -Mukatsar(PSTCL) ckt-1	Punjab & POWERGRID	23-Dec-18	4:29	400kV Amritsar(PG)-Makhu(PSTCL) ckt-2 tripped on Y-N fault. At the same time, 400kV Makhu(PSTCL) -Mukatsar(PSTCL) ckt-1 tripped on B-N fault. As per PMU, B-N fault is observed with unsuccessful autoreclosing. In antecedent conditions, 400kV Amritsar(PG)-Makhu(PSTCL) ckt-2 & 400kV Makhu(PSTCL)- Mukatsar(PSTCL) ckt-1 carrying 87 MW & 95			GI-2				Y(PG),Y(Pun)		Y(Pun)	Y(PG)		Y(Pun)	80ms
18	NR	1) 400kV Makhu(PSTCL)-Mukhtsar(PSTCL)-1 2) 400kV Makhu(PSTCL)-Nakodar(PSTCL)-1 3) 400kV Makhu(PSTCL)-Nakodar(PSTCL)-2	Punjab & POWERGRID	24-Dec-18	17:58	During charging of 400kV Makhu-Mukhtsar ckt-2, R-B fault occurred. All elements at Makhu tripped/manually opened. 400kV Nakodar(PSTCL)-Jalandhar(PG) ckt also tripped simultaneously. 400kV Amritsar D/C and Mukhtsar-1 already out on fault since 23-Dec-18			GI-2			Y(Pun)	Y(PG)		Y(Pun)	Y(PG)	Y(Pun)		400ms
19	NR	1) 400kV Orai(UP)-Paricha(UP)-2 2) 400kV Bus-1 at Orai(UP)	UP	25-Dec-18	2:34	R-N fault occurred in 400kV Orai(UP)-Paricha(UP)-2, 69km from Orai(UP). At Orai(UP), due to bus bar protection operation bus1 tripped. As per PMU data, R-N fault observed with unsuccessful auto-reclosing.			GI-2			Y(UP)			Y(UP)		Y(UP)		80ms
20	NR	1) 400kV Dhuri-Rajpura ckt-1 2) 400kV Dhuri-Talwandi Sabo ckt-1	Punjab	25-Dec-18	7:10	400kV Dhuri-Rajpura ckt-1 and 400kV Dhuri-Talwandi Sabo ckt-1 tripped. Two successive B-N faults observed. As per PMU, two B-N fault observed.			GI-2		Y(Pun)				Y(Pun)			Y(Pun)	80ms & 360ms
21	NR	1) 220kV Debari(RVPNL)-RAPS A(NPC) 2) 220kV RAPS A(NPC)-Sakatpura(RVPNL) ckt-1	NPC & Rajasthan	28-Dec-18	6:15	220kV Debari(RVPNL)-RAPS A(NPC) tripped on R-N fault. At the same time, 220kV RAPS A(NPC)-Sakatpura(RVPNL) ckt-1 also tripped on R-N fault. As per PMU, R-N fault with no autoreclosing is observed. In antecedent conditions, 220kV Debari(RVPNL)-RAPS A(NPC) & 220kV RAPS A(NPC)-Sakatpura(RVPNL) ckt-1 carrying 55 MW & 26 MW respectively.			GI-2			Y(NPC)	Y(Raj)		Y(NPC)	Y(Raj)		Y(NPC)	80ms

Northern Regional inter regional lines tripping for Dec-18

Annexure-7

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	800kV HVDC (Agra-BNC) Pole-1 at Agra^^	POWERGRID	05-Dec-18	10:19	Nil	Loss of AC voltage at BNC, Alipurdwar resulted in blocking of poles	GI-2	05-Dec-18	14:27	NA	YES	YES			Information received from NR end. From PMU, fluctuation observed in voltage magnitude. From , DR/EL & report, Pole blocked on loss of AC supply
2	800kV HVDC (Agra-BNC) Pole-2 at Agra^^							07-Dec-18	22:34						
3	800kV HVDC (Agra-BNC) Pole-1 at Agra	POWERGRID	12-Dec-18	12:35	Nil	Misoperation of VESDA at Agra end	NA	14-Dec-18	12:06	NA	YES	YES		As reported, OEM referred for furhter suggestive measures so that outside air could not enter the detctor to avoid its spurious tripping	Information received from NR end. From PMU, no fault observed. From , DR/EL & report, Pole blocked on misoperation of VESDA at Agra end
4	220kV Sasaram(PG)-Sahupuri(UP)	UP/POWERGRID	07-Dec-18	15:02	Nil	R-N Fault	NA	07-Dec-18	16:32	NO	NO	NO		Details of tripping yet to be received.	From PMU, no fault observed
5	500kV HVDC Mundra-Mohindergarh Pole-2	ATL	11-Dec-18	16:03	Nil	Water leakage in Valve cooling system	NA	11-Dec-18	17:59	NA	YES	YES		As reported, water leakage arrestted and ploe charged subsequently	Information received from NR end. From PMU, no fault observed. From , DR/EL & report, Pole blocked on VCS DI water flow low trip
6	400kV Balia(PG)-Biharshariff(PG) ckt-2^^	POWERGRID	27-Dec-18	12:26	Nil	R-B fault due to kite thread.	NA	27-Dec-18	18:28	NA	NO	YES			Information received from NR end. From PMU & DR, R-B fault occurred
7	800kV HVDC Champa(PG)-Kurukshetra(PG) Pole-2 at Kurukshetra	POWERGRID	30-Dec-18	13:35	Nil	Earth fault in DMR line	NA	30-Dec-18	14:30	NO	NO	NO		Details of tripping yet to be received	From PMU, dip in voltage observed.

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

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

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

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

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						

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HVPNL	(i) Chief Engineer (Comm.); SE (SO & SLDC): 0181-2664440 Fax-0172-2560622
NHPC	(i) Sh. N.S.Parameshwaran, E.D., Faridabad – Fax-0129-2272413 (ii) Sh.V.K.Sinha,Chief Engineer (O&M), Faridabad – Fax-0129-2272413
POWERGRID	(i) Sh. Prabhakar singh, ED (NR-I), Fax No. 011-26853488 (ii) Sh. A.K. Arora, General Manager (O&M), NR-I, (iii) Sh. R.V.S Kushwaha, General Manager (O&M), Jammu; Fax- 0191-2471187 (iv) Sh.Rajeev Sudan Dy, General Manager (OS), Fax- 0191-2471187
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