भारत सरकार
केन्द्रीय विद्युत प्राधिकरण
पश्चिम क्षेत्रीय विद्युत समिति
एफ -3, एमआयडीसी क्षेत्र, अंधेरी (पूर्व), मुंबई - 400 093

Government of India
Central Electricity Authority
Western Regional Power Committee
F-3, MIDC Area, Andheri (East), Mumbai - 400 093

आई एस ओ : 9001-2008
ISO : 9001-2008

दूरभाष / phone: 022- 28221636; 28221681; 28220194-6
फैक्स /fax: 022 – 28370193
वेबसाइट/ website: www.wrpc.nic.in
ईमेल/e-mail: opc-wrpc@nic.in

सं: पक्षेविस/प्रचा. / प्रसस-कार्यवृत्त /2019-20/ 12359 दिनांक 01 OCT 2019

सेवा में,

विषय:- प.क्षे.वि.समिति, मुंबई की प्रचालन एवं समन्वय समिति की 523 वीं बैठक का कार्यवृत्त।

महोदय,

पश्चिम क्षेत्रीय विद्युत समिति, मुंबई की प्रचालन एवं समन्वय समिति की दिनांक 17 सितंबर, 2019 को महाराष्ट्र राज्य भार प्रेषण केन्द्र (एमएसएलडीसी), कलवा, नवी मुंबई में आयोजित 523 वीं बैठक का कार्यवृत्त आपकी सूचनार्थ संलग्न है ।

धन्यवाद।

संलग्न : उपरोक्तानुसार

भवदीय,

01/10/19

(जे के राठोड)
अधीक्षण अभियंता (प्रचालन)

List of OCC Members

		Fax No.
1.	Chief Engineer (L D), GETCO, Gotri	0265-2352019
2.	Chief Engineer (Generation), GSECL, Vadodara	0265-2344734/2338847
3.	Superintendent Engineer (CP & SS), GETCO, Vadodara	0265-2337918, 2338164
4.	Chief Engineer (L D), MPPTCL, Jabalpur	0761-2664343
5.	Chief Engineer (O&M:Gen), MPPGCL, Jabalpur	0761-2664572/2668050
6.	Chief Engineer (L D), MSETCL, Kalwa	022–27601769
7.	Chief Engineer (PP), MSEDCL, Mumbai	
8.	Chief Engineer (Works),MSPGCL, Mumbai	022-26473896
9.	Superintending Engineer (LD), MSETCL Ambazari	07104-220275
10.	Chief Engineer (L D), CSPTCL /Raipur	0771-2574174
11.	Chief Engineer (O&M:GEN), CSPGCL, Raipur	0771-2574425
12.	Executive Director, PGCIL Raipur	
13.	General Manager, POSOCO, Mumbai	022-28202630
14.	General Manager (WRTS-I), Powergrid, Nagpur	0712-2641366
15.	General Manager (O & M),WRTS-II, PGCIL,Vadodara	0265-2487542
16.	Chief Engineer (Transmission), NPCIL, Mumbai	25580741/25563350
17.	Station Director, TAPS, Tarapur 1 & 2	02525-282125/244125
18.	Station Director, TAPS, Tarapur 3 & 4	02525-244021/244169
19.	Station Director, KAPP, Kakrapar	02626-231231
20.	General Manager (OS), NTPC, Mumbai	022-28216692
21.	General Manager, NTPC, Korba	07759- 237462/237552
22.	General Manager (OS), NTPC, HQ-II Raipur	0771-2544550
23.	General Manager, NTPC, Vindhyachal, M.P.	07805 –247711
24.	General Manager, NTPC, SIPAT, CG	07752-246504
25.	General Manager NTPC LARA	
26.	General Manager NTPC Solapur	
27.	General Manager, NTPC, Kawas, Surat	0261-2860290
28.	General Manager, NTPC, Gandhar	02642-287402
29.	General Manager, NTPC, Mouda	07115-281221/281219
30.	CLD TPC, Mumbai	022-25541908/67175385
31.	Head (O), Dahanu TPS, Dahanu	02528-222039
32.	Sr V P Reliance Transmission, Pune	0124-3917982/020-30471555
33.	Vice President (Generation), Torrent Power Ltd, Ahmedabad	079-27506679
34.	Executive Director, Sugen CCPP, Torrent Power Ltd, Surat.	02621-661151
35.	Vice President (O &M), APL Mundra , Gujarat	02838-266364
36.	Head Operation CGPL Mundra	
37.	Vice President (Opn), Jindal Power Ltd.,Raigarh	07767-281993/281995
38.	AGM(OS) NSPCL Delhi	011-26717363,26717366
39.	GENERAL MANAGER (POWER), RGPPL, Ratnagiri	02359-241071/ 241011
40.	Member (Power), NCA, Indore	0731-2559888
41.	Chief Engineer (PM & C), NHDC, Bhopal	0755 4030188/4030130
42.	E. E. Elect. (Ponda), Goa	0832-2313780
43.	Executive Engineer DD (UT), Daman	0260-/2230771/2250889/2230550
44.	Executive Engineer DNH (UT), Silvassa	0260-2642338
45.	Secretary, CERC, New Delhi	011-24360010/23753923
46.	CEO, JSW Energy ltd.	011-46032343/26183546
47.	VP-Power Infra-Essar Hazira Surat	0261-6688498/022-67082198
48.	Chief Electrical Distribution Engineer CR	022-22621060
49.	Vice President EPTCL Hazira Surat	0261-6682747
50.	COO, Korba West Power Co. Ltd. Raigarh	
51.	VP(COMML) Essar Power MP Ltd MP	
52.	GM Torrent power grid ltd. Ahmedabad, Gujarat	
53.	Adani Power Maharashtra Ltd Tiroda	
54.	CGM, R K M Powergen Pvt Ltd	
55.	ED, Athena Chattishgarh Power Ltd.	
56.	Head(O&M) Dhariwal Infra Ltd C'pur	
57.	Head Operation Jaypee Nigrie STPP Singrauli.	
58.	VP(O&M), GCEL, Chhattishgarh	
59.	Head Operation DB Power, Chhattishgarh.	
60.	Head operation Hindustan Power, Anuppur MP	
61.	Head operation GMR, Warora Energy ltd.	
62.	Head O&M, Sterlite Grid Ltd Bhopal	
63.	Head Operation Balco, Chhattishgarh.	
64.	Head(O& M), SKS, SPGCL, Raigarh	
65	AVP,O&M Electrical,RIPL,Amravati	

Minutes of 523rd OCC Subcommittee meeting held on 17th September 2019

The 523rd meeting of Operation & Co-ordination sub-Committee (OCC) of Western Regional Power Committee (WRPC) was held on 17th September 2019 at MSLDC, Kalwa. The list of participants is enclosed at **Annexure-I.**

Shri Anil V Kholap, Chief Engineer, MSLDC Kalwa welcomed Member Secretary, WRPC and all senior members of the OCC Subcommittee to SLDC Kalwa for 523rd OCC Subcommittee.

Shri Satyanarayan S, Member Secretary, WRPC once again extended warm welcome to all the participants of the 523rd OCC meeting, he thanked C.E, SLDC Maharashtra for hosting 523rd OCC meeting at SLDC Kalwa. He informed that, as decided in the 522nd OCCM, Gujarat will give a brief presentation on Load Forecasting Methods being followed at SLDC Gujarat. He appreciated efforts of Gujarat on load forecasting with rich renewable energy.

MS, WRPC opined that existing Outage planning procedures in WR should be discussed in detail for better operational planning better efficiency of availing outages in real time. He underlined the need for study groups for online and offline studies for better analysis and planning of outages.

After the opening remarks and introduction of Members, the agenda items were taken up for discussion in the meeting.

1 Confirmation of the Minutes

Minutes of 522nd meeting of Operation & Coordination Sub-Committee (OCC) of WRPC held on 21st August 2019 at WRPC Mumbai, were issued vide letter No. WRPC/OPN/OCC-Minutes/2019-20/11378 dated 11.09.2019.

No Comments have been received.

OCC subcommittee confirmed the 522nd OCC minutes without any modification.

2 Review of System Operation during the month of August 2019

2.1 A. Frequency Particulars (August 2019)

The frequency profile for last three months was as under:

Particulars	Frequency	Date	Time
Maximum instantaneous	50.32 Hz	15th August, 2019	09:34:10 hrs
Minimum instantaneous	49.55 Hz	04th August, 2019	14:04:00 hrs
Average	50.00 Hz		

Range	01st – 30th June,2019 (% time)	01st – 31stJuly,2019 (% time)	01st – 31st August,2019 (% time)
IEGC band (49.9 < f < 50.05 Hz)	70.34	68.27	72.69
< 49.9 Hz	9.87	7.09	7.28
> 50.05 Hz	19.79	24.64	20.03

OCC subcommittee noted as above.

2.1 B. State-wise Power Scenarios of the Region & PSP

System operation during the month of **August 2019** was satisfactory. The regional demand was 47633 MW. The corresponding peak shortfall was in the range of 0 MW (peak deficit of 0.00%). The energy requirement during the said period was 29170 MUs.

The power supply position (Revised) for the month of **August 2019** was as follows:

Peak Demand - Availability/Unrestricted Requirement (in MW)									
	GUJ	**MP**	**CG**	**MAH**	**GOA**	**DD**	**DNH**	**ESIL**	**WR**
Requirement	14599	8777	4285	20257	561	350	813	874	47633
Availability	14599	8777	4278	20250	561	350	813	874	47633
Shortfall	0.00	0.00	7.49	7.09	0.00	0.00	0.28	0.00	0.00
Reason for short- fall *	-	-	FC	FC	-	-	FC	-	FC
% Shortfall	0.00	0.00	0.17	0.03	0.00	0.00	0.03	0.00	0.00

Energy - Availability/ Requirement etc.(Ex-Bus) in (MUs)									
	GUJ	**MP**	**CG**	**MAH**	**GOA**	**DD**	**DNH**	**ESIL**	**WR**
Net Actual Energy Supplied	8441	5493	2774	11849	319	219	567	158	29822
Unrestricted Requirement	8441	5493	2775	11849	319	219	567	158	29823

SHORTFALL in MU	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00	1.08
% SHORTFALL	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00

*FC-frequency Correction
ULS-Unscheduled Load Shedding
SCS-Scheduled load shedding.
TC-Transmission constraint
CS-capacity Shortage
SC-Sign change

Revised PSP for the month of August,2019 is attached at **Annexure 2.1B.**

The Sub-Committee noted as above.

2.2 Inter-Regional Exchanges

There was a net inter-regional export of 8193 MUs from WR to other regions against net export schedule of 8024 MUs**.**

The Sub-Committee noted as above.

2.3 Voltage Profile

Voltage profile at some of 765/400 kV sub-stations furnished by WRLDC is enclosed at **Annexure-2.3**.

The Sub-Committee noted the same.

2.4 U/F Relay Operations

As per WRLDC records the system frequency didn't touch49.4Hz (which is revised Stage-I frequency after 8th NPC decision) and no UFR operation was reported to WRLDC.

The Sub-Committee noted as above.

2.5 Power Cuts / Load Restrictions

Details of Power Cuts and Regulatory measures as furnished by the State utilities are given in **Annexure. 2.5.**

The Sub-Committee noted as above.

2.6 Details of Generating Units under Forced outages

Details of generating units under forced outages are given in **Annexure-2.6.**

The Sub-Committee noted as above.

2.7 Details of Generating Units under Planned outages

The details of generating units under Planned Outages are given in **Annexure-2.7.**

The Sub-Committee noted the same.

2.8 Presentation on operational aspects by SLDCs & RLDC.

WRLDC gave brief presentations on operational aspects of WR grid for last month however, due to less available time, presentations of SLDCs could not be presented in the meeting. All the presentations are attached at **Annexure 2.8.**

OCC subcommittee noted the same.

2.9 List of New Grid Elements added / list of elements decommissioned.

The list of New Elements added in WR Grid is attached at **Annexure-2.9.**

The Sub-Committee noted the same.

2.10 Submission of failure analysis of grid elements

Under regulation 27 of CEA (Grid Standards) Regulations, 2010, failure analysis of equipment failure and tower collapse is to be submitted to RPC and Authority.

All the constituents are requested to report incidences of equipment failure and tower collapse to RPC and Authority as and when such incidences take place.

The Sub-Committee noted the same.

2.11 Coal stock position

In prevailing situation of scarcity of coal in the region, it is important to monitor the coal stocks on monthly basis in OCC forum so that deviation of load and generation can be kept minimum. To sensitize all the constituents of WR above the issue of coal scarcity and its impact on load generation, latest CEA coal stock position is attached at **Annexure-2.11-a**.

The Sub-Committee noted the same.

3 Operational Planning

3.1 Proposed planned maintenance programme of generating units

Maintenance programme of generating units for the month of **September 2019& October 2019 was** discussed.

The finalised list of maintenance programme of generating units for the months **September 2019& October 2019** given in **Annexure 3.1.**

OCC Discussion:

TAPS3&4 representative informed that TAPS 3 biennial outage is planned from 1st November 2019 for a period of 50 days.

OCC Subcommittee noted the same.

3.2 Outage programme of Transmission Lines/Elements.

Transmission element outages were discussed through VC on 16/09/19. The list of proposals for transmission elements outage to be availed during the month of **October 2019**is given at **Annexure 3.2.**

OCC Discussion:

MS, WRPC stated that with the present planning procedure outage compliance was approximately 20% to 40% between availed versus proposed. In the present planning procedure transmission element outage requests were received from entities before 5th working day of the month for outage planning of next calendar month. This gives planning horizon of minimum 25 days to maximum 55 days to entities. He opined that it is difficult for entities to plan outages as far as 55th day and this results in planning of more outages by entities which may not be availed in real time. Hence the planning horizon needs to be reviewed so that the planning becomes more realistic.

He informed that the present procedure of interregional outage planning may be continued as coordination with other regions are involved and priority may be given for interregional outage.

He stated that at present OCC Meetings are being held between 15-20th of every month and as per CBR of WRPC, OCC meeting has to be conducted before 10th every month to which he recalled that Outage planning used to be carried out for current month and up to 5th working day of next month.

He stated that the general flow of operational planning is done from year to six monthly and monthly to fortnightly to weekly/daily. He informed that commercial accounts are being done on weekly basis and similar ideas may be explored in the planning stage. Hence he suggested that Shri Murali Krishna, Senior GM, WRLDC and himself would study all the planning procedures for improving outage planning in consultation with all stakeholders and till such time the present procedures may be continued.

The Sub-Committee noted the same.

3.3 Anticipated power supply position for the months – September 2019 & October 2019.

Details of anticipated restricted & un-restricted demands for the months of **September 2019& October 2019** are given in **Annexure 3.3.**

Maharashtra, Gujarat, MP & Chhattisgarh updated the anticipated data.

The Sub-Committee noted the information.

4 Operational Statistics for the month of August 2019

The details of actual generation, demand, drawl of power from grid; exchanges etc. are given in the following Annexures:

Annexure 4.1 - Actual generation and requirement.

Annexure 4.2 - Peak demand data.

Annexure 4.3 - Integrated operation of the system and operation of Inter-state tie-lines.

Annexure 4.4 – Details of level of major reservoirs in Western Region.

The Sub-Committee noted the same

5 System Disturbances in Western Region

There was no major grid disturbance in the Western Region during the month of **August, 2019.**The details of minor incidences during the month received from WRLDC are enclosed at **Annexure-5.**

The Sub-Committee noted as above.

6 Healthiness status of SERs/DRs of equipment in the system.

The updated status of Constituents who have furnished the status of healthiness of SER/DRs in their systems is given at **Annexure-6.**

WRPC enquired about entities who have not submitted the status of SERs/DRs of equipment in the system. Constituents assured to submit the status on time.

The Sub-Committee noted as above.

7 Status of completion of ongoing schemes in WR

7.1 Status of Commissioning of Reactors

7.2 Status of Transmission schemes - 765/400 kV and above

7.3 Status of Commissioning of new Generating units in WR

The updated status of above items is at **Annexure-7**.

The Sub-Committee noted the above information.

8 Miscellaneous Operational Items

8.1 Quarterly review of Crisis Management Plan (CMP) and Physical &Cyber Security (P&CS) in power sector

All constituents are requested to submit current status of CMP and P&CS report (constituent wise) for the fourth quarter (January to March 2018) as per format enclosed at **Annexure-8.1.**

OCC Discussion:

MS, WRPC requested all entities to conduct third party audit of power sector entities and submit report at the earliest.

SE(Opn), MP SLDC informed that IS27000 norms are being implemented at SLDC MP. He requested for standardisation of cyber security audit process as it would be beneficial for entities.

CE, SLDC Gujarat informed that cyber security of Gujarat SLDC is upgraded to deal with Anti Persistent threats and audit for the same is under process. With regard to standardisation of process he informed that philosophical and technological aspects must be examined while conducting the audit.

CE, SLDC Maharshtra informed that whenever any cyber threat is detected, their system will be sandboxed.

PGCIL representative informed that IS 27000 is being followed at PGCIL offices and auditing is carried out be bureaus veritas.

MS, WRPC opined that physical and cyber Security audit is a continuous process and advances in the threats should be continuously monitored by dedicated teams identified for the purpose. He also informed that data collected through RTUs is safe and threats might occur at control centres where external internet world is connected. Further he informed that as reports from other utilities are received, more deliberations would be carried out.

The Sub-committee noted the same and agreed to furnish the third-party audit information.

8.2 *Monitoring of Schemes funded from PSDF*

As per the decision taken in NPC meetings, RPC may follow up with the utilities regularly in OCC to expedite the completion of various approved schemes by giving due priority. Accordingly, WRPC has been taking up this issue in OCC forum for discussion.

In this matter, the details related to State-wise sanctioned grant and disbursement amount for the approved schemes to be funded from PSDF is attached at **Annexure-8.2A.**

Also, as per the procedure, the utilities are required to furnish the information in the prescribed format by first week of every month on regular

basis to Member Convener, PSDF project monitoring group (AGM, NLDC, POSOCO) with a copy to NPC & WRPC division. A copy of prescribed format is attached at **Annexure–8.2B.**

OCC Discussion:

MS,WRPC informed that a meeting on PSDF will be conducted in the month of October 2019 and requested all utilities to submit the details for discussion. He also requested states to submit the status of present proposals to WRPC.

OCC Subcommittee noted as above.

8.3 State-wise details for Installation of capacitors to be furnished to WRPC

In accordance with provision in clause 1.5 (ii) of IEGC, *"RPC shall file monthly report on installation of capacitors by states vis-a-vis the requirement/ targets, as decided in the RPC"*

SLDC's /DISCOMs are therefore requested to expedite the matter and ensure to furnish the status of capacitor report in format attached at **Annexure 8.3** on monthly basis regularly. SLDC's are also requested to compile the details of various utilities and send the compiled report of entire state by 8th day of every month.

OCC Discussion:

MS, WRPC informed that studying reactive power compensation is the need of the hour and stated that high voltage scenarios are being observed in some pockets and reactors installation should be assessed along with capacitors.

MS, WRPC opined that though each state and WRLDC are conducting reactive power compensation requirements individually there is a need for joint studies among states and RLDC on subjects like reactive power requirement, Static and dynamic reactive power compensation, MVAR generation of High Voltage lines, GT tap settings at generating plants .

Shri Murali Krishna Senior GM, WRLDC informed that about 50 numbers of transmission lines are kept open due to high voltages and also stated that dynamic reactive power compensations is not available at present as units are out due to low demand period. Further he stated that tap settings of GTs also should be reviewed and corrected as per voltage variations.

SE(Opn), MSLDC informed that TAPS generating unit GT taps are on the higher side due to which high voltages are observed.

C.E, Maharashtra SLDC informed that

- Particularly in Mumbai area due to underground cables there was flow of MVAR from LV to HV side causing high voltages in grid.
- To control MVAR flows from LV to HV line reactors were planned at 220 kV level also apart from at 400 kV level.

- Due to generator transformer tap settings all the generators were not able to absorb VAR from the grid. Tap coordination studies for generating stations could help in VAR control by generators.

The Sub-Committee noted the same.

8.4 Agenda from NTPC WR 1, Mumbai.

DGM, NTPC WR1 vide e-mail dated 10/09/2019 requested for inclusion of following agenda items for discussion.

1. Ensuring Technical minimum schedule for all the coal-based stations of the WR region.
2. Frequent start stops of Gas turbine along with steam turbine for Jhanor and Kawas stations.
3. Ensuring liquid fuel schedule (minimum 30MW) for minimum 2 blocks once in 1 month for availability of gas turbine on secondary fuel (Naphtha fuel).
4. NTPC Solapur: Full load schedule for 4 hrs required twice a day from 20th Sept to 30th Oct'19 for carrying out 1%, 3% ramp tests, U#1 blr PG test, Cooling Tower PG tests.

OCC Discussion:

DGM, NTPC OS informed that Generating stations of WR are provided with schedule less than technical minimum. He requested OCC forum to ensure technical minimum schedule for coal-based stations of WR Region. He also requested that frequent Start stops of Gas turbines along with steam turbine should be avoided as it might damage the turbine parts and reduce the life of Boiler and Turbine. He also requested for running gas turbine on secondary fuel for 2 blocks for ensuring the secondary fuel line healthiness.

DGM, NTPC informed that Performance Guarantee Tests(PG) are planned to be conducted in NTPC Solapur and Mouda and requested beneficiaries to provide schedule so as the PG test can be carried out successfully.

EE, SLDC Gujarat informed that due to unpredictable load demand/rain pattern in the month of August, the schedule of Kawas and Jhanor was varied due to which instances of frequent start and stop occurred of GT along with ST. He assured NTPC that such instances would be avoided in future as load picks up.

E.E, MSEDCL stated that MSEDCL's Demand is variable in nature hence during peak hrs of Morning and Evening all stations are requested to pick -up generation but during off peak hrs backing down is done as per MOD. Hence

schedule for PG test of Mouda-2 and Solapur-1 would be provided as per Maharashtra's demand requirements.

Pertaining to S.No 1 to 2, MS WRPC informed that scheduling of generators is governed by CERC regulations and Merit order dispatch by DISCOMS. He opined that the issue could be discussed with DISCOMS in CCM meeting of WRPC. He requested NTPC to submit the details regarding point no. 3 for detailed discussion in 524th OCC.

With respect to S.No 4, MS WRPC opined that PG test is a once in a lifetime activity of generator and hence suggested that States provide the requested schedule to NTPC for successful completion of PG test of its units.

The Sub-Committee noted the same.

8.5 MPPTCL Agenda: Rerouting the Earth wire in respect of 220 KV DCDS Auraiya-Mehgaon/Malanpur line to maintain adequate clearance with the bottom conductor of 765 KV Agra-Fatehpur line (Part-II, 2nd line package-G-4) of PGCIL at Power Line crossing.

The 765 KV Agra-Fatehpur line of Power Grid is crossing above the 220 KV Auraiya- Mehgaon/ Malanpur Double ckt line in between tower location No. 83/5 and 83/6. During the course of construction of that 765 KV line in the month of June 2013, the Chief Manager (TL-C), PGCIL. Agra informed that due to oversight, the work of the 765 KV line at the power line crossing have been completed without obtaining prior approval of MPPTCL due to which the clearance of bottom conductors of 765 KV line with the earth wire of 220 KV line remained only 7 Mtr. Instead of 7.94 Mtr. Minimum prescribed clearances required as per the Regulations.

Hence to maintain the above stated minimum clearance of 7.94 Mtr., PGCIL proposed for rerouting of earth wire of the aforesaid 220 KV line through towers of the 765 KV line which was declined by MPPTCL on technical ground. Thereafter as decided in subsequent discussions, PGCIL deposited an amount of Rs. 121.10 lakh in the month of July 2013 for rerouting of the earth wire of the 220 KV line at the locations of line crossing using gantry and towers which have to be carried out by the MPPTCL. On anticipation that the earth wire shall be diverted in due course, PGCIL was permitted to commission 765 KV Agra-Fatehpur line after lowering down the earth wire of 220 KV KV Auraiya-Mehgaon/ Malanpur Double ckt line.

The rerouting of earth wire of 220 KV DCDS KV Auraiya- Mehgaon/ Malanpur line could not be executed due to severe Right of Way (RoW) problems

at site. The matter has been pursued with District Administration as well from PGCIL authority for cooperation to resolved the problem. However, no positive responses have been received from either side. The earth wire of 220 KV line is still in lowered position due to which conductors are unprotected against lightning. Moreover, in case of snapping of conductors of 765 KV on 220 KV line would initiate serious fault. It is therefore, desired that PGCIL may extend cooperation in the matter to resolve the ROW problem in coordination with District authority of Auraiya (UP) as site is situated outside periphery of MP State boundary.

OCC Discussion:

MS, WRPC enquired about the ownership of 220KV Auraiah -Mehgaon line and how the clearance was not maintained during the design stage.

S.E, MPPTCL informed that MPPTCL is the owner of 220KV Auraiah - Mehgaon line

DGM, WRTS-I Powergrid stated that the clearance might have reduced due to mechanical reasons after the execution of the construction work. Further he informed that prior to construction all regulatory clearances were obtained in the planning and design stage.

Sterlite representative suggested that Diamond formation of earth wire may be considered.

MS, WRPC requested MPPTCL and PGCIL to consider the best possible solution to resolve the issue and requested PGCIL to extend all necessary help to MPPTCL for which PGCIL agreed. Further he suggested PGCIL to coordinate with his NR counterpart and resolve the issue.

OCC Sub Committee noted the same.

9 WRLDC Agenda Items

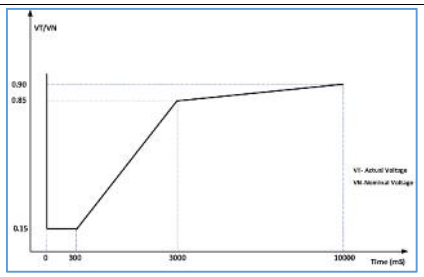
9.1 Adherence to CEA Regulations and compliance by RE Generators

The Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019 was notified on 6 Feb 2019. This amendment has several provisions in respect of Renewable Energy (RE) generation. The amendments would be applicable to all new generating units commissioned after 6th Aug 2019. Prior to this amendment, one amendment was notified by CEA on 15th Oct 2013 and effective for all units commissioned after 15th Apr 2014. The ability of RE generators to successfully ride through faults in transmission system commonly known as LVRT (Low Voltage Ride Through) was first introduced in 15th Oct 2013 amendment by CEA. This was applicable for all wind generators connected to 66 kV and above commissioned after 15th Apr 2014. CERC had issued an

order dated 5th Jan 2016 in petition filed by SRLDC mandating incorporation of LVRT feature for units commissioned before 15th Apr 2014 (with some exceptions) and extending the same to solar generation.

Considering huge RE capacity additions at state and regional level ensuring adherence and compliance to CEA regulations is need of the hour. Compliance to CEA regulations (Amendments) by RE generators to be monitored as described below and may be adopted at state level also.

CEA Regulation		Clause	Compliance
B1	**Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker**	1. Harmonic current injections from a generating station shall not exceed the limits specified in Institute of Electrical and Electronics Engineers (IEEE) Standard 519.	Submission of measurement report of harmonic current injection at PCC after commissioning
		2. The Generating station shall not inject DC current greater than 0.5 % of the full rated output at the interconnection point.	Submission of DC offset current injection measurement report at PCC
		3. The generating station shall not introduce flicker beyond the limits specified in IEC 61000. Provided that the standards for flicker will come into effect from 1st April 2014.	Submission of Flicker measurement report at PCC
		4. Measurement of harmonic content, DC injection and flicker shall be done at least once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement…..	Connection Agreement shall clearly mention this clause.
B2	**For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.**	1. The generating station shall be capable of supplying dynamically varying reactive power support so as to maintain power factor within the limits of 0.95 lagging to 0.95 leading.	Plant shall be able to operate power factor and voltage control mode, preferably voltage control mode
		2. The generating units shall be capable of operating in the frequency range of 47.5 Hz to 52 Hz and shall be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz….	Plant Shall be able to demonstrate through simulations and verified against test measurements.
		3. The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the level depicted by the thick lines in the following curve….	Plant Shall be able to demonstrate through simulations and third party certificate with test reports shall be submitted.

			
		4. The generating stations with installed capacity of more than 10 MW connected at voltage level of 33 kV and above – a. shall be equipped with the facility to control active power injection in accordance with a set point, capable of being revised based on directions of the State Load Dispatch Centre or Regional Load Dispatch Centre, as the case may be; b. shall have governors or frequency controllers of the units at a drop of 3 to 6% and a dead band not exceeding ±0.03 Hz..... c. shall have the operating range of the frequency response and regulation system from 10% to 100% of the maximum Alternating Current active power capacity, corresponding to solar insolation or wind speed, as the case may be; d. shall be equipped with the facility for controlling the rate of change of power output at a rate not more than ± 10% per minute	a. Plant shall be instructed to regulate the generator output as per RLDC/SLDC instruction and shall demonstrate prior to commence scheduling. Instructions from RLDC/SLDC CR may be issued to generator for testing this. c. Plant shall able to demonstrate the frequency response in simulation as per standard and shall respond to real time grid event if any after commissioning. Reports shall be submitted for validation of actual response w.r.t simulations d. Plant shall able to demonstrate in simulation, as well as in real time above shall be tested based on real time instruction from RLDC/SLDC.
		5. The generating stations of aggregate capacity of 500 MW and above shall have the provision to receive the signal from the State Load Dispatch Centre or Regional Load Dispatch Centre, as the case may be, for varying active and reactive power output.	Plant shall have the provision to receive the signal from RLDC/SLDC, shall be tested prior to commissioning.
		6. The standards in respect of the switchyard associated with the generating stations shall be in accordance with the provisions specified in respect of 'Sub-stations' under Part III of these Standards.	-
		7. The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point, on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises	Plant shall be able to demonstrate in simulations and third-party certificate with test reports shall be

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<tr><th>Over voltage (pu)</th><th>Minimum time to remain connected (Seconds)</th></tr>
<tr><td>1.30 < V</td><td>0 Sec (Instantaneous trip)</td></tr>
<tr><td>1.30 ≥ V > 1.20</td><td>0.2 Sec</td></tr>
<tr><td>1.20 ≥ V >1.10</td><td>2 Sec</td></tr>
<tr><td>V ≤ 1.10</td><td>Continuous</td></tr>
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*PCC- Point of Common Coupling (EHV bus of wind/solar plants.)

OCC committee may like to discuss

1. *Monitoring of compliance to CEA (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019 by RE Generators.*

2. *SLDCs to apprise OCC the status of compliance to CEA (Technical Standards for Connectivity to the Grid) (Amendment) Regulations by RE Generators.*

OCC Discussion:

GM,WRLDC informed that

- CEA regulations (Technical Standards for Connectivity to the Grid) was notified in 2007. Thereafter in 2013 amendment LVRT was mandated for wind generators commissioned after 15th Apr 2014.
- CERC vide its order in petition filed by SRLDC mandated LVRT for wind generators commissioned before 15th Apr 2014 (with some exemptions) and extended to solar generators also.
- Further new amendments had come in 2019 which were applicable to new RE generators commissioned after 6th Aug 2019. In new amendments apart from new clauses there is also a slight difference in LVRT feature when compared with 2013 amendments.
- All RE generators should comply with CEA regulations and at Inter state level, RLDC was taking undertakings and reports from RE generators to ensure compliance to regulations.
- SLDCs were requested to adopt the same procedure for intra state RE generators to ensure compliance to CEA regulations
- Inter state RE generators both wind and solar (UMPPs, IC>500 MW) may be called to OCC meeting as invitees/members for discussing operational and compliance issues.

C.E, Maharashtra SLDC informed that

- Initial commissioning test reports were being submitted by intra state RE generators.

- Will collect necessary reports or undertakings and ensure compliance to CEA regulations by RE generators as suggested by WRLDC.

C.E, Gujarat SLDC informed that

- Around 60% of RE capacity was LVRT complied.
- SLDC shall sensitize RE generators regarding new regulations and ensure compliance to the same.

OCC Sub Committee noted the same.

9.2 The requirement of model data for Simulation and Power System Stability and Dynamics.

NLDC vide its letter to RPCs dated 27th Aug 2019 (Enclosed as Annex-2) stated that

"*Simulation of power system stability conditions is important in understanding the behavior of the power system and taking necessary steps for ensuring security of the grid. Considering the complexity of India's power system and likely integration of high quantum of RE generation to the grid, efforts of all stakeholders of power system operation, planning and regulations need to be put together in building an accurate, robust and sustainable all India dynamic simulation model.*

Ministry of Power, Government of India constituted a "Taskforce on Power System Analysis under Contingencies" in December 2012 as a follow-up of the recommendations of Enquiry Committee on Grid Disturbances of 2012 in Indian Grid. The consultant appointed by the task force recommended development of standard modeling procedures and data management procedures, besides the need for periodic validation of generator models through site testing for the purpose of transient stability and small-signal stability studies.

CEA manual on transmission planning criteria 2013 under Section 6.3 and 6.4 lays out consideration for stability studies in the planning horizon and section 7.1 states that "The system shall be planned based on one or more of the following power system studies… stability studies in both operational (short-term) and planning (long-term) horizons to ensure security of the interconnected 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. A functional fit-for-purpose dynamic model would help to identify the secure operating envelope and thereby managing security effectively. It will allow assessment of the impact on grid elements due to connection of

news elements and permit power system assets to be run with margins determined on the basis of security assessments. It would also facilitate the tuning of control systems, such as power oscillation dampers, frequency controllers and improve the accuracy of online security tools.

At present, any new generator that seeks connectivity with the grid has to provide the data in the formats as prescribed by CTU or STU/SLDCs. This data is primarily related to equipment's steady-state behaver and lacks the necessary information required for dynamic modeling. Therefore, improvised templates have been prepared based on the inputs received from several consultants and POSOCO's experience. These are attached in Annex-I to Annex-II. It may please be noted that's templates for Wind and Solar have already been incorporated by the CTU in its CON-4 format after similar exercise.

These templates are to be emulated at the State level also. States may be advised to improve their connection agreement to include dynamic parameters for new generators and collect the necessary data in the prescribed format from the concerned entity before allowing them to connect with the grid. In the case of already connected plants, SLDC/STU may issue the necessary instruction to the concerned generator with modified templates and request them to furnish the information latest by Dec 2019.

All RPCs are, therefore, requested for continuous follow up with the States and Generators at various forums such as OCC and TCC/RPC level to expedite the process of preparing all India dynamic model."

The templates for dynamic data submission by RE generators were also discussed in 515th OCCM held on 18th Jan'19.

OCC committee may like to discuss on

1. *Submission of data for dynamic modeling by regional and state generators*
2. *Emulation of dynamic data templates at states and collection of data for dynamic modeling of generators*
3. *Regular follow up in OCC meetings for submission of data for dynamic modeling*

OCC discussion:

WRLDC informed that

- In 515th OCC dynamic data templates for wind and solar generators were circulated and included in 515th OCC MOM.
- Now the data templates circulated by NLDC to RPCs does include dynamic data formats for conventional generators and FACT devices apart from RE generators

- RLDCs were using the same formats for collection of dynamic data from inter state generators.
- The data templates shall be included in MOM of 523rd OCC. All SLDCs are requested to use the same formats for collection of dynamic data from new intra state conventional and RE generators
- Similarly, SLDCs may also use the same formats for collection of dynamic data from all intra state generators connected to grid

All SLDCs agreed to use the dynamic data templates and collect the data from generators and transmission utilities.

OCC Sub Committee noted the same.

9.3 Status of Disturbance Recorder & Event Logger facility at 220 kV RE Pooling stations

A Stakeholder Meet on 'Renewable Energy Regulatory framework and Integration in Western Region' was held on 23rd August 2019 at WRLDC, Mumbai. The issue of non-availability of DR/EL at 220kV substations of renewable generators was highlighted in the stakeholder meeting.

As per IEGC Regulation & CEA Standards, every switchyard should have disturbance recording system & Event logging system and shall always keep in service. The relevant clause of IEGC, CEA Connectivity Regulation & CEA Technical Standards are reproduced below-

1. **Indian Electricity Grid Code 4.6.3:** *"Recording instruments such as Data Acquisition System/Disturbance Recorder/Event Logging Facilities/Fault Locator (including time synchronization equipment) shall be provided and shall always be kept in working condition in the ISTS for the recording of dynamic performance of the system. All Users, STUs and CTU shall provide all the requisite recording instruments and shall always keep them in working condition"*

2. **CEA Technical Standard for Construction of Electrical Plants and Electric Lines: 43.4 .D.:** *Disturbance Recorders, Event Loggers and Time Synchronisation Equipment- Each 765kV, 400 kV and 220 kV line shall be provided with facility for disturbance recording, distance to fault locator and time synchronizing equipment (TSE). Event logger either stand alone or as part of sub- station or switchyard automation system shall be provided for each 220kV and higher voltage class sub-station or switchyard. TSE complete with antenna, all cables, processing equipment etc., shall be provided to receive synchronizing pulse through global positioning system (GPS) compatible for synchronization of event logger, disturbance recorder and SCADA/automation system of the sub-station or switchyard.*

3. **CEA (Technical standards for connectivity to the Grid) Regulation, 2007: Schedule Part 1 section -7**: *"Every generating station and sub-station connected to the grid at 220 kV or above shall be provided with disturbance*

recording and event logging facilities. All such equipment shall be provided with time synchronization facility for global common time reference."

In recent communication with SPDs (Solar Power Developers) connected at 220 kV RUMS (Rewa Ultra Mega Solar), it was informed that Disturbance Recorders and Event Loggers were not installed at their 220 kV substations and pooling stations. In stakeholder meeting held on 23rd Aug 19 representatives from renewable generators participated and were requested to confirm the disturbance recording and event logging facilities at their end and as well as ISTS pooling station ends.

Without DR/EL, grid event analysis cannot be completed by WRLDC to arrive at proper conclusions and to suggest remedial measures

OCC committee may like to discuss on

1. *Participation of regional RE generators in OCC meetings*
2. *Confirmation of availability of disturbance recording and event logging facilities at 220 kV substations by regional RE generators*
3. *SLDCs to apprise availability of disturbance recording and event logging facilities at state RE generating stations and connected substations*

OCC discussion:

GM, WRLDC informed that

- RLDCs ensure availability of DR and EL facilities during first time charging. In general transmission and generator utilities submit undertakings and sample DR/EL files as per first time charging procedure.
- As per tariff policy, transmission charges were not levied for electricity generated from wind and solar generators. Hence transmission utilities connecting RE generators were not obliged to submit the undertakings and documents in line with first time charging procedure.
- WRLDC was not aware of non-availability of DR and EL facilities at RE and other end substations. In recent communication with one of the SPDs at RUMS it was informed that they haven't installed DR and EL.
- Considering huge penetrations of RE in near future, one wind and solar generating stations may be invited to OCC meetings.

MS, WRPC stated that at present RE generators can be called only as special invitees based on issue.

OCC Sub Committee noted the same.

9.4 Automatic Generation Control (AGC) implementation in India

CERC vide its order dated 28th August 2019 in Petition No.: 319/RC/2018 directs that all the ISGS stations whose tariff is determined or adopted by CERC shall be

- AGC-enabled
- The ancillary services including secondary control through AGC be implemented

The directions by CERC in this regard are quoted below

Quote

i. *All thermal ISGS stations with installed capacity of 200 MW and above and all hydro stations having capacity exceeding 25 MW excluding the Run-of-River Hydro Projects irrespective of size of the generating station and whose tariff is determined or adopted by CERC are directed to install equipment at the unit control rooms for transferring the required data for AGC as per the requirement to be notified by NLDC. NLDC shall notify the said requirements within one month of this order.*
ii. *All such ISGS stations whose tariff is determined or adopted by CERC shall have communication from the nearest wide band node to the RTU in the unit control room.*
iii. *The Central Transmission Utility (CTU) is directed to have communication availability from NLDC/RLDCs to the nearest wide band node/switchyard for the generating stations in a redundant and alternate path ensuring route diversity and dual communication.*
iv. *The NLDC is also directed to commission the required communication infrastructure.*
v. *The expenditure as a result of compliance of the above directions may be claimed as per relevant regulations or provisions of the PPA.*
vi. *The NLDC is directed to monitor implementation of the above directions so that all the ISGS stations whose tariff is determined or adopted by CERC are AGC-enabled within six months of this order.*
vii. *The framework regarding compensation for AGC support and deviation charges as stipulated in the Commission"s Order in Petition no. 79/RC/2017 dated 06.12.2017 shall apply to the five pilot projects as also to other ISGS as and when they are AGC enabled. This arrangement shall remain in place till the relevant regulations inter alia on compensation for AGC services are framed by the Commission.*
viii. *NLDC/RLDCs are allowed to operate the AGC system for enabling the signals to the power plants at the earliest.*
ix. *All new thermal ISGS stations with an installed capacity of 200 MW and above and hydro stations having capacity exceeding 25 MW excluding the Run-of-River Hydro Projects irrespective of size of the generating station and whose tariff is determined or adopted by CERC shall mandatorily have the capability to provide AGC support.*

Unquote

OCC discussion:

GM, WRLDC informed that

- CERC vide its order dated 6th Dec 2017 approved commissioning of AGC pilot project between NLDC and NTPC Dadri stage-II.
- CERC also directed NLDC to replicate the pilot project in at least one station in each region. Accordingly, AGC pilot project in WR was implemented at Mouda-II from 20th Mar 2019.
- CERC vide its order dated 28th August 2019 in Petition No.: 319/RC/2018 directed all ISGS (Tariff determined or adopted by CERC) thermal generating stations of 200 MW installed capacity and above and hydro generations of installed capacity 25 MW and above (excluding ROR hydro) shall be AGC enabled.
- The communication for AGC from generating station RTU to nearby wide band node shall be made available by generating station.

OCC Sub Committee noted the same.

9.5 Black start mock drills and Healthiness of DG set at Black Start Capable Stations in Western Region

As per section 5.8(b) of IEGC,

"…the Diesel generator sets for black start would be tested on weekly basis & the test report shall be sent to RLDC on a quarterly basis."

The details of black start stations in WR and their DG set capacities are given below.

S. No	Power Station	Installed Cap. (MW)	Unit Type	Black Start Source	DG Set Capacity
Gujarat					
1	Ukai (H)	4 x 75	Hydro	Diesel	500 kVA
2	Mini Hydro	2 x 2.5	Hydro	Diesel	50 KW
3	Kadana	4 x 60	Hydro	Diesel	500 KVA

S. No	Power Station	Installed Cap. (MW)	Unit Type	Black Start Source	DG Set Capacity
4	Dhuvaran	1 x 107 (68+39) + 1 x 112 (72+40)	Gas	Diesel	2x800 KVA
5	GIPCL-II	1x104+1x56	Gas / Steam	Diesel	500 kVA
6	GPEC(CLPIPL)	3x138+1x241	Gas	Diesel	3000 kVA
7	Sugen	3x382.5 MW	Gas	Diesel	2x6MVA
Madhya Pradesh					
8	Gandhisagar	5 x 23	Hydro	DG set	100 kVA
9	Birsinghpur	1 x 20	Hydro	DC Battery bank	220 Volt DC Battery
10	Pench	2 x 80	Hydro	DG set	250 kVA
11	Bargi	2 x 45	Hydro	DG set	250 kVA
12	Tons	3 x 105	Hydro	DG set	250 kVA
13	Indira Sagar	8x125	Hydro	DG set	2x1000 KVA
14	Omkareswar	8x65	Hydro	DG set	2x2010 KVA
15	Medikheda	3x20	Hydro	DG set	250 KVA
16	Rajghat	3x15	Hydro	DG Set	250 KVA
Chhattisgarh					
17	Hasdeo Bango	3 x 40	Hydro	DG Set	250 kVA
Maharashtra					
18	Koyna I & II	4 x 65 4 x 75	Hydro	House generator	2 MVA
19	Paithan	1 x12	Hydro	DG set	-

S. No	Power Station	Installed Cap. (MW)	Unit Type	Black Start Source	DG Set Capacity
20	Uran (Gas)	4 x 60 (GT) + 4x108 (GT)+ 2x120 WHR	Gas	DG set	4 MW PH1:412kVA PH2:450kVA WH:520kVA
21	Ghatghar	2x125	Hydro	DG set	1x1250 kVA
22	Khopoli	3x24+2x12	Hydro	DC Governor & bearing oil pumps	DC power (self-start)
23	Bhivpuri	3 x 24 + 2 x 1.5 +2x12	Hydro	DC Governor & bearing	-do-
24	Bhira	6 x 25	Hydro	1 No.of 500 KVA house generator with water turbine	500 kVA
25	Bhira PSS	1 x 150	Hydro	DG set	500 kVA
26	Trombay	1 x 120 1 x 60	Gas Turbine Steam Turbine	DG Set	2.5 MW
NTPC					
27	Kawas	4 x 106 2 x 116	Gas	Diesel	2850 KW
28	Gandhar	3 x 144 + 1x225	Gas	Diesel	2975 KW
NCA					
29	SSP (RBPH & CHPH)	6x200+5*50	Hydro	Diesel	2x1000kVA

So far WRLDC haven't received any quarterly report on testing of diesel generators on weekly basis. Utilities are requested to send quarterly report

on testing of diesel generators to **wrldcso@posoco.in** for last two quarters. In addition to the above Blackstart stations, there is need for continuous checking of DG sets at various load dispatch centers. SLDCs to update on status of checking of DG sets

As mandated by IEGC, the Black start capable units need to conduct mock black start exercises once in every 6 months. Western Region has 29 generating stations with black start capability. In last 8 months no black start mock drills were conducted in WR. Utilities/Constituents are requested to expedite the Mock exercise of their black start units and submit their plan for compliance of IEGC regulation 5.8(b).

OCC committee may like to discuss

1. *Submission of the quarterly report on testing of diesel generators on weekly basis to WRLDC*
2. *Testing of DG sets at various load dispatch centers*
3. *To expedite mock drills of black start stations*

OCC discussion:

All SLDCs and generating stations agreed to send quarterly report on DG set testing at black start stations to wrldcso@posoco.in.

C.E, Gujarat SLDC informed that

- Mini Hydro of capacity (2x2.5 MW) to be removed from black start station list.
- As there was no PPA with GPEC, black start mock drill at GPEC couldn't be planned in year 2019.
- As Torrent was facing difficulty in bus split operation at Sugen black start mock drill couldn't be planned.
- In coming months black start mock drills will be conducted at few stations.

All SLDCs were requested to expedite the black start mock drills as the exercise has to be completed by year end.

OCC Sub Committee noted the same.

9.6 Elements to be excluded from the "List of Important Grid Elements in Western Region"

MPSLDC vide its mail dated 15th Jun 2019 to WRLDC reliability, informed that the following elements in updated "List of Important Grid Elements in Western Region 2019", may be excluded.

400 kV Elements

- 400 kV Nagda-Badnawar ckt I & II
- 125 MVAR Bus reactor at 400 kV s/s Badnawar
- 315 MVA, 400/220 kV ICT-I & II at 400 kV s/s Badnawar
- 100 MVA, 400/132 kV ICT-I & II at 400 kV s/s Kirnapur

220 kV Elements

- 220 kV Suwasra-Nepaniya ckt

In 522nd OCCM SLDC Chhattisgarh also informed, to include 400KV Raita-Jagdalpur line along with 315 MVA ICTs (2No.) and Line Reactors at 400/220 KV Jagdalpur substation in the exception list of grid elements of WR.

WRLDC shall include these elements in the exception list of important grid elements in WR subject to condition that

1. For the outages on ICTs/Lines which are excluded from the list, the SLDC shall prepare 'N-1' contingency plan and review reliability and submit that the system is safe under n-1 contingency prior to availing the shutdown.
2. The elements excluded from important grid elements list would not appear in OCC approved list for outages, but SLDCs to take responsibility of reviewing the reliability and ensure grid security and shall inform WRLDC before taking outage.
3. The outage of the element where different licensee is involved, to be incorporated in Web-based Outage Software for outage co-ordination on D-3 basis.
4. All long outages more than two days shall be taken up as per outage procedure agreed in OCCM or shall be approved in the OCCM forum.
5. All OCCM approved outages will be given first priority and if required unplanned outages to be deferred in real-time to facilitate the OCCM approved outages.

OCC Committee noted the same.

9.7 Review of AUFLS settings

National Power Committee (NPC) in its 8th meeting dated 30th November 2018 has revised AUFLS settings by 0.2 Hz viz. 49.4, 49.2, 49.0 & 48.8 Hz. The quantum for AUFLS would be reworked by NPC Secretariat based on the deliberation.

In 516 OCC meeting, WR constituents agreed to change the AUFLS setting as suggested by NPC. As per 521 OCC meeting the status of change in AUFLS settings is as follows

S.No	State/UT	Status of change in AUFLS settings as per NPC
1	Maharashtra	Completed
2	Gujarat	Completed
3	Madhya Pradesh	Completed
4	Chhattisgarh	Completed
5	Goa	AUFLS relays are not functioning and will be commissioned at the earliest
6	DD	Completed
7	DNH	Information to be provided by Next OCCM

Uniform implementation of AUFLS settings at regional and national level would safe guard the grid without causing unnecessary stresses.

OCC Discussion:

Goa representative informed that feeders were identified and relay procurement is under process.

SE, WRPC informed that AUFLS settings was reviewed at DD

Gujarat SLDC informed that AUFLS settings was completed in 100% feeders

OCC Sub Committee noted the same.

9.8 Demand Forecast by WR Beneficiaries

Demand forecasting is one of the critical factors for the reliable and economic operation of power system. Accurate forecast holds a great saving potential for beneficiaries. As per IEGC, WR beneficiaries viz. Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, Goa, DD and DNH are mandated to do demand forecasts and share the data to WRLDC.

The forecasted demand submitted by beneficiaries and actual demand are compared and RMSE (Root Mean Square Error) has been computed for last one month (15 Aug to 9 Sep 19). The RMSE of demand forecasting is tabulated below.

State	Maximum RMSE Error of Demand Forecast (15 Aug to 9 Sep 19)
Maharashtra	10
Gujarat	12
Madhya Pradesh	10
Chhattisgarh	18
DD	25

State	Non-Receipt of Demand forecast (No. of days)
Maharashtra	3
Gujarat	0
Madhya Pradesh	2
Chhattisgarh	5
DD	12

Beneficiaries like Goa and DNH are not submitting demand forecast data to WRLDC.

OCC may like to discuss the following

1. Maharashtra, Gujarat, Madhya Pradesh and Chhattisgarh to apprise actions being taken to improve forecast
2. Goa and DNH to submit demand forecast to WRLDC as mandated in IEGC
3. Apart from above beneficiaries like Gujarat, Maharashtra and MP having high RE installations may apprise OCC about status of RE forecasting.

OCC Discussion:

Gujarat SLDC have presented the Load Forecasting practices in SLDC.

Following are two practices followed in load forecasting.
1. The load forecasting is provided by Discoms, that is based on the previous demand patterns and other factors considered by DISCOMs.
2. A commercial contract is awarded to M/s Manikaran (50 Hz) to do demand and RE forecasting in Gujarat. The demand forecasting is doe based on historical data, weather input, agricultural load schedule and many other factors. The demand forecast submitted by Discoms is also taken into consideration. One person of the contractor is deployed at control room for demand forecasting.

Stringent payment terms are kept in the contract based on the accuracy of the demand/RE forecast. The minimum percentage of accuracy achieved in either of demand/RE is considered for payment.

MP SLDC informed that they have taken a joint project with IITDM, Jabalpur for demand forecasting. The project will be delivered after 18 months.

WRLDC informed that constituents may award contract to forecasting service vendors just like Gujarat SLDC to improve accuracy of demand forecasting.

OCC members appreciated the presentation by SLDC Gujarat.

MS,WRPC suggested Maharashtra and Madhya Pradesh to give presentation on Load forecasting methods followed in their respective states.

It was decided that written transcript of Gujarat forecasting will be included in a document after all SLDC's finish their presentation.

OCC Sub Committee noted the same.

9.9 Telemetry issues

a. Monthly telemetry status as per CERC mandate

In compliance with the CERC order dated 29.01.2016 on Petition 07/SM/2014 in the matter on "Non-compliance of Commission`s direction dated 26.9.2012 in Petition No. 168/MP/2011.", telemetry status of central sector and state sector stations in the region is to be uploaded on

WRLDC website every month. The telemetry status for the month of Aug 2019 is shown in the table below:

Western Region summary sheet and details of current status of implementation of telemetry system

Annexure - IV

Status as on : 01.09.2019

Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intermittent				Total non-availability of data in % (Telemetry not provided plus Telemetry Intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	Maharastra	37	204	0	0	0.0%	0.0%	6	14	16.2%	6.9%	16.2%	6.9%
2	Chattisgarh	7	120	0	25	0.0%	20.8%	0	33	0.0%	27.5%	0.0%	48.3%
3	Madhya Pradesh	17	189	0	0	0.0%	0.0%	1	4	5.9%	2.1%	5.9%	2.1%
4	Gujarat	25	182	0	3	0.0%	1.6%	0	5	0.0%	2.7%	0.0%	4.4%
5	Goa	2	7	1	0	50.0%	0.0%	0	0	0.0%	0.0%	50.0%	0.0%
6	DD		1										
7	DNH	-	5	-	1	-	20.0%	-	0	-	0.0%	-	20.0%
8	ISGS	17	-	-	-	-	-	0	-	0.0%	-	0.0%	-
9	ISTS	-	52	-	0	-	0.0%	-	-	-	-	-	0.0%
10	IPP	29	-	-	-	-	-	0	-	0.0%	-	0.0%	-
	TOTAL	134	760	1	29	0.7%	3.8%	7	56	5.2%	7.4%	6.0%	11.2%
	Total (over all)	894		30		3.4%		63		7.0%		10.4%	

Note:
Supporting Details are given below

1 The details of State sector telemetry are as per figures received by WRLDC from respective SLDCs
2 Maharashtra substation count is based on the stations currently commissioned

The list of stations is attached in Annexure 9.9 (a)

As agreed in the 515th OCC meeting, the telemetry status has been updated for the month of Aug. 2019

OCC members noted

b. The prolonged outage of Telemetered data.

The prolonged outage of telemetry has been observed in the following stations

Sr No	Station	Outage Date	Restoration Date
1	IEPL (Maharashtra)	26-Nov-2018 19:45 hrs	Still down

OCC discussion:

SE(Opn), MSLDC informed that despite several communications, IEPL had not restored the link. He also informed that IEPL is not functioning at present. Therefore the same may be deleted.

OCC Subcommittee noted the same.

c. Concerns of telemetry with old NTPC stations

The telemetry issues of old NTPC stations viz. Kawas, Gandhar, KSTPS and VSTPS are being discussed since the 515th OCC meeting. The list of points is attached in Annexure 9.9(b). There is a significant improvement in telemetry status of Kawas, Gandhar and KSTPS. However all the pending issues are also to be completed. There is no progress seen in the improvement of telemetry of VSTPS.

NTPC may expedite and provide the necessary extension of signals. NTPC may also explain the delay in rectification of telemetry of VSTPS stg. 1 & 2. Also in order to maintain redundancy telemetry through additional gateway is also required for Mauda STPS at WRLDC.

OCC Discussion:

MS, WRPC informed that, considering the importance of VSTPS data must be available all the time.

PGCIL representative informed that Honeywell RTUs installed at NTPC stations are old and need to be replaced. Until then, an expert who is well versed with old Honeywell system maybe hired and in their experience his services are satisfactory.

OCC Subcommittee noted the same.

d. Nonreporting of IEC 104 RTUs of PGCIL & few generating stations to Backup control center

The PGCIL RTUs reporting on IEC 104 to WRLDC do not report to Backup WRLDC due to the lack of Ethernet port availability in the gateways. The list of such RTUs is listed in the following table

WR – 1 stations	WR-2 stations

1. 765kV New Parli 2. 765kV Warora 3. Champa HVDC stg. 1 & 2	1. 765kV Vadodara 2. 400kV Rewa 3. 765kV Banaskantha 4. 765kV Bhuj

In the 1st communication meeting, PGCIL informed that the Ethernet ports in Gateways for communication with Backup WRLDC will be provided. The extension of data availability of these RTUs to backup WRLDC needs to be expedited by PGCIL.

Further, the redundant links from Bhuj & Banaskantha (both RE pooling stations) to WRLDC are highly unreliable affecting the redundancy of telemetry for these stations. More reliable option to be provided by PGCIL.

Similarly, generating stations like RGPPL and Dhariwal also do not report to Backup WRLDC. RGPPL does not have redundancy of communication and gateway resulting in outage of telemetry multiple times affecting real time drawl of Maharashtra.

RGPPL may provide alternate path up to WRLDC main and communication up to Backup WRLDC to ensure 100% availability of telemetry to WRLDC

As per the connectivity agreement of Dhariwal with CTU, an OPGW link and PLCC channel were to be established between Dhariwal and Parli (PGCIL) for telemetry and voice requirements of RLDC. However, both the links are still not established. Also, the telemetry of Dhariwal does not report to Backup WRLDC.

Dhariwal Infra Ltd. may update the progress

OCC discussion:

It was suggested by NTPC that for effective discussion/action plan, telemetry related agenda items can be taken up during the WRPC communication meeting which is attended by concerned executives from NTPC. MS, WRPC opined that telemetry is crucial for effective

grid monitoring and control and suggested that telemetry concerns should be taken up separately. GM, WRLDC informed that separate communication meeting to discuss telemetry related issues in WR has already been initiated under WRPC forum and till date two WRPC SCADA and Communication system meetings dated 26 Apr 2019 and 25 July 2019 have been conducted in WR. Emphasizing the role of WRLDC and SLDCs in this context, Member Secretary assured to that telemetry agenda in WR shall be taken up in next SCADA and Communication system meeting.

OCC Sub Committee noted the same.

9.10 Status of submission of DR/EL by utilities for the events occurred in Aug'19

- DR and Report submission status for Aug'19 events is attached as annexure 9.10A.
- Utilities who have not submitted the details are requested to submit the data immediately to WRLDC/WRPC.

OCC discussion:

GM, WRLDC informed that few utilities have not uploading DR/EL in the portal.

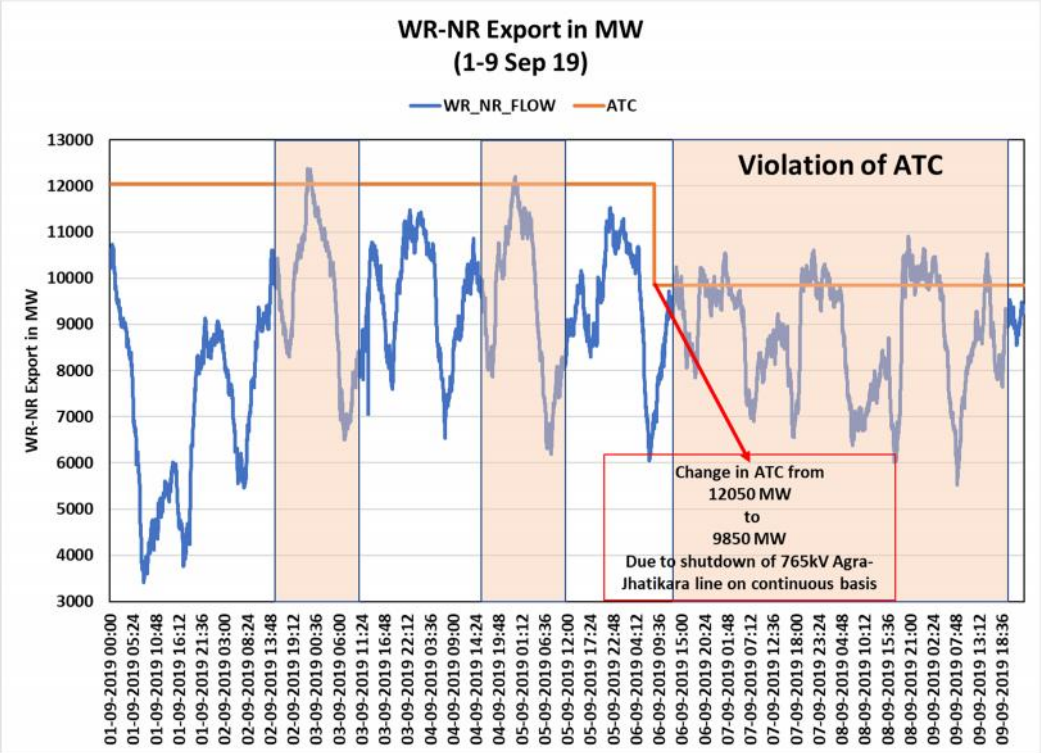
MS, WRPC requested all utilities to upload the data in the tripping portal

OCC Sub Committee noted the same.

9.11 WR-NR ATC violation

It was observed that WR-NR flow was exceeding ATC in Sep'19. On 6th Sep 19 due to shutdown of 765 kV Agra-Jhatikara, ATC of WR-NR changed from 12050 MW to 9850 MW till 20th Sep 19. After revision in ATC, violation of ATC has been increased and prevailing for considerable time. During WR-NR ATC violation the drawee entities in WR should not underdraw and entities in WR should not over inject. However, it was observed in WR constituents like Maharashtra and MP were underdrawing, generating station Sasan was over injecting during ATC violation.

WRLDC was regularly following up utilities and mandating to adhere to schedules to avoid ATC violations.



OCC Discussion:

GM, WRLDC informed that

- As WR was in upstream and NR was in downstream, under drawl by WR constituents and over injection by generators will increase flow in WR-NR corridor and may result in congestion
- It was observed that when WR-NR flow was above ATC, WR constituents viz. Maharashtra and Madhya Pradesh were under drawing and generating stations viz. VSTPS-3 and Sasan were over injecting.
- Constituents and generating stations were directed to strictly adhere to their schedules.

MS, WRPC suggested that due to the focused discussion on load forecasting and transmission element outage planning, this agenda item could not be discussed in detail. Meanwhile he informed that entities who are over injecting and underdrawing to ensure approaite actions being upstream at the end of ATC violation. The agenda will be taken up for detailed discussion in next OCC meeting.

OCC Sub Committee noted the same.

9.12 Extension of Pilot on Security Constrained Economic Dispatch (SCED) of Inter-State Generating Stations (ISGS) Pan India

Hon' CERC vide its order dated 11th Sep 2019 in Petition No. 08/SM/2019 (Suo-Motu) extended the SCED pilot for the period up to 31st March 2020. CERC had also sets out a methodology of sharing the savings / benefits accrued from the SCED for the duration of the pilot project. The summary of decisions in the order are quoted below

Quote

"21. Accordingly, POSOCO is directed to implement the SCED pilot for the thermal Inter State Generating Stations (ISGS) that are willing to participate in the SCED, for the period from 1st October, 2019 to 31st March, 2020.

22. The net savings / benefits after adjusting the compensation for part load operation to the generators shall be shared among the beneficiaries and the participating generators in the manner as specified in the preceding paras of this order, for the entire duration of the pilot from 1st April, 2019 to 31st March, 2020.

23. POSOCO shall accordingly modify the procedure to suitably incorporate the above directions.

24. POSOCO is also directed to apprise the Commission periodically regarding the experience gained in the form of a detailed feedback report covering all the aspects."

Unquote

The CERC order is available at http://cercind.gov.in/2019/orders/08-SM-2019.pdf

OCC Subcommittee noted the same.

9.13 Any other item

MS, WRPC informed that GETCO had installed STATCOM in their system.

Gujarat SLDC informed that

- GETCO had installed a STATCOM of +/-125 MVAR capacity at 220 kV Timdi station for dynamic VAR compensation.
- COD of STATCOM was done 2 months back and maximum VAR compensation provided by STATCOM so far was -88 MVAR.

OCC congratulated GETCO for being the first state in WR to install STATCOM

9.14 Date and venue of next OCC meeting

Date and venue for 524th OCC meeting will be intimated later.

The sub-committee noted the same.

****

LIST OF PARTICIPANTS OF 523RD OCC MEETING OF WRPC HELD AT MSLDC, KALWA ON 17.09.2019

Sl.No.	Organisation, Name & Designation	Mobile No.	E-mail Address
I	**WRPC**		
1	Shri Satyanarayan S., M.S.		ms-wrpc@nic.in
2	Shri K.B. Jagtap, S.E.	8652776033	kb.jagtap@gov.in
3	Shri J.K. Rathod, S.E. (Opn.)	9987910799	opc-wrpc@nic.in
4	Shri P.D. Lone, E.E.	9867622823	prc-wrpc@nic.in
5	Shri D.N. Gawali, E.E.	9930666765	opc-wrpc@nic.in
6	Shri P. Peddi Reddy, A.D.-I	7840894702	opc-wrpc@nic.in
7	Shri B. Venkata Sandeep, A.D.-I	8527622170	bvsandeep@nic.in
8	Shri Vidya Sagar Paladugu, A.D.-I	9930940630	comml-wrpc@nic.in
II	**CSPTCL/CSPGCL**		
9	Mrs. Sharda S., Addl. Chief Eng.	9424227837	sharda.sonwani@yahoo.com
III	**GETCo. / GSECL**		
10	Shri B.B. Mehta, C.E.	9879200736	bbm@gebmail.com
11	Shri B.C. Solanki, Dy. Eng.	9925208724	detechsldc.getco@gebmail.com
IV	**MSETCL / MSEDCL/MahaGenco/MSPGCL**		
12	Shri Anil V. Kolap, C.E.	7030964444	cesldc@mahasldc.in
13	Shri P.S. Sharma, S.E.	9769213865	seoperationsldc@gmail.com
14	Shri Ghodke Gopichand, E.E.	7030250444	selmkalwa@gmail.com
15	Shri Ram N. Kolhe, E.E.	9619985377	ram_kolhe@yahoo.com
16	Shri S.G. Bhagat, E.E.(Opn.)	9769213829	sbhagat743@gmail.com
17	Shri A.S. Katakdhorel, Dy. E.E.	9833290114	cegw@mahagenco.in
18	Shri M.B. Pande, Add. E.E. (Opn.)	9833608212	msldcoutage@gmail.com
V	**MPPTCL/MPPGCL**		
19	Shri S.S. Patel, S.E.	9425805270	sspatel_2261@yahoo.com
VI	**POSOCO/WRLDC**		
20	Shri K. Muralikrishna, Sr.G.M.	9869450219	kmuralikrishna@posoco.in
21	Smt. Pushpa S., G.M. (S.O.)	9869404482	pushpa@posoco.in
22	Shri S.K. Saha, Sr. D.G.M.	9869082694	sksaha@posoco.in
23	Shri S.S. Raghuwanshi, DGM	9427615762	satyendra@posoco.in
24	Shri Absar Ahmad, Dy. Mgr.	8080424278	absarahmad@posoco.in
25	Shri Pradeep Sanodiya, Dy. Mgr.	8452045338	psanodiya@posoco.in
26	Shri Sunil K. Patil, Dy. Mgr.	9869416089	skpatil@posoco.in
27	Shri Srinivas Chitturi, Dy. Mgr.	9869416078	srinivasch@posoco.in
28	Shri Pappu Kumar, J.E.	9653327823	pappu@posoco.in
VII	**POWERGRID**		
29	Shri Kuleshwar Sahu, G.M.-A.M.	9425294214	kuleshwar@powergridindia.com
30	Shri Manoj Kumar Tripathi, Sr. D.G.M.	8275025586	tripat_m@powergridindia.com
31	Shri Sanjoy Das, D.G.M.	9429976244	sanjoydas@powergridindia.com
32	Shri Mayank Shukla, D.G.M.	9873918461	mayank@powergridindia.com
VIII	**NTPC**		
33	Shri Gurudas Mishra, D.G.M.	9650993748	gurudasmishra@ntpc.co.in
34	Shri Rajesh R. Chudasama, D.G.M.	9426878323	rrchudasama@ntpc.co.in
35	Shri Abhay G. Sahu, D.G.M.	9423137986	agsahu@powergridindia.com
36	Shri Mohit Gulati, Sr. Mgr.	9650994093	mohitgulati@ntpc.co.in

37	Shri Bhaskar Maheshwari, Mgr.	8275045062	mbhaskar@ntpc.co.in
38	Shri Neeraj Kumar, Sr.Mgr.	9650998513	neerajkameshwar13@ntpc.co.in
39	Shri Ravi Kumar Singh, Mgr.	9408705188	ravisingh@ntpc.co.in
IX	**Elect. Deptt. Goa**		
40	Shri Rajendra G. Sawant, E.E.	7796633103	rajugsawant@gmail.co
X	**NSPCL**		
41	Shri Pavan Kumar N., Sr. Mgr.	9425293596	pk.nukala@nspcl.com
XI	**NPCIL**		
42	Shri Samir Pathan, SO/E	9409309743	samirpathan@npcil.co.in
43	Shri Utpal Biswas, Sr. Opn. Eng.	9423081680	utpalbiswas@npcil.co.in
44	Shri S.K. Maiti, SCE	9428821925	skmaiti@npcil.co.in
45	Shri S.S. Gadre, Opn. Supdt.	9423982777	ssgadre@npcil.co.in
XII	**APML**		
46	Shri A. Mathur, A.V.P.	9870663062	akkshayv.mathur@adani.com
47	Shri Uday Trivedi, V.P.	9099055054	uday.trivedi@adani.com
48	Shri Malakan L. Pujari, D.G.M.	9325401272	pandurang.jalkote@adnai.com
49	Shri Rakesh Bhalerao, Mgr.	7045953823	rakesh.bhalerao@adani.com
XIII	**TATA POWER**		
50	Shri Kiran Desale, Head PD & ABT	9223553342	desaleku@tatapower.com
51	Shri Chintamani Chitnis, Head Grid Opn.	9029002386	chintamani@tatapower.com
52	Shri Navnit Hasiyani, Sr. Mgr.	8866058617	navnit.hasiyani@tatapower.com
XIV	**N.C.A.**		
53	Shri Rajesh Sharma, A.E.E.	8818885970	ncarajesh@yahoo.co.in
XV	TORRENT POWER SUGEN		
54	Shri Ronak Naik, Mgr.	9227410210	ronaknaik@torrentpower.com
XVI	**N.H.P.T.L.**		
55	Shri Ramesh K. Patel, Dy. M.	9754754699	ramesh.patel@nhptl.com
XVII	D.B. POWER		
56	Shri Dhirendera Singh, Dy. M.	9109950531	dhirendra.singh@dbpower.in
XVIII	M.B. POWER		
57	Shri Varunendra Singh, A.M.	9685897034	varunendra.singh@hpppl.in
XIX	**ESSAR POWER**		
58	Shri P.S. Bhattacharya, G.M.	9926430705	partha.bhattacharya@essarpower.co.in
59	Shri Ashish Kakroo, Sr. Mgr.	9687668725	ashish.kakroo@essarpower.co.in
XX	**GMR Group**		
60	Shri Pramod Khandelwal, G.M.	8390903524	pramod.khandelwal@gmrgroup.in
XXI	STERLITE POWER		
61	Shri Prashant Karpe, Mgr.	8390152777	prashant.karpe@sterlite.com

अनुलग्नक **2.1**

आगस्त **2019** में आवृत्ति के आंकड़ों का विवरण

(पश्चिम क्षेत्र भार प्रेषण केन्द्र की आवृत्ति रिपोर्ट के आधार पर)

FREQUENCY PARTICULARS DURING August 2019

(AS PER FREQUENCY REPORT OF WRLDC)

1. INTEGRATED OVER AN-HOUR
एक घंटे में समाकलित

1.1 MAXIMUM FREQUENCY 50.26 Hz. BETWEEN 1000 Hrs & 1100 Hrs on 15.08.2019
अधिकतम आवृत्ति

1.2 MINIMUM FREQUENCY 49.81 Hz. BETWEEN 0000 Hrs & 0100 Hrs Hrs. on 18.08.2019
न्यूनतम आवृत्ति

1.3 AVERAGE FREQUENCY 50.00 Hz.
औसत आवृत्ति

2. INSTANTANEOUS तात्कालिक

2.1 MAXIMUM FREQUENCY 50.32 on 15th Aug. At 09:34:10 hrs
अधिकतम आवृत्ति

2.2 MINIMUM FREQUENCY 49.55 on 4th Aug at 14:04:00 hrs
न्यूनतम आवृत्ति

3. %AGE OF TIME WHEN FREQUENCY WAS आवृत्ति का समय प्रतिशत में	आगस्त **2019**	जूलाई **2019**	जून **2019**
3.1 Below 49.9 Hz. 49.9 हट्ज से कम	7.28	7.09	9.87
3.2 BETWEEN 49.9 Hz. AND 50.05 Hz. 49.9 हट्ज और **50.05** हट्ज के बीच मे	72.69	68.27	70.34
3.3 ABOVE 50.05 Hz. 50.05 हट्ज के ऊपर	20.03	24.64	19.79
4.1 NO. OF TIMES FREQUENCY TOUCHED 49.20 Hz.	0	0	0
4.2 NO. OF TIMES FREQUENCY TOUCHED 49.00 Hz.	0	0	0
4.3 NO. OF TIMES FREQUENCY TOUCHED 48.8 Hz.	0	0	0

पश्चिम क्षेत्रीय विद्युत समिति

एफ 3 एम आई डी सी क्षेत्र अंधेरी पूर्व मुंबई 400 093

FROM : SUPERINTENDING ENGINEER (OPERATION),WRPC,MUMBAI.

Date: 24/08/2019

TO : CHIEF ENGINEER (GRID MANAGEMENT),CEA,NEW DELHI.(FAX NO.011-26109750)

HIGHLIGHTS OF THE POWER SUPPLY POSITION OF WESTERN REGION

Revised

FOR THE MONTH OF August 2019

File no: WRPC/Opn./PSP/2018-19/

(A) GENERATION DETAILS OF WESTERN REGION

CONSTITUENT	GUVNL	MPPGCL	CSEB	MSPGCL	GOA	DAMAN & DIU	DNH	ESIL&BARC	HVDC DRAWAL	WESTERN REGION
(1) GENERATION GROSS (MUs)										
Thermal Coal+Gas Based	5632.14	1613.80	1684.42	6628.85	7.87	0.00	0.00	0.00	0.00	15567.07
Hydro	240.57	997.39	41.83	451.73	0.00	0.00	0.00	0.00	0.00	1731.52
Wind Injection	1126.01	523.34	0.00	1299.81	0.00	0.00	0.00	0.00	0.00	2949.15
Solar Injection	190.72	127.77	21.93	140.64	0.00	0.91	0.00	0.00	0.00	481.97
Bio Mass Injection	5.12	0.95	13.87	0.00	0.00	0.00	0.00	0.00	0.00	19.95
TOTAL	7194.56	3263.24	1762.05	8521.03	7.87	0.91	0.00	0.00	0.00	20749.65
(2) ACTUALDEMAND MET (GR. MW)	14599	8777	4278	20250	561	350	813	874		47633

(B) ENERGY AVAILABILITY/ REQUIREMENT ETC.(EX-BUS) IN (MUs)

CONSTITUENT	GUVNL	MPPGCL	CSEB*	MSPGCL	GOA	DAMAN & DIU	DNH	ESIL&BARC	HVDC DRAWAL	WESTERN REGION
1. OWN GEN										
Thermal Coal+Gas Based	5198.10	1528.66	1706.17	6273.81	7.71	0.00	0.00	0.00	0.00	14714.46
Hydro	240.08	985.80	41.74	445.89	0.00	0.00	0.00	0.00	0.00	1713.51
Wind Injection	1103.49	497.17	0.00	1273.81	0.00	0.00	0.00	0.00	0.00	2874.47
Solar Injection	186.91	121.38	20.83	137.83	0.00	0.89	0.00	0.00	0.00	467.84
Bio Mass Injection	5.02	0.90	13.87	0.00	0.00	0.00	0.00	0.00	0.00	19.80
Total	6733.60	3133.91	1782.62	8131.34	7.71	0.89	0.00	0.00	0.00	19790.07
2 (I). Total drawl from ISTS Grid (at State Peripheri Excluding Tr. Losses)	1707.73	2372.72	991.73	3717.62	311.35	217.99	567.20	158.18	1.42	10045.95
2 (II) B. Total drawl from ISTS Grid (Including Tr. Losses)	1757.83	2442.33	1020.83	3826.68	320.48	224.39	583.84	162.82	1.46	10339.20
3. NET IMPORT	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
4. NET EXPORT	**0.00**	**13.86**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.86**
5 TOTAL AVAILABILITY (EXC ISTS TRANS. LOSSES) / TOTAL AVAILABILITY / NET ACTUAL ENERGY SUPPLIED (INC. ISTS TRAN.LOSSES)										
5 (I) . TOTAL AVAILABILITY (EXCL. ISTS TRANS. LOSSES)	**8441**	**5493**	**2774**	**11849**	**319**	**219**	**567**	**158**	**1.42**	**29822.16**
5 (II). TOTAL AVAILABILITY / NET ACTUAL ENERGY SUPPLIED (INCL ISTS TRANS. LOSSES)	8491.43	5562.38	2803.44	11958.02	328.20	225.28	583.84	162.82	1.46	30115.41
6. SHORTFALL										
6 (I). SHORTFALL (MU)	**0.00**	**0.00**	**1.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.08**
6 (II). SHORTFALL (%)	**0.00**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Freq. correction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Un Sch.Load Shedding	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00	1.08
Sch.Load Shedding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Unrestricted Requirment	**8441**	**5493**	**2775**	**11849**	**319**	**219**	**567**	**158**	**1.42**	**29823**

AVERAGE WR GRID POOL LOSS **2.85**

(C) DEMAND AVAILABILITY/UNRESTRICTED REQUIREMENT IN (MW)

1. REQUIREMENT	14599	8777	4285	20257	561	350	813	874	2	47633
2. AVAILABILITY	14599	8777	4278	20250	561	350	813	874	2	47633
3. SHORTFALL	0.00	0.00	7.49	7.09	0.00	0.00	0.28	0.00	0.00	0.00
4. % SHORTFALL	0.00	0.00	0.17	0.03	0.00	0.00	0.03	0.00	0.00	0.00
The details of calculations for Unrestricted Requirment										
Demand met at Unrestricted max	14599	8777	4278	20250	561	350	813	874	2	47633
Freq. correction	0	0	7	7	0	0	0	0	0	0
Un Sch.Load Shedding	0	0	0	0	0	0	0	0	0	0
Sch.Load Shedding	0	0	0	0	0	0	0	0	0	0
Unrestricted Demand	14599	8777	4285	20257	561	350	813	874	2	47633
Min. Registered Demand	8303	4699	2549	12361						31122

(D) Details of Gross generation, Declared Capacity, Scheduled generation & Injection from CS and dedicated Stations

C.S. Station & Dedicated Stations	Gross Generation (MUs)	Injection (MUs)
Korba	1351.92	1284.32
Korba-III	123.51	117.34
Vindhyachal-I	738.05	701.15
Vindhyachal-II	622.13	591.02
Vindhyachal-III	683.95	649.75
Vindhyachal-IV	611.60	581.02
Vindhyachal-V	349.79	332.30
Kawas	60.94	59.72
Gandhar	16.00	15.68
Sipat I	921.06	884.22
Sipat II	623.76	598.81
MAUDA-I	380.94	365.71
MAUDA-II	97.40	93.50
Lara	102.63	98.52
Gadarwada	86.91	83.44
SOLAPUR	118.51	112.58
NSPCL	234.39	225.01
RGPPL	358.37	351.20
Kakrapar	311.13	291.53
Tarapur II (3&4)	802.43	738.24
Tarapur I (1&2)	239.48	217.93
SSP	710.77	703.66
OTHER IPPS	10476.09	9847.52
Pench	1.64	1.62
Total	20023.40	18945.79

(F) Total Drawal by the Constituents

Constituents	Actual total drawal from grid excluding grid loss
	(MUs)
GUJARAT	1707.73
MADHYA PRADESH	2372.72
CHHATISHGARH	991.73
MAHARASHTRA	3717.62
GOA(WR)	311.35
DD	217.99
DNH	567.20
ESIL	154.91
BARC	3.27
HVDC DRAWAL	1.42
TOTAL	10045.95

(G) FREQUENCY REGIME OF WESTERN REGION GRID

	1.Intantaneous (Hz)	2. Integrated (Hz)	3. Average (Hz)
Maximum Freq.	50.32	50.26	50.00
Munimum Freq.	49.55	49.81	

3. Percentage Time when the Frequency was

		4. No of Occasions when Frequency was	
3.1 Below 49.9 Hz.	7.28	FREQUENCY TOUCHED 49.20 Hz.	0.00
3.2 BETWEEN 49.9 Hz. AND 50.05 Hz.	72.69	FREQUENCY TOUCHED 49.00 Hz.	0.00
3.3 ABOVE 50.05 Hz.	20.03	FREQUENCY TOUCHED 48.8 Hz.	0.00
		Net Import / export of Energy in the Regi	
		Actual Energy import (MU	-8193
		Sch Energy import (MU)	-8024

विद्युतदाब रूपरेखा अगस्त 2019

Voltage Profile during the month of August'2019

संलग्नक Annex-2.3

दिनांक	भोपाल		खडवा		इटारसी		दमोह		नागदा		इदौर		ग्वालियर		रायपुर		रायगढ़	
Date	Bhopal		Khandwa		Itarsi		Damoh		Nagda		Indorer		Gwalior		Raipur		Raigarh	
	400kV		400kV		400kV		400kV		400kV		400kV		400kV		400kV		400kV	
	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	416	407	424	415	414	406	427	417	420	411	417	409	410	392	425	420	427	421
2	416	408	422	414	413	406	427	419	417	409	416	408	412	395	423	418	426	422
3	417	408	424	415	414	407	427	418	419	411	417	408	414	397	424	420	426	421
4	416	406	424	415	414	405	426	416	420	411	417	408	415	392	423	419	426	420
5	414	406	424	414	413	404	424	416	419	408	416	405	408	394	423	418	425	418
6	416	407	424	414	413	406	427	419	420	409	416	406	412	397	422	417	424	420
7	417	409	424	415	415	407	427	421	420	412	418	409	411	396	426	419	428	422
8	417	408	423	413	416	407	431	418	420	411	417	408	414	397	430	425	432	426
9	418	410	424	417	416	410	430	420	420	413	418	410	413	397	430	423	430	423
10	417	407	424	414	416	406	426	414	421	411	418	409	413	392	426	420	428	420
11	415	406	421	415	414	406	424	415	420	414	416	410	412	390	424	420	426	421
12	412	405	420	413	411	404	423	413	418	410	415	407	409	393	423	419	427	422
13	414	408	420	412	412	407	425	417	418	411	414	408	413	398	425	418	428	422
14	416	409	423	415	414	409	427	421	419	411	416	409	412	399	426	422	429	425
15	420	408	424	416	418	409	433	417	423	415	419	413	415	395	428	420	429	422
16	414	405	421	413	414	404	426	409	419	411	416	408	410	397	423	418	425	420
17	412	405	419	412	412	405	424	414	418	410	415	408	409	398	423	416	424	419
18	412	400	419	409	411	401	422	410	418	407	414	405	409	388	422	417	424	414
19	411	403	419	409	410	403	422	414	417	406	413	404	407	394	422	417	424	419
20	413	402	420	410	412	403	422	413	417	407	414	406	409	391	422	417	423	418
21	412	405	419	413	411	405	423	415	417	409	414	407	408	393	423	418	425	419
22	414	405	420	413	413	405	426	417	417	409	414	407	410	391	422	418	423	419
23	415	408	419	412	413	407	427	420	417	411	415	409	411	396	424	418	425	421
24	418	408	420	413	416	408	429	421	419	411	417	410	414	399	424	420	426	421
25	415	409	419	411	413	408	428	422	418	411	415	409	413	401	424	420	426	423
26	415	408	421	412	414	407	428	420	418	410	415	408	412	396	424	419	427	422
27	415	407	421	414	413	407	428	420	418	411	415	409	411	394	425	420	426	420
28	414	407	421	413	413	406	426	418	418	411	415	408	409	396	425	419	426	419
29	414	407	421	413	413	406	426	418	418	411	415	408	409	396	425	419	426	419
30	414	407	421	413	414	406	426	418	417	410	415	407	410	396	424	418	426	420
31	413	406	421	414	413	406	425	418	417	409	414	407	411	395	424	420	426	421
	420	**400**	**424**	**409**	**418**	**401**	**433**	**409**	**423**	**406**	**419**	**404**	**415**	**388**	**430**	**416**	**432**	**414**

दिनाक	भिलाई		वर्धा		धुले		परली		बोईसर		कलवा		कराड़		असोज		देहगाम	
Date	Bhilai		Wardha		Dhule		Parli		Boisar		Kalwa		Karad		Asoj		Dehgam	
	400kV		400kV		400kV		400kV		400kV		400kV		400kV		400kV		400kV	
	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	419	414	426	420	433	418	431	411	424	408	430	406	429	412	418	406	423	410
2	418	412	427	418	432	417	431	409	424	412	431	409	429	412	419	407	423	410
3	419	414	427	419	433	417	434	415	426	413	434	411	432	414	417	405	421	407
4	418	413	426	420	435	421	433	416	428	418	436	419	430	418	418	409	421	412
5	417	412	427	420	435	419	432	414	428	412	437	410	430	414	419	403	424	405
6	416	411	429	420	434	417	432	413	427	409	435	407	431	414	418	405	422	408
7	422	413	428	420	433	414	432	411	425	407	432	405	429	413	418	403	422	406
8	427	420	430	421	433	415	432	413	426	408	433	406	432	414	416	404	421	408
9	425	417	430	420	437	424	433	412	426	412	433	411	429	413	417	404	422	406
10	421	415	428	420	440	421	431	411	427	406	434	406	429	412	418	403	422	406
11	418	414	425	420	438	425	432	412	424	410	433	406	430	415	418	409	422	405
12	417	413	424	418	436	415	429	409	425	409	435	407	431	414	419	406	424	410
13	420	413	425	416	435	418	429	406	424	405	432	405	430	415	417	408	421	410
14	421	417	425	417	434	415	428	406	421	401	430	401	429	413	417	406	421	408
15	422	415	427	419	437	421	428	410	426	417	432	419	430	420	423	415	427	416
16	417	413	427	414	437	417	428	405	427	408	437	405	432	413	421	408	424	409
17	417	410	425	414	435	418	428	407	421	405	430	406	428	414	418	407	421	408
18	416	411	424	416	433	417	427	410	420	408	429	410	428	415	416	407	420	411
19	421	412	423	415	434	409	426	405	420	402	428	400	427	411	417	406	419	408
20	416	412	423	417	437	418	428	407	421	402	430	401	429	420	419	408	421	410
21	418	413	427	419	436	419	427	409	419	403	427	404	420	420	421	406	421	405
22	417	412	424	418	435	417	426	411	421	406	426	405	420	420	417	407	419	407
23	419	413	425	418	431	415	427	407	420	408	428	407	420	420	418	410	419	408
24	419	415	425	419	431	411	428	407	420	406	429	406	420	420	419	411	420	410
25	419	415	425	418	431	415	426	407	421	406	428	405	424	410	418	410	419	411
26	419	414	426	415	433	415	429	405	421	407	429	406	429	411	418	410	419	409
27	419	414	426	419	433	416	429	408	421	406	428	404	429	414	419	411	420	409
28	419	413	426	415	436	417	428	408	422	408	430	406	428	412	421	412	421	411
29	419	413	426	415	436	417	428	408	422	408	430	406	428	412	421	412	421	411
30	418	412	426	416	438	420	427	407	422	410	429	410	427	414	420	410	420	407
31	418	414	426	419	434	417	429	410	422	408	429	408	429	414	418	409	418	408
	427	**410**	**430**	**414**	**440**	**409**	**434**	**405**	**428**	**401**	**437**	**400**	**432**	**410**	**423**	**403**	**427**	**405**

दिनाक	कासोर		जेतपुर		अमरेली		वापी		मापुसा		कला		मगरवाड़ा		हज़ीरा		बीना		इंदौर	
Date	Kasor		Jetpur		Amreli		Vapi		Mapusa		Kala		Magarwada		Hazira		**Bina**		**Indore**	
	400kV		400kV		400kV		400kV		400kV		400kV		400kV		400kV		765Kv		765Kv	
	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम
	Max	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
1	425	416	419	409	425	414	418	402	436	408	421	405	425	409	422	400	792	767	775	757
2	426	417	419	408	424	414	420	406	435	409	423	409	427	413	424	405	791	771	774	758
3	425	416	416	404	420	408	422	406	440	400	425	410	428	413	423	402	793	771	775	758
4	428	419	418	406	423	411	423	413	440	422	425	416	430	419	425	407	793	763	775	755
5	426	415	416	405	420	410	425	406	440	400	426	408	430	412	424	404	787	768	773	754
6	426	416	417	408	421	408	423	404	440	400	424	407	428	409	425	403	792	773	774	757
7	426	414	419	403	421	409	420	401	437	412	422	405	426	407	422	401	794	770	776	759
8	425	415	418	408	421	414	420	401	440	400	423	404	427	407	420	400	792	771	774	757
9	425	415	416	402	420	408	420	403	437	413	422	409	428	413	421	400	792	773	777	762
10	427	415	418	405	425	409	421	400	437	406	424	405	429	407	424	400	796	767	778	758
11	427	418	419	406	421	410	418	403	438	415	420	407	426	412	422	405	789	763	773	757
12	425	415	419	410	422	407	420	402	440	409	422	405	428	409	423	402	784	767	770	754
13	424	415	424	410	426	415	418	398	439	414	421	402	426	406	421	401	788	772	770	757
14	423	413	423	415	424	416	415	395	438	411	418	399	423	402	423	403	788	774	773	757
15	429	420	424	415	426	416	424	411	436	424	428	415	431	419	430	413	796	767	779	761
16	429	414	423	413	424	415	421	398	439	407	424	404	429	407	428	401	785	770	772	754
17	423	413	423	415	424	417	414	396	434	410	418	402	422	404	421	398	786	772	768	754
18	423	417	421	413	424	416	414	400	434	415	416	405	420	410	420	407	785	753	768	745
19	425	413	422	412	424	415	413	395	434	409	418	400	422	404	421	404	782	764	768	748
20	424	414	421	413	424	417	415	395	434	407	417	400	423	404	418	400	785	763	774	753
21	426	413	422	411	424	415	411	395	431	406	416	399	421	403	418	395	785	765	773	760
22	424	414	421	414	423	416	413	396	434	407	417	401	422	406	417	398	791	770	776	759
23	422	414	422	413	425	416	413	400	432	407	417	403	422	409	417	403	794	775	776	762
24	424	414	421	413	425	416	413	398	433	408	417	401	422	408	419	402	800	778	780	760
25	423	414	420	411	421	414	413	399	432	406	417	401	423	408	419	403	795	782	776	758
26	423	416	418	411	421	415	413	400	432	398	417	403	422	408	419	404	794	774	771	756
27	426	417	419	413	421	416	414	399	434	406	417	401	422	407	418	402	793	775	772	756
28	427	417	421	411	424	416	415	400	433	407	419	403	423	408	419	403	791	776	771	757
29	427	417	421	411	424	416	415	400	433	407	419	403	423	408	419	403	791	776	771	757
30	423	416	421	412	423	416	416	401	433	407	419	404	424	410	419	402	793	776	771	753
31	422	415	419	407	422	411	416	401	435	408	418	403	423	409	418	401	793	775	769	754
	429	**413**	**424**	**402**	**426**	**407**	**425**	**395**	**440**	**398**	**428**	**399**	**431**	**402**	**430**	**395**	**800**	**753**	**780**	**745**

दिनाक	सासन		सतना		तमनार		कोटरा		वडोदरा		दुर्ग		ग्वालियर		सिपत		सियोनि		वर्धा	
Date	Sasan		Satna		Tamnar		Kotra		Vadodara		Durg		Gwalior		**Sipat**		**Seoni**		**Wardha**	
	765Kv		765Kv		765Kv		765Kv		765Kv		765Kv		765Kv		765Kv		765Kv		765Kv	
	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	अधिकतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम	अधिकतम	न्युनतम
	Max	**Min**	**Max**	**Min**	**Max**	**Max**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
1	781	765	793	765	791	780	791	779	790	770	793	780	791	762	784	772	795	781	796	779
2	779	768	788	771	793	782	792	781	790	769	794	779	795	769	781	772	792	778	795	773
3	779	769	790	770	794	782	794	780	790	768	798	781	800	770	782	774	794	781	796	777
4	779	764	789	762	792	781	790	780	791	774	792	781	801	760	781	773	794	779	794	778
5	775	766	782	768	790	781	789	781	787	766	791	779	791	765	781	775	793	780	795	776
6	780	768	789	771	793	784	793	783	791	768	794	784	797	771	784	778	795	782	796	778
7	784	767	793	770	796	787	796	786	790	768	798	788	798	766	789	780	798	783	797	778
8	779	766	786	770	798	784	799	783	787	767	800	784	798	767	789	775	799	780	803	779
9	781	769	789	773	797	783	797	782	791	773	802	782	795	770	786	775	797	779	799	776
10	780	766	790	768	795	781	795	780	787	771	796	781	796	749	784	772	795	779	794	775
11	777	762	787	765	788	780	788	779	792	778	789	780	795	759	780	772	790	778	789	776
12	773	763	781	765	788	779	788	778	792	773	790	778	790	763	779	772	788	776	788	772
13	775	766	785	770	792	781	792	780	778	764	793	778	794	769	783	771	793	774	796	764
14	775	768	786	771	795	786	795	785	783	761	797	783	795	772	785	777	794	781	791	771
15	787	765	795	768	796	779	796	778	794	776	796	779	801	760	787	771	798	773	795	775
16	775	765	784	771	789	778	788	777	790	762	791	774	791	772	778	768	786	768	804	763
17	775	767	784	774	797	779	794	778	783	762	801	778	795	773	784	770	795	769	797	764
18	775	757	784	755	787	776	786	774	786	768	788	775	795	747	778	767	789	771	794	772
19	771	762	780	764	784	776	783	774	783	754	784	775	787	761	776	768	788	773	789	769
20	771	760	781	762	789	780	789	778	790	767	792	778	791	761	777	770	789	776	791	771
21	773	761	782	765	795	779	795	778	788	765	803	781	791	765	786	771	798	779	803	775
22	775	763	785	767	789	779	788	778	788	766	791	779	795	759	782	773	793	780	792	774
23	782	766	788	770	789	779	788	778	781	761	789	781	794	769	782	772	795	781	797	775
24	785	774	795	778	795	783	794	782	784	751	796	784	799	774	785	775	797	785	796	781
25	783	776	790	780	791	785	790	784	780	777	792	784	797	779	782	776	795	783	796	778
26	782	772	790	773	795	782	795	781	780	760	798	778	795	768	785	773	795	776	799	769
27	783	770	789	772	789	781	789	779	783	762	792	780	794	767	782	773	796	781	799	775
28	780	771	787	774	792	779	791	776	784	764	798	776	793	771	786	771	798	777	800	769
29	780	771	787	774	792	779	791	776	784	764	798	776	793	771	786	771	798	777	800	769
30	782	770	789	772	789	779	788	778	787	765	791	777	795	774	783	773	797	778	798	771
31	780	770	789	773	790	784	789	782	781	760	792	783	795	769	784	777	797	783	798	780
	787	**757**	**795**	**755**	**798**	**776**	**799**	**774**	**794**	**751**	**803**	**774**	**801**	**747**	**789**	**767**	**799**	**768**	**804**	**763**

Annexure 2.5

पश्चिम क्षेत्रीय विद्युत समिति, मुंबई
WESTERN REGIONAL POWER COMMITTEE, MUMBAI

सं. पक्षेविस / प्रचालन/ विद्युत कटौतियां /2019-20 दिनांक : 05.09.2019

From: अधीक्षण अभियंता (प्रचालन), पक्षेविस, मुंबई
Superintending Engineer (Operation), WRPC, Mumbai

To: 1. Director (GM), 6th Floor, Sewa Bhawan, CEA, New Delhi (fax no. 011- 26109750)
2. Chief Engineer, OPM Division, CEA, New Delhi (Fax no. 011-26732337, 26107416)

विषय : -आगस्त 2019 के दौरान पश्चिम क्षेत्र में विद्युत कटौतियां/ पाबंदियां

Subject: -Power Cut/Restrictions in Western Region for the month of August-2019

क : गुजरात Gujarat

1 उद्योगों के लिये विद्युत कटौतियां / पाबंदियां , राज्य में भार नियमन आदि

1 **Power Cut/ Restriction on Industries, Load Shedding in the state etc**

विवरण Details	विद्युत कटौती की मात्रा Quantum of power cut (MW)	पाबन्दी का समय Restriction Timing		प्रति दिन कुल ऊर्जा कटौती Total Energy Cut (MUs /day	Remark
		From	Total Energy Cut (MUs /day		
(a) Power Restrictions(Evening peak Hour) on non continuous process HT/LT Industries	शून्य Nil	शून्य Nil	शून्य Nil	शून्य Nil	All industries are allowed to run their units on all days of week & if they want to avail staggered holiday, then they will have to stagger on notified day only & cannot avail as per their choice. All industries are required to keep their recess timings staggered.
(b) भार नियमन Load Shedding	शून्य Nil	शून्य Nil	शून्य Nil	शून्य Nil	
(c) अन्य जानकारी Other information					
1.Weekly Off	शून्य Nil	शून्य Nil	शून्य Nil	शून्य Nil	
2.Staggering of power supply	शून्य Nil	शून्य Nil	शून्य Nil	शून्य Nil	

2 कृषि क्षेत्र को विद्युत आपूर्ति

2. **Power supply to Agricultural Sector: -**

विवरण Details	से From दिनांक Date	तक To दिनांक Date	प्रति दिन आपूर्ति घंटे Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
2.1 Three phase supply	01.08.2019	31.08.2019	10:00	8:00	8:12
2.2 Single Phase supply	01.08.2019	31.08.2019	16:00	16:00	16:00

3 अन्य जानकारी

3. **Any other information**

1. Jayotigram Yojana-24 hours.
2. There is no load shedding in Urban areas

ख : मध्य प्रदेश Madhya Pradesh

1 उद्योगों के लिये विद्युत कटौतियां / पावंदियां , राज्य में भार नियमन आदि

1 **Power Cut/ Restriction on Industries, Load Shedding in the state etc**

विवरण Details	विद्युत कटौती की मात्रा Quantum of power cut (MW)	पावन्दी का समय Restriction Timing		प्रति दिन कुल ऊर्जा कटौती Total Energy Cut (MUs /day
		से From	तक To	
(a) Power Restrictions(Evening peak Hour) on non continuous process HT/LT Industries (b) भार नियमन Load Shedding	NIL	NIL	NIL	NIL
(c) अन्य जानकारी Other information 1.Weekly Off 2.Staggering of power supply	NIL	NIL	NIL	NIL

2 कृषि क्षेत्र को विद्युत आपूर्ति

2. **Power supply to Agricultural Sector: -**

विवरण Details	से From दिनांक Date	तक To दिनांक Date	प्रति दिन आपूर्ति घंटे Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
2.1 Three-Phase Supply(Mixed)	01.08.2019	31.08.2019	23:51	23:30	23:40
2.2 Three-Phase Supply(DLF)	01.08.2019	31.08.2019	23:50	23:28	23:39
2.3 Three-Phase Supply(Irrigation)	01.08.2019	31.08.2019	09:57	09:47	09:53

3 अन्य जानकारी

3. **Any other information**

शहरी क्षेत्रों में नियमन विद्युत कटौतियां Scheduled Power cuts in Urban Areas

विवरण Details	से From दिनांक Date	तक To दिनांक Date	ओसत प्रतिदिन आपूर्ति घंटे Average Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
3.1 Commissionary H. Qtrs.	01.08.2019	31.08.2019	23:56	23:44	23:51
3.2 District Head Qtrs.	01.08.2019	31.08.2019	23:57	23:46	23:52
3.3 Tehsil Head Qtrs.	01.08.2019	31.08.2019	23:57	23:37	23:47

ग : महाराष्ट्र Maharashtra

1 उध्योगों के लिये विद्युत कटौतियां / पाबंदियां , राज्य में भार नियमन आदि

1 Power Cut/ Restriction on Industries, Load Shedding in the state etc

Details	Quantum of power cut (MW)	Restriction Timing		Total Energy Cut (MUs /day
		From	To	
(a) Power Restrictions(Evening peak Hour) on non-continuous process HT/LT Industries (b) Load Shedding	NIL	NIL	NIL	NIL
(c) Other information 1.Weekly Off	NIL	NIL	NIL	NIL
2.Staggering of power supply	-			

2. **Power supply to Agricultural Sector: -**

Details	From Date	To Date	Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
2.1 Three-Phase Supply	01.08.2019	31.08.2019	10	8	9
2.1 Single-Phase Supply	01.08.2019	31.08.2019	18	18	18

3. **Scheduled Power cuts in Urban Areas**

Details	From Date	To Date	Average Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
3.1 Commissionary H. Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL
3.2 District Head Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL
3.3 Tehsil Head Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL

4. **Any other information**

	Date	Quantum in MW	Avg Mus/Day
3. Load Shedding due to Transmission Constraint in real time.	-	-	-
	-	-	-
	-	-	-

घ : छत्तीसगढ़ Chhattisgarh:

उद्योगों के लिये विद्युत कटौतियां / पाबंदियां , राज्य में भार नियमन आदि

1 **Power Cut/ Restriction on Industries, Load Shedding in the state etc**

विवरण Details	विद्युत कटौती की मात्रा Quantum of power cut (MW)	पावन्दी का समय Restriction Timing		प्रति दिन कुल ऊर्जा कटौती Total Energy Cut (MUs /day)
		से From	तक To	
(a)Power Restrictions(Evening peak Hour) on continuous process HT/LT Industries M	NIL	NIL	NIL	NIL
(b) भार नियमन Load Shedding	253MW(Max) on 02/08/2019	18:40	19:46	0.0348
(c) अन्य जानकारी Other information 1.Weekly Off 2.Staggering of power supply	शून्य Nil शून्य Nil	शून्य Nil शून्य Nil	शून्य Nil शून्य Nil	शून्य Nil शून्य Nil

2 कृषि क्षेत्र को विद्युत आपूर्ति

2. **Power supply to Agricultural Sector: -**

विवरण Details	से From दिनांक Date	तक To दिनांक Date	प्रति दिन आपूर्ति घंटे Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
2.1 Three-Phase Supply(Mixed)	01.08.2019	31.08.2019	NIL	NIL	NIL
2.2 Three-Phase Supply(DLF)	01.08.2019	31.08.2019	NIL	NIL	NIL
2.3 Three-Phase Supply(Irrigation)	01.08.2019	31.08.2019	18:00	18:00	18:00

3 अन्य जानकारी

3. **Any other information**

शहरी क्षेत्रों में नियमन विद्युत कटौतियां Scheduled Power cuts in Urban Areas

विवरण Details	से From दिनांक Date	तक To दिनांक Date	ओसत प्रतिदिन आपूर्ति घंटे Average Supply Hours per day		
			Max. (Hrs)	Min. (Hrs)	Average (Hrs)
3.1 Commissionary H. Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL
3.2 District Head Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL
3.3 Tehsil Head Qtrs.	01.08.2019	31.08.2019	NIL	NIL	NIL

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संलग्नक Annex-2.6

अनिवार्य युनिट आऊटेज का अगस्त 2019 का विस्तारित ब्यौरा

Details of forced unit outages during the month of Aug'2019

अनु क्रमांक Sl.No	युनिट Unit	संघटक Constituent /IPP	क्षमता मेगावॉट Cap.MW	से From समय Time	दिनांक Date	तक To समय Time	दिनांक Date	कारण Reason
1.	जीआईपीसीएल स्टेज GIPCL STG 2	GSECL	165	00:00	01-03-2018	Still out	Still out	No schedule
2.	बीईसीएल BECL 1	GSECL	250	19:52	29-03-2019	Still out	Still out	Coal feeding system problem
3.	डीजीबीपी DGBP 2	GSECL	112	22:30	19-06-2019	Still out	Still out	Gas line problem.
4.	जीपेक GPEC - 2	GSECL	138	21:33	13-07-2019	Still out	Still out	RSD
5.	जीपेक GPEC - 3	GSECL	138	22:02	20-07-2019	Still out	Still out	RSD
6.	डीजीबीपी DGBP 3 - 1	GSECL	375	17:30	22-07-2019	17:18	08-08-2019	Non-availability of Gas
7.	वानकबोरी Wanakbori -1	GSECL	210	23:26	24-07-2019	01:12	13-08-2019	RSD
8.	गांधीनगरGandhinagar(GTPS)3	GSECL	210	16:33	24-07-2019	00:40	13-08-2019	RSD
9.	वानकबोरी Wanakbori - 5	GSECL	210	16:04	25-07-2019	08:25	\07-08-2019	RSD
10.	वानकबोरी Wanakbori - 6	GSECL	210	00:19	25-07-2019	15:07	06-08-2019	RSD
11.	बीईसीएल BECL - 2	GSECL	250	20:46	26-07-2019	20:02	05-08-2019	BTL
12.	एसएलपीपी SLPP – 2	GSECL	125	00:06	01-08-2019	17:41	05-09-2019	COH
13.	सूजन SUGEN 1 - 3	GSECL	382	23:39	01-08-2019	09:34	16-08-2019	RSD
14.	एएलटीपीएस ALTPS - 2	GSECL	125	09:57	02-08-2019	19:17	18-08-2019	BTL
15.	डीजीबीपी DGBP 1 - 1	GSECL	297	01:14	03-08-2019	21:44	06-08-2019	RSD
16.	उकई UKAI - 4	GSECL	200	16:39	04-08-2019	09:18	19-08-2019	Water logged in basement.
17.	उकई UKAI - 5	GSECL	210	17:16	04-08-2019	13:52	17-08-2019	Water logged in basement
18.	गांधीनगर Gandhinagar(GTPS)4	GSECL	38	08:37	09-08-2019	01:25	13-08-2019	RSD
19.	वानकबोरी Wanakbori - 3	GSECL	210	10:50	09-08-2019	14:41	12-08-2019	RSD
20.	बीईसीएल BECL - 2	GSECL	250	13:16	10-08-2019	18:41	26-08-2019	raw water shortage
21.	डीजीबीपी DGBP 1 - 1	GSECL	107	23:41	12-08-2019	11:54	19-08-2019	RSD
22.	उतरण स्टेज UTRAN STG II 1	GSECL	375	21:28	13-08-2019	18:27	18-08-2019	RSD
23.	डीजीबीपी DGBP 3 - 1	GSECL	375	03:05	14-08-2019	14:31	18-08-2019	RSD
24.	जीटीपीएस Gandhinagar(GTPS)3	GSECL	210	22:55	14-08-2019	Still out	Still out	RSD
25.	जीटीपीएस Gandhinagar(GTPS)4	GSECL	210	00:12	15-08-2019	Still out	Still out	RSD
26.	वानकबोरी Wanakbori -1	GSECL	210	07:03	15-08-2019	18:35	21-08-2019	RSD
27.	वानकबोरी Wanakbori -6	GSECL	210	07:07	15-08-2019	18:15	20-08-2019	RSD
28.	वानकबोरी Wanakbori -4	GSECL	210	07:35	15-08-2019	18:55	20-08-2019	RSD
29.	डीजीबीपी DGBP 3 - 1	GSECL	375	10:03	21-08-2019	23:53	25-08-2019	RSD
30.	वानकबोरी Wanakbori - 1	GSECL	210	23:15	23-08-2019	Still out	Still out	RSD
31.	उकई Ukai - 4	GSECL	200	07:35	24-08-2019	02:52	27-08-2019	Flame failure
32.								
33.	सूजन SUGEN 1 - 2	GSECL	382	11:10	24-08-2019	Still out	Still out	BTL

34.	जीपीपीसी GPPC 2	GSPC	351	20:47	17-10-2018	Still out	Still out	RSD
35.	जीसेग GSEC - 2	GSPC	253.5	23:15	18-08-2019	Still out	Still out	RSD
36.	वानकबोरी Wanakbori - 1	GSECL	210	23:15	23-08-2019	Still out	Still out	RSD
37.	वानकबोरी Wanakbori - 4	GSECL	210	10:50	24-08-2019	17:55	31-08-2019	RSD
38.	सूजन SUGEN 1 - 2	GSECL	382	11:10	24-08-2019	Still out	Still out	BTL
39.	वानकबोरी Wanakbori - 6	GSECL	210	23:36	26-08-2019	Still out	Still out	RSD
40.	एसटीपीएस STPS -4	GSECL	250	11:14	27-08-2019	Still out	Still out	RSD
41.	उकई UKAI - UNIT 5	GSECL	210	13:31	27-08-2019	06:42	03-09-2019	RSD
42.	जीटीपीएस Gandhinagar(GTPS)5	GSECL	210	14:13	28-08-2019	Still out	Still out	RSD
43.	वानकबोरी Wanakbori - 3	GSECL	210	10:13	31-08-2019	Still out	Still out	BTL
44.	डीजीबीपी DGBP 3 - 1	GSECL	375	15:59	31-08-2019	Still out	Still out	RSD
45.	जीपीपीसी GPPC 2	GSPC	351	20:47	17-10-2018	Still out	Still out	RSD
46.	जीपीपीसी GPPC 1	GSPC	351	10:38	25-07-2019	Still out	Still out	RSD
47.	जी सेग स्टेज GSEG STG 2 -1	GSPC	351	13:26	07-08-2019	10:50	12-08-2019	RSD
48.	जीसेग GSEC - 2	GSPC	253.5	23:15	18-08-2019	19:54	29-08-2019	RSD
49.	जीसेग GSEC STG 2 - 1	GSPC	351	21:50	26-08-2019	00:45	30-08-2019	RSD
50.	जीसेग GSEG STG 2 - 1	GSECL	351	21:07	31-08-2019	06:15	03-09-2019	RSD
51.	जीपेक GPEC 4	CLPIPL	241	16:36	06-12-2018	Still out	Still out	PPA expired
52.	एएलटीपीएस ALTPS - - 1	GMDC	125	19:28	10-08-2019	08:35	20-08-2019	Coal feeding problem
53.	परली Parli 4	MAHAGENCO	210	19:47	05-07-2015	Still out	Still out	Economic shutdown
54.	परली Parli 5	MAHAGENCO	210	14:55	06-07-2015	Still out	Still out	Economic shutdown
55.	पायोनीर Pioneer(262+126) 1	MAHAGENCO	388	17:45	07-02-2017	Still out	Still out	RSD
56.	उरण Uran 7	MAHAGENCO	108	12:53	20-07-2018	Still out	Still out	Compressor & Turbine Blade Failure.
57.	डबल्यूपीसीएल WPCL 1	MAHAGENCO	135	04:48	25-11-2018	Still out	Still out	NO PPA
58.	डबल्यूपीसीएल WPCL 2	MAHAGENCO	135	00:00	27-11-2018	Still out	Still out	No schedule
59.	परली Parli 6	MAHAGENCO	250	00:00	12-12-2018	Still out	Still out	Zero schedule
60.	डबल्यूपीसीएल WPCL 4	MAHAGENCO	135	00:00	15-12-2018	Still out	Still out	RSD
61.	वीआईपीएल VIPL 1	MAHAGENCO	300	00:30	29-12-2018	Still out	Still out	Coal shortage
62.	वीआईपीएल VIPL 2	MAHAGENCO	300	00:15	17-01-2019	Still out	Still out	Coal Shortage
63.	परली PARLI 8	MAHAGENCO	250	00:00	04-06-2019	Still out	Still out	No schedule
64.	भुसावल Bhusawal 3	MAHAGENCO	210	18:35	28-06-2019	09:42	29-08-2019	RSD
65.	कोराडी Koradi MSEDCL - 8	MAHAGENCO	660	00:15	26-07-2019	15:09	10-08-2019	Air heater probelm
66.	कोराडी Koradi - 7	MAHAGENCO	210	15:47	27-07-2019	11:01	21-08-2019	No schedule.
67.	कोराडी Koradi - 6	MAHAGENCO	210	15:32	27-07-2019	02:09	21-08-2019	No schedule.
68.	कोराडी Koradi - 10	MAHAGENCO	660	23:38	30-07-2019	22:00	06-08-2019	No schedule.
69.	नासिक Nasik - 4	MAHAGENCO	220	16:00	01-08-2019	01:40	07-08-2019	Zero Schedule
70.	नासिक Nasik - 5	MAHAGENCO	400	22:45	01-08-2019	17:35	22-08-2019	Main Steam temperature not maintained due to coal feeder choke up
71.	नासिक Nasik 3	MAHAGENCO	210	09:15	05-08-2019	02:12	20-08-2019	PA fan trip due to DC failure
72.	चंद्रपुर Chandrapur -8	MAHAGENCO	500	22:16	14-08-2019	04:38	19-08-2019	BTL
73.	उरण Uran - 8	MAHAGENCO	108	23:17	16-08-2019	10:30	20-08-2019	Gas shortage
74.	उरण Uran B0 - 1	MAHAGENCO	120	23:17	16-08-2019	17:47	20-08-2019	Gas shortage
75.	जयगड Jaigad - 4	MAHAGENCO	300	07:20	21-08-2019	17:45	30-08-2019	Condenser cleaning work
76.	उरण Uran - 6	MAHAGENCO	108	19:35	21-08-2019	Still out	Still out	gas shortage

77.	चंद्रपुर Chandrapur - 3	MAHAGENCO	210	08:20	23-08-2019	02:29	29-08-2019	LPT differential expansion
78.	कोराडी Koradi MSEDCL - 8	MAHAGENCO	660	00:04	25-08-2019	Still out	Still out	AOH
79.	भुसावल Bhusawal - 5	MAHAGENCO	500	00:13	25-08-2019	Still out	Still out	AOH
80.	पारस Paras - 4	MAHAGENCO	250	00:14	25-08-2019	Still out	Still out	COH
81.	कोराडी Koradi - UNIT 7	MAHAGENCO	210	09:52	27-08-2019	Still out	Still out	Wet Coal
82.	पारस Paras-3	MAHAGENCO	250	01:13	31-08-2019	02:26	03-09-2019	BTL
83.	चंद्रपुर Chandrapur - UNIT 3	MAHAGENCO	210	16:21	31-08-2019	Still out	Still out	Wet coal problem
84.	सातपुरा Satpura II - 6	MPPGCL	200	00:05	03-08-2019	Still out	Still out	Steam line temperature high
85.	सिंघाजी Singaji - 4	MPPGCL	660	17:24	09-08-2019	09:24	27-08-2019	RSD
86.	सातपुरा Satpura II - 1	MPPGCL	210	11:47	10-08-2019	Still out	Still out	RSD
87.	सातपुरा Satpura II - 7	MPPGCL	210	12:22	10-08-2019	Still out	Still out	RSD
88.	सिंघाजी Singaji - 3	MPPGCL	660	11:29	15-08-2019	Still out	Still out	RSD
89.	एसजीटीपीएस SGTPS - 1	MPPGCL	210	11:48	15-08-2019	18:39	29-08-2019	RSD
90.	सातपुरा Satpura II - 10	MPPGCL	250	14:29	15-08-2019	06:34	29-08-2019	RSD
91.	सिंघाजी Singaji 1	MPPGCL	600	05:52	27-08-2019	Still out	Still out	Flame failure
92.	मरवा टीपीएस Marwa TPS -1	Chattisgarh	500	10:25	07-08-2019	02:29	11-08-2019	CRH NRV malfunction
93.	मारवा टीपीएस Marwa TPS - UNIT 2	Chattisgarh	500	13:06	20-08-2019	20:44	29-08-2019	Coal shortage
94.	जीएमआर छत्तीसगढ़ GMR Chhattisgarh 1	GMR Chattisgarh Energy Ltd, GMR WARORA (GWEL)	685	23:50	15-08-2019	05:14	23-08-2019	No schedule.
95.	जीएमआर छत्तीसगढ़ GMR Chhattisgarh 2	GMR Chattisgarh Energy Ltd, GMR WARORA (GWEL)	685	04:42	16-08-2019	01:24	28-08-2019	Boiler MFT (All flames off)
96.	जीएमआर वरोरा GMR WARORA - 1	GMR WARORA (GWEL)	300	00:02	20-08-2019	Still out	Still out	capital overhauling
97.	ट्रोम्बे Trombay 6	TPC	500	00:00	06-03-2016	Still out	Still out	Economic shutdown
98.	ट्रोम्बे Trombay **5**	TPC	500	09:11	12-08-2019	16:56	16-08-2019	Economiser drain valve leakage
99.	आरजीपीपीएल RGPPL-1A	RGPPL	320	13:30	8-07-2014	Still out	Still out	Less requisition
100.	आरजीपीपीएल RGPPL 2B	RGPPL	320	21:00	02-07-2019	05:25	11-08-2019	Less gas availability
101.	आरजीपीपीएल RGPPL 2A	RGPPL	320	21:00	02-07-2019	13:08	18-08-2019	Less gas availability
102.	आरजीपीपीएल RGPPL 2B	RGPPL	332	13:01	13-08-2019	12:49	18-08-2019	Less gas; Changeover of units
103.	आरजीपीपीएल RGPPL 2A	RGPPL	332	21:34	13-08-2019	01:14	19-08-2019	Less gas; Changeover of units
104.	आरजीपीपीएल RGPPL 3A	RGPPL	332	22:04	18-08-2019	Still out	Still out	Less gas; Changeover of units
105.	आरजीपीपीएल RGPPL - UNIT 3B	RGPPL	320	05:49	19-08-2019	Still out	Still out	Less gas; Changeover of units
106.	एपीएमएल मुँदरा APML Mundra 8	Adani Power	660	08:40	27-08-2019	08:17	09-09-2019	Heavy oil Leakage and abnormal sound in APH.
107.	अमरावती टीपीपी AMRAVATI TPP(INDIABULL)-1	Rattan Power India Ltd	270	08:00	25-07-2019	16:55	18-08-2019	Zero schedule
108.	अमरावती टीपीपी AMRAVATI TPP(INDIABULL)-3	Rattan Power India Ltd	270	18:00	25-07-2019	02:18	13-08-2019	Zero schedule
109.	अमरावती टीपीपी	Rattan Power India Ltd	270	02:00	25-07-2019	16:06	01-09-2019	RSD

	AMRAVATI TPP(INDIABULL)-2							
110.	अमरावती टीपीपी AMRAVATI TPP(INDIABULL)-4	Rattan Power India Ltd	270	01:09	26-07-2019	10:31	13-08-2019	Zero schedule
111.	अमरावती टीपीपी AMRAVATI TPP(INDIABULL)-5	Rattan Power India Ltd	270	20:00	26-07-2019	18:45	14-08-2019	Zero schedule
112.	अमरावती टीपीपी AMRAVATI TPP(INDIABULL)-5	Rattan India (RIPL)	270	13:50	18-08-2019	17:55	20-08-2019	Electrical fault
113.	जेपीएल स्टेज JPL Stg-I 2	JPL	250	21:15	30-08-2018	Still out	Still out	Condenser tube leakage/Coal shortage since 00:00hrs of 02-09-2018
114.	जेपीएल स्टेज JPL Stg-I 1	JPL	250	00:00	24-10-2018	Still out	Still out	Coal shortage
115.	जेपीएल स्टेज JPL Stg-II 1	JPL	600	02:07	16-03-2019	Still out	Still out	Condenser Tube Leakage/ Coal shortage
116.	जेपीएल स्टेज JPL Stg-II 4	JPL	600	04:35	03-07-2019	21:15	28-08-2019	Coal shortage
117.	जेपीएल स्टेज JPL Stg-II - 3	JPL	600	00:03	04-08-2019	22:44	12-08-2019	COAL SHORTAGE
118.	जेपीएल स्टेज JPL Stg-I -4	JPL	250	23:59	10-08-2019	21:15	28-08-2019	Coal Shortage
119.	जेपीएल स्टेज JPL Stg-II -2	JPL	600	10:59	25-08-2019	Still out	Still out	Coal shortage
120.	जेपीएल स्टेज JPL Stg-II 4	JPL	600	20:43	30-08-2019	15:03	08-09-2019	Condenser tube leakage
121.	ईपीजीएल EPGL -2	ESSAR	600	20:25	24-10-2017	Still out	Still out	Coal shortage
122.	एस्सार(महान)Essar(Mahan)-2	Essar Mahan (EMPCL)	765	02:57	03-08-2019	17:53	19-08-2019	Boiler problem
123.	एस्सार(महान)Essar(Mahan)- 1	Essar Mahan (EMPCL)	600	09:55	08-08-2019	07:23	18-08-2019	BTL
124.	वडिनार VADINAR - 1	Essar Mahan (EMPCL)	600	00:32	10-08-2019	Still out	Still out	Condenser problem
125.	वडिनार VADINAR 2	Essar Mahan (EMPCL)	600	04:38	10-08-2019	17:27	13-08-2019	Coal feeding problem
126.	एस्सार महान ESSAR(Mahan)-1	Essar Mahan (EMPCL)	600	03:22	19-08-2019	Still out	Still out	due to APH problem
127.	डीजीईएन DGEN-52	TPGL	400	00:05	01-05-2019	Still out	Still out	RSD
128.	डीजीईएन DGEN-53	TPGL	400	00:40	01-05-2019	Still out	Still out	RSD
129.	केडब्लूपीसीएल KWPCL 1	KWPCL	600	22:12	22-05-2017	Still out	Still out	Stator earth fault protection operated/maintenance
130.	आईईपीएल IEPL I	IEPL	270	21:26	28-08-2018	Still out	Still out	Coal Shortage
131.	आरकेएम पावर RKM Power 4	RKMPPL	360	00:00	20-03-2019	Still out	Still out	Commercial operation declared from 00:00hrs of 20-03-2019; kept out on less fuel; intimated that from 10-05-2019, the reason is no schedule due to no PPA
132.	आरकेएम पावर RKM Power 1	RKMPPL	360	06:52	02-07-2019	Still out	Still out	Turbine vibration high
133.	सीजीपीएल CGPL 4	CGPL	830	01:17	15-06-2019	23:12	06-08-2019	For generator inspection & capital overhauling
134.	सीजीपीएल CGPL 5	CGPL	830	08:45	15-06-2019	Still out	Still out	COH
135.	केएसके महानदी KSK Mahanadi 3	KMPCL	600	07:17	04-06-2019	08:02	15-08-2019	ID fan Problem
136.	धारीवाल एसटीयू Dhariwal STU 1	DIL	300	00:01	01-07-2019	Still out	Still out	No schedule
137.	टीआरएन एनर्जि TRN Energy - 1	ACBIL	300	01:50	10-07-2019	Still out	Still out	Due to low schedule
138.	एसकेएस SKS Power 1	SKS	300	00:22	14-08-2019	09:27	19-08-2019	Low schedule
139.	सोलापुर टीपीएस Solapur STPS 2	NTPC	660	23:30	13-06-2019	08:46	21-08-2019	RSD

140.	सोलापुर टीपीएस Solapur STPS 1	NTPC	660	01:21	16-06-2019	15:26	18-08-2019	RSD
141.	कावास KAWAS - 2B	NTPC	106	09:27	24-07-2019	15:25	12-08-2019	RSD
142.	कावास KAWAS - 1B	NTPC	106	10:08	24-07-2019	22:54	11-08-2019	RSD
143.	कावास KAWAS - 2C	NTPC	106	09:33	24-07-2019	Still out	Still out	RSD
144.	कावास KAWAS - 2A	NTPC	106	09:40	24-07-2019	15:40	12-08-2019	RSD
145.	मौदा Mouda II - 1	NTPC	660	10:53	27-07-2019	02:25	21-08-2019	RSD
146.	मौदा Mouda I - 2	NTPC	500	13:32	31-07-2019	02:20	13-07-2019	RSD
147.	गांधार Gandhar - ST 4	NTPC	224.5	00:48	01-08-2019	18:57	12-08-2019	RSD.
148.	गांधार Gandhar - GT2	NTPC	144	00:54	01-08-2019	15:39	12-08-2019	RSD.
149.	गांधार Gandhar - GT1	NTPC	144	23:47	01-08-2019	22:43	11-08-2019	RSD
150.	सिपत SIPAT I - 3	NTPC	22	23:51	05-08-2019	Still out	Still out	AOH
151.	कावास KAWAS - 1C	NTPC	11.5	05:21	06-08-2019	19:22	12-08-2019	RSD/Low Schedule
152.	कावास KAWAS - 1A	NTPC	11.5	05:44	06-08-2019	15:02	12-08-2019	RSD/Low Schedule
153.	गांधार Gandhar - GT3	NTPC	15.75	00:20	07-08-2019	20:30	11-08-2019	RSD
154.	वीएसटीपीएस VSTPS II - UNIT 1	NTPC	500	11:49	07-08-2019	22:39	10-08-2019	Hand tripped due to Hydrogen leakage in Generator
155.	गडरवाड़ा GADARWARA - 1	NTPC	800	13:10	08-08-2019	Still out	Still out	RSD
156.	लारा Lara - 1	NTPC	800	00:09	10-08-2019	Still out	Still out	PG Test completed
157.	कावास Kawas 2A	NTPC	106	21:52	12-08-2019	16:42	23-08-2019	RSD
158.	कावास Kawas 2B	NTPC	106	21:53	12-08-2019	18:13	23-08-2019	RSD
159.	गांधार Gandhar GT2	NTPC	144	22:00	12-08-2019	18:07	21-08-2019	RSD
160.	कावास Kawas 1C	NTPC	116	23:59	12-08-2019	01:15	22-08-2019	RSD
161.	कावास Kawas 1B	NTPC	106	00:06	13-08-2019	08:07	23-08-2019	RSD
162.	गांधार Gandhar ST	NTPC	224	00:24	13-08-2019	23:35	21-08-2019	RSD
163.	गांधार Gandhar GT1	NTPC	144	00:27	13-08-2019	18:41	21-08-2019	RSD
164.	गांधार Gandhar GT3	NTPC	144	20:45	13-08-2019	20:58	17-08-2019	RSD
165.	कावास Kawas 1A	NTPC	106	23:52	13-08-2019	19:22	21-08-2019	RSD
166.	खरगोन Khargone 1	NTPC	660	12:59	17-08-2019	03:29	21-08-2019	Withdrawn for overspeed test but could not be synchronised because of CW header leakage
167.	सोलापुर टीपीएस Solapur STPS -1	NTPC	660	09:38	20-08-2019	16:45	23-08-2019	BTL
168.	सोलापुर टीपीएस Solapur STPS -1	NTPC	660	16:45	23-08-2019	18:19	27-08-2019	RSD
169.	गांधार Gandhar - GT1	NTPC	144	21:57	23-08-2019	18:08	27-08-2019	RSD
170.	कावास KAWAS -2B	NTPC	106	22:26	23-08-2019	18:18	27-08-2019	RSD
171.	कावास KAWAS - 2A	NTPC	106	22:58	23-08-2019	18:01	27-08-2019	RSD
172.	गांधार Gandhar ST	NTPC	144	23:08	23-08-2019	Still out	Still out	RSD
173.	गांधार Gandhar - GT2	NTPC	144	23:15	23-08-2019	18:26	27-08-2019	RSD
174.	सोलापुर एसटीपीएस Solapur STPS - 2	NTPC	660	08:45	29-08-2019	Still out	Still out	RSD

175.	गांधार Gandhar GT3	NTPC	144.3	22:25	29-08-2019	19:02	02-09-2019	RSD
176.	कावास Kawas - 2B	NTPC	106	22:38	29-08-2019	Still out	Still out	RSD
177.	कावास Kawas - 2A	NTPC	106	23:07	29-08-2019	16:49	09-09-2019	RSD
178.	गांधार Gandhar - GT1	NTPC	144.3	23:53	29-08-2019	Still out	Still out	RSD
179.	गांधार Gandhar - GT2	NTPC	144.3	00:04	30-08-2019	Still out	Still out	RSD
180.	खरगोन Khargone -1	NTPC	660	00:10	31-08-2019	Still out	Still out	Unit tripped due to Vacuum failure at the time of testing of TD-BFP-A

Note: Units out for more than 72 hrs are only included.

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Government of India Enterprise)

पश्चिम क्षेत्र भार प्रेषण केन्द्र
एफ-3, सेन्ट्रल रोड, एम्.आई.डी.सी. एरिया, मरोल, अन्धेरी (पूर्व), मुंबई - 400 093.
दुरभाष : 022-28202691 • फैक्स : 022-28235434, 28202630 • ई-मेल : wrldc@posoco.in
WESTERN REGIONAL LOAD DESPATCH CENTRE
F-3, Central Road, MIDC Area, Marol, Andheri (East), Mumbai – 400 093.
Phone : 022-28202691 • Telefax : 28235434, 28202630 • E-mail : wrldc@posoco.in
CIN : U40105DL2009GOI188682

संलग्नक Annex-2.7

नियोजित युनिट आऊटेज का अगस्त 2019 का विस्तारित ब्यौरा

Details of planned unit outages during the month of Aug. 2019

अनु क्रमांक Sl.No	युनिट Unit	संघटक Constituent/ IPP	क्षमता मेगावॉट Cap.MW	से From समय Time	दिनांक Date	तक To समय Time	दिनांक Date	कारण Reason
1.	डबल्यूपीसीएल WPCL 3	MAHAGENCO	135	00:28	01-11-2018	Still out	Still out	AOH
2.	खपारखेड़ा Khaparkheda -4	MAHAGENCO	210	21:44	17-07-2019	19:14	11-08-2019	AOH
3.	कोराडी Koradi MSEDCL -9	MAHAGENCO	660	17:35	19-07-2019	08:09	21-08-2019	AOH.
4.	कोराडी Koradi MSEDCL - 8	MAHAGENCO	660	00:04	25-08-2019	Still out	Still out	AOH
5.	भुसावल Bhusawal - 5	MAHAGENCO	500	00:13	25-08-2019	Still out	Still out	AOH
6.	पारसParas - 4	MAHAGENCO	250	00:14	25-08-2019	Still out	Still out	COH
7.	उकाई Ukai 6	GSECL	500	00:00	06-07-2019	18:09	18-08-2019	AOH
8.	एसएलपीपी SLPP – 2	GSECL	125	00:06	01-08-2019	17:41	05-09-2019	COH
9.	उकई UKAI - 3	GSECL	200	00:00	03-08-2019	08:25	30-08-2019	AOH
10.	एपीएल मुँदरा APL Mundra - 3	ATIL	330	23:34	30-07-2019	23:18	24-08-2019	AOH.
11.	एपीएल तिरोडा APML Tiroda-2	ATIL	660	00:13	05-08-2019	07:36	22-08-2019	AOH
12.	जेपी निगरी JP Nigrie 1	JAYPEE	660	01:30	01-07-2019	17:46	08-09-2019	AOH.
13.	चंद्रपुरChandrapur - 7	MAHAGENCO	500	00:00	27-07-2019	Still out	Still out	AOH
14.	एसजीटीपीएस SGTPS -2	MPPGCL	210	23:05	15-07-2019	02:05	15-08-2019	AOH
15.	एसजीटीपीएस SGTPS - 5	MPPGCL	500	23:42	30-07-2019	23:29	05-09-2019	AOH.
16.	सिंघाजी Singaji - 2	MPPGCL	600	00:00	01-08-2019	23:01	08-09-2019	AOH
17.	एसजीटीपीएस SGTPS - 3	MPPGCL	210	00:02	07-08-2019	09:55	28-08-2019	AOH.
18.	सातपुरा Satpura II - 2	MPPGCL	210	23:59	09-08-2019	Still out	Still out	AOH
19.	झाबुवा पावर Jhabua Power - 1	Jhabua Power	600	00:04	21-08-2019	Still out	Still out	AOH
20.	केएसटीपीएस KSTPS - 7	NTPC	500	23:20	17-07-2019	17:03	18-08-2019	AOH
21.	मौदा Mouda II - 2	NTPC	660	00:00	01-08-2019	22:08	03-09-2019	AOH
22.	सिपत Sipat I - 3	NTPC	660	23:51	05-08-2019	Still out	Still out	AOH
23.	वीएसटीपीएस VSTPS IV - 1	NTPC	500	02:30	23-08-2019	Still out	Still out	AOH

STATE LOAD DISPATCH CENTRE
RAIPUR
CHHATTISGARH

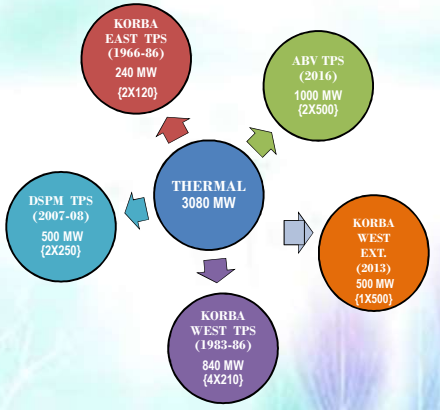
523rd OCC MEETING AT WRPC,
MUMBAI ON 17th SEPTEMBER 2019.

1

Review of system operation during the month of August-2019.

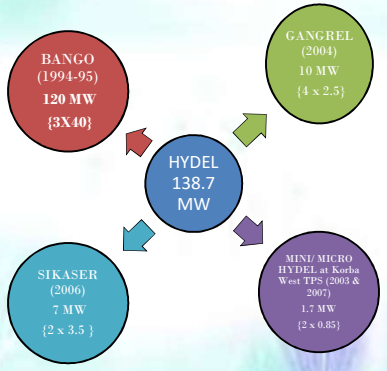
2

Installed capacity of Chhattisgarh (State generators) as on August-2019.



3

Installed capacity of Chhattisgarh (State generators) as on August-2019.



4

Demand Pattern.

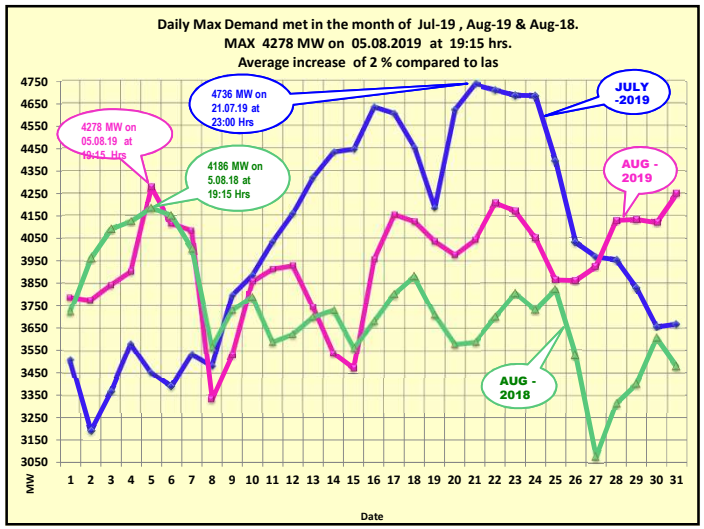
	JULY-19	AUGUST-19	AUGUST-18	% Change compared to previous year
Max. Demand Met	4736 MW 21.07.2019 23:00 Hrs	**4278 MW** **05.08.2019** **19:15 Hrs**	4186 MW 05.08.2018 19:15 Hrs	2%
Max. Unrestricted Demand at the time of Max. Demand Met	4728 MW	**4285 MW**	4190 MW	2%
Min. Demand Met	2661 MW 02.07.2019 13:45 Hrs	**2549 MW** **08.08.2019** **14:15 Hrs**	2404MW 27.08.2018 12:30 Hrs	6%
Max. Unrestricted Demand	4728 MW 21.07.2019 23:00 Hrs	**4285 MW** **05.08.2019** **19:15 Hrs**	4190 MW 05.08.2018 19:15 Hrs	2%

5

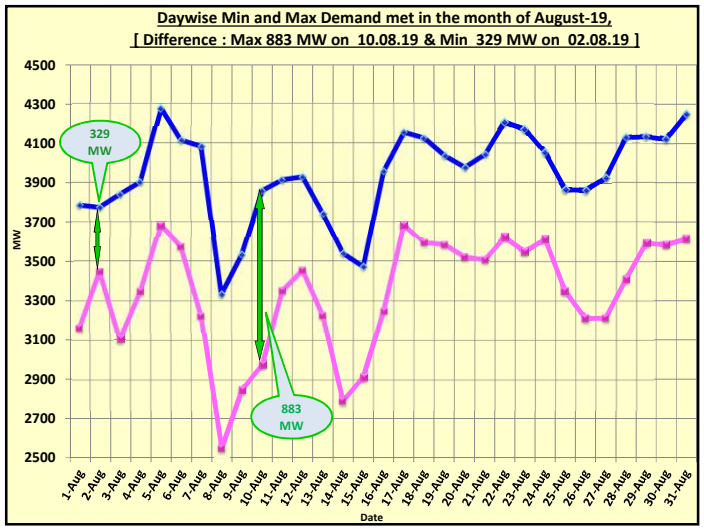
Availability during monthly Peak Demand met :
4278 MW on 05.08.2019 at 19:15 Hrs

	MW	%
CSPGCL Thermal (Ex Bus)	2458	57%
CSPGCL Hydel	106	2.48%
Injection (Solar,Biomass,unscheduled power,open access,small hydro)	47	1%
CS Share including BSP share in NSPCL	1364	32%
Net Import (+) / Export (-)	200	5%
OD(+) / UD(-)	103	2.4%
Demand Met (MW)	**4278**	

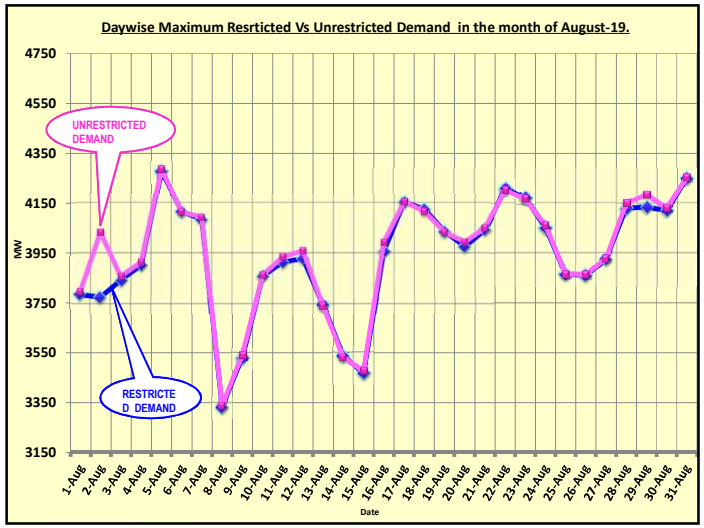
6



7



8



9

SOLAR POWER INJECTION (At 132 KV)

For August-2019.

Name of entity	capacity	Generation [MU]
M/s Azure	3X10 MW	2.876
M/s Parampujya	2X50 MW	15.083
M/s Acme	30 MW	2.870
Total		**20.829**

10

Dam level and Ex-bus generation of Bango HPS.

August-2019		August-2018	
Dam level at end of the month	Ex-bus Hydel generation	Dam level at end of the month	Ex-bus Hydel generation
Meters	MU	Meters	MU
355.30	38.25	357.50	33.16

11

Transmission elements outages- OCC planned Vs actual availed in August-2019

Total No. of Outages	No. of outages availed	No. of Deferred Outages			No. of outages not availed.
		SLDC	WRLDC	Site	
5	5	----	----	----	0

12

Addition of new grid elements during August-2019.

S. No	NAME OF SUB STATION	NAME OF CHARGED EQUIPMENTS & LINES	DATE	TIME	REMARKS
1	132/33 KV S/s Patan	20 MVA Transformer -II	28-Aug-19	16:26	First time charged.

13

Grid elements failed in August -2019 and expected date of replacement.

------- NIL -------

Important grid element prolonged outages in August -2019 and expected revival date.

------- NIL -------

14

THANK YOU !!!

15

Power System Analysis of Gujarat State for the month Of August-2019

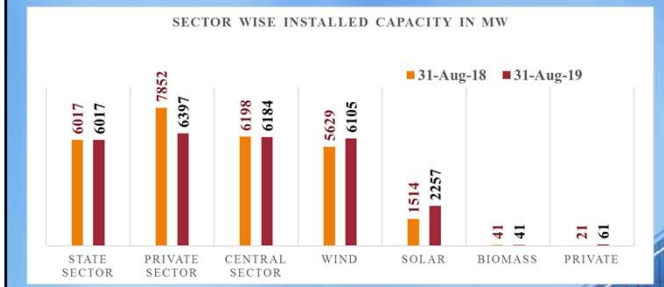
Gujarat Energy Transmission Corporation Limited

[An ISO 9001 : 2015 Company]

1

Sector wise Installed Capacity

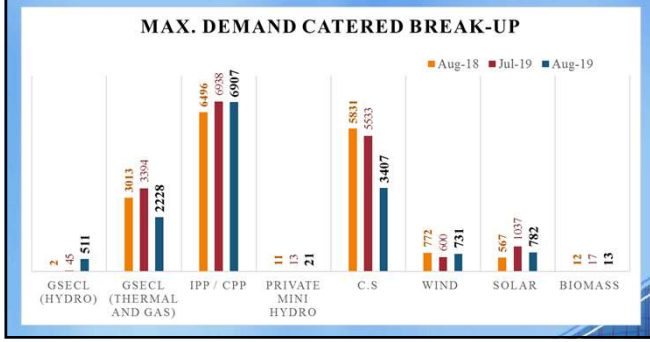
Installed Capacity (MW)	Total Gujarat
31-Aug-18	27272
31-Aug-19	27062



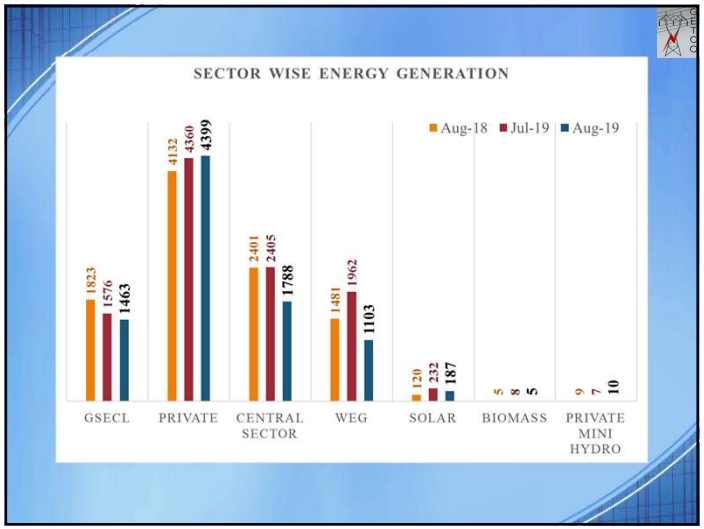
2

Maximum Demand Catered & Energy Consumption

Month	Maximum demand catered in MW	Energy consumption in MUS
Aug-18	16705	9971
Jul-19	17577	10551
Aug-19	14599	8956



3



4

RE Generation during August-19

Wind Energy		
	August-18	August-19
Installed capacity	5629	6105
Generation in MUS	1481	1103
Max. Generation in MW	4262	4179
Min. Generation in MW	106	97
Max. Generation in a day in MUS	93.11	76.90

Solar Energy		
	August-18	August-19
Installed capacity	1514	2257
Generation in MUS	120	187
Max. Generation in MW	790	1241
Max. Generation in a day in MUS	5.5	9.4

5

Daily Purchase Data – August'19

Date	Purchase MUs
01-Aug-19	12.00
02-Aug-19	14.40
03-Aug-19	14.40
04-Aug-19	14.40
05-Aug-19	14.40
06-Aug-19	14.40
07-Aug-19	16.09
08-Aug-19	15.60
09-Aug-19	14.40
10-Aug-19	10.80
11-Aug-19	10.20
12-Aug-19	8.40
13-Aug-19	14.89
14-Aug-19	20.85
15-Aug-19	14.40
16-Aug-19	23.78
17-Aug-19	2.38
18-Aug-19	1.27
19-Aug-19	18.20
20-Aug-19	7.08
21-Aug-19	1.44
22-Aug-19	0.00
23-Aug-19	6.35
24-Aug-19	8.71
25-Aug-19	8.71
26-Aug-19	13.20
27-Aug-19	15.23
28-Aug-19	17.17
29-Aug-19	17.47
30-Aug-19	17.47
31-Aug-19	17.47
Total	385.56



6

Important grid elements prolonged outages

Sr. no.	Name of element	Out from date	In date	Reason	Expected date of revival
1	400 KV 50 MVAR Bus reactor at Jetpur	9.6.18	….	50 MVAR reactor in P.F. due to Y-PH bushing of reactor blast. Internal inspection carried out by OEM engineer. Spare reactor from Chorania S/S shifted to Jetpur S/S. O/H work under progress	
2	400 KV, 125 MVAR bus reactor Kasor	12.9.18	……	Reactor breaker DCRM results found abnormal. Breaker O/H order placed. CSD sent for repair work.	

7

Addition of new grid elements in Gujarat during August-19

Sr. No.	Name of Line/ Equipment & Capacity	Date of Charging / Commissioning
1	Nil	

8

Node wise Voltage details in Gujarat system during August-19

Name of 400 KV S/S	No. of days when voltage remained >420 KV	No. of days when voltage remained <380 KV
Asoj	3	0
Jetpur	10	0
Ukai	31	0
Wanakbori	31	0
Soja	20	0
Chorania	29	0
Kansari	15	0
Amreli	31	0
Vadavi	31	0
Hadala	18	0
Varsana	25	0
Kasor	18	0
Kosamba	17	0

9

Major 400 KV Elements outages facilitated –August 19

Outage of 400 KV Bus-1 at Hadala was facilitated on 5.8.19 for bus-1 isolator maintenance work.
Outage of 400 KV Bus-2 at Hadala was facilitated on 8.8.19 for maintenance work.
Outage of 400 KV Bus-2 at Varsana with 400 KV APL-Varsana line-2 was facilitated on 27.8.19 for isolator alignment work.
Outage of 400 KV Bus-1 at Bhachau was facilitated on 28.8.19 for bus bar relay upgradation work.
Outage of 400 KV Bus-2 at Bhachau was facilitated on 30.8.19 for bus bar relay upgradation work.

10

Major Occurrence in Gujarat System – August'19

Sr. No.	Date	Location	Description	Loss in MW	
				Load	Gen
		nil	nil		

11

Thank you

12

Power System Operation Corporation Ltd.

523rd OCC Meeting





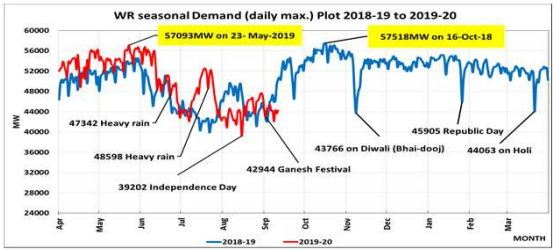
At SLDC KALWA

17th September'2019

Grid Operation Highlights

WRLDC POSOCO

1



Demand Met(MW)	Aug-19	Jul-19	Aug-18	% Change w.r.t last month	% Change w.r.t last Year
Average	41338	44610	43233	-7.34	-4.38
Max	47633	52509	49629	-9.29	-4.02
Date when Max.	30-Aug-19	18-Jul-19	6-Aug-18	~	~

Regional Demand Met in Aug.'2019

Maximum : **47633 MW**
(30th Aug 2019, 11:00 hrs)

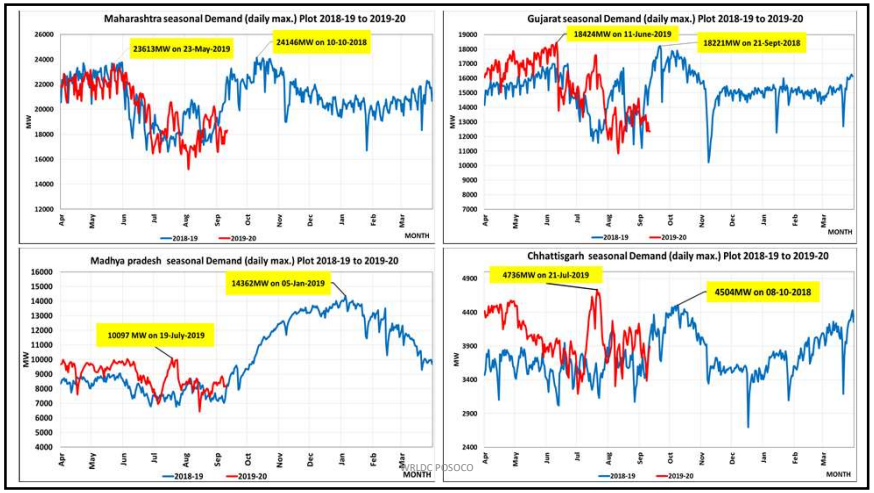
Minimum: **31122 MW**
(15th Aug 2019, 17:00 hrs)

Decrement in Average Demand compared to Aug'18: **4.38%**

Highest Demand(Gross)

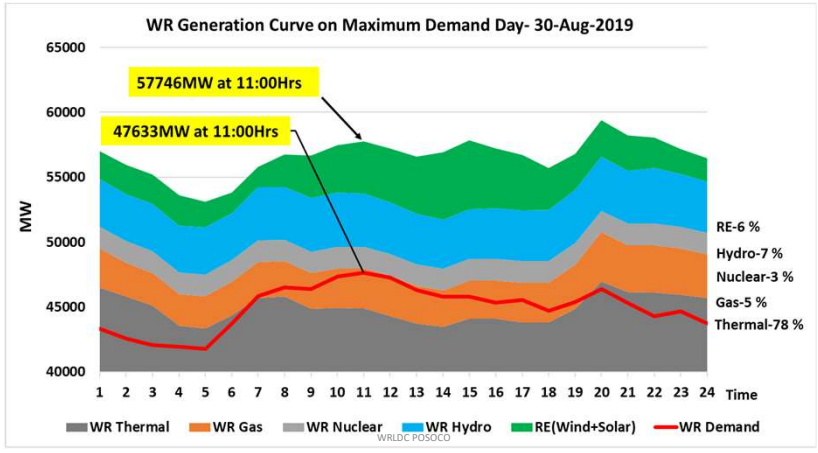
Constitute	Demand (in MW)	Date	Time
Maharashtra	24146	10.10.2018	12:00
Gujarat	18424	11.06.2019	15:00
MP	14362	05.01.2019	09:00
CSEB	4736	21.07.2019	23:00
Goa	621	19.06.2019	21:00
DD	382	19.06.2018	17:00
DNH	824	27.06.2019	17:00
ESIL	934	23.06.2019	19:00
WR	57518	16.10.2018	15:00

2



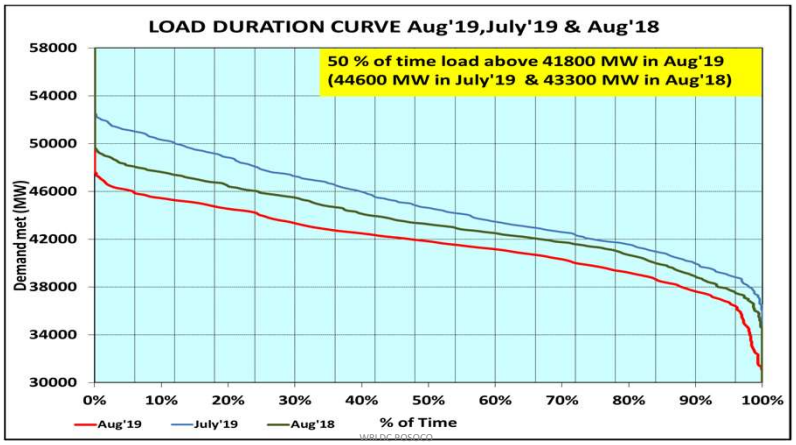
WRLDC POSOCO

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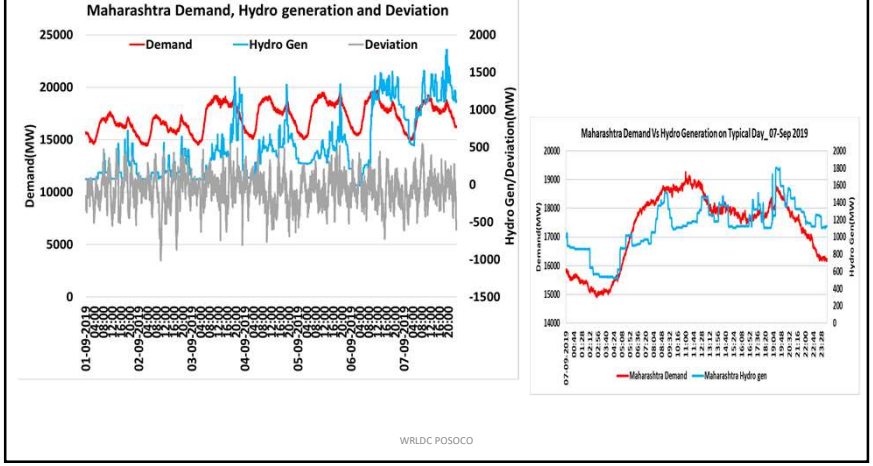


WRLDC POSOCO

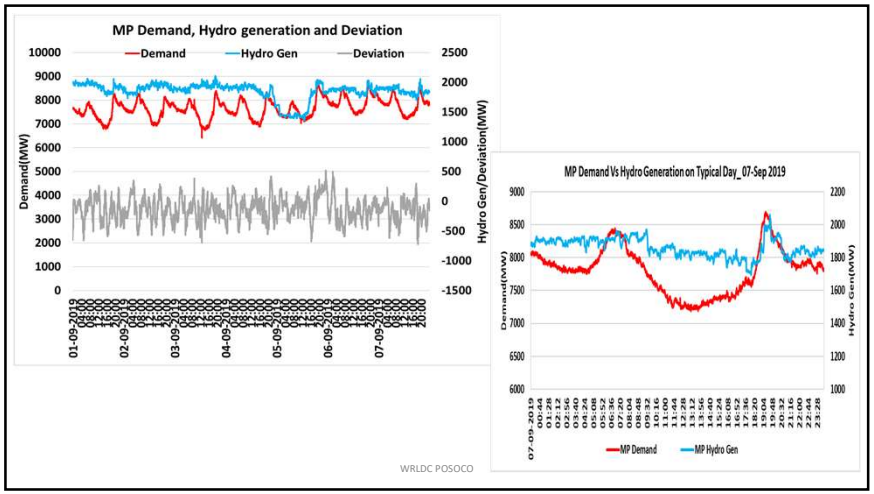
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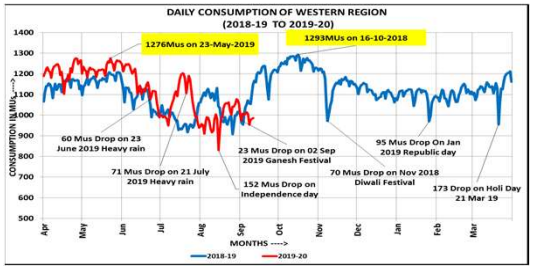
5



6



7



Energy Consumption MU/Day	Aug-19	Jul-19	Aug-18	% Change w.r.t last month	% Change w.r.t last Year
Average	992	1071	1038	-7.34	-4.38
Max	1077	1203	1131	-10.47	-4.76
Date When Max.	29-Aug-19	18-Jul-19	14-Aug-18	~	~

Maximum Energy Consumption in the month

1077 MU

on 29th Aug 2019

Minimum Energy Consumption in the month :

830 MU

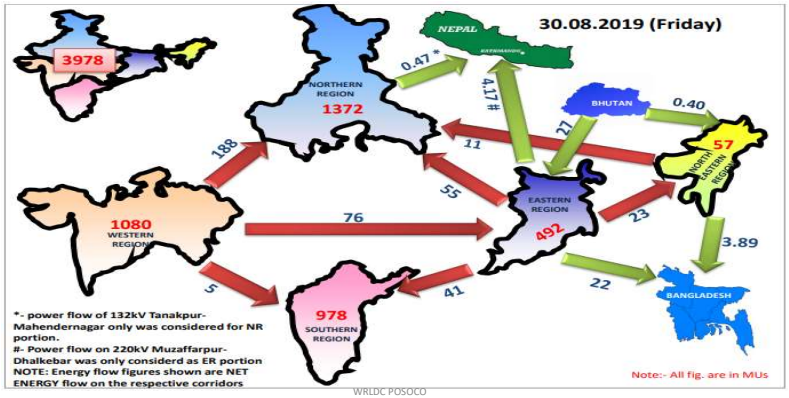
On 15th Aug 2019

Highest Ever Energy Consumption

Constitute	Energy consumption (MUs)	Date
Maharashtra	522.1	23.05.2019
Gujarat	403	21.09.2018
MP	272.3	21.11.2018
Chhattisgarh	111.6	23.07.2019
Goa	14	05.10.2018
DD	9.5	14.07.2018
DNH	19	12.09.2018
Essar Steel	14.8	21.02.2019
WR	1293	16.10.2018

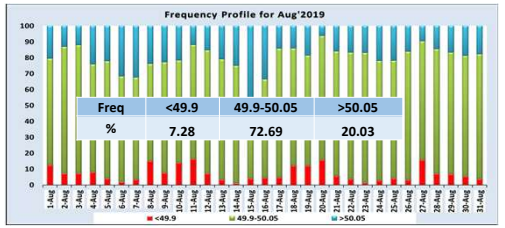
8

IR Export From Western Region – 269MUs on 30th Aug 2019 (Max. Demand Day)



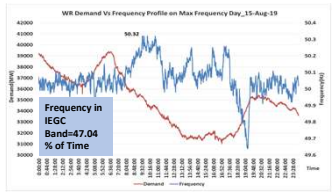
WRLDC POSOCO

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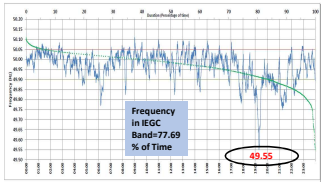


Max. Inst. freq	50.32	On 15th Aug. At 09:34:10 hrs Frequency remained above 50.05 Hz continuously from 08:30 Hrs to 11:25 Hrs and 13:03 Hrs to 14:23 Hrs due to under drawl by many states [Rajasthan, HP, Maharashtra(524MW), MP(1005MW), Chhattisgarh(229MW), Karnataka, TN].
Min. Inst. freq	49.55	on 20th Aug at 19:19:00 hrs. due to over drawl by AP,Telangana, Odisha,Bihar,WB,UP,Haryana,J&K,Uttarakhand.
Avg Freq of the month	50.00	-
Average FVI	0.4	

On 23rd Aug '19 Frequency was in IEGC band for 81.59% of time (maximum) during the month.



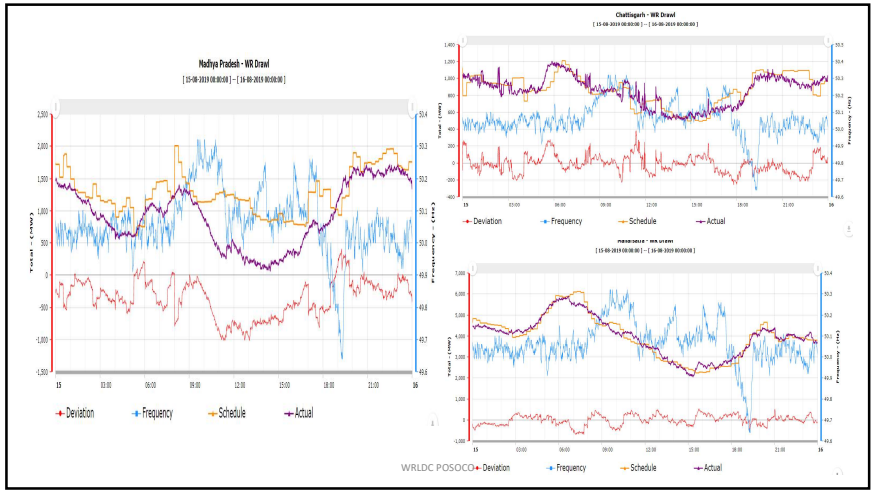
WR Demand at Max Freq time-35250 MW
All India Demand Max - 135669 MW



WR Demand at Min Freq time- 45224 MW
All India Demand Max – 161945 MW

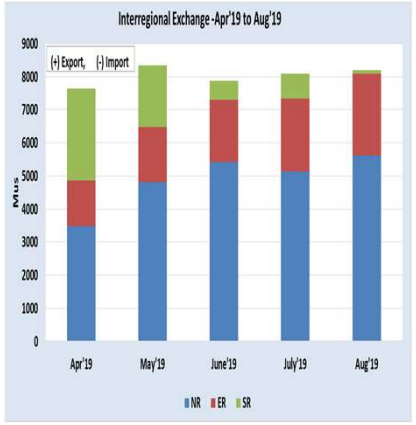
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WRLDC POSOCO

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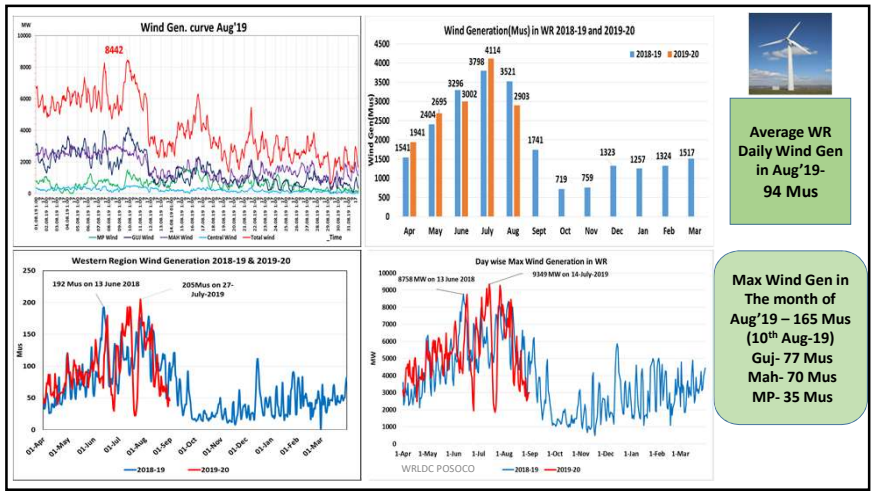
Interregional Exchange – 2019-20 (in MUs)

Month	NR	ER	SR	Net Export
Apr'19	3428	1414	2734	7576
May'19	4680	1645	1843	8168
June'19	5321	1790	696	7806
July'19	5132	2210	751	8093
Aug'19	5623	2465	105	8193

- Average Export in Aug'19 – 264 Mus/day
- Highest Ever Export – 16768MW on 29th May 2019
- Highest Energy Exported- 307 MUs on 29th May 2019
- Highest Energy Exported in 2018-19- 15209 MW (16th Aug 2018)

WRLDC POSOCO

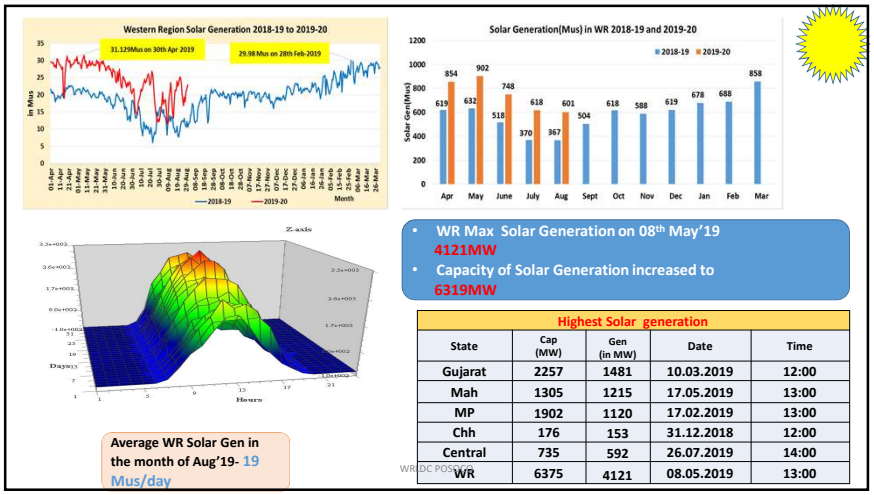
12



Average WR Daily Wind Gen in Aug'19- 94 Mus

Max Wind Gen in The month of Aug'19 – 165 Mus (10th Aug-19)
Guj- 77 Mus
Mah- 70 Mus
MP- 35 Mus

13



- WR Max Solar Generation on 08th May'19 4121MW
- Capacity of Solar Generation increased to 6319MW

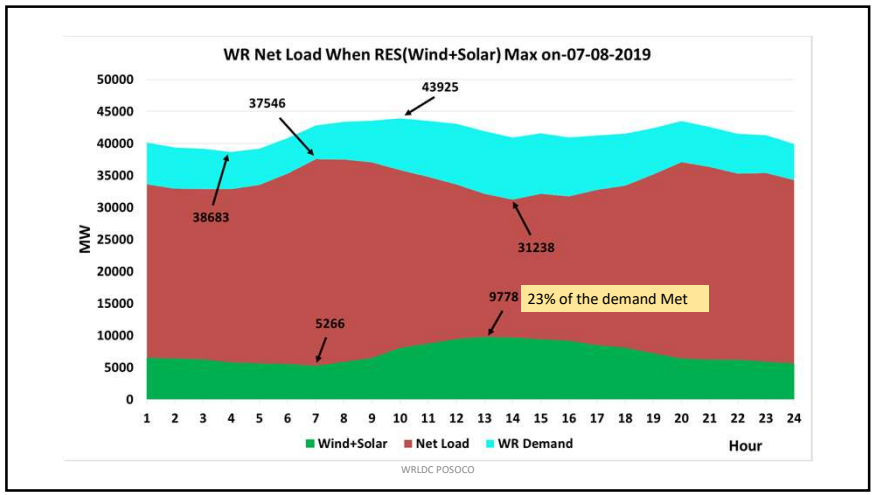
Average WR Solar Gen in the month of Aug'19- 19 Mus/day

Highest Solar generation

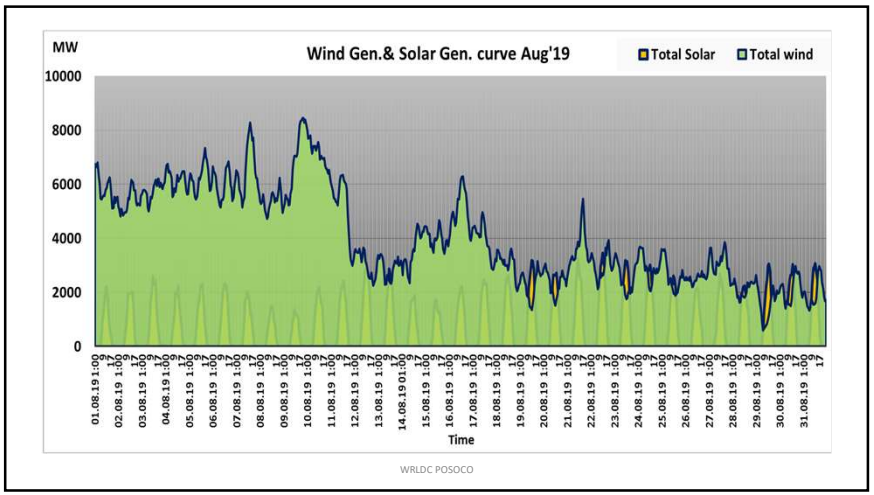
State	Cap (MW)	Gen (in MW)	Date	Time
Gujarat	2257	1481	10.03.2019	12:00
Mah	1305	1215	17.05.2019	13:00
MP	1902	1120	17.02.2019	13:00
Chh	176	153	31.12.2018	12:00
Central	735	592	26.07.2019	14:00
WR	6375	4121	08.05.2019	13:00

WRLDC POSOCO

14



15



16

New Elements Synchronized in August 2019

Generating Capacity Sync -Nil

Transmission Lines-

Sl. No.	Owner/ Location(Const.)	Line Name	Ckt No.	KV	Date of Synchronization	Added Line Length (in Km)
1	POWERGR/CWRTL	Pune-Aurangabad-I	LILO of 765kV Aurangabad PG-Padghe GIS Ckt-1 at Pune GIS	765	22-08-2019	129
2	POWERGR/CWRTL	Pune-Padghe I			23-08-2019	
					Total	129

ICTs

Sl. No.	Owner/ Location(Const.)	Station Name	ICT No	KV Ratio	Capacity (MVA)	Date
1	PGCIL/Gujarat	Dayapar	2	220/33	125	03-08-2019

Line Reactor

Sl. No.	Owner/ Location(Const.)	Station Name	Line Name	KV	Capacity (MVAR)	Date
1	NTPC/MP	VSTPS	Vindhyachal-Satna III	400	50	06-08-2019

Bus Reactor -Nill

Agenda

9.1 Adherence to CEA Regulations and compliance by RE Generators

- **CEA (Technical Standards for Connectivity to the Grid) (Amendment) Regulations: 6 Feb 2019**
  - Several provisions in respect of RE generation
  - Applicable to all new generating units commissioned after 6th Aug 2019.
- **CEA (Technical Standards for Connectivity to the Grid) (Amendment) Regulations: 15 Oct 2013**
  - LVRT for all wind generators connected to 66 kV and above commissioned after 15th Apr 2014
- **CERC order: 5th Jan 2016**
  - Incorporation of LVRT feature for units commissioned before 15th Apr 2014 (with some exceptions) and extending the same to solar generation.

9.1 Adherence to CEA Regulations and compliance by RE Generators

- **Compliance to CEA regulations (Amendments) by RE generators to be monitored at Regional and state level.**

CEA Regulation		Clause	Compliance
B1	Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker	1. Harmonic current injections from a generating station shall not exceed the limits specified in Institute of Electrical and Electronics Engineers (IEEE) Standard 519.	Submission of measurement report of harmonic current injection at PCC after commissioning
		2. The Generating station shall not inject DC current greater than 0.5 % of the full rated output at the interconnection point.	Submission of DC offset current injection measurement report at PCC
		3. The generating station shall not introduce flicker beyond the limits specified in IEC 61000. Provided that the standards for flicker will come into effect from 1st April 2014.	Submission of Flicker measurement report at PCC
		4. Measurement of harmonic content, DC injection and flicker shall be done at least once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement.....	Connection Agreement shall clearly mention this clause.

9.1 Adherence to CEA Regulations and compliance by RE Generators

CEA Regulation		Clause	Compliance
B2	For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.	…shall be capable of supplying dynamically varying reactive power support so as to maintain power factor within the limits of 0.95 lagging to 0.95 leading…	Plant shall be able to operate power factor and voltage control mode, preferably voltage control mode
		…capable of operating in the frequency range of 47.5 Hz to 52 Hz and shall be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz….	Plant Shall be able to demonstrate through simulations and verified against test measurements.
		…..shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the level …..	Plant Shall be able to demonstrate through simulations and third party certificate with test reports shall be submitted.
		……shall be equipped with the facility to control active power injection in accordance with a set point……	Plant shall be instructed to regulate the generator output, demonstrate the frequency response in simulation and shall respond to real time grid event …..
		Shall have governors or frequency controllers of the units at a drop of 3 to 6% and a dead band not exceeding ±0.03 Hz….	
		shall have the operating range of the frequency response and regulation system from 10% to 100% ….	
		…the rate of change of power output at a rate not more than ± 10% per minute…	
		Generating stations of aggregate capacity of 500 MW and above shall have the provision to receive the signal from SLDC or RLDC	Plant shall have the provision to receive the signal from RLDC/SLDC, shall be tested prior to commissioning.
		Standards in respect of the switchyard associated with the generating stations shall be in accordance with the provisions specified in respect of 'Sub-stations' under Part III of these Standards.	-
		The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point, on any or all phases ……	Plant shall be able to demonstrate in simulations and third party certificate with test reports shall be submitted.

9.2 Requirement of model data for Simulation and Power System Stability and Dynamics

- **NLDC vide its communication to RPCs dated 27th Aug 2019 informed and requested that**
- ***Simulation of power system stability conditions is important in understanding the behaviour of the power system.***
- ***Data templates for studies have been prepared based on the inputs received from several consultants***
- ***States are advised to collect the necessary data in the prescribed format before allowing connection with the grid***
- ***RPCs are requested to continuously follow up with the States and Generators at various forums such as OCC and TCC/RPC level to expedite the process of preparing all India dynamic model***
- ***The templates for dynamic data submission by RE generators was also discussed in 515th OCCM held on 18th Jan'19.***

OCC committee may like to discuss on

- Submission of data for dynamic modelling by regional and state generators
- Emulation of dynamic data templates at states and collection of data for dynamic modelling of generators
- Regular follow up in OCC meetings for submission of data for dynamic modelling

9.3. Status of Disturbance Recorder & Event Logger facility at 220 kV RE Pooling stations

- **Stakeholder Meet on**
  - **'Renewable Energy Regulatory framework and Integration in Western Region'**
  - **23rd August 2019 at WRLDC, Mumbai**
- **Highlighted non-availability of DR/EL at 220kV sub stations of renewable generators**
- **Without DR/EL, grid event analysis cannot be completed by WRLDC to arrive at proper conclusions and to suggest remedial measures**

OCC committee may like to discuss on

- Participation of regional RE generators in OCC meetings
- Confirmation of availability of disturbance recording and event logging facilities at 220 kV substations by regional RE generators
- SLDCs to apprise availability of disturbance recording and event logging facilities at state RE generating stations and connected substations

9.4. Automatic Generation Control (AGC) implementation in India

- **CERC order dated 28th August 2019 in Petition No.: 319/RC/2018**
- **Directs that all the ISGS stations whose tariff is determined or adopted by CERC shall be**
  - **AGC-enabled**
  - **The ancillary services including secondary control through AGC be implemented**

- **Directions by CERC**
  - Thermal ISGS IC > 200 MW & Hydro > 25 MW (Excluding ROR) shall install AGC equipment and Communication from the nearest wide band node to the RTU
  - CTU to ensure communication availability from NLDC/RLDCs to the nearest wide band node/switchyard for the generating stations
  - Expenditure may be claimed as per relevant regulations or provisions of the PPA
  - Compensation for AGC: Commission"s Order in Petition no. 79/RC/2017
  - Stations whose tariff is determined or adopted shall mandatorily have AGC

9.5. Black start mock drills and Healthiness of DG set at Black Start Capable Stations in Western Region

- As per section 5.8(b) of IEGC,
  "…the Diesel generator sets for black start would be tested on weekly basis & the test report shall be sent to RLDC on quarterly basis."
- So far WRLDC haven't received any quarterly report on testing of DG on weekly basis.
- Utilities are requested to send quarterly report on testing of diesel generators to *wrldcso@posoco.in* for last two quarters.

- **In last 8 months no black start mock drills were conducted in WR.**

- **Utilities/Constituents are requested to expedite the Mock exercise of their black start units and submit their plan for compliance of IEGC regulation 5.8(b).**

9.6. Elements to be excluded from the "List of Important Grid Elements in Western Region"

- MP SLDC and Chhattisgarh SLDC
  - Intimation of element details for inclusion in exception list of "List of Important Grid Elements in Western Region"

- WRLDC shall include these elements in exception list of important grid elements in WR subject to condition that

  - For the outages on ICTs/Lines which are excluded from the list, the SLDC shall prepare 'N-1' contingency plan and review reliability and submit that the system is safe under n-1 contingency prior to availing the shutdown.
  - The elements excluded from important grid elements list would not appear in OCC approved list for outages, but SLDCs to take responsibility of reviewing the reliability and ensure grid security and shall inform WRLDC before taking outage.
  - The outage of the element where different licensee is involved, to be incorporated in Web based Outage Software for outage co-ordination on D-3 basis.
  - All long outages more than two days shall be taken up as per outage procedure agreed in OCCM or shall be approved in OCCM forum.
  - All OCCM approved outages will be given first priority and if required unplanned outages to be deferred in real time to facilitate the OCCM approved outages.

9.7. Review of AUFLS settings

- NPC in its 8th meeting dated 30th November 2018 has revised AUFLS settings by 0.2 Hz viz. 49.4, 49.2, 49.0 & 48.8 Hz.

- In 516 OCC meeting WR constituents agreed to change the AUFLS setting as suggested by NPC.

- As per 521 OCC meeting the status of change in AUFLS settings is as follows

S.No	State/UT	Status of change in AUFLS settings as per NPC
1	Maharashtra	Completed
2	Gujarat	AUFLS settings was completed in 90% feeders
3	Madhya Pradesh	Completed
4	Chhattisgarh	Completed
5	Goa	AUFLS relays are not functioning and will be commissioned at the earliest
6	DD	Information Not Available
7	DNH	Information Not Available

Uniform implementation of AUFLS settings at regional and national level would safe guard the grid without causing unnecessary stresses.

9.8 Demand forecast by WR Beneficiaries

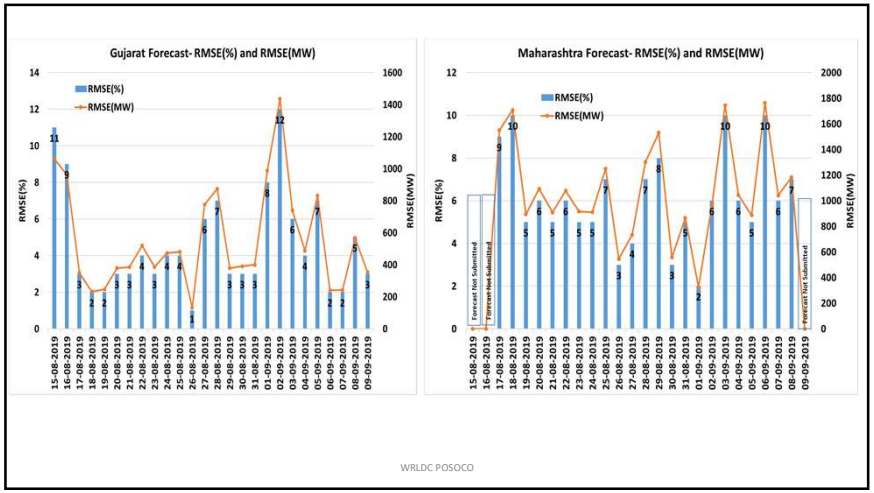
- Demand forecasting is one of the critical factors for reliable and economic operation.
- As per IEGC, beneficiaries are mandated to do demand forecast and share the data to WRLDC.

  IEGC 5.3 (b) & (f)

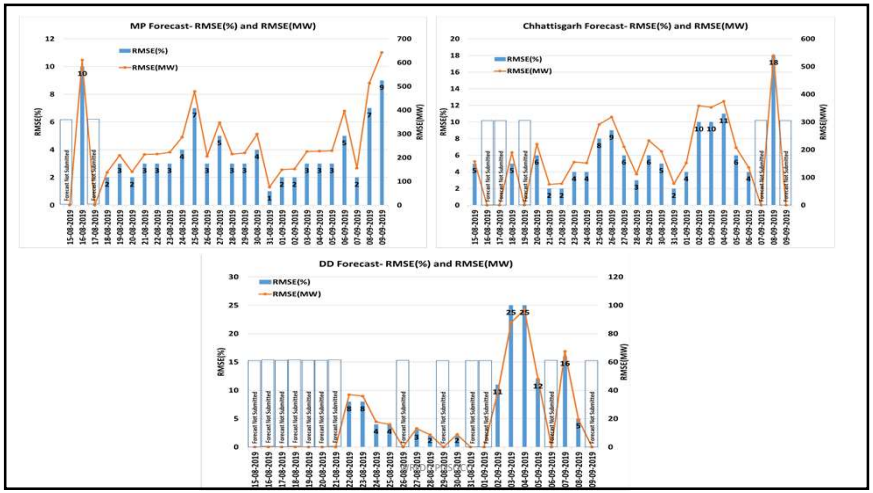
  b. The demand estimation is to be done on daily/weekly/monthly /yearly basis for current year for load - generation balance planning.

  f. The monthly estimated demand by the SLDC shall be provided to RLDC and RPC for better operation planning
- The forecasted demand submitted by beneficiaries and actual demand are compared
- The average RMSE of demand forecasting (15 Aug to 9 Sep 19).

State	Max RMSE Error of Demand Forecast (15 Aug to 9 Sep 19)	RMSE(MW)
Maharashtra	10%	1763
Gujarat	12%	1436
Madhya Pradesh	10%	611
Chhattisgarh	18%	539
DD	25	97



29



30

9.8 Demand forecast by WR Beneficiaries

- Maharashtra, MP and Chhattisgarh were not submitting the demand forecast to WRLDC regularly
- Status of demand forecast submission to WRLDC in last one month (15 Aug to 9 Sep 19)

State	Non-Receipt of Demand forecast (No. of days)
Maharashtra	3
Gujarat	0
Madhya Pradesh	2
Chhattisgarh	5
DD	12

- Beneficiaries like Goa and DNH are not submitting demand forecast data to WRLDC.

- OCC may like to discuss
  - Submission of demand forecast to WRLDC regularly by Maharashtra, MP and Chhattisgarh
  - Maharashtra, Gujarat, Madhya Pradesh and Chhattisgarh to apprise actions being taken to improve forecast
  - Goa and DNH to submit demand forecast to WRLDC as mandated in IEGC
  - Apart from above beneficiaries like Gujarat, Maharashtra and MP having high RE installations may apprise OCC about status of RE forecasting.

31

9.9 Telemetry Issues

A. Monthly telemetry status as per CERC mandate

The telemetry status for the month of Aug. 2019 is shown below

Western Region summary sheet and details of current status of implementation of telemetry system

Annexure - IV

Status as on : 01.09.2019

Sl. No.	User Name	Total Nos of Stations		Telemetry not Provided				Telemetry Intermittent				Total non-availability of data in % (Telemetry not provided plus Telemetry intermittency)	
				Total nos of station		Non-availability of data in % (wrt total nos of stations)		Total nos of station		Non-availability of data due to intermittency in % (wrt total nos of stations)			
		GS	SS	GS	SS	GS	SS	GS	SS	GS	SS	GS	SS
1	Maharastra	37	204	0	0	0.0%	0.0%	6	14	16.2%	6.9%	16.2%	6.9%
2	Chattisgarh	7	120	0	25	0.0%	20.8%	0	33	0.0%	27.5%	0.0%	48.3%
3	Madhya Prdesh	17	189	0	0	0.0%	0.0%	1	4	5.9%	2.1%	5.9%	2.1%
4	Gujarat	25	182	0	3	0.0%	1.6%	0	5	0.0%	2.7%	0.0%	4.4%
5	Goa	2	7	1	0	50.0%	0.0%	0	0	0.0%	0.0%	50.0%	0.0%
6	DD	-	1	-	-	-	-	-	-	-	-	-	-
7	DNH	-	5	-	1	-	20.0%	-	0	-	0.0%	-	20.0%
8	ISGS	17	-	-	-	-	-	0	-	0.0%	-	0.0%	-
9	ISTS	-	52	-	0	-	0.0%	-	-	-	-	-	0.0%
10	IPP	29	-	-	-	-	-	0	-	0.0%	-	0.0%	-
	TOTAL	134	760	1	29	0.7%	3.8%	7	56	5.2%	7.4%	6.0%	11.2%
	Total (over all)	894		30		3.4%		63		7.0%		10.4%	

Note:
Supporting Details are given below

1 The details of State sector telemetry are as per figures received by WRLDC from respective SLDCs
2 Maharashtra substation count is based on the stations currently commissioned

The intermittency and non-availability of telemetry may be explained by respective states.

32

9.9 Telemetry Issues

B. Prolonged outage of Telemetered data.

Sr No	Station	Outage Date	Restoration Date
1	IEPL (Maharashtra)	26-Nov-2018 19:45 hrs	Still down

9.9 Telemetry Issues

C. Concerns of telemetry with old NTPC stations

- Discrepancies in the telemetered analog and digital (status) data from
  - Kawas
  - Gandhar
  - KSTPS
  - VSTPS-I, II & III
- NTPC may expedite and provide necessary extension of signals.
- NTPC may also explain the delay in rectification of telemetry of VSTPS stg. 1 & 2.
- Additional gateway is required for Mauda STPS at WRLDC for telemetry redundancy

NTPC may update the progress in this front

9.9 Telemetry Issues

d. Non reporting of IEC 104 RTUs of PGCIL & few generating stations to Backup control centre

- PGCIL RTUs reporting on IEC 104 to WRLDC do not report to Backup WRLDC due to lack of Ethernet port availability in the gateways.
- List of RTUs

WR – 1 stations	WR-2 stations
1. 765kV New Parli	1. 765kV Vadodara
2. 765kV Warora	2. 400kV Rewa
3. Champa HVDC stg. 1 & 2	3. 765kV Banaskantha
	4. 765kV Bhuj

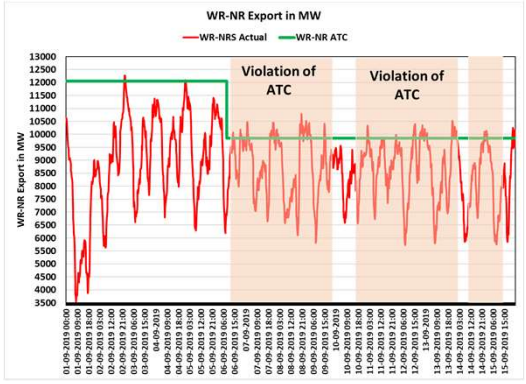
- Redundant links from Bhuj & Banaskantha (both RE pooling stations) to WRLDC are highly unreliable
- RGPPL and Dhariwal data was also do not report to Backup WRLDC.

9.10. Status of DR/EL submission for GD/GI events in Jul'19

- Complete DR/EL data was not received for the events at
  - 220 kV Uran (4 Events)
  - 220 kV Ponda
  - 220 kV Nashik
  - 400 kV Ukai (Kosamba & Navsari End)
  - 220 kV Siltara

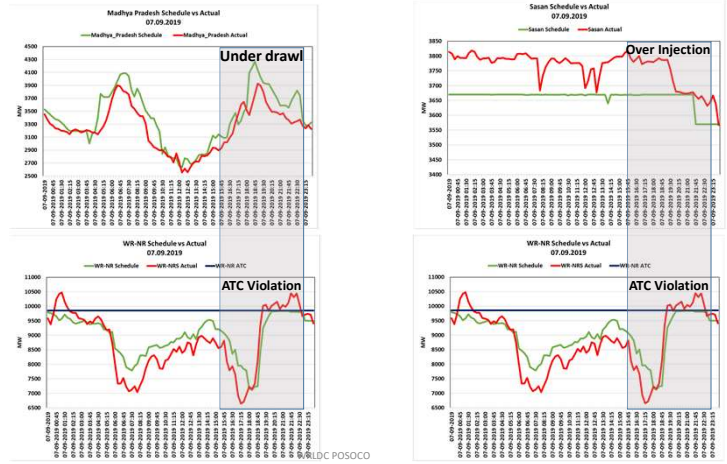
9.11. WR-NR ATC violation

- **WR-NR flow exceeding ATC in Sep'19.**
- **On 6th Sep 19 due to shutdown of 765 kV Agra-Jhatikara,**
- **ATC changed from 12050 MW to 9850 MW till 20th Sep 19.**
- **Maharashtra and MP were under drawing**
- **Sasan, VSTPS 3, 5 & KSTPS-3 generating stations were over injecting during ATC violation.**



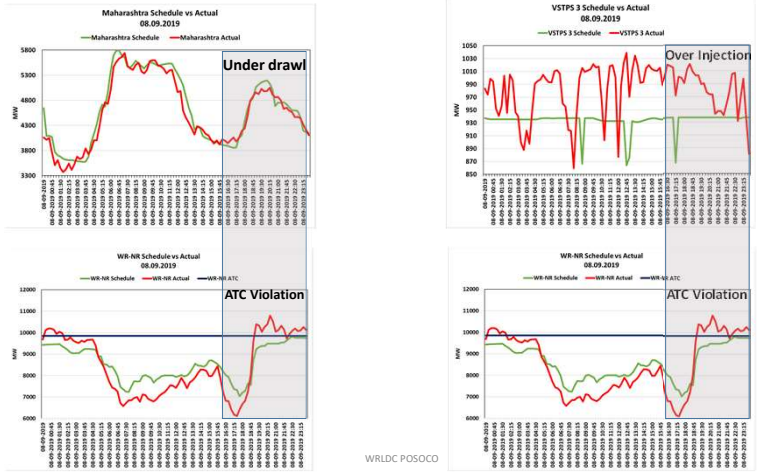
WRLDC POSOCO

37



WRLDC POSOCO

38



WRLDC POSOCO

39

9.12. Extension of Pilot on Security Constrained Economic Dispatch (SCED) of Inter-State Generating Stations (ISGS) Pan India

Hon' CERC vide its order dated 11th Sep 2019 in Petition No. 08/SM/2019 (Suo-Motu) extended the SCED pilot for the period up to 31st March 2020.

The summary of decisions in the order are quoted below

Quote

"21. Accordingly, POSOCO is directed to implement the SCED pilot for the thermal Inter State Generating Stations (ISGS) that are willing to participate in the SCED, for the period from 1st October, 2019 to 31st March, 2020.

22. The net savings / benefits after adjusting the compensation for part load operation to the generators shall be shared among the beneficiaries and the participating generators in the manner as specified in the preceding paras of this order, for the entire duration of the pilot from 1st April, 2019 to 31st March, 2020.

23. POSOCO shall accordingly modify the procedure to suitably incorporate the above directions.

24. POSOCO is also directed to apprise the Commission periodically regarding the experience gained in the form of a detailed feedback report covering all the aspects."

Unquote

OCC member may like to discuss

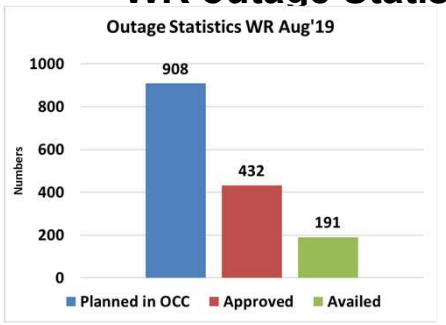
WRLDC POSOCO

40

Outage Analysis for Aug'19 Calendar Month

41

WR outage Statistics Aug'2019



Total Outages- OCC-521 : 897
Post OCC: 11

Availed Vs Proposed 21%

Availed Vs Approved 44%

42

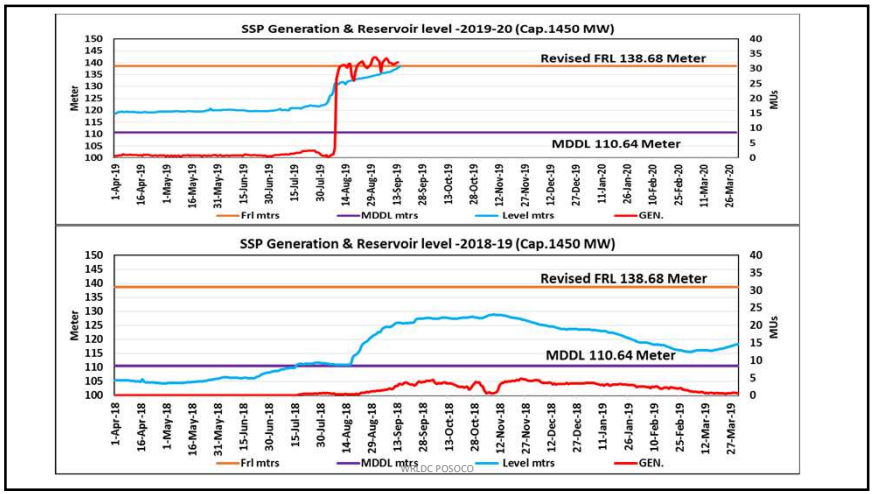
WR outage Statistics July 2019

Name of Constituent	Planned in OCC	Approved	Availed	Availed VS Planned	Availed Vs Approved
PGCIL WR-1	234	96	50	21%	52%
PGCIL WR-2	358	158	70	20%	44%
Maharashtra	93	37	19	20%	51%
Gujarat	42	14	9	21%	64%
Madhya Pradesh	60	46	13	22%	28%
Chhattisgarh	8	8	6	75%	75%
NTPC	25	15	9	36%	60%
Other Utilites	88	58	15	17%	26%
Western Region	908	432	191	21%	44%

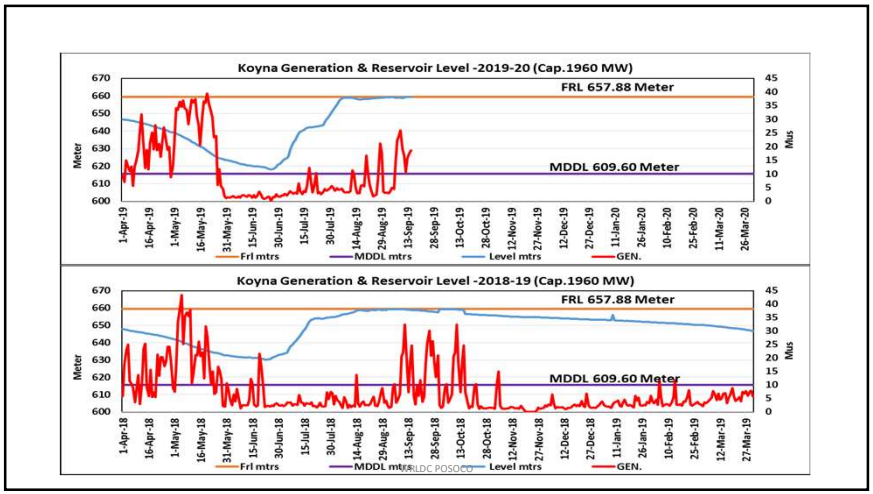
43



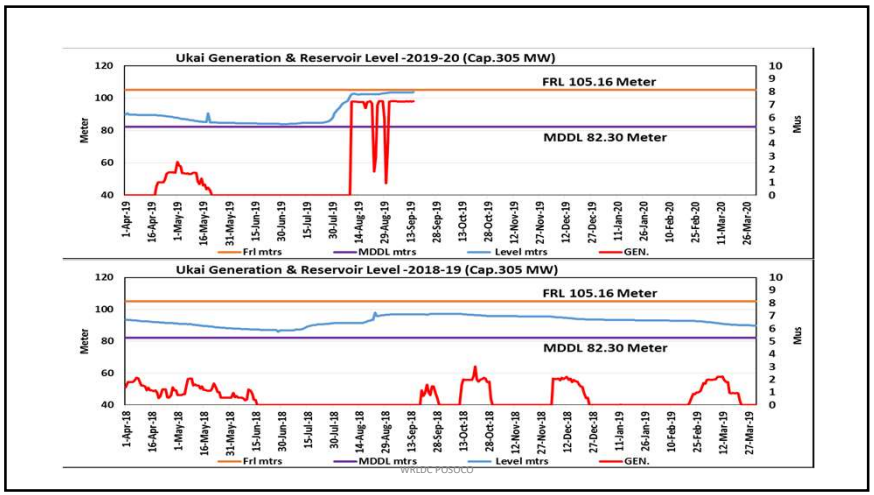
44


SSP Generation & Reservoir level -2019-20 (Cap.1450 MW)
Revised FRL 138.68 Meter
MDDL 110.64 Meter
Meter
MUs
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
SSP Generation & Reservoir level -2018-19 (Cap.1450 MW)
Revised FRL 138.68 Meter
MDDL 110.64 Meter
Meter
MUs
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

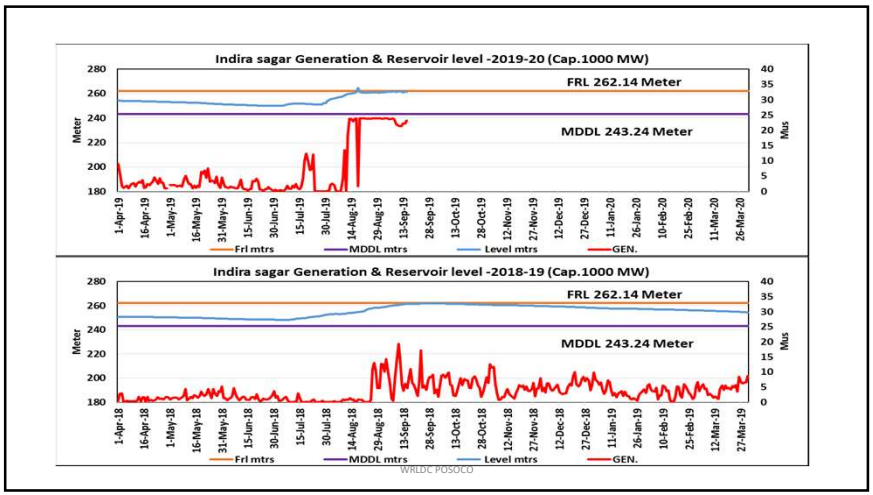
45


Koyna Generation & Reservoir Level -2019-20 (Cap.1960 MW)
FRL 657.88 Meter
MDDL 609.60 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Koyna Generation & Reservoir Level -2018-19 (Cap.1960 MW)
FRL 657.88 Meter
MDDL 609.60 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

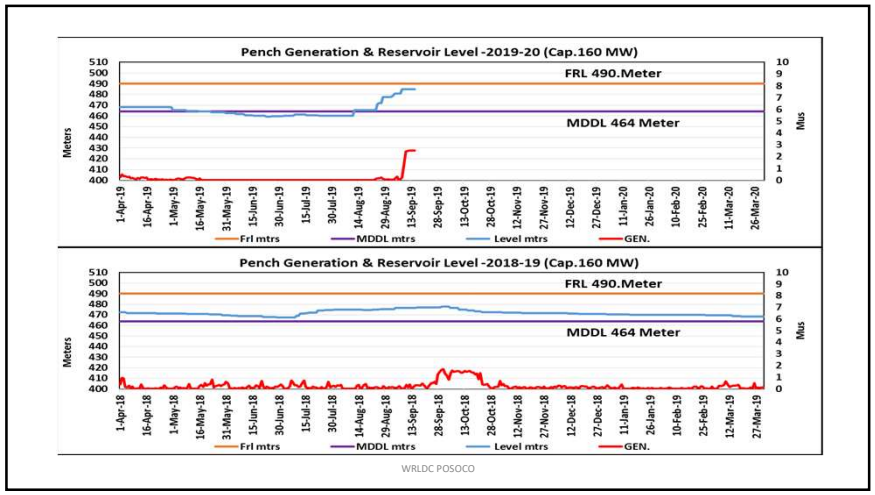
46


Ukai Generation & Reservoir Level -2019-20 (Cap.305 MW)
FRL 105.16 Meter
MDDL 82.30 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Ukai Generation & Reservoir Level -2018-19 (Cap.305 MW)
FRL 105.16 Meter
MDDL 82.30 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

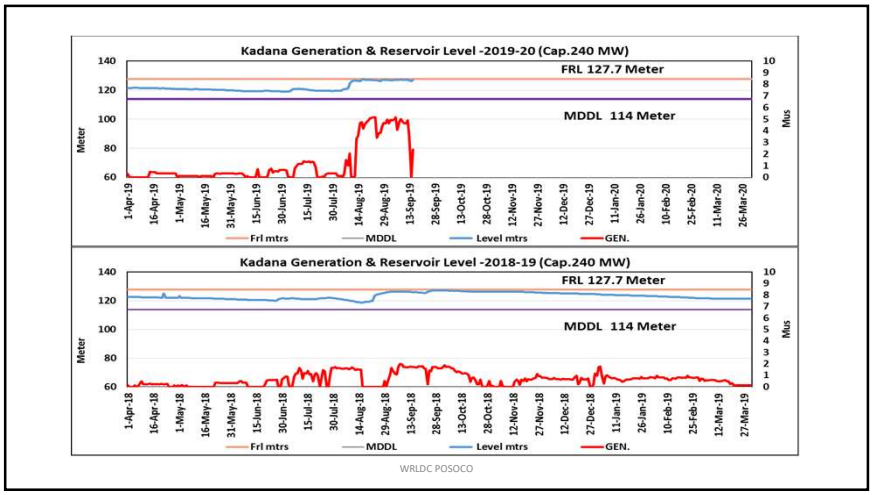
47


Indira sagar Generation & Reservoir level -2019-20 (Cap.1000 MW)
FRL 262.14 Meter
MDDL 243.24 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Indira sagar Generation & Reservoir level -2018-19 (Cap.1000 MW)
FRL 262.14 Meter
MDDL 243.24 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

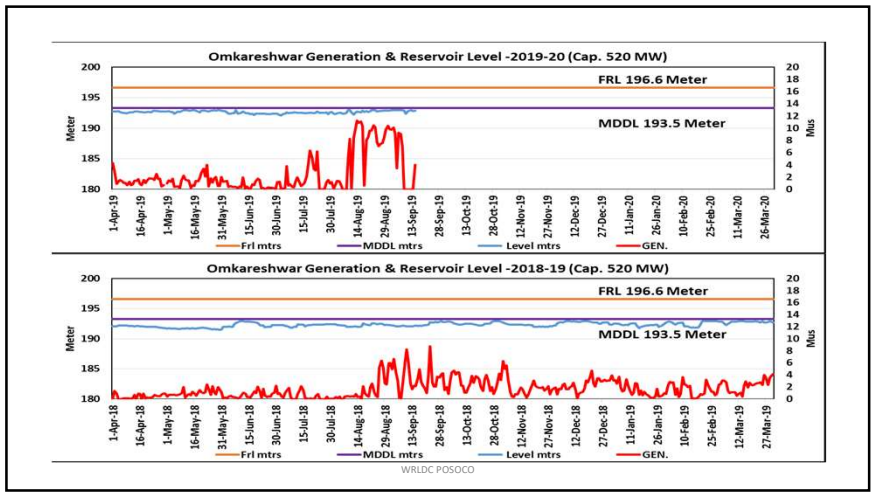
48


Pench Generation & Reservoir Level -2019-20 (Cap.160 MW)
FRL 490.Meter
MDDL 464 Meter
Meters
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Pench Generation & Reservoir Level -2018-19 (Cap.160 MW)
FRL 490.Meter
MDDL 464 Meter
Meters
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

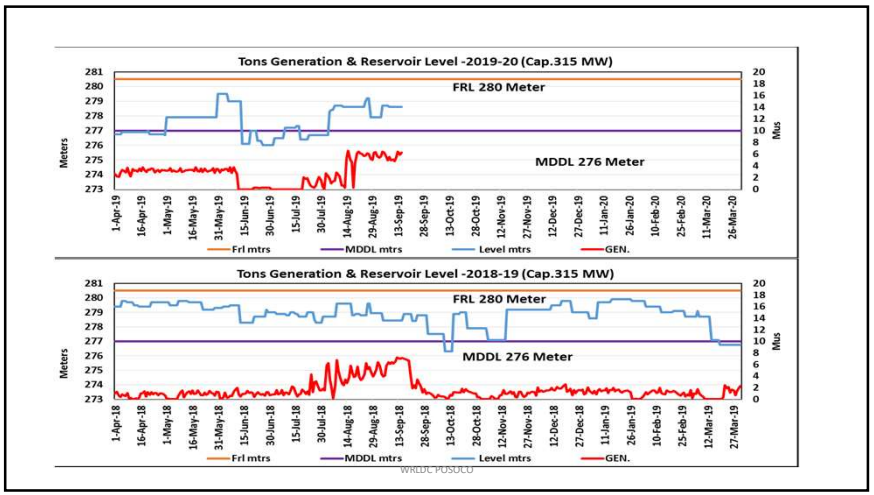
49


Kadana Generation & Reservoir Level -2019-20 (Cap.240 MW)
FRL 127.7 Meter
MDDL 114 Meter
Meter
Mus
Frl mtrs
MDDL
Level mtrs
GEN.
Kadana Generation & Reservoir Level -2018-19 (Cap.240 MW)
FRL 127.7 Meter
MDDL 114 Meter
Meter
Mus
Frl mtrs
MDDL
Level mtrs
GEN.
WRLDC POSOCO

50


Omkareshwar Generation & Reservoir Level -2019-20 (Cap. 520 MW)
FRL 196.6 Meter
MDDL 193.5 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Omkareshwar Generation & Reservoir Level -2018-19 (Cap. 520 MW)
FRL 196.6 Meter
MDDL 193.5 Meter
Meter
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

51


Tons Generation & Reservoir Level -2019-20 (Cap.315 MW)
FRL 280 Meter
MDDL 276 Meter
Meters
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
Tons Generation & Reservoir Level -2018-19 (Cap.315 MW)
FRL 280 Meter
MDDL 276 Meter
Meters
Mus
Frl mtrs
MDDL mtrs
Level mtrs
GEN.
WRLDC POSOCO

52

Commissioning of New Elements-Aug'19

Annexure 2.9

a)Generating Units

Sl. No.	Owner/ Location(Const.)	Station Name	Capacity (MW)	Unit No.	Date of Synchronization	Date of COD
NIL						

b)Transmission Lines

Sl. No.	Owner/ Location(Const.)	Line Name	Ckt No.	KV	Date of Synchronization	Added Line Length (in Km)
1	POWERGR/CWRTL	Pune-Aurangabad-I	LILO of 765kV Aurangabad PG-Padghe GIS Ckt-1 at Pune GIS	765	22/08/2019	129
2	POWERGR/CWRTL	Pune-Padghe I		220	23/08/2019	
					Total	129

c)ICTs

Sl. No.	Owner/ Location(Const.)	Station Name	ICT No	KV Ratio	Capacity (MVA)	Date
1	PGCIL/Gujarat	Dayapar	2	220/33	125	03/08/2019

d)Line Reactor

Sl. No.	Owner/ Location(Const.)	Station Name	Line Name	KV	Capacity (MVAR)	Date
1	NTPC/MP	VSTPS	Vindhyachal-Satna III	400	50	06/08/2019

e)Bus Reactor

Sl. No.	Owner/ Location(Const.)	Station Name	B/R No	KV	Capacity (MVAR)	Date
NIL						

f) Spare Elements Charged

Sl. No.	Owner/ Location(Const.)	Station Name	Element	KV	Capacity (MVA/MVAR)	Date
NIL						

g) FACTS Devices

Sl. No.	Owner/ Location(Const.)	Station Name	Element	No	KV	Capacity (MVAR)	Date
1	PGCIL/Chhattisgarh	Champa	AC Filter E-type 157 MVAR (Q43)	Q43	400	157	01/08/2019
2	PGCIL/Chhattisgarh	Champa	AC Filter E-type 157 MVAR (Q43)	Q63	400	165	02/08/2019
3	PGCIL/Chhattisgarh	Champa	AC Filter E-type 157 MVAR (Q43)	Q42	400	125	02/08/2019

Annexure 2.11.

CENTRAL ELECTRICITY AUTHORITY
FUEL MANAGEMENT DIVISION
DAILY COAL STOCK REPORT-25.09.2019
COAL STOCK POSITION FOR COAL LINKAGE BASED THERMAL POWER STATIONS IN THE COUNTRY

Region/State	Mode of Transport	Name of Thermal Power Station	Sector	Capacity (MW)	PLF % (Aug, 2019)	PLF % (Apr-Aug,19)	Normative Stock Reqd. (Days)	Requirement for the day (In '000 Tonnes')	Actual Stock				Critical(*)/Super Critical(**) as per Trigger level & other conditions	Reasons for critical coal stock/Remarks
									In '000 Tonnes'			In Days		
									Indigenous	Import	Total			
1	2	3	4	5	6	7	8	9	10	11	12	13	15	16
Northern														
Haryana														
1	RAIL	INDIRA GANDHI STPP	JV	1500	25.4	28.5	25	12.99	199.41	247.76	447.17	22		
2	RAIL	MAHATMA GANDHI TPS	P	1320	66.9	60.8	25	10.47	262.19	0	262.19	25		
3	RAIL	PANIPAT TPS	S	920	11.4	32.7	25	8.06	136.79	0	136.79	17		
4	RAIL	RAJIV GANDHI TPS	S	1200	3.1	20.1	25	10.88	344.28	0	344.28	32		
5	RAIL	YAMUNA NAGAR TPS	S	600	74.5	79.9	25	8.29	108.75	0	108.75	13		
Punjab														
6	RAIL	GH TPS (LEH.MOH.)	S	920	21.2	22.2	30	7.41	243.84	0	243.84	33		
7	RAIL	GOINDWAL SAHIB TPP	P	540	43.4	44.0	30	6.33	96.09	0	96.09	15		
8	RAIL	RAJPURA TPP	P	1400	84.4	79.1	30	15.53	137.27	14.8	152.07	10		
9	RAIL	ROPAR TPS	S	840	25.8	25.8	25	7.42	226.38	0	226.38	31		
10	RAIL	TALWANDI SABO TPP	P	1980	65.4	66.2	25	18.49	420.29	24.21	444.5	24		
Rajasthan														
11	RAIL	CHHABRA TPP	S	2320	70.7	62.7	30	15.01	0	0	0	0		Total coal stock (Linkage + Captive) available with the plant as on 31.08.2019 is 4,55,441 Tonnes.
12	RAIL	KAWAI TPS	P	1320	56.1	65.5	30	20.04	21.8	0	21.8	1		CIL Supply 111% of prorata ACQ.
13	RAIL	KOTA TPS	S	1240	47.6	66.2	30	14.66	14.36	0	14.36	1	**	CIL Supply 67% of prorata ACQ.
14	RAIL	SURATGARH TPS	S	1500	29.6	42.4	30	17.38	50.52	0	50.52	3	**	CIL Supply 67% of prorata ACQ.
Uttar Pradesh														
15	PITHEAD	ANPARA C TPS	P	1200	72.5	81.7	15	11.25	40.18	0	40.18	4		CIL Supply 130% of prorata ACQ.
16	PITHEAD	ANPARA TPS	S	2630	88.7	86.4	15	29.93	280.55	0	280.55	9		
17	RAIL	BARKHERA TPS	P	90	13.3	17.7	25	0.91	2.71	0	2.71	3		Coal supply as per payment
18	RAIL	DADRI (NCTPP)	C	1820	46.6	54.6	30	15.88	425.41	11.67	437.08	28		
19	RAIL	HARDUAGANJ TPS	S	605	71.5	66.5	25	7.21	54.07	0	54.07	7		
20	RAIL	KHAMBARKHERA TPS	P	90	15.1	17.2	30	0.92	0.6	0	0.6	1		Coal supply as per payment
21	RAIL	KUNDARKI TPS	P	90	23.4	26.9	30	0.89	0.55	0	0.55	1		Coal supply as per payment
22	RAIL	LALITPUR TPS	P	1980	49.0	55.3	30	15.92	57.51	0	57.51	4		CIL Supply 125% of prorata ACQ.
23	RAIL	MAQSOODPUR TPS	P	90	18.5	20.3	30	0.89	3.49	0	3.49	4		Coal supply as per payment
24	RAIL	MEJA STPP	JV	660	49.5	41.8	25	5.66	285.58	0	285.58	50		
25	RAIL	OBRA TPS	S	1094	43.7	42.2	20	10.99	57.31	0	57.31	5		CIL supply to UPRVUNL 97 % of prorata ACQ
26	RAIL	PARICHHA TPS	S	1140	50.3	45.8	30	10.13	92.88	0	92.88	9		
27	RAIL	PRAYAGRAJ TPP	P	1980	62.9	55.4	25	18.58	34.42	0	34.42	2		CIL Supply 78% of prorata ACQ.
28	PITHEAD	RIHAND STPS	C	3000	82.3	85.3	15	38.95	246.42	0	246.42	6		
29	RAIL	ROSA TPP Ph-I	P	1200	79.3	78.5	25	11.42	48.61	0	48.61	4		CIL Supply 135% of prorata ACQ.
30	PITHEAD	SINGRAULI STPS	C	2000	84.4	87.7	15	26.85	314.41	0	314.41	12		
31	RAIL	TANDA TPS	C	440	80.3	70.1	25	5.14	108.94	0	108.94	21		
32	RAIL	UNCHAHAR TPS	C	1550	64.4	66.9	25	14.99	107.01	1.32	108.33	7		
33	RAIL	UTRAULA TPS	P	90	14.1	23.0	30	0.89	3.85	0	3.85	4		Coal supply as per payment
Total of Northern Region				39349			24	400.36	4426.47	299.76	4726.23	12	2	

Region/State	Mode of Transport	Name of Thermal Power Station	Sector	Capacity (MW)	PLF % (Aug, 2019)	PLF % (Apr-Aug,19)	Normative Stock Reqd. (Days)	Requirement for the day (In '000 Tonnes')	Actual Stock				Critical(*)/Super Critical(**) as per Trigger level & other conditions	Reasons for critical coal stock/Remarks
									In '000 Tonnes'			In Days		
									Indigenous	Import	Total			
Western														
Chhatisgarh														
34	RAIL	AKALTARA TPS	P	1800	67.9	66.6	15	15.04	124.4	0	124.4	8		
35	RAIL	BALCO TPS	P	600	83.0	67.1	15	5.62	13.58	31.42	45	3	**	CIL Supply 70% of prorata ACQ.
36	ROAD	BANDAKHAR TPP	P	300	76.9	84.0	15	2.95	80.68	0	80.68	27		
37	RAIL	BARADARHA TPS	P	1200	36.9	61.9	15	11.26	94.15	0	94.15	8		
38	RAIL	BHILAI TPS	JV	500	66.6	72.1	20	3.98	225.31	0	225.31	57		
39	RAIL	BINJKOTE TPP	P	600	68.5	62.0	20	8.05	12.55	0	12.55	2	**	CIL Supply 66% of prorata ACQ.
40	RAIL	DSPM TPS	S	500	88.4	91.5	15	5.9	17.59	0	17.59	3		CIL Supply 92% of prorata ACQ.
41	PITHEAD	KORBA-III	S	240	67.8	66.7	15	2.12	16.62	0	16.62	8		
42	PITHEAD	KORBA STPS	C	2600	77.6	87.6	15	33.62	51.52	0	51.52	2		CIL supply to NTPC 87 % of prorata ACQ
43	PITHEAD	KORBA-WEST TPS	S	1340	88.0	77.1	15	19.69	356.93	0	356.93	18		
44	RAIL	MARWA TPS	S	1000	48.1	56.1	15	8.59	11.86	0	11.86	1		Bridge Linkage
45	RAIL	NAWAPARA TPP	P	600	38.6	55.0	15	6.37	0.91	0	0.91	0		CIL Supply 96% of prorata ACQ.
46	RAIL	PATHADI TPP	P	600	62.1	69.6	15	6.49	14.51	0	14.51	2		CIL Supply 77% of prorata ACQ.
47	PITHEAD	SIPAT STPS	C	2980	71.2	85.6	15	32.27	14.75	0	14.75	0		CIL supply to NTPC 87 % of prorata ACQ
48	RAIL	TAMNAR TPP	P	2400	29.4	38.2	20	24.33	4.25	0	4.25	0		CIL Supply 80% of prorata ACQ.
49	RAIL	UCHPINDA TPP	P	1440	20.6	21.0	15	12.36	6.66	0	6.66	1		CIL Supply 78% of prorata ACQ.
Gujarat														
50	RAIL	GANDHI NAGAR TPS	S	630	27.4	52.1	30	5.54	217.77	8.41	226.18	41		
51	RAIL	SABARMATI (D-F STATIONS)	P	362	91.8	92.5	30	4.54	51.98	41.69	93.67	16		
52	RAIL	UKAI TPS	S	1110	30.8	64.2	30	9.27	231.1	0	231.1	25		
53	RAIL	WANAKBORI TPS	S	1470	38.2	56.8	30	12.79	525.05	0	525.05	41		
Madhya Pradesh														
54	PITHEAD	AMARKANTAK EXT TPS	S	210	93.4	90.1	15	2.79	9.2	0	9.2	3		CIL Supply 83% of prorata ACQ.
55	RAIL	ANUPPUR TPP	P	1200	73.8	73.5	25	11.71	82	0	82	7		
56	RAIL	BINA TPS	P	500	63.4	60.0	25	5.97	141.61	0	141.61	24		
57	RAIL	GADARWARA TPP	C	800	14.8	24.1	20	6.86	434.61	0	434.61	63		
58	RAIL	SANJAY GANDHI TPS	S	1340	29.3	57.9	20	12.06	190.02	0	190.02	16		
59	RAIL	SATPURA TPS	S	1330	33.0	46.9	20	12.45	276.74	0	276.74	22		
60	RAIL	SEIONI TPP	P	600	37.1	55.4	20	5.74	177.1	0	177.1	31		
61	RAIL	SHREE SINGAJI TPP	S	2520	28.8	41.4	20	21.92	595.74	0	595.74	27		
62	PITHEAD	VINDHYACHAL STPS	C	4760	86.6	86.2	15	68.35	553.09	0	553.09	8		
Maharashtra														
63	RAIL	AMARAVATI TPS	P	1350	34.5	33.6	20	14.47	375.41	0	375.41	26		
64	RAIL	BHUSAWAL TPS	S	1210	52.5	64.8	20	12.31	13.33	0	13.33	1		CIL supply to MAHAGENCO is 88% of prorata ACQ
65	RAIL	BUTIBORI TPP	P	600	0.0	0.0	20	4.95	59.73	0	59.73	12		
66	RAIL	CHANDRAPUR(MAHARASHTRA) STPS	S	2920	41.6	66.0	20	27.75	81.16	0	81.16	3		CIL supply to MAHAGENCO is 88% of prorata ACQ
67	RAIL	DAHANU TPS	P	500	82.8	82.5	25	4.05	58.06	0	58.06	14		
68	RAIL	DHARIWAL TPP	P	600	42.6	59.0	20	4.36	31.34	0	31.34	7		
69	RAIL	GMR WARORA TPS	P	600	71.9	83.2	20	4.81	81.34	0	81.34	17		
70	RAIL	KHAPARKHEDA TPS	S	1340	53.3	65.0	25	14.98	4.54	0	4.54	0		CIL supply to MAHAGENCO is 88% of prorata ACQ
71	RAIL	KORADI TPS	S	2400	21.0	42.6	25	23.28	96.79	9.14	105.93	5		CIL supply to MAHAGENCO is 88% of prorata ACQ
72	RAIL	MAUDA TPS	C	2320	28.7	57.0	20	22.9	124.8	236.11	360.91	8		
73	RAIL	NASIK TPS	S	630	33.1	61.1	25	6.59	20.9	0	20.9	3		CIL supply to MAHAGENCO is 88% of prorata ACQ
74	RAIL	PARAS TPS	S	500	59.0	83.5	25	4.86	16.88	0	16.88	3		CIL supply to MAHAGENCO is 88% of prorata ACQ
75	RAIL	PARLI TPS	S	1170	7.8	5.8	25	11.23	71.25	0	71.25	6		CIL supply to MAHAGENCO is 88% of prorata ACQ
76	RAIL	SOLAPUR	C	1320	13.0	6.4	25	11.33	487.59	186.74	674.33	60		
77	RAIL	TIRORA TPS	P	3300	74.4	81.7	20	35.61	75.76	0	75.76	2		CIL Supply 88% of prorata ACQ.
78	ROAD	WARDHA WARORA TPP	P	540	0.0	0.0	20	5.21	40.64	0	40.64	8		
Total of Western Region				56832			20	587.32	6171.8	513.51	6685.31	11	2	

Region/State	Mode of Transport	Name of Thermal Power Station	Sector	Capacity (MW)	PLF % (Aug, 2019)	PLF % (Apr-Aug,19)	Normative Stock Reqd. (Days)	Requirement for the day (In '000 Tonnes')	Actual Stock				Critical(*)/Super Critical(**) as per Trigger level & other conditions	Reasons for critical coal stock/Remarks
									In '000 Tonnes'			In Days		
									Indigenous	Import	Total			
Southern														
Andhra Pradesh														
79	RAIL	DAMODARAM SANJEEVAIAH TPS	S	1600	62.5	61.0	20	15.5	48.55	0	48.55	3		CIL Supply 92% of prorata ACQ.
80	RAIL	Dr. N.TATA RAO TPS	S	1760	71.1	76.9	20	21.84	18.45	0	18.45	1		CIL Supply 91% of prorata ACQ.
81	RAIL	PAINAMPURAM TPP	P	1320	93.7	87.1	20	12.82	36.34	58.43	94.77	4		CIL Supply 75% of prorata ACQ.
82	RAIL	RAYALASEEMA TPS	S	1650	46.6	59.7	25	16.37	0	0	0	0		CIL Supply 91% of prorata ACQ.
83	RAIL	SIMHADRI	C	2000	50.3	60.2	25	26.32	62.79	0	62.79	2		CIL supply to NTPC 87% of prorata ACQ
84	RAIL	VIZAG TPP	P	1040	10.4	35.2	25	10.8	21.88	0	21.88	2		Supply kept in abeyance by MCL due to APERC order dated 31.01.2018
Karnataka														
85	RAIL	BELLARY TPS	S	1700	7.5	21.5	30	13.73	278.31	0	278.31	20		
86	RAIL	KUDGI STPP	C	2400	12.8	21.8	30	18.69	476.72	16.42	493.14	26		
87	RAIL	RAICHUR TPS	S	1720	34.3	64.0	30	14.53	53.69	0	53.69	4		CIL Supply 95% of prorata ACQ.
88	RAIL	YERMARUS TPP	S	1600	0.0	0.0	30	13.66	983.1	0	983.1	72		
Tamil Nadu														
89	INTER MODAL	METTUR TPS	S	840	54.8	79.2	30	7.71	100.9	160.72	261.62	19		
90	INTER MODAL	METTUR TPS - II	S	600	4.5	56.9	30	8.31	66.89	74.16	141.05	11		
91	INTER MODAL	NORTH CHENNAI TPS	S	1830	35.7	62.3	30	17.92	43.32	104.92	148.23	3		Coal supply as per payment
92	RAIL	TUTICORIN (JV) TPP	JV	1000	69.2	42.5	30	10.47	38.69	40.35	79.04	5	*	CIL Supply 66% of prorata ACQ.
93	INTER MODAL	TUTICORIN TPS	S	1050	51.8	71.8	30	10.73	84.07	22.41	106.48	10		
94	INTER MODAL	VALLUR TPP	JV	1500	23.2	46.1	30	14.41	111.39	0	111.39	8		
Telangana														
95	PITHEAD	KAKATIYA TPS	S	1100	65.5	84.3	15	8.96	280.96	0	280.96	31		
96	RAIL	KOTHAGUDEM TPS	S	420	74.6	69.7	20	7.11	112.27	0	112.27	16		
97	RAIL	KOTHAGUDEM TPS (NEW)	S	1000	53.4	79.6	20	13.81	113.73	0	113.73	8		
98	RAIL	KOTHAGUDEM TPS (STAGE-7)	S	800	78.3	70.2	20	8.14	112.32	0	112.32	14		
99	PITHEAD	RAMAGUNDEM STPS	C	2600	77.8	80.2	15	29.69	228.91	0	228.91	8		
100	RAIL	SINGARENI TPP	S	1200	85.6	90.5	15	15.32	96.83	0	96.83	6		Bridge Linkage
Total of Southern Region				30730			25	316.84	3370.11	477.41	3847.51	12	1	
Eastern														
Bihar														
101	RAIL	BARH II	C	1320	86.3	87.8	20	19.7	67.51	0	67.51	3		CIL supply to NTPC 87% of prorata ACQ
102	PITHEAD	KAHALGAON TPS	C	2340	80.4	77.9	15	38.65	33.9	0	33.9	1		CIL supply to NTPC 87% of prorata ACQ
103	RAIL	MUZAFFARPUR TPS	JV	610	52.2	63.9	20	6.44	51.01	0	51.01	8		
104	RAIL	NABI NAGAR TPP	JV	750	62.9	68.5	20	6.99	32.37	0	32.37	5		CIL supply to NTPC 87% of prorata ACQ
Jharkhand														
105	RAIL	BOKARO `B` TPS	C	210	17.2	11.4	20	1.62	25.78	0	25.78	16		
106	RAIL	BOKARO TPS `A` EXP	C	500	72.8	75.7	20	4.29	72.31	0	72.31	17		
107	RAIL	CHANDRAPURA(DVC) TPS	C	630	44.8	67.2	20	4.93	267.79	0	267.79	54		
108	RAIL	KODARMA TPP	C	1000	54.4	77.7	20	13.7	68.23	0	68.23	5		CIL supply to DVC is 130 % of prorata ACQ
109	RAIL	MAITHON RB TPP	JV	1050	60.7	65.5	20	12.18	286.76	0	286.76	24		
110	RAIL	TENUGHAT TPS	S	420	68.3	66.2	20	4.05	39.2	0	39.2	10		
Odisha														
111	RAIL	DERANG TPP	P	1200	40.9	47.8	20	12.94	174.04	0	174.04	13		
112	PITHEAD	IB VALLEY TPS	S	1080	25.6	50.3	15	20.92	100.38	0	100.38	5		
113	RAIL	KAMALANGA TPS	P	1050	35.8	68.4	20	9.74	8.83	0.01	8.84	1		CIL supply 87% of prorata ACQ
114	PITHEAD	TALCHER (OLD) TPS	C	460	44.9	85.9	15	7.7	8.45	0	8.45	1		CIL supply to NTPC 87 % of prorata ACQ
115	PITHEAD	TALCHER STPS	C	3000	45.6	73.6	15	31.52	10.52	0	10.52	0		CIL supply to NTPC 87 % of prorata ACQ

Region/State	Mode of Transport	Name of Thermal Power Station	Sector	Capacity (MW)	PLF % (Aug, 2019)	PLF % (Apr-Aug,19)	Normative Stock Reqd. (Days)	Requirement for the day (In '000 Tonnes')	Actual Stock				Critical(*)/Super Critical(**) as per Trigger level & other conditions	Reasons for critical coal stock/Remarks
									In '000 Tonnes'			In Days		
									Indigenous	Import	Total			
West Bengal														
116	**RAIL**	**BAKRESWAR TPS**	**S**	**1050**	**44.1**	**73.1**	**20**	**13.13**	**44.64**	**0**	**44.64**	**3**		CIL supply to WBPDCL is 100 % of prorata ACQ
117	**RAIL**	**BANDEL TPS**	**S**	**330**	**16.6**	**40.5**	**20**	**3.21**	**28.14**	**0**	**28.14**	**9**		
118	**RAIL**	**BUDGE BUDGE TPS**	**P**	**750**	**96.8**	**96.5**	**20**	**10.42**	**221.57**	**0**	**221.57**	**21**		
119	**RAIL**	**D.P.L. TPS**	**S**	**660**	**31.9**	**46.0**	**25**	**5.47**	**43.37**	**0**	**43.37**	**8**		
120	**RAIL**	**DURGAPUR STEEL TPS**	**C**	**1000**	**66.3**	**78.6**	**20**	**8.3**	**25.87**	**0**	**25.87**	**3**		CIL supply to DVC is 130 % of prorata ACQ
121	**RAIL**	**DURGAPUR TPS**	**C**	**210**	**29.6**	**20.1**	**20**	**3.4**	**39.4**	**0**	**39.4**	**12**		
122	**PITHEAD**	**FARAKKA STPS**	**C**	**2100**	**71.9**	**71.1**	**15**	**27.65**	**130.81**	**0**	**130.81**	**5**		
123	**RAIL**	**HALDIA TPP**	**P**	**600**	**93.3**	**90.6**	**20**	**9.05**	**24.96**	**0**	**24.96**	**3**		CIL supply 88% of prorata ACQ
124	**RAIL**	**KOLAGHAT TPS**	**S**	**1260**	**22.6**	**39.0**	**25**	**13.12**	**25.81**	**0**	**25.81**	**2**		CIL supply to WBPDCL is 100% of prorata ACQ
125	**RAIL**	**MEJIA TPS**	**C**	**2340**	**57.4**	**67.8**	**20**	**19.64**	**42.22**	**0**	**42.22**	**2**		CIL supply to DVC is 130% of prorata ACQ
126	**RAIL**	**RAGHUNATHPUR TPP**	**C**	**1200**	**59.3**	**53.1**	**15**	**11.51**	**36.66**	**0**	**36.66**	**3**		CIL supply to DVC is 130% of prorata ACQ
127	**RAIL**	**SAGARDIGHI TPS**	**S**	**1600**	**32.2**	**47.3**	**20**	**13.05**	**72.62**	**0**	**72.62**	**6**		CIL supply to WBPDCL is 100% of prorata ACQ
128	**RAIL**	**SANTALDIH TPS**	**S**	**500**	**71.1**	**89.6**	**20**	**6.98**	**47.27**	**0**	**47.27**	**7**		
129	**RAIL**	**SOUTHERN REPL. TPS**	**P**	**135**	**26.6**	**42.4**	**20**	**1.24**	**32.13**	**0**	**32.13**	**26**		
130	**RAIL**	**TITAGARH TPS**	**P**	**240**	**0.0**	**0.0**	**20**	**2.06**	**14.02**	**0**	**14.02**	**7**		
Total of Eastern Region				**29595**			**19**	**343.60**	**2076.57**	**0.01**	**2076.58**	**6**	**0**	
North Eastern														
Assam														
131	**RAIL**	**BONGAIGAON TPP**	**C**	**750**	**47.2**	**60.1**	**20**	**6.67**	**180.22**	**0**	**180.22**	**27**		
Total of North Eastern Region				**750**			**20**	**6.67**	**180.22**	**0**	**180.22**	**27**	**0**	
Region-wise/All India total				**157256**			**22**	**1654.79**	**16225.17**	**1290.69**	**17515.85**	**11**	**5**	

As per trigger level and other conditions	
Pithead Plants	
(*) No. of plants with Critical Stock (<5 Days)	**0**
(**) No. of plants with Super Critical Stock (<3 Days)	**0**
Non-Pithead	
(*) No. of plants with Critical Stock (<7 Days)	**1**
(**) No. of plants with Super Critical Stock (<4 Days)	**4**
Total	**5**

Mode	No. of Plants	Capacity (MW)	Daily Req ('000 T)	Total Stock ('000 T)	Total Stock (in Days)
Pithead	17	33640	430.9	2677.6	6
Non-Pithead	114	123616	1223.9	14838.3	12
TOTAL	**131**	**157256**	**1654.8**	**17515.9**	**11**

NOTE:

(i) % Materialisation (including Deemed Delivery) as per CIL is for the period 01.04.2019 to 31.07.2019

(ii) Power Plants having less coal stock due to outstanding dues/ supply more than committed quantity/ not lifting offered coal/Bridge linkage/New Linkage are not shown as having critical /supercritical coal stock.

(iii) Daily coal requirement is based on the maximum of the requirement for average actual consumption of the plant for last 7 days or requirement for installed capacity of plant at 55%PLF.

(iv) Stock resticted to 70% Domestic and 30% Imported ratio.

C:Central Sector; S: State Sector; P: Private Sector; JV: Joint Venture

						ANNEXURE 3.1
DETAILS OF PROPOSED MAINTENANCE PROGRAM OF GENERATING UNITS DURING September 2019 &October 2019						
S. No.	**Unit**	**No.**	**Capacity**	**Outage Plan**		**Reason**
			(MW)	**From**	**To**	
1	**GUJARAT**					
1.1	WTPS	3	210	27-Oct-19	20-Nov-19	AOH
2	**MADHYAPRADESH**					
3	**CHHATTISHGARH**					
3.1	KORBA WEST	4	210	26-Oct-19	5-Nov-19	AOH
4	**MAHARASHTRA**					
4.1	Nasik	3	210	1-Oct-19	26-Oct-19	AOH
4.2	Koradi	6	210	15-Oct-19	9-Nov-19	AOH
4.3	APML	1	660	18-Sep-19	20-Oct-19	COH
5	**Central Sector and IPPs**					
5.1	APL	8	660	1-Nov-19	20-Nov-19	Boiler license renewal
5.2	UNOSUGEN	40	382.5	27-Oct-19	2-Nov-19	400kV GIS OUTAGE FOR BUS REACTOR BREAKER WORKS
5.3	DB Power	2	600	1-Oct-19	25-Oct-19	AOH
5.4	TAPS	3	540	1-Nov-19	20-Dec-19	Biennnial shutdown

Transmisison element outage planning for the month of October 2019

Annexure 3.2

Sr. No	Request Type	OCC Number	Name of Requesting Agency	Line / Element	D	reason	From	time	to	Time	Remarks
1	PLANNED	OCC_523	APML	765KV-TIRODA-KORADI-III-2 L/R@ TIRODA - 765KV	Continuous	Replacement of Reactor	01/Oct/2019	06:00	04/Oct/2019	18:00	Replacement of Reactor
2	PLANNED	OCC_523	ATIL	400KV-APL-MUNDRA-SAMI-2	D	SRI Insulator replacement at different locations in line	01/Oct/2019	6:00	01/Oct/2019	18:00	
3	PLANNED	OCC_523	NTPC	Change over of VSTPS- Jabalpur#2 Line (Bay No. 21) from Main Bay to TBC (Bay No. 22)	Continuous	Replacement of Circuit Breaker of VSTPS-Jabalpur#2 lin	01/Oct/2019	8:00	01/Oct/2019	10:00	Replacement of Circuit Breaker of VSTPS-Jabalpur#2 line.
4	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV BACHAU-ICT-2 AND BACHAU - 220KV - BUS 1 at BACHAU - 220KV	D	For AMP of CB. ICT-2 will be in service through TBC.	01/Oct/2019	8:00	01/Oct/2019	18:00	
5	PLANNED	OCC_523	NTPC	VSTPS BUS #4	Continuous	Desmantling of IPS Al tube of VSTPS- Jabalpur#2 Line b	01/Oct/2019	8:00	01/Oct/2019	18:30	Desmantling of IPS Al tube of VSTPS-Jabalpur#2 Line bay below VSTPS Bus#4 for replacement Circuit Breaker.
6	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-JPL EXTN-TAMNAR-4 AND TAMNAR - 400KV - BUS 2 (407 BAY) at TAMNAR - 400KV	D	For AMP Works	01/Oct/2019	8:00	01/Oct/2019	20:00	
7	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV CHAMPA-ICT-1 AND CHAMPA - 400KV - BUS 2 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	01/Oct/2019	9:00	01/Oct/2019	13:00	
8	PLANNED	OCC_523	POWERGRID_WR2	400KV-BANASKANTHA-VELODA-1	D	CT oil sampling. A/R OFF of ckt -2 and dia to be kept op	01/Oct/2019	9:00	01/Oct/2019	14:00	
9	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV VINDHYACHAL(PS)-ICT-3 AND VINDHYACHAL(PS) - 765KV - BUS 2 at Vindhyachal(PS) - 765KV	D	For Bay AMP work	01/Oct/2019	9:00	01/Oct/2019	17:00	
10	PLANNED	OCC_523	POWERGRID_WR2	220KV-BHUJ-VADVA-1	D	JUMPER CONNECTION UNDER EXTENSION OF BHUJ S	01/Oct/2019	9:00	01/Oct/2019	17:00	CONSTRUCTION
11	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 220KV - BUS 1	D	JUMPER CONNECTION UNDER EXTENSION OF BHUJ S	01/Oct/2019	9:00	01/Oct/2019	17:00	CONSTRUCTION
12	PLANNED	OCC_523	POWERGRID_WR2	BOISAR - 400KV - BUS 1	D	For AMP Works	01/Oct/2019	9:00	01/Oct/2019	17:30	
13	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 765KV/400KV KORADI-III-ICT-1 AND KORADI-III - 400KV - BUS 1 at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	01/Oct/2019	09:00	01/Oct/2019	18:00	Maintenance of Bay Equipment
14	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIGARH-JHARSUGUDA-1 AND RAIGARH - 400KV - BUS 1 at Raigarh - 400KV	D	For AMP works	01/Oct/2019	9:00	01/Oct/2019	18:00	
15	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV AURANGABAD-ICT-1 AND AURANGABAD - 220KV - BUS 1 at AURANGABAD - 220KV	D	For AMP works	01/Oct/2019	9:00	01/Oct/2019	18:00	
16	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-3 AND 765KV-WARDHA-AURANGABAD-1 at Wardha	D	For AMP work	01/Oct/2019	9:00	01/Oct/2019	18:00	
17	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-SOLAPUR-SOLAPUR-NTPC-3 AND FUTURE at Solapur - 400KV	D	Bay AMP works.	01/Oct/2019	9:00	01/Oct/2019	18:00	
18	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV WARORA-PG-ICT-2	D	For AMP works	01/Oct/2019	9:00	01/Oct/2019	18:00	
19	PLANNED	OCC_523	POWERGRID_WR2	INDORE - 765KV - BUS 2	D	AMP WORKS	01/Oct/2019	9:00	01/Oct/2019	18:00	
20	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DEHGAM-ICT-2 AND DEHGAM - 400KV - BUS 2 at DEHGAM - 400KV	D	AMP works	01/Oct/2019	9:00	01/Oct/2019	18:00	
21	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR - 400KV B/R 2 AND JABALPUR - 400KV - BUS 2 at JABALPUR - 400KV	D	Bay AMP	01/Oct/2019	9:00	01/Oct/2019	18:00	
22	PLANNED	OCC_523	POWERGRID_WR2	765KV-BINA-JABALPUR-1	D	For checking of auto recloser scheme in relay. A/R OFF	01/Oct/2019	9:15	01/Oct/2019	14:00	
23	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV RAIPUR-ICT-1	D	AMP works at Raipur SS	01/Oct/2019	9:30	01/Oct/2019	17:30	
24	PLANNED	OCC_523	MSETCL	400KV/11.5KV KORADI-II-ST-2	Daily	Tan delta Measurement of Line CT	01/Oct/2019	10:00	01/Oct/2019	16:00	Station Transformer I & III will remain in service Koradi-II-Koradi-III Ckt-I will remain service through its Main Bay 409(full DIA)
25	PLANNED	OCC_523	POWERGRID_WR2	400KV-MAGARWADA-NAVSARI-1	D	CVT replacement B phase at Navsari PG end. A/R in Ckt	01/Oct/2019	10:00	01/Oct/2019	17:00	
26	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV/400KV CHAMPA-ICT-1 AND 765KV/400KV CHAMPA-ICT-2 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	01/Oct/2019	14:00	01/Oct/2019	17:30	Missed in data base
27	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NEW KOYNA-2	Daily	Earth wire replacement, routine maintenance work, fault	01/Oct/2019	08:00	02/Oct/2019	18:00	Load will be managed on Dabhol-New Koyna I line
28	PLANNED	OCC_523	MSETCL	220KV-WARDHA-WARDHA-M-1	Daily	Shifting and Charging of line through ERS from Loc No 1	01/Oct/2019	08:00	02/Oct/2019	18:00	na
29	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV PARLI NEW-ICT-1	D	For Spare Change Over	01/Oct/2019	9:00	02/Oct/2019	18:00	
30	PLANNED	OCC_523	NTPC	400KV-WARDHA-MOUDA-2	C	Annual Maintenance: Annual testing-IR, CT testing, isola	01/Oct/2019	8:00	03/Oct/2019	18:00	
31	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-RANCHODPURA-1	D	Providing Bird Diverters. A/R OFF of ckt-2 and dia to be	01/Oct/2019	8:00	04/Oct/2019	18:00	
32	PLANNED	OCC_523	NTPC	Gadarwara-Jabalpur Line-2 Reactor ,Bay-709R	Continuous	Annual testing of Line Reactor	01/Oct/2019	8:00	04/Oct/2019	18:30	Annual testing of Line Reactor
33	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-1	D	AR in non auto mode for PID testing	01/Oct/2019	8:00	07/Oct/2019	18:00	
34	PLANNED	OCC_523	GETCO	125 MVAR REACTOR - 400 kV Vadavi	Continuous	Breaker replacement work having CSD device.	01/Oct/2019	7:00	09/Oct/2019	18:00	The Outage is on Continuous Basis during the outage the Reactor is out of service
35	PLANNED	OCC_523	MSETCL	400KV-DHULE-MS-BABLESHWAR-1	Daily	For Carrying PID Work	01/Oct/2019	08:00	10/Oct/2019	18:00	-

36	PLANNED	OCC_523	MSETCL	400KV-DHULE-MS-BABLESHWAR-2	Daily	For Carrying PID Work	01/Oct/2019	08:00	10/Oct/2019	18:00	-
37	PLANNED	OCC_523	POWERGRID_WR2	220KV-VAPI-KHARADPADA-DNH-1	C	Tower Shifting due to Bullet train project	01/Oct/2019	9:00	10/Oct/2019	17:00	
38	PLANNED	OCC_523	POWERGRID_WR2	220KV-VAPI-BHILOSA-DNH-1	C	Tower Shifting due to Bullet train project	01/Oct/2019	9:00	10/Oct/2019	17:00	
39	PLANNED	OCC_523	MSETCL	400KV-KALWA-PADGHE-2	Daily	PID Testing work for line Insulator strings at various loc	01/Oct/2019	09:00	10/Oct/2019	18:00	-
40	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-WARDHA-AKOLA-2 AND AKOLA - 400KV - BUS 2 at Wardha	C	For Replacement of BHEL CB with GE CB.	01/Oct/2019	9:00	10/Oct/2019	18:00	
41	PLANNED	OCC_523	MSETCL	220KV-WARDHA-PUSAD-1	Daily	PID Work	01/Oct/2019	07:00	25/Oct/2019	17:00	PID Work
42	PLANNED	OCC_523	POWERGRID_WR2	765KV-SATNA-BINA-1	D	A/R OFF for Tower Strengthening works	01/Oct/2019	7:00	31/Oct/2019	18:00	
43	PLANNED	OCC_523	POWERGRID_WR2	765KV-SATNA-BINA-2	D	A/R OFF for Tower Strengthening works	01/Oct/2019	7:00	31/Oct/2019	18:00	
44	PLANNED	OCC_523	POWERGRID_WR2	765KV-GWALIOR-AGRA-1	D	A/R OFF for Tower Strengthening works	01/Oct/2019	7:00	31/Oct/2019	18:00	
45	PLANNED	OCC_523	POWERGRID_WR2	765KV-GWALIOR-AGRA-2	D	A/R OFF for Tower Strengthening works	01/Oct/2019	7:00	31/Oct/2019	18:00	
46	PLANNED	OCC_523	MSETCL	400KV-SOLAPUR-M-SOLAPUR-1	Daily	For PID Work,Shifting of auto reclose switch to non auto	01/Oct/2019	09:00	31/Oct/2019	06:00	Line will be in service.
47	PLANNED	OCC_523	POWERGRID_WR2	400KV-CGPL-JETPUR-1	D	A/R OFF - A/R to be kept in non-A/R for live line OPGW	01/Oct/2019	9:00	31/Oct/2019	18:00	
48	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-PS-MB POWER-1	D	A/R OFF - A/R to be kept in non-A/R for live line OPGW	01/Oct/2019	9:00	31/Oct/2019	18:00	
49	PLANNED	OCC_523	POWERGRID_WR2	765KV-SEONI-BINA-1	D	A/R OFF - A/R to be kept in non-A/R for live line OPGW	01/Oct/2019	9:00	31/Oct/2019	18:00	
50	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAV-1	D	A/R OFF - A/R to be kept in non-A/R for live line OPGW	01/Oct/2019	9:00	31/Oct/2019	18:00	
51	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAV-2	D	A/R OFF - A/R to be kept in non-A/R for live line OPGW	01/Oct/2019	9:00	31/Oct/2019	18:00	
52	PLANNED	OCC_523	POWERGRID_WR2	400KV-VADODARA-ASOJ-1	C	Retrofitting of Distnace Relays (Main 1 & 2) with 02 Nos I	02/Oct/2019	8:00	04/Oct/2019	8:00	
53	PLANNED	OCC_523	MSETCL	220KV-SOLAPUR-JEUR-1	Daily	work of conversion of SSN to DSN	02/Oct/2019	09:00	02/Oct/2019	06:00	Load will be managed on 220KV Malinagar & 220KV Tembhurni
54	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-PARLI-PUNE-PG-1 AND 400KV-WARORA-PG-PARLI-1 at PARLI - 400KV	D	For bay AMP works	02/Oct/2019	9:00	02/Oct/2019	18:00	
55	PLANNED	OCC_523	POWERGRID_WR1	WARORA-PG - 765KV B/R 1	D	Reactor AMP work	02/Oct/2019	9:00	02/Oct/2019	18:00	
56	PLANNED	OCC_523	KTL-Sterlite	400KV-INDORE-KHANDWA-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	02/Oct/2019	8:00	03/Oct/2019	18:00	
57	PLANNED	OCC_523	KTL-Sterlite	400KV-INDORE-KHANDWA-2	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	02/Oct/2019	8:00	03/Oct/2019	18:00	
58	PLANNED	OCC_523	MSETCL	400KV-KALWA-PUNE-PG-1 ON TBC @ KALWA	Daily	400 KV CB Pole and mechanism overhauling work	02/Oct/2019	09:30	04/Oct/2019	17:30	Feeder will be shifted on TBC. There will be no interruption.
59	PLANNED	OCC_523	ATIL	400KV-APL-MUNDRA-SAMI-1	D	A/R mode to be kept OFF for PID Scanning Work	02/Oct/2019	8:00	31/Oct/2019	8:00	
60	PLANNED	OCC_523	ATIL	400KV-APL-MUNDRA-SAMI-2	D	A/R mode to be kept OFF for PID Scanning Work	02/Oct/2019	8:00	31/Oct/2019	8:00	
61		OCC_523	POWERGRID	RIHAND NTPC (400KV)-VINDHYACHAL POOL-WR (400KV)1	DAILY	For Insulator cleaning	02/Oct/2019	09:30	02/Oct/2019	18:30	
62	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NAGOTHANE-1	Daily	PID testing of Insulators	03/Oct/2019	10:00	17/Oct/2019	15:00	A/R to be required ofF during PID testing
63	PLANNED	OCC_523	GETCO	400 kV-APL-MUNDRA-HADALA-1	Daily	Feeder Bay Water Washing work and maintenance work	03/Oct/2019	8:00	03/Oct/2019	18:00	
64	PLANNED	OCC_523	NTPC	VSTPS BUS #3	Continuous	Rectification of Bus-3 side isolator alignment.	03/Oct/2019	8:00	03/Oct/2019	18:30	Rectification of Bus-3 side isolator alignment.
65	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-JPL EXTN-TAMNAR-3 AND TAMNAR - 400KV - BUS 2 (410 BAY) at TAMNAR - 400KV	D	For AMP Works	03/Oct/2019	8:00	03/Oct/2019	20:00	
66	PLANNED	OCC_523	POWERGRID_WR2	400KV-PADGHE-BOISAR-1	D	Main-I relay replacement & For tripping and A/R Trials (	03/Oct/2019	9:00	03/Oct/2019	14:00	
67	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-1 AND RAIGARH-PS - 765KV - BUS 2 at RAIGARH-PS - 765KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	17:00	
68	PLANNED	OCC_523	MP_SLDC	220KV Gwalior (PGCIL)-Malanpur-I	D	For line maintenance work	03/Oct/2019	9:00	03/Oct/2019	17:00	
69	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV ICT 1 -DHARAMJAYGARH AND FUTURE at DHARAMJAYGARH - 765 KV at DHARAMJAYGARH - 400KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	17:00	Missed in data base
70	PLANNED	OCC_523	POWERGRID_WR2	400KV-KALA-VAPI-1	D	For AMP Works. A/R OFF of ckt-2, dia to be kept open at	03/Oct/2019	9:00	03/Oct/2019	17:00	
71	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - VINDHYACHAL(PS) - 765KV B/R 1 AND VINDHYACHAL(PS) - 765KV - BUS 1 at Vindhyachal(PS) - 765KV	D	For Bay AMP work	03/Oct/2019	9:00	03/Oct/2019	17:00	
72	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 220KV - BUS 2	D	JUMPER CONNECTION UNDER EXTENSION OF BHUJ S	03/Oct/2019	9:00	03/Oct/2019	17:00	CONSTRUCTION
73	PLANNED	OCC_523	MEGPTCL	TIE BAY - 765KV/400KV KORADI-III-ICT-1 AND FUTURE at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	03/Oct/2019	09:00	03/Oct/2019	18:00	Maintenance of Bay Equipment
74	PLANNED	OCC_523	MSETCL	220KV-WARDHA-PUSAD-1	Daily	For Routine Maintainance Work	03/Oct/2019	09:00	03/Oct/2019	18:00	For Routine Maintainance Work
75	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-BILASPUR-FUTURE-3 AND 400KV-ACBIL-BILASPUR-1 at BILASPUR - 400KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	

76	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV AURANGABAD-ICT-2 AND AURANGABAD - 220KV - BUS 1 at AURANGABAD - 220KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	
77	PLANNED	OCC_523	POWERGRID_WR1	400KV AC - 457 BAY - AC FILTER MAIN BAY OF AC FILTER - I at CHAMPA-HVDC - 400KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	Missed in data base
78	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIPUR-PS (DURG)-GMR CHHATTISGARH-1 AND FUTURE at RAIPUR-PS (DURG) - 400KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	
79	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHADRAWATI-PARLI-1 AND BHADRAWATI - 400KV - BUS 2 at BHADRAWATI - 400KV	D	For AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	
80	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-PARLI-SOLAPUR-1 AND 400KV-ALKUD-SOLAPUR-1 at Solapur - 400KV	D	To change Bph CT bellow due to low oil level.	03/Oct/2019	9:00	03/Oct/2019	18:00	
81	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV PUNE-GIS-ICT-1	D	For taking Winding resistance at all Taps in forward/reve	03/Oct/2019	9:00	03/Oct/2019	18:00	
82	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV PARLI NEW-ICT-2	D	Faulty Aircell replacement Works under warranty and Di	03/Oct/2019	9:00	03/Oct/2019	18:00	
83	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARORA-PG-PARLI NEW-1 L/R@ WARORA-PG - 765KV	D	To attend Aircell problem .Line shall remain in service.	03/Oct/2019	9:00	03/Oct/2019	18:00	
84	PLANNED	OCC_523	POWERGRID_WR2	INDORE - 400KV B/R 2	D	AMP WORKS. DIA TO BE KEPT OPEN.	03/Oct/2019	9:00	03/Oct/2019	18:00	
85	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV/220KV DEHGAM-ICT-1 AND 400KV-DEHGAM-GANDHAR-2 at DEHGAM - 400KV	D	AMP works	03/Oct/2019	9:00	03/Oct/2019	18:00	
86	PLANNED	OCC_523	POWERGRID_WR2	400KV/38.5KV SATNA-STATCOM-ICT-1 and 38.5KV Bus of STATCOM	D	AMP Work	03/Oct/2019	9:00	03/Oct/2019	18:00	
87	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-KHANDWA-DHULE-MS-1 AND KHANDWA - 400KV - BUS 1 at KHANDWA - 400KV	D	AMP WORK	03/Oct/2019	9:00	03/Oct/2019	18:00	
88	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-VINDHYACHAL-JABALPUR-1 AND JABALPUR - 400KV B/R 2 at JABALPUR - 400KV	D	Bay AMP	03/Oct/2019	9:00	03/Oct/2019	18:00	
89	PLANNED	OCC_523	POWERGRID_WR2	765KV-INDORE-VADODARA-1	D	AMP and Insulator replacement works by Vadodara, Dia	03/Oct/2019	9:00	03/Oct/2019	18:00	
90	PLANNED	OCC_523	POWERGRID_WR2	765KV-BINA-GWALIOR-1	D	For AMP of Line/Line Reactor . dia to be kept open at bo	03/Oct/2019	9:15	03/Oct/2019	17:30	
91	PLANNED	OCC_523	POWERGRID_WR1	220KV-RAIPUR-DOMA-2	D	AMP works at Raipur SS	03/Oct/2019	9:30	03/Oct/2019	17:30	
92	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - DAMOH - 400KV B/R 2 AND DAMOH - 400KV - BUS 2 at Damoh - 400KV	D	AMP Work	03/Oct/2019	9:30	03/Oct/2019	18:00	
93	PLANNED	OCC_523	TPL-DGEN	400KV/22KV DGEN-GT-1	D	De Energization of Transformer for Energy Conservation (	03/Oct/2019	10:00	03/Oct/2019	17:00	DGEN Unit under RSD
94	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-NAVSARI-2	D	AMP works at GETCO Navsari	03/Oct/2019	10:00	03/Oct/2019	17:00	
95	PLANNED	OCC_523	POWERGRID_WR2	JABALPUR-PS - 400KV B/R 1	D	For AMP Works. Dia to be kept open.	03/Oct/2019	10:00	03/Oct/2019	18:00	
96	PLANNED	OCC_523	TPL-DGEN	400KV-NAVSARI-DGEN-1	D	Online SF6 Gas filling at remote end 400KV DGEN Navsa	03/Oct/2019	11:00	03/Oct/2019	13:00	
97	PLANNED	OCC_523	TPL-DGEN	400KV/22KV DGEN-GT-2	D	De-Energization of Transformer for Energy Conservation (	03/Oct/2019	12:00	03/Oct/2019	17:00	DGEN Unit under RSD
98	PLANNED	OCC_523	TPL-DGEN	400KV-NAVSARI-DGEN-2	D	Online SF6 Gas filling at remote end 400KV DGEN Navsa	03/Oct/2019	14:00	03/Oct/2019	17:00	
99	PLANNED	OCC_523	GETCO	KASOR- 400 kV Aux (Transfer) Bus	Continuous	Replacement of pantograph isolator of 400 kV Aux Bus for overhauling work of pantograph isolators of ICT-02 and 400 kV GPEC feeder bay.	03/Oct/2019	7:00	04/Oct/2019	18:00	
100	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NAGOTHANE-1	Daily	Earth wire replacement ,Routine maint., Faulty string rep	03/Oct/2019	08:00	04/Oct/2019	18:00	Load will be managed on 400KV Dabhol-Nagothane II line
101	PLANNED	OCC_523	NTPC	400KV/132KV SOLAPUR-NTPC-ICT-1	C	Preventive maintenance activities	03/Oct/2019	8:00	04/Oct/2019	18:00	Preventive maintenance activities
102	PLANNED	OCC_523	NTPC	VSTPS BUS SECTION-3 (Stage-III, Bay No. 28)	Continuous	Annual Bay Maintenance	03/Oct/2019	8:00	04/Oct/2019	18:30	Annual Bay Maintenance
103	PLANNED	OCC_523	MSETCL	CHANDRAPUR SWITCHING STATION - 400KV - BUS 1	Daily	for Diagnostic testing & allied bay maintenance work	03/Oct/2019	09:00	04/Oct/2019	17:00	Subject to availability of generating units
104	PLANNED	OCC_523	GETCO	400 kV CHARAL - KOSAMBA - 1	Daily	Bay Maintenanance & condition monitoring work	03/Oct/2019	9:00	04/Oct/2019	18:00	
105	PLANNED	OCC_523	NTPC	400KV Korba Mahan Line outage & Bay at NTPC Korba end	D	For Shunt reactor erection work & Opportunity work per	03/Oct/2019	8:00	05/Oct/2019	18:30	
106	PLANNED	OCC_523	CSPTCL	400 KV Bay no. 2-ICT (500MVA) at 400 KV HTPS, Korba (West).	c	Replacement & installation work of CTalong with testing	03/Oct/2019	8:30	05/Oct/2019	17:30	
107	PLANNED	OCC_523	MP_SLDC	400KV Sarni-Seoni Bay with 400 KV Main Bus -II at 400 kv S/s Satpura	C	For Replacement of PG isolator of Main Bus II of 400 KV	03/Oct/2019	9:00	06/Oct/2019	18:00	400 KV Sarni Seoni feeder wiil br in service through TIE Breaker .After completion of work 400kv Seoni Feeder will remain out for 2 hrs. for getting charge through 400KV Seoni feeder breaker
108	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIGARH-JHARSUGUDA-1 AND 400KV/220KV RAIGARH-ICT-1 at Raigarh - 400KV	D	For AMP works	04/Oct/2019	9:00	04/Oct/2019	18:00	
109	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-NIZAMABAD-2 L/R@ WARDHA - 765KV	D	For AMP work	04/Oct/2019	9:00	04/Oct/2019	18:00	
110	PLANNED	OCC_523	POWERGRID_WR1	Main Bay - 765KV-RAIPUR-PS (DURG)-CHAMPA-2 AND CHAMPA - 765KV - Bus 1 at CHAMPA - 765KV	D	For AMP WORK	04/Oct/2019	9:00	04/Oct/2019	17:30	
111	PLANNED	OCC_523	GETCO	400 kV-GPEC-KASOR-1	Daily	replacement of pantograph isolators on 400 kV GPEC fee	04/Oct/2019	7:00	04/Oct/2019	17:00	
112	PLANNED	OCC_523	GETCO	400 kV-SSP-DHULE-MS-2	Daily	PMM work.	04/Oct/2019	7:00	04/Oct/2019	18:00	Auto reclose of SSP- Dhule No. 1 will remain out
113	PLANNED	OCC_523	POWERGRID_WR1	PARLI NEW - 765KV B/R 1	D	PRD Oil Leakage	04/Oct/2019	8:00	04/Oct/2019	10:00	
114	PLANNED	OCC_523	GETCO	ICHCHAPUR - 220 kV - BUS 1	Daily	Preventive Maintenance work	04/Oct/2019	8:00	04/Oct/2019	18:00	All EHV lines will remain on bus - 2
115	PLANNED	OCC_523	GETCO	400 kV-HADALA-VARSANA-1	Daily	Feeder Bay Water Washing work and maintenance work	04/Oct/2019	8:00	04/Oct/2019	18:00	
116	PLANNED	OCC_523	MP_SLDC	220KV Bhanpura - Ranpur (KOTA)	D	For line maintenance work	04/Oct/2019	8:00	04/Oct/2019	18:00	

117	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV/400KV TAMNAR-ICT-1 AND 400KV-JPL EXTN-TAMNAR-4 (408 BAY) at TAMNAR - 400KV	D	For AMP Works	04/Oct/2019	8:00	04/Oct/2019	20:00	
118	PLANNED	OCC_523	POWERGRID_WR1	400KV-BHADRAWATI-RAIPUR-2	D	Auto-reclose relay retro-fitting works in Main Bay at Raip	04/Oct/2019	8:00	04/Oct/2019	20:00	
119	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-1 AND RAIGARH-PS - 765KV - BUS 2 at RAIGARH-PS - 765KV	D	For AMP works	04/Oct/2019	9:00	04/Oct/2019	17:00	
120	PLANNED	OCC_523	MP_SLDC	220KV Gwalior (PGCIL)-Malanpur-II	D	For line maintenance work	04/Oct/2019	9:00	04/Oct/2019	17:00	
121	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV ICT 2 -DHARAMJAYGARH AND FUTURE at DHARAMJAYGARH - 765 KV at DHARAMJAYGARH - 400KV	D	For AMP works	04/Oct/2019	9:00	04/Oct/2019	17:00	Missed in data base
122	PLANNED	OCC_523	POWERGRID_WR2	400KV-KALA-VAPI-2	D	For AMP Works. A/R OFF of ckt-1, dia to be kept open at	04/Oct/2019	9:00	04/Oct/2019	17:00	
123	PLANNED	OCC_523	POWERGRID_WR2	765KV/400KV BANASKANTHA-ICT-2	D	Spare changeover with B phase. Dia to be kept open on b	04/Oct/2019	9:00	04/Oct/2019	17:00	
124	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - VINDHYACHAL(PS) - 765KV B/R 1 AND FUTURE at Vindhyachal(PS) - 765KV	D	For Bay AMP work	04/Oct/2019	9:00	04/Oct/2019	17:00	
125	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 400KV - BUS 1	D	JUMPER CONNECTION UNDER EXTENSION OF BHUJ S	04/Oct/2019	9:00	04/Oct/2019	17:00	CONSTRUCTION
126	PLANNED	OCC_523	POWERGRID_WR2	BOISAR - 400KV - BUS 2	D	For AMP Works	04/Oct/2019	9:00	04/Oct/2019	17:30	
127	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-4 AND KORADI-III - 400KV - BUS 2 at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	04/Oct/2019	09:00	04/Oct/2019	18:00	Maintenance of Bay Equipment
128	PLANNED	OCC_523	MSETCL	220KV-AURANGABAD-CHITEGAON-2	Daily	Routine Maintenance & Diagnostic testing work	04/Oct/2019	09:00	04/Oct/2019	18:00	Routine Maintenance & Diagnostic testing work
129	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV RAIGARH-ICT-1 AND RAIGARH - 400KV - BUS 2 at Raigarh - 400KV	D	For AMP works	04/Oct/2019	9:00	04/Oct/2019	18:00	
130	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY-400KV-BILASPUR-LANCO-2 AND FUTURE at BILASPUR - 400KV	D	For AMP works	04/Oct/2019	9:00	04/Oct/2019	18:00	Missed in data base
131	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV MAPUSA-ICT-3 AND MAPUSA - 400KV - BUS 2 at MAPUSA - 400KV	D	For AMP works.	04/Oct/2019	9:00	04/Oct/2019	18:00	
132	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - PARLI - 400KV B/R 1 AND PARLI - 400KV - BUS 1 at PARLI - 400KV	D	For bay AMP works	04/Oct/2019	9:00	04/Oct/2019	18:00	
133	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-PARLI-SOLAPUR-2 AND SOLAPUR - 400KV - BUS 1 at Solapur - 400KV	D	To change Bph CT bellow due to low oil level.	04/Oct/2019	9:00	04/Oct/2019	18:00	
134	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV PUNE-GIS-ICT-2	D	For taking Winding resistance at all Taps in forward/reve	04/Oct/2019	9:00	04/Oct/2019	18:00	
135	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARORA-PG-PARLI-1	D	For line AMP works & 400 KV Warora-Parli# 2 AR in NOI	04/Oct/2019	9:00	04/Oct/2019	18:00	
136	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV INDORE-ICT-1 AND INDORE - 765KV - BUS 2 at INDORE - 765KV	D	AMP WORKS	04/Oct/2019	9:00	04/Oct/2019	18:00	
137	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV/220KV DEHGAM-ICT-3 AND 400KV/220KV DEHGAM-ICT-2 at DEHGAM - 400KV	D	AMP works	04/Oct/2019	9:00	04/Oct/2019	18:00	
138	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-ITARSI-4	D	For AMP Works/to attend shut down nature defect of Lin	04/Oct/2019	9:00	04/Oct/2019	18:00	
139	PLANNED	OCC_523	POWERGRID_WR2	BAY NO. 601 (STATCOM 1 BAY) at Satna	D	AMP Work	04/Oct/2019	9:00	04/Oct/2019	18:00	
140	PLANNED	OCC_523	POWERGRID_WR2	765KV-BINA-GWALIOR-2	D	For AMP of Line/Line Reactor . dia to be kept open at bot	04/Oct/2019	9:15	04/Oct/2019	17:30	
141	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DAMOH-ICT-1 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	AMP Work	04/Oct/2019	9:30	04/Oct/2019	18:00	
142	PLANNED	OCC_523	POWERGRID_WR2	400KV-GWALIOR-MORENA-1	D	For Point to point testing and NTAMC integration. Dia to	04/Oct/2019	9:45	04/Oct/2019	18:00	
143	PLANNED	OCC_523	MSETCL	TIE BAY (403) OF ICT - 1 & AURANGABAD CKT - 1 @ AKOLA	Daily	Routine Maintenance & testing work	04/Oct/2019	10:00	04/Oct/2019	17:00	na
144	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-NAVSARI-1	D	AMP works at GETCO Navsari	04/Oct/2019	10:00	04/Oct/2019	17:00	
145	PLANNED	OCC_523	POWERGRID_WR2	JABALPUR-PS - 400KV B/R 2	D	For AMP Works. Dia to be kept open.	04/Oct/2019	10:00	04/Oct/2019	18:00	
146	PLANNED	OCC_523	POWERGRID_WR2	765KV/400KV VADODARA-ICT-1	D	For Spare ICT free and AMP work of R and B Phase. Dia	04/Oct/2019	10:00	04/Oct/2019	18:00	
147	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV PUNE-PG-ICT-1 AND PUNE-PG - 400KV - BUS 2 at PUNE-PG - 400KV	D	AMP Work	04/Oct/2019	9:00	04/Oct/2019	18:00	
148	PLANNED	OCC_523	MP_SLDC	220KV ICT-I at 220KV S/s Sukha	C	For bay equipment maintenance and testing work	04/Oct/2019	9:00	05/Oct/2019	17:00	
149		OCC_523	RRVPNL	MODAK (220KV)-BHANPURA MPSEB-WR (220KV)+MPSE	DAILY	QUARTERLY MAINTENANCE WORK AT 220KV GSS MOR	04/Oct/2019	09:30	04/Oct/2019	16:00	
150	PLANNED	OCC_523	GETCO	400 kV-SSP-DHULE-MS-1	Daily	PMM work.	05/Oct/2019	7:00	05/Oct/2019	18:00	Auto reclose of SSP- Dhule No. 2 will remain out
151	PLANNED	OCC_523	POWERGRID_WR2	400KV/32KV GWALIOR-STATCOM-ICT-1	D	For fine tunning of CSD in coupling Transformer and Po	05/Oct/2019	9:45	05/Oct/2019	18:00	
152	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-VAV-1	D	For NHSRCL Diversion Work: Tower Erection	05/Oct/2019	10:00	06/Oct/2019	17:00	
153	PLANNED	OCC_523	MSETCL	AURANGABAD-M (WALUJ) - 400KV - BUS 2	Daily	ROUTINE MAINTENANCE WORKS	05/Oct/2019	09:00	05/Oct/2019	17:00	ROUTINE MAINTENANCE WORKS
154	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 220KV-AURANGABAD-CHITEGAON-1 AND AURANGABAD - 220KV - BUS 1 at AURANGABAD - 220KV	D	For AMP works	05/Oct/2019	9:00	05/Oct/2019	18:00	
155	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - RAIPUR-PS (DURG) - 765KV B/R 1 AND 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-1 at RAIPUR-PS (DURG) - 765KV	D	For AMP works	05/Oct/2019	9:00	05/Oct/2019	18:00	
156	PLANNED	OCC_523	POWERGRID_WR2	400KV-DEHGAM-GANDHAR-1	C	By Vadodara- For diversion of 400kV Gandhar- Dehgam	05/Oct/2019	9:00	24/Oct/2019	18:00	
157	PLANNED	OCC_523	POWERGRID_WR2	400KV-DEHGAM-GANDHAR-2	C	By Vadodara- For diversion of 400kV Gandhar- Dehgam	05/Oct/2019	9:00	24/Oct/2019	18:00	
158	PLANNED	OCC_523	GETCO	400 kV-SSP-ASOJ-1	Daily	PMM work.	05/Oct/2019	7:00	05/Oct/2019	18:00	Auto reclose of SSP- Kasor will remain out
159	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV TAMNAR-ICT-1 AND TAMNAR - 400KV - BUS 1 (409 BAY) at TAMNAR - 400KV	D	For AMP Works	05/Oct/2019	8:00	05/Oct/2019	20:00	
160	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV CHAMPA-ICT-2 AND CHAMPA - 400KV - BUS 1 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	05/Oct/2019	9:00	05/Oct/2019	13:00	
161	PLANNED	OCC_523	POWERGRID_WR2	220KV-TARAPUR 3&4-BOISAR-1	D	Main-I relay replacement & For tripping and A/R Trials	05/Oct/2019	9:00	05/Oct/2019	14:00	

162	PLANNED	OCC_523	MSETCL	400KV-WARORA-CHANDRAPU-II-1	Daily	Attending the issues of 400 KV releted to SCADA and Pr	05/Oct/2019	09:00	05/Oct/2019	17:00	Load will be managed on 400KV Chandrapur Ckt-2
163	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV BALCO-DHARAMJAYGARH-1 AND 400KV - BUS 2 at DHARAMJAYGARH - 400KV	D	For AMP works	05/Oct/2019	9:00	05/Oct/2019	17:00	Missed in data base
164	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 400KV - BUS 2	D	JUMPER CONNECTION UNDER EXTENSION OF BHUJ S	05/Oct/2019	9:00	05/Oct/2019	17:00	CONSTRUCTION
165	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 765KV/400KV KORADI-III-ICT-2 AND KORADI-III - 400KV - BUS 1 at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	05/Oct/2019	09:00	05/Oct/2019	18:00	Maintenance of Bay Equipment
166	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIGARH-JHARSUGUDA-3 AND RAIGARH - 400KV - BUS 1 at Raigarh - 400KV	D	For AMP works	05/Oct/2019	9:00	05/Oct/2019	18:00	
167	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-1	D	For Retrofitting of PLCC with DTPC, WT dismantlling & L	05/Oct/2019	9:00	05/Oct/2019	18:00	
168	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV SATNA-ICT-3	D	AMP Work. Dia to be kept open on both ends	05/Oct/2019	9:00	05/Oct/2019	18:00	
169	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-INDORE-PITHAMPUR-1 AND INDORE - 400KV - BUS 1 at INDORE - 400KV	D	BAY AMP WORKS	05/Oct/2019	9:00	05/Oct/2019	18:00	
170	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - DEHGAM - 400KV B/R 2 AND DEHGAM - 400KV - BUS 2 at DEHGAM - 400KV	D	AMP works	05/Oct/2019	9:00	05/Oct/2019	18:00	
171	PLANNED	OCC_523	POWERGRID_WR2	TBC BAY - PIRANA - 220KV	D	AMP work	05/Oct/2019	9:00	05/Oct/2019	18:00	
172	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL-JABALPUR-1 AND JABALPUR - 400KV - BUS 1 at JABALPUR - 400KV	D	Bay AMP	05/Oct/2019	9:00	05/Oct/2019	18:00	
173	PLANNED	OCC_523	POWERGRID_WR2	400KV-GWALIOR-MORENA-2	D	For Point to point testing and NTAMC integration. Dia to	05/Oct/2019	9:45	05/Oct/2019	18:00	
174	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV/400KV CHAMPA-ICT-2 AND 765KV/400KV CHAMPA-ICT-3 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	05/Oct/2019	14:00	05/Oct/2019	17:30	Missed in data base
175	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NAGOTHANE-2	Daily	Earth wire replacement ,Routine maint. , Faulty string re	05/Oct/2019	08:00	06/Oct/2019	18:00	Load will be managed on 400KV Dabhol-Nagothane I line
176	PLANNED	OCC_523	KTL-Sterlite	400KV-KHANDWA-RAJGARH-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	05/Oct/2019	8:00	06/Oct/2019	18:00	
177	PLANNED	OCC_523	KTL-Sterlite	400KV-KHANDWA-KHARGONE-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	05/Oct/2019	8:00	06/Oct/2019	18:00	
178	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-1 L/R@ WARDHA - 765KV	C	For AMP work, NGR Replacement	05/Oct/2019	9:00	06/Oct/2019	18:00	
179	PLANNED	OCC_523	POWERGRID_WR2	400KV-VADODARA-ASOJ-2	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos I	05/Oct/2019	8:00	07/Oct/2019	8:00	
180	PLANNED	OCC_523	MSETCL	400KV-KALWA-PADGHE-2 ON TBC @ KALWA	Daily	400 KV CB Pole and mechanism overhauling work	05/Oct/2019	09:30	07/Oct/2019	17:30	Feeder will be shifted on TBC. There will be no interruption
181	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-RANCHODPURA-2	D	Providing Bird Diverters. A/R OFF of ckt-1 and dia to be	05/Oct/2019	8:00	08/Oct/2019	18:00	
182	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-VAV-1	C	Simultaneous S/D for NHSRCL Diversion Work, Tower E	05/Oct/2019	10:00	09/Oct/2019	17:00	
183	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-VAV-2	C	Simultaneous S/D for NHSRCL Diversion Work, Tower E	05/Oct/2019	10:00	09/Oct/2019	17:00	
184	PLANNED	OCC_523	NTPC	220KV-KAWAS-VAV-1	C	CT replacement. Dismanteling of Old CTs and erection ar	05/Oct/2019	9:00	08/Oct/2019	18:00	Same was approved in 522 OCCM but could not be availed due to heavy rain.
185	PLANNED	OCC_523	POWERGRID_WR1	WARDHA - 765KV - BUS 1	D	For AMP work	06/Oct/2019	9:00	06/Oct/2019	18:00	
186	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 220KV-AURANGABAD-SHENDRA-1 AND AURANGABAD - 220KV - BUS 1 at AURANGABAD - 220KV	D	For AMP works	06/Oct/2019	9:00	06/Oct/2019	18:00	
187	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR-PS - 400KV B/R 2 AND JABALPUR-PS - 400KV - BUS 2 at JABALPUR-PS - 400KV	D	AMP Works	06/Oct/2019	10:00	06/Oct/2019	16:00	
188	PLANNED	OCC_523	JPNIGRIE	400KV-JP NIGRIE-SATNA-2	D	To provide Step Bolts on the Towers and Cutting/Trimmi	06/Oct/2019	9:00	06/Oct/2019	17:00	
189	PLANNED	OCC_523	POWERGRID_WR2	BOISAR - 220KV - BUS 1	D	For AMP Works	06/Oct/2019	9:00	06/Oct/2019	17:30	
190	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARORA-PG-PARLI-2	D	For line AMP works & 400 KV Warora-Parli# 1 AR in NOI	07/Oct/2019	9:00	07/Oct/2019	18:00	
191	PLANNED	OCC_523	GETCO	KASOR- 400 kV Aux (Transfer) Bus	Daily	Replacement of pantograph isolator of 400 kV Aux Bus for overhauling work of pantograph isolators of SSP feeder bay.	07/Oct/2019	7:00	07/Oct/2019	18:00	
192	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-BACHAU-MORBI-1 AND BACHAU - 220KV - BUS 1 at BACHAU - 220KV	D	For AMP of CB. Line will be in service through TBC	07/Oct/2019	8:00	07/Oct/2019	18:00	
193	PLANNED	OCC_523	POWERGRID_WR1	Main Bay - 765KV/400KV CHAMPA-ICT-5 AND CHAMPA - 765KV - Bus 2 at CHAMPA - 765KV	D	For AMP WORK	07/Oct/2019	9:00	07/Oct/2019	13:00	
194	PLANNED	OCC_523	POWERGRID_WR2	400KV-KALA-VAPI-2	D	AMP of Terminal equipments. A/R OFF of ckt-1 and dia t	07/Oct/2019	9:00	07/Oct/2019	13:00	
195	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV BALCO 2 AND FUTURE at DHARAMJAYGARH - 765 KV at DHARAMJAYGARH - 765KV	D	For AMP works	07/Oct/2019	9:00	07/Oct/2019	17:00	Missed in data base
196	PLANNED	OCC_523	MEGPTCL	TIE BAY - 765KV/400KV KORADI-III-ICT-2 AND FUTURE at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	07/Oct/2019	09:00	07/Oct/2019	18:00	Maintenance of Bay Equipment
197	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-2 AND RAIPUR-PS (DURG) - 765KV - BUS 2 at RAIPUR-PS (DURG)	D	For AMP works	07/Oct/2019	9:00	07/Oct/2019	18:00	
198	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARORA-PG-PARLI NEW-2 L/R@ WARORA-PG - 765KV	D	Switchable Breaker AMP work . Line shall remain in serv	07/Oct/2019	9:00	07/Oct/2019	18:00	
199	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV SATNA-ICT-2	D	AMP Work. Dia to be kept open on both ends	07/Oct/2019	9:00	07/Oct/2019	18:00	
200	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV INDORE-KHANDWA LINE -1 (BAY -713)	c	BAY ISOLATOR 89 a ALIGNMENT	07/Oct/2019	9:00	07/Oct/2019	18:00	
201	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL-JABALPUR-2 AND JABALPUR - 400KV - BUS 2 at JABALPUR - 400KV	D	Bay AMP	07/Oct/2019	9:00	07/Oct/2019	18:00	
202	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-BINA-MP-BINA-4 AND FUTURE at BINA-MP - 400KV	D	For AMP work.	07/Oct/2019	9:15	07/Oct/2019	17:30	
203	PLANNED	OCC_523	POWERGRID_WR1	RAIPUR - 400KV B/R 2	D	AMP works at Raipur SS.	07/Oct/2019	9:30	07/Oct/2019	17:30	

204	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DAMOH-ICT-2 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	AMP Work	07/Oct/2019	9:30	07/Oct/2019	18:00	
205	PLANNED	OCC_523	POWERGRID_WR2	GWALIOR - 400KV B/R 2	D	AMP work and For control of Bus Reactor from STATCOM	07/Oct/2019	9:45	07/Oct/2019	18:00	
206	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-WARDHA-AKOLA-1 AND AKOLA - 400KV - BUS 2 at AKOLA - 400KV	Daily	Routine Maintenance & testing work	07/Oct/2019	10:00	07/Oct/2019	17:00	na
207	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY- 400KV-SHUJALPUR-BINA-1 AND SHUJALPUR - 400KV -BUS 1 at SHUJALPUR - 400KV	D	AMP Work	07/Oct/2019	10:00	07/Oct/2019	18:00	
208	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NEW KOYNA-1	Daily	Routine maint. Work & Faulty string replacement Work	07/Oct/2019	08:00	08/Oct/2019	18:00	Load will be managed on Dabhol-New Koyna CKT-II line
209	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-VAV-2	D	AMP works at GETCO vav	07/Oct/2019	10:00	07/Oct/2019	17:00	
210	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VADODARA-PIRANA-1 AND PIRANA - 400KV - BUS 1 at PIRANA - 400KV	D	AMP work	08/Oct/2019	9:00	08/Oct/2019	18:00	
211	PLANNED	OCC_523	GETCO	400 kV-SSP-KASOR-1	Daily	TBC isolator maintenance work and line maintenance wo	08/Oct/2019	7:00	08/Oct/2019	17:00	Auto reclose of SSP- Asoj and Asoj - Chorania will remain out
212	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-2 AND WARDHA - 765KV - BUS 2 at Wardha	D	For AMP work	08/Oct/2019	9:00	08/Oct/2019	18:00	
213	PLANNED	OCC_523	CGPL	MAIN BAY - CGPL - 400KV B/R 1 AND CGPL - 400KV - BUS 1	D	Breaker PM and testing	08/Oct/2019	8:00	08/Oct/2019	20:00	
214	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-PUNE-GIS-PARLI-1 AND PARLI - 400KV - BUS 2 at PARLI - 400KV	D	For bay AMP works	08/Oct/2019	9:00	08/Oct/2019	18:00	
215	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARORA-PG-PARLI-2 L/R@ WARORA-PG - 400KV	D	Switchable Breaker AMP work . Line shall remain in serv	08/Oct/2019	9:00	08/Oct/2019	18:00	
216	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-4	D	For Retrofitting of PLCC with DTPC, WT dismantlling & L	08/Oct/2019	9:00	08/Oct/2019	18:00	
217	PLANNED	OCC_523	POWERGRID_WR2	GWALIOR - 400KV B/R 3	D	AMP work and For control of Bus Reactor from STATCOM	08/Oct/2019	9:45	08/Oct/2019	18:00	
218	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY- 400KV-SHUJALPUR-BINA-1 AND SHUJALPUR - 400KV -ICT 1 at SHUJALPUR - 400KV	D	AMP Work	08/Oct/2019	10:00	08/Oct/2019	18:00	
219	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-4 L/R@ WARDHA - 765KV	C	For AMP work, NGR Replacement	08/Oct/2019	9:00	09/Oct/2019	18:00	
220	PLANNED	OCC_523	MSETCL	400KV-KORADI-BHUSAWAL-1	Continuous	Restringing of conductor of all three phases of 400 kV Ko	08/Oct/2019	08:00	12/Oct/2019	18:01	400 kV Akola- Bhusawal, 400 kV Akola-Nandgaonpeth & 400 kV Koradi-Nandgaonpeth are in service.
221	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-2	D	AR in non auto mode for PID testing	08/Oct/2019	8:00	14/Oct/2019	18:00	
222	PLANNED	OCC_523	POWERGRID_WR1	PUNE-PG - 400KV - BUS 2	D	Replacement of Clamp & connectors	08/Oct/2019	9:00	08/Oct/2019	18:00	
223	PLANNED	OCC_523	GETCO	220 kV-HALVAD-BHIMASAR-2	Daily	Bay Maintenance work	08/Oct/2019	8:00	08/Oct/2019	18:00	Maint work
224	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV BACHAU-ICT-2	D	Insulation coating work on tertiary equipment. AMP of Ba	09/Oct/2019	8:00	11/Oct/2019	18:00	
225	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARORA-PG-PARLI-1 L/R@ WARORA-PG - 400KV	D	Switchable Breaker AMP work . Line shall remain in serv	09/Oct/2019	9:00	09/Oct/2019	18:00	
226	PLANNED	OCC_523	POWERGRID_NR3	800kV HVDC Champa-Kurukshetra-1	D	For fixing of E/W VD,Grading Ring,Copper Bond, Rigid S	09/Oct/2019	7:00	09/Oct/2019	18:00	
227	PLANNED	OCC_523	MSETCL	220KV-PARLI-OSMANABAD-M-1	Daily	NH 211 Crossing and Work Line Maintenance	09/Oct/2019	08:00	09/Oct/2019	16:00	-
228	PLANNED	OCC_523	MSETCL	220KV-MAHALAXMI(KONALKATTA)-AMONA-1	Daily	Routine Maintenance & Dignostic testing work	09/Oct/2019	08:00	09/Oct/2019	17:00	-
229	PLANNED	OCC_523	GETCO	220 kV-HALVAD-BHIMASAR-1	Daily	Bay Maintenance work	09/Oct/2019	8:00	09/Oct/2019	18:00	Maint work
230	PLANNED	OCC_523	MSETCL	220KV-PANDURNA-KALMESHWAR-1	Daily	Routine Maintenance & Diagnostic testing work	09/Oct/2019	08:00	09/Oct/2019	18:00	_
231	PLANNED	OCC_523	MP_SLDC	400KV Badnawar - Rajgarh-I	D	For line maintenance work	09/Oct/2019	8:00	09/Oct/2019	18:00	
232	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-LALPAR-GUJARAT-BACHAU-1 AND BACHAU - 220KV - BUS 1 at BACHAU - 220KV	D	For AMP of CB. Line will be in service through TBC	09/Oct/2019	8:00	09/Oct/2019	18:00	
233	PLANNED	OCC_523	NTPC	VSTPS BUS #5	Continuous	Rectification of Bus-5 side isolator alignment.	09/Oct/2019	8:00	09/Oct/2019	18:30	Rectification of Bus-5 side isolator alignment.
234	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV/26KV CGPL-GT-1 AND CGPL - 400KV - BUS 1	D	Breaker PM and testing	09/Oct/2019	8:00	09/Oct/2019	20:00	
235	PLANNED	OCC_523	MP_SLDC	220KV Gwalior (PGCIL)-Mahalgaon-I	D	For line maintenance work	09/Oct/2019	9:00	09/Oct/2019	17:00	
236	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV, ICT 1 AND DHARAMJAYGARH - 400KV - BUS 2 at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 765KV	D	For AMP works	09/Oct/2019	9:00	09/Oct/2019	17:00	Missed in data base
237	PLANNED	OCC_523	POWERGRID_WR2	220KV-VAPI-MAGARWADA-1	D	AMP of Terminal equipments	09/Oct/2019	9:00	09/Oct/2019	17:00	
238	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-BOISAR-BOISAR-M-2 AND BOISAR - 220KV - BUS 1 at BOISAR - 220KV	D	FOR AMP Works. Line will be in service through TBC.	09/Oct/2019	9:00	09/Oct/2019	17:30	
239	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV/220KV SOLAPUR-ICT-2 AND 400KV-SOLAPUR-M-SOLAPUR-1 at Solapur - 400KV	Daily	Diagnostic Testing of 405-52 CB and allied equipment	09/Oct/2019	09:00	09/Oct/2019	18:00	Load will be managed on 400KV LBT-Parali Line
240	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-3 AND KORADI-III - 400KV - BUS 2 at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	09/Oct/2019	09:00	09/Oct/2019	18:00	Maintenance of Bay Equipment
241	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 220KV-AURANGABAD-SHENDRA-2 AND AURANGABAD - 220KV - BUS 1 at AURANGABAD - 220KV	D	For AMP works	09/Oct/2019	9:00	09/Oct/2019	18:00	
242	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIPUR-PS (DURG)-GMR CHHATTISGARH-2 AND FUTURE at RAIPUR-PS (DURG) - 400KV	D	For AMP works	09/Oct/2019	9:00	09/Oct/2019	18:00	

243	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHADRAWATI-GWEL-2 AND BHADRAWATI - 400KV - BUS 1 at BHADRAWATI - 400KV	D	For AMP works	09/Oct/2019	9:00	09/Oct/2019	18:00	
244	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-PUNE-PG-SOLAPUR-1 AND SOLAPUR - 765KV - BUS 2 at Solapur - 765KV	D	Bay AMP works.	09/Oct/2019	9:00	09/Oct/2019	18:00	
245	PLANNED	OCC_523	POWERGRID_WR1	765KV-PUNE-PG-SOLAPUR-1	D	For attending Hot Spot in Y-ph Wave Trap at Pune-GIS en	09/Oct/2019	9:00	09/Oct/2019	18:00	
246	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DEHGAM-KHANPUR-1 AND DEHGAM - 220KV - BUS 1 at DEHGAM - 220KV	D	AMP works. Line will remain in service through TBC	09/Oct/2019	9:00	09/Oct/2019	18:00	
247	PLANNED	OCC_523	POWERGRID_WR2	BAY NO. 602 (STATCOM 2 BAY) at Satna	D	AMP Work	09/Oct/2019	9:00	09/Oct/2019	18:00	
248	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-BINA-MP-BINA-1 AND FUTURE at BINA-MP - 400KV	D	For AMP work.	09/Oct/2019	9:15	09/Oct/2019	17:30	
249	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-SIPAT-RAIPUR-1 AND RAIPUR - 400KV - BUS 2 at RAIPUR - 400KV	D	AMP works at Raipur SS.	09/Oct/2019	9:30	09/Oct/2019	17:30	
250	PLANNED	OCC_523	POWERGRID_WR2	TBC BAY - DAMOH - 220KV - BUS 1 AND FUTURE at Damoh - 220KV	D	AMP Work	09/Oct/2019	9:30	09/Oct/2019	18:00	
251	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-63MVAR Bus Reactor - 400KV - BUS 2 at SHUJALPUR - 400KV	D	AMP Work	09/Oct/2019	10:00	09/Oct/2019	18:00	
252	PLANNED	OCC_523	MSETCL	220KV-SOLAPUR-KUMBARI-1	Daily	Quarterly Maintenance & Diagnostic Testing Work	09/Oct/2019	11:00	09/Oct/2019	16:00	Outage is required for Quarterly Maintenance & Diagnostic Testing Work
253	PLANNED	OCC_523	POWERGRID_WR1	Tie Bay - 765KV/400KV CHAMPA-ICT-2 AND 765KV-RAIGARH-PS-CHAMPA-2 at CHAMPA - 765KV	D	For AMP WORK	09/Oct/2019	14:00	09/Oct/2019	17:30	
254	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NAGOTHANE-1	Daily	TREE CUTTING WORK	09/Oct/2019	08:00	10/Oct/2019	17:00	NIL
255	PLANNED	OCC_523	GETCO	220 kV-DEHGAM (PG)-KHANPUR-1	Daily	Bay equipment maintenance work at Khanpur end	09/Oct/2019	8:00	10/Oct/2019	18:00	
256	PLANNED	OCC_523	NTPC	400KV/132KV SOLAPUR-NTPC-ICT-2	C	Preventive maintenance activities	09/Oct/2019	8:00	10/Oct/2019	18:00	Preventive maintenance activities
257	PLANNED	OCC_523	NTPC	VSTPS BUS COUPLER#3 BAY (Stage-III, Bay No. 35)	Continuous	Annual Bay Maintenance	09/Oct/2019	8:00	10/Oct/2019	18:30	Annual Bay Maintenance
258	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 765KV - BUS 1	D	RTV Coating STAGE-4	09/Oct/2019	9:00	10/Oct/2019	17:00	CONSTRUCTION
259	PLANNED	OCC_523	MP_SLDC	400KV BHEL Bus Reactor at 400KV S/s Bina	C	For Post Monsoon maintenace work & Testing work	09/Oct/2019	8:00	11/Oct/2019	17:00	
260	PLANNED	OCC_523	NTPC	400KV Korba Mahan Line outage & Bay at NTPC Korba end	Daily	For Shunt reactor erection work	09/Oct/2019	8:00	11/Oct/2019	18:30	For Shunt reactor erection work
261	PLANNED	OCC_523	POWERGRID_WR2	TBC BAY - ITARSI - 220KV - BUS 1 AND FUTURE	C	For CB Driving Mechanisam Overhauling works at Itarsi	09/Oct/2019	9:00	12/Oct/2019	18:00	
262	PLANNED	OCC_523	POWERGRID_WR2	400KV-RANCHODPURA-CHORANIA-2	C	CB overhauling work at Vadavi, Line will be in service the	09/Oct/2019	9:00	16/Oct/2019	18:00	
263	PLANNED	OCC_523	POWERGRID_WR2	400KV-VADINAR-BACHAU-1	D	Providing Bird Diverters. A/R OFF of ckt-2 and dia to be	09/Oct/2019	8:00	17/Oct/2019	18:00	
264	PLANNED	OCC_523	GETCO	400 kV-HADALA-CHORANIA-1	D	Feeder Bay Water Washing work and maintenance work	09/Oct/2019	8:00	09/Oct/2019	18:00	
265		OCC_523	POWERGRID	KURUKSHETRA-CHAMPA POLE-1/1500	DAILY	For fixing Earth wire VD, Grading Ring, Copper bond, Rig	09/Oct/2019	09:00	09/Oct/2019	17:00	
266	PLANNED	OCC_523	GETCO	ICHCHAPUR - 220 kV - BUS 2	Daily	Preventive Maintenance work	10/Oct/2019	8:00	10/Oct/2019	18:00	All EHV lines will remain on bus - 1
267	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-VINDHYACHAL-JABALPUR-2 AND 400KV-JABALPUR-REWA-2 at JABALPUR - 400KV	D	Bay AMP	10/Oct/2019	9:00	10/Oct/2019	18:00	
268	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-2 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	09:30	10/Oct/2019	10:00	1) 400KV Koradi-II Koradi-III Ckt.-II will remain in service through Tie Bay 405. 2) Outage subject to weather Condition & availablity of Kit.
269	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV/11.5KV KORADI-II-ST-2 AND 400KV-KORADI-II-KORADI-III-1 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	10:00	10/Oct/2019	10:30	1)Station Transformer II will remain in service through Main Bay 407 & Koradi-II CKt-I will remain service through Main Bay 409 2) Outage subject to weather Condition & availability of Kit.
270	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-1 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	10:30	10/Oct/2019	11:00	1)400KV Koradi-II Koradi-III Ckt.-I will remain service through Tie Bay 408. 2) Outage subject to weather Condition & availability of Kit.
271	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-WARDHA-KORADI-II-1 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	11:00	10/Oct/2019	11:30	1)400KV Wardha(PG) line will remain service through Tie Bay 411. 2) Outage subject to weather Condition & availability of Kit.
272	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHULE-KHANDWA-1 L/R@ DHULE - 765KV	D	For AMP works, line outage required for take out/in of nc	10/Oct/2019	7:00	10/Oct/2019	14:00	
273	PLANNED	OCC_523	GETCO	400 kV-SSP-RAJGARH-1	Daily	PMM work.	10/Oct/2019	7:00	10/Oct/2019	18:00	Auto reclose of SSP - Rajgadh No. 2 will remain out
274	PLANNED	OCC_523	POWERGRID_NR3	800kV HVDC Champa-Kurukshetra-2	D	For fixing of E/W VD,Grading Ring,Copper Bond, Rigid S	10/Oct/2019	7:00	10/Oct/2019	18:00	
275	PLANNED	OCC_523	GETCO	VARSANA - 400 kV - BUS 1	Daily	For replacement of Fix contact Rod & L clamp of 89A Isol	10/Oct/2019	8:00	10/Oct/2019	18:00	
276	PLANNED	OCC_523	GETCO	400 kV-CHARANKA-VARSANA-1	Daily	For replacement of Fix contact Rod & L clamp of 89A Isol	10/Oct/2019	8:00	10/Oct/2019	18:00	
277	PLANNED	OCC_523	GETCO	400 kV-AMRELI-JETPUR-2	D	Auto reclose checking	10/Oct/2019	8:00	10/Oct/2019	18:00	
278	PLANNED	OCC_523	MSETCL	400KV-LONIKHAND-CHAKAN-1	Daily	Line Maintenance & Routine Diagnostic testing work	10/Oct/2019	08:00	10/Oct/2019	18:00	-
279	PLANNED	OCC_523	MP_SLDC	400KV Badnawar - Rajgarh-II	D	For line maintenance work	10/Oct/2019	8:00	10/Oct/2019	18:00	

280	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-BACHAU-CHARADVADA-2 AND BACHAU - 220KV - BUS 1 at BACHAU - 220KV	D	For AMP of CB. line will be in service through TBC	10/Oct/2019	8:00	10/Oct/2019	18:00	
281	PLANNED	OCC_523	CGPL	CGPL MUNDRA 400KV BUS REACTOR	D	Reactor PM and Testing	10/Oct/2019	8:00	10/Oct/2019	20:00	
282	PLANNED	OCC_523	MSETCL	CHANDRAPUR SWITCHING STATION - 400KV - BUS 2	Daily	for Diagnostic testing & allied bay maintenance work	10/Oct/2019	09:00	10/Oct/2019	17:00	for Diagnostic testing & allied bay maintenance work
283	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV, ICT 2 AND DHARAMJAYGARH - 400KV - BUS 2 at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 765KV	D	For AMP works	10/Oct/2019	9:00	10/Oct/2019	17:00	Missed in data base
284	PLANNED	OCC_523	POWERGRID_WR1	RAIGARH-PS - 765KV B/R 1	D	For AMP works	10/Oct/2019	9:00	10/Oct/2019	17:00	
285	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV KALA-ICT-1	D	For AMP Works. Dia to kept open.	10/Oct/2019	9:00	10/Oct/2019	17:00	
286	PLANNED	OCC_523	POWERGRID	KOLHAPUR-MS - 400KV B/R 1	Daily	QMW	10/Oct/2019	09:00	10/Oct/2019	18:00	-
287	PLANNED	OCC_523	MP_SLDC	400KV-DAMOH-KATNI-1	D	For line maintenance work	10/Oct/2019	9:00	10/Oct/2019	18:00	
288	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIGARH-JHARSUGUDA-3 AND RAIGARH - 400KV B/R 1 at Raigarh - 400KV	D	For AMP works	10/Oct/2019	9:00	10/Oct/2019	18:00	
289	PLANNED	OCC_523	POWERGRID_WR1	400KV AC - 458 BAY - AC FILTER TIE BAY OF AC FILTER - I and II at CHAMPA-HVDC - 400KV	D	For AMP works	10/Oct/2019	9:00	10/Oct/2019	18:00	Missed in data base
290	PLANNED	OCC_523	POWERGRID_WR1	765KV-BILASPUR-SEONI-1 L/R@ BILASPUR - 765KV at BILASPUR - 765KV	D	For AMP works	10/Oct/2019	9:00	10/Oct/2019	18:00	
291	PLANNED	OCC_523	POWERGRID_WR1	PARLI - 400KV B/R 2	D	For bay AMP works	10/Oct/2019	9:00	10/Oct/2019	18:00	
292	PLANNED	OCC_523	POWERGRID_WR1	765KV/440KV WARDHA-ICT-2	D	For Y-Ph 400Kv side Isolator Arm Replacement work	10/Oct/2019	9:00	10/Oct/2019	18:00	
293	PLANNED	OCC_523	POWERGRID_WR2	SATNA - 400KV B/R 2	D	AMP Work. Dia to be kept open.	10/Oct/2019	9:00	10/Oct/2019	18:00	
294	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-SOJA-DEHGAM-1 AND DEHGAM - 400KV - BUS 1 at DEHGAM - 400KV	D	AMP works	10/Oct/2019	9:00	10/Oct/2019	18:00	
295	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-JABALPUR-REWA-1 AND JABALPUR - 400KV - BUS 1 at JABALPUR - 400KV	D	Bay AMP	10/Oct/2019	9:00	10/Oct/2019	18:00	
296	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BINA-BINA-NHPTL-1 AND BINA - 400KV - BUS 1 at BINA - 400KV	D	For AMP work.	10/Oct/2019	9:15	10/Oct/2019	17:30	
297	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV/11.5KV KORADI-II-ST-3 AND KORADI-II - 400KV - BUS 1 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	09:30	10/Oct/2019	10:00	1)Station Transformer III will remain in service through Tie Bay 405. 2) Outage subject to weather Condition & availability of Kit.
298	PLANNED	OCC_523	POWERGRID_WR1	220KV-RAIPUR-URLA-CHHATTISGARH-1	D	Auto-reclose relay retro-fitting works.	10/Oct/2019	9:30	10/Oct/2019	17:30	
299	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV TAMNAR-ICT-1	D	For AMP works	10/Oct/2019	9:30	10/Oct/2019	17:30	
300	PLANNED	OCC_523	POWERGRID_WR2	400KV-DAMOH-KATNI-1	D	For AMP Work of Terminal Equipments. Dia to be kept op	10/Oct/2019	9:30	10/Oct/2019	18:00	
301	PLANNED	OCC_523	POWERGRID_WR2	765KV-BINA-GWALIOR-3	D	For AMP Works / to attend shut down nature defects. Di	10/Oct/2019	9:45	10/Oct/2019	18:00	
302	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV/11.5KV KORADI-II-ST-3 AND 400KV-KORADI-II-KORADI-III-2 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	10:00	10/Oct/2019	10:30	Station Transformer III will remain in service through Main Bay 404 & Koradi-III CKt-II will remain service through Main Bay 406
303	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR-PS - 400KV B/R 1 AND JABALPUR-PS - 400KV - BUS 2 at JABALPUR-PS - 400KV	D	AMP Works	10/Oct/2019	10:00	10/Oct/2019	16:00	
304	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-WARDHA-AKOLA-2 AND AKOLA - 400KV - BUS 2 at AKOLA - 400KV	Daily	Routine Maintenance & testing work	10/Oct/2019	10:00	10/Oct/2019	17:00	na
305	PLANNED	OCC_523	MEGPTCL	765KV/400KV KORADI-III-ICT-2	Daily	Maintenance of ICT	10/Oct/2019	10:00	10/Oct/2019	18:00	Maintenance of ICT
306	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-NAGDA-SHUJALPUR-1 AND SHUJALPUR - 400KV - BUS 1 at SHUJALPUR - 400KV	D	AMP Work	10/Oct/2019	10:00	10/Oct/2019	18:00	
307	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV/11.5KV KORADI-II-ST-2 AND KORADI-II - 400KV - BUS 1 at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	10:30	10/Oct/2019	11:00	1)Station Transformer II will remain in service through Tie Bay 408. 2) Outage subject to weather Condition & availability of Kit.
308	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV-WARDHA-KORADI-II-1 AND FUTURE at KORADI-II - 400KV	Daily	Dew Point Measurement of SF6 Gas of Circuit Breaker	10/Oct/2019	11:00	10/Oct/2019	11:30	1) 400KV Wardha(PG) line will remain service through Main Bay 412. 2) Outage subject to weather Condition & availability of Kit.
309	PLANNED	OCC_523	CSPTCL	315 MVA ICT -II at 400 KV S/s Raita.	c	Annual Maintenance Programme.	10/Oct/2019	8:00	11/Oct/2019	17:00	
310	PLANNED	OCC_523	GETCO	400 kV-KASOR-CHORANIA - 1	D	Line maintenance work	10/Oct/2019	8:00	11/Oct/2019	17:00	
311	PLANNED	OCC_523	MSETCL	220KV-WARDHA-WARDHA-M-1	Daily	Restoration of line from ERS to new erected tower from L	10/Oct/2019	08:00	11/Oct/2019	18:00	na
312	PLANNED	OCC_523	KTL-Sterlite	400KV-SINGAJI-PITHAMPUR-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	10/Oct/2019	8:00	11/Oct/2019	18:00	
313	PLANNED	OCC_523	KTL-Sterlite	400KV-SINGAJI-PITHAMPUR-2	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	10/Oct/2019	8:00	11/Oct/2019	18:00	
314	PLANNED	OCC_523	POWERGRID_WR1	Main Bay - 765KV/400KV CHAMPA-ICT-4 AND CHAMPA - 765KV - Bus 4 at CHAMPA - 765KV	D	For AMP WORK	10/Oct/2019	9:00	11/Oct/2019	17:30	
315	PLANNED	OCC_523	KTL-Sterlite	765KV-DHULE-KHANDWA-1 LR@DHULE - 765KV	D	For PSD Commissioning	10/Oct/2019	9:00	11/Oct/2019	18:00	
316	PLANNED	OCC_523	POWERGRID_WR1	400KV-PADGHE-BOISAR-1	C	For Replacement of Line CT due to oil leakage at Padghe	10/Oct/2019	10:00	11/Oct/2019	12:00	
317	PLANNED	OCC_523	TPL-DGEN	400KV/220KV DGEN-ICT-1	C	ICT 1 routine energisation testing during RSD and shutd	10/Oct/2019	10:00	11/Oct/2019	17:00	ICT No load charging only, Not connected at 220 KV side.

318	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV SEONI-ICT-1	C	For taking Spare Unit in Service	10/Oct/2019	9:00	12/Oct/2019	17:30	
319	PLANNED	OCC_523	POWERGRID_WR2	INDORE-MP - 400KV - BUS 1	C	FOR BUS - 1 ISOLATOR RETROFITTING WORK OF ASOJ	10/Oct/2019	9:00	12/Oct/2019	18:00	
320	PLANNED	OCC_523	CSPTCL	400 KV Bay no. 8 Bus Coupler along with Bus-I dead at 400 KV HTPS, Korba (West).	c	Installation, Commissioning & Testing work of control &	10/Oct/2019	8:30	19/Oct/2019	17:30	
321	PLANNED	OCC_523	POWERGRID_WR1	765KV-AURANGABAD-Solapur-2 L/R@ Solapur - 765KV	D	Reactor AMP works.	10/Oct/2019	9:00	10/Oct/2019	18:00	
322		OCC_523	POWERGRID	KUREKSHETRA -CHAMPA POLE -II/800	DAILY	For fixing Earth wire VD, Grading Ring, Copper bond, Rig	10/Oct/2019	09:00	10/Oct/2019	17:00	
323	PLANNED	OCC_523	POWERGRID_WR2	765KV-SATNA-GWALIOR-2	D	For AMP Works / to attend shut down nature defects. Di	11/Oct/2019	9:45	11/Oct/2019	18:00	
324	PLANNED	OCC_523	POWERGRID_WR1	220KV-TALEGAON-PUNE-PG-1	D	For line equipments AMP work & Relay Testing, at PUNE	11/Oct/2019	9:00	11/Oct/2019	18:00	
325	PLANNED	OCC_523	GETCO	HADALA - 400 kV - BUS 1	D	Feeder Bay Water Washing work and maintenance work	11/Oct/2019	8:00	11/Oct/2019	18:00	
326	PLANNED	OCC_523	MSETCL	220KV-TARAPUR 1&2-BOISAR-M-1	Daily	Routine Maintenance & Dignostic testing work	11/Oct/2019	09:00	11/Oct/2019	07:00	-
327	PLANNED	OCC_523	MP_SLDC	220KV Betul (PGCIL)-Betul-I	D	For line maintenance work	11/Oct/2019	9:00	11/Oct/2019	17:00	
328	PLANNED	OCC_523	MP_SLDC	220KV Gwalior (PGCIL)-Mahalgaon-II	D	For line maintenance work	11/Oct/2019	9:00	11/Oct/2019	17:00	
329	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV BALCO 2 AND DHARAMJAYGARH - 400KV - BUS 2 at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 400KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	17:00	Missed in data base
330	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIGARH-PS-RAIPUR-PS (DURG)-1 L/R@ RAIGARH-PS - 765KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	17:00	
331	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV KALA-ICT-2	D	For AMP Works. Dia to kept open.	11/Oct/2019	9:00	11/Oct/2019	17:00	
332	PLANNED	OCC_523	POWERGRID_WR2	220KV-VAPI-MAGARWADA-2	D	AMP of Terminal equipments	11/Oct/2019	9:00	11/Oct/2019	17:00	
333	PLANNED	OCC_523	POWERGRID_WR2	765KV-BHUJ-BANASKANTHA-2 L/R@ BANASKANTHA - 765KV	D	CSD fine tunning work.	11/Oct/2019	9:00	11/Oct/2019	17:00	
334	PLANNED	OCC_523	APML	TIRODA - 400KV - BUS 2	Daily	Maintenance of Bus Equipment	11/Oct/2019	09:00	11/Oct/2019	18:00	Subject to availability of generation
335	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - RAIGARH - 400KV B/R 1 AND RAIGARH - 400KV - BUS 2 at Raigarh - 400KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	18:00	
336	PLANNED	OCC_523	POWERGRID_WR1	Tie Bay - 400KV-BILASPUR-FUTURE-2 AND 765KV/400KV BILASPUR-ICT-2 at BILASPUR - 400KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	18:00	
337	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-1 AND RAIPUR-PS (DURG) - 765KV - BUS 1 at RAIPUR-PS (DURG) - 765KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	18:00	
338	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-CHANDRAPUR-BHADRAWATI-1 AND BHADRAWATI - 400KV - BUS 1 at BHADRAWATI - 400KV	D	For AMP works	11/Oct/2019	9:00	11/Oct/2019	18:00	
339	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - WARDHA - 765KV B/R 1 AND WARDHA - 765KV - BUS 1 at Wardha	D	For AMP work	11/Oct/2019	9:00	11/Oct/2019	18:00	
340	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - SATNA - 400KV B/R 1 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	For installation of additional compressor	11/Oct/2019	9:00	11/Oct/2019	18:00	
341	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-KHANDWA-DHULE-MS-1 AND 400KV/220KV KHANDWA-ICT-1 at KHANDWA - 400KV	D	AMP WORK	11/Oct/2019	9:00	11/Oct/2019	18:00	
342	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV REWA-ICT-1	D	AMP WORK. Dia to be kept open on both sides.	11/Oct/2019	9:00	11/Oct/2019	18:00	
343	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-JABALPUR-REWA-2 AND JABALPUR - 400KV - BUS 2 at JABALPUR - 400KV	D	Bay AMP	11/Oct/2019	9:00	11/Oct/2019	18:00	
344	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BINA-MP-BINA-2 AND BINA-MP - 400KV - BUS 2 at BINA-MP - 400KV	D	For AMP work.	11/Oct/2019	9:15	11/Oct/2019	17:30	
345	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV TAMNAR-ICT-2 AND TAMNAR - 765KV - BUS 1 (706 BAY) at TAMNAR - 400KV	D	For AMP Works	11/Oct/2019	9:30	11/Oct/2019	17:30	
346	PLANNED	OCC_523	POWERGRID_WR2	400KV-DAMOH-KATNI-2	D	For AMP Work of Terminal Equipments. Dia to be kept op	11/Oct/2019	9:30	11/Oct/2019	18:00	
347	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - JABALPUR - 765KV B/R 1 AND 765KV/400KV JABALPUR-ICT-1 at JABALPUR - 765KV	D	AMP Works	11/Oct/2019	10:00	11/Oct/2019	16:00	
348	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-BINA-SHUJALPUR-2 AND SHUJALPUR - 400KV -ICT 2 at SHUJALPUR - 400KV	D	AMP Work	11/Oct/2019	10:00	11/Oct/2019	18:00	
349	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-SSP-RAJGARH-1 AND 400KV-KHARGONE-RAJGARH-1 at RAJGARH - 400KV	D	For Circuit Breaker testing	11/Oct/2019	12:00	11/Oct/2019	19:00	
350	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV-CGPL-JETPUR-2 AND CGPL - 400KV - BUS 2	D	Breaker drive box painting	11/Oct/2019	8:00	12/Oct/2019	20:00	
351	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 765KV - BUS 2	D	RTV Coating STAGE-4	11/Oct/2019	9:00	12/Oct/2019	17:00	CONSTRUCTION
352	PLANNED	OCC_523	EPTCL	MAIN BAY - 400KV-ESSAR MAHAN-BILASPUR-1 AND BILASPUR - 400KV - BUS 2 at BILASPUR - 400KV	C	CT oil sampling	11/Oct/2019	9:00	12/Oct/2019	18:00	Bay no. 409 at PGCIL Bilaspur (Mahan Bilaspur line-1 main bay) Line will be charged through tie bay - 408
353	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-NAVSARI-1	C	Simultaneous S/D for NHSRCL Diversion Work, Tower E	11/Oct/2019	10:00	17/Oct/2019	17:00	
354	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-NAVSARI-2	C	Simultaneous S/D for NHSRCL Diversion Work, Tower E	11/Oct/2019	10:00	17/Oct/2019	17:00	
355	PLANNED	OCC_523	MSETCL	400KV-KALWA-PADGHE-1	Daily	PID Testing work for line Insulator strings at various loc	11/Oct/2019	09:00	19/Oct/2019	18:00	-
356	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-WARDHA-AKOLA-1 AND AKOLA - 400KV - BUS 2 at Wardha	C	For Replacement of BHEL CB with GE CB.	11/Oct/2019	9:00	20/Oct/2019	18:00	
357	PLANNED	OCC_523	MSETCL	400KV-BABLESHWAR-PADGHE-PG-2	Daily	For Carrying PID Work	11/Oct/2019	08:00	25/Oct/2019	18:00	-
358	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-VARSANA-1	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos	12/Oct/2019	8:00	14/Oct/2019	8:00	

359	PLANNED	OCC_523	POWERGRID_WR1	400KV-KORBA-NTPC-BHILAI-1	D	Diversion work of line due to ash dyke of Maruti Clean P	12/Oct/2019	8:00	21/Oct/2019	18:00	
360	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHULE-KHANDWA-2 L/R@ DHULE - 765KV	D	For AMP works, line outage required for take out/in of nc	12/Oct/2019	7:00	12/Oct/2019	14:00	
361	PLANNED	OCC_523	NTPC	VSTPS BUS #4	Continuous	Installation / erection of IPS Al tube of VSTPS- Jabalpur	12/Oct/2019	8:00	12/Oct/2019	18:30	Installation / erection of IPS Al tube of VSTPS- Jabalpur#2 Line bay Circuit Breaker below VSTPS Bus#4 after replacement of Circuit Breaker.
362	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV BOISAR-ICT-1	D	For AMP Works. Dia to be kept open on both sides	12/Oct/2019	9:00	12/Oct/2019	17:30	
363	PLANNED	OCC_523	POWERGRID_WR1	WARORA-PG - 400KV - BUS 1	D	For AMP works	12/Oct/2019	9:00	12/Oct/2019	18:00	
364	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-BHADRAWATI-RAIPUR-1 AND 400KV-BHILAI-RAIPUR-1 at RAIPUR - 400KV	D	AMP works at Raipur SS	12/Oct/2019	9:30	12/Oct/2019	17:30	
365	PLANNED	OCC_523	POWERGRID_WR2	VARSANA - 400KV - BUS 1	D	RTV COATING by Bhachau	12/Oct/2019	8:00	13/Oct/2019	18:00	
366	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-VARSANA-1	D	RTV COATING. A/R OFF of ckt-2 and dia to be kept open	12/Oct/2019	8:00	15/Oct/2019	18:00	
367	PLANNED	OCC_523	POWERGRID_WR1	765KV-CHAMPA-DHARAMJAYGARH-1	D	AR in non auto required for Rectification of earthwire sus	12/Oct/2019	8:00	16/Oct/2019	18:00	
368	PLANNED	OCC_523	POWERGRID_WR1	400KV-SOLAPUR-ALKUD-1 L/R @Solapur-400KV	D	Bay AMP works.	12/Oct/2019	9:00	12/Oct/2019	18:00	
369	PLANNED	OCC_523	GETCO	400 kV-AMRELI-HADALA-1	D	Feeder Bay Water Washing work and maintenance work	12/Oct/2019	8:00	12/Oct/2019	18:00	
370	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV CHAMPA-KSK-4 AND FUTURE at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	12/Oct/2019	9:00	12/Oct/2019	13:00	
371	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIGARH-PS-RAIPUR-PS (DURG)-2 L/R@ RAIGARH-PS - 765KV	D	For AMP works	12/Oct/2019	9:00	12/Oct/2019	17:00	
372	PLANNED	OCC_523	MSETCL	400KV-PARLI-M-LONIKHAND-II-2	Daily	C & Tand delta measurement of CT, Line maintenance wo	12/Oct/2019	09:00	12/Oct/2019	18:00	-
373	PLANNED	OCC_523	MSETCL	220KV-WARDHA-PUSAD-1	Daily	For Routine Maintainance Work	12/Oct/2019	09:00	12/Oct/2019	18:00	For Routine Maintainance Work
374	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-1 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	Maintenance of Bay Equipment	12/Oct/2019	09:00	12/Oct/2019	18:00	Maintenance of Bay Equipment
375	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIGARH-RAIPUR-2 AND RAIGARH - 400KV - BUS 1 at Raigarh - 400KV	D	For AMP works	12/Oct/2019	9:00	12/Oct/2019	18:00	
376	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-SOLAPUR-SOLAPUR-NTPC-3 AND SOLAPUR - 400KV - BUS 2 at Solapur - 400KV	D	Bay AMP works.	12/Oct/2019	9:00	12/Oct/2019	18:00	
377	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-2	D	For Retrofitting of PLCC with DTPC, WT dismantlling & L	12/Oct/2019	9:00	12/Oct/2019	18:00	
378	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - SATNA - 400KV B/R 1 AND 400KV/220KV SATNA-ICT-1 at SATNA - 400KV	D	For installation of additional compressor	12/Oct/2019	9:00	12/Oct/2019	18:00	
379	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - JABALPUR - 400KV B/R 1 AND 400KV-JABALPUR-REWA-2 at JABALPUR - 400KV	D	Bay AMP	12/Oct/2019	9:00	12/Oct/2019	18:00	
380	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BINA-MP-BINA-1 AND BINA-MP - 400KV - BUS 2 at BINA-MP - 400KV	D	For AMP work.	12/Oct/2019	9:15	12/Oct/2019	17:30	
381	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV TAMNAR-ICT-2	D	For AMP works	12/Oct/2019	9:30	12/Oct/2019	17:30	
382	PLANNED	OCC_523	POWERGRID_WR2	765KV-BINA-JABALPUR-2	D	For AMP Works by Jabalpur. A/R OFF of ckt-1 and dia to	12/Oct/2019	9:30	12/Oct/2019	17:30	
383	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV CHAMPA-ICT-5 AND CHAMPA - 400KV - BUS 3 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	12/Oct/2019	14:00	12/Oct/2019	17:30	Missed in data base
384	PLANNED	OCC_523	POWERGRID_WR1	TALEGAON - 220KV - BUS 1	D	Replacement of Clamp & connectors	12/Oct/2019	9:00	12/Oct/2019	18:00	
385	PLANNED	OCC_523	KTL-Sterlite	765KV-DHULE-KHANDWA-2 LR@DHULE - 765KV	D	For PSD Commissioning	12/Oct/2019	9:00	13/Oct/2019	18:00	
386	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-2 L/R@ WARDHA - 765KV	C	For AMP work, NGR Replacement	12/Oct/2019	9:00	13/Oct/2019	18:00	
387	PLANNED	OCC_523	MSETCL	400KV-KALWA-KHARGHAR-1	Daily	Routine Maintenance & Diagnostic Testing	13/Oct/2019	08:00	13/Oct/2019	17:00	-
388	PLANNED	OCC_523	POWERGRID_WR1	400KV-KHARGHAR-PUNE-PG-1	D	For line equipments AMP work & Relay Testing, at PUNE	13/Oct/2019	9:00	13/Oct/2019	18:00	
389	PLANNED	OCC_523	GETCO	ASOJ - 400 kV - BUS 2	D	400 kv Bus-2 Pantograph Isolator replacement work of 4	13/Oct/2019	7:00	13/Oct/2019	18:00	All elements will remain on bus - 1
390	PLANNED	OCC_523	GETCO	400 kV-ASOJ-CHORANIA-2	D	400 kv Bus-2 Pantograph Isolator replacement work	13/Oct/2019	7:00	13/Oct/2019	18:00	
391	PLANNED	OCC_523	POWERGRID_WR1	DHULE - 400KV B/R 1	D	For AMP works	13/Oct/2019	7:00	13/Oct/2019	18:00	
392	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV BOISAR-ICT-3 AND BOISAR - 220KV - BUS 1 at BOISAR - 220KV	D	FOR AMP Works. ICT-3 will be in service through TBC.	13/Oct/2019	9:00	13/Oct/2019	17:30	
393	PLANNED	OCC_523	POWERGRID_WR1	WARORA-PG - 400KV - BUS 2	D	For AMP works	13/Oct/2019	9:00	13/Oct/2019	18:00	
394	PLANNED	OCC_523	POWERGRID_WR2	765KV/400KV JABALPUR-ICT-2	D	For AMP Works. Dia to be kept open on both ends.	13/Oct/2019	10:00	13/Oct/2019	18:00	
395	PLANNED	OCC_523	MSETCL	220KV-BOISAR-BOISAR-M-3	Daily	Routine Maintenance & Dignostic testing work	13/Oct/2019	09:00	13/Oct/2019	17:00	-
396	PLANNED	OCC_523	JPNIGRIE	400KV-JP NIGRIE-SATNA-1	D	To provide Step Bolts on the Towers and Cutting/Trimmi	13/Oct/2019	9:00	13/Oct/2019	17:00	
397	PLANNED	OCC_523	MSETCL	NANDED - 400KV - BUS 2	Daily	Relay routine testing work and bus equipment maintenar	14/Oct/2019	10:00	14/Oct/2019	18:00	-
398	PLANNED	OCC_523	GETCO	400 kV-SSP-RAJGARH-2	D	PMM work.	14/Oct/2019	7:00	14/Oct/2019	18:00	Auto reclose of SSP - Rajgadh No. 1 will remain out
399	PLANNED	OCC_523	MSETCL	400KV-BABLESHWAR-PADGHE-PG-1	Daily	Diagnostic Testing Work	14/Oct/2019	09:00	14/Oct/2019	18:00	Bay Maintenance work also.
400	PLANNED	OCC_523	POWERGRID_WR2	VARSANA - 400KV - BUS 2	D	RTV COATING by Bhachau	14/Oct/2019	8:00	15/Oct/2019	18:00	
401	PLANNED	OCC_523	GETCO	400 kV-KASOR-CHORANIA-1	D	Conditioning monitoring work	14/Oct/2019	8:00	14/Oct/2019	17:00	
402	PLANNED	OCC_523	GETCO	50 MVAR REACTOR- 400 kV Jetpur	D	POST MONSOON MAINTENANCE	14/Oct/2019	8:00	14/Oct/2019	18:00	
403	PLANNED	OCC_523	GETCO	220 kV-VAPI-VAPI-GUJARAT-1	C	Maintenance work	14/Oct/2019	8:00	14/Oct/2019	18:00	
404	PLANNED	OCC_523	MP_SLDC	400KV ISP-Nagda	D	For line maintenance work	14/Oct/2019	8:00	14/Oct/2019	18:00	

405	PLANNED	OCC_523	KWPCL	400KV-KWPCL-RAIGARH-PS-2	Daily	Bay : 406 Bay Breaker & Isolator Maintenance	14/Oct/2019	8:00	14/Oct/2019	18:00	
406	PLANNED	OCC_523	BDTCL	765KV/400KV BHOPAL-BDTCL-ICT-1	D	AMP and testing works	14/Oct/2019	8:00	14/Oct/2019	18:00	
407	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - RAIGARH-PS - 765KV B/R 1 AND RAIGARH-PS - 765KV - BUS 2 at RAIGARH-PS - 765KV	D	For AMP works	14/Oct/2019	9:00	14/Oct/2019	17:00	
408	PLANNED	OCC_523	MP_SLDC	220KV Betul (PGCIL)-Betul-II	D	For line maintenance work	14/Oct/2019	9:00	14/Oct/2019	17:00	
409	PLANNED	OCC_523	MP_SLDC	220KV Sabalgarh-Adani	D	For line maintenance work	14/Oct/2019	9:00	14/Oct/2019	17:00	
410	PLANNED	OCC_523	POWERGRID_WR1	DHARAMJAYGARH - 765KV B/R 2	D	For AMP works	14/Oct/2019	9:00	14/Oct/2019	17:00	
411	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL(PS)-SASAN-2 AND SASAN - 400KV - BUS 1 at SASAN - 400KV	D	For Bay AMP work	14/Oct/2019	9:00	14/Oct/2019	17:00	
412	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-BHUJ-BANASKANTHA-2 AND BHUJ - 765KV - BUS 1 at Bhuj - 765KV	D	RTV Coating STAGE-4	14/Oct/2019	9:00	14/Oct/2019	17:00	CONSTRUCTION
413	PLANNED	OCC_523	RRWTL	RAJNANDGAON-RRWTL - 765KV - BUS 1	D	Annual Maintenance	14/Oct/2019	9:00	14/Oct/2019	18:00	
414	PLANNED	OCC_523	MEGPTCL	765KV-AKOLA (2)-KORADI-III-2 L/R@ KORADI-III - 765KV	Daily	Maintenance of Line Reactor	14/Oct/2019	09:00	14/Oct/2019	18:00	Maintenance of Line Reactor
415	PLANNED	OCC_523	MSETCL	AKOLA - 400KV - BUS 2	Daily	Routine Maintenance & testing work	14/Oct/2019	09:00	14/Oct/2019	18:00	na
416	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV BHATAPARA-ICT-1 AND BHATAPARA - 400KV - BUS 2 at BHATAPARA - 400KV	D	For AMP works	14/Oct/2019	9:00	14/Oct/2019	18:00	
417	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-CHANDRAPUR-BHADRAWATI-2 AND BHADRAWATI - 400KV - BUS 2 at BHADRAWATI - 400KV	D	For AMP works	14/Oct/2019	9:00	14/Oct/2019	18:00	
418	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-3	D	For Retrofitting of PLCC with DTPC, WT dismantlling & L	14/Oct/2019	9:00	14/Oct/2019	18:00	
419	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV SATNA-ICT-1 AND SATNA - 400KV - BUS 2 at SATNA - 400KV	D	For installation of additional compressor	14/Oct/2019	9:00	14/Oct/2019	18:00	
420	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-ITARSI-MP-ITARSI-1 AND ITARSI - 220KV - BUS 1	D	For Retrofitting of existing ABB make RAICA LBB relay w	14/Oct/2019	9:00	14/Oct/2019	18:00	
421	PLANNED	OCC_523	POWERGRID_WR2	400KV-RANCHODPURA-KANSARI-2	D	AMP work by Pirana	14/Oct/2019	9:00	14/Oct/2019	18:00	
422	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - KHANDWA - 400KV B/R 2 AND KHANDWA - 400KV - BUS 2 at KHANDWA - 400KV	D	AMP WORK	14/Oct/2019	9:00	14/Oct/2019	18:00	
423	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV REWA-ICT-2	D	AMP WORK. Dia to be kept open on both sides.	14/Oct/2019	9:00	14/Oct/2019	18:00	
424	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-KORBA-NTPC-RAIPUR-3 AND 400KV-KORBA-NTPC-RAIPUR-4 at RAIPUR - 400KV	D	AMP works at Raipur SS	14/Oct/2019	9:30	14/Oct/2019	17:30	Missed in data base
425	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV TAMNAR-ICT-3	D	For AMP works	14/Oct/2019	9:30	14/Oct/2019	17:30	
426	PLANNED	OCC_523	POWERGRID_WR2	DAMOH - 400KV B/R 1	D	AMP Work. Dia to be kept open.	14/Oct/2019	9:30	14/Oct/2019	18:00	
427	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIPUR-PS (DURG)-CHAMPA-1 L/R@ RAIPUR-PS (DURG) - 765KV	D	For Chang Over of B phase bank with Spare	14/Oct/2019	10:00	14/Oct/2019	13:00	
428	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV JABALPUR-ICT-2 AND JABALPUR - 765KV - BUS 1 at JABALPUR - 765KV	D	AMP Works	14/Oct/2019	10:00	14/Oct/2019	16:00	
429	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-SSP-RAJGARH-2 AND RAJGARH - 400KV - BUS 1 at RAJGARH - 400KV	D	For Circuit Breaker testing	14/Oct/2019	10:00	14/Oct/2019	17:00	
430	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV VADODARA-ICT-2 AND VADODARA - 765KV - BUS 2 at VADODARA - 765KV	D	For AMP Works	14/Oct/2019	10:00	14/Oct/2019	18:00	
431	PLANNED	OCC_523	BDTCL	765KV/400KV DHULE-ICT-1	D	For Switching of ICT Spare phase with B phase	14/Oct/2019	12:00	14/Oct/2019	13:00	
432	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV/11.5KV KORADI-II-ST-3 AND KORADI-II - 400KV - BUS 1 at KORADI-II - 400KV	Daily	PID test for Insulator string of 400KV Bay in Switchyard	14/Oct/2019	13:00	14/Oct/2019	15:00	Work will be carried out Online by PID Unit Nagpur.
433	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-2 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	PID test for insulator string of 400KV Bay in Switchyard	14/Oct/2019	15:00	14/Oct/2019	17:00	Work will be carried out by Online PID Unit, Nagpur
434	PLANNED	OCC_523	JPNIGRIE	400KV-JP NIGRIE-BUS REACTOR	D	Maintenance Work.	14/Oct/2019	9AM	14/Oct/2019	1PM	
435	PLANNED	OCC_523	MSETCL	400KV-BHUSAWAL-DEEPNAGAR-1	Daily	For On Line PID of insulator string	14/Oct/2019	08:00	15/Oct/2019	18:00	The A/R is required in Non-Auto mode.The ckt will be in service.
436	PLANNED	OCC_523	MSETCL	400KV-BHUSAWAL-DEEPNAGAR-2	Daily	For On Line PID of insulator string	14/Oct/2019	08:00	15/Oct/2019	18:00	The A/R is required in Non-Auto mode.The ckt will be in service.
437	PLANNED	OCC_523	KTL-Sterlite	400KV-SINGAJI-JULWANIA-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	14/Oct/2019	8:00	15/Oct/2019	18:00	
438	PLANNED	OCC_523	KTL-Sterlite	400KV-CHHEGAON-JULWANIA-1	C	Overhead stringing of U/C 400 kV DC Quad Khargone TI	14/Oct/2019	8:00	15/Oct/2019	18:00	
439	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV-CGPL-BACHAU-4 AND CGPL - 400KV - BUS 2	D	Breaker drive box painting	14/Oct/2019	8:00	15/Oct/2019	20:00	
440	PLANNED	OCC_523	EPTCL	MAIN BAY - 400KV-ESSAR MAHAN-BILASPUR-2 AND BILASPUR - 400KV - BUS 2 at BILASPUR - 400KV	C	CT oil sampling	14/Oct/2019	9:00	15/Oct/2019	18:00	Bay no. 412 at PGCIL Bilaspur (Mahan Bilaspur line-2 main bay) Line will be charged through tie bay 411
441	PLANNED	OCC_523	MSETCL	400KV-TARAPUR 3&4-PADGHE-1	Continuous	Annual Diagnostic Testing Work & Bay Maintenance Wo	14/Oct/2019	09:00	15/Oct/2019	18:00	Annual Testing Work
442	PLANNED	OCC_523	TARAPUR 3&4	400KV-TARAPUR 3&4-PADGHE-1	C	CB, ES, DS, LA, CT, LA, WT, CVT Annual PM	14/Oct/2019	9:00	15/Oct/2019	18:00	
443	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-SIPAT-BILASPUR-3 AND BILASPUR - 765KV - BUS 1 at BILASPUR - 765KV	D	For AMP works	14/Oct/2019	9:00	15/Oct/2019	18:00	
444	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-AURANGABAD-3 L/R@ WARDHA - 765KV	C	For AMP work, NGR Replacement	14/Oct/2019	9:00	15/Oct/2019	18:00	
445	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-BINA-BINA-NHPTL-1 AND 765KV-BINA-GWALIOR-2 at BINA - 765KV	D	For AMP work.	14/Oct/2019	9:15	15/Oct/2019	17:30	

446	PLANNED	OCC_523	POWERGRID_WR2	765KV-GWALIOR-AGRA-1	D	Fixing of sleave in D Type of Angle Tower and Tower strer	14/Oct/2019	9:45	16/Oct/2019	18:00	
447	PLANNED	OCC_523	POWERGRID_WR1	400KV-KOLHAPUR GIS-MAPUSA-1	C	For NRV replacement in external Bus duct at Kolhapur G	14/Oct/2019	10:00	16/Oct/2019	18:00	
448	PLANNED	OCC_523	NTPC	220KV/6.6KV KAWAS-ST-1	C	CT replacement. Dismanteling of Old CTs and erection ar	14/Oct/2019	9:00	17/Oct/2019	18:00	Same was approved in 522 OCCM but could not be availed due to heavy rain.
449	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-ITARSI-MP-ITARSI-1 AND ITARSI - 220KV - BUS 1	C	For CB Driving Mechanisam Overhauling works at Itarsi	14/Oct/2019	9:00	18/Oct/2019	18:00	
450	PLANNED	OCC_523	MP_SLDC	400KV Bina-Bhopal -I	C	For replacement of 04 No. 400KV isolators	14/Oct/2019	8:00	21/Oct/2019	17:00	
451	PLANNED	OCC_523	MSETCL	NANDED - 400KV - BUS 1	Daily	Relay routine Testing and Bus equipment maintenance w	15/Oct/2019	10:00	15/Oct/2019	18:00	-
452	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL(PS)-SASAN-2 AND VINDHYACHAL(PS) - 400KV - BUS 1 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	15/Oct/2019	9:00	15/Oct/2019	17:00	
453	PLANNED	OCC_523	GETCO	AMRELI -50NVAR Bus reactor Kasor-1	Daily	For Bus-1 PG Isolator maintenance	15/Oct/2019	8:00	15/Oct/2019	18:00	
454	PLANNED	OCC_523	GETCO	220 kV-BHILAD-VAPI-1	Daily	maintenance work	15/Oct/2019	8:00	15/Oct/2019	18:00	
455	PLANNED	OCC_523	GETCO	400 kV HADALA-VADINAR-1	Daily	Feeder Bay Water Washing work and maintenance work	15/Oct/2019	8:00	15/Oct/2019	18:00	
456	PLANNED	OCC_523	MP_SLDC	400KV Nagda - Badnawar-I	D	For line maintenance work	15/Oct/2019	8:00	15/Oct/2019	18:00	
457	PLANNED	OCC_523	KWPCL	400KV-KWPCL-RAIGARH-PS-1	Daily	Bay : 403 Bay Breaker & Isolator Maintenance	15/Oct/2019	8:00	15/Oct/2019	18:00	
458	PLANNED	OCC_523	BDTCL	765KV-BHOPAL-BDTCL-INDORE-1	D	AMP and testing works	15/Oct/2019	8:00	15/Oct/2019	18:00	
459	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-2	D	For line and SS AMP works & 400kV Raigarh-Sundargarl	15/Oct/2019	8:00	15/Oct/2019	18:00	
460	PLANNED	OCC_523	POWERGRID_WR1	400KV-SIPAT-RAIPUR-1	D	Auto-reclose relay retro-fitting works in Main Bay at Raip	15/Oct/2019	8:00	15/Oct/2019	20:00	
461	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV/11.5KV KORADI-II-ST-2 AND KORADI-II - 400KV - BUS 1 at KORADI-II - 400KV	Daily	PID test for insulator string of 400KV Bay in Switchyard	15/Oct/2019	09:00	15/Oct/2019	11:00	Work will be carried out by Online PID Unit, Nagpur
462	PLANNED	OCC_523	POWERGRID_WR2	400KV-VAPI-BOISAR-1	D	FOR LINE EQUIPMENTS AMP. Dia to be kept open at bot	15/Oct/2019	9:00	15/Oct/2019	15:00	
463	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - RAIGARH-PS - 765KV B/R 1 AND RAIGARH-PS - 765KV - BUS 2 at RAIGARH-PS - 765KV	D	For AMP works	15/Oct/2019	9:00	15/Oct/2019	17:00	
464	PLANNED	OCC_523	MSETCL	BUS COUPLER @ BABHALESHWAR	Daily	Quarterly Maintenance work & Relay Testing	15/Oct/2019	09:00	15/Oct/2019	17:00	All 4 nos of ICT and 400kV Lines will be in service
465	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-VINDHYACHAL(PS)-SASAN-2 AND 765KV/400KV VINDHYACHAL(PS)-ICT-2 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	15/Oct/2019	9:00	15/Oct/2019	17:00	
466	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-BHUJ-BANASKANTHA-2 AND 765KV/400KV BHUJ-ICT-2 at Bhuj - 765KV	D	RTV Coating STAGE-4	15/Oct/2019	9:00	15/Oct/2019	17:00	CONSTRUCTION
467	PLANNED	OCC_523	RRWTL	RAJNANDGAON-RRWTL - 765KV - BUS 2	D	Annual Maintenance	15/Oct/2019	9:00	15/Oct/2019	18:00	
468	PLANNED	OCC_523	GETCO	400 kV-VELODA-CHARANKA-1	Daily	FOR BAY MAINTENANCE/CONDITIONING MONITORING	15/Oct/2019	9:00	15/Oct/2019	18:00	
469	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 765KV/400KV AKOLA-ICT-1 AND AKOLA - 765KV - BUS 1 at AKOLA - 765KV	Daily	Maintenance of Bay Equipment	15/Oct/2019	09:00	15/Oct/2019	18:00	Maintenance of Bay Equipment
470	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-KORBA-NTPC-BHATAPARA-1 AND 400KV/220KV BHATAPARA-ICT-1 at BHATAPARA - 400KV	D	For AMP works	15/Oct/2019	9:00	15/Oct/2019	18:00	
471	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIGARH-RAIPUR-2 AND 400KV/220KV RAIGARH-ICT-2 at Raigarh - 400KV	D	For AMP works	15/Oct/2019	9:00	15/Oct/2019	18:00	
472	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - AURANGABAD - 400KV B/R 1 AND AURANGABAD - 400KV - BUS 1 at AURANGABAD - 400KV	D	For AMP works	15/Oct/2019	9:00	15/Oct/2019	18:00	
473	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARDHA-MOUDA-1	D	For line AMP works & 400kV Mauda-Wardha-2 AR in nor	15/Oct/2019	9:00	15/Oct/2019	18:00	
474	PLANNED	OCC_523	POWERGRID_WR1	765KV-PUNE-PG-Solapur-1 L/R@ Solapur - 765KV-	D	Reactor AMP works & To change Imax make Auxiliary an	15/Oct/2019	9:00	15/Oct/2019	18:00	Included with Feeder Shutdown
475	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-SATNA-BINA-2 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	For installation of additional compressor	15/Oct/2019	9:00	15/Oct/2019	18:00	
476	PLANNED	OCC_523	POWERGRID_WR2	400KV-RAJGARH-KASOR-1	D	AMP work by Pirana	15/Oct/2019	9:00	15/Oct/2019	18:00	
477	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-KHANDWA-DHULE-MS-2 AND KHANDWA - 400KV B/R 2 at KHANDWA - 400KV	D	AMP WORK	15/Oct/2019	9:00	15/Oct/2019	18:00	
478	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV TAMNAR-ICT-2 AND TAMNAR - 765KV - BUS 1 (706 BAY) at TAMNAR - 400KV	D		15/Oct/2019	9:30	15/Oct/2019	17:30	
479	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIPUR-RAIPUR-PS (DURG)-1 AND RAIPUR - 400KV B/R 2 at RAIPUR - 400KV	D	AMP works at Raipur SS.	15/Oct/2019	9:30	15/Oct/2019	17:30	
480	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-REWA-1	D	For AMP Works by Jabalpur. A/R OFF of ckt-2 and dia to	15/Oct/2019	9:30	15/Oct/2019	17:30	
481	PLANNED	OCC_523	POWERGRID_WR2	DAMOH - 220KV - BUS 2	D	AMP work	15/Oct/2019	9:30	15/Oct/2019	18:00	
482	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DAMOH-ICT-1 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. ICT will be inservice throug	15/Oct/2019	9:30	15/Oct/2019	18:00	
483	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DAMOH-ICT-2 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. ICT will be inservice throug	15/Oct/2019	9:30	15/Oct/2019	18:00	
484	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV DAMOH-ICT-3 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. ICT will be inservice throug	15/Oct/2019	9:30	15/Oct/2019	18:00	
485	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-TIKAMGAD-1 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	
486	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-DAMOH-MP-1 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	

487	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-DAMOH-MP-2 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	
488	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-SAGAR-1 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	
489	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-DAMOH-MP-3 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	
490	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DAMOH-SAGAR-2 AND DAMOH - 220KV - BUS 1 at Damoh - 220KV	D	For AMP of Bus side isolator. Line will be inservice throu	15/Oct/2019	9:30	15/Oct/2019	18:00	
491	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV/400KV JABALPUR-ICT-2 AND JABALPUR - 765KV B/R 2 at JABALPUR - 765KV	D	AMP Works	15/Oct/2019	10:00	15/Oct/2019	16:00	
492	PLANNED	OCC_523	TPL-DGEN	DGEN - 400KV B/R 1	D	testing and Change over of 400 kv bus isolators.400 KV I	15/Oct/2019	10:00	15/Oct/2019	17:00	
493	PLANNED	OCC_523	TPL-DGEN	400KV-NAVSARI-DGEN-1	D	testing and Change over of 400 kv bus isolators.400 KV I	15/Oct/2019	10:00	15/Oct/2019	17:00	
494	PLANNED	OCC_523	TPL-DGEN	400KV-NAVSARI-DGEN-2	D	testing and Change over of 400 kv bus isolators.400 KV I	15/Oct/2019	10:00	15/Oct/2019	17:00	
495	PLANNED	OCC_523	TPL-DGEN	400KV-DGEN-VAGHODIYA-1	D	testing and Change over of 400 kv bus isolators.400 KV I	15/Oct/2019	10:00	15/Oct/2019	17:00	Bay is connected to 400 KV bus only. Not connected to line side.
496	PLANNED	OCC_523	TPL-DGEN	400KV-DGEN-VAGHODIYA-2	D	testing and Change over of 400 kv bus isolators.400 KV I	15/Oct/2019	10:00	15/Oct/2019	17:00	Bay is connected to 400 KV bus only. Not connected to line side.
497	PLANNED	OCC_523	POWERGRID_WR1	400KV-DHARIWAL-PARLI-2	D	For replacement of PMU at Parli end	15/Oct/2019	10:00	15/Oct/2019	17:00	
498	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-SSP-RAJGARH-2 AND 400KV-KHANDWA-RAJGARH-1 at RAJGARH - 400KV	D	For Circuit Breaker testing	15/Oct/2019	10:00	15/Oct/2019	17:00	
499	PLANNED	OCC_523	CWRTL	400KV-GWALIOR-MORENA-1	D	Maintenance of Line Equipments	15/Oct/2019	10:00	15/Oct/2019	18:00	
500	PLANNED	OCC_523	MSETCL	220KV-WARDHA-BHUGAON-1	Daily	tightening of jumper nut bolt at loc. No.02,04 and other v	15/Oct/2019	10:00	15/Oct/2019	18:00	na
501	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BINA-SHUJALPUR-2 AND SHUJALPUR - 400KV - BUS 1 at SHUJALPUR - 400KV	D	AMP Work	15/Oct/2019	10:00	15/Oct/2019	18:00	
502	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV/11.5KV KORADI-II-ST-2 AND 400KV-KORADI-II-KORADI-III-1 at KORADI-II - 400KV	Daily	PID test for insulator string of 400KV Bay in Switchyard	15/Oct/2019	11:00	15/Oct/2019	13:00	Work will be carried out by Online PID Unit, Nagpur
503	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-1 AND KORADI-II - 400KV - BUS 2 at KORADI-II - 400KV	Daily	PID test for insulator string of 400KV Bay in Switchyard	15/Oct/2019	13:00	15/Oct/2019	15:00	Work will be carried out by Online PID Unit, Nagpur
504	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV-WARDHA-KORADI-II-1 AND FUTURE at KORADI-II - 400KV	Daily	PID test for insulator string of 400KV Bay in Switchyard	15/Oct/2019	15:00	15/Oct/2019	17:00	Work will be carried out Online by PID Unit, Nagpur
505	Planned	OCC_523	GETCO	400 kV Kansari - Bhinmal	Daily	Reactor & NGR Wdg Bush.Tan-d,CT-CVT Tan-d & Bkr. D	15/Oct/2019	8.00	15/Oct/2019	18.00	Load on other 400kv Line.
506	PLANNED	OCC_523	DBPOWER	400KV-DB POWER-RAIGARH-PS-1	D	For AMP works	15/Oct/2019	8:00	16/Oct/2019	18:00	Shutdown is Planned considering the DBPL Unit#2 AOH in Oct-19
507	PLANNED	OCC_523	GETCO	AMRELI - 400 kV - BUS 1	C	For Kasor-1 and Kasor-2 Bus-1 isolator maintenance	15/Oct/2019	8:00	16/Oct/2019	18:00	
508	PLANNED	OCC_523	MP_SLDC	220KV ICT-II at 220KV S/s Sukha	C	For bay equipment maintenance and testing work	15/Oct/2019	9:00	16/Oct/2019	17:00	
509	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV JABALPUR-ICT-2	C	AMP and degassing of ICT - II. Dia to be kept open on bo	15/Oct/2019	9:00	16/Oct/2019	18:00	
510	PLANNED	OCC_523	TPL-DGEN	400KV/220KV DGEN-ICT-2	C	ICT 2 routine energisation testing during RSD and shutd	15/Oct/2019	10:00	16/Oct/2019	17:00	ICT No load charging only, Not connected at 220 KV side.
511	PLANNED	OCC_523	MSETCL	400KV-CHANDRAPUR-GCR-CHANDRAPUR HVDC-2	Continuous	1) For replacement of old damaged quadraple bus condu	15/Oct/2019	05:00	18/Oct/2019	18:00	During, this outage 400KV HVDC Ckt. No.- 1 will be in service. The outage on 400KV HVDC Ckt. No.-2 bay is required as the work of replacement of bus conductor of Main Bus-II is to be carried out in HVDC -2 bay.
512	PLANNED	OCC_523	MSETCL	400kv Stn. TF No 5 @ C'pur GCR ON TBC	Continuous	1) For replacement of old damaged quadraple bus condu	15/Oct/2019	05:00	18/Oct/2019	18:00	The shifting of 400KV STN T/F No.-V bay on TBC-2 bay is required as the work of replacement of bus conductor of Main Bus-2 is to be carried out in STN-5 bay.
513	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-DEHGAM-KHANPUR-2 AND DEHGAM - 220KV - BUS 1 at DEHGAM - 220KV	C	Overhauling of CB. Line will remain in service through TI	15/Oct/2019	9:00	18/Oct/2019	18:00	
514	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-3	D	AR in non auto mode for PID testing	15/Oct/2019	8:00	21/Oct/2019	18:00	
515	PLANNED	OCC_523	MP_SLDC	400KV Main Bus-II at 400KV S/s Satpura	C	For replacement of ACSR moose conductor of Main bus-I	15/Oct/2019	9:00	23/Oct/2019	18:00	During the shutdown of 400 kv Bus II entire load of 400 kv Bus -II will be shifted to 400 kv Bus -I

516		OCC_523	ER-II/Odisha/Sundergarh	Sundergarh-Raigarh Ckt #2	ODB	For Insulator replacement and TL maintenance work	15/Oct/2019	8:00	15/Oct/2019	18:00	
517	PLANNED	OCC_523	MSETCL	400KV-PARLI-M-PARLI-2	Daily	C & Tand measurement work of CTs and breakere testing	16/Oct/2019	09:00	16/Oct/2019	18:00	-
518	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-VARSANA-2	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos I	16/Oct/2019	8:00	17/Oct/2019	8:00	
519	PLANNED	OCC_523	GETCO	400 kV-GPEC-KASOR-1	Daily	Line maint. Work	16/Oct/2019	8:00	17/Oct/2019	17:00	
520	PLANNED	OCC_523	POWERGRID_WR2	VARSANA - 400KV - BUS 1	D	RTV COATING by Bhachau	16/Oct/2019	8:00	17/Oct/2019	18:00	
521	PLANNED	OCC_523	NTPC	400KV Korba sipat line outage and Bay at NTPC korba end	Daily	For Bay PM	16/Oct/2019	8:00	17/Oct/2019	18:30	For Bay PM
522	PLANNED	OCC_523	POWERGRID_WR2	INDORE-MP - 400KV - BUS 2	C	FOR BUS - 2 ISOLATOR RETROFITTING WORK OF ASOJ	16/Oct/2019	9:00	18/Oct/2019	18:00	
523	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-VARSANA-2	D	RTV COATING. A/R OFF of ckt-1 and dia to be kept open	16/Oct/2019	8:00	19/Oct/2019	18:00	
524	PLANNED	OCC_523	MSETCL	400KV-BHUSAWAL-AKOLA-1	Continuous	Restringing of conductor of all three phases of 400 kV Ak	16/Oct/2019	08:00	20/Oct/2019	18:00	400 kV Koradi- Bhusawal, 400 kV Akola-Nandgaonpeth & 400 kV Koradi-Nandgaonpeth are in service.
525	PLANNED	OCC_523	MSETCL	220KV-TILLARI-AMONA-1	Daily	Routine Maintenance & Dignostic testing work	16/Oct/2019	08:00	16/Oct/2019	17:00	-
526	PLANNED	OCC_523	DBPOWER	DB POWER - 400KV - BUS 1	D	For AMP works	16/Oct/2019	8:00	16/Oct/2019	18:00	Shutdown is Planned considering the DBPL Unit#2 AOH in Oct-19
527	PLANNED	OCC_523	GETCO	AMRELI-50NVAR Bus reactor Kasor-2	Daily	For Bus-1 PG Isolator maintenance	16/Oct/2019	8:00	16/Oct/2019	18:00	
528	PLANNED	OCC_523	GETCO	220 kV-BHILAD-VAPI (PG)-2	Daily	maintenance work	16/Oct/2019	8:00	16/Oct/2019	18:00	
529	PLANNED	OCC_523	GETCO	400 kV HADALA-VADINAR-2	Daily	Feeder Bay Water Washing work and maintenance work	16/Oct/2019	8:00	16/Oct/2019	18:00	
530	PLANNED	OCC_523	MP_SLDC	220KV Chhanera-Khandwa (PGCIL) -I	D	For line maintenance work	16/Oct/2019	8:00	16/Oct/2019	18:00	
531	PLANNED	OCC_523	KWPCL	Tie Bay - 400KV/11.5KV KWPCL-ST-1 AND 400KV-KWPCL-RAIGARH-PS-2	Daily	Bay : 405 Bay Breaker & Isolator Maintenance	16/Oct/2019	8:00	16/Oct/2019	18:00	
532	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-1	D	For line and SS AMP works & 400kV Raigarh-Sundargarl	16/Oct/2019	8:00	16/Oct/2019	18:00	
533	PLANNED	OCC_523	POWERGRID_WR2	765KV-VINDHYACHAL(PS)-JABALPUR-2	D	For taking "B' Ph Jabalpur #2 Line Reactor inplace of spa	16/Oct/2019	9:00	16/Oct/2019	14:00	
534	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV RAIGARH-PS-ICT-1 AND RAIGARH-PS - 765KV B/R 1 at RAIGARH-PS - 765KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	17:00	
535	PLANNED	OCC_523	MSETCL	400KV-WARDHA-WARORA-1	Daily	Routine Maintenance & Dignostic testing work Nut Bolt T	16/Oct/2019	09:00	16/Oct/2019	17:00	400KV WARORA-IEPL Line is in ckt
536	PLANNED	OCC_523	MSETCL	132KV-MANSAR-MS-PENCH-1	Daily	Routine maintenance work	16/Oct/2019	09:00	16/Oct/2019	17:00	_
537	PLANNED	OCC_523	MP_SLDC	220KV Malanpur-Aouriya	D	For line maintenance work	16/Oct/2019	9:00	16/Oct/2019	17:00	
538	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-KALA-VAPI-1 AND VAPI - 400KV - BUS 2 at VAPI - 400KV	D	Main Bay AMP work	16/Oct/2019	9:00	16/Oct/2019	17:00	
539	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV BHUJ-ICT-2 AND BHUJ - 765KV - BUS 2 at Bhuj - 765KV	D	RTV Coating STAGE-4	16/Oct/2019	9:00	16/Oct/2019	17:00	CONSTRUCTION
540	PLANNED	OCC_523	POWERGRID_WR2	400KV-AURANGABAD-BOISAR-2 L/R@ BOISAR - 400KV	D	For AMP Works	16/Oct/2019	9:00	16/Oct/2019	17:30	
541	PLANNED	OCC_523	MSETCL	220KV-PARLI-OSMANABAD-M-1	Daily	NH 211 Crossing work	16/Oct/2019	09:00	16/Oct/2019	18:00	-
542	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-KORBA-NTPC-BHATAPARA-1 AND BHATAPARA - 400KV - BUS 1 at BHATAPARA - 400KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	
543	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV RAIGARH-ICT-2 AND RAIGARH - 400KV - BUS 2 at Raigarh - 400KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	
544	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-AURANGABAD-M (WALUJ)-AURANGABAD-2 AND 400KV/220KV AURANGABAD-ICT-3 at AURANGABAD - 400KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	
545	PLANNED	OCC_523	POWERGRID_WR1	400KV AC - 459 BAY - AC FILTER MAIN BAY OF AC FILTER - II at CHAMPA-HVDC - 400KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	Missed in data base
546	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - RAIPUR-PS (DURG) - 765KV B/R 1 AND RAIPUR-PS (DURG) - 765KV - BUS 2 at RAIPUR-PS (DURG) - 765KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	
547	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHADRAWATI-RAIPUR-1 AND BHADRAWATI - 400KV - BUS 2 at BHADRAWATI - 400KV	D	For AMP works	16/Oct/2019	9:00	16/Oct/2019	18:00	
548	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-AURANGABAD-3 AND WARDHA - 765KV - BUS 1 at Wardha	D	For AMP work	16/Oct/2019	9:00	16/Oct/2019	18:00	
549	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-SATNA-BINA-2 AND 400KV-VINDHYACHAL-SATNA-2 at SATNA - 400KV	D	For installation of additional compressor	16/Oct/2019	9:00	16/Oct/2019	18:00	
550	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-HOSHANGABAD-ITARSI-1 AND ITARSI - 220KV - BUS 1	D	For Retrofitting of existing ABB make RAICA LBB relay w	16/Oct/2019	9:00	16/Oct/2019	18:00	
551	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-KHANDWA-DHULE-MS-2 AND KHANDWA - 400KV - BUS 1 at KHANDWA - 400KV	D	AMP WORK	16/Oct/2019	9:00	16/Oct/2019	18:00	
552	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 220KV-RAIPUR-URLA-CHHATTISGARH-1 AND RAIPUR - 220KV - BUS 1 at RAIPUR - 220KV	D	AMP works at Raipur SS.	16/Oct/2019	9:30	16/Oct/2019	17:30	
553	PLANNED	OCC_523	POWERGRID_WR1	TAMNAR - 765KV B/R 1	D	For Spare Reactor Switching with R-ph .	16/Oct/2019	9:30	16/Oct/2019	17:30	
554	PLANNED	OCC_523	MSETCL	220KV-SOLAPUR-JEUR-1	Daily	Quarterly maintenance & Diagnostic testing work	16/Oct/2019	10:00	16/Oct/2019	16:00	Outage is required for Quarterly maintenance & Diagnostic testing work

555	PLANNED	OCC_523	POWERGRID_WR1	400KV-PARLI-SOLAPUR-2	D	For replacement of PMU at Parli end	16/Oct/2019	10:00	16/Oct/2019	17:00	
556	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BADNAWAR-RAJGARH-1 AND RAJGARH - 400KV - BUS 1 at RAJGARH - 400KV	D	For Circuit Breaker testing	16/Oct/2019	10:00	16/Oct/2019	17:00	
557	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-50MVAR Line Reactor BINA-SHUJALPUR-1 at SHUJALPUR - 400KV	D	AMP Work	16/Oct/2019	10:00	16/Oct/2019	18:00	
558	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-VADODARA-DHULE-1 AND VADODARA - 765KV - BUS 1 at VADODARA - 765KV	D	For AMP Works	16/Oct/2019	10:00	16/Oct/2019	18:00	
559	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NAGOTHANE-2	Daily	tree cutting work	16/Oct/2019	08:00	17/Oct/2019	17:00	nil
560	PLANNED	OCC_523	GETCO	220 kV-DEHGAM (PG)-KHANPUR-2	Daily	FOR BAY MAINTENANCE/CONDITIONING MONITORING	16/Oct/2019	8:00	17/Oct/2019	19:00	
561	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV-CGPL-BACHAU-3 AND CGPL - 400KV - BUS 2	D	Breaker drive box painting	16/Oct/2019	8:00	17/Oct/2019	20:00	
562	PLANNED	OCC_523	ATIL	MAIN BAY (414) OF TIRODA CKT - 2 @ WARORA	Continuous	Replacement of Breaker	16/Oct/2019	09:00	17/Oct/2019	18:00	Replacement of Breaker
563	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-BINA-BINA-NHPTL-1 AND BINA - 765KV - BUS 1 at BINA - 765KV	D	For AMP work.	16/Oct/2019	9:15	17/Oct/2019	17:30	
564	PLANNED	OCC_523	EPTCL	TIE BAY - 400KV-ESSAR MAHAN-BILASPUR-2 AND FUTURE at BILASPUR - 400KV	C	CT oil sampling & Testing of Spare CB interrupter	16/Oct/2019	9:00	18/Oct/2019	18:00	Bay no. 411 at PGCIL Bilaspur) (Mahan Bilaspur line-2 Tie Bay) Line will be charged through Main bay - 412
565	PLANNED	OCC_523	MSETCL	400KV-CHANDRAPU-II-NANDED-2	Daily	For PID Work,Shifting of auto reclose switch to non auto	16/Oct/2019	08:00	25/Oct/2019	17:00	These lines are on DC tower so both lines require on same day A/R out.
566	PLANNED	OCC_523	MSETCL	400KV-CHANDRAPUR-GCR-PARLI-M-3	Daily	For PID Work,Shifting of auto reclose switch to non auto	16/Oct/2019	08:00	25/Oct/2019	17:00	These lines are on DC tower so both lines require on same day A/R out.
567		OCC_523	ER-II/ODISHA/SUNDERGARH	400KV Sundergarh-Raigarh Ckt #1	ODB	TL Maintenance works	16/Oct/2019	8:00	16/Oct/2019	18:00	
568	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-RAIGARH-PS-CHAMPA-1 AND 765KV/400KV CHAMPA-ICT-5 at CHAMPA - 765KV	D	For AMP WORK	17/Oct/2019	9:00	18/Oct/2019	17:30	
569	PLANNED	OCC_523	GETCO	400 kV-AMRELI-CHORANIA-1	Daily	For Conidtioning monitoring work at 400kV Chorania en	17/Oct/2019	8:00	17/Oct/2019	18:00	Maint work
570	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV DHARAMJAYGARH-ICT-1	D	For AMP works	17/Oct/2019	9:00	17/Oct/2019	17:00	
571	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV/220KV MAPUSA-ICT-3 AND FUTURE at MAPUSA - 400KV	D	For AMP works.	17/Oct/2019	9:00	17/Oct/2019	18:00	
572	PLANNED	OCC_523	POWERGRID_WR1	220KV-TALEGAON-PUNE-PG-2	D	For line equipments AMP work & Relay Testing, at PUN	17/Oct/2019	9:00	17/Oct/2019	18:00	
573	PLANNED	OCC_523	MSETCL	400KV-PARLI-M-LONIKHAND-II-1	Daily	Line maintenance work	17/Oct/2019	09:00	17/Oct/2019	18:00	-
574	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV JABALPUR-ICT-1 AND JABALPUR - 765KV - BUS 1 at JABALPUR - 765KV	D	AMP Works	17/Oct/2019	10:00	17/Oct/2019	16:00	
575	PLANNED	OCC_523	GETCO	400 kV-ASOJ-CHORANIA-1	Daily	PMM work.	17/Oct/2019	7:00	17/Oct/2019	18:00	Auto reclose of SSP- Asoj will remain out
576	PLANNED	OCC_523	DBPOWER	DB POWER - 400KV - BUS 2	D	For AMP works	17/Oct/2019	8:00	17/Oct/2019	18:00	Shutdown is Planned considering the DBPL Unit#2 AOH in Oct-19
577	PLANNED	OCC_523	GETCO	AMRELI-50NVAR Bus reactor Kasor-1	Continuous	For Bus-2 PG Isolator maintenance	17/Oct/2019	8:00	17/Oct/2019	18:00	
578	PLANNED	OCC_523	GETCO	220 kV-BHILAD-VAPI (PG)-3	Daily	maintenance work	17/Oct/2019	8:00	17/Oct/2019	18:00	
579	PLANNED	OCC_523	KWPCL	Tie Bay - 400KV/21KV KWPCL-GT-1 AND 400KV-KWPCL-RAIGARH-PS-1	Daily	Bay : 402 Bay Breaker & Isolator Maintenance	17/Oct/2019	8:00	17/Oct/2019	18:00	
580	PLANNED	OCC_523	POWERGRID_ER2	400KV-RAIGARH-JHARSUGUDA-3	D	For line and SS AMP works & 400kV Raigarh-Sundargarh	17/Oct/2019	8:00	17/Oct/2019	18:00	
581	PLANNED	OCC_523	NTPC	VSTPS ICT#2 BAY (Stage-I, Bay No. 11)	Continuous	Replacement of gear box of Bus-2 side isolator 89B.	17/Oct/2019	8:00	17/Oct/2019	18:30	Replacement of gear box of Bus-2 side isolator 89B.
582	PLANNED	OCC_523	NTPC	VSTPS BUS #2	Continuous	Desmantling of IPS Al tube of VSTPS- TBC #1 (Bay No. 1	17/Oct/2019	8:00	17/Oct/2019	18:30	Desmantling of IPS Al tube of VSTPS-TBC #1 (Bay No. 10) below VSTPS Bus#2 for replacement Circuit Breaker. (Note: Bus #2 shall be normalised after dismataliing of IPS Al tube and VSTS TBC#1 shall remain under permit for next 15 days for its breaker replacement.)
583	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV RAIGARH-PS-ICT-1 AND RAIGARH-PS - 765KV B/R 1 at RAIGARH-PS - 765KV	D	For AMP works	17/Oct/2019	9:00	17/Oct/2019	17:00	
584	PLANNED	OCC_523	MP_SLDC	220KV Mahegaon-Aouriya	D	For line maintenance work	17/Oct/2019	9:00	17/Oct/2019	17:00	
585	PLANNED	OCC_523	POWERGRID_WR2	BANASKANTHA - 765KV B/R 1	D	Taking spare reactor out of service. Dia to be kept open.	17/Oct/2019	9:00	17/Oct/2019	17:00	
586	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV VINDHYACHAL(PS)-ICT-2 AND VINDHYACHAL(PS) - 400KV - BUS 2 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	17/Oct/2019	9:00	17/Oct/2019	17:00	
587	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-BHUJ-BANASKANTHA-1 AND BHUJ - 765KV - BUS 1 at Bhuj - 765KV	D	RTV Coating STAGE-4	17/Oct/2019	9:00	17/Oct/2019	17:00	CONSTRUCTION
588	PLANNED	OCC_523	RRWTL	RAJNANDGAON-RRWTL - 765KV - BUS 1	D	Annual Maintenance	17/Oct/2019	9:00	17/Oct/2019	18:00	
589	PLANNED	OCC_523	GETCO	400 kV-VELODA-CHARANKA-2	Daily	FOR BAY MAINTENANCE/CONDITIONING MONITORING	17/Oct/2019	9:00	17/Oct/2019	18:00	
590	PLANNED	OCC_523	MEGPTCL	TIE BAY - AKOLA - 765KV B/R 1 AND 765KV/400KV AKOLA-ICT-1 at AKOLA - 765KV	Daily	Maintenance of Bay Equipment	17/Oct/2019	09:00	17/Oct/2019	18:00	Maintenance of Bay Equipment
591	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIGARH-RAIGARH-PS-1 AND RAIGARH - 400KV - BUS 2 at Raigarh - 400KV	D	For AMP works	17/Oct/2019	9:00	17/Oct/2019	18:00	

592	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-AURANGABAD-AKOLA-1 AND 400KV-WARDHA-AURANGABAD-1 at AURANGABAD - 400KV	D	For AMP works	17/Oct/2019	9:00	17/Oct/2019	18:00	
593	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - PARLI - 400KV B/R 2 AND PARLI - 400KV - BUS 1 at PARLI - 400KV	D	For bay AMP works	17/Oct/2019	9:00	17/Oct/2019	18:00	
594	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-3 AND WARDHA - 765KV - BUS 2 at Wardha	D	For AMP work	17/Oct/2019	9:00	17/Oct/2019	18:00	
595	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 220KV-SOLAPUR-KUMBARI-1 AND SOLAPUR - 220KV - BUS 1 at Solapur - 220KV	D	Bay AMP works. Line Shutdown is required for Carrying	17/Oct/2019	9:00	17/Oct/2019	18:00	
596	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL-SATNA-2 AND SATNA - 400KV - BUS 2 at SATNA - 400KV	D	For installation of additional compressor	17/Oct/2019	9:00	17/Oct/2019	18:00	
597	PLANNED	OCC_523	POWERGRID_WR2	400KV-RAJGARH-KASOR-2	D	AMP work by Pirana	17/Oct/2019	9:00	17/Oct/2019	18:00	
598	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR - 400KV B/R 1 AND JABALPUR - 400KV - BUS 1 at JABALPUR - 400KV	D	Bay AMP	17/Oct/2019	9:00	17/Oct/2019	18:00	
599	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-TAMNAR-2 AND TAMNAR - 765KV - BUS 2 (701 BAY) at TAMNAR - 400KV	D	For AMP Works	17/Oct/2019	9:30	17/Oct/2019	17:30	
600	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV RAIPUR-ICT-3 AND RAIPUR - 220KV - BUS 1 at RAIPUR - 220KV	D	AMP works at Raipur SS.	17/Oct/2019	9:30	17/Oct/2019	17:30	
601	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV/220KV RAJGARH-ICT-1 AND 400KV-BADNAWAR-RAJGARH-1 at RAJGARH - 400KV	D	For Circuit Breaker testing	17/Oct/2019	10:00	17/Oct/2019	17:00	
602	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-50MVAR Line Reactor BINA-SHUJALPUR-2 at SHUJALPUR - 400KV	D	AMP Work	17/Oct/2019	10:00	17/Oct/2019	18:00	
603	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-VINDHYACHAL(PS)-JABALPUR-2 AND FUTURE at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	17/Oct/2019	10:00	17/Oct/2019	18:00	
604	PLANNED	OCC_523	POWERGRID_WR1	220KV-TALEGAON-PUNE-PG-2	D	For line equipments AMP work & Relay Testing, at PUNI	17/Oct/2019	9:00	17/Oct/2019	18:00	
605	PLANNED	OCC_523	MSETCL	400KV-CHANDRAPUR-GCR-CHANDRAPUR HVDC-1	Continuous	1) For replacement of old damaged quadraple bus condu	17/Oct/2019	05:00	18/Oct/2019	18:00	During, this outage 400KV HVDC Ckt. No.-2 will be in service. The outage on 400KV HVDC -1 bay is required as the work of replacement of bus conductor of Main Bus-II is to be carried out in HVDC -1 bay.
606	PLANNED	OCC_523	CSPTCL	315 MVA ICT -I at 400 KV S/s Raita.	c	Annual Maintenance Programme.	17/Oct/2019	8:00	18/Oct/2019	17:00	
607	PLANNED	OCC_523	GETCO	400 kV-SSP-KASOR-1	Daily	Line maint. Work	17/Oct/2019	8:00	18/Oct/2019	17:00	Auto reclose of SSP- Asoj will remain out
608	PLANNED	OCC_523	DBPOWER	400KV-DB POWER-RAIGARH-PS-2	D	For AMP works	17/Oct/2019	8:00	18/Oct/2019	18:00	Shutdown is Planned considering the DBPL Unit#2 AOH in Oct-19
609	PLANNED	OCC_523	GETCO	AMRELI - 400 kV - BUS 2	Continuous	For Kasor-1 and Kasor-2 Bus-2 isolator maintenance	17/Oct/2019	8:00	18/Oct/2019	18:00	
610	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-SIPAT-BILASPUR-1 AND BILASPUR - 765KV - BUS 2 at BILASPUR - 765KV	D	For AMP works	17/Oct/2019	9:00	18/Oct/2019	18:00	
611	PLANNED	OCC_523	MSETCL	NEW KOYNA - 400KV - BUS 1	Continuous	Cold washing, condutor replacement, Isolator replacemer	17/Oct/2019	08:00	19/Oct/2019	18:00	Main Bus-II will be in service
612		OCC_523	ER-II/ODISHA/SUNDERGARH	400KV Sundergarh-Raigarh Ckt # 3	ODB	TL Maintenance works	17/Oct/2019	8:00	17/Oct/2019	18:00	
613	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-HALDARWA-2	C	Isolator Replacemnet in Kawas haldarwa 2 at GETCO Ha	18/Oct/2019	10:00	23/Oct/2019	17:00	
614	PLANNED	OCC_523	MSETCL	220KV-NASIK-NAVSARI-1	Daily	For the work of Porcelain Long rod fixing,	18/Oct/2019	08:00	25/Oct/2019	18:00	if issued by CO before proposed date.
615	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAPI-1	C	Tower Shifting due to Bullet train project	18/Oct/2019	9:00	27/Oct/2019	17:00	
616	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAPI-2	C	Tower Shifting due to Bullet train project	18/Oct/2019	9:00	27/Oct/2019	17:00	
617	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHARAMJAYGARH-JHARSUGUDA-1 & 2	D	Both curcuits AR in Non auto required for Rectification o	18/Oct/2019	8:00	19/Oct/2019	18:00	
618	PLANNED	OCC_523	MSETCL	400KV-RGPPL-NEW KOYNA-2	Daily	PID testing of Insulators	18/Oct/2019	10:00	30/Oct/2019	15:00	A/R to be required ofF during PID testing
619	PLANNED	OCC_523	POWERGRID_WR2	VARSANA - 400KV - BUS 2	D	RTV COATING by Bhachau	18/Oct/2019	8:00	19/Oct/2019	18:00	
620	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-CHANDRAPUR-BHADRAWATI-2 AND BHADRAWATI - 400KV B/R 1 at BHADRAWATI - 400KV	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	18:00	
621	PLANNED	OCC_523	GETCO	HADALA - 400 kV - TRANSFER BUS	Daily	Feeder Bay Water Washing work and maintenance work	18/Oct/2019	8:00	18/Oct/2019	18:00	
622	PLANNED	OCC_523	GETCO	AMRELI-50NVAR Bus reactor Kasor-2	Continuous	For Bus-2 PG Isolator maintenance	18/Oct/2019	8:00	18/Oct/2019	18:00	
623	PLANNED	OCC_523	GETCO	220 kV-TARAPUR 1&2-VAPI-1	Daily	maintenance work	18/Oct/2019	8:00	18/Oct/2019	18:00	
624	PLANNED	OCC_523	MSETCL	400KV-LONIKHAND-PUNE-PG-1	Daily	Line Maintenance & Routine Diagnostic testing work	18/Oct/2019	08:00	18/Oct/2019	18:00	-

625	PLANNED	OCC_523	KWPCL	Main Bay - KWPCL - 400KV - Bus 1 AND 400KV/21KV KWPCL-GT-1	Daily	Bay : 401 Bay Breaker & Isolator Maintenance	18/Oct/2019	8:00	18/Oct/2019	18:00	
626	PLANNED	OCC_523	POWERGRID_WR1	400 Kv NSPCL-Raipur -1	D	For Rectification of CC Rings & Open Line Spacers, 400	18/Oct/2019	8:00 AM	18/Oct/2019	6:00 PM	
627	PLANNED	OCC_523	POWERGRID_WR1	400KV-BHADRAWATI-RAIPUR-3	D	Auto-reclose relay retro-fitting works in Main Bay at Raip	18/Oct/2019	8:00	18/Oct/2019	20:00	
628	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV RAIGARH-PS-ICT-3	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	17:00	
629	PLANNED	OCC_523	MSETCL	400KV-WARDHA-KORADI-II-1	Daily	Routine Maintenance & Dignostic testing work Nut Bolt T	18/Oct/2019	09:00	18/Oct/2019	17:00	400KV WARORA-IEPL Line is in ckt
630	PLANNED	OCC_523	MSETCL	220KV-BOISAR-NALASOPARA-1	Daily	Post monsoon maintenance work	18/Oct/2019	09:00	18/Oct/2019	17:00	-
631	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV BOISAR-ICT-2	D	For AMP Works. Dia to be kept open on both sides	18/Oct/2019	9:00	18/Oct/2019	17:30	
632	PLANNED	OCC_523	RRWTL	RAJNANDGAON-RRWTL - 765KV - BUS 2	D	Annual Maintenance	18/Oct/2019	9:00	18/Oct/2019	18:00	
633	PLANNED	OCC_523	APML	MAIN BAY - 400KV/11.5KV TIRODA-ST-4 AND TIRODA - 400KV - BUS 2 at TIRODA - 400KV	Daily	Maintenance of Bay Equipment	18/Oct/2019	09:00	18/Oct/2019	18:00	Maintenance of Bay Equipment
634	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHILAI-BHATAPARA-1 AND BHATAPARA - 400KV - BUS 1 at BHATAPARA - 400KV	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	18:00	
635	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIGARH-RAIPUR-1 AND FUTURE at Raigarh - 400KV	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	18:00	
636	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-DHULE-AURANGABAD-1 AND 765KV/400KV AURANGABAD-ICT-2 at AURANGABAD - 765KV	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	18:00	
637	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIPUR-PS (DURG)-GMR CHHATTISGARH-2 AND RAIPUR-PS (DURG) - 400KV - BUS 2 at RAIPUR-PS (DURG) - 400KV	D	For AMP works	18/Oct/2019	9:00	18/Oct/2019	18:00	
638	PLANNED	OCC_523	POWERGRID_WR1	WARDHA - 220KV - BUS 1	D	For AMP work	18/Oct/2019	9:00	18/Oct/2019	18:00	
639	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-SOLAPUR-RAICHUR-1 AND SOLAPUR - 765KV - BUS 1 at Solapur - 765KV	D	Bay AMP works.	18/Oct/2019	9:00	18/Oct/2019	18:00	
640	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV ITARSI-ICT-1 AND ITARSI - 220KV - BUS 1	D	For Retrofitting of existing ABB make RAICA LBB relay w	18/Oct/2019	9:00	18/Oct/2019	18:00	
641	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - INDORE - 400KV B/R 2 AND INDORE - 400KV - BUS 2 at INDORE - 400KV	D	BAY AMP WORKS	18/Oct/2019	9:00	18/Oct/2019	18:00	
642	PLANNED	OCC_523	POWERGRID_WR2	REWA - 400KV B/R 1	D	AMP WORK. Dia to be kept open.	18/Oct/2019	9:00	18/Oct/2019	18:00	
643	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-JABALPUR-JABALPUR-PS-1 AND JABALPUR - 400KV - BUS 1 at JABALPUR - 400KV	D	Bay AMP	18/Oct/2019	9:00	18/Oct/2019	18:00	
644	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-TAMNAR-2 AND TAMNAR - 765KV - BUS 2 (701 BAY) at TAMNAR - 400KV	D	For AMP Works	18/Oct/2019	9:30	18/Oct/2019	17:30	
645	PLANNED	OCC_523	CWRTL	400KV-GWALIOR-MORENA-2	D	Maintenance of Line Equipments	18/Oct/2019	10:00	18/Oct/2019	18:00	
646	PLANNED	OCC_523	MP_SLDC	220KV Chhanera-Khandwa (PGCIL) -I	D	For bay equipment maintenance and testing work	18/Oct/2019	10:00	18/Oct/2019	18:00	
647	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV PUNE-PG-ICT-2 AND PUNE-PG - 400KV - BUS 2 at PUNE-PG - 400KV	D	Replacement of Clamp & connectors	18/Oct/2019	9:00	18/Oct/2019	18:00	
648	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV-CGPL-BACHAU-2 AND CGPL - 400KV - BUS 2	D	Breaker drive box painting	18/Oct/2019	8:00	19/Oct/2019	20:00	
649	PLANNED	OCC_523	POWERGRID_WR1	400KV-KOLHAPUR GIS-NARENDRA KUDGI-1	C	For Support/Partition Insulator replacement work in ext	18/Oct/2019	10:00	21/Oct/2019	18:00	
650		OCC_523	NHPTL	100 MVA, 400/11.5-11.5 kV, 3 Phase, Station Transformer.	D	SC testing	18/Oct/2019	8:00	20/Oct/2019	16:00	
651	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIPUR-PS (DURG)-CHAMPA-1	D	For line AMP works & 765kV Champa-Durg-2 AR in non	19/Oct/2019	8:00	19/Oct/2019	18:00	
652	PLANNED	OCC_523	BDTCL	BHOPAL-BDTCL-765KV-BUS 1	D	AMP and testing works	19/Oct/2019	8:00	19/Oct/2019	19:00	
653	PLANNED	OCC_523	MSETCL	400KV-KALWA-KHARGHAR-1	Daily	R&M and Diagnostic testing work	19/Oct/2019	08:00	19/Oct/2019	18:00	400kV Kharghar-Talegaon line will be in service
654	PLANNED	OCC_523	MSETCL	220KV-WARDHA-PUSAD-1	Daily	tightening of jumper nut bolt at loc. No.76 ,17,01,08,12 a	19/Oct/2019	10:00	19/Oct/2019	18:00	na
655	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV/400KV VADODARA-ICT-1 AND VADODARA - 765KV - BUS 2 at VADODARA - 765KV	D	For AMP Works	19/Oct/2019	10:00	19/Oct/2019	18:00	
656	PLANNED	OCC_523	MSETCL	400KV-CHANDRAPUR-BHADRAWATI-1	Continuous	For replacement of old S & S power make 400KV R, Y & I	19/Oct/2019	05:00	21/Oct/2019	18:00	During this outage period, the 400KV CHD-PGCIL Bhadrawati Ckt. No.- II, III and IV bays/lines will be in service. Subject to availability of generation.
657	PLANNED	OCC_523	MSETCL	CHANDRAPUR - 400KV - BUS 2	Continuous	1) For replacement of old damaged quadraple bus condu	19/Oct/2019	05:00	21/Oct/2019	18:00	During outage, all connected bays/feeders of Main Bus-II will be shifted to Main Bus-I by using the TBC-I & TBC-II bay. After shifting of all bays/feeders connected to Main Bus-II on 400KV Main Bus-I, then after the 400KV Bus Coupler bay will be kept off. Subject to availability of generation.
658	PLANNED	OCC_523	MP_SLDC	400KV Itarsi (PGCIL)-Bhopal-I	D	For bay equipment maintenance and testing work	19/Oct/2019	7:00	19/Oct/2019	19:00	
659	PLANNED	OCC_523	GETCO	400 kV/220 kV JETPUR-ICT-1	Daily	POST MONSOON MAINTENANCE	19/Oct/2019	8:00	19/Oct/2019	18:00	
660	PLANNED	OCC_523	GETCO	400 kV Chorania-Hadala Line	Daily	For PMM work of line	19/Oct/2019	8:00	19/Oct/2019	18:00	Maint work
661	PLANNED	OCC_523	GETCO	220 kV-TARAPUR 1&2-BHILAD-1	Daily	maintenance work	19/Oct/2019	8:00	19/Oct/2019	18:00	

662	PLANNED	OCC_523	KWPCL	Main Bay - KWPCL - 400KV - Bus 1 AND 400KV/11.5KV KWPCL-ST-1	Daily	Bay : 404 Bay Breaker & Isolator Maintenance	19/Oct/2019	8:00	19/Oct/2019	18:00	
663	PLANNED	OCC_523	POWERGRID_WR1	400 Kv NSPCL-Raipur -2	D	For Rectification of CC Rings & Open Line Spacers, 400	19/Oct/2019	8:00 AM	19/Oct/2019	6:00 PM	
664	PLANNED	OCC_523	BDTCL	BHOPAL-BDTCL-400KV-BUS 2	D	AMP and testing works	19/Oct/2019	8:00	19/Oct/2019	19:00	
665	PLANNED	OCC_523	MSETCL	220KV-BOISAR-BOISAR-M-1	Daily	Routine Maintenance & Dignostic testing work	19/Oct/2019	09:00	19/Oct/2019	17:00	-
666	PLANNED	OCC_523	MEGPTCL	MAIN BAY (703) BUS REACTOR @ AKOLA 2	Daily	Maintenance of Bay Equipment	19/Oct/2019	09:00	19/Oct/2019	18:00	Maintenance of Bay Equipment
667	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 400KV-KORADI-II-KORADI-III-1 AND KORADI-III - 400KV - BUS 2 at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	19/Oct/2019	09:00	19/Oct/2019	18:00	Maintenance of Bay Equipment
668	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-BHILAI-BHATAPARA-1 AND 400KV/220KV BHATAPARA-ICT-2 at BHATAPARA - 400KV	D	For AMP works	19/Oct/2019	9:00	19/Oct/2019	18:00	
669	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIGARH-JHARSUGUDA-2 AND RAIGARH - 400KV - BUS 1 at Raigarh - 400KV	D	For AMP works	19/Oct/2019	9:00	19/Oct/2019	18:00	
670	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV AURANGABAD-ICT-2 AND AURANGABAD - 765KV - BUS 2 at AURANGABAD - 765KV	D	For AMP works	19/Oct/2019	9:00	19/Oct/2019	18:00	
671	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-KOLHAPUR GIS-MAPUSA-2 AND MAPUSA - 400KV - BUS 1 at MAPUSA - 400KV	D	For AMP works.	19/Oct/2019	9:00	19/Oct/2019	18:00	
672	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-AURANGABAD-4 AND WARDHA - 765KV - BUS 1 at Wardha	D	For AMP work	19/Oct/2019	9:00	19/Oct/2019	18:00	
673	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV Solapur-ICT-1	D	For AMP works	19/Oct/2019	9:00	19/Oct/2019	18:00	
674	PLANNED	OCC_523	POWERGRID_WR2	TBC BAY - ITARSI - 220KV - BUS 1 AND FUTURE	D	For Retrofitting of existing ABB make RAICA LBB relay w	19/Oct/2019	9:00	19/Oct/2019	18:00	
675	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-JABALPUR-JABALPUR-PS-1 AND 400KV-JABALPUR-ITARSI-4 at JABALPUR - 400KV	D	Bay AMP	19/Oct/2019	9:00	19/Oct/2019	18:00	
676	PLANNED	OCC_523	MP_SLDC	400KV Indore PGCIL (Hatuniya)- Pithampur-I	D	For line maintenance work	19/Oct/2019	10:00	19/Oct/2019	17:00	
677	PLANNED	OCC_523	MP_SLDC	220KV Chhanera-Khandwa (PGCIL) -II	D	For bay equipment maintenance and testing work	19/Oct/2019	10:00	19/Oct/2019	18:00	
678	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV SHUJALPUR-ICT-2	C	Oil leakage attending from 220KV side Y phase Turet. Di	19/Oct/2019	10:00	21/Oct/2019	18:00	
679	PLANNED	OCC_523	POWERGRID_WR2	220KV-NAVSARI-NAVSARI-GETCO-2	D	Simultaneous S/D for NHSRCL Diversion Work, Tower E	19/Oct/2019	10:00	26/Oct/2019	17:00	
680	PLANNED	OCC_523	POWERGRID_WR2	400KV-VADINAR-BACHAU-2	D	Providing Bird Diverters. A/R OFF of ckt-1 and dia to be	19/Oct/2019	8:00	29/Oct/2019	18:00	
681		OCC_523	POWERGRID	400 KV RANCHI-SIPAT-1 LINE AND 80 MVAR LINE REACTOR	ODB	Replacement of defective CAPTHOR in FSC	19/Oct/2019	09:30	19/Oct/2019	17:00	
682	PLANNED	OCC_523	GETCO	VARSANA - 400 kV - BUS 2	D	For replacement of Fix contact Rod & L clamp of 8BA Iso	20/Oct/2019	8:00	20/Oct/2019	18:00	
683	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV CHAMPA-ICT-1	D	For AMP works	20/Oct/2019	9:00	20/Oct/2019	17:30	
684	PLANNED	OCC_523	BDTCL	BHOPAL-BDTCL-765KV-BUS 2	D	AMP and testing works	20/Oct/2019	8:00	20/Oct/2019	19:00	
685	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV DHARAMJAYGARH-ICT-2	D	For AMP works	20/Oct/2019	9:00	20/Oct/2019	17:00	
686	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-REWA-2	D	For AMP Works by Jabalpur. A/R OFF of ckt-1 and dia t	20/Oct/2019	9:30	20/Oct/2019	17:30	
687	PLANNED	OCC_523	MSETCL	220KV-BOISAR-BOISAR-M-2	Daily	Routine Maintenance & Dignostic testing work	20/Oct/2019	09:00	20/Oct/2019	17:00	-
688	PLANNED	OCC_523	MP_SLDC	220KV Indore (PGCIL) Hatunia-Ujjain-I	D	For line maintenance work	20/Oct/2019	10:00	21/Oct/2019	17:00	
689		OCC_523	POWERGRID	400 KV RANCHI-SIPAT-2 LINE AND 80 MVAR LINE REACTOR	ODB	Replacement of defective CAPTHOR in FSC	20/Oct/2019	09:30	20/Oct/2019	17:00	
690	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIPUR-PS (DURG)-CHAMPA-2	D	For line AMP works & 765kV Champa-Durg-1 AR in non	21/Oct/2019	8:00	21/Oct/2019	18:00	
691	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHARAMJAYGARH-JABALPUR-1 & 2	D	Both curcuits AR in Non auto required for Rectification o	21/Oct/2019	8:00	23/Oct/2019	18:00	
692	PLANNED	OCC_523	POWERGRID_WR2	765KV-GWALIOR-AGRA-2	D	Fixing of sleave in D Type of Angle Tower and Tower strer	21/Oct/2019	9:45	23/Oct/2019	18:00	
693	PLANNED	OCC_523	BDTCL	BHOPAL-BDTCL-400KV-BUS 1	D	AMP and testing works	21/Oct/2019	8:00	21/Oct/2019	19:00	
694	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-SATNA-BINA-1 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	For installation of additional compressor	21/Oct/2019	9:00	21/Oct/2019	18:00	
695	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-BINA-GWALIOR-3 AND BINA - 765KV - BUS 2 at BINA - 765KV	D	For AMP work.	21/Oct/2019	9:15	21/Oct/2019	17:30	
696	PLANNED	OCC_523	POWERGRID_WR2	SHUJALPUR - 400KV - BUS 1	D	AMP Work	21/Oct/2019	10:00	21/Oct/2019	18:00	
697	PLANNED	OCC_523	MSETCL	400KV-KALWA-PUNE-PG-1	Daily	Routine Maintenance & Diagnostic Testing	21/Oct/2019	08:00	21/Oct/2019	17:00	-
698	PLANNED	OCC_523	MP_SLDC	400KV Itarsi (PGCIL)-Bhopal-II	D	For line maintenance work	21/Oct/2019	7:00	21/Oct/2019	19:00	
699	PLANNED	OCC_523	GETCO	VARSANA - 400 kV - BUS 2	Daily	For replacement of Fix contact Rod & L clamp of 89B Iso	21/Oct/2019	8:00	21/Oct/2019	19:00	
700	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV RAIGARH-PS-ICT-1 AND RAIGARH-PS - 765KV - BUS 1 at RAIGARH-PS - 765KV	D	For AMP works	21/Oct/2019	9:00	21/Oct/2019	17:00	
701	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-WARDHA-WARORA-1 AND WARDHA - 400KV - BUS 2 at Wardha - 400KV	Daily	Routine Maintenance & Dignostic testing work Nut Bolt T	21/Oct/2019	09:00	21/Oct/2019	17:00	Line will be charged through Tie CB 428.
702	PLANNED	OCC_523	MP_SLDC	220KV Morena-Adani	D	For line maintenance work	21/Oct/2019	9:00	21/Oct/2019	17:00	
703	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - VINDHYACHAL(PS) - 400KV B/R 1 AND 765KV/400KV VINDHYACHAL(PS)-ICT-3 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	21/Oct/2019	9:00	21/Oct/2019	17:00	
704	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - BHUJ - 765KV B/R 1 AND BHUJ - 765KV - BUS 2 at Bhuj - 765KV	D	RTV Coating STAGE-4	21/Oct/2019	9:00	21/Oct/2019	17:00	CONSTRUCTION
705	PLANNED	OCC_523	MEGPTCL	MAIN BAY - 765KV-AKOLA-EKTUNI-1 AND AKOLA - 765KV - BUS 1 at AKOLA - 765KV	Daily	Maintenance of Bay Equipment	21/Oct/2019	09:00	21/Oct/2019	18:00	Maintenance of Bay Equipment
706	PLANNED	OCC_523	MSETCL	400KV-PARLI-M-PARLI-1	Daily	C & Tan delta measurement work of CTs	21/Oct/2019	09:00	21/Oct/2019	18:00	-
707	PLANNED	OCC_523	MSETCL	BUS COUPLER @ KOLHAPUR-III (TALANDGE)-400 KV	Daily	QMW	21/Oct/2019	09:00	21/Oct/2019	18:00	-
708	PLANNED	OCC_523	MEGPTCL	TIE BAY - 400KV-KORADI-II-KORADI-III-1 AND FUTURE at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	21/Oct/2019	09:00	21/Oct/2019	18:00	Maintenance of Bay Equipment

709	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV/220KV BHATAPARA-ICT-2 AND BHATAPARA - 400KV - BUS 2 at BHATAPARA - 400KV	D	For AMP works	21/Oct/2019	9:00	21/Oct/2019	18:00	
710	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-AURANGABAD-PADGHE-PG-2 AND AURANGABAD - 765KV - BUS 1 at AURANGABAD - 765KV	D	For AMP works	21/Oct/2019	9:00	21/Oct/2019	18:00	
711	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-RAIPUR-RAIPUR-PS (DURG)-1 AND RAIPUR-PS (DURG) - 400KV - BUS 1 at RAIPUR-PS (DURG) - 400KV	D	For AMP works	21/Oct/2019	9:00	21/Oct/2019	18:00	
712	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-BHADRAWATI-RAIPUR-1 AND BHADRAWATI - 400KV B/R 2 at BHADRAWATI - 400KV	D	For AMP works	21/Oct/2019	9:00	21/Oct/2019	18:00	
713	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV/400KV SOLAPUR-ICT-1 AND 765KV-SOLAPUR-PARLI NEW-2 at Solapur - 765KV	D	Closing Damper replacemet in Siemens make CB	21/Oct/2019	9:00	21/Oct/2019	18:00	
714	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-1 AND 765KV-WARDHA-AURANGABAD-4 at Wardha	D	For AMP work	21/Oct/2019	9:00	21/Oct/2019	18:00	
715	PLANNED	OCC_523	POWERGRID_WR2	DEHGAM - 400KV B/R 2	D	AMP works. Dia to be kept open.	21/Oct/2019	9:00	21/Oct/2019	18:00	
716	PLANNED	OCC_523	POWERGRID_WR2	PIRANA - 400KV B/R 1	D	For AMP work. Dia to be kept open.	21/Oct/2019	9:00	21/Oct/2019	18:00	
717	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-JABALPUR-REWA-2 AND 400KV/220KV REWA-ICT-3 at REWA - 400KV	D	For CB Alignment attending by M/s GE in the reference c	21/Oct/2019	9:00	21/Oct/2019	18:00	
718	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV JABALPUR-ICT-1	D	ICT AMP WORK. Dia to be kept open on both sides	21/Oct/2019	9:00	21/Oct/2019	18:00	
719	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-TAMNAR-1 AND TAMNAR - 765KV - BUS 2 (704 BAY) at TAMNAR - 400KV	D	For AMP Works	21/Oct/2019	9:30	21/Oct/2019	17:30	
720	PLANNED	OCC_523	POWERGRID_WR1	RAIPUR - 400KV - BUS 3	D	AMP works at Raipur SS.	21/Oct/2019	9:30	21/Oct/2019	17:30	
721	PLANNED	OCC_523	POWERGRID_WR2	GWALIOR - 400KV B/R 1	D	AMP work and For control of Bus Reactor from STATCOM	21/Oct/2019	9:45	21/Oct/2019	18:00	
722	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - PADGHE-PG - 765KV B/R 1 AND PADGHE-PG - 765KV - BUS 2 at PADGHE-PG - 765KV	D	For AMP works	21/Oct/2019	10:00	21/Oct/2019	17:00	
723	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BADNAWAR-RAJGARH-2 AND RAJGARH - 400KV - BUS 1 at RAJGARH - 400KV	D	For Circuit Breaker testing	21/Oct/2019	10:00	21/Oct/2019	17:00	
724	PLANNED	OCC_523	MSETCL	400KV-BHUSAWAL-DEEPNAGAR-1	Daily	For On Line PID of Insulator string	21/Oct/2019	08:00	22/Oct/2019	18:00	The AR required in NON-Auto Mode. The ckt will be in service
725	PLANNED	OCC_523	MSETCL	400KV-BHUSAWAL-DEEPNAGAR-2	Daily	For On Line PID of Insulator string	21/Oct/2019	08:00	22/Oct/2019	18:00	The AR required in NON-Auto Mode. The ckt will be in service
726	PLANNED	OCC_523	POWERGRID_WR2	400KV-AURANGABAD-BOISAR-1	D	For Insulator replacement work. Ouatge of Aurangabd-Bo	21/Oct/2019	8:00	22/Oct/2019	18:00	
727	PLANNED	OCC_523	POWERGRID_WR2	400KV-MAGARWADA-BOISAR-2	D	For Insulator replacement work. Ouatge of Aurangabd-Bo	21/Oct/2019	8:00	22/Oct/2019	18:00	
728	PLANNED	OCC_523	CGPL	MAIN BAY - 400KV-CGPL-JETPUR-1 AND CGPL - 400KV - BUS 2	D	Breaker drive box painting	21/Oct/2019	8:00	22/Oct/2019	20:00	
729	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-SIPAT-BILASPUR-2 AND BILASPUR - 765KV - BUS 2 at BILASPUR - 765KV	D	For AMP works	21/Oct/2019	9:00	22/Oct/2019	18:00	
730	PLANNED	OCC_523	POWERGRID_WR2	400KV-BINA-MP-BINA-1	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos I	21/Oct/2019	8:00	23/Oct/2019	8:00	
731	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 220KV-HOSHANGABAD-ITARSI-1 AND ITARSI - 220KV - BUS 1	C	For CB Driving Mechanisam Overhauling works at Itarsi	21/Oct/2019	9:00	25/Oct/2019	18:00	
732	PLANNED	OCC_523	NTPC	Inter Bus Transformer-1, Bay-706	Continuous	Annual testing of IBT-1	21/Oct/2019	8:00	26/Oct/2019	18:30	Annual testing of IBT-1
733	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-AKOLA-AURANGABAD-2 AND AKOLA - 400KV - BUS 1 at Wardha	C	For Replacement of BHEL CB with GE CB.	21/Oct/2019	9:00	30/Oct/2019	18:00	
734	PLANNED	OCC_523	MSETCL	400KV-KALWA-PUNE-PG-1	Daily	PID Testing work for line Insulator strings at various loc	21/Oct/2019	09:00	31/Oct/2019	18:00	-
735	PLANNED	OCC_523	POWERGRID_WR1	PUNE-PG - 400KV - BUS 1	D	Replacement of Clamp & connectors	22/Oct/2019	9:00	22/Oct/2019	18:00	
736	PLANNED	OCC_523	POWERGRID_WR1	765KV/400KV CHAMPA-ICT-2	D	For AMP works	22/Oct/2019	9:00	22/Oct/2019	17:30	
737	PLANNED	OCC_523	GETCO	VARSANA - 400 kV - BUS 1	Daily	For replacement of Fix contact Rod & L clamp of 89A Isol	22/Oct/2019	8:00	22/Oct/2019	18:00	
738	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-SATNA-BINA-1 AND 400KV-VINDHYACHAL-SATNA-1 at SATNA - 400KV	D	For installation of additional compressor	22/Oct/2019	9:00	22/Oct/2019	18:00	
739	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-BINA-JABALPUR-2 AND 765KV-BINA-GWALIOR-3 at BINA - 765KV	D	For AMP work.	22/Oct/2019	9:15	22/Oct/2019	17:30	
740	PLANNED	OCC_523	POWERGRID_WR1	400KV-KORBA-NTPC-BHILAI-2	D	Diversion work of line due to ash dyke of Maruti Clean P	22/Oct/2019	8:00	30/Oct/2019	18:00	
741	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARDHA-AKOLA-1	D	For line and SS AMP works & 400kV Wardha-Akola-2 Al	22/Oct/2019	9:00	22/Oct/2019	18:00	
742	PLANNED	OCC_523	GETCO	ASOJ - 400 kV - BUS 1	Daily	400 kv Bus-1 Pantograph Isolator replacement work of 4	22/Oct/2019	7:00	22/Oct/2019	18:00	
743	PLANNED	OCC_523	GETCO	400 kV-ASOJ-CHORANIA-2	Daily	400 kv Bus-1 Pantograph Isolator replacement work	22/Oct/2019	7:00	22/Oct/2019	18:00	
744	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV DEHGAM-ICT-1	D	Retrofitting of RET relay. Dia to be kept open on both sid	22/Oct/2019	9:00	22/Oct/2019	16:00	
745	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV RAIGARH-PS-ICT-1 AND RAIGARH-PS - 765KV - BUS 1 at RAIGARH-PS - 765KV	D	For AMP works	22/Oct/2019	9:00	22/Oct/2019	17:00	
746	PLANNED	OCC_523	MSETCL	MAIN BAY - 400KV-WARDHA-KORADI-II-1 AND WARDHA - 400KV - BUS 1 at Wardha - 400KV	Daily	Routine Maintenance & Dignostic testing work Nut Bolt T	22/Oct/2019	09:00	22/Oct/2019	17:00	400KV KORADI-WARDHA Line will be charged through Tie CB 414.
747	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL(PS)-RIHAND-2 AND VINDHYACHAL(PS) - 400KV - BUS 2 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	22/Oct/2019	9:00	22/Oct/2019	17:00	
748	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - BHUJ - 765KV B/R 1 AND FUTURE at Bhuj - 765KV	D	RTV Coating STAGE-4	22/Oct/2019	9:00	22/Oct/2019	17:00	CONSTRUCTION
749	PLANNED	OCC_523	MP_SLDC	220KV Pandurna-Kamleshwar	D	For line maintenance work	22/Oct/2019	9:00	22/Oct/2019	18:00	
750	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - BHATAPARA - 400KV B/R 1 AND BHATAPARA - 400KV - BUS 2 at BHATAPARA - 400KV	D	For AMP works	22/Oct/2019	9:00	22/Oct/2019	18:00	

751	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - RAIGARH - 400KV B/R 2 AND 400KV-RAIGARH-JHARSUGUDA-2 at Raigarh - 400KV	D	For AMP works	22/Oct/2019	9:00	22/Oct/2019	18:00	
752	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-AURANGABAD-SOLAPUR-1 AND 765KV-WARDHA-AURANGABAD-1 at AURANGABAD - 765KV	D	For AMP works	22/Oct/2019	9:00	22/Oct/2019	18:00	
753	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV/220KV MAPUSA-ICT-2 AND 400KV-KOLHAPUR GIS-MAPUSA-2 at MAPUSA - 400KV	D	For AMP works.	22/Oct/2019	9:00	22/Oct/2019	18:00	
754	PLANNED	OCC_523	POWERGRID_WR1	WARDHA - 765KV - BUS 2	D	For AMP work, Phase CVT Errection.	22/Oct/2019	9:00	22/Oct/2019	18:00	
755	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-AURANGABAD-SOLAPUR-2 AND 765KV-PUNE-PG-SOLAPUR-1 at Solapur - 765KV	D	Closing Damper replacemet in Siemens make CB	22/Oct/2019	9:00	22/Oct/2019	18:00	
756	PLANNED	OCC_523	POWERGRID_WR2	MSR-1 AND MSR-2 at Satna	D	AMP Work	22/Oct/2019	9:00	22/Oct/2019	18:00	
757	PLANNED	OCC_523	POWERGRID_WR2	BUS COUPLER BAY - ITARSI - 220KV - BUS 1 AND ITARSI - 220KV - BUS 2	D	For Retrofitting of existing ABB make RAICA LBB relay w	22/Oct/2019	9:00	22/Oct/2019	18:00	
758	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV PIRANA-ICT-2	D	For 33kV RTV coating work, dia to be kept open on both	22/Oct/2019	9:00	22/Oct/2019	18:00	
759	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV/220KV RAJGARH-ICT-2 AND 400KV-BADNAWAR-RAJGARH-2 at RAJGARH - 400KV	D	For Circuit Breaker testing	22/Oct/2019	9:00	22/Oct/2019	18:00	
760	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-ITARSI-KHANDWA-1 AND KHANDWA - 400KV - BUS 1 at KHANDWA - 400KV	D	AMP WORK	22/Oct/2019	9:00	22/Oct/2019	18:00	
761	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-TAMNAR-1 AND TAMNAR - 765KV - BUS 2 (704 BAY) at TAMNAR - 400KV	D	For AMP Works	22/Oct/2019	9:30	22/Oct/2019	17:30	
762	PLANNED	OCC_523	POWERGRID_WR1	RAIPUR - 220KV - BUS 2	D	AMP works at Raipur SS.	22/Oct/2019	9:30	22/Oct/2019	17:30	
763	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV GWALIOR-ICT-3	D	For AMP Work. Dia to be kept open on both sides.	22/Oct/2019	9:45	22/Oct/2019	18:00	
764	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV/400KV PADGHE-PG-ICT-2 AND 765KV-AURANGABAD-PADGHE-PG-1 at PADGHE-PG - 765KV	D	For AMP works	22/Oct/2019	10:00	22/Oct/2019	17:00	
765	PLANNED	OCC_523	POWERGRID_WR2	BUS COUPLER BAY - VADODARA - 220KV - BUS 1 AND VADODARA - 220KV - BUS 2 at VADODARA - 220KV	D	For AMP Works	22/Oct/2019	10:00	22/Oct/2019	18:00	
766	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV REWA-ICT-3	D	For CSD Commissioning. Dia to be kept open on both sid	22/Oct/2019	9:00	23/Oct/2019	18:00	
767	PLANNED	OCC_523	MP_SLDC	220KV Indore (PGCIL) Hatunia-Ujjain-II	D	For line maintenance work	22/Oct/2019	10:00	23/Oct/2019	17:00	
768	PLANNED	OCC_523	TPL-DGEN	400KV/220KV DGEN-ICT-3	C	ICT 3 routine energisation testing during RSD and shutd	22/Oct/2019	10:00	23/Oct/2019	17:00	ICT No load charging only, Not connected at 220 KV side.
769	PLANNED	OCC_523	POWERGRID_WR2	400KV-AURANGABAD-BOISAR-1 L/R@ BOISAR - 400KV	D	For AMP Works	22/Oct/2019	9:00	22/Oct/2019	17:30	
770	PLANNED	OCC_523	GETCO	HADALA - 400 kV - BUS 2	D	Feeder Bay Water Washing work and maintenance work	23/Oct/2019	8:00	23/Oct/2019	18:00	
771	PLANNED	OCC_523	GETCO	400 kV Chorania-Hadala Line	Daily	For PMM work of line	23/Oct/2019	8:00	23/Oct/2019	18:00	Maint work
772	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-CHORANIA-1	D	AMP of Terminal equipement work by Pirana. Dia to be k	23/Oct/2019	9:00	23/Oct/2019	18:00	
773	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-RAIPUR-PS (DURG)-CHAMPA-1 AND CHAMPA - 765KV B/R 1 at CHAMPA - 765KV	D	For AMP WORK	23/Oct/2019	9:00	24/Oct/2019	17:30	
774	PLANNED	OCC_523	MP_SLDC	400 KV Satna(PG)-Bina (PG)- 3	C	For making LILO arrangement at 400 KV Sagar S/s	23/Oct/2019	10:00	30/Oct/2019	17:00	
775	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL-SATNA-1 AND SATNA - 400KV - BUS 2 at SATNA - 400KV	D	For installation of additional compressor	23/Oct/2019	9:00	22/Oct/2019	18:00	
776	PLANNED	OCC_523	MSETCL	400KV-KALWA-KHARGHAR-1	Daily	PID Testing work for line Insulator strings at various loc	23/Oct/2019	09:00	27/Oct/2019	18:00	-
777	PLANNED	OCC_523	GETCO	MANSAR - 400 kV - BUS 1	Daily	89-A & 89-L Line isolator mechanical & electrical setting	23/Oct/2019	8:00	23/Oct/2019	18:00	Maint work
778	PLANNED	OCC_523	GETCO	400 kV-MANSAR-CHORANIA	Daily	89-A & 89-L Line isolator mechanical & electrical setting	23/Oct/2019	8:00	23/Oct/2019	18:00	Maint work
779	PLANNED	OCC_523	POWERGRID_WR1	400KV-WARDHA-AKOLA-2	D	For line and SS AMP works & 400kV Wardha-Akola-1 AI	23/Oct/2019	9:00	23/Oct/2019	18:00	
780	PLANNED	OCC_523	GETCO	400 kV-ASOJ-WANAKBORI-1	Daily	PMM work.	23/Oct/2019	7:00	23/Oct/2019	18:00	
781	PLANNED	OCC_523	POWERGRID_WR1	765KV-AURANGABAD-SOLAPUR-2 L/R@ AURANGABAD - 765KV	D	For AMP works	23/Oct/2019	8:00	23/Oct/2019	18:00	
782	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - BACHAU - 400KV B/R 1 AND BACHAU - 400KV - BUS 2 at BACHAU - 400KV	D	For AMP of CB & CT	23/Oct/2019	8:00	23/Oct/2019	18:00	
783	PLANNED	OCC_523	POWERGRID_WR2	765KV-SATNA-VINDHYACHAL(PS)-2 L/R@ VINDHYACHAL(PS) - 765KV	D	For taking 'Y' Ph Satna #2 Line Reactor inplace of spare	23/Oct/2019	9:00	23/Oct/2019	14:00	
784	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV DEHGAM-ICT-2	D	Retrofitting of RET relay.Dia to be kept open on both side	23/Oct/2019	9:00	23/Oct/2019	16:00	
785	PLANNED	OCC_523	MSETCL	TIE BAY - 400KV-WARDHA-WARORA-1 AND FUTURE at Wardha - 400KV	Daily	Routine Maintenance & Dignostic testing work Nut Bolt T	23/Oct/2019	09:00	23/Oct/2019	17:00	Line will be charged through mainCB 429.
786	PLANNED	OCC_523	MSETCL	132KV-PENCH-MP-KANHAN-1	Daily	Routine maintenance work	23/Oct/2019	09:00	23/Oct/2019	17:00	_
787	PLANNED	OCC_523	POWERGRID_WR2	220KV-BHUJ-VADVA-1	D	Testing of Bus Busbar/LBB Relays.	23/Oct/2019	9:00	23/Oct/2019	17:00	CONSTRUCTION
788	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 220KV - BUS 1	D	Testing of Bus Busbar/LBB Relays.	23/Oct/2019	9:00	23/Oct/2019	17:00	CONSTRUCTION
789	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV BOISAR-ICT-3	D	For AMP Works. Dia to be kept open on both sides	23/Oct/2019	9:00	23/Oct/2019	17:30	
790	PLANNED	OCC_523	MEGPTCL	TIE BAY - 765KV-AKOLA-EKTUNI-1 AND FUTURE at EKTUNI - 765KV	Daily	Maintenance of Bay Equipment	23/Oct/2019	09:00	23/Oct/2019	18:00	Maintenance of Bay Equipment
791	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - BHATAPARA - 400KV B/R 1 AND FUTURE at BHATAPARA - 400KV	D	For AMP works	23/Oct/2019	9:00	23/Oct/2019	18:00	
792	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-GADARWARA-WARORA-PG-2 AND 765KV-WARORA-PG-PARLI NEW-1 at WARORA-PG - 765KV	D	For AMP works	23/Oct/2019	9:00	23/Oct/2019	18:00	
793	PLANNED	OCC_523	POWERGRID_WR1	400KV AC - 460 BAY - AC FILTER MAIN BAY OF AC FILTER - III at CHAMPA-HVDC - 400KV	D	For AMP works	23/Oct/2019	9:00	23/Oct/2019	18:00	Missed in data base
794	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-2 AND RAIPUR-PS (DURG) - 765KV - BUS 1 at RAIPUR-PS (DURG) - 765KV	D	For AMP works	23/Oct/2019	9:00	23/Oct/2019	18:00	
795	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV/220KV BHADRAWATI-ICT-1 AND 400KV-BHADRAWATI-GWEL-2 at BHADRAWATI - 400KV	D	For AMP works	23/Oct/2019	9:00	23/Oct/2019	18:00	

796	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-WARDHA-RAIPUR-PS (DURG)-2 AND 765KV-WARDHA-AURANGABAD-3 at Wardha	D	For AMP work	23/Oct/2019	9:00	23/Oct/2019	18:00	
797	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-SOLAPUR-RAICHUR-2 AND SOLAPUR - 765KV - BUS 1 at Solapur - 765KV	D	AMP & Closing Damper replacemet in Siemens make CB	23/Oct/2019	9:00	23/Oct/2019	18:00	
798	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-SATNA-BINA-3 AND 400KV-VINDHYACHAL-SATNA-3 at SATNA - 400KV	D	AMP Work	23/Oct/2019	9:00	23/Oct/2019	18:00	
799	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-INDORE-VADODARA-1 AND INDORE - 765KV - BUS 2 at INDORE - 765KV	D	AMP WORKS	23/Oct/2019	9:00	23/Oct/2019	18:00	
800	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV PIRANA-ICT-1	D	For 33kV RTV coating work, dia to be kept open on both	23/Oct/2019	9:00	23/Oct/2019	18:00	
801	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV RAJGARH-ICT-2 AND RAJGARH - 400KV - BUS 2 at RAJGARH - 400KV	D	For Circuit Breaker testing	23/Oct/2019	9:00	23/Oct/2019	18:00	
802	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-ITARSI-KHANDWA-1 AND 400KV/220KV KHANDWA-ICT-2 at KHANDWA - 400KV	D	AMP WORK	23/Oct/2019	9:00	23/Oct/2019	18:00	
803	PLANNED	OCC_523	POWERGRID_WR2	JABALPUR - 400KV B/R 2	D	Bus Reactor AMP Work. Dia to be kept open.	23/Oct/2019	9:00	23/Oct/2019	18:00	
804	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-RAIGARH-PS-TAMNAR-1 AND 765KV/400KV TAMNAR-ICT-2 (705 BAY) at TAMNAR - 400KV	D	For AMP Works	23/Oct/2019	9:30	23/Oct/2019	17:30	
805	PLANNED	OCC_523	POWERGRID_WR1	RAIPUR - 400KV - BUS 2	D	AMP works at Raipur SS.	23/Oct/2019	9:30	23/Oct/2019	17:30	
806	PLANNED	OCC_523	POWERGRID_WR2	400KV-NAGDA-SHUJALPUR-1 L/R@ NAGDA - 400KV	D	Vizimax CSD relay installation and commissioning work	23/Oct/2019	10:00	23/Oct/2019	18:00	
807	PLANNED	OCC_523	MSETCL	220KV-SOLAPUR-KUMBARI-2	Daily	Quarterly Maintenance & Diagnostic testing work	23/Oct/2019	11:00	23/Oct/2019	16:00	Outage is required for Quarterly Maintenance & Diagnostic testing work
808	PLANNED	OCC_523	MSETCL	220KV-PARLI-PARLI-M-1	Continuous	Railway crossing work and Line maintenance work.	23/Oct/2019	08:00	24/Oct/2019	16:00	Line maintenance work may need 08 Hrs and Railway crossing work may require more than 08 Hrs
809	PLANNED	OCC_523	POWERGRID_WR2	400KV-AURANGABAD-BOISAR-2	D	For Insulator replacement work. Ouatge of Aurangabd-Bo	23/Oct/2019	8:00	24/Oct/2019	18:00	
810	PLANNED	OCC_523	POWERGRID_WR2	400KV-MAGARWADA-BOISAR-1	D	For Insulator replacement work. Ouatge of Aurangabd-Bo	23/Oct/2019	8:00	24/Oct/2019	18:00	
811	PLANNED	OCC_523	POWERGRID_WR2	BANASKANTHA - 400KV - BUS 2	D	For 400 kV bay extension work	23/Oct/2019	9:00	24/Oct/2019	17:00	
812	PLANNED	OCC_523	POWERGRID_WR1	Tie Bay - 765KV-SIPAT-BILASPUR-3 AND FUTURE at BILASPUR - 765KV	D	For AMP works	23/Oct/2019	9:00	24/Oct/2019	18:00	
813	PLANNED	OCC_523	NTPC	MOUDA - 400KV ICT-2	C	Annual Maintenance: Annual testing-IR, TanDelta, DGA,	23/Oct/2019	8:00	25/Oct/2019	18:00	
814	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - GWALIOR - 400KV B/R 1 AND GWALIOR - 400KV - BUS 1 at GWALIOR - 400KV	C	Overhauling of CB	23/Oct/2019	9:45	25/Oct/2019	18:00	
815	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAWAS-HALDARWA-1	C	Isolator Replacemnet in Kawas haldarwa 1 at GETCO Ha	24/Oct/2019	10:00	29/Oct/2019	17:00	
816	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHARAMJAYGARH-RANCHI-1	D	For Replacement of Broken Insulator at NH/River for saf	24/Oct/2019	9:00	24/Oct/2019	18:00	
817	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-VINDHYACHAL(PS)-JABALPUR-2 AND JABALPUR - 765KV - BUS 1 at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	24/Oct/2019	10:00	24/Oct/2019	18:00	
818	PLANNED	OCC_523	NTPC	VSTPS BUS #1	Continuous	Replacement of gear box of Bus-1 side isolator 89A.	24/Oct/2019	8:00	24/Oct/2019	18:30	Replacement of gear box of Bus-1 side isolator 89A.
819	PLANNED	OCC_523	NTPC	VSTPS - HVDC Line# 1 (Stage-I, BAY No. 2) at VSTPS end. Being DMT scheme, line outage is required for complete bay maintenance including CT.	Continuous	Annual Bay Maintenance	24/Oct/2019	8:00	25/Oct/2019	18:30	Annual Bay Maintenance
820	PLANNED	OCC_523	GETCO	MANSAR - 400 kV - BUS 1	Daily	89-A & 89-L Line isolator mechanical & electrical setting	24/Oct/2019	8:00	24/Oct/2019	18:00	Maint work
821	PLANNED	OCC_523	GETCO	400 kV-MANSAR-BACHAU	Daily	89-A & 89-L Line isolator Isolator mechanical & electrica	24/Oct/2019	8:00	24/Oct/2019	18:00	Maint work
822	PLANNED	OCC_523	GETCO	400 kV-ASOJ-KOSAMBA-1	Daily	PMM work.	24/Oct/2019	7:00	24/Oct/2019	18:00	
823	PLANNED	OCC_523	CSPTCL	400 KV Raita-Jagdalpur Line at 400 KV S/s Raita.	D	Annual Maintenance Programme.	24/Oct/2019	8:00	24/Oct/2019	17:00	
824	PLANNED	OCC_523	MP_SLDC	400KV ISP-Nagda	D	For line maintenance work	24/Oct/2019	8:00	24/Oct/2019	18:00	
825	PLANNED	OCC_523	POWERGRID_WR1	765KV-AURANGABAD-SOLAPUR-1 L/R@ AURANGABAD - 765KV	D	For AMP works	24/Oct/2019	8:00	24/Oct/2019	18:00	
826	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BACHAU-VARSANA-2 AND BACHAU - 400KV - BUS 1 at BACHAU - 400KV	D	For AMP of CB & CT	24/Oct/2019	8:00	24/Oct/2019	18:00	
827	PLANNED	OCC_523	POWERGRID_WR1	400KV-BHILAI-RAIPUR-1	D	Auto-reclose relay retro-fitting works in Tie Bay at Bhilai	24/Oct/2019	8:00	24/Oct/2019	20:00	
828	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-VINDHYACHAL(PS)-RIHAND-2 AND FUTURE at Vindhyachal(PS) - 400KV	D	For Bay AMP work	24/Oct/2019	9:00	24/Oct/2019	17:00	
829	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 220KV - BUS 2	D	Testing of Bus Busbar/LBB Relays.	24/Oct/2019	9:00	24/Oct/2019	17:00	CONSTRUCTION
830	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV SEONI-PG-ICT-1	D	For AMP work	24/Oct/2019	9:00	24/Oct/2019	17:30	
831	PLANNED	OCC_523	MP_SLDC	400KV Seoni-Kirnapur	D	For line maintenance work	24/Oct/2019	9:00	24/Oct/2019	18:00	
832	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV WARORA-PG-ICT-2 AND WARORA-PG - 765KV - BUS 2 at WARORA-PG - 765KV	D	For AMP works	24/Oct/2019	9:00	24/Oct/2019	18:00	
833	PLANNED	OCC_523	POWERGRID_WR1	220KV-WARDHA-WARDHA-M-1 at Wardha	D	Line Impedance Kit Demo	24/Oct/2019	9:00	24/Oct/2019	18:00	
834	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-SOLAPUR-RAICHUR-2 AND FUTURE at Solapur - 765KV	D	Closing Damper replacemet in Siemens make CB	24/Oct/2019	9:00	24/Oct/2019	18:00	
835	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL-SATNA-3 AND SATNA - 400KV - BUS 2 at SATNA - 400KV	D	AMP Work	24/Oct/2019	9:00	24/Oct/2019	18:00	
836	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV INDORE-ICT-1	D	CSD Commissioning. Dia to be kept open.	24/Oct/2019	9:00	24/Oct/2019	18:00	
837	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-DEHGAM-NICOL-II-1 AND DEHGAM - 400KV - BUS 2 at DEHGAM - 400KV	D	AMP works	24/Oct/2019	9:00	24/Oct/2019	18:00	
838	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-RAIGARH-PS-TAMNAR-1 AND 765KV/400KV TAMNAR-ICT-2 (705 BAY) at TAMNAR - 400KV	D	For AMP Works	24/Oct/2019	9:30	24/Oct/2019	17:30	

839	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-KALA-KUDUS-1 AND KUDUS - 400KV - BUS 1 at KUDUS - 400KV	D	For AMP works	24/Oct/2019	10:00	24/Oct/2019	17:00	
840	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV/400KV VADODARA-ICT-1 AND 765KV-VADODARA-DHULE-1 at VADODARA - 765KV	D	For AMP Works	24/Oct/2019	10:00	24/Oct/2019	18:00	
841	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-LARA-CHAMPA-2 AND CHAMPA - 400KV - BUS 1 at CHAMPA - 400KV	D	For AMP WORK	24/Oct/2019	14:00	24/Oct/2019	17:30	Missed in data base
842	PLANNED	OCC_523	MSETCL	NEW KOYNA - 400KV - BUS 2	Continuous	Cold washing, condutor replacement, Isolator replacemer	24/Oct/2019	08:00	26/Oct/2019	18:00	Main Bus-I will be in service
843		OCC_523	POWERGRID	PHAGI (765KV)-GWALIOR-WR (765KV)1	DAILY	For insulator cleaning & line Maintenance work	24/Oct/2019	08:18	26/Oct/2019	08:18	
844		OCC_523	POWERGRID	PHAGI (765KV)-GWALIOR-WR (765KV)2	DAILY	For insulator cleaning & line Maintenance work	24/Oct/2019	08:00	26/Oct/2019	18:00	
845	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-NAGDA-DEHGAM-2 AND DEHGAM - 400KV - BUS 1 at DEHGAM - 400KV	D	AMP works	25/Oct/2019	9:00	25/Oct/2019	18:00	
846	PLANNED	OCC_523	GETCO	RANCHODPURA - 400 kV - BUS 1	Daily	Bus PMM work	25/Oct/2019	7:00	25/Oct/2019	18:00	
847	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-DHARAMJAYGARH-JABALPUR-4 AND FUTURE at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 765KV	D	For AMP works	25/Oct/2019	9:00	25/Oct/2019	17:00	
848	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-VINDHYACHAL(PS)-JABALPUR-1 AND JABALPUR - 765KV - BUS 1 at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	25/Oct/2019	10:00	25/Oct/2019	18:00	
849	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV CHAMPA-ICT-2 AND CHAMPA - 765KV - BUS 2 at CHAMPA - 765KV	D	For AMP WORK	25/Oct/2019	9:00	25/Oct/2019	17:30	
850	PLANNED	OCC_523	CSPTCL	400 KV Raita-Korba (W) Line at 400 KV S/s Raita.	D	Annual Maintenance Programme.	25/Oct/2019	8:00	25/Oct/2019	17:00	
851	PLANNED	OCC_523	GETCO	JETPUR - 400 kV - BUS 1	Daily	POST MONSOON MAINTENACE	25/Oct/2019	8:00	25/Oct/2019	18:00	
852	PLANNED	OCC_523	MEGPTCL	765KV/400KV AKOLA (2)-ICT-1	Daily	Maintenance of ICT	25/Oct/2019	08:00	25/Oct/2019	18:00	Maintenance of ICT
853	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-JABALPUR-ITARSI-1 AND ITARSI - 400KV B/R 3	D	For Retrofitting of existing ABB make RAICA LBB relay w	25/Oct/2019	8:00	25/Oct/2019	18:00	
854	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-BACHAU-VARSANA-2 AND 400KV-VADINAR-BACHAU-1 at BACHAU - 400KV	D	For AMP of CB & CT	25/Oct/2019	8:00	25/Oct/2019	18:00	
855	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-KSK-CHAMPA-3 AND KSK-CHAMPA-2 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	25/Oct/2019	9:00	25/Oct/2019	13:00	Missed in data base
856	PLANNED	OCC_523	MP_SLDC	220KV Malanpur-Adani	D	For line maintenance work	25/Oct/2019	9:00	25/Oct/2019	17:00	
857	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VINDHYACHAL(PS)-RIHAND-1 AND VINDHYACHAL(PS) - 400KV - BUS 2 at Vindhyachal(PS) - 400KV	D	For Bay AMP work	25/Oct/2019	9:00	25/Oct/2019	17:00	
858	PLANNED	OCC_523	POWERGRID_WR2	BHUJ - 400KV - BUS 2	D	Testing of Bus Busbar/LBB Relays.	25/Oct/2019	9:00	25/Oct/2019	17:00	CONSTRUCTION
859	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-WARDHA-AURANGABAD-4 AND FUTURE at AURANGABAD - 765KV	D	For AMP works	25/Oct/2019	9:00	25/Oct/2019	18:00	
860	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIPUR-RAIPUR-PS (DURG)-2 AND FUTURE at RAIPUR-PS (DURG) - 400KV	D	For AMP works	25/Oct/2019	9:00	25/Oct/2019	18:00	
861	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-CHANDRAPUR-BHADRAWATI-3 AND CHANDRAPUR - 400KV - BUS 1 at CHANDRAPUR - 400KV	D	For AMP works	25/Oct/2019	9:00	25/Oct/2019	18:00	
862	PLANNED	OCC_523	POWERGRID_WR1	WARDHA - 400KV - BUS 1	D	For AMP work	25/Oct/2019	9:00	25/Oct/2019	18:00	
863	PLANNED	OCC_523	POWERGRID_WR1	765KV-Solapur-Raichur-1 L/R@ Solapur - 765KV	D	AMP & Closing Damper replacemet in Siemens make CB	25/Oct/2019	9:00	25/Oct/2019	18:00	
864	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-SATNA-BINA-3 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	AMP Work	25/Oct/2019	9:00	25/Oct/2019	18:00	
865	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV INDORE-ICT-2	D	CSD Commissioning. Dia to be kept open.	25/Oct/2019	9:00	25/Oct/2019	18:00	
866	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHILAI-KORADI-1 AND BHILAI - 400KV - BUS 2 at BHILAI - 400KV	D	AMP works at Bhilai SS.	25/Oct/2019	9:30	25/Oct/2019	17:30	
867	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-KALA-KUDUS-2 AND KUDUS - 400KV - BUS 1 at KUDUS - 400KV	D	For AMP works	25/Oct/2019	10:00	25/Oct/2019	17:00	
868	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-KSK-CHAMPA-3 AND CHAMPA - 400KV - BUS 2 at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	25/Oct/2019	14:00	25/Oct/2019	17:30	Missed in data base
869	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-ITARSI-1	D	For scheme testing and checking of trippings of retrofitte	25/Oct/2019	16:00	25/Oct/2019	18:00	
870	PLANNED	OCC_523	POWERGRID_WR2	ITARSI - 400KV B/R 3	D	For scheme testing and checking of trippings of retrofitte	25/Oct/2019	16:00	25/Oct/2019	18:00	
871	PLANNED	OCC_523	POWERGRID_WR2	400KV-BINA-MP-BINA-2	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos I	25/Oct/2019	8:00	27/Oct/2019	8:00	
872		OCC_523	ER-II/Odisha/Sundergarh	765kV Sundargarh-Dharamjaygarh Ckt#3 at Sundargarh	ODB	BPI erection works at T-point + TL Maintenace work	25/Oct/2019	9:00	25/Oct/2019	14:00	
873	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-DEHGAM-SAMI-2 AND DEHGAM - 400KV - BUS 2 at DEHGAM - 400KV	D	AMP works	26/Oct/2019	9:00	26/Oct/2019	18:00	
874	PLANNED	OCC_523	MSETCL	220KV-NASIK-NAVSARI-2	Daily	For the work of Porcelain Long fixing, and bay maintenar	26/Oct/2019	08:00	30/Oct/2019	18:00	if issued by CO before proposed date.
875	PLANNED	OCC_523	POWERGRID_WR1	TALEGAON - 220KV - BUS 2	D	Replacement of Clamp & connectors	26/Oct/2019	9:00	26/Oct/2019	18:00	
876	PLANNED	OCC_523	POWERGRID_WR1	765KV-DHARAMJAYGARH-RANCHI-2	D	For Replacement of Broken Insulator at NH/River for saf	26/Oct/2019	9:00	26/Oct/2019	18:00	
877	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-VINDHYACHAL(PS)-JABALPUR-1 AND FUTURE at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	26/Oct/2019	10:00	26/Oct/2019	18:00	
878	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-JABALPUR-GADARWARA-1 AND JABALPUR - 765KV - BUS 2 at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	26/Oct/2019	10:00	26/Oct/2019	18:00	
879	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV/400KV CHAMPA-ICT-4 AND CHAMPA - 765KV - BUS 4 at CHAMPA - 765KV	D	For AMP WORK	26/Oct/2019	9:00	26/Oct/2019	17:30	

880	PLANNED	OCC_523	GETCO	JETPUR - 400 kV - BUS 2	Daily	POST MONSOON MAINTENACE	26/Oct/2019	8:00	26/Oct/2019	18:00	
881	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-JABALPUR-ITARSI-3 AND 400KV-JABALPUR-ITARSI-2	D	For Retrofitting of existing ABB make RAICA LBB relay w	26/Oct/2019	8:00	26/Oct/2019	18:00	
882	PLANNED	OCC_523	POWERGRID_WR2	765KV/400KV VINDHYACHAL(PS)-ICT-1	D	For taking Spare ICT with ICT#1 B Ph. Dia to be kept ope	26/Oct/2019	9:00	26/Oct/2019	14:00	
883	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-WARDHA-AURANGABAD-4 AND AURANGABAD - 765KV - BUS 2 at AURANGABAD - 765KV	D	For AMP works	26/Oct/2019	9:00	26/Oct/2019	18:00	
884	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-CHANDRAPUR-BHADRAWATI-4 AND CHANDRAPUR - 400KV - BUS 1 at CHANDRAPUR - 400KV	D	For AMP works	26/Oct/2019	9:00	26/Oct/2019	18:00	
885	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-SOLAPUR-RAICHUR-1 AND SOLAPUR - 765KV B/R 1 at Solapur - 765KV	D	AMP & Closing Damper replacemet in Siemens make CB	26/Oct/2019	9:00	26/Oct/2019	18:00	
886	PLANNED	OCC_523	POWERGRID_WR2	GWALIOR - 400KV - BUS 1	D	AMP Work	26/Oct/2019	9:45	26/Oct/2019	18:00	
887	PLANNED	OCC_523	MP_SLDC	220KV Annupur-Kotmikala-I	D	For line maintenance work	26/Oct/2019	10:00	26/Oct/2019	17:00	
888	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-ITARSI-2	D	For scheme testing and checking of trippings of retrofitte	26/Oct/2019	16:00	26/Oct/2019	18:00	
889	PLANNED	OCC_523	POWERGRID_WR2	400KV-JABALPUR-ITARSI-3	D	For scheme testing and checking of trippings of retrofitte	26/Oct/2019	14:00	26/Oct/2019	16:00	
890		OCC_523	ER-II/Odisha/Sundergarh	765kV Sundargarh-Dharamjaygarh Ckt#4 at Sundargarh	ODB	BPI erection works at T-point + TL Maintenace work	26/Oct/2019	9:00	26/Oct/2019	14:00	
891	PLANNED	OCC_523	POWERGRID_WR2	BOISAR - 220KV - BUS 2	D	For AMP Works	27/Oct/2019	9:00	27/Oct/2019	17:30	
892	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-DEHGAM-SAMI-1 AND DEHGAM - 400KV - BUS 1 at DEHGAM - 400KV	D	AMP works	27/Oct/2019	9:00	27/Oct/2019	18:00	
893	PLANNED	OCC_523	MSETCL	400KV-LONIKHAND-CHAKAN-1	Daily	Half yearly testing and maintenance activities	27/Oct/2019	09:00	27/Oct/2019	17:00	-
894	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-DHARAMJAYGARH-RANCHI-2 AND DHARAMJAYGARH - 765KV - BUS 1 at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 765KV	D	For AMP works	27/Oct/2019	9:00	27/Oct/2019	17:00	
895	PLANNED	OCC_523	POWERGRID_WR2	NAVSARI - 400KV - BUS 1	D	AMP works	27/Oct/2019	10:00	27/Oct/2019	17:00	
896	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 765KV-DHARAMJAYGARH-JABALPUR-2 AND FUTURE at JABALPUR - 765KV	D	AMP Works	27/Oct/2019	10:00	27/Oct/2019	16:00	
897	PLANNED	OCC_523	MP_SLDC	220KV Mahgaon-Adani	D	For line maintenance work	27/Oct/2019	9:00	27/Oct/2019	17:00	
898	PLANNED	OCC_523	MP_SLDC	220KV Jaitpura (PGCIL) Hatunia-Indore-I	D	For line maintenance work	27/Oct/2019	10:00	27/Oct/2019	17:00	
899	PLANNED	OCC_523	POWERGRID_ER2	765kV GIS BUS-I along with AIS section of Darmajaygar-I & II Main Bays	C	for 765KV GIS and 765KV ICT-3&4 commissioning work	27/Oct/2019	9:00	28/Oct/2019	17:00	
900	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-NAGDA-DEHGAM-1 AND DEHGAM - 400KV - BUS 2 at DEHGAM - 400KV	D	AMP works	28/Oct/2019	9:00	28/Oct/2019	18:00	
901	PLANNED	OCC_523	GETCO	400 kV-DEHGAM-RANCHODPURA-1	Daily	Bay and Line Maintenance	28/Oct/2019	7:00	29/Oct/2019	18:00	
902	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-DHARAMJAYGARH-JABALPUR-2 AND JABALPUR - 765KV - BUS 2 at JABALPUR - 765KV	D	AMP Works	28/Oct/2019	10:00	28/Oct/2019	16:00	
903	PLANNED	OCC_523	POWERGRID_WR2	NAVSARI - 400KV - BUS 2	D	AMP works	28/Oct/2019	10:00	28/Oct/2019	17:00	
904	PLANNED	OCC_523	POWERGRID_ER2	765KV-DHARAMJAYGARH-JHARSUGUDA-4	D	For BPI erection at T-point at Jharsuguda end, for systen	28/Oct/2019	15:00	28/Oct/2019	18:00	
905	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAV-2	D	AMP works at GETCO vav	28/Oct/2019	10:00	28/Oct/2019	17:00	
906	PLANNED	OCC_523	MSETCL	400KV-CHAKAN-PUNE-PG-1	Daily	Line Maintenance & Routine Diagnostic testing work	28/Oct/2019	08:00	28/Oct/2019	18:00	-
907	PLANNED	OCC_523	NTPC	VSTPS BUS #2	Continuous	Installation/ erection of IPS Al tube of VSTPS- TBC #1 B	28/Oct/2019	8:00	28/Oct/2019	18:30	Installation/ erection of IPS Al tube of VSTPS- TBC #1 Bay No. 10) below VSTPS Bus#2 after replacement Circuit Breaker.
908	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-LARA-CHAMPA-1 AND FUTURE at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	28/Oct/2019	9:00	28/Oct/2019	13:00	Missed in data base
909	PLANNED	OCC_523	POWERGRID_ER2	765KV-DHARAMJAYGARH-JHARSUGUDA-1	D	For BPI erection at T-point at Jharsuguda end, for systen	28/Oct/2019	9:00	28/Oct/2019	14:00	
910	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-GADARWARA-WARORA-PG-1 AND WARORA-PG - 765KV - BUS 1 at WARORA-PG - 765KV	D	For AMP works	28/Oct/2019	9:00	28/Oct/2019	18:00	
911	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-RAIGARH-PS-RAIPUR-PS (DURG)-2 AND 765KV-WARDHA-RAIPUR-PS (DURG)-1 at RAIPUR-PS (DURG) - 765KV	D	For AMP works	28/Oct/2019	9:00	28/Oct/2019	18:00	
912	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - SOLAPUR - 765KV B/R 1 AND SOLAPUR - 765KV - BUS 2 at Solapur - 765KV	D	Bay AMP works and To change Imax make Auxiliary and	28/Oct/2019	9:00	28/Oct/2019	18:00	
913	PLANNED	OCC_523	POWERGRID_WR1	400KV-AURANGABAD-BOISAR-2 L/R@ AURANGABAD - 400KV	D	For AMP works	28/Oct/2019	9:00	28/Oct/2019	18:00	
914	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV INDORE-ICT-2 AND INDORE - 400KV - BUS 2 at INDORE - 400KV	D	BAY AMP WORKS	28/Oct/2019	9:00	28/Oct/2019	18:00	
915	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHADRAWATI-BHILAI-1 AND BHILAI - 400KV - BUS 2 at BHILAI - 400KV	D	AMP works at Bhilai SS.	28/Oct/2019	9:30	28/Oct/2019	17:30	
916	PLANNED	OCC_523	MP_SLDC	220KV Jaitpura (PGCIL) Hatunia-Indore-II	D	For line maintenance work	28/Oct/2019	10:00	28/Oct/2019	17:00	
917	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-LARA-CHAMPA-2 AND FUTURE at CHAMPA - 400KV	D	RTAMC/ NTAMC SIGNAL VALIDATION	28/Oct/2019	14:00	28/Oct/2019	17:30	Missed in data base
918	PLANNED	OCC_523	MSETCL	400KV-BABLESHWAR-PADGHE-PG-1	Daily	For Carrying PID Work	28/Oct/2019	08:00	31/Oct/2019	18:00	-
919	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV ITARSI-ICT-1 AND ITARSI - 220KV - BUS 1	C	For CB Driving Mechanisam Overhauling works at Itarsi	28/Oct/2019	9:00	31/Oct/2019	18:00	

920		OCC_523	ER-II/Odisha/Sundergarh	765kV Sundargarh-Dharamjaygarh Ckt#1 at Sundargarh	ODB	BPI erection works at T-point + TL Maintenace work	28/Oct/2019	9:00	28/Oct/2019	14:00	
921	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - DHARAMJAYGARH - 765KV B/R 1 AND DHARAMJAYGARH - 765KV - BUS 1 at DHARAMJAYGARH - 765KV at DHARAMJAYGARH - 765KV	D	For AMP works	29/Oct/2019	9:00	29/Oct/2019	17:00	
922	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR - 765KV B/R 2 AND JABALPUR - 765KV - BUS 2 at JABALPUR - 765KV	D	AMP Works	29/Oct/2019	10:00	29/Oct/2019	16:00	
923	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - ITARSI - 400KV B/R 1 AND 400KV/220KV ITARSI-ICT-2	D	For Retrofitting of existing ABB make RAICA LBB relay w	29/Oct/2019	8:00	29/Oct/2019	18:00	
924	PLANNED	OCC_523	NTPC	VSTPS-TIE LINE#1 (BETWEEN STAGE-V TO STAGE-III) BAY (Stage-V/ Bay No. 424) at VSTPS end.	Continuous	Annual Bay Maintenance	29/Oct/2019	8:00	29/Oct/2019	18:30	Annual Bay Maintenance
925	PLANNED	OCC_523	POWERGRID_ER2	765KV-DHARAMJAYGARH-JHARSUGUDA-2	D	For BPI erection at T-point at Jharsuguda end, for systen	29/Oct/2019	9:00	29/Oct/2019	14:00	
926	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-LARA-CHAMPA-1 AND CHAMPA - 400KV - BUS 2 at CHAMPA - 400KV	D	For AMP WORK	29/Oct/2019	9:00	29/Oct/2019	17:30	Missed in data base
927	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 765KV-GADARWARA-WARORA-PG-1 AND FUTURE at WARORA-PG - 765KV	D	For AMP works	29/Oct/2019	9:00	29/Oct/2019	18:00	
928	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 765KV-AURANGABAD-SOLAPUR-2 AND SOLAPUR - 765KV - BUS 1 at Solapur - 765KV	D	Bay AMP works.	29/Oct/2019	9:00	29/Oct/2019	18:00	
929	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV AURANGABAD-ICT-1	D	For AMP works	29/Oct/2019	9:00	29/Oct/2019	18:00	
930	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV WARDHA-ICT-1	D	For AMP work	29/Oct/2019	9:00	29/Oct/2019	18:00	
931	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV/220KV INDORE-ICT-1 AND INDORE - 400KV - BUS 2 at INDORE - 400KV	D	BAY AMP WORKS	29/Oct/2019	9:00	29/Oct/2019	18:00	
932	PLANNED	OCC_523	POWERGRID_WR1	MAIN BAY - 400KV-BHILAI-RAIPUR-1 AND BHILAI - 400KV - BUS 2 at BHILAI - 400KV	D	AMP works at Bhilai SS.	29/Oct/2019	9:30	29/Oct/2019	17:30	
933	PLANNED	OCC_523	POWERGRID_WR2	220KV-KAKRAPAR 1&2-VAV-1	D	AMP works at GETCO vav	29/Oct/2019	10:00	29/Oct/2019	17:00	
934	PLANNED	OCC_523	POWERGRID_WR2	ITARSI - 400KV B/R 1	D	For scheme testing and checking of trippings of retrofitte	29/Oct/2019	16:00	29/Oct/2019	18:00	
935	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV ITARSI-ICT-2	D	For scheme testing and checking of trippings of retrofitte	29/Oct/2019	16:00	29/Oct/2019	18:00	
936	PLANNED	OCC_523	NTPC	VSTPS TIE BAY (Stage-V/ Bay No. 423) at VSTPS end.	Continuous	Annual Bay Maintenance	29/Oct/2019	8:00	30/Oct/2019	18:30	Annual Bay Maintenance
937		OCC_523	ER-II/Odisha/Sundergarh	765kV Sundargarh-Dharamjaygarh Ckt#2 at Sundargarh	ODB	BPI erection works at T-point + TL Maintenace work	29/Oct/2019	9:00	29/Oct/2019	14:00	
938	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-JABALPUR-GADARWARA-2 AND JABALPUR - 765KV - BUS 2 at JABALPUR - 765KV	D	Tightening of nut & bolt of CGL make circuit breaker to	30/Oct/2019	10:00	30/Oct/2019	18:00	
939	PLANNED	OCC_523	POWERGRID_ER2	765KV-DHARAMJAYGARH-JHARSUGUDA-3	D	For BPI erection at T-point at Jharsuguda end, for systen	30/Oct/2019	9:00	30/Oct/2019	14:00	
940	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - JABALPUR - 765KV B/R 1 AND JABALPUR - 765KV - BUS 2 at JABALPUR - 765KV	D	AMP Works	30/Oct/2019	10:00	30/Oct/2019	16:00	
941	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV Solapur-ICT-2	D	For AMP works	30/Oct/2019	9:00	30/Oct/2019	18:00	
942	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-ITARSI-INDORE-MP-2 AND 400KV-ITARSI-KHANDWA-1	D	For Retrofitting of existing ABB make RAICA LBB relay w	30/Oct/2019	8:00	30/Oct/2019	18:00	
943	PLANNED	OCC_523	POWERGRID_WR2	400KV-BACHAU-CHORANIA-1	D	For Fixing of Open Spacer Damper. A/R OFF of 400 Bha	30/Oct/2019	8:00	30/Oct/2019	18:00	
944	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-VADINAR-BACHAU-1 AND BACHAU - 400KV - BUS 2 at BACHAU - 400KV	D	For AMP of CB & CT	30/Oct/2019	8:00	30/Oct/2019	18:00	
945	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-VINDHYACHAL(PS)-RIHAND-1 AND FUTURE at Vindhyachal(PS) - 400KV	D	For Bay AMP work	30/Oct/2019	9:00	30/Oct/2019	17:00	
946	PLANNED	OCC_523	POWERGRID_WR2	400KV-BHUJ-CGPL-1	D	Testing of Bus Busbar/LBB Relays. A/R OFF of ckt-2 an	30/Oct/2019	9:00	30/Oct/2019	17:00	CONSTRUCTION
947	PLANNED	OCC_523	POWERGRID_WR1	CHAMPA - 765KV B/R 2	D	Bus Reactor-2 Main Bay 726 CSD commission work	30/Oct/2019	9:00	30/Oct/2019	17:30	
948	PLANNED	OCC_523	MEGPTCL	TIE BAY - 400KV-KORADI-II-KORADI-III-2 AND FUTURE at KORADI-III - 400KV	Daily	Maintenance of Bay Equipment	30/Oct/2019	09:00	30/Oct/2019	18:00	Maintenance of Bay Equipment
949	PLANNED	OCC_523	POWERGRID_WR1	400KV AC - 461 BAY - AC FILTER TIE BAY OF AC FILTER - III at CHAMPA-HVDC - 400KV	D	For AMP works	30/Oct/2019	9:00	30/Oct/2019	18:00	Missed in data base
950	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIGARH-PS-TAMNAR-1	D	For line AMP works & 765kV Tamnar-Kotra-2 n auto mo	30/Oct/2019	9:00	30/Oct/2019	18:00	
951	PLANNED	OCC_523	POWERGRID_WR1	400KV/220KV AURANGABAD-ICT-2	D	For AMP works	30/Oct/2019	9:00	30/Oct/2019	18:00	
952	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-NIZAMABAD-1	D	For line AMP works & 765 KV Wardha-Nizamabad-2 AR	30/Oct/2019	9:00	30/Oct/2019	18:00	
953	PLANNED	OCC_523	POWERGRID_WR1	400KV-BHILAI-KORADI-1	D	For AMP work	30/Oct/2019	9:00	30/Oct/2019	18:00	
954	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-JP NIGRIE-SATNA-1 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	AMP Work	30/Oct/2019	9:00	30/Oct/2019	18:00	
955	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-JP NIGRIE-SATNA-1 AND SATNA - 400KV - BUS 1 at SATNA - 400KV	D	AMP Work	30/Oct/2019	9:00	30/Oct/2019	18:00	
956	PLANNED	OCC_523	POWERGRID_WR1	765KV-WARDHA-RAIPUR-PS (DURG)-2 L/R@ RAIPUR-PS (DURG) - 765KV	D	For Chang Over of Y phase bank with Spare	30/Oct/2019	10:00	30/Oct/2019	13:00	
957	PLANNED	OCC_523	POWERGRID_WR2	765KV-VINDHYACHAL(PS)-JABALPUR-1	D	For AMP Works. Dia to be kept open at both ends and A/	30/Oct/2019	10:00	30/Oct/2019	18:00	
958	PLANNED	OCC_523	POWERGRID_WR2	400KV-INDORE-MP-ASOJ-1	D	By Vadodara- For taking line Reactor out of service for D	30/Oct/2019	10:00	30/Oct/2019	18:00	
959	PLANNED	OCC_523	POWERGRID_WR2	400KV/220KV NAVSARI-ICT-3	D	AMP Works at Navsari GIS	30/Oct/2019	11:00	30/Oct/2019	18:00	

960	PLANNED	OCC_523	POWERGRID_WR2	400KV-ITARSI-KHANDWA-1	D	For scheme testing and checking of trippings of retrofitte	30/Oct/2019	16:00	30/Oct/2019	18:00	
961	PLANNED	OCC_523	POWERGRID_WR2	400KV-ITARSI-INDORE-MP-2	D	For scheme testing and checking of trippings of retrofitte	30/Oct/2019	14:00	30/Oct/2019	16:00	
962	PLANNED	OCC_523	POWERGRID_WR1	TIE BAY - 400KV-RAIPUR-RAIPUR-PS (DURG)-2 AND FUTURE at RAIPUR - 400KV	D	AMP works at Raipur SS.	30/Oct/2019	9.3	30/Oct/2019	17:30	
963	PLANNED	OCC_523	POWERGRID_WR1	Tie Bay - 765KV/400KV BILASPUR-ICT-1 AND FUTURE at BILASPUR - 400KV	D	For AMP works	30/Oct/2019	9:00	31/Oct/2019	18:00	
964	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 765KV-BINA-INDORE-1 AND INDORE - 765KV - BUS 1 at INDORE - 765KV	D	BAY AMP WORKS	30/Oct/2019	9:00	31/Oct/2019	18:00	
965	PLANNED	OCC_523	MP_SLDC	80MVAR Reactor-I at 400KV S/s Bhopal	C	For replacement of PRV of reactor by M/s CGL	30/Oct/2019	8:00	02/Nov/2019	18:00	
966		OCC_523	NHPTL	1. 275 MVA, 22/(765/√3) kV, 1 Phase, Generator Transformer.	D	SC testing	30/Oct/2019	8:00	01/Nov/2019	16:00	
967	PLANNED	OCC_523	POWERGRID_WR2	765KV-SASAN-VINDHYACHAL(PS)-1	C	Retrofitting of Distance Relays (Main 1 & 2) with 02 Nos I	31/Oct/2019	8:00	31/Oct/2019	18:00	
968	PLANNED	OCC_523	POWERGRID_WR1	765KV-Solapur-Raichur-2 L/R@ Solapur - 765KV	D	To change multiple base LA with single base LA and Reac	31/Oct/2019	9:00	31/Oct/2019	18:00	
969	PLANNED	OCC_523	POWERGRID_WR1	400KV/38.5KV AURANGABAD-STATCOM-ICT-1	D	For AMP works	31/Oct/2019	8:00	31/Oct/2019	18:00	
970	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-ITARSI-KHANDWA-2 AND 400KV-SATPURA-ITARSI-1	D	For Retrofitting of existing ABB make RAICA LBB relay w	31/Oct/2019	8:00	31/Oct/2019	18:00	
971	PLANNED	OCC_523	POWERGRID_WR2	MAIN BAY - 400KV-BACHAU-VARSANA-1 AND BACHAU - 400KV - BUS 1 at BACHAU - 400KV	D	For AMP of CB & CT	31/Oct/2019	8:00	31/Oct/2019	18:00	
972	PLANNED	OCC_523	POWERGRID_WR2	400KV-BHUJ-CGPL-2	D	Testing of Bus Busbar/LBB Relays. A/R OFF of ckt-1 an	31/Oct/2019	9:00	31/Oct/2019	17:00	CONSTRUCTION
973	PLANNED	OCC_523	POWERGRID_WR1	CHAMPA - 765KV B/R 2	D	Bus Reactor-2 Main Bay 726 CSD commission work	31/Oct/2019	9:00	31/Oct/2019	17:30	
974	PLANNED	OCC_523	POWERGRID_WR1	765KV-RAIGARH-PS-TAMNAR-2	D	For line AMP works & 765kV Tamnar-Kotra-1 n auto mo	31/Oct/2019	9:00	31/Oct/2019	18:00	
975	PLANNED	OCC_523	POWERGRID_WR2	TIE BAY - 400KV-JP NIGRIE-SATNA-1 AND 765KV/400KV SATNA-ICT-1 at SATNA - 400KV	D	AMP Work	31/Oct/2019	9:00	31/Oct/2019	18:00	
976	PLANNED	OCC_523	MP_SLDC	220KV Annupur-Kotmikala-II	D	For line maintenance work	31/Oct/2019	10:00	31/Oct/2019	17:00	
977	PLANNED	OCC_523	POWERGRID_WR2	400KV-SATPURA-ITARSI-1	D	For scheme testing and checking of trippings of retrofitte	31/Oct/2019	16:00	31/Oct/2019	18:00	
978	PLANNED	OCC_523	POWERGRID_WR2	400KV-ITARSI-KHANDWA-2	D	For scheme testing and checking of trippings of retrofitte	31/Oct/2019	16:00	31/Oct/2019	18:00	
979	PLANNED	OCC_523	NTPC	VSTPS BUS #2	Continuous	Replacement of gear box of Bus-2 side isolator 89B.	17/Oct/2019	8:00	17/Oct/2019	18:30	Replacement of gear box of Bus-2 side isolator 89B.

अनुलग्नक 3.3

सितंबर 2019 और अक्टूबर 2019 माह के लिये अपेक्षित मांग एवं ऊर्जा की आवश्यकता

Anticipated demand and energy for the month of September 2019 AND October 2019

राज्य	State	मांग DEMAND मेगावाट (MW)		ऊर्जा की आवश्यकता ENERGY REQUIREMENT मिलियन युनिटस	
		सितंबर 2019 September 2019	अक्टूबर 2019 October 2019	सितंबर 2019 September 2019	अक्टूबर 2019 October 2019
1 गुजरात	**GUJARAT**				
सीमित	RESTRICTED	19000	18250	11040	12040
असीमित	UNRESTRICTED	19025	18275	11050	12050
2 मध्य प्रदेश	**MADHYA PRADESH**				
सीमित	RESTRICTED	9570	11556	5800	7541
असीमित	UNRESTRICTED	9570	13419	5800	8905
3 छत्तीसगढ़	**CHHATISGARH**				
सीमित	RESTRICTED	4880	4916	2033	2050
असीमित	UNRESTRICTED	4880	4916	2033	2050
4 महाराष्ट्र	**MAHARASHTRA**				
सीमित	RESTRICTED	20950	25150	12450	13750
असीमित	UNRESTRICTED	21000	25200	12500	13800
5 गोवा	**GOA**				
सीमित	RESTRICTED	571	550	344	350
असीमित	UNRESTRICTED	627	577	350	360
6 दमन दीव	**DD**				
सीमित	RESTRICTED	340	340	222	222
असीमित	UNRESTRICTED	350	350	240	250
7 डी एन एच	**DNH**				
सीमित	RESTRICTED	853	863	493	495
असीमित	UNRESTRICTED	860	870	500	510
8 पश्चिम क्षेत्र	**WESTERN REGION**				
सीमित	RESTRICTED	57487	58100	35239	37925
असीमित	UNRESTRICTED	61285	61000	39986	43279

अनुलग्नक 4.1

Unit -wise Actual generation for the month of August 2019 आगस्त 2019

क्रमांक Sr. No.	स्टेशन का नाम Station Name	Actual वास्तविक ऊर्जा Energy (MUs)	चरम Peak (Mw)	Auxillary Consumption (MUs)
	UKAI(H) - 1	35.05	77	
	UKAI(H) - 2	33.12	76	
	UKAI(H) - 3	37.23	76	
	UKAI(H) - 4	33.79	77	0.00
	UKAI(TOTAL)	**139.18**	**306**	**0.3140**
	UKAI LBCH - 1	1.50	3	
	UKAI LBCH - 2	1.15	3	0.00
	UKAI LBCH (TOTAL)	**2.65**	**5**	**0.04**
	KADANA - 1	21.58	58	
	KADANA - 2	26.74	59	
	KADANA - 3	21.09	55	
	KADANA - 4	19.27	56	0.00
	KADANA (TOTAL)	**88.68**	**228**	**0.11**
	PANAM	0.00	0	0.00
	Madhuban Dam (Hy.)-1	1.09	2	
	Madhuban Dam (Hy.)-2	0.68	2	
	Madhuban Dam (Hy.)-3	1.64	2	0.01
	AREVA HY(KARJAN)	2.07	2	0.00
	Ajanta hy (DOLATPURA)-1	1.62	0	
	Ajanta hy (DOLATPURA)-2	1.48	4	
	Ajanta hy (DOLATPURA)-3	1.49	4	0.00
	SMALL HYDRO	**10.06**	**15**	**0.02**
	SSP RBPH-1	106.09	0	1.59
	SSP RBPH-2	105.65	0	1.58
	SSP RBPH-3	106.85	0	1.60
	SSP RBPH-4	106.92	0	1.60
	SSP RBPH-5	107.25	0	1.61
	SSP RBPH-6	103.08	0	1.55
	SSP-CHPH-1	31.13	35	0.47
	SSP-CHPH-2	8.10	34	0.12
	SSP-CHPH-3	0.00	37	0.00
	SSP-CHPH-4	20.34	36	0.31
	SSP-CHPH-5	18.96	35	0.28
	SSP (TOTAL) *	**714.38**	**177**	**10.72**
	SSP GUVNL Share	**114.30**	**28**	**1.71**
	GUJARAT TOTAL (HYDRO)	**240.57**	**583**	**486.58**

	THERMAL(GUJARAT)			
	Torrent Power Ltd.- D	77.72	123	6.86
	Torrent Power Ltd.- E	82.85	123	6.69
	Torrent Power Ltd.- F	86.65	124	7.41
	TOTAL TP AHMEDABAD	**247.22**	**370**	**20.96**
	DGB - GT1	5.76	91	
	DGB - STG1	2.36	0	0.98
	DGB - GT2	0.00	0	
	DGB - STG2	0.00	0	0.28
	DGB - GT3	33.43	0	
	DGB - STG3	17.56	0	2.27
	TOTAL DHUVARAN	**59.12**	**91**	**3.53**
	UKAI-3	5.02	174	0.97
	UKAI-4	50.00	201	5.44
	UKAI-5	54.03	210	5.58
	UKAI-6	145.64	508	9.61
	TOTAL UKAI	**254.69**	**1093**	**21.60**
	GANDHINAGAR -3	7.64	208	1.62
	GANDHINAGAR -4	16.27	210	3.00
	GANDHINAGAR -5	104.97	217	10.70
	TOTAL GANDHINAGAR	**128.88**	**635**	**15.33**
	WANAKBORI -1	15.98	213	
	WANAKBORI -2	0.00	0	
	WANAKBORI -3	108.42	214	
	WANAKBORI -4	44.51	211	
	WANAKBORI -5	69.72	213	
	WANAKBORI -6	45.37	210	
	WANAKBORI -7	133.38	215	
	TOTAL WANAKBORI	**471.03**	**1276**	**42.27**
	UGPP GT-4	15.98	233	
	UGPP STG-2	10.27	141	1.77
	TOTAL UTRAN	**26.24**	**374**	1.77
	SIKKA - 3	141.81	255	13.37
	SIKKA - 4	107.54	258	10.83
	TOTAL SIKKA	**249.35**	**513**	24.20
	Akrimota Linite-1	24.28	93	6.60
	Akrimota Linite-2	18.73	76	5.30

	TOTAL Akrimota Lignite	**43.01**	**169**	11.90
	Kutch Lig.-1	15.04	65	2.99
	Kutch Lig.-2	6.33	66	1.52
	Kutch Lig.-3	12.81	73	2.11
	Kutch Lig.-4	9.24	68	3.44
	TOTAL Kutch Lig	**43.42**	**272**	10.06
	GIPCL - GT 1	12.71	31	
	GIPCL - GT 2	11.27	31	
	GIPCL - GT 3	10.51	29	
	GIPCL - ST 1	20.20	32	
	GIPCL - GT 4	0.00	0	
	GIPCL - ST 2	0.00	0	
	TOTAL GIPCL	**54.69**	**123**	1.51
	SURAT - LIG1	77.50	118	8.32
	SURAT - LIG 2	0.01	11	0.39
	SURAT - LIG 3	62.75	116	7.72
	SURAT - LIG 4	84.23	128	9.19
	Total SURAT -LIG	**224.48**	**373**	25.63
	EPGL1	60.87	451	6.32
	EPGL 2	210.02	630	14.31
	TOTAL ESSAR	**270.89**	**1081**	20.63
	CLPIPL GT1	0.00	0	0.00
	CLPIPL GT2	0.00	0	0.00
	CLPIPL GT3	0.00	0	0.00
	CLPIPL STG	0.00	0	0.00
	TOTAL CLPIPL	**0.00**	**0**	0.00
	GSEG 1	1.07	46	
	GSEG 2	0.94	47	
	GSEG STG	0.23	46	0.55
	GSEG -II GT 1	32.59	227	0.00
	GSEG -II STG	19.85	123	1.97
	TOTAL GSEG	**54.68**	**489**	2.52
	Sugen (GT 1)	193.29	378	
	Sugen (GT 2)	192.85	383	
	Sugen (GT 3)	101.79	382	11.87
	Uno Sugen	171.42	380	3.89
	TOTAL SUGEN	**659.35**	**1522**	15.76
	APL 1	210.33	349	0.00
	APL 2	226.74	339	0.00
	APL 3	48.70	338	0.00
	APL 4	212.53	342	0.00
	APL 5	393.47	676	0.00
	APL 6	394.56	672	0.00

	APL 7	413.72	674	0.00
	APL 8	342.83	681	0.00
	APL 9	397.70	682	0.00
	TOTAL APMuL	**2640.56**	**4754**	193.19
	OPGS GT1	80.55	144	7.40
	OPGS GT2	76.01	132	6.40
	TOTAL OPGS	**156.56**	**276**	13.80
	BECL 1	0.00	0	1.79
	BECL 2	19.82	0	6.29
	TOTAL BECL	**19.82**	**0**	8.08
	GPPC GT1	11.08	228	
	GPPC STG1	6.98	124	0.95
	GPPC GT2	0.00	0	
	GPPC STG2	0.00	0	0.35
	TOTAL GPPC	**18.06**	**0**	1.29
	OTHER CPP	**10.09**	**14**	0.00
	TOTAL CPP	**10.09**	**14**	0.00
	GUJARAT TOTAL (Th.)	**5632.14**	**13425**	434.04
				0.00
	GUVNL TOTAL (H+T)	**5872.70**	**14008**	434.52
	WIND ENERGY	1126.01	1564	22.52
	SOLAR ENERGY	190.72	265	3.81
	BIO -MASS ENERGY	5.12	7	0.10
	GUJARAT TOTAL RES	**1321.85**	**1836**	**26.44**
	GUVNL TOTAL (H+T+RES)	**7194.56**	**15844**	**434.55**
	MADHYA PRADESH			
	H Y D R O			
	G.' SAGAR	9.30	0	0.09
	R.P.SAGAR	9.28	0	0.02
	J.' SAGAR	33.45	66	0.04
	TOTAL CHAMBAL(100%)	**52.02**	**66**	**0.15**
	MP CHAMBAL SHARE (50%)	**26.01**	**33**	**0.07**
	PENCH	1.68	157	0.06
	MP PENCH SHARE(2/3)	1.12	105	0.04
	BARGI	55.54	92	0.08
	BARGI (LEFT BANK (NVDA)	0.00	0	0.00
	Bansagar TONS	122.75	315	0.11
	Bansagar Devlondh	20.48	63	0.02
	Bansagar Silpara	0.15	20	0.07
	Bansagar Jinaha	0.14	22	0.02
	Madikheda	22.20	69	0.22

	BIR'PUR	12.45	21	0.02
	TAWA	0.00	0	0.00
	TOTAL	233.71	602	0.53
	RAJGHAT	10.67	42	0.06
	MP SHARE RAJGHAT(50%)	5.33	21	0.03
	Omkareshwar			
	Unit-1	24.57	65	
	Unit-2	27.34	65	
	Unit-3	29.04	65	
	Unit-4	27.47	65	
	Unit-5	29.95	65	
	Unit-6	28.30	65	
	Unit-7	27.20	65	
	Unit-8	19.85	64	
	TOTAL Omkareshwar	**213.69**	**460**	**0.76**
	Indira Sagar - 1	10.14	134	
	Indira Sagar - 2	6.73	134	
	Indira Sagar - 3	7.40	135	
	Indira Sagar - 4	11.72	135	
	Indira Sagar - 5	13.95	134	
	Indira Sagar - 6	8.71	132	
	Indira Sagar - 7	10.52	133	
	Indira Sagar - 8	11.44	129	
	TOTAL INDIRA SAGAR (100%)	**517.52**	**555**	**10.15**
	MP SSP SHARE	407.19	101	6.11
	MP TOTAL (H)	**997.39**	**1776**	**11.59**
	MADHYA PRADESH (THERMAL)			
	AMARKANTAK (III UNIT-5)	145.80	220	0.00
	TOTAL AMARKANKTAK-II	**145.80**	**220**	**13.89**
	SATPURA-II UNIT - 6	7.22	0	
	SATPURA-II UNIT - 7	34.83	175	
	SATPURA-II (UNITS 6 - 7)	**42.05**	**175**	**5.30**
	SATPURA-III UNIT - 8	35.03	188	
	SATPURA-III UNIT - 9	32.75	195	
	SATPURA-III (UNITS 8-9)	**67.78**	**383**	**7.96**
	SATPURA-IVUNIT - 10	87.86	265	
	SATPURA-IV UNIT - 11	128.72	259	
	SATPURA-III (UNITS 10-11)	**216.58**	**524**	**20.99**
	TOTAL SATPURA	**326.41**	**1082**	**34.24**

	S.GANDHI TPS-1	66.82	204	
	S.GANDHI TPS-2	68.88	202	
	SGTPS PHASE-I	**135.70**	**406**	**14.63**
	S.GANDHI TPS-3	33.34	209	
	S.GANDHI TPS-4	123.00	213	
	SGTPS PHASE-II	**156.34**	**422**	**17.30**
	S.GANDHI TPS-5	0.00	509	
	SGTPS PHASE-III	**0.00**	**509**	**3.23**
	TOTAL S.GANDHI TPS	**292.04**	**1337**	**35.15**
	SRI SINGHAJI(SSTPS)-I	311.34	605	
	SRI SINGHAJI(SSTPS)-II	0.00	599	
	SSTPS PHASE-I	**311.34**	**1204**	**22.64**
	SRI SINGHAJI(SSTPS)-III	140.22	527	
	SRI SINGHAJI(SSTPS)-IV	88.28	0	
	SSTPS PHASE-II	228.50	527	
	TOTAL SSTPS	**539.84**	**1731**	**37.04**
	BLA POWER	25.94	36	1.47
	JP BINA+CPP	127.09	177	7.19
	MP IPP INJECTION	**153.03**	**213**	**8.66**
	MP TOTAL (Th.)	**1613.80**	**4583**	**128.99**
	MP TOTAL (H+T)	**2611.19**	**6358**	**140.58**
	WIND ENERGY	523.34	727	26.17
	SOLAR ENERGY	127.77	177	6.39
	BIO -MASS ENERGY	0.95	1	0.05
	TOTAL MP RES	**652.05**	**906**	**32.60**
	MP TOTAL (H+T+RES)	**3263.24**	**7264**	**173.18**
	CHHATTISGARH			
	HYDRO			
	H. BANGO	38.32	120	0.07
	Gangrel	1.53	10	0.02
	Mini Micro KWB	1.99	7	0.00
	CHHATTISHGARH TOTAL (H)	**41.83**	**137**	**0.09**
	CHHATTISHGARH (THERMAL)			
	KORBA (E-II) -1	0.00	0	
	KORBA (E-II) -2	0.00	0	
	KORBA (E-II) -3	0.00	0	
	KORBA (E-II) -4	0.00	0	
	TOTAL KORBA (E) 1-4	**0.00**	**0**	**0.00**

	KORBA (E) -5	55.97	97	
	KORBA (E) -6	65.04	78	
	TOTAL KORBA (E) 5-6	**121.01**	**182**	**13.59**
	TOTAL KORBA (E)	**121.01**	**182**	**13.59**
	KORBA(W) - 1	118.07	177	
	KORBA(W) - 2	132.34	195	
	TOTAL KORBA (W) 1-2	**250.41**	**372**	**23.70**
	KORBA(W) - 3	138.78	190	
	KORBA(W) - 4	118.13	193	
	TOTAL KORBA (W) 3-4	**256.91**	**383**	**23.41**
	KWB EXTN -5	371.18	498	18.37
	TOTAL KORBA (W)	**878.50**	**2008**	**65.48**
	KORBA(EB) Extn - 1 (DSPM 1)	166.96	255	
	KORBA(EB) Extn - 2 (DSPM 2	160.82	255	
	TOTAL KORBA (E) DSPM	**327.78**	**510**	**26.17**
	MARWA-1	202.86	0	
	MARWA-2	154.26	461	
	TOTAL MARWA	**357.12**	**461**	**25.15**
	TOTAL CHHATTISHGARH (THERMAL)	**1684.42**	**3161**	**130.39**
	CHHATTISGARH (TH+HY)	**1726.25**	**3298**	**130.49**
	MAHARASHTRA			
	H Y D R O			
	Koyana I & II	77.48	0	1.04
	Koyana IV	54.60	0	0.74
	Koyana III	58.12	0	0.22
	K.D.P.H.	15.63	0	0.02
	Total KGSC	**205.83**	**0**	**2.02**
	Panshet	4.21	0	0.01
	V'sgaon	1.26	0	0.00
	Pawna	2.22	0	0.01
	M'kdoh	0.04	0	0.01
	Dimbhe	1.15	0	0.00
	Bhatghar	2.71	0	0.01
	Kanher	0.92	0	0.01
	Dhom	0.83	0	0.00
	Ujjani	0.93	0	0.01
	Warna	2.69	0	0.01
	Tillari	5.98	0	0.03
	D'ganga	0.00	0	0.02
	T'medhe	0.05	0	0.00
	R'nagari	0.00	0	0.00
	Bhira	9.28	0	0.01
	Total HPC Pune	**32.27**	**0**	**0.14**

	Vaitarna	5.30	0	0.07
	Vaitarna D.T.	0.36	0	0.00
	Bhatsa	8.61	0	0.02
	Surya	0.00	0	0.01
	Yeldari	0.00	0	0.01
	Paithan	2.39	0	0.02
	Ghatghar U-I	4.15	0	0.14
	Ghatghar U-II	0.00	0	0.00
	Total HPC Nasik	**20.81**	**0**	**0.27**
	TATA HYDRO			
	KHOPOLI	28.22	75	
	BHIVPURI	13.73	72	
	BHIRA	35.11	150	
	BHIRA PS	51.16	165	
	TOTAL TATA HYDRO	**128.21**	**0**	**3.79**
	TOTAL MAHARASHTRA (Hydro)	**451.73**	**0**	**5.84**
	THERMAL			
	NASIK - 3	41.48	160	
	NASIK - 4	81.28	198	
	NASIK - 5	32.40	168	
	TOTAL NASIK	**155.16**	**526**	
	TROMBAY - 5	218.57	483	
	TROMBAY - 6	0.00	0	
	TROMBAY -8	147.96	239	
	TROMBAY - 7 A	53.06	117	
	TROMBAY - 7 B	35.69	68	
	TOTAL TROMBAY	**455.28**	**907**	
	KORADI - 6	27.00	155	
	KORADI - 7	10.79	125	
	KORADI - 8	94.67	351	
	KORADI - 9	73.74	425	
	KORADI - 10	171.64	460	
	TOTAL KORADI	**377.84**	**1516**	
	BHUSAWAL - 3	9.84	190	
	BHUSAWAL - 4	252.13	500	
	BHUSAWAL - 5	210.80	490	
	TOTAL BHUSAWAL	**472.77**	**1180**	

	PARLI - 4	0.00	0	
	PARLI - 5	0.00	0	
	PARLI - 6	21.83	238	
	PARLI - 7	45.68	249	
	PARLI - 8	0.00	0	
	TOTAL PARLI	**67.51**	**487**	
	K'KHEDA - II - 1	72.60	170	
	K'KHEDA - II - 2	34.18	155	
	K'KHEDA - II - 3	101.10	170	
	K'KHEDA - II - 4	71.84	190	
	K'KHEDA - II - 5	252.12	475	
	TOTAL K'KHEDA	**531.83**	**1160**	
	PGPL-1	0.00	0	
	PGPL-2	0.00	0	
	TOTAL PGPL	**0.00**	**0**	
	URAN (G) - 5	0.00	0	
	URAN (G) - 6	0.00	0	
	URAN (G) - 7	0.00	0	
	URAN (G) - 8	178.80	424	
	ALL URAN (G)	**230.08**	**406**	
	URAN - WHR -I	0.00	0	
	URAN - WHR -II	0.00	0	
	TOTAL URAN - WHR	**0.00**	**0**	
	CHANDRAPUR -3	57.80	180	
	CHANDRAPUR -4	78.05	164	
	CHANDRAPUR -5	207.17	380	
	CHANDRAPUR -6	214.93	410	
	CHANDRAPUR -7	0.00	0	
	CHANDRAPUR -8	159.99	470	
	CHANDRAPUR -9	187.99	426	
	TOTAL CHANDRAPUR	**905.92**	**2030**	
	PARAS -3	131.03	261	
	PARAS - 4	85.18	255	
	TOTAL PARAS	**216.21**	**516**	
	REL DAHANU - I	144.76	250	
	REL DAHANU - I I	144.76	250	
	TOTAL DAHANU	**308.17**	**500**	

	APML(All Units)	1824.86	0	
	JSWEL(All Units)	654.67	0	
	VIPL(All Units)	0.00	0	
	RPL AMT(All Units)	346.83	0	
	WPCL(All Units)	0.00	0	
	Other CPPS/IPPS	81.71	0	
	TOTAL MAHARASHTRA CPPS/IPPS	**2908.07**	**4039**	
	MAHARASHTRA TOTAL (Th.)(INCL TATA,ADANI)	**6628.85**	**13267**	**355.04**
	MAHARASHTRA TOTAL (H+T)	**7080.58**	**13267**	**360.88**
	Wind injection (W)	1299.81	1805	26.00
	Solar injection (S)	140.64	195	2.81
	TOTAL MAHARASHTRA RES	**1440.45**	**2001**	**28.81**
	TOTAL MAHARASHTRA (TH+H+RES)	**8521.03**	**15268**	**389.69**
	GOA			
	IPP GOA	7.87	11	0.15
	CENTRAL SECTOR			
	N P C I L			
	TAPS - I	118.79	160	0.00
	TAPS - II	115.20	160	0.00
	TOTAL TAPS 1-2	**233.99**	**320**	**16.06**
	TAPS - III	406.39	549	0.00
	TAPS - IV	404.04	546	0.00
	TOTAL TAPS 3-4	**810.43**	**1095**	**72.20**
	KAKRAPAR - I	159.64	0	0.00
	KAKARAPAR - II	164.88	222	0.00
	TOTAL KAPS 1-2	**324.52**	**222**	**32.99**
	TOTAL NPCIL GENERATION	**1044.42**	**1415**	**121.24**
	N T P C			
	K S T P S - 1	140.33	215	0.00
	K S T P S - 2	124.92	214	0.00
	K S T P S - 3	146.36	213	0.00
	K S T P S - 4	312.68	513	0.00
	K S T P S - 5	327.81	514	0.00
	K S T P S - 6	323.46	515	0.00
	K S T P S - 7	124.66	513	0.00

	TOTAL K S T P S	**1500.22**	**2697**	**98.38**
	V S T P S - 1	127.40	215	0.00
	V S T P S - 2	134.16	212	0.00
	V S T P S - 3	134.77	211	0.00
	V S T P S - 4	130.13	213	0.00
	V S T P S - 5	128.00	214	0.00
	V S T P S - 6	129.19	215	0.00
	V S T P S -7	277.13	513	0.00
	V S T P S -8	350.98	515	0.00
	V S T P S -9	326.91	514	0.00
	V S T P S -10	355.79	513	0.00
	V S T P S -11	252.36	513	0.00
	V S T P S -12	365.43	514	0.00
	V S T P S -13	352.66	515	0.00
	TOTAL V S T P S	**3064.89**	**4877**	**210.16**
	SIPAT STPS-1	409.45	660	0.00
	SIPAT STPS-2	457.83	660	0.00
	SIPAT STPS-3	73.02	670	0.00
	SIPAT STPS-4	306.04	520	0.00
	SIPAT STPS-5	331.98	520	0.00
	TOTAL SIPAT	**1578.32**	**3030**	**95.50**
	KAWAS-GT-1A	21.39	105	0.00
	KAWAS-GT-1B	16.97	106	0.00
	KAWAS- ST-1	20.63	116	0.00
	KAWAS-GT-2A	2.10	106	0.00
	KAWAS-GT- 2 B	1.66	106	0.00
	KAWAS-ST-2	0.00	116	0.00
	TOTAL KAWAS	**62.75**	**655**	**3.02**
	GANDHAR - GT1	4.12	144	0.00
	GANDHAR - GT2	3.75	144	0.00
	GANDHAR - GT3	8.63	144	0.00
	GANDHAR - ST3	0.55	0	0.00
	TOTAL GANDHAR	**17.05**	**432**	**1.37**
	MAUDA-1	251.16	510	0.00
	MAUDA-2	140.10	510	0.00
	MAUDA-3	104.72	660	0.00
	MAUDA-4	0.00	500	0.00
	TOTAL MAUDA	**495.97**	**2180**	**36.96**
	SOLAPUR-1	61.30	680	0.00
	SOLAPUR-2	66.16	0	0.00
	TOTAL SOLAPUR	**127.46**	**660**	**14.88**

	LARA-1	0.00	0	0.00
	LARA-2	0.00	0	0.00
	TOTAL LARA	**0.00**	**660**	**0.00**
	GADARWADA-1	87.98	800	0.00
	GADARWADA-2	0.00	0	0.00
	TOTAL GADARWADA	**87.98**	**800**	**4.55**
	KHARGAONE-1	0.00	0	0.00
	KHARGAONE-2	0.00	0	0.00
	TOTAL KHARGAONE	**0.00**	**660**	**0.00**
	TOTAL NTPC GENERATION	**6934.64**	**16651**	**464.83**
	RGPPL			
	RGPPL (Dabhol) Phase I	0.00	0	0.00
	RGPPL (Dabhol) Phase II	1.34	560	0.00
	RGPPL (Dabhol) Phase III	373.23	265	0.00
	RGPPL TOTAL	**374.57**	**560**	**9.36**
	OTHER REGIONAL IPPS			
	SASAN TOTAL	**2380.39**	**0**	**119.02**
	CGPL TOTAL	**1885.54**	**0**	**94.28**
	JPL TOTAL	**102.92**	**0**	**5.15**
	JPL EXT TOTAL	**517.65**	**0**	**25.88**
	BALCO -1	0.00	0	0.00
	BALCO -2	0.00	0	0.00
	BALCO -3	0.00	0	0.00
	BALCO -4	0.00	0	0.00
	BALCO TOTAL	**328.29**	**0**	**16.41**
	ACBIL -1	0.00	0	0.00
	ACBIL -2	0.00	0	0.00
	ACBIL TOTAL	**378.93**	**0**	**18.95**
	TRN -1	0.00	0	0.00
	TRN-2	0.00	0	0.00
	TRN TOTAL	**165.33**	**0**	**8.27**
	NSPCL -1	0.00	0	0.00
	NSPCL-2	0.00	0	0.00
	NSPCL TOTAL	**236.85**	**0**	**11.84**
	JAYPEE NIGRIE -1	0.00	0	0.00
	JAYPEE NIGRIE-2	0.00	0	0.00
	JAYPEE NIGRIE TOTAL	**289.27**	**0**	**14.46**
	KSK MAHANADI -1	0.00	0	0.00
	KSK MAHANADI -2	0.00	0	0.00
	KSK MAHANADI -3	0.00	0	0.00
	KSK MAHANADI TOTAL	**886.65**	**0**	**44.33**
	MB POWER -1	0.00	0	0.00
	MB POWER-2	0.00	0	0.00

	MB POWER TOTAL	**635.80**	**0**	**31.79**
	DB POWER -1	0.00	0	0.00
	DB POWER-2	0.00	0	0.00
	DB POWER TOTAL	**426.51**	**0**	**21.33**
	RKM POWER GENERATION -1	0.00	0	0.00
	RKM POWER GENERATION -2	0.00	0	0.00
	RKM POWER GENERATION -3	0.00	0	0.00
	RKM POWER GENERATION TOTAL	**208.42**	**0**	**10.42**
	KWPCL -1	0.00	0	0.00
	KWPCL-2	0.00	0	0.00
	KWPCL TOTAL	**-0.58**	**0**	**-0.03**
	JHABUA POWER-1	0.00	0	0.00
	JHABUA POWER-2	0.00	0	0.00
	JHABUA POWER TOTAL	**159.44**	**0**	**7.97**
	LANCO(AMERKANTAK PATHADI)-1	0.00	0	0.00
	LANCO(AMERKANTAK PATHADI)-2	0.00	0	0.00
	LANCO(AMERKANTAK) TOTAL	**262.41**	**0**	**13.12**
	SKS-1	0.00	0	0.00
	SKS-2	0.00	0	0.00
	SKS POWER GEN TOTAL	**270.40**	**0**	**13.47**
	GMR RAIPUR -1	0.00	0	0.00
	GMR RAIPUR-2	0.00	0	0.00
	GMR RAIPUR GEN TOTAL	444.03	0	22.20
	DHARIWAL-1	0.00	0	0.00
	DHARIWAL-2	0.00	0	0.00
	DHARIWAL GEN TOTAL	183.99	0	9.20
	EPML-1	0.00	0	0.00
	EPML-2	0.00	0	0.00
	EMPL GEN TOTAL	184.56	0	9.23
	TOTAL WR IPP	**9946.80**	**0**	**465.89**
(I)	**पश्चिमी क्षेत्र WESTERN REGION**			
	ग्रोस उत्पादन Gross generation	39013.38		
(J)	उपलब्धता Availability	36823.99		
	नेट विनिमय Net Exchanges	-8263.59		
	उपलब्ध ऊर्जा Energy Availability	28560.40		

अनुलग्नक 4.2
ANNEX-4.2

Restricted and Unrestricted demand for the month of August 2019

राज्य	State	वास्तविक Actual (MW)					दिनांक Date	समय Time	आवृत्ति Frequency
		आपूर्ति Catered	UNSCH LS	FC	SCH LS	कुल Total			
गुजरात	***GUJARAT***								
पंजीकृत	Registered	14599	-	-	-	14599	31.08.2019	16:00	50.03
सीमित	Restricted								
असीमित	Unrestricted	14599	0	0	0	14599	31.08.2019	16:00	50.03
न्यूनतम पंजीकृत मांग	Min. Registered Demand	8303				8303	15.08.19	0:00	50.08
मध्य प्रदेश	***MADHYA PRADESH***								
पंजीकृत	Registered	8777	-	-	0	8777	12.08.2019	7:30	50.01
सीमित	Restricted								
असीमित	Unrestricted	8777	0	0	0	8777	12.08.2019	7:30	50.01
न्यूनतम पंजीकृत मांग	Min. Registered Demand	4699				4699	15.08.2019	15:00	
छत्तीसगढ़	***CHHATTISGARH***								
पंजीकृत	Registered	4278	-	-	-	4278	05.08.2019	19:15	49.95
सीमित	Restricted								
असीमित	Unrestricted	4278	0	7	0	4285	05.08.2019	19:15	49.95
न्यूनतम पंजीकृत मांग	Min. Registered Demand	2549				2549	08.08.2019	14:15	
महाराष्ट्र	***MAHARASHTRA***								
पंजीकृत	Registered	20250	-	-	-	20250	29.08.2019	10:00	49.99
सीमित	Restricted								
असीमित	Unrestricted	20250	0	7	0	20257	29.08.2019	10:00	49.99
न्यूनतम पंजीकृत मांग	Min. Registered Demand	12361				12361	5-Aug-19	4:00	50.02
गोवा	****GOA***								
पंजीकृत	Registered	561	-	-	-	561	23.08.2019	20:00	50.01
असीमित	Unrestricted	561	0	0.00	0	561	23.08.2019	20:00	50.01
न्यूनतम पंजीकृत मांग	Min. Registered Demand								
एस्सार	***ESSAR(ESIL)***								
पंजीकृत	Registered	874	-	-	-	874	05.08.2019	3:00	50.00
असीमित	Unrestricted	874	0	0	0	874	05.08.2019	3:00	50.00
न्यूनतम पंजीकृत मांग	Min. Registered Demand								
दमन एवं दीव	***DD***								
पंजीकृत	Registered	350	-	-	-	350	07.08.2019	10:00	50.05
असीमित	Unrestricted	350	0	0	0	350	07.08.2019	10:00	50.05
न्यूनतम पंजीकृत मांग	Min. Registered Demand								
दादरा व न हवेली	***DNH***								
पंजीकृत	Registered	813	-	-	-	813	29.08.2019	20:00	49.99
असीमित	Unrestricted	813	0	0	0	813	29.08.2019	20:00	49.99
न्यूनतम पंजीकृत मांग	Min. Registered Demand								
पश्चिम क्षेत्र	***WESTERN REGION***								
पंजीकृत	Registered	47633	-	-	-	47633	30.08.2019	11:00	50.01
सीमित	Restricted								
असीमित	Unrestricted	47633	0	0	0	47633	30.08.2019	11:00	50.01
न्यूनतम पंजीकृत मांग	Min. Registered Demand	31122				31122	15.08.2019	17:00	

NOTE: LS= Load Shedding
PC= Power Cuts/Regulatory Measures
FC= Frequency Correction
Registered demand= Actual Demand Met
= Registered + LS + FC
= Registered + LS + FC + PC + Holiday Staggering + Recess Staggering.

List of Inter-state/Inter-Regional Lines- Parallel/ Radial Operation			
अनु.क्र.	समांतर/वृतीय प्रचालन	PARALLEL / RADIAL OPERATION	Total Operating Hours(HH:MM:SS)
एचवीडीसी लाइनें HVDC Lines			
1	एचवीडीसी बॅक टु बॅक लिंक विंध्याचल पोल 1	HVDC back-to back link Vindhyachal-Pole 1	698:02:00
2	एचवीडीसी बॅक टु बॅक लिंक विंध्याचल पोल 2	HVDC back-to back link Vindhyachal-Pole 2	741:20:00
3	एचवीडीसी मुँदरा टु महेनदरगढ़ पोले 1	HVDC Mundra-Mahendergarh Pole 1	744:00:00
4	एचवीडीसी मुँदरा टु महेनदरगढ़ पोले 2	HVDC Mundra-Mahendergarh Pole 2	744:00:00
5	एचवीडीसी चांपा टु कुरुक्षेत्र पोल 1	HVDC Champa-Kurukshetra Pole-1	719:29:00
6	एचवीडीसी चांपा टु कुरुक्षेत्र पोल 2	HVDC Champa-Kurukshetra Pole-2	719:33:00
7	एचवीडीसी चांपा टु कुरुक्षेत्र पोल 3	HVDC Champa-Kurukshetra Pole-3	744:00:00
8	एचवीडीसी बॅक टु बॅक लिंक भद्रावती पोल 1	HVDC back-to back link Bhadrawti Pole-1	744:00:00
9	एचवीडीसी बॅक टु बॅक लिंक भद्रावती पोल 2	HVDC back-to back link Bhadrawti Pole-2	744:00:00
अंतर-क्षेत्रीय लाइनें Inter-Regional Lines			
1	765 केवी सोलापुर से रायचूर -I	765kV solapur to Raichur I	735:00:00
2	765 केवी सोलापुर से रायचूर -II	765kV solapur to Raichur II	744:00:00
3	765 केवी वर्धा से निजामाबाद-I	765kV Wardha to Nizamabad I	710:30:00
4	765 केवी वर्धा से निजामाबाद-II	765kV Wardha to Nizamabad II	734:47:00
5	765 केवी ग्वालियर से फागी-I	765kV Gwalior to Phagi I	744:00:00
6	765 केवी ग्वालियर से फागी-II	765kV Gwalior to Phagi II	744:00:00
7	765 केवी ग्वालियर से आगरा-I	765kV Gwalior to Agra I	744:00:00
8	765 केवी ग्वालियर से आगरा-II	765kV Gwalior to Agra II	744:00:00
9	765 केवी धरमजयगड से न्यू रांची-I	765kV D'garh to New Ranchi I	714:38:00
10	765 केवी धरमजयगड से न्यू रांची-II	765kV D'garh to New Ranchi II	744:00:00
11	765 केवी धरमजयगड से झारसुगुड़ा-I	765kV D'garh to Jharsuguda I	744:00:00
12	765 केवी धरमजयगड से झारसुगुड़ा-II	765kV D'garh to Jharsuguda II	744:00:00
13	766 केवी धरमजयगड से झारसुगुड़ा-III	765kV D'garh to Jharsuguda III	718:42:00
14	767 केवी धरमजयगड से झारसुगुड़ा-IV	765kV D'garh to Jharsuguda IV	744:00:00
15	400 केवी कोल्हापुर से नरेंद्र I	400kV Kolhapur-Narendra I	744:00:00
16	400 केवी कोल्हापुर से नरेंद्र II	400kV Kolhapur-Narendra II	744:00:00
17	400 केवी कंसारी से भिनमल	400kV Kansari- Bhinmal	744:00:00
18	400 केवी कंसारी से कंक्रोली	400kV Kansari- Kankroli	744:00:00
19	400 केवी रैप से सूजलपुर-I	400 kV RAPP-Sujalur I	744:00:00
20	400 केवी रैप से सूजलपुर-II	400kV RAPP-Sujalur II	744:00:00
21	400 केवी सिपत से रांची I	400kV Sipat-Ranchi I	701:42:00
22	400 केवी सिपत से रांची II	400kV Sipat-Ranchi II	708:45:00
23	400 केवी रायगढ़ से झरसुगुड़ा I	400kV Raigarh to Jharsuguda I	719:42:00
24	400 केवी रायगढ़ से झरसुगुड़ा II	400kV Raigarh to Jharsuguda II	708:27:00
25	400 केवी रायगढ़ से झरसुगुड़ा III	400kV Raigarh to Jharsuguda III	744:00:00
26	400 केवी रायगढ़ से झरसुगुड़ा IV	400kV Raigarh to Jharsuguda IV	744:00:00
27	400 केवी रायगढ़ से बुद्धिपदर	220kV Raigarh-Budhipadar	744:00:00
28	220 केवी कोरबा पूर्व से बुद्धिपादर-II	220kV K(E) to Budhipadar-II	744:00:00
29	220 केवी कोरबा पूर्व से बुद्धिपादर-III	220kV K(E) to Budhipadar-III	744:00:00
30	220 केवी बदोड़ से साकतपुर	220kV Badod to Sakatpur	744:00:00
31	220 केवी भनपुर से मोडक	220kV Bhanpur to Modak	717:21:00
32	220 केवी महगाओं से औरैया	220kV Mehgaon to Auraiya	744:00:00
33	220 केवी मालनपुर से औरैया	220kV Malanpur to Auraiya	744:00:00
अंतर-राज्यीय लाइनें Inter-State Lines			
1	765 केवी सिवनी से वर्धा-I	765kV Seoni to Wardha-I	667:33:00
2	765 केवी सिवनी से वर्धा-II	765kV Seoni to Wardha-II	744:00:00

3	765 केवी दुर्ग से वर्धा -I	765kV Durg to Wardha I	**460:02:00**
4	765 केवी दुर्ग से वर्धा -II	765kV Durg to Wardha II	**496:36:00**
5	765 केवी दुर्ग से वर्धा -III	765kV Durg to Wardha III	**384:48:00**
6	765 केवी दुर्ग से वर्धा -IV	765kV Durg to Wardha IV	**417:11:00**
7	765 केवी धुले से वडोदरा-I	765kV Dhule to Vadodara I	**717:27:00**
8	765 केवी इंदौर से वडोदरा-I	765kV Indore(PG) to Vadodara I	**734.03:00**
9	765 केवी धरमजयगड से जबलपुर-I	765kV D'garh to Jabalpur I	**568:52:00**
10	765 केवी धरमजयगड से जबलपुर-II	765kV D'garh to Jabalpur II	**527:19:00**
11	765 केवी धरमजयगड से जबलपुर-III	765kV D'garh to Jabalpur III	**716:56:00**
12	765 केवी धरमजयगड से जबलपुर-IV	765kV D'garh to Jabalpur IV	**344:45:00**
13	765 केवी सिवनी से बिलासपुर-I	765kV Seoni to Bilaspur-I	**744:00:00**
14	765 केवी सिवनी से बिलासपुर-II	765kV Seoni to Bilaspur-II	**744:00:00**
15	400 केवी भिलाई से कोराडी	400kV Bhilai to Koradi	**744:00:00**
16	400 केवी भिलाई से भद्रावती	400kV Bhilai to Bhadravati	**744:00:00**
17	400 केवी भिलाई से सियोनि	400kV Bhilai to Seoni	**744:00:00**
18	400 केवी रायपुर से भद्रावती -I	400kV Raipur to Bhadravati-I	**744:00:00**
19	400 केवी रायपुर से भद्रावती -II	400kV Raipur to Bhadravati-II	**744:00:00**
20	400 केवी रायपुर से भद्रावती -III	400kV Raipur to Bhadravati-III	**744:00:00**
21	400 केवी रायपुर से वर्धा-I	400kV Raipur to Wardha-I	**709:00:00**
22	400 केवी रायपुर से वर्धा-II	400kV Raipur to Wardha-II	**744:00:00**
23	400 केवी सातपुरा से कोराडी	400kV Satpura to Koradi	**744:00:00**
24	400 केवी कोल्हापुर(GIS) से मापुसा-I	400kV Kolhapur(GIS)-Mapusa-I	**716:14:00**
25	400 केवी कोल्हापुर(GIS) से मापुसा-II	400kV Kolhapur(GIS)-Mapusa-II	**717:45:00**
26	400 केवी खंडवा से धुले-I	400kV Khandwa-Dhule-I	**546:17:00**
27	400 केवी खंडवा से धुले-II	400kV Khandwa-Dhule-II	**504:44:00**
28	400 केवी एसएसपी से धुले-I	400kV SSP-Dhule-I	**744:00:00**
29	400 केवी एसएसपी से धुले-II	400kV SSP-Dhule-II	**719:53:00**
30	400 केवी वापी से बोईसर	400kV Vapi-Boisar	**717:20:00**
31	400 केवी एसएसपी से राजगढ़-I	400kV SSP- Rajgarh -I	**744:00:00**
32	400 केवी एसएसपी से राजगढ़-II	400kV SSP- Rajgarh -II	**744:00:00**
33	400 केवी कासोर से राजगढ़-I	400kV Kasor- Rajgarh -I	**688:36:00**
34	400 केवी कासोर से राजगढ़-II	400kV Kasore- Rajgarh -II	**710:24:00**
35	400 केवी इंदौर से असोज-I	400kV Indore to Asoj-I	**744:00:00**
36	400 केवी इंदौर से असोज-II	400kV Indore to Asoj-II	**744:00:00**
37	400 केवी कोरबा से बीरसिंगपुर I	400kV Korba-Birsigpur I	**744:00:00**
38	400 केवी कोरबा से बीरसिंगपुर II	400kV Korba-Birsigpur II	**744:00:00**
39	400 केवी कोरबा से एस्सार महान	400kV Korba-Essar Mahan	**744:00:00**
40	400 केवी कोरबा से विंध्याचल	400kV Korba-Vindhyachal	**744:00:00**
41	400 केवी नागदा से देहगाम-I	400kV Nagda to Dehgam I	**704:20:00**
42	400 केवी नागदा से देहगाम-II	400kV Nagda to Dehgam II	**669:29:00**

अनुलग्नक 4.4

Annex-4.4

आगस्त 2019 के अंत में पश्चिम क्षेत्र के मुख्य जलाशयों के स्तर

LEVEL OF MAJOR RESERVOIRS IN WESTERN REGION AT THE END OF MONTH OF August 2019

विवरण Particulars	गु उ वि नि लि GUVNL	मप्रविउकं लि MPPGCL	एन एच डी सी NHDC	मराविउकं लि MSEGCL
	उकाई Ukai	गांधीसागर Gandhisagar	इंदिरा सागर Indira Sagar	कोयना Koyna
Levels in Mtrs. स्तर मीटर में				
माह के अंत में At the end of the month	103.40	399.32	261.04	659.19
पिछले वर्ष इस माह के अनुरूप आंकड़ें Corresponding Figure of the month Last Year	96.75	390.88	258.58	659.13

Western Region-Event Report for August 2019

Annexure 5

S.No	Region	Name of Elements	Owner/Agency	Outage		Revival		Outage Duration	Event	Generation Loss (MW)	Load Loss (MW)	Category as per CEA standards	Energy Unserved (MU)
				Date	Time	Date	Time	Time					
1	WR	Tripping of 1.220 kV Uran-Apta 2&3 2.220 kV Uran-Khargar 2 3.220 kV Uran-JNPT 4.Uran 108 MW Unit 6&8 5.Uran 120 MW Unit A0	MSETCL	03/08/2019	20:29	03/08/2019	20:45	0:16	At 220 kV Uran s/s, flashover on Main Bus 2 R Phase Tension Disc Insulator String at 220 KV ONGC Bay resulted in tripping of all the elements connected to 220 kV Uran Bus 2 on Busbar protection operation.	202	13	GI-1	0.003466667
2	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC 4.Uran 108 MW Unit 5 5.Uran 120 MW Unit B0	MSETCL	03/08/2019	13:41	03/08/2019	14:11	0:30	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	176	8	GI-1	0.004
3	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC 4.Uran 108 MW Unit 5 5.Uran 120 MW Unit A0	MSETCL	04/08/2019	3:57	04/08/2019	4:30	0:33	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	220	18	GI-1	0.0099
4	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC	MSETCL	04/08/2019	5:27	04/08/2019	6:59	1:32	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	Nil	12	GI-1	0.0184
5	WR	Tripping of 1.220 Kv Bhuj-Vadva 2.220/33 kV Vadva ICT 1 3.220/33 kV Vadva ICT 2 4.220/33 kV Vadva ICT 3	GIWEL	12/08/2019	5:48	12/08/2019	6:56	1:08	Due to the tripping of 220 kV Bhuj-Vadva S/C on B-E fault, 220/33 kV Vadva ICTs 1,2& 3 deenergized at 220 kv Vadva S/s.	78	Nil	GD-1	Nil
6	WR	Tripping of 1.220 kV Ponda Bus 1 2.220 kV Mapusa-Ponda 1 3.220 kV Ponda-Xeldem 2 4.220/110 kV Ponda ICT 1&2 5.220 kV Mahalakshmi-Amona	Goa	13/08/2019	19:31	13/08/2019	20:33	1:02	At 220 kV Ponda s/s, Dropper of 220KV Ponda-Xeldem-2 fell on 220KV Bus-1 and all the elements connected to 220 kV ponda Bus 1 tripped.	Nil	110	GI-1	0.1

7	WR	Tripping of 1.220 kV Nashik-Airoli 2.220 kV Nashik-Bableshwar 1&2 3.220 kV Nashik-Ghatghar 4.220 kV Nashik-Airoli 5.Nashik Unit 4 (210 MW) 6.220/132 kV 200 MVA Nashik ICT 1&6 7.220/132 kV 150 MVA Nashik ICT 2	MSETCL	15/08/2019	9:17	15/08/2019	9:40	0:23	220 kV Nashik-Bableshwar 2 was taken on TBC at Nashik s/s for bus sectionaliser 3 outage.Trip circuit faulty alarm appeared on the Nashik TBC. To attend the problem the circuit was opened at Bableshwar end and the TBC isolator was opened with charging current which rersulted in sparking of the isolator and created R-E fault. As	110	30	GD-1	0.02
8	WR	Tripping of 1.220 kV Amona-Ponda 2&3 2.220 kV Mahalakshmi-Amona 3.220 kV Amona-Tillari 4.220 kV Halkarni-Tillari	Goa	15/08/2019	7:00	15/08/2019	8:16	1:16	At 220 kV Amona s/s, due to failure of Y-ph LA of 220KV Tillari feeder all the elements connected to 220 kV Amona Bus 2 tripped.	Nil	Nil	GI-1	Nil
9	WR	Tripping of 1.400 kV Ukai-Kosamba 2.400 kV Ukai-Navsari 3.400/220 kV Ukai ICT 1	GETCO	15/08/2019	14:00	15/08/2019	19:20	5:20	At 400/220 kV Ukai s/s, 400kV Ukai-Kosamba and Ukai-Navsari lines tripped on over-voltage & 400/220kV ICT tripped on Overflux & differential protection operation. Due to tripping of all the elements, 400kV Bus 1&2 at Ukai substation deenergized.	Nil	Nil	GI-2	Nil
10	WR	Tripping of 1.400 kV Ukai-Kosamba 2.400/220 kv Ukai ICT 1	GETCO	16/08/2019	1:06	16/08/2019	6:55	5:49	At 400/220 kV Ukai s/s, 400kV Ukai-Kosamba tripped on over-voltage & 400/220kV ICT tripped on Overflux protection operation. 400kV Bus 1&2 at Ukai substation deenergized as 400kV Ukai -Navsari was already out on voltage regulation.	Nil	Nil	GI-2	Nil
11	WR	Tripping of 1.220 kV Dhule Interconnector 1&2 2.220 kV Dhule-Chalisgaon 3.220/132 kV 200 MVA Dhule ICT 1&2	MSETCL	22/08/2019	12:36	22/08/2019	13:00	0:24	At 220/132 kV Dhule(MH) s/s, due to the sparking in 220 kV Bus Bar relay panel on RQDA module of RADSS bus bar panel, Bus bar protection operated and all elements connected to 220 kV Main Bus tripped.	Nil	19	GI-1	0.0095
12	WR	Tripping of 1.220 Kv Bhuj-Vadva 2.220/33 kV Vadva ICT 1 3.220/33 kV Vadva ICT 2 4.220/33 kV Vadva ICT 3	GIWEL	24/08/2019	18:00	24/08/2019	19:49	1:49	Due to the tripping of 220 kV Bhuj-Vadva S/C on O/C current protection operation, 220/33 kV Vadva Icts 1,2& 3 deenergized at 220 kv Vadva S/s.	30	Nil	GD-1	Nil
13	WR	Tripping of 1.220 kV Panandhro Bus 2 2.220 kV Panandhro -Akrimota 1 3.220 kV Panandhro -Kukma 2 4.220 kV Panandhro - Nakhatrana 1&2 5.70 MW KLTPS Unit 2 6.75 MW KLTPS Unit 4	GETCO	25/08/2019	2:22	25/08/2019	3:59	1:37	At 220 kV Panandhro, R-phase CT of 25MVAR BR caught fire and resulted in tripping of all the elements connected to 220 kV Panandhro Bus 2.	105	Nil	GI-1	Nil

14	WR	Tripping of 1.132 kV Siltara-Vandana 2.220/132 kV Siltara ICT 2 3.220/132 kV Siltara ICT 3	CSPTCL	28/08/2019	15:36	28/08/2019	15:55	0:19	Due to the R phase fault in 132 kV Siltara-Vandana feeder, 220/132 kV Siltara ICTs 2&3 tripped.	Nil	192	GI-1	0.0608

Disclaimer : The Above details are based on the preliminary/flash report of the event and may change after finalisation of the detailed report.The qunatum of load/generation loss is based on details given by SLDC and utility and may vary later with updated details.

Annexure-6

Status of healthiness of SERs/DRs

S.l. No.	Name of Constituent	Date Receipt
1	PGCIL,WRTS-I	05.04.2019
2	PGCIL,WRTS-II	05.09.2019
3	MPPTCL	15.05.2019
4	NTPC	02.10.2018
5	CSPTCL	05.09.2019
6	GETCO	05.10.2018
7	MSETCL	06.09.2019
8	DD/DNH	17.08.2018
9	GOA	02.10.2018
10	NPCIL	01.03.2019
11	NCA/SSP	04.06.2019
12	NHDC	04.10.2018
13	Jindal PL	17.08.2018
14	CGPL	05.10.2018
15	DB POWER	03.04.2019
16	KWPCL	01.03.2019
17	ACBIL/TRN ENERGY	04.10.2018
18	KSK	02.01.2019
19	GMR CHHATTISHGARH	21.08.2018
20	JNSTPS	05.10.2018
21	MB POWER	09.08.2018
22	SASAN UMPP	21.08.2018
23	NSPCL	21.08.2018
24	RGPPL	06.10.2018
25	SUGEN/DGEN	06.09.2019
26	RKM POWER	05.10.2018
27	ESSAR POWER	09.08.2018
28	BDTCL/JTCL/RTCL	08.10.2018
29	RELIANCE TRANSMISSION	04.04.2018
30	ADANI POWER	04.09.2019
31	JHABUA POWER	04.10.2018
32	EPTCL	05.10.2018
33	TPGL	01.03.2019

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Annexure-7.1

Status of Reactors

Sl. No.	400 kV Sub/Stn.	Size (MVAr)	Implementing agency	Expected date of commissioning
1	Nanded	125	MSETCL	Commissioned on 02/2018
2	Kolhapur	125	MSETCL	Commissioned on 02/2018
3	Akola	125	MSETCL	Commissioned on 02/2018
4	ISP	125	NHDC	December – 2019 expected
5	Satpura-ISP Line Rx(at Satpura end)	50	MPPGCL	Sep 2019
6	Bus Reactor at New Parli(PG)	330	PGCIL	Commissioned on 24.04.2018
7	Bus Reactor at Dhariwal	80	DIL	Commissioned on 23.05.2018
8	Warora(PS)	80	PWTL/Maharashtra	Commissioned on 09-05-2018
9	Warora(PS)	80	PWTL/Maharashtra	Commissioned on 09-05-2018
10	Warora(PS)	330	PWTL/Maharashtra	Commissioned on 18-05-2018
11	Warora(PS)	330	PWTL/Maharashtra	Commissioned on 18-05-2018
12	New Parli	330	PPTL/Maharashtra	Commissioned on 21-05-2018
13	New Parli	330	PPTL/Maharashtra	Commissioned on 21-05-2018
14	Warora(PS)	330	PWTL/Maharashtra	Commissioned on 10-05-2018
15	KAPS 3&4	125	NPCIL/Gujarat	Commissioned on 14-05-2018
16	EPTCL/ Chhattisgarh	50	EPTCL	Commissioned on 21.07.2018
17	EPTCL / Chhattisgarh	50	EPTCL	Commissioned on 27.07.2018

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Annexure 7.2

Status of Transmission schemes: 765/400 kV and above

The updated status on various ongoing transmission schemes for the year 2018-19 as per the current information available is as follows: -

Sl. No.	Name of the Line	Ckt km	Target Completion Date as per TRM on 07.05	Revised estimated target date	Remarks
Powergrid					
1	LILO of Lonikhand-Kalwa at Navi Mumbai GIS-JSL/LS Cable	16	Mar 19		
2	Parli(PG)-New Parli(PG) ckt I & II	18			Commissioned on 21.04.2018
3	765kV Vindhyachal - Jabalpur D/C	749			Charged on 29.12.2018
4	765kV D/C Gadarwara STPP - Warora	453.6			Commissioned in Oct 18
5	800 kV Raigarh-Pugalur HVDC Bipole	3676	March-19		Work under progress
6	765kV D/C Banaskantha - Chittorgarh	293.3	March 2018		
7	400kV D/C Banaskantha (Radhanesda) - Banaskantha (PG)	132	June 2019		
8	765kV Bhuj-Banaskamta DC	583	Mar 19		
9	400 kV Mundra UMPP – Bhuj DC	190	Mar 19		
10	400 kV D/c Wardha-Aurangabad(Upgradable to 1200 kV)	347	February 19		Work is in progress
11	765 kV D/C Jharsuguda-Dharamjaigarh line 2	149			Charged on 01.11.18

12	400kV D/C Banaskantha (Radhanesda) - Banaskantha (PG) T/L.	132	Sep 19		WIP
14	765kV D/C Vindhyachal - Varanasi T/L. (WR-II Portion Only)	183.5	Aug 20		WIP
Chhattishgarh					
1	LILO of 400kV Raita-Jagdalpur at Dhamtari	2	Aug 19	Oct 19	Work under Progress
2	220 kV Barsoor-Jagdalpur	175	Mar 19	Jun 19	
3	220kV Gurur-Kurud (Bangoli)	73.6	Aug 19	Oct 19	
4	LILO of 220kV Korba(E)-Siltara at DSPM	3			Line work in progress and for feeder bay works tender to be issued shortly
5	LILO of 220 KV Mopka-Bhatapara Circuit & 220 KV Mopka-Siltara Circuit on multicircuit tower at proposed 220/132 KV S/s at Dherdehi (Bilaspur)	128	July 18	Jun 19	WIP
6	Second circuit of 220kv Bemetara-Mungeli	39.58	Jul 19		WIP
Gujarat					
1	400 kV D/C Vadinar-Amreli line	116.85	Aug 19		400kV Hadala-Jetpur made LILO at Amreli through Vadinar-Amreli line (Pkg-1) at Amreli S/s on 22.11.13 (Stop Gap).

2	400kV APL-Hadala LILO to Halvad	89.40	June 19	Dec 19	Work in Progress
3	400 kV D/C Amreli-Kasor line	164.30	June 19	Mar 20	WIP(Severe RoW Problem)
4	400kV D/C Vadavi - Halvad Line	146.4	March 19	Mar 20	WIP
5	400 kV Varsana-Halvad	143.38	June 19		
6	400 kV Wanakbori-Soja DC	121.758	Jun 19	Jun 19	WIP(package-I charged on 30.03.2019)
7	400 kV Soja-Zerda DC	268.92	Jun 19	Jun 19	WIP(RoW Problem)
8	400 kV Hadala-Shapar D/c	124.34	Mar 19	Mar 20	WIP
9	400 kV Bhogat- Kalawad D/C	260.57	Mar 20	Mar 20	
10	400 kV Bhachuunda-Varsana D/c	276.16	June 20	June 20	
11	LILO of both ckt. of 400kV D/C Mundra - Zerda line at 400kV Charanka S/s	25.76	Mar 19		WIP
12	400KV mundra-zerda line-I	664	MAR 20(Package-3)	Mar 20	WIP(Severe RoW Problem)
13	400KV LILO wanakbori-soja line 2 at Dehgam	12.9	Jul 19		WIP
14	400KV D/C shapar-Fedra(pachchham) Line	346	Jun 21		WIP
Madhya Pradesh					
1	400KV DCDS Line for LILO of one circuit of Satna (PGCIL)-Bina(PGCIL) 400kV line at Sagar 400kV S/s	49.90	Sept.'19		WIP
2	400kV DCDS line from Nagda 400kV S/s to Mandsaur 400kV S/s	137.32	June'20		WIP
3	400kV DCDS line from Ashta 400kV S/s to Ujjain	179.47	Apr'20		WIP

	400kV S/s				
4	400kV DCDS line from Indore (PGCIL) 765kV S/s to Ujjain 400kV S/s	90.46	Apr'20		WIP
5	400kV DCDS line from Nagda 400kV S/s to Ujjain 400kV S/s	106.86	Apr'20		WIP
Maharashtra (STU)					
1	400 kV Bableshwar-Kudus D/C (Quad)	150	March 19	Mar 20	Forest clearance awaited, severe ROW problem
2	New Parli(PG)-Solapur ckt-I & II	118			Commissioned on 24.04.2018
3	400 KV D/C Jejuri-Hinjewadi Line(Jejuri-Wainjhar) Package-I.	101	March 19	March 20	WIP
4	400 KV D/C Jejuri-Hinjewadi Line (Wainjhar- Hinjewadi) Package-II.	92.67	Mar 19	March 20	WIP
5	LILO on another Ckt of 400KV Bhusawal II - Aurangabad-I for Thaptitanda	177.37	Dec 19	Dec 19	WIP
6	220 kV M/C line, LILO on 220 kV Boisar (M) - Borivali express feed-II at Boisar (PG) s/s		Jun 19	Jun 19	WIP
Other ISTS lines					
1	LILO of one ckt of Aurangabad - Padghe 765 KV D/C line at Pune	130	May 2019		Severe RoW problem

2	Jharsuguda – Raipur 765 kV D/C (hexa) line (Sterlite)	610	March 19		Ready to charge
3	765KV D/C Khandwa Pool (KTL)-Indore (PGCIL) Line(Sterlite)	180	July 19	July 19	
4	765KV D/C Khandwa Pool (KTL)-Dhule (BDTCL) Line(Sterlite)	379	July 19	July 19	
5	400KV D/C Khargone TPP Switchyard (NTPC)-Khandwa Pool (KTL) Line(Sterlite)	49	July 2019	July 2019	
6	Inter- connection with Xeldem (existing) substation through 220kV D/c line with HTLS conductor (ampacity equivalent to twin moose conductor)	29.17	Jun-20	Jun-20	Actual COD : May -21
7	LILO of one ckt. of Narendra (existing) – Narendra (New) 400kV D/c quad line at Xeldem	93.67	Apr-21	Apr-21	WIP
8	Dharamjaygarh Pool Section B – Raigarh (Tamnar) Pool 765 kV D/c line	70	Jun-20	Jun-20	Actual COD : July -21

The WR utilities may intimate the current status on above.

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Annexure 7.3

Status of Generating Units in WR

The status regarding Generating units, commissioned /expected to be commissioned during the current year 2018-19 is as below:

Name of the Power Projects	**Unit No.**	**Capacity (MW)**	**Date of Commissioning /Schedule Date**
Gujarat			
Chhattisgarh			
NIL			
Maharashtra			
NIL			
Madhya Pradesh			
NIL			
Central sector/IPP			
NTPC LARA	UNIT 2	800	
NTPC GADARWADA	UNIT 2	800	

****

ANNEXURE-8.1

REPORT ON MOCK DRILL FOR CRISIS MANAGEMENT PLAN IN POWER SECTOR

for the quarter ending ……..

1. **Name of Power Utility / Generating Station :**

2. **Date / Time of Mock-drill :**

3. **Location site of Mock-drill :**

4. **Observers :**
   (Indicate names of Team designated Leader / Members to handle crisis situation)

5. **Scenario of mock emergent situation :**

6. **Objective :**

7. **Chronological order of events logged :**

Time	Events	Response Time

8. **Observations on effectiveness of Mock Drill :**

9. **Recommendations / Suggestions on the observations (S. No. 8) :**

Signature of Designated
(Safety / Security Officer)

Dated……

Signature of
(Head O & M of Plant)

Dated……

Annexure -8.2 B

Reporting Format to the PSDF Project Monitoring Group

1. Name of the Scheme	
1.1 Name of the substation and its Location	
1.2 Executing Agency	
1.3 State/Region	
2. Date of Sanction order	
2.1 Date of Agreement of Entity with State Govt./NLDC	
2.2 Total Approved Cost of the Scheme	
2.3 Approved Grant by Monitoring Committee (Rs. In Lakhs)	
2.4 Date of Requisition by the Entity	
2.4.a) date and Reference of LOA	
2.4.b) Amount of LOA	
2.5 Date of Disbursement and amount	
2.5.1 : Ist Installment	
2.5.2: IInd installment	
2.5.3: IIIrd installment	
2.6 Date of Scheduled completion of Work	
2.7 Date of handing over of Site to entity (in case of turnkey projects)	

Report for the Month of ____MM / YY_____

No.	Supply Description	Qty. AS PER LOA	Quantity Received during Month	CUMMULATIVE PROGRESS Till date		BALANCE	Remarks
				Sch.	Act.		
1	item Details						
1.1							
1.2							
….							

	Erection Description	works as per LOA	Progress During Month	CUMMULATIVE PROGRESS Till date		Balance	
2	work details						
2.1							
2.2							
….							
3	Others						

Signature with seal of the Nodal Officer

Annexure-8.5

Progress of Capacitor Installation for the month of----------

State	Constituent	Installed as on 01.04.2017	Installed as on 31.10.2017	Installed During the current month	Installed Capacity at the end of the month	Capacitors installed from April 17 to Current Month	Remarks
		MVAR	MVAR	MVAR	MVAR	MVAR	
Gujarat							
	GETCO - 11 kV & above						
	Electricity Dept. Daman						
	Torrent Power - 11 kV & above						
Madhya Pradesh							
	MPPTCL - All voltage levels						
	MP Discom Poorva 11-33 kV						
	MP Discom Madhya 11-33 kV						
	MP Discom Paschim 11-33 kV						
Maharastra							
	MSETCL - 132 kV & above						
	Mah Discom(1) -11 - 33 kV						
	TATA Power - 11 kV and above						
	RIL - 11 kV and above						
	BEST - 11 kV - 33 kV						
Chattisgarh							
	CSPTCL- 132 kV and above						
	CS Discoms(1) - 11-33 kV						
Goa	GED - 11kV and above						
WR	WR-11 kV and above						

पावर सिस्टम ऑपरेशन कॉर्पोरेशन लिमिटेड
(भारत सरकार का उद्यम)
POWER SYSTEM OPERATION CORPORATION LIMITED
(A Govt. of India Enterprise)
पंजीकृत एवं केन्द्रीय कार्यालय : प्रथम तल, बी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली-110016
Registered & Corporate Office : Ist Floor, B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi -110016
CIN : U40105DL2009GOI188682, Website : www.posoco.in, E-mail : posococc@posoco.in, Tel.: 011- 41035696, Fax : 011- 26536901

Ref: NLDC / 2019 / Dynamic_Templates/RPC Dated: 27th Aug 2019

Chief Engineer, National Power Committee NRPC Building, 3rd Floor Katwaria Sarai, New Delhi-110 016	Member Secretary Northern Regional Power Committee 18-A, Shaheed Jeet Singh Sansanwal Marg, Katwaria Sarai, New Delhi-110 016
Member Secretary Western Regional Power Committee F-3, MIDC Area, Marol, Opp. SEEPZ, Central Road, Andheri (East),Mumbai - 400 093	Member Secretary Southern Regional Power Committee Central Electricity Authority No. 29 Race Course Cross Road Bangalore-560 009
Member Secretary Eastern Regional Power Committee 14, Golf Club Road Tollygunge Kolkata-700033	Member Secretary North Eastern Regional Power Committee NERPC Complex, Dong Parmaw Lapalang, Shillong – 793006 (Meghalaya)

Sub : Requirement of model data for simulation of power system stability and dynamics

Dear Sir,

Simulation of power system stability conditions is important in understanding the behavior of the power system and taking necessary steps for ensuring security of the grid. Considering the complexity of India's power system and likely integration of high quantum of RE generation to the grid, efforts of all stakeholders of power system operation, planning and regulations need to be put together in building an accurate, robust and sustainable all India dynamic simulation model .

Ministry of Power, Government of India constituted a "Taskforce on Power System Analysis under Contingencies" in December 2012 as a follow-up of the recommendations of Enquiry Committee on Grid Disturbances of 2012 in Indian Grid. Consultant appointed by the taskforce recommended development of standard modelling procedures and data management procedures, besides the need for periodic validation of generator models through site testing for the purpose of transient stability and small-signal stability studies.

CEA manual on transmission planning criteria 2013 under Section 6.3 and 6.4 lays out consideration for stability studies in planning horizon and section 7.1 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)". It is imperative to conduct stability studies in both operational (short-term) and planning (long-term) horizons to ensure security of the interconnected 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. A functional fit-for-purpose

dynamic model would help to identify the secure operating envelope and thereby managing security effectively. It will allow assessment of impact on grid elements due to connection of new elements and permit power system assets to be run with margins determined on the basis of security assessments. It would also facilitate the tuning of control systems, such as power oscillation dampers, frequency controllers and improve the accuracy of online security tools.

At present, any new generator that seeks connectivity with the grid has to provide the data in the formats as prescribed by CTU or STU/SLDCs. This data is primarily related to equipment's steady state behavior and lacks the necessary information required for dynamic modelling. Therefore, improvised templates have been prepared based on the inputs received from several consultants and POSOCO's experience. These are attached in **Annex-I** to **Annex-VII**. It may please be noted that templates for Wind and Solar have already been incorporated by the CTU in its CON-4 format after similar exercise.

These templates are to be emulated at State level also. States may be advised to improve their connection agreement to include dynamic parameters for new generators and collect the necessary data in the prescribed format from the concerned entity before allowing them to connect with the grid. In case of already connected plants, SLDC/STU may issue the necessary instruction to the concerned generator with modified templates and request them to furnish the information latest by Dec 2019.

All RPCs are, therefore, requested for continuous follow up with the States and Generators at various forums such as OCC and TCC/RPC level to expedite the process of preparing all India dynamic model

Encl: As Above

Thanking you,

Yours faithfully,

27/08/19

Debasis De
Chief General Manager, NLDC

Copy to:

1. Chairperson, CEA
2. Member (GO&D), CEA
3. Secretary CERC
4. CMD, POSOCO
5. Director Operation, POWERGRID
6. Director SO, POSOCO
7. Executive Director, NRLDC
8. Executive Director, WRLDC
9. Executive Director, SRLDC
10. Executive Director, ERLDC
11. Chief General Manager, NERLDC

Annexure-I

Wind Generation Modeling

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:

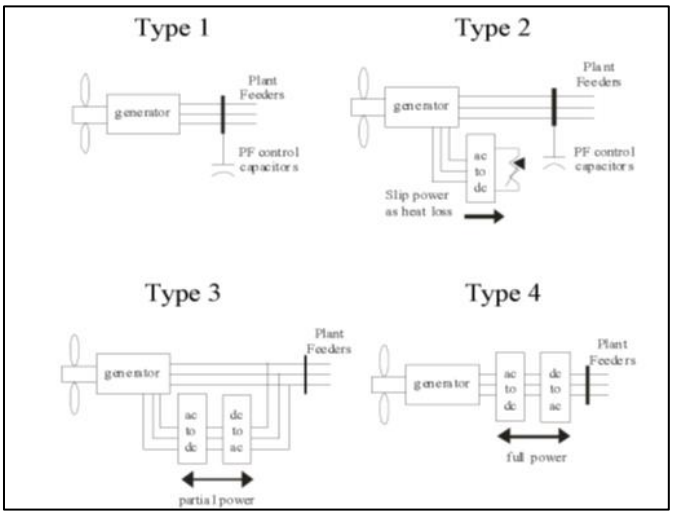
- Facilitate significant power system efficiencies and reliability by allowing power system operations to confidently identify the secure operating envelope and thereby manage security effectively
- Allow assessment of impact on grid elements due to connection of new elements (network elements, generators, 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 simulation studies that deliver reasonably accurate outcomes.

2.0 Wind generation technologies:

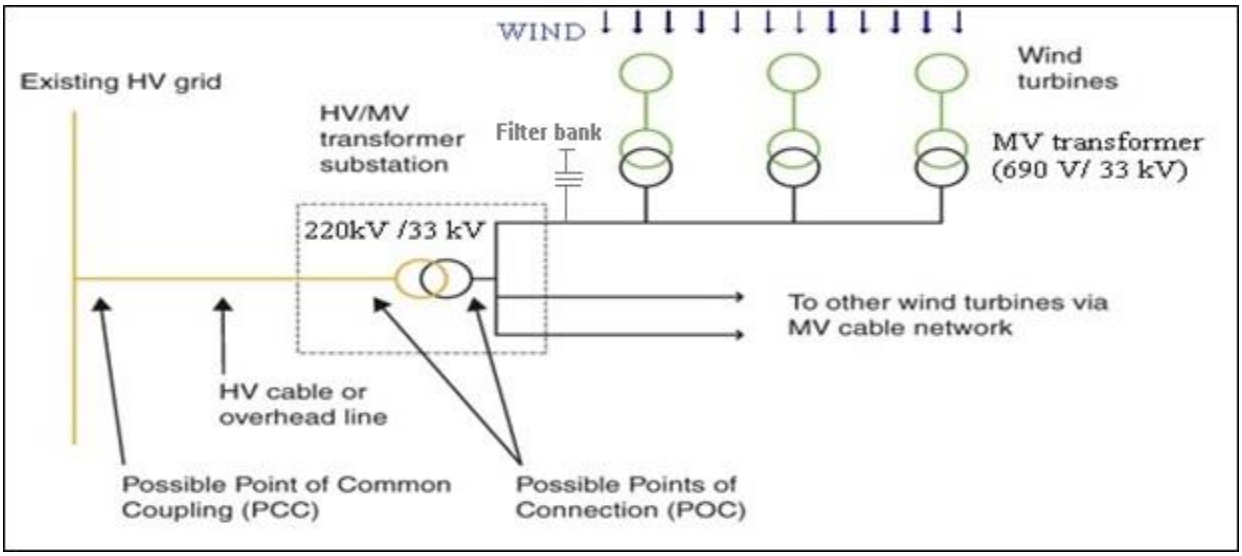
The majority of commercially available wind power plants use one of the wind turbine-generator (WTG) technologies listed below:

- 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:

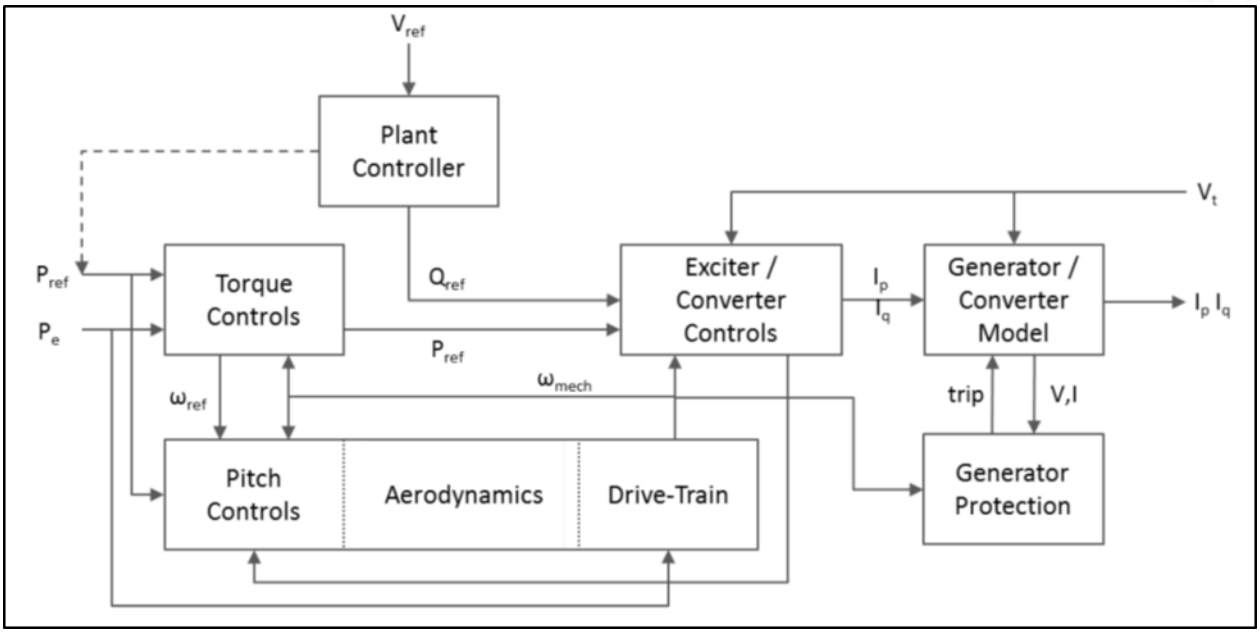


In a typical wind farm / park, individual WTGs (typically rated 3 MW or less) are connected in a system of twigs and feeders. Wind generation at around 660 V / 690 V is stepped up to a MV level of typically 33 kV in Indian system and finally pooled to grid at 220 kV / 400 kV through step-up transformers. 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 and usage 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 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 (if available)
2. 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
    - User guide for Encrypted models to be provided including instructions on how the model should be set-up
    - Corresponding transfer function block diagrams to be provided
    - Simulation results depicting validation of User-Defined models against actual measurement to be provided
    - The use of black-box type representation is not 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.

3. Generic models of WTGs / Wind farms (in case of non-availability of item as per Sl.no.2 above).
    - Simulation results depicting validation of Generic models against User-Defined models or against actual measurement to be provided
    - Models should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 600s.
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 (both UDM and generic)
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	

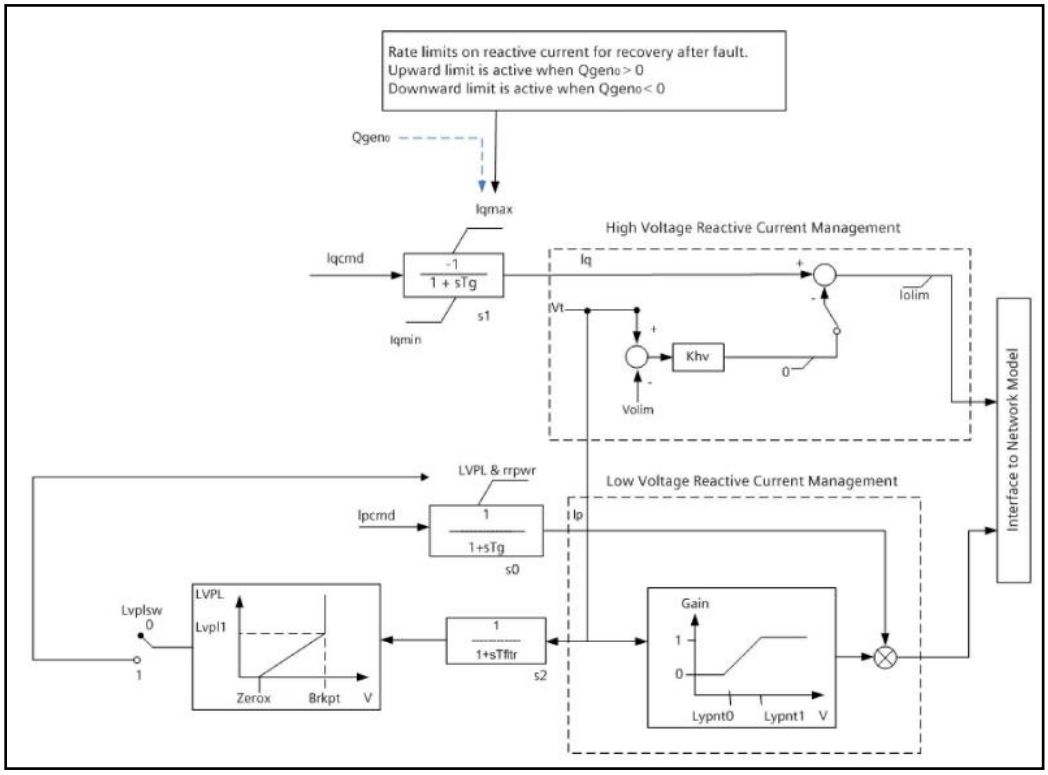
Note: SOCini represents the initial state of charge on the battery and is a user entered value. This is entered in pu; with 1 pu meaning that the batter is fully charged and 0 means the battery is completely discharged

Annexure – I

Block Diagrams

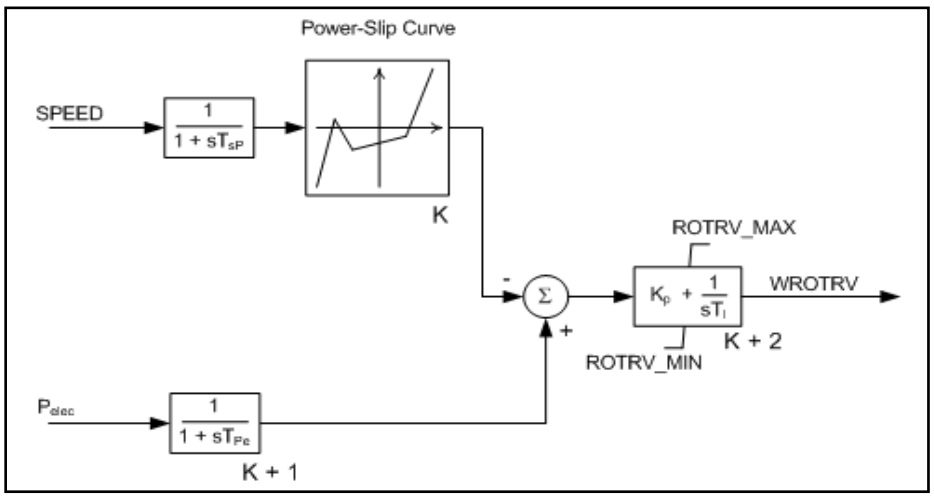
A. Generators:

- 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) :

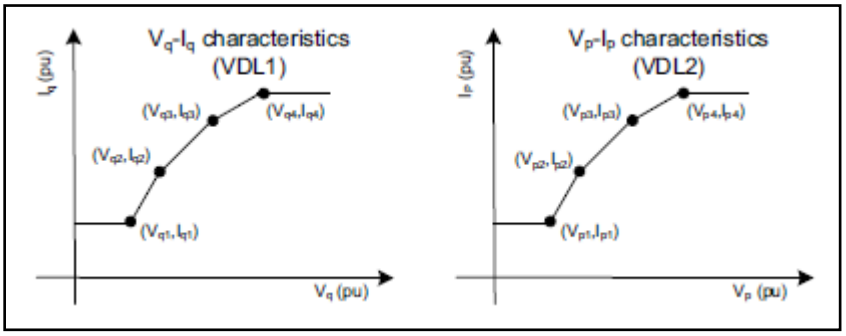
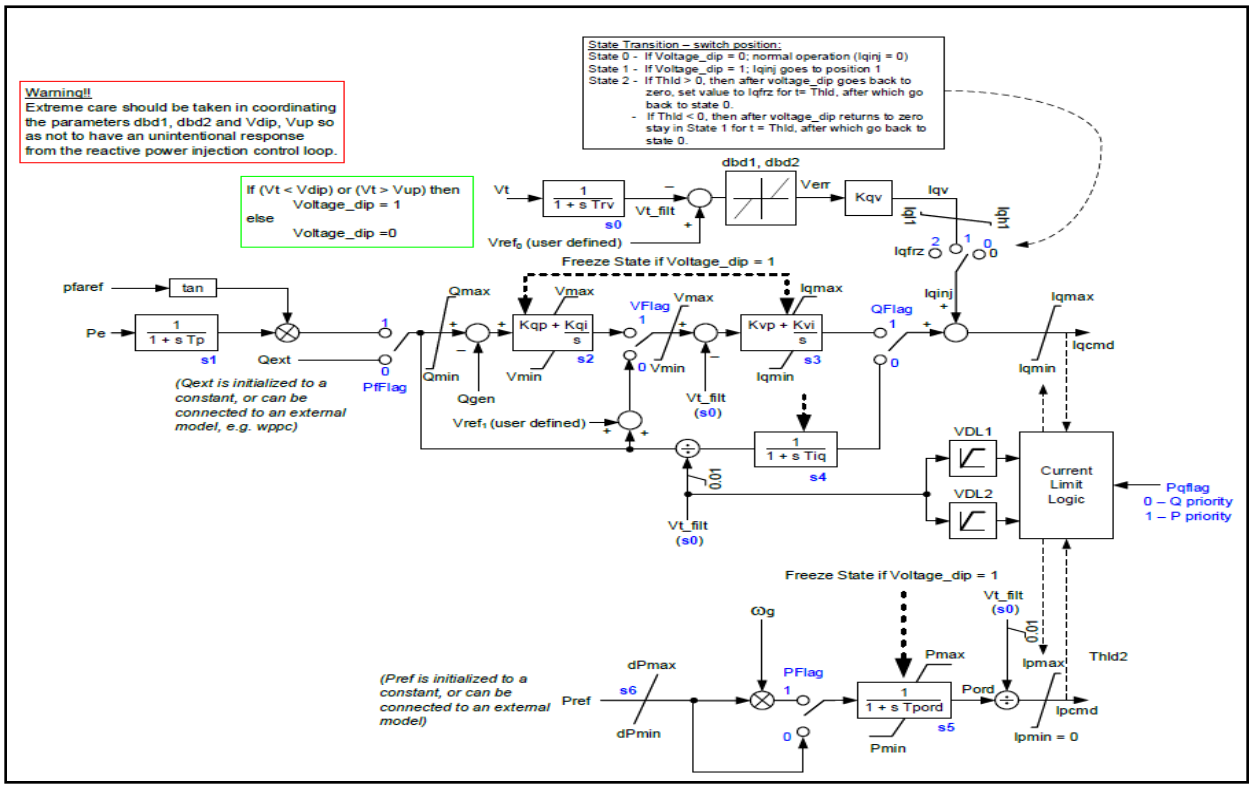
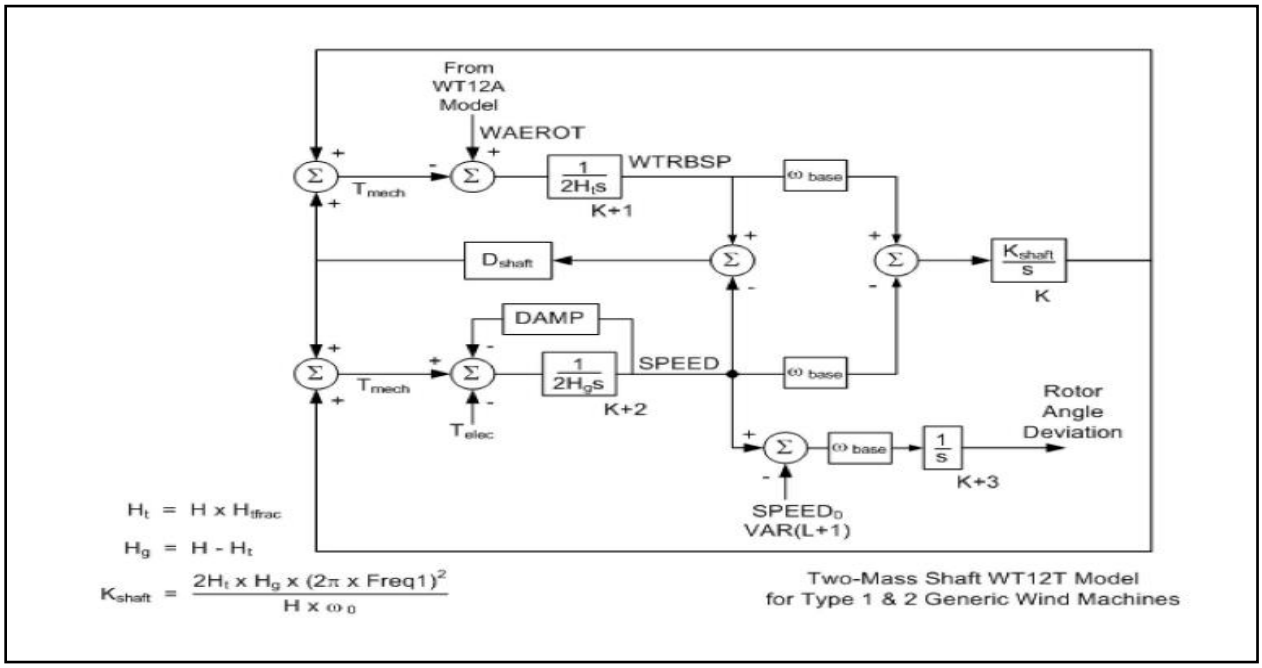


Figure: *Vp-Ip and Vq-Iq curves for REECA1 model*

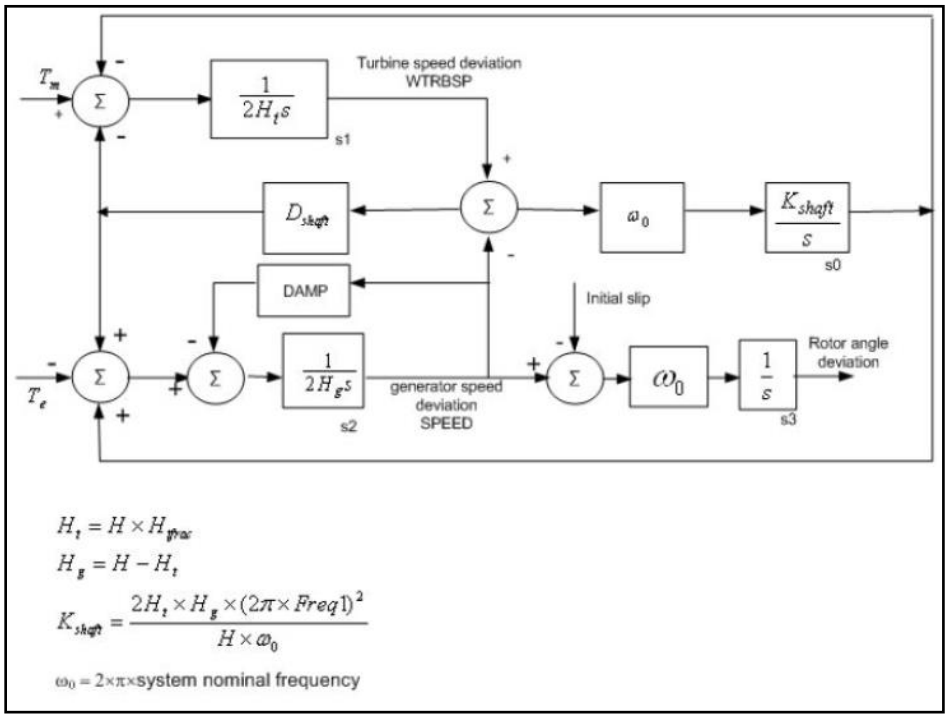


C. Drive Train Model:

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

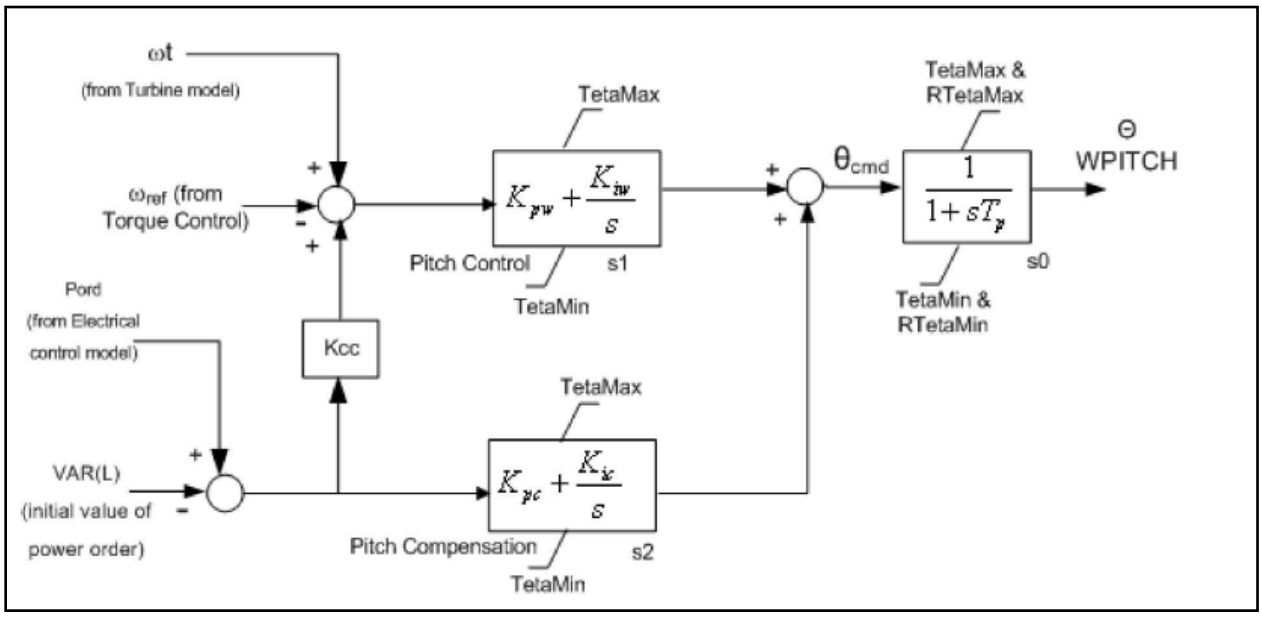


- WTDTA1 : Generic Drive Train model for Type-3 and Type-4 turbines



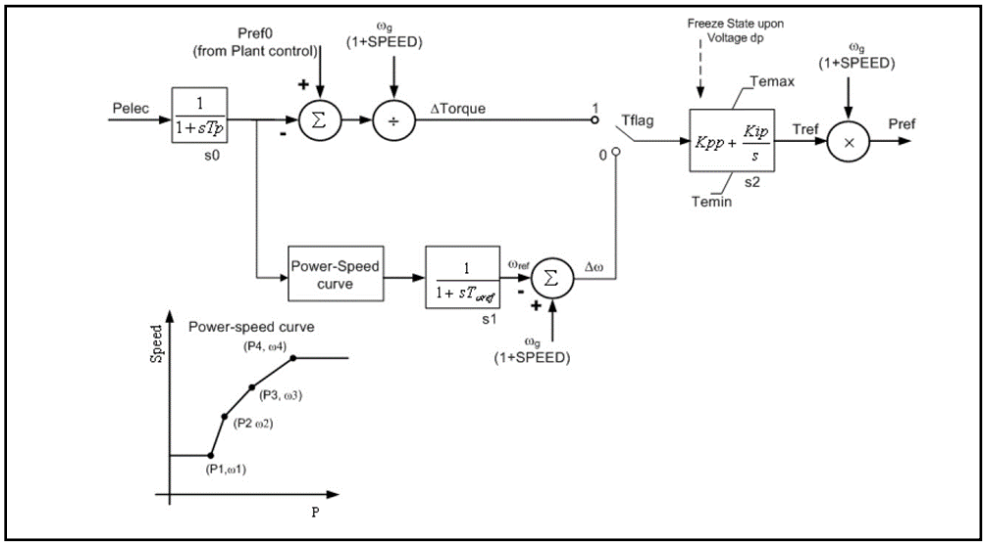
D. Pitch Control:

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



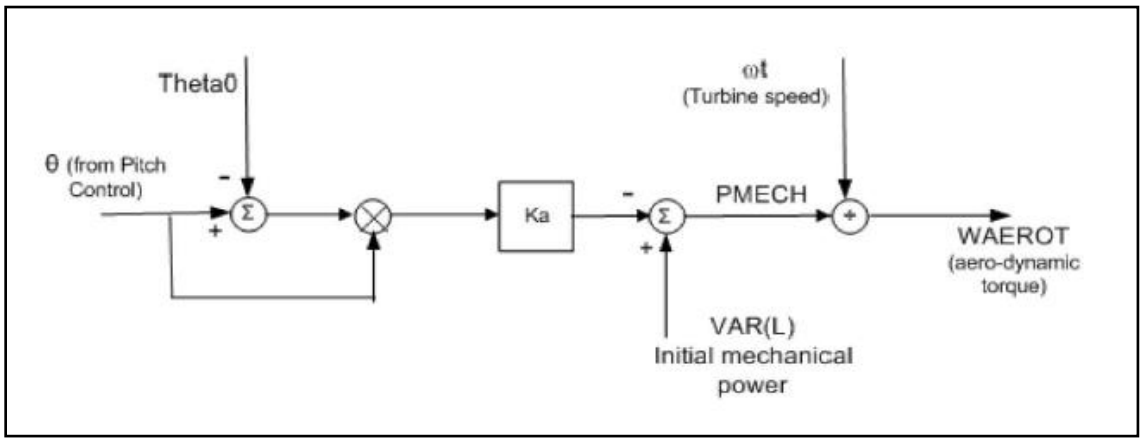
E. Torque Controller Model:

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



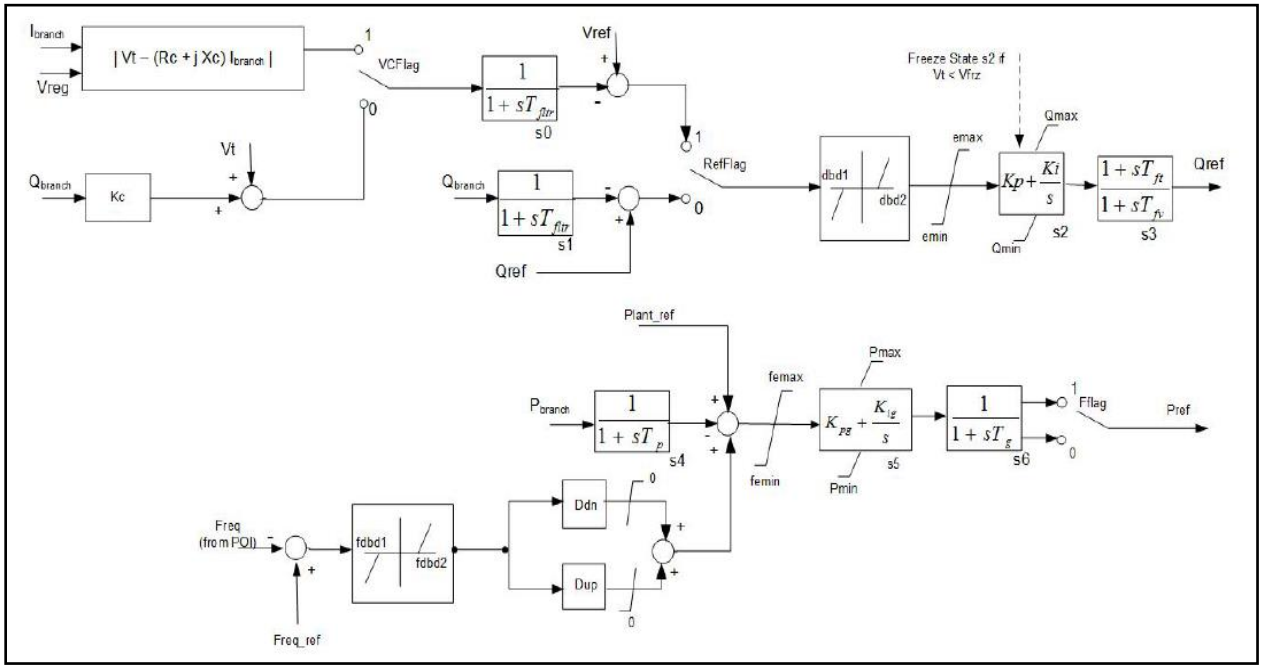
F. Aerodynamic Model:

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

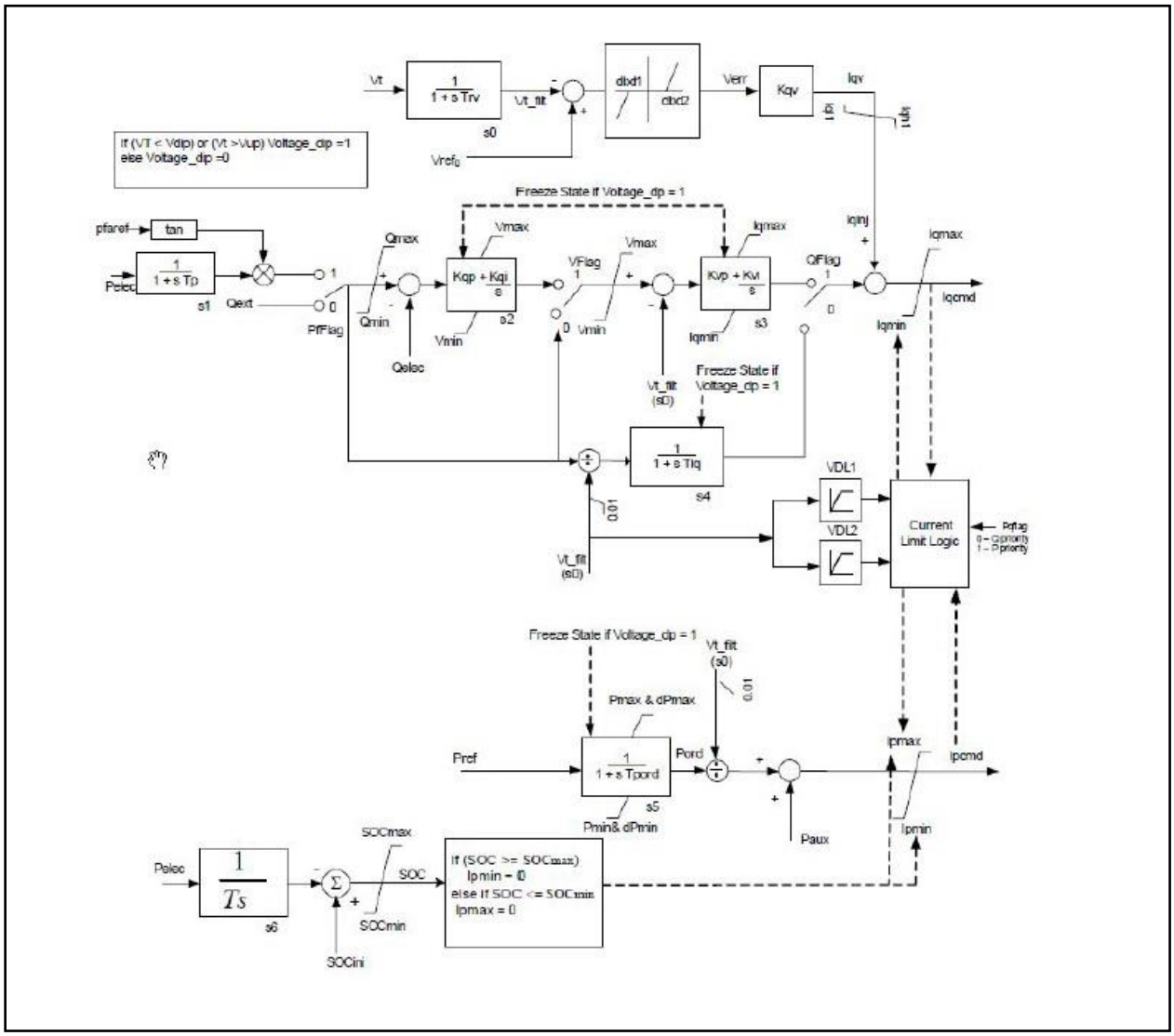


G. Power Plant Controller (PPC) Model:

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



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



Annexure-II

Solar Generation Modeling

Procedure for furnishing information for modelling Solar PV 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 utility scale solar generation installations in India. With India poised to integrate more than 100 GW of solar PV generation in the form of Solar parks and farms (Inland and Offshore) and Rooftop Solar (distributed generation), availability of fit-for-purpose steady state and dynamics models of solar generation installations 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 solar generation installations in India except distributed generation installations (for example rooftop solar), which 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 Solar generation installations 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 simulation studies that deliver reasonably accurate outcomes.

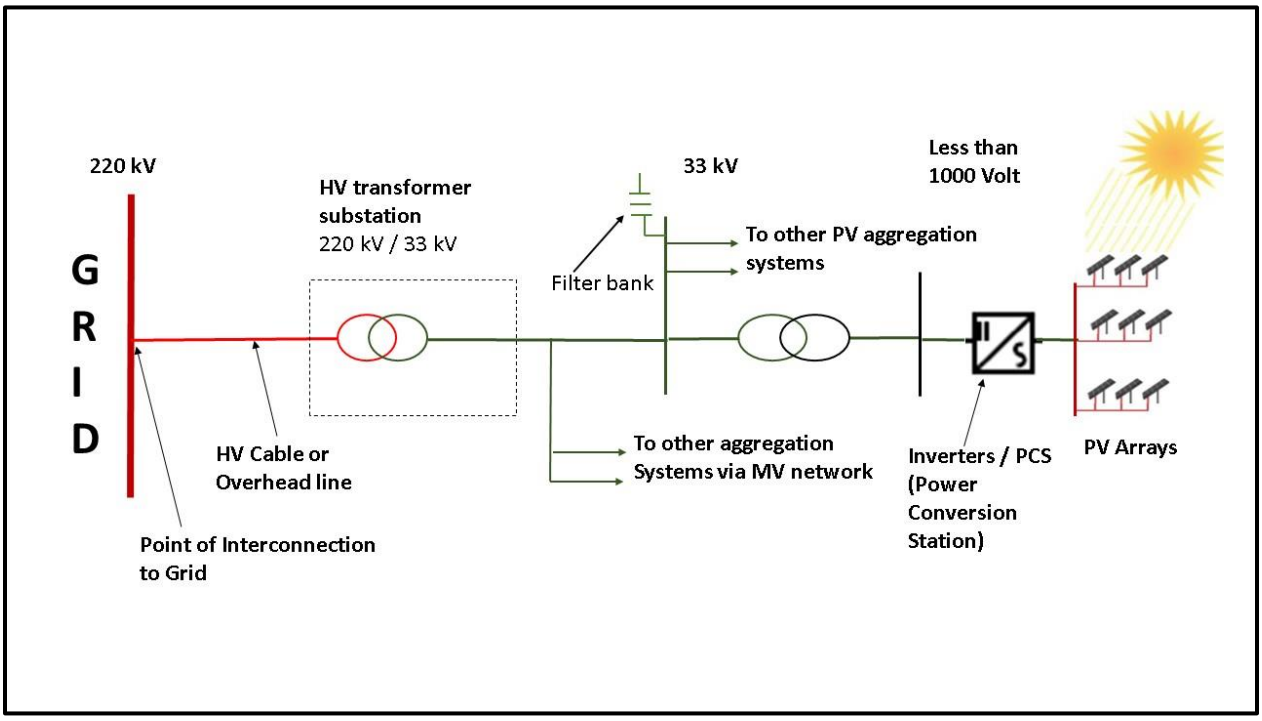
2.0 Solar generation technologies

Electricity generation using energy from sun as the primary energy can be done using 2 distinct methods:

1. Solar thermal technologies: Utilise the **heat** aspect of Sunlight.
2. Solar PV technologies:Utilise the **light** aspect of sunlight
    a. 1st Generation Bulk Silicon technology
    b. 2nd Generation Thin Film technology
    c. 3rd Generation High efficiency concentrated PV technologies

Solar generation plants are being increasingly coupled with complimentary Battery Energy Storage Systems (BESS) to reduce the net variability of 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 Utility scale Solar generation farms:



In a typical utility scale solar farm / park, arrays of Solar PV panels connected to an inverter (Power Conditioning System / Power Conversion Station – PCS), which is stepped up to form part of the MV reticulation system (typically at 33 kV or less). A number of inverters are pooled and then stepped up to the voltage of 220 kV / 400 kV prior to connection to EHV grid. A Power Plant controllers (PPC) is usually

installed at the point of interconnection to grid or the reticulation system. The PPC(s) control behavior of solar farms in accordance with mandates as per grid codes.

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

1. Generator or Converter
2. Electrical control including fault ride through
3. Power Plant Controller (PPC)
4. Energy storage (i.e. battery), if applicable

Depending on the nature of technology and usage of components at site ('As built'), the requirements for steady state and dynamic modelling evolves.

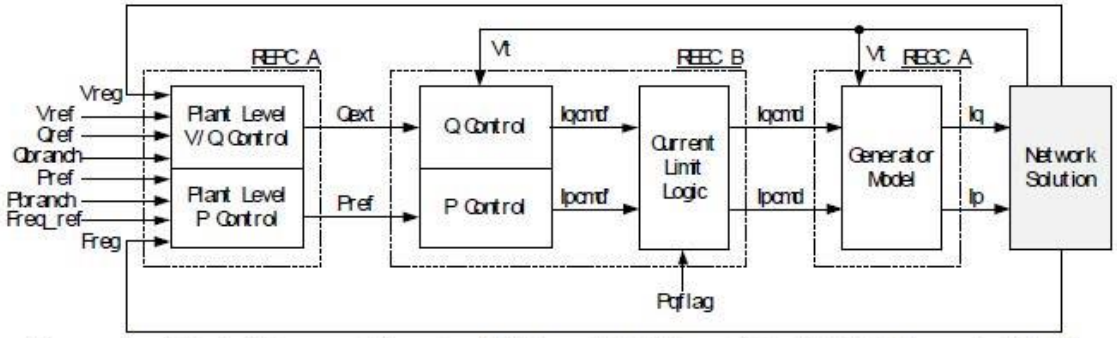


Figure 4 – Block Diagram Showing Different Modules of the WECC Generic Models

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

1. Electrical Single Line Diagram(SLD) of Solar farm /park depicting :
    - For individual Inverters / Power Condition system (PCS): Type, MW rating, MVAR capability, temperature dependent capability curves, short circuit contribution, Manufacturer, Model no., Harmonic profile of inverters
    - Configuration and Details of PV arrays behind each inverter / PCS
    - Reticulation system (MV system within the solar farm) : Length of individual branch / twig, Type of conductor, Electrical parameters (R, X, B)
    - Details of MV (~660V/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.)
    - Filters (active or passive) or capacitor banks
    - Aggregated steady state model (if available)
2. Encrypted user-defined model (UDM) in a format suitable for use in latest release of PSS/E (*.dll files) for electromechanical transient simulation for components of Solar farm:
    - User guide for Encrypted models to be provided including instructions on how the model should be set-up
    - Corresponding transfer function block diagrams to be provided

- Simulation results depicting validation of User-Defined models against actual measurement to be provided
- The use of black-box type representation is not 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.

3. Generic models of Solar farms (in case of non-availability of item as per Sl.no.2 above).
   - Simulation results depicting validation of Generic models against User-Defined models or against actual measurement to be provided
   - Models should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 600s.
4. Inverter datasheet
5. Voltage/reactive control strategy of farm, reactive capability curves at point of interconnection (temperature and voltage dependence)
6. Settings from an inverter / PCS (each model in the farm)
   - Mapping of settings from the inverter/PCS to the model (UDM and Generic)
7. Settings from the Power plant controller (PPC)
   - Mapping of settings from the inverter/PCS to the model (UDM and Generic)
8. Disturbance recordings – of Solar farm response to disturbance together with any associated information about the circumstances of the disturbance

3.1 Generic models in PSS/E for modelling utility scale Solar PV installations:

Solar Technology	Generic model	Model Description
Utility Scale Solar PV	REGCA1	Renewable energy generator converter model
	REECA1	Renewable energy controls model
	REPCA1	Renewable energy plant controller
Utility Scale Battery Energy Storage System (BESS)	REECCU1	Electrical Control Model (To be used alongwith REGCA1 and REPCA1)

Refer Annexure – II for Detailed block diagrams of the above models

Formats for submission of modelling data for PV inverters

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 Solar plants / farms / parks:

Category	Parameter Description	Data
Inverter Details	Manufacturer, model number and product details	
	Year of commissioning	
	As found settings (obtained either from HMI or downloaded from controller in digital systems)	
Technology	• Grid following • Grid forming (viz. Assist in regulation of Voltage and Frequency) • Reactive power priority (Controls Pf or Voltage? Point of control?)	-
Single Line Diagram	Single line diagram of the solar farm showing number and location of inverters and PV arrays behind each inverter, 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 PV-array to Inverters, Inverters to MV reticulation system, MV reticulation system till Point of Interconnection (POI) at EHV level (220 kV/400 kV)	
Capability	DC/AC ratio	
	Number of inverters	
	Panel type	
	Number of modules per string	
	Tracking in 0/1/2 axes	
	Capability diagram at nominal (STC) and typical temperature	
Controls	Does the solar farm have a PPC? If yes, whether PPC controls all or part of the inverters in Solar 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	
	Is there a droop setting? • Voltage control • Frequency control	
	Is reactive power limited? Details thereof	
	Is active power limited below MPPT at high output? Details thereof	
	Temperature dependency details	
	Active power ramp rate limiters	
	Fault Ride Through (FRT) protocols and setpoints • LVRT • HVRT	
	Provide settings from controller	

Category	Parameter Description	Data
Reticulation System	Voltage of the reticulation system	
	Number of feeders	
	Cable schedules (lengths, cable size, conductor material, rating info)	
Inverter station transformer	Details of the turbine transformer, including vector group, impedance, and number of taps, tap position, tap ratio	
	Nameplate details	
Solar Farm step-up transformer	Details of the main solar 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 solar farm have a PPC? If yes, whether PPC controls all or part of the inverters in solar 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.	

3.4 Generic Models for Utility Scale Solar-PV generation:

Category	Parameter Description	Data
GENERATOR model		
Solar PV (REGCA1)	Tg, Converter time constant (s)	
	Rrpwr, Low Voltage Power Logic (LVPL) ramp rate limit (pu/s)	
	Brkpt, LVPL characteristic voltage 2 (pu)	
	Zerox, LVPL characteristic voltage 1 (pu)	
	Lvpl1, LVPL gain (pu)	
	Volim, Voltage limit (pu) for high voltage reactive current manage-	
	Lvpnt1, High voltage point for low voltage active current management (pu)	
	Lvpnt0, Low voltage point for low voltage active current management (pu)	
	Iolim, Current limit (pu) for high voltage reactive current management (specified as a negative value)	
	Tfltr, Voltage filter time constant for low voltage active current management (s)-	
	Khv, Overvoltage compensation gain used in the high voltage reactive 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		
Large Solar PV : (REECB1) [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)	
	Tp (s), Filter time constant for electrical power	

Category	Parameter Description	Data
Electrical Control model		
Large Solar PV : (REECB1) [Refer Block Diagrams]	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	

Category	Parameter Description	Data
Power Plant Controller (PPC) model		
Generic Power Plant Controller (PPC) model: (REPCA1)	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)	

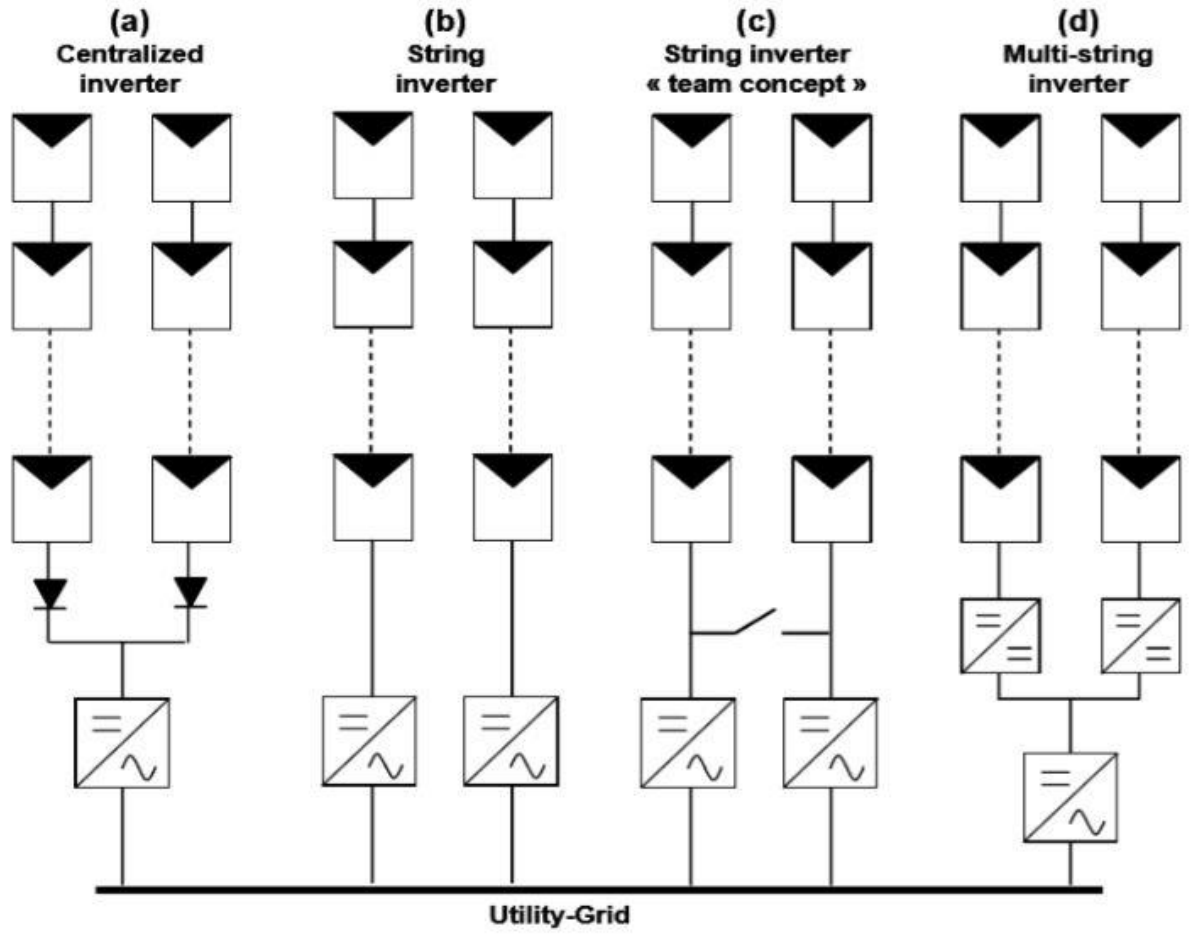
Category	Parameter Description	Data
Electrical Control model : BESS		
Generic Electrical Control model for Utility Scale BESS: (REECCU1)	Vdip (pu), low voltage threshold to activate reactive current injection logic	
	Vup (pu), Voltage above which reactive current injection logic is activated	
	Trv (s), 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

Inverter Configurations:

Inverters within a Solar farm can be present in different configurations, as indicated below:



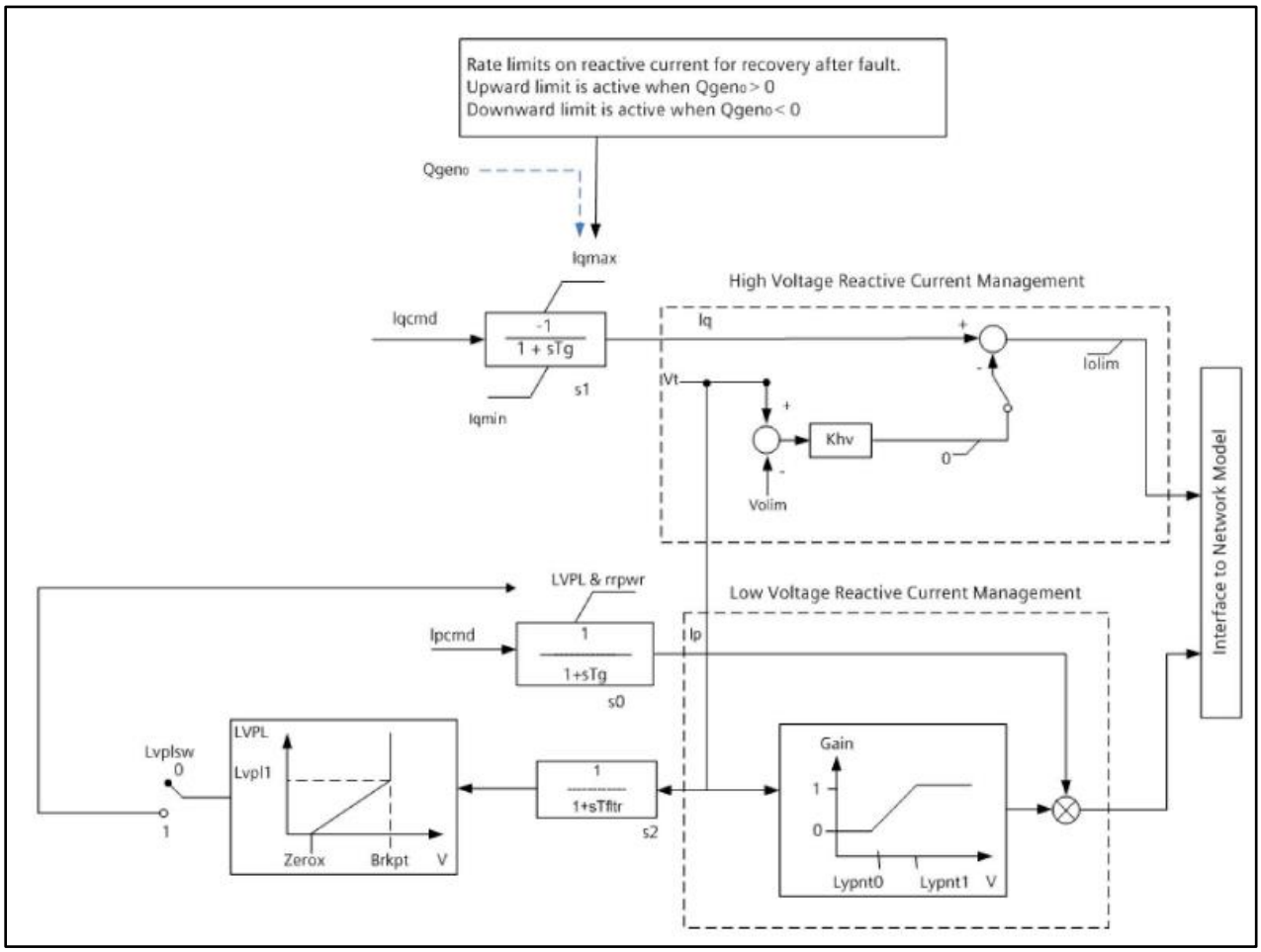
The data furnished must take into account the individual inverter configurations accordingly.

Annexure - II

Block Diagrams:

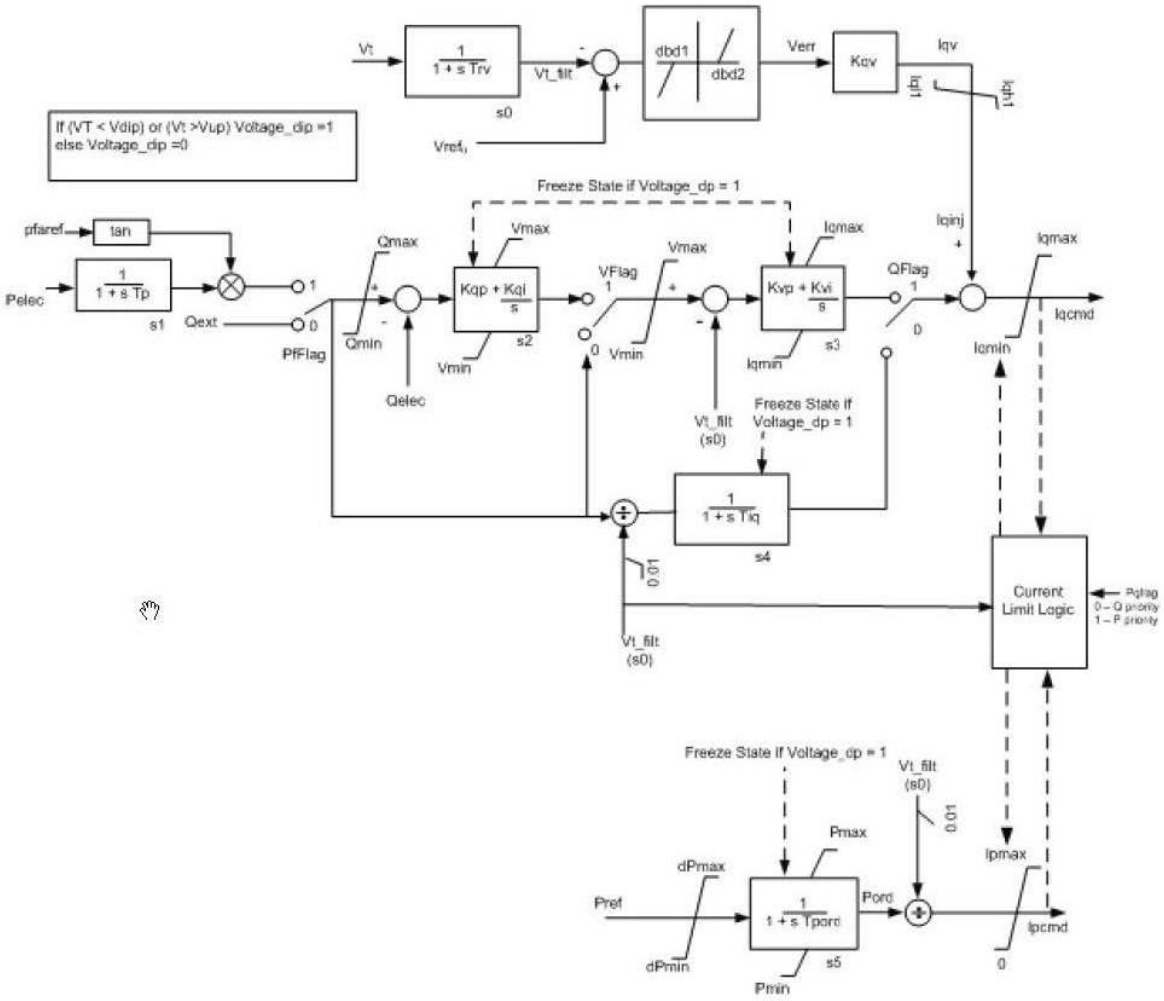
A. Generators:

- **REGCA1:** Generic Model for Utility Scale Solar PV



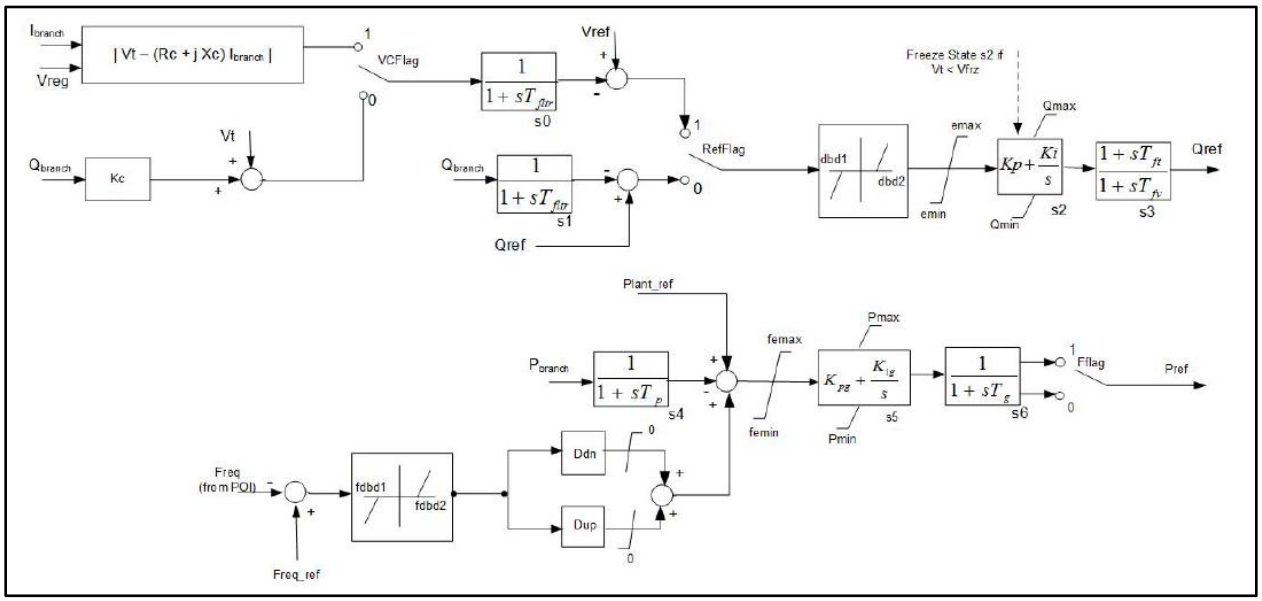
B. Electrical Control:

- **REECB1:** Generic Model for Utility Scale Solar PV

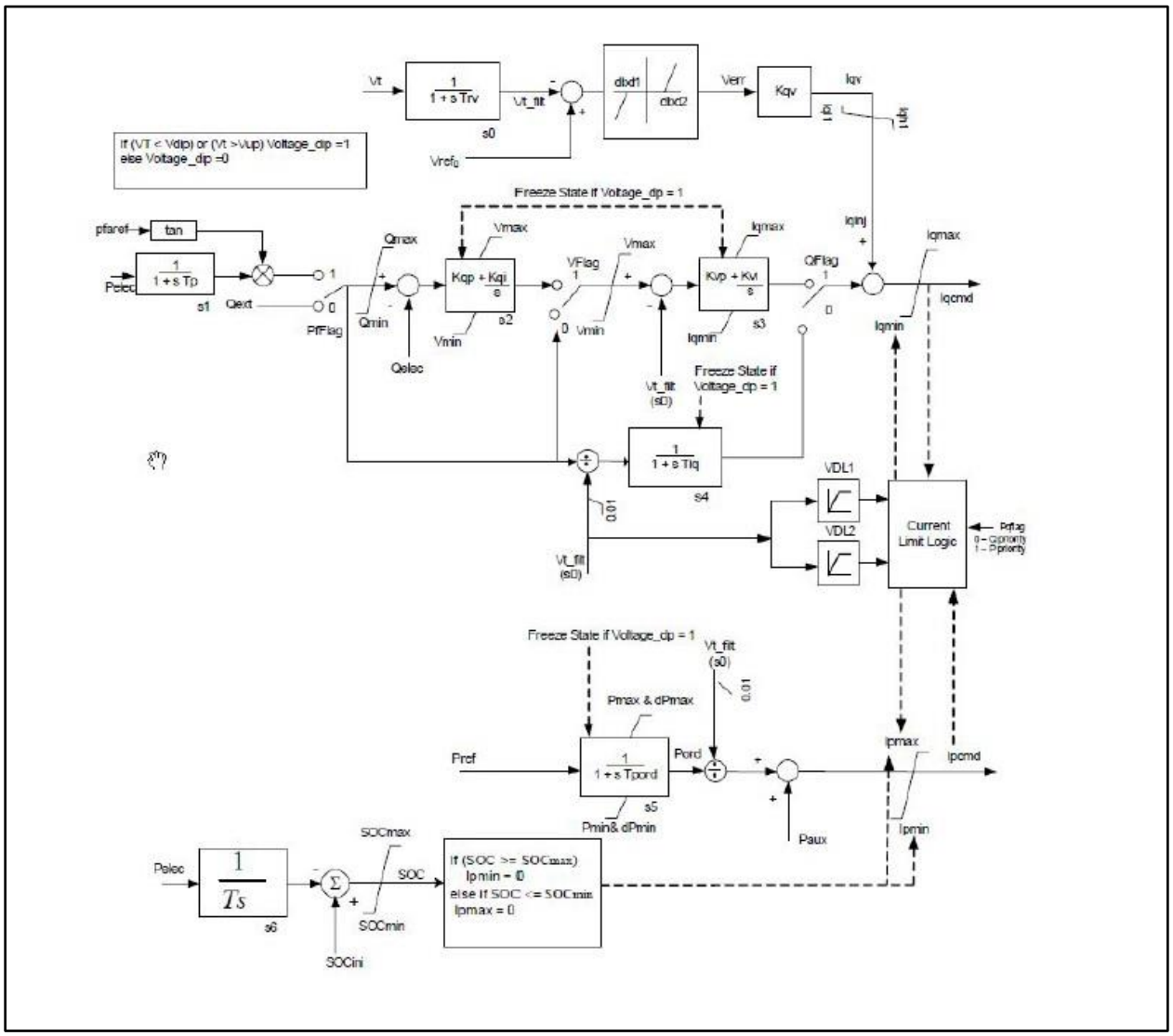


C. Power Plant Controller (PPC) Model:

- **REPCA1** for Utility scale Solar PV:



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



Annexure-III

Modelling Coal Fired Thermal Generation

Guideline for furnishing information for modelling Coal fired generation 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 coal fired thermal generation in India. Availability of fit-for-purpose steady state and dynamics models of coal fired thermal stations 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 coal fired thermal generation 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 coal fired thermal generation 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 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 stabilizers, 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 simulation studies that deliver reasonably accurate outcomes.

1.3 Regulation:

- **CEA Connectivity Standard 6.4.d :**

The requester and user shall cooperate with RPC and Appropriate Load Despatch Centre in respect of the matters listed below, but not limited to

furnish data as required by Appropriate Transmission Utility or Transmission Licensee, Appropriate Load Despatch Centre, Appropriate Regional Power Committee and any committee constituted by the Authority or appropriate Government for system studies or for facilitating analysis of tripping or disturbance in power system;

Here Requester and User Includes a generating company, captive generating plant, energy storage system, transmission licensee (other than Central Transmission Utility and State Transmission Utility), distribution licensee, solar park developer, wind park developer, wind-solar photovoltaic hybrid system, or bulk consumer *(2019 Amendment)*

- **IEGC 4.1 :**

CTU, STU and Users connected to, or seeking connection to ISTS shall comply with Central Electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2007 which specifies the minimum technical and design criteria and Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters) Regulations,2009.

2.0 Coal fired thermal generation technologies:

Coal fired power plants typically burn coal to heat a boiler that produces high-temperature, high-pressure steam that is passed through the turbine to produce mechanical energy (IEEE Power and Energy Society, 2013).

Coal fired power plants constitute 54.70% of India's installed generation capacity as on 31.12.2018, and supply around 75% of energy as on 21.02.2019. The Indian Power Sector initially comprised of sub-100MW steam-driven generators in the 1970's, until the first 200 MW generating unit was introduced in 1977. This became almost the standard size and most generating units added during the next two decades were of 200/210 MW.

The first 500 MW unit was subsequently commissioned in 1984 and a number of 500 MW units have been commissioned since then. These 200/210 and 500 MW units form the backbone of Indian Power Sector. Meanwhile, 250 MW units have also evolved by upgrading the turbine design of existing 210 MW generating units. In last decade, super-critical plants have been commissioned of magnitude 600/660 MW and 800 MW size.

The majority of commercially available coal fired thermal generators use one of the three technologies depending upon the stream pressure within the boiler as listed below:

Technology	Temperature	Pressure
Sub-critical	537 °C / 565 °C	Below 225 kg/cm2
Super-critical	538/565 °C ~ Older units 565/593 °C ~ later commissioned	247kg/cm2
Ultra-supercritical	600/610 °C to 700°C	250-300 /cm2

**Figures taken from Standard Technical features of BTG system for subcritical and supercritical units issued by CEA 2013. Above values are typical values only.*

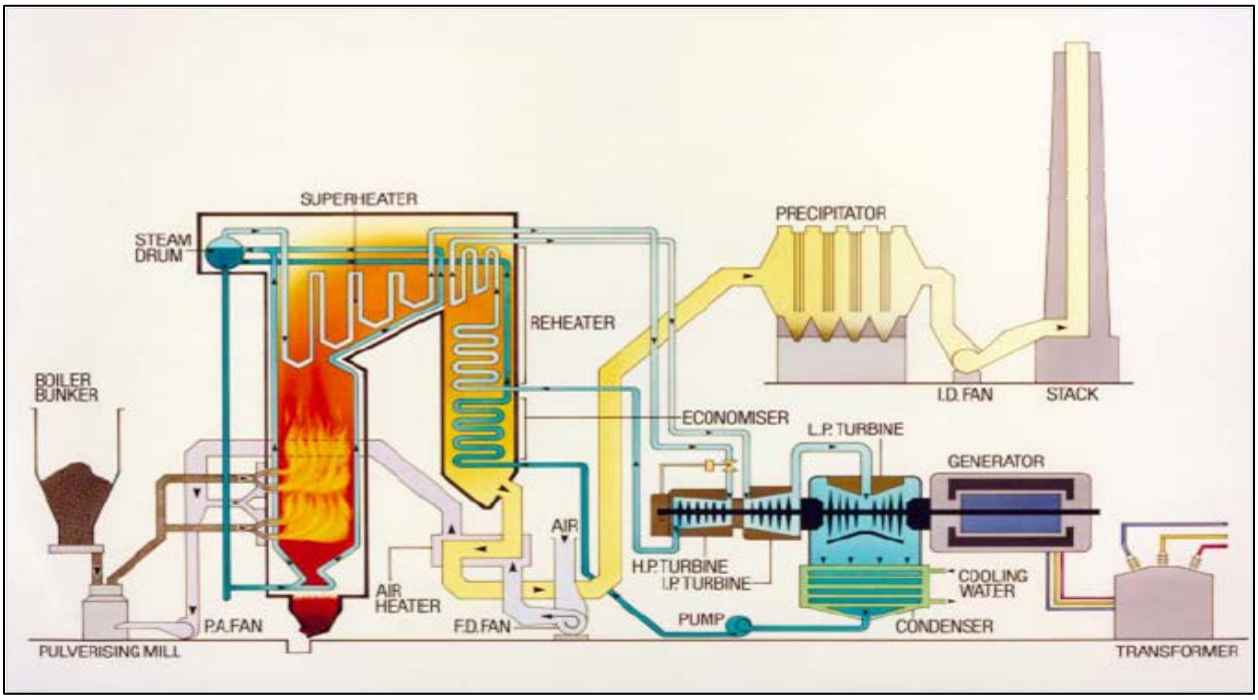


Figure 1: Schematic of a Typical Coal Fired Generator

For POSOCO to have access to verified fit-for-purpose models of coal fired thermal generation connected to Indian grid, following information is required:

1. Electrical Single Line Diagram of coal fired thermal station depicting;
    - **For individual generating units:** type of technology, **Complete Generator OEM Technical Datasheet** (which comprises namely generator parameters like impedances & time constants, generator capability curve, V-curve, generator open and short circuit characteristics, excitation system details, inertia of generator & exciter), generator name plate, generator SAT reports including Short circuit and open circuit test results during commissioning/recent overhauling.
    - **Generator step up transformer**: GT name plate/datasheet, details of LV, MV and HV, MVA rating, impedance, tap changer details, vector group, short-circuit parameters (actual positive & zero sequence impedance of GT, NGR nameplate with impedance).
    - **Excitation system :-** Type of excitation system (Direct Current Commutator Exciters (type DC), AC Excitation (Rotor or brushless excitation) Systems (type AC) and Static Excitation Systems (type ST), Excitation system schematics (Block diagram of AVR system), transfer function block

diagram of Excitation system, excitation transformer nameplate, saturation curves of the exciter (I_a versus I_f curve), IEEE standard model of excitation system, IEEE standard model and its parameter of subsystems such as Power system stabilizer (PSS), Under Excitation Limiter (UEL), Over Excitation Limiter (OEL), Voltage per Hz Limiter(V/Hz) control etc. and details thereof, factory acceptance test reports (FAT). Excitation system actual settings to be provided. AVR test report (excitation step response test).

- **Power System Stabilizer (PSS):** Transfer function block diagram of PSS, IEEE Standard Model, Actual PSS software settings, PSS commissioning report and **Recent PSS tuning report**.
- **Turbine-Governor system :** Type of turbine (Tandem/Cross compound), model of turbine and boiler (including details of boiler controls, technology, valves, valve characteristics), model of speed governor and turbine load (if applicable) control system (including details of technology, valves, valves characteristics) , mode of operation and control, ramp rates, **turbine inertia**, IEEE standard model of turbine governor system and its transfer function Block diagram and its parameters, details of control mode (boiler-follow, turbine-follow, or coordinated control), commissioning report of turbine-governor system or recent governor testing report.

2. Generic models of individual components (generator, exciter (including OEL, UEL), turbine-governor and PSS of coal fired thermal plants (refer sections 3.2 to section 3.5)
   - Model should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 100 s
   - 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 PSSE release PSS/E (*.dll files) for electromechanical transient simulation for components coal fired thermal generators (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 to be provided
   - The use of black-box type representation is not preferred.

Annexure: Formats for submission of modelling data for coal fired thermal generation

Version History:

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

*Mention Designation and Contact Details

Details submitted:

Details pending:

3.1 Details of models in PSS/E for modelling coal fired thermal generation:

(a) Synchronous Machine

Category	Parameter Description	Data
Generator Nameplate	Rated apparent power in MVA	
	Rated terminal voltage	
	Rated power factor	
	Rated frequency (in Hz)	
	Rated speed (in RPM)	
	Rated excitation (in Amperes and Volts)	
Type of synchronous machine	Round rotor or salient pole No. of Poles:	-
Generator capability curve	The generator capability curve shows the reactive capability of the machine and should include any restrictions on the real or reactive power range like under/over excitation limits, stability limits, etc. Capability curve should have properly labelled axis and legible data	
Generator Open Circuit and Short Circuit Characteristic	Graph of excitation current versus terminal voltage and stator current	
	No load excitation current	
	Excitation current at rated stator current	
Generator vee-curves	Otherwise referred to as “V-curve”. A plot of the terminal (armature) current versus the generating unit field voltage.	
Resistance values	Resistance measurements of field winding and stator winding to a known temperature	
Generator Data sheet	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd’ in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd’’ in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xa in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Quadrature axis transient synchronous reactance Xq’ in p.u. (Unsaturated or saturated)	
	Quadrature axis sub-transient synchronous reactance Xq’’ in p.u. (Unsaturated or saturated)	
	Direct axis open circuit transient time constant Tdo’ in sec	
	Direct axis open circuit sub-transient time constant Tdo’’ in sec	
	Quadrature axis open circuit transient time constant Tqo’ in sec	
	Quadrature axis open circuit sub-transient time constant Tqo’’ in sec	
	Inertia constant of total rotating mass (generator, AVR, turbo-governor set) H in MW.s/MVA	
	Speed Damping D	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

Category	Parameter Description	Data
Generator step up transformer (GSUT)	Nameplate Rating - Rated primary and secondary voltage - Vector group - Impedance - Tap changer details (Number of taps, tap position, tap ratio etc.)	

(b) Site Load

	Low Output			High Output		
	kW	kvar	kVA	kW	kvar	kVA
Auxiliary Load						

(c) Excitation System

Category	Parameter Description	Data
Type of Automatic Voltage Regulator (AVR)	Manufacturer and product details	
	Type of control system :- Analogue or digital	
	Year of commissioning / Year of manufacture	
	As found settings (obtained either from HMI or downloaded from controller in digital systems)	
Type of excitation system	Static excitation system OR	
	Indirect excitation system (i.e. rotating exciter) - AC exciter, or - DC exciter	
Details of AVR converter	Rated excitation current (converter rating in Amperes)	
	Six pulse thyristor bridge or PWM converter	
Source of excitation supply	Excitation transformer or auxiliary supply (Details thereof)	
	If excitation transformer, nameplate information such as type of transformer, HV and HV winding ratings, positive and zero sequence impedance, tap positions, voltage step per tap is required.	
Schematics	Saturation curves of the exciter (if applicable – see Type AC and DC)	
	Drawings of excitation system, typically prepared and supplied by the OEM	
	Single line diagram (i.e. one-line diagram) for the excitation system	
Excitation limiters	What excitation limiters are commissioned?	
	Under Excitation Limiters settings	
	Over Excitation Limiters settings	
	Voltage/frequency limiter	
	Stator current limiter	
	Minimum excitation current limiter	
PSS	Is the AVR equipped with a PSS?	
	How many input Channels does the PSS have? (speed, real power output or both	

Category	Parameter Description	Data
	If the PSS uses speed, is this a derived speed signal (i.e. synthesized speed signal) or measured directly (i.e. actual rotor speed)?	
	Type of PSS Block Diagram of PSS and as commissioned parameters value (Gain, time constants, filter coefficients, output limits of the PSS)	

(d) Turbine Details

Category	Parameter Description	Data
Manufacturer of turbine	Manufacturer and name plate details Rating of turbine	
Type of Governor	Electro-mechanical governor	
	Digital electric governor	
	Block diagram of the speed governor	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min	
	Stroke limits of speed changer (values of full stroke, full load and no-load in mm)	
Droop	Droop setting (% on machine base)	
	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz)	
Steam turbine	**Tandem compound** : all sections on one shaft with a single generator	
	Cross compound: consists of two shafts, each connected to a generator and driven by one or more turbine section	
	Turbine sections: High pressure (HP), intermediate pressure (IP) and low pressure (LP)	
	Reheat or non-reheat: In a reheat, steam upon leaving HP section returns to boiler where it passed through reheater before entering IP section	
	Valves: - Main inlet stop valve (MSV) - Governor control valve (CV) - Reheater stop valve (RSV) - Intercept valves (IV)	
	Turbine control action: - Boiler follow mode - Turbine follow mode - Coordinated control	
	Fast valving /bypass operation	
	Block diagram of the turbine load control	
	Reheater volume (m^3), volume flow (kg/s), and average specific volume (m^3/kg)	

3.2 Generic Models for synchronous machine

There are two typical groups of synchronous machine models, depending upon the type of machine:

- Round rotor machine (2 poles):
  - GENROU – Round rotor machine model with quadratic saturation function
  - GENROE – Round rotor machine model with exponential saturation function
- Salient pole machine (more than two poles):
  - GENSAL – Salient pole machine with quadratic saturation function
  - GENSAE – Salient pole machine with exponential saturation function

Category	Parameter Description	Data
GENERATOR model		
GENROU OR **GENROE**	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit transient time constant Tqo' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Quadrature axis transient synchronous reactance Xq' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated) = Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xl in p.u.	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	
GENSAE OR **GENSAL**	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated) = Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xl in p.u.	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

While entering the values in above table, following relationship must be kept:

Xd>Xq>Xq'≥Xd'>Xq"≥Xd''

Tdo'>Td'>Tdo''>Td''

Tqo''>Tq'>Tqo''>Tq''

3.3 Excitation system model:

If a generic model is used, the first step must be to identify what type of exciter is present in the excitation system. The IEEE Std 421.5 (IEEE Recommended Practice for Excitation System Models for Power System Stability Studies published on 26th Aug 2016) has published several generic models, which are classified into three groups:

- Type DC : for excitation systems with a DC exciter
- Type AC : for excitation systems with an AC exciter
- Type ST : for excitation systems with a static exciter

The following table shows the types of models separated into their respective groups.

DC exciter	AC exciter	Static excitation system
Type DC1A	Type AC1A	Type ST1A
Type DC2A	Type AC2A	Type ST2A
Type DC3A	Type AC4A	Type ST3A
Type DC4B	Type AC5A	Type ST4B
	Type AC6A	Type ST5B
	Type AC7B	Type ST6B
	Type AC8B	Type ST7B

Category	Parameter Description	Data
DC Exciter		
ESDC1A OR ESDC2A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (> 0) rate feedback time constant (sec)	
	Switch	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESDC3A	TR regulator input filter time constant (sec)	
	KV (pu) limit on fast raise/lower contact setting	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	TRH (> 0) Rheostat motor travel time (sec)	
	TE (> 0) exciter time-constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	VEMIN (pu) exciter minimum limit	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
DC Exciter		
ESDC4B	TR regulator input filter time constant (sec)	
	KP (pu) (> 0) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KD (pu) voltage regulator derivative gain	
	TD voltage regulator derivative channel time constant (sec)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KA (> 0) (pu) voltage regulator gain	
	TA voltage regulator time constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
AC Exciter		
ESAC1A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	

Category	Parameter Description	Data
AC Exciter		
ESAC2A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KB, Second stage regulator gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	KH, Exciter field current feedback gain	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESAC3A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	KR (>0), Constant associated with regulator and alternator field power supply	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KN, Exciter feedback gain	
	EFDN, A parameter defining for which value of UF the feedback gain shall change from KF to KN	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC4A	TR regulator input filter time constant (sec)	
	VIMAX, Maximum value of limitation of the integrator signal VI in p.u	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC, rectifier regulation factor (pu)	
ESAC5A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (sec), Regulator stabilizing circuit time constant in seconds	
	TF2 (sec), Regulator stabilizing circuit time constant in seconds	
	TF3 (sec), Regulator stabilizing circuit time constant in seconds	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC6A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TK (sec), Lead time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFELIM, Exciter field current limit reference	
	KH, Damping module gain	
	VHMAX, damping module limiter	
	TH (sec), damping module lag time constant	
	TJ (sec), damping module lead time constant	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC7B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KPA (pu) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KP (pu)	
	KL (pu)	
	KF1 (pu)	
	KF2 (pu)	
	KF3 (pu)	
	TF3 (sec) time constant (> 0)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) exciter field current limit (> 0)	
	VEMIN (pu)	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC8B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VPIDMAX (pu) PID maximum limit	
	VPIDMIN (pu) PID minimum limit	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) max exciter field current limit (> 0)	
	VEMIN (pu),	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
Static Exciter		
ST1A	TR (sec) regulator input filter time constant	
	VIMAX, Controller Input Maximum	
	VIMIN, Controller Input Minimum	
	TC (s), Filter 1st Derivative Time Constant	
	TB (s), l Filter 1st Delay Time Constant	
	TC1 (s), Filter 2nd Derivative Time Constant	
	TB1 (s), Filter 2nd Delay Time Constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KLR, Current Input Factor	
	ILR, Current Input Reference	

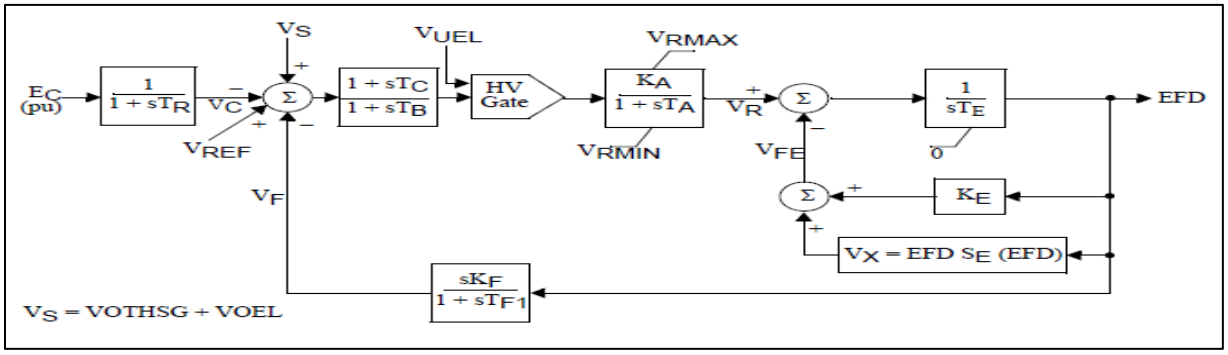
Category	Parameter Description	Data
Static Exciter		
ST2A	TR (sec) regulator input filter time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	EFDMAX	
ST3A	TR (sec) regulator input filter time constant	
	VIMAX, Maximum value of limitation of the signal VI in p.u.	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	KM, Forward gain constant of the inner loop field regulator	
	TC (s), lag time constant	
	TB (s), lead time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KG, Feedback gain constant of the inner loop field regulator	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX, Maximum value of limitation of the signal VB in p.u.	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL, Reactance associated with potential source	
	VGMAX, Maximum value of limitation of the signal VG in p.u	
	Θ_P (degrees)	
	TM (sec), Forward time constant of the inner loop field regulator	
	VMMAX, Maximum value of limitation of the signal VM in p.u	
	VMMIN, Minimum value of limitation of the signal VM in p.u.	

Category	Parameter Description	Data
Static Exciter		
ST4B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TA (sec) voltage regulator time constant	
	KPM, Regulator gain	
	KIM, Regulator gain	
	VMMAX, Maximum value of limitation of the signal in p.u.	
	VMMIN, Minimum value of limitation of the signal in p.u.	
	KG	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL	
	Θ_P (degrees)	
ST5B	TR regulator input filter time constant (sec)	
	TC1 lead time constant of first lead-lag block (voltage regulator channel) (sec)	
	TB1 lag time constant of first lead-lag block (voltage regulator channel) (sec)	
	TC2 lead time constant of second lead-lag block (voltage regulator channel) (sec)	
	TB2 lag time constant of second lead-lag block (voltage regulator channel) (sec)	
	KR (>0) (pu) voltage regulator gain	
	VRMAX (pu) voltage regulator maximum limit	
	VRMIN (pu) voltage regulator minimum limit	
	T1 voltage regulator time constant (sec)	
	KC (pu)	
	TUC1 lead time constant of first lead-lag block (under-excitation channel) (sec)	
	TUB1 lag time constant of first lead-lag block (under-excitation channel) (sec)	
	TUC2 lead time constant of second lead-lag block (under-excitation channel) (sec)	
	TUB2 lag time constant of second lead-lag block (under-excitation channel) (sec)	
	TOC1 lead time constant of first lead-lag block (over-excitation channel) (sec)	
	TOB1 lag time constant of first lead-lag block (over-excitation channel) (sec)	
	TOC2 lead time constant of second lead-lag block (over-excitation channel) (sec)	
	TOB2 lag time constant of second lead-lag block (over-excitation channel) (sec)	

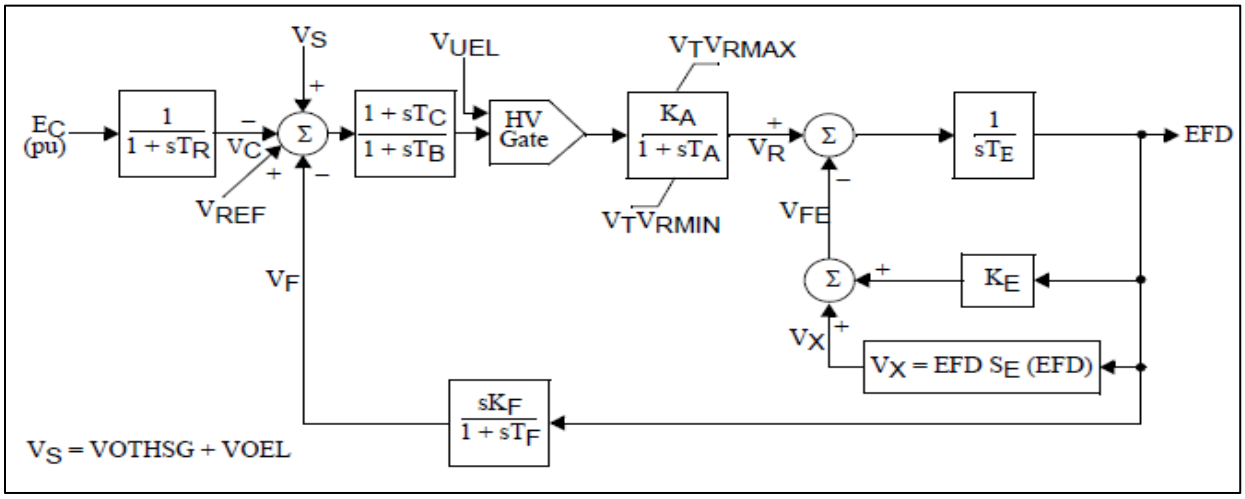
Category	Parameter Description	Data
Static Exciter		
ST6B	TR regulator input filter time constant (sec)	
	KPA (pu) (> 0) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	KDA (pu) voltage regulator derivative gain	
	TDA voltage regulator derivative channel time constant (sec)	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KFF (pu) pre-control gain of the inner loop field regulator	
	KM (pu) forward gain of the inner loop field regulator	
	KCI (pu) exciter output current limit adjustment gain	
	KLR (pu) exciter output current limiter gain	
	ILR (pu) exciter current limit reference	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KG (pu) feedback gain of the inner loop field voltage regulator	
	TG (> 0) feedback time constant of the inner loop field voltage regulator (sec)	
ST7B	TR regulator input filter time constant (sec)	
	TG lead time constant of voltage input (sec)	
	TF lag time constant of voltage input (sec)	
	Vmax (pu) voltage reference maximum limit	
	Vmin (pu) voltage reference minimum limit	
	KPA (pu) (>0) voltage regulator gain	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KH (pu) feedback gain	
	KL (pu) feedback gain	
	TC lead time constant of voltage regulator (sec)	
	TB lag time constant of voltage regulator (sec)	
	KIA (pu) (>0) gain of the first order feedback block	
	TIA (>0) time constant of the first order feedback block (sec)	

(i) **DC Exciters Generic model:**

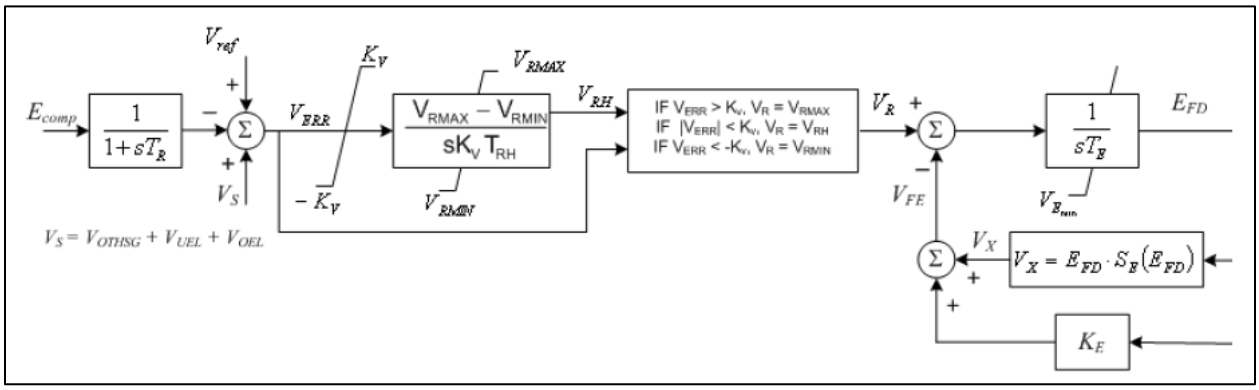
- **Type DC1A: 1992 IEEE type DC1A excitation system model**



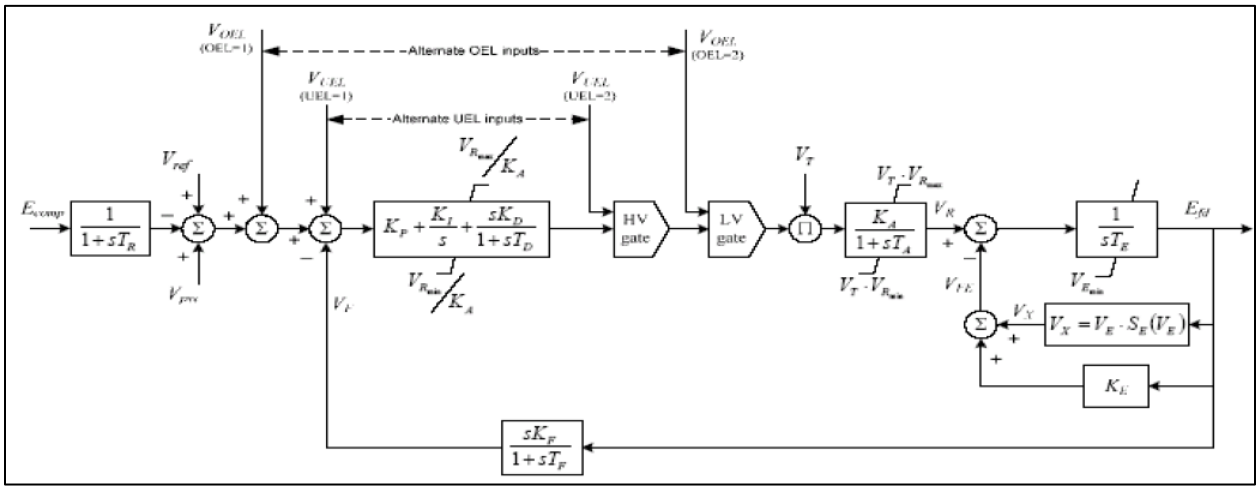
➢ **Type DC2A: 1992 IEEE type DC2A excitation system model**



➢ **Type DC3A: IEEE 421.5 2005 DC3A excitation system**

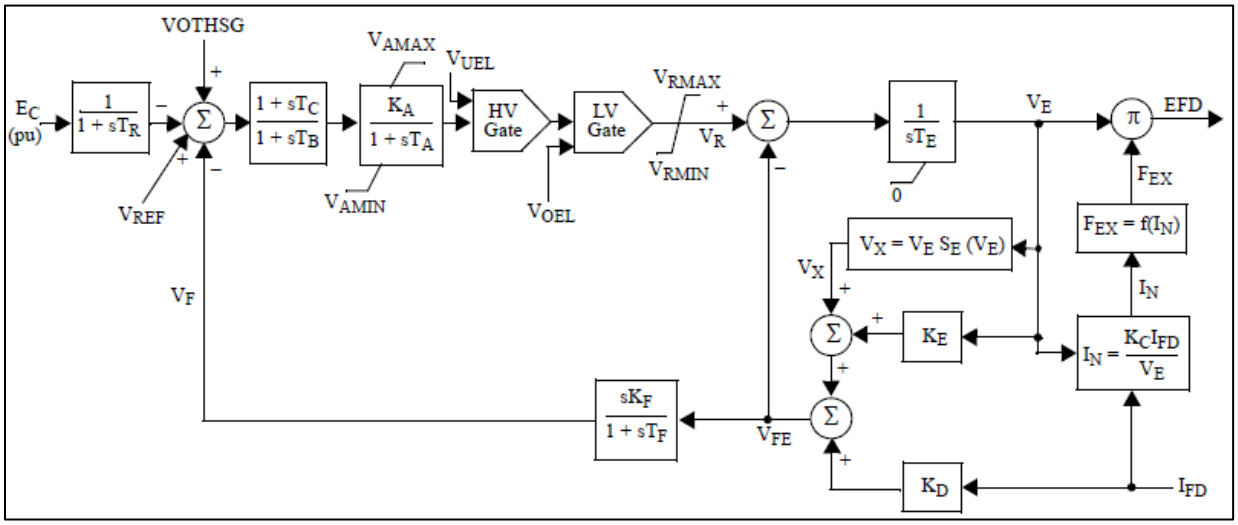


➢ **Type DC4B: IEEE 421.5 2005 DC4B excitation system**



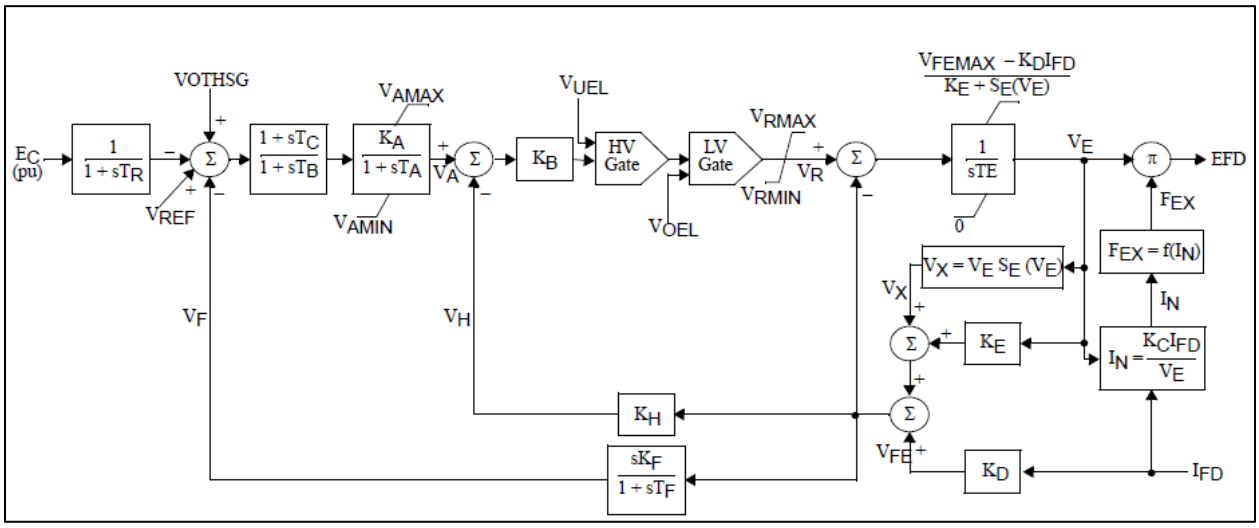
(ii) **AC Exciters Generic Models:**

- **Type AC1A: 1992 IEEE type AC1A excitation system model**

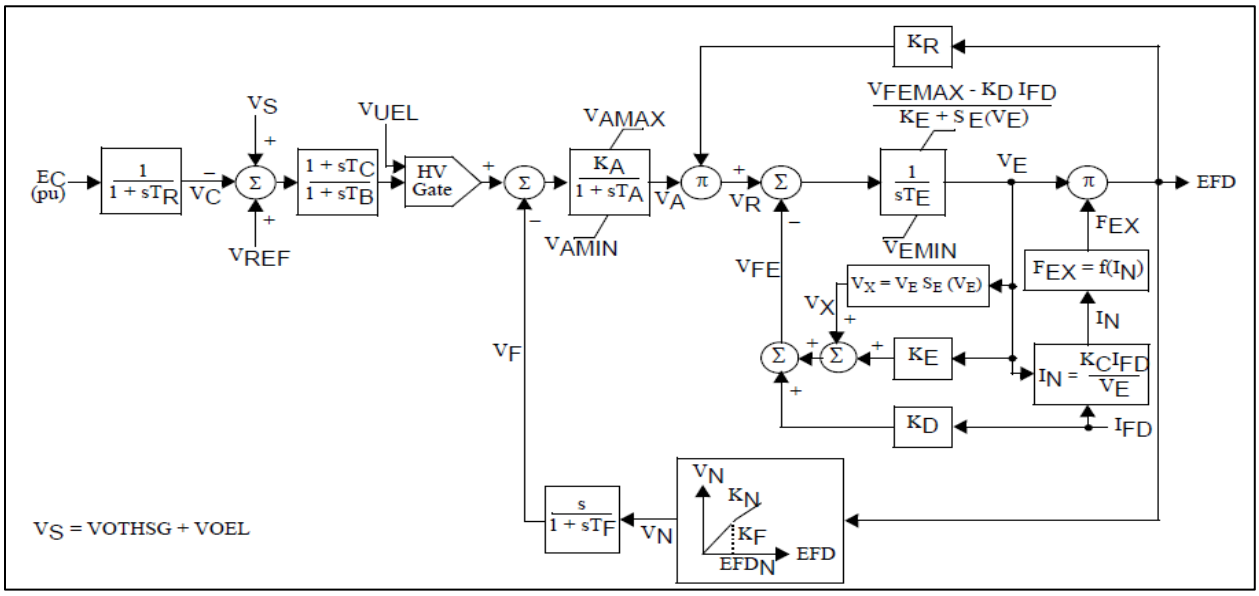


I_N → **If $I_N \le 0$: $F_{EX} = 1$**
If $I_N \le 0.433$: $F_{EX} = 1 - 0.577\ I_N$
If $0.433 < I_N < 0.75$: $F_{EX} = \sqrt{0.75 - I_N^2}$
If $I_N \ge 0.75$: $F_{EX} = 1.732(1 - I_N)$
If $I_N > 1$: $F_{EX} = 0$ → F_{EX}

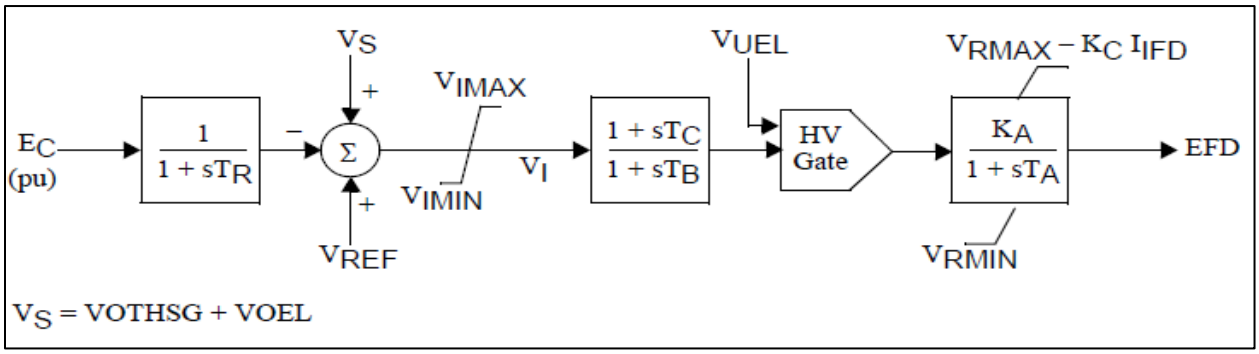
- **Type AC2A: 1992 IEEE type AC2A excitation system model**



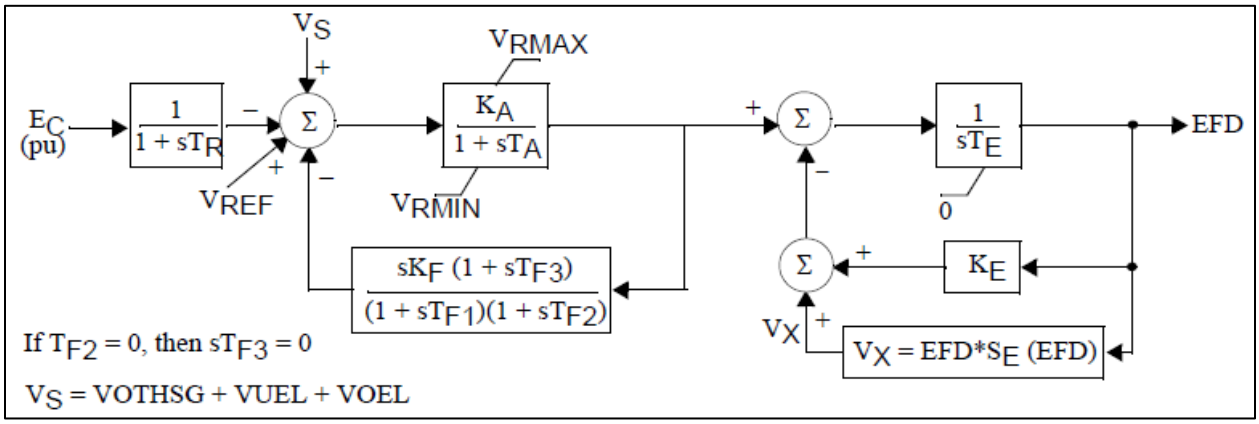
➢ **Type AC3A: 1992 IEEE type AC3A excitation system model**



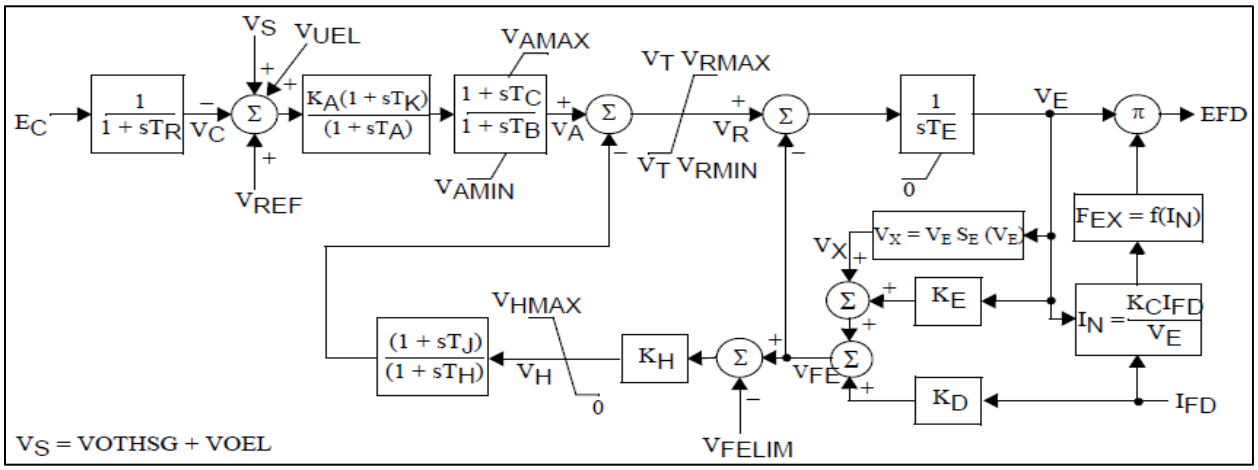
➢ **Type AC4A: 1992 IEEE type AC4A excitation system model**



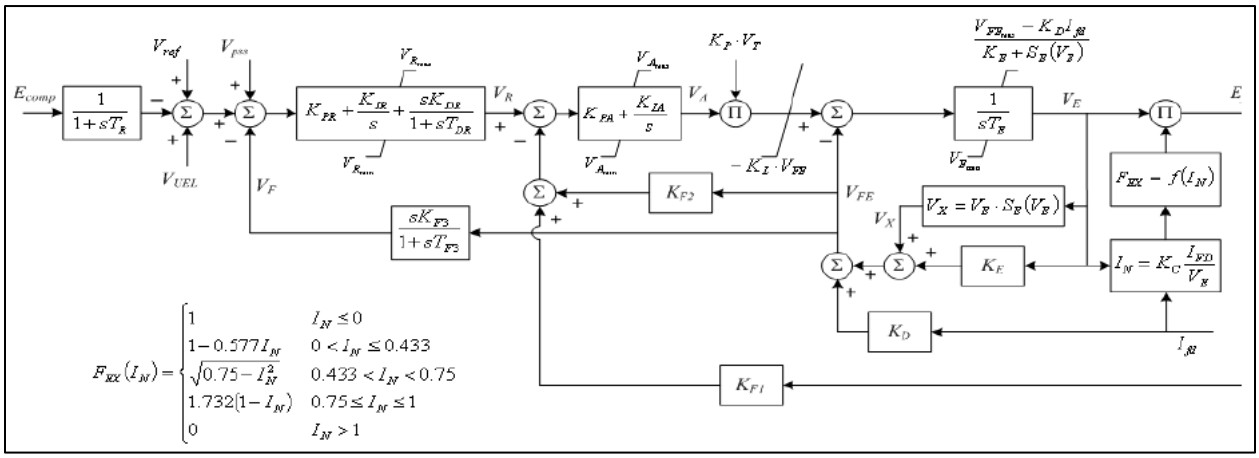
➢ **Type AC5A: 1992 IEEE type AC5A excitation system model**



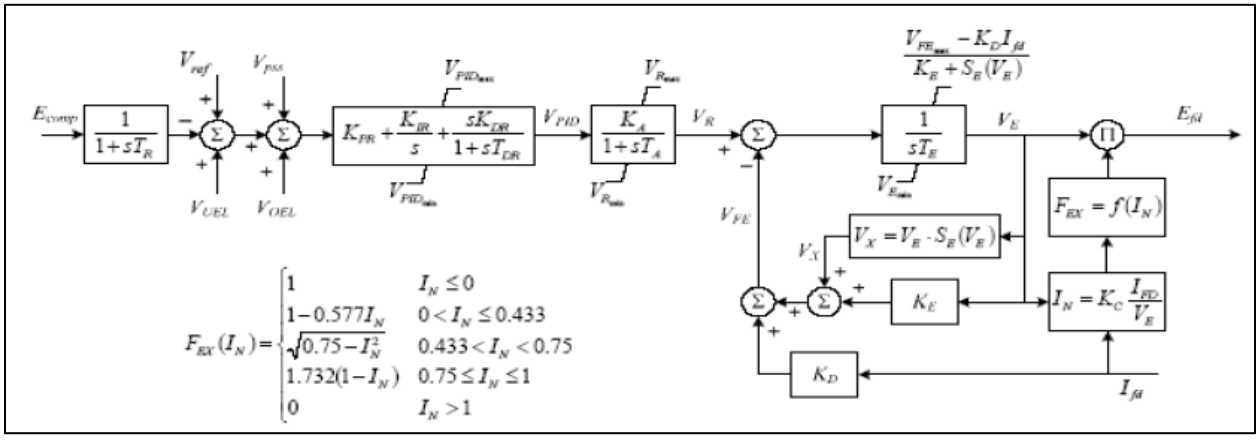
➢ **Type AC6A: IEEE 421.5 excitation system model**



➢ **Type AC7B: IEEE 421.5 2005 AC7B excitation system**

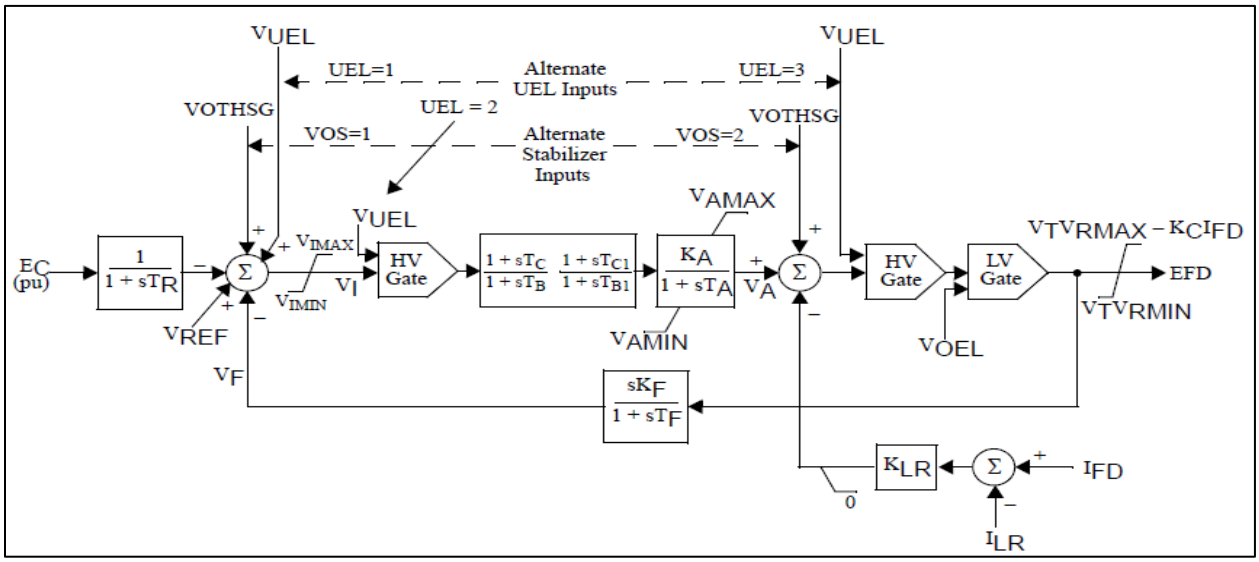


➢ **Type AC8B: IEEE 421.5 2005 AC8B excitation system**

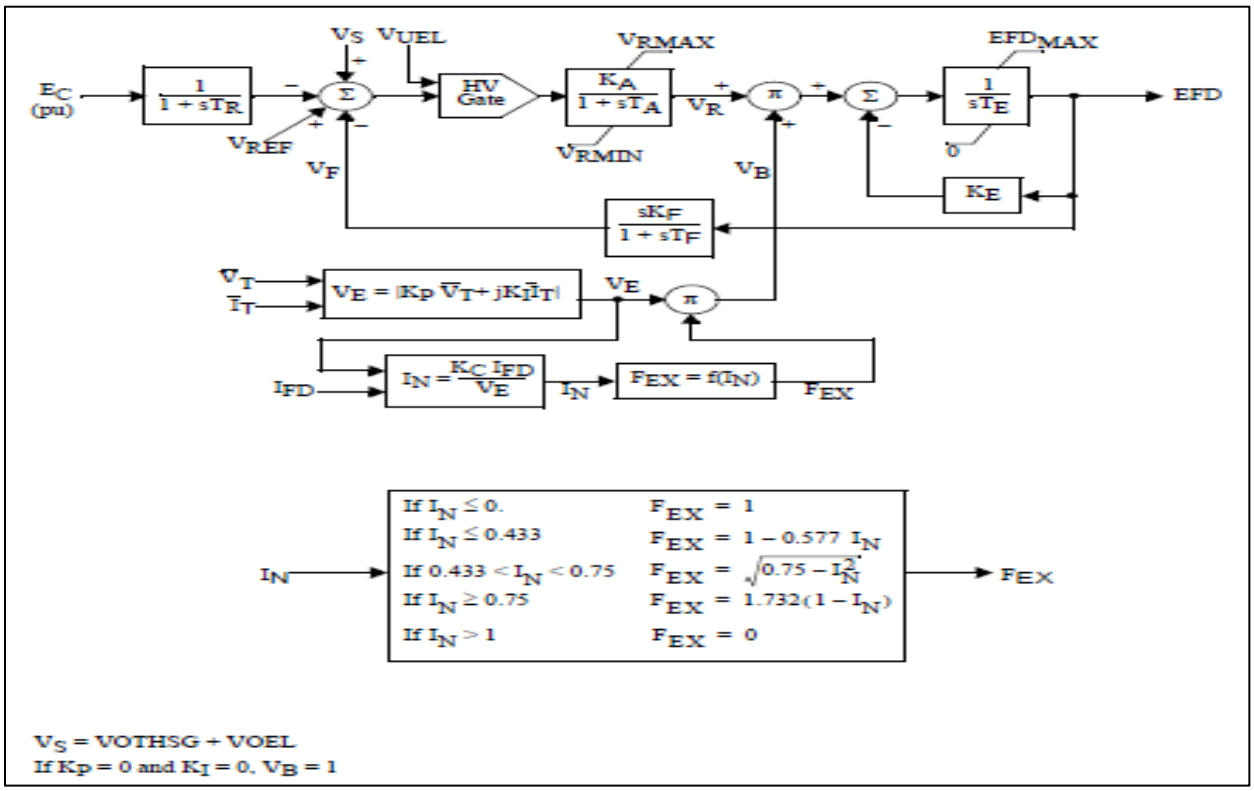


(iii) **Commonly Used Static Exciters Generic Models block diagrams:**

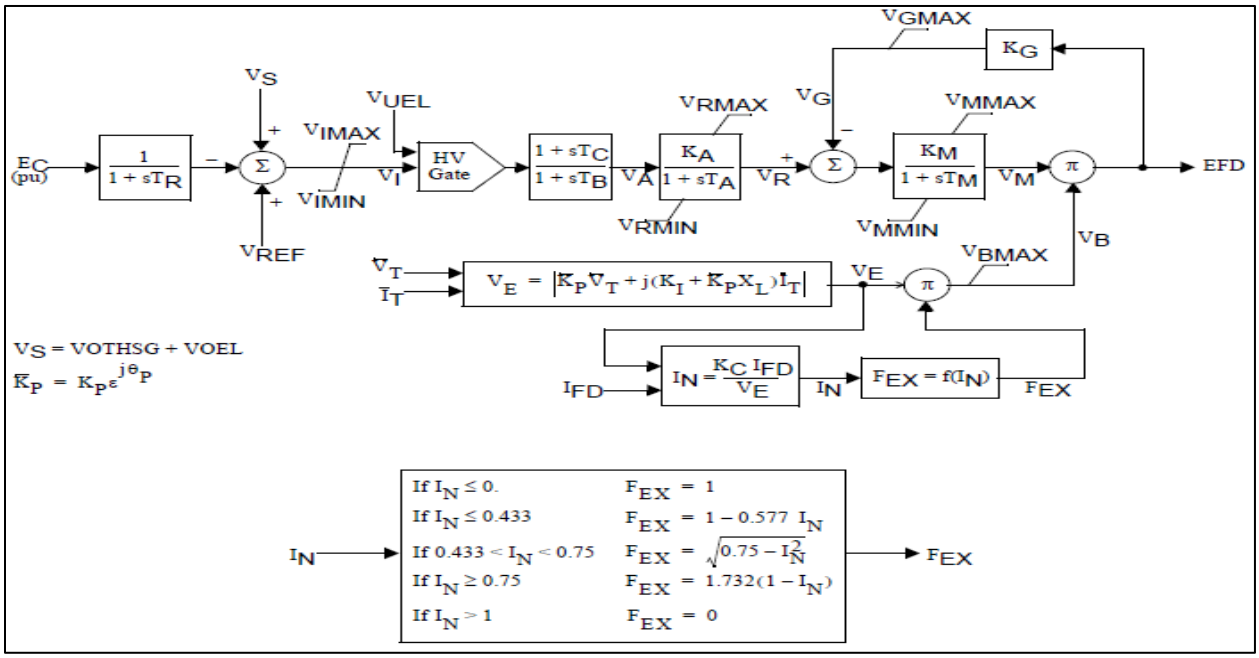
- **Type ST1A: 1992 IEEE type ST1A excitation system model**



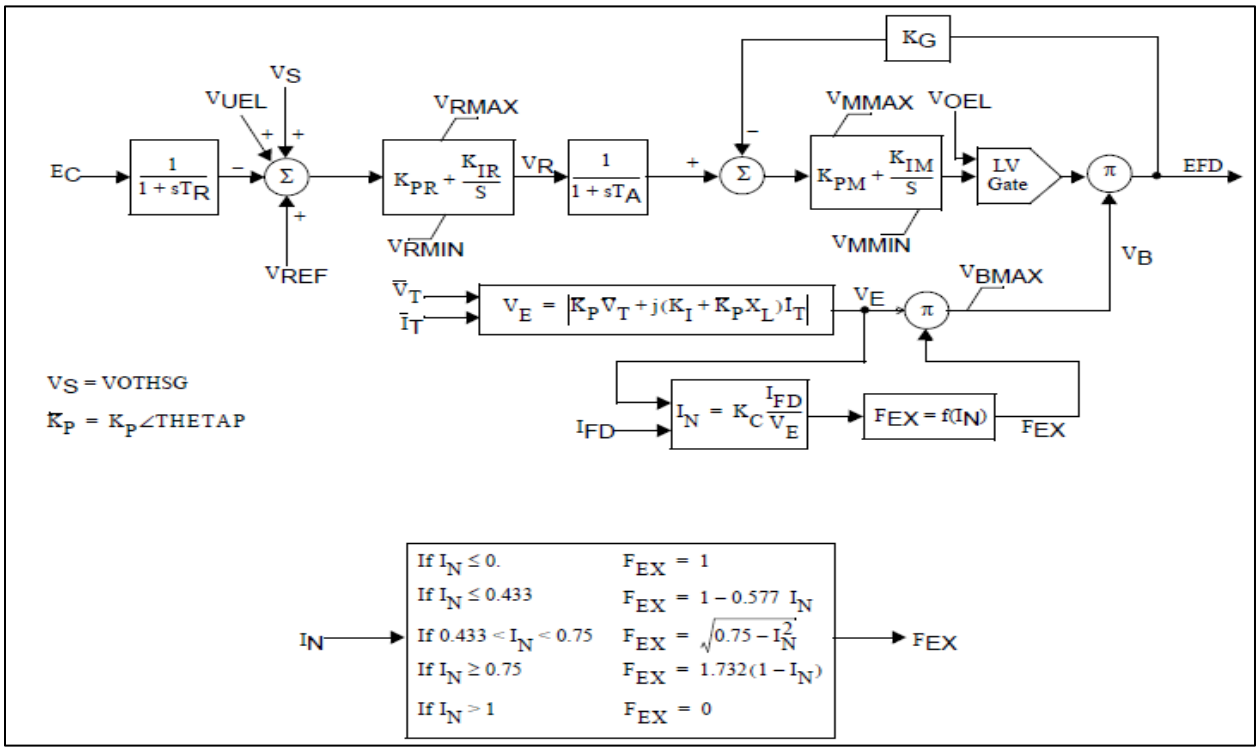
- **Type ST2A: 1992 IEEE type ST2A excitation system model**



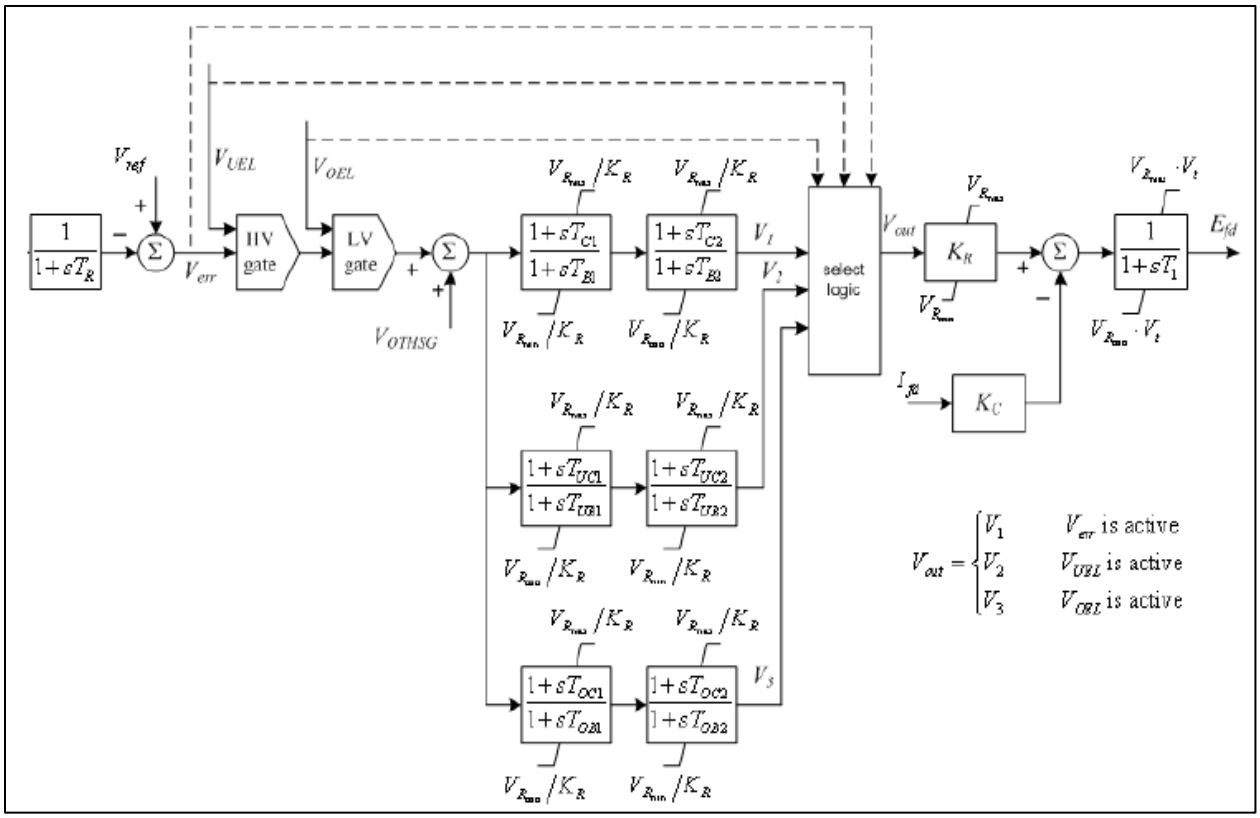
➢ **Type ST3A: 1992 IEEE type ST3A excitation system model**



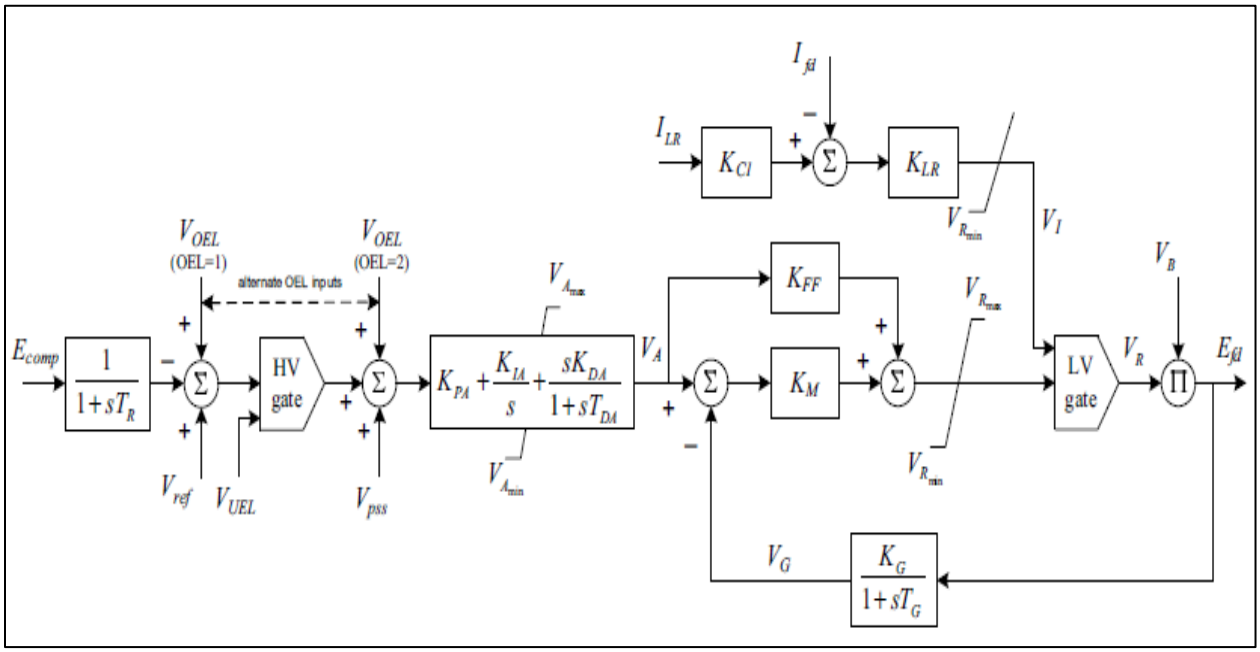
➢ **Type ST4B: IEEE type ST4B potential or compounded source-controlled rectifier exciter**



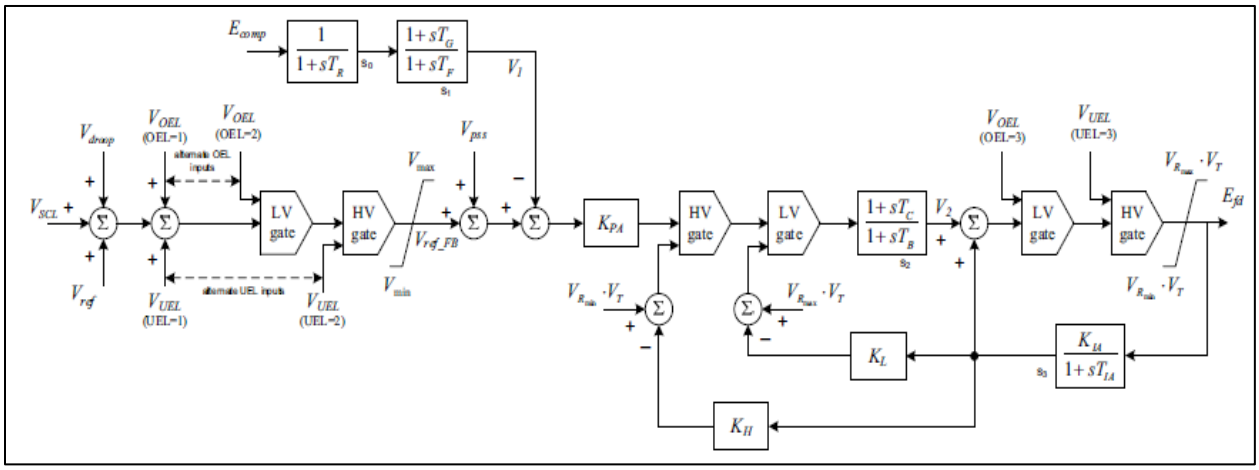
➢ **Type ST5B: IEEE 421.5 2005 ST5B excitation system**



➢ **Type ST6B: IEEE 421.5 2005 ST6B excitation system**



➢ **Type ST7B: IEEE 421.5 2005 ST7B excitation system**



Source-PSSE Model Library

3.4 Power system stabilizer:

The function of the PSS is to add to the unit's characteristic electromechanical oscillations. This is achieved by modulating excitation to develop a component in electrical torque in phase with rotor speed deviations.

The most important aspect when considering a PSS model is the number of inputs. The following table shows the type of models separated based on the inputs:

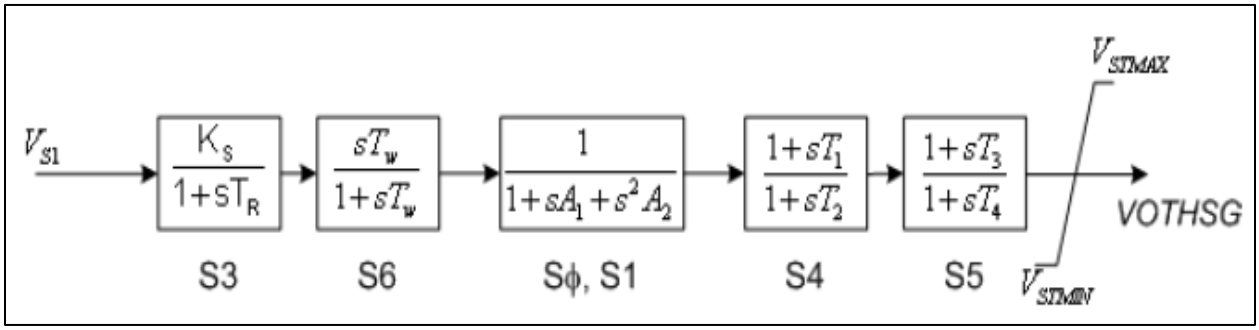
Type	Inputs	Remarks
PSS1A	Single input	Two lead-lags Input can either be speed, frequency or power
PSS2B	Dual input	Integral of accelerating power Speed and Power Most common type Supersedes PSS2A (three versus two lead lags)
PSS3B	Dual input	Power and rotor angular frequency deviation Stabilising signal is a vector sum of processed signals Not very common

Category	Parameter Description	Data
Stabilizer Models		
PSS1A	A1, Filter coefficient	
	A2, Filter coefficient	
	TR, transducer time constant	
	0	
	0	
	0	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	Tw, Washout Time Constant	
	Tw, Washout Time Constant	
	Ks, input channel gain	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	
	0	
	0	

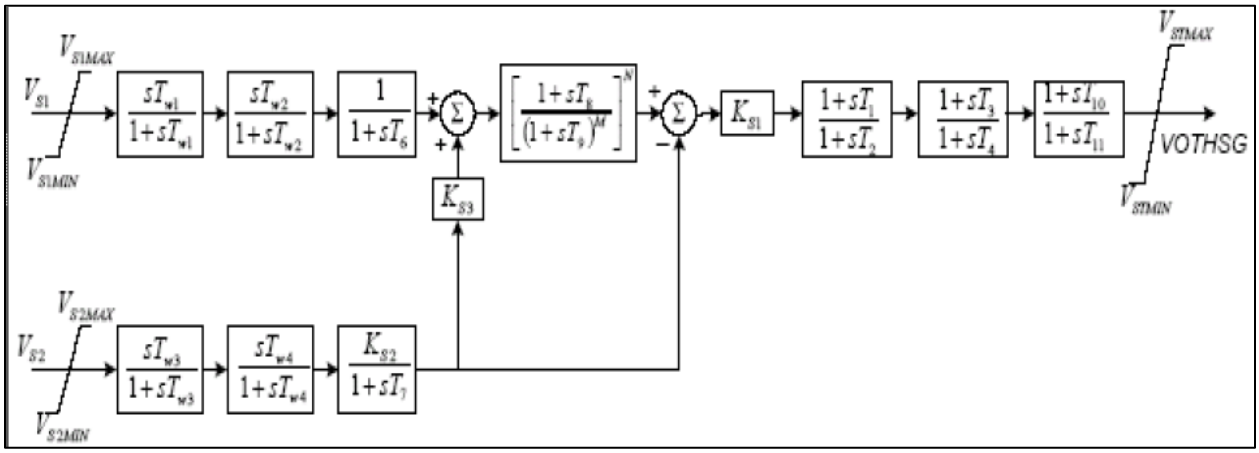
Category	Parameter Description	Data
Stabilizer Models		
PSS2B	TW1, 1st Washout 1th Time Constant	
	TW2, 1st Washout 2th Time Constant	
	T6, 1st Signal Transducer Time Constant	
	TW3, 2nd Washout 1th Time Constant	
	TW4, 2nd Washout 2th Time Constant	
	T7, 2nd Signal Transducer Time Constant	
	KS2, 2nd Signal Transducer Factor	
	KS3, Washouts Coupling Factor	
	T8, Ramp Tracking Filter Deriv. Time Constant	
	T9, Ramp Tracking Filter Delay Time Constant	
	KS1, PSS Gain	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	T10, 3rd Lead-Lag Derivative Time Constant	
	T11, 3rd Lead-Lag Delay Time Constant	
	VS1MAX, Input 1 Maximum limit	
	VS1MIN, Input 1 Minimum limit	
	VS2MAX, Input 2 Maximum limit	
	VS2MIN, Input 2 Minimum limit	
	VSTMAX, Controller Maximum Output	
	VSTMIN, Controller Minimum Output	
PSS3B	KS1 (pu) (≠0), input channel #1 gain	
	T1 input channel #1 transducer time constant (sec)	
	Tw1 input channel #1 washout time constant (sec)	
	KS2 (pu) (0), input channel #2 gain	
	T2 input channel #2 transducer time constant (sec)	
	Tw2 input channel #2 washout time constant (sec)	
	Tw3 (0), main washout time constant (sec)	
	A1, Filter coefficient	
	A2, Filter coefficient	
	A3, Filter coefficient	
	A4, Filter coefficient	
	A5, Filter coefficient	
	A6, Filter coefficient	
	A7, Filter coefficient	
	A8, Filter coefficient	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	

Commonly Used Power System Stabilizer generic models block diagrams:

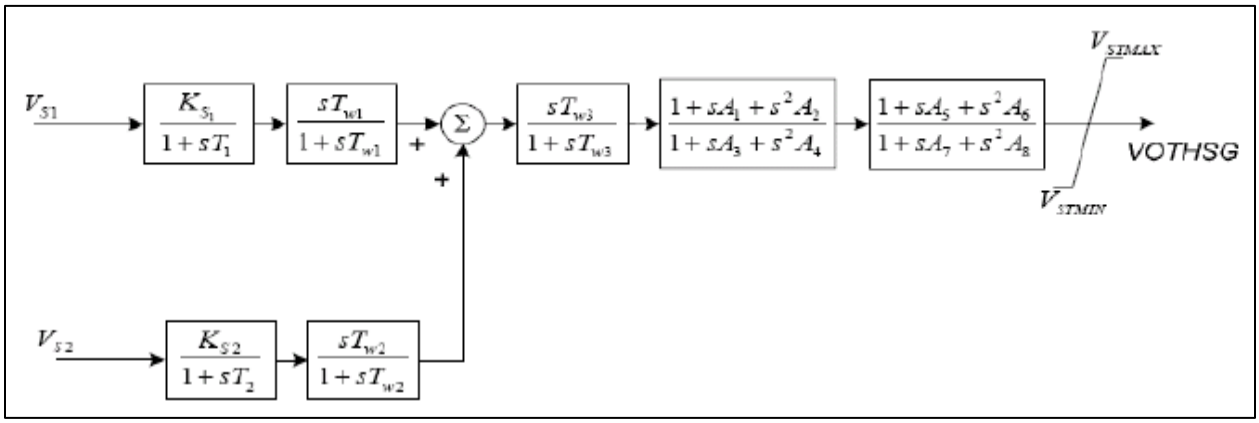
- **PSS1A: IEEE Std. 421.5-2005 PSS1A Single-Input Stabilizer model**



- **PSS2B: IEEE 421.5 2005 PSS2B IEEE dual-input stabilizer model**



- **PSS3B: IEEE Std. 421.5 2005 PSS3B IEEE dual-input stabilizer model**



Source-PSSE Model Library

3.5 Generic models for turbine-governor:

The following table is a list for generic models of steam turbines:

Type	Name	Remarks
BBGOV1	Brown-Boveri turbine governor model	Mainly used for steam turbine with electrical damping feedback
TGOV1	Steam-turbine governor	Mainly used for steam turbine with reheater
CRCMGV	Cross-compound turbine	-
IEEEG1	IEEE type 1 Speed-Governor Model	Used to represent non-reheat, tandem compound, and cross compound types.
IEEEG2	IEEE Type 2 Speed-Governing Model	Linearized model for representing a hydro turbine-governor and penstock dynamics
IEEEG3	IEEE type 3 turbine-governor model	Includes a more complex representation of the governor controls than IEEEG2 does
IEESGO	IEEE Standard Model	Simple model of reheat steam turbine
TGOV2	Steam –turbine governor with fast valving	Fast valving model of steam turbine
TGOV3	Modified IEEE Type 1 Speed-Governing Model with fast valving	Modification of IEEEG! For fast valving studies
TGOV4	Modified IEEE Type 1 Speed-Governing Model with PLU and EVA	Model of steam turbine and boiler, explicit action for both control valve (CV) and inlet valve (IV), main reheat and LP steam effects, and boiler
TGOV5	IEEE Type 1 Speed-Governor Model Modified to Include Boiler Controls	Most common type of governor model, based on TGOV1 with boiler controls
TURCZT	Czech hydro or steam turbine governor model	General-purpose hydro and thermal turbine-governor model. Penstock dynamic is not included in the model

Source: PSSE Model Library, for models other than the above list refer to

https://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/transmission-system-planning-tab/pages/user-support.aspx

Category	Parameter Description	Data
TURBINE GOVERNOR model		
BBGOV1	fcut (>=0) (pu), cut off frequency	
	KS, frequency gain	
	KLS (> 0)	
	KG	
	KP, power regulator gain	
	TN (sec) (> 0)	
	KD, damping gain	
	TD (sec) (> 0), damping time constant	
	T4 (sec), high pressure time constant	
	K2, intermediate pressure time constant	
	T5 (sec), intermediate re-heater time constant	
	K3, high pressure time constant	
	T6 (sec), re-heater time constant	
	T1 (sec), measuring transducer time constant	
	SWITCH	
	PMAX, maximum power output limiter	
	PMIN, minimum power output limiter	
TGOV1	R, Permanent Droop	
	T1 (>0) (sec), Steam bowl time constant	
	VMAX, Maximum valve position	
	VMIN, Minimum valve position	
	T2 (sec), Time constant	
	T3 (>0) (sec), reheater time constant	
	Dt, Turbine damping coefficient	
	VMAX, VMIN, Dt and R are in per unit on generator MVA base. *T2/T3 = high-pressure fraction.*	
CRCMGV	PMAX (HP)1, maximum HP value position (on generator base)	
	R (HP), HP governor droop	
	T1 (HP) (>0), HP governor time constant	
	T3 (HP) (>0), HP turbine time constant	
	T4 (HP) (>0), HP turbine time constant	
	T5 (HP) (>0), HP reheater time constant	
	F (HP), fraction of HP power ahead of reheater	
	DH (HP), HP damping factor (on generator base)	
	PMAX (LP), maximum LP value position (on generator base)	
	R (LP), LP governor droop	
	T1 (LP) (>0), LP governor time constant	
	T3 (LP) (>0), LP turbine time constant	
	T4 (LP) (>0), LP turbine time constant	
	T5 (LP) (>0), LP turbine time constant	
	F (LP), fraction of LP power ahead of reheater	
	DH (LP), LP damping factor (on generator base)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
IEEEG1	K, Governor gain, (1/droop) pu	
	T1 (sec), Lag time constant (sec)	
	T2 (sec), Lead time constant (sec)	
	T3 (> 0) (sec), valve position time constant	
	Uo (pu/sec), maximum valve opening rate	
	Uc (< 0) (pu/sec), maximum valve closing rate	
	PMAX (pu on machine MVA rating)	
	PMIN (pu on machine MVA rating)	
	T4 (sec), time constant for steam inlet	
	K1, HP fraction	
	K2, LP fraction	
	T5 (sec), Time Constant for Second Boiler Pass [s]	
	K3, HP Fraction	
	K4, LP fraction	
	T6 (sec), Time Constant for Third Boiler Pass [s]	
	K5, HP Fraction	
	K6, LP fraction	
	T7 (sec), Time Constant for Fourth Boiler Pass [s]	
	K7, HP Fraction	
	K8, LP fraction	
IEEEG2	K, Governor gain	
	T1 (sec), Governor lag time constant	
	T2 (sec), Governor lead time constant	
	T3 (>0) (sec), Gate actuator time constant	
	PMAX (pu on machine MVA rating), gate maximum	
	PMIN (pu on machine MVA rating), gate minimum	
	T4 (>0) (sec), water starting time	
IEEEG3	TG, (>0) (sec), gate servomotor time constant	
	TP (>0) (sec), pilot value time constant	
	Uo (pu per sec), opening gate rate limit	
	Uc (pu per sec), closing gate rate limit (< 0)	
	PMAX maximum gate position (pu on machine MVA rating)	
	PMIN minimum gate position (pu on machine MVA rating)	
	σ, permanent speed droop coefficient	
	δ, transient speed droop coefficient	
	TR, (>0) (sec), Dashpot time constant	
	TW (>0) (sec), water starting time	
	a11 (>0), Turbine coefficient	
	a13, Turbine coefficient	
	a21, Turbine coefficient	
	a23 (>0), Turbine coefficient	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
IEESGO	T1, Controller Lag	
	T2, Controller Lead Compensation	
	T3, Governor Lag (> 0)	
	T4, Delay Due To Steam Inlet Volumes	
	T5, Reheater Delay	
	T6, Turbine, pipe, hood Delay	
	K1, 1/Per Unit Regulation	
	K2, Fraction	
	K3, fraction	
	PMAX, Upper Power Limit	
	PMIN, Lower Power Limit	
TGOV2	R (pu), permanent droop	
	T1 (>0) (sec), Steam bowl time constant	
	VMAX (pu), Maximum valve position	
	VMIN (pu), Minimum valve position	
	K (pu), Governor gain	
	T3 (>0) (sec), Time constant	
	Dt (pu), Turbine damping coefficient	
	Tt (>0) (sec), Valve time constant	
	TA, Valve position at time 2 (fully closed after fast valving initialization)	
	TB, Valve position at time 3 (start to reopen after fast valving initialization)	
	TC, Valve position at time 4 (again fully open after fast valving initializations)	
TGOV3	K, Governor gain	
	T1 (sec), Governor lead time constant	
	T2 (sec), Governor lag time constant	
	T3 (>0) (sec), Valve positioner time constant	
	Uo, Maximum valve opening velocity	
	Uc (< 0), Maximum valve closing velocity	
	PMAX, Maximum valve opening	
	PMIN, Minimum valve opening	
	T4 (sec), Inlet piping/steam bowl time constant	
	K1, Fraction of turbine power developed after first boiler pass	
	T5 (> 0) (sec), Time constant of second boiler pass	
	K2, Fraction of turbine power developed after second boiler pass	
	T6 (sec), Time constant of crossover or third boiler pass	
	K3, Fraction of hp turbine power developed after crossover or third boiler pass	
	TA (sec), Valve position at time 2 (fully closed after fast valving initializations)	
	TB (sec), Valve position at time 3 (start to reopen after fast valving initializations)	
	TC (sec), Valve position at time 4 (again fully open after fast valving initializations)	
	PRMAX (pu), Max. pressure in reheater	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
TGOV4	K, The inverse of the governor speed droop	
	T1 (sec), The governor controller lag time constant	
	T2 (sec), The governor controller lead time constant	
	T3 (>0) (sec), The valve servomotor time constant for the control valves	
	Uo, The control valve open rate limit	
	Uc (<0), The control valve close rate limit	
	KCAL	
	T4 (sec), The steam flow time constant	
	K1	
	T5 (> 0) (sec)	
	K2	
	T6 (sec)	
	PRMAX	
	KP	
	KI	
	TFuel (sec)	
	TFD1 (sec)	
	TFD2 (sec)	
	Kb	
	Cb (> 0) (sec)	
	TIV (> 0) (sec)	
	UOIV	
	UCIV	
	R (>0)	
	Offset	
	CV position demand characteristic	
	CV #2 offset	
	CV #3 offset	
	CV #4 offset	
	IV position demand characteristic	
	IV #2 offset	
	CV valve characteristic	
	IV valve characteristic	
	CV starting time for valve closing (sec)	
	CV closing rate (pu/sec)	
	Time closed for CV #1 (sec)	
	Time closed for CV #2	
	Time closed for CV #3	
	Time closed for CV #4	
	IV starting time for valve closing (sec)	

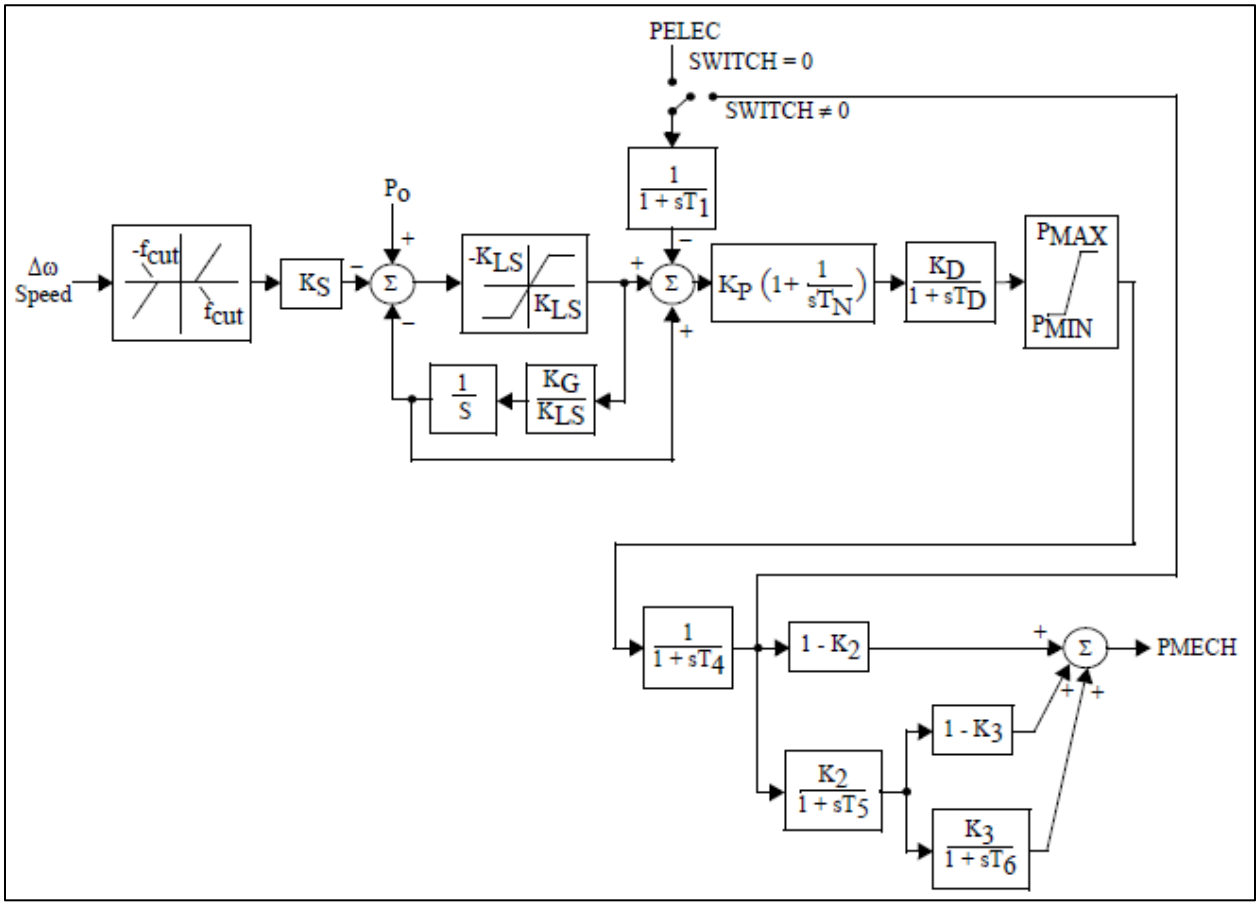
Category	Parameter Description	Data
TURBINE GOVERNOR model		
TGOV4	IV closing rate (pu/sec)	
	Time closed for IV #1 (sec)	
	Time closed for IV #2 (sec)	
	TRPLU (>0) (sec)	
	PLU rate level	
	Timer	
	PLU unbalance level	
	TREVA (>0) (sec)	
	EVA rate level	
	EVA unbalance level	
	Minimum load reference (pu)	
	Load reference ramp rate (pu/sec)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
TGOV5	K, The inverse of the governor speed droop	
	T1 (sec), The governor controller lag time constant	
	T2 (sec), The governor controller lead time constant	
	T3 (>0) (sec), The valve servomotor time constant for the control valves	
	Uo, The control valve open rate limit	
	Uc (<0), The control valve close rate limit	
	VMAX, The maximum valve area	
	VMIN, The minimum valve area	
	T4 (sec), The steam flow time constant	
	K1, The fractions of the HP	
	K2, fractions of the LP	
	T5 (sec), The first reheater time constant	
	K3, The fractions of the HP	
	K4, fractions of the LP	
	T6 (sec), second reheater time constant	
	K5, The fractions of the HP	
	K6, fractions of the LP	
	T7 (sec), crossover time constant	
	K7, The fractions of the HP	
	K8, fractions of the LP	
	K9, The adjustment to the pressure drop coefficient as a function of drum pressure	
	K10, The gain of anticipation signal from main stream flow	
	K11, The gain of anticipation signal from load demand	
	K12, The gain for pressure error bias	
	K13, The gain between MW demand and pressure set point	
	K14, Inverse of load reference servomotor time constant (= 0.0 if load reference does not change).	
	RMAX, The load reference positive rate of change limit	
	RMIN, The load reference negative rate of change limit	
	LMAX, The maximum load reference	
	LMIN, The minimum load reference	
	C1, The pressure drop coefficient	
	C2, The gain for the pressure error bias	
	C3, The adjustment to the pressure set point	
	B, The frequency bias for load reference control	
	CB (>0) (sec), The boiler storage time constant	
	KI, The controller integral gain	
	TI (sec), The controller proportional lead time constant	
	TR (sec), The controller rate lead time constant	
	TR1 (sec), The inherent lag associated with lead TR (usually about TR/10)	
	CMAX, The maximum controller output	

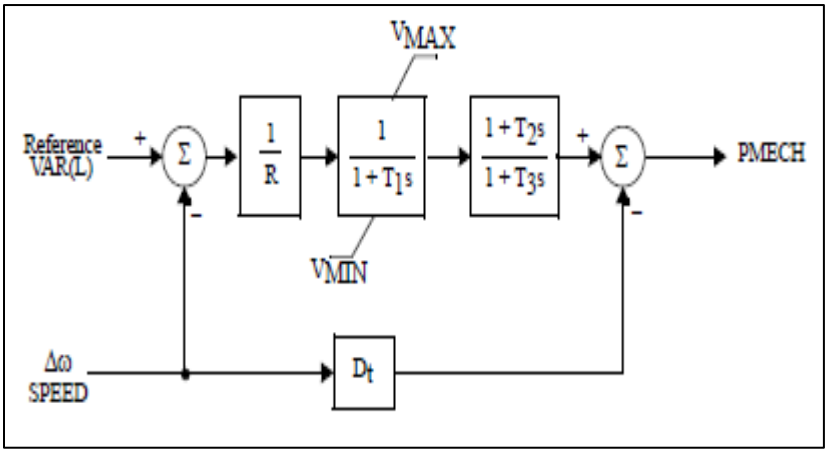
Category	Parameter Description	Data
TURBINE GOVERNOR model		
TGOV5	CMIN, The minimum controller output	
	TD (sec), The time delay in the fuel supply system	
	TF (sec), The fuel and air system time constant	
	TW (sec), The water wall time constant	
	Psp (initial) (>0), The initial throttle pressure set point	
	TMW (sec), The MW transducer time constant	
	KL (0.0 or 1.0), The feedback gain from the load reference	
	KMW (0.0 or 1.0), The gain of the MW transducer	
	DPE (pu pressure), The dead band in the pressure error signal for load reference control	
	• *The fractions of the HP unit's mechanical power developed by the various turbine stages. The sum of K1, K3, K5 andK7 constants should be one for a non cross-compound unit.* • *Similarly fractions of the LP unit's mechanical power should be zero for a non cross-compound unit. For a cross-compound unit, the sum of K1 through K8 should equal one.*	
TURCZT	fDEAD (pu), Frequency Dead Band	
	fMIN (pu), Frequency Minimum Deviation	
	fMAX (pu), Frequency Maximum Deviation	
	KKOR (pu), Frequency Gain	
	KM > 0 (pu), Power Measurement Gain	
	KP (pu), Regulator Proportional Gain	
	SDEAD (pu), Speed Dead Band	
	KSTAT (pu), Speed Gain	
	KHP (pu), High Pressure Constant	
	TC (sec), Measuring transducer time constant	
	T 1 (sec), Regulator Integrator Time Constant	
	TEHP (sec), Hydro Converter Time Constant	
	TV > 0 (sec), Regulation Valve Time Constant	
	THP (sec), High Pressure Time Constant	
	TR (sec), Reheater time constant	
	TW (sec), Water Time Constant	
	NTMAX (pu), Power Regulator-Integrator Maximum Limiter	
	NTMIN (pu), Power Regulator-Integrator Minimum Limiter	
	GMAX (pu), Valve Maximum Open	
	GMIN (pu), Valve Minimum Open	
	VMIN (pu/sec), Valve Maximum Speed Close	
	VMAX (pu/sec), Valve Maximum Speed Open	

Commonly Used Steam Turbine Generic Models Block Diagrams:

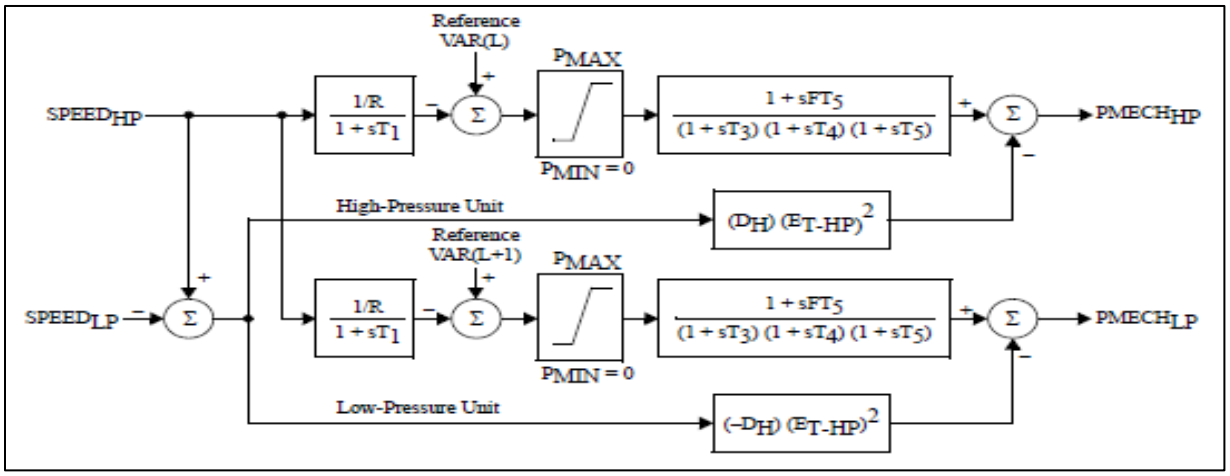
- **BBGOV1: Brown-Boveri turbine-governor model**



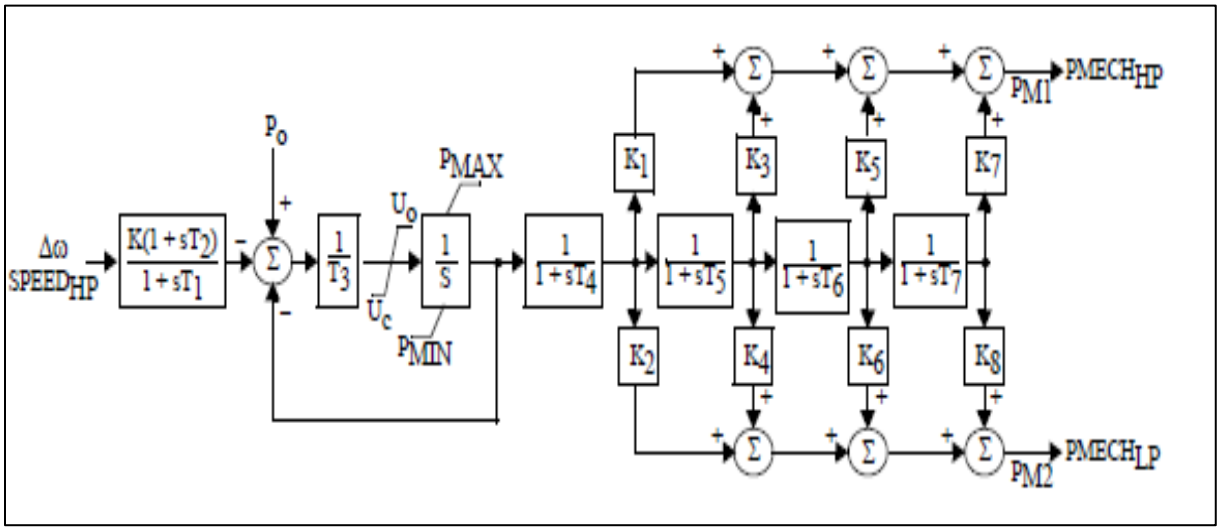
- **TGOV1: Steam turbine-governor model**



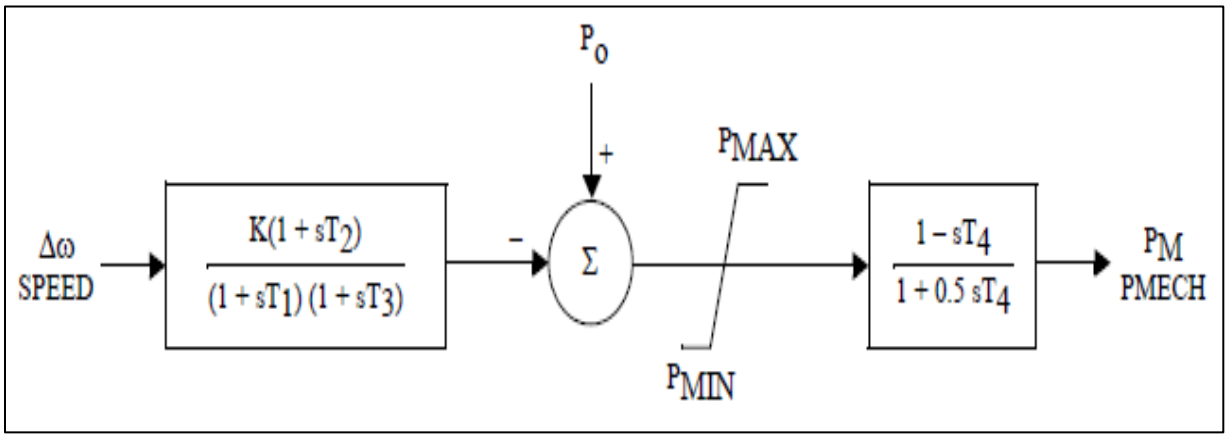
➢ **CRCMGV: Cross compound turbine-governor model**



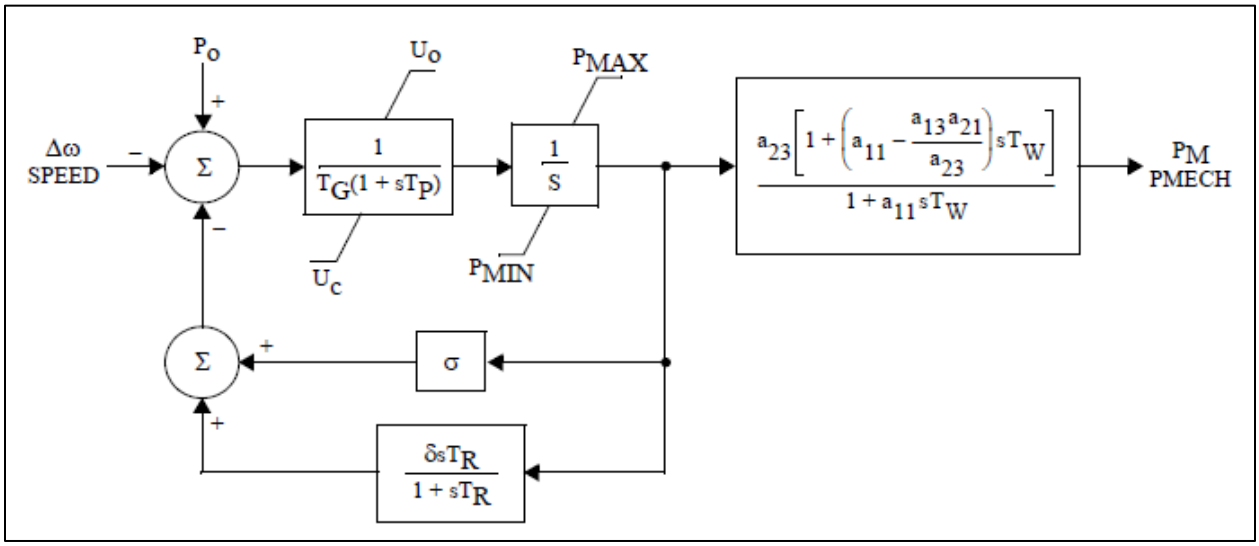
➢ **IEEEG1: 1981 IEEE type 1 turbine-governor model**



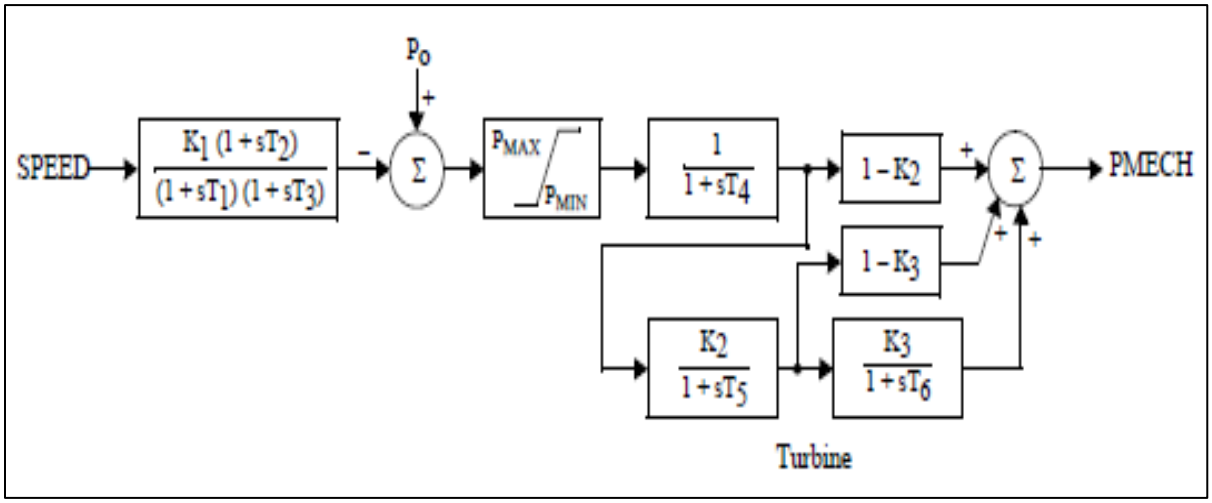
➢ **IEEEG2: 1981 IEEE Type 2 Speed-Governing Model**



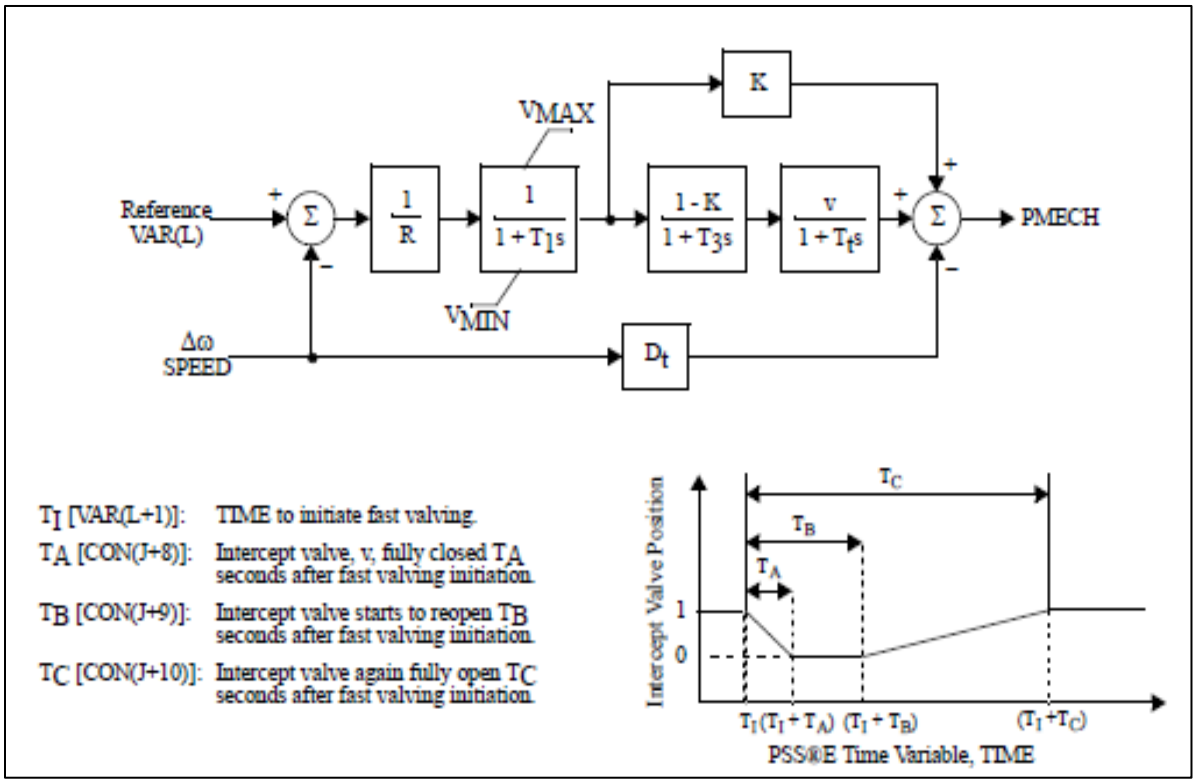
➢ **IEEEG3: 1981 IEEE Type 3 Speed-Governing Model**



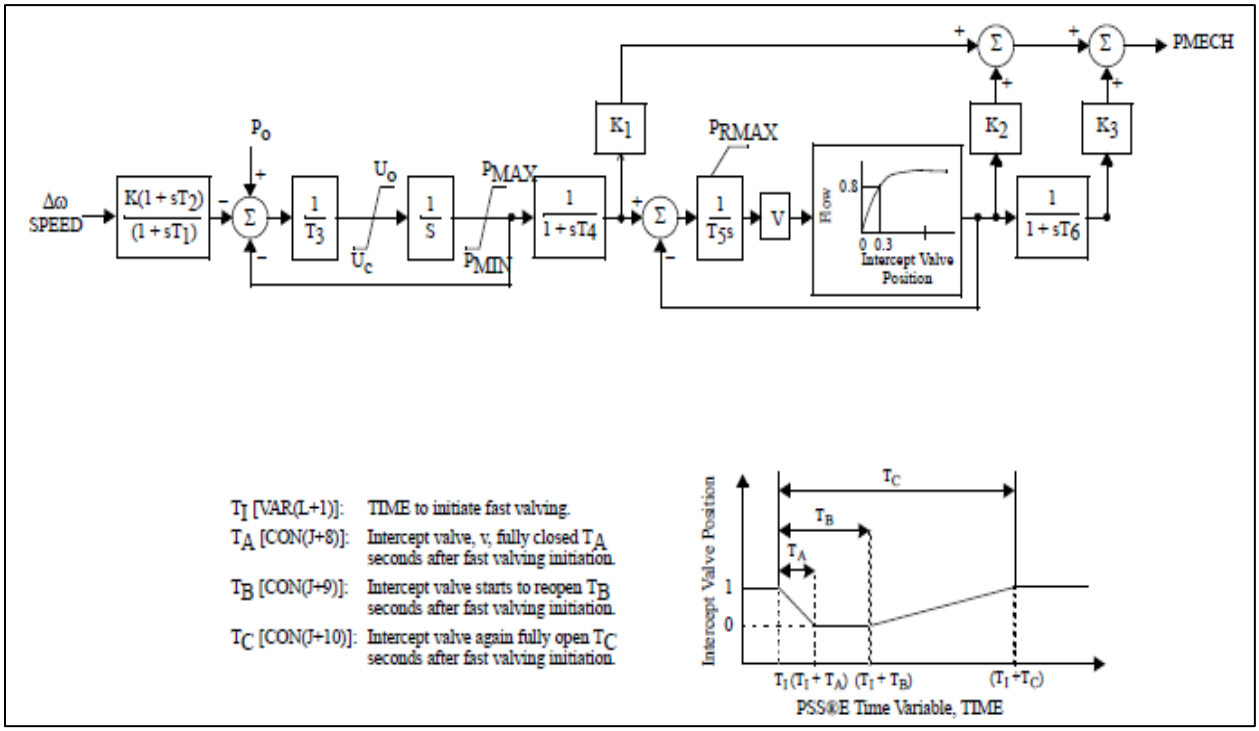
➢ **IEESGO: 1973 IEEE standard turbine-governor model**



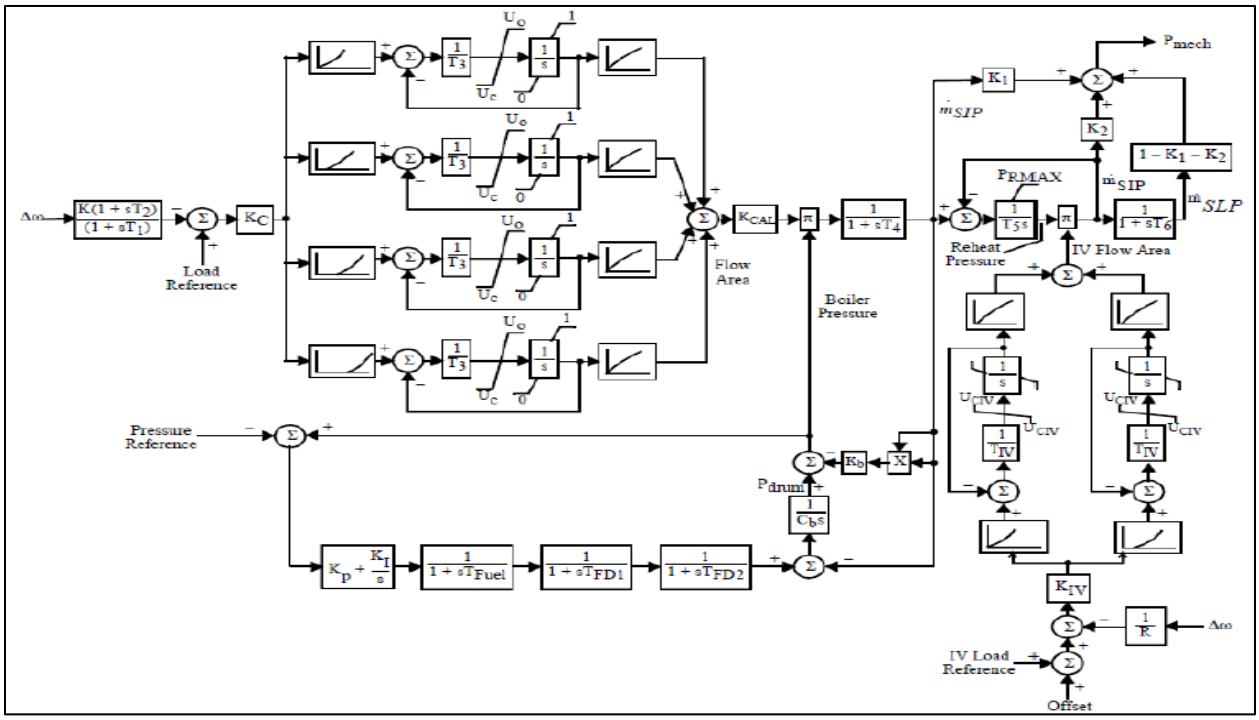
➢ **TGOV2: Steam turbine-governor model with fast valving**



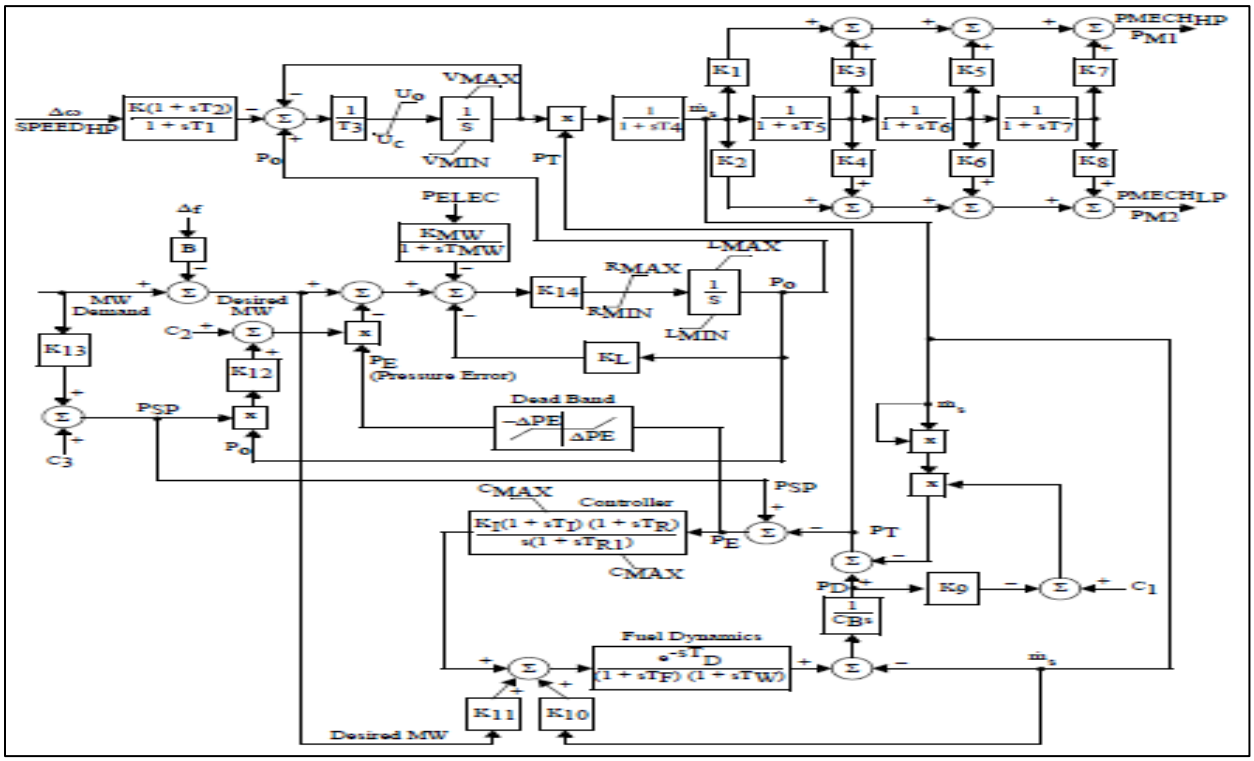
➢ **TGOV3: Modified IEEE type 1 turbine-governor model with fast valving**



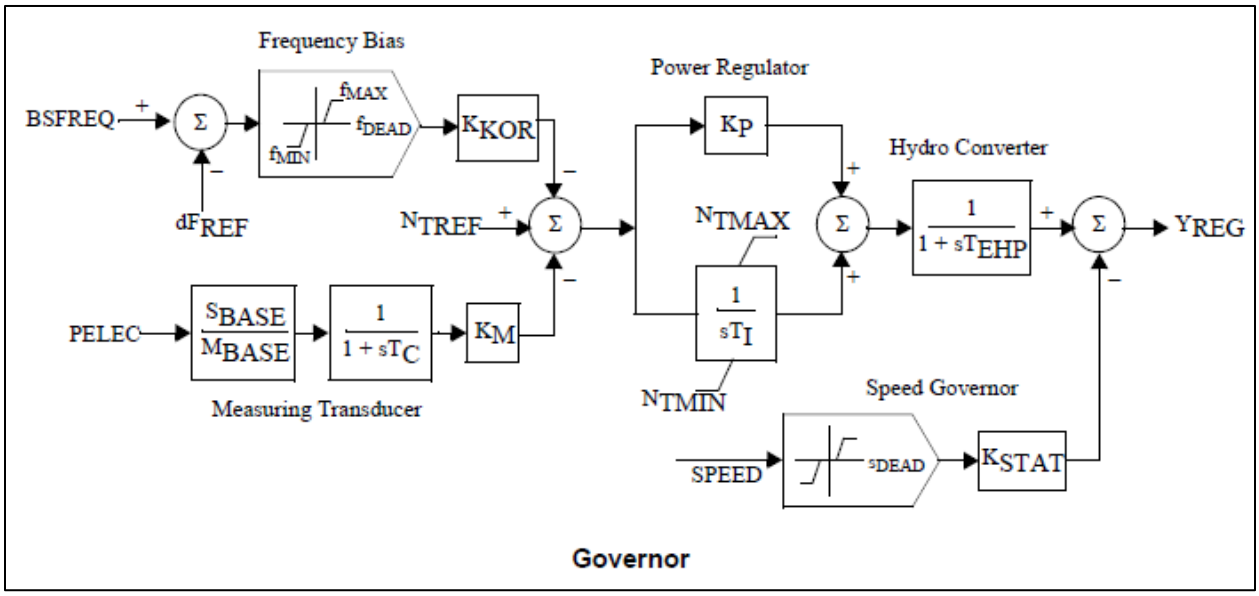
➢ **TGOV4: Modified IEEE type 1 speed governing model with PLU and EVA**

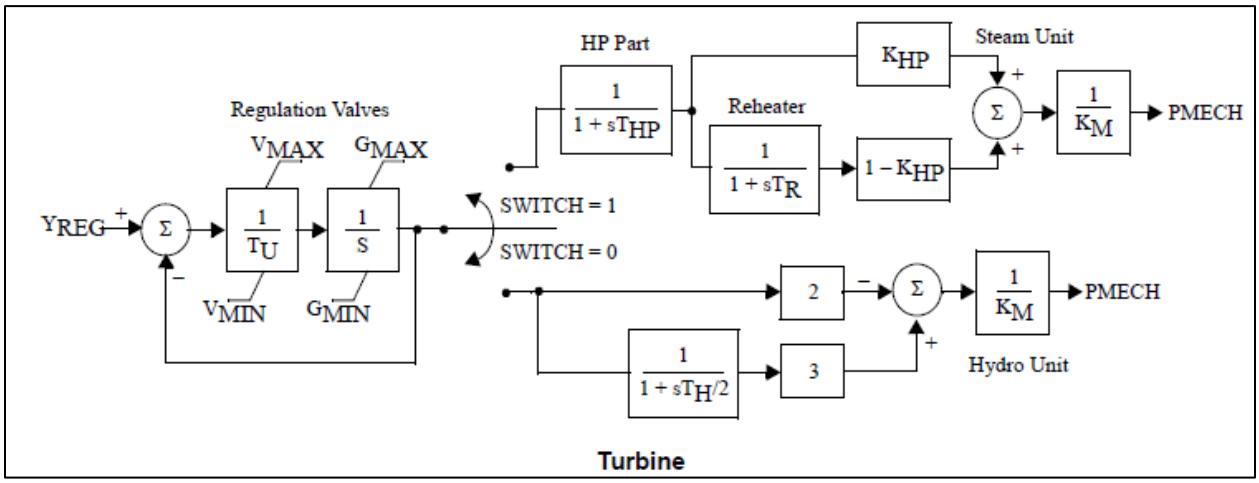


➢ **TGOV5: Modified IEEE type 1 turbine-governor model with boiler controls**



➢ **TURCZT: Czech Hydro and Steam Governor**





Source-PSSE Model Library

Calculation of saturation parameters:

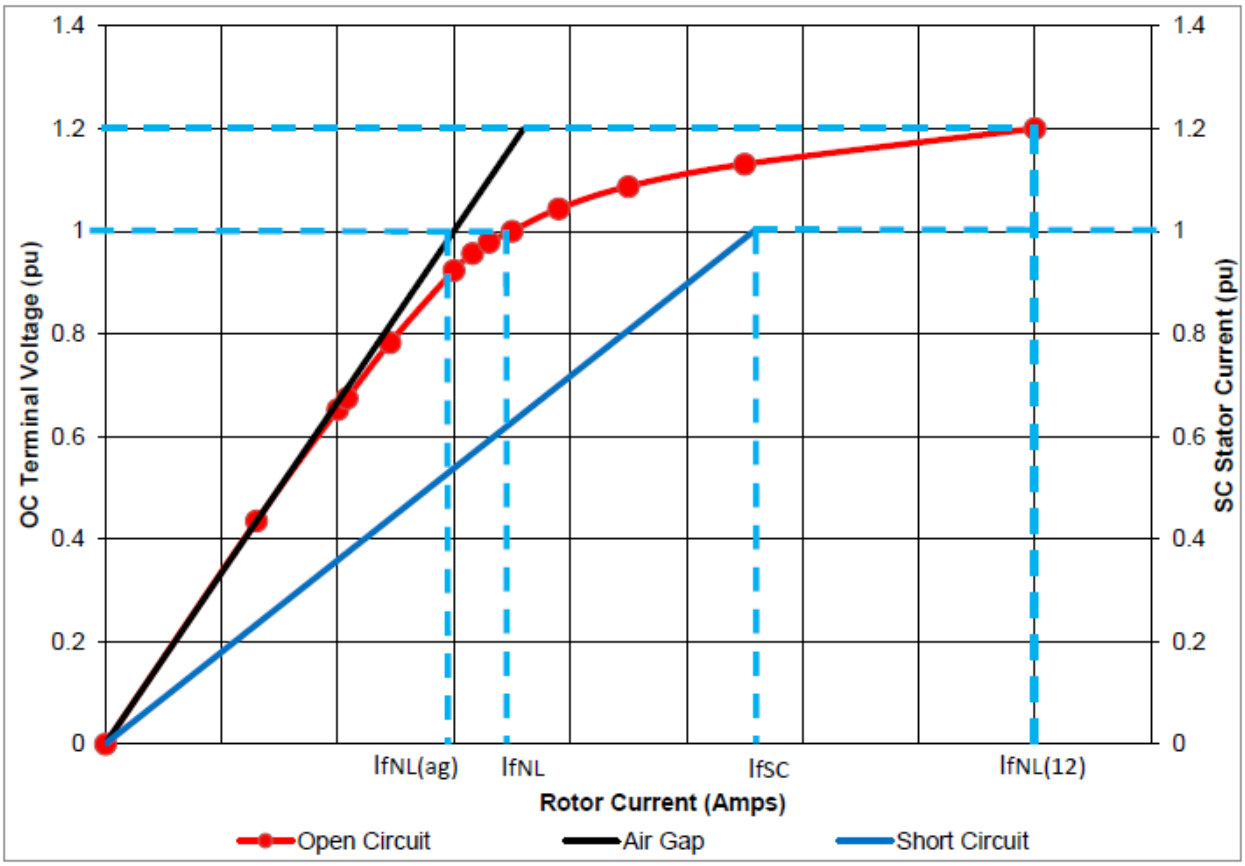


Figure 2: Open and short circuit characteristics

The saturation can be calculated using the following calculation:

$$S(1.0) = \frac{If_{NL} - If_{NL(AG)}}{If_{NL(AG)}}$$

$$S(1.2) = \frac{If_{NL(12)} - 1.2 \times If_{NL(AG)}}{1.2 \times If_{NL(AG)}}$$

Annexure-IV

Modeling Hydro Power Generation

Procedure for furnishing information for modelling Hydro Power Generation 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 hydro power generation in India. Availability of fit-for-purpose steady state and dynamics models of hydro power generation 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 hydro power generation 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 hydro power generation 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 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 stabilizers, 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 simulation studies that deliver reasonably accurate outcomes.

1.3 Regulation:

- **CEA Connectivity Standard 6.4.d :**

The requester and user shall cooperate with RPC and Appropriate Load Despatch Centre in respect of the matters listed below, but not limited to

furnish data as required by Appropriate Transmission Utility or Transmission Licensee, Appropriate Load Despatch Centre, Appropriate Regional Power Committee and any committee constituted by the Authority or appropriate Government for system studies or for facilitating analysis of tripping or disturbance in power system;

Here Requester and User Includes a generating company, captive generating plant, energy storage system, transmission licensee (other than Central Transmission Utility and State Transmission Utility), distribution licensee, solar park developer, wind park developer, wind-solar photovoltaic hybrid system, or bulk consumer *(2019 Amendment)*

- **IEGC 4.1 :**

CTU, STU and Users connected to, or seeking connection to ISTS shall comply with Central Electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2007 which specifies the minimum technical and design criteria and Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters) Regulations,2009.

2.0 Hydro Power Plant Classification:

a. **Run-of-river:**
Run of river hydropower projects have no, or very little, storage capacity behind the dam and generations dependent on the timing and size of river flows.

b. **Reservoir (HPP):**
Reservoir based hydropower schemes have the ability to store water behind the dam in a reservoir in order to de-couple generation from hydro inflows. A hydroelectric reservoir makes use of potential energy of water for generating electricity. Water is held back by the dam, and released through a turbine, which in turn produces electricity. Reservoir capacities can be small or very large, depending on the characteristics of the site and the economics of dam construction.

c. Pumped storage (PSP):
Pumped storage hydropower schemes use off-peak electricity to pump water from a reservoir located after the tailrace to the top of the reservoir, so that the pumped storage plant can generate electricity at peak times and provide grid stability and flexibility services

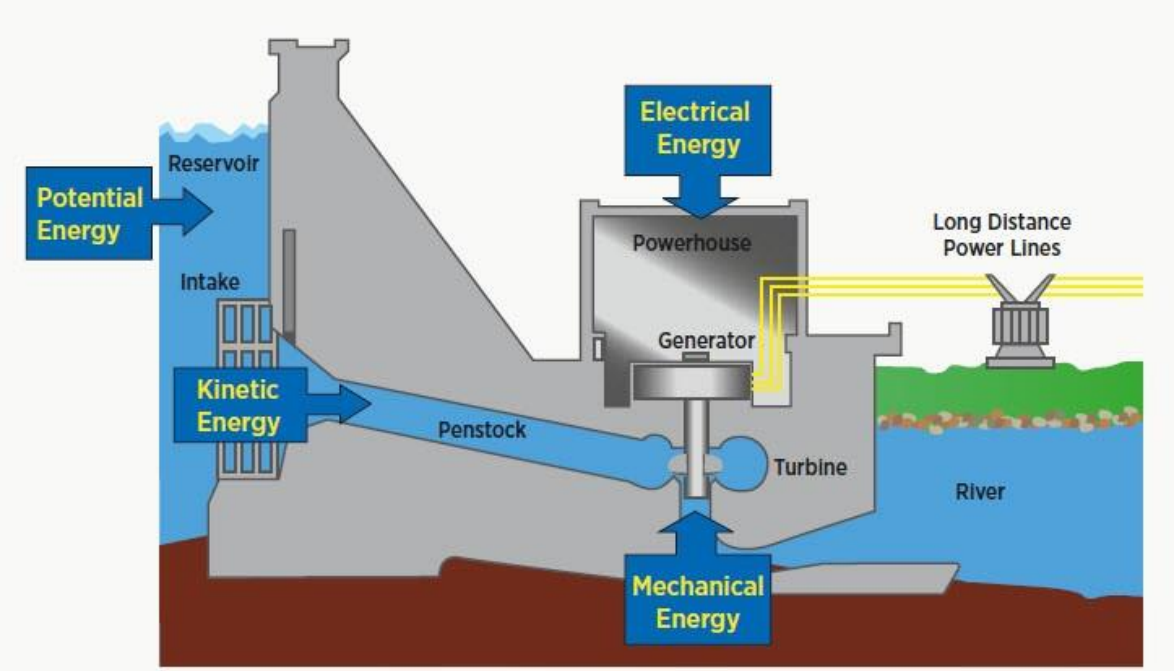


Figure 1: Typical "LOW HEAD" Hydro Power Plant with storage

Types of hydraulic turbines in regional grid:

The conventional hydroelectric generator can be classified broadly into three categories based on the hydraulic turbine type given as under:

1) Pelton wheel turbine
2) Kaplan Turbine
3) Francis Turbine
4) Bulb and other types of turbines

Pelton wheel turbine is an impulse turbine for high head and low discharges (flow rate) conditions. Kaplan wheel turbine is a reaction type turbine suitable for low head and high discharge (flow rate) conditions. Francis turbine is mix type of turbine that operates at medium head and flow rate.

Among the hydro generators the Francis turbine generators are characterized by unstable operation zone over a certain range of generation (typically 10-70%) where it experiences vibration due to cavitation. Cavitation is the resulting vibration caused by bubbles formed in water column due to pressure change and this causes loss of head and turbine efficiency. The Pelton wheel turbines on the other hand do have better load following characteristics and are capable of extended part load operation since they don't have any such forbidden zones.

Region wise distribution of different turbine types has been given below:

Region	Pelton	Capacity	Francis	Capacity	Kaplan	Capacity	Bulb	Capacity
	Number	MW	Number	MW	Number	MW	Number	MW
ER	6	1200	27	3014	13	534	0	0
NER	1	1.5	38	1260.5	0	0	0	0
NR	48	1580	103	10544	3	94	0	0
SR	68	4705	48	4096	12	426	20	594
WR	23	1047	56	5266	20	885	0	0
All India	**146**	**8534**	**272**	**24181**	**48**	**1939**	**20**	**594**

Source: Report on Operational Analysis for Optimization of Hydro resources – FOLD
https://posoco.in/hydro-committee-report/

For POSOCO to have access to verified fit-for-purpose models of hydro power generator connected to Indian grid, following information is required:

1. Electrical Single Line Diagram of coal fired thermal station depicting;
    - **For individual generating units:** type of technology, **Complete Generator OEM Technical Datasheet** (which comprises namely generator parameters like impedances & time constants, generator capability curve, V-curve, generator open and short circuit characteristics, excitation system details, inertia of generator & exciter), generator name plate, generator SAT report including short circuit and open circuit test results during commissioning/recent overhauling.
    - **Generator step up transformer**: GT name plate/datasheet, details of LV, MV and HV, MVA rating, impedance, tap changer details, vector group, short-circuit parameters (actual positive & zero sequence impedance of GT, NGR nameplate with impedance).
    - **Excitation system :-** Type of excitation system (Direct Current Commutator Exciters (type DC), AC Excitation (Rotor or brushless excitation) Systems (type AC) and Static Excitation Systems (type ST), Excitation system schematics (Block diagram of AVR system), transfer function block diagram of Excitation system, excitation transformer nameplate, saturation curves of the exciter (I_a versus I_f curve), IEEE standard model of excitation system, IEEE standard model and its parameter of subsystems such as Power system stabilizer (PSS), Under Excitation Limiter (UEL), Over Excitation Limiter (OEL), Voltage per Hz Limiter(V/Hz) control etc. and details thereof, factory acceptance test reports (FAT). Excitation system actual settings to be provided. AVR test report (excitation step response test).

- **Power System Stabilizer (PSS):** Transfer function block diagram of PSS, IEEE Standard Model, Actual PSS software settings, PSS commissioning report and **Recent PSS tuning report**.
- **Turbine-Governor system :-** Type of prime mover (hydro-electric or pumped storage), type of hydro turbine (impulse or reaction turbine) and details of head, model of turbine (including details of technology, valves, valve characteristics), model of governor control system (including details of technology, valves, valves characteristics) , penstock details (length, area, diameter, thickness, elastic or non-elastic, no of penstock supplied through common tunnel and flow of water through turbine) , mode of operation (hydro, pump storage or synchronous condenser) and control, surge tank details (height, diameter and restricted inlet orifice), pump characteristic (Active power Vs head) ramp rates, losses in case of synchronous condenser operation (Mechanical loss and copper loss as a function of MVAr output), Block diagram of turbine-governor system, IEEE standard model of turbine governor system and its transfer function diagram and its parameters, Turbine inertia, commissioning report of turbine-governor system or recent governor testing report.

2. Generic models of individual components (generator, exciter, turbine-governor and PSS of hydro power generator (refer sections 3.2 to section 3.5)
   - Model should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 100 s
   - 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 PSSE release PSS/E (*.dll files) for electromechanical transient simulation for components of hydro power generators (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 to be provided
   - The use of black-box type representation is not preferred

Annexure: Formats for submission of modelling data for hydro power generator

Version History:

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

*Mention Designation and Contact Details

Details submitted:

Details pending:

3.1 Details of models in PSS/E for modelling hydro power generator:

(a) Synchronous Machine – HPP and PSP types

Category	Parameter Description	Data
Generator Nameplate	Rated apparent power in MVA	
	Rated terminal voltage	
	Rated power factor	
	Rated speed (in RPM)	
	Rated frequency (in Hz)	
	Rated excitation (in Amperes and Volts)	
Type of synchronous machine	Round rotor or salient pole No. of poles	
Generator capability curve	The generator capability curve shows the reactive capability of the machine and should include any restrictions on the real or reactive power range like under/over excitation limits, stability limits, etc. Capability curve should have properly labelled axis and legible data	
Generator Open Circuit and Short Circuit Characteristic	Graph of excitation current versus terminal voltage and stator current	
	No load excitation current – used to derive per unit values	
	Excitation current at rated stator current	
Generator vee-curves	Otherwise referred to as "V-curve". A plot of the terminal (armature) current versus the generating unit field voltage.	
Resistance values	Resistance measurements of field winding and stator winding to a known temperature	
Generator Data sheet	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xa in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Quadrature axis transient synchronous reactance Xq' in p.u. (Unsaturated or saturated)	
	Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit transient time constant Tqo' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass (generator, AVR, turbo-governor set) H in MW.s/MVA	
	Speed Damping D	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

Category	Parameter Description	Data
Generator step up transformer (GSUT)	Nameplate Rating - Rated primary and secondary voltage - Vector group - Impedance - Tap changer details (Number of taps, tap position, tap ratio etc.)	
Auxiliary power (i.e. active and reactive auxiliary load)	Value of auxiliary load (MW and Mvar) at rated power of the generating unit.	
	Whether or not the load trips if the generating unit trips.	
Test Reports	Factory acceptance test (FAT) reports	

(b) Site Load

	Low Output			High Output		
	kW	kvar	kVA	kW	kvar	kVA
Auxiliary Load						

(c) Excitation System

Category	Parameter Description	Data
Type of Automatic Voltage Regulator (AVR)	Manufacturer and product details (for example ABB UNITROL)	
	Type of control system :- Analogue or digital	
	Year of commissioning / Year of manufacture	
	As found settings (obtained either from HMI or downloaded from controller in digital systems)	
Type of excitation system	Static excitation system OR	
	Indirect excitation system (i.e. rotating exciter) - AC exciter, or - DC exciter	
Details of AVR converter	Rated excitation current (converter rating in Amperes)	
	Six pulse thyristor bridge or PWM converter	
Source of excitation supply	Excitation transformer or auxiliary supply (Details thereof)	
	If excitation transformer, nameplate information required	
Schematics	Saturation curves of the exciter (if applicable – see Type AC and DC)	
	Drawings of excitation system, typically prepared and supplied by the OEM	
	Single line diagram (i.e. one-line diagram) for the excitation system	
Excitation limiters	What excitation limiters are commissioned?	
	Under Excitation Limiters settings	
	Over Excitation Limiters settings	
	Voltage/frequency limiter	
	Stator current limiter	
	Minimum excitation current limiter	

Category	Parameter Description	Data
PSS	Is the AVR equipped with a PSS?	
	How many input Channels does the PSS have? (speed, real power output or both	
	If the PSS uses speed, is this a derived speed signal (i.e. synthesized speed signal) or measured directly (i.e. actual rotor speed)?	
	Type of PSS Block Diagram of PSS and as commissioned parameters value (Gain, time constants, filter coefficients, output limits of the PSS)	
Test Reports	Factory acceptance test (FAT) reports	

(d) Turbine Details (to be filled in for the HPP and PSP separately)

Category	Parameter Description	Data
Type of prime mover	Hydro-electric turbine Other (Pumped storage)	
Manufacturer of turbine	Manufacturer and name plate details	
Modes of operation	Type of modes of operation capable: - Generator - Pump storage - Synchronous condenser	
Governor	- Electro-mechanical governor (including settings and drawings) - Digital electric governor (including settings and drawings) - PID governor details and settings - Transient droop (dashpot) governor details and settings - Tacho-accelerometric governor details and settings - Input transducer details - Transfer function data	
	Digital electric governor	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min Guide vane/wicket gate characteristic, including opening, closing rates/times and limits	
Droop	Droop setting (% on machine base)	
	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz or RPM)	
Hydro-electric turbine	Type of hydro turbine	
	- Impulse turbines : typical with high head plants (Pelton wheel)	
	- Reaction turbine : typical with low and medium head plants (such as Francis and Kaplan turbine	
	Head, water flow, velocity and pressure (e.g. intake and outtake/draft tube)	

Penstock	Length (m)	
	Area (m^2)	
	Internal penstock diameter	
	Pipe thickness, material or other characteristics (such as tapering)	
	Non-elastic or elastic	
	Linear or non-linear model (with or without relief valve) or Kaplan model	
	Flow of water through turbine (m^3/s) – with gates fully open	
	Number of penstocks supplied from common tunnel	
Pressure relief valve	Drawings/schematics	
	Settings	
	Operational descriptions	
Surge tank, reservoir and tail water (i.e. head)	Vertical distance between the upper reservoir and level of turbine (in meters)	
	Head at turbine admission (lake head minus tailrace head) – (in meters)	
	Head loss due to friction in conduit (in meters)	
	Surge tank height, diameter and other characteristics (e.g. restricted inlet orifice)	
Pump characteristics	Active power draw vs head (table)	
	PSS status when pumping (on/off/not used)	
Synchronous condenser	Dewatered when operating as Syncon (yes/no)	
	Losses when operating as Syncon: • Mechanical loss (0 Mvar) : ..... MW • Copper loss (table) MW loss as a function of MVar output	
Other	Details of protection schemes that could influence dynamics (if any)	
	Details of resonance chamber for pipes (if any)	
	Temperature (e.g. water , ambient , unit)	
	Characteristic curve of blade versus gate (from 0MW to maximum MW)	

3.2 Generic Models for synchronous machine

Hydro machines are multi-pole machines and depending upon the saturation characteristic of the machine they are classified in two groups:

- GENSAL – Salient pole machine with quadratic saturation function
- GENSAE – Salient pole machine with exponential saturation function

Category	Parameter Description	Data
GENERATOR model		
GENSAE OR **GENSAL**	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated) = Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xl	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

While entering the values in above table, following relationship must be kept:

Xd>Xq>Xq'≥Xd'>Xq"≥Xd''

Tdo'>Td'>Tdo''>Td''

Tqo''>Tq'>Tqo''>Tq''

3.3 Excitation system model:

If a generic model is used, the first step must be to identify what type of exciter is present in the excitation system. The IEEE Std 421.5 (IEEE Recommended Practice for Excitation System Models for Power System Stability Studies published on 26th Aug 2016) has published several generic models, which are classified into three groups:

- Type DC : for excitation systems with a DC exciter
- Type AC : for excitation systems with an AC exciter
- Type ST : for excitation systems with a static exciter

The following table shows the types of models separated into their respective groups.

DC exciter	AC exciter	Static excitation system
Type DC1A	Type AC1A	Type ST1A
Type DC2A	Type AC2A	Type ST2A
Type DC3A	Type AC4A	Type ST3A
Type DC4B	Type AC5A	Type ST4B
	Type AC6A	Type ST5B
	Type AC7B	Type ST6B
	Type AC8B	Type ST7B

Category	Parameter Description	Data
DC Exciter		
ESDC1A OR ESDC2A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (> 0) rate feedback time constant (sec)	
	Switch	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
DC Exciter		
ESDC3A	TR regulator input filter time constant (sec)	
	KV (pu) limit on fast raise/lower contact setting	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	TRH (> 0) Rheostat motor travel time (sec)	
	TE (> 0) exciter time-constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	VEMIN (pu) exciter minimum limit	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESDC4B	TR regulator input filter time constant (sec)	
	KP (pu) (> 0) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KD (pu) voltage regulator derivative gain	
	TD voltage regulator derivative channel time constant (sec)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KA (> 0) (pu) voltage regulator gain	
	TA voltage regulator time constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC1A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
ESAC2A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KB, Second stage regulator gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	KH, Exciter field current feedback gain	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC3A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	KR (>0), Constant associated with regulator and alternator field power supply	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KN, Exciter feedback gain	
	EFDN, A parameter defining for which value of UF the feedback gain shall change from KF to KN	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESAC4A	TR regulator input filter time constant (sec)	
	VIMAX, Maximum value of limitation of the integrator signal VI in p.u	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC, rectifier regulation factor (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC5A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (sec), Regulator stabilizing circuit time constant in seconds	
	TF2 (sec), Regulator stabilizing circuit time constant in seconds	
	TF3 (sec), Regulator stabilizing circuit time constant in seconds	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
AC6A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TK (sec), Lead time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFELIM, Exciter field current limit reference	
	KH, Damping module gain	
	VHMAX, damping module limiter	
	TH (sec), damping module lag time constant	
	TJ (sec), damping module lead time constant	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC7B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KPA (pu) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KP (pu)	
	KL (pu)	
	KF1 (pu)	
	KF2 (pu)	
	KF3 (pu)	
	TF3 (sec) time constant (> 0)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) exciter field current limit (> 0)	
	VEMIN (pu)	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC8B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VPIDMAX (pu) PID maximum limit	
	VPIDMIN (pu) PID minimum limit	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) max exciter field current limit (> 0)	
	VEMIN (pu),	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
Static Exciter		
ST1A	TR (sec) regulator input filter time constant	
	VIMAX, Controller Input Maximum	
	VIMIN, Controller Input Minimum	
	TC (s), Filter 1st Derivative Time Constant	
	TB (s), l Filter 1st Delay Time Constant	
	TC1 (s), Filter 2nd Derivative Time Constant	
	TB1 (s), Filter 2nd Delay Time Constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KLR, Current Input Factor	
	ILR, Current Input Reference	

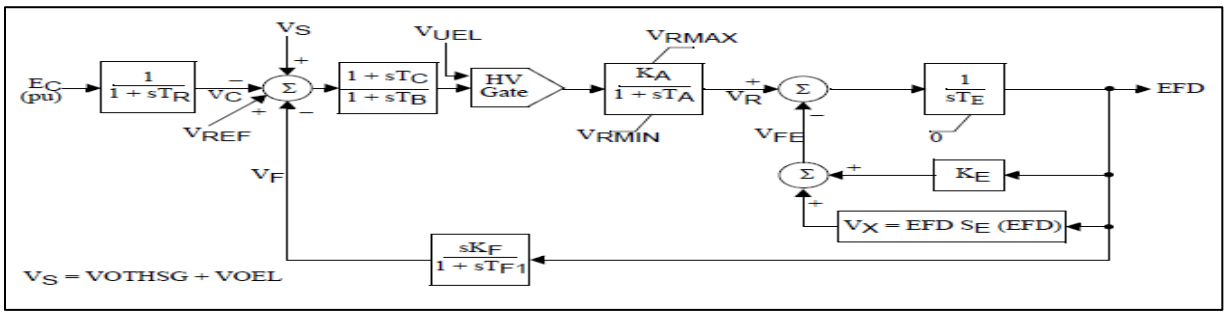
Category	Parameter Description	Data
Static Exciter		
ST2A	TR (sec) regulator input filter time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	EFDMAX	
ST3A	TR (sec) regulator input filter time constant	
	VIMAX, Maximum value of limitation of the signal VI in p.u.	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	KM, Forward gain constant of the inner loop field regulator	
	TC (s), lag time constant	
	TB (s), lead time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KG, Feedback gain constant of the inner loop field regulator	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX, Maximum value of limitation of the signal VB in p.u.	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL, Reactance associated with potential source	
	VGMAX, Maximum value of limitation of the signal VG in p.u	
	Θ_P (degrees)	
	TM (sec), Forward time constant of the inner loop field regulator	
	VMMAX, Maximum value of limitation of the signal VM in p.u	
	VMMIN, Minimum value of limitation of the signal VM in p.u.	

Category	Parameter Description	Data
Static Exciter		
ST4B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TA (sec) voltage regulator time constant	
	KPM, Regulator gain	
	KIM, Regulator gain	
	VMMAX, Maximum value of limitation of the signal in p.u.	
	VMMIN, Minimum value of limitation of the signal in p.u.	
	KG	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL	
	Θ_P (degrees)	
ST5B	TR regulator input filter time constant (sec)	
	TC1 lead time constant of first lead-lag block (voltage regulator channel) (sec)	
	TB1 lag time constant of first lead-lag block (voltage regulator channel) (sec)	
	TC2 lead time constant of second lead-lag block (voltage regulator channel) (sec)	
	TB2 lag time constant of second lead-lag block (voltage regulator channel) (sec)	
	KR (>0) (pu) voltage regulator gain	
	VRMAX (pu) voltage regulator maximum limit	
	VRMIN (pu) voltage regulator minimum limit	
	T1 voltage regulator time constant (sec)	
	KC (pu)	
	TUC1 lead time constant of first lead-lag block (under-excitation channel) (sec)	
	TUB1 lag time constant of first lead-lag block (under-excitation channel) (sec)	
	TUC2 lead time constant of second lead-lag block (under-excitation channel) (sec)	
	TUB2 lag time constant of second lead-lag block (under-excitation channel) (sec)	
	TOC1 lead time constant of first lead-lag block (over-excitation channel) (sec)	
	TOB1 lag time constant of first lead-lag block (over-excitation channel) (sec)	
	TOC2 lead time constant of second lead-lag block (over-excitation channel) (sec)	
	TOB2 lag time constant of second lead-lag block (over-excitation channel) (sec)	

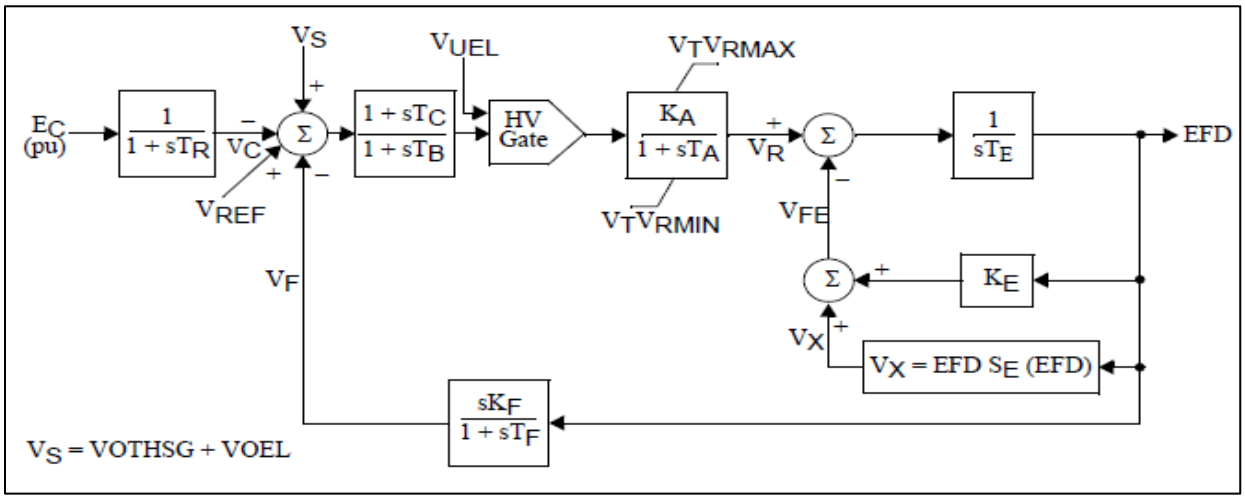
Category	Parameter Description	Data
Static Exciter		
ST6B	TR regulator input filter time constant (sec)	
	KPA (pu) (> 0) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	KDA (pu) voltage regulator derivative gain	
	TDA voltage regulator derivative channel time constant (sec)	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KFF (pu) pre-control gain of the inner loop field regulator	
	KM (pu) forward gain of the inner loop field regulator	
	KCI (pu) exciter output current limit adjustment gain	
	KLR (pu) exciter output current limiter gain	
	ILR (pu) exciter current limit reference	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KG (pu) feedback gain of the inner loop field voltage regulator	
	TG (> 0) feedback time constant of the inner loop field voltage regulator (sec)	
ST7B	TR regulator input filter time constant (sec)	
	TG lead time constant of voltage input (sec)	
	TF lag time constant of voltage input (sec)	
	Vmax (pu) voltage reference maximum limit	
	Vmin (pu) voltage reference minimum limit	
	KPA (pu) (>0) voltage regulator gain	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KH (pu) feedback gain	
	KL (pu) feedback gain	
	TC lead time constant of voltage regulator (sec)	
	TB lag time constant of voltage regulator (sec)	
	KIA (pu) (>0) gain of the first order feedback block	
	TIA (>0) time constant of the first order feedback block (sec)	

(i) **DC Exciters Generic model:**

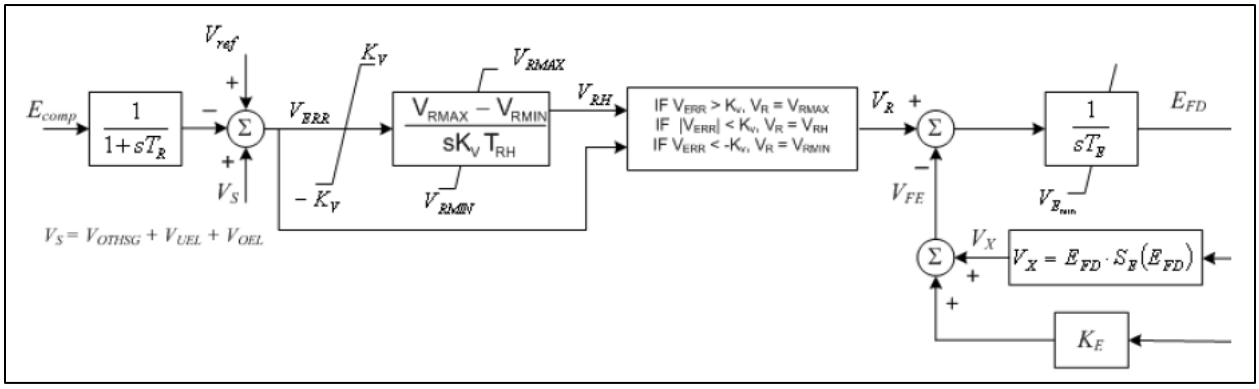
- **Type DC1A: 1992 IEEE type DC1A excitation system model**



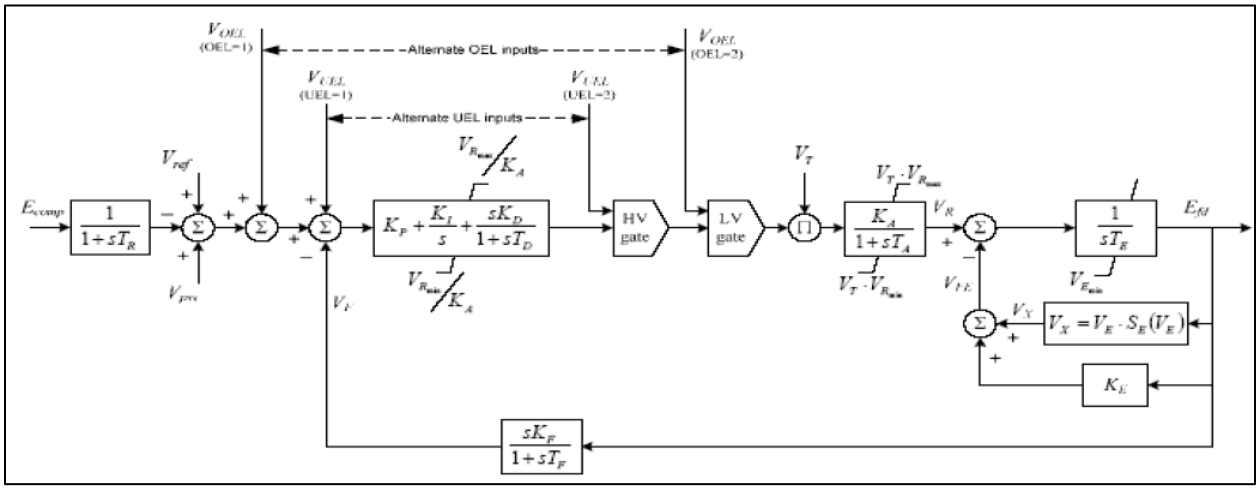
➢ **Type DC2A: 1992 IEEE type DC2A excitation system model**



➢ **Type DC3A: IEEE 421.5 2005 DC3A excitation system**

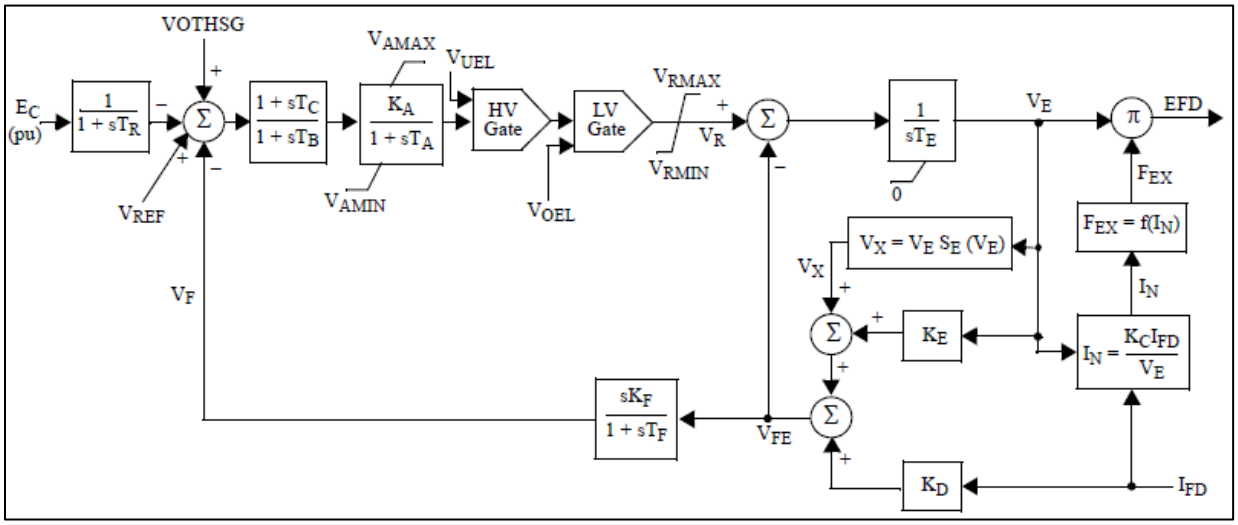


➢ **Type DC4B: IEEE 421.5 2005 DC4B excitation system**



(ii) **AC Exciters Generic Models:**

- **Type AC1A: 1992 IEEE type AC1A excitation system model**



I_N → If $I_N \le 0$: $F_{EX} = 1$

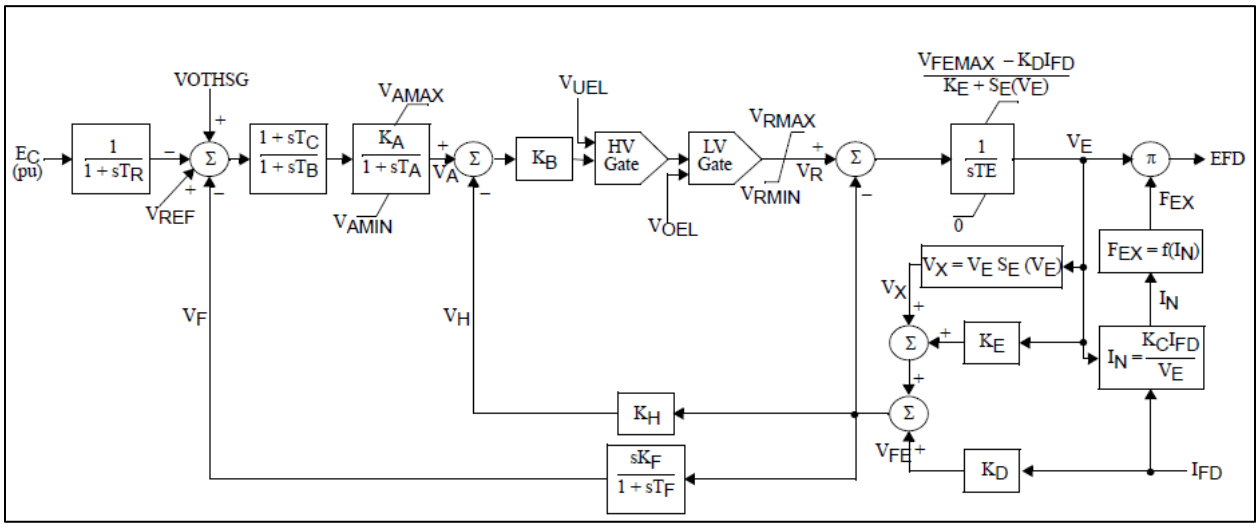
If $I_N \le 0.433$: $F_{EX} = 1 - 0.577\ I_N$

If $0.433 < I_N < 0.75$: $F_{EX} = \sqrt{0.75 - I_N^2}$

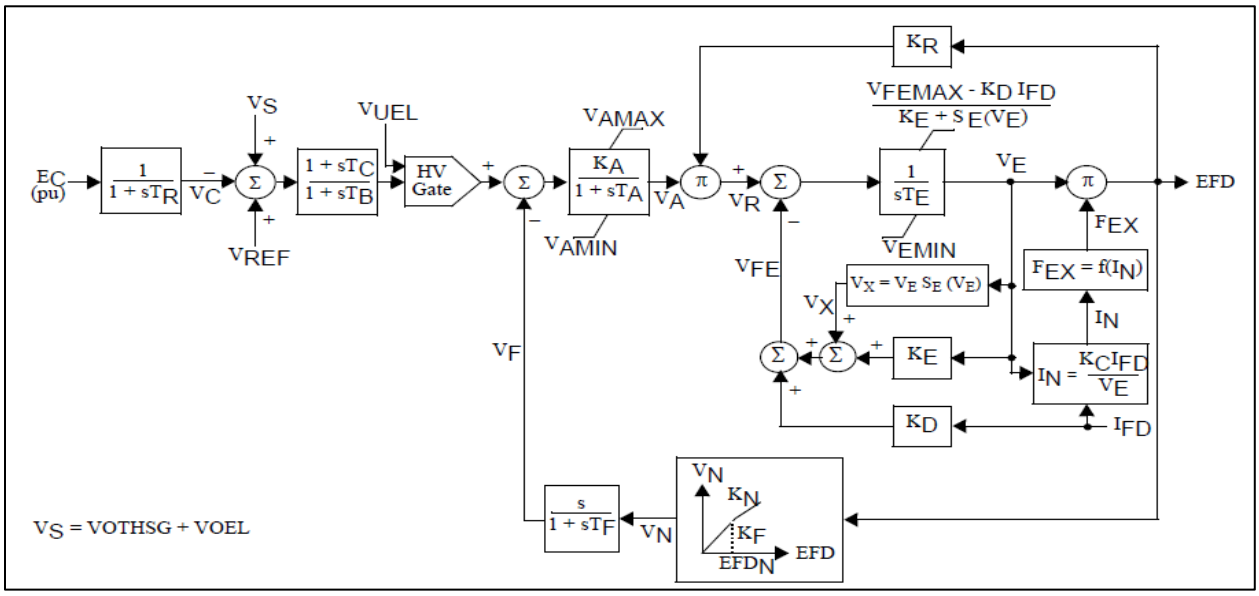
If $I_N \ge 0.75$: $F_{EX} = 1.732(1 - I_N)$

If $I_N > 1$: $F_{EX} = 0$ → F_{EX}

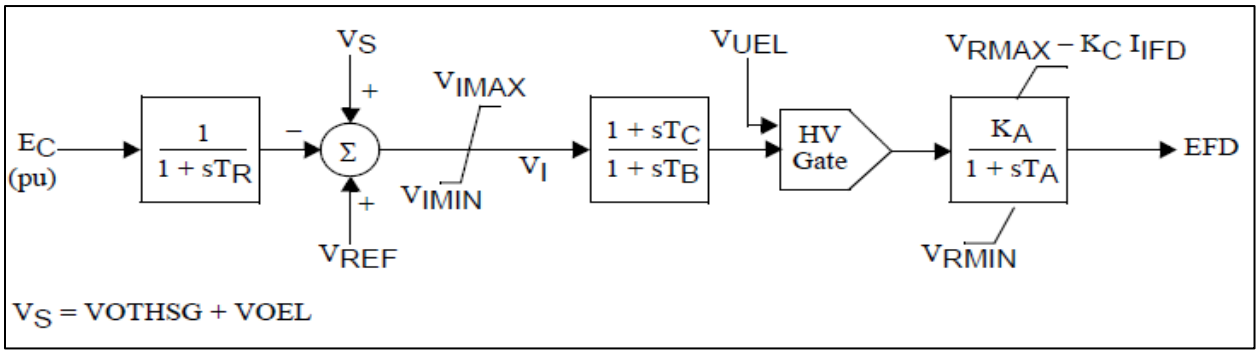
- **Type AC2A: 1992 IEEE type AC2A excitation system model**



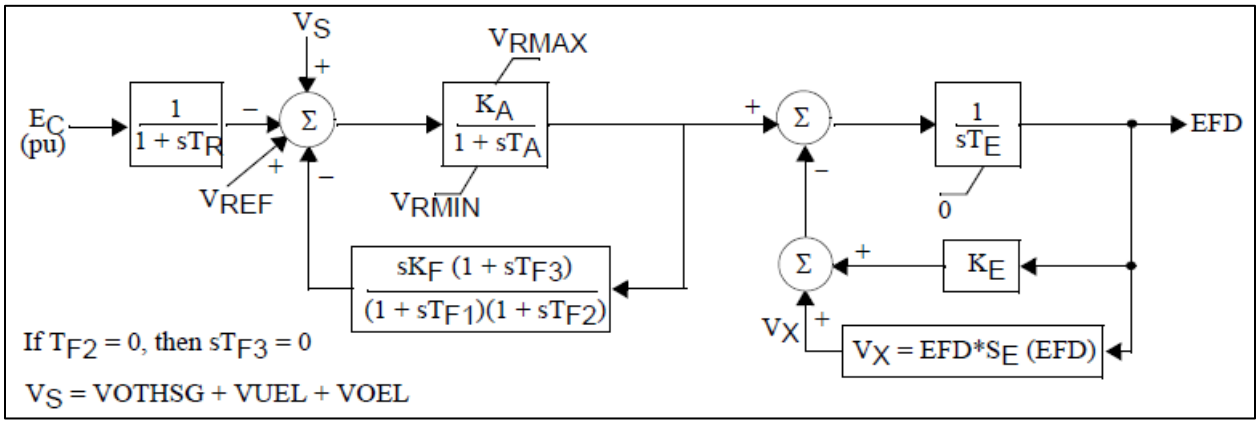
- **Type AC3A: 1992 IEEE type AC3A excitation system model**



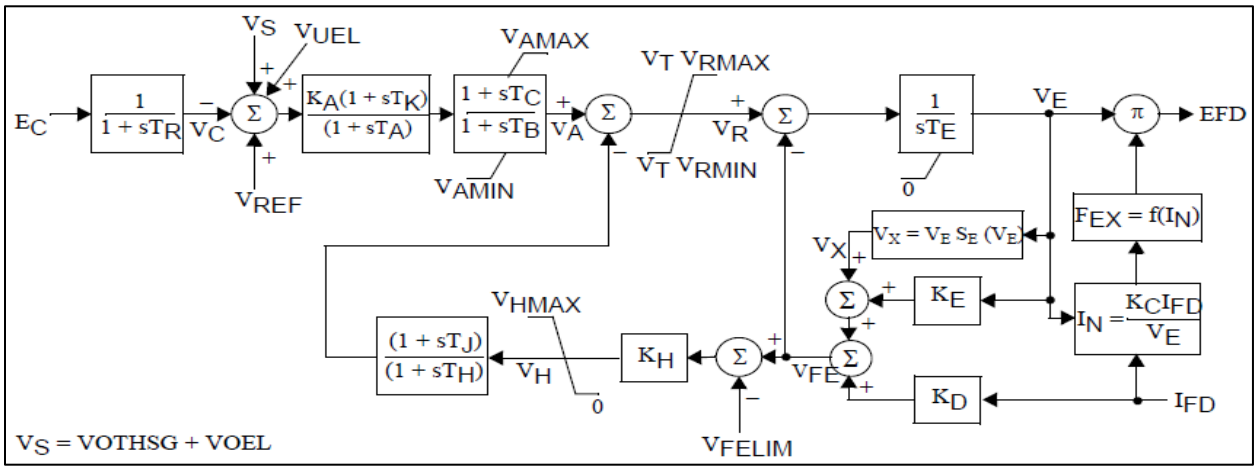
- **Type AC4A: 1992 IEEE type AC4A excitation system model**



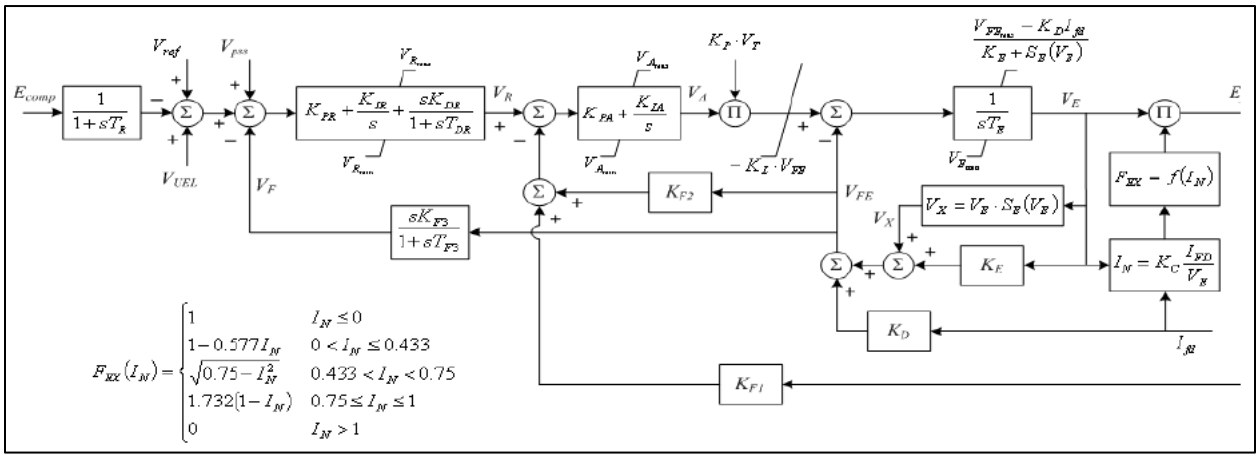
- **Type AC5A: 1992 IEEE type AC5A excitation system model**



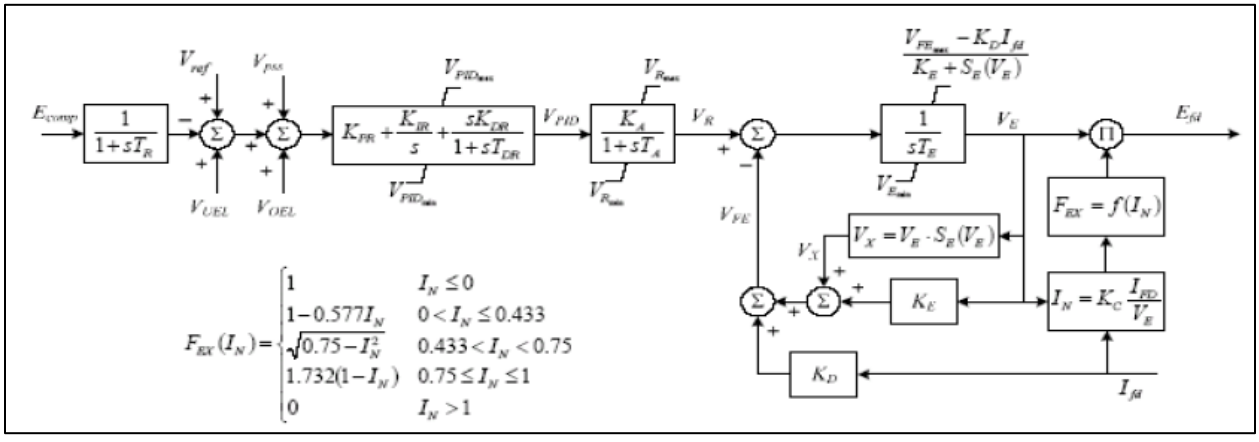
- **Type AC6A: IEEE 421.5 excitation system model**



- **Type AC7B: IEEE 421.5 2005 AC7B excitation system**

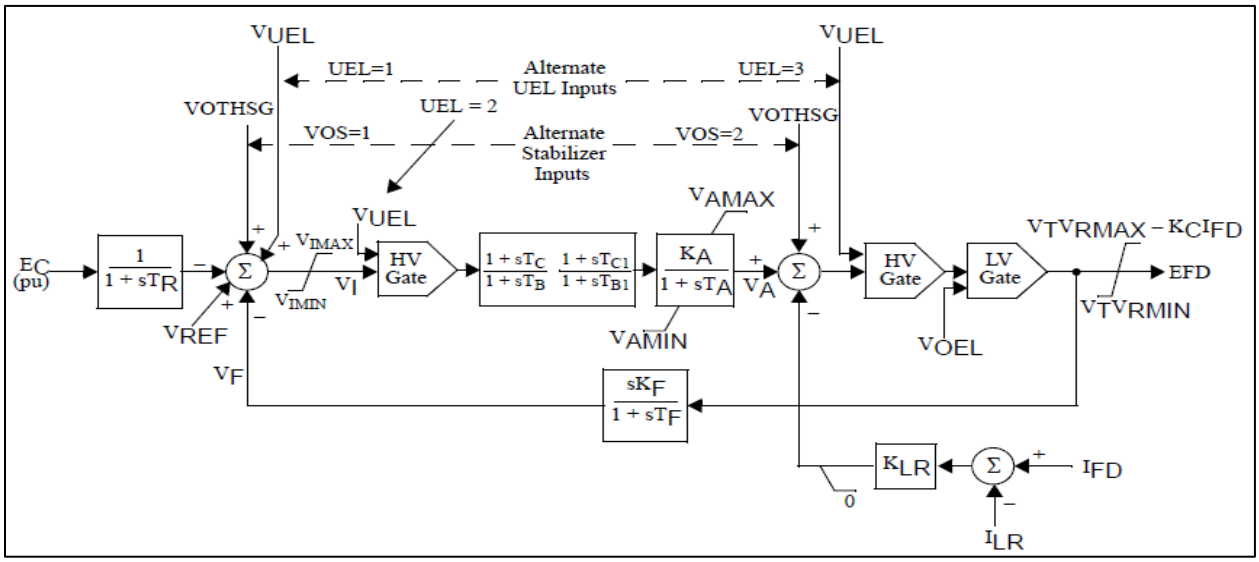


- **Type AC8B: IEEE 421.5 2005 AC8B excitation system**

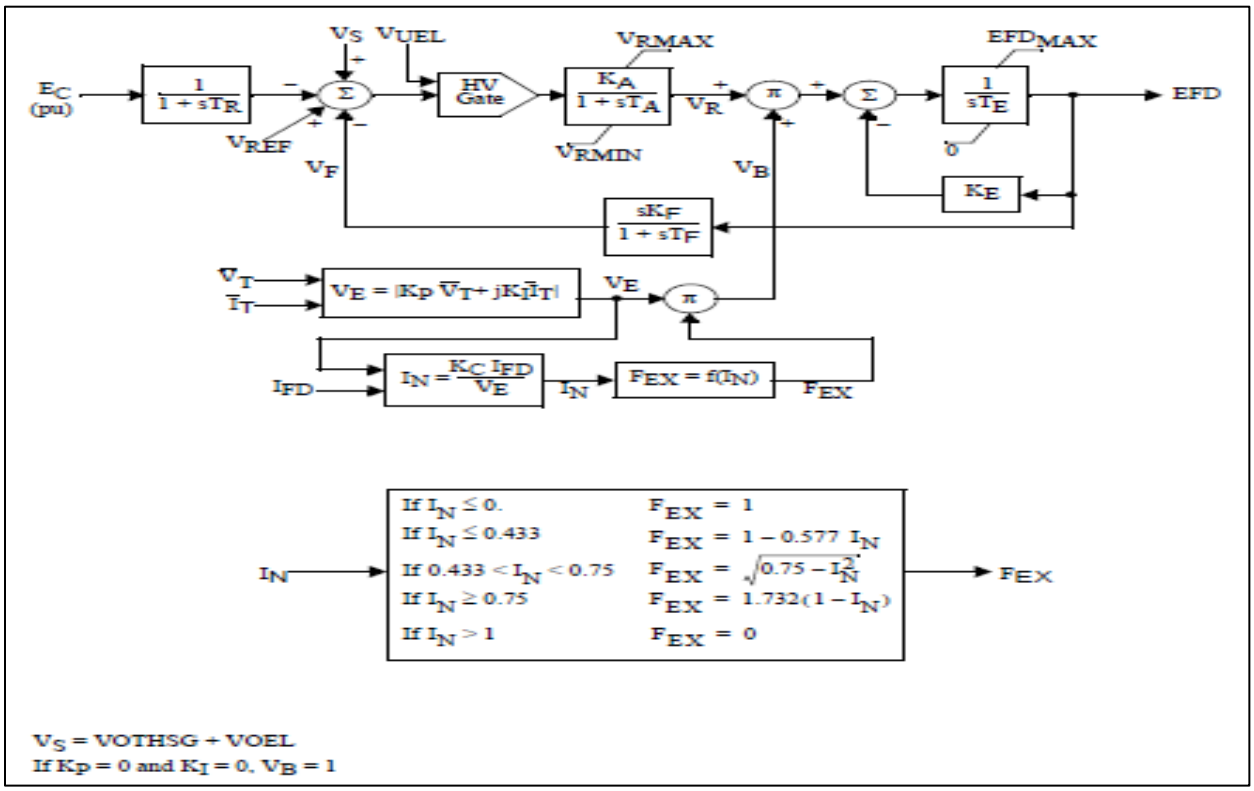


(iii) **Commonly Used Static Exciters Generic Models block diagrams:**

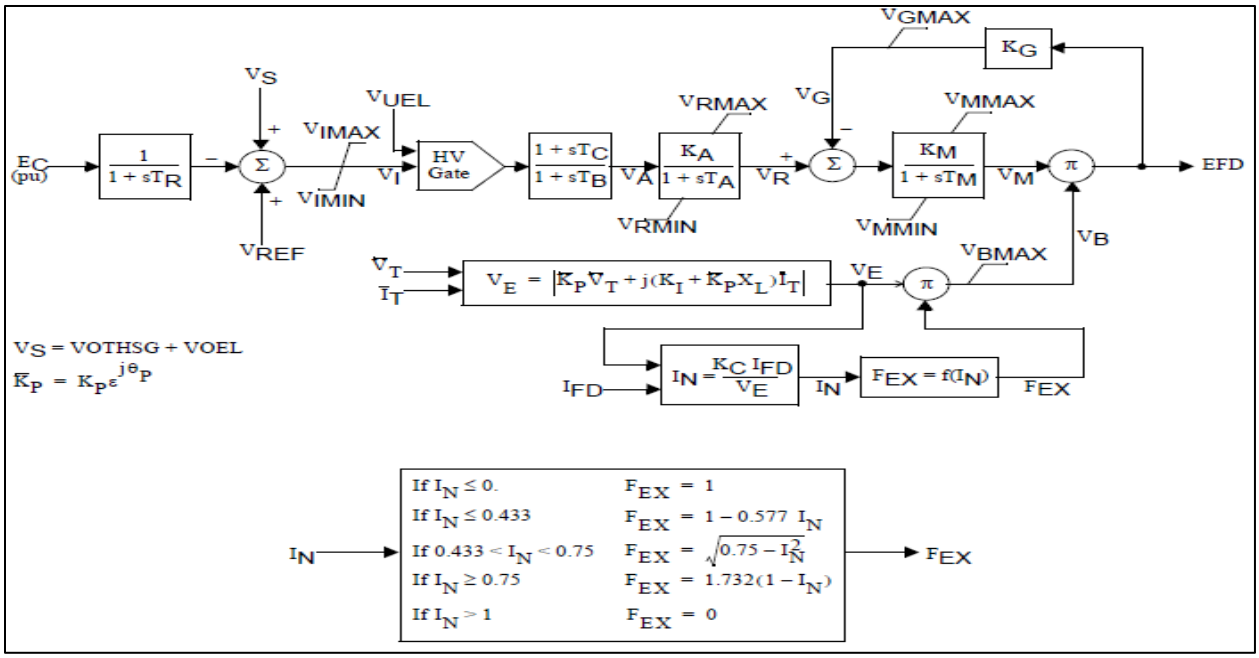
- **Type ST1A: 1992 IEEE type ST1A excitation system model**



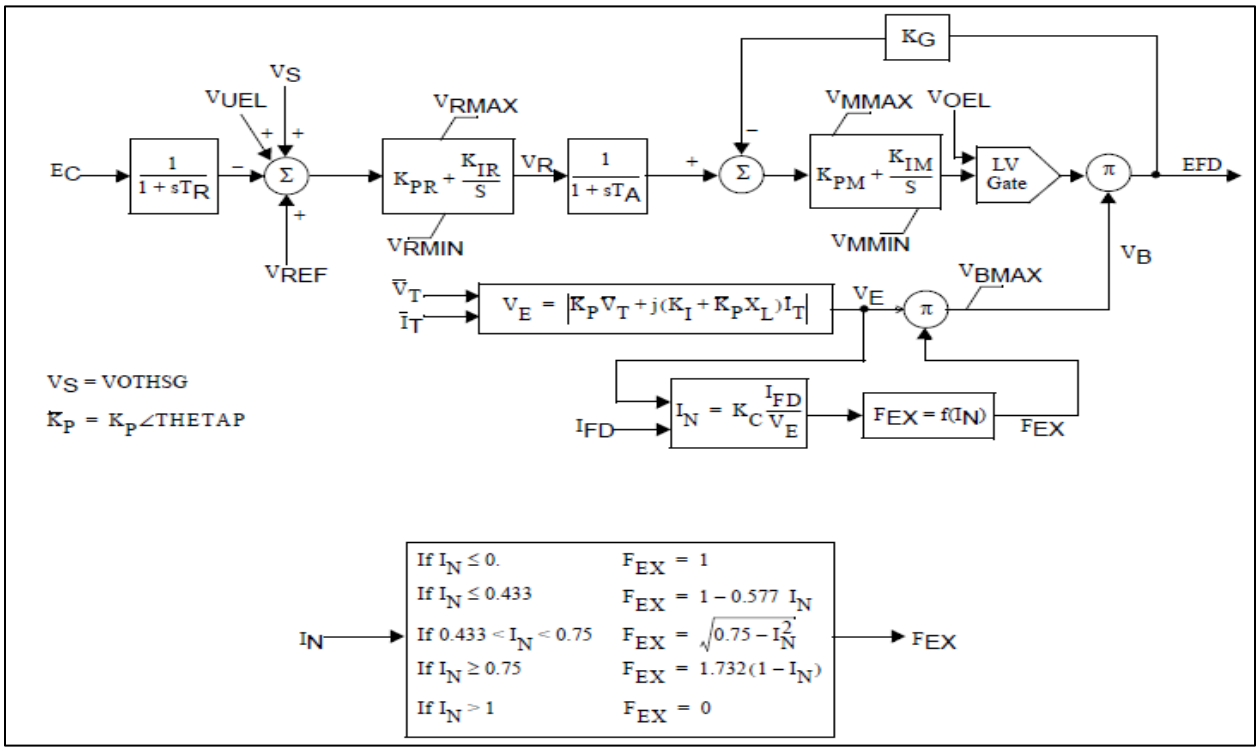
- **Type ST2A: 1992 IEEE type ST2A excitation system model**



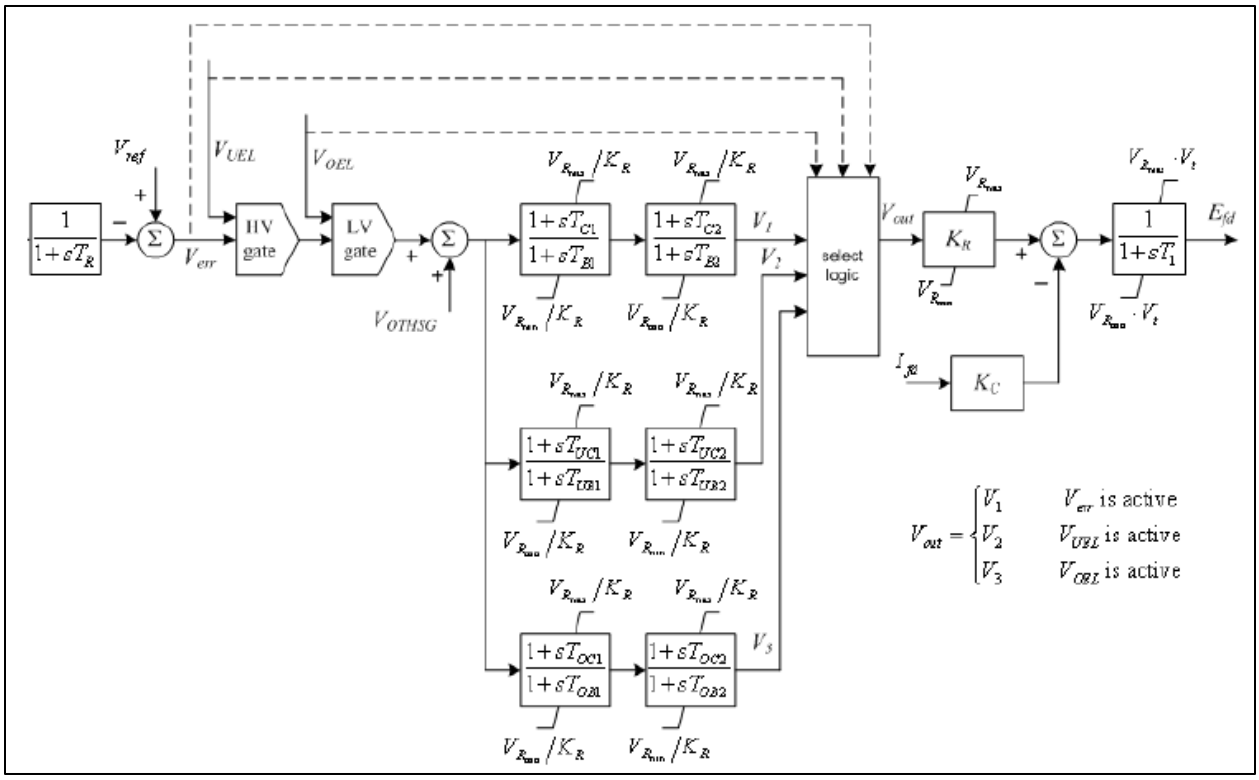
➢ **Type ST3A: 1992 IEEE type ST3A excitation system model**



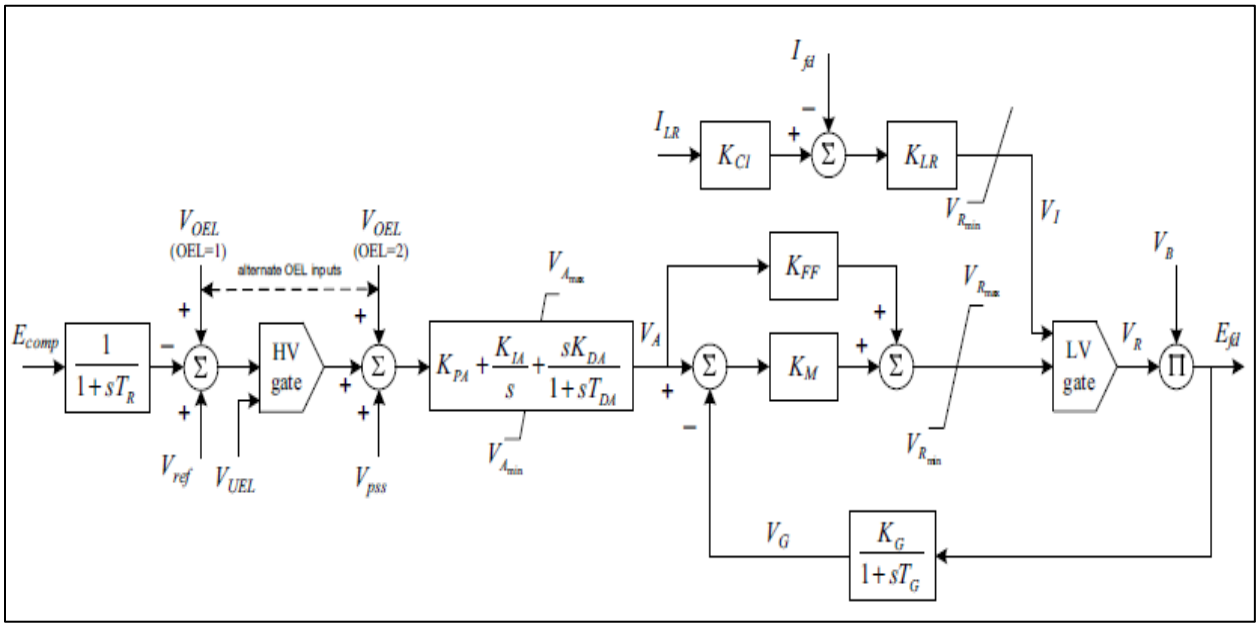
➢ **Type ST4B: IEEE type ST4B potential or compounded source-controlled rectifier exciter**



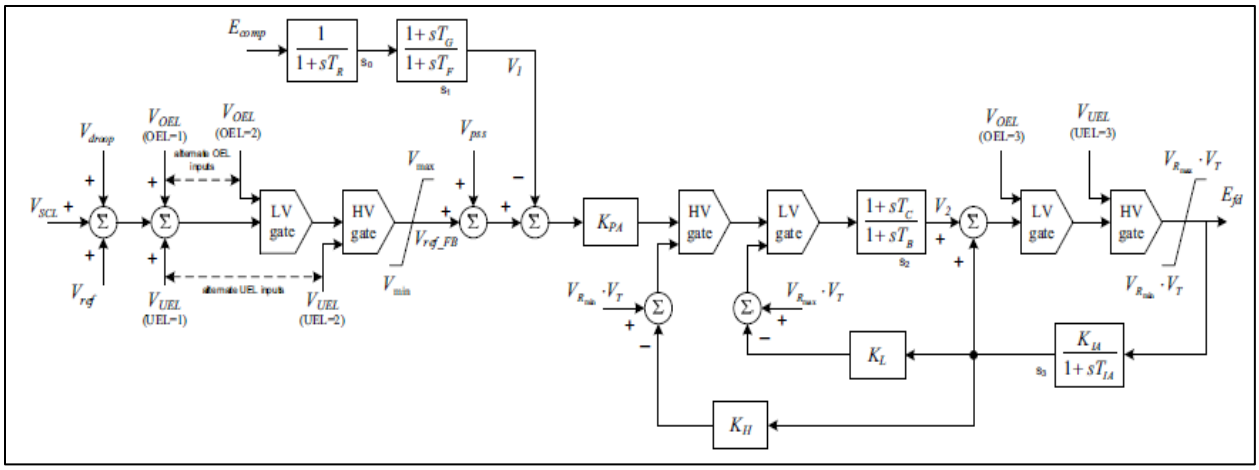
➢ **Type ST5B: IEEE 421.5 2005 ST5B excitation system**



➢ **Type ST6B: IEEE 421.5 2005 ST6B excitation system**



➢ **Type ST7B: IEEE 421.5 2005 ST7B excitation system**



Source-PSSE Model Library

3.4 Power system stabilizer:

The function of the PSS is to add to the unit's characteristic electromechanical oscillations. This is achieved by modulating excitation to develop a component in electrical torque in phase with rotor speed deviations.

The most important aspect when considering a PSS model is the number of inputs. The following table shows the type of models separated based on the inputs:

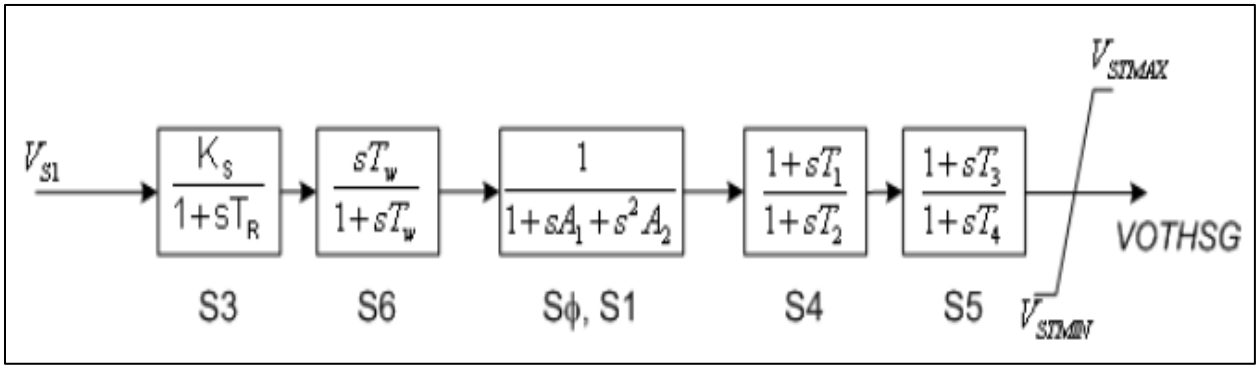
Type	Inputs	Remarks
PSS1A	Single input	Two lead-lags Input can either be speed, frequency or power
PSS2B	Dual input	Integral of accelerating power type stabiliser Speed and Power Most common type Supersedes PSS2A (three versus two lead lags)
PSS3B	Dual input	Power and rotor angular frequency deviation Stabilising signal is a vector sum of processed signals Not very common

Category	Parameter Description	Data
Stabilizer Models		
PSS1A	A1, Filter coefficient	
	A2, Filter coefficient	
	TR, transducer time constant	
	0	
	0	
	0	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	Tw, Washout Time Constant	
	Tw, Washout Time Constant	
	Ks, input channel gain	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	
	0	
	0	
PSS2B	TW1, 1st Washout 1th Time Constant	
	TW2, 1st Washout 2th Time Constant	
	T6, 1st Signal Transducer Time Constant	
	TW3, 2nd Washout 1th Time Constant	
	TW4, 2nd Washout 2th Time Constant	
	T7, 2nd Signal Transducer Time Constant	
	KS2, 2nd Signal Transducer Factor	
	KS3, Washouts Coupling Factor	
	T8, Ramp Tracking Filter Deriv. Time Constant	
	T9, Ramp Tracking Filter Delay Time Constant	
	KS1, PSS Gain	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	T10, 3rd Lead-Lag Derivative Time Constant	
	T11, 3rd Lead-Lag Delay Time Constant	
	VS1MAX, Input 1 Maximum limit	
	VS1MIN, Input 1 Minimum limit	
	VS2MAX, Input 2 Maximum limit	
	VS2MIN, Input 2 Minimum limit	
	VSTMAX, Controller Maximum Output	
	VSTMIN, Controller Minimum Output	

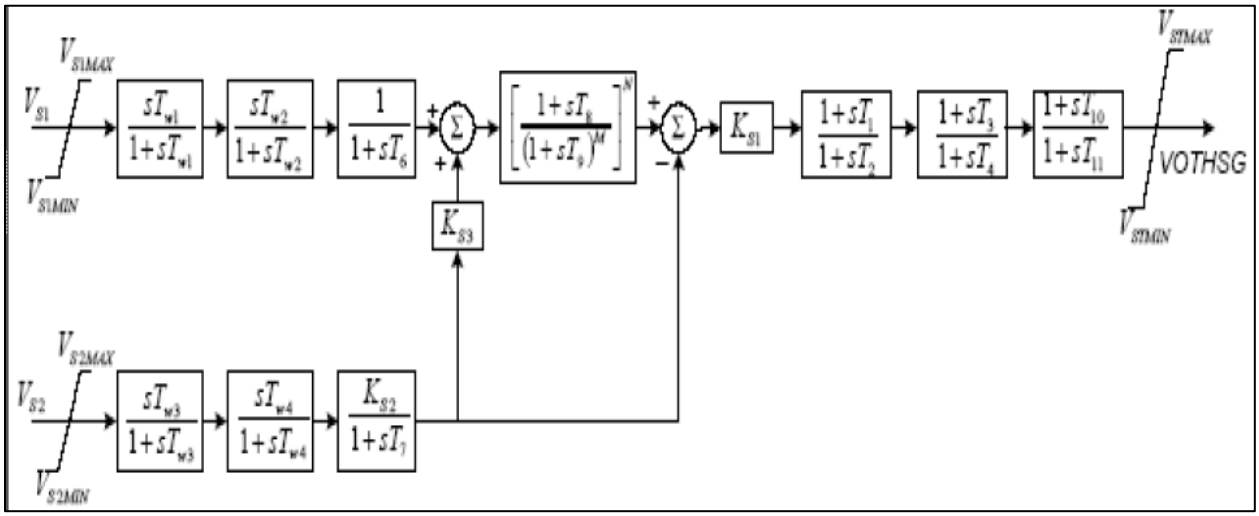
Category	Parameter Description	Data
Stabilizer Models		
PSS3B	KS1 (pu) (≠0), input channel #1 gain	
	T1 input channel #1 transducer time constant (sec)	
	Tw1 input channel #1 washout time constant (sec)	
	KS2 (pu) (0), input channel #2 gain	
	T2 input channel #2 transducer time constant (sec)	
	Tw2 input channel #2 washout time constant (sec)	
	Tw3 (0), main washout time constant (sec)	
	A1, Filter coefficient	
	A2, Filter coefficient	
	A3, Filter coefficient	
	A4, Filter coefficient	
	A5, Filter coefficient	
	A6, Filter coefficient	
	A7, Filter coefficient	
	A8, Filter coefficient	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	

Commonly Used Power System Stabilizer generic models block diagrams:

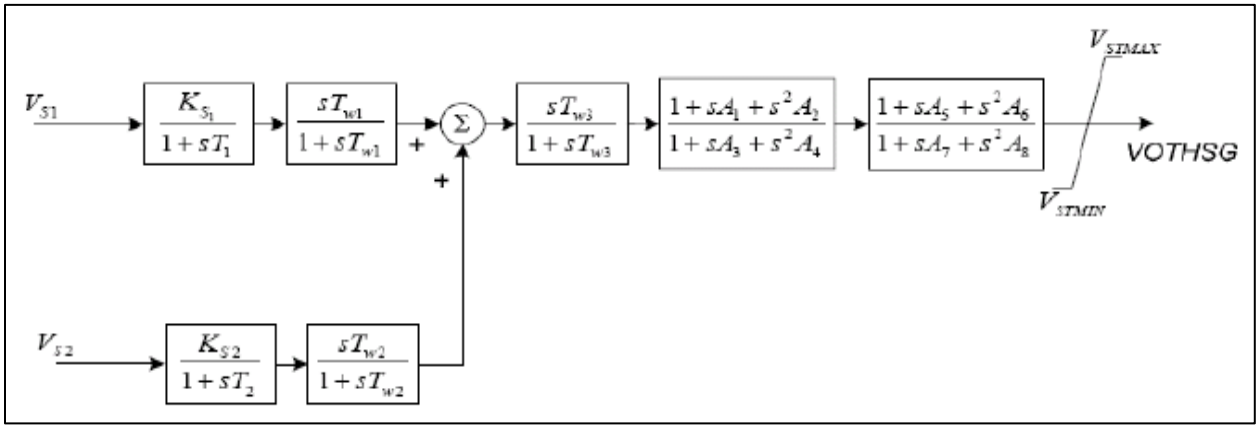
- **PSS1A: IEEE Std. 421.5-2005 PSS1A Single-Input Stabilizer model**



- **PSS2B: IEEE 421.5 2005 PSS2B IEEE dual-input stabilizer model**



- **PSS3B: IEEE Std. 421.5 2005 PSS3B IEEE dual-input stabilizer model**



Source-PSSE Model Library

3.5 Generic models for turbine-governor:

The following table is a list for common generic models of hydro turbines:

Type	Name	Remarks
HYGOV	Hydro-turbine Governor	Simple hydro model with unrestricted head race and tail race, no surge tank
HYGOVDU	Hydro turbine-governor model with speed dead band	Added asymmetrical deal band
HYGOVM	Hydro-Turbine Governor	Includes detailed representation of surge chamber
WEHGOV	Woodward Electric Hydro Governor Model	Woodward hydro governor with non-linear model for penstock dynamics
HYGOVT	Hydro Turbine-Governor traveling wave model	Travelling-wave solution applied to penstock and tunnel
PIDGOV	Hydro Turbine Governor	Straight forward penstock configuration with PID governor
HYGOVR1	Fourth order lead-lag hydro-turbine	for a unit with digital controls, allows a nonlinear relationship between the gate position and power
TURCZT	Czech hydro or steam turbine governor model	General-purpose hydro and thermal turbine-governor model. Penstock dynamic is not included in the model
TWDM1T	Tail water depression hydro governor model 1	same basic permanent and transient droop elements as the HYGOV model, but it adds a representation for a tail water depression protection system
TWDM2T	Tail water depression hydro governor model 2	Same as TWDM1T and uses a governor proportional-integral-derivative (PID) controller
WPIDHY	Woodward PID hydro governor model	includes governor controls representing a Woodward PID hydro governor .The model includes a nonlinear gate/power relationship and a linearized turbine/penstock model.
WSHYDD	WECC double derivative hydro governor model	Double-derivative hydro turbine-governor mode. Includes two dead band, also includes a nonlinear gate/power relationship and a linearized turbine/ penstock model
WSHYGP	WECC GP hydro governor plus turbine model	WECC GP hydro turbine-governor model with a PID controller, penstock dynamics are similar to those of the WECC WSHYDD

Source: PSSE Model Library, for models other than the above list refer to

https://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/transmission-system-planning-tab/pages/user-support.aspx

Category	Parameter Description	Data
TURBINE GOVERNOR model		
HYGOV	R, permanent droop	
	r, temporary droop	
	Tr (>0) governor time constant	
	Tf (>0) filter time constant	
	Tg (>0) servo time constant	
	+ VELM, gate velocity limit	
	GMAX, maximum gate limit	
	GMIN, minimum gate limit	
	TW (>0) water time constant	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
HYGOVDU	R, permanent droop	
	r, temporary droop	
	Tr (>0) governor time constant	
	Tf (>0) filter time constant	
	Tg (>0) servo time constant	
	+ VELM, gate velocity limit	
	GMAX, maximum gate limit	
	GMIN, minimum gate limit	
	TW (>0) water time constant	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	DBH (pu), droop for over-speed, (> 0)	
	DBL (pu), droop for under-speed, (< 0)	
	TRate (MW), turbine rating, if zero, then MBASE used	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
HYGOVM	Prated, rated turbine power (MW	
	Qrated, rated turbine flow (cfs or cms)	
	Hrated, rated turbine head (ft or m)	
	Grated, gate position at rated conditions (pu)	
	QNL, no power flow (pu of Qrated)	
	R, permanent droop (pu)	
	r, temporary droop (pu)	
	Tr, governor time constant (> 0) (sec)	
	Tf, filter time constant (> 0) (sec)	
	Tg, servo time constant (> 0) (sec)	
	MXGTOR, maximum gate opening rate (pu/sec)	
	MXGTCR, maximum gate closing rate (< 0) (pu/sec)	
	MXBGOR, maximum buffered gate opening rate (pu/sec)	
	MXBGCR, maximum buffered gate closing rate (< 0) (pu/sec)	
	BUFLIM, buffer upper limit (pu)	
	GMAX, maximum gate limit (pu)	
	GMIN, minimum gate limit (pu)	
	RVLVCR, relief valve closing rate (< 0) (pu/sec) or MXJDOR, maximum jet deflector opening rate (pu/sec)	
	RVLMAX, maximum relief valve limit (pu) or MXJDCR, maximum jet deflector closing rate (< 0) (pu/sec)	
	HLAKE, lake head (ft or m)	
	HTAIL, tail head (ft or m)	
	PENL/A, summation of penstock, scroll case and draft tube lengths/ cross sections (> 0) (1/ft or 1/m)	
	PENLOS, penstock head loss coefficient (ft/cfs2 or m/cms2)	
	TUNL/A, summation of tunnel lengths/cross sections (>0) (1/ft or 1/m)	
	TUNLOS, tunnel head loss coefficient (ft/cfs^2 or m/cms^2)	
	SCHARE, surge chamber effective cross section (>0) (ft^2 or m^2)	
	SCHMAX, maximum water level in surge chamber (ft or m)	
	SCHMIN, minimum water level in surge chamber (ft or m)	
	SCHLOS, surge chamber orifice head loss coefficient (ft/cfs^2 or m/cms^2)	
	DAMP1, turbine damping under RPM1	
	RPM1, over speed (pu)	
	DAMP2, turbine damping above RPM2	
	RPM2, over speed (pu)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
WEHGOV	R-PERM-GATE (Feedback settings)	
	R-PERM-PE (Feedback settings)	
	TPE (sec), Power time constant	
	Kp, Proportional gain	
	KI, Integral gain	
	KD, Derivative gain	
	TD (sec), Derivative time constant	
	TP (sec), Gate servo time constant	
	TDV (sec), Time constant	
	Tg (sec), Gate servo time constant	
	GTMXOP (>0), Max gate opening velocity	
	GTMXCL (<0), Max gate closing velocity	
	GMAX, Maximum governor output	
	GMIN, Minimum governor output	
	DTURB, Turbine damping factor	
	TW (sec), Water inertia time constant	
	Speed Dead Band (DBAND)	
	DPV, Governor limit factor	
	DICN, Gate limiter modifier	
	GATE 1	
	GATE 2	
	GATE 3	
	GATE 4	
	GATE 5	
	FLOW G1	
	FLOW G2	
	FLOW G3	
	FLOW G4	
	FLOW G5	
	FLOW P1	
	FLOW P2	
	FLOW P3	
	FLOW P4	
	FLOW P5	
	FLOW P6	
	FLOW P7	
	FLOW P8	
	FLOW P9	
	FLOW P10	
	PMECH1	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
WEHGOV	PMECH2	
	PMECH3	
	PMECH4	
	PMECH5	
	PMECH6	
	PMECH7	
	PMECH8	
	PMECH9	
	PMECH10	
HYGOVT	Prated, rated turbine power (MW)	
	Qrated, rated turbine flow (cfs or cms)	
	Hrated, rated turbine head (ft or m)	
	Grated, gate position at rated conditions (pu)	
	QNL, no power flow (pu of Qrated)	
	R, permanent droop	
	r, temporary droop (pu)	
	Tr, governor time constant (> 0) (sec)	
	Tf, filter time constant (> 0) (sec)	
	Tg, servo time constant (> 0) (sec)	
	MXGTOR, maximum gate opening rate (pu/sec)	
	MXGTCR, maximum gate closing rate (< 0) (pu/sec)	
	MXBGOR, maximum buffered gate opening rate (pu/sec)	
	MXBGCR, maximum buffered gate closing rate (< 0) (pu/sec)	
	BUFLIM, buffer upper limit (pu)	
	GMAX, maximum gate limit (pu)	
	GMIN, minimum gate limit (pu)	
	RVLVCR, relief valve closing rate (< 0) (pu/sec) or MXJDOR, maximum jet deflector opening rate (pu/sec)	
	RVLMAX, maximum relief valve limit (pu) or MXJDCR, maximum jet deflector closing rate (< 0) (pu/sec)	
	HLAKE, lake head (ft or m)	
	HTAIL, tail head (ft or m)	
	PENLGTH, penstock length (ft or m)	
	PENLOS, penstock head loss coefficient (ft/cfs2 or m/cms2)	
	TUNLGTH, tunnel length (ft or m)	
	TUNLOS, tunnel head loss coefficient (ft/cfs2 or m/cms2)	
	SCHARE, surge chamber effective cross section (>0) (ft2 or m2)	
	SCHMAX, maximum water level in surge chamber (ft or m)	
	SCHMIN, minimum water level in surge chamber (ft or m)	
	SCHLOS, surge chamber orifice head loss coefficient (ft/cfs2 or m/cms2)	
	DAMP1, turbine damping under RPM1	
	RPM1, overspeed (pu)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
HYGOVT	DAMP2, turbine damping above RPM2	
	RPM2, overspeed (pu)	
	PENSPD, penstock wave velocity (>0) (ft/sec or m/sec)	
	PENARE, penstock cross section (>0) (ft2 or m2)	
	TUNSPD, tunnel wave velocity (>0) (ft/sec or m/sec)	
	TUNARE, tunnel cross section (>0) (ft2 or m2)	
PIDGOV	Rperm, permanent drop, pu	
	Treg (sec), speed detector time constant	
	Kp, proportional gain, pu/sec	
	Ki, reset gain, pu/sec	
	Kd, derivative gain, pu	
	Ta (sec) > 0, controller time constant	
	Tb (sec) > 0, gate servo time constant	
	Dturb, turbine damping factor, pu	
	G0, gate opening at speed no load, pu	
	G1, intermediate gate opening, pu	
	P1, power at gate opening G1, pu	
	G2, intermediate gate opening, pu	
	P2, power at gate opening G2, pu	
	P3, power at full opened gate, pu	
	Gmax, maximum gate opening, pu	
	Gmin, minimum gate opening, pu	
	Atw > 0, factor multiplying Tw, pu	
	Tw (sec) > 0, water inertia time constant	
	Velmax, minimum gate opening velocity, pu/sec	
	Velmin < 0, minimum gate closing velocity, pu/sec	
HYGOVR1	db1, Intentional dead band width, Hz	
	Err, deadband hysteresis (p.u.)	
	Td (sec), Input filter time constant, s	
	T1 (sec), Lead time constant 1, s	
	T2 (sec) q, Lag time constant 1, s	
	T3 (sec), Lead time constant 2, s	
	T4 (sec), Lag time constant 2, s	
	T5 (sec), Lead time constant 3, s	
	T6 (sec), Lag time constant 3, s	
	T7 (sec), Lead time constant 4, s	
	T8 (sec), Lag time constant 4, s	
	KP, proportional gain	
	R, Steady-state droop, p.u.	
	Tt, Power feedback time constant, s	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
HYGOVR1	KG, Gate servo gain, p.u.	
	TP (sec), Gate servo time constant, s	
	VELOPEN, Maximum gate opening velocity, p.u./s	
	VELCLOSE, Maximum gate closing velocity, p.u./s (<0)	
	PMAX, Maximum gate opening, p.u. of mwcap	
	PMIN, Minimum gate opening, p.u. of mwcap	
	db2, Unintentional deadband, MW	
	TW (>0) water time constant	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	Trate (Turbine MW rating)	
TURCZT	fDEAD (pu), Frequency Dead Band	
	fMIN (pu), Frequency Minimum Deviation	
	fMAX (pu), Frequency Maximum Deviation	
	KKOR (pu), Frequency Gain	
	KM > 0 (pu), Power Measurement Gain	
	KP (pu), Regulator Proportional Gain	
	SDEAD (pu), Speed Dead Band	
	KSTAT (pu), Speed Gain	
	KHP (pu), High Pressure Constant	
	TC (sec), Measuring transducer time constant	
	T 1 (sec), Regulator Integrator Time Constant	
	TEHP (sec), Hydro Converter Time Constant	
	TV > 0 (sec), Regulation Valve Time Constant	
	THP (sec), High Pressure Time Constant	
	TR (sec), Reheater time constant	
	TW (sec), Water Time Constant	
	NTMAX (pu), Power Regulator-Integrator Maximum Limiter	
	NTMIN (pu), Power Regulator-Integrator Minimum Limiter	
	GMAX (pu), Valve Maximum Open	
	GMIN (pu), Valve Minimum Open	
	VMIN (pu/sec), Valve Maximum Speed Close	
	VMAX (pu/sec), Valve Maximum Speed Open	
TWDM1T	R, permanent droop	
	r, temporary droop	
	Tr, governor time constant (>0)	
	Tf, filter time constant (>0)	
	Tg, servo time constant (>0)	
	VELMX, open gate velocity limit (pu/sec)	

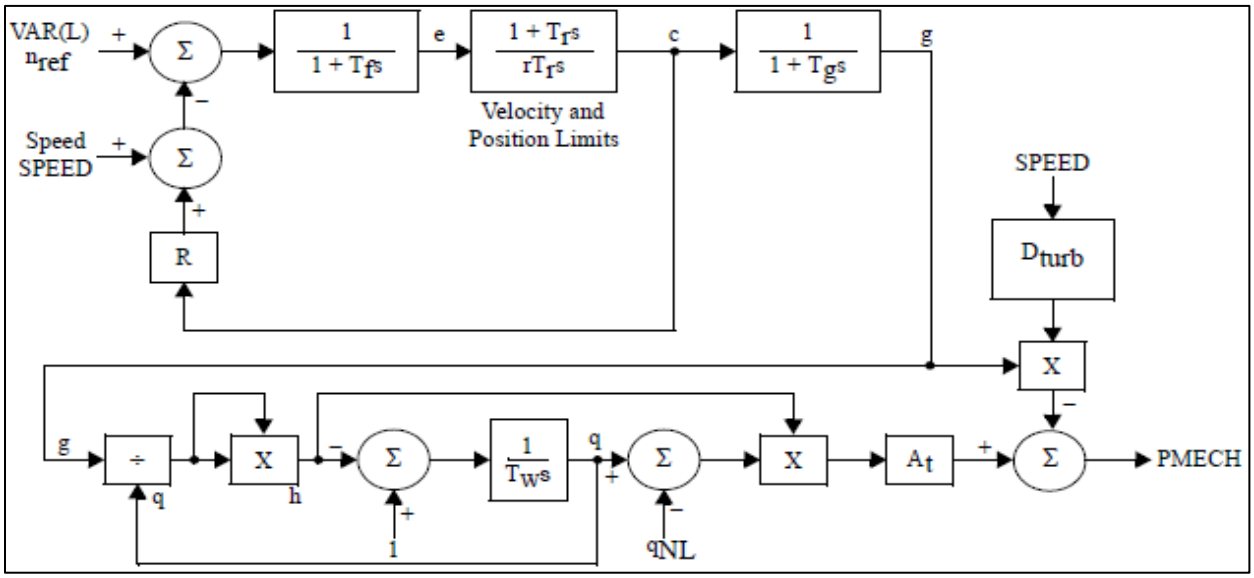
Category	Parameter Description	Data
TURBINE GOVERNOR model		
TWDM1	VELMN, close gate velocity limit (pu/sec) (<0)	
	GMAX, maximum gate limit	
	GMIN, minimum gate limit	
	TW, water time constant (sec) (>0)	
	At, turbine gain	
	Dturb, turbine damping	
	qNL, no power flow	
	F1, frequency deviation (pu)	
	TF1, time delay (sec)	
	F2, frequency deviation (pu)	
	sF2, frequency (pu/sec)	
	TF2, time delay (sec)	
	GMXRT, rate with which GMAX changes when TWD is tripped (pu/sec)	
	NREF, setpoint frequency deviation (pu)	
	Tft, frequency filter time constant (>0	
TWDM2	TREG (sec), governor time constant (s)	
	Reg, permanent droop (p.u. on generator MVA rating)	
	KP, controller proportional gain (p.u.)	
	KI, controller integral gain (p.u./s)	
	KD, controller derivative gain (p.u.-s)	
	TA (sec) (> 0), controller time constant (s)	
	TB (sec) (> 0), controller time constant (s)	
	VELMX (pu/sec), open gate velocity limit (p.u./s)	
	VELMN (pu/sec) (> 0), close gate velocity limit (p.u./s)	
	GATMX (pu), maximum gate limit (p.u.)	
	GATMN (pu), minimum gate limit (p.u.)	
	TW (sec) (> 0), water time constant (s)	
	At, turbine gain	
	qNL, flow rate at no load (p.u.)	
	Dturb, turbine damping factor	
	F1, frequency deviation (pu)	
	TF1, time delay (sec)	
	F2, frequency deviation (pu)	
	sF2, frequency (pu/sec)	
	TF2, time delay (sec)	
	PREF, power reference (pu)	
	Tft, frequency filter time constant (sec) (>0)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
WPIDHY	TREG (sec), governor time constant (s)	
	REG1, permanent droop (p.u. on generator MVA base)	
	KP, controller proportional gain (p.u.)	
	KI, controller integral gain (p.u./s)	
	KD, controller derivative gain (p.u./s)	
	TA (>0) (sec), controller time constant (s)	
	TB (>0) (sec), controller time constant (s)	
	VELMX (>0), open gate velocity limit (p.u./s)	
	VELMN (<0), close gate velocity limit (p.u./s)	
	GATMX, maximum gate limit (p.u.)	
	GATMN, minimum gate limit (p.u.)	
	TW (>0) (sec), water time constant (s)	
	PMAX, maximum gate position (p.u.)	
	PMIN, minimum gate position (p.u.)	
	D	
	G0, gate position at no load (p.u.)	
	G1, first gate intermediate position (p.u.)	
	P1, power at gate position G1 (p.u. on generator MVA rating)	
	G2, second gate intermediate position (p.u.)	
	P2, power at gate position G2 (p.u. on generator MVA rating)	
	P3, power at fully open gate (p.u. on generator MVA rating)	
WSHYDD	db1, deadband width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	Td (sec), input filter time constant (s)	
	K1, derivative gain (p.u.)	
	Tf (sec), derivative time constant (s)	
	KD, double derivative gain (p.u.)	
	KP, integral gain (p.u.)	
	R, droop (p.u. on Trate)	
	Tt, power feedback time constant (s)	
	KG, gate servo gain (p.u.)	
	TP (sec), gate servo time constant (s)	
	VELOPEN (>0), maximum gate opening rate (p.u./s)	
	VELCLOSE (>0), maximum gate closing rate (p.u./s)	
	PMAX, maximum gate opening (p.u.)	
	PMIN, minimum gate opening (p.u.)	
	db2, deadband (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	
	PGV1, coordinate of power-gate look-up table (p.u. power)	
	GV2, coordinate of power-gate look-up table (p.u. gate)	

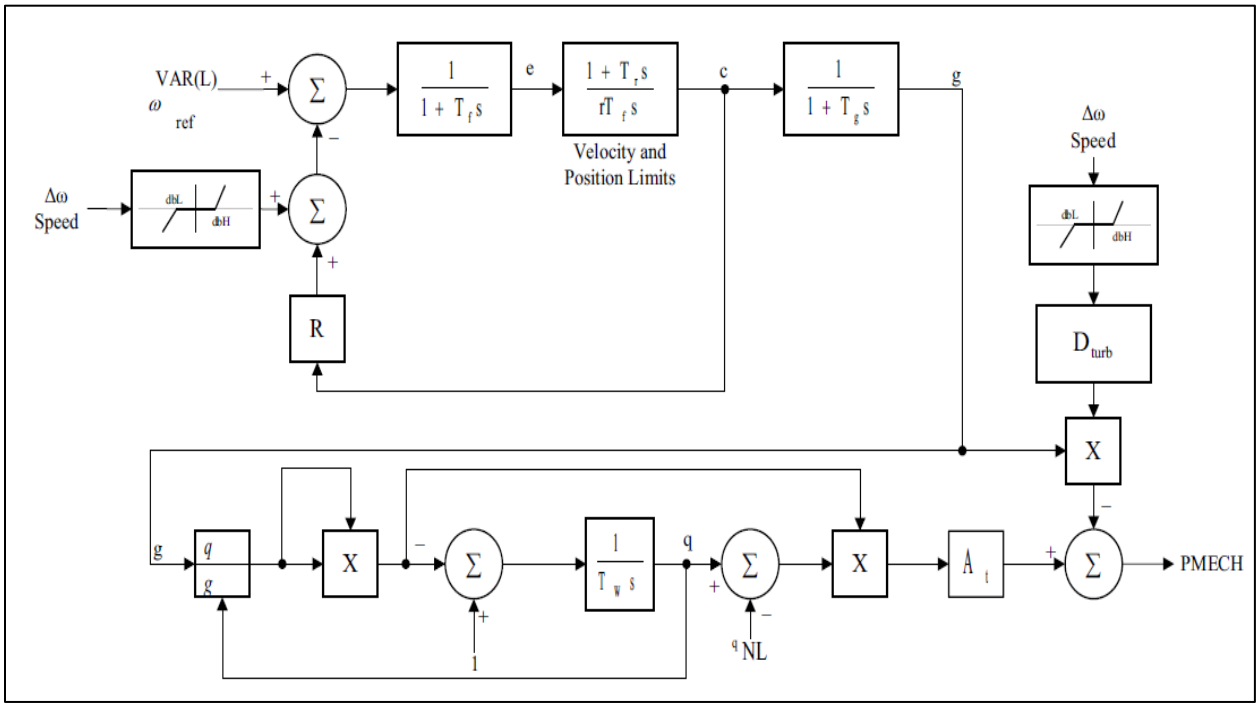
Category	Parameter Description	Data
TURBINE GOVERNOR model		
WSHYDD	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Aturb, turbine lead time constant multiplier	
	Bturb (> 0), turbine lag time constant multiplier	
	Tturb (> 0) (sec), turbine time constant (s)	
	Trate, turbine rating (MW)	
WSHYGP	db1, deadband width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	Td (sec), input filter time constant (s)	
	K1, derivative gain (p.u.)	
	Tf (sec), derivative time constant (s)	
	KD, double derivative gain (p.u.)	
	KP, integral gain (p.u.)	
	R, droop (p.u. on Trate)	
	Tt, power feedback time constant (s)	
	KG, gate servo gain (p.u.)	
	TP (sec), gate servo time constant (s)	
	VELOPEN (>0), maximum gate opening rate (p.u./s)	
	VELCLOSE (>0), maximum gate closing rate (p.u./s)	
	PMAX, maximum gate opening (p.u.)	
	PMIN, minimum gate opening (p.u.)	
	db2, deadband (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	
	PGV1, coordinate of power-gate look-up table (p.u. power)	
	GV2, coordinate of power-gate look-up table (p.u. gate)	
	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Aturb, turbine lead time constant multiplier	
	Bturb (> 0), turbine lag time constant multiplier	
	Tturb (> 0) (sec), turbine time constant (s)	
	Trate, turbine rating (MW)	

Commonly Used Hydro Turbine Generic Models Block Diagrams:

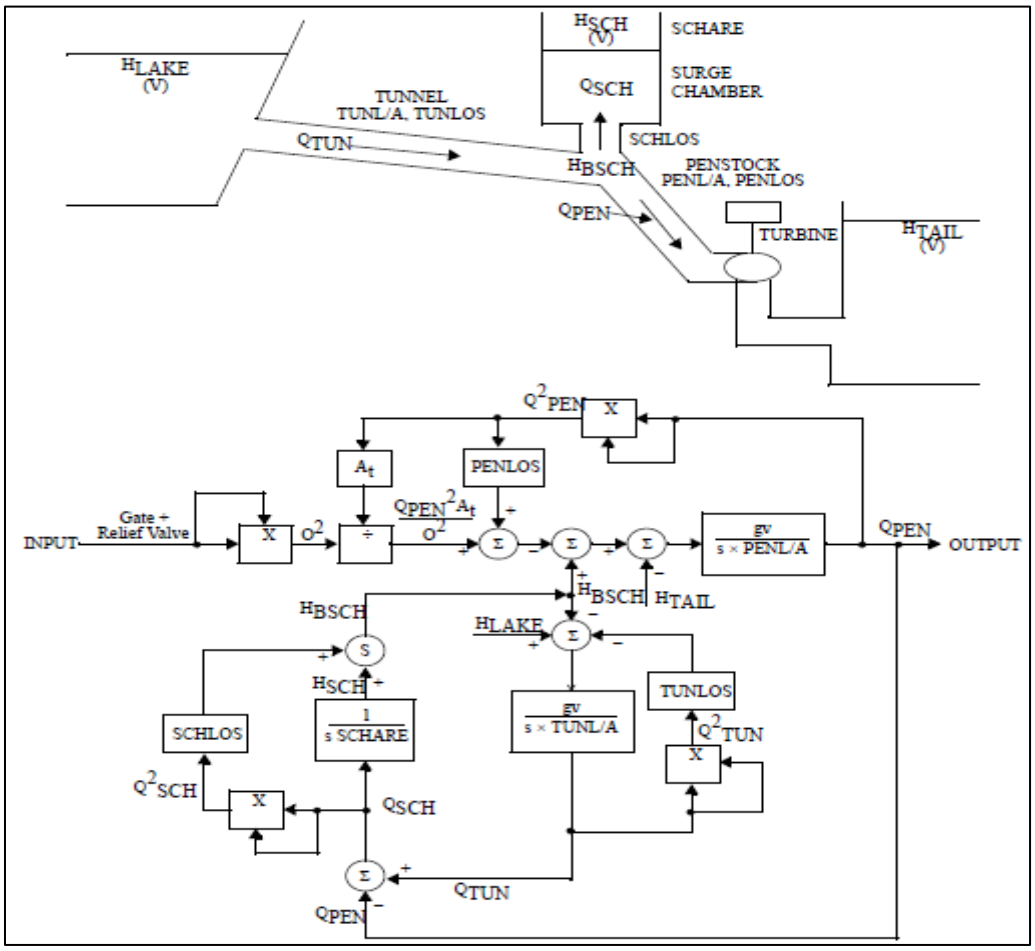
- **HYGOV: Hydro Turbine-Governor**



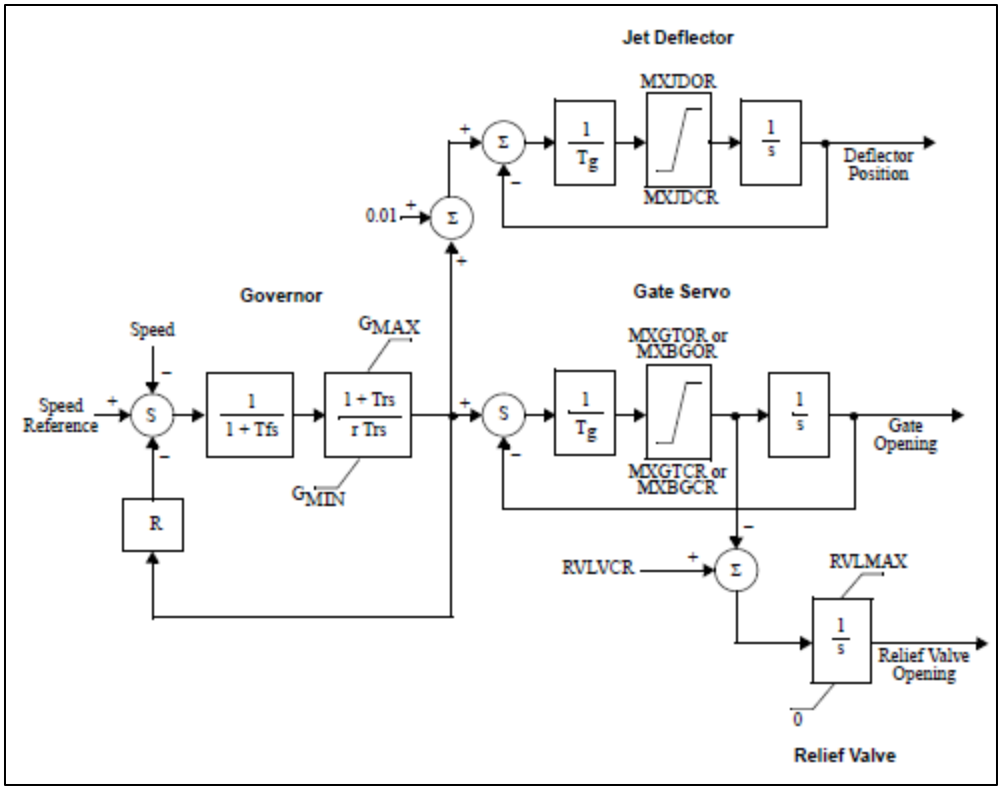
- **HYGOVDU: Hydro Turbine-Governor**



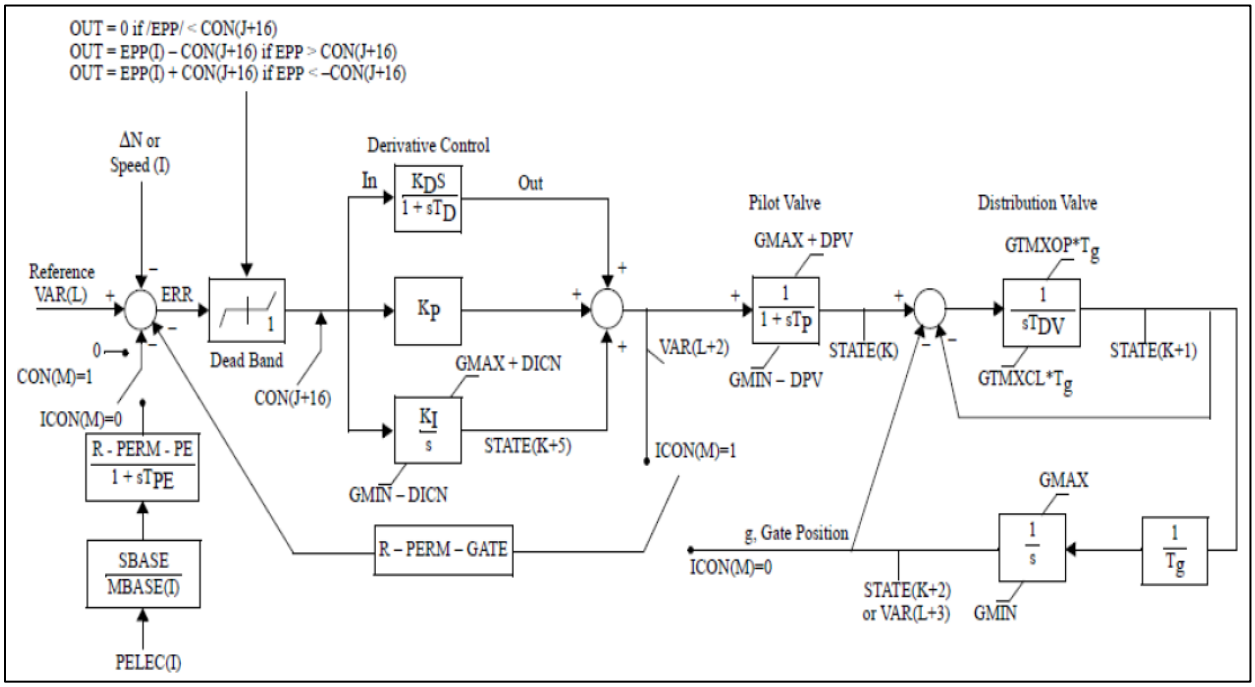
➢ **HYGOVM: Hydro Turbine-Governor Lumped Parameter Model**



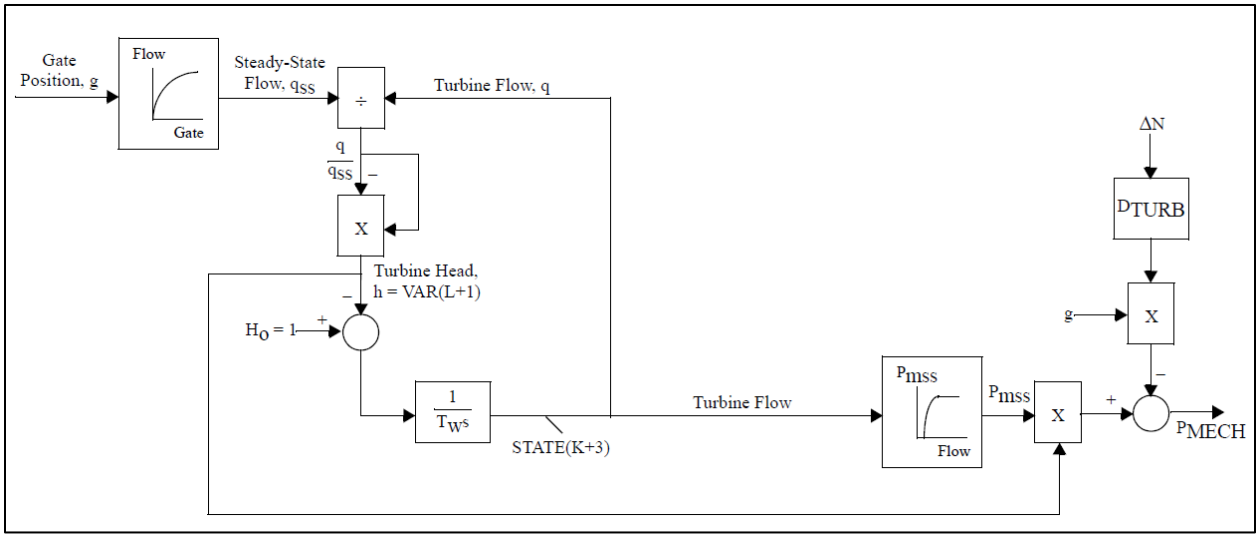
gv	Gravitational acceleration	A_t	Turbine flow gain
TUNL/A	Summation of length/cross section of tunnel	O	Gate + relief valve opening
SCHARE	Surge chamber cross section	HSCH	Water level in surge chamber
PENLOS	Penstock head loss coefficient	QPEN	Penstock flow
TUNLOS	Tunnel head loss coefficient	QTUN	Tunnel flow
FSCH	Surge chamber orifice head loss coefficient	QSCH	Surge chamber flow
PENL/A	Summation of length/cross section of penstock, scroll case and draft tube		



➢ **WEHGOV: Woodward Electric Hydro Governor Model**

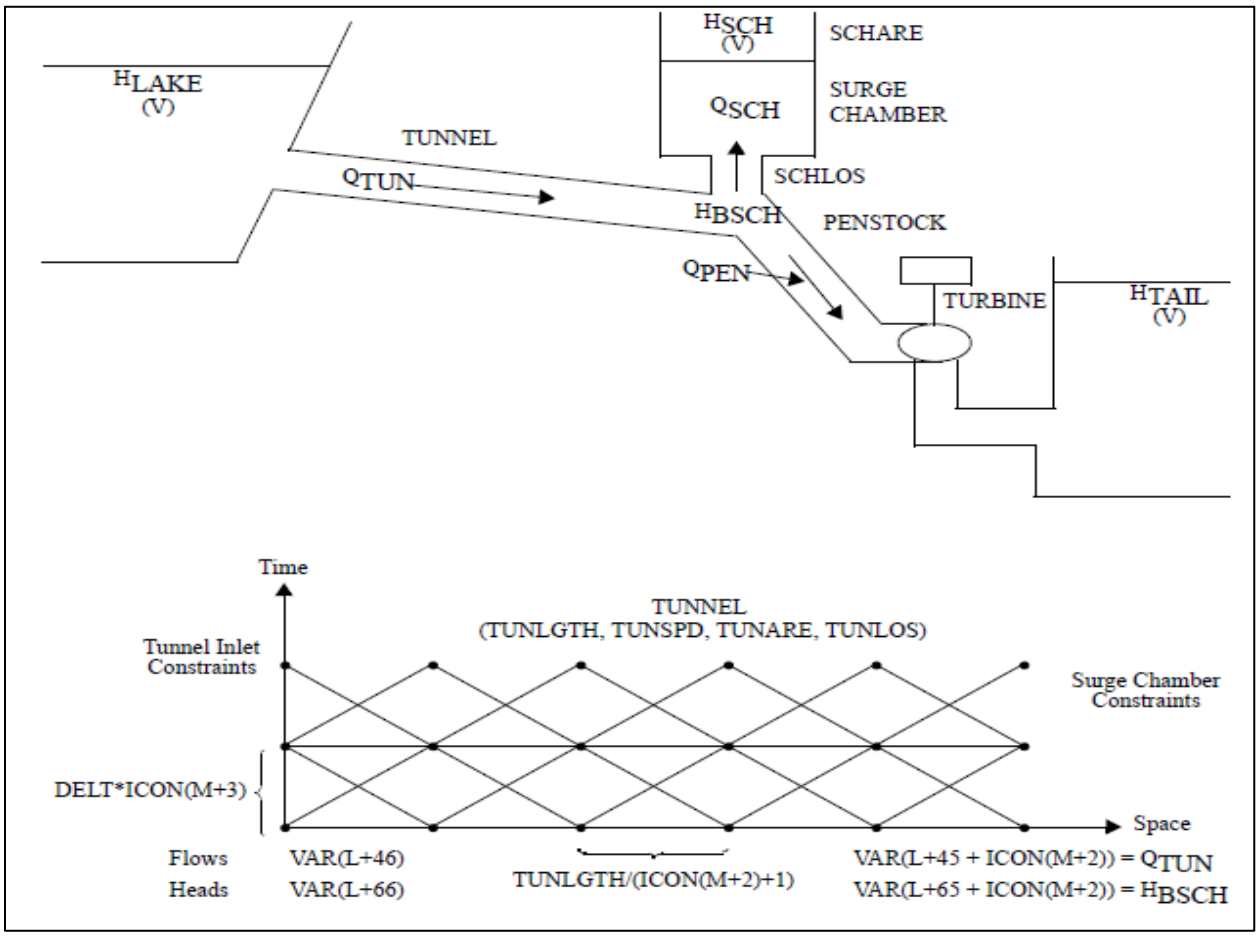


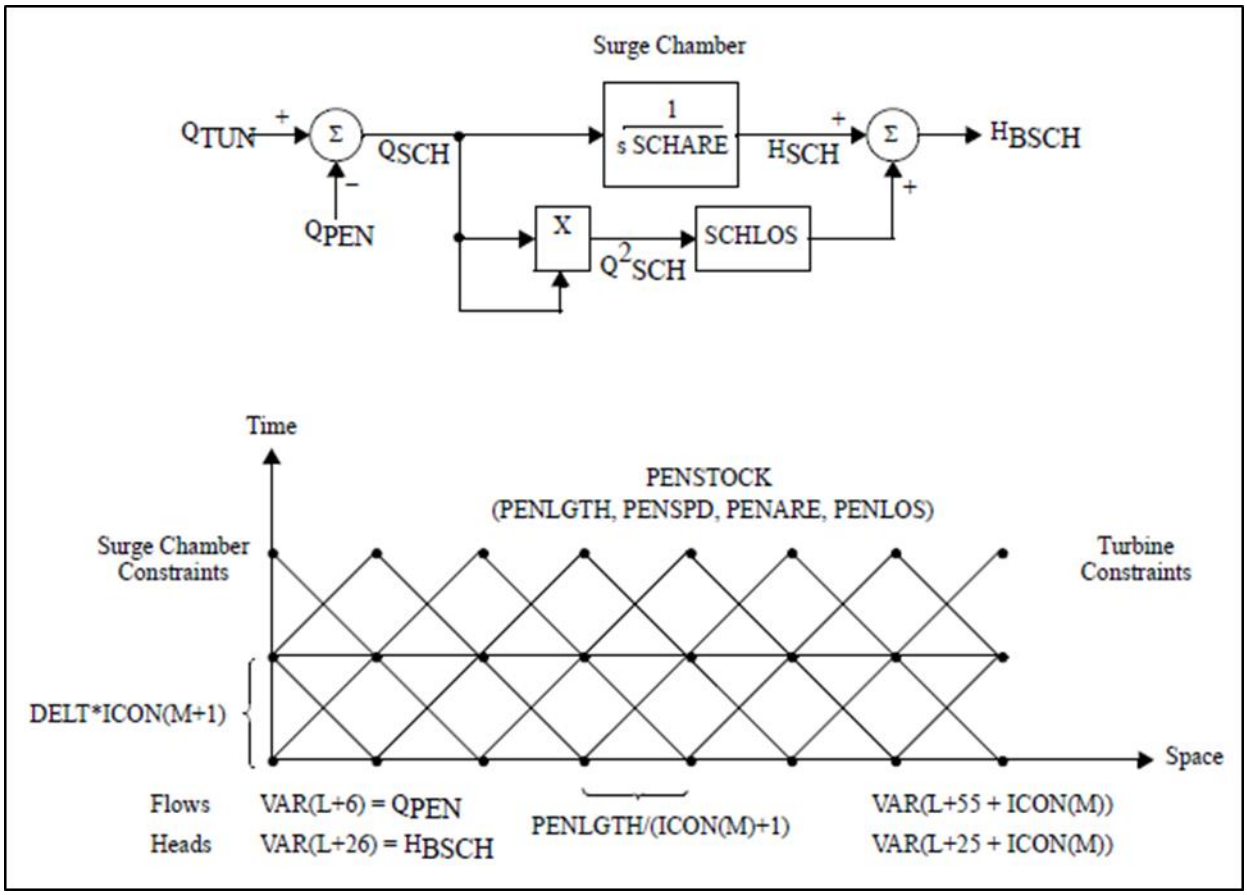
Governor and Hydraulic Actuators

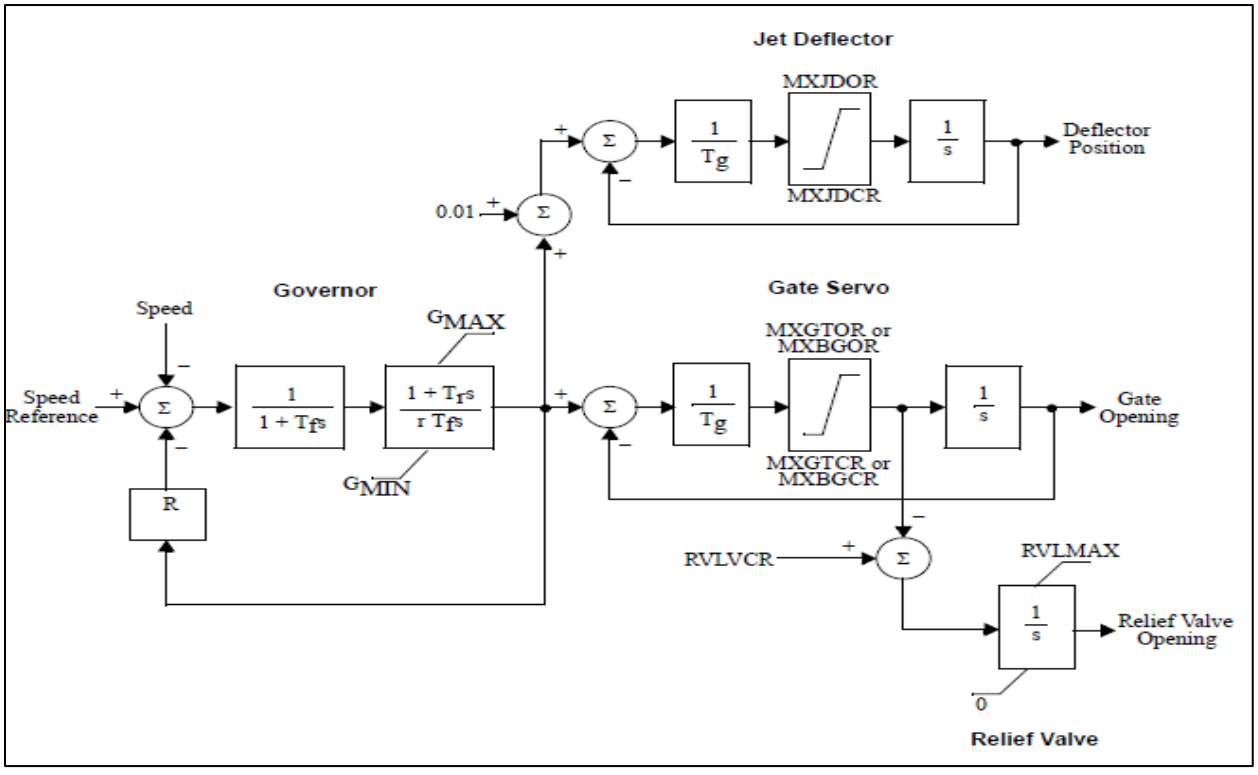


Turbine Dynamics

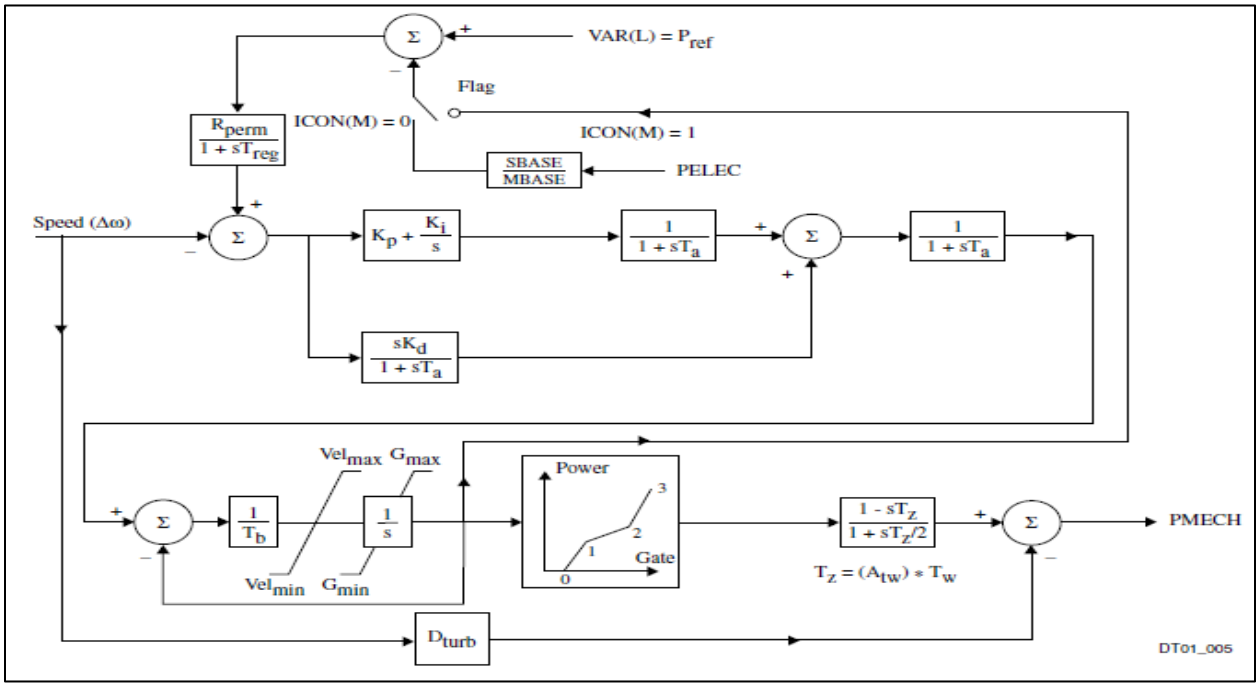
- **HYGOVT: Hydro Turbine-Governor Traveling Wave Model**



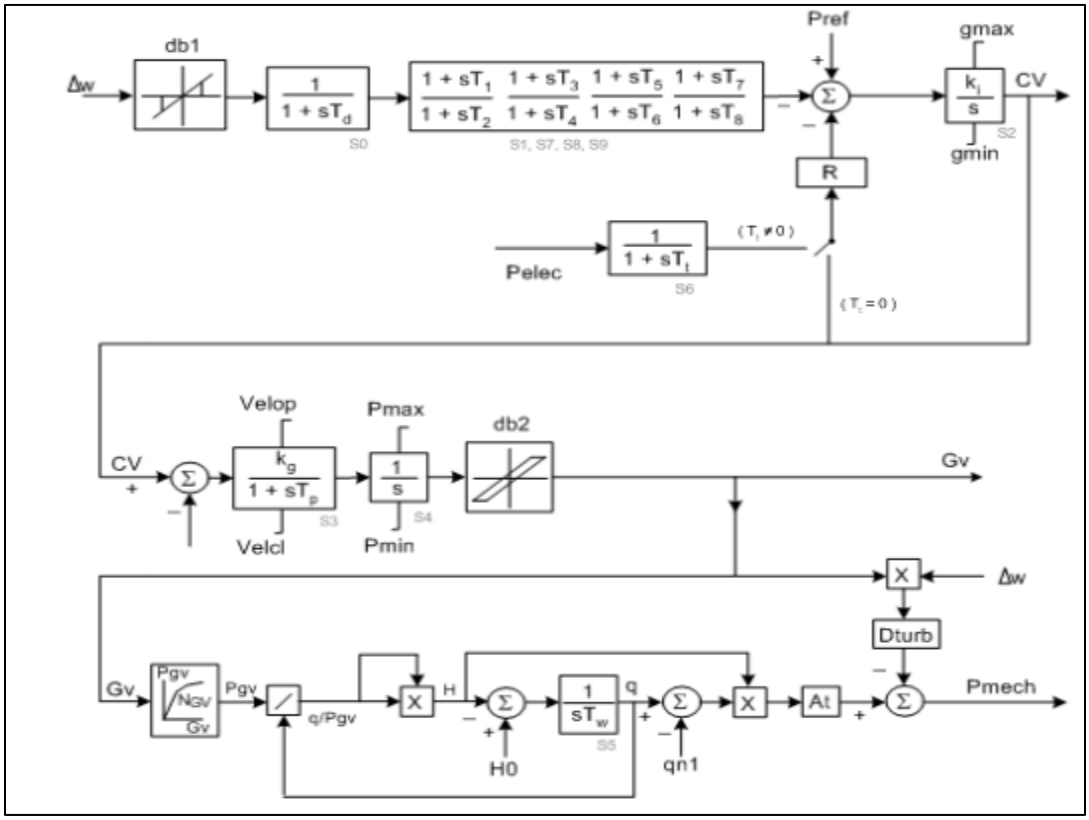

Surge Chamber
QTUN
QSCH
QPEN
1
s SCHARE
HSCH
HBSCH
X
Q2SCH
SCHLOS
Time
PENSTOCK
(PENLGTH, PENSPD, PENARE, PENLOS)
Surge Chamber Constraints
Turbine Constraints
DELT*ICON(M+1)
Space
Flows
Heads
VAR(L+6) = QPEN
VAR(L+26) = HBSCH
PENLGTH/(ICON(M)+1)
VAR(L+55 + ICON(M))
VAR(L+25 + ICON(M))


Jet Deflector
MXJDOR
MXJDCR
Deflector Position
0.01
Governor
Gate Servo
Speed
Speed Reference
GMAX
GMIN
R
MXGTOR or MXBGOR
MXGTCR or MXBGCR
Gate Opening
RVLVCR
RVLMAX
Relief Valve Opening
0
Relief Valve

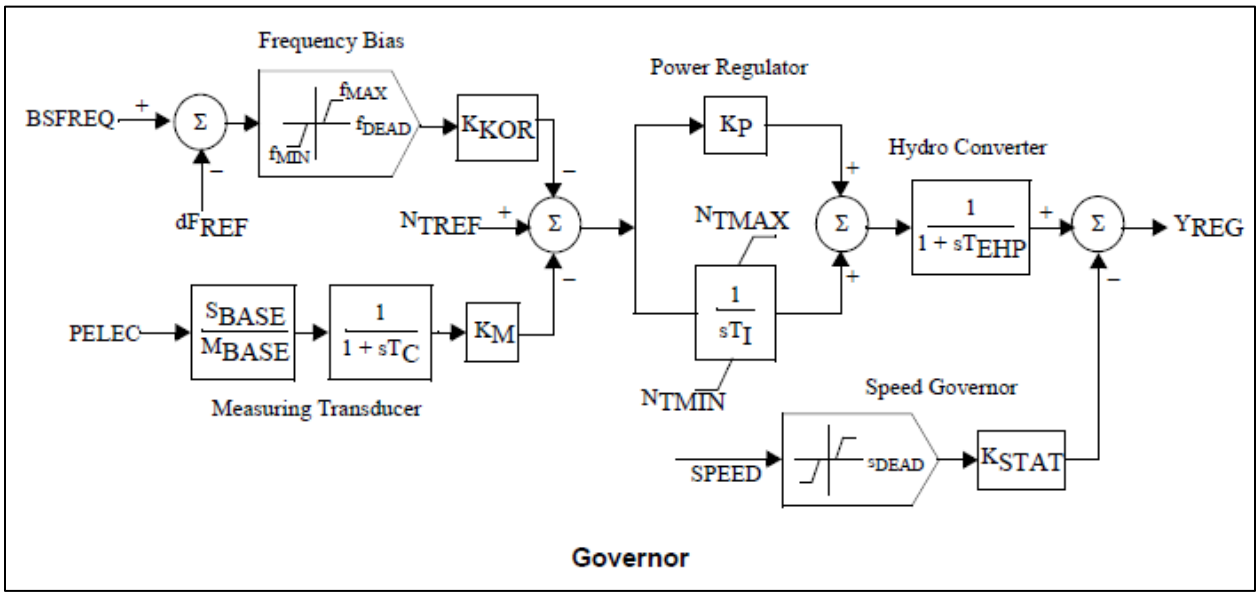
➢ **PIDGOV: Hydro Turbine-Governor**



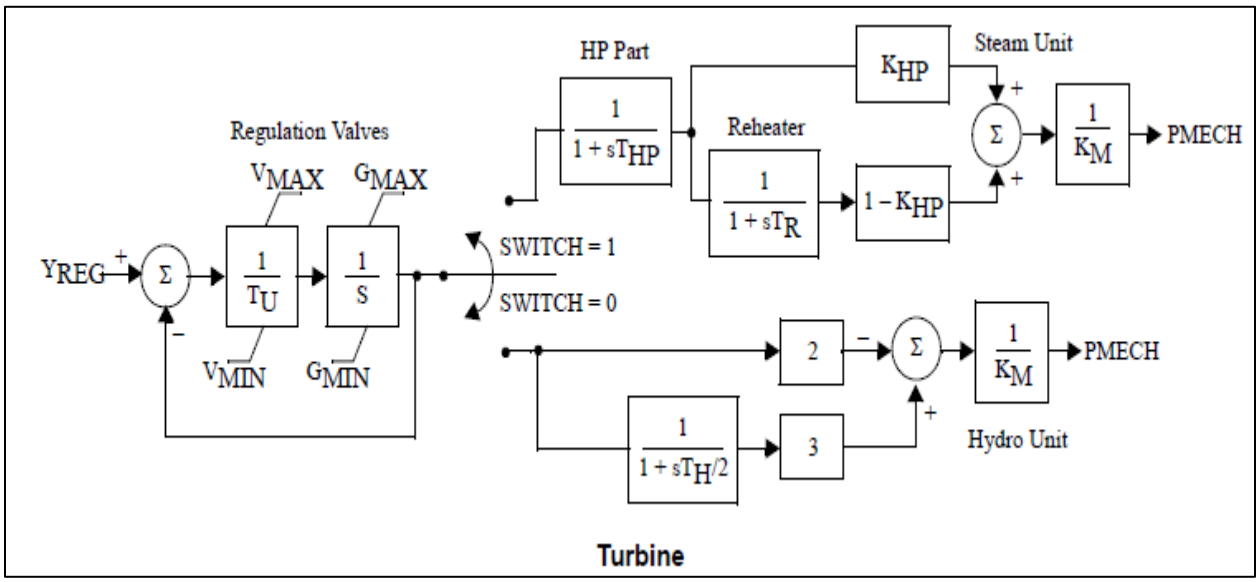
➢ **HYGOVR1: Fourth order lead-lag hydro-turbine**



➢ **TURCZT: Czech Hydro and Steam Governor**

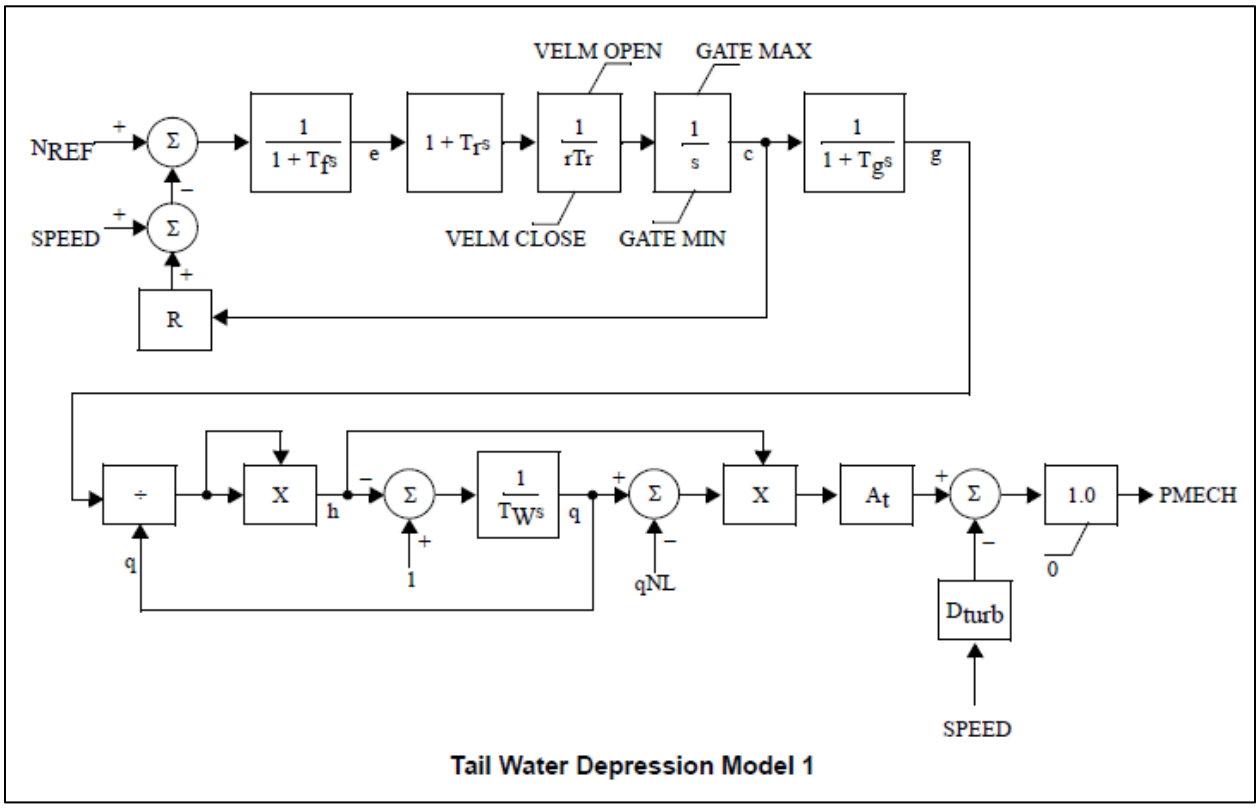


Governor

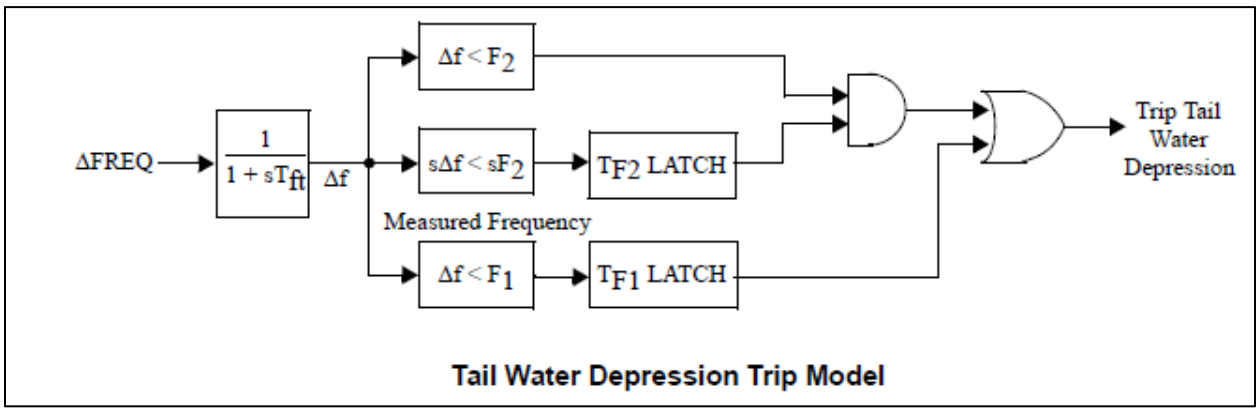


Turbine

➢ **TWDM1T: Tail Water Depression Hydro Governor Model 1**

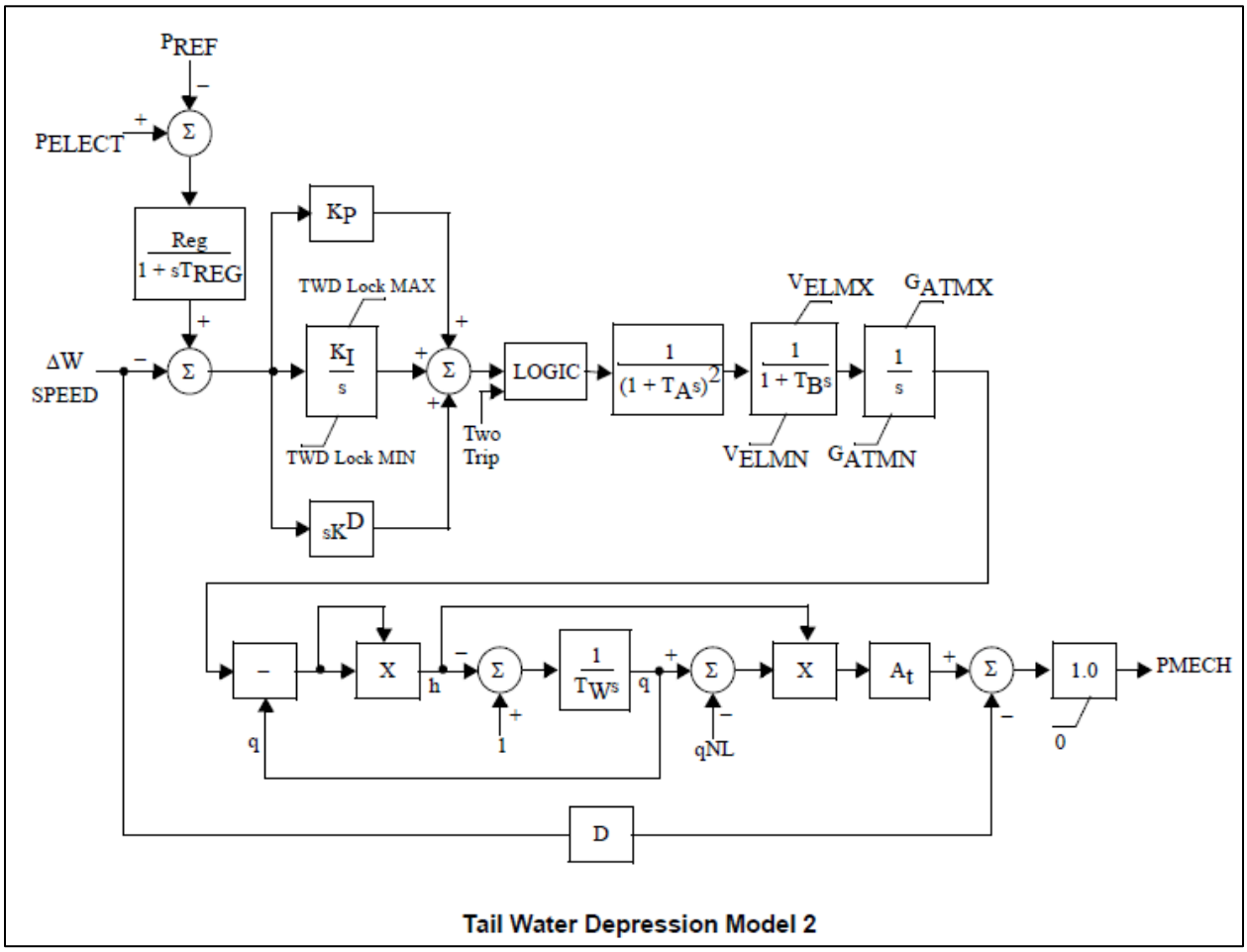


Tail Water Depression Model 1

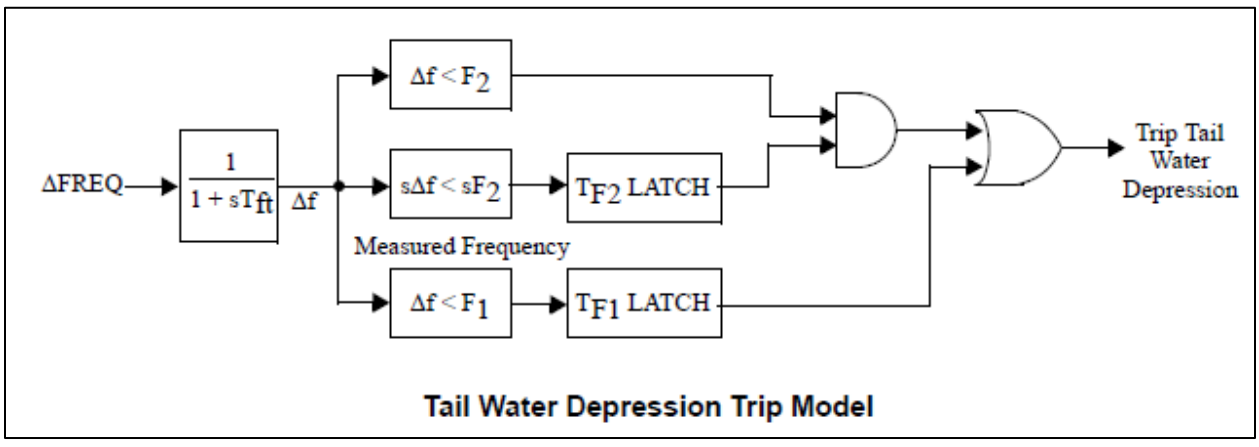


Tail Water Depression Trip Model

➢ **TWDM2T: Tail Water Depression Hydro Governor Model 2**

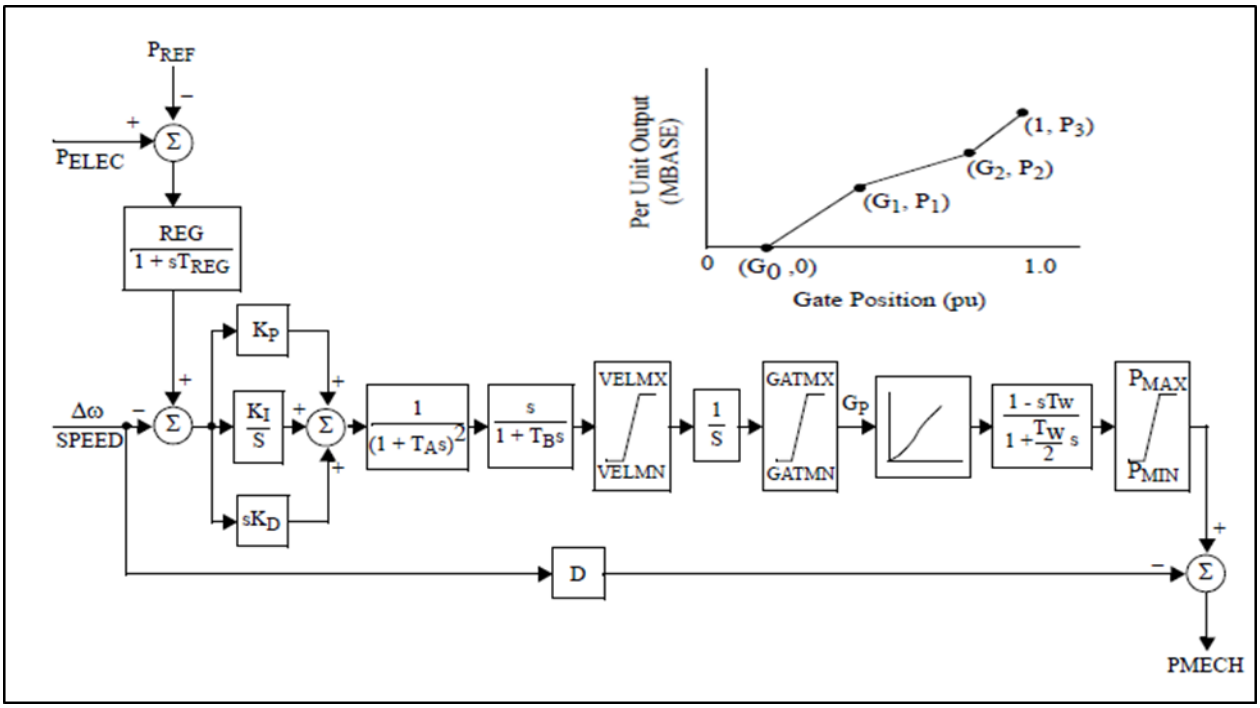


Tail Water Depression Model 2

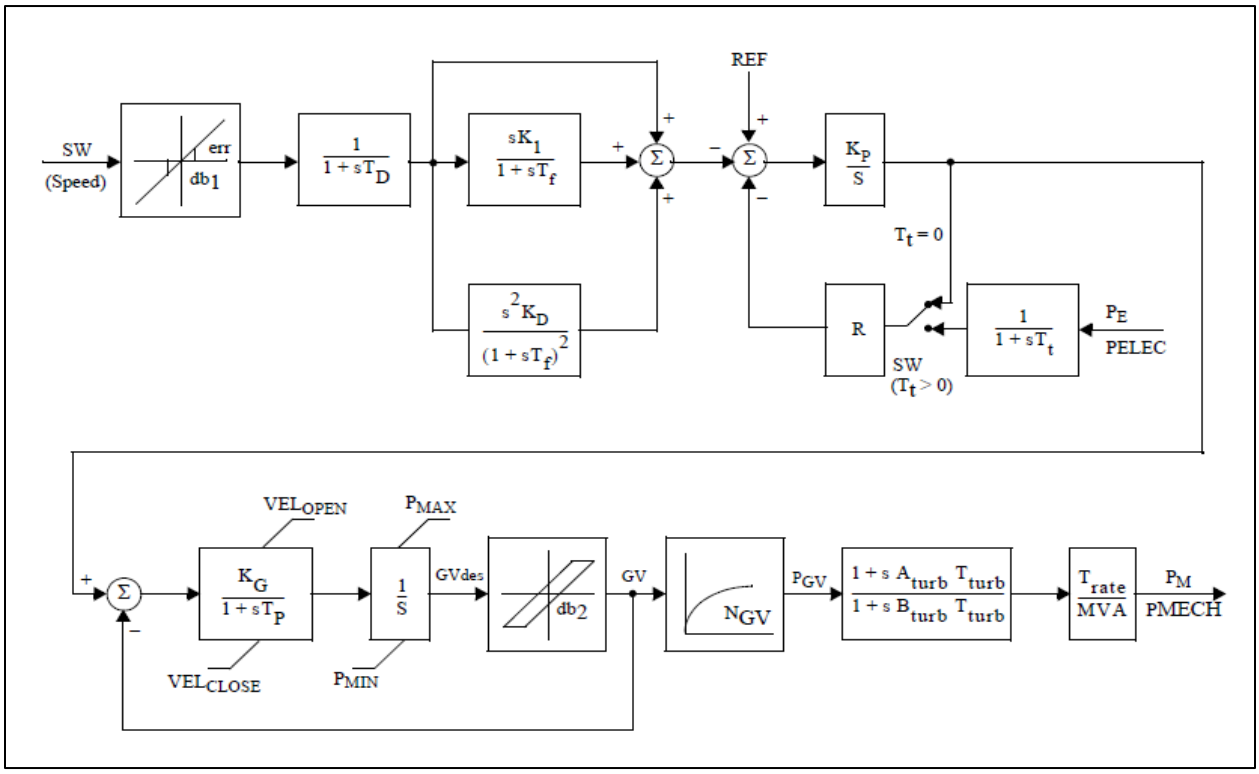


Tail Water Depression Trip Model

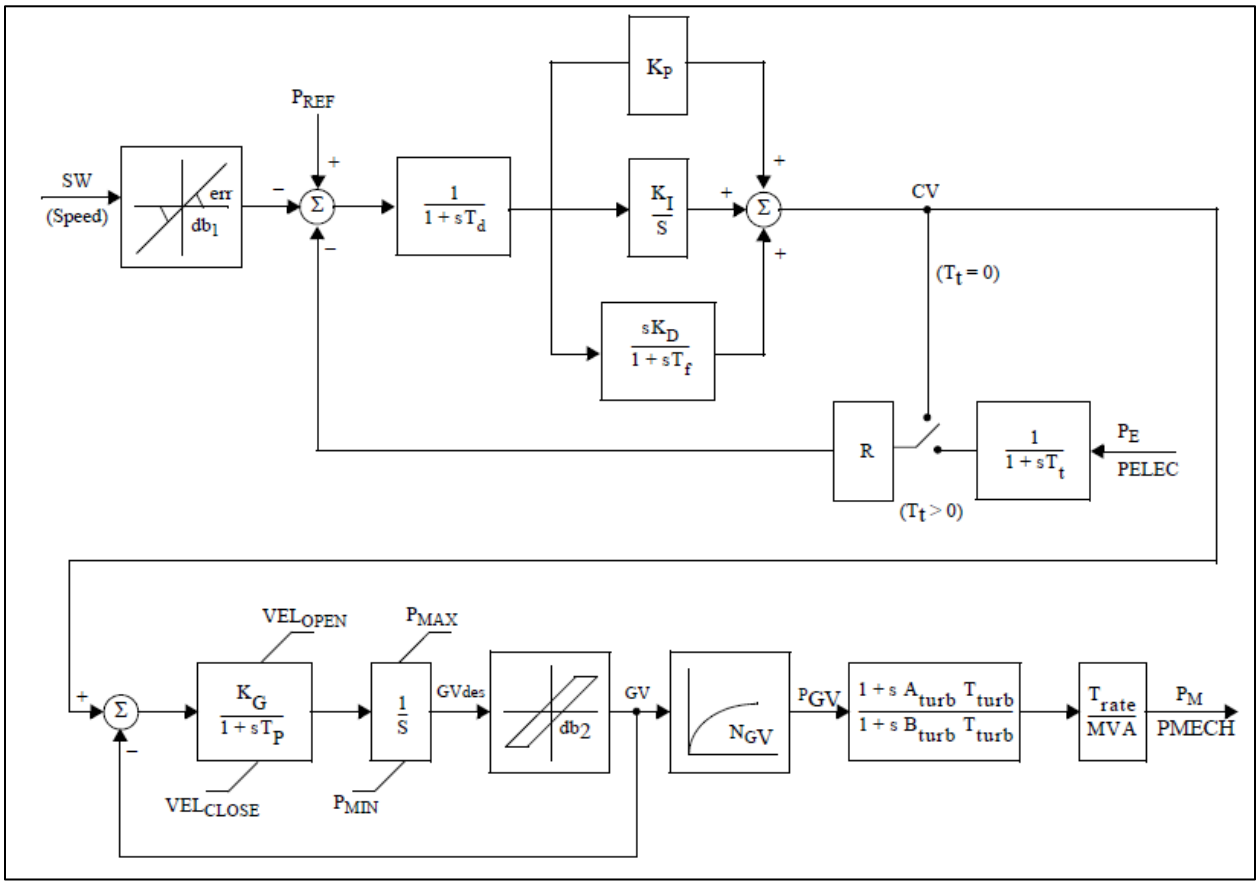
➢ **WPIDHY: Woodward PID Hydro Governor**



➢ **WSHYDD: WECC Double-Derivative Hydro Governor**



➢ **WSHYGP: WECC GP Hydro Governor Plus Turbine**



Source-PSSE Model Library

Calculation of saturation parameters:

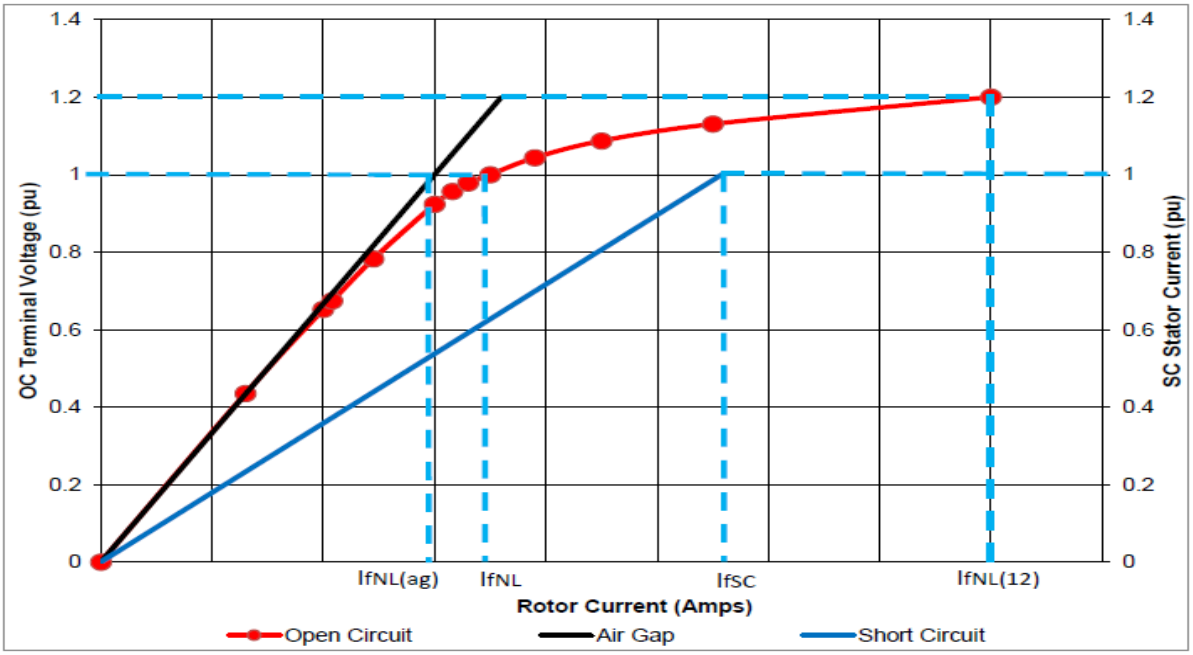


Figure 2: Open and short circuit characteristics

The saturation can be calculated using the following calculation:

$$S(1.0) = \frac{If_{NL} - If_{NL(AG)}}{If_{NL(AG)}}$$

$$S(1.2) = \frac{If_{NL(12)} - 1.2 \times If_{NL(AG)}}{1.2 \times If_{NL(AG)}}$$

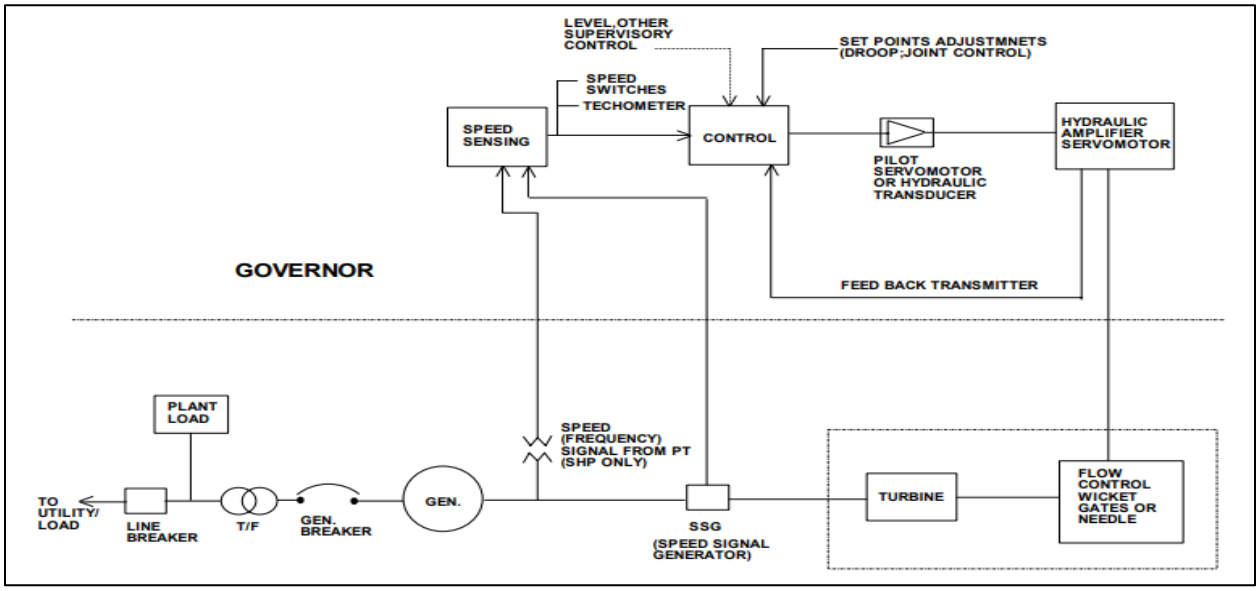


Figure 3: Governing system - Block Diagram (Typical) as per IEEE std. -75

Annexure-V

Modeling Gas Fired Generation

Guideline for furnishing information for modelling Gas-fired Power generation 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 Gas-fired power generation in India. Availability of fit-for-purpose steady state and dynamics models of Gas-fired power generators 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 Gas-fired power generation 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 Gas-fired power generators 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 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 stabilizers, 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 simulation studies that deliver reasonably accurate outcomes.

1.3 Regulation:

- **CEA Connectivity Standard 6.4.d :**

The requester and user shall cooperate with RPC and Appropriate Load Despatch Centre in respect of the matters listed below, but not limited to

furnish data as required by Appropriate Transmission Utility or Transmission Licensee, Appropriate Load Despatch Centre, Appropriate Regional Power Committee and any committee constituted by the Authority or appropriate Government for system studies or for facilitating analysis of tripping or disturbance in power system;

Here Requester and User Includes a generating company, captive generating plant, energy storage system, transmission licensee (other than Central Transmission Utility and State Transmission Utility), distribution licensee, solar park developer, wind park developer, wind-solar photovoltaic hybrid system, or bulk consumer *(2019 Amendment)*

- **IEGC 4.1 :**

CTU, STU and Users connected to, or seeking connection to ISTS shall comply with Central Electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2007 which specifies the minimum technical and design criteria and Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters) Regulations,2009.

2.0 Gas Power Plant Classification:

The gas turbine power plants which are used in electric power industry are classified into two main groups as per the cycle of operation and configuration:

a. **Open cycle gas turbine (OCGT):**

In open cycle, air at the ambient condition is drawn into the compressor (either an axial-flow or centrifugal compressor) where its temperature and pressure are raised. The high pressure air proceeds into the combustion chamber, where the fuel is burnt at constant pressure. The high temperature gases then enter into the turbine where they expand to the atmospheric pressure while producing power output. The exhaust gases leaving the turbine are thrown out (not recirculated), causing the cycle to be classified as open cycle. All masses are typically on the same shaft (the compressor, combustion chamber, and turbine). This is also referred to as a "single-shaft" gas turbine.

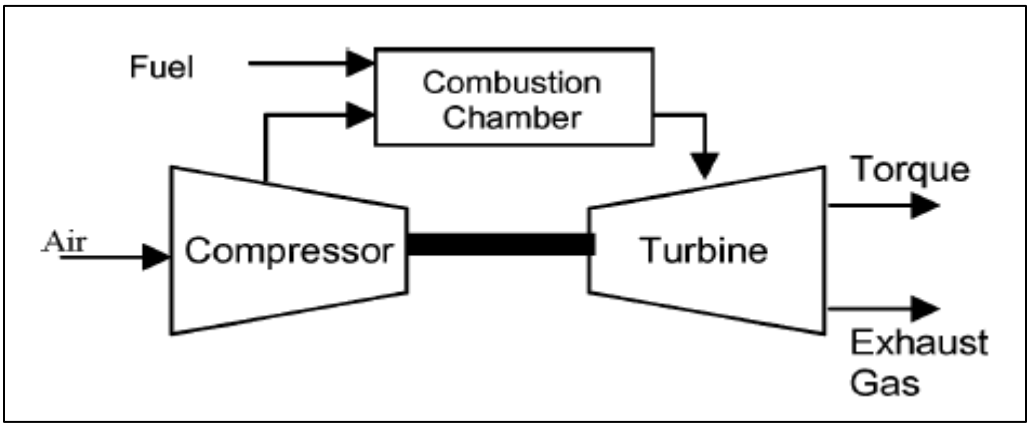


Figure 1: Single Shaft Gas Turbine

In aero-derivative type turbines, the gas generator (compressor and compressor turbine) are mechanically separated from the power turbine. The compressor can have different speed settings to achieve higher efficiency. However, the inertia will be lower than a "single-shaft" gas turbine.

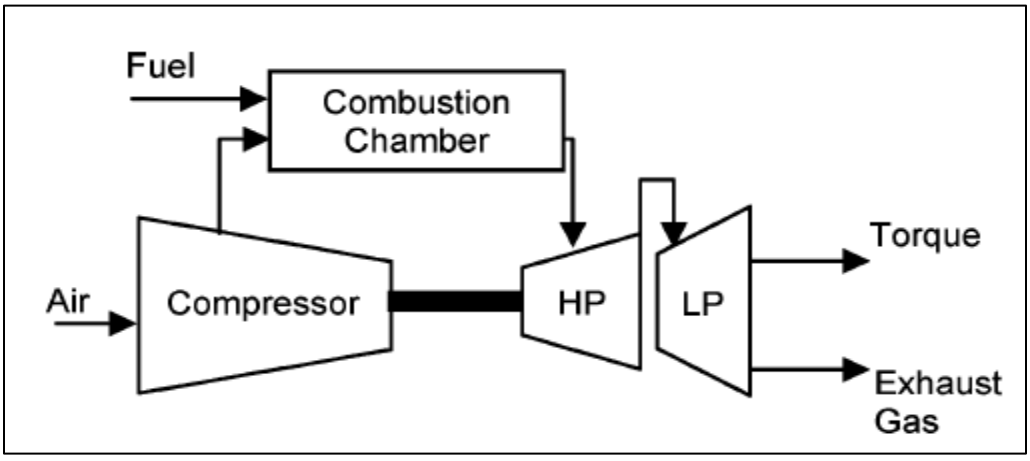


Figure 2: Aero-derivative Gas Turbine

b. **Closed cycle gas turbine (CCGT):**

In a closed cycle gas turbine, working fluid does not come in contact with atmospheric air. The compression and expansion process remains the same but the combustion process is replaced by constant pressure heat addition process from an external source. The exhaust process is replaced by constant pressure heat rejection process to the ambient air. The exhaust gases leaving the turbine are cooled in heat exchanger called sink where it reject heat. Therefore in this cycle, same working fluid is recirculated, causing the cycle to be classified as close cycle.

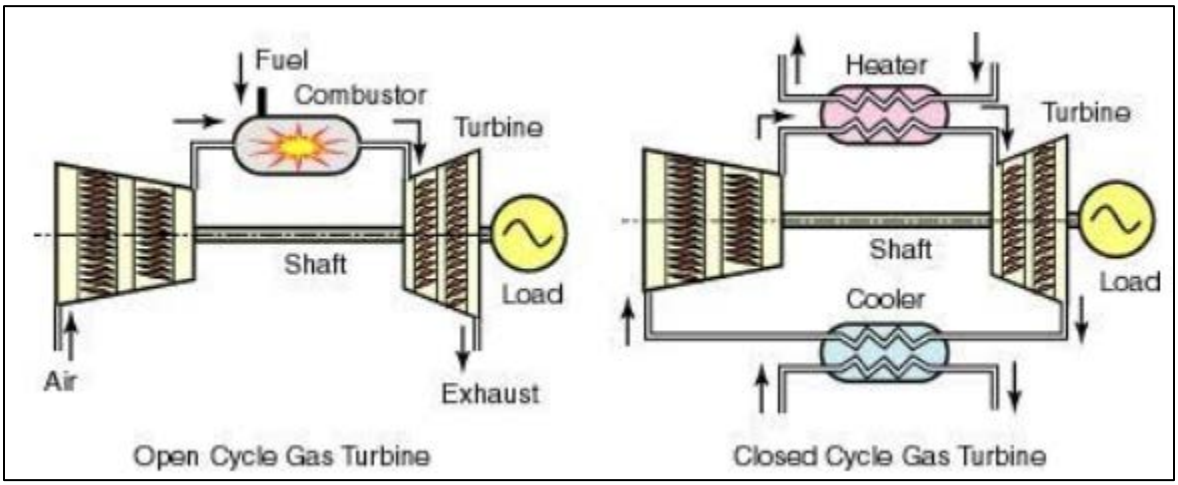


Figure 3: Typical Open and Close cycle Gas Turbine

For POSOCO to have access to verified fit-for-purpose models of gas power generator connected to Indian grid, following information is required:

1. Electrical Single Line Diagram of gas power station depicting;
    - For individual generating units: type of technology, Complete Generator OEM Technical Datasheet (which comprises namely generator parameters like impedances & time constants, generator capability curve, V-curve, generator open and short circuit characteristics, excitation system details, inertia of generator & exciter), generator name plate, generator SAT report including Short circuit and open circuit test results during commissioning/recent overhauling.
    - **Generator step up transformer**: GT name plate/datasheet, details of LV, MV and HV, MVA rating, impedance, tap changer details, vector group, short-circuit parameters (actual positive & zero sequence impedance of GT, NGR nameplate with impedance).
    - **Excitation system :-** Type of excitation system (Direct Current Commutator Exciters (type DC), AC Excitation (Rotor or brushless excitation) Systems (type AC) and Static Excitation Systems (type ST), Excitation system schematics (Block diagram of AVR system), transfer function block diagram of Excitation system, excitation transformer nameplate, saturation curves of the exciter (E_{fd} versus I_f curve), IEEE standard model of excitation system, IEEE standard model and its parameter of subsystems such as Power system stabilizer (PSS), Under Excitation Limiter (UEL), Over Excitation Limiter (OEL), Voltage per Hz Limiter(V/Hz) control etc. and details thereof, factory acceptance test reports (FAT). Excitation system actual settings to be provided. AVR test report (excitation step response test).

- **Power System Stabilizer (PSS):** Transfer function block diagram of PSS, IEEE Standard Model, Actual PSS software settings, PSS commissioning report and recent PSS tuning report.
- **Turbine-Governor system :-** Type of prime mover (open cycle, aero-derivative gas turbine or close cycle), droop and dead-band setting, characteristic of active power versus fuel valve position (or fuel stroke reference), size of steam turbine (ST), frequency control of ST, time lag and relationship of GT and ST, model of governor control system (including details of technology, valves, valves characteristics) , inlet guide vane (IGV) characteristic, ramp rates, base load/frequency control, details of heat recovery generator-HRSG (Block diagram, GT output vs heat relationship, Drum time constant, Pressure loss due to friction in boiler tubes), , turbine inertia, IEEE standard model of turbine governor system and its transfer function Block diagram and its parameters, details of control mode (boiler-follow, turbine-follow, or coordinated control), commissioning report of turbine-governor system or recent governor testing report.

2. Generic models of individual components (generator, exciter, turbine-governor and PSS of gas power generator (refer sections 3.2 to section 3.5)
   - Model should be suitable for an integration time step between 1ms and 20ms, and suitable for operation up-to 100 s
   - 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 PSSE release PSS/E (*.dll files) for electromechanical transient simulation for components of gas power generators (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 to be provided
   - The use of black-box type representation is not preferred

Annexure: Formats for submission of modelling data for Gas-fired power generation

Version History:

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

*Mention Designation and Contact Details

Details submitted:

Details pending:

3.1 Details of models in PSS/E for modelling gas power generator:

(a) Synchronous Machine – To be filled separately for Gas turbine (GT) and steam turbine (ST)

Category	Parameter Description	Data
Generator Nameplate	Rated apparent power in MVA	
	Rated terminal voltage	
	Rated power factor	
	Rated speed (in RPM)	
	Rated frequency (in Hz)	
	Rated excitation (in Amperes and Volts)	
Type of synchronous machine	Round rotor or salient pole No. of poles	
Generator capability curve	The generator capability curve shows the reactive capability of the machine and should include any restrictions on the real or reactive power range like under/over excitation limits, stability limits, etc. Capability curve should have properly labelled axis and legible data	
Generator Open Circuit and Short Circuit Characteristic	Graph of excitation current versus terminal voltage and stator current	
	No load excitation current – used to derive per unit values	
	Excitation current at rated stator current	
Generator vee-curves	Otherwise referred to as "V-curve". A plot of the terminal (armature) current versus the generating unit field voltage.	
Resistance values	Resistance measurements of field winding and stator winding to a known temperature	
Generator Data sheet	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xa in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Quadrature axis transient synchronous reactance Xq' in p.u. (Unsaturated or saturated)	
	Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit transient time constant Tqo' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass (generator, AVR, turbo-governor set) H in MW.s/MVA	
	Speed Damping D	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

Category	Parameter Description	Data
Generator step up transformer (GSUT)	Nameplate Rating - Rated primary and secondary voltage - Vector group - Impedance - Tap changer details (Number of taps, tap position, tap ratio etc.)	
Auxiliary power (i.e. active and reactive auxiliary load)	Value of auxiliary load (MW and Mvar) at rated power of the generating unit.	
	Whether or not the load trips if the generating unit trips.	
Test Reports	Factory acceptance test (FAT) reports	

(b) Site Load

	Low Output			High Output		
	kW	kvar	kVA	kW	kvar	kVA
Auxiliary Load						

(c) Excitation System

Category	Parameter Description	Data
Type of Automatic Voltage Regulator (AVR)	Manufacturer and product details (for example ABB UNITROL or GE EX2100e)	
	Type of control system :- Analogue or digital	
	Year of commissioning / Year of manufacture	
	As found settings (obtained either from HMI or downloaded from controller in digital systems)	
Type of excitation system	Static excitation system OR	
	Indirect excitation system (i.e. rotating exciter) - AC exciter, or - DC exciter	
Details of AVR converter	Rated excitation current (converter rating in Amperes)	
	Six pulse thyristor bridge or PWM converter	
Source of excitation supply	Excitation transformer or auxiliary supply (Details thereof)	
	If excitation transformer, nameplate information required	
Schematics	Saturation curves of the exciter (if applicable – see Type AC and DC)	
	Drawings of excitation system, typically prepared and supplied by the OEM	
	Single line diagram (i.e. one-line diagram) for the excitation system	
Excitation limiters	What excitation limiters are commissioned?	
	Under Excitation Limiters settings	
	Over Excitation Limiters settings	
	Voltage/frequency limiter	
	Stator current limiter	
	Minimum excitation current limiter	

Category	Parameter Description	Data
PSS	Is the AVR equipped with a PSS?	
	How many input Channels does the PSS have? (speed, real power output or both	
	If the PSS uses speed, is this a derived speed signal (i.e. synthesized speed signal) or measured directly (i.e. actual rotor speed)?	
	Type of PSS Block Diagram of PSS and as commissioned parameters value (Gain, time constants, filter coefficients, output limits of the PSS)	
Test Reports	Factory acceptance test (FAT) reports	

(d) Turbine Details (to be filled in for the GT and ST separately)

Category	Parameter Description	Data
Type of prime mover	- Open cycle gas turbine - Aero-derivative (twin shaft) gas turbine - Combined cycle plant (closed cycle gas turbine)	
Manufacturer of turbine	Manufacturer and name plate details	
Governor	Electro-mechanical governor (including settings and drawings)	
	Digital electric governor (including settings and drawings)	
Ramp rates	How fast can the turbine increase and/or decrease load, specified in MW/min Guide vane/wicket gate characteristic, including opening, closing rates/times and limits	
Droop	Droop setting (% on machine base)	
	Frequency influence limiters - Maximum frequency deviation limiter (eg +/-2 Hz) - Maximum influence limiter (eg 10% of rating)	
Dead band	Details of frequency dead band (typically in Hz or RPM)	
Technology	- Open cycle - Close cycle	
Gas turbine	Does turbine operate in dual fuel (gas and liquid fuel)	
	Inlet guide vane (IGV) characteristic	
	Limit for exhaust gas temperature (EGT)	
	Base load/frequency control	
	Power output versus ambient temperature	
	No load fuel flow and turbine gain (determined by relationship of active power versus fuel valve position or fuel stroke reference)	

Category	Parameter Description	Data
Combine cycle plant	Details on heat recovery steam generator (HRSG) - Block diagram - GT output vs heat relationship (look up table) - Drum time constant - Pressure loss due to friction in boiler tubes	
	Size of steam turbine	
	Frequency control of ST	
	Time lag and relationship of GT and ST	
	Is the combined cycle plant a single shaft plant – i.e. the gas and steam turbine are on same shaft and drive same generator	

3.2 Generic Models for synchronous machine

Gas turbine (GT) or steam turbines (ST) are generally round rotor machines however, salient pole Gas turbine (aero-derivative) with synchronous machine having four poles has also been installed at some of the places. Depending upon the saturation characteristic of the machine they are classified further:

- **Round rotor machine (2 poles):**
  - GENROU – Round rotor machine model with quadratic saturation function
  - GENROE – Round rotor machine model with exponential saturation function
- **Salient pole machine (more than two poles):**
  - GENSAL – Salient pole machine with quadratic saturation function
  - GENSAE – Salient pole machine with exponential saturation function

Category	Parameter Description	Data
GENERATOR model		
GENROU OR **GENROE**	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit transient time constant Tqo' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Quadrature axis transient synchronous reactance Xq' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated) = Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xl in p.u.	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	
GENSAE OR **GENSAL**	Direct axis open circuit transient time constant Tdo' in sec	
	Direct axis open circuit sub-transient time constant Tdo'' in sec	
	Quadrature axis open circuit sub-transient time constant Tqo'' in sec	
	Inertia constant of total rotating mass H in MW.s/MVA	
	Speed Damping D	
	Direct axis synchronous reactance Xd in p.u. (Unsaturated or saturated)	
	Quadrature axis synchronous reactance Xq in p.u. (Unsaturated or saturated)	
	Direct axis transient synchronous reactance Xd' in p.u. (Unsaturated or saturated)	
	Direct axis sub-transient synchronous reactance Xd'' in p.u. (Unsaturated or saturated) = Quadrature axis sub-transient synchronous reactance Xq'' in p.u. (Unsaturated or saturated)	
	Stator leakage reactance Xl in p.u.	
	Saturation constant S (1.0) in p.u.	
	Saturation constant S (1.2) in p.u.	

While entering the values in above table, following relationship must be kept:

Xd>Xq>Xq'≥Xd'>Xq"≥Xd''

Tdo'>Td'>Tdo''>Td''

Tqo''>Tq'>Tqo''>Tq''

3.3 Excitation system model:

If a generic model is used, the first step must be to identify what type of exciter is present in the excitation system. The IEEE Std 421.5 (IEEE Recommended Practice for Excitation System Models for Power System Stability Studies published on 26th Aug 2016) has published several generic models, which are classified into three groups:

- Type DC : for excitation systems with a DC exciter
- Type AC : for excitation systems with an AC exciter
- Type ST : for excitation systems with a static exciter

The following table shows the types of models separated into their respective groups.

DC exciter	AC exciter	Static excitation system
Type DC1A	Type AC1A	Type ST1A
Type DC2A	Type AC2A	Type ST2A
Type DC3A	Type AC4A	Type ST3A
Type DC4B	Type AC5A	Type ST4B
	Type AC6A	Type ST5B
	Type AC7B	Type ST6B
	Type AC8B	Type ST7B

Category	Parameter Description	Data
DC Exciter		
ESDC1A OR ESDC2A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (> 0) rate feedback time constant (sec)	
	Switch	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESDC3A	TR regulator input filter time constant (sec)	
	KV (pu) limit on fast raise/lower contact setting	
	VRMAX (pu) regulator output maximum limit or Zero	
	VRMIN (pu) regulator output minimum limit	
	TRH (> 0) Rheostat motor travel time (sec)	
	TE (> 0) exciter time-constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	VEMIN (pu) exciter minimum limit	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
DC Exciter		
ESDC4B	TR regulator input filter time constant (sec)	
	KP (pu) (> 0) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KD (pu) voltage regulator derivative gain	
	TD voltage regulator derivative channel time constant (sec)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KA (> 0) (pu) voltage regulator gain	
	TA voltage regulator time constant (sec)	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESAC1A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	

Category	Parameter Description	Data
DC Exciter		
ESAC2A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KB, Second stage regulator gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	KH, Exciter field current feedback gain	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC3A	TR regulator input filter time constant (sec)	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VEMIN (pu) minimum exciter voltage output	
	KR (>0), Constant associated with regulator and alternator field power supply	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KN, Exciter feedback gain	
	EFDN, A parameter defining for which value of UF the feedback gain shall change from KF to KN	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	VFEMAX, parameter of VEMAX, exciter field maximum output	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
ESAC4A	TR regulator input filter time constant (sec)	
	VIMAX, Maximum value of limitation of the integrator signal VI in p.u	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	TB (s), lag time constant	
	TC (s), lead time constant	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC, rectifier regulation factor (pu)	

Category	Parameter Description	Data
AC Exciter		
ESAC5A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related to self-excited field	
	TE (> 0) rotating exciter time constant (sec)	
	KF (pu) rate feedback gain	
	TF1 (sec), Regulator stabilizing circuit time constant in seconds	
	TF2 (sec), Regulator stabilizing circuit time constant in seconds	
	TF3 (sec), Regulator stabilizing circuit time constant in seconds	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
AC6A	TR regulator input filter time constant (sec)	
	KA (> 0) (pu) voltage regulator gain	
	TA (s), voltage regulator time constant	
	TK (sec), Lead time constant	
	TB (s), lag time constant	
	TC (s), lead time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TE (> 0) rotating exciter time constant (sec)	
	VFELIM, Exciter field current limit reference	
	KH, Damping module gain	
	VHMAX, damping module limiter	
	TH (sec), damping module lag time constant	
	TJ (sec), damping module lead time constant	
	KC, rectifier regulation factor (pu)	
	KD, exciter regulation factor (pu)	
	KE (pu) exciter constant related to self-excited field	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC7B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KPA (pu) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KP (pu)	
	KL (pu)	
	KF1 (pu)	
	KF2 (pu)	
	KF3 (pu)	
	TF3 (sec) time constant (> 0)	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) exciter field current limit (> 0)	
	VEMIN (pu)	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	

Category	Parameter Description	Data
AC Exciter		
AC8B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	KDR (pu) regulator derivative gain	
	TDR (sec) regulator derivative block time constant	
	VPIDMAX (pu) PID maximum limit	
	VPIDMIN (pu) PID minimum limit	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KD (pu) demagnetizing factor, function of AC exciter reactances	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	VFEMAX (pu) max exciter field current limit (> 0)	
	VEMIN (pu),	
	E1, exciter flux at knee of curve (pu)	
	SE(E1), saturation factor at knee of curve	
	E2, maximum exciter flux (pu)	
	SE(E2), saturation factor at maximum exciter flux (pu)	
Static Exciter		
ST1A	TR (sec) regulator input filter time constant	
	VIMAX, Controller Input Maximum	
	VIMIN, Controller Input Minimum	
	TC (s), Filter 1st Derivative Time Constant	
	TB (s), l Filter 1st Delay Time Constant	
	TC1 (s), Filter 2nd Derivative Time Constant	
	TB1 (s), Filter 2nd Delay Time Constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KLR, Current Input Factor	
	ILR, Current Input Reference	

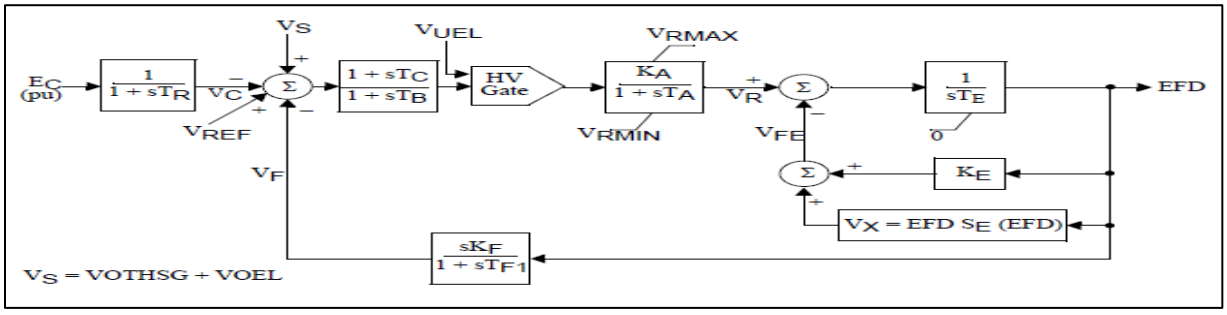
Category	Parameter Description	Data
Static Exciter		
ST2A	TR (sec) regulator input filter time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KE (pu) exciter constant related fo self-excited field	
	TE (pu) exciter time constant (>0)	
	KF (pu) rate feedback gain	
	TF (> 0) rate feedback time constant (sec)	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	EFDMAX	
ST3A	TR (sec) regulator input filter time constant	
	VIMAX, Maximum value of limitation of the signal VI in p.u.	
	VIMIN, Minimum value of limitation of the signal VI in p.u.	
	KM, Forward gain constant of the inner loop field regulator	
	TC (s), lag time constant	
	TB (s), lead time constant	
	KA (pu) voltage regulator proportional gain	
	TA (sec) voltage regulator time constant	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	KG, Feedback gain constant of the inner loop field regulator	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX, Maximum value of limitation of the signal VB in p.u.	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL, Reactance associated with potential source	
	VGMAX, Maximum value of limitation of the signal VG in p.u	
	Θ_P (degrees)	
	TM (sec), Forward time constant of the inner loop field regulator	
	VMMAX, Maximum value of limitation of the signal VM in p.u	
	VMMIN, Minimum value of limitation of the signal VM in p.u.	

Category	Parameter Description	Data
Static Exciter		
ST4B	TR (sec) regulator input filter time constant	
	KPR (pu) regulator proportional gain	
	KIR (pu) regulator integral gain	
	VRMAX (pu) regulator output maximum limit	
	VRMIN (pu) regulator output minimum limit	
	TA (sec) voltage regulator time constant	
	KPM, Regulator gain	
	KIM, Regulator gain	
	VMMAX, Maximum value of limitation of the signal in p.u.	
	VMMIN, Minimum value of limitation of the signal in p.u.	
	KG	
	KP (pu) voltage regulator proportional gain	
	KI (pu) voltage regulator integral gain	
	VBMAX	
	KC (pu) rectifier loading factor proportional to commutating reactance	
	XL	
	Θ_P (degrees)	
ST5B	TR regulator input filter time constant (sec)	
	TC1 lead time constant of first lead-lag block (voltage regulator channel) (sec)	
	TB1 lag time constant of first lead-lag block (voltage regulator channel) (sec)	
	TC2 lead time constant of second lead-lag block (voltage regulator channel) (sec)	
	TB2 lag time constant of second lead-lag block (voltage regulator channel) (sec)	
	KR (>0) (pu) voltage regulator gain	
	VRMAX (pu) voltage regulator maximum limit	
	VRMIN (pu) voltage regulator minimum limit	
	T1 voltage regulator time constant (sec)	
	KC (pu)	
	TUC1 lead time constant of first lead-lag block (under-excitation channel) (sec)	
	TUB1 lag time constant of first lead-lag block (under-excitation channel) (sec)	
	TUC2 lead time constant of second lead-lag block (under-excitation channel) (sec)	
	TUB2 lag time constant of second lead-lag block (under-excitation channel) (sec)	
	TOC1 lead time constant of first lead-lag block (over-excitation channel) (sec)	
	TOB1 lag time constant of first lead-lag block (over-excitation channel) (sec)	
	TOC2 lead time constant of second lead-lag block (over-excitation channel) (sec)	
	TOB2 lag time constant of second lead-lag block (over-excitation channel) (sec)	

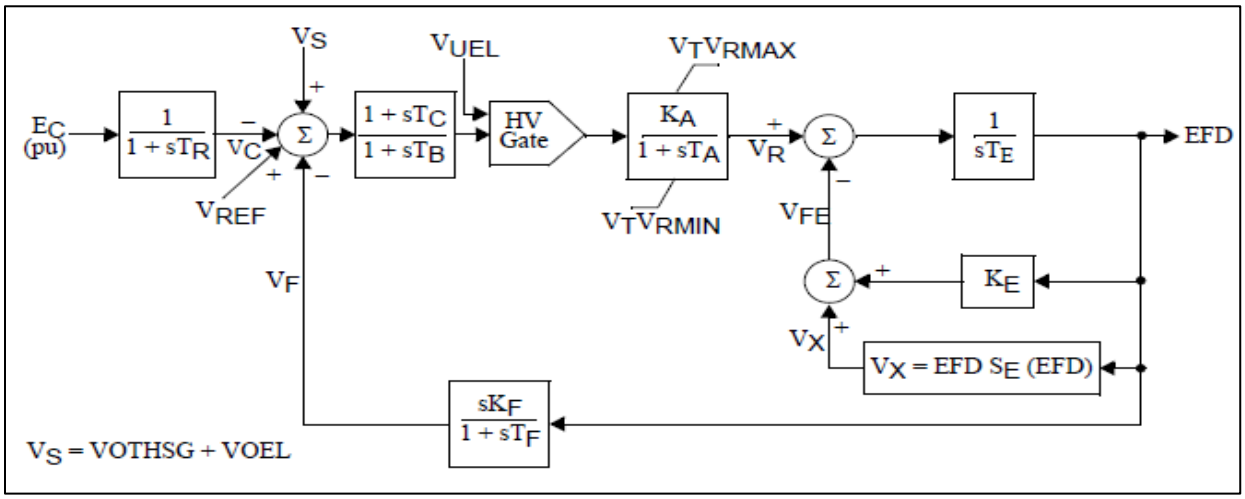
Category	Parameter Description	Data
Static Exciter		
ST6B	TR regulator input filter time constant (sec)	
	KPA (pu) (> 0) voltage regulator proportional gain	
	KIA (pu) voltage regulator integral gain	
	KDA (pu) voltage regulator derivative gain	
	TDA voltage regulator derivative channel time constant (sec)	
	VAMAX (pu) regulator output maximum limit	
	VAMIN (pu) regulator output minimum limit	
	KFF (pu) pre-control gain of the inner loop field regulator	
	KM (pu) forward gain of the inner loop field regulator	
	KCI (pu) exciter output current limit adjustment gain	
	KLR (pu) exciter output current limiter gain	
	ILR (pu) exciter current limit reference	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KG (pu) feedback gain of the inner loop field voltage regulator	
	TG (> 0) feedback time constant of the inner loop field voltage regulator (sec)	
ST7B	TR regulator input filter time constant (sec)	
	TG lead time constant of voltage input (sec)	
	TF lag time constant of voltage input (sec)	
	Vmax (pu) voltage reference maximum limit	
	Vmin (pu) voltage reference minimum limit	
	KPA (pu) (>0) voltage regulator gain	
	VRMAX (pu) voltage regulator output maximum limit	
	VRMIN (pu) voltage regulator output minimum limit	
	KH (pu) feedback gain	
	KL (pu) feedback gain	
	TC lead time constant of voltage regulator (sec)	
	TB lag time constant of voltage regulator (sec)	
	KIA (pu) (>0) gain of the first order feedback block	
	TIA (>0) time constant of the first order feedback block (sec)	

(i) **DC Exciters Generic model:**

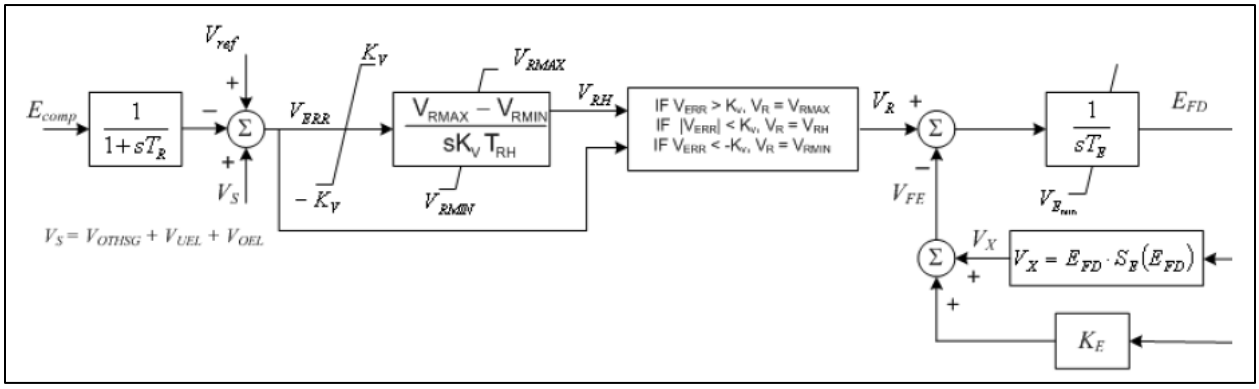
- **Type DC1A: 1992 IEEE type DC1A excitation system model**



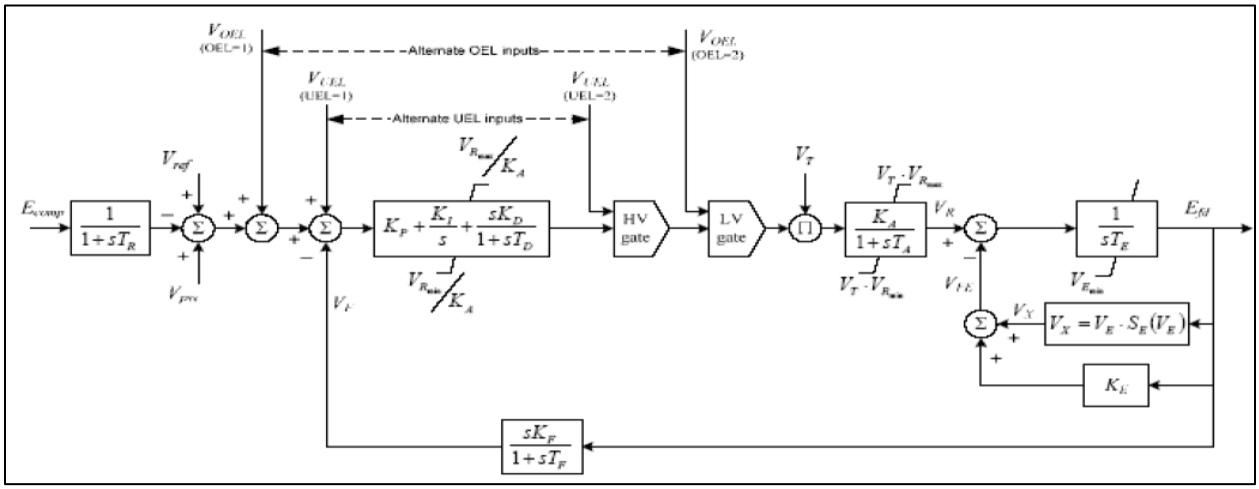
➢ **Type DC2A: 1992 IEEE type DC2A excitation system model**



➢ **Type DC3A: IEEE 421.5 2005 DC3A excitation system**

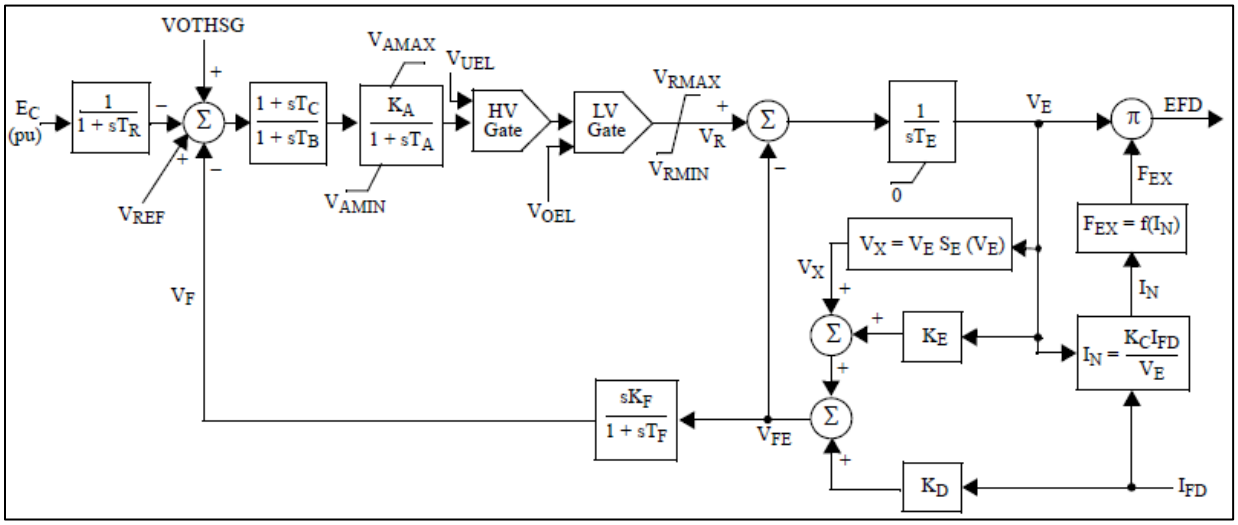


➢ **Type DC4B: IEEE 421.5 2005 DC4B excitation system**



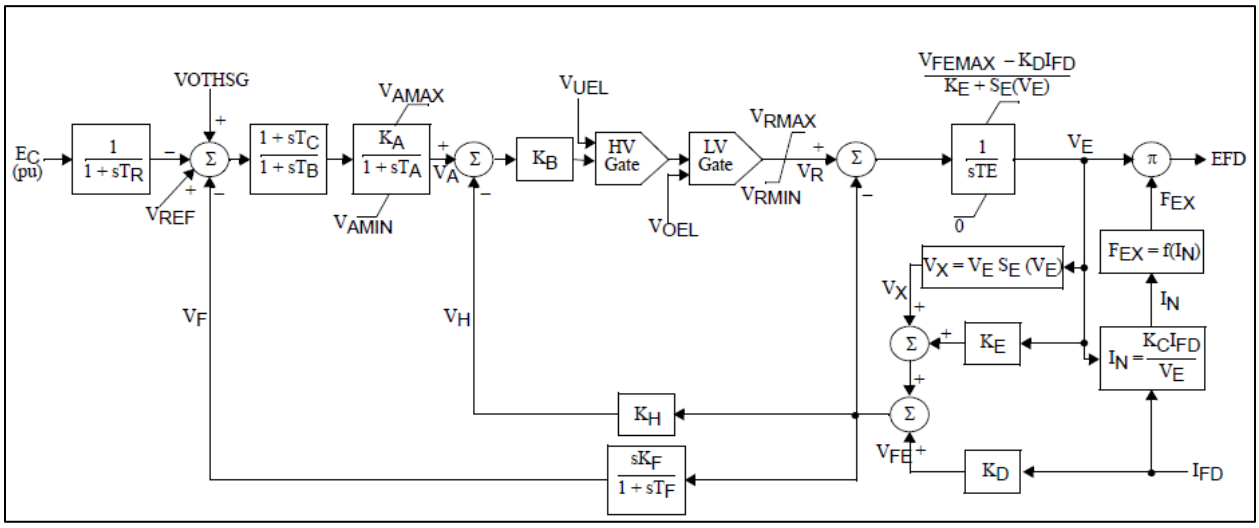
(ii) **AC Exciters Generic Models:**

- **Type AC1A: 1992 IEEE type AC1A excitation system model**

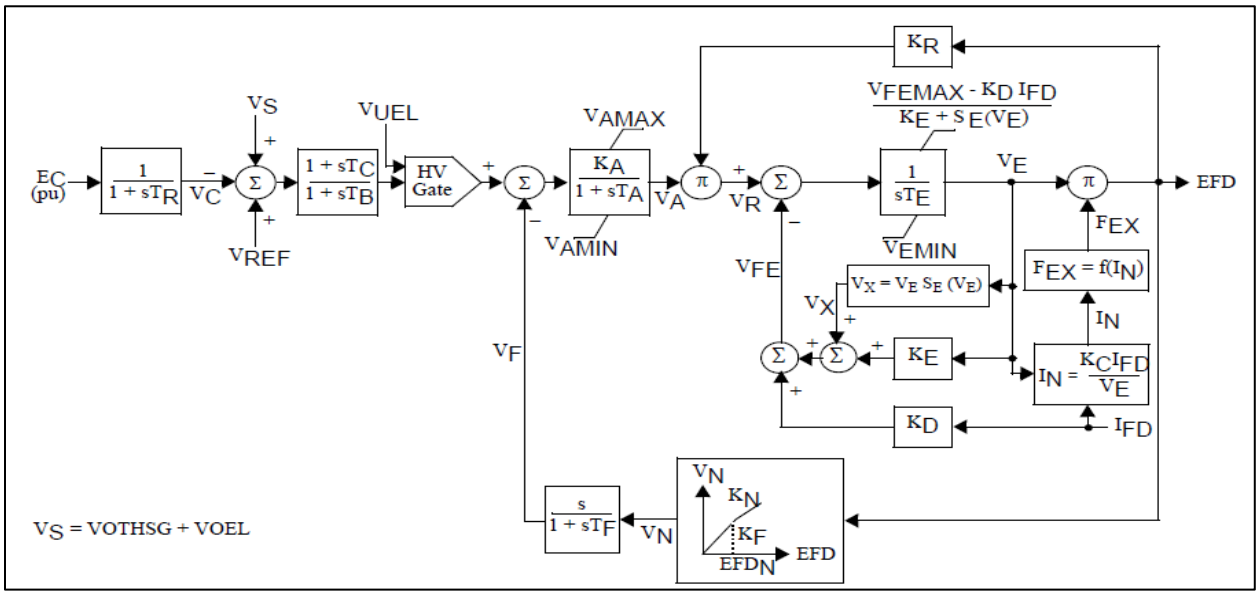


$$
I_N \rightarrow \begin{cases} \text{If } I_N \le 0 & F_{EX} = 1 \\ \text{If } I_N \le 0.433 & F_{EX} = 1 - 0.577\ I_N \\ \text{If } 0.433 < I_N < 0.75 & F_{EX} = \sqrt{0.75 - I_N^2} \\ \text{If } I_N \ge 0.75 & F_{EX} = 1.732(1 - I_N) \\ \text{If } I_N > 1 & F_{EX} = 0 \end{cases} \rightarrow F_{EX}
$$

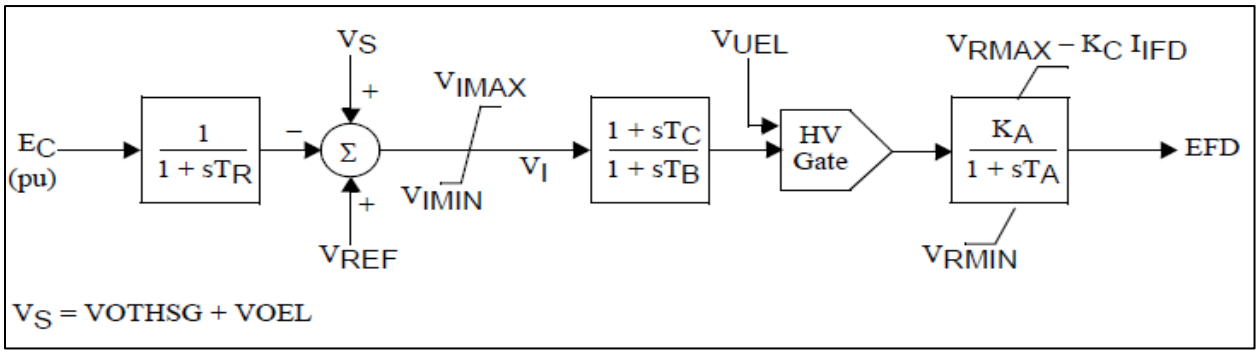
- **Type AC2A: 1992 IEEE type AC2A excitation system model**



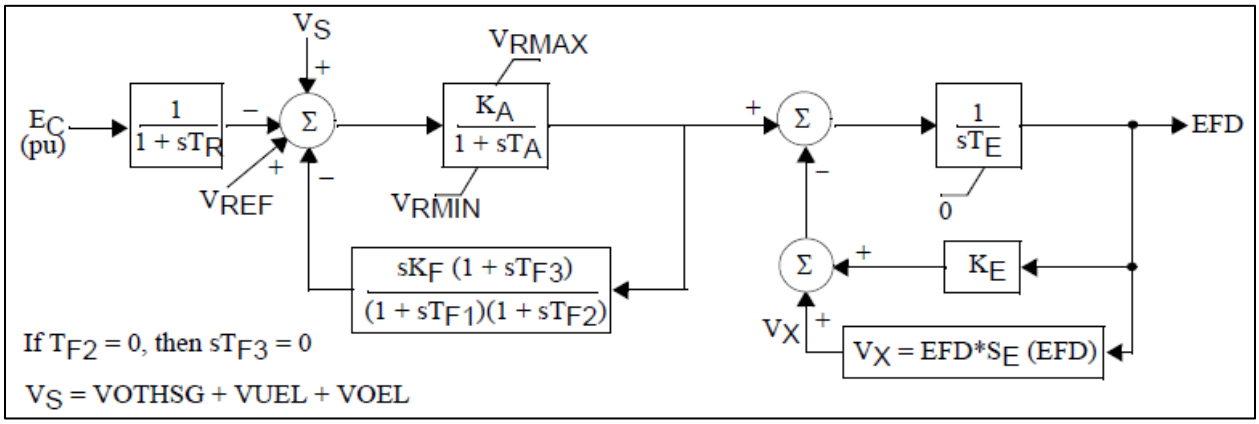
➢ **Type AC3A: 1992 IEEE type AC3A excitation system model**



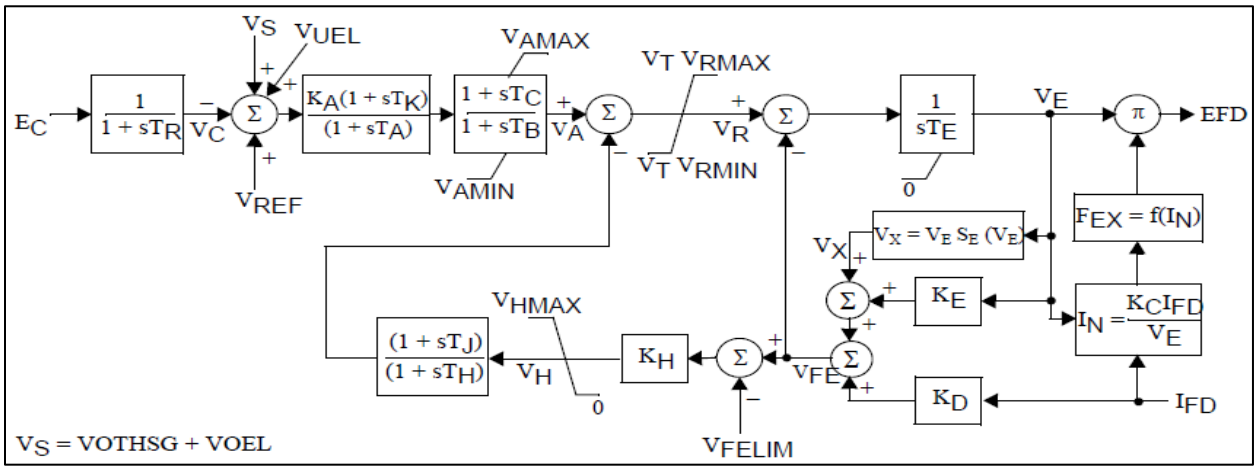
➢ **Type AC4A: 1992 IEEE type AC4A excitation system model**



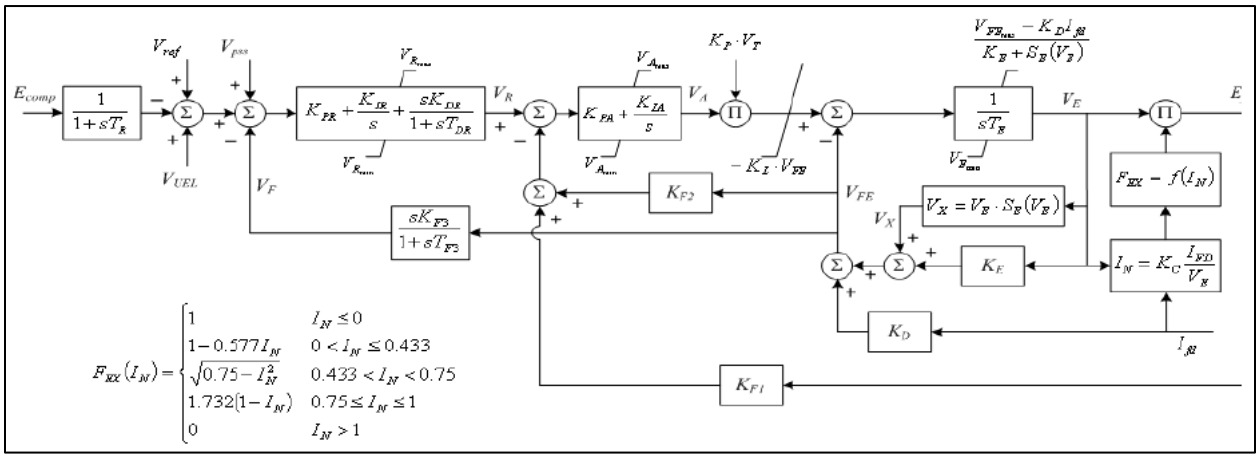
➢ **Type AC5A: 1992 IEEE type AC5A excitation system model**



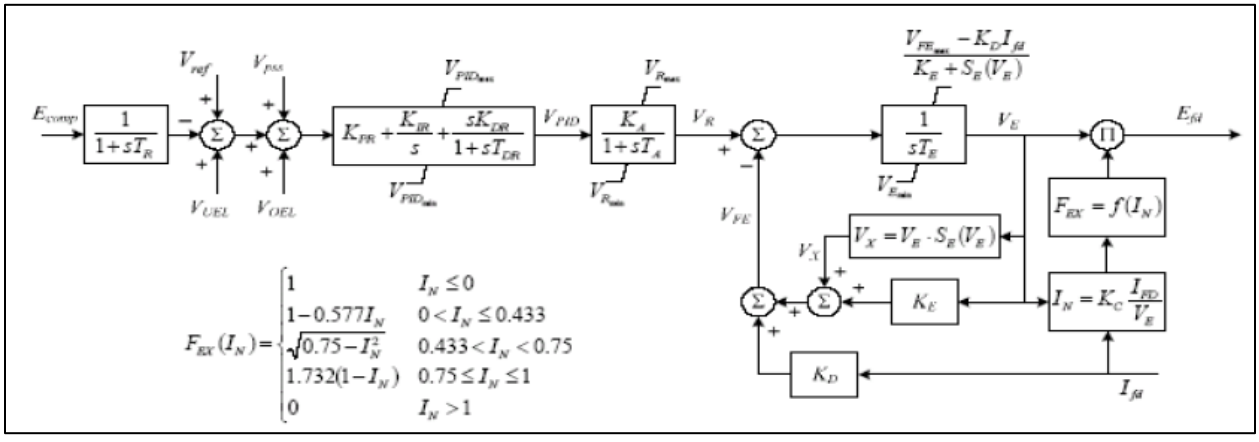
- **Type AC6A: IEEE 421.5 excitation system model**



- **Type AC7B: IEEE 421.5 2005 AC7B excitation system**

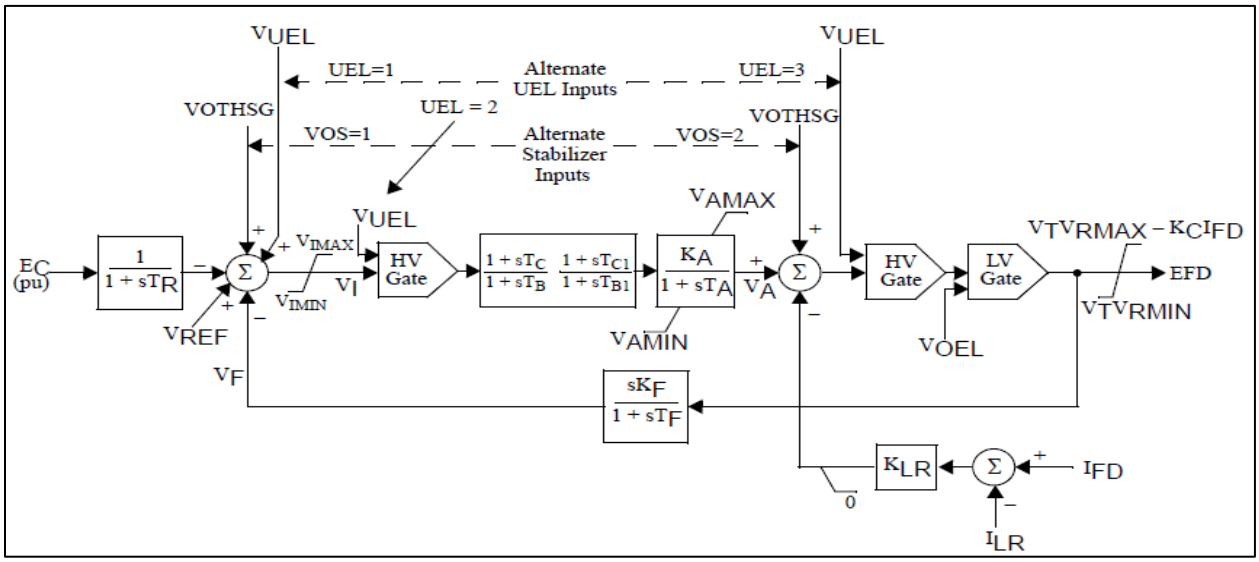


- **Type AC8B: IEEE 421.5 2005 AC8B excitation system**

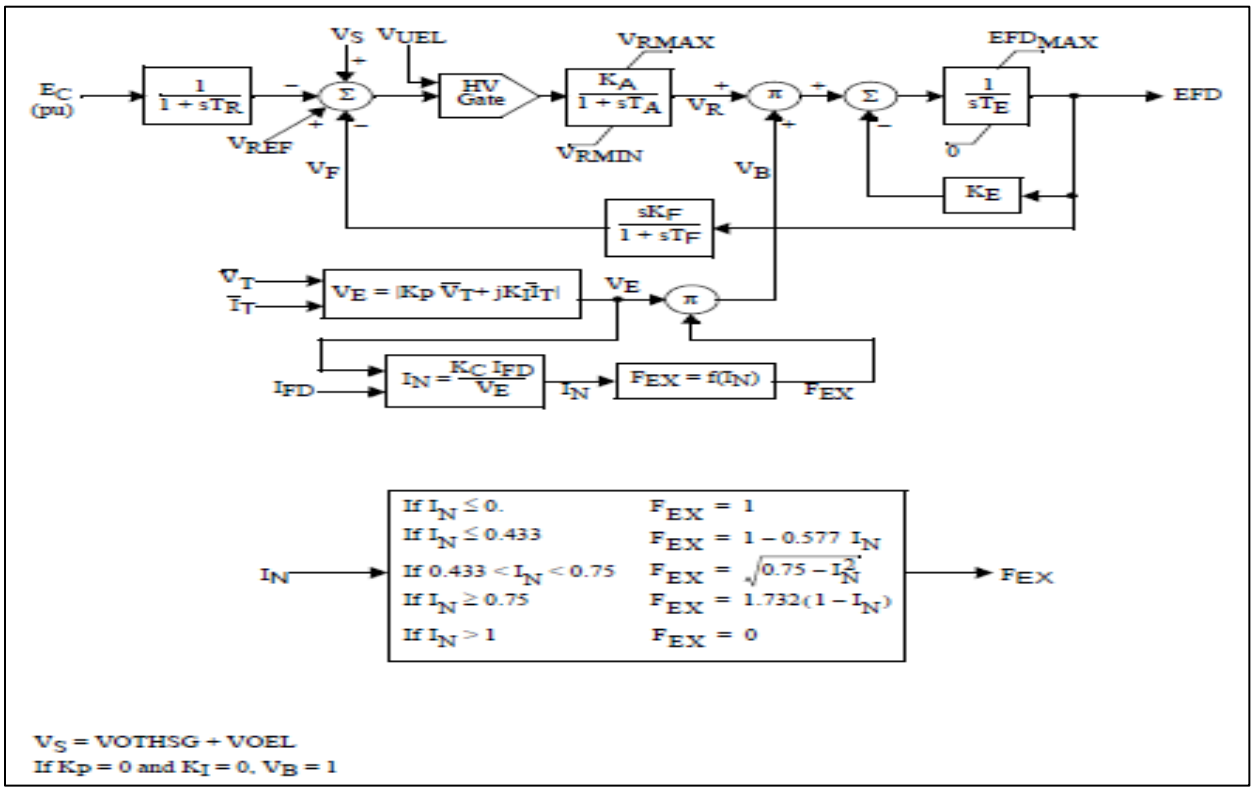


(iii) **Commonly Used Static Exciters Generic Models block diagrams:**

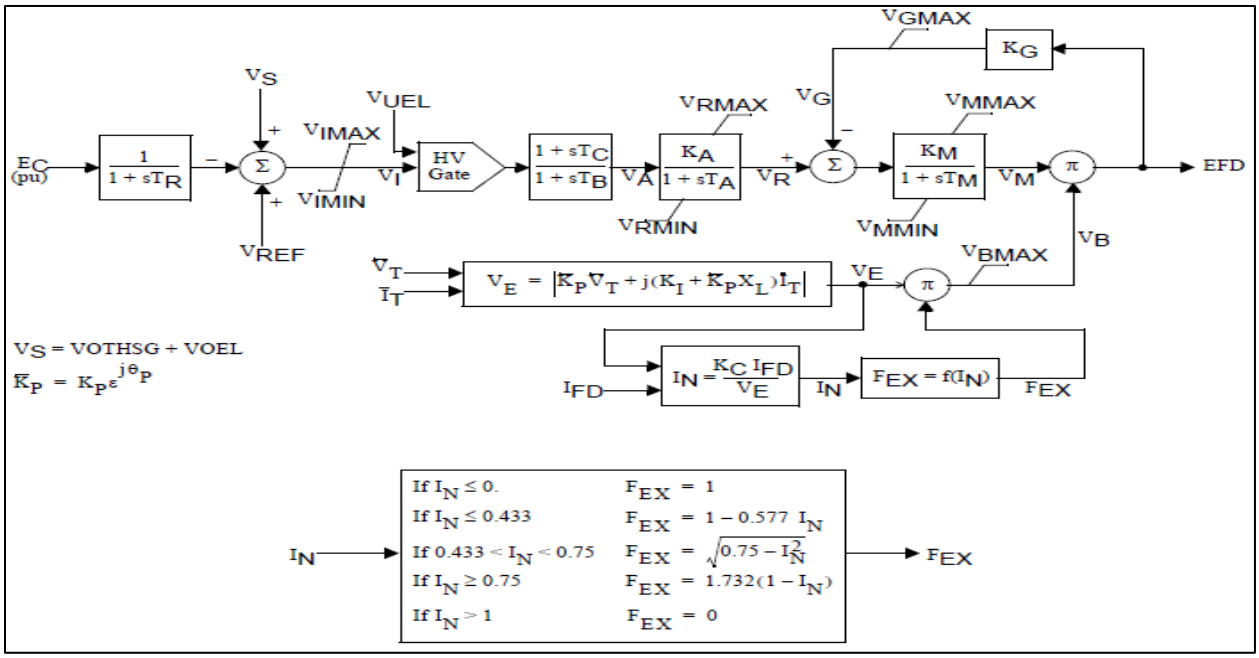
- **Type ST1A: 1992 IEEE type ST1A excitation system model**



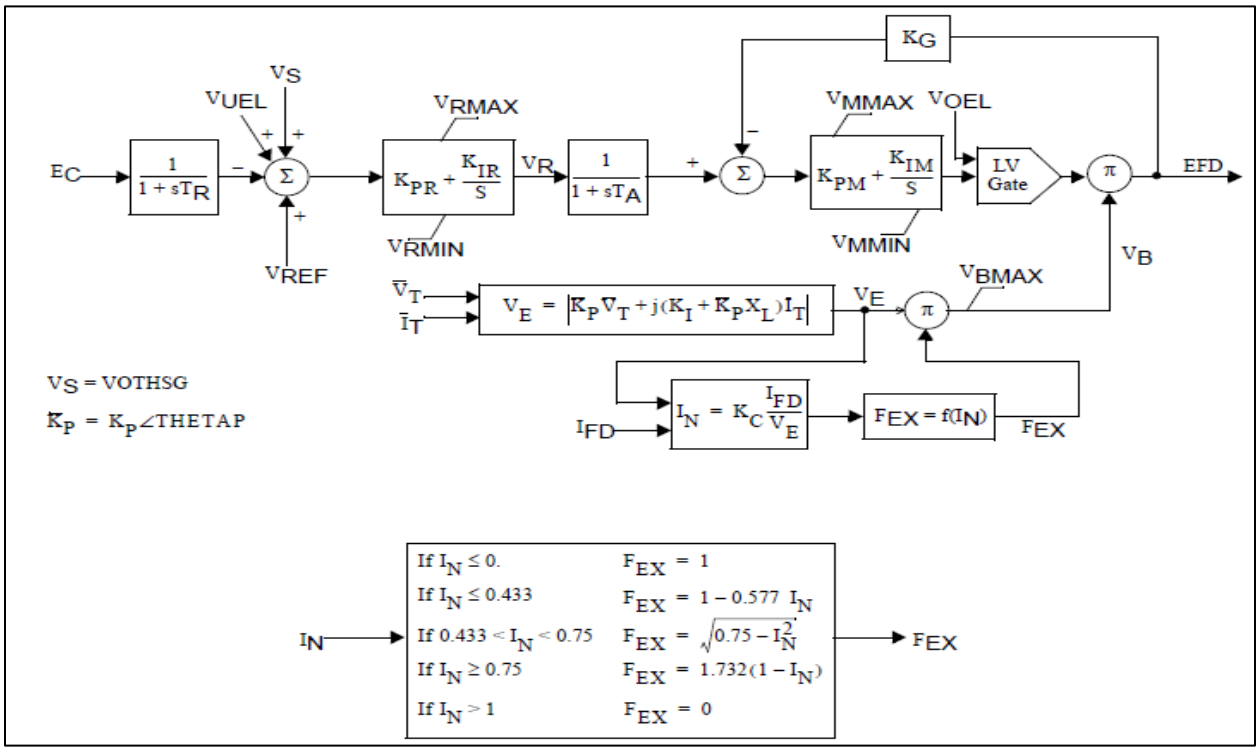
- **Type ST2A: 1992 IEEE type ST2A excitation system model**



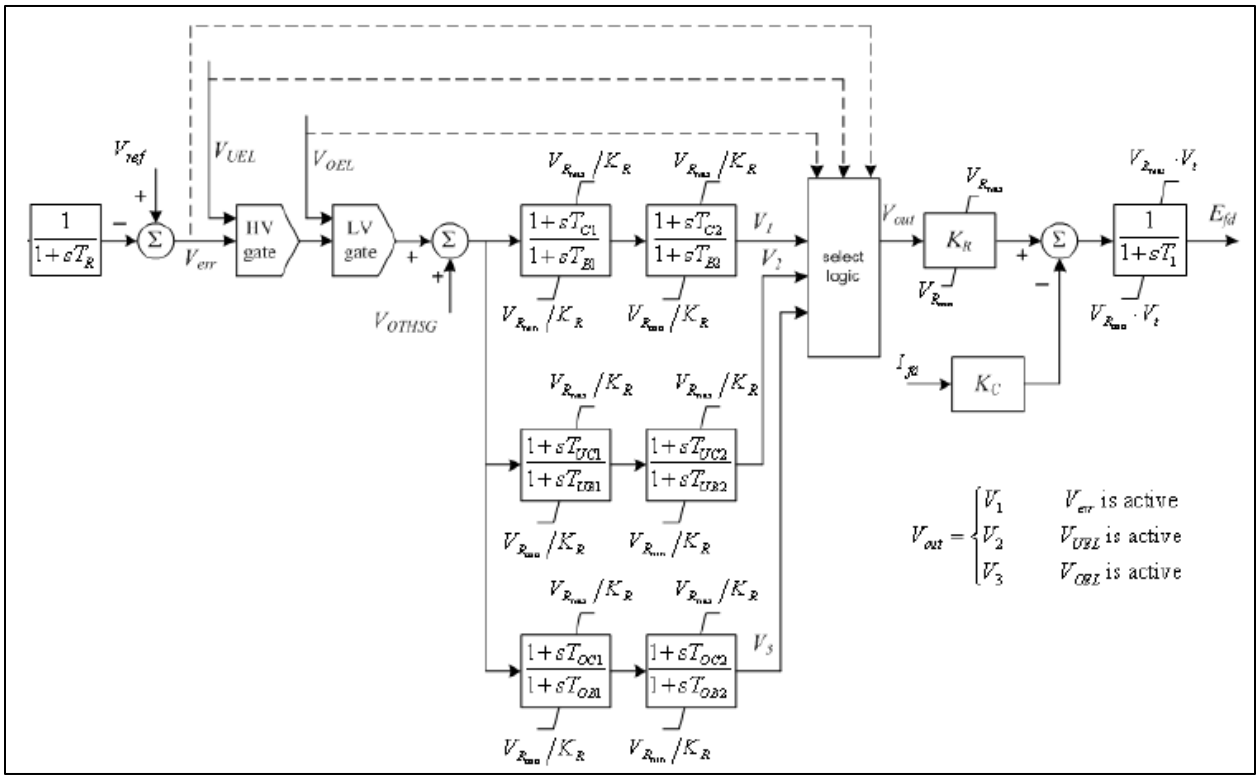
➢ **Type ST3A: 1992 IEEE type ST3A excitation system model**



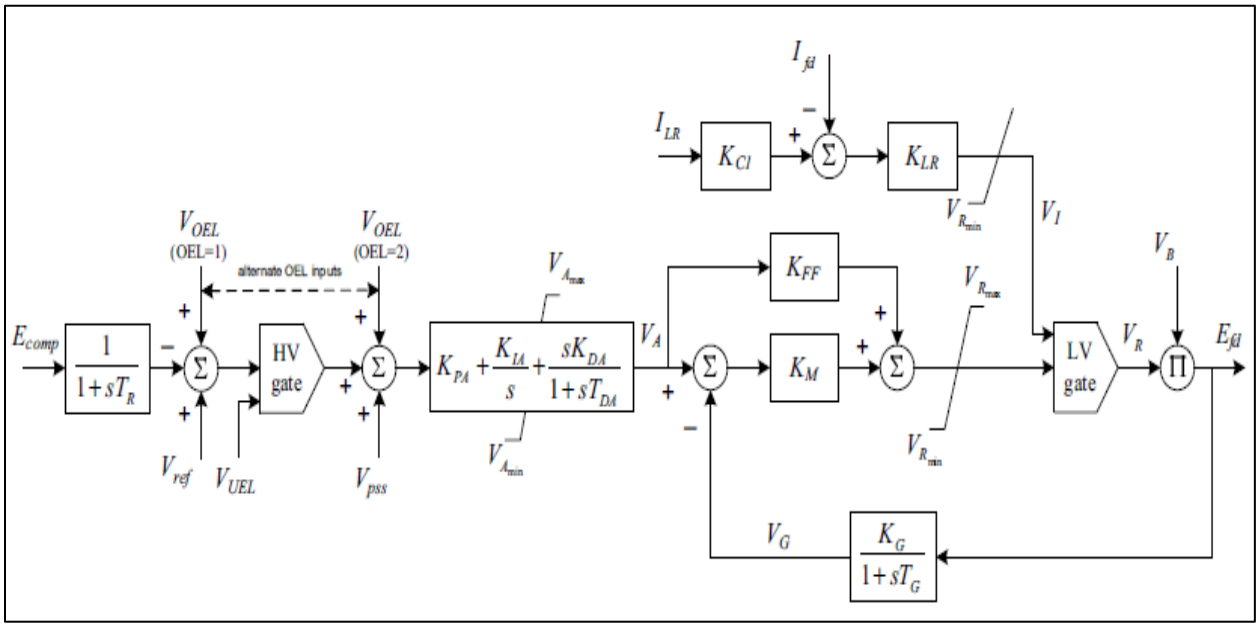
➢ **Type ST4B: IEEE type ST4B potential or compounded source-controlled rectifier exciter**



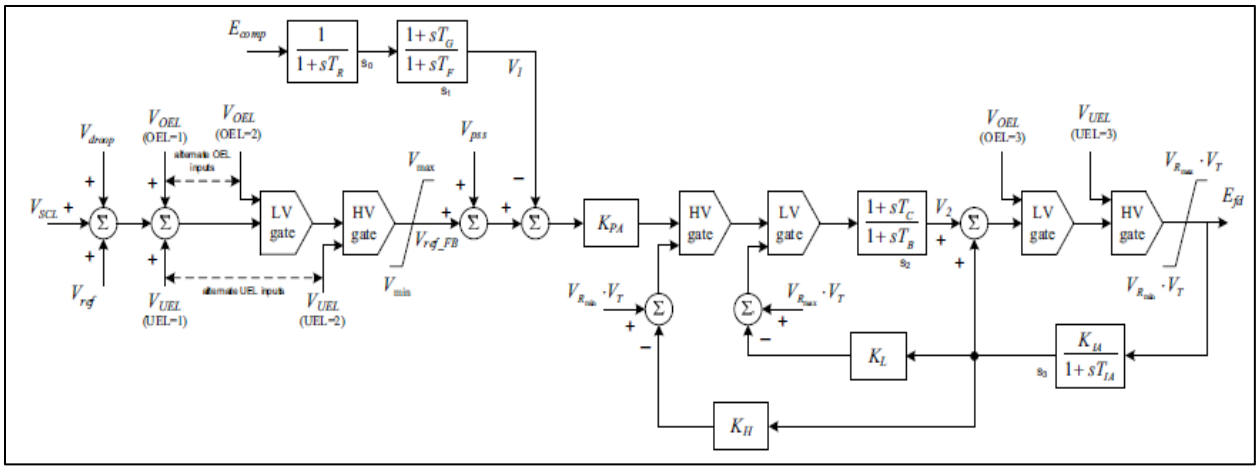
➢ **Type ST5B: IEEE 421.5 2005 ST5B excitation system**



➢ **Type ST6B: IEEE 421.5 2005 ST6B excitation system**



➢ **Type ST7B: IEEE 421.5 2005 ST7B excitation system**



Source-PSSE Model Library

3.4 Power system stabilizer:

The function of the PSS is to add to the unit's characteristic electromechanical oscillations. This is achieved by modulating excitation to develop a component in electrical torque in phase with rotor speed deviations.

The most important aspect when considering a PSS model is the number of inputs. The following table shows the type of models separated based on the inputs:

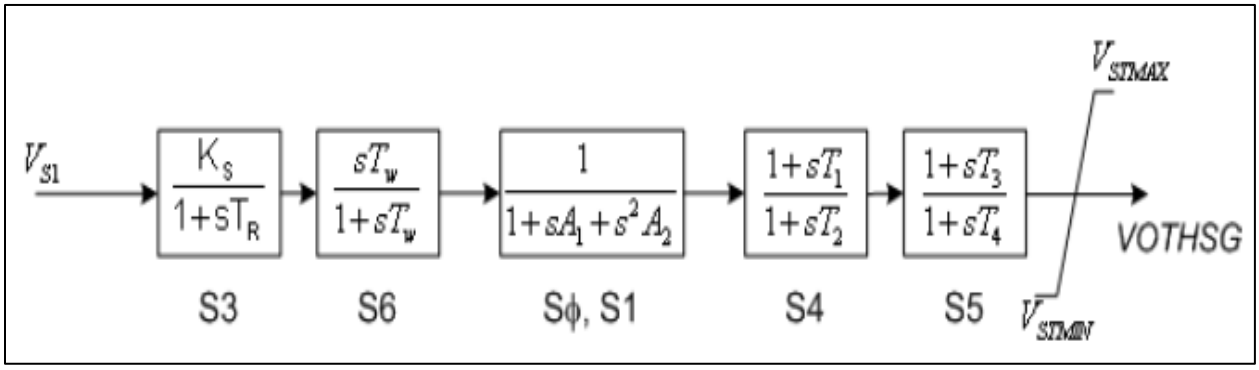
Type	Inputs	Remarks
PSS1A	Single input	Two lead-lags Input can either be speed, frequency or power
PSS2B	Dual input	Integral of accelerating power type stabiliser Speed and Power Most common type Supersedes PSS2A (three versus two lead lags)
PSS3B	Dual input	Power and rotor angular frequency deviation Stabilising signal is a vector sum of processed signals Not very common

Category	Parameter Description	Data
Stabilizer Models		
PSS1A	A1, Filter coefficient	
	A2, Filter coefficient	
	TR, transducer time constant	
	0	
	0	
	0	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	Tw, Washout Time Constant	
	Tw, Washout Time Constant	
	Ks, input channel gain	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	
	0	
	0	
PSS2B	TW1, 1st Washout 1th Time Constant	
	TW2, 1st Washout 2th Time Constant	
	T6, 1st Signal Transducer Time Constant	
	TW3, 2nd Washout 1th Time Constant	
	TW4, 2nd Washout 2th Time Constant	
	T7, 2nd Signal Transducer Time Constant	
	KS2, 2nd Signal Transducer Factor	
	KS3, Washouts Coupling Factor	
	T8, Ramp Tracking Filter Deriv. Time Constant	
	T9, Ramp Tracking Filter Delay Time Constant	
	KS1, PSS Gain	
	T1, 1st Lead-Lag Derivative Time Constant	
	T2, 1st Lead-Lag Delay Time Constant	
	T3, 2nd Lead-Lag Derivative Time Constant	
	T4, 2nd Lead-Lag Delay Time Constant	
	T10, 3rd Lead-Lag Derivative Time Constant	
	T11, 3rd Lead-Lag Delay Time Constant	
	VS1MAX, Input 1 Maximum limit	
	VS1MIN, Input 1 Minimum limit	
	VS2MAX, Input 2 Maximum limit	
	VS2MIN, Input 2 Minimum limit	
	VSTMAX, Controller Maximum Output	
	VSTMIN, Controller Minimum Output	

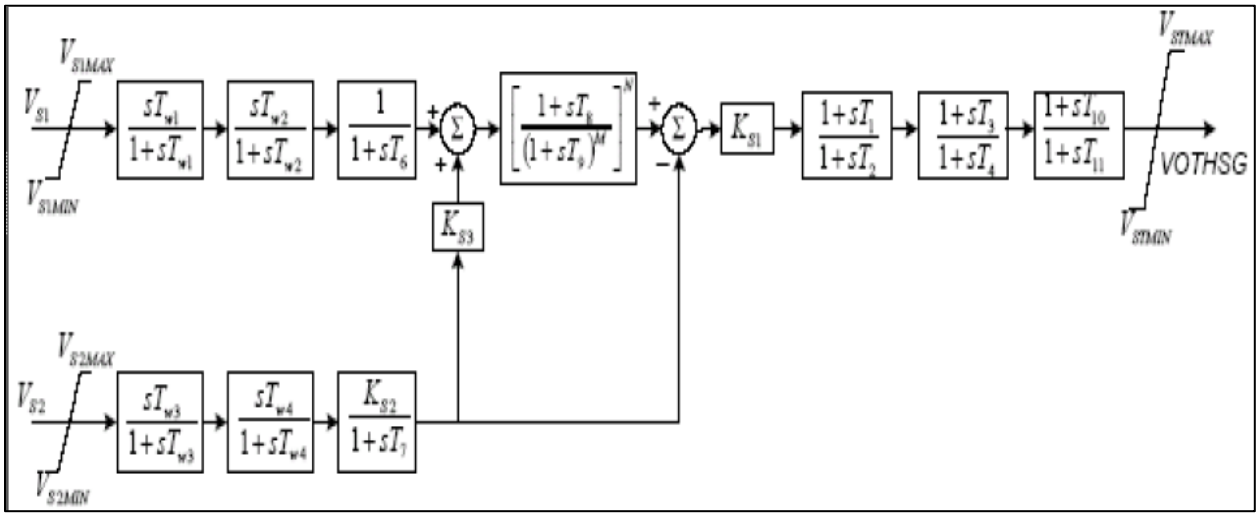
Category	Parameter Description	Data
Stabilizer Models		
PSS3B	KS1 (pu) (≠0), input channel #1 gain	
	T1 input channel #1 transducer time constant (sec)	
	Tw1 input channel #1 washout time constant (sec)	
	KS2 (pu) (0), input channel #2 gain	
	T2 input channel #2 transducer time constant (sec)	
	Tw2 input channel #2 washout time constant (sec)	
	Tw3 (0), main washout time constant (sec)	
	A1, Filter coefficient	
	A2, Filter coefficient	
	A3, Filter coefficient	
	A4, Filter coefficient	
	A5, Filter coefficient	
	A6, Filter coefficient	
	A7, Filter coefficient	
	A8, Filter coefficient	
	VSTMAX, Controller maximum output	
	VSTMAX, Controller minimum output	

Commonly Used Power System Stabilizer generic models block diagrams:

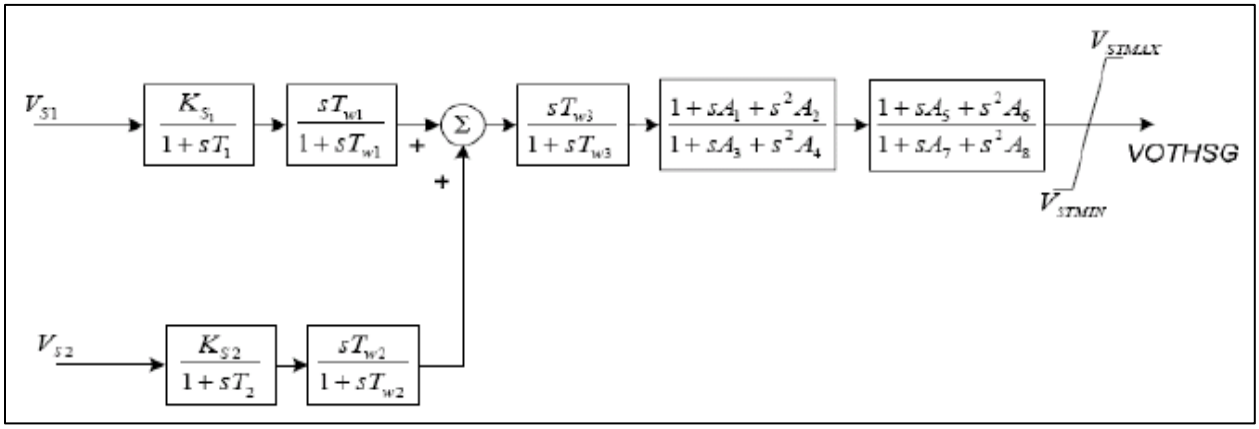
- **PSS1A: IEEE Std. 421.5-2005 PSS1A Single-Input Stabilizer model**



- **PSS2B: IEEE 421.5 2005 PSS2B IEEE dual-input stabilizer model**



- **PSS3B: IEEE Std. 421.5 2005 PSS3B IEEE dual-input stabilizer model**



Source-PSSE Model Library

3.5 Generic models for gas turbine-governor:

The following table is a list for common generic models of gas turbines:

Type	Name	Remarks
GAST	Gas turbine governor	Simplified model for industrial gas turbine (i.e. OCGT)
GAST2A	Gas turbine governor	More detailed GT from GAST. Governor can be configured for droop or isochronous control. Includes temperature control
GASTWD	Woodward Gas Turbine-Governor model	Same detail of turbine dynamics as GAST2A but with a Woodward governor controls
WESGOV	Westinghouse Digital governor for Gas Turbine	Westinghouse 501 combination turbine governor
GGOV1	GE General Governor/Turbine model	General purpose GE GT model (neglects ICV control)
PWTBD1	Pratt & Whitney Turboden turbine-governor	Turbine load PI control with valve and look-up table
URCSCT	Combined cycle, single shaft turbine-governor model	
URGS3T	WECC gas turbine governor	

Source: PSSE Model Library, for models other than the above list refer to

https://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/transmission-system-planning-tab/pages/user-support.aspx

Category	Parameter Description	Data
TURBINE GOVERNOR model		
GAST	R, permanent droop	
	T1 (>0) (sec), Governor mechanism time constant	
	T2 (>0) (sec), Turbine power time constant	
	T3 (>0) (sec), Turbine exhaust temperature time constant	
	Ambient temperature load limit, AT	
	KT, Temperature limiter gain	
	VMAX, Maximum turbine power	
	VMIN, Minimum turbine power	
	Dturb, Turbine damping factor	
GAST2A	W, governor gain (1/droop) (on turbine rating)	
	X (sec) governor lead time constant	
	Y (sec) (> 0) governor lag time constant	
	Z, governor mode:1 Droop or 0 ISO	
	ETD (sec), Turbine exhausts time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	
	ECR (sec), Combustor time constant	
	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	Tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	Tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	
	bf2, describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR (degree), Rated temperature	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
GASTWD	KDROOP (on turbine rating)	
	KP, Proportional gain	
	KI, Integral gain	
	KD, Derivative gain	
	ETD (sec), Turbine exhaust time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	
	ECR (sec), Combustor time constant	
	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	
	bf2 (>0), describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR(degree), Rated temperature1	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control1	
	TD (sec) (> 0), Power transducer	
WESGOV	ΔTC (sec), Δt sample for controls	
	ΔTP (sec), Δt sample for PE	
	Power Droop	
	Kp, Trubine proportional gain	
	TI (> 0) (sec), Integral time constant	
	T1 (sec), Constant time	
	T2 (sec), Constant time	
	ALIM	
	Tpe (sec), Power time constant	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
GGOV1	R, Permanent droop, pu	
	Tpelec, Electrical power transducer time constant, sec	
	maxerr, Maximum value for speed error signal	
	minerr, Minimum value for speed error signal	
	Kpgov, Governor proportional gain	
	Kigov, Governor integral gain	
	Kdgov, Governor derivative gain	
	Tdgov, Governor derivative controller time constant, sec	
	vmax, Maximum valve position limit	
	vmin, Minimum valve position limit	
	Tact, Actuator time constant, sec	
	Kturb, Turbine gain	
	Wfnl, No load fuel flow, pu	
	Tb, Turbine lag time constant, sec	
	Tc, Turbine lead time constant, sec	
	Teng, Transport lag time constant for diesel engine, sec	
	Tfload, Load Limiter time constant, sec	
	Kpload, Load limiter proportional gain for PI controller	
	Kiload, Load limiter integral gain for PI controller	
	Ldref, Load limiter reference value pu	
	Dm, Mechanical damping coefficient, pu	
	Ropen, Maximum valve opening rate, pu/sec	
	Rclose, Maximum valve closing rate, pu/sec	
	Kimw, Power controller (reset) gain	
	Aset, Acceleration limiter setpoint, pu/sec	
	Ka, Acceleration limiter gain	
	Ta, Acceleration limiter time constant, sec (> 0)	
	Trate, Turbine rating (MW)1	
	db, Speed governor deadband	
	Tsa, Temperature detection lead time constant, sec	
	Tsb, Temperature detection lag time constant, sec	
	Rup, Maximum rate of load limit increase	
	Rdown, Maximum rate of load limit decrease	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
PWTBD1	Trate (MW), Turbine rating (MW)	
	K (pu), Proportional gain	
	Ki (pu), Integral gain	
	Vrmax (pu), Upper Limit of PI controller	
	Vrmin (pu), Lower Limit of PI controller	
	Tv (s) (>0), Control valve Time Constant	
	Lo (pu/sec) (>0), Control valve open rate limit	
	Lc (pu/sec) (>0), Control valve close rate limit	
	Vmax (pu), Maximum valve position	
	Vmin (pu), Minimum valve position	
	Tb1 (s), steam buffer time constant	
	Tb2 (s), steam buffer time constant	
	v1 (pu), valve position 1	
	p1 (pu), power output for valve position v1	
	v2 (pu), valve position 2	
	p2 (pu), power output for valve position v2	
	v3 (pu), valve position 3	
	p3 (pu), power output for valve position v3	
	v4 (pu), valve position 4	
	p4 (pu), power output for valve position v4	
	v5 (pu), valve position 5	
	p5 (pu), power output for valve position v5	
	v6 (pu), valve position 6	
	p6 (pu), power output for valve position v6	
	v7 (pu), valve position 7	
	p7 (pu), power output for valve position v7	
	v8 (pu), valve position 8	
	p8 (pu), power output for valve position v8	
	v9 (pu), valve position 9	
	p9 (pu), power output for valve position v9	
	v10 (pu), valve position 10	
	p11 (pu), power output for valve position v11	
	v11 (pu), valve position 11	
	p11 (pu), power output for valve position v11	

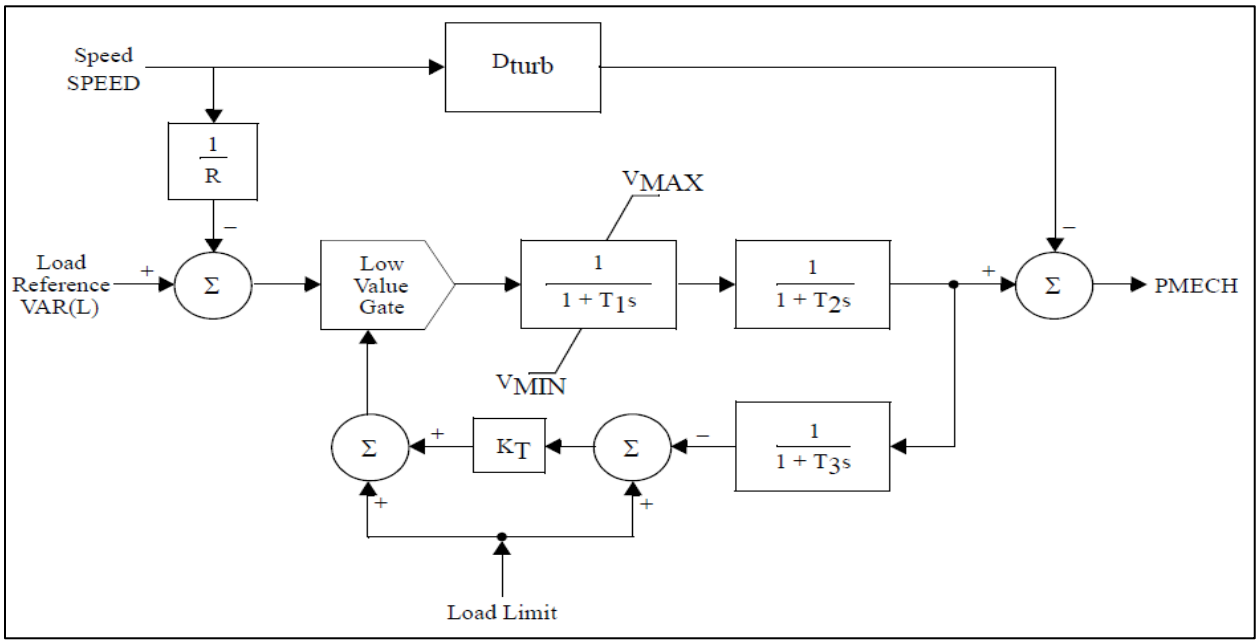
Category	Parameter Description	Data
TURBINE GOVERNOR model		
URCSCT	W, governor gain (1/droop) (on turbine rating)	
	X (sec) governor lead time constant	
	Y (sec) (> 0) governor lag time constant	
	Z, governor mode:1 Droop or 0 ISO	
	ETD (sec), Turbine exhausts time constant	
	TCD (sec), Gas turbine dynamic time constant	
	TRATE turbine rating (MW)	
	T (sec), Fuel control time constant	
	MAX (pu) limit (on turbine rating)	
	MIN (pu) limit (on turbine rating)	
	ECR (sec), Combustor time constant	
	K3, Fuel control gain	
	a (> 0) valve positioner	
	b (sec) (> 0) valve positioner	
	c valve positioner	
	Tf (sec) (> 0), Fuel system time constant	
	Kf, feedback gain	
	K5, Radiation shield	
	K4, Radiation shield	
	T3 (sec) (> 0), Radiation shield time constant	
	T4 (sec) (> 0), Thermocouple time constant, seconds	
	Tt (> 0), Temperature control time constant	
	T5 (sec) (> 0), Temperature control time constant	
	af1, describes the turbine characteristic	
	bf1, describes the turbine characteristic	
	af2, describes the turbine characteristic	
	bf2, describes the turbine characteristic	
	cf2, describes the turbine characteristic	
	TR (degree), Rated temperature	
	K6 (pu), Minimum fuel flow	
	TC (degree), Temperature control	
	K, Governor gain, (1/droop) pu	
	T1 (sec), Lag time constant (sec)	
	T2 (sec), Lead time constant (sec)	
	T3 (> 0) (sec), valve position time constant	
	Uo (pu/sec), maximum valve opening rate	
	Uc (< 0) (pu/sec), maximum valve closing rate	
	PMAX (pu on machine MVA rating)	
	PMIN (pu on machine MVA rating)	

Category	Parameter Description	Data
TURBINE GOVERNOR model		
URSCT (continued)	T4 (sec), time constant for steam inlet	
	K1, HP fraction	
	K2, LP fraction	
	T5 (sec), Time Constant for Second Boiler Pass [s]	
	K3, HP Fraction	
	K4, LP fraction	
	T6 (sec), Time Constant for Third Boiler Pass [s]	
	K5, HP Fraction	
	K6, LP fraction	
	T7 (sec), Time Constant for Fourth Boiler Pass [s]	
	K7, HP Fraction	
	K8, LP fraction	
	ST Rating, Steam turbine rating (MW)	
	POUT A, Plant total, point A (MW)	
	STOUT A, Steam turbine output, point A (MW)	
	POUT B, Plant total, point B (MW)	
	STOUT B, Steam turbine output, point B (MW)	
	POUT C, Plant total, point C (MW)	
	STOUT C, Steam turbine output, point C (MW)	
URGS3T	R	
	T1 (> 0) (sec)	
	T2 (> 0) (sec)	
	T3 (> 0) (sec)	
	Lmax	
	Kt	
	Vmax	
	Vmin	
	Dturb	
	Fidle	
	Rmax	
	Linc (> 0)	
	Tltr (>0) (sec)	
	Ltrat	
	a	
	b (> 0)	
	db1, dead band width (p.u.)	
	Err, deadband hysteresis (p.u.)	
	db2, dead band width (p.u.)	
	GV1, coordinate of power-gate look-up table (p.u. gate)	

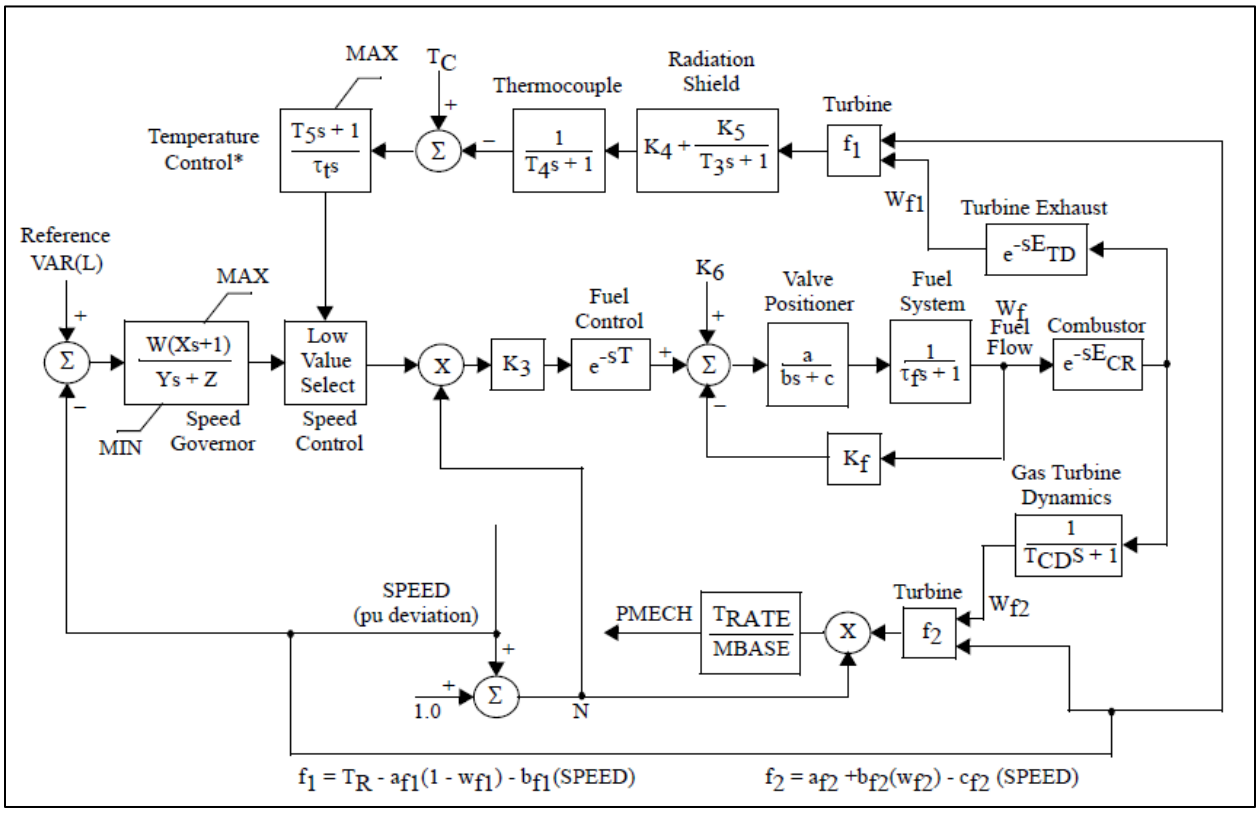
URGS3T (CONTINUED)	PGV1, coordinate of power-gate look-up table (p.u. power)	
	GV2, coordinate of power-gate look-up table (p.u. gate)	
	PGV2, coordinate of power-gate look-up table (p.u. power)	
	GV3, coordinate of power-gate look-up table (p.u. gate)	
	PGV3, coordinate of power-gate look-up table (p.u. power)	
	GV4, coordinate of power-gate look-up table (p.u. gate)	
	PGV4, coordinate of power-gate look-up table (p.u. power)	
	GV5, coordinate of power-gate look-up table (p.u. gate)	
	PGV5, coordinate of power-gate look-up table (p.u. power)	
	Ka	
	T4	
	T5	
	MWCAP	

Commonly Used Gas Turbine Generic Models Block Diagrams:

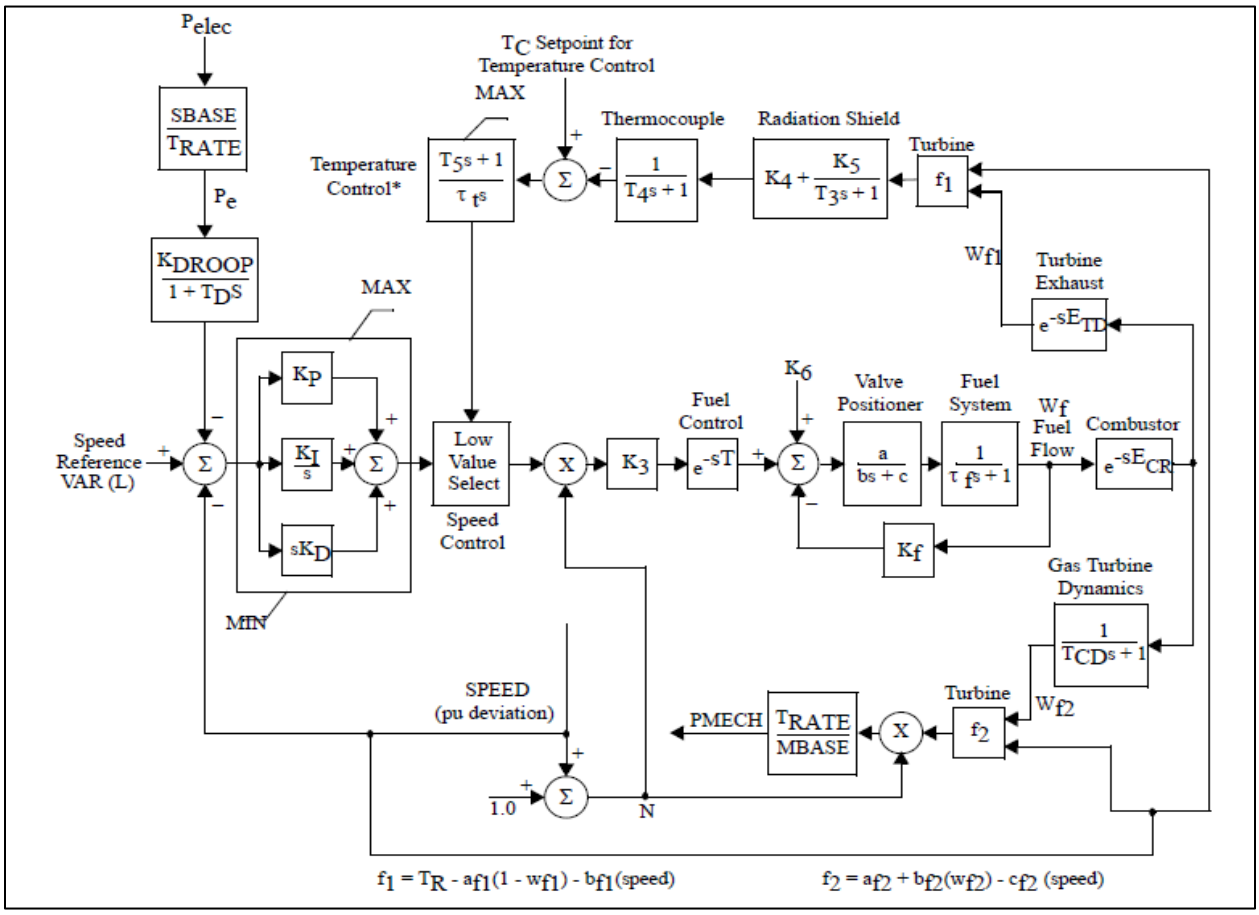
- **GAST: Gas Turbine-Governor**



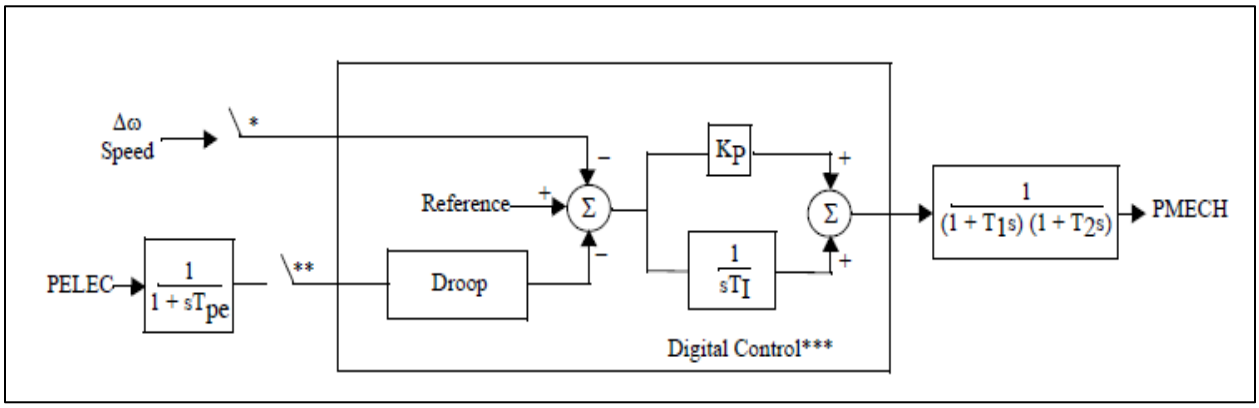
- **GAST2A: Hydro Turbine-Governor**



➢ **GASTWD: Woodward Gas Turbine-Governor Model**



➢ **WESGOV: Westinghouse Digital Governor for Gas Turbine**

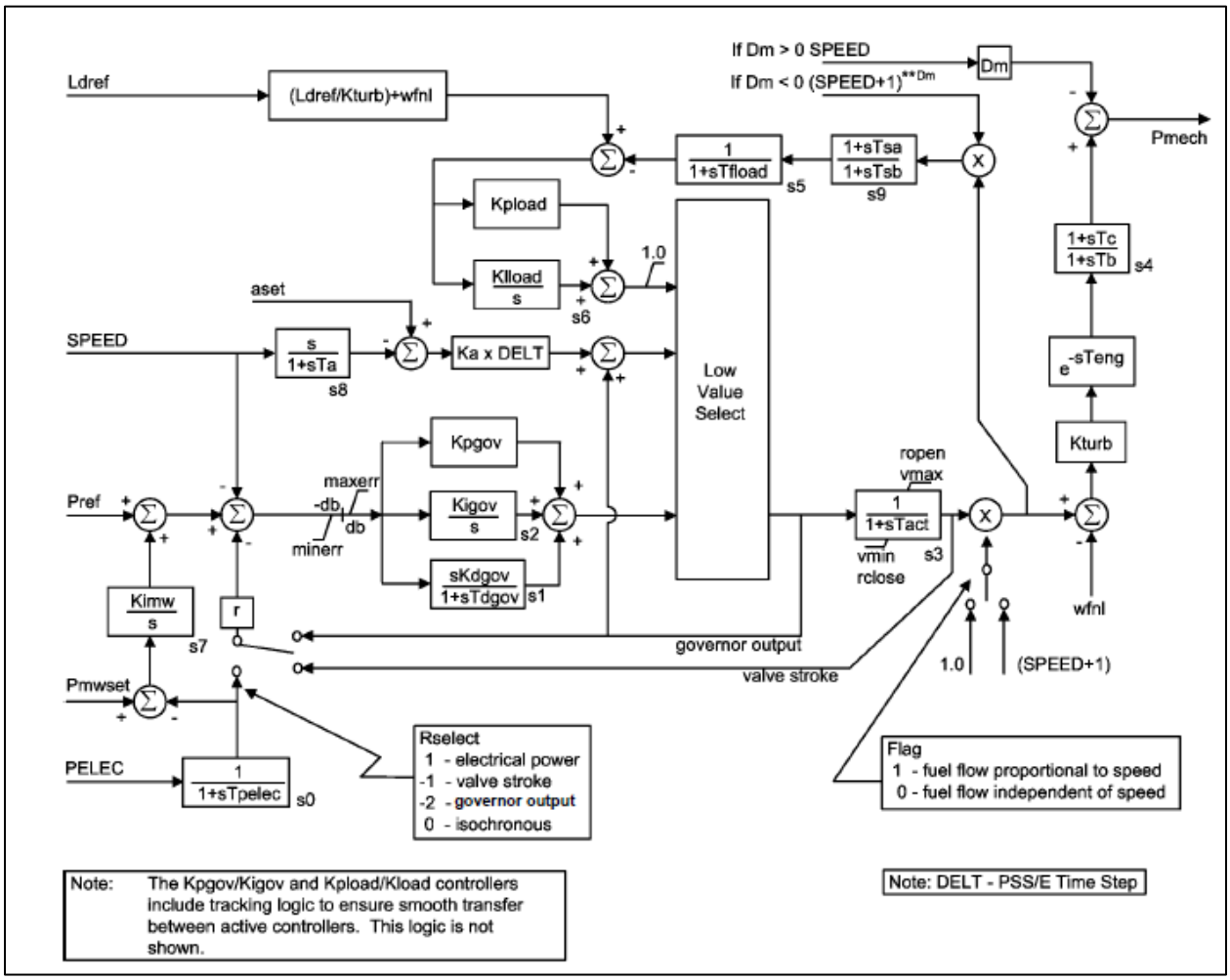


**Sample hold with sample period defined by ΔTC.*

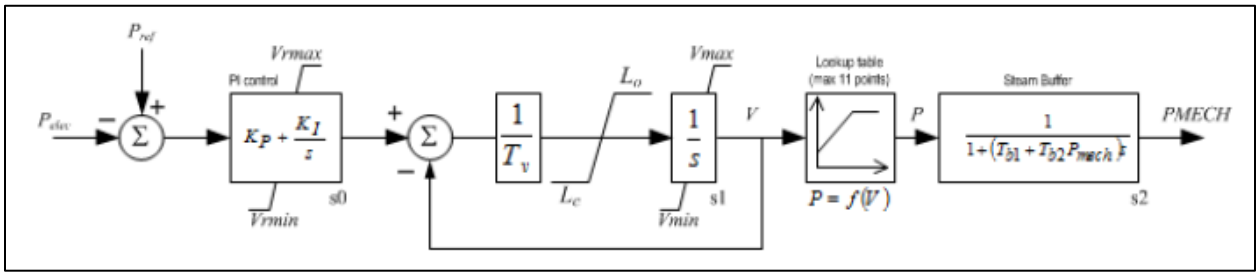
***Sample hold with sample period defined by ΔTP.*

****Maximum change is limited to ALIM between sampling times.*

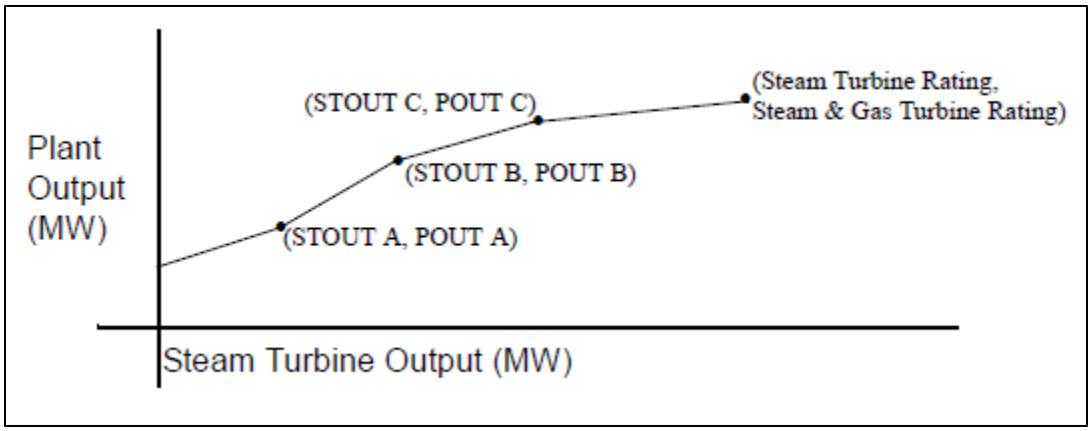
➢ **GGOV1: GE General Governor/Turbine Model**



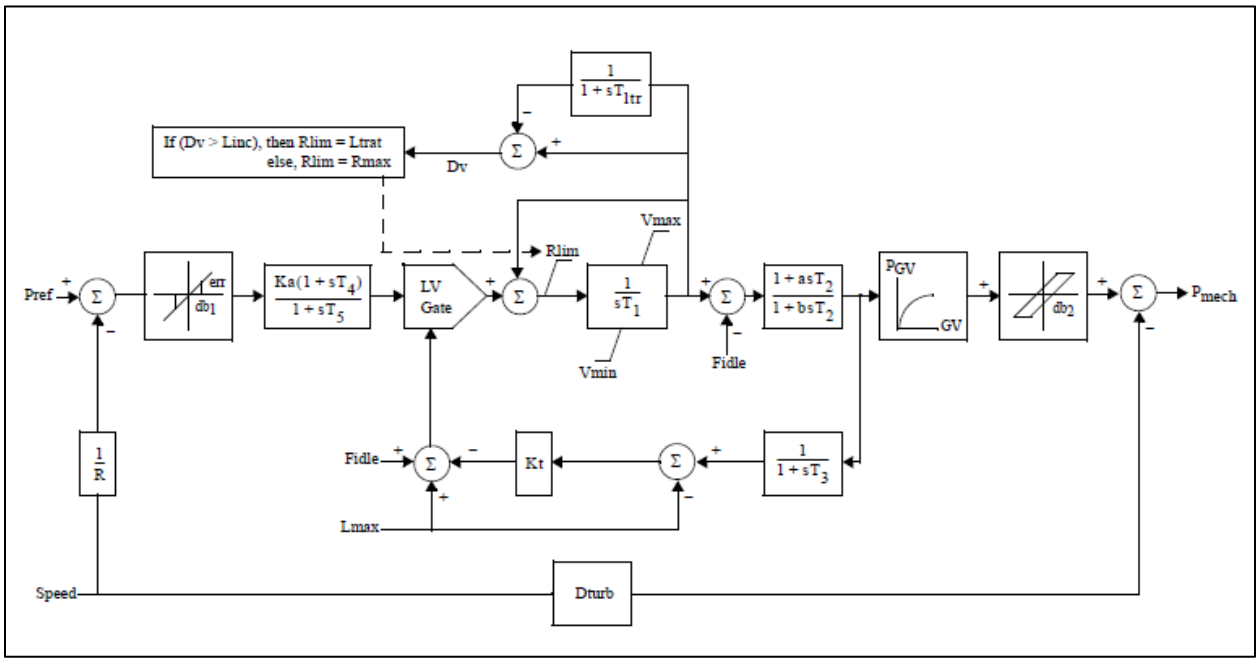
➢ **PWTBD1: Pratt & Whitney Turboden Turbine-Governor Model**



- **URCSCT: Combined Cycle on Single Shaft**



- **URGS3T: WECC Gas Turbine Model**



Source-PSSE Model Library

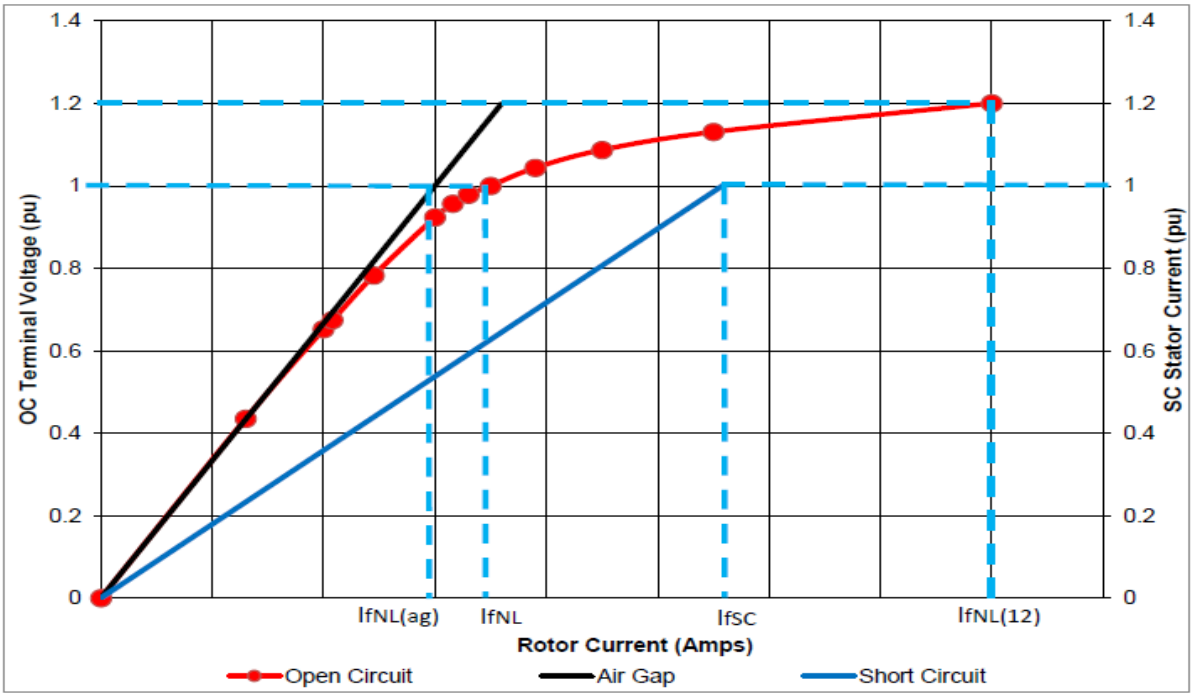


Figure 4: Open and short circuit characteristics

The saturation can be calculated using the following calculation:

$$S(1.0) = \frac{If_{NL} - If_{NL(AG)}}{If_{NL(AG)}}$$

$$S(1.2) = \frac{If_{NL(12)} - 1.2 \times If_{NL(AG)}}{1.2 \times If_{NL(AG)}}$$

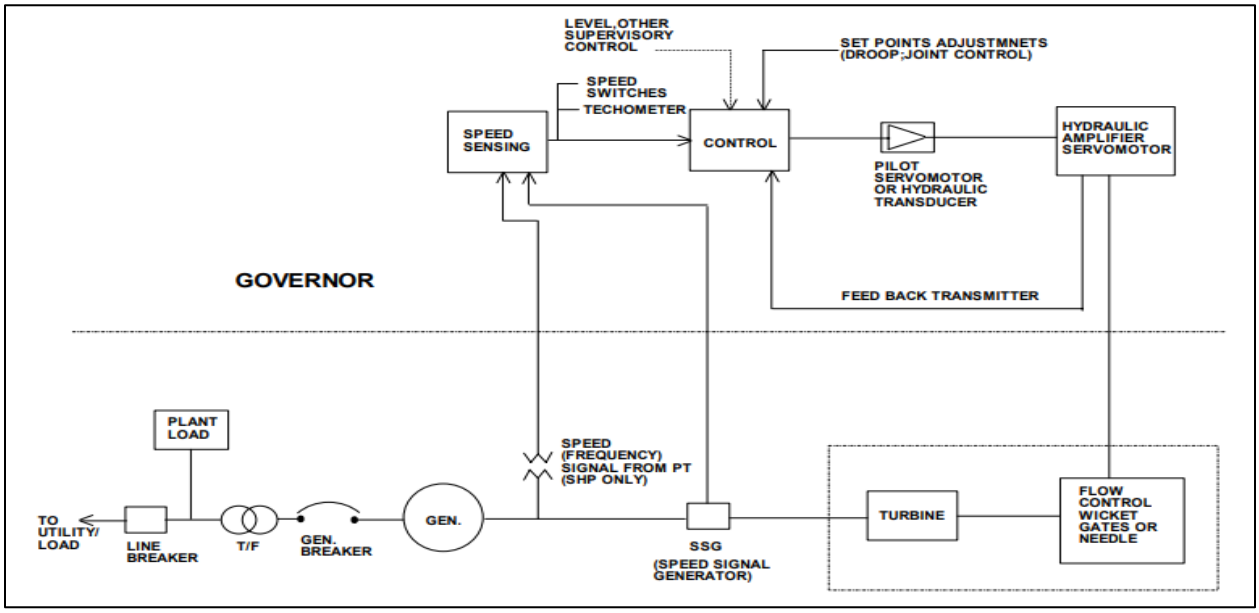


Figure 5: Governing system - Block Diagram (Typical) as per IEEE std. -75

Annexure-VI

HVDC

Modeling

Guideline for furnishing information for Modelling HVDC links 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 high voltage direct current (HVDC) links in India. HVDCs have played a pivotal role in integration and formation of the Indian national grid, and still continue to enable bulk power transfer across regions. HVDCs enable additional flexibility in power system operations, aiding in control of active power flows and voltages. Availability of fit-for-purpose steady state and dynamics models of HVDC installations are necessary to undertake simulation studies for secure operation of Indian power grid.

1.1 Applicability:

The guideline shall be applicable to all HVDC installations in India, irrespective of the technologies used.

This document presents the desired information for collection of data for modelling of HVDC installations 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 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 oscillation dampers, frequency controllers, 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 simulation studies that deliver reasonably accurate outcomes.

1.3 Regulation:

- **CEA Connectivity Standard 6.4.d :**

The requester and user shall cooperate with RPC and Appropriate Load Despatch Centre in respect of the matters listed below, but not limited to

furnish data as required by Appropriate Transmission Utility or Transmission Licensee, Appropriate Load Despatch Centre, Appropriate Regional Power Committee and any committee constituted by the Authority or appropriate Government for system studies or for facilitating analysis of tripping or disturbance in power system;

Here Requester and User Includes a generating company, captive generating plant, energy storage system, transmission licensee (other than Central Transmission Utility and State Transmission Utility), distribution licensee, solar park developer, wind park developer, wind-solar photovoltaic hybrid system, or bulk consumer *(2019 Amendment)*

- **IEGC 4.1 :**

CTU, STU and Users connected to, or seeking connection to ISTS shall comply with Central Electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2007 which specifies the minimum technical and design criteria and Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters) Regulations,2009.

2.0 HVDC technologies

HVDC systems is widely recognized as having the ability to transfer more power over longer distances than comparable HVAC (high voltage alternating current) systems, along with several other benefits such as lower transmission losses, higher stability, and more controllability. HVDCs can also be utilized to connect parts of the grid at different frequencies (such as connections between India and Bangladesh in Eastern Region) as well as facilitate long distance undersea cable transmission (such as proposed transmission between India and Sri Lanka). HVDC schemes can be classified in two types:

- Back-to-Back schemes
- Long distance transmission schemes

Back-to-back schemes are usually used to interconnect two AC networks with different frequencies. Both the converters in this scheme are located in the same location and no transmission line is used between them. Because no DC conductor is used back-to-back schemes are operated with high currents (3-4 KA) in order to minimize the cost and losses of the converter equipment.

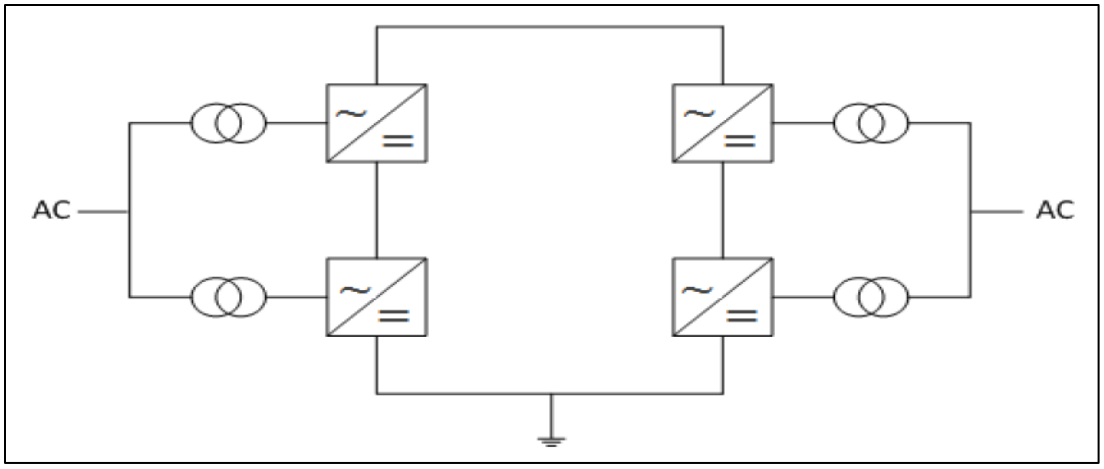


Figure 1: Back to Back Scheme

On the other hand transmission schemes are used for bulk energy transmission over long distances. The two converter stations are connected through a DC conductor, either a transmission line or an underground/submarine cable. Two configurations are usually used for this scheme:

- Monopolar configuration
- Bipolar configuration

In monopolar configuration, the return is accomplished either by ground or sea (depending on the application) or by a metallic conductor.

The bipolar configuration has two independent poles, each consisting of an independent converter. This configuration uses two conductors; one has positive polarity while the other negative. Power flow can be in one or both directions. The bipolar configuration is arranged in such a way that the return currents cancel each other out. Each pole can operate separately or in a master slave configuration.

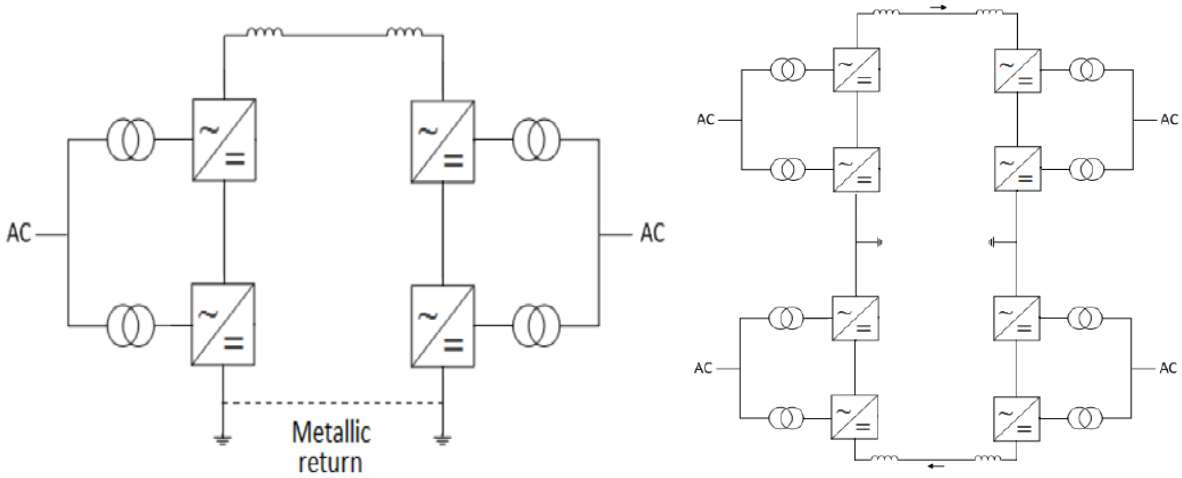


Figure 2: Monopolar and Bipolar HVDC links

The power electronic based converters (rectifiers at sending end, and inverters at receiving end) are the core component of HVDC systems. Depending on the type of technologies used in converters, 2 broad categories of HVDC systems are in place:

1. Line Commutated Converter (LCC) based HVDCs
2. Voltage Source Converter (VSC) based HVDCs

With integration of inherently variable renewable energy generation in Indian grid, the operation of HVDCs assumes greater importance.

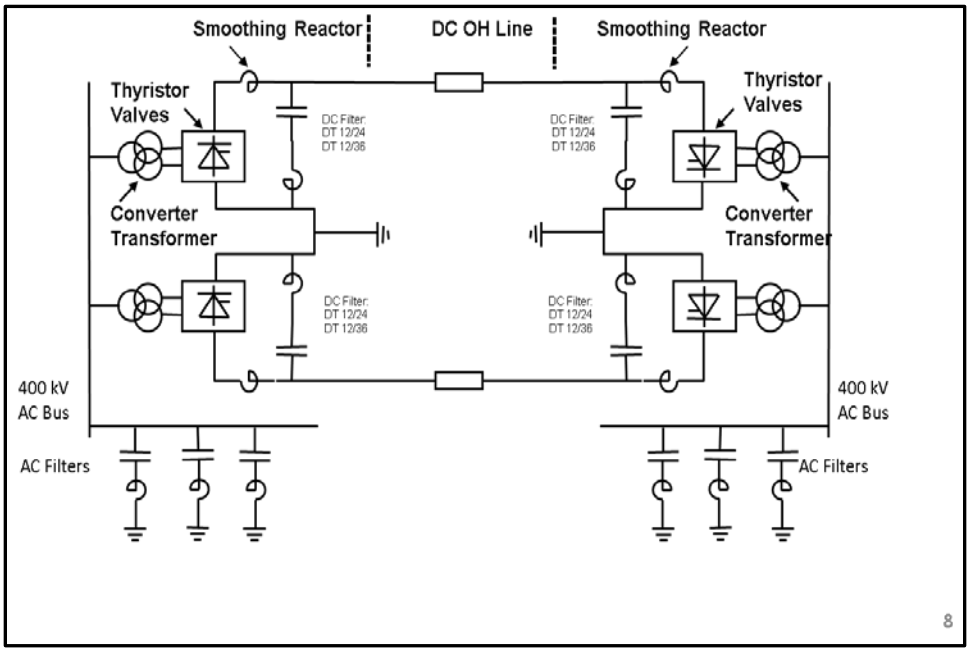
3.0 Models for HVDC links:

- **Line Commutated Converter (LCC) based HVDCs**

LCCs are also known as line commutated converters. As the name indicates, conversion depends on the line voltage of the AC system. This happens because the switching device used in this type of converters is a thyristor. In order to achieve high voltage levels needed for HVDC transmission applications, each thyristor valve of the converter bridge consists of a series connection of a number of thyristors. For typical applications 24 to 30 thyristors are connected in series to create a valve. Regarding the mode of operation LCCs operate in the two lower quadrants of the PQ plane. This means that they can provide or absorb active power but only absorb reactive power.

The reactive power consumption of CSC converters is usually about 50% to 60% of the active power transferred. Due to this reactive power consumption reactive power sources such as shunt capacitors, must be connected at the terminals of the converters.

Components of a typical LCC HVDC system are depicted in figure below:



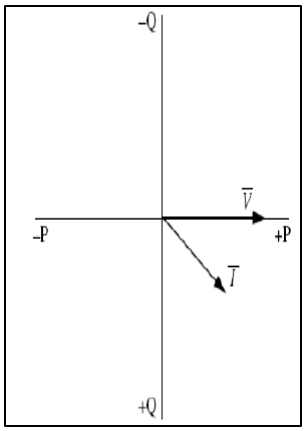


Figure 3: Typical components of LCC HVDC installation

- **Voltage Source Converter Based VSC:**

VSC-HVDC links consist of the converter station and the DC conductor. VSCs use solid state devices such as IGBTs (for high switching frequency) or thyristor-type devices such as GTOs or IGCTs (for low switching frequencies) so that their switching-on and switching-off are fully controlled. This allows VSCs to operate on the four quadrants of the P-Q plane and therefore can generate or absorb reactive power in contrast to LCCs which only absorb. In VSC-HVDC transmission the voltage polarity is constant and power flow reversal is accomplished through current reversal.

Just as in the LCC case, filters are needed in order to block harmonics in the converter's output reach the AC grid. Filters in VSC-HVDC schemes are much smaller than in LCC-HVDC schemes due to the smaller harmonic content of the VSC converter output. Components of typical VSC HVDC are depicted in figure below:

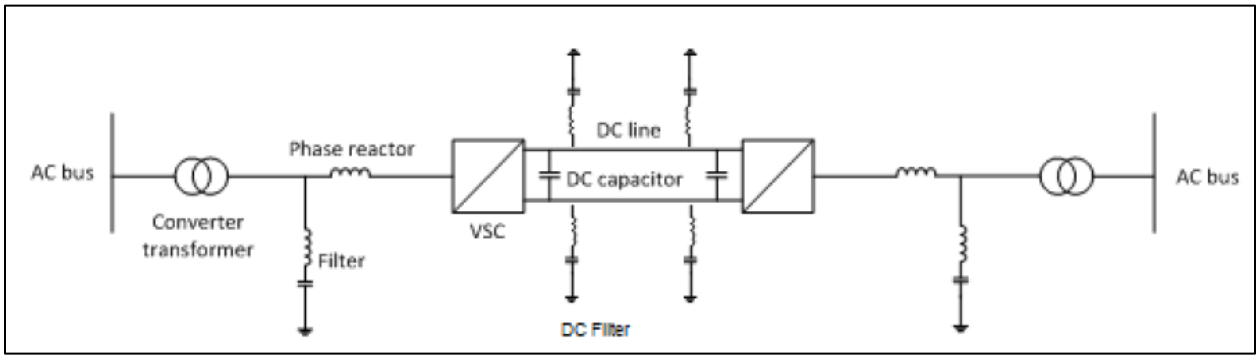


Figure 4: Typical VSC link

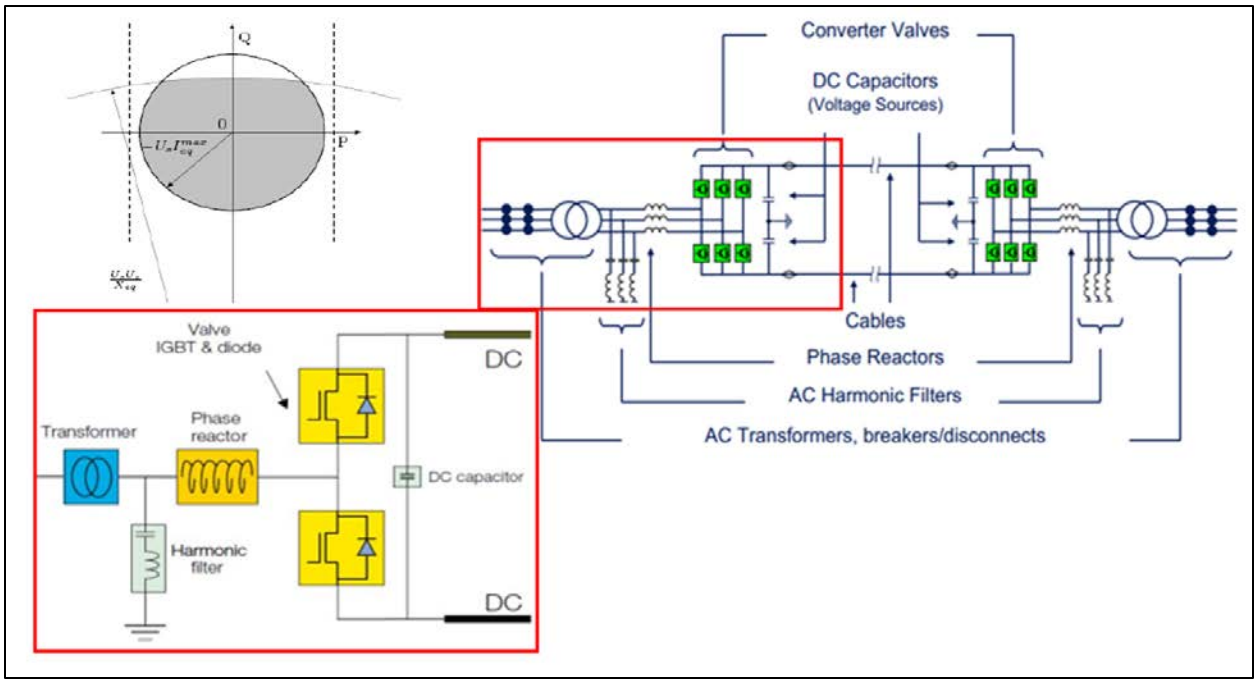


Figure 5: VSC Components and capability chart

Within PSSE the transformer impedance data is only required to be separated if a three winding converter transformer is used and there is reactive power equipment connected to its tertiary winding. In this case, the star-point to secondary data must be entered into the HVDC model however the primary to star-point and star-point to tertiary impedances must be represented explicitly as AC branches within the load-flow case (with appropriate equivalencing if there are multiple transformers in parallel). Otherwise, the primary to secondary converter transformer impedances should be calculated and directly entered into the DC line data with no additional AC components. Please refer to the PSSE manual (PAG Volume 1, Section 6.4.7.5).

Formats for submission of modelling data for HVDC Links

Version History:

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

*Mention Designation and Contact Details

Details submitted:

Details pending:

Depending on the nature of technology and usage of components at site ('As built'), the requirements for steady state and dynamic modelling evolves.

For POSOCO to get access to steady state and transient simulation models of HVDC links in India grid, the following information is required.

1. Load-flow data for the HVDC station: rated DC voltage, rated DC current, rated power, line length, converter type (LCC or VSC)
2. Electrical Single Line Diagram (SLD) of as built HVDC station depicting:
    - AC infeed with filter banks
    - Converter transformers
    - DC system with filters and other equipment
3. Generic models of HVDC link and auxiliaries. Refer **Table-2** for details.
4. Encrypted user defined model (UDM) in a format suitable for latest release PSS/E (*.dll files) for electromechanical transient simulation for HVDC station (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. It should contain all relevant technical information, including block diagrams, list of state variables and values / descriptions of all model parameters.
    - 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.

Apart from this, salient aspects of the physical operation may also be provided, like details of inter-pole compensation, inter-station compensation, metallic return operation, other special cases etc.

4.0 PSS/E representation for HVDC links:

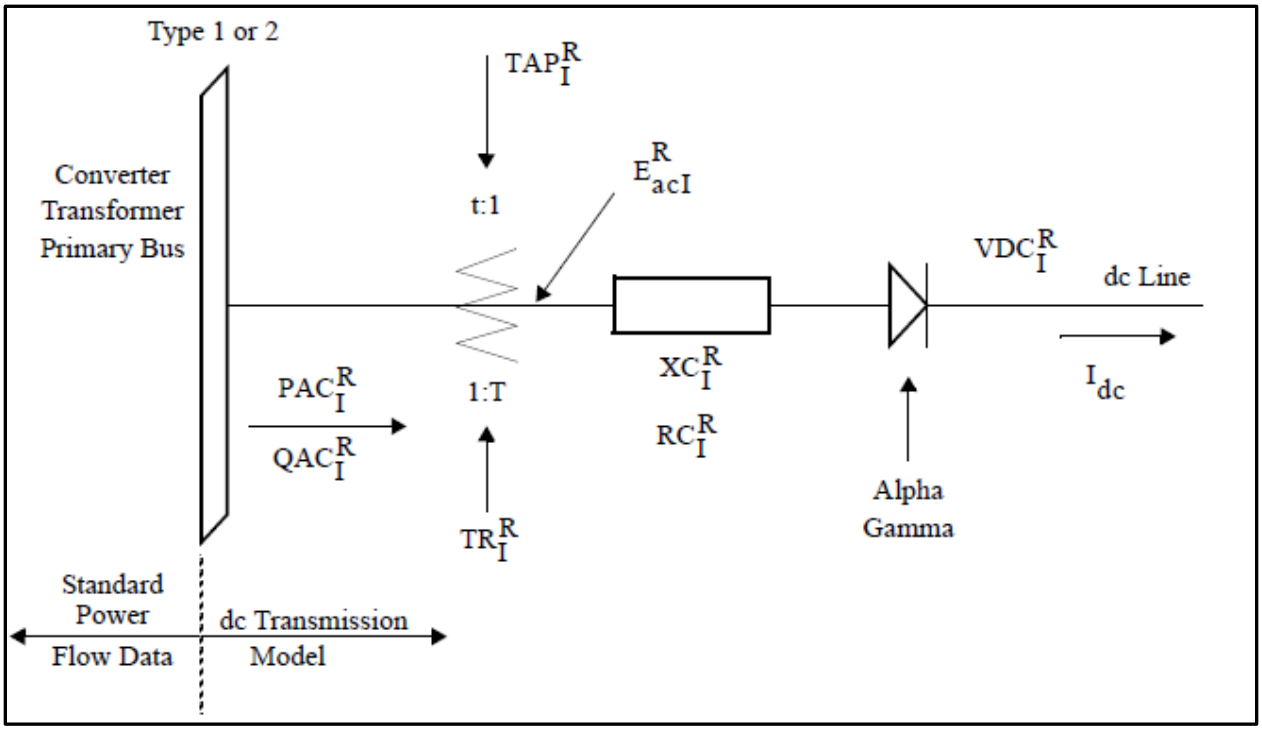


Figure 6: PSS/E rectifier/inverter representation of HVDC link



Figure 7: PSS/E power flow representation of HVDC model

The power flow representation of HVDC links in PSS/E is depicted in Figure-2 and Figure-3 above.

Details of models in PSS/E for modelling HVDC Links:

A. Steady State model (Power Flow)

Table 1: Information for Steady State model of HVDC links

Category	Parameter Description	Data
Link OEM and rating	Manufacturer and product details (for example Siemens, Areva, ABB, etc)	
	Year of commissioning	
	Rated DC voltage	
	Length of the link	
	Conductor Type (of DC lines)	
	Number of Poles	
	Rating of Each Pole (Power-MW, and Current-Amperes)	
	Minimum Power flow on DC link (per pole) in MW	
	Overload capability of DC link (per pole) in MW and no. of hours	
	LCC, Rectifier controls maintain - constant DC power or DC current?	
	LCC, Inverter controls maintain - constant DC voltage or extinction angle?	
	LCC, For DC voltage control, whether any compensation is utilized?	
	LCC, Inverter current margin	
	VSC, converter controls DC voltage or DC power?	
	VSC, converter controls AC voltage or power factor ?	
Technology	Converters: - LCC (conventional) - Voltage Source Converter (VSC) - Multi-terminal	
DC Components	Smoothing Reactors	
	DC Line resistance (Rdc) in Ohms	
	Minimum inverter dc voltage for power control mode (in kV)	
Converter transformer	Make	
	MVA rating	
	Two winding transformer or three winding transformer?	
	If three winding, any auxiliary equipment connected to tertiary winding?	
	AC side base voltage	
	DC side base voltage	
	Impedance (in Ohms, in % on 100 MVA base and mention Voltage reference side)	
	Converter transformer secondary commutating reactance in ohms per bridge[Star point to Secondary]	
	Converter transformer secondary commutating resistance in ohms per bridge [Star point to Secondary]	
	Primary to Star-point impedance of Converter transformer (R+jX)	
	Tertiary to Star-point impedance of Converter transformer (R+jX)	

Category	Parameter Description	Data
	Maximum value of converter transformer tap ratio (in p.u. of Voltage)	
	Minimum value of converter transformer tap ratio (in p.u. of Voltage)	
	Converter transformer tap-step (in pu of voltage)	
Converter Details	Minimum firing (delay) angle of rectifier in degrees (Alpha-min)	
	Maximum firing (delay) angle objective for rectifier in degrees (Alpha-max)	
	Minimum margin angle of inverter in degrees (Gamma-min)	
	Maximum margin angle objective for inverter in degrees (Gamma-max)	
	Number of Pulses (Ex. 12 pulse bridge, with 2 nos. 6 pulse bridge in series)	
	Alpha-min, actual absolute minimum firing angle during transients	
	Gamma-min, actual absolute minimum extinction angle during transients	
Additional information for VSC HVDC	AC side MVA rating	
	Q limits	
	Converter Losses	
	Voltage Control Settings	
AC Filters	Details of AC filters (Switching sequence w.r.t. Power order, MVAR values at nominal voltage and fundamental frequency	

B. Transient simulation model (Dynamics):

For representation of the electromechanical transient behavior of HVDC links, standard models are available in PSS/E library. A list of standard models are listed below:

Table 2: Generic Models for HVDC links

Category	Type	Model Description
CDC1T	LCC	Two-terminal dc line model
CDC4T	LCC	Two-terminal dc line model
CDC6T	LCC	Two-terminal dc line model
CDC6TA	LCC	Two-terminal dc line model
CDC7T	LCC	DC line model
CDCABT	LCC	ABB dc line model for Kontek line
CEELRIT	LCC	New Eel River dc line and auxiliaries model
CEELT	LCC	New Eel River dc line and auxiliaries model
CHIGATT	LCC	Highgate dc line model.
CHVDC2U1	LCC	WECC Generic 2-Terminal HVDC Model
CMDWAST	LCC	Madawaska dc line model
CMDWS2T	LCC	New Madawaska dc line model

CMFORDT	LCC	Comerford dc line model
HVDCPL1	VSC	Siemens HVDC plus model
VSCDCT	VSC	Two-terminal VSC dc line model
MTDC1T	MTDC	Multiterminal (five converter) dc line model
MTDC2T	MTDC	Multiterminal (five converter) dc line model
MTDC3T	MTDC	Multiterminal (eight converter) dc line model

Source: PSSE Model Library, for models other than the above list refer to

https://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/transmission-system-planning-tab/pages/user-support.aspx

At present, it is preferred to use one of the three models viz., CDC4T, CDC7T, and CHVDC2U1 for LCC type HVDCs.

In addition to the above, any modulation control of relevance to system performance for RMS simulations should be modelled utilizing generic HVDC auxiliary models as listed below:

Table 3: Generic HVDC auxiliary signal models

Model	Model Description
CHAAUT	Chateauguay auxiliary signal model
CPAAUT	Frequency sensitive auxiliary signal model
DCCAUT	Comerford auxiliary signal model
DCVRFT	HVDC ac voltage controller model
FCTAXBU1	FACTS device Auxiliary Control Model
HVDCAT	General purpose auxiliary signal model
PAUX1T	Frequency sensitive auxiliary signal model
PAUX2T	Bus voltage angle sensitive auxiliary signal model
RBKELT	Runback model
RUNBKT	Runback model
SQBAUT	dc line auxiliary signal model

Commonly Used LCC based HVDCs:

- **CDC4T: Two-terminal dc line model**

CDC4T is a pseudo steady-state model and omit some of the dynamics of HVDC converters such as L/R dynamics of DC line, smoothing reactors, and high frequency controller dynamics. A more detailed representation (CDC7T / CHVDC2U1) would be preferred if information pertaining to the same are verifiable against actual measurements.

- **CDC7T: DC line model**

There are significant differences between this model and generic HVDC models, such as CDC4T or CDC6T, available in the PSS®E library. The CDC4T and CDC6T models assume an instantaneous response of the dc system to disturbances coming from adjacent grids. The dc circuit arrangement that can be simulated by the CDC7T model is shown in Figure 1. A dc line may comprise overhead lines from both rectifier and inverter sides and a cable.

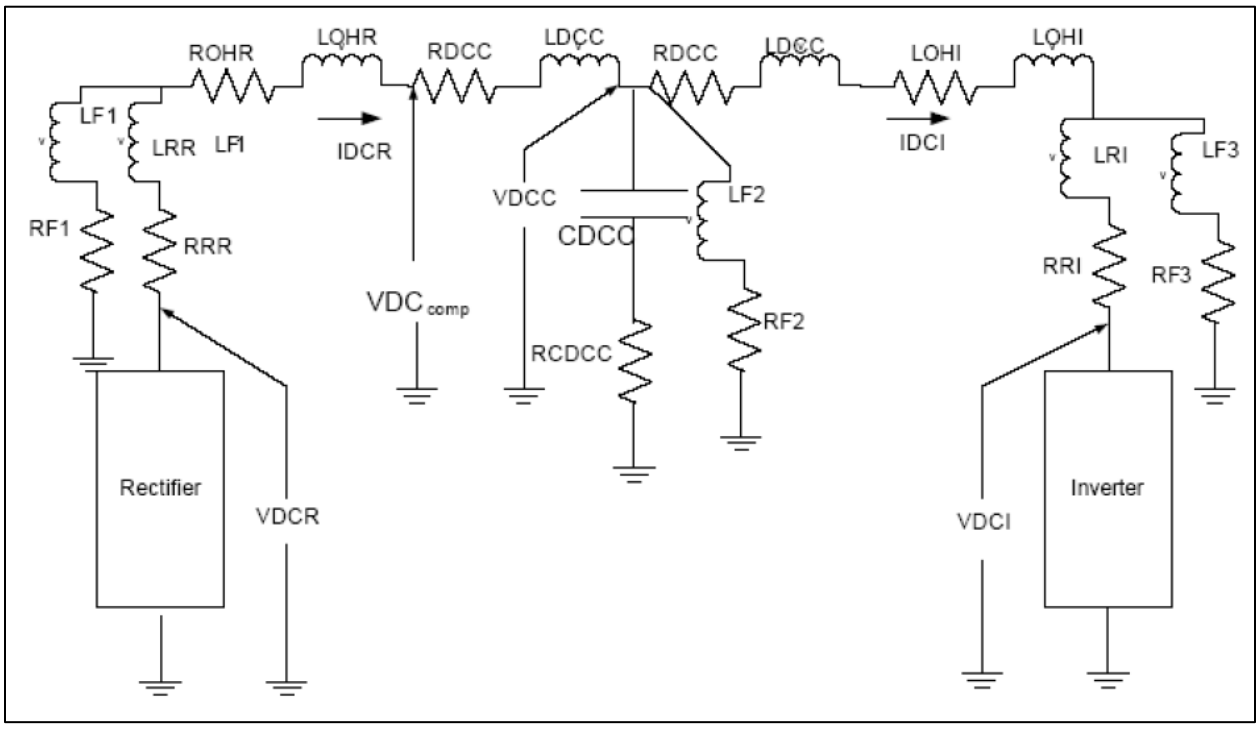


Figure 8: A DC Circuit Arrangement Simulated by the CDC7T Model

Although the dc line can be represented by a T-circuit with lumped Rdc and Ldc parameters, for the sake of flexibility the model uses resistances and inductances of overhead lines on rectifier (ROHR, LOHR) and inverter (ROHI, LOHI) sides, resistance, inductance, and capacitance of the dc cable (RDCC, LDCC, CDCC), and resistance and inductance of smoothing reactors on both sides (RRR, LRR and RRI, LRI). CDC7T model has a provision for choosing the control configuration. The CDC7T model uses 79 parameters of the dc circuit and controls.

Category	Parameters	Data
LCC based HVDC		
CDC4T	ALFDY, minimum alpha for dynamics (degrees)	
	GAMDYa, minimum gamma for dynamics (degrees)	
	TVDC, dc voltage transducer time constant (sec)	
	TIDC, dc current transducer time constant (sec)	
	VBLOCK, rectifier ac blocking voltage (pu)	
	VUNBL, rectifier ac unblocking voltage (pu)	
	TBLOCK, minimum blocking time (sec)	
	VBYPAS, inverter dc bypassing voltage (kV)	
	VUNBY, inverter ac unbypassing voltage (pu)	
	TBYPAS, minimum bypassing time (sec)	
	RSVOLT, minimum dc voltage following block (kV)	
	RSCUR, minimum dc current following block (amps	
	VRAMP, voltage recovery rate (pu/sec)	
	CRAMP, current recovery rate (pu/sec)	
	C0, minimum current demand (amps)	
	V1, voltage limit point 1 (kV)	
	C1, Current limit point 1 (amps); >C0	
	V2, voltage limit point 2 (kV)	
	C2, current limit point 2 (amps)	
	V3, voltage limit point 3 (kV)	
	C3, current limit point 3 (amps)	
	TCMODE, minimum time stays in switched mode (sec)	
CDC7T	dc voltage sensor time constant, sec.	
	dc current sensor time constant, sec.	
	Rectifier smoothing reactor inductance, mH	
	Rectifier smoothing reactor resistance, ohm	
	Inverter smoothing reactor inductance, mH	
	Inverter smoothing reactor resistance, ohm	
	Inductance of O/H dc line from rectifier side, mH	
	Resistance of O/H dc line from rectifier side, ohm	
	Inductance of O/H dc line from inverter side, mH	
	Resistance of O/H dc line from inverter side, ohm	
	Inductance of dc cable line, mH	
	Damping resistance of dc cable line, ohm	
	dc line capacitance, µF	
	dc fault shunt inductance, rectifier side, mH	
	dc fault shunt resistance, rectifier side, ohm	

Category	Parameters	Data
LCC based HVDC		
CDC7T	dc fault shunt inductance, mid-line, mH	
	dc fault shunt resistance, mid-line, ohm	
	dc fault shunt inductance, inverter side, mH	
	dc fault shunt resistance, inverter side, ohm	
	dc cable damping resistor	
	Rated dc current, A	
	Rated dc voltage, kV	
	VDComp down time constant for VDCL, rectifier, sec	
	VDComp up time constant for VDCL, rectifier, sec	
	VDComp down time constant for VDCL, inverter, sec	
	VDComp up time constant for VDCL, inverter, sec	
	Current margin, rectifier, pu	
	Current margin, inverter, pu	
	Voltage margin, rectifier, pu	
	Voltage margin, inverter, pu	
	Gamma margin, rectifier, pu	
	Gamma margin, inverter, pu	
	IDC error to V-control gain, rectifier	
	IDC error to V-control gain, inverter	
	IDC error to Gamma-control gain, inverter	
	VDComp filter gain, rectifier, pu	
	VDComp filter gain, inverter, pu	
	VDComp filter time constant, rectifier, sec.	
	VDComp filter time constant, inverter, sec.	
	Selected controller output gain, rectifier	
	Selected controller output gain, inverter	
	PI-controller proportional gain, rectifier	
	PI-controller integrator time constant, rectifier, sec.	
	PI-controller proportional gain, inverter	
	PI-controller integrator time constant, inverter, sec.	
	Max Alfa limit, rectifier	
	Min Alfa limit, rectifier	
	Max Alfa limit, inverter	
	Min Alfa limit, inverter	
	Control configuration 1	
	Control configuration 3	
	Min GAMA in dynamics	
	Rate of current order change when blocking, A/sec	
	Rate of current order change when unblocking, A/sec	
	VDC filter time constant for Pordr calculation, sec.	
	5 pairs of rectifier VDCL coordinates (Vd1, Id1) … (Vd5, Id5)1	
	5 pairs of inverter VDCL coordinates (Vd1, Id1) … (Vd5, Id5)1	

Category	Parameters	Data
	VSC based HVDC	
HVDCPL1	Rated AC voltage on DC side of converter Xfmr [kV]	
	Rectifier transformer impedance [pu of SBASE]	
	Inverter transformer impedance [pu of SBASE]	
	DC line total inductance [H]	
	DC line total capacitance [F]	
	Gain GQr of the rectifier reactive power controller	
	Lead time constant TLeadQr of the rectifier reactive power controller [s]	
	Lag time constant TLagQr of the rectifier reactive power controller [s]	
	Gain GQi of the inverter reactive power controller	
	Lead time constant TLeadQi of the inverter reactive power controller [s]	
	Lag time constant TLagQi of the inverter reactive power controller [s]	
	Gain G1Ud of the DC voltage controller	
	Lead time constant TLead1Ud of the DC voltage controller [s]	
	Lag time constant TLag1Ud of the DC voltage controller [s]	
	Gain G2Ud of the DC voltage controller	
	Lead time constant TLead2Ud of the DC voltage controller [s]	
	Lag time constant TLag2Ud of the DC voltage controller [s]	
	Ramp rate of the inverter active power setting value [p.u./s] (used for interconnected application)	
	Gain G1P of the inverter active power controller (interconnected application)	
	Lead time constant TLead1P of the inverter active power controller [s] (interconnected application)	
	Lag time constant TLag1P of the inverter active power controller [s] (interconnected application)	
	Gain G2P of the inverter active power controller (interconnected application)	
	Lead time constant TLead2P of the inverter active power controller [s] (interconnected application)	
	Lag time constant TLag2P of the inverter active power controller [s] (interconnected application)	
	TIntQr (s); Rectifier Q controller integrator time constant	
	LMXQr (pu); Rectifier Q controller integrator upper limit	
	LMNQr (pu); Rectifier Q controller integrator lower limit	
	TIntQi (s); Inverter Q controller integrator time constant	
	LMXQi (pu); Inverter Q controller integrator upper limit	
	LMNQi (pu); Inverter Q controller integrator lower limit	
	TIntUd (s); Inverter dc voltage controller integrator time constant	
	LMXIUd (pu); Inverter dc voltage controller integrator upper limit	
	LMNIUd(pu); Inverter dc voltage controller integrator lower limit	
	TIntP (s); Inverter P controller integrator integrator time constant	
	LMXP (pu); Inverter P controller integrator upper limit	
	LMNP (pu); Inverter P controller integrator lower limit	
	Tsync (s); Inverter POI Angle measurement delay	
	LMX1Ud (deg.); Rectifier dc voltage controller first lead-lag upper limit	

Category	Parameters	Data
VSC based HVDC		
HVDCPL1	LMN1Ud (deg.); Rectifier dc voltage controller first lead-lag lower limit	
	LMX2Ud (deg.); Rectifier dc voltage controller second lead-lag upper limit	
	LMN2Ud (deg.); Rectifier dc voltage controller second lead-lag lower limit	
	LMX1P (deg.); Inverter P controller first lead-lag upper limit	
	LMN1P (deg.); Inverter P controller first lead-lag lower limit	
	LMX2P (deg.); Inverter P controller second lead-lag upper limit	
	LMN2P (deg.); Inverter P controller second lead-lag lower limit	
	C_Module (F),Converter module capacitor	
	V_Module (kV), Converter module rated capacitor voltage	
	Protection threshold peak current of the IGBTs, kA	
	Model Acceleration factor(>0 and <=1)	
	Undervoltage characteristics, X1 (measured AC-voltage in pu)	
	Undervoltage characteristics, Y1 (AC-voltage reference in pu)	
	Undervoltage characteristics, X2	
	Undervoltage characteristics, Y2	
	Undervoltage characteristics, X3	
	Undervoltage characteristics, Y3	
	Undervoltage characteristics, X4	
	Undervoltage characteristics, Y4	
	Undervoltage characteristics, X5	
	Undervoltage characteristics, Y5	
	Undervoltage characteristics, X6	
	Undervoltage characteristics, Y6	
	Undervoltage characteristics, X7	
	Undervoltage characteristics, Y7	
	Undervoltage characteristics, X8	
	Undervoltage characteristics, Y8	
	Undervoltage characteristics, X9	
	Undervoltage characteristics, Y9	
	Undervoltage characteristics, X10	
	Undervoltage characteristics, Y10	
	Power-Voltage characteristics, X1 (measured AC-voltage in pu)	
	Power-Voltage characteristics, Y1 (maximum active power in pu of MVA rating of second converter)	
	Power-Voltage characteristics, X2	
	Power-Voltage characteristics, Y2	
	Power-Voltage characteristics, X3	
	Power-Voltage characteristics, Y3	
	Power-Voltage characteristics, X4	
	Power-Voltage characteristics, Y4	
	Power-Voltage characteristics, X5	
	Power-Voltage characteristics, Y5	

Category	Parameters	Data
VSC based HVDC		
HVDCPL1	Power-Voltage characteristics, X6	
	Power-Voltage characteristics, Y6	
	DC Chopper characteristics, X1 (Direct voltage in pu)	
	DC Chopper V-I characteristics, Y1 (chopper current in kA)	
	DC Chopper characteristics, X2	
	DC Chopper characteristics, Y2	
	DC Chopper characteristics, X3	
	DC Chopper characteristics, Y3	
	DC Chopper characteristics, X4	
	DC Chopper characteristics, Y4	
	DC Chopper characteristics, X5	
	DC Chopper characteristics, Y5	
	DC Chopper characteristics, X6	
	DC Chopper characteristics, Y6	
	DC Chopper characteristics, X7	
	DC Chopper characteristics, X7	
	DC Chopper characteristics, X8	
	DC Chopper characteristics, X8	
	DC Chopper characteristics, X9	
	DC Chopper characteristics, X9	
	DC Chopper characteristics, X10	
	DC Chopper characteristics, X10	
VSCDCT	Tpo_1, Time constant of active power order controller, sec (For VSC # 1).	
	AC_VC_Limits_1, Reactive power limit for ac voltage control, pu on converter MVA rating. When 0, it is not used and Qmax/Qmin pair is used instead (For VSC # 1).	
	AC_Vctrl_kp_1, AC Voltage control proportional gain, converter MVA rating/BASEKV (For VSC # 1).	
	Tac_1 > 0.0, Time constant for AC voltage PI integral, sec (For VSC # 1). When 0, VSC#1 is ignored.	
	Tacm_1, Time constant of the ac voltage transducer, sec (For VSC # 1).	
	Iacmax_1, Current Limit, pu on converter MVA rating (For VSC # 1).	
	Droop_1, AC Voltage control droop, converter MVA rating/BASEKV (For VSC # 1).	
	VCMX_1, Maximum VSC Bridge Internal Voltage (For VSC # 1).	
	XREACT_1 > 0.0, Pu reactance of the ac series reactor on converter MVA rating (For VSC # 1). When 0.0, default value 0.17 is used.	
	QMAX_1, Maximum system reactive limits in Mvars (For VSC # 1). When AC-VC_Limits_1 >0, QMAX_1 is not used.	
	QMIN_1, Minimum system reactive limits in MVARs (For VSC # 1). When AC-VC_Limits_1 >0, QMIN_1 is not used.	
	AC_VC_KT_1, Adjustment Parameter for the feedback from reactive power limiter to ac voltage controller (For VSC #1).	
	AC_VC_KTP_1, Adjustment Parameter for the feedback from current order limiter to ac voltage controller (For VSC #1).	
	Tpo_2, Time constant of active power order controller, sec (For VSC # 2).	

Category	Parameters	Data
VSC based HVDC		
VSCDCT	AC_VC_Limits_2, Reactive power limit for ac voltage control, pu on converter MVA rating. When 0, it is not used and Qmax/Qmin pair is used instead (For VSC # 2).	
	AC_Vctrl_kp_2, AC Voltage control proportional gain, converter MVA rating/BASEKV (For VSC # 2).	
	Tac_2 > 0.0, Time constant for AC voltage PI integral, sec (For VSC # 2). When 0, VSC#2 is ignored.	
	Tacm_2, Time constant of the ac voltage transducer, sec (For VSC # 2).	
	Iacmax_2, Current Limit, pu on converter MVA rating (For VSC # 2).	
	Droop_2, AC Voltage control droop, converter MVA rating/BASEKV (For VSC # 2).	
	VCMX_2, Maximum VSC Bridge Internal Voltage (For VSC # 2).	
	XREACT_2 > 0.0, Pu reactance of the ac series reactor on converter MVA rating (For VSC # 2). When 0.0, default value 0.17 is used.	
	QMAX_2, Maximum system reactive limits in MVARs (For VSC # 2). When AC-VC_Limits_2 >0, QMAX_2 is not used.	
	QMIN_2, Minimum system reactive limits in MVARs (For VSC # 2). When AC-VC_Limits_2 >0, QMIN_2 is not used.	
	AC_VC_KT_2, Adjustment Parameter for the feedback from reactive power limiter to ac voltage controller (For VSC #2).	
	AC_VC_KTP_2, Adjustment Parameter for the feedback from current order limiter to ac voltage controller (For VSC #2).	
	Tpo_DCL, Time constant of the power order controller, sec (For DC Line).	
	Tpo_lim, Time constant of the power order limit controller, sec (For DC Line).	
MTDC		
MTDC1T	DY1, minimum angle converter 1 (degrees)	
	TVAC1, ac voltage transducer converter 1 (sec)	
	TVDC1, dc voltage transducer converter 1 (sec)	
	TIDC1, current transducer converter 1 (sec)	
	RSVLT1, minimum dc voltage following block, converter 1 (kV)1	
	RSCUR1, minimum dc current following block, converter 1 (amps)2	
	VRMP1, voltage recovery rate, converter 1 (pu/sec)1	
	CRMP1, current recovery rate, converter 1 (pu/sec)2	
	C0-1, minimum current demand converter 1 (amps)3	
	V1-1, voltage limit point 1, converter 1 (kV)2	
	C1-1, current limit point 1, converter 1 (amps)2	
	V2-1, voltage limit point 2, converter 1 (kV)2	
	C2-1, current limit point 2, converter 1 (amps)2	
	V3-1, voltage limit point 3, converter 1 (kV)2	
	C3-1, current limit point 3, converter 1 (amps)2	
	DY2, minimum angle converter 2 (degrees)	
	TVAC2, ac voltage transducer converter 2 (sec)	
	TVDC2, dc voltage transducer converter 2 (sec)	
	TIDC2, current transducer converter 2 (sec)	
	RSVLT2, minimum dc voltage following block, converter 2 (kV)1	
	RSCUR2, minimum dc current following block, converter 2 (amps)2	

Category	Parameters	Data
	MTDC	
MTDC1T	VRMP2, voltage recovery rate, converter 2 (pu/sec)1	
	CRMP2, current recovery rate, converter 2 (pu/sec)2	
	C0-2, minimum current demand converter 2 (amps)3	
	V1-2, voltage limit point 1, converter 2 (kV)2	
	C1-2, current limit point 1, converter 2 (amps)2	
	V2-2, voltage limit point 2, converter 2 (kV)2	
	C2-2, current limit point 2, converter 2 (amps)2	
	V3-2, voltage limit point 3, converter 2 (kV)2	
	C3-2, current limit point 3, converter 2 (amps)2	
	DY3, minimum angle converter 3 (degrees)	
	TVAC3, ac voltage transducer converter 3 (sec)	
	TVDC3, dc voltage transducer converter 3 (sec)	
	TIDC3, current transducer converter 3 (sec)	
	RSVLT3, minimum dc voltage following block, converter 3 (kV)1	
	RSCUR3, minimum dc current following block, converter 3 (amps)2	
	VRMP3, voltage recovery rate, converter 3 (pu/sec)1	
	CRMP3, current recovery rate, converter 3 (pu/sec)2	
	C0-3, minimum current demand converter 3 (amps)3	
	V1-3, current limit point 1, converter 3 (kV)2	
	C1-3, current limit point 1, converter 3 (amps)2	
	V2-3, voltage limit point 2, converter 3 (kV)2	
	C2-3, current limit point 2, converter 3 (amps)2	
	V3-3, voltage limit point 3, converter 3 (kV)2	
	C3-3, current limit point 3, converter 3 (amps)2	
	DY4, minimum angle converter 4 (degrees)	
	TVAC4, ac voltage transducer converter 4 (sec)	
	TVDC4, dc voltage transducer converter 4 (sec)	
	TIDC4, current transducer converter 4 (sec)	
	RSVLT4, minimum dc voltage following block, converter 4 (kV)1	
	RSCUR4, minimum dc current following block, converter 4 (amps)2	
	VRMP4, voltage recovery rate, converter 4 (pu/sec)1	
	CRMP4, current recovery rate, converter 4 (pu/sec)2	
	C0-4, minimum current demand converter 4 (amps)3	
	V1-4, voltage limit point 1, converter 4 (kV)2	
	C1-4, current limit point 1, converter 4 (amps)2	
	V2-4, voltage limit point 2, converter 4 (kV)2	
	C2-4, current limit point 2, converter 4 (amps)2	
	V3-4, voltage limit point 3, converter 4 (kV)2	
	C3-4, current limit point 3, converter 4 (amps)2	
	DY5, minimum angle converter 5 (degrees)	
	TVAC5, ac voltage transducer converter 5 (sec)	
	TVDC5, dc voltage transducer converter 5 (sec)	

Category	Parameters	Data
MTDC		
MTDC1T	TIDC5, current transducer converter 5 (sec)	
	RSVLT5, minimum dc voltage following block, converter 5 (kV)1	
	RSCUR5, minimum dc current following block, converter 5 (amps)2	
	VRMP5, Voltage recovery rate, converter 5 (pu/sec)1	
	CRMP5, current recovery rate, converter 5 (pu/sec)2	
	C0-5, minimum current demand converter 5 (amps)3	
	V1-5, voltage limit point 1, converter 5 (kV)2	
	C1-5, current limit point 1, converter 5 (amps)2	
	V2-5, voltage limit point 2, converter 5 (kV)2	
	C2-5, current limit point 2, converter 5 (amps)2	
	V3-5, voltage limit point 3, converter 5 (kV)2	
	C3-5, current limit point 3, converter 5 (amps)2	
	TCMODE (sec)	
MTDC2T	DY1, minimum angle converter 1 (degrees)	
	TVAC1, ac voltage transducer converter 1 (sec)	
	TVDC1, dc voltage transducer converter 1 (sec)	
	TIDC1, current transducer converter 1 (sec)	
	RSVLT1, minimum dc voltage following block, converter 1 (kV)1	
	RSCUR1, minimum dc current following block, converter 1 (amps)	
	VRMP1, voltage recovery rate, converter 1 (pu/sec)1	
	CRMP1, current recover rate, converter 1 (pu/sec)	
	C0-1, minimum current demand converter 1 (amps)	
	V1-1, minimum current demand converter 1	
	C1-1, minimum current demand converter 1 (amps)	
	V2-1, minimum current demand converter 1	
	C2-1, minimum current demand converter 1 (amps)	
	V3-1, minimum current demand converter 1	
	C3-1, minimum current demand converter 1 (amps)	
	DY2, minimum angle converter 2 (degrees)	
	TVAC2, ac voltage transducer converter 2 (sec)	
	TVDC2, dc voltage transducer converter 2 (sec)	
	TIDC2, current transducer converter 2 (sec)	
	RSVLT2, minimum dc voltage following block, converter 2 (kV)1	
	RSCUR2, minimum dc current following block, converter 2 (amps)	
	VRMP2, voltage recovery rate, converter 2 (pu/sec)1	
	CRMP2, current recover rate, converter 2 (pu/sec)	
	C0-2, minimum current demand converter 2 (amps)	
	V1-2, minimum current demand converter 2	
	C1-2, minimum current demand converter 2 (amps)	
	V2-2, minimum current demand converter 2	
	C2-2, minimum current demand converter 2 (amps)	
	V3-2, minimum current demand converter 2	

Category	Parameters	Data
	MTDC	
MTDC2T	C3-2, minimum current demand converter 2 (amps)	
	DY3, minimum angle converter 3 (degrees)	
	TVAC3, ac voltage transducer converter 3 (sec)	
	TVDC3, dc voltage transducer converter 3 (sec)	
	TIDC3, current transducer converter 3 (sec)	
	RSVLT3, minimum dc voltage following block, converter 3 (kV)1	
	RSCUR3, minimum dc current following block, converter 3 (amps)	
	VRMP3, voltage recovery rate, converter 3 (pu/sec)1	
	CRMP3, current recover rate, converter 3 (pu/sec)	
	C0-3, minimum current demand converter 3 (amps)	
	V1-3, minimum current demand converter 3	
	C1-3, minimum current demand converter 3 (amps)	
	V2-3, minimum current demand converter 3	
	C2-3, minimum current demand converter 3 (amps)	
	V3-3, minimum current demand converter 3	
	C3-3, minimum current demand converter 3 (amps)	
	DY4, minimum angle converter 4 (degrees)	
	TVAC4, ac voltage transducer converter 4 (sec)	
	TVDC4, dc voltage transducer converter 4 (sec)	
	TIDC4, current transducer converter 4 (sec)	
	RSVLT4, minimum dc voltage following block, converter 4 (kV)1	
	RSCUR4, minimum dc current following block, converter 4 (amps)	
	VRMP4, voltage recovery rate, converter 4 (pu/sec)1	
	CRMP4, current recovery rate, converter 4 (pu/sec)	
	C0-4, minimum current demand converter 4 (amps)	
	V1-4, minimum current demand converter 4	
	C1-4, minimum current demand converter 4 (amps)	
	V2-4, minimum current demand converter 4	
	C2-4, minimum current demand converter 4 (amps)	
	V3-4, minimum current demand converter 4	
	C3-4, minimum current demand converter 4 (amps)	
	DY5, minimum angle converter 5 (degrees)	
	TVAC5, ac voltage transducer converter 5 (seconds)	
	TVDC5, dc voltage transducer converter 5 (seconds)	
	TIDC5, current transducer converter 5 (seconds)	
	RSVLT5, minimum dc voltage following block, converter 5 (kV)1	
	RSCUR5, minimum dc current following block, converter 5 (amps)	
	VRMP5, voltage recovery rate, converter 5 (pu/sec)1	
	CRMP5, current recovery rate, converter 5 (pu/sec)	
	C0-5, minimum current demand converter 5 (amps)	
	V1-5, minimum current demand converter 5	
	C1-5, minimum current demand converter 5 (amps)	

Category	Parameters	Data
MTDC		
MTDC2T	V2-5, minimum current demand converter 5	
	C2-5, minimum current demand converter 5 (amps)	
	V3-5, minimum current demand converter 5	
	C3-5, minimum current demand converter 5 (amps)	
	TVF, power control VDC transducer time constant (sec)	
	VDCOLUP, voltage transducer time constants (sec)	
	VDCOLON, voltage transducer time constants (sec)	
	Current margin (amps)	
	Converter 1 DV/DI multiplier (pu)2	
	Converter 2 DV/DI multiplier (pu)2	
	Converter 3 DV/DI multiplier (pu)2	
	Converter 4 DV/DI multiplier (pu)2	
	Converter 5 DV/DI multiplier (pu)2	

CDC4T: Two-terminal dc line model

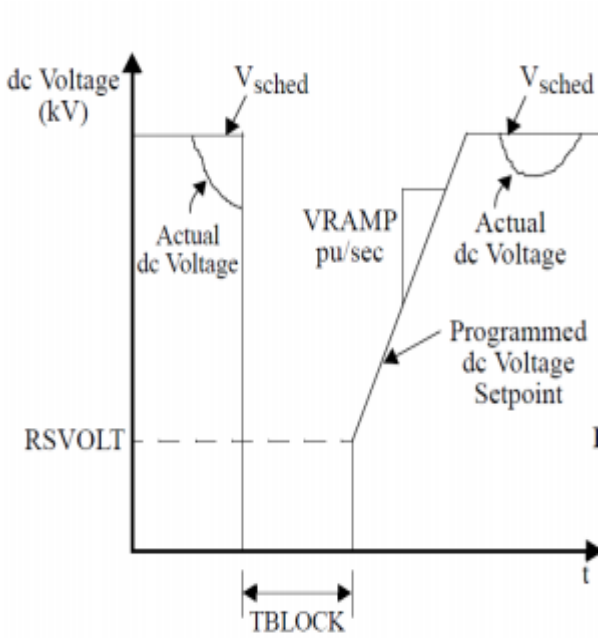


Figure 9: Illustration of RSVOLT, VRAMP

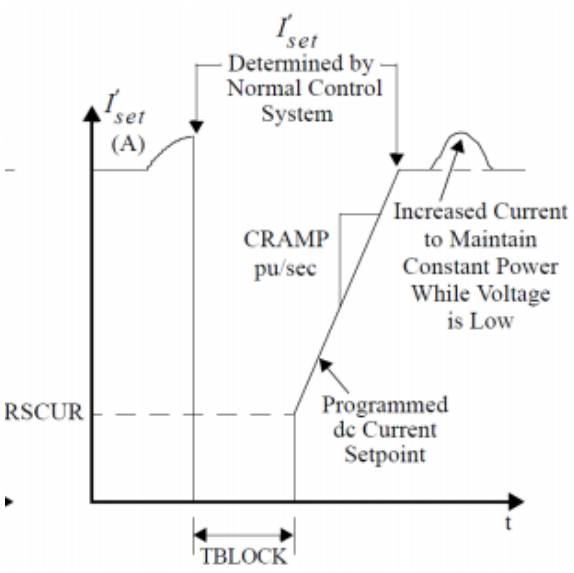


Figure 10: Illustration of RSCUR, CRAMP

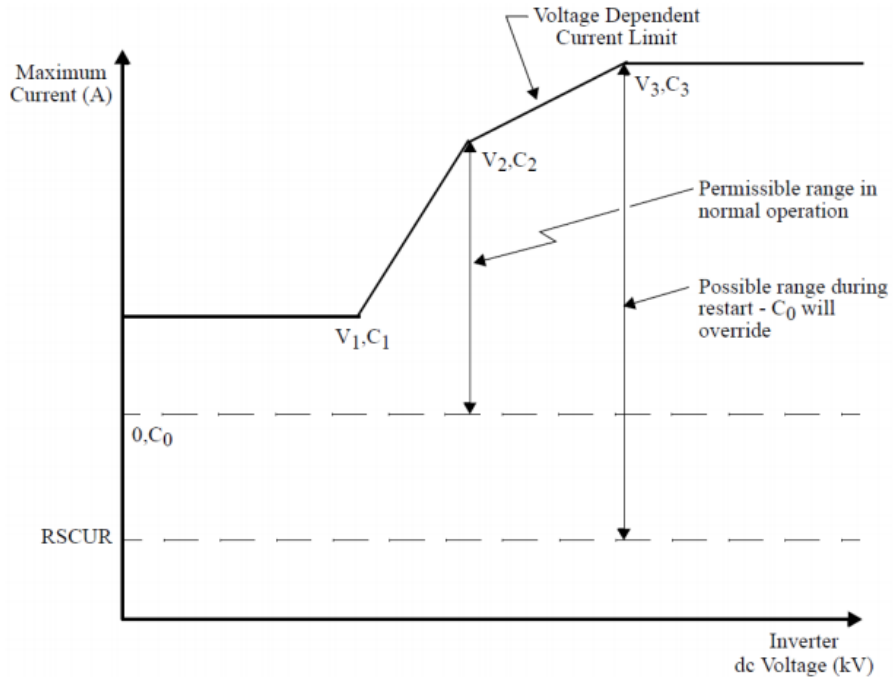
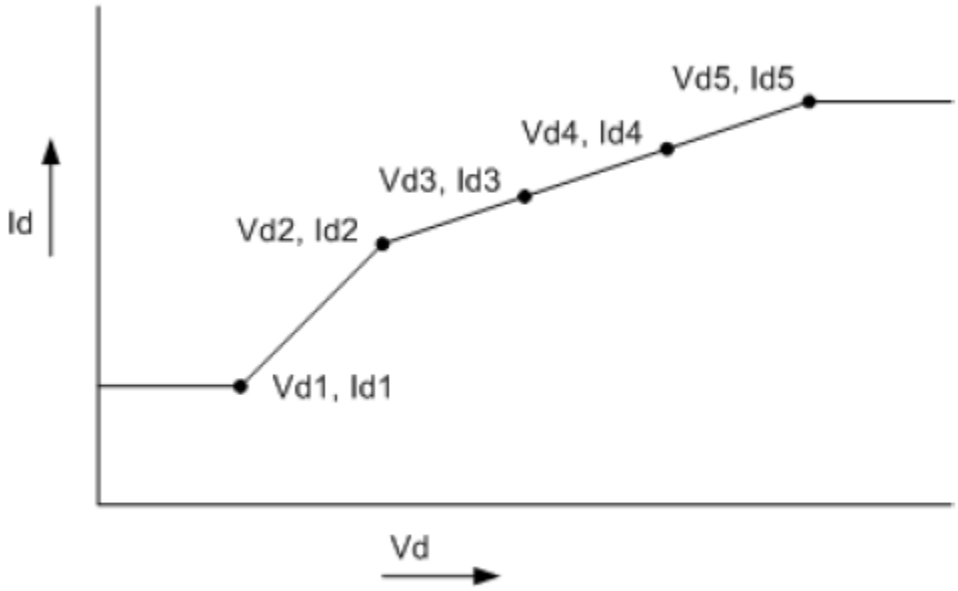


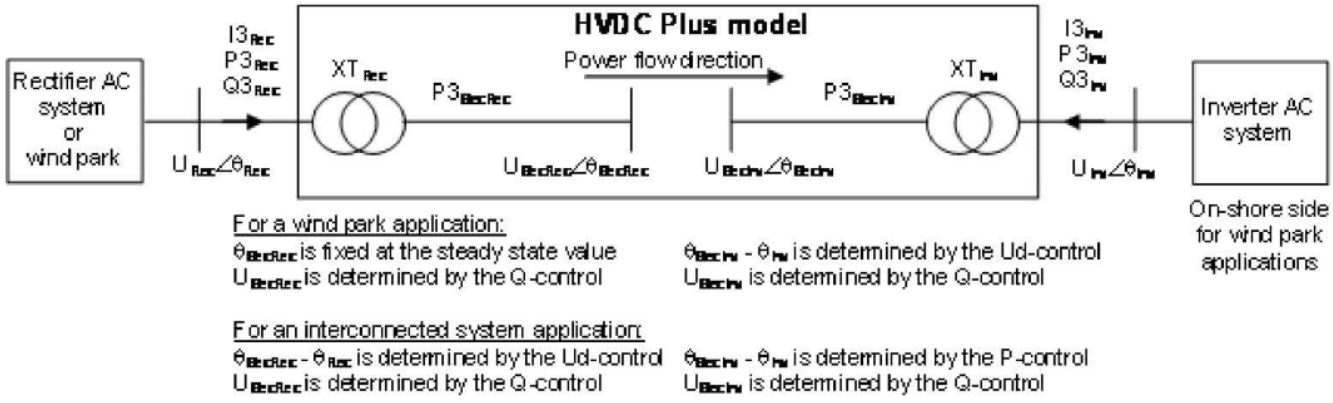
Figure 11: Illustration of VDCOL characteristic

- **CDC7T: dc Line VDCOL**



VDCL Characteristics

- **HVDCPL1: dc Line Model**



Annexure-VII

Modeling STATCOM

Guideline for furnishing information for Modelling Static Synchronous Compensator (STATCOM) 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 Static Synchronous Compensator (STATCOM) in India. STATCOMs are relatively recent technological additions into the Indian grid and their number is expected to increase further in the future. STATCOMs deliver reactive power to counter voltage deviations from the nominal, supporting the stability of the grid. STATCOMs are typically voltage source converter (VSC) devices. Availability of fit-for-purpose steady state and dynamics models of STATCOM installations are necessary to undertake simulation studies for secure operation of the Indian power grid.

1.1 Applicability:

The guideline shall be applicable to all STATCOM installations in India, irrespective of the technologies used.

This document presents the desired information for collection of data for modelling of STATCOM installations 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 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 oscillation dampers, frequency controllers, 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 simulation studies that deliver reasonably accurate outcomes.

1.3 Regulation:

- **CEA Connectivity Standard 6.4.d :**

The requester and user shall cooperate with RPC and Appropriate Load Despatch Centre in respect of the matters listed below, but not limited to

furnish data as required by Appropriate Transmission Utility or Transmission Licensee, Appropriate Load Despatch Centre, Appropriate Regional Power Committee and any committee constituted by the Authority or appropriate Government for system studies or for facilitating analysis of tripping or disturbance in power system;

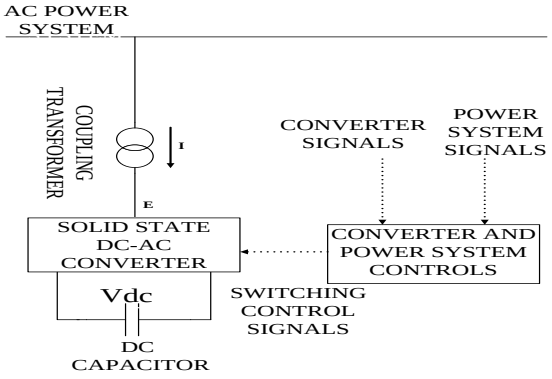
Here Requester and User Includes a generating company, captive generating plant, energy storage system, transmission licensee (other than Central Transmission Utility and State Transmission Utility), distribution licensee, solar park developer, wind park developer, wind-solar photovoltaic hybrid system, or bulk consumer *(2019 Amendment)*

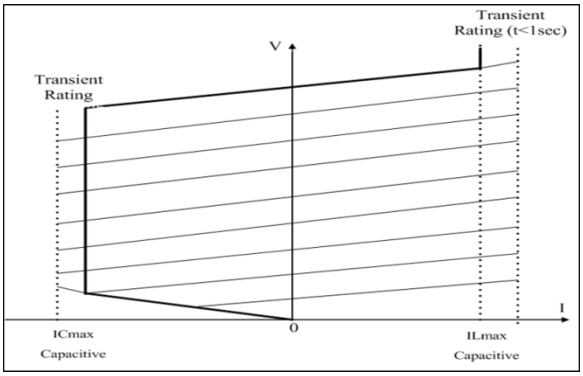
- **IEGC 4.1 :**

CTU, STU and Users connected to, or seeking connection to ISTS shall comply with Central Electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2007 which specifies the minimum technical and design criteria and Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-state Transmission and related matters) Regulations,2009.

2.0 STATCOM:

Static Synchronous Compensator (STATCOM) is a reactive power regulating device based on the voltage source converter (VSC) used to maintain AC system voltage and enhance stability of the AC system. STATCOM provides operating characteristic similar to rotating synchronous compensator (condenser) but without mechanical inertia since it has no rotating component. By generating and absorbing reactive power within its working output range the STATCOM is able to maintain virtually constant voltage at its point of connection to the power system.STATCOM may be combined with mechanically switched Reactors & Capacitors controlled by STATCOM controller. The STATCOM would be primarily for dynamic compensation while the mechanically switched reactors/capacitors would be for reactive compensation under steady state.





Version History:

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

*Mention Designation and Contact Details

Details submitted:

Details pending:

Depending on the nature of technology and usage of components at site ('As built'), the requirements for steady state and dynamic modelling evolves.

For POSOCO to get access to steady state and transient simulation models of STATCOMs in the Indian grid, the following information is required.

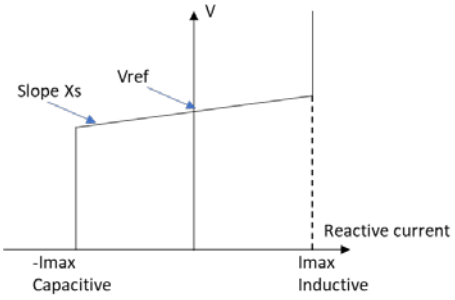
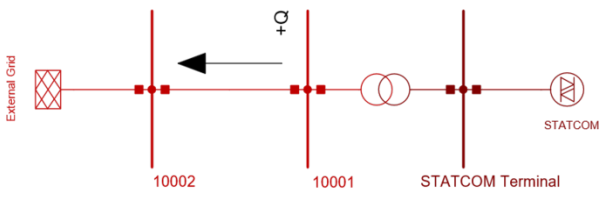
1. Load-flow data for the STATCOM **(Section-3.0)**
2. Electrical Single Line Diagram (SLD) of as built STATCOM station depicting:
    - VSC
    - Coupling Transformer
    - DC capacitor
    - Thyristor Switched Capacitor (TSC) / Mechanically Switched Capacitor
    - Thyristor Switched Reactor (TSR) / Mechanically Switched Reactor
3. Generic models of STATCOM **(Section-3.0)**
4. Encrypted user defined model (UDM) in a format suitable for latest release PSS/E (*.dll files) for RMS simulation for STATCOM (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. It should contain all relevant technical information, including block diagrams, list of state variables and values / descriptions of all model parameters.
    - 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.

3.0 Data for STATCOM:

A. Steady State model (Power Flow):

Table 1 can be used as a guideline for gathering the relevant modelling parameters of STATCOM for steady state power flow calculations.

Table 1: Steady State STATCOM model parameters with example value for voltage droop control

Parameter	Example value
STATCOM rating (MVA) This is the MVA base for all control parameters.	10 MVA
Continuous current limit (kA)	0.175 kA
Nominal voltage at the controlled remote bus (kV)	33 kV
Nominal voltage at the converter terminal (kV)	0.5 kV
Temperature and voltage dependence of STATCOM rating (e.g. 90% of MVA base when voltage is at 90%)	9 MVAr when terminal voltage is at 90% of nominal voltage.
Overload capacity	+25% of nominal current for 1second
Modulation limit	1.0
No-load loss (kW)	100 kW
Switching loss factor (kW/A)	5 kW/A
Resistive loss factor (ohm)	0 ohm
Negative sequence impedance r2, x2	998 + j1503 pu
Typical control mode (Voltage control, voltage droop, reactive power, or power factor)	Voltage droop
Typical setpoint (Voltage, reactive power, or power factor)	1.0 pu
Voltage droop (% of MVA base) or relevant V-I curve	4% Or V-I curve as shown below 
Voltage deviation deadband for reducing controller sensitivity (pu)	0.0 pu
Load flow single line diagram of the STATCOM 	As shown

Parameter	Example value
Remote bus for voltage measurement	10001/Bus Name & Voltage Level
Remote bus for branch / line for reactive power measurement – sending end (where reactive current injection convention to this bus is positive)	10001/Bus Name & Voltage Level
Remote bus for branch / line for reactive power measurement – receiving end (where reactive current injection convention to this bus is negative)	10002/Bus Name & Voltage Level

B. Transient simulation model (Dynamics):

For representation of the RMS behavior of STATCOMs, two standard models are available in the PSS/E library, namely SVSMO3T2 and CSTCNT. Details for SVSMO3T2 are given in Table 2 and Table 3 and the CSTCNT model are given in Table 4 and Table 5. The SVSMO3T2 has been described as STATCOM based SVC with logic to trip mechanically switched shunts (MSS). In comparison, the CSTCNT is a simpler representation of STATCOM with no dependence on shunt devices.

Note that for a user-defined model, similar level of details presented in the steady state (Table 1) and transient may be required.

Table 2: Parameters of SVSMO3T2 generic STATCOM model

Parameter (Controller parameters or PSS/E CON)	**Value**
Xc0, linear droop	
Tc1, voltage measurement lead time constant (sec)	
Tb1, voltage measurement lag time constant (sec)	
Kp, proportional gain	
Ki, integral gain	
Vemax, voltage error max. (pu)	
Vemin, voltage error min. (pu)	
T0, firing sequence control delay (sec)	
Imax1, max. continuous current rating (pu on STBASE)	
dbd, deadband range for voltage control (pu)	
Kdbd, ratio of outer to inner deadband	
Tdbd, deadband time (sec)	
Kpr, proportional gain for slow-reset control	
Kir, integral gain for slow-reset control	
Idbd, deadband range for slow-reset control (pu on STBASE)	
Vrmax, max. limit on slow-reset control output (pu)	
Vrmin, min. limit on slow-reset control output (pu)	
Ishrt, max. short-term current rating as a multiplier of max. cont. current rating (pu)	

Parameter (Controller parameters or PSS/E CON)	Value
UV1, voltage at which STATCOM limit starts to be reduced linearly (pu)	
UV2, voltage below which STATCOM is blocked (pu)	
OV1, voltage above which STATCOM limit linearly drops (pu)	
OV2, voltage above which STATCOM blocks (pu)	
Vtrip, voltage above which STATCOM trips after time delay Tdelay2 (pu)	
Tdelay1, short-term rating time(sec)	
Tdelay2, trip time for V .GT. Vtrip(sec)	
Vrefmax, max. limit on voltage reference (pu)	
Vrefmin, min. limit on voltage reference (pu)	
Tc2, lead time constant(sec)	
Tb2, lag time constant(sec)	
I2t, short-term limit	
Reset, reset rate for I2t limit	
hyst, width of hysteresis loop for I2t limit	
Xc1, non-linear droop slope 1	
Xc2, non-linear droop slope 2	
Xc3, non-linear droop slope 3	
V1, non-linear droop upper voltage (pu)	
V2, non-linear droop lower voltage (pu)	
Tmssbrk, time for MSS breaker to operate (sec)	
Tout, time MSC should be out before switching back in (sec)	
TdelLC, Time delay for switching in a MSS(sec)	
Iupr, Upper threshold for switching MSSs(pu on STBASE)	
Ilwr, Lower threshold for switching MSSs(pu on STBASE)	
Sdelay, time STATCOM should remain blocked before being unblocked	
STBASE (>0), STATCOM BASE MVA	

Table 3: Parameters of SVSMO3T2 generic STATCOM model – additional information

Parameter (Other relevant information or PSS/E ICON)	Value
Remote bus number for voltage regulation	Bus Name & Voltage Level
Disable or enable coordinated MSS switching, 0 - no MSS switching, 1 - MSS switching based on STATCOM current	
flag1, slow-reset off/on, flag1 (0/1)	
flag2, non-linear droop off/on, flag2 (0/1)	
1st MSS bus #	
1st MSS Id (to be entered within single quotes)	
2nd MSS bus #	
2nd MSS Id (to be entered within single quotes)	

3rd MSS bus #	
3rd MSS Id (to be entered within single quotes)	
4th MSS bus #	
4th MSS Id (to be entered within single quotes)	
5th MSS bus #	
5th MSS Id (to be entered within single quotes)	
6th MSS bus #	
6th MSS Id (to be entered within single quotes)	
7th MSS bus #	
7th MSS Id (to be entered within single quotes)	
8th MSS bus #	
8th MSS Id (to be entered within single quotes)	

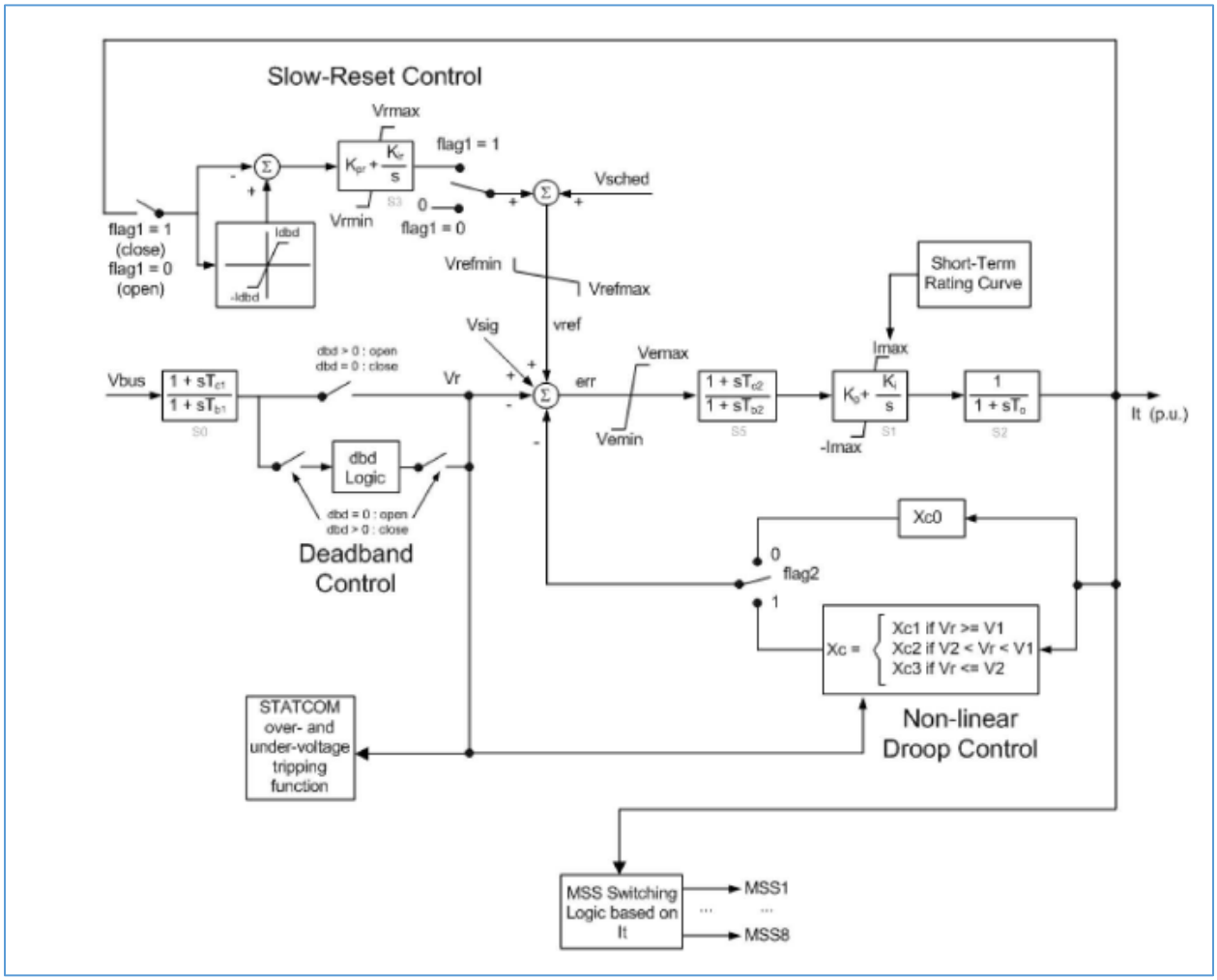


Figure 1: Illustration of STATCOM characteristic for model SVSMO3T2

Table 4: Parameters of CSTCNT generic STATCON model

Parameter (Controller parameters or PSS/E CON)	Value
T1 (>0)	
T2 (>0)	
T3 (>0)	
T4 (>0)	
K(Typical = 25/(dv/dei))	
Droop (typical = 0.03)	
VMAX (typical = 999)	
VMIN (typical = -999)	
ICMAX (typical = 1.25) Max capacitive current	
ILMAX (typical = 1.25) Max inductive current	
Vcutout (typical = 0.2)	
Elimit (typical = 1.2)	
Xt (>0) (transformer reactance, typical = 0.1)	
Acc (acceleration factor, typical = 0.5)	
STBASE (>0) STATCON base MVA	

Table 5: Parameters of CSTCNT generic STATCOM model – additional information

Parameter (Other relevant information or PSS/E ICON)	Value
IB, remotely regulated bus	Bus Name & Voltage Level

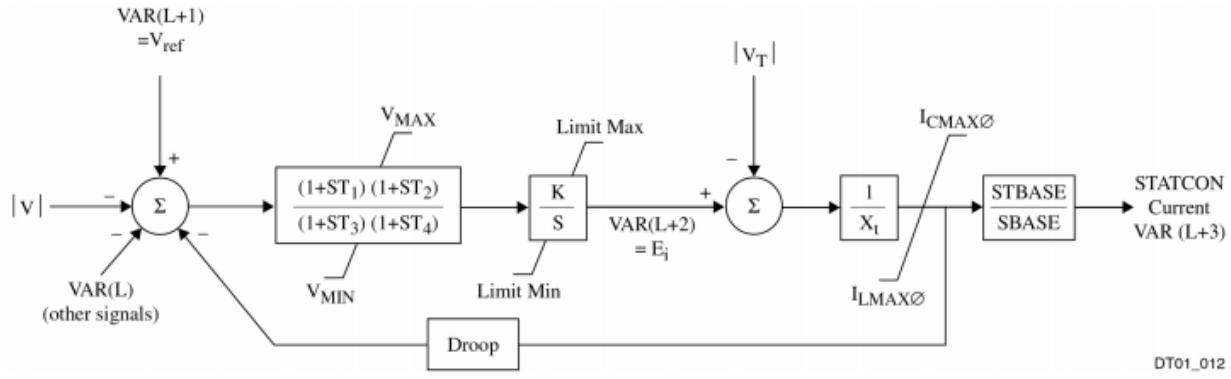


Figure 2: Illustration of STATCOM characteristic for model CSTCNT

Annexure-9.9(a)

A.3		220 kV / 132 kV Sub - Stations				
Sl. No.	Control area	Name of sub-Stations	Voltage level	Date of first sysnchonisation	Target Date as per User	Remark
1	CSPTCL	BISHRAMPUR	220	14.08.2014		No communication available
2		KAWARDHA	220			No communication available
3		BORJHARA	220			No communication available
4		KUTHREL (DHARSHIWA)	220			Gateway issue
5		PRATAPPUR	132	05.03.2014		No communication available
6		BALRAMPUR	132			No communication available
7		MAGARLOAD	132	22.02.2013		RTU issues
8		GOPALPUR LAFARGE	132			No communication available
9		MANA	132	30.10.2010		RTU issues
10		SECTOR-A URLA	132	27.04.2012		RTU issues
11		GEVRA	132	16.03.2016		No communication available
12		KONDATARAI	132	07.06.2018		No communication available
13		DHABHARA	132	16.04.2018		No communication available
14		BHAKHARA	132	16.04.2018		No communication available
15		MOHLA	132	27.05.2018		No communication available
16		LORMI	132	18.05.2018		No communication available
17		TAKHTPUR	132	10.07.2018		No communication available
18		SUKMA	132	07.04.2018		No communication available
19		BATOLI	132			No communication available
20		KANSABEL	132			No communication available
21		RAJPUR	132			No communication available
22		WADRAFNAGAR	132			HIGHLY INTERMITTENT
23		NAGRI	132			No communication available
24		PAKHANJUR	132			No communication available
25		DORNAPAL	132			No communication available
26	DNH	NEW KHARADPARA	220 kV			No communication available
27	GETCO	KAWANT	220 kV			Gateway not configured
28		AMOD	220 kV			Gateway not configured
29		220Kv Moti-Gop	220 kV			Gateway not configured
30		BAGODARA	220 kV			Gateway not configured
31		SANTEJ	220 kV			Gateway not configured

Annexure-9.9 (b)

Incorrect telemetered data from NTPC

List of non/wrongly updating points at Kawas			
Analogs			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	220kV Kawas Icchapur 1 MW	3048	Wrong value
2	220kV Kawas Icchapur 1 MVAR	3049	The raw count is 0
3	220kV Kawas Icchapur 2 MVAR	3051	The raw count is 0
CB			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	20652 ST1 CB	2004	Updating as Faulty
2	21352 ST2 CB	2011	Updating as Faulty

3	21552 Icchapore 1 CB	2017	Updating as Open whereas actual status is closed
4	21952 Icchapore 2 CB	2018	Updating as Open whereas actual status is closed
5	22052 Vav 2 CB	2019	Updating as Open whereas actual status is closed
1	21552 SOE Icchapore 1	1041	Suspect
2	21952 SOE Icchapore 2	1042	Suspect
3	22052 SOE Vav 2	1043	Suspect
Isolators			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	All isolators of bays 215 & 219 (Icchapore 1 & 2)		Suspect

List of non/wrongly updating points at Jhanor			
Analogs			
Sr. No.	**Point name**	**IEC address**	**Remarks**
11	ICT 1 MW 220kV side	address required	Not configured at site
12	ICT 1 MVAR 220kV side	address required	Not configured at site
13	ICT 2 MW 220kV side	address required	Not configured at site
14	ICT 2 MVAR 220kV side	address required	Not configured at site

Isolators			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	40189A	address required	Not configured at site
2	40589A	55	Updating as Open whereas actual status is closed
3	40589B	56	Updating as Open whereas actual status is closed
4	40689A	66	Updating as Open whereas actual status is closed
5	40689B	67	Updating as Open whereas actual status is closed
6	40689L	address required	Not configured at site

7	40789A	address required	Not configured at site
8	40989B	address required	Not configured at site
9	41089L	74	Updating as Open whereas actual status is closed
10	41189A	68	Updating as Open whereas actual status is closed
11	41189B	69	Updating as Open whereas actual status is closed
12	41289A	70	Updating as Open whereas actual status is closed
13	41289B	address required	Not configured at site
14	41289L	71	Updating as Open whereas actual status is closed
15	41389A	58	Updating as Open whereas actual status is closed
16	41389B	address required	Not configured at site
17	41389L	address required	Not configured at site
18	41489A	address required	Not configured at site
19	41489B	address required	Not configured at site
20	All 220kV Isolators	Proper addreses requried	Wrongly updating at WRLDC

List of non/wrongly updating points at KSTPS			
Analogs			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	GT 1 MVAR	3041	Wrong value
CB			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	GT 7 CB	2025	Not configured
2	Korba West CB	2008	Updating as open but at site it is closed
3	Bus coupler 2 CB	2019	Updating as open but at site it is closed
4	Raipur 3 CB	2023	Not configured
5	Raipur 4 CB	2024	Not configured
6	TBC	2004	Updating as closed but at site it is open
7	Birsingpur 1 CB	2026	Not configured
8	Birsingpur 2 CB	2027	Not configured
9	Bus sectionaliser 1	2012	Updating as open but at site it is closed
10	Bus sectionaliser 2	2013	Updating as open but at site it is closed

Isolators			
Sr. No.	**Point name**	**IEC address**	**Remarks**
1	All isolators need to be checked		

List of non/wrongly updating points at VSTPS stg.1 & 2

Analogs

Sr. No.	Point Name	IEC address	Remarks
1	Bus 2 kV	Address to be configured	Suspect
2	Bus 1 frequency	3114	Suspect
3	Bus 2 frequency	3136	Suspect
4	Bus 3 frequency	3137	Suspect
5	Bus 4 frequency	3109	Suspect
6	GT 4 MW	3042	Wrong value
7	GT 4 MVAR	3043	Wrong value
8	GT 5 MW	3038	Wrong value
9	GT 5 MVAR	3039	Value updating as zero
10	GT 6 MW	3030	Wrong value
11	GT 6 MVAR	3031	Wrong value
12	GT 7 MW	3064	Wrong value
13	GT 7 MVAR	3065	Wrong value
14	GT 1 MVAR	3056	Wrong value
15	GT 2 MVAR	3052	Wrong value
16	GT 3 MVAR	3048	Wrong value
17	Rewa MVAR	3035	Wrong value
18	Sasan MVAR	3033	Value updating as zero
19	HVDC 1 MVAR	3025	Wrong value
20	HVDC 2 MVAR	3027	Wrong value
21	Essar Mahan MVAR	3059	Wrong value
22	Satna 2 MVAR	3071	Wrong value
23	Satna 1 MVAR	3069	Value updating as zero
24	Jabalpur 2 MVAR	3063	Wrong value
25	Jabalpur 1 MVAR	3061	Wrong value
26	KSTPS MW	3018	Wrong value
27	KSTPS MVAR	3021	Wrong value
28	Essar Mahan LR MVAR	Address to be configured	
29	Satna 2 LR MVAR	Address to be configured	

30	Satna 1 LR MVAR	Address to be configured	
31	Jabalpur 2 LR MVAR	Address to be configured	
32	Jabalpur 1 LR MVAR	Address to be configured	
33	KSTPS LR MVAR	Address to be configured	
34	Rewa LR MVAR	Address to be configured	

Status			
Sr. No.	Point Name	IEC address	Remarks
CB			
1	GT-3 CB	2010	Reporting as open, however on field it is closed
2	GT-5 CB	2006	Reporting as open, however on field it is closed
3	Jabalpur-2 CB	2021	Reporting as faulty
4	Jabalpur-1 CB	2020	Reporting as faulty
5	KSTPS CB	2036	Reporting as faulty
6	Bus reactor CB	2018	Reporting as open, however on field it is closed
7	Bus coupler of Bus 3 & 4 CB	address to be configured	
8	IBT 1 400kV CB	2017	Reporting as open, however on field it is closed
9	Waidhan 1 CB	2034	Reporting as faulty
10	Waidhan 2 CB	2035	Reporting as faulty
11	IBT 1 132kV side CB	2026	Reporting as faulty
12	IBT 2 132kV side CB	2039	Reporting as faulty
13	132kV Bus coupler CB	2030	Reporting as faulty

Iso			
1	HVDC line 2 isolator B	52	Reporting as open, however on field it is closed
2	HVDC line 1 isolator A	58	Reporting as open, however on field it is closed
3	HVDC line 2 isolator A	54	Reporting as open, however on field it is closed

4	GT8 Isolator A	125	Reporting as open, however on field it is closed
5	Jabalpur 2 isolator A	109	Reporting as open, however on field it is closed
6	KSTPS isolator A	Address to be configured	
7	KSTPS isolator B	Address to be configured	
9	Bus coupler of Bus 1 & 2 isolator A	75	Reporting as open, however on field it is closed
10	Rewa Isolator L	70	Reporting as open, however on field it is closed
11	Sasan Isolator L	65	Reporting as open, however on field it is closed
12	Essar Mahan Isolator L	Address to be configured	
13	Satna 2 Isolator B	113	Reporting as open, however on field it is closed
14	Satna 2 Isolator L	124	Reporting as open, however on field it is closed
15	Satna 1 Isolator L	119	Reporting as open, however on field it is closed
16	Jabalpur 2 isolator L	Address to be configured	
17	Jabalpur 1 isolator L	Address to be configured	
18	KSTPS isolator L	Address to be configured	
19	Bus sectionalizer 1 Isolator A	Address to be configured	
20	Bus sectionalizer 2 Isolator A	Address to be configured	
21	Bus coupler of Bus 3 & 4 Isolator A	101	Reporting as open, however on field it is closed
22	Bus coupler of Bus 3 & 4 Isolator B	102	Reporting as open, however on field it is closed
23	KSTPS Line reactor Isolator	Address to be configured	
24	Jabalpur 1 Line reactor Isolator	Address to be configured	
25	Jabalpur 2 Line reactor Isolator	Address to be configured	
26	Satna 1 Line reactor Isolator	Address to be configured	
27	Satna 2 Line reactor Isolator	Address to be configured	

28	Essar Mahan Line reactor Isolator	Address to be configured	
29	Rewa Line reactor Isolator	Address to be configured	
30	IBT 1 132kV side Isolator A	128	Wrong updation
31	IBT 1 132kV side Isolator B	Address to be configured	
32	IBT 1 132kV side Isolator T	129	Wrong updation
33	IBT 2 132kV side Isolator A	155	Wrong updation
34	IBT 2 132kV side Isolator B	Address to be configured	
35	IBT 2 132kV side Isolator T	156	Wrong updation
36	Waidhan 1 Isolator A	141	Wrong updation
37	Waidhan 1 Isolator B	143	Wrong updation
38	Waidhan 1 Isolator T	142	Wrong updation
39	Waidhan 2 Isolator A	144	Wrong updation
40	Waidhan 2 Isolator B	146	Wrong updation
41	Waidhan 2 Isolator T	145	Wrong updation
42	132kV Bus sectionalizer isolator A	Address to be configured	
43	132kV Bus sectionalizer isolator B	Address to be configured	

Western Region-Event Report for August 2019

S.No	Region	Name of Elements	Owner/Agency	Outage		Revival		Outage Duration	Event	Generation Loss (MW)	Load Loss (MW)	Category as per CEA standards	DR/EL submitted Yes/No
				Date	Time	Date	Time	Time					
1	WR	Tripping of 1.220 kV Uran-Apta 2&3 2.220 kV Uran-Khargar 2 3.220 kV Uran-JNPT 4.Uran 108 MW Unit 6&8 5.Uran 120 MW Unit A0	MSETCL	03-08-2019	20:29	03-08-2019	20:45	00:16	At 220 kV Uran s/s, flashover on Main Bus 2 R Phase Tension Disc Insulator String at 220 KV ONGC Bay resulted in tripping of all the elements connected to 220 kV Uran Bus 2 on Busbar protection operation.	202	13	GI-1	No DR available at Uran end as it has been overwritten by other DRs.
2	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC 4.Uran 108 MW Unit 5 5.Uran 120 MW Unit B0	MSETCL	03-08-2019	13:41	03-08-2019	14:11	00:30	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	176	8	GI-1	Yes
3	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC 4.Uran 108 MW Unit 5 5.Uran 120 MW Unit A0	MSETCL	04-08-2019	03:57	04-08-2019	04:30	00:33	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	220	18	GI-1	Yes
4	WR	Tripping of 1.220 kV Uran-Apta 1&2 2.220 kV Uran-Khargar 1 3.220 kV Uran-ONGC	MSETCL	04-08-2019	05:27	04-08-2019	06:59	01:32	At 220 kV Uran s/s, 220 kV Bus 1 and all the connected elements tripped due to spurious LBB signal generated due to the faulty Binary input module of REB 670	Nil	12	GI-1	Yes
5	WR	Tripping of 1.220 Kv Bhuj-Vadva 2.220/33 kV Vadva ICT 1 3.220/33 kV Vadva ICT 2 4.220/33 kV Vadva ICT 3	GIWEL	12-08-2019	05:48	12-08-2019	06:56	01:08	Due to the tripping of 220 kV Bhuj-Vadva S/C on B-E fault, 220/33 kV Vadva Icts 1,2& 3 deenergized at 220 kv Vadva S/s.	78	Nil	GD-1	DR not submitted for Bhuj end by GIWEL/PGCIL
6	WR	Tripping of 1.220 kV Ponda Bus 1 2.220 kV Mapusa-Ponda 1 3.220 kV Ponda-Xeldem 2 4.220/110 kV Ponda ICT 1&2 5.220 kV Mahalakshmi-Amona	Goa	13-08-2019	19:31	13-08-2019	20:33	01:02	At 220 kV Ponda s/s, Dropper of 220KV Ponda-Xeldem-2 fell on 220KV Bus-1 and all the elements connected to 220 kV ponda Bus 1 tripped.	Nil	110	GI-1	No DR facility available in Ponda due to old relays
7	WR	Tripping of 1.220 kV Nashik-Airoli 2.220 kV Nashik-Bableshwar 1&2 3.220 kV Nashik-Ghatghar 4.220 kV Nashik-Airoli 5.Nashik Unit 4 (210 MW) 6.220/132 kV 200 MVA Nashik ICT 1&6 7.220/132 kV 150 MVA Nashik ICT 2	MSETCL	15-08-2019	09:17	15-08-2019	09:40	00:23	220 kV Nashik-Bableshwar 2 was taken on TBC at Nashik s/s for bus sectionaliser 3 outage.Trip circuit faulty alarm appeared on the Nashik TBC. To attend the problem the circuit was opened at Bableshwar end and the TBC isolator was opened with charging current which rersulted in sparking of the isolator and created R-E fault. As the trip circuit of the line was faulty, TBC not opened and resulted in tripping of all the elements connected to 220 kV Nashik Main Bus on LBB operation.	110	30	GD-1	No (LBB scheme electrostatic relay -no DR facility available & Bableshwar 2 line backup relay DR could not be downloaded due to relay issue)
8	WR	Tripping of 1.220 kV Amona-Ponda 2&3 2.220 kV Mahalakshmi-Amona 3.220 kV Amona-Tillari 4.220 kV Halkarni-Tillari	Goa	15-08-2019	07:00	15-08-2019	08:16	01:16	At 220 kV Amona s/s, due to failure of Y-ph LA of 220KV Tillari feeder all the elements connected to 220 kV Amona Bus 2 tripped.	Nil	Nil	GI-1	No DR facility available in Amona due to old relays
9	WR	Tripping of 1.400 kV Ukai-Kosamba 2.400 kV Ukai-Navsari 3.400/220 kV Ukai ICT 1	GETCO	15-08-2019	14:00	15-08-2019	19:20	05:20	At 400/220 kV Ukai s/s, 400kV Ukai-Kosamba and Ukai-Navsari lines tripped on over-voltage & 400/220kV ICT tripped on Overflux & differential protection operation. Due to tripping of all the elements, 400kV Bus 1&2 at Ukai substation deenergized.	Nil	Nil	GI-2	No (Navsari submitted some other event DR)

10	WR	Tripping of 1.400 kV Ukai-Kosamba 2.400/220 kv Ukai ICT 1	GETCO	16-08-2019	01:06	16-08-2019	06:55	05:49	At 400/220 kV Ukai s/s, 400kV Ukai-Kosamba tripped on over-voltage & 400/220kV ICT tripped on Overflux protection operation. 400kV Bus 1&2 at Ukai substation deenergized as 400kV Ukai - Navsari was already out on voltage regulation.	Nil	Nil	GI-2	No
11	WR	Tripping of 1.220 kV Dhule Interconnector 1&2 2.220 kV Dhule-Chalisgaon 3.220/132 kV 200 MVA Dhule ICT 1&2	MSETCL	22-08-2019	12:36	22-08-2019	13:00	00:24	At 220/132 kV Dhule(MH) s/s, due to the sparking in 220 kV Bus Bar relay panel on RQDA module of RADSS bus bar panel, Bus bar protection operated and all elements connected to 220 kV Main Bus tripped.	Nil	19	GI-1	Yes
12	WR	Tripping of 1.220 Kv Bhuj-Vadva 2.220/33 kV Vadva ICT 1 3.220/33 kV Vadva ICT 2 4.220/33 kV Vadva ICT 3	GIWEL	24-08-2019	18:00	24-08-2019	19:49	01:49	Due to the tripping of 220 kV Bhuj-Vadva S/C on O/C current protection operation, 220/33 kV Vadva Icts 1,2& 3 deenergized at 220 kv Vadva S/s.	30	Nil	GD-1	DR not submitted for Bhuj end by GIWEL/PGCIL
13	WR	Tripping of 1.220 kV Panandhro Bus 2 2.220 kV Panandhro -Akrimota 1 3.220 kV Panandhro -Kukma 2 4.220 kV Panandhro - Nakhatrana 1&2 5.70 MW KLTPS Unit 2 6.75 MW KLTPS Unit 4	GETCO	25-08-2019	02:22	25-08-2019	03:59	01:37	At 220 kV Panandhro, R-phase CT of 25MVAR BR caught fire and resulted in tripping of all the elements connected to 220 kV Panandhro Bus 2.	105	Nil	GI-1	DR not submitted for following: 1. Panandhro Bus 2 2. KLTPS Unit 2&4 3. 220 kV Akrimota-Panandhro DR at Akrimota end 4. 220 kV Kukma-Panandhro 2 at Panandhro end
14	WR	Tripping of 1.132 kV Siltara-Vandana 2.220/132 kV Siltara ICT 2 3.220/132 kV Siltara ICT 3	CSPTCL	28-08-2019	15:36	28-08-2019	15:55	00:19	Due to the R phase fault in 132 kV Siltara-Vandana feeder, 220/132 kV Siltara ICTs 2&3 tripped.	Nil	192	GI-1	No

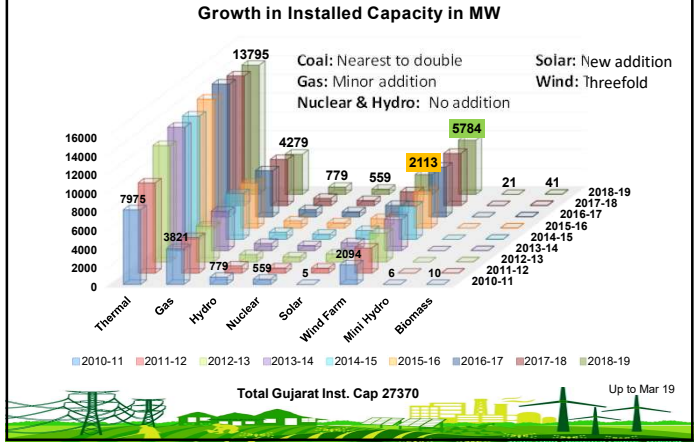
Disclaimer : The Above details are based on the preliminary/flash report of the event and may change after finalisation of the detailed report.The qunatum of load/generation loss is based on details given by SLDC and utility and may vary later with updated details.

Methodology for Load Forecasting

State Load Despatch Centre,
Gujarat Energy Transmission Co. Ltd.

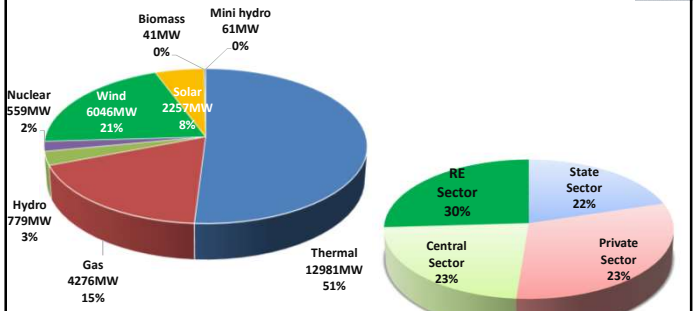
1

Changing Dynamic of Installed Capacity



2

Power System Statistics at a Glance



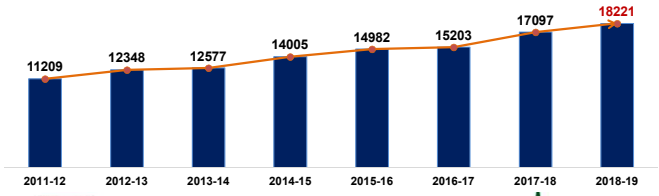
Total Gujarat Installed Capacity: 27002 MW

3

Maximum Demand Analysis

System scenario	Energy	Date
Max Catered in Mus	403.204	21.09.18
Max Catered in MW	18305	07.06.19

Maximum Demand in MW in Power System



4

Study of Operational Complexity - Demand Variation

Year	No of days when **variation** between Maximum and Minimum **demand**				
	>1500 MW	**>2000 MW**	**>2500 MW**	**>3000 MW**	**>3500 MW**
2012-13	259	104	22	0	0
2013-14	260	114	34	6	0
2014-15	304	137	58	20	4
2015-16	336	213	94	28	2
2016-17	332	252	139	54	13
2017-18	350	302	198	119	54
2018-19	354	298	194	93	35

5

Key Factors influencing load forecasting

Non AG load pattern	AG load pattern
1. Residential / Commercial load: • Season : Winter , Summer , Monsoon • Peak Hr / Off peak Hr load pattern • Seasonal Lighting load effect (Sunrise / Sunset timing) • Festival effect, Holiday effect, • Sunday effect, Office timing • Bandh / Agitation / Strike / Election / Local issues **2. Industrial Load:** • Industrial Staggering effect (District / area wise) • Festival effect • Any special effect like Bandh / Agitation / Strike / Election / Local issues • Peak Hr / Off peak Hr load pattern • Recess/Lunch time • Continues/Non Continues Industries	• Area wise Rain fall • Timing of rainfall i.e. rain during morning or rain at evening • Water level in agriculture pocket in Discom area • Irrigation facilities in Discom area (Depends upon type of soil) • Area wise Type of Crop • Special type of crop like Paddy, Geera or Cummins • Crop wise Load pattern during Starting / Ending period of Agriculture season

6

Load Forecasting Practice - DISCOM

- Consider previous three Week load pattern & regular growth in load.
- Bifurcation of AG load & Non AG load

- AG load effect - Consider, previous day load pattern and changes shall be made in accordance to crops situation, atmospheric condition etc.
- Non AG load effect - Consideration of Non AG load for festival and weekly off effect for Industrial load, URB, JGY, also considered atmospheric condition. – last few year pattern.
- Festival effect - consideration of last three year (most probably last year) load pattern along with normal days before and after festival and change in the load
- Staggered day average MW load relief area wise - Mainly, No variation in industrial load in normal days and No major effect of staggering days are being found (Generally no relaxation observed except PGVCL area). However, Any special effect like Bandh / Agitation / Strike / Election / Local is also considered.

7

Load Forecasting Practice - SLDC

Day Ahead

- Discoms submits forecast on online web based module on Day ahead Basis in the morning @ 9.00 hrs. by considering all related factor of the pertaining day.
- Day ahead forecast is revised at 16:00 Hrs. and at 22:00 Hrs. considering real time trend. Subsequently, the instructions are conveyed to State generators for bringing / withdrawing machines.

Real Time

- Discom gives revised forecast due to load variation.
- The total forecast is auto gross up by loss factor on day ahead basis in web based.
- The anticipated forecast is compared with actual SCADA data in real time. Subsequently, the forecasted values are fine tuned for rest of the period and advised Discoms to revise its forecast accordingly.

8

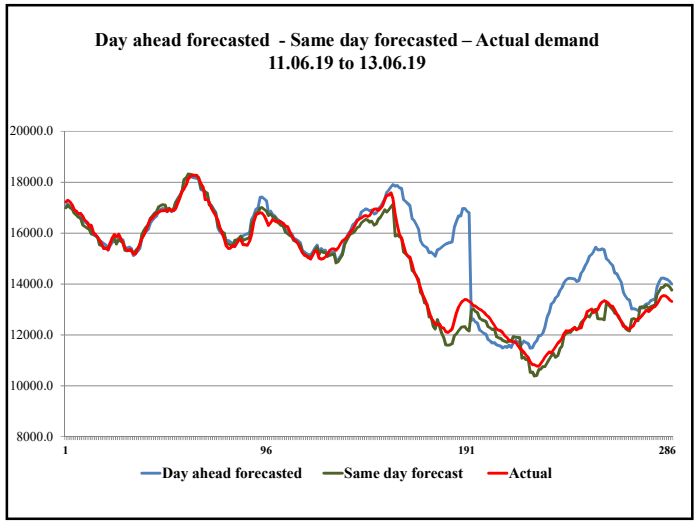
In-house Load Forecasting – DA Accuracy

Month	Average Forecast (Mus)	Average Actual (Mus)	Average Nos of block in a day when the difference ± 250 MW	% Nos of block 250 MW or Below	Nos of blocks In +/-3% (wrt F)	% Nos of blocks In +/-3% (wrt F)
April 18 to March 19	332	330	51	53	72	75
April 19 to August 19	350	348	39	40	62	64

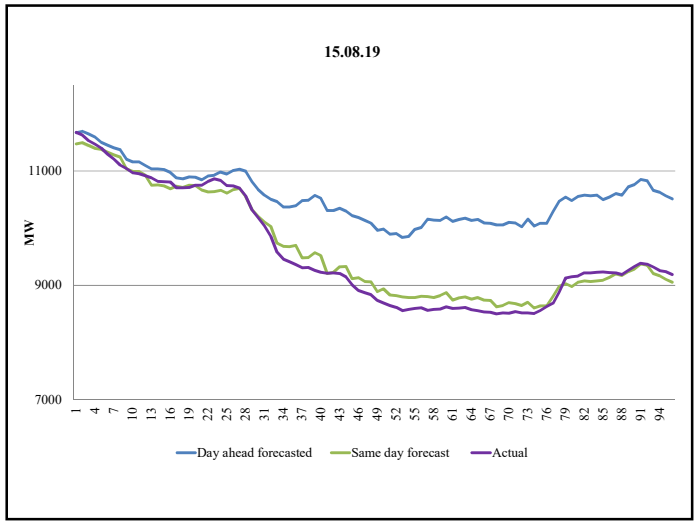
In-house Load Forecasting – RT Accuracy

Month	Average Forecast (Mus)	Average Actual (Mus)	Average Nos of block in a day when the difference ± 250 MW	% Nos of block 250 MW or Below	Nos of blocks In +/-3% (wrt F)	% Nos of blocks In +/-3% (wrt F)
April 18 to March 19	331	330	64	67	84	88
April 19 to August 19	346	348	58	61	84	88

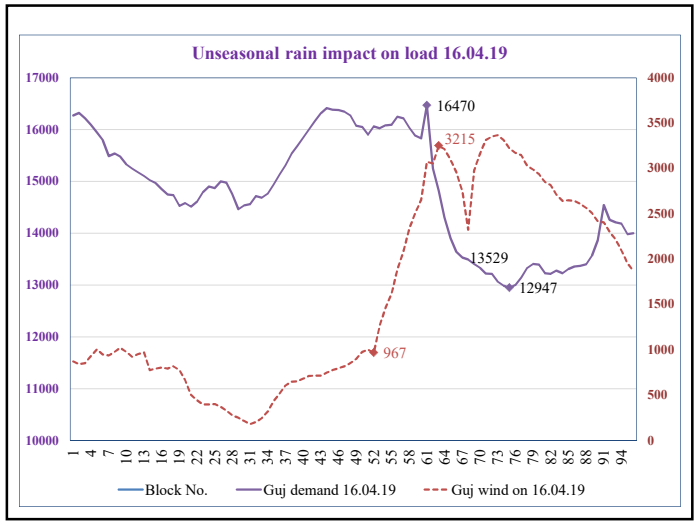
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10



11



12

Why Forecasting V/S Actual Drawl differe

- Human Factor
- System Factor
- Time Factor
- Geographic Factor
- Past Data Factor
- Real time DATA pooling Factor
- Way of Information Factor
- Weather Factor
- Time of Rainfall
- Mapping of all affecting factors

13

Way forward – Availing Forecast Service

- SLDC availing service of M/S 50Hz for following forecasting service since 01st July 19.

- Load Forecasting for State of Gujarat as a whole & Load forecasting for each Discom (Six Discoms)
- RE (Wind & Solar) Generation Forecasting

Forecast Deliverables

- Weekly forecast: Forecast in MWh in 672 blocks for week
- Day ahead forecast: Forecast in MWh in 96 blocks for next day
- Intraday forecast: Forecast in MWh in 96 blocks for intraday

14

Forecast Revision & Accuracy Terms

Scope for revision:

- Intraday forecast shall be revised at span of every 1.30 hrs.
- Effective from 00.00 hrs. i.e. 16 revisions in a day for load forecast and wind generation forecast.
- E.g.: Forecast revised at 09.00 hrs. shall be effective from 10.30 hrs.

Accuracy Evaluation

Deviation = (Actual data – Forecast data)

This deviation should be ± 250 MW or less than ± 250 MW for each block.

15

Payment calculation

Basic terms of Payment

Fixed Amount: it will be **10 % of contract value**.

Variable Amount: balance **90 % based on accuracy** of day ahead and intraday forecast.

- **50 %** based on accuracy for **day ahead basis.**
- **40 %** based on accuracy for **Intraday basis.**

- Accuracy shall be calculated separately for load, wind generation and solar generation forecasting.
- However, **lower accuracy out of three forecast** (load, wind generation and solar generation forecasting) **shall be considered for payment purpose.**

16

Payment calculation

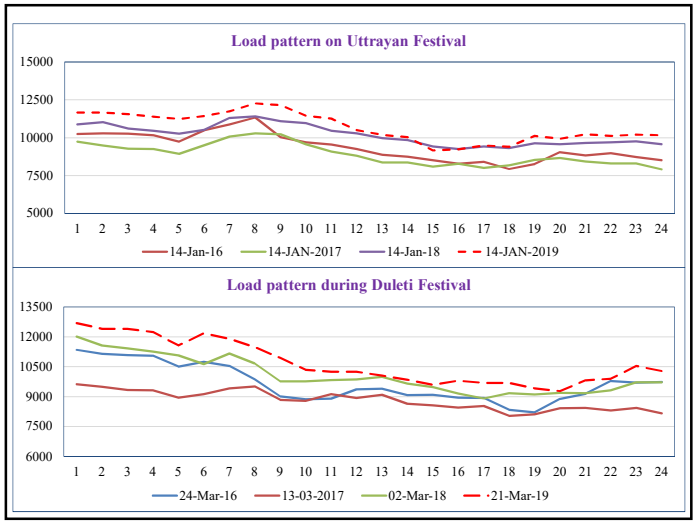
Day ahead forecast

Criteria	Nos. of block achieved within range in a day For Load Forecasting	Balance amount released
A	Equal or above 72 block in a day (75%)	100% of balance 50%
B	In between 61 to 71 block in a day	50% of balanced 50%
C	In between 49 to 60 block in a day	25% of balanced 50%
D	*Below or equal to 48 block in a day*	*Nil payment*

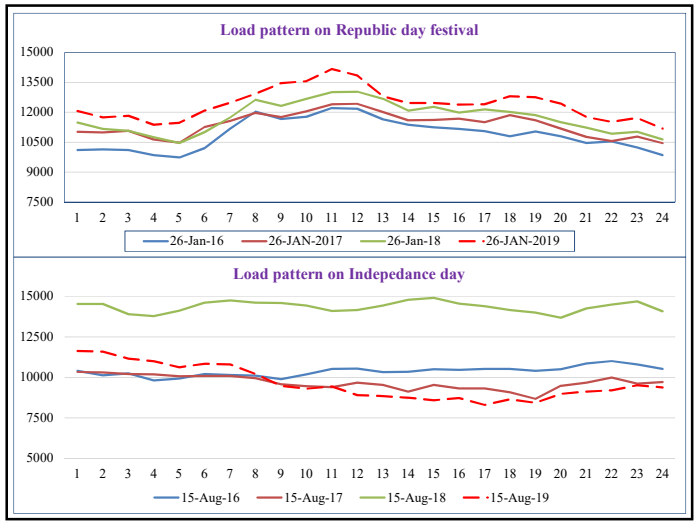
Intraday forecast

Criteria	Nos. of block achieved within range in a day For Load Forecasting	Balance amount released
A	Equal or above 91 block in a day	100 % of balance 40%
B	In between 81 to 90 block in a day	90% of balanced 40%
C	In between 71 to 80 block in a day	80% of balanced 40%
D	In between 61 to 70 block in a day	70% of balanced 40%
E	In between 49 to 60 block in a day	50% of balanced 40%
F	*Below or equal to 48 block in a day*	*Nil payment*

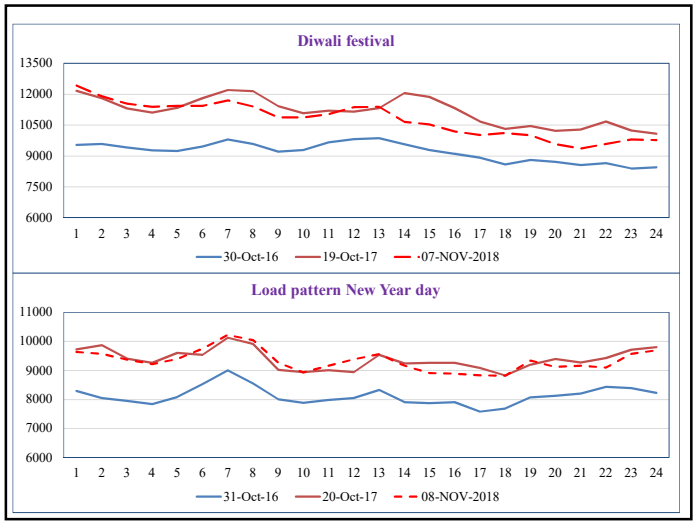
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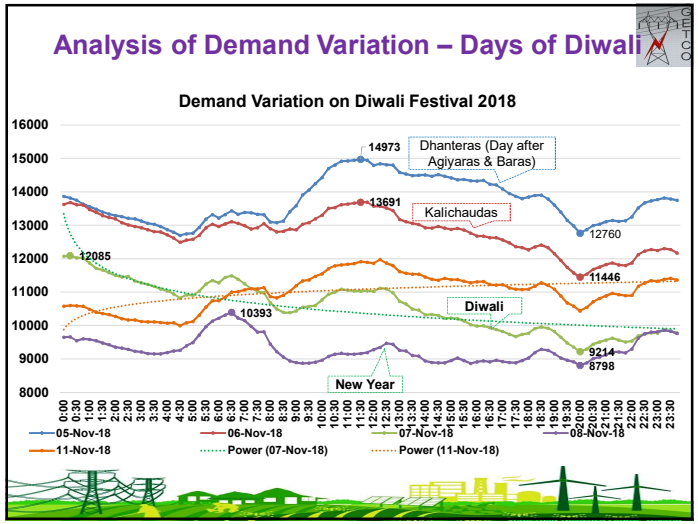
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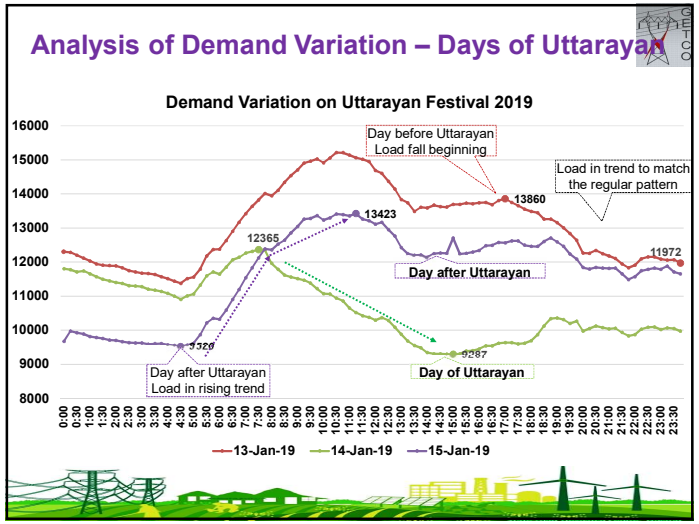
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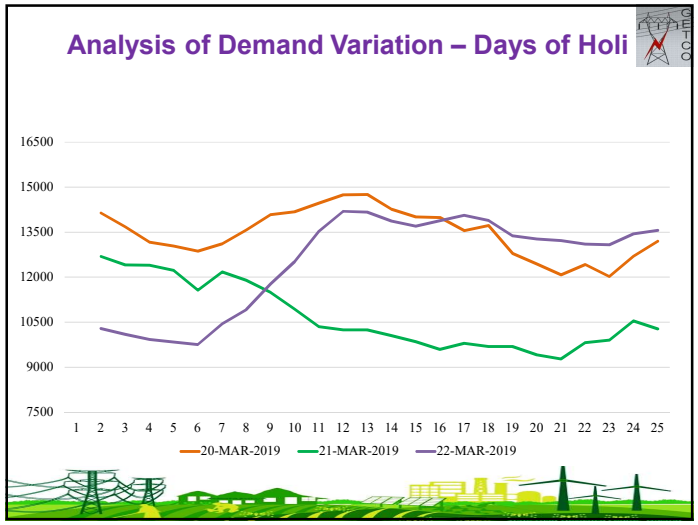
20


Analysis of Demand Variation – Days of Diwali
Demand Variation on Diwali Festival 2018
Dhanteras (Day after Agiyaras & Baras)
Kalichaudas
Diwali
New Year
14973
13691
12760
12085
11446
10393
9214
8798
05-Nov-18
06-Nov-18
07-Nov-18
08-Nov-18
11-Nov-18
Power (07-Nov-18)
Power (11-Nov-18)

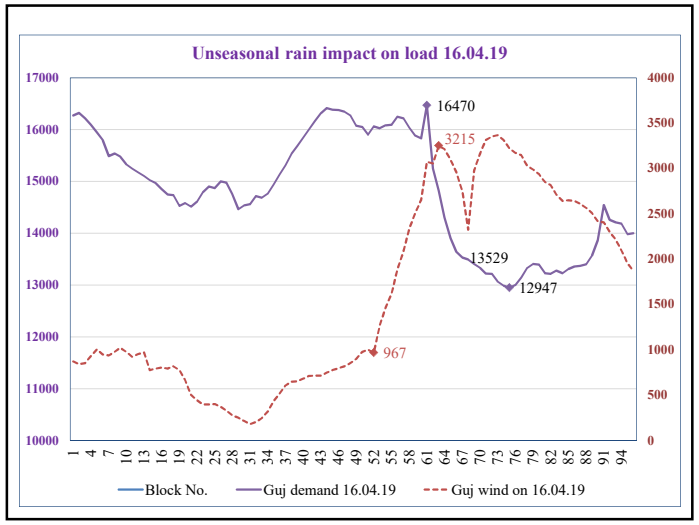
21


Analysis of Demand Variation – Days of Uttarayan
Demand Variation on Uttarayan Festival 2019
Day before Uttarayan Load fall beginning
Load in trend to match the regular pattern
Day after Uttarayan
Day after Uttarayan Load in rising trend
Day of Uttarayan
13860
13423
12365
11972
9320
9287
13-Jan-19
14-Jan-19
15-Jan-19

22


Analysis of Demand Variation – Days of Holi
20-MAR-2019
21-MAR-2019
22-MAR-2019

23


Unseasonal rain impact on load 16.04.19
16470
3215
13529
12947
967
Block No.
Guj demand 16.04.19
Guj wind on 16.04.19

24



25

Payment calculation

Minimum eligible payment

- In case, day wise accuracy of day ahead forecast are as per criteria “D” (equal or below to 48 number of blocks for load & wind generation forecasting and 26 block for solar generation forecasting) for 15 days in a month, ‘NIL’ monthly payment will be released for that particular month for variable amount (i.e. 90%).
- If bidder unable to extend forecast data of consecutive 16 time blocks in a day due to any inbuilt model data error or disappearing web display, then bidder will not eligible for payment of that particular day for variable amount.
- If such ‘NIL’ payment of variable amount persist for two consecutive months, 10 % fix amount will not be admissible for the next months till minimum monthly accuracy achieved.

26