



सत्यमेव जयते

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

संख्या:NRPC/OPR/106/01/2020/2428-2469

दिनांक:05.03.2020

विषय: उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 168^{वीं} बैठक का कार्यवृत्त |

Subject: Minutes of 168th OCC meeting of NRPC.

उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 168^{वीं} बैठक 19.02.2020 को आयोजित की गयी थी। उक्त बैठक का कार्यवृत्त उत्तर क्षेत्रीय विद्युत समिति की वेबसाइट <http://www.nrpc.gov.in> पर उपलब्ध है। यदि कार्यवृत्त पर कोई टिप्पणी हो तो कार्यवृत्त जारी करने के एक सप्ताह के अन्दर इस कार्यालय को भेजें |

168th meeting of the Operation Co-ordination Sub-Committee of NRPC was held on 19.02.2020. The Minutes of this meeting has been uploaded on the NRPC website <http://www.nrpc.gov.in>. Any comments on the minutes may kindly be submitted within a week of issuance of the minutes.

संलग्नक: यथोपरि

(सौमित्र मजूमदार)
अधीक्षण अभियंता (प्रचालन)

सेवा में,

प्रचालन समन्वय उप-समिति के सभी सदस्य

**उत्तर क्षेत्रीय विद्युत समिति की प्रचालन समन्वय उप-समिति की 168^{वीं}
बैठक का कार्यवृत्त**

168th meeting of OCC of NRPC was held on 19.02.2020 at Hyatt Regency, Lucknow. The list of participants of the meeting is attached at **Annexure-A.I.**

खण्ड-क: उ.क्षे.वि.स.

PART-A: NRPC

1. Confirmation of Minutes

No comments on the minutes were received from any member.

OCC confirmed the minutes of 167th OCC meeting.

2. Review of Grid operations of January 2020

2.1. Anticipated vis-à-vis Actual Power Supply Position (Provisional) for January 2020

Sub-Committee was informed that there was negative / significant variation ($\geq 5\%$) in Actual Power Supply Position (Provisional) vis-à-vis Anticipated figures in terms of Energy Requirement for Chandigarh, Delhi, Haryana, Punjab and Rajasthan and in terms of Peak Demand for Chandigarh, Delhi, HP, Haryana, UTs of J&K and Ladakh, Punjab and Rajasthan.

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

Delhi – Lower than normal temperature persisted for maximum days of the month which led to increase in demand and energy consumption.

Himachal Pradesh – More than anticipated rainfall led to increased peak demand.

Rajasthan – Government policy of supplying power in two blocks during Rabi season has led to increase in peak demand. However, certain local network problems were being encountered leading to a decline in energy requirement.

Haryana & Punjab: There was reduction of agricultural load in the respective states during January 2020.

2.2. Power Supply Position for NCR:

2.2.1. The Sub-Committee was informed that the NCR Planning Board (NCRPB) is closely monitoring the power supply position of National Capital Region. Monthly power supply position for NCR till the month of January 2020 is available on NRPC website (<http://nrpc.gov.in/operation-category/power-supply-position>).

2.3. The highlights of grid operation during January 2020 are as follows:

2.3.1. Frequency remained within the IEGC band for **75.04%** of the time during January 2020, which is higher than that of last year during same month (January 2019) when frequency (within IEGC band) remained **70.24%** of

the time. The frequency regime improved significantly in comparison of last year. For further improvement, Utilities were advised to take necessary action to improve the frequency regime by not changing abruptly the loads at block boundaries and assuring primary response from the generators.

- 2.3.2. Maximum and minimum load for the region during January 2020 were **51,617 MW** (01.01.2020 at 09:55 hrs) and **26,764 MW** (16.01.2020 at 03:30 hrs).
- 2.3.3. The average Thermal generation in January 2020 decreased by **9%** (54.00 MU/day) with respect to the corresponding month in the previous year. The details are enclosed at **Annexure-A.II (A)**.
- 2.3.4. The average Hydro generation in January 2020 increased by **1.04%** (1.26MU/day) with respect to the corresponding month in previous year. The details are enclosed at **Annexure-A.II (B)**.
- 2.3.5. The average Nuclear generation in January 2020 increased by **5.41 MU/day** as compared to corresponding month in previous year. The details are enclosed at **Annexure-A.II (C)**.
- 2.3.6. The average Renewable generation in January 2020 increased by **12.54 MU/day** with respect to the corresponding month in previous year. All utilities were requested to send the data for renewable generation regularly. The details are enclosed at **Annexure-A.II (D)**.

3. Maintenance Programme of Generating Units and Transmission Lines

- 3.1. The maintenance programme for Generating Units and Transmission lines for the month of March 2020 was discussed on **18.02.2020** at **UPSLDC, Lucknow**.
- 3.2. Members were presented with the following tabulated details of outage availed vis-à-vis outage approved in previous OCC meetings for the period of **01.01.2020** to **14.02.2020**:

Entity	Planned (Approval in OCC)	Non-Planned Approvals	Emergency Approvals	Total Approvals	D-3 Requests	% of D-3 Requests
ANTA GAS	1	0	0	1	1	100.0%
AURAIYA GAS	0	0	1	1	0	-
BBMB	43	0	0	43	39	90.7%
BUDHIL	0	0	5	5	0	-
CHAMERA2	4	0	0	4	3	75.0%
CHAMERA3	0	0	3	3	0	-
CPCC1	241	0	34	275	147	61.0%
CPCC2	178	0	15	193	67	37.6%
CPCC3	224	0	34	258	60	26.8%

Entity	Planned (Approval in OCC)	Non-Planned Approvals	Emergency Approvals	Total Approvals	D-3 Requests	% of D-3 Requests
DADRI	7	0	0	7	3	42.9%
DADRI SY	0	0	2	2	0	-
DHAULIGANGA	0	0	0	0	0	-
GPTL	0	0	2	2	0	-
JHAKRI	2	0	0	2	2	100.0%
KARCHAM	3	0	1	4	0	-
KOTESHWAR	2	0	2	4	2	100.0%
NTPC NCR	4	0	0	4	4	100.0%
RAMPUR	21	0	12	33	19	90.5%
RAPP-C	4	0	0	4	3	75.0%
RENEW	1	0	1	2	1	100.0%
RIHAND	0	0	1	1	0	-
SALAL	6	0	3	9	3	50.0%
SEWA2	12	0	0	12	12	100.0%
SINGRAULI	65	0	0	65	2	3.1%
SLDC-DV	59	0	1	60	55	93.2%
SLDC-HP	2	0	0	2	0	-
SLDC-HR	112	0	5	117	10	8.9%
SLDC-JK	0	0	9	9	0	-
SLDC-PS	183	0	0	183	167	91.3%
SLDC-RS	129	0	4	133	123	95.3%
SLDC-UK	7	0	0	7	6	85.7%
SLDC-UP	0	0	39	39	0	-
STERLITE	17	0	2	19	13	76.5%
STU-UP	245	0	0	245	126	51.4%
URI2	0	0	0	0	0	-

All members, especially CPCC NR-2, NR-3, NTPC and Haryana SLDC were advised to take necessary steps so that percentage of availing the planned outages (approved by OCC) is improved.

4. Planning of Grid Operation

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

Anticipated Power Supply Position for March 2020 has been revised as per following figures of concerned states:

State	(Avl. / Req.)	Energy (MU)	Peak (MW)
Delhi	Availability	3706	4890
	Requirement	2000	4100
Haryana	Availability	5560	10020
	Requirement	3800	7350
Himachal Pradesh	Availability	863	1711
	Requirement	868	1688
Rajasthan	Availability	9280	14900
	Requirement	6800	13200
Uttar Pradesh	Availability	9455	18000
	Requirement	9455	18200
Uttarakhand	Availability	1043	1930
	Requirement	1054	1980

5. Submission of breakup of Energy Consumption by the states

5.1. Following status on the submission of energy consumption breakup was discussed:

State	Period of submitted data	Submitted in specified format or not
Rajasthan	Apr'18 – Dec'19	Yes
Punjab	Apr'18 – Oct'19	Yes
Uttar Pradesh	Apr'18 – Nov'19	Yes
Haryana	Apr'18 – Nov'19	No
Himachal Pradesh	Apr-18 – Mar'19	No

In the case of Rajasthan and Uttar Pradesh, significant negative growth in energy demand for traction load was noted. Representatives of the respective states clarified that actual picture of traction load demand cannot be drawn from DISCOM data as most of the demand is now being met through Open Access.

5.2. The sub-committee desired that remaining states/UTs viz., Delhi, Uttarakhand, UTs of J&K and Ladakh and Chandigarh shall submit the requisite data w.e.f. April 2018 as per the billed data information in the format given as under:

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

Representatives of Haryana and Himachal Pradesh were requested to submit data upto December'2019 in the prescribed format.

All SLDCs were requested to make it a monthly exercise and submit the information accordingly.

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

- 6.1. Members were informed that CPRI has again highlighted issues regarding missing data in respect of Haryana on 18.02.2020 and has sought clarifications (**Annexure-A.III**). Representative of Haryana was of the view that all the data has been duly submitted to CPRI and the PSSE file submitted was converging with an accuracy of 0.3%.
- 6.2. Further, regarding the PSSE files for the other states it was informed that none of the state has verified the file as submitted by NRLDC on 07.02.2020 and Rajasthan vide e-mail dated 18.02.2020 has intimated that .sav file was not opening in PSSE@E33 of Rajasthan.
- 6.3. Members expressed concern on the progress in the study for the year 2019-20 as the year would be over in next 40 days and the study is still pending.
- 6.4. In view of the above, OCC forum decided to formulate a Sub-Group of all the SLDC representatives of NR, NRLDC and NRPC Secretariat to look into the reasons for extraordinary delay in the execution of the project. OCC forum also stated that the sub-group should also explore whether an alternate approach of maintaining power factor greater than 0.9 may be adopted rather than going for entire capacitor requirement study. OCC advised that the committee shall submit the findings before next OCC meeting.

7. Phase nomenclature mismatch issue with BBMB and interconnected stations

- 7.1. Sub-Committee was informed that duly signed requisite information has been submitted by **Rajasthan, BBMB, Punjab, Delhi, Uttar Pradesh and Haryana**. It was highlighted that apart from the phase nomenclature mismatch involving BBMB, only two other locations in Rajasthan (400 kV Ajmer & 400 kV Ratangarh) have been reported.
- 7.2. POWERGRID representative stated that Rajasthan is connected to POWERGRID at around 15 locations and if there is phase nomenclature mismatch at one location then it is bound to happen at other locations also. POWERGRID was of the view that the same may be re-verified to assess the quantum of work and its requirement before moving forward with the action plan.
- 7.3. Most of the OCC members were of the view that the issue is only related to mismatch of phase nomenclature and there is no electrical mismatch of phases. It was also discussed that only post fault analysis of the affected stations can get complicated if the concerned officials are not aware of the nomenclature mismatch or their submitted reports fail to take care of the mismatch issue. In this regard, decision taken in the 142nd OCC meeting was also discussed, wherein BBMB was directed to widely circulate the phase nomenclature mismatch instances to all their interconnected utilities and display the phase nomenclature of BBMB and their corresponding phases in the grid at their Switchyard and Control Room.
- 7.4. However, NRLDC representative was of the view that a committee may be formed

and tasked to assess the quantum of work and formulate the action plan for rectification of the issue as a whole. In this regard, it was mentioned that a committee in the past had submitted its recommendations after visiting the sites; however, the proposed implementation plan was not acceptable to POWERGRID.

7.5. Nevertheless, OCC forum decided that a committee may be constituted under the chairmanship of NRLDC with representatives from NRPC Secretariat, POWERGRID, Rajasthan, BBMB and Himachal Pradesh. Further, it was decided that the committee may submit its findings in the next OCC meeting.

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

Details of the updated status as discussed in the 168th OCC meeting is enclosed at **Annexure-A.IV**.

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

9.1. UP-SLDC representative informed that the mock testing was conducted on 30.01.2020 which brought out the requirement of certain modifications to be done in the scheme. It was also informed that the same has been done and the next mock testing may be carried out on 26.02.2020.

9.2. Regarding the non-inclusion of a condition wherein Anpara-Sarnath line is under shutdown and during that period if Anpara-Unnao line gets tripped, UP representative stated that entire logic had already been vetted by NRLDC and NRPC forum and in case if some logic were left out the same would be taken into account during the modification which would be required due to the commissioning of Anpara-D – Unnao line.

9.3. UP-SLDC was advised to coordinate the mock testing of SPS on 26.02.2020.

10. Automatic Demand Management System

10.1. Punjab SLDC representative informed that budgetary offer of M/s Siemens for the implementation of ADMS Scheme is still under consideration.

10.2. Delhi SLDC representative informed that the execution of ADMS in the NDMC area is delayed and would be completed by 31.03.2020.

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

11.1. NRLDC representative briefed the latest state-wise summary of UFR and df/dt feeder mapping and availability of data (enclosed in the Agenda). All states were advised to ensure displaying the status of healthiness of UFR and df/dt relays so as to ascertain their availability.

12. Transmission Constraints faced by M/s IA Hydro Energy Pvt. Ltd. (agenda based on letter from GM Division, CEA)

12.1. As per the communication dated 04.12.2019 from GM Division, CEA (enclosed as Annexure-A.V of the Agenda), the representative from HP was requested to update the status on reported transmission constraints.

12.2. It was noted from the intimation of HPSEBL (enclosed as Annexure-A.IV of the Agenda) that about 37hrs. planned outage was taken during last week of July

2019 for 132 kV Jassur-Bathri line to shift conductors on tower shifting related works.

12.3. HP representative mentioned that transmission constraint took place mainly due to tower failure during July 2019. However, the same has been rectified and the line is in healthy condition presently and proper operation and maintenance of all the asset are being carried out.

13. Requirement of 01 No. of 220 kV GIS Disconnecter Switch for 231 MW Chamera-III Power Station of NHPC Ltd. on returnable basis (agenda based on Letter from NHPC)

13.1 NHPC representative stated that 231 MW (3 x 77 MW) Chamera-III Power station of NHPC has two outgoing feeders connected to Chamba Pooling Station at Chamba through 220 kV GIS installed by M/s GE T&D Ltd. in July 2012. One of the two feeders is under breakdown due to fault in Disconnecter of Line bay since 14.05.2019. In view of the same, the power is being evacuated through the other available feeder

13.2 OCC expressed concerns on the availability of only one feeder out of two at Chamera-III Power Station of NHPC citing the upcoming hydro peak season and the evacuation of power from the upcoming Holi Bajoli HEP. It was highlighted that if the healthiness of feeders is not ensured financial losses would be incurred due to non-utilisation of hydro power and spillage of water.

13.3 NHPC representative stated that a meeting has been held with Director, DTL wherein DTL has advised for submission of an undertaking while providing the spare Disconnecter. It was informed that DTL has in-principle agreed for providing the spare disconnecter for utilization of NHPC.

13.4 PGCIL was also advised to complete the tower rectification work of the Chamera-III – Chamba lines and charge the same before the Disconnecter switch is replaced at Chamera-III. PGCIL agreed to the same.

14. Provisioning of PMUs on HVDC and FACTS device locations (agenda based on Letter from POSOCO)

POWERGRID representative stated that the letter has been addressed to Director (O), POWERGRID and any internal communication was still awaited from the higher authorities. In view of the above, it was decided that the matter would be taken up in the upcoming TeST Sub-Committee meeting.

15. To restrict DC of coal/lignite based generating stations not giving requisite primary response (agenda by UPSLDC)

In the meeting it was decided that the instances wherein the requisite primary response has not been provided may be tabulated and brought for deliberation in the next Commercial Sub-Committee meeting of NRPC for further deliberations.

16. Approval of Electrical Inspector for replacement works (agenda by UPSLDC)

Considering the difficulties being faced by the STUs and CTU for replacement works, OCC forum advised all STUs to submit their concerns in writing to MS, NRPC for taking it further with the competent authority for necessary amendments in the regulations.

Further, all the STUs and CTU were advised to seek time from Chairperson, CEA and express their concern so as to seek quick redressal of the difficulties being faced.

17. Furnishing bank account details by beneficiary to facilitate payments of net benefits accrued in national Pool Account (SCED) (agenda by NLDC)

Rajasthan stated that separate account has been opened and the details for the same would be submitted by 02.03.2020.

All the other beneficiaries were advised to furnish their bank account details for transfer of net SCED benefits at the earliest.

18. Continuous overloading of 400kV S/C Kota-Anta line since commissioning (agenda by PGCIL)

Rajasthan representative informed that the loading cited in the agenda note does not correspond to the thermal limit of the line, however, augmentation of 315 MVA ICT at Kalisindh to 500 MVA would reduce the prevailing loading on 400 kV Kota-Anta line.

Further, Rajasthan SLDC was advised to propose the load management plan in order to reduce the loading and cause any loss to the line and its terminal equipment.

19. Request for Minimum Unit running in Stage-1 of Dadri-Thermal (agenda by NTPC)

Representative of Delhi agreed in-principle for providing schedule as per the requirement of the Delhi grid tentatively in the first week of April when the demand is forecasted to pick-up.

20. Request for Reserve Shutdown of 1 unit of Unchahar Stage-I (additional agenda by UP)

Representative of UP stated that UP has got a share of 53% in Unchahar Stage-I (2 x 210 MW). In view of UP being the major beneficiary, it was requested to allow them for availing 1 unit under reserve shutdown.

Further, UP clarified that in case 1 unit is put under RSD, UP would not ask for their proportionate share (53%) in the remaining unit of Unchahar Stage-I.

NRLDC representative was of the view that putting the machine under reserve shutdown would reduce the quantum of power available on bar in the grid and

advised UP to maintain adequate spinning reserve in the case of 1 unit under RSD.

OCC allowed UP for taking 1 unit of Unchahar Stage-I under reserve shutdown and advised UP to maintain adequate spinning reserve.

खण्ड-ख: उ.क्षे.भा.प्रे.के.

Part-B: NRLDC

1. Demand and Generation projections of Q1-2020-21 for POC charges calculation:

In line with CERC sharing of ISTS charges and losses regulation 2010 and subsequent amendments thereof, all the DICs have to submit the data for new transmission assets, Yearly transmission charges (YTC), forecast injection and withdrawal and node wise injection/withdrawal data to implementing agency for computation of PoC charges and losses for the application period. The format for data submission is available on NLDC website at <https://posoco.in/transmission-pricing/formats-for-data-submission/>.

NLDC vide its letter dated 06.01.2020 and NRLDC vide their letter dated 10.01.2020 have requested utilities to furnish Technical and commercial data for Apr'20-Jun'20 Q1 (2020-2021). Details have been received only from NTPC, Rampur, Jhakri, Tehri, HP, Delhi & UP. Other utilities are also requested to submit data as early as possible.

Further, generation and load projection has been done by NLDC/RLDCs based on monthly maximum injection/demand met in the last 3 years from actual metered data and accordingly projections have been made. Utilities are requested to kindly check the data and correct anomalies, if any with valid justification.

Utilities were requested check the data and correct anomalies and submit same within 15 days.

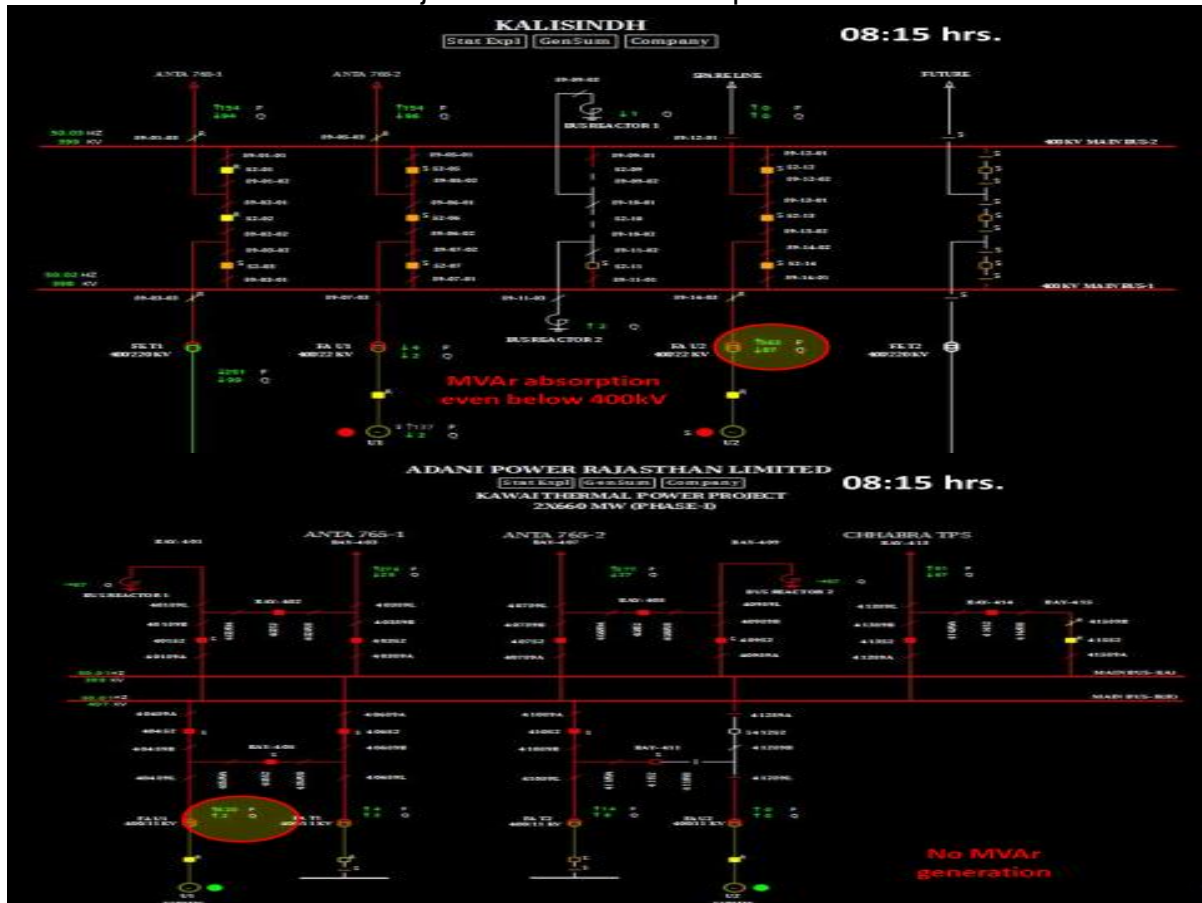
2. Grid Operation related Issues:

a) Low voltages at 400kV Hinduan, Alwar:

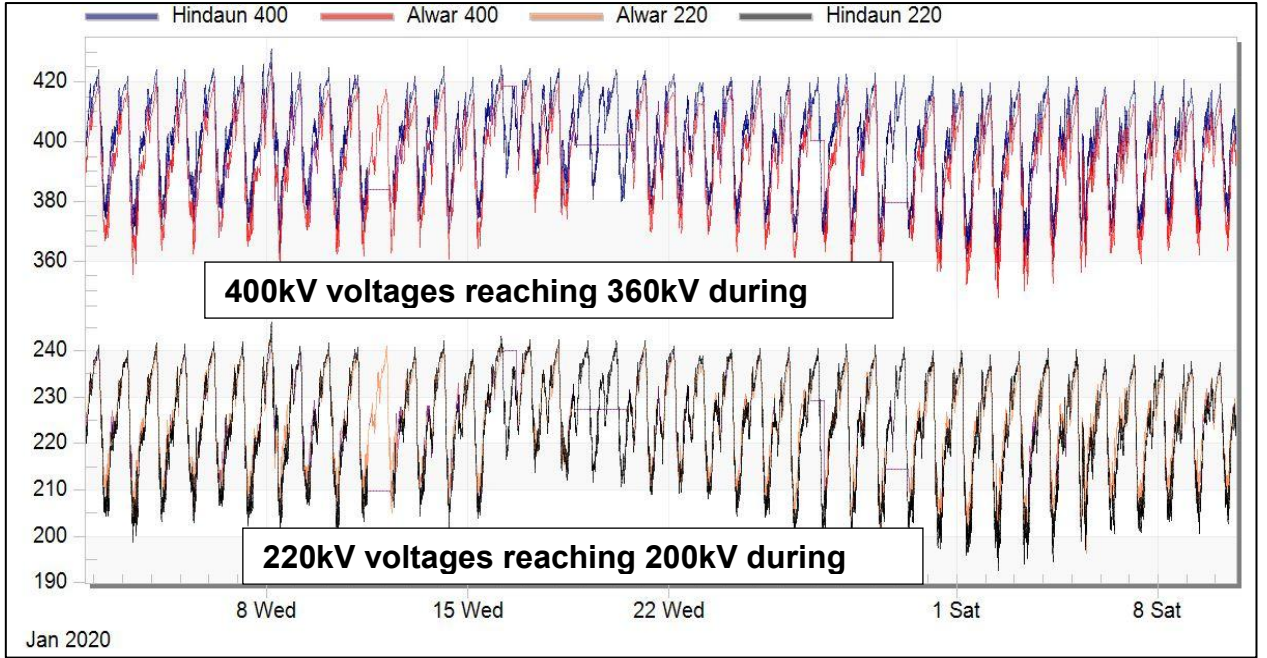
Issue of low voltages observed at Hindaun and Alwar were deliberated at 44th TCC/ 47th NRPC meeting. It was highlighted that voltages at Hindaun and Alwar vary by 50-60 kV in a single day from past few days. Tap positions at these locations were changed on request from Rajasthan SLDC to improve voltage profile at 220kV voltage level. However, as demand of Rajasthan rises from 6000MW at 04:00hrs to 12000MW at 07:00hrs, 400kV voltages at Hindaun and Alwar fall by nearly 50kV even reaching 370kV and 360kV respectively. TCC had deliberated that, although, tap changes were done temporarily at Hindaun and Alwar, this is not long-term solution. There is need to plan for more reactive power support or additional connectivity at Hindaun/Alwar to avoid such situation in future.

From the available plots, it could be seen that tap positions were revised for short duration, however, these were once again changed which again degraded 400kV voltage profile of these stations. It is to be noted that this is high demand period in Rajasthan and such low voltages may lead to voltage stability issues in the area.

SCADA SLDs of morning hours were presented by NRLDC depicting MVAR generation by Kalisindh TPS, Kawai TPS and Chabra TPS. It was evident that the generators are not injecting sufficient MVAR in the Grid as per their capability. Same was discussed and Rajasthan SLDC was requested to take suitable action.



Rajasthan was requested to share their plan to mitigate low voltage issues at these stations and increase MVAR generation from nearby generators.



b) Reactive power performance of generators

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

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

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

Based on available SCADA data, it is observed that there are margins available as per capability curves for most of the generating stations. In addition, telemetry (sign and magnitude of MVAR) of various state generating station is yet to be corrected.

It was agreed in previous OCC meetings that states shall also develop MVAR vs voltage plots for generators under their jurisdiction. This would also help to improve telemetry of MVAR data and eventually, more reliable MVAR vs voltage plots will be available.

In last OCC meeting, Koteshwar (THDC) was asked to share MVAR data from their end and if required reactive power capability testing of Koteshwar may be carried out alongwith site visit planned for dedicated bus coupler bay allocation at Koteshwar. Koteshwar may update.

States were requested to develop MVA_r vs voltage plots for generators under their jurisdiction.

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

Need of power flow and dynamic data for modeling renewable energy generation was discussed in detail in 155th and 157th OCC meeting. It was highlighted that to ensure security of the interconnected power grid, it is imperative to conduct stability studies in both operational (short-term) and planning (long-term) horizons in the power grid. To gain confidence in the stability studies that adequately represent system performance, fit-for-purpose models of power system elements are of utmost importance. Dynamic data of conventional generator are still pending from various agencies.

Utilities were requested to submit dynamic data of conventional generators.

4. Frequent forced outages of transmission elements in the month of Jan'20:

The following transmission elements were frequently under forced outages during the month of **Jan'20**:

S. NO.	Element Name	No. of forced outages	Utility/SLDC
1	400 KV Aligarh-Mainpuri (UP) Ckt-1	8	UP
2	400 KV Baspa(JP)-Karcham Wangtoo(JSW) (HBPCL) Ckt-2	5	JSW/HP
3	400 KV Bawana-Mundka (DV) Ckt-1	5	Delhi
4	400 KV Kishenpur-NewWanpoh (PG) Ckt-3	5	POWERGRID
5	400/220 kV 315 MVA ICT 1 at Makhu(PS)	5	Punjab
6	400 KV Kishenpur-New Wanpoh (PG) Ckt-1	4	POWERGRID
7	400 KV Akal-Jodhpur (RS) Ckt-1	3	Rajasthan
8	400 KV Aligarh-Sikandrabad (UP) Ckt-1	3	UP
9	400 KV Banda-Rewa Road (UP) Ckt-1	3	UP
10	400 KV Bareilly-Unnao (UP) Ckt-2	3	UP
11	400 KV Kishenpur-New Wanpoh (PG) Ckt-4	3	POWERGRID
12	400 KV Merta-Heerapura (RS) Ckt-1	3	Rajasthan
13	400 KV Obra_B-Rewa Road (UP) Ckt-1	3	UP

14	400 KV Suratgarh(RVUN)-Ratangarh(RS) (RS) Ckt-1	3	Rajasthan
15	400 KV Suratgarh(RVUN)-Ratangarh(RS) (RS) Ckt-2	3	Rajasthan
16	765/400 kV 1500 MVA ICT 2 at Phagi(RS)	3	Rajasthan

Frequent outages of such elements affect the reliability and security of the grid. Hence, utilities are requested to look into such frequent outages and share the remedial measures taken/being taken in this respect.

Utilities were requested to analyze the trippings and submit report within 15 days.

5. Multiple element tripping events in Northern region in the month of Jan'20:

A total of **12** grid events occurred in the month of Jan'20 of which **7** are of GD-1 category. The preliminary report of all the events have been issued from NRLDC.

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

Maximum Fault Duration is **2320ms** in the event of multiple element tripping at 400/220 kV Malerkotla (PG) on 28-Jan-20 at 19:27hrs.

Delayed clearance of fault (more than 100ms for 400kV and 160ms for 220kV system) observed in total **6** events out of 12 grid events occurred in the month.

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

Members were requested to take necessary steps to ensure faults are cleared within stipulated time and protection system is kept in healthy condition.

6. Details of tripping of Inter-Regional lines from Northern Region for Jan'20:

A total of **07** inter-regional lines tripping occurred in the month of Jan'20. Out of 07 number of trippings, no tripping incident is related to HVDC system. The status of receipt of preliminary reports, DR/EL within 24hrs of the event and fault clearing time as per PMU data has also been mentioned in the table. The non-receipt of DR/EL & preliminary report within 24hrs of the event is in violation of various regulations. As per regulations, all the utilities shall furnish the DR/EL, flag details & preliminary report to RLDC/RPC within 24hrs of the event. They shall also furnish the detailed investigation report within 7 days of the event if fault clearance time is higher than mandated by CEA (Grid Standard) Regulations.

Members were requested for taking corrective action to avoid such trippings as well as timely submission of the information.

Operational Highlights:

- **Charging of 220 KV Khodari-Majri Ckt-2**
220 KV Khodari-Majri Ckt-2 has been charged on 11.01.2020 the line length is 36 kms.
- **Commissioning of 220 kV Zainkot-Alusteng D/C line**
220KV Zainkot-Alusteng D/C line was commissioned on 15.2.2020. This line will act as a Link for reliable power supply to Ladakh. Now Alusteng-Leh transmission system is connected to rest of the grid through a 220 kV D/C line. Telemetry of the above transmission line is not available.
- **Renewable Energy Curtailment by Rajasthan in January 2020**
Total 15 no of instances for RE curtailment were recorded during the month. Total energy curtailment was to the tune of 31 MUs. Rajasthan was requested to back down thermal power plants in order to prevent RE curtailment.
- NRLDC also requested UPPCL to expedite commissioning of 765 kV Anpara D-Unnao S/C. With the commissioning of 765kV Anpara D- Unnao S/C, it is expected that the loading of following would reduce.
 - 400kV Anpara-Sarnath D/C
 - 400kV Anpara-Obra · 400kV Anpara-Mau
 - 400kV Singrauli-Allahabad D/C
 - 400kV Singrauli-Fatehpur
 - 400/220kV Obra ICTs · 400/220kV Sarnath ICTs(As per CEA report 20 kM stringing pending)
- Commissioning of 765kV Bara-Mainpuri ckt-1:-765kV Bara-Mainpuri ckt 2 has been commissioned and 2nd 765/400kV ICT at Bara & Mainpuri would strengthen the evacuation of Bara TPS (3x660 MW) generation
- NRLDC presented the major highlights of draft IEGC 2020. Copy of the presentation is enclosed.
- HVDC and FACTS devices are important transmission components in Indian power system. As these power electronic devices are known to enhance the stability of the grid, therefore understanding behavior of these devices during perturbations or faults in the power system, is very important besides controller-controller interactions. Apart from local high resolution recording already available at these installations, the high resolution data provided by the Phasor Measurement Units (PM Us) can be very helpful in carrying out the necessary analysis/studies. NRLDC informed that a letter has been sent to Director (o), POWERGRID in this regard. POWERGRID was requested to wire the bays associated with HVDC and FACT devices to PMUs.

Attendance sheet for 168th OCC Meeting, 19th February 2020 at Lucknow

Sr. No.	Name	Designation	Organisation	Contact No.	E-mail
1	Akshay Dubey	AEE(O)	NRPC	9599179744	DUBEY.AKSHAY@GOV.IN
2	Chandraekhar	AEE(O)	NRPC	9502825155	BCSEEE@GMAIL.COM
3	Kaushik Panditbora	AEE(P)	NRPC	9869081939	kaushik.panditbora@gov.in
4	S.P. Gupta	SE EA	UPSLDC	9455094501	secda.upsl
5	Vivek Dikshit	SE(OA)	UPSLDC	9415609753	vivek.dikshit@gmail.com
6	A.K. Singh	CE	UPSLDC	9415006223	cecs.slde@bimale
7	B.S. Tripathi	CE (T.E.)	UPPTCL	9415099028	cebc@upptcl.org
8	S.K. Bhattacharya	CE	UPPTCL	8004944660	cecmut@upptcl.org
9	Sangeeta Saxena	SE	UPPTCL	9415099026	director_op@upptcl.org
10	J. Sen Sarma	GM	NTPC	9425234042	jaysantansarma@ntpc.co.in
11	Y.P.S. BAAITH	C.E. SLDC	PSTCL	9646118001	ce-slde@pstcl.org
12	AKSHAY GARG	ASE	PSTCL	9696118017	ase-slde@pstcl.org
13	NITISH DANDAL	AEE	PSTCL	9696155394	— do — org
14	IBRAL SINGH	ASE	PSPCL	9696122263	sepr@pspc@gnid
15	N.D.K. MAICKAR	EE	SLDC HUPA	9466219042	sldehayanar@gmail.com
16	S.K. Sinha	DGM(T)	SLDC Delhi	9899533673	sinha.surendra123@gmail.com
17	नवीन कुमार	सं.प्र. (त)	रा. म. य. के. बि. मी. सी. टी. एम.	9899533223	dtldata@gmail.com
18	S.D. Sharma	EE	PTCL	7088117001	ee2-slde@ptcl.org
19	DB Yadav	SE	UPJVNL	7408429592	mail4db@yadav@gmail.com
20	Shailendra Pratap	SE	UPJVNL	7408429625	se@ge@ptcl@gmail.com
21	ABHIMANYU UPADHYAY	DGM-EMD	LPCL	7408418182	ABHIMANYU.LTP@LPCL.COM
22	D. K. Singh	Sr VP	LPCL	7081007908	dk.singh.LTP@LPCL.COM
23	Dileep Tripathi	Asst Manager	GVIC AHPCL	79975242077	dileep.tripathi@gvic.com
24	Bishuambara Bag	Dy. Manager	GNK, AHPCL	9759700592	bishuambara.bag@gvic.com
25	Himadri S. Bhakta	Asst (ops)	APCL Bara	9204853168	himadri.bhakta@tatapower.com
26	Sanjay Bhargava	Head (REC)	APCL Bara	9212139731	sanjay.bhargava@tatapower.com
27	Ram sharan singh	EE (RPA)	UPSLDC	8004921990	secoutage@upslde.org
28	Brijesh Kr. Singh	EE (TD)	UPRVUNL	9415901993	cg.m.to@uprvunl.org
29	Pankaj Saxena	EE (STU)	UPPTCL	9415902780	smart.saxena@gmail.com
30	Zahir Ahmad	SE	UPSLDC	9415609365	sera@upslde.org

Attendance sheet for 168th OCC Meeting, 19th February 2020 at Lucknow

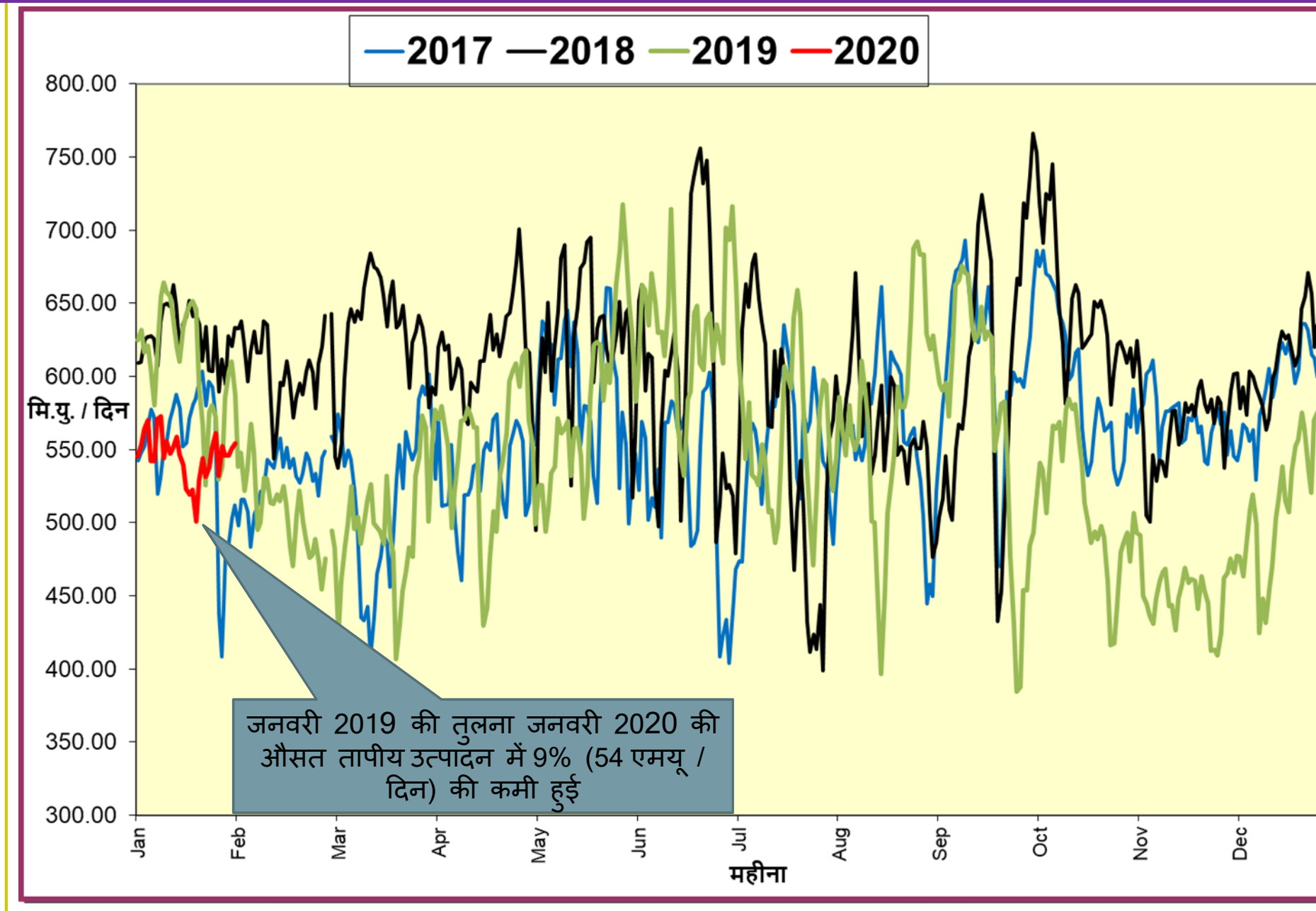
Sr. No.	Name	Designation	Organisation	Contact No.	E-mail
31	Anuj Kumar	Assistant Eng.	UPSLDC	8005402892	anujkumar389@gmail.com
32	Mithilesh Kr Gupta	EE	UPSLDC	9415232479	emnis@upslde.com
33	Amit Hooda	Manager - EEMG Cannor	APCL, Jhajjar	9416212595	amit.hooda01@gmail.com
34	Sanjey Jaiswal	AE, SLDC UKO	SLDC UKO	9891738624	radhey09071990@gmail.com
35	Rajeev Kr Pandey	DGM (EM)	MUNPL	9650994412	rajeev.pandey@npsc.co.in
36	Vinod Kr Jain	Asst M (Comm)	MUNPL	9650991726	vinod.jain@npsc.co.in
37	Chandan Barmajee	DGM (ELM)	RPSCL	9305421857	Chandan.A.Barmajee@kiliatada.com
38	Chamehal Kumar	DGM (Operation)	RPSCL	9305421865	chamehal.k.kumar@kiliatada.com
39	MANOJ TAUNK	GM	Adani Power Ltd	9899005517	manoj.taunk@adani.com
40	SATYENDRA PRAKASH	AGM (IT)	IPGCL-PPCL	9717694813	satyendrap@ipgcl-ppcl.nic.in
41	ANIL KUMAR GARG	General Manager	ADHPL	9910796444	anilgarg@anjbhil-wara.com
42	Ganesh Mishra	Manager (OBM)	THDC (Ratnagiri)	8126821766	gpmishra14@gmail.com
43	आशीष दुबरा	Asst M (adm)	THDC (Tehri)	8979889888	ashishdubra1.gbpc@gmail.com
44	Rajeev Agarwal	DGM	SJVN	9418045426	rajeev_sjvn@rediffmail.com
45	Amandeep Singh	Asst SE/PC	BBMB	9478200223	powerc@bbmb.nic.in
46	R.K. Sharma	DIR/PR	BBMB	9417216047	dirpr@bbmb.nic.in
47	S K GOYAL	SO/G	NAPS, NPEIL	9412768103	skgoyal@npeil.co.in
48	Vijay Kumar	Sr. Manager (OBM)	NHPC	9818696821	Vijay.Kumar239@gmail.com
49	Susindeo Kumar	Assistant Engineer	HPSLDC	9418888436	Susinda1198@gmail.com
50	Kamal Patidar	XEN (SOLD)	SLDC, Rajasthan	9413382632	se.edsvpk@rupn.co.in
51	A.K. Arora	SE (SOLD)	SLDC, Rajasthan	9414061066	se.edsvpnl@rupn.co.in
52	S.C. Sharma	Sr DGM	POWERGRID	9823918526	sc_sharma@powergridindia.com
53	M-S. Hada	DGM	- - -	9650553992	
54	BIMAL KUMAR	ST DGM	Powergrid, NR3	6393542588	bimalkumar@powergridindia.com
55	K.N. Singh	CGM	Powergrid	9435730548	kn.singh@powergridindia.com
56	Sanjey Sabara	SE, PMC	UPPCL	9415099212	sanjey@uppcl.co.in
57	Alok Mehrotra	EE, PMC	UPPCL	9415099257	cepmmcuppcl@gmail.com
58	Shashank Tyagi	CM	NRDC	9599441243	shashank@nrdc.co.in
59	KAMALDEEP	CM	NRDC	9971700422	kamaldeep@nrdc.co.in
60	MM HASSAN	GM	UPSLDC	9910952915	mmhassan@upslde.com



Attendance sheet for 168th OCC Meeting, 19th February 2020 at Lucknow

Sr. No.	Name	Designation	Organisation	Contact No.	E-mail
61	Alok Kumar	Sr DGM	NRDC	9999039321	alok.kumar@psrco.in
62	M.S. Aasari	E.E	UPPEL	945097374	ceprupped@psrco.in
63	S.C. Gaurav	EE	UPSLDC	9418609362	swrsgaurav@psrco.in
64	S.K. Dubey	AGM. OS	NTPC. UKO	9415803138	skdubey02@npsc.co.in
65					skdubey02@npsc.co.in
66					npsc.co.in
67	R.K. Singh	Sr. Mgr (OS)	NTPC LKO	9450963079	ramkesh@npsc.co.in
68	Pradeep Kumar	A.E	powergrid	9971114822	pradeepkumar@powergrid.co.in
69	Praveen Kumar	DGM	POWERGRID, NRZ	9906546606	mr.praveenkumar@powergridindia.com
70	Sunil Kumar Maurya	AE	UPSLDC	9794301969	eeactag@upslcd.org
71	Ritesh Kr. Gupta	AE	UPSLDC	9919635545	ritesh3793@gmail.com
72	Avinash Singh	AE	UPSLDC	8004915548	system.uppd@psrco.in
73	Dharmendra Kumar	AE	UPSLDC	8004915531	dharmendra26@psrco.in
74	Sateesh Maurya	AE	UPSLDC	9452000258	Sateeshmr11@gmail.com
75	Mohsin Khan	AE	UPSLDC	8004949277	sera@upslcd.org
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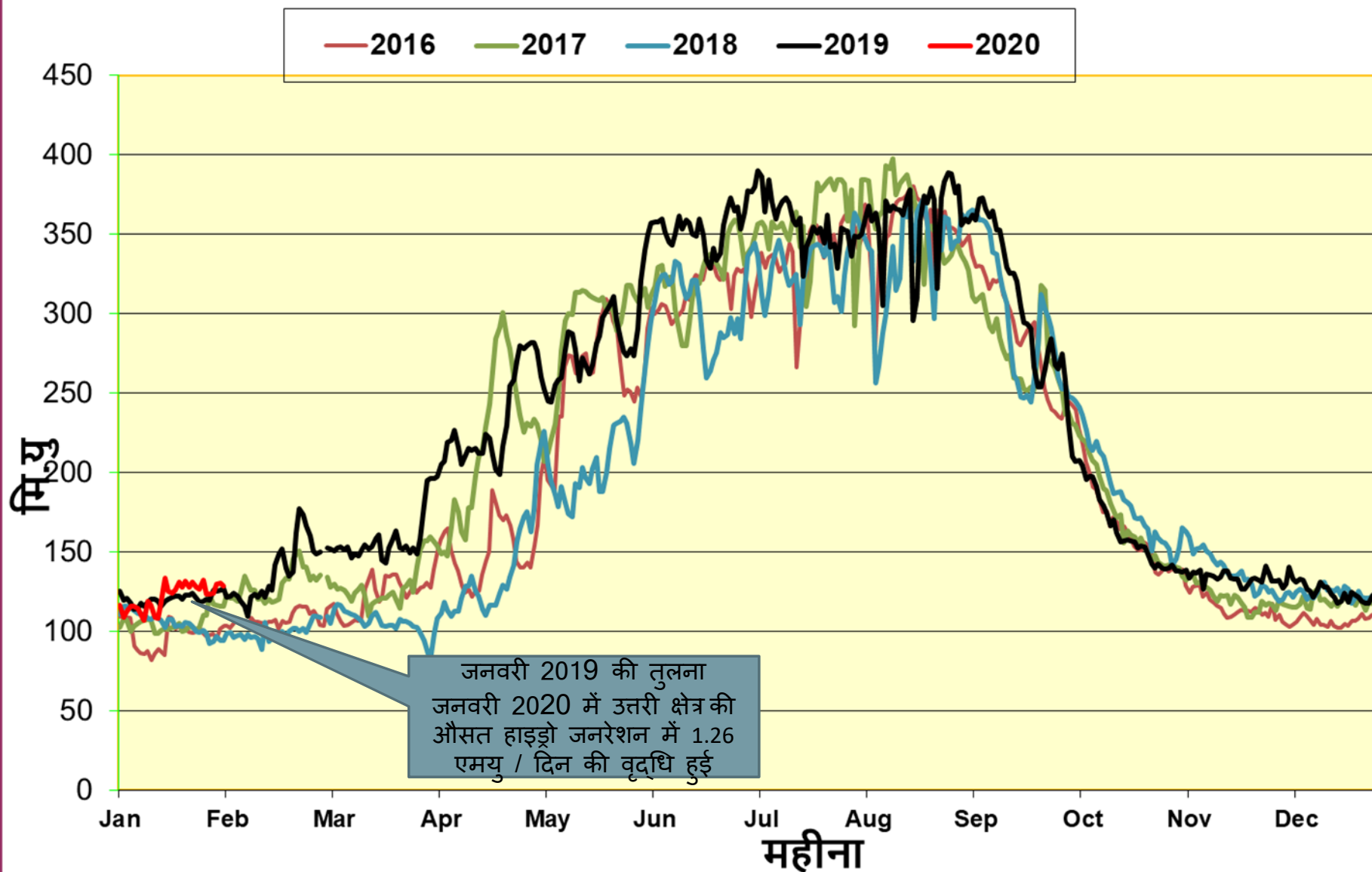
उत्तरी क्षेत्र की तापीय (Thermal) उत्पादन की स्थिति (MUs)



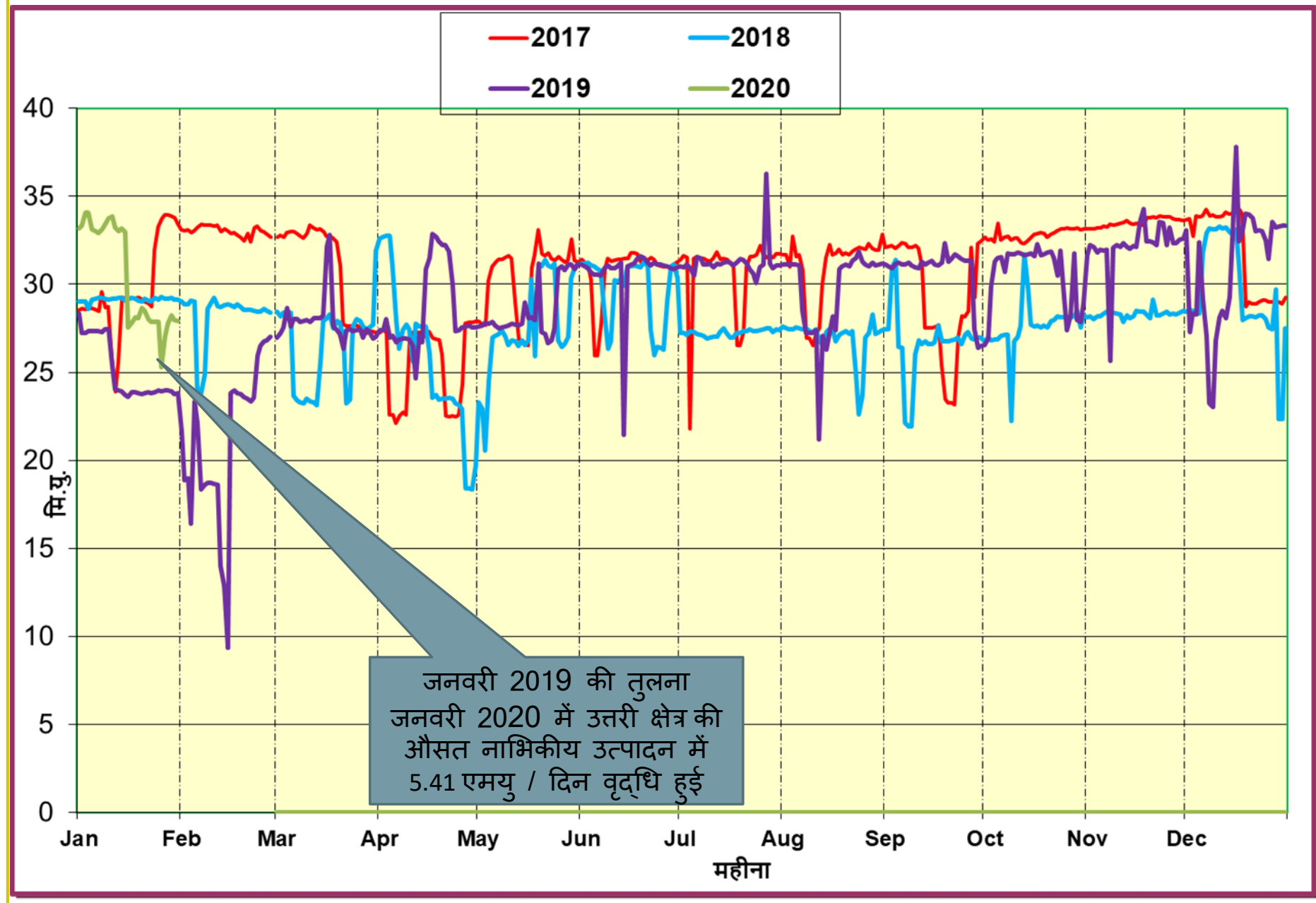
उत्तरी क्षेत्र की जलीय (हाइड्रो) उत्पादन की स्थिति (MUs)



Northern Regional Total Hydro Generation



उत्तरी क्षेत्र की नाभिकीय उत्पादन की स्थिति (MUs)



Haryana Missing Data

- **66/11 kV Configuration:**

- a) Type of the conductor for the 66kV line at 120029 is not clear.
- b) 66kV line lengths are found missing for the buses:
120028,120033,120030, 120034,120001 & 120029.

- **132/11 kV Configuration:**

- a) Active power values at 132kV bus are missing for the following buses:
121022,121024,121042,121196,121142,121143,121144 & 121138.
- b) Reactive power value at 132kV bus is missing for the bus 121203.

- **132/33/11 kV Configuration:**

- a) Check the active and reactive power values which are directly connected at 33kV bus of 121145.
- b) Reactive power value at 132kV bus is missing for the bus 121019.
- c) One downstream data given for the bus 121023 in 132/33/11kV configuration is not clear.
- d) Active power values at 33kV bus are missing for the following buses:
121080,121081,121082,121083,121084,121086,121096,121122,121013,
121014,121018,121098,121099,121100,121101,121113,121139,121141,
121142,121144,121146 & 121147.
- e) Reactive power values at 33kV bus are missing for the following buses:
121105,121232 & 121150.
- f) Reactive power values at 11kV bus are missing for the following buses:
121061,121036,121228,121130,121232,121233,121106,121127,121128,
121131,121215,121102,121201,121157,121137,121136,121135,121133,
121132,121129,121126,121105 & 121103.
- g) Type of the conductor and length of 33kV line are found missing for the following buses:
121103,121105,121126,121129,121132,121157,121102,121215,121131,
121128,121127,121106,121233,121232,121130,121228,121006,121054,
121055,121056,121057,121066,121069,121072,121075,121148,121206,
121058,121043,121044,121161 & 121213.

Follow up issues from previous OCC meetings

Sl. No.	Agenda point	Details	Status / Decision
1.	Sub-stations likely to be commissioned in next six months.	All the concerned states were requested to submit the details of the downstream network associated specially with POWERGRID substations along with the action plan of their proposed / approved networks.	Present members confirmed the status details of downstream networks mentioned in Annexure-A.III.I of the Agenda.
2.	Progress of installing new capacitors and repair of defective capacitors	Information regarding installation of new capacitors and repair of defective capacitors is to be submitted to NRPC Secretariat.	Information received from Rajasthan, Uttar Pradesh and Uttarakhand up to January 2020. Haryana up to November 2019 Delhi, HP and Chandigarh (up to Sep'2019). All states were requested to furnish updated status monthly.
3.	Healthiness of defence mechanism: Self- certification	Report of mock exercise for healthiness of UFRs carried out by utilities themselves on quarterly basis is to be submitted to NRPC Secretariat and NRLDC. All utilities were advised to certify specifically, in the report that " <i>All the UFRs are checked and found functional</i> ".	Report for the period ending Dec'2019 received from Rajasthan, UP and Punjab . BBMB have submitted information up to Nov'2019 . Delhi, Haryana and HP have submitted information up to Sep'2019 . All states were requested to submit details of feeder-wise expected load relief through UFR and df/dt relays in the format enclosed at Annexure-A.2.3 of agenda of 165 th OCC. Team of officers from NRPC, NRLDC, HVPNL & Haryana SLDC conducted UFR testing at Karnal substation of Haryana on 07.02.2020 (Report enclosed at Annexure-A.IV.I).
4.	Recommendations of Enquiry Committee on grid disturbances on 30 & 31.7.2012	Based on the recommendations of the Enquiry Committee on grid disturbances on 30 th & 31 st July 2012, utilities of NR were requested to take necessary	Updated status awaited from Chandigarh and J&K.

Sl. No.	Agenda point	Details	Status / Decision
		action and submit compliance/status report to NRPC.	
5.	Status of FGD installation vis-à-vis installation plan at identified TPS	List of FGDs to be installed in NR was finalized in the 36 th TCC (special) meeting dt. 14.09.2017. All SLDCs were regularly requested since 144 th OCC meeting to take up with the concerned generators where FGD was required to be installed. Further, progress of FGD installation work on monthly basis is monitored in OCC meetings.	Updated status in the month of February 2020 has been received from Punjab and UP . All states/utilities are requested to update status on monthly basis.

6. Reactive compensation at 220 kV/ 400 kV level

Sl. No.	Owner	Substation	Reactor	Updated Status
1.	POWERGRID	Kurukshetra	500 MVar TCR	Anticipated commissioning: Jan-Mar'2021
2	DTL	Peeragarhi	1x50 MVar at 220 kV	Likely tender opening date: 20.02.2020
		Harsh Vihar	2x50 MVar at 220 kV	
		Mundka	1x125 MVar at 400 kV	Likely tender opening date: 04.03.2020
			1x25 MVar at 220 kV	
		Electric Lane	1x50 MVar at 220 kV	BOD approval pending
		Bamnauli	2x25 MVar at 220 kV	Likely tender opening date: 04.03.2020
3.	Punjab	Dhuri	1x125 MVar at 400 kV	Corrigendum to the NIT has been placed and the same is likely to open on 05.03.2020
			1x25 MVar at 220 kV	
		Nakodar	1x25 MVar at 220 kV	
4.	PTCUL	Kashipur	1x125 MVar at 400 kV	PTCUL advised to submit the proposal for PSDF funding.
5.	Rajasthan	Akal	1x25 MVar	PSDF funding sanctioned. Under tendering
		Bikaner	1x25 MVar	
		Suratgarh	1x25 MVar	
		Barmer	1x25 MVar	Response awaited from TESSG of PSDF.
		Jodhpur	1x125 MVar	

Joint inspection report of UFR

- | | |
|--|--|
| 1. Sub-Station:- | 220 KV S/Stn. Karnal |
| 2. Utility:- | Haryana Vidyut Prasaran Nigam Ltd. |
| 3. State:- | Haryana |
| 4. Make & Model of UFR:- | SIEMENS - TST66 (SIPROTEC) |
| 5. Type pf UFR:- | Numerical |
| 6. Frequency setting (Hz):- | 49.0 Hz |
| 7. Name (s) of Feeder(s) connected to UFR:- | 132KV Incomer T-4, 50 MVA T/F |
| 8. Loading on above mentioned feeders:- | 15 MW |
| 9. Weather UFR operated?: Yes/No | Yes |
| 10. Any other relevant observation:- | NA |
| 11. Whether separate register is maintained for recording UFRs/RLSS? If yes, mention date, name of the feeder and load relief of last operation. | Yes
17.12.2019
132 KV Incomer T-4, 50 MVA
12 MW |

Atish
07/02/2020
A/P K. Yadav
AM, NRDC

P. Chand Prakash
07/02/2020
P. Chand Prakash
DM, NRDC

Kaushik Panliban
07/02/2020
Kaushik Panliban
AD, NRDC

7/2/2020
XEN T/S HVPC
Karnal

7/2/2020
XEN MSP
HUPN Karnal.

7/02/2020
XEN DEXC
SIDC, Karnal
Caul et
Karnal.

Joint inspection report of df/dt

- | | |
|---|---|
| 1. Sub-Station:- | 132 KV S/Stn. Karnal |
| 2. Utility:- | Haryana Vidyut Prasaran Nigam Ltd. |
| 3. State:- | Haryana |
| 4. Make & Model of df/dt:- | CSC-211 |
| 5. Type pf df/dt:- | Numerical |
| 6. Frequency setting (Hz):- | 49.9 Hz & 0.2 Hz/Sec (120 msec delay) |
| 7. Name (s) of Feeder(s) connected to df/dt:- | 132KV Ramba Line |
| 8. Loading on above mentioned feeders:- | 18 MW |
| 9. Weather df/dt operated?: Yes/No | Yes |
| 10. Any other relevant observation:- | NA |
| 11. Whether separate register is maintained for recording df/dts /RLSS? If yes, mention date, name of the feeder and load relief of last operation. | Yes
17.12.2019
132 KV Ramba line
11 MW |

Kaushik Pandit
07/02/2020
Kaushik Pandit
AD, NRPL.

Ajit
07/02/2020
AJIT KUMAR YADAV
AM, NRLDC

P. Saravana Prakash
07/02/2020
PSARAVANA
PRAKASH.
DM, NRLDC

Xen
XEN MDP
SLDC, Pawla
Camp at
Karnal

Xen
7/2/2020
XEN MDP
KARNAL

Xen
7/2/2020
XEN MDP
KARNAL

Joint inspection report of UFR

- | | |
|--|--|
| 1. Sub-Station:- | 132 KV S/Stn. Karnal |
| 2. Utility:- | Haryana Vidyut Prasaran Nigam Ltd. |
| 3. State:- | Haryana |
| 4. Make & Model of UFR:- | CSC-211 Sifang |
| 5. Type pf UFR:- | Numerical |
| 6. Frequency setting (Hz):- | 48.6 Hz |
| 7. Name (s) of Feeder(s) connected to UFR:- | 132/33KV, 40/50 MVA, T/F T-2 |
| 8. Loading on above mentioned feeders:- | 17 MW |
| 9. Weather UFR operated?: Yes/No | Yes |
| 10. Any other relevant observation:- | NA |
| 11. Whether separate register is maintained for recording UFRs/RLSS? If yes, mention date, name of the feeder and load relief of last operation. | Yes
17.12.2019
132/33KV, 40/50MVA T/F T-2
13 MW |

Kaushtik Pandit
07/02/2020.
Kaushtik Pandit
AD, NRPL.

P. Saravana Prakash
07/02/2020
P. SARAVANA PRAKASH
DM, NRPLDC

XGN
07/02/2020
XGN (US & R)
SIDC,
Camp at
Karnal.

XGN
7/2/2020
XGN T/S, HYPNL
Karnal

XGN
7/2/2020
XGN MDP
HVPN Karnal.

AM
07/02/2020
Ajit kr Yadav
AM, NRPLDC

Draft Indian Electricity Grid Code

(Recommendations of Expert Group)



Power System Operation Corporation Limited

Indian Electricity Grid Code – Progress so far

CENTRAL ELECTRICITY REGULATORY COMMISSION
NOTIFICATION
No. L188(4)/2006-CERC New Delhi, the 14th March, 2006

In exercise of powers conferred by section 17B of the Electricity Act, 2003 (26 of 2003), and of all other powers enabling it in this behalf, and after previous publication, the Central Electricity Regulatory Commission hereby specifies the Grid Code to be known as the Indian Electricity Grid Code, which shall come into force on and from 1.4.2006:-

CHAPTER I
GENERAL

1.1 Introduction
The Indian Power System is a conglomeration of a number of agencies. The Indian Electricity Grid Code (IEGC) lays down the rules, guidelines and standards to be followed by the various agencies and participants in the system to plan, develop, maintain and operate the power system, in the most efficient, reliable, economic and secure manner, while facilitating healthy competition in the generation and supply of electricity.

1.2 Objective
2002: POWERGRID drafted grid code, approved by commission

1.3 Scope
All parties that connect with and/or utilize the IEGC are required to abide by the provisions and procedures contained in the IEGC, so far as they apply to their part.

CENTRAL ELECTRICITY REGULATORY COMMISSION
NOTIFICATION
No. L188(4)/2006-CERC New Delhi, the 14th March, 2006

In exercise of powers conferred by section 17B of the Electricity Act, 2003 (26 of 2003), and of all other powers enabling it in this behalf, and after previous publication, the Central Electricity Regulatory Commission hereby specifies the Grid Code to be known as the Indian Electricity Grid Code, which shall come into force on and from 1.4.2006:-

CHAPTER I
GENERAL

1.1 Introduction
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1.2 Objective
14-03-2006: IEGC Regulations, 2006 notified (effective from 01-04-2006)

2010, September, 2010

भारत का राजपत्र
The Gazette of India

EXTRAORDINARY
PART III-SECTION 4
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

No.118
NEW DELHI, WEDNESDAY, APRIL 28, 2010

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

F.No. L184(2010)-CERC Dated: 28th April, 2010

28-04-2010: CERC (IEGC) Regulations, 2010 gazetted (effective from 03-05-2010)

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI
No. L-118(2010)-CERC New Delhi, 0⁶ March, 2012

NOTIFICATION

In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 17B of the Electricity Act, 2003 (26 of 2003), and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010, hereinafter referred to as "the Principal Regulations":

1. Short title, extent and commencement
(1) These Regulations may be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (First Amendment) Regulations, 2012.
(2) The
(3) These Regulations shall come into force with effect from 02-04-2012.

05-03-2012: CERC (IEGC, 1st Amendment) Regulations, 2012 notified
06-03-2012: CERC (IEGC, 1st Amendment) Regulations, 2012 gazetted (effective from 02-04-2012)

Followed by:
Corrigendum dated 03-07-2010
Addendum dated 03-07-2010

Amended in 2002

Undergone several amendments till 2009

Substituted the IEGC Regulations 2006

01st Amendment of IEGC by CERC

Draft grid code prepared by POWERGRID in year 1999, approved by CERC in Dec 1999. The Grid code was renotified on 14th March 2006 and again on 28th April 2010

05th Amendment of IEGC by CERC

04th Amendment of IEGC by CERC

03rd Amendment of IEGC by CERC

02nd Amendment of IEGC by CERC

CENTRAL ELECTRICITY REGULATORY COMMISSION
NOTIFICATION
No. L118(2010)-CERC In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 17B of the Electricity Act, 2003 (26 of 2003), and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 including the first amendment thereof (hereinafter referred to as "the Principal Regulations"):

1. Short title and commencement
(1) These Regulations may be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Second Amendment) Regulations, 2014.
(2) These Regulations shall come into force with effect from 17.2.2014.

2. Amendment in Regulation 2 of Principal Regulations. Following new clauses shall be added after clause (gggg) of sub-Regulation (1) of Regulation 2 of Principal Regulations as under, namely:-
(hhhh) Deviation Settlement Mechanism Regulations means Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) Regulations, 2014 including any subsequent amendments thereof.
(ii) Pricing Station means the substation where pairing of generation of individual wind generators or solar generators is done for interfacing with the next higher voltage level.
Provided that where there is no pairing station for a wind or solar generator and the generating station is connected through common feeder and terminated at a sub-station of distribution company/STU/CTU, the sub-

06-01-2014: CERC (IEGC, 2nd Amendment) Regulations, 2014 notified
07-01-2014: CERC (IEGC, 2nd Amendment) Regulations, 2014 gazetted (effective from 17-12-2014)

Followed by:
Corrigendum dated 21-02-2014

Central Electricity Regulatory Commission
New Delhi
Notification
Date: 12th April, 2017

No. L118(2010)-CERC - In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 17B of the Electricity Act, 2003 (26 of 2003), and of all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 including the first to fourth amendments thereof (hereinafter referred to as "the Principal Regulations"):

1. Short title and commencement
(1) These regulations shall be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fifth Amendment) Regulations, 2017.

2. These regulations shall come into force with effect from 1st May, 2017.

2. Amendment in Regulation 2 in General Part of Principal Regulations
(1) In Regulation 2(i)(ii) of General Part of Principal Regulations, the definition of "Sporning Reserves" shall be substituted as under:
(a) Spinning Reserve means: The Capacitors which are provided by devices including generating station or units thereof synchronized to the grid and which can be activated on the direction of the System Operator and affect the change in active power".

(2) Regulation 2(i) of General Part of Principal Regulations shall be substituted as under:-
"Words and expressions used in these regulations and not defined herein but defined in the Act or other relevant Regulations, or of

12-04-2017: CERC (IEGC, 5th Amendment) Regulations, 2017 notified
19-04-2017: CERC (IEGC, 5th Amendment) Regulations, 2017 gazetted (effective from 01-05-2017)

Followed by:
Corrigendum dated 03-05-2017

05-Mar-20

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI
NOTIFICATION
No. L118(2010)-CERC In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 17B of the Electricity Act, 2003 (26 of 2003), and of all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 including the first to fourth amendments thereof (hereinafter referred to as "the Principal Regulations"):

1. Short title and commencement
(1) These Regulations may be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Fourth Amendment) Regulations, 2016.

(2) These Regulations shall come into force with effect from date of gazetted notification except Sub-Regulation 6.3B which shall come into force on the date as the Commission may appoint by notification in the Official Gazette.

2. Amendment in Regulation 2 of Principal Regulations. Following new clauses shall be added after clause (ii) of Regulation 2 of Principal Regulations as under, namely:-
(iii) Date of Commercial Operation of "COG" shall have the same meaning as provided in Sub-Regulation 6.3A, 6.3C, 6.3D and 6.3E of these Regulations.
(iiii) Trial Operator or Trial Run shall have the same meaning as provided in Sub-Regulation 6.3A, 6.3B, 6.3C, 6.3D and 6.3E of these Regulations.
(v) Technical Minimum Schedule in respect of Central Generating Stations and Inter-State Generating Stations shall have the same meaning as provided in Sub-Regulation 6.3 of these Regulations.

3. Amendment in Regulation 6.1 of the Principal Regulations. Following clause shall be added after clause (ii) of Principal Regulations:
(iii) Procedure for declaration of commercial operation of Central Generating Stations, Inter-State Generating Stations and Inter-State Transmission Stations shall have the same meaning as provided in Sub-Regulation 6.3 of these Regulations.

4. Amendment in Regulation 6.2 of the Principal Regulations. Following clause shall be added at the end of first para of Regulation 6.2 of the Principal Regulations:

06-04-2016: CERC (IEGC, 4th Amendment) Regulations, 2016 notified
29-04-2016: CERC (IEGC, 4th Amendment) Regulations, 2016 gazetted (effective from 29-04-2016)

Central Electricity Regulatory Commission
New Delhi, the 0⁸ August, 2015

No. L174(2015)-Reg.A/FF/EDSS(S)/CERC - In exercise of powers conferred under clause (h) of sub-section (1) of Section 79 read with clause (g) of sub-section (2) of Section 17B of the Electricity Act, 2003 (26 of 2003), and of all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 including the first to fourth amendments thereof (hereinafter referred to as "the Principal Regulations"), namely:-

1. Short title and commencement. - (1) These regulations shall be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Third Amendment) Regulations, 2015.
(2) These regulations shall come into force with effect from 1st No 2015.

2. Amendment of Regulation 1 of Part 1 of Principal Regulations. Regulation (c) under Regulation 1.4 of the Principal Regulations, substituted as under:-
"Part 6: Scheduling and Dispatch Code: This section deals with the procedure to be adopted for scheduling and dispatch of generation of the inter-State Generating Stations (IGS) and scheduling of other transactions through long-run across, real-time and short-term open access including complementary commercial transactions, on a day-ahead and intra-day basis with the process of the flow of information between the DSO, National Load Dispatch Centre (NLDC), Regional Load Dispatch Centre (RLDC), Power Exchanges and the State Load Dispatch Centre (SLDC), and other concerned persons.
Most of the wind and solar energy generations are presently connected to inter-state network and in future are likely to be connected to the inter-state transmission system (ISTS) as well. Keeping in view the variable nature of generation from such sources and the effect of India's diverse on renewable energy sources, scheduling of wind and solar generators which are regional nature, has been incorporated in this code."

3. Amendment of Regulation 2 (Definitions) of Principal Regulations:
(i) Sub-Regulation (ee) of Regulation 2 of the Principal Regulations, shall be substituted as under:-

07-08-2015: CERC (IEGC, 3rd Amendment) Regulations, 2015 notified
10-08-2015: CERC (IEGC, 3rd Amendment) Regulations, 2015 gazetted (effective from 01-05-2015)

Indian Electricity Grid Code – *CERC empowered by EA 2003*

Section 178. (Powers of Central Commission to make regulations): --- (1) The Central Commission may, by notification make regulations consistent with this Act and the rules generally to carry out the provisions of this Act.

(2) In particular and without prejudice to the generality of the power contained in sub-section (1), such regulations may provide for all or any of following matters, namely:-

(g) Grid Code under sub-section (2) of section 28;

Section 79. (Functions of Central Commission): --- (1) The Central Commission shall discharge the following functions, namely:-

(h) to specify Grid Code having regard to Grid Standards;

EA 2003: Section 178, Sub-section 2, Clause (g)

EA 2003: Section 79, Sub-section 1, Clause (h)

Provisions under Electricity Act 2003 to empower CERC for issuing Grid Code

Indian Electricity Grid Code (IEGC) and subsequent amendments being issued by CERC from time-to-time

05-Mar-20

CERC (IEGC), 2010 Regulations

CERC (IEGC xx Amendments), 20xx Regulations

w Delhi 5th March, 2012

h) of sub-section (1) of section 79 read with clause (g) or sub-section (2) of section 178 of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, the Central Electricity Regulatory Commission hereby makes the following regulations to amend the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010, hereinafter referred to as "the Principal Regulations".

1. **Short title, extent and commencement**
(1) These Regulations may be called the Central Electricity Regulatory Commission (Indian Electricity Grid Code) (First Amendment) Regulations, 2012.
(2) These Regulations shall come into force with effect from 2nd of April 2012.
2. **Amendment in Regulation 2.3.2 of Principal Regulations:**
In sub-regulation (d) of Regulation 2.3.2 of Principal Regulations, the words "Metering and data collection" shall be substituted by the words "Meter data processing".
3. **Amendment in Regulation 2.5.1 of Principal Regulations:**
The sub-regulation (2) of Regulation 2.5.1 of Principal Regulations shall stand deleted.
4. **Amendment in Regulation 3.4 of Principal Regulations:**
The last sentence of the sub-regulation (c) of Regulation 3.4 of Principal Regulations shall be substituted as under:
"In case of associated transmission system where all PPAs have not been signed, and where agreement could not be reached in respect of system strengthening schemes, the CTU may approach the Commission for the regulatory approval in accordance with Central Electricity Regulatory Commission (Grant of Regulatory Approval for execution of Inter-State Transmission Scheme to Central Transmission Utility) Regulations, 2010."

POSOCO

Indian Electricity Grid Code – Objective



IEGC



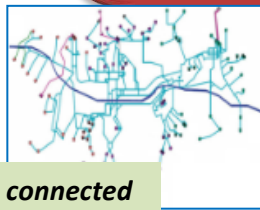
Technical Rules



Commercial Mechanism

Facilitates

Applicable to all entities connected or using ISTS

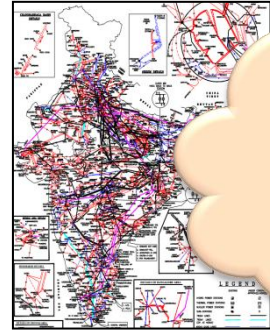


Entities connected to ISTS (or using it)



Documentation of principles and procedures to define relationship between –

- Users of ISTS
- NLDC
- RLDCs
- SLDCs



Facilitation of various aspects of grid –

- Optimal operation
- Coordinated and optimal maintenance planning of gen./trans. facilities
- Development/Planning of economic and reliable grid



Facilitation of various functionalities -

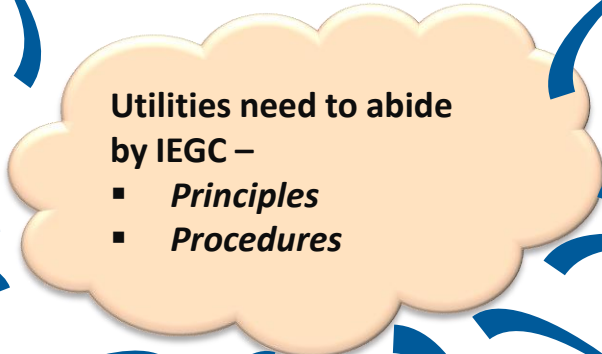
- Power Markets
- Ancillary Services



Facilitation of RE sources by specifying following for integration in grid -

- Technical aspects
- Commercial aspects

Indian Electricity Grid Code – *Scope*



Interconnection with Neighbouring Countries (treated as separate control area)



Sardar Sarovar Project



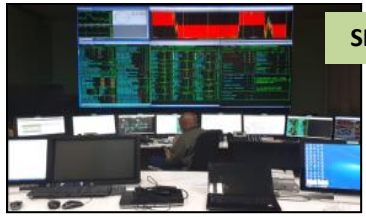
Bhakra Beas Management Board



Damodar Valley Corporation



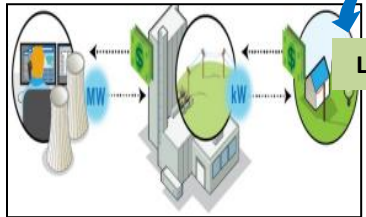
SLDCs



NLDC/ RLDCs



Licensees



CEA/ Regional Power Committees



Power Exchanges

Indian Electricity Grid Code 2010 – *Structure*

Part 2: Role of Various Organizations and their linkages

Part 4: Connection Code

Part 6: Scheduling and Despatch Code

Part 7: Miscellaneous

Part 3: Planning Code for Inter-State Transmission

Part 5: Operating Code

Operating Philosophy

System Security Aspects

Demand Estimation for Operational purposes

Demand Management

Periodic Reports

Operational Liaison

Outage Planning

Recovery Procedures

Event Information

Structure of the IEGC contains 07 parts

Major Highlights of Draft IEGC 2020

(As per Recommendations of Expert Group)

Ground Work for drafting IEGC

- Uniqueness of each power system decided by evolution and practices followed
- Grid Code shall be a dynamic document which evolves over a time
- Two decades of experience of Indian power system
- Literature survey to understand practices followed in large power systems of world
- Idea sharing with all the stakeholders
- Grid code must recognise:
 - i. the current operating environment
 - ii. future mix of energy-resources
 - iii. technological advancements and
 - iv. the maturity of the system

References

- **LIST OF INTERNATIONAL REFERENCES:**

- [1] Reliability Standards for the Bulk Electric Systems of North America, Updated April 17, 2019, North American Electric Reliability Corporation.
- [2] COMMISSION REGULATION (EU) 2017/1485 of 2 August 2017, Official Journal of the European Union establishing a guideline on electricity transmission system operation.
- [3] THE GRID CODE, National Grid Electricity System Operator Limited, United Kingdom.
- [4] National Electricity Rules Version 122, Australia, 30 May 2019.
- [5] Australian Energy Market Operator (AEMO), Mar 2018, Power system requirements, Reference Paper.
- [6] REPORT ON ASEAN GRID CODE COMPARISON REVIEW, ASEAN Centre for Energy (ACE) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Energynautics GmbH, with the support of the German Federal Ministry for Economic Cooperation and Development (BMZ) through the ASEAN-German Energy Programme (AGEP).
- [7] Review of International Grid Codes, Energy Analysis and Environmental Impacts Division Lawrence Berkeley National Laboratory, February 2018.
- [8] Scaling up variable renewable power: the role of grid codes, International Renewable Energy Agency (IRENA)
- [9] PJM Resource Adequacy Analysis Revision: 10, Effective Date: March 21, 2019, Prepared by: Resource Adequacy Planning
- [10] 2018 Long-Term Reliability Assessment, December 2018, North American Electric Reliability Corporation (NERC)
- [11] Mid-term Adequacy Forecast, 2018 Edition, European Network of Transmission System Operators, ENTSO-E
- [12] Power System Stability and Control, Prabha Kundur, McGrawHill, Inc.
- [13] REPORT ON COORDINATION OF GRID CODES AND GENERATOR STANDARDS: Consequences of Diverse Grid Code Requirements on Synchronous Machine Design and Standards, IEEE-PES, Electrical Machinery Committee Task Force on Grid Code Impacts on Generator Standards
- [14] 2018 Frequency Response Annual Analysis, November 2018, North American Electric Reliability Corporation (NERC)

References

- **LIST OF REFERENCES FROM INDIA:**

[1] Electricity Act, 2003, Govt. of India, Jun-2003

[2] Tariff Policy, Ministry of Power, Govt. of India, 2016

[3] Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 [4] Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010

[5] Central Electricity Authority (Technical Standards for Connectivity to the Grid), Regulations, 2007

[6] Central Electricity Authority (Grid standards), Regulations, 2010

[7] Manual on Transmission Planning Criteria, January 2013, Central Electricity Authority

[8] National Electricity Plan, Central Electricity Authority, January 2018

[9] Central Electricity Regulatory Commission (Ancillary Services Operations) Regulations, 2015.

[10] Report of the Committee on Fixation of Tariffs for Central Sector Power Stations, CEA, Govt. of India, Jun-1990

[11] Model Regulations on Forecasting, Scheduling and Deviation Settlement of Wind and Solar Generating Stations at the State Level. (2015), Forum of Regulators, <http://www.forumofregulators.gov.in/Data/study/MR.pdf>

[12] Large Scale Integration of Renewable Energy Sources - Way Forward, Central Electricity Authority, Govt. of India, Nov-2013

[13] Report on India's Renewable Electricity Roadmap 2030, Niti Ayog, Govt. of India, Feb-2015 [14] Report of the Expert Group on 175 GW RE by 2022, Niti Ayog, Govt. of India, Dec-2015 [15] POSOCO – Requirement of equipment for AGC implementation at power plants Sep 2019 [16] CERC order (02/SM/19) on implementation of Security Constrained Economic Despatch (SCED) on pilot basis – 31 Jan 2019

Grid Code: Requirements & Challenges

- Strengthen grid security and resilience
- Emphasis on flexibility of resources
- Absorption of variable renewable energy
 - Present penetration is 9% , expected to cross 20% in next few years
 - Infection point reached , necessary to adopt structured and organised approach
- Adequacy :Generation, Transmission & Distribution
- Cyber Security
- Monitoring and Compliance

Grid Code-Structure

- Preamble, Notification & Definitions
- Chapter 3: Role of Various Organizations and their Linkages
- Chapter 4: Planning Code
- Chapter 5: Connection Code
- Chapter 6: Protection and Commissioning Code
- Chapter 7: Operating Code
- Chapter 8: Unit Commitment, Scheduling and Despatch Code for Physical Delivery of Electricity
- Chapter 9: Cyber Security
- Chapter 10: Monitoring and Compliance Oversight
- Chapter 11: Miscellaneous
- Annexures

Preamble & Notification

- Preamble has been redrafted to reflect focus on reliable grid operation and integration of Renewable energy as follows.
 - *The IEGC lays down regulations to be followed by various persons and participants to plan, develop, maintain and operate power system in the country in a secure, economic, reliable, resilient and efficient manner. The regulations provide for integration of renewable energy resources in the grid, **flexible operation of energy resources, optimum scheduling & despatch**, open access, promoting competition in the generation sector and various measures including reserves necessary for grid stability. It seeks to create a robust framework for maintaining demand-supply balance under credible contingencies and an enabling framework for transition to clean energy*
 - State Commission shall specify its state grid code consistent with the IEGC
 - Applicable to all users, SLDC, RLDC, NLDC, CTU, STU, Licensees, RPC, NPC and Power Exchanges

Chapter-3 Role of Various Organizations and their Linkages

- Role of SLDC(additional new points) :

- i. Ensuring adequate primary, secondary and tertiary reserves.
- ii. Ensuring must-run status of renewable sources of energy contracted by the state

- Role of RLDC(additional new points) :

- i. System operation and control including inter-state transfer of power, covering contingency analysis and operational planning on real time basis
- ii. Regional renewable energy forecasting week ahead, day ahead and intra day
- iii. Monitoring the absorption of renewable energy by the constituents from contracted sources and adherence to must run status of regional entity renewable plants

Role of Various Organizations and their Linkages

- **Role of NLDC(additional new points) :**
 - i. nodal agency for *ancillary services*
 - ii. Scheduling and Despatch of electricity over transnational links.
 - iii. Operation of Security Constrained Unit Commitment / Economic Despatch
 - iv. NLDC shall perform the roles as defined under Central Electricity Regulatory Commission (Cross Border Trade of Electricity) Regulations, 2019
- **Role of RPC (additional new points) :**
 - i. To perform the functions as mandated under the Central Electricity Regulatory Commission (Ancillary Services Operation) Regulations, 2015.
 - ii. ***Maintaining a database of protection settings***
 - iii. RPC secretariat shall carry out intra-regional optimization studies with a view to enhancing ISTS-STU ATC of the constituent states and take further necessary action in the matter
 - iv. Member Secretary, RPC shall certify transmission system availability factor for regional AC and HVDC transmission systems separately for the purpose of payment of transmission charges and publish the details thereof on the RPC website

Role of Various Organizations and their Linkages

- Role of National Power Committee (NPC) :

- i. Discuss and resolve issues referred to NPC requiring consultation among one or more RPCs, concerning inter-alia inter-regional implication or any other issue affecting more than one region or all regions.
- ii. To resolve issues amongst RPCs.

- Role of Qualified Coordinating Agency (QCA) :

- i. To act as nodal agency on behalf of RE generators connected to one or more pooling station
- ii. To undertake generation forecasting, declaration of combined capability on behalf of generators, energy storage systems at one or more pooling stations to the concerned load despatch centre for the purpose of scheduling
- iii. To undertake scheduling, metering and accounting of energy
- iv. To operate and maintain a co-ordination centre manned by qualified and competent personal for round the clock operational coordination
- v. To settle all payments as per DSM regulation

Chapter-4 Planning Code

- Planning code covers system planning in holistic manner to accommodate following factors:
 - i. adequacy of transmission and generation
 - ii. flexibility of conventional generation
 - iii. system inertia
 - iv. adequacy of reserves
 - v. institutional mechanism for long-term and short-term demand forecasting by each control area
 - vi. Data sharing and model validation between STU and CTU
- **Aspects of Planning**
 - i. Demand Forecasting
 - ii. Generation Resource Planning
 - iii. Inter-state transmission planning

Planning Code(Contd.)

- Demand Forecasting: to be done for next five financial years, hourly basis for a typical day of each month:

Jurisdiction	Agency	Cut off Date	Agency to Furnish
Control area of DISCOM	Distribution Licensee	30 th Sep	STU
State	STU	31 st Oct	CTU/CEA
Region/country	CTU	31 st Dec	

Each distribution licensee shall estimate the demand in its control area including the Demand of Open Access customers for next five years from 1st of April of next year by 30th Spetember

STU is coordination with all Distribution licensee shall submit demand by 31st Oct

Considering diversity and using econometric methods or any state of the art methods

CTU shall estimate demand of entire country in coordination with STUs by 31st December

Planning Code(Contd.)

- Generation resource planning

- i. Each distribution licensee shall ensure demonstrable resource adequacy as specified by the respective SERC for the next five (5) years starting 1st April of the next year. Adequacy statement containing a list of such resources along with associated capacities shall be submitted to the respective STU and SERC. STU shall submit the same to CTU.

- ii. The National Electricity Plan may consider following from grid operation perspective :

- Generation flexibility, ramping and minimum turndown level and start-stops
- Requirement of energy storage systems and demand response measures
- Generation reserve requirement
- System inertia for grid stability
- Cross-border electricity exchange
- Fuel security

- iii. While finalizing transmission plan for implementation, CTU shall simulate the economic dispatch considering grid security under various scenarios based on adequacy statement furnished by STU and provide feedback to CEA

Planning Code(Contd.)

• Inter-State Transmission Planning (Key Points):

- To be carried out by CTU
- Inputs for interstate planning shall be collated by CTU based on
 - National Electricity plan of CEA, Conventional and Renewable Generation capacity addition assessment of various agencies , Demand forecast of Electric power survey and Demand estimate by CTU etc.
 - Consult stakeholders in the process..CEA,MNRE,LDCs ,STUs
- CTU shall prepare Load generation balance scenario for each month and disseminate in public domain/shared with stakeholders
- CTU shall duly factor CERC Regulations, n-2 contingencies which may cause cascade tripping (SPS with adequate redundancies may be designed wherever necessary them)
- While Planning CTU shall consider resilience in terms of nearby black start resources and building up of cranking path to load centres and Thermal st.
- CTU to submit periodic all India transmission review and re-optimisation study to CEA under intimation to CERC via feedback report in consultation with STU by 1st April every year.
- Maximum utilisation of existing assets via reconductoring, reconfiguration, FACTS, series/shunt compensation, etc. prior to planning new corridor

Chapter 5: Connection Code

- **Objective:**

- As per CERC/SERC regulations for ISTS/InSTS connectivity by CTU/STU
- The code specifies the technical requirement to be complied by connectivity grantees prior to energising the element
- Lists out the tests to be conducted after connectivity and prior to trial run for declaration of commercial operation

- **Procedure of connection:**

- Post completion of all physical arrangements of connectivity and completing the necessary site tests, the connectivity grantee and/or licensee shall request the RLDC for permission of first energization in the specified format as per the procedure for first time energization of power system elements.
- NLDC/SLDC shall prepare a First Time Energisation Procedure which contains requirements for integration with the grid (Protection, Telemetry , Communication Systems etc..)
- NLDC/RLDC in consultation with CTU shall carry out a joint system study six (6) months before expected date of first energization of a new power system element to identify operational constraints, if any. ..similar exercise shall be done by SLDC/STU in Intra-State System

Connection Code(contd.)

- **Tests prior to trial run for declaration of commercial operation :**
 - Different requirements for Coal/Lignite, Hydro, Gas, Renewable, Energy storage
 - Tests include Ramp up, Ramp down, MCR, reactive power capability, frequency response, overload, synchronous condenser, black start, etc. for generators
 - Operation of control load of 50% of MCR for sustained period of 4 hours
 - Ramp up from 50% of MCR to rated capacity at ramp rate of atleast 3% of MCR per minute
 - To demonstrate Overload capability of Valve wide open ..sustained operation for at least 5 minutes
 - To demonstrate the frequency response of M/Cs as per CEA technical standards, Reactive power capability test as per OEM rating at the available irradiance or the wind energy
 - ESS: To demonstrate the frequency response of ESS and ramping capability as per design
 - Different test requirements for HVDC, FACTS etc... (minimum load operation , Ramp rate, overload capability)
 - Ramp rate, overload, black start in case of VSC (Voltage source converter) , SVC /STATCOM: Full reactive power capability in both directions

Connection Code(contd.)

- **Tests required for thermal (coal/lignite) generating stations :**
 - Operation of control load of fifty (50) percent of MCR as per CEA standards for a sustained period of four (4) hours.
 - Ramp-up from fifty (50) percent MCR to rated capacity at a ramp rate of at least three (3) percent of MCR per minute. Sustained operation at MCR for one (1) hour.
 - To demonstrate overload capability with valve wide open as per Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010. Sustained operation at this level for at least five (5) minutes.
 - Ramp-down from MCR to fifty (50) percent of MCR at a ramp rate of at least three (3) percent of MCR per minute.
 - Testing primary response through injecting a frequency test signal with a step change of ± 0.1 Hz at 60%, 75% and 100% load.
 - Reactive power capability test as per the generator capability curve considering over-excitation and under-excitation limiter settings.

Connection Code(contd.)

• Tests/Documents required for hydro stations :

Documents

- The generating company shall submit the document for turbine characteristics curve indicating the operating zone(s) and prohibited zone(s). In order to demonstrate operating flexibility of generating unit, it shall be operated below and above the prohibited zone(s).

Tests

- Testing primary response through injecting a frequency test signal with a step change of ± 0.1 Hz for various loadings within the operating zone.
- Reactive power capability test as per the generator capability curve considering over-excitation and under-excitation limiter settings.
- Black start capability.
- Operation in synchronous condenser mode wherever designed.
- The tests will be performed considering the water availability and head.

Connection Code(contd.)

• Tests/Documents required for gas turbine based generating stations

Documents

- Submit documents having information about starting time of gas turbine from cold and warm conditions and ramping up from no load to full load at design ramp rate.

Tests

- Testing primary response through injecting a frequency test signal with a step change of ± 0.1 Hz for various loadings within the operating zone.
- Reactive power capability test as per the generator capability curve considering
- over-excitation and under-excitation limiter settings.
- Test to validate Black start capability upto 100 MW capacity wherever designed.
- Test to validate Operation in synchronous condenser mode wherever designed.

• Tests/Documents required for wind/solar generating stations

Documents

- Submission of certificate confirming compliance to CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007

Tests

- To demonstrate the frequency response of machines as per CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 Reactive power capability test as per OEM rating at the available irradiance or the wind energy, as the case may be.
- To demonstrate the Grid forming capability, wherever provided.

Connection Code(contd.)

• Tests/Documents required for Energy Storage Systems

Documents

- Submission of certificate confirming compliance to CEA connectivity standards.

Tests

- To demonstrate the frequency response of ESS.
- To demonstrate the ramping capability as per design.
- To demonstrate rated power output capability in MW and energy output capacity in MWh.

• Tests/Documents required for HVDC transmission elements

Documents

- Submission of technical particulars including operating guidelines such as filter bank requirements at various operating loads and monopolar/bipolar mode reactive power controller, power demand overrides, run-back features, frequency controller, reduced voltage mode of operation, power oscillation damping.

Tests

- Minimum load operation.
- Ramp rate
- Overload capability
- Black start capability in case of Voltage source convertor (VSC) HVDC

Connection Code(contd.)

• Tests /Documents required for SVC/STATCOM

Documents

- Submission of technical particulars including operating guidelines such as number of blocks and rating of each block, single line diagram, V/I characteristics, rating of coupling transformer, MSR/MSC design parameters, different operating modes, IEEE standard Model, Power Oscillation Damping (POD) enabled and tuned (if not then reasons for same). The results for Offline simulation-based study to validate the performance of POD

Tests

- Tests to validate full reactive power capability of SVC/STATCOM in both the directions i.e. absorption as well as injection mode, POD performance, dynamic performance testing

Chapter 6 : Protection And Commissioning Code (New Chapter)

Protection code

- **Objective:**

- To have a Common protection philosophy amongst users of the grid
- To provide proper coordination of protection system in order to isolate the faulty equipment and avoid unintended operation of protection system
- Repository of protection data
- To provide periodic audit of Protection system

- **Protection philosophy and settings :**

- RPC shall develop the protection philosophy*, and review and revise from time to time in consultation with stakeholders as well as maintain centralized database for 220 kV and above (132 kV and above for NER)
- Provide database access to all users ..NLDC,RLDC,STU.....may have different access rights for different users.
- All users connected to the grid shall cooperate and coordinate for protection settings
- RPC carry out system wide studies, twice a year, for protection settings and advise modifications/ changes if any to all users, CTU and STU

* rationale(not a part of Grid Code): It is observed that in absence of a coordinated procedure and specific guidelines of protection systems the desired outcomes are not being witnessed. Reports/Guidelines as constituted under the various orders (Report of the Task Force on Power System Analysis under Contingencies (2013), TASK II PHASE I AND PHASE II – FINAL REPORT (2017), CBIP Manual on Power System Protection (Publication No. 328), Protection philosophy of different RPC (Regional Power Committee)/ NPC (National Power Committee) and any other as prescribed by commission) may form the basis for finalising the protection philosophy by all RPCs uniformly.

Protection Code

- All users shall conduct internal audit of their protection system annually and shall also conduct third party protection audit of each sub-station (132 kV and above in NER and 220 kV and above for rest of the grid) once in five years or earlier as advised by RPC.
- Annual audit plan shall be submitted by users to RPC Secretariat by 31st October for the next financial year
- Users shall submit the protection performance indices to RPC Secretariat on monthly basis
 - Dependability index, Security index and Reliability index
- The RPC Secretariat shall report to the Commission if the above indices are less than one in a year and if any user has failed to undertake any remedial action identified by RPC
- SPS review by RPC and DR/EL standardization by RPC
 - RPC secretariat shall perform regular dynamic study of SPS and mock testing at least once in a year

COMMERCIAL DECLARATION OPERATION CODE

- Notice for trial run of not less than three days to the concerned RLDC or SLDC and the beneficiaries/long-term customers of the generating station wherever identified
 - RLDC/SLDC shall endeavor to commence the trial run from the requested date or in case of any system constraint not later than 7 days from the proposed date of trial run.
- The transmission licensee shall give a notice of not less than 7 days to RLDC/SLDC and long term transmission customers.
- Modalities of trial run defined for all generation units as well as transmission system
- All generating companies shall declare the Date of Commercial Operation of unit or plant thereof within fifteen (15) days from the date of clearance by RLDC/SLDC.
- Scheduling of generating unit/station shall start from 0000 hours of the date of declaration of Commercial Operation

Trial Run of Thermal Generating units

- Continuous operation at MCR for 72 hours
 - Short interruption or load reduction shall be permissible with corresponding increase in duration of test
 - Cumulative interruption of more than 4 hours shall call for repeat trial run
 - If a unit fails to demonstrate unit capacity corresponding to MCR , the generating unit has option to derate or go for repeat trial run. If generating company decides to derate the unit capacity , the demonstrated capacity in such cases shall be more or equal to 105% of derated capacity.

Trial run for Hydro Stations

- Continuous operation at MCR for 12 hours provided that any interruption shall lead to repeat of trial operation

- **Trial run for wind/solar/storage/hybrid/ generating unit :**

- Successful trial run of a solar inverter unit(s) aggregating to 50 MW and above shall mean flow of power and communication signal for not less than the period between sunrise to sunset in a single day with the requisite metering system telemetry and protection system in service.
- The generating company shall record the output of the station during the trial run and corroborate its performance with the solar irradiation during the day and plant design parameters.
- Further, a declaration would be given that no unit tripped during period of the trial operation: Provided that:
 - (i) The output below the corroborated performance level with the solar irradiation of the day shall call for repeat of the trial run.
 - (ii) If it is not possible to demonstrate the rated capacity of the plant due to insufficient solar irradiation, the same shall be demonstrated immediately when sufficient solar irradiation is available after the date of declaration of COD.

- Successful trial run of a wind turbine(s) aggregating to 50 MW and above shall mean flow of power and communication signal for a period of not less than four (4) hours during periods of wind availability with the requisite metering system telemetry and protection system in service.
- The generating company shall record the output of the station during the trial run and corroborate its performance with the wind speed during the day and plant design parameters. Further, a declaration would be given that no unit tripped during period of the trial operation:

Provided that:

- (i) the output below the corroborated performance level with the wind speed of the day shall call for repeat of the trial run.
- (ii) If it is not possible to demonstrate the rated capacity of the plant due to insufficient wind velocity, the same shall be demonstrated immediately when sufficient wind velocity is available after declaration of date of COD.

- Successful trial run of standalone energy storage device shall mean one (1) cycle of charging and discharging of energy as per the design capability with the requisite metering system telemetry and protection system in service.
- Successful trial run of hybrid systems shall mean individual compliance as per above definitions with the requisite metering system telemetry and protection system in service.

Chapter 7: Operating code

- The primary objective of the operation of the integrated grid is to enhance the overall reliability and economy of the power system
- **Newly added points in Operation Philosophy:**
 - Operating procedure by SLDC/RLDC/NLDC shall be updated each year and published on website
 - Provided that a transmission licensee not having its own substation terminating with the line, shall also be required to have a coordination centre .QCA & SNA shall have a coordination centre
- **System security aspects:**
 - Any tripping, whether manual or automatic, of any of the above elements of Regional grid shall be precisely intimated by the concerned SLDC/CTU/User to RLDC as soon as possible, say within ten minutes of the event
 - PSS tuning procedure to be developed by RLDC and implemented in coordination with RPC
 - Protection relay settings and islanding schemes to be coordinated by RPC periodically

Operating code (Contd.)

- All Distribution licensees ,STU ,Bulk consumers shall provide Automatic Under frequency and Df/dt relays for load shedding
- Settings for UFR based load shedding plan adopted for all India in line with recommendation of consultant is given below:

S. No.	Stage of UFR Operation	Frequency (Hz)	Load Shedding (% of demand)
1	Stage-1	49.40	6%
2	Stage-2	49.20	6%
3	Stage-3	49.00	6%
4	Stage-4	48.80	7%
Total (Cumulative)			25%

Note 1: All states shall plan further UFR settings for frequency below 48.8 Hz and *df/dt* load shedding schemes depending on their local load generation balance. The same shall be coordinated and agreed by the concerned RPC.

Note 2: Pumped storage hydro plants or ESS operating in pumping or charging mode shall be automatically disconnected before the first stage of UFR.

Operating code (Contd.)

- **Generation reserve estimation and frequency control :**
 - The National Reference frequency of 50.000 Hz and measurement shall be done at a resolution of 0.001 Hz
 - Frequency band tightened to 49.95 -50.05 Hz
 - Frequency to be brought within band within 15 minutes after excursion through dispatch of secondary and tertiary reserves
 - There shall be different levels of reserves such as Primary, Secondary, Tertiary, ESS and any other reserve for the purpose of frequency control and regulating area control error
- **Primary Control**
 - Immediate automatic control implemented through turbine speed governors or frequency controllers.
 - The generating units shall have their governors in operation at all times with droop settings of 3-6 %
 - To be activated immediately and shall be fully activated within 30 secs and sustain for 5 minutes
 - Primary reserve for reference contingency shall be declared by NLDC every year
 - Maximum steady state frequency deviation should not cross 0.30 Hz for the reference contingency
 - NLDC will notify by 15th Mar every year FRO and target All India FRC
 - RLDC/NLDC will also assess the FRO of each control area as per FRP index
 - The power System must be operated at all times with a minimum inertia to be specified by NLDC so that minimum nadir frequency post reference contingency stays above threshold set of ULFS

- The Power System must be operated with a minimum inertia to be specified by NLDC so that nadir frequency post reference contingency stays above setting of ULFS
 - Rescheduling of generation may be done including curtailment of RE

Assessment of Reference Contingency

- Quantum of Sudden Generation or demand outage
 - May consider outage of largest power plant, group of power plants , a generation complex, or a generation pooling station or outage of single largest load centre
 - To start with reference contingency is considered as 4500 MW (to be revised by NLDC from time to time)
 - Therefore minimum quantum of reserve shall be 4500 MW
- All India minimum target frequency response characteristic (MW/Hz) = Reference contingency quantum/maximum steady frequency deviation allowable
- Nadir frequency shall be at least 0.1 Hz above first stage of UFR ...Therefore maximum frequency deviation should not cross 0.30 Hz
- Maximum All India Target FRC=Load/Generation loss in reference contingency/Freq deviation value=4500/0.3 =15000 MW/Hz

Calculation of Frequency response obligation (FRO)

The minimum FRO of each control area in MW/Hz is calculated as

- $$\text{FRO} = \left(\text{Control area average demand} + \text{control area average generation} \right) * \text{mimimum all India target frequency response characteristics} / \left(\text{Sum of peak/average demand of all control areas} + \text{sum of average generation of all control areas} \right)$$
- Criteria for reportable event: The FRC calculation shall be carried out for any load generation loss incident involving 1000 MW of load /generation or a frequency change involving 0.1 Hz or more

Calculation of Frequency Response Performance

- Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC) divided by Frequency Response Obligation (FRO) i.e.

$$(FRP = AFRC / FRO)$$

- Each control area shall be graded based on median Frequency Response Performance annually (at least 10 events) as per following criteria:

<u>S.No.</u>	<u>Performance</u>	<u>Grading</u>
i.	$FRP \geq 1$	Excellent
ii.	$0.85 \leq FRP < 1$	Good
iii.	$0.75 \leq FRP < 0.85$	Average
iv.	$0.5 \leq FRP < 0.75$	Below Average
v.	$FRP < 0.5$	Poor

Operating code (Contd.)

The primary response requirement of various generators alongwith upper ceiling limit(% of MCR) is given in Table below.

TABLE 2: PRIMARY RESPONSE RANGE OF VARIOUS TYPES OF GENERATING UNITS

Fuel/ Source	Min. Capacity /Requirement to fall in Primary Response purview	Upper ceiling limit (% of MCR)
Coal/Lignite Based	200 MW and above	105
Hydro	25 MW and above & non-canal based	110
Gas based	Gas Turbine above 50 MW	105 (corrected for ambience temperature)
Wind/ Solar (commissioned between 6th Aug 2019 -31st March 2022)	Capacity of Generating station more than 10 MW and connected at 33 kV and above	110 (subject to availability of capacity and commensurate wind speed in case of wind generating stations and solar insolation in case of solar generating stations)
Wind/ Solar/Hybrid (commissioned after 31st March 2022) [^]	Capacity of Generating station more than 10 MW and connected at 33 kV and above	105

[^]Wind/ Solar/Hybrid plant commissioned after 31st March 2022 shall have the option to provide primary response individually through BESS or through a common BESS installed at its pooling station.

Operating code (Contd.)

- **Secondary Control :**

- $ACE = (I_a - I_s) - 10 * B_f * (F_a - F_s) + \text{Offset}$
- I_a =Actual net interchange, in MW I_s =Schedule net interchange in MW
- B_f frequency bias MW/0.1 Hz, F_a =Actual freq. F_s =Schedule freq, Offset =provision to compensate measurement error (to be decided in respective control area).
 - Frequency bias shall be equal to median FRC during previous financial year
- Area-wise automatic generation control which regulates ACE
- Regulated from SLDC/RLDC/NLDC and can be in Flat Frequency mode or Tie-line bias mode
- Shall respond within thirty (30) seconds of ACE of a particular control area going beyond the minimum threshold limit of +/- 10 MW. Fully delivered within 15 minutes and sustain for next 30 minutes
- Reserve shall be estimated based on

The positive and negative secondary reserve capacity for any control area for a financial year shall be equal to 99 percentile of positive and negative ACE respectively of that control area during the previous financial year, or

The secondary reserves capacity for any control area shall be equal to the 110 % of largest unit size in that control area plus load forecast error plus wind forecast error plus solar forecast error.

- NLDC will publish on its website the information on minimum quantum of reserves to be kept by a control area on 1st Mar every year
- Secondary reserves shall be maintained in ISGS to be activated by RLDC/NLDC and InSGS by SLDC
- Option of ESS and Demand Response to provide secondary control

AGC activation Timeline/Supervision

S. No.	Generating unit/ ESS category	Control Centre for supervision	Start Date for Application
1	Regional entity generating stations with CERC regulated or adopted Tariff (Thermal with rated capacity more than 200 MW and Hydro with rated capacity more than 25 MW)	NLDC	On or before 1 st Apr 2020
2	Other Regional entity generating stations not covered under Sl.No.1(Thermal with rated capacity more than 200 MW and Hydro with rated capacity more than 25 MW) and ESS for providing secondary response	NLDC	To be notified by Commission
3	State (having annual Peak demand more than 10 GW or renewable energy rich states) generating stations (Thermal with rated capacity more than 200 MW and Hydro with rated capacity more than 25 MW) and ESS for providing secondary response	SLDC	On or before 1 st Apr 2021
4	State (not covered under Sl. No. 3) generating stations (Thermal with rated capacity more than 200 MW and Hydro with rated capacity more than 25 MW) and ESS for providing secondary response	SLDC	To be notified by the Commission or earlier if agreed by State. However secondary reserves within the state shall be activated manually till the implementation of AGC.

Operating code (Contd.)

- **Tertiary Control :**

- Tertiary control Shall be greater or equal to secondary reserves to take care of contingencies, and shall be maintained at both regional entity level as well as state control area.
- Shall be fully activated within 15 minutes of Operator's instruction instructions from appropriate load despatch centre and shall be capable of delivering until next 60 minutes.
- **Instruction shall be given when ACE of 100 MW or more in one direction for more than 15 minutes, loss of generation or load of more than 100 MW in the control area and in case the secondary reserve has been deployed continuously in one direction for fifteen (15) minutes for more than 100 MW**
- Each state control area shall keep reserve capacity one day in advance and inform RLDC

- **Operational Planning :**

- Agencies specified for operational planning along with time horizons
 - Ex=Monthly/yearly=RPC/CTU/NLDC/RLDC/SLDC
 - Intra day= NLDC/RLDC/SLDC
- RLDC/NLDC issue procedure for Operational planning analysis, Real-time monitoring, Real-time assessments and format for data submission and updating
- Procedure for demand estimation defined for SLDCs
 - Describes the procedures/responsibilities of SLDCs for demand estimation of both Active power and Reactive Power incident on the transmission system based on details collected from Discoms, Distributed generating resources , captive power plants.....day ahead /weekly/monthly/yearly

Timeline of Demand estimation

- Granularity of demand estimation:
 - Forecast should be either time block or lower
 - RLDC shall submit regional demand estimate and submit to NLDC
 - NLDC shall prepare National demand estimate based on above
 - SLDC may submit the revised demand estimate in case of major change
 - SLDC shall use Historical data, Weather data for demand forecasting
 - SLDC/NRLDC/NLDC ...Forecast error for daily /monthly and yearly to be uploaded on website
- Timeline of Demand estimation
 - Daily demand estimation : 10 hrs of previous day
 - Weekly demand estimation: First working day of previous week
 - Monthly demand estimation: Fifth day of previous month
 - Yearly demand estimation: 31st october of previous year
- Outage planning process timeline issued to be followed by STUs, transmission licensees, CTU, all generating stations, SLDC,RLDC and NLDC

Outage Planning

TABLE 5: TIMELINE FOR OUTAGE PLANNING PROCESS

Activity	Agency	Cut-off date
Submission of proposed outage plan of element(s) for next financial year to RPC with the earliest start date and latest finishing date	STUs, transmission licensees, CTU, all generating stations	31 st October
Submission of LGBR of the control area to RPC for both peak and off-peak scenarios	SLDC	31 st October
Publishing draft LGBR and draft outage plan of regional grid for next financial year in website	RPC	30 th November
Publishing final LGBR and final outage plan of regional grid for next financial year in website	RPC	31 st December

Operating code (Contd.)

- **LGBR to be prepared by SLDC for time block wise granularity and at regional level RPC shall compile LGBR**
- NPC in consultation with RPC shall prepare All India LGBR
- Projected load curve shall be matched with actual curve and discrepancy above 5% would be reported
- annual outage plan shall be reviewed by RPC Secretariat on quarterly and monthly basis in coordination with all parties concerned, and adjustments made wherever found to be necessary.
- **Operational Planning Study :**
 - Based on the operational planning analysis data, operational planning study shall be carried out by various stakeholders in different time frame
 - **SLDC, RLDC and NLDC shall utilize network estimation tool integrated in their EMS/SCADA system for the real time operational planning study.**
 - SLDC, RLDC and NLDC shall also perform day-ahead/ weekly/ monthly/ yearly study for assessing ATC/TTC, planned outage, special scenario, SPS, natural incident etc.
 - SLDC, RLDC, NLDC, STU, CTU and RPC shall have evidence that it has an operating plan to address potential violation of system operational limit identified as a result of the operational planning study
 - SLDC/RLDC/NLDC to perform assessment for new element to be commissioned

Time horizon for operational planning study

TABLE 6: TIME HORIZON FOR OPERATIONAL PLANNING STUDY

Time horizon of operational planning study	Agency	Means for carrying out study
Real time/Intra-day	NLDC/RLDC/ SLDC	At least fifteen (15) minutes interval using online/offline SCADA/EMS system
Day-ahead	NLDC/RLDC/ SLDC	For various operating condition using offline tool
Weekly	NLDC/RLDC/ SLDC	For various operating condition using offline tool
Monthly/Yearly	Study committee formed by RPC secretariat/ NLDC/ RLDC/SLDC	For various operating condition using offline tool

Operating code (Contd.)

- **System Restoration:**

- RLDC/NLDC shall issue plans and procedures for restoration to be updated /reviewed every year
- Simulation studies shall be carried out for preparing restoration procedures considering Black start capability of generator; Ability of black start generator to build cranking path and sustain island; Impact of block load switching in or out; Line/transformer charging; Reduced fault levels; Protection settings under restoration condition;
- Mock trial runs of the procedure for different subsystems , including black start of generating units along with VSC based HVDC black start support shall be carried out.
- House load operation for thermal generators
- during restoration process following a black out, SLDC, RLDC and NLDC is authorised to operate with reduced security standards

- **Real Time Operation :**

- Classification of System States into Normal, Alert, Emergency, Extreme Emergency Restorative
- NLDC/RLDC/SLDC shall endeavor to maintain the grid in a normal state
- The operational code shall have validity of thirty (30) minutes from the time of issue. In case such operation does not take place within validity period, the entity shall obtain the operational code again.

Operating code (Contd.)

- **Demand Management :**
 - SLDC shall ensure adequacy at state level and contract ADMS
 - load shedding shall be resorted to after the demand response schemes have been exhausted
 - the disconnected load, if any, shall be restored as soon as possible
- **Post Despatch Analysis :**
 - All defined important happenings of Grid shall be analysed and reported as per timeline given below

S. N	Grid Event^ (Classification)	Flash report submission deadline (users/ SLDC)	Disturbance record and station event log submission deadline (users/ SLDC)	Detailed report and data submission deadline (users/ SLDC)	Draft report submission deadline (RLDC/ NLDC)	Discussion in protection committee meeting and final report submission deadline (RPC)
1	GI-1/GI-2	8 hours	24 hours	+7 days	+14 days	+30 days
2	Near miss*	8 hours	24 hours	+7 days	+30 days	+30 days
3	GD-1	8 hours	24 hours	+7 days	+14 days	+30 days
4	GD-2/GD-3	8 hours	24 hours	+7 days	+21 days	+30 days
5	GD-4/GD-5	8 hours	24 hours	+7 days	+30 days	+30 days

Operating Code (Contd.)

- **Reactive Power Management :**

- NLDC, RLDC or SLDC may direct the users about reactive power set-points, voltage set points and power factor control to maintain the voltage at interconnection point
- NLDC, RLDC and SLDC shall assess the dynamic reactive power reserve available at various substations or generating stations under any credible contingency on a regular basis
- Reactive power facility shall be in operation at all times and shall not be taken out without the permission of concerned RLDC or SLDC.

- **Field Testing For Model Validation :**

- specifies the periodicity and tests to be carried out on power system elements for ascertaining correctness of mathematical models used for simulation studies
- The tests shall be performed once every five (5) years or whenever major retrofitting is done or if necessitated earlier due to any adverse performance observed during any grid event.
- Tests like validation of governor control system and excitation system

Operating Code (Contd.)

• Capacity Building And Certification :

Certification of System Operators

- Capacity building, skill upgradation and certification of the personnel deployed in load despatch centres shall be done periodically under an institutional framework
- A governing board shall be formed by certifying agency(ies), comprising of members from CEA, CERC/SERC, NLDC, CTU and academia for administering the entire certification process.
- The grid operators at NLDC, RLDC, SLDC and sub-LDC shall undergo periodic recertification once in every three (3) years to ensure continuous skill upgradation.

Certification of Transmission System Planners

- Capacity building, skill upgradation and certification of the personnel involved in transmission planning in CEA, CTU, STU and distribution licensees shall be done periodically under an institutional framework.
- A detailed procedure shall be issued by the governing board for periodic capacity building, certification and recertification for transmission planners at CEA, CTU, STU and distribution licensees.
- The transmission planners at CEA, CTU, STU and distribution licensees shall undergo periodic re-certification once in every five (5) years to ensure continuous skill upgradation.

Chapter 8: Unit Commitment, Scheduling And Despatch

Code For Physical Delivery Of Electrical Energy

- The SCUC exercise shall be carried out to facilitate reliability of supply to the regional entities/beneficiaries taking into account optimal cost , adequate reserves , ramping requirements factoring security constraints
- Chapter covers:
 - Scheduling and despatch in a decentralised manner
 - Mechanism for unit commitment
 - Framework for Security constrained economic despatch of regional entity generators
 - Compensatory mechanism for part load operation of generating stations
- Addition of new terminologies such as real time market, combined scheduling for QCA, Security Constrained Unit Commitment.
- The role of QCA for scheduling and coordination has been prescribed
- The technical minimum operating level has been reworded as minimum turn down level, compensation prescribed for generation below the normative level
- NLDC shall be responsible for scheduling and despatch of electricity over interregional links and cross-border link

Unit Commitment, Scheduling And Despatch Code For Physical

Delivery Of Electrical Energy

- **Security Constrained Unit Commitment (SCUC)**

- The SCUC exercise shall take into account optimal cost, adequate reserves, ramping requirements factoring security constraint
- For adequate secondary and tertiary reserves with sufficient ramping capability , NLDC shall identify the generating units for unit committeemen at the national level 3 days in advance of actual day of scheduling for regional entity generators on a rolling basis
- NLDC, through RLDC shall advise the regional entity generators to commit or de-commit the unit
 - Provided that as and when enabling framework is in place reserves may be procured through market
- Based on the SCUC instructions from RLDC, the generating station shall revise the on-bar DC (with due consideration to ramp up/down capability), off-bar DC and ramp up/down rate.
- SLDC shall perform similar exercise at Intra-state level.

Details needed for regional entity generating stations

Description	Units
Installed Capacity of station	MW
Installed Capacity of station	MWh
Number x unit size	No x MW
Time required for cold start	Minute
Time required for warm start	minute
Time required for hot start	Minute
Time required for combined cycle operation under cold conditions	Minute
Time required for combined cycle operation under warm conditions	Minute
Ramping up capability	% per minute
Ramping down capability	% per minute
Minimum turndown level	% of ex-bus capacity
Inverter Loading Ratio (DC/AC capacity)	
Name of QCA	
Full reservoir level (FRL)	Metre
Design Head	Metre
Minimum draw down level (MDDL)	Metre
Water released at Design Head	M ³ / MW

- **Functions Of Control Area :**

- Entities such as SLDC, DVC, cross-border control centre shall be responsible for the following in its control area:
 - Forecasting demand and internal renewable generation for each time block on a day ahead and intraday basis.**
 - Scheduling/despatch of internal generation.**
 - Requisitioning drawal from the regional entity generating stations/cross-border generating stations with whom its embedded entities have PPA.**
 - Scheduling long-term, medium-term and short-term open access and power exchange transactions for embedded entities in accordance with the contracts.**
 - Balancing demand and supply to minimize Area Control Error (ACE).**
 - Facilitating absorption of energy from renewable energy sources**
 - Maintaining and despatching of reserves of various kinds as envisaged in these regulations. Deployment of secondary reserves (Automatic Generation Control) and tertiary reserves.**
 - Declaration of Import/Export TTC/ATC of respective control area with respect to ISTS in coordination with RLDC/NLDC on three (3) months in advance and day-ahead basis, which shall be revised from time to time based on grid conditions.**
 - Declaration of intra-state TTC/ATC of each distribution licensee in coordination with state grid entities and STU. TTC/ATC along with all the assumptions and limiting constraints would be published on the SLDC website.**

- **RLDC, NLDC shall be responsible for the following in its control area:**
- i. Forecasting demand and ISTS connected renewable generation for each time block on a day-ahead and intraday basis.**
 - ii. Running a Security Constraint Unit Commitment (SCUC) on regional and All India**
 - iii. Scheduling of regional entity generating stations/cross-border generating stations with whom its regional entities have PPA**
 - iv. Scheduling long-term, medium-term and short-term open access and power exchange transactions for regional entities in accordance with the contracts.**
 - v. Running Security Constrained Economic Despatch (SCED) on All India basis.**
 - vi. Balancing demand and supply to minimize Area Control Error (ACE).**
 - vii. Facilitating absorption of energy from renewable energy sources.**
 - viii. Maintaining and despatching reserves of various kinds as envisaged in these regulations. Deployment of secondary reserves (Automatic Generation Control) and tertiary reserves.**
 - ix. Declaration of simultaneous Import/Export TTC/ATC across regions and for cross-border interconnections in three (3) months in advance, which shall be revised from time to time based on grid conditions. TTC/ATC along with all the assumptions and limiting constraints would be published on the NLDC website.**
 - x. Declaration of Import/Export TTC/ATC of each state in coordination with respective SLDC. TTC/ATC along with all the assumptions and limiting constraints would be published on the NLDC website.**

- **Must Run Plants:**

- **Wind, solar, wind-solar hybrid and hydro plants (in case of excess water leading to spillage) shall be treated as MUST RUN power plants and shall not be subjected to curtailment on account of merit order despatch or any other commercial consideration.**
- **In the event of transmission or system security constraint, the renewable generation may be curtailed after harnessing available flexible resources including energy storage systems.**
- ***In the event of extreme circumstances when any MUST RUN plant has to be curtailed, the details shall be published on the RLDC/SLDC website the following day, as the case may be, giving the date, name of RE generation plant, installed capacity, curtailment quantum in MWh, duration of curtailment and detailed reasons thereof.***

Chapter 9 :Cyber Security

- Newly drafted chapter
- All users, CEA, NLDC, RLDC, SLDC, CTU and STU shall undertake the due process for identification of Critical Information Infrastructure (CII)
- Appointment and responsibilities of information security committee and chief information security officer
- All users, CEA, NLDC, RLDC, SLDC, CTU and STU shall take necessary measures in accordance with Guidelines for the Protection of National Critical Information Infrastructure by NCIIPC.
- All entities shall develop Cyber Crisis Management Plan case of any major cyber-attack. which includes continuity plans, recovery plans, communication plans, cyber incident response plan, disaster recovery plan and priority resource and manpower allocation plan.

Chapter 10: Monitoring And Compliance Code

- Newly drafted chapter
- The performance of all users, CTU, STU, NLDC, RLDC, SLDC and RPC with respect to grid code compliance shall be assessed periodically
- to ensure compliance, two methodologies shall be followed:
(a) Self-Audit (b) Compliance Audit
- All users, CTU, STU, NLDC, RLDC, RPC and SLDC shall conduct annual self-audits to review compliance of the regulations and submit by 31st July of every year
- The self-audit reports by users shall be submitted to the concerned RLDC/SLDC. The self-audit reports of NLDC, RLDC, CTU, and RPC Secretariat shall be submitted to CERC. The self-audit report of SLDC and STU shall be submitted to SERC.
- CERC may order independent third-party compliance audit for any user, CTU, NLDC, RLDC and RPC as deemed necessary.

Reporting Requirements

S. No.	Entity Responsible	Reporting Requirement and Frequency
1.	RPC Secretariat	<ul style="list-style-type: none"> Exception report of UFR (<i>monthly</i>) Annual LGBR (<i>annual</i>) Annual Outage Plan(<i>annual</i>) Feedback Report to address potential violation of system operational limit (<i>quarterly</i>)
2.	RPC	<ul style="list-style-type: none"> Final report on grid disturbance (<i>post grid disturbance</i>)
3.	NPC	<ul style="list-style-type: none"> All India LGBR (<i>annual</i>)
4.	CTU	<ul style="list-style-type: none"> All India transmission review(<i>yearly</i>) Planned inter-regional and ISTS-STU power transfer capability for the next 3-5 years(<i>yearly</i>)
5.	NLDC	<ul style="list-style-type: none"> Forecast error (<i>daily/day-ahead / weekly / monthly and yearly</i>) Operational study (<i>Day-ahead/ weekly/ monthly/ yearly</i>) Operational analysis (<i>post despatch</i>) Draft report of each grid disturbance/grid (<i>post grid disturbance</i>) Daily and monthly report of integrated grid performance (<i>daily and monthly</i>)
6.	RLDC	<ul style="list-style-type: none"> Forecast error (<i>daily/day-ahead / weekly / monthly and yearly</i>) Operational study (<i>Day-ahead/ weekly/ monthly/ yearly</i>) Operational analysis (<i>post despatch</i>) Draft report of each grid disturbance (<i>post grid disturbance</i>) Integrated grid performance (<i>daily and monthly</i>)
7.	SLDC	<ul style="list-style-type: none"> Exception report of UFR (<i>monthly</i>) Forecast error (<i>daily/day-ahead/weekly/monthly and yearly</i>) Operational study (<i>Day-ahead/ weekly/ monthly/ yearly</i>) Operational analysis (<i>post despatch</i>) Flash report and detailed report on any grid disturbance (<i>post grid disturbance</i>) Details of regional entity generating stations (<i>quarterly</i>)
8.	User	<ul style="list-style-type: none"> Flash report and detailed report on any grid disturbance (<i>post grid disturbance</i>) PSS tuning report by generators (<i>based on tuning requirements</i>)

Procedure Drafting Requirements

S. No.	Entity Responsible	Drafting Responsibilities
1.	RPC	<ul style="list-style-type: none"> Common outage planning procedure
2.	CTU	<ul style="list-style-type: none"> All India transmission review Planned inter-regional and ISTS-STU power transfer capability for the next 3-5 years
3.	NLDC	<ul style="list-style-type: none"> Detailed procedure covering modalities for first time energization and integration of new or modified power system elements Operating procedure PSS tuning procedure Quantum of secondary/Tertiary reserves Assessment of Secondary/Tertiary control Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating Restoration Procedure Timeline for scheduling activities
4.	RLDC	<ul style="list-style-type: none"> Operating procedure Procedure for operational planning analysis, real-time monitoring, real-time assessments and format for data submission and updating Restoration Procedure
5.	SLDC	<ul style="list-style-type: none"> Detailed procedure covering modalities for first time energization and integration of new or modified power system elements Operating procedure Restoration Procedure
6.	Governing board of certifying agency	<ul style="list-style-type: none"> Periodic capacity building, certification and recertification for system operators at NLDC, RLDC, SLDC and sub-LDC



Regulatory Changes – Indian Electricity Grid Code



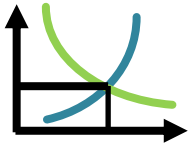
1. Right to recall: Changed from 4th time block to 7th (odd) and 8th (even) time block
2. Provision for revision of estimated time of restoration per day of a generation unit in case of unit tripping – Deleted
3. Power sell by ISGS from the share of original beneficiary in RTM:
 - a) Without the consent of the beneficiary.
 - b) Share gain with beneficiary in the ratio of 50:50
 - c) Gain of ISGS restricted to 7 paisa/ Kwh
 - d) Gain computed as difference of selling price and fuel charge including incidental expenses.
 - e) No sharing of loss, if any.
 - f) Original beneficiary shall continue to pay the fixed charge.
4. In case of curtailment day ahead collective transactions shall be curtailed first followed by real time transactions.



Regulatory Changes – Short Term Open Access



- ✓ An organized platform for energy trade closer to real time
- ✓ Half Hourly market
 - ❖ To be conducted every half an hour (48 times per day)
 - ❖ Delivery for 30 minutes in two time blocks of 15 minutes each
- ✓ Price discovery Mechanism
 - Double sided closed auction with uniform price
- ✓ Allocation of transmission corridor between the power exchanges
 - ❖ In the ratio of shares in the cleared volumes in the day ahead collective market subject to a minimum of 10%
- ✓ The Nodal Agency shall indicate to the Power Exchange(s) the available margin on each of the transmission corridors before the gate closure, i.e. before the window for trade closes for specified duration





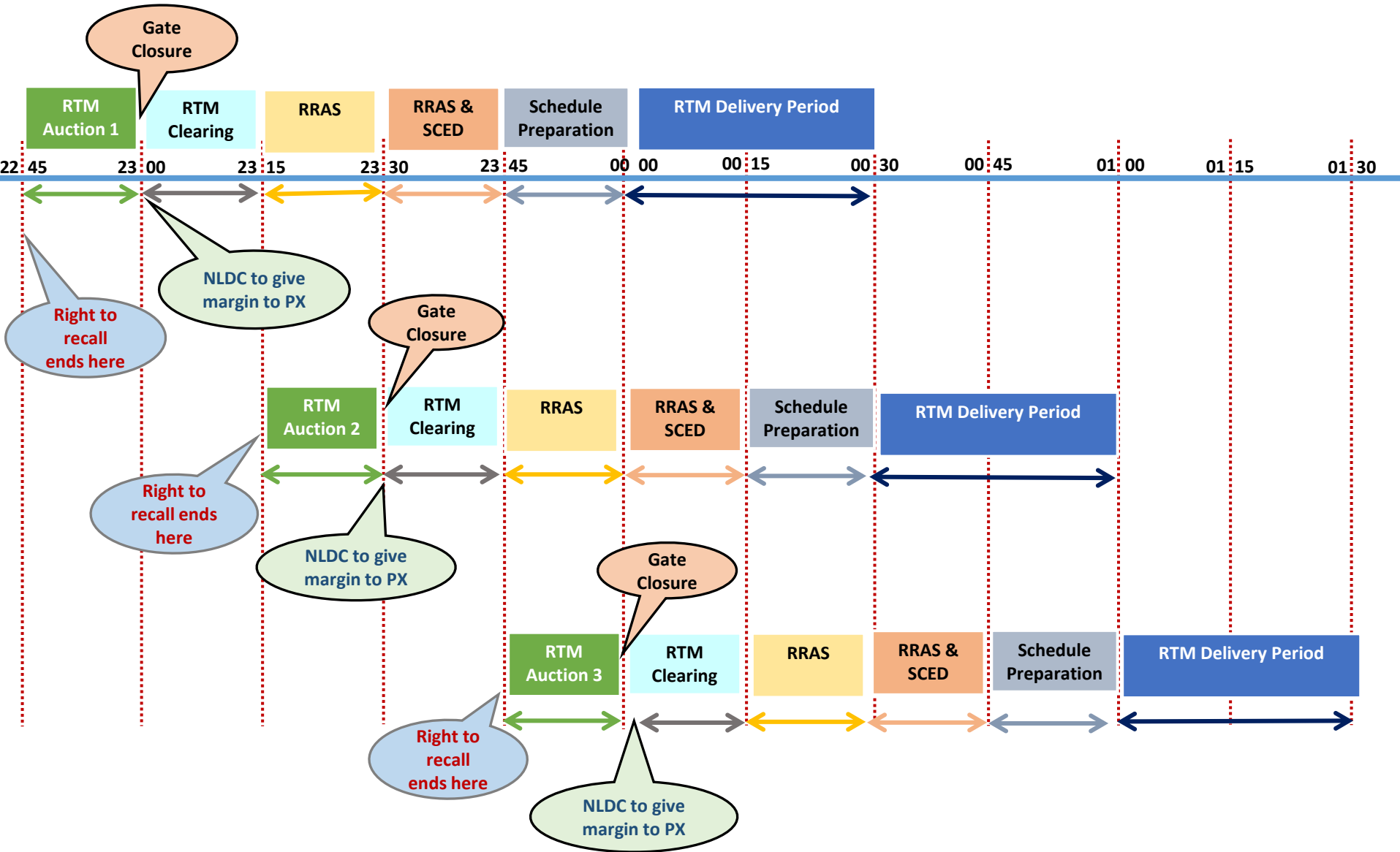
Regulatory Changes – Power Market Regulation



1. Real-time Contract: Contract other than day ahead contract and intraday or contingency contract, where collective transactions occur on the day (T) or (T-1) after the right to revision of schedule ends.
2. Real-Time Market: market for collective transactions of Real time Contracts through Power Exchange(s).
3. Collective Transaction: set of transactions discovered in power exchange(s) through anonymous, simultaneous competitive bidding by buyers and sellers
4. Gate Closure : Bids once submitted cannot be modified after gate closure



Operational Timelines for RTM



The background is an abstract painting with a rich color palette. It features a central vertical element, possibly a stylized figure or a column, rendered in dark tones. The background is composed of broad, textured brushstrokes in shades of red, orange, yellow, green, and blue, creating a sense of depth and movement. The overall effect is one of dynamic energy and artistic expression.

धन्यवाद

Adani PL.	(i) Sh. Nirmal Sharma, VP (O&M), Fax- 0141-2292065 (ii) Sh. Sameer Ganju, Head-Northern Region, Fax No. 011-24115560
APCPL	(i) AGM (O&M)-I, IGSTPP, Fax No. 01251-266326 (ii) AGM (EEMG), 01251-266326
BBMB	(i) Director (PR) Fax- 0172-2652820 (ii) Power Controller, Fax- 0172-2653297.
HVPNL	(i) Chief Engineer (Comm.); SE (SO & SLDC): 0181-2664440 Fax-0172-2560622
NHPC	(i) Sh. N.S.Parameshwaran, Executive Director (O&M), Faridabad – Fax-0129-2272413 (ii) Sh.V.K.Sinha, General Manager (O&M), Faridabad – Fax-0129-2272413
POWERGRID	(i) Sh. Prabhakar Singh, ED (NR-I), Fax No. 011-26853488 (ii) Sh. A.K. Arora, General Manager (O&M), NR-I, (iii) Sh. R.V.S Kushwaha, General Manager (O&M), Jammu; Fax- 0191-2471187 (iv) Sh.Rajeev Sudan Dy, General Manager (OS), Fax- 0191-2471187
RRVUNL	(i) Sh. A.K. Saxena, Addl. Chief Engineer (PPMC & IT), Fax- 0141-2740989/44521
NTPC	(i) Head of OS/ Head of RCC, Fax No. 0120-2410082 (ii) Sh. Praveen Chaturvedi, GM (OS), NRHQ Lucknow; Fax-0522-2305849. (iii) DP Singh AGM –OS NRHQ NTPC LIMITED Lucknow
HPSEBL	(i) Chief Engineer (SLDC), HPSLDC (ii) SE (PR& ALDC), HPSLDC
NRLDC	General Manager - 26854861, 4051, 26569504 Fax- 26852747
NLDC	General Manager, NLDC, Fax: 011-26853488/26601079
Lanco APTL	Sh. Raj Kumar Roy, Director, Fax: 0124-2341627/4741024
SJVNL/NJHPS	General Manager (C&SO), Fax- 0177-2673283
PTCUL/UPCL	(i) Sh. Anupam Sharma, SE (SLDC), Fax- 0135-2451160, 0135-2763570
UPPTCL	(i) Director (Op), Fax- 0522-2286476 (ii) Chief Engineer (SLDC), Fax- 0522-2287880, 2288736
HPLDS	(i) Sh. N.P.sharma, SE, SLDC, Fax: 0177-2837649 (ii) Sh. Lokesh Thakur, Executive engineer, Fax: 0177-2837649
DTL	General Manager (SLDC)/ General Manager (Protection) Fax-23236462, 23221069
THDCIL	Sh. GM (EM - Design), Rishikesh
PSTCL	(i) Chief Engineer (SLDC) Fax – 0175-2365340 (ii) Dy.Chief Engineer (SLDC) Fax – 0175-2365340
CHANDIGARH	Sh. M.P.Singh, SE (Elect. Op.Circle) – Fax-0172-2740505
IPGCL/PPCL	(i) Sh. Y.P.Arora, GM (T), IPGCL, New Delhi, Fax- 23370884 (ii) Sh. R.K.Yadav, DGM (T), IPGCL, New Delhi, Fax- 23370884
BRPL	Sh. Satinder Sondhi, VP & Head System Operations, Fax No. 011-39996549
Everest PPL	Sh. Yogendra Kumar, Chief Operating Officer, Fax No. 011-45823862/ 43852507
RPSCCL	Sh. Niranjana Jena, Addl.VP/ Sh. Suvendu Dey, Asst. VP-O&M, Fax: 05842-300003
HPGCL	Sh. S.K. Wadhwa SE/Technical(HQ), Fax: 0172-5022436
CEA	(i) Sh. Vikram Singh, Director; Fax-26170385,26108834 (ii) Chief Engineer, NPC, New Delhi
TPDDL	(i) Sh. Sanjay Banga, VP, Tata power-DDL, New Delhi (Fax: 011-27468042) (ii) Sh. Praveen Verma, Addl. GM, Tata Power-DDL, New Delhi (Fax: 011-27468042)
PTC India Ltd.	Sh. Ajit Kumar, Director (Commercial & Operations), PTC India Ltd., New Delhi (Fax- 011-41659144,41659145)
AD Hydro	Sh. Anil Kumar Garg, General Manager(BD), AD Hydro Power Ltd., Noida-201301, (Fax: 0120-4323271/4278772)
DISCOM UP	Sh. Rakesh Kumar, Director (T), Dakshinanchal VVNL, Agra-282007 (Fax- 0562-2605465)

NPL Mr. Rajesh Kumar, Head Operations- 08427183924, Email id: Kumar.Rajesh@larsentoubro.com
Address: Nabha Power Limited, PO box 28, Near Village Nalash, Rajpura, Punjab 140401.

Mr. Ravinder Singh Lall, Head O&M – 09815355411, Email : Ravindersingh.lall@larsentoubro.com
Mr. Pinaki Mukherjee, Sr. DGM, Commercial – 09871391388, Email id: Pinaki.mukherjee@larsentoubro.com

HPPTCL	Director (Planning & Contracts), Fax: 0177-2626284
J&K (PDD)	Chief Engineer (Survey & Commercial) Fax-0191-2476213
J&K SPDCL	GM, Fax: 0194-2500145
PSPCL	Engineer-in- Chief (PPRR), Fax- 0175-2308698.
RRVNL	Chief Engineer (LD); SE (SO&LD) – Fax- 0141-2740920
UPRVUNL	DGM (TOM), 0522-2287861
UJVNL	General Manager Engineering: 0135-2761485, fax- 0135-2761549
NPCIL	(i) Station Director, NAPS; Fax. 05734-222177.(ii) Sr. Manager (Transmission), NPCILFax.-022-25563350
JPPVL	Sh. Suresh Chandra, Director, Fax- 0120-4516201/4609464/4609496
Jhajjar PL	Sh. Goutam Biswas, GM (Production), 01251-270155.
	Nabha Power Ltd (Rajpura)
LPGCL	Sh. A. N. Sar, Unit Head And Exec. Director, Fax- 91-22-22048681

Talwandi saboo Pvt ltd Amit Mittal,GM- Power Sales, Strategy & Corporate Affairs,Talwandi Saboo