सत्यमेव जयते

भारत सरकार Government of India

विद्युत मंत्रालय Ministry of Power

उत्तर पूर्वी क्षेत्रीय विद्युत समिति

North Eastern Regional Power Committee

एन ई आर पी सी कॉम्प्लेक्स,डोंग पारमाओ, लापालाङ, शिल्लोंग-७९३००६, मेघालय

NERPC Complex, Dong Parmaw, Lapalang, Shillong - 793006, Meghalaya

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No. NERPC/SE(O)/OCC/2026/1736 - 1778. **Date:**16-09-2026

सेवा में / To,

संलग्न सूची के अनुसार / As per list enclosed.

विषय: 242वीं ऑपरेशन कोऑर्डिनेशन उप-समिति (ओसीसी) की बैठक का एजेंडा-तत्संबंधी।

Subject: Agenda of 242nd Operation Coordination Sub-Committee (OCC) Meeting - reg.

महोदय/महोदया,

कृपया आपकी जानकारी और आवश्यक कार्रवाई के लिए 22 सितंबर 2026 को एनईआरपीसी कॉन्फ्रेंस हॉल, शिलांग में आयोजित होने वाली 242वीं ओसीसी बैठक के एजेंडे के साथ यहां संलग्न देखें। एजेंडा एनईआरपीसी की वेबसाइट **www.nerpc.gov.in** पर भी उपलब्ध है।

Sir/Madam,

Please find enclosed herewith the agenda of the 242nd OCC Meeting to be held at NERPC Conference Hall, Shillong on 22nd September 2026 for your kind information and necessary action. The agenda is also available on the website of NERPC: **www.nerpc.gov.in**.

भवदीय / Yours faithfully,

Encl: As above

डिरेक्टर बाउरी 16/IX/2026

(डी.के. बाउरी/ D.K Bauri)

निदेशक/ Director

परिचालन/ Operation

अभिभावकों की सूची /List of Addressees:

1. Managing Director, AEGCL, Bijuli Bhawan, Guwahati – 781 001
2. Managing Director, APGCL, Bijuli Bhawan, Guwahati – 781 001
3. Managing Director, APDCL, Bijuli Bhawan, Guwahati – 781 001
4. Managing Director, MSPCL, Electricity Complex, Keishampat, Imphal – 795 001
5. Managing Director, MSPDCL, Secure Office Bldg. Complex, South Block, Imphal – 795 001
6. Director (Transmission), MePTCL, Lumjingshai, Short Round Road, Shillong – 793 001
7. Director (Generation), MePGCL, Lumjingshai, Short Round Road, Shillong – 793 001
8. Director (Distribution), MePDCL, Lumjingshai, Short Round Road, Shillong – 793 001
9. Director (Tech.), TSECL, Banamalipur, Agartala -799 001.
10. Director (Generation), TPGCL, Banamalipur, Agartala -799 001.
11. GM (Transmission), TPTL, Bidyut Bhaban, Banamalipur, Agartala -799 001.
12. Chief Engineer (WE Zone), Department of Power, Govt. of Arunachal Pradesh, Itanagar- 791111
13. Chief Engineer (TP&MZ), Department of Power, Govt. of Arunachal Pradesh, Itanagar- 791111
14. Chief Engineer (Commercial) -cum- CEI, DoP, Govt. of Arunachal Pradesh, Itanagar- 791111
15. Engineer-in-Chief, P&E Department, Govt. of Mizoram, Aizawl – 796 001
16. Engineer-in-Chief, Department of Power, Govt. of Nagaland, Kohima – 797 001
17. ED (O&M), NEEPCO Ltd., Brookland Compound, Lower New Colony, Shillong-793003
18. ED (O&M), NHPC, NHPC Office Complex, Sector-33, Faridabad, Haryana-121003
19. Group GM, NTPC, Bongaigoan Thermal Power Project, P.O. Salakati, Kokrajhar- 783369
20. Vice President (Plant), OTPC, Badarghat Complex, Agartala, Tripura – 799014
21. ED, PGCIL/NERTS, Dongtieh-Lower Nongrah, Lapalang, Shillong -793 006
22. AGM (BD), NVVN, Core 5, 3rd floor, Scope Complex, 7 Institutional Area, Lodhi Rd., N. Delhi-3
23. Vice President, PTCIL, 2nd Floor, NBCC Tower, 15, Bhikaji Cama Place, New Delhi – 110066
24. Dy. COO, CTUIL, "Saudamini", 1st Floor, Plot No. 2, Sector-29, Gurugram, Haryana – 122001
25. Chief Engineer, GM Division, Central Electricity Authority, New Delhi – 110066
26. Chief Engineer, NPC Division, Central Electricity Authority, New Delhi – 110066
27. ED, NERLDC, Dongtieh, Lower Nongrah, Lapalang, Shillong -793 006
28. CGM, AEGCL, Bijuli Bhawan, Guwahati – 781001
29. CGM, APGCL, Bijuli Bhawan, Guwahati – 781001
30. CGM, DISCOM, Bijuli Bhawan, Guwahati – 781001
31. Head of SLDC, Dept. of Power, Govt. of Arunachal Pradesh, Itanagar – 791111
32. CGM, (LDC), SLDC Complex, AEGCL, Kahilipara, Guwahati-781 019
33. Head of SLDC, MSPCL, Imphal – 795001
34. Head of SLDC, MePTCL, Lumjingshai, Short Round Road, Shillong – 793 001
35. Head of SLDC, P&E Deptt. Govt. of Mizoram, Aizawl – 796 001
36. Head of SLDC, Dept. of Power, Govt. of Nagaland, Dimapur – 797103
37. Head of SLDC, TSECL, Agartala – 799001
38. Chief Engineer (Elect), Loktak HEP, Vidyut Vihar, Kom Keirap, Manipur- 795124
39. DGM (O&M), OTPC, Badarghat Complex, Agartala, Tripura – 799014
40. Director, NETC, 2C, 3rdFloor, D21Corporate Park, DMRC Building Sector 21, Dwarka, Delhi-77
41. AGM Regulatory & Commercial, NER II TL, 10th Floor, Berger Tower, Noida sector 16B-201301
42. Project Head, NERPSIP/PGCIL, Pub Suraj Nagar, Nutun Bazar, Kahelipara, Guwahati- 781019
43. ED, Comprehensive Scheme (Ar. Pradesh), PGCIL, Tayeng Building, Nitivihar, Itanagar-791111

डी के बाउरी 16/1x/2026

(डी के बाउरी/ D K Bauri)
निदेशक (O) /Director (O)

सत्यमेव जयते

AGENDA FOR

242nd OCC MEETING

Time: 10:30 Hrs.

Date: 22nd September, 2026 (Tuesday)

Venue: NERPC Conference Hall, Shillong

Contents

NORTH EASTERN REGIONAL POWER COMMITTEE

AGENDA FOR 242nd OCC MEETING TO BE HELD ON 22.09.2026 (TUESDAY) AT 10:30 HRS

1. PART-A: CONFIRMATION OF MINUTES

1.1. Confirmation of Minutes of 241st Meeting of OCC Sub-Committee of NERPC

The minutes of 241st meeting of OCC Sub-committee held on 21.08.2026 at NERPC Conference Hall, Shillong were circulated vide letter No. NERPC/SE (O)/OCC/2026/1577-1619 dated 2nd September 2026.

No comments were received from constituents

Sub-committee may confirm the minutes of 241st OCCM

2. PART-B: ITEMS FOR DISCUSSION

2.1. CEA Report on Ramp Rate Compliance Framework and Scheduling Methodology for Coal-Based Thermal Power Plants-NERPC

The Central Electricity Authority (CEA), vide report dated **21.08.2026**, has prepared a report on the **Ramp Rate Compliance Framework and Scheduling Methodology for Coal-Based Thermal Power Plants** in the context of increasing renewable energy integration and the consequent requirement for enhanced operational flexibility of coal-based generating stations.

The report has been prepared based on stakeholder consultations under the Chairmanship of Principal Chief Engineer-II, involving NTPC, GRID-INDIA, BHEL, DVC, RVUNL, Adani Power and other stakeholders. The report examines various aspects related to compliance with prescribed ramp-rate requirements, operation at minimum technical load, scheduling methodology, DSM rate implications, equipment stress and other practical challenges associated with flexible operation of coal-based thermal generating units.

The report consolidates the technical deliberations, key observations and recommendations emerging from the stakeholder consultations and is intended for information, wider dissemination and appropriate consideration by thermal generating companies in their operational planning and future flexibility initiatives.

The CEA Report dated 21.08.2026 is enclosed as **Annexure 2.1** for information and necessary consideration of all thermal generating stations in the NER. The thermal generating stations may examine the provisions and recommendations contained in the report and take appropriate action, as applicable, in their operational planning and flexibility measures.

For information of thermal generating stations of NER only.

2.2. SCADA/EMS Upgradation/Replacement Project under NER ULDC Phase-III – Implementation Timeline and Project Status-NERPC

POWERGRID, vide email dated 09.09.2026, has referred to the implementation timeline of the SCADA/EMS Upgradation/Replacement Project at Regional and State Load Despatch Centres in the North-Eastern Region under NER ULDC Phase-III. POWERGRID informed that the Detailed Project Report (DPR) for the project has been prepared and is presently under approval, while the proposal for PSDF funding is also under consideration for approval by the management.

POWERGRID further highlighted that, as per the Minutes of the 31st TCC Meeting of NERPC, the project implementation period has been mentioned as 24 months, without explicitly clarifying whether the said period includes both pre-award and post-award activities or pertains only to the post-award phase. In this regard, during the Special NERPC Meeting held on 03.07.2026, an implementation schedule of 24 months from the date of award of contract was presented, covering post-award activities such as engineering, FAT, installation and commissioning, SAT, SAVT, parallel operation and issuance of TOC. The pre-award activities, including stakeholder agreement, DPR preparation, submission and approval of the PSDF proposal, tendering and award of contract, were envisaged separately. The detailed project timeline appended to the Minutes of the Special Meeting also indicates the distinction between pre-award and post-award activities.

POWERGRID has also intimated that the project implementation period proposed in the PSDF application format (Format A-1, Point (h)) is 36 months from the date of PSDF fund sanction. The said duration has been considered taking into account the time required for pre-award activities, including DPR/Investment Approval, CE approval, tendering and award of contract, followed by the post-award activities.

Subsequently, NERPC, vide email dated 11.09.2026, requested POWERGRID to furnish the current status of preparation and submission of the DPR to the PSDF Nodal Agency, detailed justification and activity-wise break-up for the proposed 36-month implementation period from the date of PSDF sanction, and the expected project cost for SCADA/EMS Upgradation Phase-III in the NER.

In response, POWERGRID vide mail dated 14/09/2026 has submitted the following information:

1) Status of DPR Preparation and PSDF Proposal submission

The DPR for the subject project has already been prepared and is presently under approval by POWERGRID Management. Simultaneously, the proposal for obtaining financial assistance under the Power System Development Fund (PSDF) is also under consideration for approval by the competent management. Upon receipt of the requisite approvals, the DPR and PSDF application shall be submitted to the PSDF Nodal Agency for further processing (Draft PSDF Application form is attached herewith).

2) Justification and Break-up of Implementation Timeline

The tentative implementation schedule envisages completion of the project within 36 months from the date of PSDF sanction, considering statutory approvals, stakeholder coordination (MoU & Tripartite agreement signing), pre-award activities including DPR/Investment Approval, NIT CE approval, tendering, award of contract, engineering, procurement activities, testing, commissioning, and finally taking over of the complete system.

The break-up of indicative Timeline is as below:

Activity	**Tentative Timeline**	**Duration (in Months)**
Approval of Project by NERPC/TCC	Sep'26	1
DPR approval & Submission of PSDF Proposal	Oct'26	1
MoU/Agreement by all Stakeholders	Nov'26	1
PSDF Approval/Sanction Order	Dec'26	1
Preparation and Floating of NIT	Jan'27	2
Bidding Process and Award of Contract	Aug'27	6
Engineering, Procurement activities, Factory Acceptance Test (FAT), Installation & Commissioning, Site Acceptance Test (SAT), SAVT & Parallel Operation and Taking Over Certificate	Aug'29 (18 months for existing Control Centres and 24 months for New Control Centres)	24
	Total	**36**

The above timeline is same as of NR and ER – SCADA / EMS Upgradation / Replacement Project under ULDC Phase-III which are being executed by POWERGRID.

Justification for the Timeline

i) Formal approval of the project by NERPC/TCC, including endorsement of the complete implementation schedule, is yet to be obtained.

ii) MoU signing for execution of project with all participating SLDCs is expected to require considerable time. Draft agreements were circulated and discussed during the Special NERPC Meeting held on 03.07.2026; however, feedback from all constituents is still awaited.

iii) SCADA/EMS projects involve highly specialized technology with limited availability of qualified vendors. Accordingly, the tendering process is expected to be conducted through a two-stage bidding methodology comprising technical qualification and commercial bidding.

iv) Finalization of technical specifications requires extensive consultations with prospective bidders and GRID-INDIA to ensure compliance with current operational, cyber security, and interoperability requirements.

v) The implementation phase includes detailed engineering, Factory Acceptance Testing (FAT), installation, commissioning, Site Acceptance Testing (SAT), System Availability Tests (SAVT), parallel operation, and final takeover activities. Based on experience from similar projects (i.e. NR & ER ULDC Phase-III) in other regions, this phase is estimated to require approximately 18 months for existing control centres and up to 24 months for new control centres.

3) Expected Project Cost

As per the DPR, the estimated cost of the SCADA/EMS Upgradation/ Replacement Project for the North-Eastern Region is approximately **₹919.67 Crore at March 2026 price level**, inclusive of the cost of a seven (7) year Annual Maintenance Contract (AMC) and excluding IDC (Nil).

The project cost comprises:

i) **₹730.94** Crores towards Supply, Installation, Testing and Commissioning of the SCADA/EMS system and associated infrastructure.

ii) **₹188.73** Crores towards AMC for a period of seven (7) years.

In accordance with the PSDF funding pattern, the proposed PSDF Grant works out to ₹700.39 Crore, comprising 70% of the project cost and 100% of the AMC cost. The balance amount of ₹219.28 Crore shall be funded by POWERGRID through its internal resources/equity contribution.

The above information was submitted for kind consideration and further deliberation in the NERPC forum.

Forum may deliberate.

2.3. Shifting of Fibre optic (SDH-PDH) Panel from its current location to new location-NHPC(Loktak)

During the proposed R&M works of Loktak Power Station, additional panels, which were not present in the earlier installation, are envisaged to be installed in the room currently housing the SDH-PDH panel. In view of the limited space and dimensional constraints of the room, the existing SDH-PDH panel is required to be shifted to another suitable location within the Powerhouse of Loktak Power Station.

In light of the above, PGCIL is requested to kindly take up the shifting of the SDH-PDH panel to a suitable location during the scheduled shutdown period, so as to facilitate the installation of the additional panels as part of the proposed R&M works.

Forum may deliberate.

2.4. Installation of Transmission Line Surge Arrestor [TLSA] in 220 KV System-PGCIL

The North Eastern Region (NER) falls under a high isokeraunic zone and experiences one of the highest lightning incidences in the country. Analysis of tripping data indicates that nearly 70% of line outages and auto-reclosures in NERTS are attributable to lightning-related disturbances. In view of the recurring outages and their adverse impact on system reliability, installation of Transmission Line Surge Arresters (TLSAs) was explored as a mitigation measure.

The matter was deliberated in the 18th, 24th and 26th TCC/RPC meetings, wherein installation of TLSAs on the 132 kV transmission system was recommended and subsequently implemented in a phased manner. Based on the recommendations, NERTS initiated large-scale deployment of TLSAs across identified 132 kV lines vulnerable to lightning.

As on date, TLSA installation has been completed on around 14 transmission lines, while procurement and installation for another 20 lines are under progress and are expected to be completed by April, 2027.

Post-installation performance analysis in 132 kV system indicates a substantial reduction in lightning-related trippings and auto-reclosures on the protected lines. In several lines, lightning-related outages have been completely eliminated, while significant reductions have been observed in the remaining lines.

The observed performance clearly establishes the effectiveness of 100% TLSA coverage in reducing lightning-induced interruptions and enhancing system reliability across the 132 kV network of NERTS.

The performance against tripping and auto reclosure count at those lines due to lightening after installation of TLSAs have significantly reduced as per the given details:

S. N	Name of the Line	FY: 23-24 [Trip+AR]	FY: 24-25 [Trip+AR]	FY: 25-26 [Trip+AR]	FY: 26-27 [Trip+AR]	Remarks
1	132 KV SALAKATI-GELEPHU	0	0	0	0	TLSA installed in 2021
2	132 KV KHANDONG-KHLIEHRIAT II	0	2	1	0	TLSA installed in 2019
3	132 KV KHANDONG-KHLIEHRIAT I	1	3	3	0	TLSA installed in 2022
4	132 KV KHLIEHRIAT-KHLIEHRIAT I	0	0	0	0	TLSA installed in 2024
5	132 KV BADARPUR-KHLIEHRIAT	5	20	2	0	TLSA installed in 2024
6	132 KV JIRIBAM-HAFLONG	8	16	3	1	TLSA installed in 2024
7	132 KV AIZAWL-TIPAIMUKH	20	27	4	2	TLSA installed in 2025-26
8	132 KV AIZAWL-KUMARGHAT	8	8	12	3	TLSA installed in 2026
9	132 KV KOLASIB-AIZAWL	9	11	4	2	TLSA installed in 2026
10	132 KV SILCHAR-BADARPUR I & II	0	6	8	0	TLSA installed in 2025-26
11	132 KV SILCHAR-HAILAKANDI I& II	4	7	0	0	TLSA installed in 2025-26
12	132 KV JIRIBAM-LOKTAK II	4	11	6	0	TLSA installed in 2026
13	132 KV JIRIBAM-TIPAIMUKH	4	5	8	1	TLSA installed in 2026

While substantial benefits have been achieved in the 132 kV network, analysis of outage records for the last three years indicates that several 220 kV transmission lines continue to experience frequent lightning-related trippings and auto-reclosures.

The affected lines have collectively recorded a significant number of lightning-related outages, with the following major contributors:

S. N	Name of the Line	No of Loc	FY: 23-24 [Trip+AR]	FY: 24-25 [Trip+AR]	FY: 25-26 [Trip+AR]	FY: 26-27 [Trip+AR]	TOTAL AR+TRIP in Last 03-years
1	220 KV MARIANI-MOKOKCHUNG I&II TL	161	7	13	3	**3**	**26**
2	220 KV SALAKATI ALIPURDUAR I&II	170	2	5	3	**7**	**17**
3	220 KV MISA-DIMAPUR I & II	382	2	3	3	**3**	**11**
4	220 KV MISA-KOPILI I&II TL	215	1	3	3	**2**	**9**
5	220 KV SALAKATI-BTPS I&II	15	0	2	1	**1**	**4**
6	220 KV BALIPARA-SONABIL-I& II	34	0	1	1	**0**	**2**
7	220 KV MISA-KOPILI III TL	228	0	0	0	**1**	**1**
8	220 KV MISA-SAMAGURI	112	0	1	0	**0**	**1**
9	220 KV Namsai Kathalguri 1&2 TL [Commissioned in June'2025]	221	NA	NA	0	**1**	**1**

Field investigations of recent outages have further confirmed lightning flashovers and surge-related failures as the predominant causes of trippings.

Few tripping instances/photographs are given below:

Loc 425 of 220 kV Salakati Alipurduar-1 dtd 21.04.2026

Loc 468 of 220 kV Salakati BTPS-2 dtd 03.06.2026

Loc 180 of 220 kV Misa Dimapur-1 dtd 29.07.2026

Loc 287 of 220 kV Misa Kopili-1 dtd 22.08.2026

Loc 347 of 220 kV Salakati Alipurduar-2 dtd 17.08.2026

Considering the successful implementation and proven performance of Transmission Line Surge Arresters (TLSAs) in the 132 kV system, the significant reduction in lightning-related trippings and auto-reclosures observed after installation of TLSAs, the high lightning density prevailing across the North Eastern Region, and the criticality of 220 kV transmission corridors in maintaining reliable power transfer and grid security, it is proposed to install TLSAs at 100% locations on the identified 220 kV transmission lines to mitigate lightning-induced outages and enhance overall system reliability.

The financial implication for installation of TLSA at these lines are given below:

S. N	DESCRIPTION	Nos of TLSA	Unit Rate [in ₹]	Total Amount [in ₹]	Remarks
1	Supply & installation of 220 kV TLSA	7992	79768	63.75 Cr	
	TOTAL Amount [in Rs]			**63.75 Cr**	

In view of the above it is proposed for installation of 100% TLSA coverage on all the above 220 kV Transmission Lines in NERTS and accord in-principal approval for execution of the scheme under Additional Capitalization (Add-Cap) works during the Tariff Block 2024-29. The proposal is expected to improve transmission system reliability and significantly reduce lightning-related outages in the North Eastern Region.

Forum may deliberate.

2.4. Persistent High Loading of 132 kV Panyor HEP–Pare HEP Line-NERLDC

High loading of more than 80 MW on the 132 kV Panyor HEP–Pare HEP transmission line is being observed for prolonged durations under normal operating conditions. The situation becomes more prominent when the Panyor HEP machine is scheduled without corresponding scheduling of the Pare HEP machine. It has also been observed that the frequency of requests for emergency shutdowns of the 132 kV Panyor HEP–Pare HEP line has increased. These shutdowns are primarily being sought for the rectification of identified hotspots at Pare substation in the bay equipment associated with the transmission line.

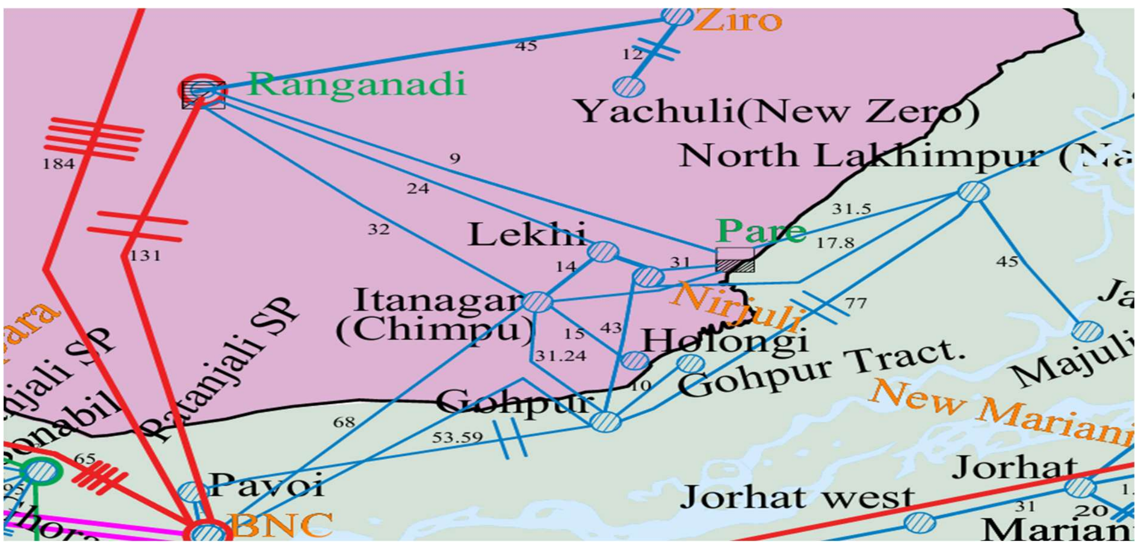


Figure-1: Power map of Panyor and Pare HEP connectivity

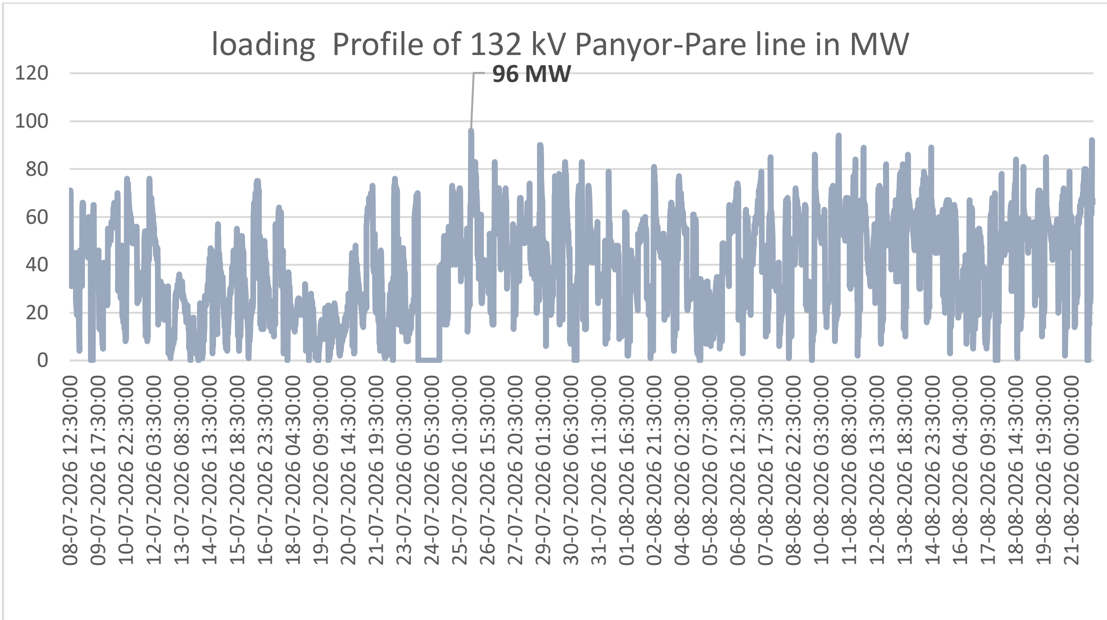


Figure-2: Loading profile of the 132 kV Panyor HEP–Pare HEP line

At present, the situation is being managed by opening the 132 kV Pare HEP–North Lakhimpur transmission line. This has become a regular operational practice during the months of July and August 2027.

Element Name	Reason for ESD	Date	Start time	End time
132 kV Panyor-Pare Line	Hotspot observed in the R phase of CB towards line side connector pad connected to the 132 kV RHEP line.	21-08-2026	17:41:00	18:57:00
	Hot spot in line isolator	17-08-2026	17:37:00	20:13:00
	Hotspot observed in the Y & B phases of the Bus-1 isolator (At Pare end)	30-07-2026	10:19:00	13:12:00
	Hot- spot on R phase	09-07-2026	10:23:00	12:35:00

Table:1 ESD taken for 132 kV Panyor-Pare Line

S. No.	Line	Reason	Date	Time
1	132kV Pare - North Lakhimpur	Line was opened to avoid overloading of 132kV Panyor-Pare line	08-09-2026	14:37:00
2			30-08-2026	11:12:00
3			29-08-2026	13:14:00
4			28-08-2026	11:37:00
5			27-08-2026	12:04:00
6			26-08-2026	13:32:00
7			25-08-2026	16:26:00
8			23-08-2026	21:25:00
9			22-08-2026	21:46:00
10			21-08-2026	22:18:00
11			20-08-2026	23:04:00
12			19-08-2026	22:36:00
13			18-08-2026	23:10:00
14			18-08-2026	15:19:00
15			18-08-2026	00:18:00
16			16-08-2026	23:43:00
17			15-08-2026	22:04:00
18			14-08-2026	22:48:00
19			13-08-2026	22:38:00
20			13-08-2026	00:11:00
21			12-08-2026	00:17:00
22			10-08-2026	22:21:00
23			07-08-2026	23:36:00
24			06-08-2026	11:36:00
25			31-07-2026	22:36:00
26			26-07-2026	23:46:00
27			25-07-2026	23:15:00

Table:2 Opening of line detail to control the loading of 132 kV Panyor -Pare line

Since frequent opening of a transmission line is not a healthy operational practice, strengthening of the 132 kV Panyor HEP–Pare HEP transmission line may be taken up by DoP, Arunachal Pradesh, to address the issue on a long-term basis.

Additionally, Pare HEP is requested to thoroughly inspect and check the associated bay equipment to identify and rectify any possible deficiencies, thereby minimizing the emergency shutdowns and ensuring reliable operation of the transmission line.

Forum may deliberate.

2.5. Repeated Tripping of Subansiri Lower HEP Unit-1 & Unit-3-NERLDC

The tripping of Subansiri Lower HEP Unit-1 and Unit-3 was observed on two occasions during September 2026, as detailed below:

Element	Tripping Date	Outage Time	Revival Time	Outage Hour (HH:MM)	Reason
Subansiri Lower HEP – Unit 1	02/Sep/2026	18:23	19:26	01:03	Governor OPU oil sump level too low
Subansiri Lower HEP – Unit 3	02/Sep/2026	18:24	19:05	00:41	Failure of auxiliary power
Subansiri Lower HEP – Unit 1	08/Sep/2026	16:23	17:04	00:41	Shaft seal pressure too low
Subansiri Lower HEP – Unit 3	08/Sep/2026	16:24	17:40	01:16	Failure of auxiliary power

It may be observed that, on both occasions, Unit-3, which was otherwise healthy, remained unavailable due to failure of the common auxiliary power supply associated with Unit-1.

Any delay in restoration of the generating unit is critical in view of the prevailing high-demand scenario across India and the NER. The demand is trending high, partly due to the prevailing El Niño conditions, while beneficiaries are facing difficulty in arranging replacement power at short notice.

The following action points are requested from NHPC:

1. Restore/replace the UAT for Unit-3 at the earliest possible.
2. Until commissioning of the dedicated UAT for Unit-3, NHPC is requested to explore suitable arrangements for early revival of Unit-3 whenever it trips along with Unit-1 due to auxiliary supply failure. The healthy Unit-3

may preferably be revived at the earliest using the available State HT supply or DG supply, and thereafter its auxiliary supply may be shifted back to the normal source once Unit-1 is successfully revived.

Forum may deliberate.

2.6. Restoration of 132 kV AgGBPS–Agartala Line-I-NERLDC

The 132 kV AgGBPS–Agartala Line-I was taken under shutdown on 27 June 2026 on an emergency basis for rectification of SF_6 gas leakage observed in the 145kV, 50 Hz, 2000 A spring-operated SF_6 circuit breaker at the 132 kV AgGBPS substation.

The study suggests that, in the event of an outage of the 132 kV AgGBPS–Agartala Line-II, approximately 40% of the loading of this link would be shifted towards the 400/132 kV SM Nagar (ISTS) side. Thus, the 132 kV AgGBPS–Agartala Line-I provides vital connectivity to the Tripura power system, and its prolonged unavailability may affect the reliability and operational flexibility of the system.

In view of the above, the AgGBPS/NEEPCO team is requested to apprise the forum of the expected restoration schedule and take necessary action to restore the line at the earliest.

Forum may deliberate

2.7. Persistent Peak Hour Power Shortfall in Manipur -NERLDC

Power shortfall is being declared by the State of Manipur almost on regular basis. In this regard, NERLDC has issued letters to Manipur SLDC on 14.08.2026 & 10.09.2026. Details of shortfall declared by the State during the first nine days of September 2026 are tabulated below.

September	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**
Shortfall (MW)									
17:00 Hrs		NIL				NIL		24	20

18:00 Hrs	50		49	20	53.91		70	68	40
19:00 Hrs	40		58	40	43.36		65	93	50
20:00 Hrs	30		45	35	28.16		55	40	40
21:00 Hrs	20		17	30			50	26	30
22:00 Hrs			9	20			40	17	30
Shortage Energy (MU)	0.16		0.18	0.15	0.13		0.28	0.27	0.21

The anticipated resource gap in the State of Manipur during the month of September 2026 was also highlighted by NERLDC during the 241st OCC Meeting held on 21.08.2026. Further, the Week-Ahead and Day-Ahead Resource Adequacy (RA) assessments are also shared with SLDCs, wherein anticipated resource gap in Manipur during peak hours is indicated.

It has been further observed that the State of Manipur is substantially dependent on the Real-Time Market (RTM) for meeting its power requirement during peak hours. As it is observed that due to high demand of power during peak hours, clearance of the entire buy bid volume is not assured in RTM, thereby posing a risk of resource gap during peak hours.

In view of the above, Manipur is requested to take necessary measures and explore avenues like DAM, GDAM etc. for maintaining resource adequacy so as to avoid any power shortages.

Forum may deliberate.

2.8. Violation of TTC/ATC by Assam and Tripura Power system- NERLDC

Continuous violations of the TTC/ATC limits of the Assam and Tripura power systems are being observed. These violations are primarily due to the persistent delay in the commissioning of approved projects.

In the Assam power system, excessive drawal of around 533 MW beyond the TTC limit was observed during August 2026, resulting in undue stress on the 220 kV BTPS-Salakati DC, 220 kV Agia–BTPS D/C, 220 kV Balipara–

Sonabil D/C, and 220 kV Misa–Samaguri D/C transmission corridors. The outage of any one of these transmission circuits may result in cascading tripping, thereby jeopardizing the security of the Assam power system. Study suggests that the early commissioning of the 400/220 kV Sonapur, 400/220 kV Rangia, and 220/132 kV Agomoni (Gossaigaon) substations, along with the associated downstream network developments, would enhance the drawl capability of the Assam power system.

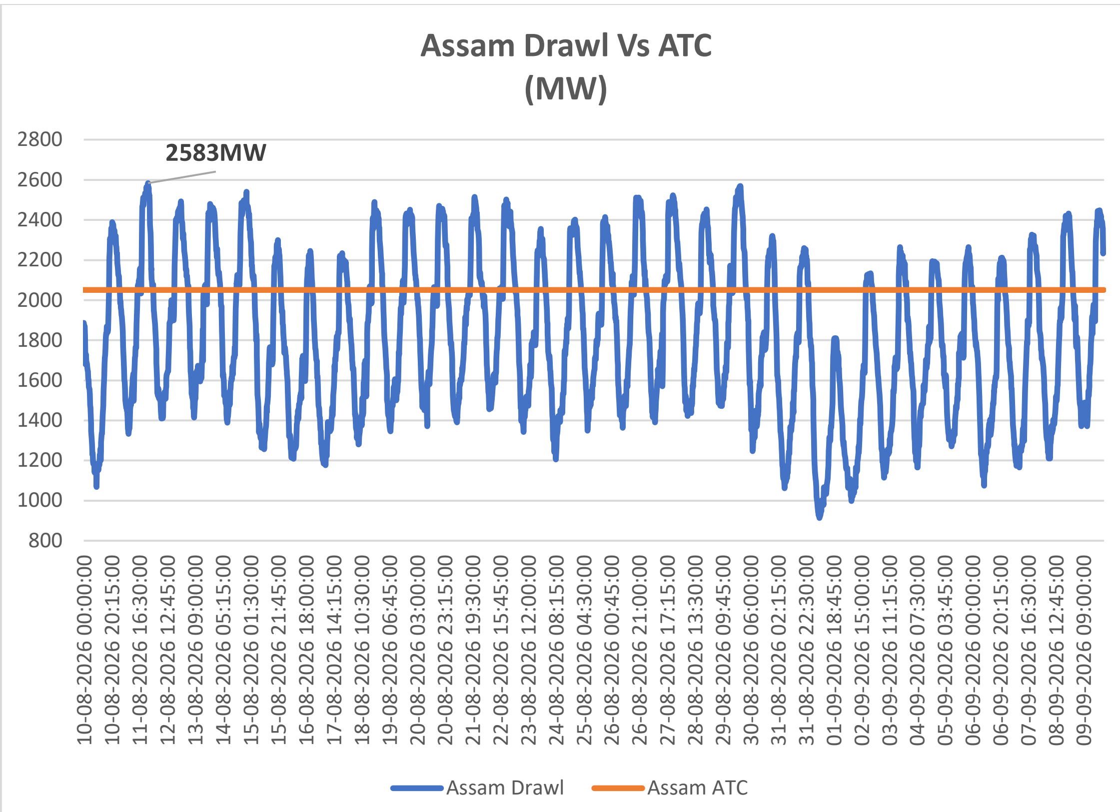


Figure-3: Assam drawl vs ATC for the month July 2026

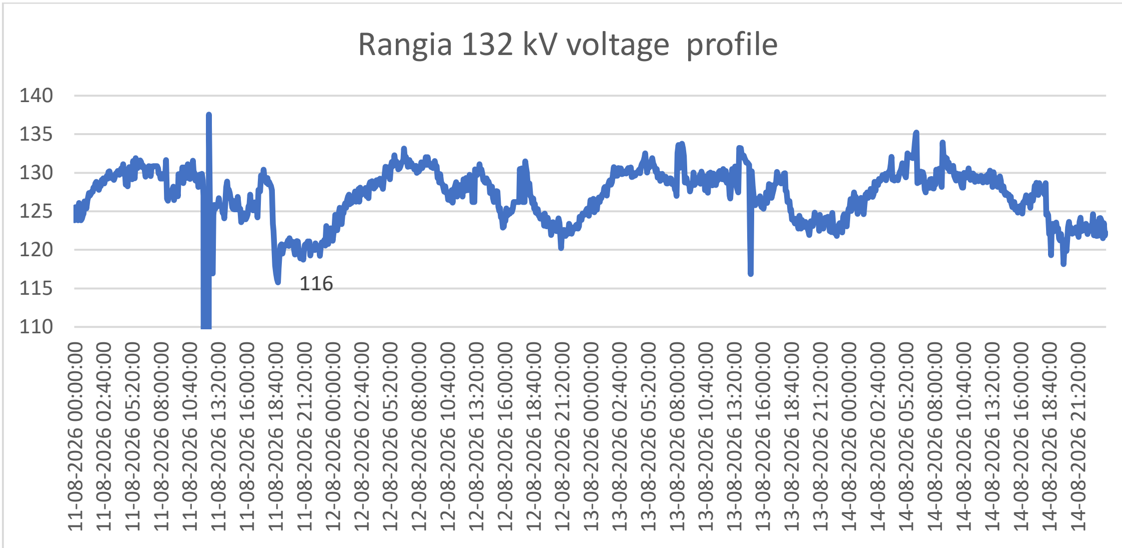


Figure-4: Voltage profile of 132 kV Rangia Bus

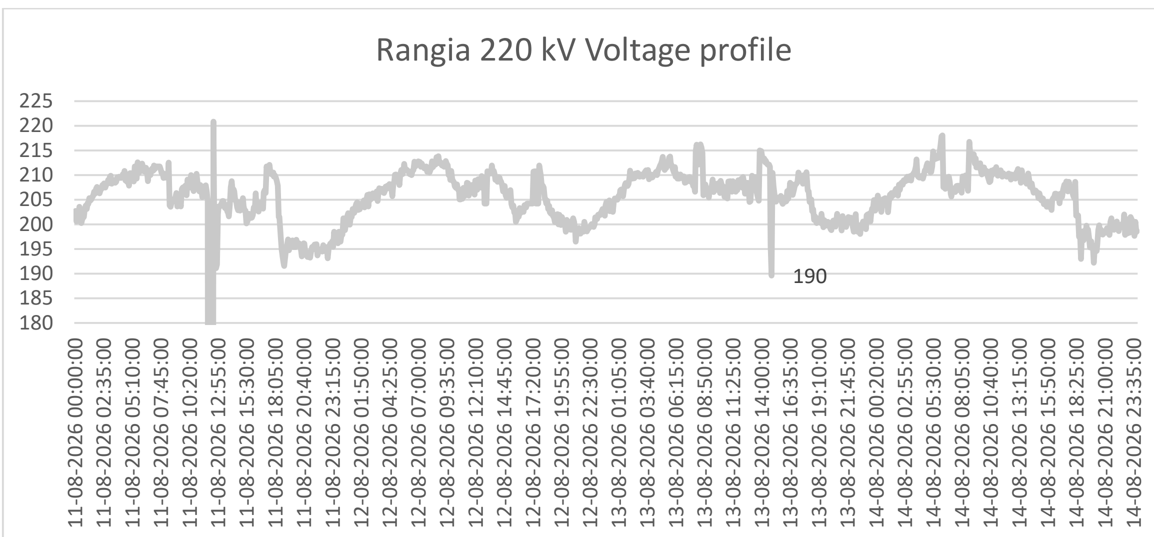


Figure-5: Voltage profile of 220kV Rangia Bus

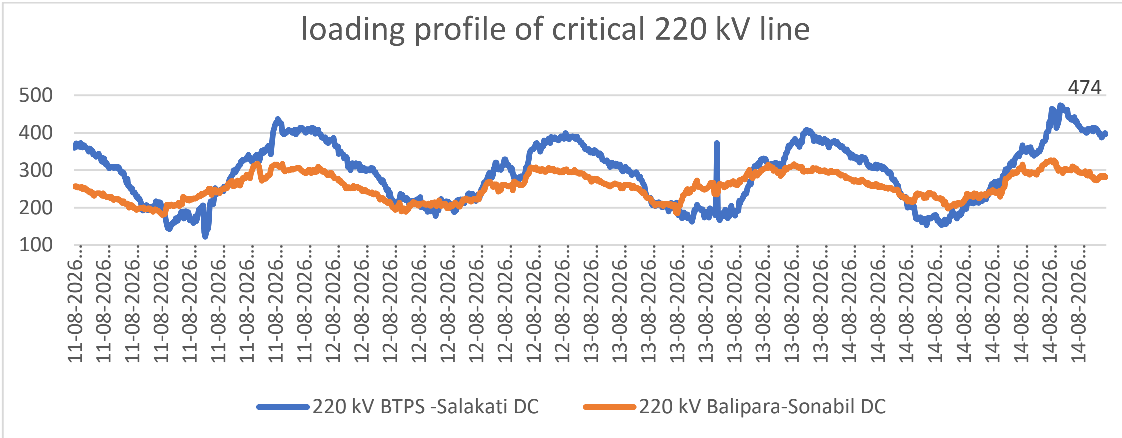


Figure-6: loading profile of critical 220 kV Balipara-Sonabil DC and 220 kV Salakati-BTPS DC

Similarly, in the Tripura power system, although ATC has increased from the earlier value of 312 MW to 420 MW following the completion of reconductoring works on the 132 kV SM Nagar (ISTS)–SM Nagar line, 132 kV SM Nagar (ISTS)–Budhjungnagar–SM Nagar link, and 132 kV PK Bari (ISTS)–PK Bari line, the actual drawl continues to exceed the TTC limit. Early completion of the reconductoring work on the 132 kV PK Bari (ISTS)–Manu–Ambassa link transmission lines would further enhance the drawl capability of the Tripura power system. In addition, increased generation from the Rokhia and Baramura generating stations is expected to alleviate the existing constraints in the Tripura power system.

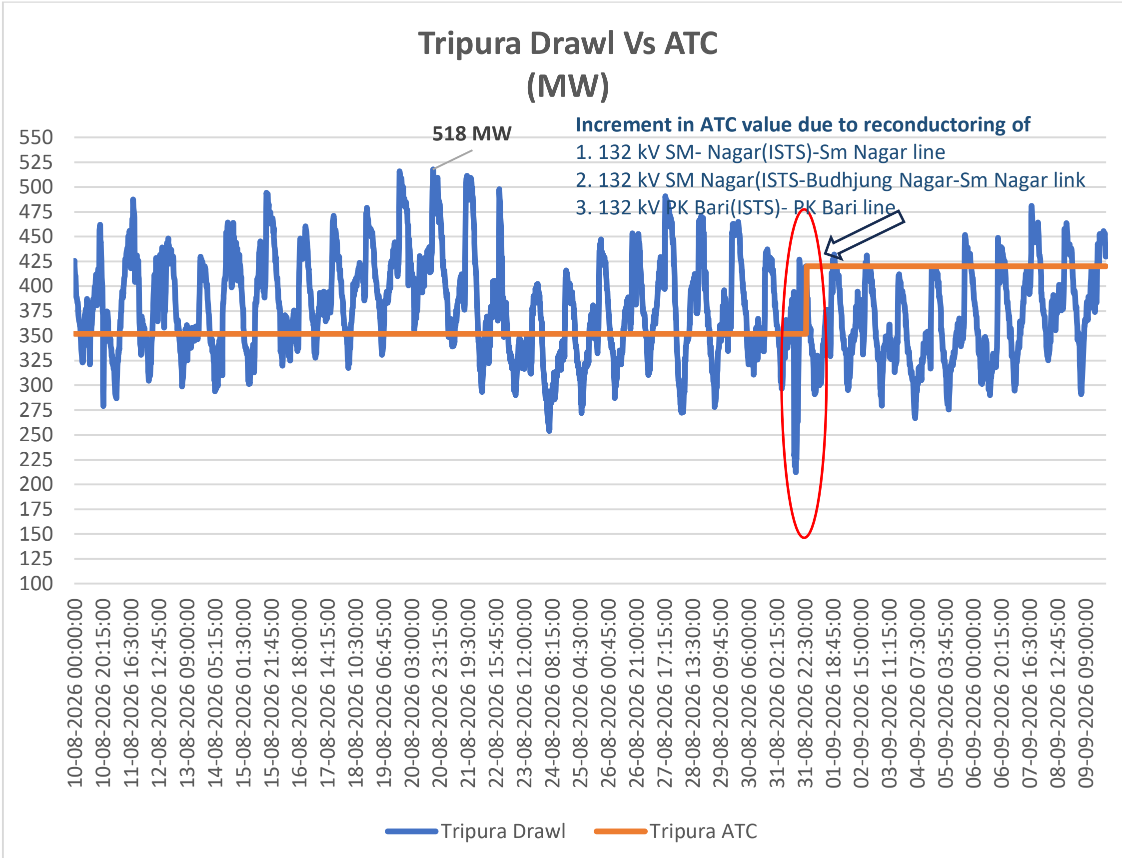


Figure-7: Tripura drawl vs ATC for the month July 2026

AEGCL and TSECl are requested to take all necessary measures to improve the drawl capability of their respective power systems by ensuring the timely implementation and commissioning of the approved projects.

Forum may deliberate.

2.9. Enhancement of GNA to 400 MW w.e.f. 1st September 2026: Tripura

The General Network Access (GNA) of Tripura has been enhanced to 400 MW w.e.f. 1st September 2026. However, it has been observed that the full quantum of scheduled power is not being reflected in real time on certain occasions due to generation loss/shortfall.

This is adversely affecting the availability of power to the State and is also resulting in financial implications due to the requirement of procuring additional power from the market.

Therefore, the matter may kindly be examined with regard to:

- Availability of the full GNA quantum in real time.
- Reasons for shortfall in scheduled power due to generation loss.
- Alternative arrangements for ensuring availability of the approved GNA quantum.
- Financial implications arising from such shortfall and the mechanism for mitigation.

CTU & NERLDC may update.

2.10. Interim arrangement for power supply to Rengpang area during complete Shutdown of Loktak

Background:

In the special meeting held on 05.08.2026 under the chairmanship of Member Secretary, NERPC, it was decided that, during the complete shutdown of Loktak, power supply to Rengpang Sub-Station may be maintained through an interim arrangement by temporarily connecting the 132 kV Rengpang line of MSPCL and the 132 kV Imphal-2 line of POWERGRID at the first tower located outside the 132 kV Loktak Switchyard.

Accordingly, vide letter dated 24.08.2026, NERPC constituted a committee comprising representatives of NERPC, NERLDC, NHPC, MSPCL and POWERGRID to conduct a physical inspection and finalize all technical aspects of the interim arrangement, including system configuration, protection coordination, operational clearances and associated safety requirements.

A joint site survey was conducted on 09.09.2026 for finalization of the interim power supply arrangement to the Rengpang area.

During the site survey, it was observed that the phase positions of the Loktak–Rengpang line and the Loktak–Imphal-2 line are different. Therefore, in case the 132 kV Rengpang line is connected with the 132 kV Imphal-2-

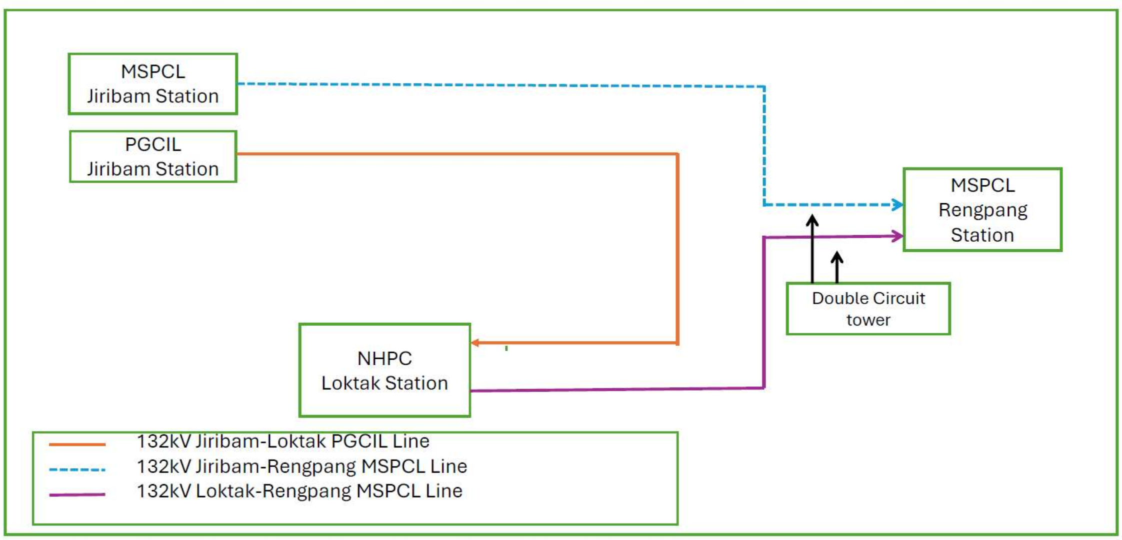
line, interchange of phase connections through jumpering at either Rengpang Sub-Station or Imphal Sub-Station may be required.

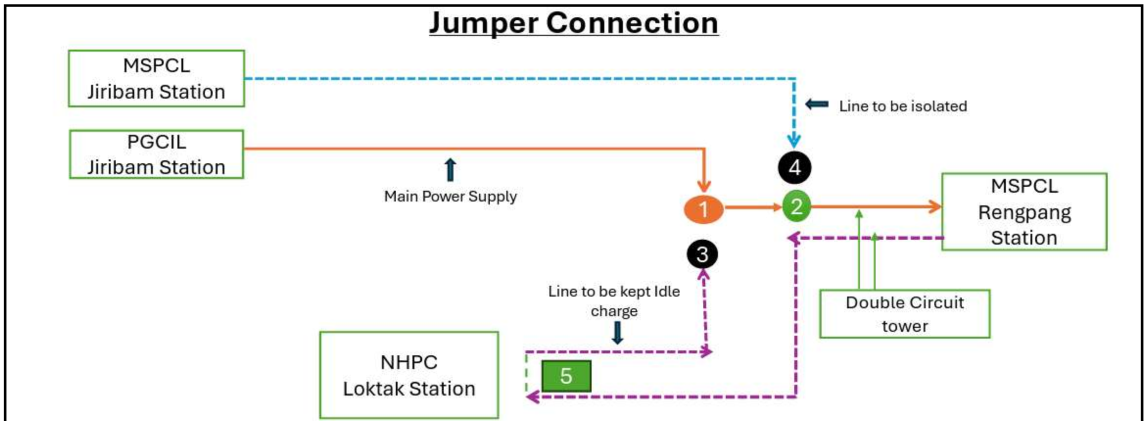
It was further observed that the phase positions of the Loktak–Rengpang line and the Loktak–Jiribam line are the same. However, the relatively longer line length associated with the Jiribam line option was also considered. NERLDC informed that, based on the system studies carried out, there is no system-related issue with the proposed arrangement.

During the subsequent discussion through VC, all concerned agreed to proceed with the Jiribam line option, as the additional line length was not considered significant from the technical point of view.

MSPCL proposed that the interconnection/jumpering arrangement may be carried out near Rengpang Sub-Station.

Subsequently, MSPCL, vide email dated 11.09.2026, submitted the following detailed proposal for the proposed arrangement.





1	1 2	**Jumper to be connected between Point 1 (Jiribam–PGCIL Line) and Point 2 (Jiribam–MSPCL Line) at Rengpang, which are approximately 20 metres apart.**
2	3 4	3) Jumper to be isolated for Loktak – Jiribam line. 4) jumper to be isolated for remaining portion of Jiribam-Rengpang line
3	5	Jumper to be connected at Loktak end (NHPC) so that idle charging of portion Rengpang-NHPC-Jiribam (PG) from Rengpang end (*Anti theft measures)*
4	2	From Point 2, a double-circuit MSPCL line extends towards Rengpang Sub-Station, comprising the Jiribam–Rengpang and Loktak–Rengpang circuits. The double-circuit line is approximately 3.5 km long from Rengpang Sub-Station and consists of 13 transmission towers.

- The proposed jumpering arrangement is at Rengpang, where Point-1 is on the 132 kV Jiribam–Loktak PGCIL Line and Point-2 is on the 132 kV Jiribam–Rengpang MSPCL Line. The two points are located approximately 20 metres apart.
- There is a gantry arrangement on the MSPCL side, associated with both the 132 kV Jiribam–Rengpang Line and the 132 kV Loktak–Rengpang Line. From this gantry portion onwards, there is a double-circuit section located approximately 3.5 km from Rengpang Sub-Station, comprising 13 transmission towers.The 13 double-circuit towers carry both MSPCL 132 kV transmission lines, namely:
  132 kV Jiribam–Rengpang Line,
  and 132 kV Loktak–Rengpang Line.
- Jumpering is to be done from the 132 kV Jiribam–Loktak PGCIL Line to the 132 kV Jiribam–Rengpang MSPCL Line. The jumpers of both the Jiribam–Loktak PGCIL Line and Jiribam–Rengpang MSPCL Line shall be isolated near the proposed jumpering point.
  The jumper is also to be connected near the NHPC end for both the 132 kV Jiribam–Loktak PGCIL Line and the 132 kV Loktak–Rengpang Line, so that the line can be kept idle and charged from Rengpang Sub-Station. Whenever

tripping occurs on the said line, the fault can be identified and localized from Rengpang Sub-Station.

- This arrangement would be a better and more reliable option, as it is expected to minimize frequent faults and reduce the difficulties associated with jungle clearance and line patrolling along the Loktak side. At present, there are red-zone areas along the Loktak side, where considerable difficulty is faced in engaging local people for jungle clearance and maintenance activities due to restrictions and sensitivities involving both the Naga and Kuki communities. Furthermore, the other workers are also reluctant to enter the border areas. Therefore, utilizing the proposed interconnection at Rengpang would provide a more practical and reliable alternative.

Members may deliberate.

2.11. Regarding non-submission of Demand forecast and Resource Adequacy (RA) data as per IEGC 2023-NERLDC

IEGC 2023 mandated that each SLDC and such other entities (like bulk consumers) which are directly connected to ISTS will carry out the demand estimation for both active and reactive power (as per clause 31.2(a), 31.2(b), 31.2(f)) along with the generation capacity availability (as per clause 31.4(b)) for meeting the projected demand and submit the same to respective RLDC for regional level forecast by method of aggregation, each RLDC would further furnish the regional level as well as state level forecast data to NLDC for computation for all India level demand and generation estimation (as per clause 31.2(g)).

The timeline for submitting these data to RLDC/NLDC would be as given in Table-I (as per IEGC clause 31.2(h)).

Table-I: Timeline for Demand Estimation

Daily demand estimation	10:00 hours of previous day
Weekly demand estimation (Monday to Sunday)	First working day of previous week

Monthly demand estimation	Fifth day of previous month
Yearly demand estimation	30th September of the previous year

The status of submission of Demand estimation and RA data for the month of August 2026 is shown in the table below:

	Day-Ahead Demand Forecast *	Week Ahead Demand Forecast (Aug 2026)					Month Ahead Demand Forecast		Year Ahead Demand Forecast for 2026-27
		Week 1	Week 2	Week 3	Week 4	Week 5	Aug-26	Sep-26	
Arunachal Pradesh									
Assam									
Manipur									
Meghalaya									
Mizoram									
Nagaland									
Tripura									

*Through RA portal

Not in prescribed format	Data not submitted	Data Submitted	Irregular

To facilitate effective operational planning, forecast and Resource adequacy data is essential. Hence, all SLDCs are requested to submit the required forecast data as per formats mentioned in NER operating Procedure 2025 and IEGC timeline mentioned above regularly.

Further as per the Report of honourable Member (Technical), CERC in order on Suo-motu petition No. 09/SM/2024, the issues of non-submission of resource adequacy data including demand estimation and generation data by the states to be deliberated.

Forum may deliberate.

2.12. Operational Planning and Resource Adequacy for October 2026-NERLDC

The Operational Planning and Resource Adequacy assessment for October 2026 is attached for review and comments.

- All utilities are requested to review the assessment and provide any necessary inputs or observations.
- Kindly share your feedback at the earliest to ensure comprehensive planning.

NERLDC may present.

2.13. Submission of Year ahead Resource Adequacy Data for FY. 2027-28-NERLDC

As per clause 3.2 of Section 3 of CEA, Guidelines for Resource Adequacy Planning Framework for India- June 2023:

"NLDC shall annually publish a one-year look-ahead Short-term National Resource Adequacy Plan (ST-NRAP) which shall include parameters such as demand forecasts, resource availability based on under-construction status of new projects, planned maintenance schedules of existing stations, station-wise historic forced outage rates and decommissioning plans."

Further, as per Regulation 5.3 (d) of CERC India Electricity Grid Code Regulations, 2023, the concerned entities shall furnish the required data to NLDC every year for carrying out a national level simulation for generation resource adequacy of states.

Accordingly, timely furnishing of data by all concerned entities is essential for preparation of the national level adequacy plan.

As per the “Procedure for Resource Adequacy and Operational Planning” (Annexure 3.1 of Operating Procedures of North-Eastern Region -July 2026), the data for year ahead operational planning is to be submitted by following entities:

- STUs/SLDCs or such other agency as may be designated by the State Commission
- Interstate Transmission Licensees
- Regional Entity Generating Stations and ISTS Connected Bulk Consumers

In view of the above, it is requested to ensure timely furnishing of the data sets as mentioned in the table below:

Sl. No.	Data to be furnished	Format	Responsible entities
1	Electricity Demand Data	RA-1	STU/SLDC
2	Reserve Requirement	RA-2	STU/SLDC
3	Tie-Line Details	RA-3	STU/SLDC, ISTS
4	Transfer Capability	RA-4	STU/SLDC
5	Generation Data	RA-5	STU/SLDC, ISGS

Data submission should be as per formats indicated in table above and as mentioned letter from CGM(SO), NERLDC vide ref. no NERLDC/SO/SO-I/9778 date 11th September 2026. For ready reference the excel formats in which data to be submitted in Annexure 1.

Please ensure submission of all the data by 30th September 2026 to NERLDC so that timely validation of data can be done and forwarded it to NLDC for national resource adequacy assessment for the FY 2027-28.

Forum may deliberate.

2.14. Preparation of Annual Outage Plan and LGBR 2027-28- NERPC

As per Grid Code 2023, Annual outage plan of grid elements under regional control area and identified elements of State control areas under sub-clause (b) of clause (2) of Regulation 29 of these regulations, shall be prepared in advance for the financial year by the RPCs in consultation with the users, respective SLDCs, RLDCs and NLDC and reviewed before every quarter and every month.

(b) Annual outage plan shall be prepared in such a manner as to minimize the overall downtime, particularly where multiple entities are involved in the outage of any grid element(s).

(c) The outage plan of hydro generation plants, REGS and ESS and its associated evacuation network shall be prepared with a view to extracting maximum generation from these sources.

Example: Outage of wind generator may be planned during lean wind season. Outage of solar generator, if required, may be planned during the rainy season. Outage of hydro generator may be planned during the lean water season.

The timeline for Outage Planning Process shall be as follows

Activity	**Agency**	**Cut-off date**
Submission of proposed outage plan for the next financial year to RPC with the earliest start date and latest finishing date	STUs, transmission licensees, generating stations and other entities directly connected to ISTS	31st October
Submission of LGBR of the control area to RPC for both peak and off-peak scenarios	SLDC	31st October
Publishing draft LGBR and draft outage plan of regional grid for next financial year on the concerned RPC"s website for inviting suggestions, comments, objections of stakeholders.	RPC	30th November

Publishing final LGBR and final outage plan of regional grid for next financial year on the concerned RPC"s website	RPC	31st December

For preparation of the Load Generation Balance Report (LGBR) for FY 2027-28, NERPC had sought the proposed planned shutdown schedule of generating units from all NER States and Central Generating Stations. The shutdown schedules furnished by the respective utilities are compiled and enclosed as **Annexure 2.14**.

In order to finalize the proposed shutdown schedule for consideration in the LGBR 2027-28, all NER States are requested to review the shutdowns pertaining to the generating stations in their respective areas, particularly with regard to the proposed dates and likely availability of power during the shutdown period.

The States may raise any concern regarding the proposed shutdown dates, wherever required, so that necessary changes in the schedule may be considered in consultation with the concerned generating stations. This exercise is intended to ensure that the States are adequately prepared to arrange alternate power to meet the anticipated demand during the planned shutdown period and to minimize the possibility of subsequent shifting/deferment of shutdown dates due to system requirements.

The matter is placed before the OCC forum for review and deliberation, and the concerned States and generating stations are requested to communicate any specific concern regarding the proposed shutdown schedule for further consideration and finalization of the LGBR 2027-28.

Forum may deliberate.

2.15. Outage planning-NERPC

Outage Planning of Generation/Transmission elements

As per the Outage planning procedure of NER the planned outages approved in the OCC forum has to be reconfirmed by the availing utilities on

10:00hrs. of D-4 to 12:00 hrs. of D-3) to NERLDC in order to either avail the approved shutdown or cancel it.

If an outage is to be availed on say 10th of the month, the shutdown availing agency would reconfirm to NERLDC between 10 hrs. of 6th of the month to 1200 hrs. of 7th of the month. This practice is necessary to ensure optimal capacity utilization and the time required for associated system study/coordination by/amongst RLDC/NLDC.

Utilities have submitted the shutdown proposals for the month of October 2026 for discussion in OCC shutdown discussion meeting.

The SD Meeting for deliberating the Shutdowns proposals is scheduled on 16.09.2026 through online mode.

NERLDC may present the shutdowns that needed further discussion in the forum.

2.16. Collection and verification of RMS and EMT Model Data of RE Plants at Intra-State Level-NERLDC

At present, Assam has approximately 269 MW and Mizoram has 22 MW (Total-296 MW) of Renewable Energy (RE) generation capacity connected at the grid level, with several additional applications are under consideration for FTC.

Validation of the RMS and EMT models of RE plants is a critical part of the FTC procedure and is essential for ensuring reliable and secure grid operation. Therefore, proper validation and verification of the submitted models at the intra-state level may be ensured by the respective SLDCs. List of studies/tests to be conducted by re generators/parks in process of submission of final technical connection data for demonstrating compliance with CEA technical standards for connectivity to the grid is attached in **Annexure 2.16**.

Forum may deliberate.

2.17. Frequent Grid disturbances in Rangia areas of Assam during June–August 2026-NERLDC

Rangia, Amingaon, Kamalpur, Sipajhar, Tangla, Nalbari and Nathkuchi areas of the Assam Power System are primarily connected to the rest of the NER Grid through the 220 kV BTPS–Rangia D/C transmission corridor.

Rangia also has international connectivity with Bhutan through the 132 kV Rangia–Motonga line.

During June–August 2026, seven (7) nos, Category-I Grid Disturbances had occurred in these areas, including five (5) events within the short period from 11th to 27th August 2026 alone, posing a serious threat to the reliability of power supply to Rangia and the downstream areas.

The key observations are as follows:

1. Four (4) disturbances in August'26 occurred when one circuit of the 220 kV BTPS–Rangia D/C line was under shutdown, followed by the tripping of the other circuit.
2. On 18th August 2026, two (2) Grid Disturbances occurred following the tripping of Circuit-II while Circuit-I was under shutdown, resulting in a load loss of approximately 110–140 MW.
3. On 27th August 2026, the SPS not initiated during the line fault, resulting in the disturbance extending to 132 kV Rangia (Old) Substation and affecting multiple stations in the Bhutan Power System.

The frequent disturbances were also communicated to AEGCL vide NERLDC Letter No. NERLDC/SO/2026/9768 dated 07th September 2026.

AEGCL is requested to urgently identify the root cause and implement necessary corrective measures to prevent tripping of one circuit during the outage/shutdown of the other circuit, as such tripping is highly undesirable, and to ensure reliable operation and prevent recurrence of frequent Grid Disturbances in Rangia and radially fed areas of the Assam Power System.

Forum may deliberate.

2.18. Grid Incident at Surajmaninagar (TPTL) substation on 31st August 2026-NERLDC

At 14:52 hrs, all the transmission lines emanating from 132 kV Surajmaninagar (TPTL) Bus-I, Bus-II, ICTs and Bus Coupler except the 132 kV Surajmaninagar (TPTL) - Budhjungnagar line, tripped resulting into the load loss at Surajmaninagar (TPTL) and radially fed Comilla area of Bangladesh.

- Load in Surajmaninagar area of Tripura: 24 MW &
- Load in Comilla area of Bangladesh: 140 MW.

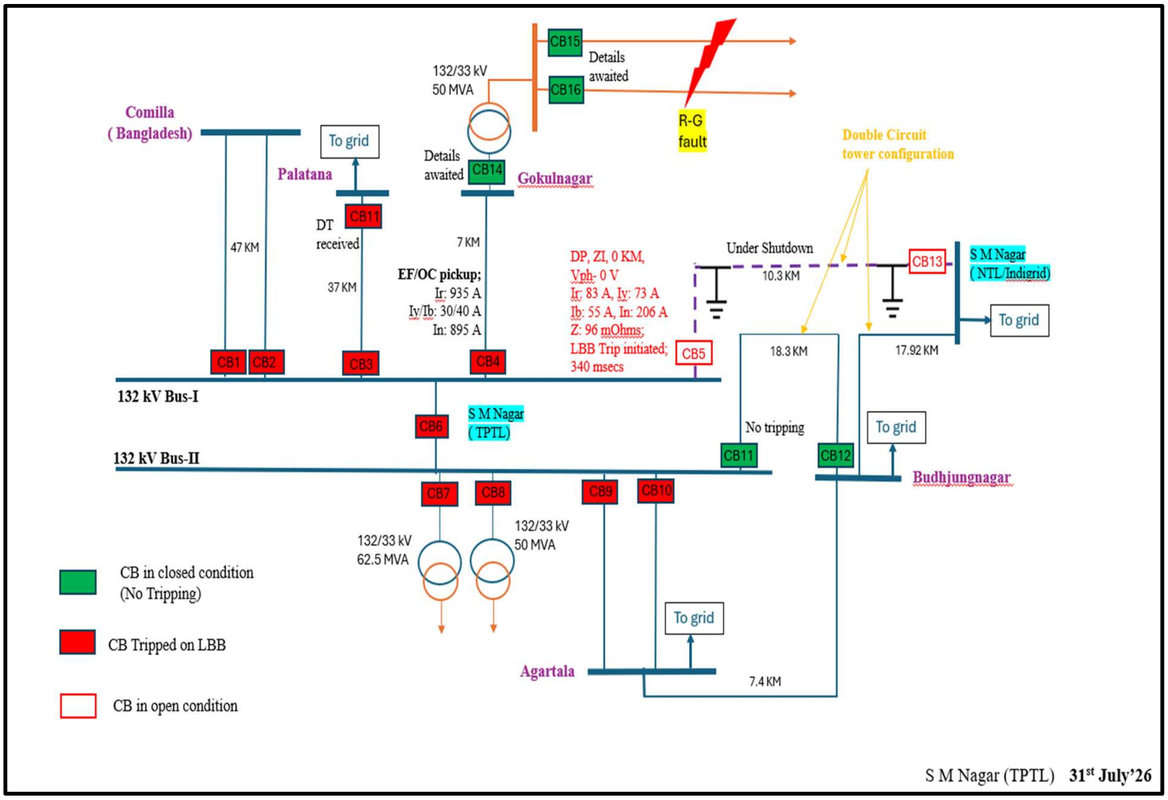
Power was extended to 132kV Surajmaninagar (TPTL) by charging 132 kV Agartala–Surajmaninagar D/C at 16:05 hrs of 31-08-2026 and load restored at Surajmaninagar (TPTL) by charging the Transformers at 16:08 Hrs.

Additionally, supply extended to Comilla area of Bangladesh by charging 132 kV Surajmaninagar (TPTL) –Comilla 2 line at 18:03 hrs of 31-08-2026.

The Sequence of the events-

1. At 14:52 Hrs, TPTL end of the Surajmaninagar (NTL) line under shutdown (CB5), detected the 3-phase current due to mutual coupling during the high current flowing in the other ckt of the DC tower and issued ZI tripping command.
2. As the CB5 was under open condition but there was current in each phase & neutral, the LBB relay seems the condition as Breaker Fail (CB5) and issued LBB tripping command to all the element present in the Bus.
3. All the elements of Bus 1 & Bus 2 tripped on LBB protection.

4. As per PMU R-phase fault (20 kV dip) observed in the 400 kV Surajmaninagar (NTL) for 400 kV Surajmaninagar (NTL) – Palatana Line indicates the fault in the system close to the Surajmaninagar area. Also, TPTL confirmed the fault in 33 kV line outgoing from 132 kV Gokulnagar SS around the same time.



<u>**Action Points for TPTL:**</u>

1. The fault at 33 kV should be isolated by the 33 kV line CB or the HV side of the 50 MVA transformer at Gokulnagar substation to avoid trippings at upstream. TPTL to ensure the healthiness of protection system at Gokulnagar.
2. Absence of mutual compensation wiring between the Main relay of SM Nagar (TPTL) end of S M Nagar (NTL) and Budhjungnagar lines causes ZI operation at SM Nagar (TPTL) end of the 132 kV Surajmaninagar (TPTL)– Surajmaninagar (NTL) line. The mutual compensation wiring may be explored for the DC tower.

3. The LBB initiation may be reviewed and ensure the settings in line with the NER Protection Philosophy.The LBB protection should not have picked up based solely on the maximum fault current of approximately 83 A observed in the R-phase.
4. Implement Bus Bar Protection at Surajmaninagar (TPTL) at the earliest.
5. Review the connection to CB11 for LBB protection. CB11 did not trip during the LBB operation, resulting in the line remaining in an idle-charged condition along with Bus-II from Budhjungnagar Substation.
6. Time drift observed in the multiple DRs at S M Nagar SS. All the relays should be time synchronised for proper analysis of the trippings.
7. Submit Detailed Report of the grid event as mandated in the IEGC'26.

Forum may deliberate.

PART-C: ITEMS FOR UPDATE/FOLLOW-UP

3.1. Automatic Generation Control (AGC) in NER-NERLDC

As discussed in the 33rd NETeST Meeting held in Guwahati on 24th April 2026, the Forum advised that the above-mentioned agenda be discussed in the monthly OCCM for regular updates.

Utilities concerned are requested to provide updated status for the 242nd OCC meeting, as tabulated below:

Station Name	Status as per 241st OCCM	Status as per 242nd OCCM
AGBPP (Kathalguri)	NEEPCO informed that they will decide internally for the necessary action on the Gas based plant to carry out the AGC in plant. Likely to go to CERC for exemption.	
Doyang	NEEPCO apprised the forum that the OEM had quoted a comparatively high price for the closed loop testing for implementation of AGC and that negotiations with the OEM are underway. Work is expected to be completed by August 2026.	
Kameng	Implementation of AGC at Kameng HEP is pending due to high vibration issues in the machines. Discussions are ongoing with the OEM for resolution of the issue. Work is expected to be completed by August 2026.	
Ranganadi (Panyor)	SCADA is very old, and for which DCS upgradation is required. Tender has been floated, and Technical Evaluation going on. AGC implementation will be carried out in the lean period, i.e., after Nov'26. Work is expected to be completed by August 2026.	

Station Name	Status as per 241st OCCM	Status as per 242nd OCCM
Pare	AGC implementation will be carried out in the lean period, i.e., after Nov'26. Work is expected to be completed by August 2026.	
RC Nagar	NEEPCO informed that they will decide internally for the necessary action on the Gas based plant to carry out the AGC in plant. Likely to go to CERC for exemption.	
Palatana	OTPC apprised the forum that implementation of AGC at Palatana is not considered feasible owing to the isolated nature of the Palatana grid system, and that frequent increase/decrease in generation as per AGC signals may not be operationally feasible under prevailing grid conditions. A request seeking exemption from AGC implementation has already been submitted before the Hon'ble CERC.	
Subansiri Lower HEP	NHPC informed that AGC would be enabled after getting dam safety clearance for full FRL of Subansiri reservoir.	

Action: All concerned utilities (NEEPCO, NHPC, OTPC).

****

Annexure

Annexure-2.1

सत्यमेव जयते

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
तापीय परियोजना नवीनीकरण एवं आधुनिकीकरण प्रभाग
Thermal Project Renovation & Modernization Division

Date: 21.08.2026

विषय: कोयला आधारित ताप विद्युत संयंत्रों हेतु रैम्प दर अनुपालन रूपरेखा एवं अनुसूचन (शेड्यूलिंग) कार्यप्रणाली पर केंद्रीय विद्युत प्राधिकरण (CEA) की रिपोर्ट - के संबंध में।

Subject: CEA Report on Ramp Rate Compliance Framework and Scheduling Methodology for Coal-Based Thermal Power Plants – reg.

With the increasing integration of renewable energy into the Indian power system, coal-based thermal power plants are required to provide enhanced operational flexibility through operation at minimum technical load and compliance with prescribed ramp rate requirements. In this context, a report has been prepared by the Central Electricity Authority (CEA), through a series of stakeholder consultations held under the Chairmanship of Principal Chief Engineer-II with representatives from NTPC, GRID-India, BHEL, DVC, RVUNL, Adani Power and other stakeholders, by examining the practical challenges associated with ramp rate compliance, scheduling methodology, Deviation Settlement Mechanism (DSM) implications and equipment stress during flexible operation.

The enclosed report consolidates the technical deliberations, key observations and recommendations emerging from these discussions, and is circulated for information, wider dissemination and appropriate consideration by all thermal generating companies in their operational planning and future flexibility initiatives.

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(सुरता राम / Surata Ram)
Chief Engineer (TPRM), CEA

Copy to: All Genclos/NLDC/RLDCs/RPCs

Copy to: 1. Chairperson, CEA 2. Principal Chief Engineer-II, CEA

3. IT & Procurement, CEA-with a request to upload on CEA website.

Report

On

Ramp Rate compliance framework

And

Scheduling Methodology for the coal-based power plant

Date: 21st August 2026

Background:

A meeting was held on 11th March 2026 at 03:00 PM under the Chairmanship of PCE-II, CEA in Manthan Hall, Sewa Bhawan, New Delhi to deliberate upon issues relating to ramp rate compliance and scheduling methodology in the context of flexible operation of coal-based thermal power plants. The meeting was attended by representatives from NTPC Limited, Damodar Valley Corporation, Bharat Heavy Electricals Limited, Rajasthan Rajya Vidyut Utpadan Nigam Limited, Grid Controller of India Limited and Adani Power Limited. List of participants is enclosed as Annexure-I

At the outset, PCE-II welcomed the participants and highlighted that with the increasing penetration of renewable energy in the grid, the requirement for flexibility from thermal power plants has significantly increased. He emphasized that ramp rate capability and scheduling practices should remain aligned with the regulatory provisions so that grid balancing requirements are met while ensuring that it is technically feasible and safe for the operation of thermal generating units. He then invited the participants to share their perspectives.

Discussion

GRID-INDIA

Representatives from Grid-India made a presentation on ramp rate treatment in inter-state scheduling and highlighted the growing requirement of system flexibility in view of increasing renewable energy integration. It was stated that thermal generating stations play an important role in providing balancing support to the grid by offering ramping capability for managing variability in generation and demand.

GRID-INDIA explained the regulatory framework governing ramp rate provisions. Reference was made to the relevant provisions under the Tariff Regulations issued by the Central Electricity Regulatory Commission, wherein ramp rate performance of thermal generating stations has been linked with return on equity. As per Clause 30(2) of the Tariff Regulations, 2019, with effect from 1 April 2020, the rate of return on equity is reduced by 0.25% in case of failure to achieve the ramp rate of 1% per minute. Further, an additional return on equity of 0.25% is allowed for every incremental ramp rate of 1% per minute achieved over and above the base ramp rate of 1% per minute, subject to a ceiling of 1.00%. It was informed that detailed guidelines for ramp rate measurement and assessment were issued by NLDC in February 2020 and subsequently revised in December 2020 after incorporating feedback received from thermal generating stations. Ramp rate computation for the control period 2019-24 has been carried out in accordance with these guidelines.

GRID-INDIA further explained the current scheduling methodology wherein generating stations declare their ramp-up and ramp-down capabilities for scheduling. These ramp limits are considered while preparing generation schedules, and beneficiary requisitions are moderated, wherever feasible, to ensure that schedules remain within the declared ramping limits. It was stated that ramp rate constraints are taken into account during schedule preparation in order to maintain grid security and operational feasibility.

NTPC

Representatives from NTPC highlighted certain operational and commercial challenges faced by thermal generating stations in meeting ramp rate requirements under the present assessment methodology. It was explained that ramp rate assessment is presently based on the change in average generation between two consecutive 15-minute time blocks. However, the ramping process in thermal generating units inherently involves different stages including boiler response time, active ramping phase and stabilization phase. During the boiler response and stabilization phases, the change in generator output may be negligible even though the ramping process has already been initiated.

NTPC submitted that due to these inherent operational characteristics, generating units often ramp at instantaneous rates higher than the stipulated average ramp rate in order to achieve the required block-average ramp rate. As a result, the effective ramp rate observed on a 15-minute block-average basis may not accurately reflect the actual ramping behaviour of the unit.

NTPC further highlighted that the difference between scheduled generation and actual generation during the ramping process result in deviation in all ramp time blocks and gets eliminated only in the time block with no ramp. Such deviation between scheduled generation and actual generation may attract charges under the Deviation Settlement Mechanism governed by the Central Electricity Regulatory Commission. It was therefore stated that generators may be exposed to DSM charges during ramping even when the unit is operating within its technical ramping capability.

NTPC also highlighted that frequent cyclic scheduling patterns such as V-type, W-type and M-type ramping trajectories can impose mechanical and thermal stresses on boiler and turbine components due to repeated ramp-up and ramp-down instructions within short time intervals.

NTPC suggested that ramp rate assessment methodology may be reviewed to better capture the actual ramping behaviour of thermal generating units, and that ramp rate evaluation could consider the active ramping phase using higher-resolution SCADA/AGC data rather than relying solely on 15-minute block-average measurements.

Other GENCOs (DVC/ADANI/RRVUNL) present in the meeting also raised the similar issue pertaining to ramp rate assessment methodology, scheduling practices and associated operational constraints. A clarification w.r.t to nature of ramp rate (average/instantaneous) as mentioned in CEA Flexible operation regulation was also sought by the GENCOs.

2nd meeting was held on 8th May 2026 at 03:00 PM under the Chairmanship of PCE-II, CEA in Manthan Hall, Sewa Bhawan, New Delhi to deliberate upon issues relating to ramp rate compliance and scheduling methodology in the context of flexible operation of coal-based thermal power plants. The meeting was attended by representatives from Bharat Heavy Electricals Limited and Grid Controller of India Limited. List of participants is enclosed as Annexure-II.

At the outset, PCE-II welcomed the participants and requested that all participants continue the discussion on the ramp rate compliance framework and scheduling methodology for coal-based power plants.

Discussion

GRID-INDIA

Representatives from Grid-India made a presentation on ramp rate treatment in inter-state scheduling and highlighted the growing requirement of system flexibility in view of increasing renewable energy integration. It was stated that thermal generating stations play an important role in providing balancing support to the grid by offering ramping capability for managing variability in generation and demand.

GRID-INDIA explained the regulatory framework governing ramp rate provisions. Reference was made to the relevant provisions under the Tariff Regulations issued by the Central Electricity Regulatory Commission, wherein ramp rate performance of thermal generating stations has been linked with return on equity. As per Clause 30(2) of the Tariff Regulations, 2019, with effect from 1 April 2020, the rate of return on equity is reduced by 0.25% in case of failure to achieve the ramp rate of 1% per minute. Further, an additional return on equity of 0.25% is allowed for every incremental ramp rate of 1% per minute achieved over and above the base ramp rate of 1% per minute, subject to a ceiling of 1.00%. It was informed that detailed guidelines for ramp rate measurement and assessment were issued by NLDC in February 2020 and subsequently revised in December 2020 after incorporating feedback received from thermal generating stations. Ramp rate computation for the control period 2019-24 has been carried out in accordance with these guidelines.

GRID-INDIA further explained the current scheduling methodology wherein generating stations declare their ramp-up and ramp-down capabilities for scheduling. These ramp limits are considered while preparing generation schedules, and beneficiary requisitions **are** moderated, wherever feasible, to ensure that schedules remain within the declared ramping limits. It was stated that ramp rate constraints are taken into account during schedule preparation in order to maintain grid security and operational feasibility.

BHEL

Following are the views of BHEL on subject of implementation of load ramps in the grid as discussed during the Meeting on 08.05.2026 amongst CEA, NLDC & BHEL:

- Load ramp rate implementation in the grid is being done by grid operators (NLDC etc.) assuming instantaneous load change response of thermal units.
- Currently, load change is being given by the grid as a step load change commencing at the start of any block (Figure 1). Such sudden load change/ increase is not realistically possible as time is required for achieving the load change (Figure 2).

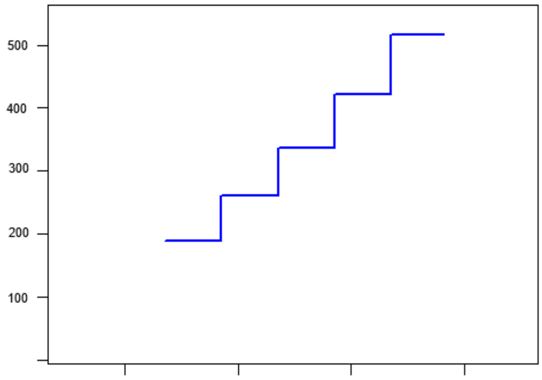

Figure 1: Step load change being mandated in the grid over several blocks continuously

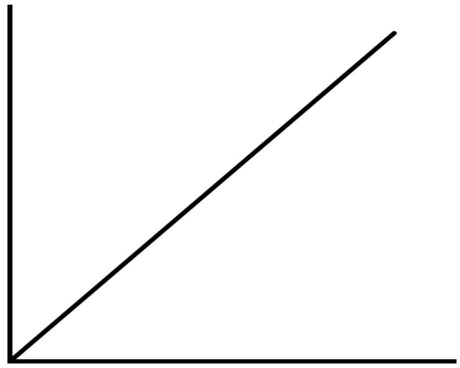

Figure 2: Linear load change that can ideally be expected from a thermal set, simplified for understanding as actual nature of load change will be in the form of a curve

- Actual response of a thermal set for load ramp is as per Figure 3.

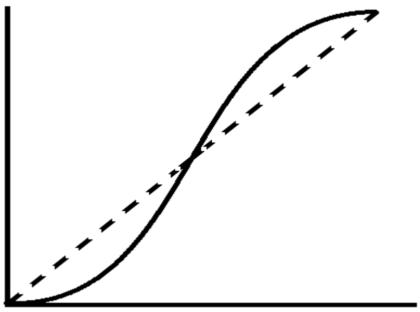

Figure 3: Actual response of a thermal unit during load ramping (Dotted line is linear load setpoint that can be ideally expected from thermal sets, solid line is actual load change of thermal set)

- Consequently, desired load during load ramping is achieved somewhere in between the block depending on load change quantum and actual load ramp rates possible. For example, consider a 500 MW set for which load ramping is to be done at 1%/minute in 67th block for two cases, as described below:
  - **<u>Case 1:</u>** load change from 300 MW to 350 MW

    Case 1 will need 10 minutes for achieving the target load and it will reach the target load in between the 67th load block (see Figure 4)
  - **<u>Case 2:</u>** load change from 300 MW to 375 MW.

    Case 2 will need 15 minutes for achieving the target load and will reach the target load by the end of the block.

  Hence, load ramping setpoint change and actual response of the unit would be as depicted in Figure 4. Accordingly, there could be different scenario of load change, depending on the magnitude of the load change and the load ramp rate.

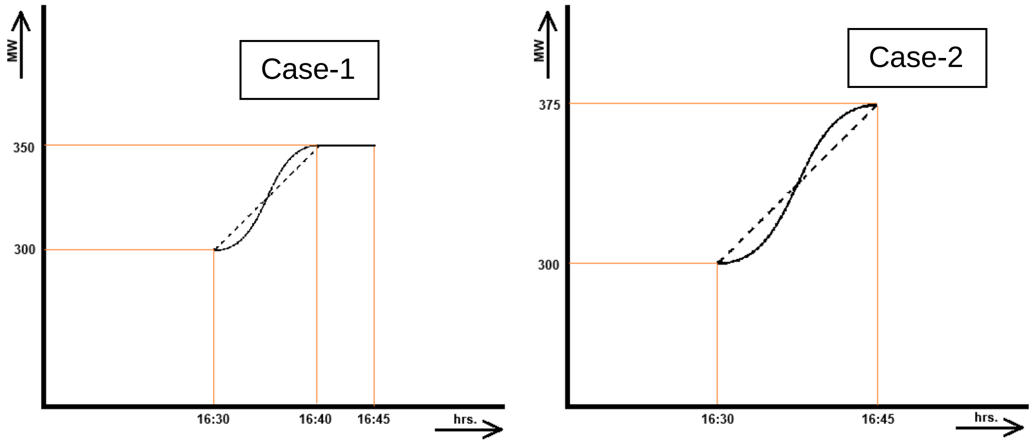

Figure 4: Actual load ramping response of a thermal set at 1%/minute for 300 MW to 350 MW in Case 1 and for 300 MW to 375 MW in Case 2 in the 67th block. (*Dotted line is linear load setpoint that can be ideally expected from thermal sets, solid line is actual load change of thermal set*)

- Due to this behaviour, there is a deviation in the actual generation from that specified by the grid over the block. To compensate the deviation in generation, utilities are going for higher quantum of load change in the same time block to achieve the generation target. This is resulting in actual load ramp rates being higher than what is required and this is putting additional stress on the thermal sets as the above ramp rates may be higher than design conditions.
- The above is primarily happening as grid is giving step load change commands.
- Further, after achieving a load ramp, in the next block itself another ramp is being given from the grid (as shown in Figure 1, which is a continuous step load change over several blocks). In the process, the unit does not have time to stabilize which is creating additional disturbances in the system and putting stress on the components. In worst case, the next load ramp is in the opposite direction in the next block, thereby putting more stress on the system.

- This issue can be mitigated if there is a block dedicated to the ramp itself, followed by stabilization blocks as shown in Figure 5.

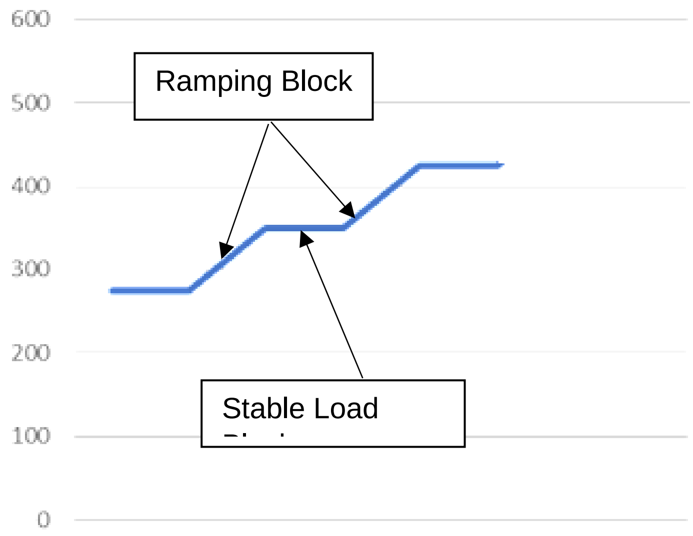

Figure 5: Suggested approach to operate grid for load ramping, stable load block in between ramping blocks

- Further, the system/ equipment design characteristics require that ramps are not given continuously over several consecutive blocks, as depicted in Figure 1. Instead load ramps can be either clubbed to be given as a single command which will continue over different blocks as per the quantum of load change and load ramp rates (Figure 6). Otherwise, load ramps can be scheduled as per the Figure 7 as it allows stable operation of unit between two ramps.

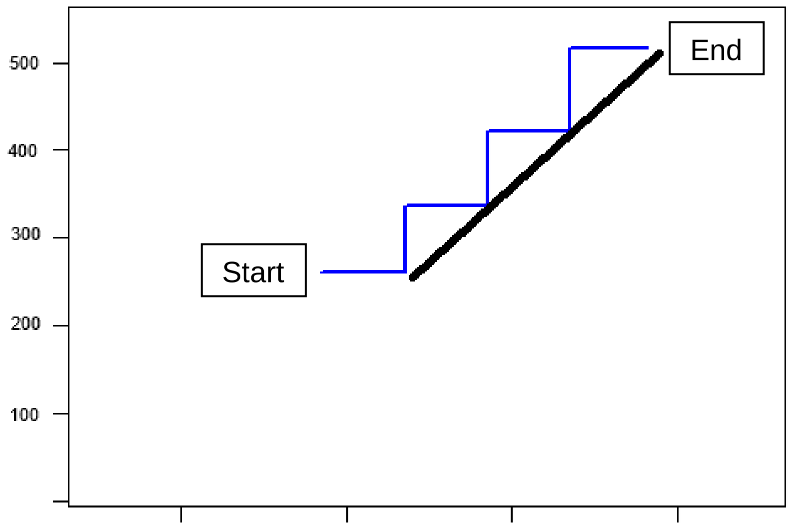

Figure 6: Single load ramp command to be given from starting to end instead of continuous step load change (Blue line: Step load change as per the existing practice of grid, Black line: Suggested load change from start to end for thermal set)

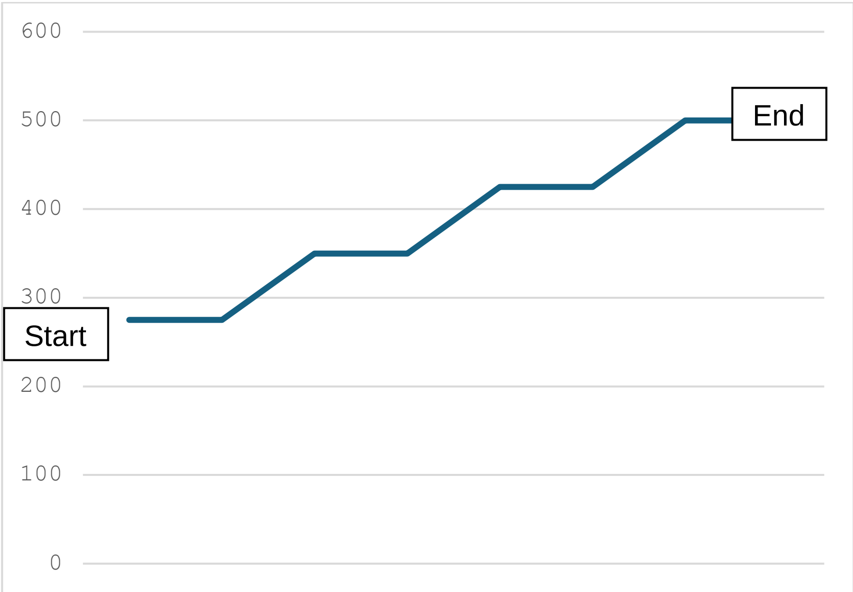

Figure 7: Staggering of load change with a stable load block in between load ramps from start to end

- Flexible Operation means load generation of thermal sets follows renewable generation during solar hours. Accordingly, in a day there should be one ramp down in the morning, followed by minimum load operation for 4-5 hours (during solar hours) and then one load ramp up in the evening, after solar hours. But currently, load variation of thermal sets is not happening in this manner and there are many additional load ramps during the day of various magnitude.
- While doing load pattern/demand analysis, grid controllers are representing the grid as an average for a day and looking for maximum and minimum. Instead, if the load pattern of one day is studied block-wise, then grid controllers can understand the number of additional load cycles that are being forced onto a thermal unit.
- These additional load cycles are due to Grid stabilizing mechanisms of AGC, SCUC, SCED etc. Ultimately, these cycles are not part of flexible operation and are detrimental for thermal units.

3rd meeting was held under the chairmanship of Principal Chief Engineer-II, CEA in Manthan Hall, CEA on 18.06.2026 at 11:00 AM. The officers of TPRM and TETD Divisions of CEA, BHEL, NTPC, RVUN, Damodar Valley Corporation (DVC), National Load Despatch Centre (NLDC), New Delhi, and Adani Power Limited (APL) participated in the meeting. The list of participants is enclosed at **Annexure-III**.

At the outset, Shri B.C. Mallick, Principal Chief Engineer-II, CEA welcomed the participants. He outlined the issues faced by generating companies when complying with ramping up and down under different loading conditions. He pointed out that to achieve the specified average ramp rate (in 15-minute block) expressed as a percentage of Maximum Continuous Rating (MCR) per minute, thermal power plant (TPP) units are actually applying a much higher ramp rate than CEA regulations require. This is done to avoid penalties for failing to meet generation targets within the 15-minute time block, especially under DSM regulations.

He raised four key concerns regarding the application of ramp rates in scheduling as reported by GENCOs. First, operation at higher ramp rates puts undue stress on the machines. Second, continuous ramping across successive time blocks without stabilization periods adversely impacts plant lifespan and health. Third, generators receive ramp-up or ramp-down directives just 12 to 15 minutes in advance, which is insufficient for smooth machine response. Finally, plants must often ramp up in one block and immediately ramp down in the next, creating an onerous burden due to sharp ramp-rate demands.

At the same time, PCE-II recognizes the complexity of the current national grid, where scheduling accounts for various factors. These include grid demand, renewable energy integration, the requirement for flexible power, the availability and flexing capability of coal-based units, the MOD, and PPAs. He emphasizes the need to operate coal-based power plants at their minimum technical load (MTL)—presently 55% and phase-wise 40%, as per CEA regulations—for the smooth integration of renewable generation into the grid. Concurrently, the health of the machinery must be maintained. Finally, he sought the views of the participants on all issues so the machine could be operated at MTL successfully.

NTPC submitted that to achieve average ramp rate of 1% per min in a time block, generators need to ramp at the rate of 2.5 to 3% per min during active ramping phase of around 5 to 7 minutes to compensate for negligible change in load during boiler response time and stabilization time. Thus, to achieve 1%/min rate, the machine needs to actually attain 2.5%/min. This way, thermal characteristics varies these many times within a single time block of 15 minutes.

NTPC also submitted that BHEL in its offer of Advanced Process Control to NTPC also offered to demonstrates ramp rate up to 3% per min for a single ramp test excluding the boiler response time & stabilization time. The relevant excerpt from BHEL's APC offer is as follows:

Further, these trials will be conducted with a minimum load change of 3% per minute for 5 minutes in a single ramp test due to manual addition and removal of mills. Sufficient stabilization time will be provided between each ramp trial. No additional and withdrawal of mills should be attempted during ramps.

All other Gencos also informed that in order to achieve 1% of units capacity per min ramping up, the unit has to attain 2.5% MW/ min, other-wise it would not be possible for the unit to achieve the MW level for the next block, yet it faces the penalty under DSM as it will not be able to meet the schedule in terms of MWh during the block under ramping.

NTPC pointed out that the ISGS and SCED units face DSM penalty during ramping in terms of DSM Regulations 2024 for deviation from scheduled generation.

NTPC pointed out that the Regulation 30(3)(iii) of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024 provides for that :

"iii. in the case of a thermal generating station:

a) rate of return on equity shall be reduced by 0.25% in case of failure to achieve the ramp rate as specified under Regulation 45(9) of IEGC Regulations, 2023.
b) an additional rate of return on equity of 0.125% shall be allowed for every incremental ramp rate of 0.50% per minute achieved over and above the ramp rate specified by Central Electricity Authority, subject to the ceiling of additional rate of return on equity of 1.00%:"

NTPC also added that Grid India has considered that block-wise 0.5 % MW/ min. ramp rate is deemed equivalent to 1 % MW/min ramp rate in the first ramp time block to avoid the penalty under regulation 30(3)(iii)(a). NTPC requested that the same should be extended to the provision of penalty for deviations under Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related Matters) Regulations, 2024. Grid-India informed that this has been considered only for the first ramping block and not applicable for subsequent ramping block.

Representative of APL informed that schedule of an upcoming time block is known only 8 to 10 minutes before the block in which ramping up/down is required.

NLDC informed that the schedule of inter state generators are prepared by RLDCs. Intra state generators are being scheduled by their concerned SLDC and further only their inter state transactions are scheduled as per their PPA and mutually agreed schedule with buyers through RLDCs. Further for IPPs, the schedules are prepared based on the PPAs and mutually agreed schedule with their buyers and/or their market transactions. These IPP are despatched under Ancillary services (shortfall category) based on the consent provided by them to NLDC. The Ramp rate declared by the IPPs is considered despatch under Ancillary Services. For section 62 generators having share allocations, the schedule is prepared based on requisitions received from their Beneficiaries and the time block wise Ramp Up and Down rate declared by the power plant. Further as per Grid Code, thermal stations are mandated to provide 1% ramp rate per minute. Further CEA Flexible Operation of Coal based Thermal Power Generating Units Regulations, 2023 mandate the coal based thermal power generating units shall have ramp rate capability of minimum three percent per minute for their operation between seventy percent to hundred percent of maximum continuous power rating and shall have ramp rate capability of minimum two percent per minute for their operation between fifty-five percent to seventy percent of maximum continuous power rating. The schedule is prepared based on the requisitions provided by beneficiaries, sale in DAM/RTM, SCUC,SCED and Ancillary services. Plants participating in SCED are able to get their final dispatch schedule 30 minutes before the start of time block and plants getting dispatch under Ancillary services are able to get the schedule 15 minutes before the start of the block. Further with the implementation of SCED since April'2019, most of the power plants having low and high variable charge are generally get dispatch at constant schedule with minimal changes in schedule. Only mid-merit plants get changes in schedules, which is based on the ramp rate declared by the power station.

Further, as a result of operation of SCED, there is reduction in the number of time blocks where plants need to ramp as per schedule, as well as the ramping quantum in MW. This aspect has been documented in the Detailed Feedback Report on SCED Pilot. During April-December 2019, number of schedule changes reduced by 29% and cumulative MW quantum of schedule changes reduced by 42% on aggregate basis as a result of SCED.

Further NLDC informed that the deviation in schedule is calculated based on the energy recorded in the SEM and schedule energy (not on the Schedule MW).Plants can accordingly start increasing or decreasing their generation from any point one time block in advance in such a way that plant is able to achieve its actual energy close to schedule energy in the next block to avoid any deviation liability. Further the deviation with respect to schedule by the power station during the change in schedule is already acknowledged in DSM regulation and accordingly DSM charges are payable/receivable for deviations up to 10% or 100 MW as per their Variable charges.

In this regard, DVC said that the machine should run sustainably rather than gaining DSM pool charges.

BHEL stated that ramp instruction has been given to the generators plant-wise. Thus, each ramp instruction per time block may be implemented to the TPP units alternatively. NLDC clarified that schedules are prepared on a plant-wise basis and not on a unit-wise basis. Accordingly, any unit-wise allocation of ramping within a plant needs to be managed by the generating station.

PCE-II opined that technical ramping feasibility, the minimum number of unit ramp-ups and ramp-downs, and the subsequent impact on plant life must be considered during merit order dispatch scheduling. He further noted that during the flexible operation of thermal power plant (TPP) units, repeated high boiler ramp rates on the same machine primarily elevate the risk of tube leakage. BHEL stated that Merit order despatch needs to change, although, consumer can get relatively costlier power but O&M cost will be reduced and machine life will be extended.

NLDC informed that major part of the schedule is prepared based on the beneficiary's requisition. The Beneficiaries are different plant wise. NLDC moderates the schedule of section 62 and plants participating in SCED and Ancillary services based on the Un-requestion surplus available and margin available above technical minimum and ramp rate declared by the plant.

The PCE-II asked all OEM(s) and GENCO(s) to specify the maximum number of time blocks allowable for continuous ramping up at 1% MW/min, and how many time blocks should pass before a stabilization period is introduced.

Upon this, RVUN representative drew attention of the participants to the IEGC provision of Tests prior to declaration of Commercial Operation under Regulation 24(3)(b)(ii) and 24(3)(b)(ii) of IEGC 2023 where stabilisation period of 30 minutes is mandated between two steps which provide for :

"(ii) Ramp-up from fifty five (55) percent of MCR to MCR at a ramp rate of at least one (1) percent of MCR per minute, in one step or two steps (with stabilization period of 30 minutes between two steps), and sustained operation at MCR for one (1) hour."

"(iv) Ramp-down from MCR to fifty five(55) percent of MCR at a ramp rate of at least one (1) percent of MCR per minute, in one or two steps (with stabilization period of 30 minutes between two steps)."

Extending his logic from above, RVUN representative requested that on the above line, where the ramp rate is 1% MW/min, a stabilization period of at least 1 time block should be given after ramping up for 2 time blocks continuously to allow for smooth mill addition to ramp up generation to the desired level.

NLDC informed that the referred clause in the Grid Code pertains to tests conducted prior to the declaration of commercial operation. Such provisions are not covered under the applicable clauses of the Procedure for Scheduling and Despatch for Inter-State Transactions under the Grid Code. NLDC further reiterated that neither the CEA Flexible Operation Regulations nor the CERC Regulations presently provide for any stabilization period while scheduling generating stations. If such a requirement is considered necessary, it may be introduced through an appropriate regulatory amendment.

To mitigate the impact of same unit getting subjected to frequent ramp up and down same day and sometimes ramp reversal in the continuous time blocks, PCE-II suggested that ramp scheduled should be rotated between some pool of units/ plants instead strictly as per Merit Order so that the stresses exposure to the TPPs could be alleviated and the burden of stress is shared among larger pool of units for the better health of the TPPs. NLDC observed that schedules are prepared on a plant-wise basis rather than unit-wise. Accordingly, if rotation of ramping among individual units is desired, the same may be managed by the respective generating stations.

DVC, APL and NTPC were also supported the same view in this regard.

After detailed deliberation and discussions, the following conclusions have been reached:

1. Flexible power is essential for integrating renewable energy into the grid, and it can be provided by operating coal-based power plants at their minimum technical load (MTL). Therefore, the objective is to operate these plants at MTL of 55% or less (down to 40%) in accordance with CEA Regulations, while ensuring minimal wear and tear on the equipment.

2. Frequent, high-magnitude ramping—rather than low-load operation—is the primary cause of severe wear and tear in coal-fired power plants. Because coal units are increasingly being used for fine grid balancing, they ramp up and down constantly. When these load ramps occur consecutively, the unit lacks sufficient time to stabilize. This creates additional system disturbances and stresses critical components. Furthermore, an immediate counter-ramp in the next scheduling block compounds this mechanical stress.

3. The difference between scheduled generation and actual generation during the ramping process remains in all ramp time blocks and gets eliminated only in the time block with no ramp. Such deviation between scheduled generation and actual generation may attract charges under the Deviation Settlement Mechanism governed by the Central Electricity Regulatory Commission, i.e. generators may be

exposed to DSM charges during ramping even when the unit is operating within its technical ramping capability.

4. As per the proposal of NLDC, if a power plant starts increasing or decreasing its generation from any point, one time block in advance, it may be able to achieve its actual energy close to the scheduled energy in the next block to avoid deviation liabilities. However, this proactive ramping may result in excess or less generation (MWh) in the previous block, which could attract charges under the Deviation Settlement Mechanism, thus not recommended.

5. Due to inherent limitations of thermal sets ramping (up/down), generation cannot follow side route (vertically upward) of schedule generation block. Instead, it follows diagonal route of schedule generation block. Thus, there will always be a difference between schedule and actual generation. There is a possibility of difference of fifty percent between schedule and actual generation, if steady ramp rate is applied.

6. To compensate the deviation in generation, utilities are going for higher quantum of load change in the same time block (even more than 3% per minute) to achieve the generation target/ avoid DSM. This results in actual load ramp rates exceeding recommended limits, putting additional stress on the thermal sets by surpassing their design conditions.

7. To achieve an average ramp rate of 1% per minute in a 15-minute block, utilities are giving higher ramp command (up to 2.5 %) in the load range of 70% to 55%. As boiler has its inertia & existing control systems are not designed for such ramp rates, the resultant is often uncontrolled or uneven higher ramp rates between 0.5% to 2.5%, in the 55-70% load band. This approach for ramping is technically undesirable, because when higher ramp rates, say 3% will be required, utilities would target 4% to 5% ramp rate. According to CEA regulations, a ramp rate capability of 2% per minute is prescribed when the machine load is between 55% and 70% and a 3% per minute capability is prescribed between 70% and 100%. LDC's are currently giving ramp rates limited to 1% (as per current norms) to utilities. However, if the actual ramp rate is restricted to 2% per minute in the load range of 55%–70%, the generating unit will achieve average ramp rate of around 0.8% per min (in present conditions without retrofits/control system tuning) against the required average ramp rate of 1% per minute in a 15-min time block. Therefore, such a restriction will expose the generator to financial implications arising from non-achievement of the prescribed ramp rate, in addition to the deviation related charges under the applicable DSM Regulations.
8. According to the CEA Regulations, the ramp rate between 40% and 55% load shoud be kept within 1% per minute, while the average ramp rate in a 15-minute generation schedule may not be achievable more than 0.5% per minute (in present conditions without retrofits/control system tuning). Similiarly average ramp rate in a 15-minute generation schedule may not be achievable more than 1.2% per minute for MTL between 70% and 100% load in present conditions without retrofits/control system tuning.

9. In cases where Load ramps require spread over several time blocks due to the magnitude of load change, the same may be implemented as:
    a. By single ramp command to achieve the target load where utilities need to develop capability for mills cut-in & cut-out without operator intervention (implementation of mill scheduler) – Before implementation of this solution a pilot study regarding the same is suggested.
    b. By multiple ramp command ensuring stable load block between two load ramps.

For large scale integration of RE and minimize the adverse impact of low load operation following are the **Recommendations**:

1. Avoid consecutive ramp-up and ramp-down of the same units or plants; instead, select a group of units for ramp-up and another group of units for ramp-down. Ramping schedules should be rotated among a pool of units or plants rather than assigned strictly according to the Merit Order. This will alleviate the stress exposure of individual TPPs and share the burden among a larger pool of units to preserve the overall health of the plants.

2. A set of power plants shall ramp down to the Minimum Technical Load (55% or 40%) in the morning when solar generation increases, followed by minimum load operation during solar hours and then load ramp up in the evening when solar generation declines, or sufficient stabilization time shall be provided before change in direction of ramp. The Merit Order Despatch (MOD) may be reviewed, if necessary, to adopt the above recommendations. This will reduce the O&M costs of power plants and extend their operational life.

3. Instead of using the thermal fleet for fine grid balancing, the same may be done from other sources, such as hydro power plants, gas power plants, pump storage plants, and, BESS.

4. As thermal sets ramp up in diagonal manner, they cannot give a step ramp/ change in load. Therefore, while ramping up/down, a new concept called ramping block should be introduced. In such a block, the target load will be achieved at the end of the block & generation in the block will be about 50% less/ more than scheduled generation. It is recommended to multiply 0.5 with schedule generation of 15-minute block when raping (up/down) to avoid penalty (DSM) due to less generation during ramping up and excess generation during ramping down.

5. Introduce stable-load (stabilization) blocks between ramping blocks to allow the unit to stabilize before the next ramp command which will reduce the O&M costs of power plants and extend their operational life.

6. Utility shall adopt proper control or tune existing control system so that average ramp rate of 1% per minute in a 15-minute block is achieved in between 55% and 70%, resulting in a maximum machine ramp rate of 2% per minute. For loads between 70% and 100% an average scheduled ramp rate of 1.5% per minute in a 15-minute block may be adopted. Similarly, an average ramp rate of 0.5% per minute 15-minute block should be adopted for loads between 55% and 40% resulting in a maximum machine ramp rate of 1% per minute.

7. For fine grid balancing sufficient battery storage at certain specific locations may be installed.

8. It is also recommended to carryout the requisite modification or changes in the respective regulatory framework to give effect to the recommendations.

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Annexure-I

List of Participants in 1st meeting:

1. Sh. BC Mallick, PCE-II, CEA
2. Md. Anwar, Director, TPRM
3. Sh. Rohit Yadav, Dy. Director, TPRM
4. Sh. Vikalp Saini, Asst. Director, TPRM
5. Sh. Jaysinh Jadeja, Adani Power
6. Sh. Pratyush Lenka, L&T
7. Sh. Rajiv Goyal, Head (Power trading), Adani Power
8. Sh. Mayur Sinh Gohil, DGM Adani Power
9. Sh. Ian Rabello, SIEMENS
10. Sh. Umang Swaroop, SIEMENS
11. Sh. Vivek Rastogi, DVC
12. Sh Ashis Kumar Dab, DVC
13. Sh. Mukesh Saini, AD, TETD
14. Sh. Nilesh Dangayach, NTPC
15. Sh. Nishant Bansal, NTPC
16. Sh. Dr. Vikram Singh, EEC
17. Sh Arvind Shukla, SE, RRVUNL
18. Sh P Dhariwal, RRVUNL
19. Sh. Anupam Kumar, Grid India
20. Sh. Manoj Kumar Agarwal, ED, Grid India

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List of Participants in 2nd meeting:

1. Sh. BC Mallick, PCE-II, CEA
2. Md. Anwar, Director, TPRM
3. Sh. Rohit Yadav, Dy. Director, TPRM
4. Sh. Vikalp Saini, Asst. Director, TPRM
5. Shri S. Bhattacharya, BHEL
6. Shri KV Singh, BHEL
7. Shri Saif Rehman, Grid India
8. Shri Nitin Yadav, Grid India

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List of participants in 3rd meeting

1. Shri B.C. Mallick, Principal Chief Engineer- the Chair
2. Shri Surata Ram, Chief Engineer, CEA
3. Shri Md. Anwar, Director
4. Shri Vikalp Saini, AD, CEA
5. Shri Sakil Ahmad, AD, CEA
6. Shri Mukesh Saini, TETD
7. Shri Nilesh Dangayan, NTPC LTD.
8. Shri Nishant Bansal, NTPC LTD.
9. Shri P. Dhariwal, RVUN
10. Shri S. Bhattacharya, BHEL
11. Shri Vivek Rastogi, DVC
12. Shri Ashish Kumar Dab, DVC
13. Shri Rajesh Ohali, Adani Power Ltd.
14. Shri Mayursinh Gohil, Adani Power Ltd.
15. Shri Anupam Kumar, NLDC, Grid-India

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Annexure 2.14

Unit-wise Planned Maintenance schedule for the year-(2027-28)

										Outage1				Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Remarks	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
KATHALGURI CCPP	1	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	12.07.2027	06.08.2027	Major overhauling of Generator &Exciter (26 Days)		10.10.2027	29.10.2027	Retrofitting of static relays by numerical relays (20 days)												
KATHALGURI CCPP	2	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	19.11.2027	08.12.2027	Retrofitting of static relays by numerical relays (20 days)																
KATHALGURI CCPP	3	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	30.10.2027	18.11.2027	Retrofitting of static relays by numerical relays (20 days)																
KATHALGURI CCPP	4	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	26.04.2027	30.05.2027	Major Inspection of Gas Turbine & Major overhauling of Generator &Exciter (35 Days)		09.12.2027	28.12.2027	Retrofitting of static relays by numerical relays (20 days)												
KATHALGURI CCPP	5	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	07.06.2027	19.06.2027	Replacement of 125 Volt Battery bank (13 Days)		29.12.2027	10.01.2028	Retrofitting of 415 volt electromechanical relay with numerical relay (13 Days)												
KATHALGURI CCPP	6	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	33.50	21.06.2027	10.07.2027	Replacement of 125 Volt Battery bank (20 Days)		18.10.2027	11.11.2027	Hot Gas Path Inspection (25 Days)	18.10.2027	11.11.2027	Generator Transfoermer overhauling (25 Days)	11.01.2028	24.01.2028	Retrofitting of 415 volt electromechanical relay with numerical relay (14 Days)						
KATHALGURI CCPP	7	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	30.00	01.04.2027	21.04.2027	Rectrofitting of 220 Volt. Battery Bank & Battery Charger (21 Days)		10.10.2027	20.10.2027	Condenser Cleaning (11 Days)	12.11.2027	08.12.2027	Generator Transfoermer overhauling (28 Days)									
KATHALGURI CCPP	8	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	30.00	13.05.2027	02.06.2027	Rectrofitting of 220 Volt. Battery Bank & Battery Charger & Isolator (21 Days)		05.11.2027	06.12.2027	MI Steam Turbine # 2 & Condenser Cleaning (32 Days)												
KATHALGURI CCPP	9	T	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	NATURAL GAS	30.00	22.04.2027	12.05.2027	Rectrofitting of 220 Volt. Battery Bank & Battery Charger & Isolator (21 Days)		21.10.2027	31.10.2027	Condenser Cleaning (11 Days)	21.10.2027	20.11.2027	Major inspection & Overhauling of Generator & Exciter. (30 Days)									
AGARTALA GT	1	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	21.00	26.07.2027	09.08.2027	HGPI of GT-1 (15 Days)		25.12.2027	26.12.2027	Compressor Washing & Inlet Air Filter Replacement (2 Days)												
AGARTALA GT	2	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	21.00	15.07.2027	15.07.2027	Compressor Washing (1 Day)		23.12.2027	29.12.2027	CIBI of GT-2 (7 Days)												
AGARTALA GT	3	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	21.00	15.05.2027	15.05.2027	Compressor Washing (1 Day)		07.12.2027	08.12.2027	Compressor Washing & Inlet Air Filter Replacement (2 Days)												
AGARTALA GT	4	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	21.00	05.08.2027	10.09.2027	MI of U#4 GT with new rotor replacement (37 Days)		05.01.2028	06.01.2028	Compressor Washing & Inlet Air Filter Replacement (2 Days)												
AGARTALA GT	5	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	25.50	24.05.2027	30.05.2027	Hydrotest of HRSG#1 (7 Days)		15.05.2027	21.05.2027	Hydrotest of HRSG#2 (7 Days)												
AGARTALA GT	6	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	25.50	14.12.2027	20.12.2027	Hydrotest of HRSG#1 (7 Days)		02.11.2027	08.11.2027	Hydrotest of HRSG#2 (7 Days)												
MONARCHAK CCPP	1	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	65.40	09.05.2027	14.05.2027	GT Compressor Off Line Washing anf Other Electrical Maintenance Work (6 Days)		05.09.2027	10.09.2027	GT Compressor Washing Thermographic and Tightness checking of Electrical System (6 Days)	12.11.2027	19.11.2027	Boiler Hydro Test for renewal of License of Boiler and GT Inlet Air Filter Replacement (8 Days)									
MONARCHAK CCPP	2	T	CENTRAL SECTOR	North Eastern	Tripura	NEEPCO.	FALSE	NATURAL GAS	35.60																			
Panyor HEP	1	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	135.00	01.11.2027	21.11.2027	Annual Planned Maintenance (21 Days)																
Panyor HEP	2	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	135.00	01.12.2027	21.12.2027	Annual Planned Maintenance (21 Days)																
Panyor HEP	3	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	135.00	02.01.2028	22.01.2028	Annual Planned Maintenance (21 Days)																
Doyang HEP	1	H	CENTRAL SECTOR	North Eastern	Nagaland	NEEPCO.	FALSE	Hydro	25.00	07.02.2028	02.03.2028	Annual Planned Maintenance (25 Days)																
Doyang HEP	2	H	CENTRAL SECTOR	North Eastern	Nagaland	NEEPCO.	FALSE	Hydro	25.00	03.01.2028	27.01.2028	Annual Planned Maintenance (25 Days)																
Doyang HEP	3	H	CENTRAL SECTOR	North Eastern	Nagaland	NEEPCO.	FALSE	Hydro	25.00	08.11.2027	02.12.2027	Annual Planned Maintenance (25 Days)																
Pare HEP	1	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	55.00	01.12.2027	31.12.2027	Annual Planned Maintenance work along with Upgradation of obsolete Control System hardware (31 Days)																
Pare HEP	2	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	55.00	01.01.2028	31.01.2028	Annual Planned Maintenance work along with Upgradation of obsolete Control System hardware (31 Days)																
Kameng HEP	1	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	150.00	30.10.2027	29.12.2027	Inspection of Penstock-1 & APM of U-1&2 (60 Days)																
Kameng HEP	2	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	150.00																			
Kameng HEP	3	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	150.00	25.01.2028	09.02.2028	Annual Planned Maintenance (15 Days)																
Kameng HEP	4	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NEEPCO.	FALSE	Hydro	150.00	20.02.2028	06.03.2028	Annual Planned Maintenance (15 Days)																
Tuirial HEP	1	H	CENTRAL SECTOR	North Eastern	Mizoram	NEEPCO.	FALSE	Hydro	30.00	20.04.2027	09.05.2027	Annual Planned Maintenance (20 Days)																
Tuirial HEP	2	H	CENTRAL SECTOR	North Eastern	Mizoram	NEEPCO.	FALSE	Hydro	30.00	12.05.2027	31.05.2027	Annual Planned Maintenance (20 Days)																
Kopili HEP	1	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	50.00	14.02.2028	29.02.2028	Annual Planned Maintenance (16 Days)																
Kopili HEP	2	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	50.00	17.01.2028	31.01.2028	Annual Planned Maintenance (15 Days)																
Kopili HEP	3	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	50.00	13.12.2027	30.12.2027	Annual Planned Maintenance (18 Days)																
Kopili HEP	4	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	50.00	15.11.2027	30.11.2027	Annual Planned Maintenance (16 Days)																
Khandong HEP	1	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	23.00	01.12.2027	20.12.2027	Annual Planned Maintenance (20 Days)																
Khandong HEP	2	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	23.00	22.12.2027	10.01.2028	Annual Planned Maintenance (20 Days)																
Kopili St.II	1	H	CENTRAL SECTOR	North Eastern	Assam	NEEPCO.	FALSE	Hydro	23.00	22.01.2028	15.02.2028	Annual Planned Maintenance (25 Days)																

Unit-wise Planned Maintenance schedule for the year-(2027-28)

										Outage1			Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
BONGAIGAON TPP	1	T	CENTRAL SECTOR	North Eastern	Assam	NTPC Ltd.	FALSE	COAL	250.00	NA	NA	NA															
BONGAIGAON TPP	2	T	CENTRAL SECTOR	North Eastern	Assam	NTPC Ltd.	FALSE	COAL	250.00	15.03.2028	18.04.2028	Unit Overhaul (35 days)															
BONGAIGAON TPP	3	T	CENTRAL SECTOR	North Eastern	Assam	NTPC Ltd.	FALSE	COAL	250.00	NA	NA	NA															

Unit-wise Planned Maintenance schedule for the year-(2027-28)

										Outage1			Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
Subansiri Lower HEP	1	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro	250.00	11-Nov-27	10-Dec-27	Annual Maintenance															
Subansiri Lower HEP	2	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro	250.00				11-Dec-27	9-Jan-28	Annual Maintenance												
Subansiri Lower HEP	3	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro	250.00							11-Jan-28	9-Feb-28	Annual Maintenance									
Subansiri Lower HEP	4	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro											11-Feb-28	11-Mar-28	Annual Maintenance						
Subansiri Lower HEP	5	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro														12-Mar-28	10-Apr-28	Annual Maintenance			
Subansiri Lower HEP	6	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro																	12-Mar-28	10-Apr-28	Annual Maintenance
Subansiri Lower HEP	7	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro																			
Subansiri Lower HEP	8	H	CENTRAL SECTOR	North Eastern	Ar. Pradesh	NHPC	FALSE	Hydro																			

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Unit-wise Planned Maintenance schedule for the year-(2027-28) for Loktak

										Outage1			Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
Loktak HEP	1	H	CENTRAL SECTOR	North Eastern	Manipur	NHPC	FALSE	Hydro	35.00	1-Nov-26	30-Apr-27	Common Shutdown Period of all Generating Units & 132kV Switchyard for Renovation & Modernization Works of Loktak Power Station	1-May-27	31-Jul-27	Renovation & Modernization Works of Unit-1. Unit-2 & 3 will be running.												
Loktak HEP	2	H	CENTRAL SECTOR	North Eastern	Manipur	NHPC	FALSE	Hydro	35.00	1-Nov-26	30-Apr-27		1-Aug-27	31-Dec-27	Renovation & Modernization Works of Unit-2. Unit-1 & 3 will be running.												
Loktak HEP	3	H	CENTRAL SECTOR	North Eastern	Manipur	NHPC	FALSE	Hydro	35.00	1-Nov-26	30-Apr-27		1-Jan-28	31-May-28	Renovation & Modernization Works of Unit-3. Unit-1 & 2 will be running.												

Unit-wise Planned Maintenance schedule for the year-(2027-28)

										Outage1			Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
NAMRUP CCPP	2	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	17.00	NTPS is under forced shut down since 6th Aug'2025 due to ageing of generators and transformers.																	
NAMRUP CCPP	3	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	15.00																		
NAMRUP CCPP	6	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.00																		
NAMRUP CCPP	1	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	62.25	1-Apr-27	8-May-27	PM2/HGPI	1-Feb-28	10-Feb-28	PM3/ COOLING TOWER BASIN CLEANING/ GT AIR FILTER REPLACEMENT												
NAMRUP CCPP	2	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	36.15	1-Apr-27	8-May-27	NO GT	1-Feb-28	10-Feb-28	PM3/CONDENSER CLEANING												
LAKWA GT	5	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	20.00	1-Oct-27	20-Nov-27	Major Overhauling with additional works	1-Oct-27	20-Nov-27	Generator, Generator Transformer Overhauling												
LAKWA GT	6	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	20.00	1-May-27	5-May-27	Lube Oil Cooler Cleaning,Air Filter Replacement	1-Jan-28	10-Jan-28	Combustion Inspection												
LAKWA GT	7	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	20.00	1-Aug-27	10-Aug-27	Combustion Inspection	1-Mar-28	5-Mar-28	Lube Oil Cooler Cleaning,Air Filter Replacement												
LAKWA GT	8	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	37.20	20-Apr-27	20-May-27	Major Overhauling	20-Jan-28	5-Feb-28	All water reservoirs clening	20-Apr-27	20-May-27	Generator, Genrator Transformer and Station Transformer Overhauling									
LAKWA REPLACEMENT	1	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	1-Jun-27	1-Jun-27	4K Maintenance	1-Sep-27	1-Sep-27	2K Maintenance	1-Dec-27	2-Dec-27	8K Maintenance	1-Mar-28	7-Mar-28	2K+ T/c Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	31-Jul-27	2-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	2	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	3-May-27	3-May-27	2K Maintenance	8-Aug-27	8-Aug-27	4K Maintenance	1-Nov-27	7-Nov-27	2K+ T/c Maintenance	1-Feb-28	2-Feb-28	8k Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	3-Aug-27	4-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	3	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	2-Jun-27	2-Jun-27	2K Maintenance	2-Sep-27	2-Sep-27	4K Maintenance	3-Dec-27	9-Dec-27	2K+ T/c Maintenance	8-Mar-28	9-Mar-28	8k Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	5-Aug-27	6-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	4	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	1-Apr-27	1-Apr-27	4K Maintenance	1-Jul-27	7-Jul-27	2K+ T/c Maintenance	1-Oct-27	2-Oct-27	8k Maintenance	2-Jan-28	2-Jan-28	2K Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	7-Aug-27	9-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	5	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	2-Apr-27	2-Apr-27	4K Maintenance	8-Jul-27	8-Jul-27	2K Maintenance	3-Oct-27	11-Oct-27	8K+ T/c Maintenance	3-Jan-28	3-Jan-28	2K Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	10-Aug-27	11-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	6	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	2-May-27	2-May-27	2K Maintenance	1-Aug-27	7-Aug-27	4K+ T/c Maintenance	8-Nov-27	8-Nov-27	2K Maintenance	3-Feb-28	4-Feb-28	8k Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	12-Aug-27	13-Aug-27	intergartion to sWOIS
LAKWA REPLACEMENT	7	T	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	NATURAL GAS	9.97	3-Apr-27	3-Apr-27	2K Maintenance	9-Jul-27	9-Jul-27	4K Maintenance	12-Oct-27	12-Oct-27	2K Maintenance	4-Jan-28	5-Jan-28	8K Maintenance	29-Jul-27	30-Jul-27	sWOIS upgradation	14-Aug-27	16-Aug-27	intergartion to sWOIS
KARBI LANGPI HPS	1	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	50.00	1-Dec-27	29-Feb-28	Major Overhauling of Unit															
KARBI LANGPI HPS	2	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	50.00	12-Nov-27	28-Nov-27	Annual Preventive Maintenance															
LOWER KOPILI HPS	1	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	55.00	THE SCHEDULE SHALL BE PROVIDED AFTER COMMERCIAL OPERATION IS DONE																	
LOWER KOPILI HPS	2	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	55.00																		
LOWER KOPILI HPS	3	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	5.00																		
LOWER KOPILI HPS	4	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	2.50																		
LOWER KOPILI HPS	5	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	2.50																		
Myntreng HPS	1	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	3.00	5-Jan-28	25-Jan-28	Annual Maintenance															
Myntreng HPS	2	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	3.00	1-Dec-27	28-Feb-28	Major Overhauling															
Myntreng HPS	3	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	3.00	1-Mar-28	20-Mar-28	Annual Maintenance															
Myntreng HPS	1	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	1.50	25-Mar-28	15-Apr-28	Annual Maintenance															
Myntreng HPS	2	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	1.50	20-Dec-27	10-Jan-28	Annual Maintenance															
Myntreng HPS	3	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	1.50	15-Dec-27	15-Mar-28	Major Overhauling															
Champavati / HHPCPL	1	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	2.03			Nil			Nil			Nil			Nil			Nil			Nil
Champavati / HHPCPL	2	H	STATE SECTOR	North Eastern	Assam	APGCL	FALSE	Hydro	2.03			Nil			Nil			Nil			Nil			Nil			Nil

Unit-wise Planned Maintenance schedule for the year-(2027-28)

Name of Station	UNIT_NUM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Outage1 Start Date	Outage1 End Date	Outage1 Reason	Outage2 Start Date	Outage2 End Date	Outage2 Reason	Outage3 Start Date	Outage3 End Date	Outage3 Reason
KYRDEMKULAI HPS	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	60.00									
MYNTDU(LESHKA) St-1 HPS	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	42.00	01-Nov-27	15-Dec-27	Annual Maintenance						
MYNTDU(LESHKA) St-1 HPS	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	42.00	03-Jan-28	16-Feb-28	Annual Maintenance						
MYNTDU(LESHKA) St-1 HPS	3	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	42.00	20-Feb-28	5-Apr-28	Annual Maintenance						
NEW UMTRU HPS	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	20.00	01-Nov-26	25-Nov-26	Annual Maintenance	05-Jan-27	15-Jan-27	Annual Maintenance of Switchyard and common equipment of the Generating Units.			
NEW UMTRU HPS	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	20.00	26-Nov-26	20-Nov-26	Annual Maintenance	05-Jan-27	15-Jan-27	Annual Maintenance of Switchyard and common equipment of the Generating Units.			
UMIAM HPS ST-IV	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	30.00	8-Jun-27	8-Jun-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	9-Jun-27	9-Jun-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	10-Jun-27	10-Jun-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs
UMIAM HPS ST-IV	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	30.00	18-May-27	18-May-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	19-May-27	19-May-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	20-May-27	20-May-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs
UMIAM HPS ST-III	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	30.00	6/4/2027 00:00Hrs	6/4/2027 17:00Hrs	Runner Inspection of both Units	6/12/2027 09:00Hrs	11/12/2027 17:00Hrs	Annual Maintenance works	1/12/2027 09:00Hrs	1/12/2027 17:00Hrs	Total Bus Shutdown for General maintenance works on all terminal equipments in Switchyard.
UMIAM HPS ST-III	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	30.00	6/4/2027 00:00Hrs	6/4/2027 17:00Hrs		13/12/2027 09:00Hrs	18/12/2027 17:00Hrs		1/12/2027 09:00Hrs	1/12/2027 17:00Hrs	
UMIAM HPS ST-II	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	10.00	1-Nov-27	20-Nov-27	Annual Maintenance						
UMIAM HPS ST-II	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	10.00	22-Nov-27	11-Dec-27	Annual Maintenance						
UMIAM HPS ST-I	1	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	9.00	1-Nov-27	20-Nov-27	Annual Maintenance						
UMIAM HPS ST-I	2	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	9.00	22-Nov-27	11-Dec-27	Annual Maintenance						
UMIAM HPS ST-I	3	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	9.00	3-Jan-28	22-Jan-28	Annual Maintenance						
UMIAM HPS ST-I	4	H	STATE SECTOR	North Eastern	MePGCL	Meghalaya	FALSE	Hydro	9.00	24-Jan-28	5-Feb-28	Annual Maintenance						

Name of Station	UNIT_NUM	Outage-4 Start Date	Outage-4 End Date	Outage-4 Reason	Outage-5 Start Date	Outage-5 End Date	Outage-5 Reason	Outage-6 Start Date	Outage-6 End Date	Outage-6 Reason						
KYRDEMKULAI HPS	1															
MYNTDU(LESHKA) St-1 HPS	1															
MYNTDU(LESHKA) St-1 HPS	2															
MYNTDU(LESHKA) St-1 HPS	3															
NEW UMTRU HPS	1															
NEW UMTRU HPS	2															
UMIAM HPS ST-IV	1	11-Jun-27	11-Jun-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	14-Dec-27	14-Dec-27	General Maintenance Works of Switchyard, terminal equipments, 132 Kv bus etc. Time: 09:00hrs upto 16:00 hrs	15-Dec-27	15-Dec-27	General Maintenance Works of Switchyard, terminal equipments, 132 Kv bus etc. Time: 09:00hrs upto 16:00 hrs	11-Jan-28	9-Feb-28	Annual Maintenance Works Post Monsoon 1.Checking IR/PI values of Rotor, Stator, 11 KV Bus, Generator X-mers, UAT'S, SS X-mer etc. 2.Oil filtration of Transformers depending on test results. 3.Tightness works of all terminals and replacement of defective parts/components especially for Stator & Rotor of Generator; Cleaning of all Cubicles etc.. 4. Thorough inspection of underwater parts of the turbine. 5. Replacement of Guide Vanes and Shaft Seal sealing elements depending on the leakages found. 6. Servicing of Stator Air Coolers and other Bearing Coolers of Generator if found necessary. 7. Cleaning of Unit Cooling Strainers. 8. Cleaning of Turbine, MIV Sump tanks and their respective Leakage Tanks. 9. Thorough inspection of Stator & Rotor of Generator; General Cleaning works of the same. Time: 09:00 hrs Upto 16:00 hrs Note: The S/D will be withdrawn prior to the scheduled timing on earlier completion of work.	16-Mar-28	16-Mar-28	For Replacing the Shaft Sealing. Time:09:00 hrs Upto 16:00 hrs
UMIAM HPS ST-IV	2	21-May-27	21-May-27	For Servicing and Cleaning of Stator Air Coolers and Cleaning of Stator Air Dust and Rotor. Time: 09:00 hrs Upto 16:00 hrs	9-Nov-27	8-Dec-27	Annual Maintenance Works Post Monsoon 1.Checking IR/PI values of Rotor, Stator, 11 KV Bus, Generator X-mers, UAT'S, SS X-mer etc. 2.Oil filtration of Transformers depending on test results. 3.Tightness works of all terminals and replacement of defective parts/components especially for Stator & Rotor of Generator; Cleaning of all Cubicles etc.. 4. Thorough inspection of underwater parts of the turbine. 5. Replacement of Guide Vanes and Shaft Seal sealing elements depending on the leakages found. 6. Servicing of Stator Air Coolers and other Bearing Coolers of Generator if found necessary. 7. Cleaning of Unit Cooling Strainers. 8. Cleaning of Turbine, MIV Sump tanks and their respective Leakage Tanks. 9. Thorough inspection of Stator & Rotor of Generator; General Cleaning works of the same Time: 09:00 hrs Upto 16:00 hrs . Note: The S/D will be withdrawn prior to the scheduled timing on earlier completion of work.	14-Dec-27	14-Dec-27	General Maintenance Works of Switchyard, terminal equipments, 132 Kv bus etc. Time: 09:00hrs upto 16:00 hrs	15-Dec-27	15-Dec-27	General Maintenance Works of Switchyard, terminal equipments, 132 Kv bus etc. Time: 09:00hrs upto 16:00 hrs	10-Feb-28	10-Feb-28	For Replacing the Shaft Sealing. Time:09:00 hrs Upto 16:00 hrs
UMIAM HPS ST-III	1															
UMIAM HPS ST-III	2															
UMIAM HPS ST-II	1															
UMIAM HPS ST-II	2															
UMIAM HPS ST-I	1															
UMIAM HPS ST-I	2															
UMIAM HPS ST-I	3															
UMIAM HPS ST-I	4															

Unit-wise Planned Maintenance schedule for the year-(2027-28)

										Outage1			Outage2			Outage3			Outage-4			Outage-5			Outage-6		
Name of Station	UNIT_NM	STN_TYPE_ID	SECTOR	REGION_NM	ST_NM	SH_NM	IPP	FUEL_NM	Capacity (MW) 31-03-2026	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason	Start Date	End Date	Reason
TRIPURA CCPP	1	T	CENTRAL SECTOR	North Eastern	Tripura	ONGC	FALSE	NATURAL GAS	363.30	01.07.2027	04.08.2027	Major inspection (MI) of Gas Turbine-1, Major overhauling of steam Turbine-1, Major overhauling of Gas Turbine Generator-1, Major overhauling of Steam Turbine Generator-1, HRSH-1 Overhauling & License renewal	06.12.27	09.12.27	GT-1 Compressor off-line washing & Air intake Filter changing												
TRIPURA CCPP	2	T	CENTRAL SECTOR	North Eastern	Tripura	ONGC	FALSE	NATURAL GAS	363.30	07.06.2027	21.6.2027	GT-2 Borescopic inspection, Annual inspection & license renewal of HRSG-2.	08.11.2027	11.11.2027	GT-2 Compressor off-line washing & Air intake Filter changing												

Annexure 2.16

LIST OF STUDIES/TESTS TO BE CONDUCTED BY RE GENERATORS/PARKS IN PROCESS OF SUBMISSION OF FINAL TECHNICAL CONNECTION DATA FOR DEMONSTRATING COMPLIANCE WITH CEA TECHNICAL STANDARDS FOR CONNECTIVITY TO THE GRID

09.03.2025 Rev.0

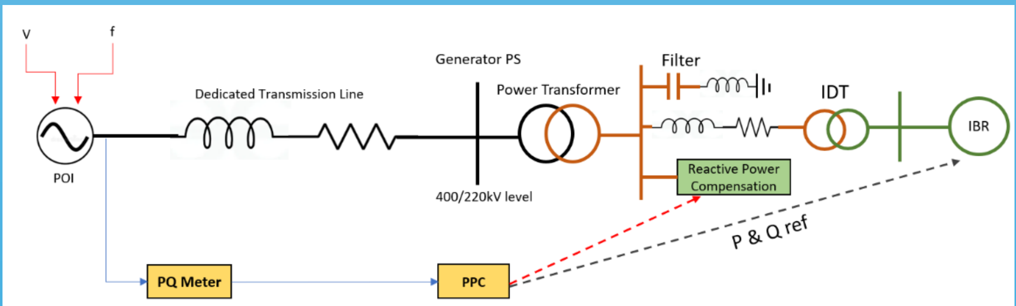

Table of contents

List of Abbreviations

CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
DC	Direct Current
DMAT	Dynamic Model Acceptance Test
EMT	Electromagnetic Transients
HVRT	High Voltage Ride Through
IBR	Inverter Based Resource
LL	Line to Line
LVRT	Low Voltage Ride Through
OEM	Original Equipment Manufacturer
PCC	Point of Common Connection/Coupling
POI	Point of Interconnection
PPC	Power Plant Controller
PSCAD	Power Systems Computer Aided Design
PSS/E	Power System Simulation for Engineering
pf	Power Factor
pu	Per Unit
RE	Renewable Energy
RMS	Root Mean Square
SCR	Short Circuit Ratio
SMIB	Single Machine Infinite Bus
TSCG	Technical Standards for Connectivity to Grid
WTG	Wind Turbine Generator

A. Introduction

1. This document provides a list of tests to be carried out by RE Generators/Parks in EMT and RMS platform for demonstrating compliances w.r.t CEA Technical Standards for Connectivity to grid, 2007 (incl. amendments thereof). RE Generators/parks are required to submit tests and study reports in process of submission of final Technical Connection Data to CTU for issuance of Technical Connection Details and subsequent signing of Connectivity Agreement (CAT-II) as per CERC GNA Regulations, 2022.
2. The document shall be updated based on experiential learning and knowledge base gathered in future course and stakeholders shall consider updates and revision(s) in this context as may be published from by CTUL from time to time.
3. Dynamic Model Acceptance Test (DMAT) of the facility(ies) shall be done on Single Machine Infinite bus (SMIB), the details of which are given in this document.
4. The tests and technical details to be submitted by RE developers listed in this document are as per the CEA Technical Standards for Connectivity, GNA Regulations,2022 & the Detailed procedure thereunder and other relevant Regulations of CERC/CEA. No new requirements have been specified and hence the document shall not be construed as change in Law in any form.

B. General, Technical & Certification Details to be furnished by the entity:

1. General Details to be furnished by the entity:

Sr. No.	Relevant Regulation Clauses	Description	General Details (GD)
1.1	General Details	Name of Connectivity Grantee	GD
1.2		CTU Connectivity / GNA Application Number	GD
1.3		Connectivity Quantum (MW)	GD
1.4		Connection Details (CONN-TD 4) Quantum applied for (MW)	GD
1.5		CEA Registration Number	GD
1.6		Type of RE Plant (Solar/Wind/Hybrid/with or without BESS)	GD
1.7		Installed Capacity (in MW) with Breakup of different sources for Hybrid	GD
1.8		ISTS Station (POI bus)	GD
1.9		POI Bus Voltage	GD
1.10		Scheduled Date of First COD/Final COD	GD
1.11		Expected Date of First COD/Final COD	GD
1.12		Inverter/WTG Make(s)	GD
1.13		Inverter/WTG Model Name(s)	GD
1.14		Inverter/WTG Rating - Nameplate rating (MW and MVA both)	GD

Sr. No.	Relevant Regulation Clauses	Description	General Details (GD)
1.15		Inverter/WTG Rating at the site assessed extreme temperature (MW and MVA both)	GD
1.16		Number of Inverters/WTGs	GD
1.17	CEA TSCG - Part-I.1(3)	**Site temperature considered for plant compliance as per CEA Procedure for assessment of the Design Temperature for RE Plants**	GD

2. **Technical Details to be furnished by the entity:**

Sr. No.	Relevant Regulation Clauses	Description	Technical Details (TD)
2.1	CEA TSCG: 6, CERC GNA Regulations: Clause-10.1	**Technical Details of IBR Unit**	
2.1.1		Technical Datasheet (including Wind speed Vs Power Curve or Irradiance Vs Power characteristics)	TD
2.1.2		Reactive Power Capability Curve (PQ, VQ curve)	TD
2.1.3		Temperature Derating PQ Curve	TD
2.1.4		Operator Manual of Inverter/WTG unit(s)	TD
2.1.5		Proposed Protection Settings of Inverter/WTG unit (in accordance with Grid-India's FTE&I procedure)	TD
2.1.6		Actual Protection Settings of Inverter/WTG unit (in accordance with Grid-India's FTE&I procedure)	Required during FTE stage only
2.2	CEA TSCG: Part-I.8	**Single Line Diagram**	
2.2.1		RE Pooling Station Switchyard (should include 220 kV, 33kV, IBR level SLD)	TD
2.2.2		Proposed Geographical SLD (shall comprise lengths, location of IBRs, conductor type, rating)	TD
2.3	CEA TSCG: Part-I.8	**Equipment details**	
2.3.1		Technical Datasheet of IBR unit transformer	TD
2.3.2		Nameplate of the IBR unit transformer	TD
2.3.3		Technical Datasheet of Power transformer	TD
2.3.4		Nameplate of the Power transformer	TD
2.3.5		Technical Datasheet of cables	TD

Sr. No.	Relevant Regulation Clauses	Description	Technical Details (TD)
2.3.6		Technical Datasheet of overhead conductors	TD
2.4	CEA TSCG: Part-II.B2(4)	**PPC_MASTER**	
2.4.1		PPC Model & Make	TD
2.4.2		Technical Datasheet of PPC	
2.4.3		Functional description of the PPC and technical functionality document	
2.4.4		Operator manual of PPC	
2.4.5		Control settings of PPC	
2.5	CEA TSCG: Part-II.B2(4)	**PPC_SLAVE (if applicable - details to be filled for all the slave PPCs in the plant)**	
2.5.1		PPC Model & Make	TD
2.5.2		Technical Datasheet of PPC	
2.5.3		Functional description of the PPC and technical functionality document	
2.5.4		Operator manual of PPC	
2.5.5		Control settings of PPC	
2.6		**Technical Details of SVG**	
2.6.1		Technical Datasheet of SVG	
2.6.2		Control Philosophy document of SVG	
2.6.3		Protection settings of SVG	
2.6.4		Operator Manual of the SVG	
2.6.5		Nameplate rating of SVG	
2.6.6		SVG rating (both capacitive and inductive) at site assessed extreme temperature	

C. Certification & Unit level testing to be furnished by the entity:

Sr. No.	Relevant Regulation Clauses	Description	Reports (R)
3.1	CEA TSCG: Part-I.1(2), IEGC 2023: 24	**Type Certification**	
3.1.1		Type Certificate of single WTG Unit(s)	R
3.2	CEA TSCG: Part-II(B), IEGC 2023: 24	**Type Test Report for Inverter / WTG** (Tests to be covered as per CEA Connectivity Standards)	
3.2.1	CEA TSCG: Part-II.B1(1)	Harmonics	Single report containing all the test results.
3.2.2	CEA TSCG: Part-II.B1(2)	DC Current Injection	
3.2.3	CEA TSCG: Part-II.B1(3)	Flicker	

Sr. No.	Relevant Regulation Clauses	Description	Reports (R)
3.2.4	CEA TSCG: Part-II.B2(1)	PQ Capability Test	Tests to be conducted as per the details provided in respective benchmarking section
3.2.5	CEA TSCG: Part-II.B2(2)	Capable to operate in frequency range: 47.5 Hz to 52 Hz with +/-5% voltage variation	
3.2.6		Capable to provide rated output in frequency range of 49.5 Hz to 50.5 Hz with +/-5% voltage variation	
3.2.7	CEA TSCG: Part-II.B2(3)	LVRT (Shall include details of Id & Iq calculation principles for LVRT & HVRT)	
3.2.8	CEA TSCG: Part-II.B2(4)(i)	Active power control feature and Rate of change of active power	
3.2.9	CEA TSCG: Part-II.B2(4)(ii,iii) IEGC: 30(10)	Primary Frequency Response (PFR)	
3.2.10	CEA TSCG: Part-II.B2(4)(ii, iii)	Immediate (within 1 second) real power primary frequency response of at least 10% of the maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz	
3.2.11	CEA TSCG: Part-II.B2(7)	HVRT	
3.3	CEA TSCG: Part-II.B1/B2, IEGC 2023: 24	**Evaluation Report on Test Reports of IBR Units**	R
3.4		**Statement of Compliance of IBR Unit**	
3.5		**Test Reports for SVG/STATCOM Unit(s) - If installed**	
3.5.1	CEA TSCG: Part-II.B1(1)	Harmonics	Single report containing all the test results
3.5.2	CEA TSCG: Part-II.B1(2)	DC Current Injection	
3.5.3	CEA TSCG: Part-II.B1(3)	Flicker	
3.5.4	CEA TSCG: Part-II.B2(1)	PQ Capability Test	
3.5.5	CEA TSCG: Part-II.B2(2)	Capable to operate in frequency range: 47.5 Hz to 52 Hz with +/-5% voltage variation	
3.5.6	CEA TSCG: Part-II.B2(2)	Capable to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation	
3.5.7	CEA TSCG: Part-II.B2(3)	LVRT (Shall include details of Id & Iq calculation principles for LVRT & HVRT)	

Sr. No.	Relevant Regulation Clauses	Description	Reports (R)
3.5.8	CEA TSCG: Part-II.B2(7)	HVRT	
3.6	CEA TSCG: Part-II.B1/B2	**Evaluation Report on Test Reports of SVG/STATCOM Unit(s)**	R
3.7		**Statement of Compliance of SVG/STATCOM Unit(s)**	

D. IBR/WTG Single Unit - Benchmarked Simulation Model and Report Submission:

The objective of Unit IBR benchmarking in RMS domain is to demonstrate that the IBR performance as given in the type test report is matching with model performance to the extent possible in RMS platform.

a) List of Benchmarking report & Unit IBR Models to be submitted:

Sr. no.	Relevant Regulation Clause	Details of unit models & benchmarking report of SVG/STATCOM	Simulation Models (SM)/Reports (R)
1	CEA TSCG: 6(6)	Benchmarked Generic RMS (**PSS/E**) model of IBR unit(s) alongwith test setup and user model guide	SM
2		.sav files, .dyr files, .sld files, .plb files, .py files	
3		Benchmarking Report of RMS (**PSS/E**) IBR unit(s) model (Tests to be conducted as per CEA Connectivity Standards are provided below)	R
4		Whether SCR and X/R ratio considered in the simulation study (**PSS/E**) is same as the one considered in the test results?	[Y/N]
5		Benchmarked EMT(**PSCAD**) model of IBR unit(s) along with user model guide & other supporting files	SM
6		.pscx, .pswx, .dll files along with test setup & test cases	
7		Benchmarking Report of EMT (**PSCAD**) model of IBR unit(s)	R
8		Report on comparison of RMS & EMT equivalent model response under steady state & dynamic condition	
9		Whether SCR and X/R ratio considered in the simulation study (**PSCAD**) is same as the one considered in the test results?	[Y/N]

b) List of tests to be incorporated in RMS Benchmarking report

1. PQ Capability Curve of IBR / WTG		
Test No.	Relevant Regulation Clause	**POI / PCC Voltage (pu)**
1	CEA TSCG: Part-II.B2(1)	1.0
2		0.95
3		1.05

2. Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation				
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor
4	CEA TSCG: Part-II.B2(2)	50 to 47.5	1.0	Any
5		50 to 52		

3. Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation					
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)
6	CEA TSCG: Part-II.B2(2)	50 to 49.5	0.95	Lagging (0.95)	1.0
7			1.05	Leading (0.95)	
8		50 to 50.5	0.95	Lagging (0.95)	
9			1.05	Leading (0.95)	

4. Low voltage ride through [Other partial active power levels in place of 25% and 50% may also be considered] [For WTGs, full load test may be conducted at any power level between 90-100%] [Test for voltage dip up to 0.5 p.u. may be conducted for any other voltage dip also between 0.15 p.u. to 0.85 p.u. The time duration shall be considered as per the LVRT curve in CEA TSCG]					
Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre-fault Active Power dispatch (pu)	Nature of voltage dip
10	CEA TSCG: Part-II.B2(3)	0.85	3.0	1.0	Balanced Three-Phase
11		0.5	1.65		
12		0.15	0.3		
13		0.85	3.0	0.5	
14		0.5	1.65		
15		0.15	0.3		
16		0.85	3.0	0.25	
17		0.5	1.65		
18		0.15	0.3		

5. Active power set-point and Rate of change of active power				
Test No.	Relevant Regulation Clause	**Change in active power dispatch**	POI Voltage (pu)	Power factor (pf)
19	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (ramp rate < 10% per minute)	1.0	Unity
20		Active power set-point and Ramp down test (ramp rate < 10% per minute)		

6. Frequency response test (any droop in range of 3 - 6%) [In place of step change of 0.15 Hz, any other step change for tests may also be considered] [Other partial active power levels in place of 10% and 50% may also be considered]					
Test No.	Relevant Regulation Clauses	**Frequency change (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)
21	CEA TSCG: Part-II.B2(4)(ii,iii) IEGC: 30(10)	50 to 50.15	0.9-1.0	1.0	Unity
22			0.5		
23			0.1		
24		50 to 49.85	0.5		
25			0.1		
Note: During the above test, frequency shall be first changed upto dead band limit to show its insensitivity to active power change					

7. Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz					
Test No.	Relevant Regulation Clause	**Change in frequency (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)
26	CEA TSCG: Part-II.B2(4) (ii, iii)	Greater than 0.3Hz (upwards)	0.9-1.0	1.0	Unity
27		Greater than 0.3Hz (downwards)			

8. High voltage ride through [For WTGs, full load test may be conducted at any power level between 90-100%] [Other partial active power levels in place of 25% and 50% may also be considered]					
Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
28	CEA TSCG: Part-II.B2(7)	1.3	0.2	1.0	Balanced Three phase
29		1.2	2		
30		1.3	0.2	0.5	
31		1.2	2		
32		1.3	0.2	0.25	
33		1.2	2		

c) **List of tests to be incorporated in Unit IBR EMT Benchmarking report**

The objective of Unit IBR benchmarking in EMT domain is to demonstrate that the IBR performance as given in the type test report is matching with model performance to the extent possible in EMT platform.

Entity shall submit the unit benchmarking report containing following tests:

1. PQ Capability Curve of IBR / WTG		
Test No.	Relevant Regulation Clause	**POI /PCC Voltage (pu)**
1	CEA TSCG: Part-II.B2(1)	1.0
2		0.95
3		1.05

2. Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation				
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor
4	CEA TSCG: Part-II.B2(2)	50 to 47.5	1.0	Any
5		50 to 52		

3. Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation					
Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI /PCC Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)
6	CEA TSCG: Part-II.B2(2)	50 to 49.5	0.95	Lagging (0.95)	1.0
7			1.05	Leading (0.95)	
8		50 to 50.5	0.95	Lagging (0.95)	
9			1.05	Leading (0.95)	

4. Low Voltage Ride Through (LVRT) [Other partial active power levels in place of 25% and 50% may also be considered] [For WTGs, full load test may be conducted at any power level between 90-100%] [Test for voltage dip up to 0.5 p.u. may be conducted for any other voltage dip also between 0.15 p.u. to 0.85 p.u. The time duration shall be considered as per the LVRT curve in CEA TSCG]					
Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre - fault Active Power dispatch (pu)	Nature of voltage dip
10		0.85	3.0	1.0	Balanced Three phase
11		0.5	1.65		
12		0.15	0.3		
13		0.85	3.0		Unbalanced (LL)
14		0.5	1.65		
15		0.15	0.3		
16		0.85	3.0		Unbalanced (L)
17		0.5	1.65		
18		0.15	0.3		

4. Low Voltage Ride Through (LVRT)

[Other partial active power levels in place of 25% and 50% may also be considered]
[For WTGs, full load test may be conducted at any power level between 90-100%]
[Test for voltage dip up to 0.5 p.u. may be conducted for any other voltage dip also between 0.15 p.u. to 0.85 p.u. The time duration shall be considered as per the LVRT curve in CEA TSCG]

Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre - fault Active Power dispatch (pu)	Nature of voltage dip
19	CEA TSCG: Part-II.B2(3)	0.85	3.0	0.5	Balanced Three phase
20		0.5	1.65		
21		0.15	0.3		
22		0.85	3.0		Unbalanced (LL)
23		0.5	1.65		
24		0.15	0.3		
25		0.85	3.0		Unbalanced (L)
26		0.5	1.65		
27		0.15	0.3		
28		0.85	3.0	0.25	Balanced Three phase
29		0.5	1.65		
30		0.15	0.3		
31		0.85	3.0		Unbalanced (LL)
32		0.5	1.65		
33		0.15	0.3		
34		0.85	3.0		Unbalanced (L)
35		0.5	1.65		
36		0.15	0.3		

5. Active power set-point and Rate of change of active power

Test No.	Relevant Regulation Clause	**Change in active power dispatch**	POI/PCC Voltage (pu)	Power factor (pf)
37	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (ramp rate < 10% per minute)	1.0	Unity
38		Active power set-point and Ramp down test (ramp rate < 10% per minute)		

6. Frequency response test (any droop in range of 3 - 6%)

[In place of step change of 0.15 Hz, any other step change for tests may also be considered]
[Other partial active power levels in place of 10% and 50% may also be considered]

Test No.	Relevant Regulation Clauses	**Frequency change (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)
39	CEA TSCG: Part-II.B2(4)(ii,iii)	50 to 50.15	0.9-1.0	1.0	Unity
40			0.5		
41			0.1		

42	IEGC: 30(10)	50 to 49.85	0.5		
43			0.1		
Note: During the above test, frequency shall be first changed upto dead band limit to show its insensitivity to active power change					

7. Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz:

Test No.	Relevant Regulation Clause	**Change in frequency (Hz)**	Active Power dispatch (pu)	POI/PCC Voltage (pu)	Power factor (pf)
44	CEA TSCG: Part-II.B2(4)(ii, iii)	Greater than 0.3Hz (upwards)	1.0	1.0	Unity
45		Greater than 0.3Hz (downwards)			

8. High Voltage Ride Through (HVRT)

[For WTGs, full load test may be conducted at any power level between 90-100%]

[Other partial active power levels in place of 25% and 50% may also be considered]

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
46	CEA TSCG: Part-II.B2(7)	1.3	0.2	1.0	Balanced Three phase
47		1.2	2		
48		1.3	0.2		Single phase
49		1.2	2		
50		1.3	0.2	0.5	Balanced Three phase
51		1.2	2		
52		1.3	0.2		Single phase
53		1.2	2		
54		1.3	0.2	0.25	Balanced Three phase
55		1.2	2		
56		1.3	0.2		Single phase
57		1.2	2		

Total number of tests to be performed at Unit IBR level (RMS+EMT) = 33 + 57 = 90nos.

E. SVG/STATCOM Single Unit - Benchmarked Simulation Model and Report

a) List of Benchmarking report & Unit SVG/STATCOM Models to be submitted

The objective of Unit IBR benchmarking in EMT domain is to demonstrate that the SVG/STATCOM performance as given in the type test report is matching with model (simulation) performance to the extent possible.

Sr. No.	Relevant Regulation Clause	Details of unit models & benchmarking report of SVG/STATCOM	Simulation Models (SM)/Reports (R)
1	CEA TSCG: 6(6)	Benchmarked RMS (**PSS/E**) model of SVG/STATCOM with supporting files like .sav, .dyr, .sld along with test setup	SM
2		Benchmarked EMT (**PSCAD**) model of SVG/STATCOM with supporting files like .dll, .pswx, .pscx along with test setup	
3		Benchmarking Report of RMS (**PSS/E**) model of SVG/STATCOM	R
4		Benchmarking Report of EMT (**PSCAD**) model of SVG/STATCOM	
5		Report on comparison of RMS & EMT equivalent model response under steady state & dynamic condition	

b) List of tests to be incorporated in RMS Benchmarking report

1. Low voltage ride through				
Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre-fault Reactive Power dispatch
1	CEA TSCG: Part-II.B2(3)	0.85	3.0	Max. absorption
2		0.5	1.65	
3		0.15	0.3	

2. High voltage ride through				
Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Initial Reactive Power dispatch
4	CEA TSCG: Part-II.B2(7)	1.3	0.2	Max. injection
5		1.2	2	

3. Demonstration of ± Q capability		
Test No.	Relevant Regulation Clause	**Range**
6	CEA TSCG: Part-II.B2(1)	Upto full capacitive range
7		Upto full inductive range

c) List of tests to be done on EMT Benchmarking report

The objective of Unit IBR benchmarking in EMT domain is to demonstrate that the SVG/STATCOM performance as given in the type test report is matching with model performance to the extent possible in EMT platform.

<table>
<tr><th colspan="6">1. Low voltage ride through</th></tr>
<tr><th>Test No.</th><th>Relevant Regulation Clause</th><th>LVRT Target Voltage (pu)</th><th>Duration of voltage dip (sec)</th><th>Pre-fault Reactive Power dispatch (pu)</th><th>Nature of voltage dip</th></tr>
<tr><td>1</td><td rowspan="6">CEA TSCG: Part-II.B2(3)</td><td>0.85</td><td>3.0</td><td rowspan="6">Max. absorption mode</td><td rowspan="3">Balanced Three phase</td></tr>
<tr><td>2</td><td>0.5</td><td>1.65</td></tr>
<tr><td>3</td><td>0.15</td><td>0.3</td></tr>
<tr><td>4</td><td>0.85</td><td>3.0</td><td rowspan="3">Unbalanced (LL)</td></tr>
<tr><td>5</td><td>0.5</td><td>1.65</td></tr>
<tr><td>6</td><td>0.15</td><td>0.3</td></tr>
</table>

<table>
<tr><th colspan="6">2. High voltage ride through</th></tr>
<tr><th>Test No.</th><th>Relevant Regulation Clause</th><th>HVRT Target Voltage (pu)</th><th>Duration of voltage dip (sec)</th><th>Initial Reactive Power dispatch (pu)</th><th>Nature of voltage dip</th></tr>
<tr><td>7</td><td rowspan="4">CEA TSCG: Part-II.B2(7)</td><td>1.3</td><td>0.2</td><td rowspan="4">Max. injection mode</td><td rowspan="2">Balanced Three phase</td></tr>
<tr><td>8</td><td>1.2</td><td>2</td></tr>
<tr><td>9</td><td>1.3</td><td>0.2</td><td rowspan="2">Single phase</td></tr>
<tr><td>10</td><td>1.2</td><td>2</td></tr>
</table>

<table>
<tr><th colspan="3">3. Demonstration of ± Q capability</th></tr>
<tr><th>Test No.</th><th>Relevant Regulation Clauses</th><th>Range</th></tr>
<tr><td>11</td><td rowspan="2">CEA TSCG: Part-II.B2(1)</td><td>Upto full capacitive range</td></tr>
<tr><td>12</td><td>Upto full inductive range</td></tr>
</table>

Total number of tests to be performed at SVG/STATCOM (RMS+EMT) = 7+12 = 19

F. List of tests to be conducted at plant level in EMT platform

1. Power Quality tests:

a) Evaluation of current harmonics at POI (Harmonic Load Flow model)

Test No.	Relevant Regulation Clause	Default Active Power (pu)
1	CEA TSCG: Part-II.B1(2)	P=1.0
2		P=0.9
3		P=0.8
4		P=0.7
5		P=0.6
6		P=0.5
7		P=0.4
8		P=0.3
9		P=0.2
10		P=0.1

b) DC Current injection at POI

Test No.	Relevant Regulation Clause	Default Active and Reactive power dispatch (pu)
11	CEA TSCG: Part-II.B1(2)	P=1.0; Q=0

c) Flicker study at POI (Pst & Plt)

Test No.	Relevant Regulation Clause	Default Active and Reactive power dispatch (pu)
12	CEA TSCG: Part-II.B1(2)	P=1.0; Q=0

2. Reactive power capability test

Test No.	Relevant Regulation Clause	**POI Voltage (pu)**	Supplemental device (if any) (In service/out of service)
13	CEA TSCG: Part-II.B2(1)	0.95	In service
14		1.05	
15		0.95	Out of service
16		1.05	

3. Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	PPC Frequency Flag
17	CEA TSCG: Part-II.B2(2)	50 to 47.5	P=1.0	1.0	Any	Off
18		50 to 52				

4. **Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation**

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)	PPC Frequency Flag
19	CEA TSCG: Part-II.B2(2)	50 to 49.50	0.95	0.95 lagging	1.0	Off
20			1.05	0.95 leading		
21		50 to 50.50	0.95	0.95 lagging		
22			1.05	0.95 leading		

5. **Low voltage ride through**

Test No.	Relevant Regulation Clauses	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre-fault Active Power dispatch (pu)	Nature of voltage dip
23	CEA TSCG: Part-II.B2(3)	0.85	3.0	1.0	Balanced Three phase
24		0.5	1.65		
25		0.15	0.3		
26		0.85	3.0		Unbalanced (LL)
27		0.5	1.65		
28		0.15	0.3		
29		0.85	3.0		Unbalanced (LG)
30		0.5	1.65		
31		0.15	0.3		
32		0.85	3.0	0.5	Balanced Three phase
33		0.5	1.65		
34		0.15	0.3		
35		0.85	3.0		Unbalanced (LL)
36		0.5	1.65		
37		0.15	0.3		
38		0.85	3.0		Unbalanced (LG)
39		0.5	1.65		
40		0.15	0.3		
41		0.85	3.0	0.25	Balanced Three phase
42		0.5	1.65		
43		0.15	0.3		
44		0.85	3.0		Unbalanced (LL)
45		0.5	1.65		
46		0.15	0.3		
47		0.85	3.0		Unbalanced (LG)
48		0.5	1.65		
49		0.15	0.3		

6. **Rate of change of active power:**

Test No.	Relevant Regulation Clause	**Change in active power dispatch**	POI Voltage (pu)	Power factor (pf)
50	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (ramp rate < 10% per minute)	1.0	Unity
51		Active power set-point and Ramp down test (ramp rate < 10% per minute)		

7. **Frequency response test (any droop in range of 3 - 6%):**

Test No.	Relevant Regulation Clauses	**Frequency change (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	PPC Frequency Flag
52	CEA TSCG: Part-II.B2(4)(ii,iii) IEGC: 30(10)	50 to 50.15	1.0	1.0	Unity	On
53			0.5			
54			0.1			
55		50 to 49.85	1.0			
56			0.5			
57			0.1			
Note: During the above test, frequency shall be first changed upto dead band limit to show its insensitivity to active power change						

8. **Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz:**

Test No.	Relevant Regulation Clause	**Change in frequency (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)
58	CEA TSCG: Part-II.B2(4)(ii, iii)	Greater than 0.3Hz (upwards)	0.9	1.0	Unity
59		Greater than 0.3Hz (downwards)			

9. **High voltage ride through:**

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
60		1.3	0.2	1.0	Balanced Three phase
61		1.2	2		
62		1.1	Continuous		
63		1.3	0.2		Single phase
64		1.2	2		
65		1.1	Continuous		

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
66	CEA TSCG: Part-II.B2(7)	1.3	0.2	0.5	Balanced Three phase
67		1.2	2		
68		1.1	Continuous		
69		1.3	0.2		Single phase
70		1.2	2		
71		1.1	Continuous		
72		1.3	0.2	0.25	Balanced Three phase
73		1.2	2		
74		1.1	Continuous		
75		1.3	0.2		Single phase
76		1.2	2		
77		1.1	Continuous		

G. **List of tests to be conducted at plant level in RMS platform:**

1. **Reactive power capability test:**

Test No.	Relevant Regulation Clause	**POI Voltage (pu)**	Supplemental devices (SVC/STATCOM) (if any) (In service/out of service)
1	CEA TSCG: Part-II.B2(1)	1.0	In-service (If installed)
2		0.95	
3		1.05	
4		1.0	Out of service
5		0.95	
6		1.05	

2. **Capability to operate in frequency range: 47.5Hz to 52Hz with +/-5% voltage variation**

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	Default Active Power dispatch (pu)	POI Voltage (pu)	PPC Frequency Flag
7	CEA TSCG: Part-II.B2(2)	50 to 47.5	1.0	1.0	Off
8		50 to 52			

3. **Capability to provide rated output in frequency range of 49.5Hz to 50.5Hz with +/-5% voltage variation**

Test No.	Relevant Regulation Clause	**Frequency change (Hz)**	POI Voltage (pu)	Power factor (pf)	Active Power dispatch (pu)	PPC Frequency Flag
9	CEA TSCG: Part-II.B2(2)	50 to 49.5	0.95	Lagging (0.95)	1.0	Off
10			1.05pu	Leading (0.95)		
11		50 to 50.5	0.95pu	Lagging (0.95)		
12			1.05pu	Leading (0.95)		

4. **Low voltage ride through**

Test No.	Relevant Regulation Clause	**LVRT Target Voltage (pu)**	Duration of voltage dip (sec)	Pre-fault Active Power dispatch (pu)	Nature of voltage dip
13	CEA TSCG: Part-II.B2(3)	0.85	3.0	1.0	Balanced Three-Phase
14		0.50	1.65		
15		0.15	0.3		
16		0.85	3.0	0.5	
17		0.50	1.65		
18		0.15	0.3		
19		0.85	3.0	0.25	
20		0.5	1.65		
21		0.15	0.3		

5. Active power set-point and Rate of change of active power

Test No.	Relevant Regulation Clauses	**Change in active power dispatch**	POI Voltage (pu)	Power factor (pf)
22	CEA TSCG: Part-II.B2(4)(i)	Active power set-point and Ramp up test (rate < 10% per minute)	1.0	Unity
23		Active power set-point and Ramp down test (ramp rate < 10% per minute)		

6. Frequency response test (any droop in range of 3 - 6%)

Test No.	Relevant Regulation Clauses	**Frequency change (Hz)**	Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)	PPC Frequency Flag
24	CEA TSCG: Part-II.B2(4)(ii,iii) IEGC: 30(10)	50 to 50.15	1.0	1.0	Unity	On
25			0.5			
26			0.1			
27		50 to 49.85	1.0			
28			0.5			
29			0.1			
Note: During the above test, frequency shall be first changed upto dead band limit to show its insensitivity to active power change						

7. Demonstration of immediate (within 1 second) real power primary frequency response of at least 10% of maximum Alternating Current active power capacity for frequency deviation in excess of 0.3 Hz:

Test No.	Relevant Regulation Clauses	**Change in frequency (Hz)**	Default Active Power dispatch (pu)	POI Voltage (pu)	Power factor (pf)
30	CEA TSCG: Part-II.B2(4)(ii, iii)	Greater than 0.3Hz (upwards)	0.9	1.0	Unity
31		Greater than 0.3Hz (downwards)			

8. High voltage ride through:

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
32	CEA TSCG: Part-II.B2(7)	1.3	0.2	1.0	Balanced Three-Phase
33		1.2	2		
34		1.1	Continuous		
35		1.3	0.2	0.5	
36		1.2	2		
37		1.1	Continuous		

Test No.	Relevant Regulation Clause	**HVRT Target Voltage (pu)**	Duration of voltage rise (sec)	Initial Active Power dispatch (pu)	Nature of voltage rise
38		1.3	0.2	0.2	
39		1.2	2		
40		1.1	Continuous		

Total number of tests to be performed at Plant level (EMT+RMS) = 77+40 = 117

H. List of models & reports to be submitted at plant level:

Sr. No.	**Relevant Regulation Clauses**	**Description**	**Reports (R) / Simulation Models (SM)**
1	CEA TSCG: 6(6)	Compliance Report in RMS (**PSS/E**)- Reactive power Analysis	R
2		Compliance Report in RMS (**PSS/E**)- Dynamic Studies	
3		Compliance Report in EMT (**PSCAD**)- Dynamic & other applicable tests	
4		Compliance Report in EMT (**PSCAD**) for Power Quality Assessment	
5		Report on **comparison of RMS & EMT** equivalent model response under steady state & dynamic conditions	
6		Generic RMS (**PSS/E**) model of RE plant (**detailed**) along with all supporting files (.dyr, .sav, .raw, .sld, .py, model user guide etc.)	SM
7		Generic RMS (**PSS/E**) model of RE plant (**equivalent**) along with all supporting files (.dyr, .sav, .raw, .sld, .py, model user guide etc.)	
8		RE Plant EMT (**PSCAD**) model of RE plant (equivalent model) along with all supporting files including model user guide	
9		RE Plant EMT (**PSCAD**) Power Quality Assessment model along with all supporting files including model user guide	
10	CEA TSCG: Part-III.5	Short Circuit (Non-Conventional Source - Fault Contribution) Table & Model (.seq)	

I. Others Technical Requirements (Required at the time of FTE Only)

Sr. No.	**Relevant Regulation Clauses**	**Description**	**Remarks**
1	CEA Technical Standards for Construction of Electric Plants and Electric Lines: 48(6)	Installation of Phasor measurement units	**Required at the time of FTE only**

Sr. No.	Relevant Regulation Clauses	Description	Remarks
2	CEA TSCG: 6(4)	Installation of DR/EL	
3	CEA TSCG: Part-III.6	Power Supply to Sub-station Auxiliaries	
4	CEA Technical Standards for Construction of Electric Plants and Electric Lines: 48(3)	Whether auto reclose setting enabled in 220 kV line for single phase	
5	CEA Grid Standards 2010	Data reporting format (For analysis of LVRT and HVRT events, IBR level high resolution data is required. Sample data may be provided)	

J. Details of Models for carrying out different studies

Sr. No.	Simulation Test Description	Simulation to be carried out on
1	Reactive Power Capability	Detailed RMS and Equivalent EMT Model
2	Power Quality	Power Quality Assessment Model
3	Low Voltage Ride Through	Equivalent RMS and Equivalent EMT Model
4	High Voltage Ride Through	
5	Operating Frequency Range	
6	Frequency Response	
7	Dynamic Reactive Power Support	
8	Ramping Capability	

K. Points to be considered while submission:

1. The above list shall be considered for a RE plant involving one type of IBR. In case of hybrid, the above DMAT shall be carried out for following scenarios:
   a) With both **Solar and Wind capacity taken into account** subject to condition that active power observed at POI is not exceeding the connectivity quantum as per CTU grant (as per the proportionality of the sources).
   b) With consideration of **only solar component**.
   c) With consideration of **only wind component**.
2. Based on specific requirements, additional tests shall be carried out by the entity.
3. For all the tests except power quality assessment, if actual SCR at the POI is more than 5 then SCR of 5 needs to be considered in the plant level dynamic simulation studies. If actual SCR is less than 5, then actual SCR shall be considered in simulation studies. The power quality studies shall be carried out considering the **actual SCR**.
4. The entity shall ensure that SCR and X/R considered while Unit IBR type testing is same as in the single unit IBR /supplemental device model(s) also.

5. The X/R ratio of 10 shall be considering while **modelling the POI** in SMIB models unless specifically provided.
6. The X/R ratio of 10 shall be considering while conducting **Low Voltage Ride through Tests** if voltage dips are emulated through application of fault in plant level SMIB models unless specifically provided.
7. The dedicated transmission line(s) shall be modelled as frequency dependent model in the plant level EMT model.
8. The power transformer(s) at Generator Pooling Station shall be modelled explicitly and no aggregation shall be done at such level.
9. Communication delays, polling rates & IBR level protections shall be appropriately modelled in the plant level models.
10. Time series data indicated in Unit IBR/SVG test report shall be of appropriate resolution and scale. Entity may refer IEC 61400-21 for data reporting table and representation of electrical quantities.
11. Unit level IBR/Supplemental device model and Plant level PSS/E model shall be submitted in Version 36.0 and above. In PSCAD platform unit level and plant level models shall be submitted in Version 5.0 or above and 64-bit compiler alongwith IVF 2015 or above.
12. Entity shall conduct the benchmarking of equivalent model with detailed plant model (in PSS/E) to validate the steady state and dynamic performance (one LVRT & HVRT case).
13. The aggregation of IBRs shall be done only for IBR of same make (OEM) and model. Also, aggregation shall be done for the same nature of source (e.g. WTG to WTG).
14. Entity shall include the Rate-1,2,3 (as applicable) in all elements in the models.
15. Entity shall use element ID “S” for Solar and “W” for WTGs in the models.
16. In case of unbalances cases, entity shall also include Negative Sequence currents & Negative sequence Voltage of IBR (including supplemental devices) and POI.
17. Stakeholders may align their test sequences matching with plant level tests given in this document.
18. Other requirements as mentioned in the **Report of the working group & CONN TD-1** shall remain same.

------------x-----------------------------xxx-------------------------------x------------