MINUTES OF THE SECOND MEETING OF STANDING TECHNICAL COMMITTEE RE-CONSTITUTED BY FOR

Venue	**: CERC, Conference Hall,**
	7th Floor, Tower B, World Trade Centre
	Nauroji Nagar, New Delhi-110029
Day/ Date	**: Friday, September 20, 2024**
List of Participants	**: Appendix – I**

The Second Meeting of the Standing Technical Committee was held on September 20, 2024, under the Chairmanship of Shri Ramesh Babu Veeravalli, Member (Technical), CERC. At the outset, the Chairman welcomed all the members of the Standing Technical Committee including representatives from GRID-INDIA and the Consultants for the meeting. The Chairman provided an overview of the agenda items, emphasizing the growing integration of renewable energy and the challenges in managing the grid. He stressed the importance of balancing the interests of Discoms, generators, and grid operators for effective operations. Thereafter the agenda items were taken up for discussion.

AGENDA NO. 1: CONFIRMATION OF MINUTES OF THE 1ST MEETING OF THE STANDING TECHNICAL COMMITTEE HELD ON 11th DECEMBER 2023

1. The minutes of the 1st meeting were confirmed by the standing technical committee.

AGENDA NO. 2: STATUS OF THE STATE FRAMEWORK FOR MINIMUM TURN DOWN LEVEL OF STATE THERMAL GENERATORS AND COMPENSATION

2. Representatives of the GRID-India apprised the committee on the framework of minimum turn-down levels and compensation for inter-state and intra-state thermal generating stations . It was highlighted that for inter-State generating stations, a minimum turn-down level of 55% has been specified in IEGC to enable flexible operation in the wake of RE integration into the system. This has also been supported with a corresponding compensation mechanism for the deterioration of heat rates, auxiliary energy consumption and oil support. Representative of Grid-India apprised the Forum that many States are yet to implement the matching provisions of minimum turn down level for intra-state thermal generating stations. Some States have specified a minimum turn--down level up to 55% but have not provided any compensation mechanism for intra-state generators to recover their cost due to heat rate deterioration, auxiliary consumption, or oil support. It was highlighted

during the meeting that on a number of instances where even pit head cheaper inter-state generating stations are being backed down by the system operator to accommodate renewable energy. In view of the ambitious RE integration targets by 2030, it was emphasised that the intra-State generating stations also need to be enabled to run at a minimum turn-down level of 55% on lines of inter-state thermal generating stations.

3. After deliberations, it was decided that a sub-group of technical experts should be formed to assist state- thermal plant operators in lowering the minimum turn down level upto 55%. This group should consist of representatives from GRID India, NTPC and key states like Uttar Pradesh, Haryana, Maharashtra, Madhya Pradesh, and Karnataka. Further, it was decided that the state thermal generating stations from five states namely, Andhra Pradesh, Telangana, Tamil Nadu, West Bengal and Odisha, may be selected in the initial phase for technical experts to visit and implement the required testing and procedure to implement minimum turn down level for state thermal generating stations.

AGENDA NO. 3: SCED IMPLEMENTATION AT STATE LEVEL

4. Representative of GRID India presented a brief overview on implementation of 'Security Constrained Economic Despatch (SCED)' at inter-state level and current status of SCED Implementation at State Level. It was highlighted that states like Uttar Pradesh, West Bengal and Gujarat were part of the initial SCED pilot, where customized intra-state software was provided to manage SCED. The next phase involved integrating inter-state and intra-state generating stations. This phase demonstrated the benefits of harmonizing inter-state and intra-state generation portfolios. Subsequently, combined Merit Order Dispatch and SCED across all participating states would yield greater efficiency and system benefits.
5. It was stressed that there is a need for harmonization between the central and state systems, such as gate closure mechanism, scheduling system etc for seamless operation for the seamless operation of SCED.
6. It was clarified that intra-state generators involved in the pilot would need to incur capital expenditure, which may be approved by SERC. It was also recommended for generators to provide ex-ante cost declarations was emphasized to improve transparency and enhance planning in the scheduling process.

7. It was recommended to initiate pilot projects in Madhya Pradesh, Maharashtra and Gujarat to explore the potential of SCED implementation at the state level with required approval from respective ERCs.

AGENDA NO. 4: PARTICIPATION OF INTRA-STATE GENERATING STATION FOR PROVIDING SECONDARY RESERVE ANCILLARY SERVICES (SRAS)

8. Representative of Grid India delivered a presentation on Secondary Reserve Ancillary Services (SRAS) for Intra-State Generating Stations and gave a brief overview about the Automatic Generation Control (AGC). The discussion highlighted that with increasing penetration of renewable energy, maintaining frequency control during peak solar generation periods has become a challenge. It was emphasized that relying solely on ISTS-connected generators is not sufficient and that more participation from intra-State generators is essential for effective frequency management and SRAS
9. It was highlighted that a regulatory framework similar to the one developed by CERC for SRAS at the central level is necessary for intra-state operations. This framework would assist in the effective management and integration of reserves at the state level. Intra-state generators should follow guidelines aligned with CERC's AGC participation process, covering areas such as (a)the procedure for obtaining NOCs from the respective state (b)Allowances for capital expenditure to implement AGC infrastructure and (c)Clarification on the sharing of financial gains from AGC participation.
10. It was proposed that to start with, a few State generating stations may be allowed to participate in inter-State SRAS mechanism with gradual development of the necessary infrastructure and control mechanisms. In this regard, issuance of Non-Objection Certificates (NOCs) to enable participation of State generators in the SRAS mechanism may be facilitated by respective State ERC.
11. It was recommended that pilot projects should be initiated in Madhya Pradesh, Maharashtra, and Gujarat to establish the regulatory framework required for intra-state SRAS participation. These projects will act as models which can then be replicated in other states. Additionally, respective SERCs may facilitate the issuance of NOCs to enable state generators' participation in the SRAS mechanism.

12. The Meeting ended with a vote of thanks to all members for their valuable contributions. Appreciation was also extended to Grid India for their presentation and to the USAID SAREP team for their assistance to the Standing Technical Committee.

ACTION POINTS:

1. A sub-group of technical experts, comprising representatives from GRID India, NTPC, and states that have already achieved 55% minimum turn down level should be established to assist other states and thermal plant operators in reducing their minimum turn down level to 55%.
2. As decided, pilot project for Security Constrained Economic Dispatch (SCED) will be initiated in Madhya Pradesh, Maharashtra and Gujarat to evaluate its potential at the state level.
3. Initiation of pilot projects in Madhya Pradesh, Maharashtra and Gujarat to develop the regulatory framework for participation of intra-state SRAS participation SERCs may facilitate NOCs for state generators to participate in Inter-state SRAS framework.

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APPENDIX -I

LIST OF PARTICIPANTS OF THE SECOND MEETING OF "STANDING TECHNICAL COMMITTEE RE-CONSTITUTED BY FOR"

Members

1. Shri. Ramesh Babu Veeravalli, Member, CERC -Chairperson of the STC
2. Shri Satyendra Nath Kalita, Member, Assam ERC -Member
3. Shri. Satyendra R. Pandey, Member, Gujarat ERC - Member
4. Shri. Arun Kumar Sinha, Member, Bihar ERC -Member
5. Shri. Prashant Chaturvedi, Member, MPERC -Member
6. Dr. S.K. Chatterjee, Chief (RA), CERC -Convener

Special Invitee:

7. Shri. A.S. Bakshi -Ex Member, CERC
8. Shri. S.R. Narasimhan -CMD, Grid India
9. Shri. S.C. Saxena -Director, Grid India
10. Shri. Awdhesh K. Yadav -Chief (Engg.) CERC
11. Ms. Shilpa Agrawal -Joint Chief (Engg.)CERC
12. Shri. Aditya P. Das -Senior DGM, Grid India
13. Shri. Phanisankar Chilukuri -Chief Manager, Grid India
14. Shri. Saif Rehman - Chief Manager, Grid India

Other Participants

15. Shri. Ravindra Kadam -Senior Advisor, CERC
16. Ms. Sukanya Mandal -Assistant Chief, CERC
17. Shri. Pankaj Rana -Assistant Secretary, FOR
18. Ms. Jijnasa Behera -Research Officer, FOR
19. Ms. Nausheen -Research Associate, CERC
20. Shri. Ajit Pandit -Consultant, USAID SAREP
21. Ms. Shreya Pandit -Consultant, USAID SAREP
22. Ms. Shivali Dwivedi - Consultant, USAID SAREP
23. Shri. Akhil Katiyar - Consultant, USAID SAREP

Annexure I

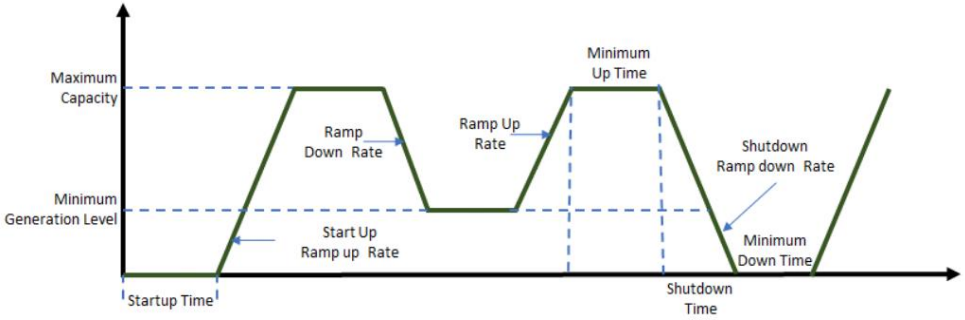
Status of the State framework for Minimum Turn Down level of State thermal Generators and Compensation

2nd Meeting of FOR Standing Technical Committee
20th September 2024

Key flexibility attributes

Minimum Turndown Level

- Minimum output (as % of capacity) that the generator can sustain continuously
- Lower MTL enables wider operating range of power plant



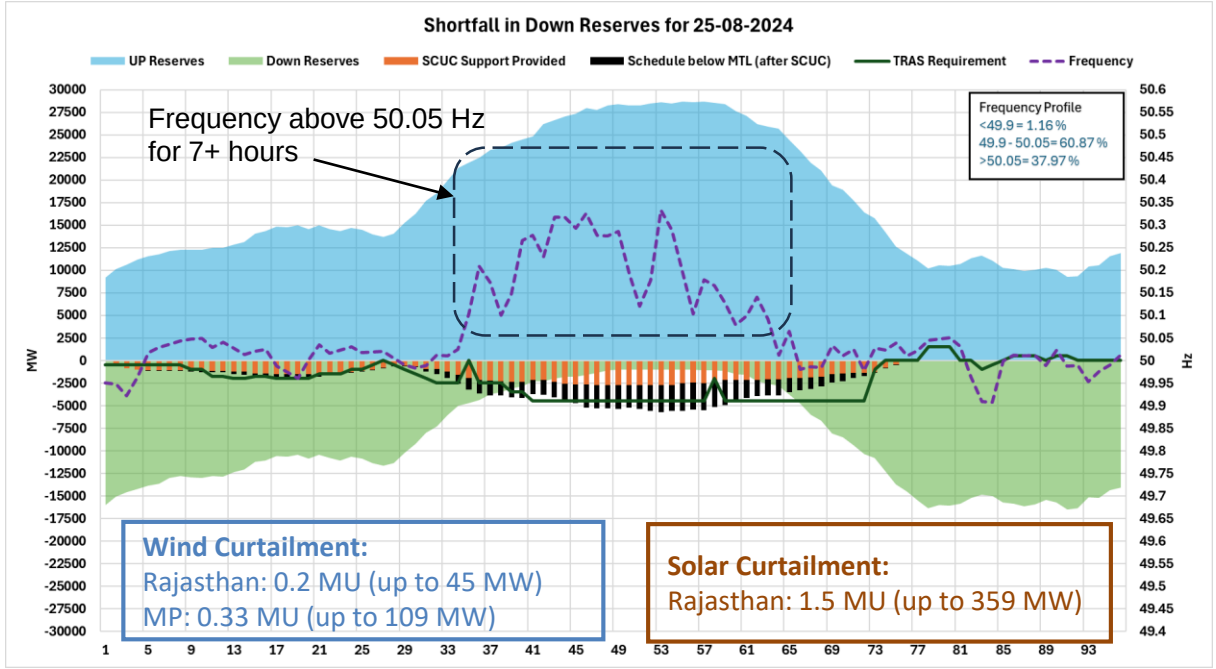
Ramp rate

- Rate at which generator can change output (as % of capacity/min)
- Faster ramp rate enables meeting net load ramping requirement

Minimum up/down time

- Min. time for which generator has to stay online before going offline and vice versa
- Lower minimum up/down times together with faster startup/shutdown time enables two-shifting operation

Deficit in Down Reserves at Inter-state level 25th Aug



- Coal & gas units being supported through SCUC to maintain adequate reserve during non-solar peaks
- Reduction in down reserves due to backing down of other generators
  - All units being backed down till MTL → no down reserves available resulting in high frequency
  - **15+ days since June 2024 with shortfall in down reserves**
- Lower Minimum levels would mitigate this issue

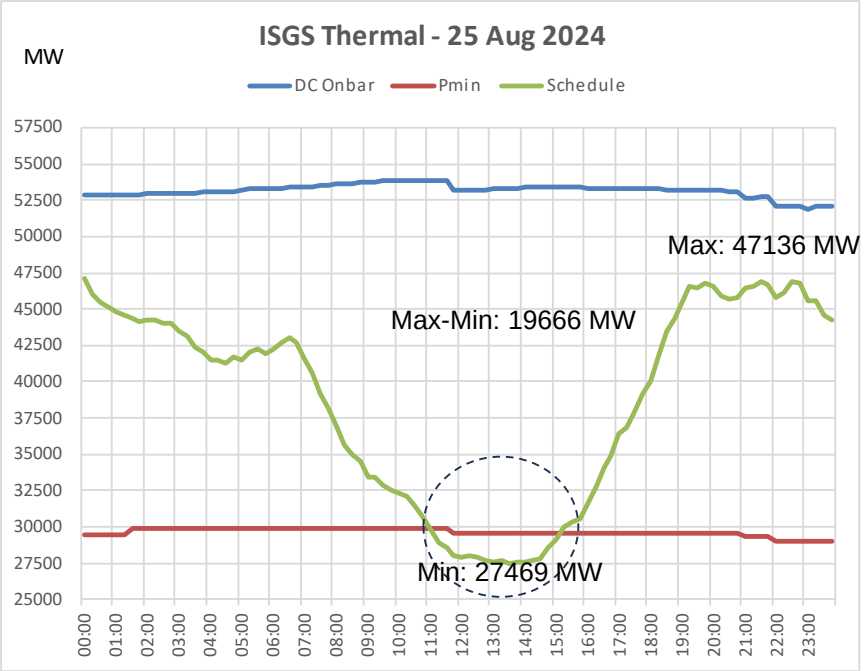
Schedule below MTL by buyers: 5800 MW

SCUC support provided: 2700 MW

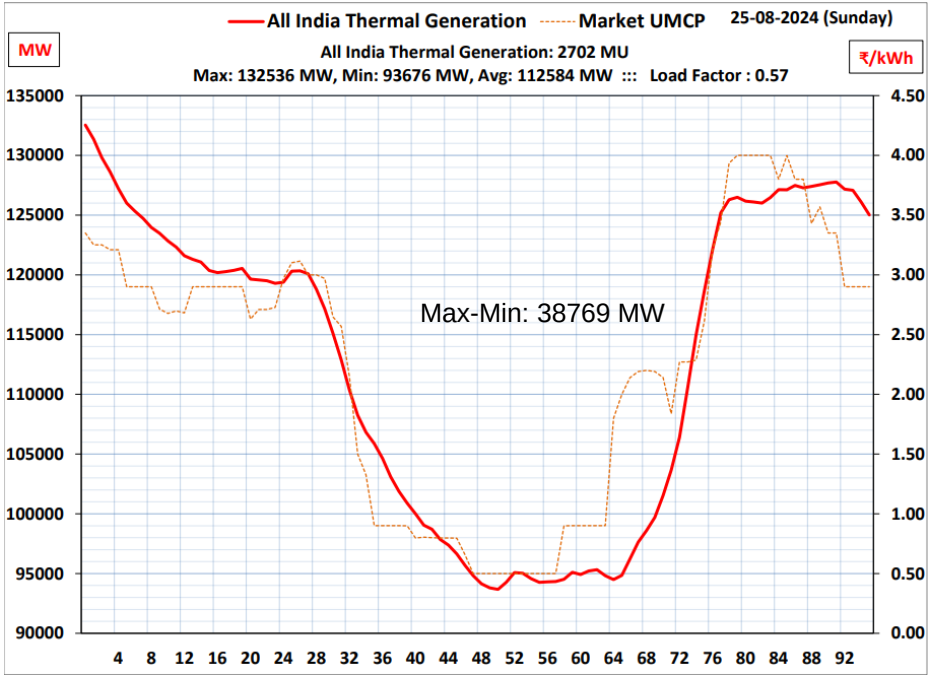
Down Reserves available: 1000 MW

TRAS dispatch Requirement in real-time: -4500 MW

Case Study – 25th August 2024

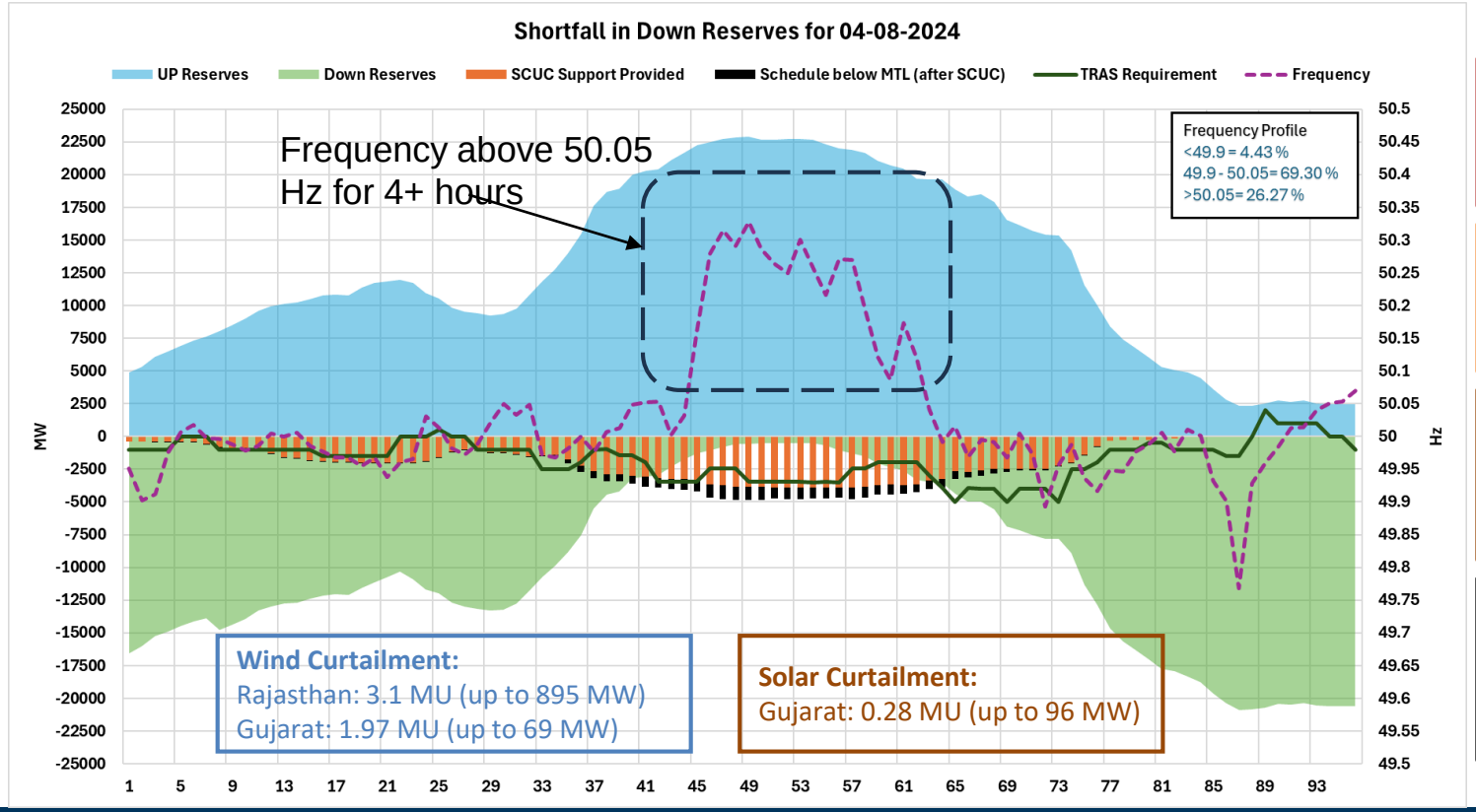


Aggregate ISGS Thermal scheduled below 55%



All India Thermal Generation below 100 GW

Deficit in Down Reserves at Inter-state level 4th Aug



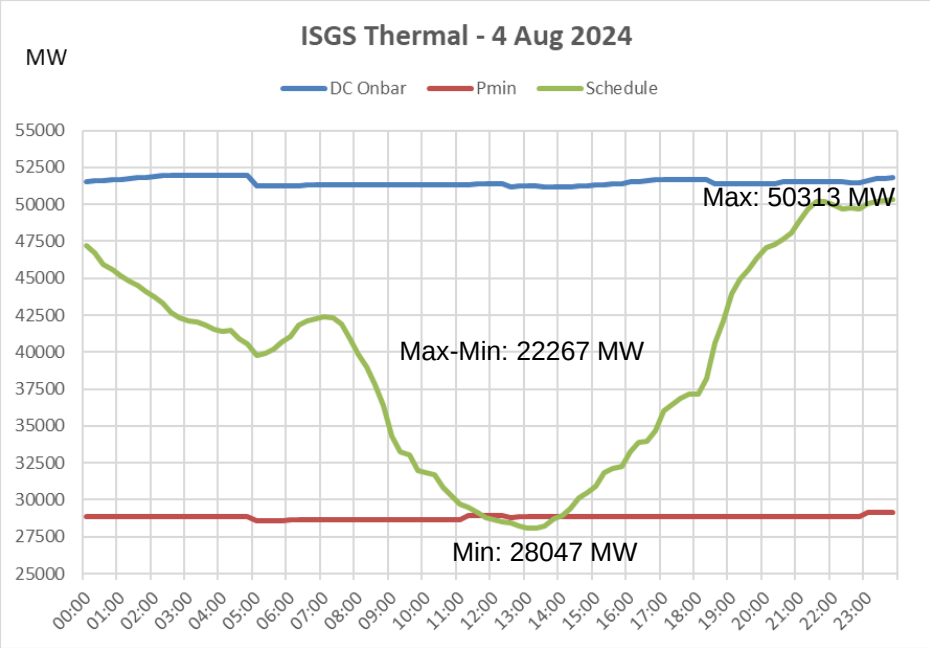
SCUC Support provided: 3900 MW

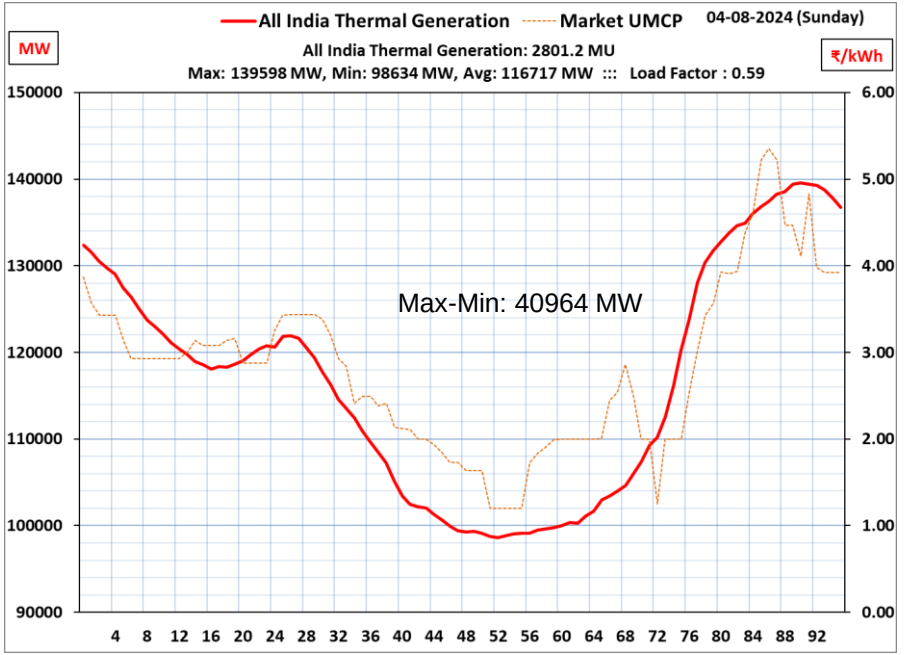
Down Reserves available (after SCUC dispatch): 500 MW

TRAS dispatch Requirement in real-time: -3500 MW
(40 MW dispatched from MBAS)

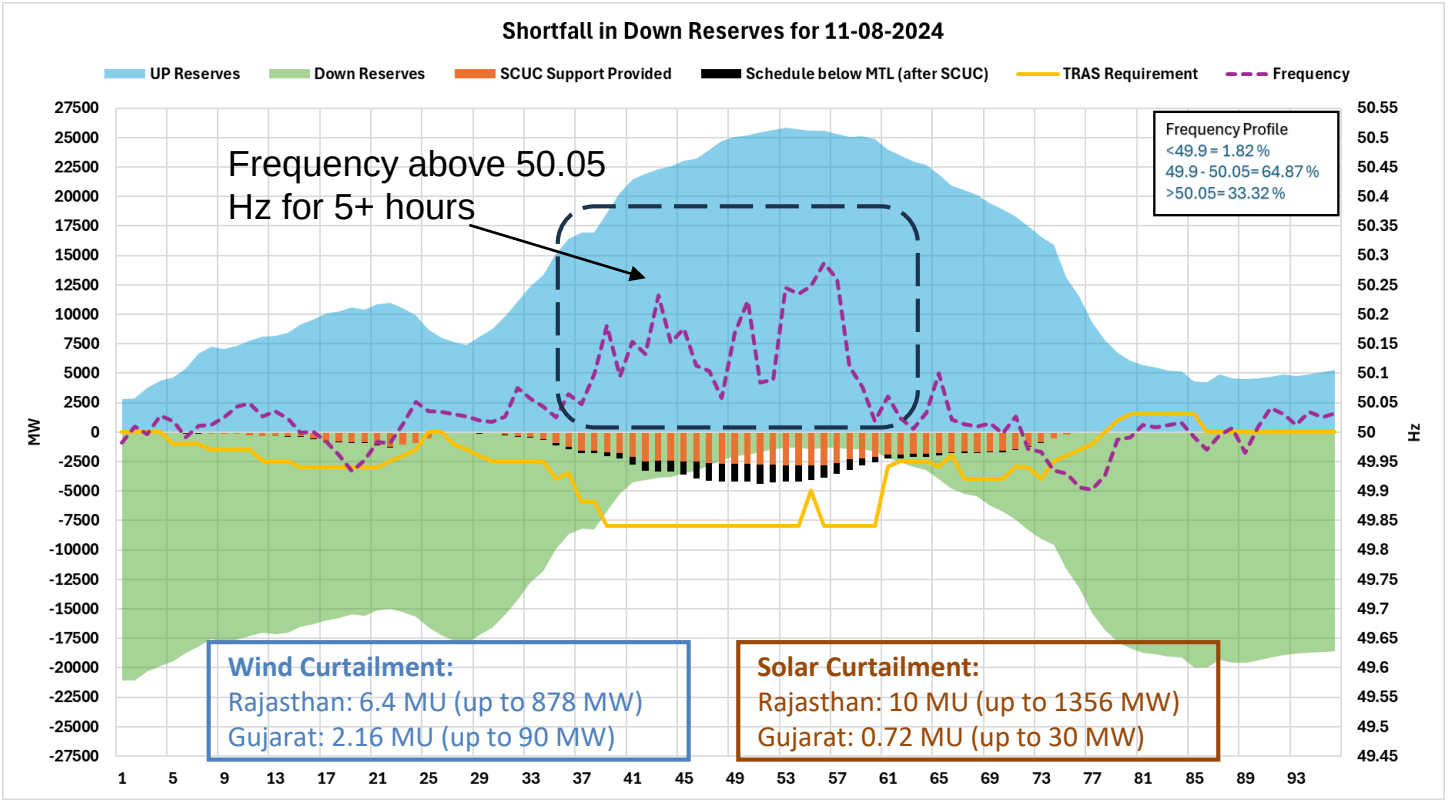
Schedule below MTL (addl. support req. from SCED): 1000 MW

Case Study – 4th August 2024





Deficit in Down Reserves at Inter-state level 11th Aug



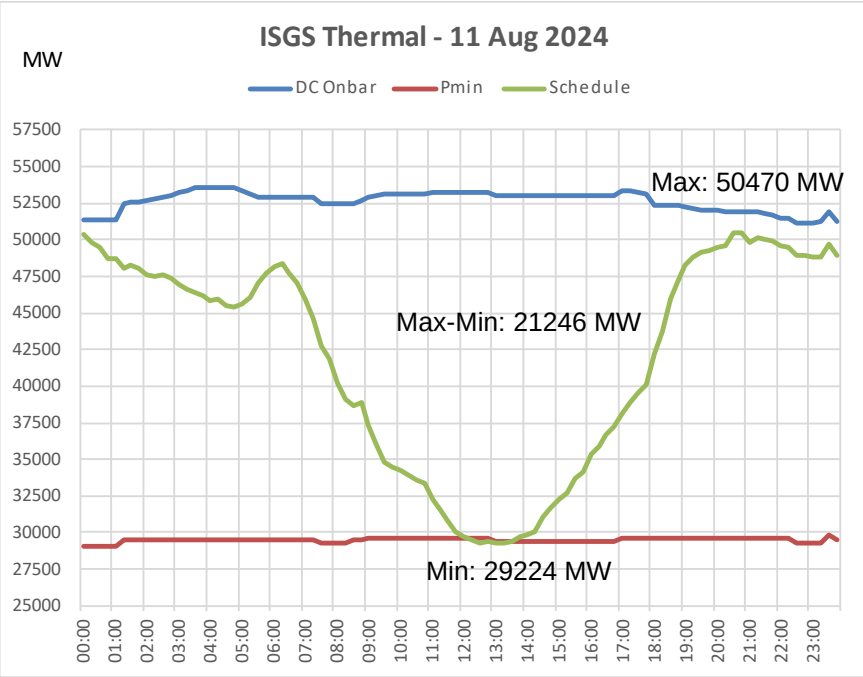
SCUC Support provided: 2800 MW

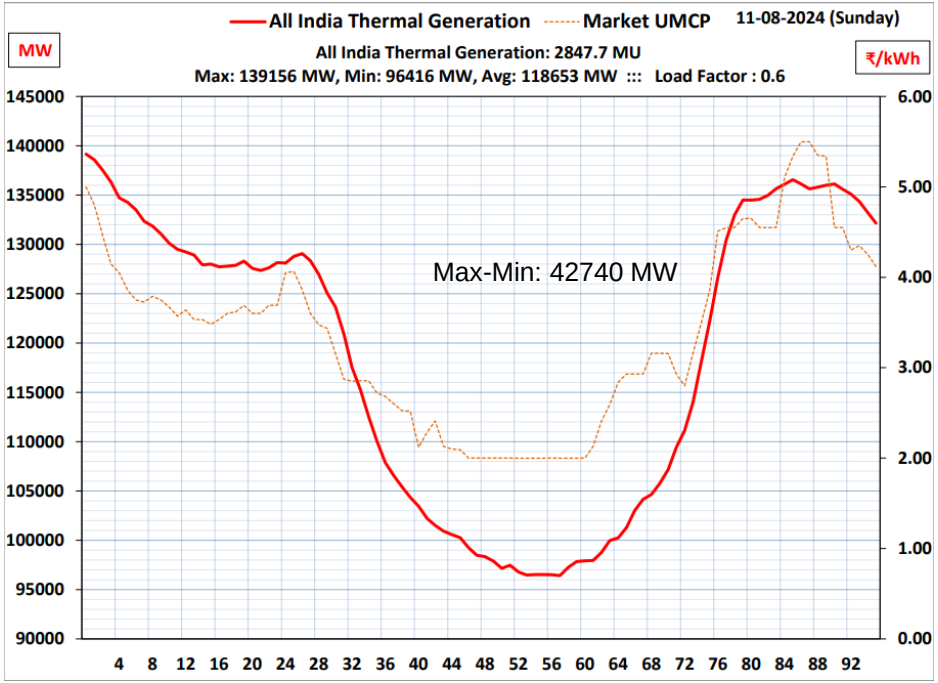
Down Reserves available (after SCUC dispatch): 1300 MW

TRAS dispatch Requirement in real-time: -8000 MW
(40 MW dispatched from MBAS)

Schedule below MTL (addl. support req. from SCED): 1500 MW

Case Study – 11th August 2024





Available down margins in Intra-State Thermal Plants at 12:02 hrs. (highest frequency – 50.39 Hz) on 4th August 2024 (1)

S.No.	Plant Name	STATE	Running capacity(B)	Generation at maximum frequency (A)	55% of Running Capacity (C = .55 * B)	Down Margin available (A-C)
1	RAYALASEEMA TPP	ANDHRA PRADESH	1440	860	792	**68**
2	MARWA TPS (2*500)	CHATTISGARH	1000	919	550	**369**
3	KORBA EAST EXT(DSPM) (2*250)	CHATTISGARH	250	230	138	**92**
4	WANAKBORI (7*210+1*800)	GUJARAT	1010	669	556	**113**
5	UKAI (2*200+1*210+1*500)	GUJARAT	700	445	385	**60**
6	GANDHINAGAR(GTPS) (3*210)	GUJARAT	210	145	116	**29**
7	BLTPS (2*250)	GUJARAT	250	162	138	**24**
8	KLTPS (2*75)	GUJARAT	75	58	41	**17**
9	RGTPP(KHEDAR)(2 * 600)	HARYANA	1200	744	660	**84**
10	KODERMA (2 * 500)	JHARKHAND	1000	642	550	**92**
11	BOKARO-A' (1 * 500)	JHARKHAND	500	341	275	**66**
12	TENUGHAT (2 * 210)	JHARKHAND	420	282	231	**51**
13	RAICHUR TPS	KARNATAKA	1090	721	600	**121**
14	JP BINA (2*250)	MADHYA PRADESH	250	141	138	**4**
15	TATA TROMBAY Th (1*250+1*500)	MAHARASTRA	250	270	138	**132**
16	DAHANU (2*250)	MAHARASTRA	500	284	275	**9**
17	IB.TPS (2 * 210)	ODISHA	420	317	231	**86**
18	RAJPURA(NPL) TPS(2 * 700)	PUNJAB	1400	1318	770	**548**
19	TALWANDI SABO TPS(3 * 660)	PUNJAB	1320	1037	726	**311**
20	GURU HARGOBIND SINGH TPS (LEHRA MOHABBAT)(2 * 210 + 2 * 250)	PUNJAB	710	634	391	**243**
21	GURU GOBIND SINGH TPS (ROPAR) (4 * 210)	PUNJAB	840	703	462	**241**
22	GOINDWAL(GVK)(2 * 270)	PUNJAB	270	231	149	**83**

Available down margins in Intra-State Thermal Plants at 12:02 hrs. (highest frequency – 50.39 Hz) on 4th August 2024 (2)

S.No.	Plant Name	STATE	Running capacity(B)	Generation at maximum frequency (A)	55% of Running Capacity (C = .55 * B)	Down Margin available (A-C)
23	KOTA TPS(2 * 110 + 2 * 195 + 3 * 210)	RAJASTHAN	1240	936	682	**254**
24	CHHABRA TPS(2 * 660 + 4 * 250)	RAJASTHAN	2320	1484	1276	**208**
25	RAJWEST (IPP) LTPS(8 * 135)	RAJASTHAN	945	725	520	**205**
26	KAWAI TPS(2 * 660)	RAJASTHAN	1320	852	726	**126**
27	BARSINGSAR (IPP) LTPS(2 * 125)	RAJASTHAN	250	169	138	**31**
28	KALISINDH TPS(2 * 600)	RAJASTHAN	600	361	330	**31**
29	METTUR TPS	TAMILNADU	1440	923	792	**131**
30	ST - CMS	TAMILNADU	250	170	138	**33**
31	NORTH CHENNAI TPS STG-II	TAMILNADU	600	347	330	**17**
32	KOTHAGUDEM TPS	TELANGANA	1550	1113	853	**260**
33	SINGARENI TPS	TELANGANA	600	441	330	**111**
34	JAWAHARPUR TPS (1 * 660)	UTTAR PRADESH	660	383	363	**20**
35	OBRA TPS (5 * 200)	UTTAR PRADESH	800	449	440	**9**
36	SAGARDIGHI(2 * 300 + 2 * 500)	WEST BENGAL	1100	789	605	**184**
37	MEJIA TPS(2 * 250 + 4 * 210)	WEST BENGAL	710	540	391	**150**
38	MEJIA TPS II (2 * 500)	WEST BENGAL	1000	681	550	**131**
39	KOLAGHAT(4 * 210)	WEST BENGAL	630	447	347	**101**
40	RTPS(2 * 600)	WEST BENGAL	600	425	330	**95**
41	BAKRESHWAR(5 * 210)	WEST BENGAL	840	542	462	**80**
42	SANTALDIH TPS(2 * 250)	WEST BENGAL	500	323	275	**48**
43	BANDEL TPS (1 * 60 + 1 * 215)	WEST BENGAL	275	198	151	**46**
						2271

Available down margins in Intra-State Thermal Plants at 13:44 hrs. (highest frequency – 50.33 Hz) on 11th August 2024

S.No.	Plant Name	STATE	Running capacity(B)	Generation at maximum frequency (A)	55% of Running Capacity (C = .55 * B)	Down Margin available (A-C)
1	KRISHNAPATTANAM	ANDHRAPRADESH	2400	1442	1320	**122**
2	KORBA EAST EXT(DSPM) (2*250)	CHATTISGARH	250	167	138	**30**
3	MARWA TPS (2*500)	CHATTISGARH	500	349	275	**74**
4	RGTPP(KHEDAR)(2 * 600)	HARYANA	1200	732	660	**72**
5	DCRTPP (YAMUNA NAGAR)(2 * 300)	HARYANA	600	337	330	**7**
6	TENUGHAT (2 * 210)	JHARKHAND	420	274	231	**43**
7	KODERMA (2 * 500)	JHARKHAND	1000	626	550	**76**
8	JP BINA (2*250)	MADHYA PRADESH	250	143	138	**6**
9	DAHANU (2*250)	MAHARASTRA	500	309	275	**34**
10	TATA TROMBAY Th (1*250+1*500)	MAHARASTRA	750	606	413	**194**
11	IB.TPS (2 * 210)	ODISHA	420	293	231	**62**
12	GURU GOBIND SINGH TPS (ROPAR)(4 * 210)	PUNJAB	630	455	347	**109**
13	KALISINDH TPS(2 * 600)	RAJASTHAN	1200	723	660	**63**
14	KAWAI TPS(2 * 660)	RAJASTHAN	1320	854	726	**128**
15	NORTH CHENNAI TPS STG-II	TAMILNADU	1200	672	660	**12**
16	OBRA TPS (5 * 200)	UTTAR PRADESH	600	376	330	**46**
17	JAWAHARPUR TPS (1 * 660)	UTTAR PRADESH	660	378	363	**15**
18	CHANDRAPURA TPS (2*250)	WEST BENGAL	500	323	275	**48**
19	DURGAPUR STPS(2 * 500)	WEST BENGAL	1000	690	550	**140**
20	MEJIA TPS II (2 * 500)	WEST BENGAL	500	349	275	**74**
21	RTPS(2 * 600)	WEST BENGAL	1200	773	660	**113**
22	KOLAGHAT(4 * 210)	WEST BENGAL	630	451	347	**104**
23	SAGARDIGHI(2 * 300 + 2 * 500)	WEST BENGAL	1300	811	715	**96**
24	SANTALDIH TPS(2 * 250)	WEST BENGAL	500	318	275	**43**
						1668

Available down margins in Intra-State Thermal Plants at 13:07 hrs. (highest frequency – 50.38 Hz) on 25th August 2024 (1)

S.No.	Plant Name	STATE	Running capacity(B)	Generation at maximum frequency (A)	55% of Running Capacity (C = .55 * B)	Down Margin available (A-C)
1	RAYALASEEMA TPP	ANDHRAPRADESH	1230	717	677	**41**
2	VIJAYAWADA TPS	ANDHRAPRADESH	1550	948	853	**96**
3	BARAUNI TPS (2 * 110 + 2 * 250)	BIHAR	500	425	275	**150**
4	KORBA EAST EXT(DSPM) (2*250)	CHATTISGARH	250	163	138	**25**
5	KORBA(W) CSETCL (4*210+1*500)	CHATTISGARH	1130	658	622	**37**
6	MARWA TPS (2*500)	CHATTISGARH	1000	567	550	**17**
7	GANDHINAGAR(GTPS) (3*210)	GUJARAT	210	135	116	**19**
8	KLTPS (2*75)	GUJARAT	75	57	41	**16**
9	WANAKBORI (7*210+1*800)	GUJARAT	1220	787	671	**116**
10	UKAI (2*200+1*210+1*500)	GUJARAT	500	290	275	**15**
11	RGTPP(KHEDAR)(2 * 600)	HARYANA	1200	760	660	**100**
12	TENUGHAT (2 * 210)	JHARKHAND	210	140	116	**25**
13	BOKARO-A' (1 * 500)	JHARKHAND	500	295	275	**20**
14	KODERMA (2 * 500)	JHARKHAND	1000	558	550	**8**
15	RAICHUR TPS	KARNATAKA	1300	823	715	**108**
16	JP BINA (2*250)	MADHYA PRADESH	250	144	138	**7**
17	SATPURA II (2*250)	MADHYA PRADESH	250	141	138	**4**
18	BHUSAWAL (1*210+2*500)	MAHARASTRA	710	399	391	**8**
19	KHAPARKHEDA (4*210+1*500)	MAHARASTRA	1340	740	737	**3**
20	DAHANU (2*250)	MAHARASTRA	500	277	275	**2**
21	TATA TROMBAY Th (1*250+1*500)	MAHARASTRA	750	564	413	**152**
22	IB.TPS (2 * 210)	ODISHA	420	285	231	**54**

Available down margins in Intra-State Thermal Plants at 13:07 hrs. (highest frequency – 50.38 Hz) on 25th August 2024 (2)

S.No.	Plant Name	STATE	Running capacity(B)	Generation at maximum frequency (A)	55% of Running Capacity (C = .55 * B)	Down Margin available (A-C)
23	GOINDWAL(GVK)(2 * 270)	PUNJAB	540	303	297	**6**
24	GURU HARGOBIND SINGH TPS (2 * 210 + 2 * 250)	PUNJAB	500	297	275	**22**
25	GURU GOBIND SINGH TPS (ROPAR)(4 * 210)	PUNJAB	630	461	347	**115**
26	BARSINGSAR (IPP) LTPS(2 * 125)	RAJASTHAN	125	84	69	**16**
27	CHHABRA TPS(2 * 660 + 4 * 250)	RAJASTHAN	2070	1341	1139	**203**
28	KALISINDH TPS(2 * 600)	RAJASTHAN	1200	715	660	**55**
29	KAWAI TPS(2 * 660)	RAJASTHAN	1320	847	726	**121**
30	KOTA TPS(2 * 110 + 2 * 195 + 3 * 210)	RAJASTHAN	835	641	459	**182**
31	RAJWEST (IPP) LTPS(8 * 135)	RAJASTHAN	810	573	446	**127**
32	METTUR TPS	TAMILNADU	210	313	116	**198**
33	NORTH CHENNAI TPS STG-II	TAMILNADU	1200	694	660	**34**
34	KOTHAGUDEM TPS	TELANGANA	1800	1271	990	**281**
35	KAKATIYA ST1&ST2	TELANGANA	1100	644	605	**39**
36	SINGARENI TPS	TELANGANA	600	446	330	**116**
37	ANPARA (A&B) TPS(3*210 + 2 * 500)	UTTAR PRADESH	1630	1303	897	**407**
38	BARA PPGCL TPS(3 * 660)	UTTAR PRADESH	1980	1174	1089	**85**
39	JAWAHARPUR TPS (1 * 660)	UTTAR PRADESH	660	374	363	**11**
40	MEJIA TPS(2 * 250 + 4 * 210)	WEST BENGAL	920	625	506	**119**
41	MEJIA TPS II (2 * 500)	WEST BENGAL	1000	590	550	**40**
42	RTPS(2 * 600)	WEST BENGAL	1200	720	660	**60**
43	BAKRESHWAR(5 * 210)	WEST BENGAL	1050	719	578	**141**
44	BANDEL TPS (1 * 60 + 1 * 215)	WEST BENGAL	275	194	151	**43**
45	KOLAGHAT(4 * 210)	WEST BENGAL	630	437	347	**90**
46	SAGARDIGHI(2 * 300 + 2 * 500)	WEST BENGAL	1300	788	715	**73**
47	SANTALDIH TPS(2 * 250)	WEST BENGAL	500	320	275	**45**
						2629

Thermal Flexibilization – Regulatory Initiatives for MTL

- **CERC Grid Code – 4th Amendment, Regulations 2016**
  - ❑ Reduction of conventional thermal generation (Central Generating Station) to the **55% level**

  Following incentivization for the operation of thermal plants at Lower Operational Levels also introduced in the amendment (continued in **IEGC, 2023**)

  - ❑ Compensation for the Increase in Heat Rate Degradation
  - ❑ Compensation for Auxiliary Energy Consumption Degradation
  - ❑ Start-up fuel cost over and above seven (7) start/stop in a year
- **Central Electricity Authority (Flexible Operation of Coal-based Thermal Power Generating Units) Regulations, 2023**
  - ❑ Specified **Minimum Power Level of 40%** for Thermal Generating Units
  - ❑ Requires thermal generators to be **capable of providing 1%–3% ramp rate**
- **Central Electricity Authority – Phasing Plan for Implementation of 40% Technical Minimum Level, Dec 2023**
- **Draft CERC (Terms & Conditions of Tariff) (First Amendment) Regulations, 2024**
  - ❑ Specifies compensation norms for degradation in heat rate and auxiliary energy consumption for operation below NAPAF **up to 40% level**

MTL & Compensation Mechanism at Intra-state level

State	MTL guideline	Source	Remarks
Uttar Pradesh	55%	UPERC MOD Regulations, 2021	Includes compensation mechanism for part load operation
Haryana	55%	HERC TCT Regulations, 2019	Includes compensation mechanism for part load operation and additional start/stop
Maharashtra	55%	MERC Grid Code, 2020	Includes compensation mechanism for part load operation and additional start/stop
Madhya Pradesh	55%	MPERC Grid Code, 2024	Includes compensation mechanism for part load operation and additional start/stop
Karnataka	55% (40% for two units)	KERC MOD Regulations, 2024	Includes compensation mechanism for part load operation
Andhra Pradesh	55% (>500 MW) 71.4% (<=500 MW)	Minutes of 210th OCC meeting of SR	
Tamil Nadu	60-80%		
Telangana	58-67%		
West Bengal	70%	Minutes of 214th OCC meeting of ER	
Odisha	55-60%		

Capacity with regulatory Mandate for 55% MTL

State/Sector	Generation Capacity (MW)
ISGS, Regional IPPs & DVC	103630
Uttar Pradesh	15710
Haryana	3830
Maharashtra	21355
Madhya Pradesh	5990
Karnataka	7680
Andhra Pradesh	3440
Total	**161635**

Way Forward (1)

- Implementation of 55% Technical minimum for all SGS
  - Followed by 40% Technical Minimum Level as per CEA Phasing Plan

- Suitable regulatory mechanism to compensate generating stations for flexible operation
  - Additional capital/R&M expenditure for required retrofit
  - Incremental O&M costs due to higher wear & tear
  - Degradation in station heat rate and auxiliary energy consumption
  - Incremental secondary fuel oil consumption due to increase in start/stops

- Ensuring reserves within the state through SCUC by SLDCs, as being done at National level
  - At present, revival of units from RSD left to discoms/procurers

- Studies for exploring the possibility of two-shift operation of existing thermal generating units as per the grid requirement
  - Design of new thermal units to allow 2-shift operation on a regular basis
  - Specifying metrics for Minimum Up/Down Time, Startup Time etc.

Way Forward (2)

- Adaptability and willingness of generation utilities to embrace and prepare for the future as more units are subjected to low load and cyclic operations.
  - Capacity building, knowledge dissemination, and executive exchanges
  - Hand-holding by inter-state generation utilities, if required
- Strict monitoring of state resource adequacy plans
  - Buildout and tie-ups with flexible resources to meet ramp as well as energy shortfall in non-solar hours
- Implementing essential reliability services from renewable generation needed
- Interim mechanism for incentivization until norms finalized for compensation for flexible operation
- Compliance monitoring mechanism to be put in place

Likely increase in tariff considering capital investment of Rs. 30 crores, increase of O&M cost, variable cost and EFOR cost

Unit Size (MW)	Loading (%)	Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	Fixed Tariff increase (Paisa/kWh)		EFOR compensation (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Total tariff (fixed & variable) increase (Paisa/kWh)	Proposed total tariff (fixed & variable) increase (Paisa/kWh)
		Variable Tariff increase (Paisa/kWh)	Variable Tariff increase (Paisa/kWh)	due to increased O&M cost	due to increased capital cost		Coal price Rs 2000.00 per ton	Coal price Rs 3300.00 per ton	
200	<55 to 50	13.68	22.57	6.70	7.68	1	29.06	37.95	33.51
	<50 to 45	17.78	29.34	10.42	7.68	1	36.88	48.44	42.66
	<45 to 40	21.89	36.11	14.88	7.68	1	45.45	59.67	52.56
500	<55 to 50	14.66	24.20	4.57	3.07	1	23.30	32.84	28.07
	<50 to 45	18.30	30.19	7.11	3.07	1	29.48	41.37	35.43
	<45 to 40	21.53	35.52	10.16	3.07	1	35.76	49.75	42.76
660	<55 to 50	11.17	18.42	4.12	2.56	1	18.85	26.10	22.48
	<50 to 45	15.27	25.20	6.40	2.56	1	25.23	35.16	30.20
	<45 to 40	18.74	30.92	9.14	2.56	1	31.44	43.62	37.53
800	<55 to 50	10.65	17.57	3.70	1.92	1	17.27	24.19	20.73
	<50 to 45	14.86	24.52	5.76	1.92	1	23.54	33.20	28.37
	<45 to 40	18.58	30.65	8.23	1.92	1	29.73	41.80	35.77

Source: CEA

INCREASE OPERATIONAL COST

***Operational Expenditure (OPEX)*:**

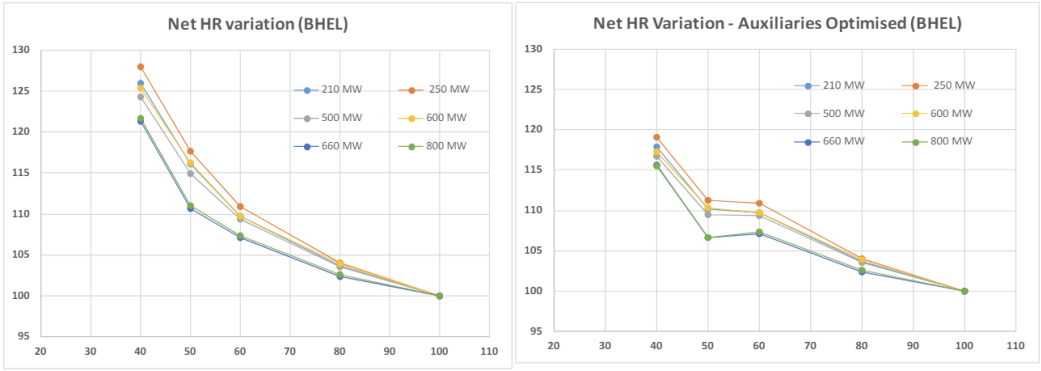
i. Cost due to increase in Net Heat Rate
ii. Cost due to Increased Life Consumption (damage costs)- considered under fixed part
iii. Cost due to additional oil consumption for additional EFOR

Source: CEA

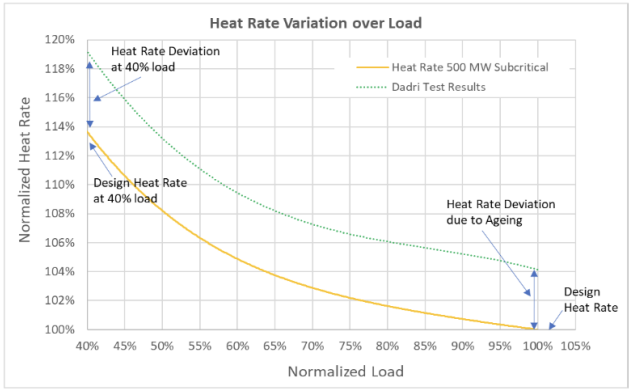
2. OPERATIONAL EXPENDITURE (OPEX)

i. INCREASE HEAT RATE

Heat Balance study



Efficiency captured during flexibilisation test



Source: CEA

After analyzing the HBD report of major OEMs (BHEL/GE/Siemens) and actual test report of low load operation unit size wise NHR degradation is given in table.

The study conducted by CEA indicates the impact of low load operation at 40% on variable part of tariff is around 16% for subcritical units (200/500MW) and around 15% for supercritical units(660/800MW).

Capacity (MW)	Loading (%)	Net Heat Rate Increase (%)
200	<55 to 50	10.00
	<50 to 45	13.00
	<45 to 40	16.00
500	<55 to 50	10.90
	<50 to 45	13.60
	<45 to 40	16.00
660	<55 to 50	8.70
	<50 to 45	11.90
	<45 to 40	14.60
800	<55 to 50	8.60
	<50 to 45	12.00
	<45 to 40	15.00

2. OPERATIONAL EXPENDITURE (OPEX)

iii. ADDITIONAL OIL CONSUMPTION

Based on the increased EFOR the norms for specific oil consumption and increased compensation may be allowed as per the Table.

S. No.	Specific Oil Consumption	Increased ECR (p/kWh)
1	CERC Norms (Present): 0.5 ml/kWh	2.5
2	At 0.7 ml/kWh (40-50% load)	3.5
3	At 0.8 ml/kWh (30-40% load)	4.0

In addition, due to flexible operation there would be loss of availability on account of increased maintenance requirements and increased EFOR which will make it difficult for the generator to recover full capacity charges.

Source: CEA

Thank You !!

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Summary on efforts on intra-state SCED undertaken through MOP group on MOD

Gujarat

- Day Ahead and Intra day optimization are running in auto mode
- Since October 2021, model is running in intra day basis for every 1 hour covering all the revisions and the output is also visible in the SCED application developed by WRLDC.
- Model is presently running at WRLDC end and the results can be accessed by Gujarat SLDC through SCED web application.
- Parallel mode operation by Gujarat SLDC needs to be done.
- Schedule of intra-state generators are not updated in real time in Gujarat scheduling software
- Need for software upgrade highlighted by Gujarat SLDC
- GERC and Management approval for the next steps

Uttar Pradesh

- M/s Idam Consultants appointed by World Bank for supporting integration in UP
- Since December, 2021, model is running in intra day basis for every 4 hours covering all the revisions and the output is also visible in the SCED application developed by world bank consultant.
- Model is presently running at NRLDC end and the results can be accessed by UP SLDC.
- Real time intra-state generation scheduling data is being shared with POSOCO/IDAM by UP SLDC in auto mode.
- The report of World Bank consultant has been submitted incorporating UP SLDC suggestions.
- UP SLDC informed that Merit order despatch regulation issued by Hon'ble state commission has already been implemented and is strictly adhered.
- UPSLDC would approach UPERC provided there is a scope of intra state SCED, since UP scheduling is being done as single DISCOM (UPPCL)/drawee entity.

Haryana

- Scheduling system still under implementation in Haryana
- Scheduling system is a pre-requisite for SCED

Annexure II

SCED implementation at State Level – Past initiatives and ongoing recent efforts

2nd Meeting of FOR Standing Technical Committee
20th September 2024

Inter-state SCED – Journey so far

- There was unutilized capacity left in the cheaper power stations and vice versa
  - Non-uniform entitlements, Margin available on inter regional transmission corridors
- Need for algorithm-based software to send dispatch instructions closer to real time
  - Post gate closure, after the states have exercised choice to balance their load-generation portfolio
- 12-Sep-18: A consultation paper on SCED submitted to CERC
  - Explored the scope for an optimal solution to minimize the total production cost
  - Consultations made with all stakeholders as per CERC directions in Sep 2018
- 31-Jan-19: CERC directed a pilot on SCED of central sector thermal generating stations pan India with effect from 1st Apr 2019
  - 138 thermal units with ~58 GW capacity part of SCED pilot
- 2020-2023: Pilot extended by CERC. FOR sub-group for intra-state reserves (SANTULAN)
- **1-Oct-23**: **SCED formalized in the IEGC-2023 as an integral part of scheduling**

Regulatory Framework for SCED in IEGC 2023

- SCUC/SCED applicable to Sec-62 regional entity thermal generators
  - Other regional entity thermal generators may opt to participate
  - SCUC generators mandated to participate in SCED
- Ex-ante declaration of **energy charge/compensation charge** - weekly basis
- Declaration of scheduling parameters, limits:
  - Minimum turn down level: 55% (or as specified in CEA Regulations)
  - Ramp rate: 1%/min for coal & lignite ; 3%/min for gas-based
- SCED optimizes schedules after gate closure & finalization of RTM schedules
  - As per consolidated merit order stack w.r.t. energy charge/compensation charge
  - By factoring all constraints - ramp rate, response time, congestion etc.
  - Beneficiary schedules not changed on account of SCED
- Net saving shared between buyers and generating stations

Intra-State SCED - Motivation

- **SCED vis-a-vis Merit order dispatch (MOD)**
  - Better handling of ISGS requisitions, optimal portfolio management as per ECR
  - Simultaneously factors constraints viz., ramp rates, load generation balance, transfer capability margins, and any other limits
  - Better congestion management
  - Retrieves the marginal cost (SMP) in real time (for each TB)
- Optimization algorithm used in SCED causes saving while honoring all constraints
- SCED implementation by products
  - Improved reporting (customized charts, tables), facilitates better decisions
  - Visibility of ramp limited reserves in real time
  - Duals (shadow prices) of the constraints helps policy level / investment decisions.
- Distinct Gate closure (introduced thru SCED) streamlines scheduling process
  - Facilitates Ancillary dispatch for reliable grid operation with rising RE penetration

Intra-state SCED – Progress between 2019-2023

- Pilot on intra-state SCED for MP, Gujarat & Maharashtra as part of FOR Report on Intra-State Reserves and Ancillary Services For Balancing (SANTULAN) 2019
  - Identified the basic hygiene and modalities for roll out at intra-state level
  - Model Regulation and Road Map for intra-state Essential Reliability Services

- Pilot on intra-state SCED for Gujarat, UP, Haryana undertaken under MOP working group on MOD – 2021-22
  - Development of day-ahead and intra-day schedule optimization models
  - Web-based application developed for visualization of results
  - Successful SCED pilots for Gujarat (43 generators) and UP (57 generators)
  - Haryana: Bottlenecks - Lack of SAMAST, Non-availability of scheduling system

Initiatives by FOR Sub-Group on SANTULAN 2019

- Categorization of States for implementation
  - Group-A (7 States – where SAMAST was implemented)
  - Group-B (15 States - SAMAST under implementation)
  - Group-C (all other states and union territories)
- Capacity Building on Optimization, ED, UC
  - Curated training on Optimization using GAMS by IIT-D and NLDC
- Pilot exercise on Optimization and Reserves Dispatch
  - At 3 Group-A states (Gujarat, Maharashtra, Madhya Pradesh)
- SANTULAN Report 2020 - Model Regulations & Implementation Road Map for intra-state Essential Reliability Services

SANTULAN - Suggested Intervention by SERCs

- SAMAST Implementation
  - Framework for scheduling, metering and energy accounting
- Provisions in Intra-state Regulations (viz. Grid Code, DSM)
  - Gen thresholds – Pmax, Pmin (Min Turn Down level), Ramp limits
  - Ex-ante declaration of Costs - FC, VC, Start-Stop cost
  - Gate Closure in scheduling
  - Reserve assessment using probabilistic methods (historic ACE)
  - Reserve creation thru periodic unit commitment and deployment
  - Non-zero-sum intra-state pool for Settlement of dispatched reserves
- Capacity building: Adequate HR and IT infrastructure at SLDC

2021-22: SCED Pilots for Gujarat and UP

Gujarat

- 43 Plants (SGS+ISGS)
- GAMS based SCED Engine for GJ state hosted at WRLDC
- Remote log-in to SLDC GJ
- Hourly intra-day SCED run since Oct 2021
- Assumed Tech min, Ramp rate
- Saving potential: 5-10 lakh per day

Uttar Pradesh

- 57 plants (SGS+ISGS)
- SCED engine (developed by Idam/WB) hosted at NRLDC
- Log-in to UP-SLDC
- 4 hourly SCED run since Dec 2021
- Assumed Tech min, Ramp limit
- Saving potential: 5-10 lakh per day

Intra-state SCED – Progress during 2024

- Workshop conducted at GETRI Vadodara on Intra-state SCED for SLDC Executives – 24 June 2024
- Workshop at Maharashtra SLDC on Intra-state SCED – 2-3 September 2024

- Formation of internal core teams for implementation of inter-state SCED
  - In SLDC Gujarat – with IIT Gandhinagar
  - In SLDC Maharashtra – with IIT Bombay

- FOLD Discussion on action points for states on intra-state SCED – 21 Aug 2024
  - “My-SCED” Project to encourage states to develop SCED solutions in-house
  - Pilot projects started by Gujarat & Maharashtra; UP working towards intra-state SCED
  - States to nominate officers from different backgrounds for intra-state SCED initiative; completion aimed by 2025

Suggested Action Points for SLDCs (My-SCED)

- **Create a cross functional team to lead implementation - Desired composition:**
  - Scheduling and Despatch
  - Market operations and regulatory aspects
  - Computer Science, IT, Communication – for facilitating data exchange, developing portals, cybersecurity.
  - Contracts/procurement departments – for facilitating procurement or upgrading existing scheduling software
- Take Lead and institute a pilot study on the implementation in respective State.
- Develop a consultation paper.
- SCED optimization algorithm - preferably developed in-house
- Work on both Automation & Optimization

Support from Grid-India through FOLD

- Shared resources, handbooks, publications folders, and sample code directories:
  - Handbook under development – shall be shared for comments
- Technical support through online workshops
- Interactions with national and international experts
- Short deputations of resource personnel for training/brainstorming
- Experience sharing on Automation & Optimization

Way Forward

- Regulatory support - key enablers for intra-state SCED:
  - Introduction of gate closure concept
  - Essential implementation of Scheduling, Metering, Accounting and Settlement (SAMAST)
  - Mandate for upfront declaration of energy charge by generators

- Development of mechanism to identify, create reserves at intra-state level:
  - Maintaining allocated reserves by state control areas as per IEGC
  - Deficit in Deviation & Ancillary Pool Account to be recovered in ratio of shortfall of reserves from 01.04.2026 onwards

- Participation of intra-state resources in inter-state SCED as an interim measure to gain first-hand experience

Thank You !!

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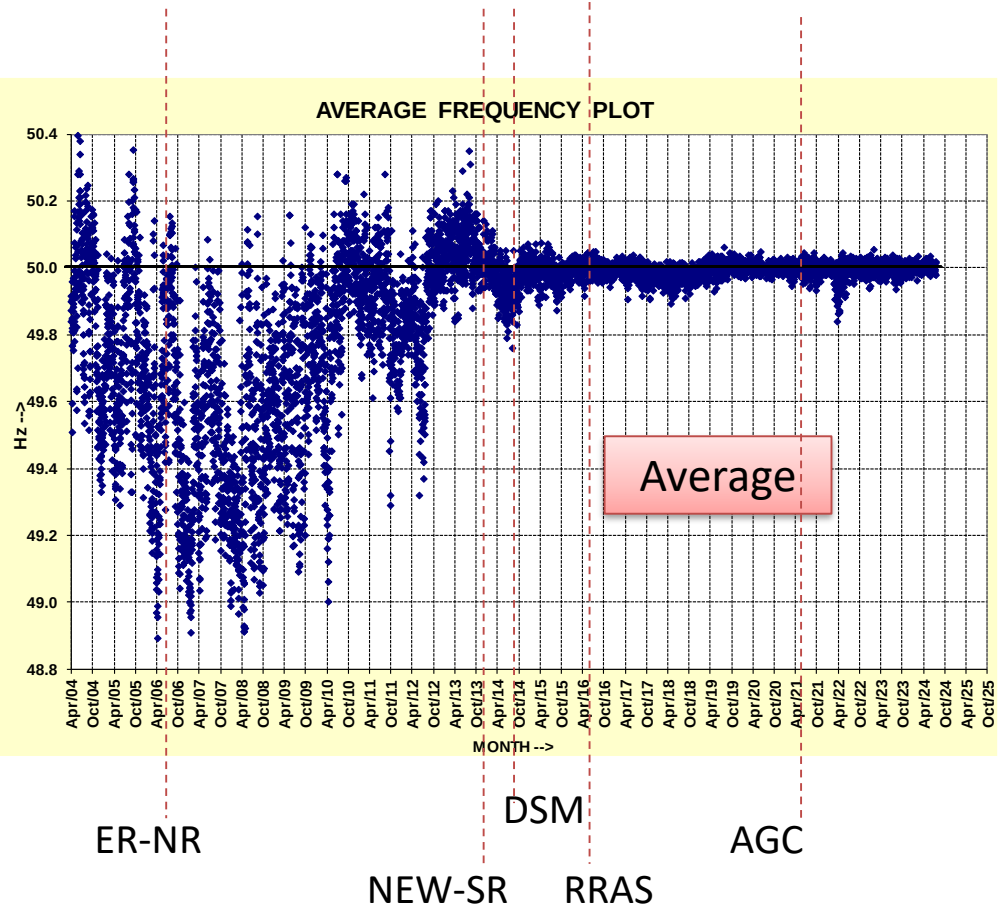
Annexure III

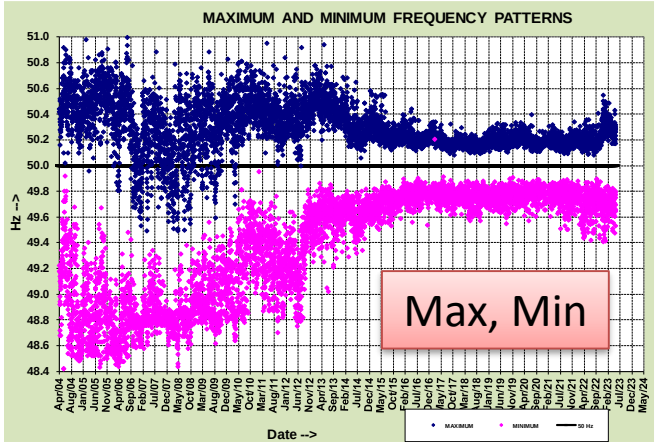
Secondary Reserve Ancillary Services (SRAS) for Intra-State Generating Stations

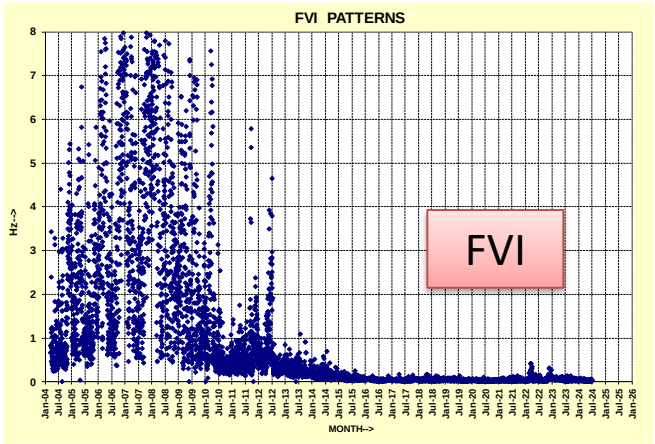
2nd Meeting of FOR Standing Technical Committee

Venue: CERC, 20th Sep 2024

Frequency Profile over the years…

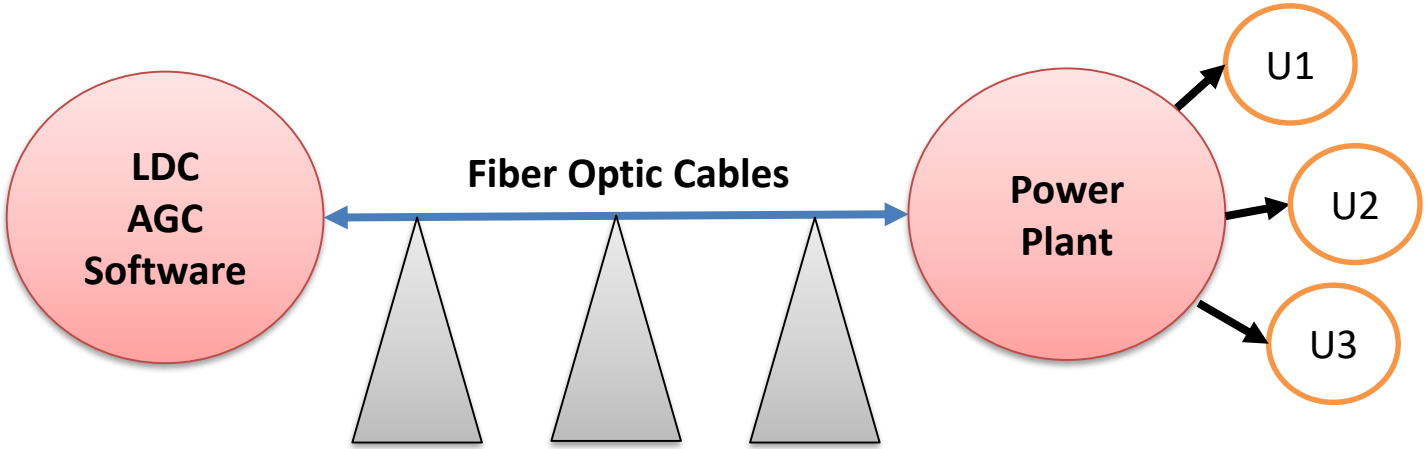




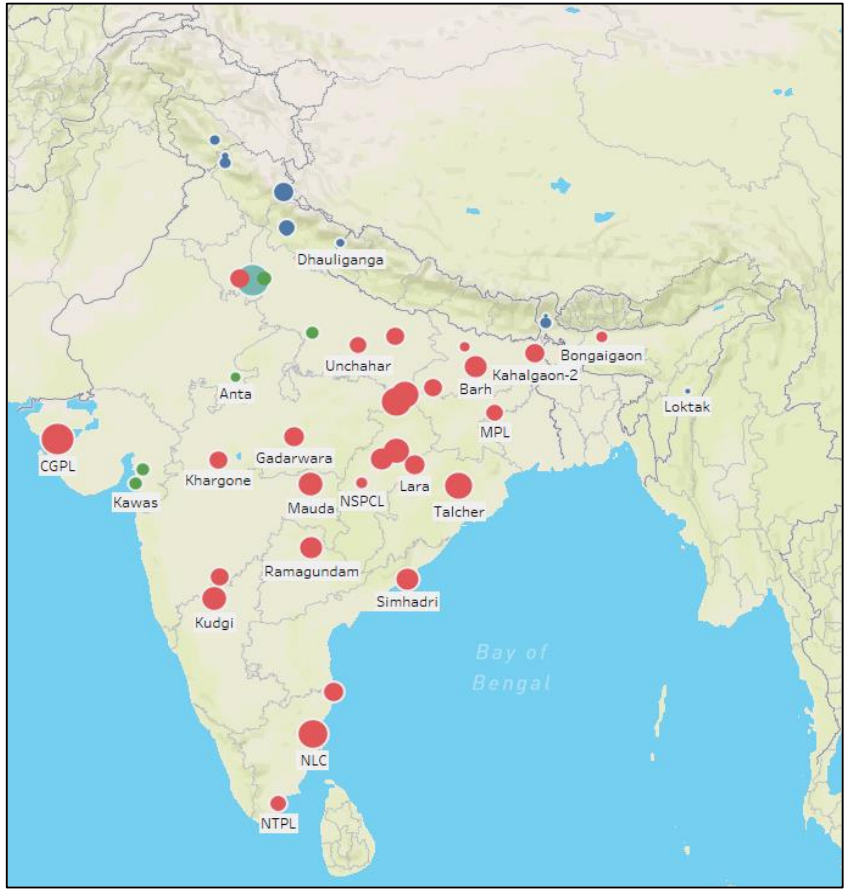


Automatic Generation Control (AGC) in Brief

- Automatic and supplementary control mechanism, 24x7
  - To control frequency and tie-line flows
- Several signals exchanged with generators every 4 seconds
- AGC will help replenish the exhausted primary reserves
  - Be ready for any next contingency
- Efficient and automatic frequency control during high RE periods
- To improve the reliability of the Indian power system.

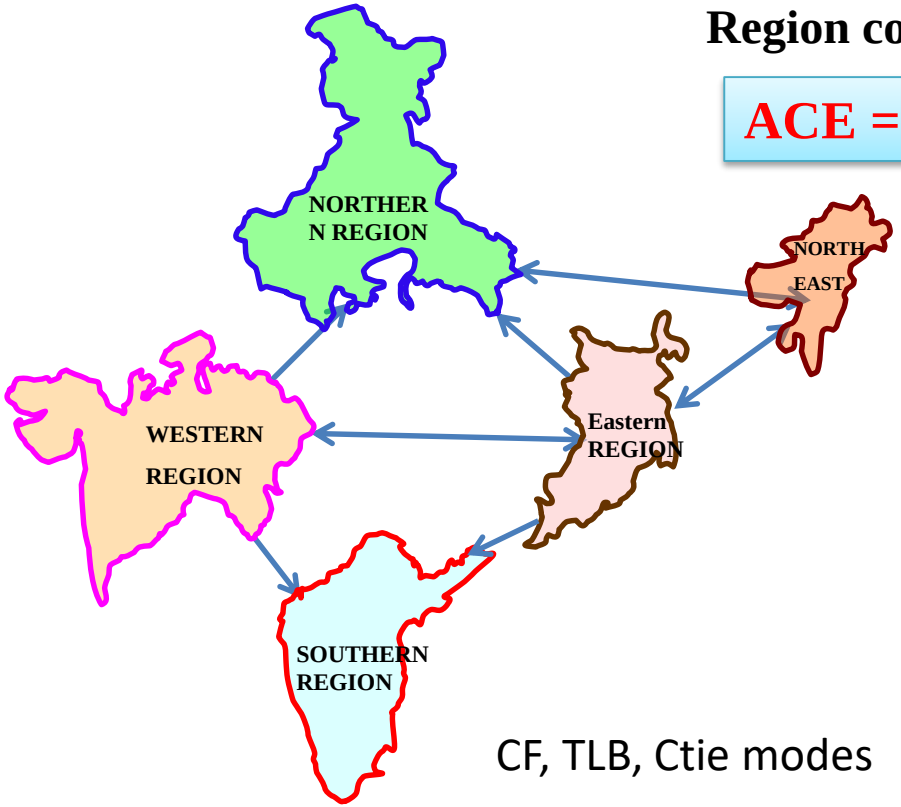


AGC Project Status



- Large size of the Indian power system
  - Pan India distributed
- 74 power plants with 72116 MW capacity under AGC, 196 units
  - 62.3 GW coal-based, 6.6 GW is hydro and 3.2 GW is gas-based.
- Far away plants operating in remote
  - NTPL 2760 kms
  - Loktak 2500 kms
- Communication infrastructure planned by the Central Transmission Utility(CTUIL) utilized.
- Up & Down Regulation up to +/- 1500 MW-2000 MW pan-India

Area Control Error (ACE) Calculation



CF, TLB, Ctie modes

Region considered as an Area for secondary control

$$ACE = (Ia - Is) - 10 * Bf * (Fa - Fs) + Offset$$

- Ia = Actual net interchange in MW (positive for export)
- Is = Scheduled net interchange in MW (positive for export)
- Bf = Frequency Bias Coefficient in MW/0.1 Hz (negative value)
- Fa = Actual system frequency in Hz
- Fs = Schedule system frequency in Hz (default 50 Hz)
- Offset = Provision for compensating errors such as measurement error; default value zero
- ACE positive means area is in surplus and its internal generation has to back down
- ACE negative means area is in deficit and its internal generation has to increase

https://posoco.in/en/market/ancillary-services/english-frequency-bias-coefficient/

IEEE Task Force Report. 2017. "Measurement, Monitoring, and Reliability Issues Related to Primary Governing Frequency Response," Technical Report PES-R-24, October 2017. https://resourcecenter.ieee-pes.org/publications/technical-reports/PESTECRPTGS0001.html

Balancing Reserves Dimensioning (2024-25)

Solar hours	Within State (MW)	ISGS (MW)	All India Total (MW)
With diversity benefit (limited up to reference contingency)	**12099**	**7577**	**19676**
Without diversity benefit	**17036**	**11330**	**28397**

Reserve Requirement reduces by up to 30% on all India basis with consideration of diversity benefits in estimation of reserves

Reference contingency for 2024-25 (7000 MW (for Solar hours) 4500 MW (for non- Solar hours)) published on NLDC website

Regulation and Energy Statistics

Actual Reserves Available for AGC from 74 power plants +/- 1000-1500

Chronic shortage of both Up reserves (non-solar) and Down reserves (solar)

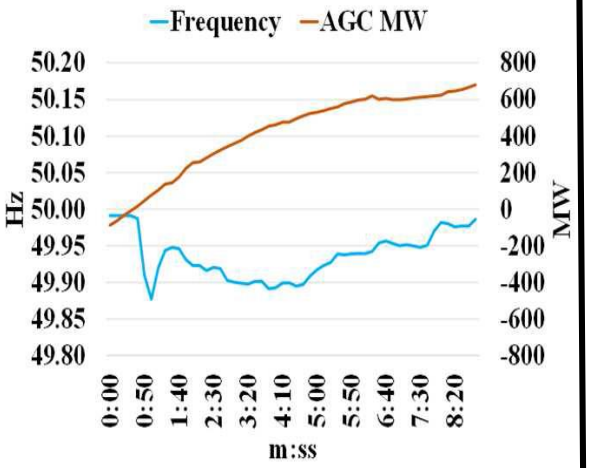
July 2021 – March 2024

Sno	Title	Value
1	Maximum Up Regulation MW	1751 MW
2	Maximum Down Regulation MW	2193 MW
3	Total Up Regulation MU; (a)	4882 MU
4	Total Down Regulation MU; (b)	(-) 11761
5	Total MU energy (+) delivered/ (-) absorbed; (a) + (b)	(-) 7019 MU
6	Total mileage; (c) = |a| + |b|	16503 MU
7	Total Mark-up/incentive disbursed	₹758 Cr
8	Maximum MW contribution during contingency	1400 MW
9	Maximum ramp contribution during contingency	240 MW/min

Services Offered by AGC

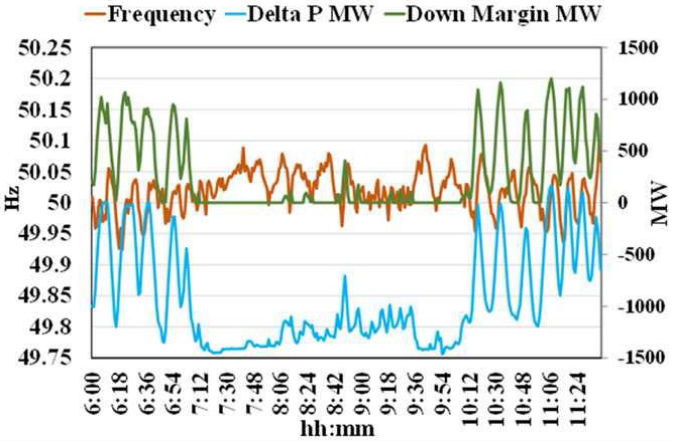
Service (1): Support during contingencies

During contingencies like generation loss or load loss, AGC quickly increases or decreases generation to restore the frequency to 50 Hz.



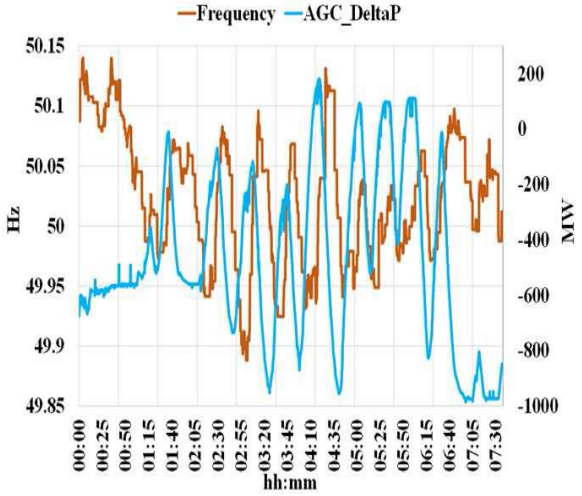
Service (2): Support during sustained frequency deviations

During sustained frequency deviations, AGC provides a sustained support of Up or Down, to the extent that spinning reserves are available under the AGC wired plants.



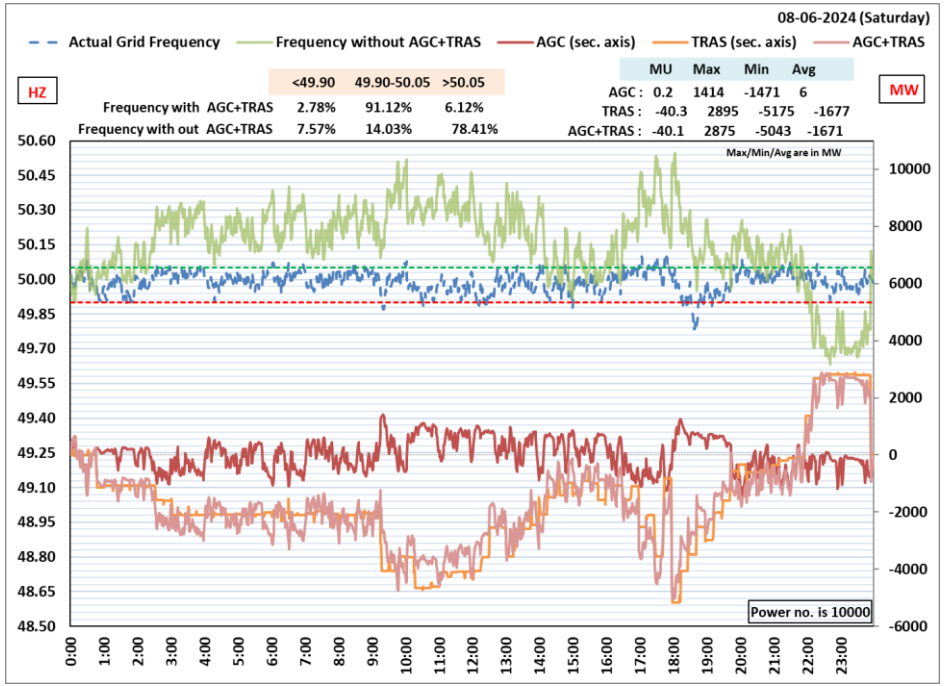
Service (3): Support during regular frequency changes

During periods when the grid frequency varies around 50 Hz, AGC increases or decreases the generation, intended to restrict the magnitude of frequency deviations.



Grid Operation with and without Ancillary Services

Best Frequency Profile Day – 08 June 2024



Sno	With & without Ancillary support	% time Frequency remained within the band (49.9 Hz – 50.05 Hz)	No. of 50 Hz crossings
1	**Without** Ancillary support	**14.0 %**	82
2	With TRAS support	50.0 %	271
3	**With** SRAS & TRAS support	**90.5 %**	459

Capacity for Up and Down Regulation

- Secondary Regulation is mainly capacity only
  - ❖ Net Energy over a large period of time is negligible
  - ❖ Pit head plants usually provide down regulation as up margin is available only for a limited time
  - ❖ Similarly, load centre plants provide Up regulation

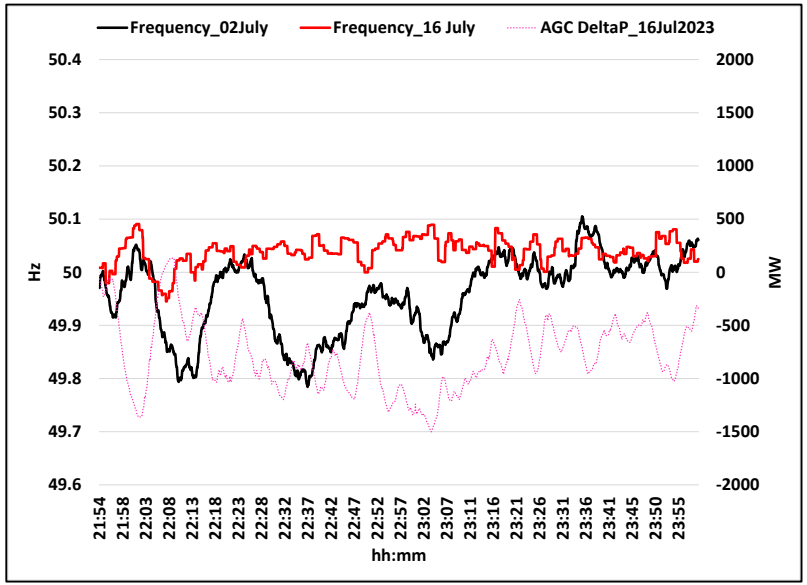
Sno	Plant	Up & Down (MU)	AGC Incentive (Rs. Crores)
1	Rihand-II	9 & 115	5
2	Mauda-I	60 & 87	5.7
3	MPL	36 & 147	9

- +/- 5% MCR typically offered under SRAS for Up and Down Regulation
  - ❖ A few plants offer +/-15% reserves

Performance based incentives under CERC (Ancillary Services) Regulations, 2022

Expanding the Ambit of AGC

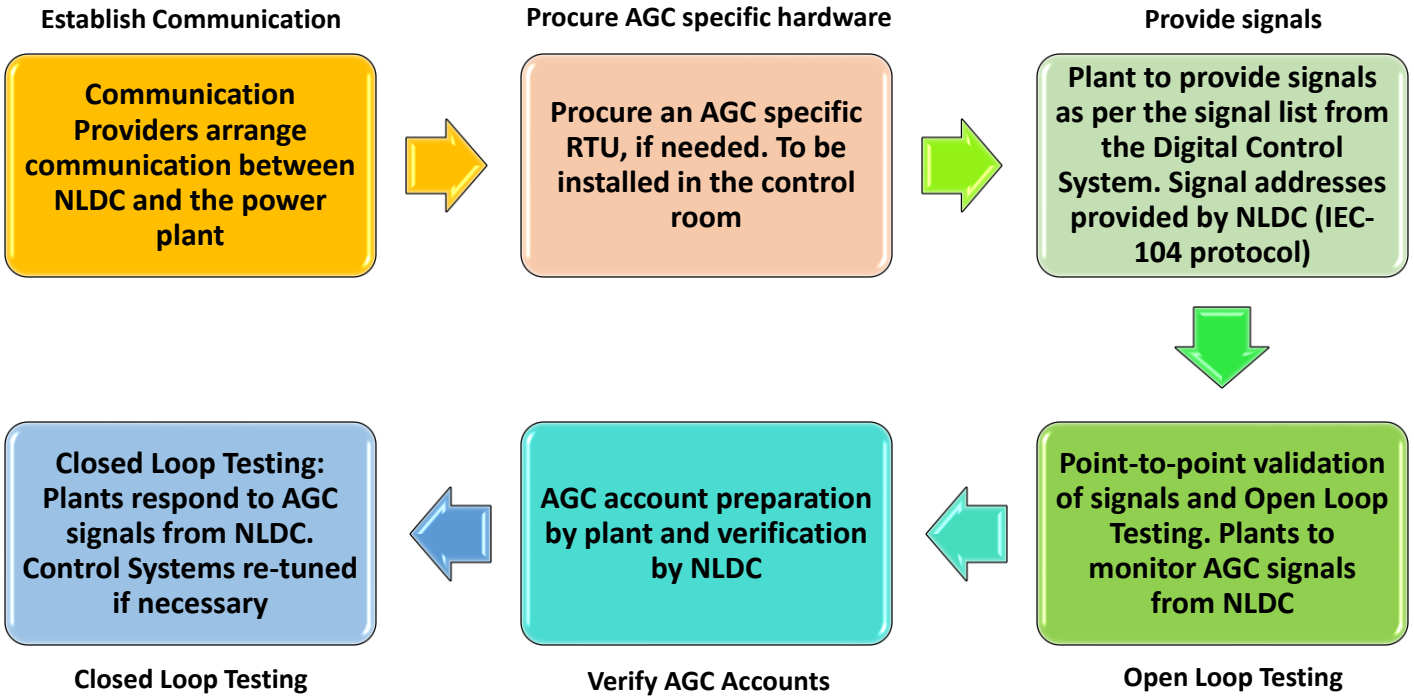
- AGC is playing a crucial role in enhancing frequency control and grid stability.
- Growing need for flexibility of conventional generation. Need to expand the ambit.
- CERC (Ancillary Services) Regulations, 2022 enables participation of IPPs and Intra-state generators under SRAS
- Regional Entity generators encouraged to join SRAS
- Intra-State AGC is an option for State entities
  - Intra-state generators can join SRAS if there is no-objection by the state
- Multiple workshops arranged for the stakeholders by Grid-India



Frequency with and without AGC

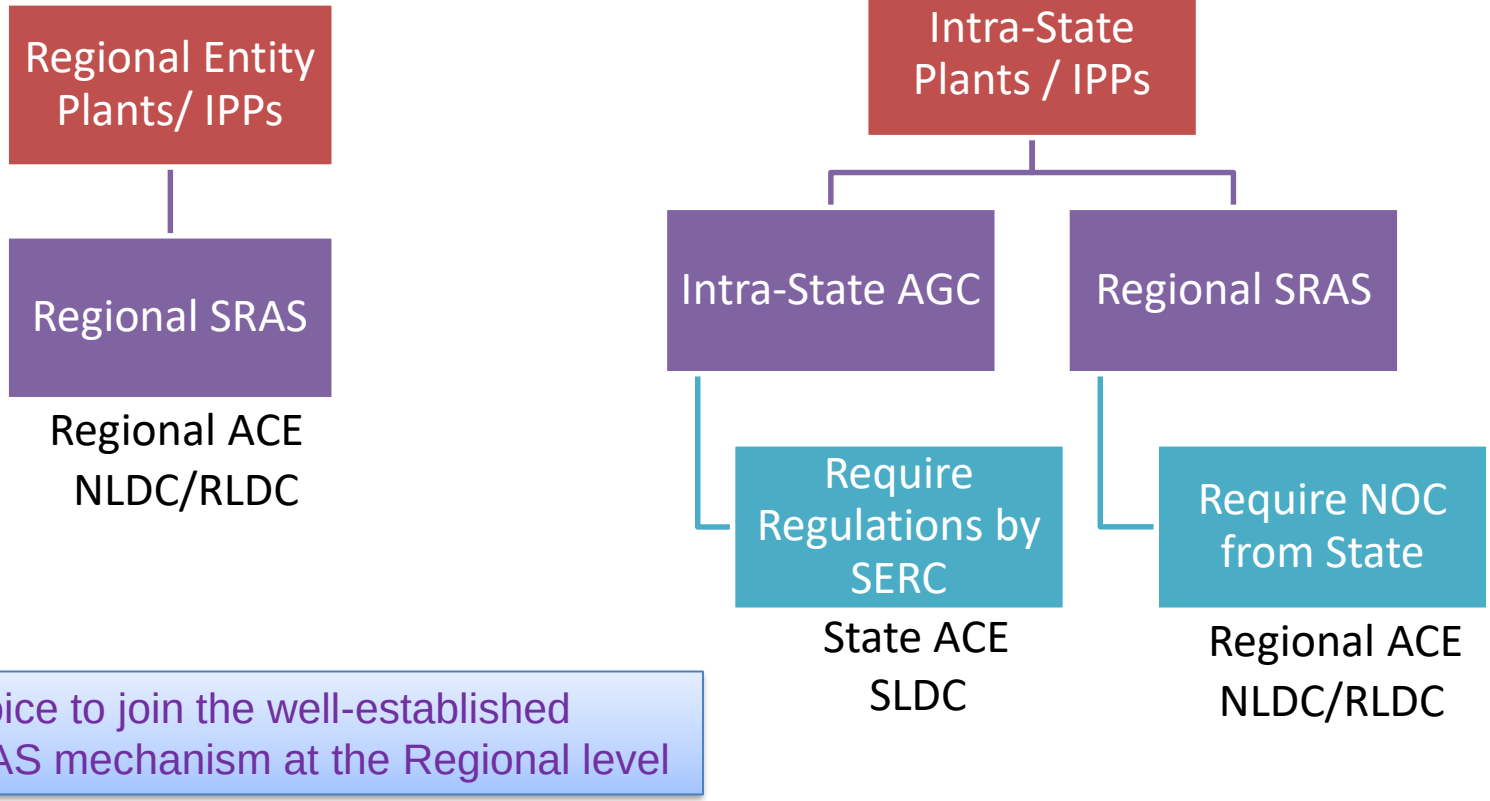
10 workshops in FY 2023-24, 12 in 2022-23

New Plant Integration Process



~ Total 72 GW Ready, 74 plants already on board

Options for Participation under AGC



Choice to join the well-established SRAS mechanism at the Regional level

If basic infrastructure is created, switch/joint operation by LDCs can be explored too!

Cost components in SRAS implementation

Sno	Cost component	Approximate Cost in (Rs.)	Type of cost
1	LDC infrastructure	0.58 Cr / LDC	One-time SCADA/EMS upgrade, incl services
2	Dedicated RTU, Switches, communication equipment	1.2 Cr/plant	One-time purchase, incl services
3	Wide band communication, terminal equipment	Subsumed in OPGW	Subsumed in transmission planning by CTUIL / STU. e.g. https://cercind.gov.in/2023/orders/37-TT-2021.pdf
4	Incentive for the plant under SRAS (based on historical performance statistics/records)	5 Cr. per plant per annum	Weekly performance based incentive. 40-50 paise/kWh CERC (AS) Regulations, 2022.

Multi vendor integration is also a major highlight in SRAS – generic specifications on website

Typical recovery of AGC investment by the plants through incentive in 6-12 months

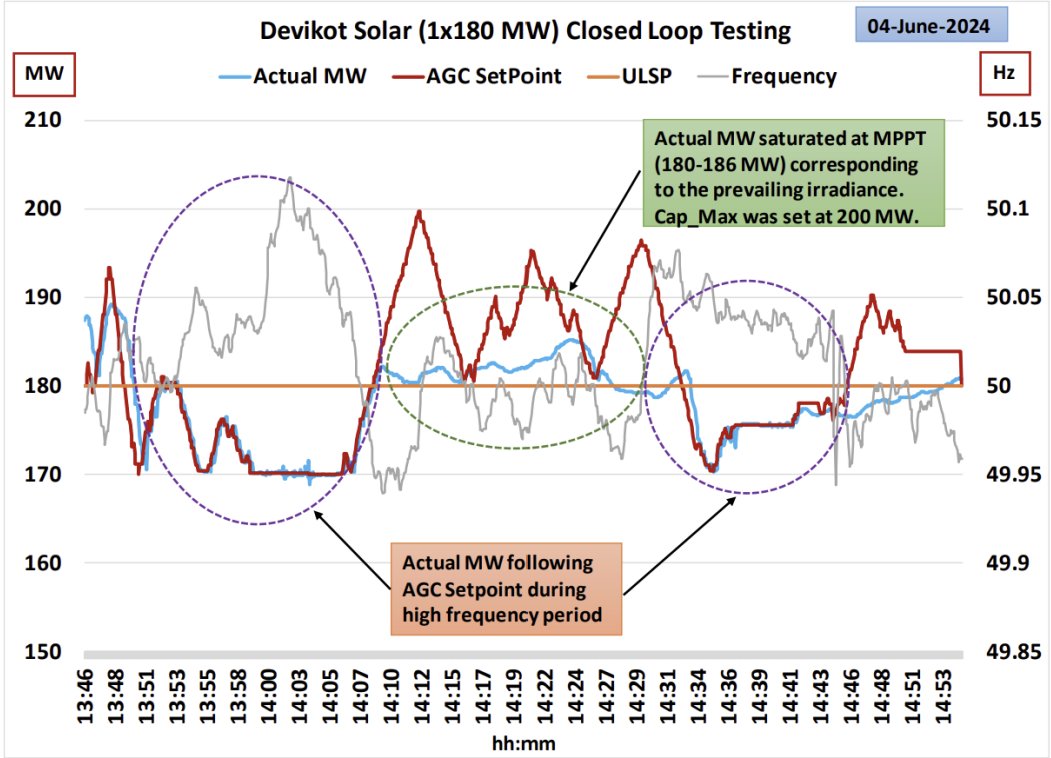
Intra-State SRAS Scheduling

Plant	DC MW	Schedule MW (a)	AGC MW (b)	Net Schedule MW (c) = (a)+(b)
Tiroda	3000	2500	100	2600
Chandrapur	3000	2200	200	2400
Total			300	

State	Drawl Schedule MW before AGC (d)	Net AGC MW (e) = sum (b)	Drawl Schedule MW after AGC (f) = (d)-(e)
Maharashtra	9000	300	8700

AGC Pilot project at Devikot Solar (180 MW)

- With high RE penetration, frequency control during high solar periods is a challenge
- Flexibility attributes needed from thermal power plants
- Down regulation to Solar plants may be needed
- Efficient curtailment mechanism based on grid requirements
- Signal list ready
  - Sensitizing stakeholders
  - More pilots



Challenges and Way Forward

- Increasing the pool of AGC generators
  - from the present central sector power plants to the state sector power plants
  - Choice to join the well-established SRAS mechanism at the Regional level
- Ongoing initiatives for AGC of Solar generation and Battery storage in India.
  - New technologies, demand response, hydrogen electrolyzes
- Low ramp rate declared by the coal-based power plants
- Thermal plants prefer to operate around the base schedule citing operation stability of thermal units due to constraints on boiler combustion side.
- Managing forbidden zones, daily energy constraints for Hydro Units,
- Ensuring participation from gas based units within small timelines.
- Liquidity of reserves in market based Ancillary Services

Suggested Intervention from State Regulators

- Have mandate for SLDCs
  - to monitor Area Control Error (ACE)
  - to maintain the allocated share of spinning reserves in the scheduling process
  - to identify list of prospective intra-state plants for joining in SRAS
  - to encourage intra-state plants to give expression of interest to join SRAS
  - to issue NOC to intra-state plants interested in joining SRAS
- Direction to the intra-state generators to create infrastructure for participating in AGC and establish communication with LDC
  - Similar to CERC Order 319/RC/2018
  - Capital expenditure (one time) may be allowed for AGC infrastructure
- Direct State Transmission Utility (STU), SLDC to establish robust communication between SLDC and AGC power plants
- Provide clarity for the power plants on the capital recovery through Ancillary Services and sharing of gains

Thank You

Ongoing Initiatives with Intra-State Plants & Regional Entity IPPs

- WBERC (Ancillary Services) Regulations, 2023 for AGC
  - Regular follow up by ERPC in OCC meetings; but needs some more push
- MPERC– Draft AS Regulation – public stakeholder suggestions provided by Grid-India
- Stakeholder meeting on improving participation by all the GENCOs in AGC conducted by CEA & Grid-India
  - Hybrid mode; 462 participants. Several doubts clarified.
  - Regulatory backing and clarity on gain sharing requested by stakeholders.
- DVC (Durgapur (2x500 MW), Koderma (2x500 MW) and Mejia (2x500 MW))
  - Planned to be integrated under Regional SRAS
  - Purchase Order placed
- PPS-III Bawana (4x216 GT + 2x253.6 ST) – Delhi
  - Received NOC from Delhi SLDC
  - Project stuck in contractual issues in integration with the digital control system OEM
- PPGCL Bara (3x660 MW) – Uttar Pradesh
  - 170 MW merchant portion (10%)
  - Formally approached UPSLDC, NRLDC, and NLDC
  - NOC from UPSLDC pending
- MGTPS Jhajjar – Haryana, Meja – Uttar Pradesh
  - Interest expressed with NRLDC/NLDC
  - Suggested to formally approach SLDC, SERC
- Other regional entities (issues with commercial/incentives?)
  - JPL-II - workshop conducted
  - Sasan – WRLDC pursued – procurement pending