CIGRE-India Study Committee C2, C4 & C5, in collaboration with GRID-INDIA and Forum of Load Despatchers (FOLD)

Participation of Battery Energy Storage in Ancillary Services

Challenges and Opportunities

GRID CONTROLLER OF INDIA LIMITED

Outline

- Ancillary Services in India
- AGC Project Highlights
  - Infrastructure and Architecture for AGC
- AGC pilot Project on Battery Energy Storage System (BESS)
  - Logics for handling SOC and Cycles in BESS
  - Results of Closed Loop Testing under AGC
- Essential Reliability Services with BESS
- Commercial aspects of BESS operations under AGC
- Simulations for BESS Capacity (MW/MWh)
- Operational strategies for BESS value stacking
- Participation of Intra-State Entities under SRAS

India's Energy Transition Roadmap

Resource	Mar-25	Mar-30	Mar-47 (Tentative Figures)
Hydro	47	54	100
Small Hydro	5	5.3	
Solar PV	82	**293**	**1200**
Wind	46	**100**	**450**
Biomass	11	15	23
Nuclear	8	15	55
Coal + Lignite	218	252	235
Gas	25	25	11
Total	442	**777**	**2075**
BESS (5 hrs)	-	**42**	**300**
Pumped Storage	4.7	**19**	**115**

All capacities in GW

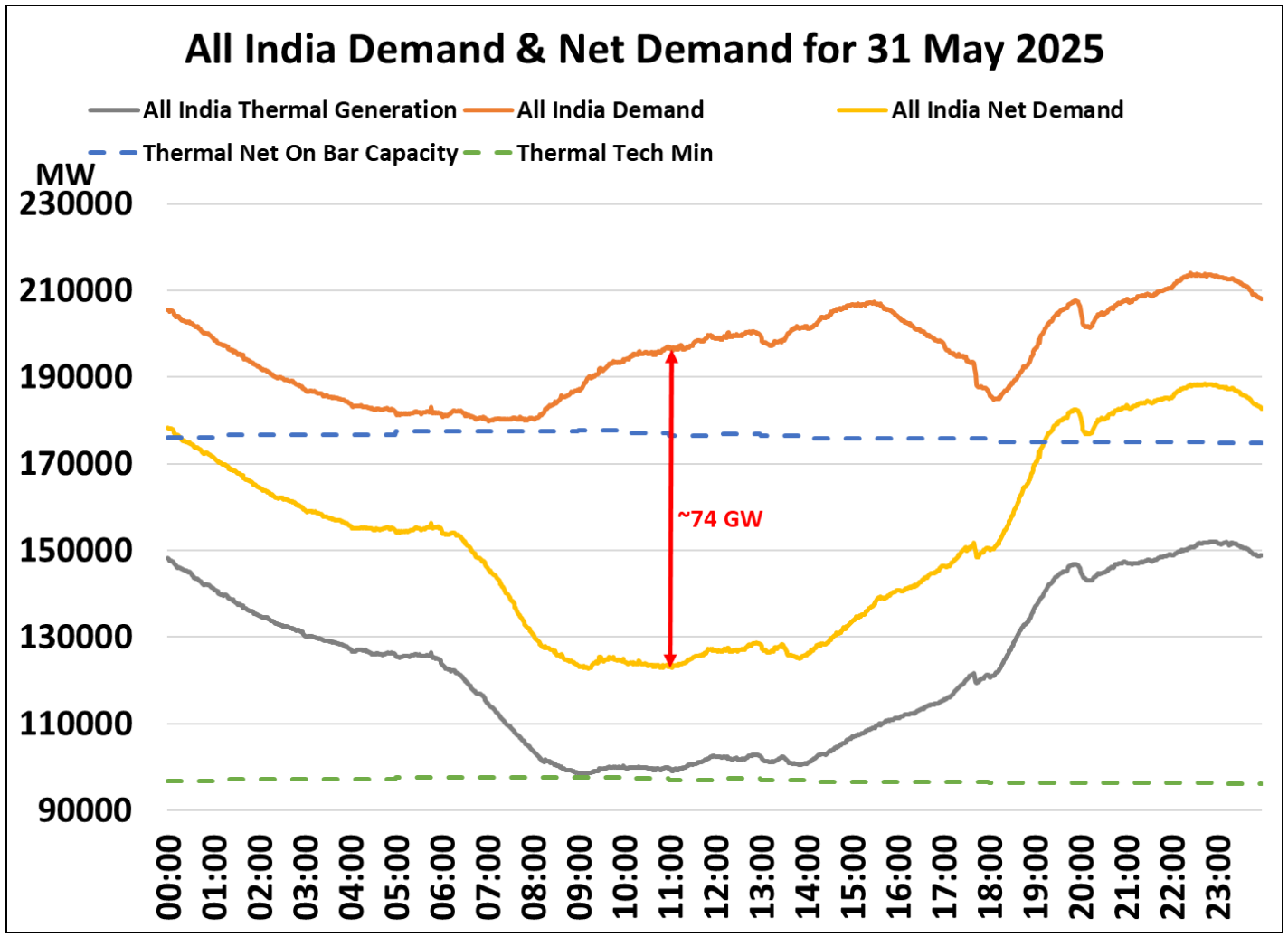
Source: CEA Report on Optimal Generation Capacity Mix for 2030 (Ver 2.0)
https://cea.nic.in/wp-content/uploads/irp/2023/05/Optimal_mix_report__2029_30_Version_2.0__For_Uploading.pdf
*Tentative figures for 2047 from various sources

Rooftop Solar I/C (as on Nov 2025): 23.6 GW

	till Dec 2025*	2030	2047
Maximum Demand Met (GW)	~250#	334^	~700
Electricity Consumption for preceding FY (BU)	~1620#	1949^	6402
Total Generation Installed Capacity (GW)	513*	777	2075
Non-fossil Fuel Based Generation Installed Capacity (GW)	267	500	1828
Wind & Solar Installed Capacity (GW)	189	393	1650

Source: # Operational Data of Grid-India https://grid-india.in/en/reports/daily-psp-report
* As on Nov 2025, CEA Installed Capacity Report
https://cea.nic.in/installed-capacity-report/?lang=en
^ 20th EPS Survey by CEA
https://powerline.net.in/wp-content/uploads/2022/11/20th_EPS___Report___Final___16.11.2022.pdf

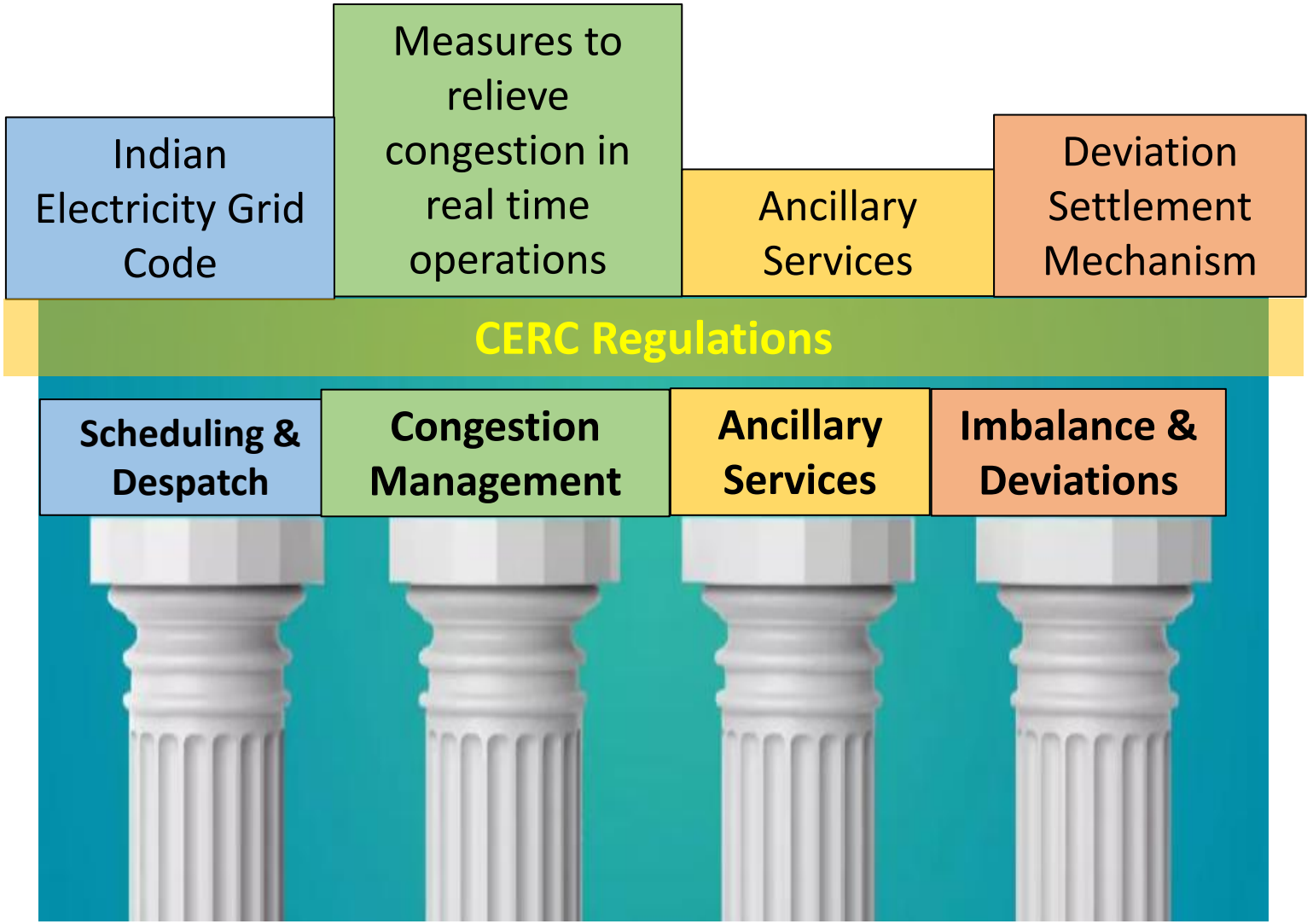
Growing Need for Flexibility – Increasing Duck Curve Belly



- Increasing "Duck Curve" Belly
- Issues in absorbing additional RE (solar) beyond a certain quantum
- Increasing difference b/w Max. and Min Demand
- In Solar Hours, no down margin available in Thermal stations

Highest Instantaneous RE penetration (in 25-26) of ~40.96 % was recorded on 05th Mar 2026

The 4 Basic Pillars of Market Design



Objectives for Grid Operation

- Frequency Control
- Voltage Control
- Tie-Lines Flows
- Stability
- International
- Reliability (n-1, etc.)
- Economy
- Sustainability

Sally Hunt – ' Making Competition Work in Electricity'

Regulations and Procedures

Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2022.

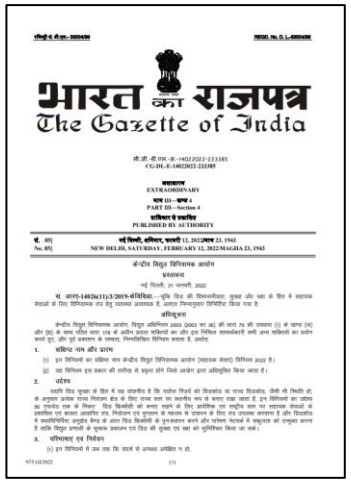
Gazette Notification Statement of Reasons

Notification - effective date 05.12.2022 --- SRAS

Notification - effective date 01.06.2023 --- TRAS

CERC orders on implementation aspects

Introduction of AS contracts Expansion of scope

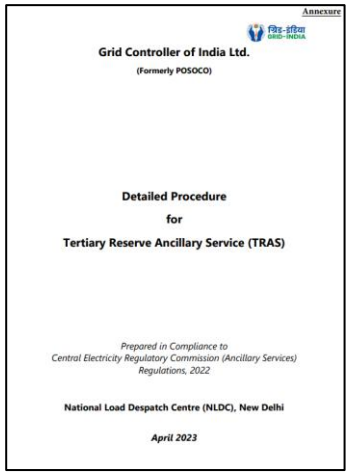

भारत का राजपत्र
The Gazette of India

EXTRAORDINARY

PART III—Section 4

PUBLISHED BY AUTHORITY

NEW DELHI, SATURDAY, FEBRUARY 12, 2022/MAGHA 23, 1943


Annexure

Grid Controller of India Ltd.

(Formerly POSOCO)

Detailed Procedure

for

Tertiary Reserve Ancillary Service (TRAS)

Prepared in Compliance to
Central Electricity Regulatory Commission (Ancillary Services) Regulations, 2022

National Load Despatch Centre (NLDC), New Delhi

April 2023

Detailed Procedure for Secondary Reserve Ancillary Services (SRAS) – Dec 2022 - Link

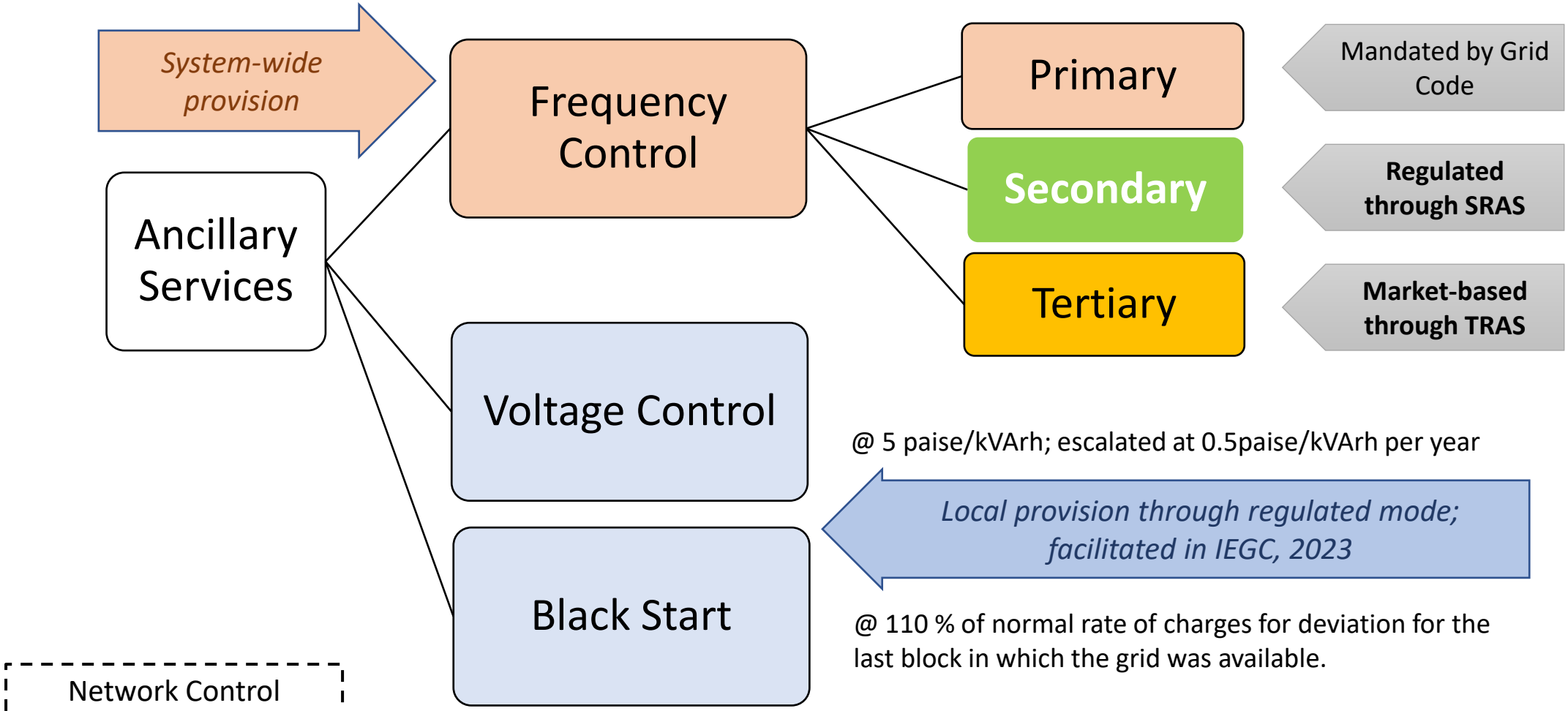
Detailed Procedure for Tertiary Reserve Ancillary Services (TRAS) – April 2023 – Link

Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 – Link

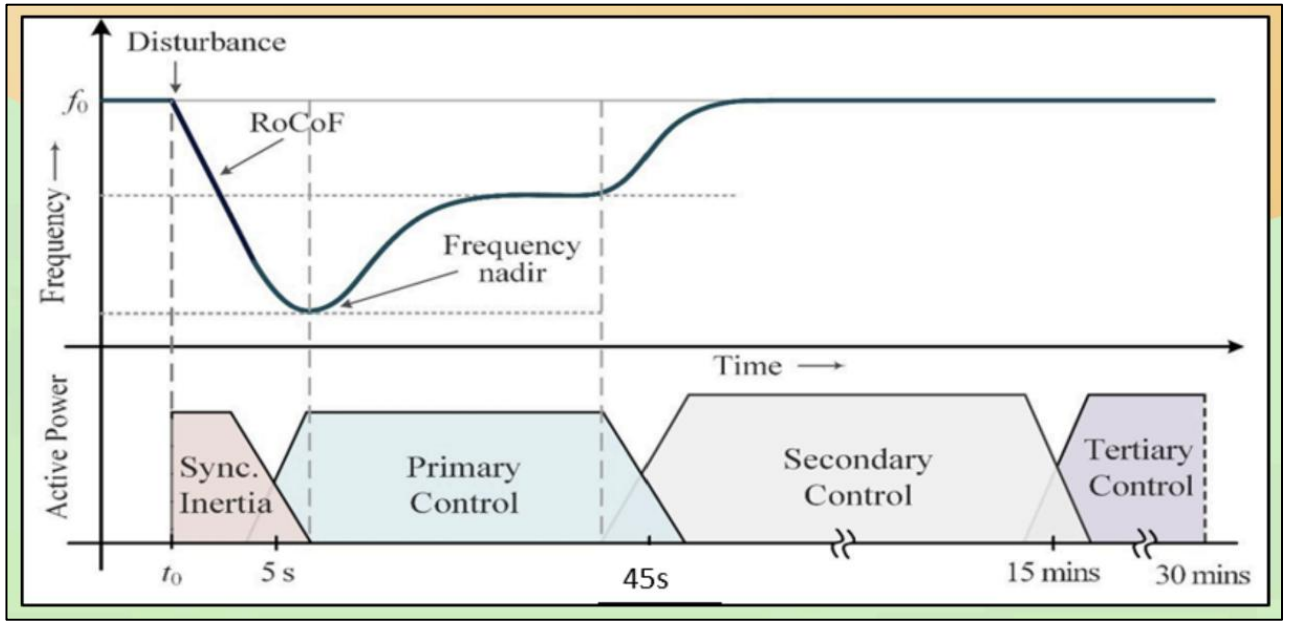
Procedure for Assessment and Procurement of Reserves – IEGC 2023 – Link

Procedure for Performance Assessment of TRAS and SRAS Providers – IEGC 2023 - Link

Ancillary Services - Classification

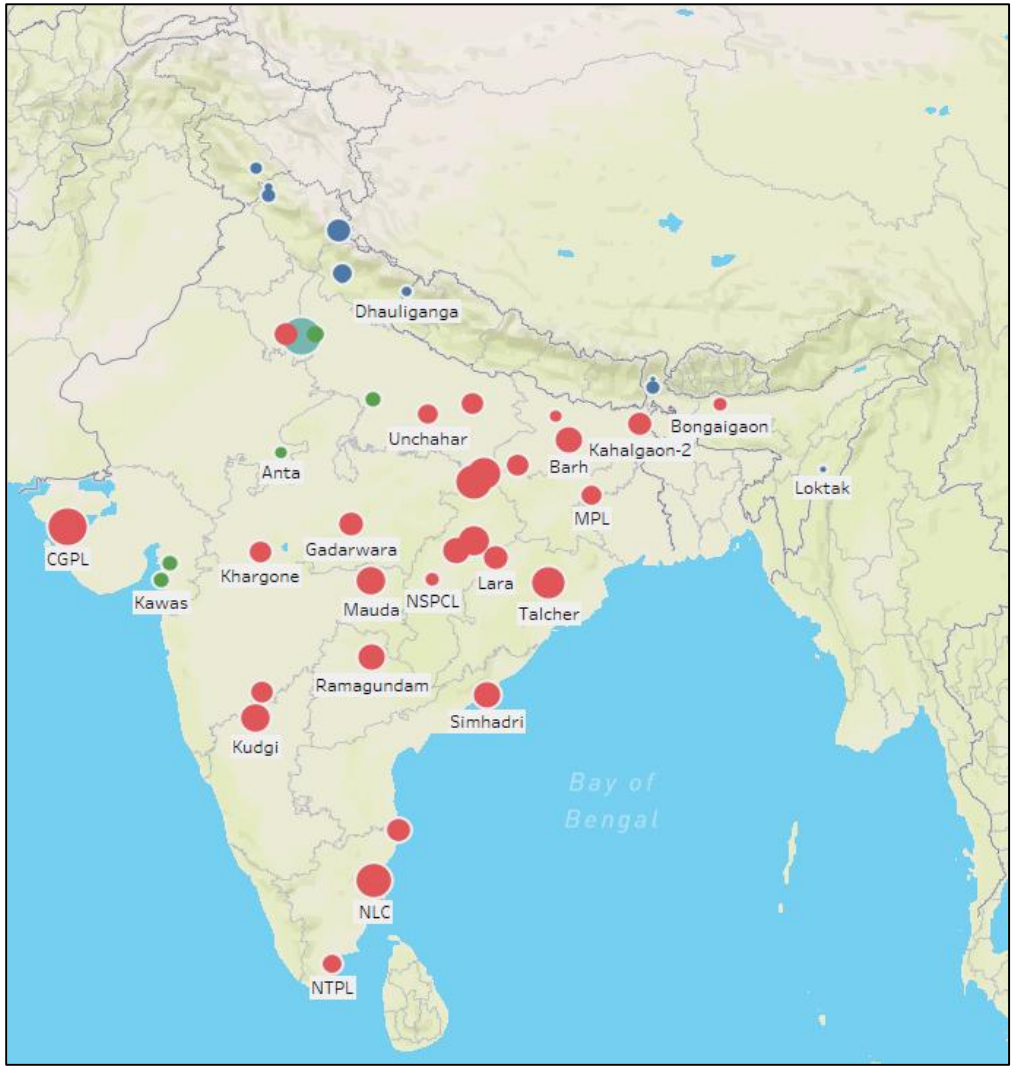


Frequency Control Ancillary Services



Reserve	Start of activation	Full Availability/ deployment	Ability to sustain the full deployment
Primary Response	Immediately as soon as frequency crosses dead band	Within 45 sec	5 min
Secondary Reserve Ancillary Service (SRAS)	Within 30 seconds after the receipt of AGC signal	Within 15 Min	30 min or till replaced by Tertiary Reserves
Tertiary Reserve Ancillary Service (TRAS)	Within 15 minutes of dispatch instruction from NLDC/RLDC		60 min

Automatic Generation Control (AGC) / Secondary Reserve Ancillary Services (SRAS)



- 86 power plants with 83630 MW capacity under AGC, 220 units
  - 73.1 GW coal-based
  - 6.6 GW hydro
  - 3.2 GW gas-based
  - 180 MW solar
  - 20 MW/40 MWh BESS
  - 2x250 MW pumped hydro
- 7600 MW intra-state generation under SRAS
- Around +/- 5% reserves provided by each generator for Ancillary Services
- Up & Down Regulation up to 2000 to - 2400 MW pan-India for secondary frequency control
- A combined ramp rate of 200-250 MW/minute.

https://webcdn.grid-india.in/files/grdw/2026/01/SRAS_Highlights_Jan2026_256.pdf

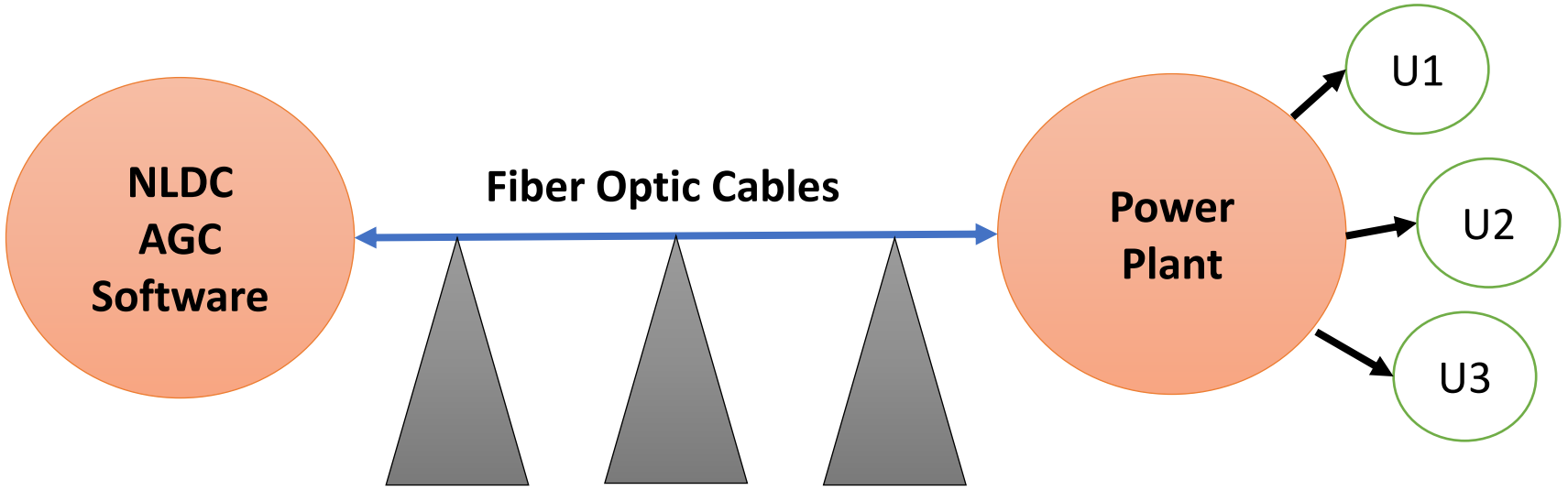
Energy market & TRAS market Prices

- Plants fully requisitioned in the evening peak – no up reserves
- Plants scheduled at MTL or below in the solar hours – no down reserves.
- BESS may participate in High Price DAM segments of both Energy market and TRAS-Up
  - Order carry forward available for TRAS-Up
- TRAS-RTM includes a high price segment for the HP Providers of TRAS-Up https://cercind.gov.in/2023/orders/359-MP-2022.pdf

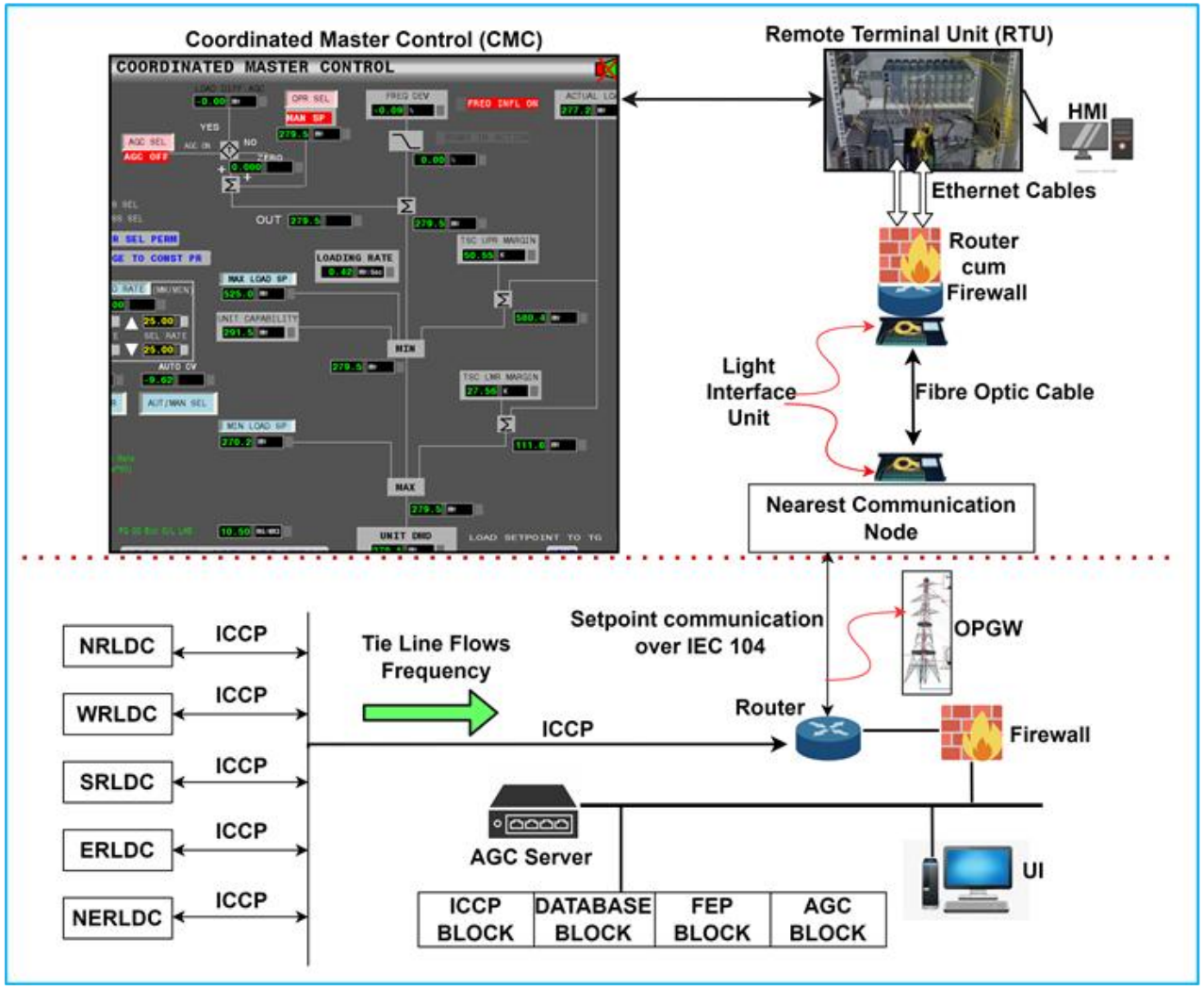
- Despatched TRAS-Up bids are paid from the DSA Pool @ UMCP.
- Cleared but not despatched TRAS-Up bids have a Commitment charge @ 10% of MCP (capped at 20p/kWh)
- Cleared TRAS-Down bids may pay to the DSA Pool @ Pay-as-bid
- Energy markets responsive to high solar penetration scenario
  - Prices as low as Rs. 0.1 per kWh in the Solar hours
  - Non Solar hours prices frequently at the cap of 10 Rs/kWh – 20 Rs/kWh

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 helps replenish the exhausted primary reserves
  - Be ready for any next contingency
- Efficient and automatic frequency control during high RE periods
- AGC improves the reliability of the Indian power system.



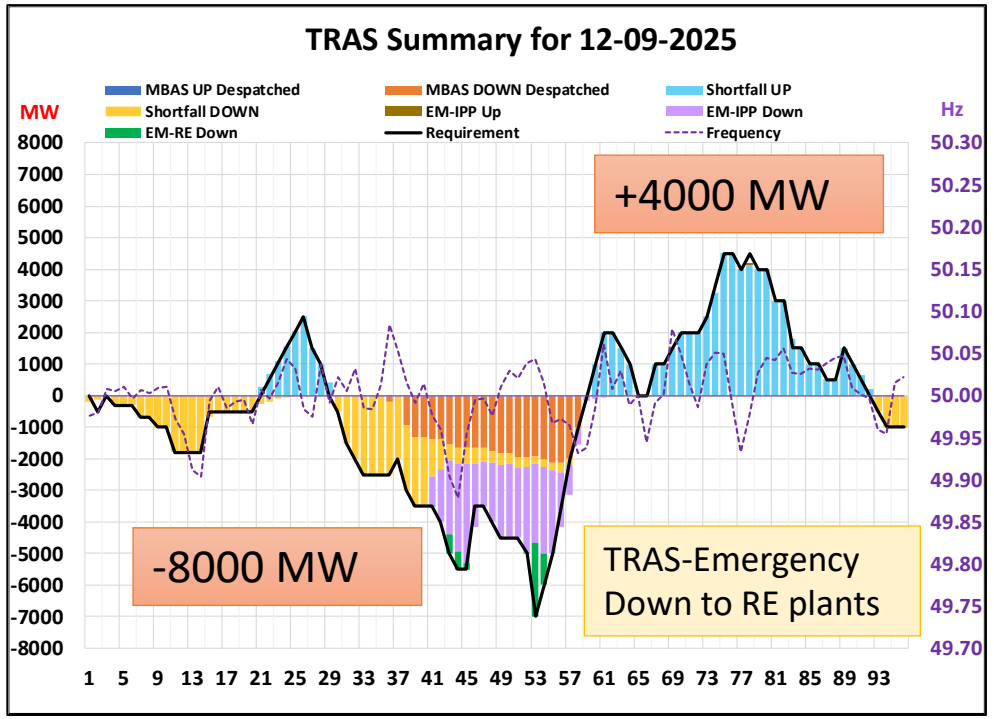
AGC Architecture

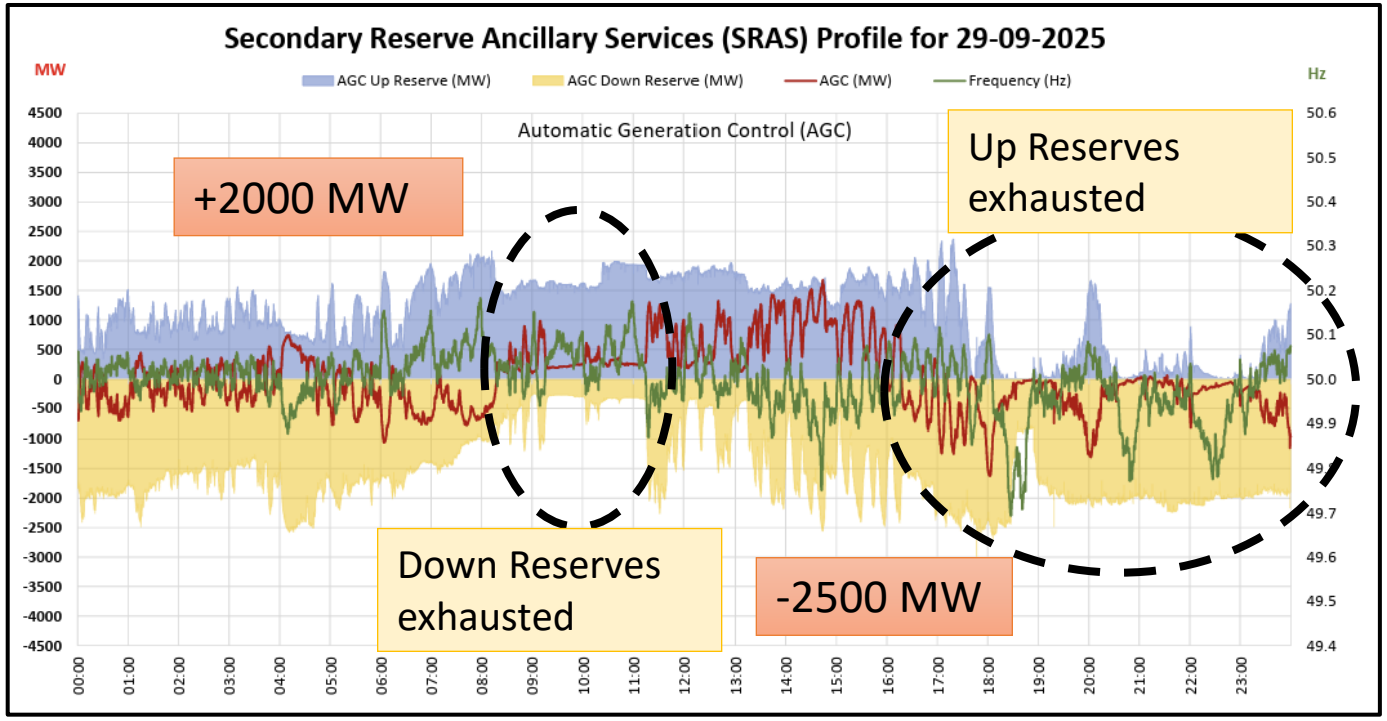


Key Components

- Digital Control System
- Dedicated RTU
- Router cum Firewall
- Fiber Optic cables - OPGW
- IEC 104 protocol
- Signal lists
- Area Control Error (ACE)
- NLDC AGC Software

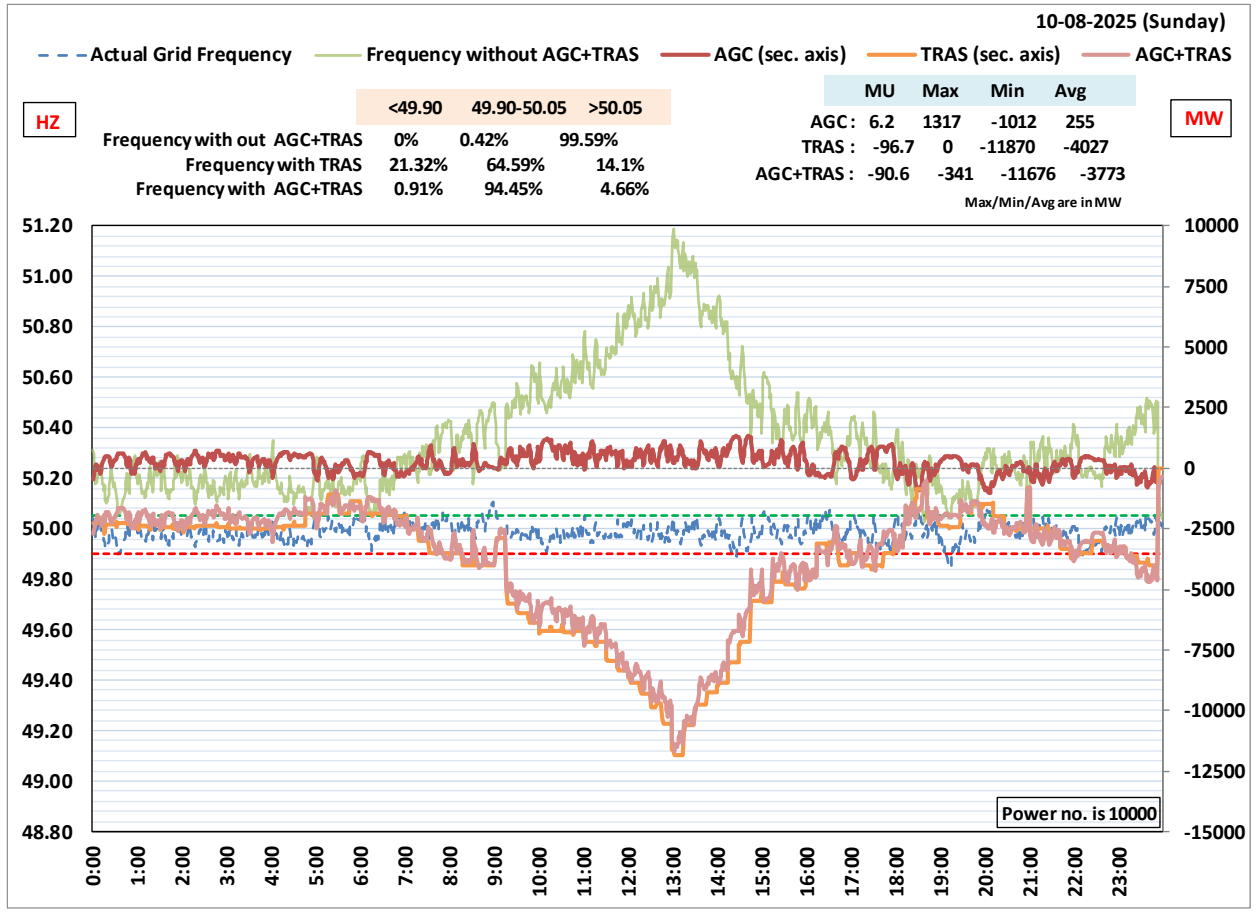
Secondary and Tertiary Reserve Ancillary Services

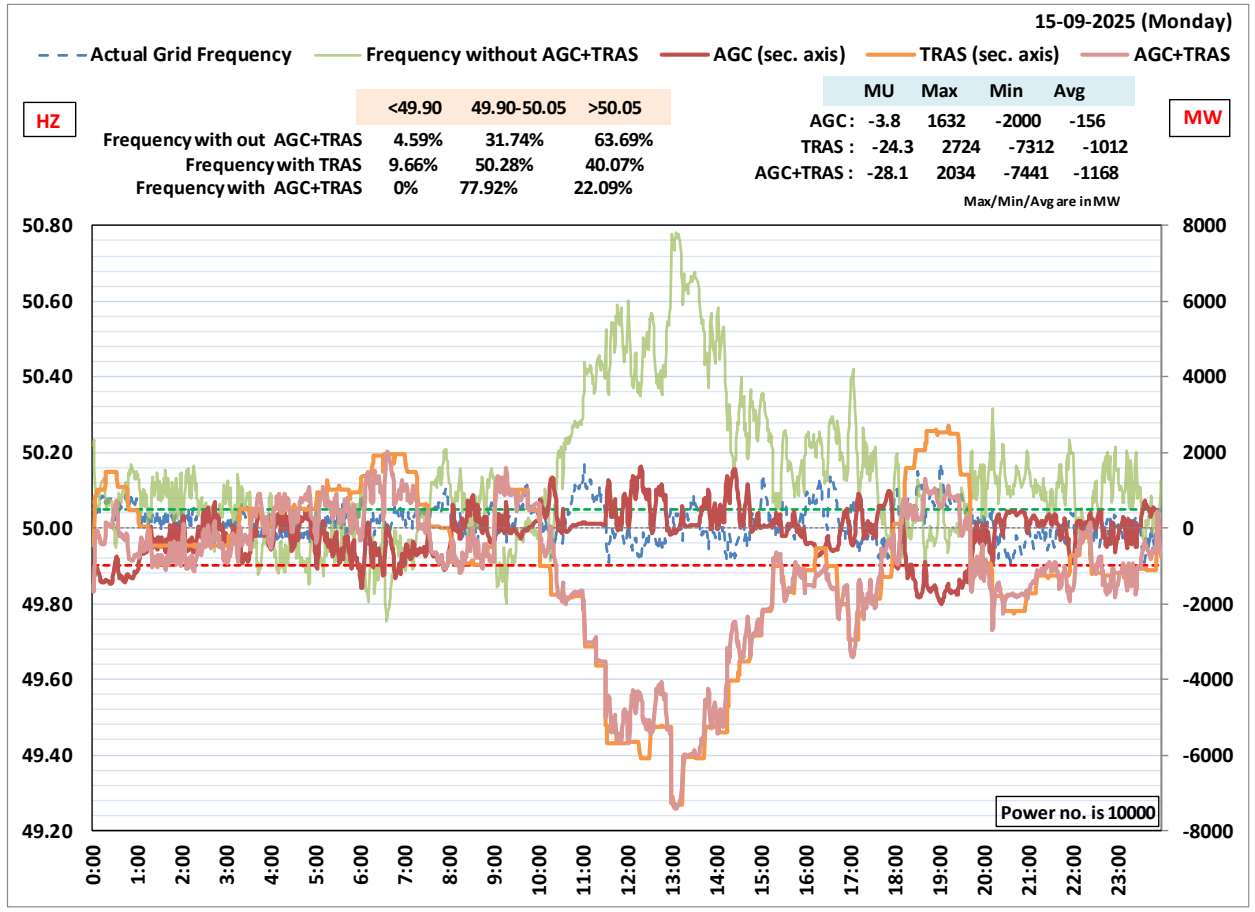




- Both TRAS and SRAS require Resource Adequacy and their availability on bar
- TRAS can make course corrections of energy injection using on bar resources
- SRAS is used for finer corrections within the limited reserves (+/- 5%*MCR)

Frequency with & without Ancillary Services

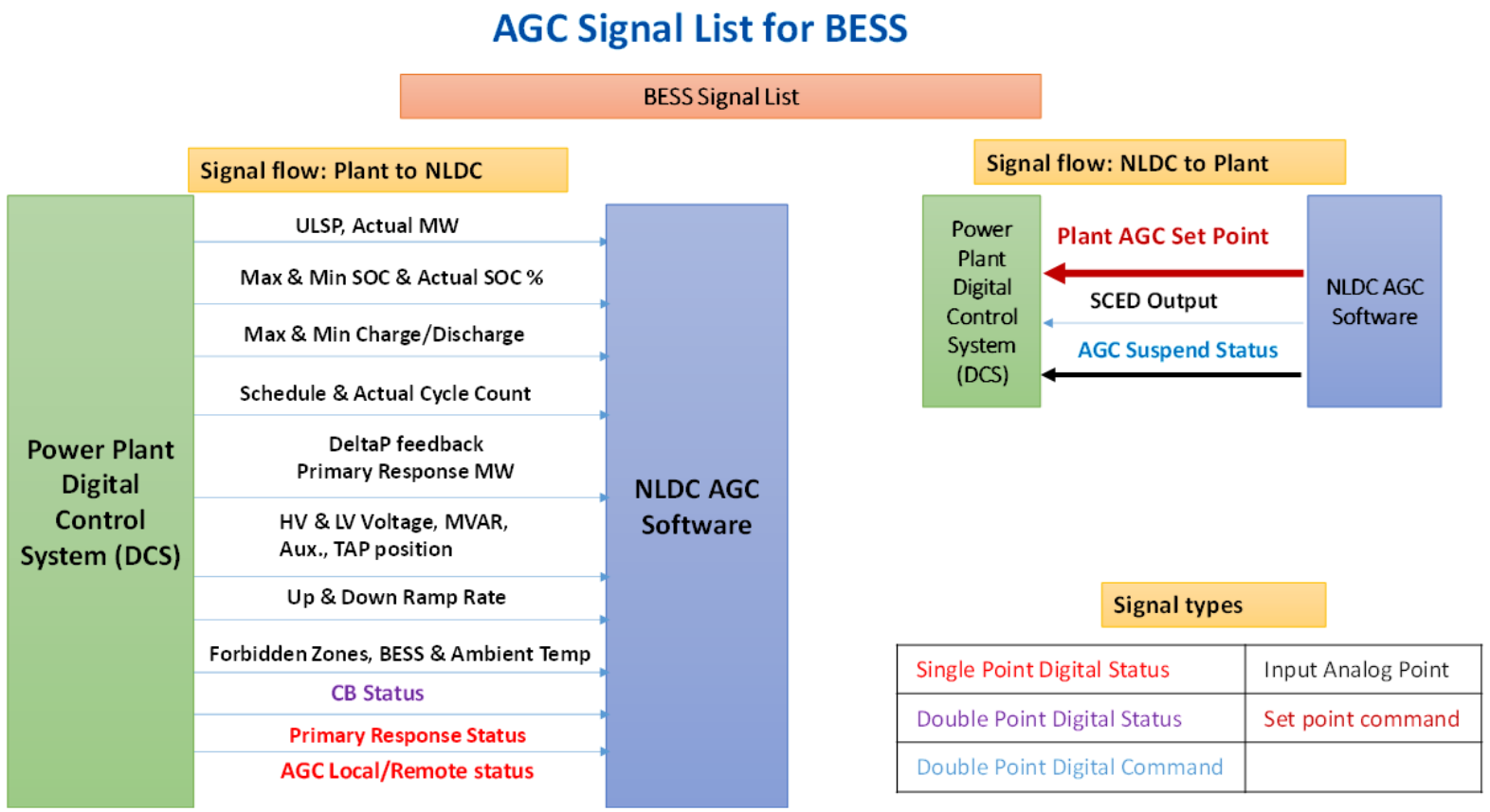




Period	Frequency within IEGC band without Ancillary Support	Frequency within IEGC band with Ancillary Support
01-Apr-2024 to 31-Mar-2025	31%	78%

AGC Pilot Project on BESS

- BSES Rajdhani Power Limited (BRPL) has commissioned a utility-scale standalone BESS project at Kilokari (near Maharanibagh PG substation), New Delhi in April 2025.
  - 20 MW/40 MWh Lithium Ion (LFP) BESS.
- AGC pilot project undertaken by NLDC and closed loop testing was conducted in May 2025.
- AGC Signal list in place
- AGC software enhancements undertaken to cater to BESS, Solar and PSP

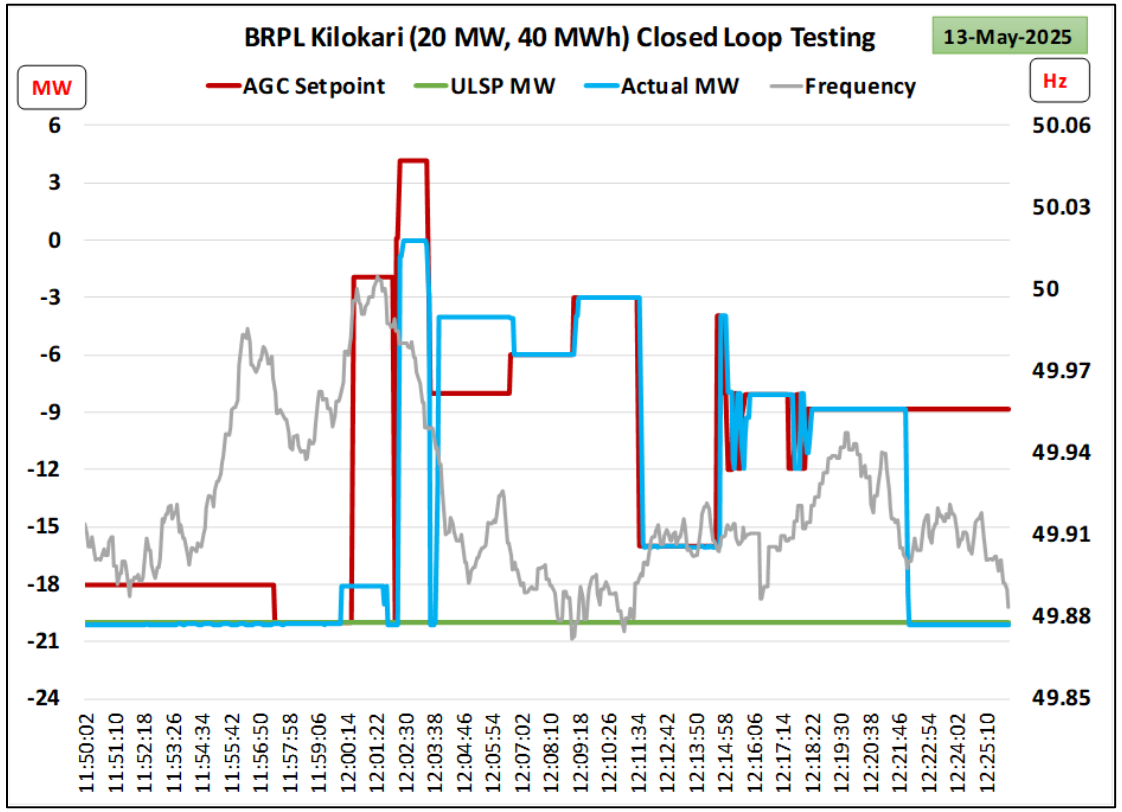


Logics for handling SOC and Cycles in BESS

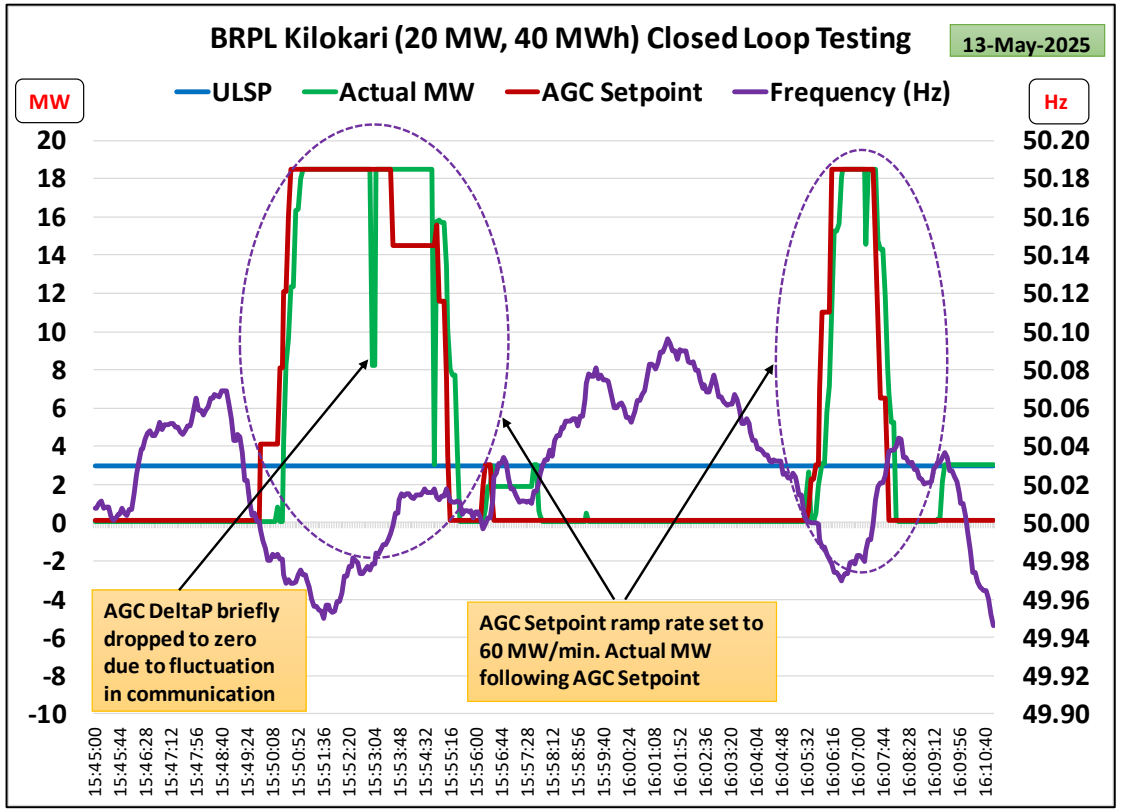
S. No.	**Condition**	**Cap_Max**	**Cap_Min**	**Local / Remote Status** (under normal conditions)
1	If Actual SOC% = Maximum State of Charge SOC % or 100%	Cap_Max	0	Remote
2	If Actual SOC% = Minimum State of Charge SOC % or 0%	0	Cap_Min	Remote
3	If Cycle Count > Scheduled Cycle Count or 2	0	0	Local

Closed loop testing of BESS under AGC

Charging



Discharging



- Excellent performance by BESS in both charging and discharging periods
- Inflexibility to seamlessly switch between charging and discharging modes.
- Feedback from the pilot resulted in the amendment to a few upcoming tender specifications.

Consultation Paper by GRID-INDIA

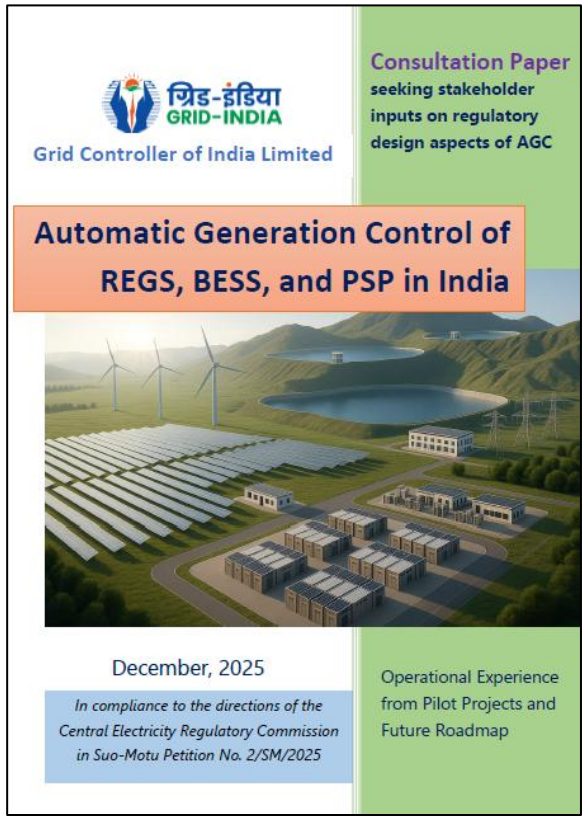
GRID-INDIA has published a Consultation Paper on

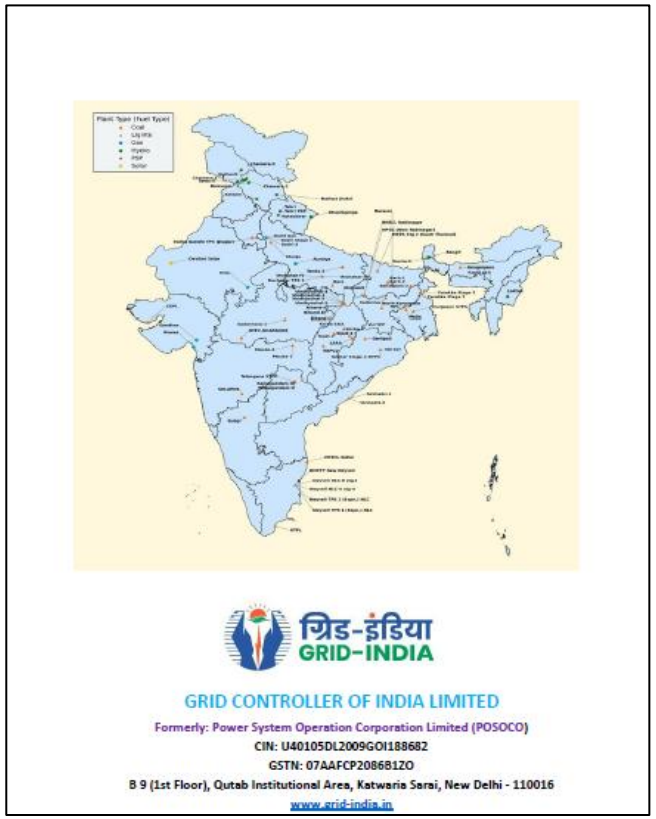
“Automatic Generation Control of REGS, BESS, and PSP in India”

AGC Pilot on REGS-Solar

AGC Pilot on BESS

AGC of Pumped Storage Plants





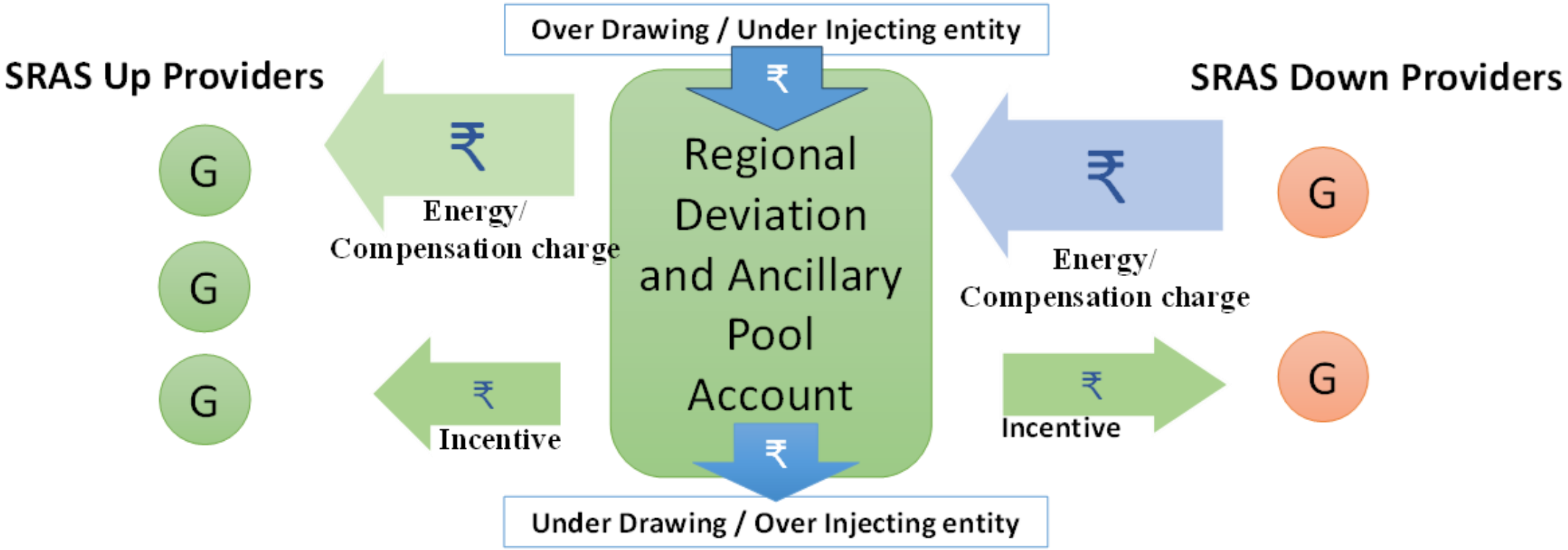
Modalities and Accounting Framework for AGC of REGS, BESS, and PSP

Operational strategies and technical aspects discussed

Intra-State Generator Participation in SRAS

https://webcdn.grid-india.in/files/grdw/2026/01/Consultation%20Paper%20on%20AGC%20of%20RE_BESS_PSP_31122025_215.pdf

Accounting & Settlement for SRAS



SRAS Up Providers to be paid (in case of SRAS Up) or to pay back (in case of SRAS Down) Energy/compensation charges

- Corresponding to net energy despatched under SRAS Up or Down
- Using 15-min SCADA MWh

SRAS Up and Down Providers are eligible for incentive based on performance:

Incentive between 0 - 50 paisa/kWh for every **5-min AGC Up/down MWh (using SCADA)**

Compensation Mechanism for BESS under SRAS

Option-A: Declared Compensation Charges plus Incentive

- Symmetric ECR For settlement
  - Charging energy for SRAS-Down may be refunded at the declared compensation charge rate.
  - SRAS-Up energy may be paid from the pool at the same rate.
- RTE losses (~15%) may be borne by the BESS.
- This approach ensures neutrality and prevents gaming of charging windows.
- **Mileage-based incentives** (up to ₹0.50/kWh) provide an important revenue stream. However, simulations indicate that SRAS-only operation does not fully recover the fixed costs of large BESS installations.
- A **premium recognizing the superior technical capabilities** of BESS, such as high ramp rates, fast and accurate response, frequent cycling, and precise controllability may be necessary to ensure full cost recovery and sustained participation.

Option-B: Fixed Charges only

- SRAS committed reserves may be compensated weekly through payment of fixed charges only, which would subsume the committed reserve related costs as well as applicable incentives.
- No separate settlement of energy charges may be undertaken for such utilisation.

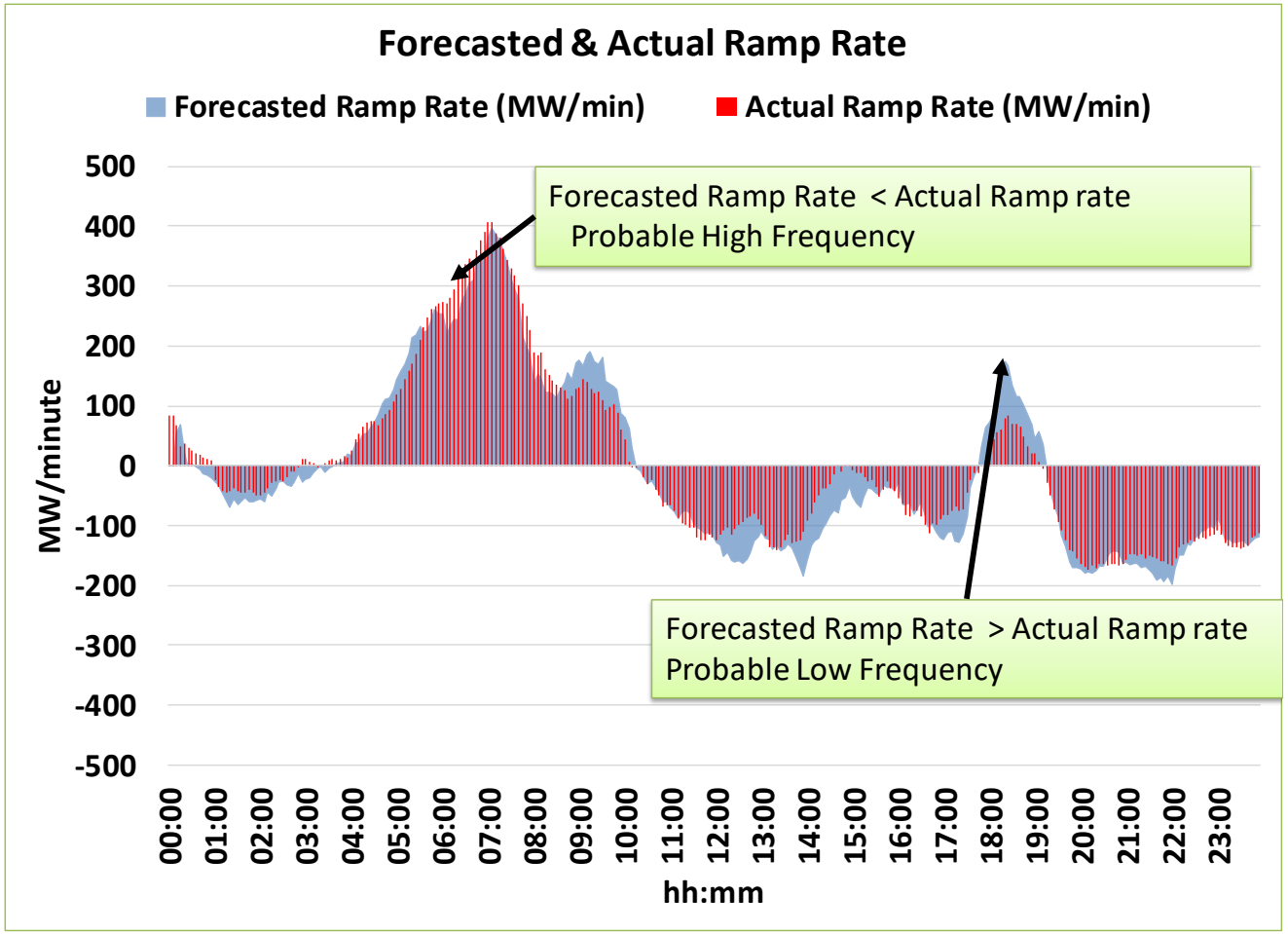
Essential Reliability Services from BESS

- Shall be capable of providing droop based primary response
- Shall be capable of providing Virtual Inertia response
  - Fast ramp, enough to provide ROCOF control service (or synthetic inertia) within 1s.
- Voltage control. IEGC 2023 provides a compensation (6 paise/kVArh) for voltage support from ancillary services.
- Black start capability. IEGC 2023 specifies a compensation (110% normal rate) for black start services.
  - Grid Forming Mode is desired. GFM-capable BESS can support black start operations in remote or islanded IBR-dominated pockets.
- Efficient transmission system utilization and congestion management

- Capacity (MW)/ Energy (MWh)
- Storage duration, C-Rate
- Cycle count, partial cycles
- Round Trip Efficiency, State of Health
- Ramp rate, Droop
- AGC Signal List & AGC Software

- Continuous bi directional operation desired.
  - Utilize -100% MW to 100% MW
- 0% (min) to 100% (max) State of Charge.
- 1-2 cycles per day
  - A cycle is a charge and discharge of total energy.
  - 1 cycles means the cumulative charge and discharge of 2 x BESS MWh in case of partial cycles.

Advantage of BESS in Ramping

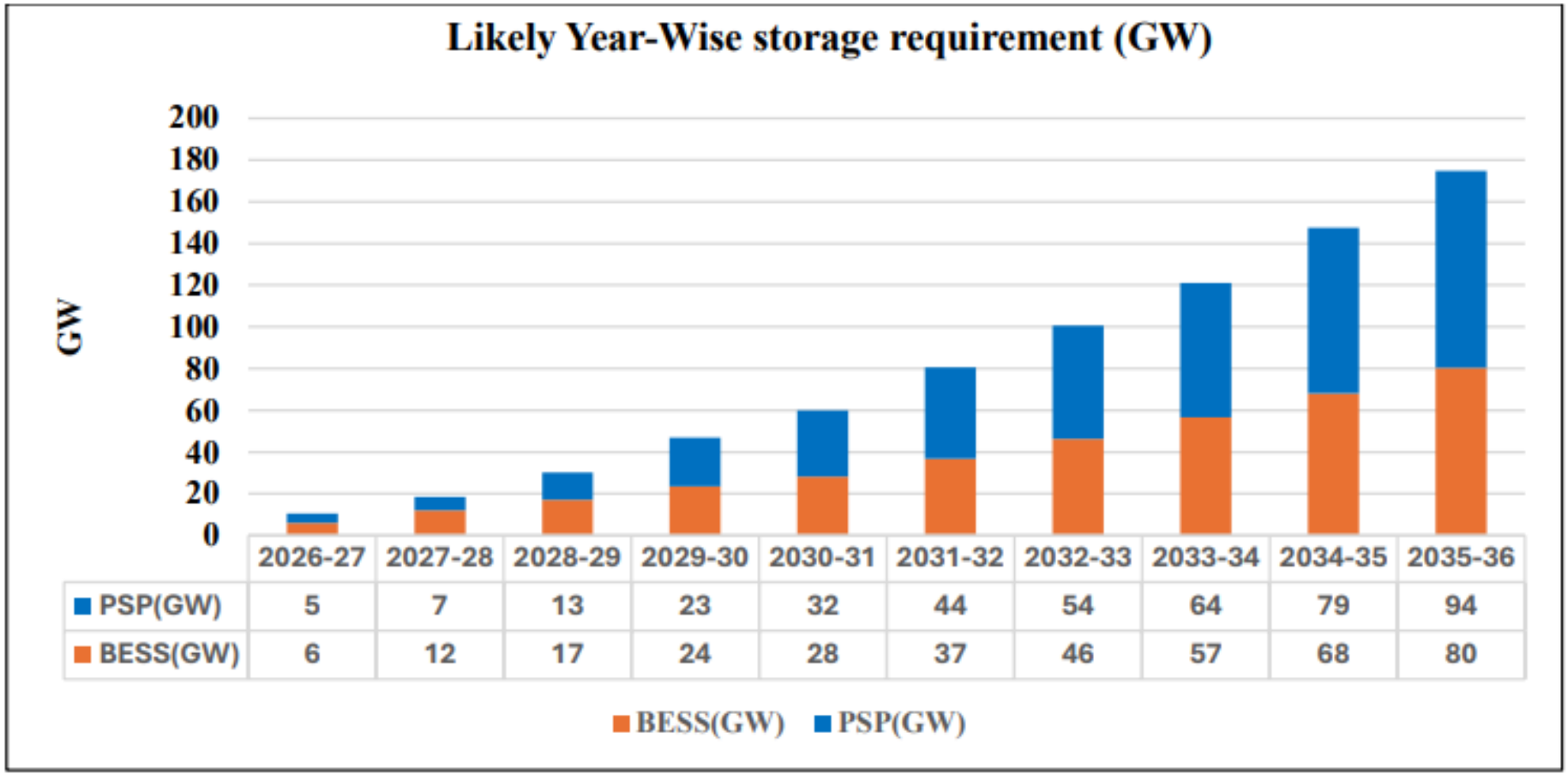


- Forecasted Ramp Rate is dependant on the system needs
- Actual Ramp Rate is based on the portfolio balancing of the DISCOMs
- **Custom Participation Factor** adopted in SRAS as per CERC (Ancillary Services) Regulations, 2022.
  - Equal weightage to ramp rate and compensation charge
  - High ramping resources will get priority in the regular merit order dispatch to avoid ramp shortfall

BESS Capacity Installed as on 30-Apr-2026

Sr. No	Generating Station	Pooling Station	Plant Type	Region	COD declared Capacity (MW)	MWh
1	Rajnandgaon/ SECI	Thelkadih 132 kV	Hybrid	WR	40	120
2	JUNIPER GREEN COSMIC PRIVATE LIMITED	Bikaner II /33kV	Hybrid	NR	41	82
3	RENEW SURYA ROSHNI PVT LTD	Fatehgarh III/33 kV	Hybrid	NR	23	92
4	Kilokari Battery Energy Storage System	Kilokari/33kV	BESS	NR	20	40
5	ReNew Surya Ojas Private Limited_BESS	400/220kV Koppal	Hybrid	SR	75	150
6	Kajra BESS	Kajra/132kV	BESS	ER	45	181.6
7	Gujarat BESS Pvt Ltd	Charal	BESS	WR	90	180
8	ACME SUN POWER PRIVATE LIMITED(ASPPL)	Bhadla-II	BESS	NR	167	666.7
9	ACME SURYODAYA PRIVATE LIMITED(ACME_SPL)	Fatehgarh-I	BESS	NR	285	1140
10	ACME Surya POWER Private Limited (ASRPPL)	Bikaner-II	BESS	NR	139.5	558
11	ARE43L BESS - SRPL Khavda PSS10	KPS3	BESS	WR	400	1200
12	ARE37L BESS - AGEL Khavda PSS5	KPS1	BESS	WR	380	1140
13	ARE36L BESS - AGEL Khavda PSS8	KPS3	BESS	WR	160	480
14	Juniper Green Stellar Private Limited(JGSPL)	Fatehgarh-IV	Hybrid	NR	180	360
Total BESS Capacity					**2046**	**6390**

Expected Year-on-Year Growth of BESS



	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36
PSP(GW)	5	7	13	23	32	44	54	64	79	94
BESS(GW)	6	12	17	24	28	37	46	57	68	80

43,000 MWh of BESS has received VGF approval from GOI

10.7 GW of BESS is under construction, and 22 GW is under tendering stage

BESS installed capacity is projected to increase to 80 GW by 2035-36

Source: CEA "Long-term National Resource Adequacy Plan (2026-27 to 2035-36)"
https://cea.nic.in/wp-content/uploads/notification/2026/04/Long_term_National_Resource_Adeqaucy_Plan2026_27_to_2035_36.pdf

AGC for Upcoming BESS Plants

- AGC from BESS is ideally required 24x7.
- India is planning ~30 GW of storage in the next 3-5 years.
- During non-charge/discharge periods, 3-5% of BESS nameplate capacity set aside for AGC
  - At 5% of 30 GW installations, this would provide an additional 1500 MW of AGC reserves
  - This would treat BESS similar to conventional generators, which typically offer AGC on the range of +/-5% of rated capacity
  - This 3-5% should be on the power capacity, not energy.
- A 2500 MW/5000 MWh BESS would only be required to set aside 125 MW/62.5 MWh (30 minutes) of reserves for AGC (not 125 MW/250 MWh).
- This would ensure a minimal impact on the overall availability of energy for energy arbitrage
- Setting aside a specific percentage of capacity as reserve may require appropriate regulatory interventions.
- **As a logical first step, all new BESS installations (including those primarily intended for energy arbitrage) may actively be integrated with AGC.**
- Higher premium for BESS services under AGC will be a key driver

Simulation for Assessment of BESS Size

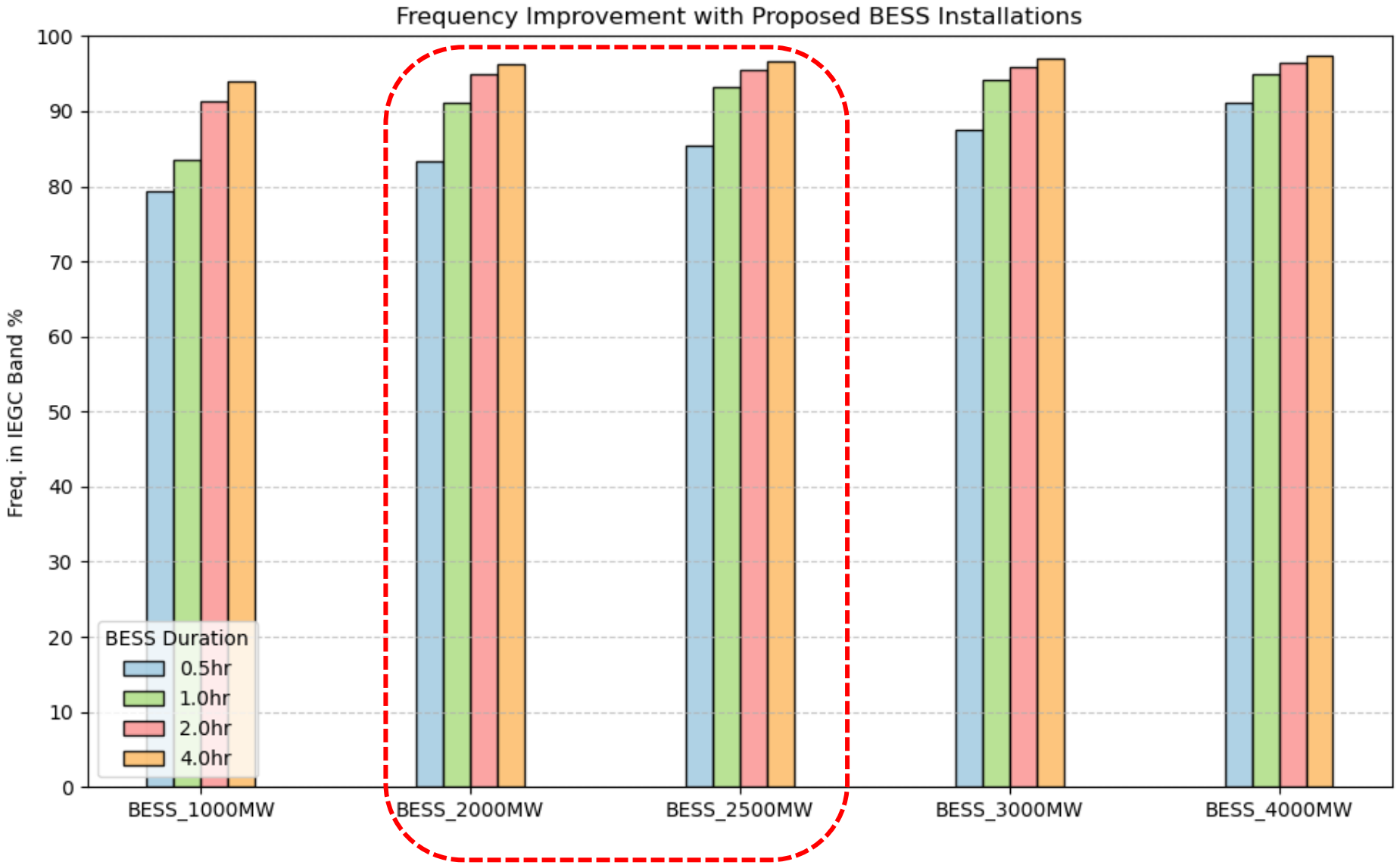
Objective: Estimation of BESS capacity to improve frequency % within the IEGC band

- Effect of existing frequency control mechanisms retained. AGC/SRAS, TRAS-Market, TRAS-Shortfall, and TRAS-Emergency.
- Data analyzed using 4 second samples → 21600 samples/day
  - ➢ 1 year data analyzed → 21600x365 = 7884000 samples
- Area Control Error (ACE) of each region. AGC to drive ACE to zero
- Wide range of BESS configurations simulated to assess both power and energy requirement under SRAS
  - BESS MW
  - C-rate
  - Cycle limit
- Partial Cycles calculated. Daily Cycle requirement
- Frequency improvement with different BESS configurations is analysed to arrive at the optimal capacity

Parameters & Assumptions

- Power number = 10800 MW/Hz
- Ts = 4s ; data resolution
- Samples_day = 86400/Ts
- Daily Cycle Limit = 2
- Participation Factor = 50%
- RTE = 85%
- SOC_min = 10%
- SOC_max = 90%
- Continuous bi directional operation

BESS Capacity Required to Improve Frequency Profile



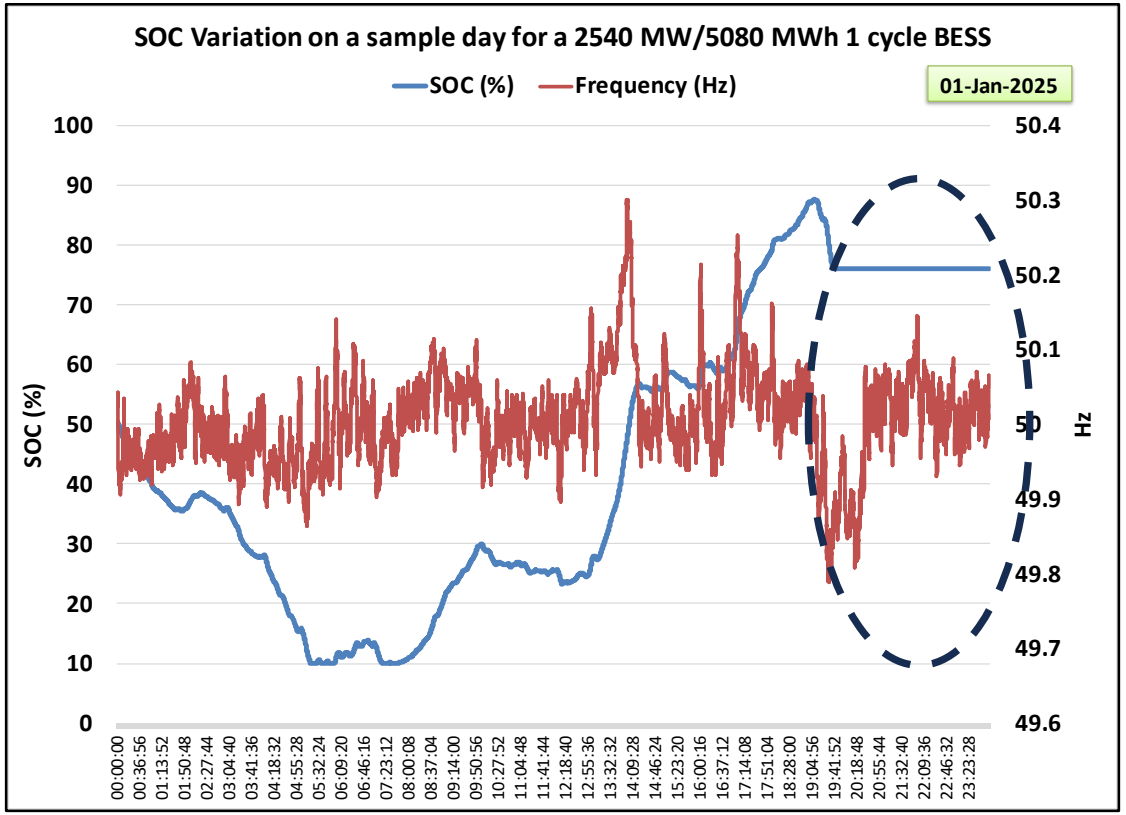
Multiple simulations performed to arrive at the optimal sizing

Different combinations of technical parameters attempted and simulated effect on the grid was observed

BESS support is in addition to all steps already being taken

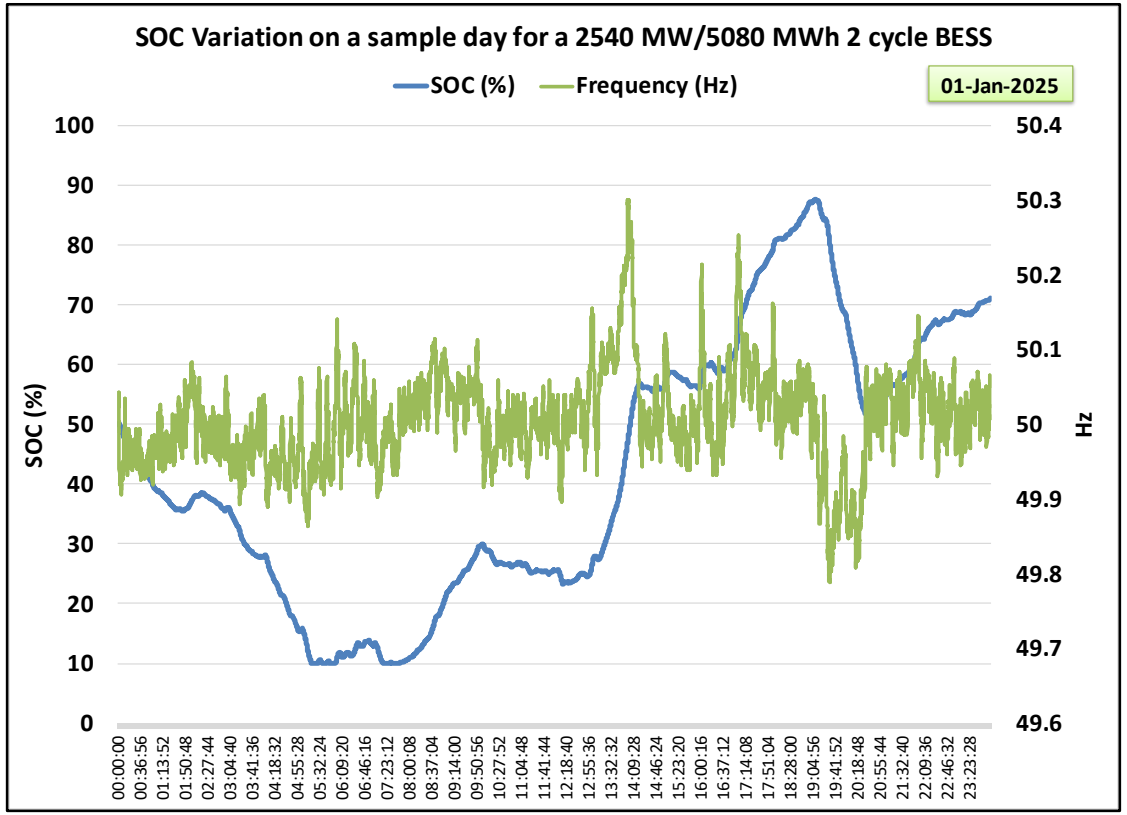
State of Charge & Cycle count

1 cycle BESS



- First cycle completed at 1900 hrs
- BESS not available to counter the 1930 hrs low frequency

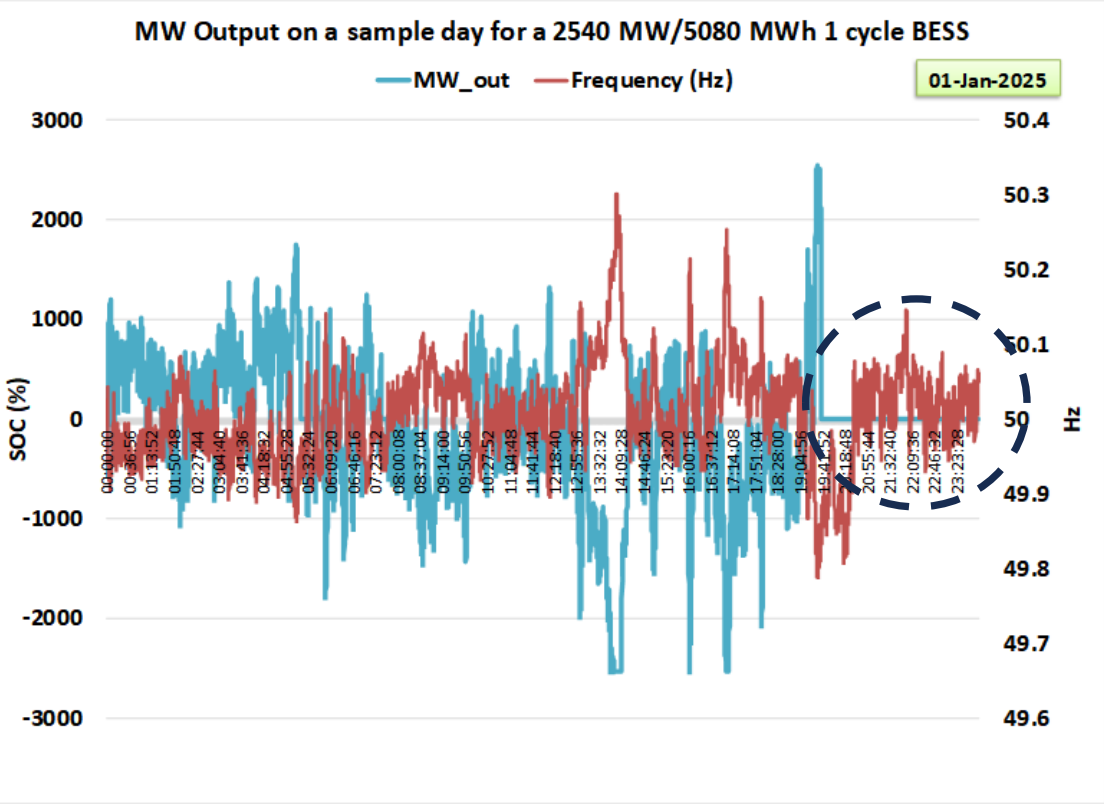
2 cycle BESS



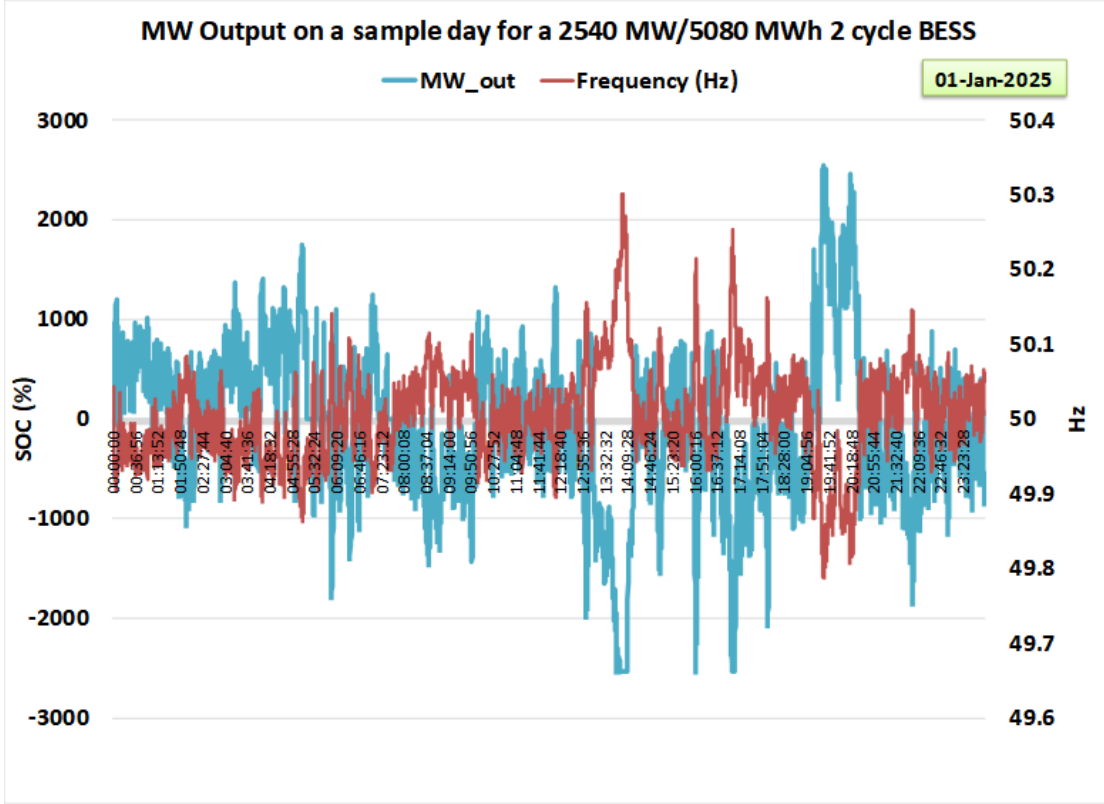
- Second cycle available to counter the evening peak dip in frequency at 1930 hrs

MW Output & Cycles on a Typical Day

1 cycle BESS

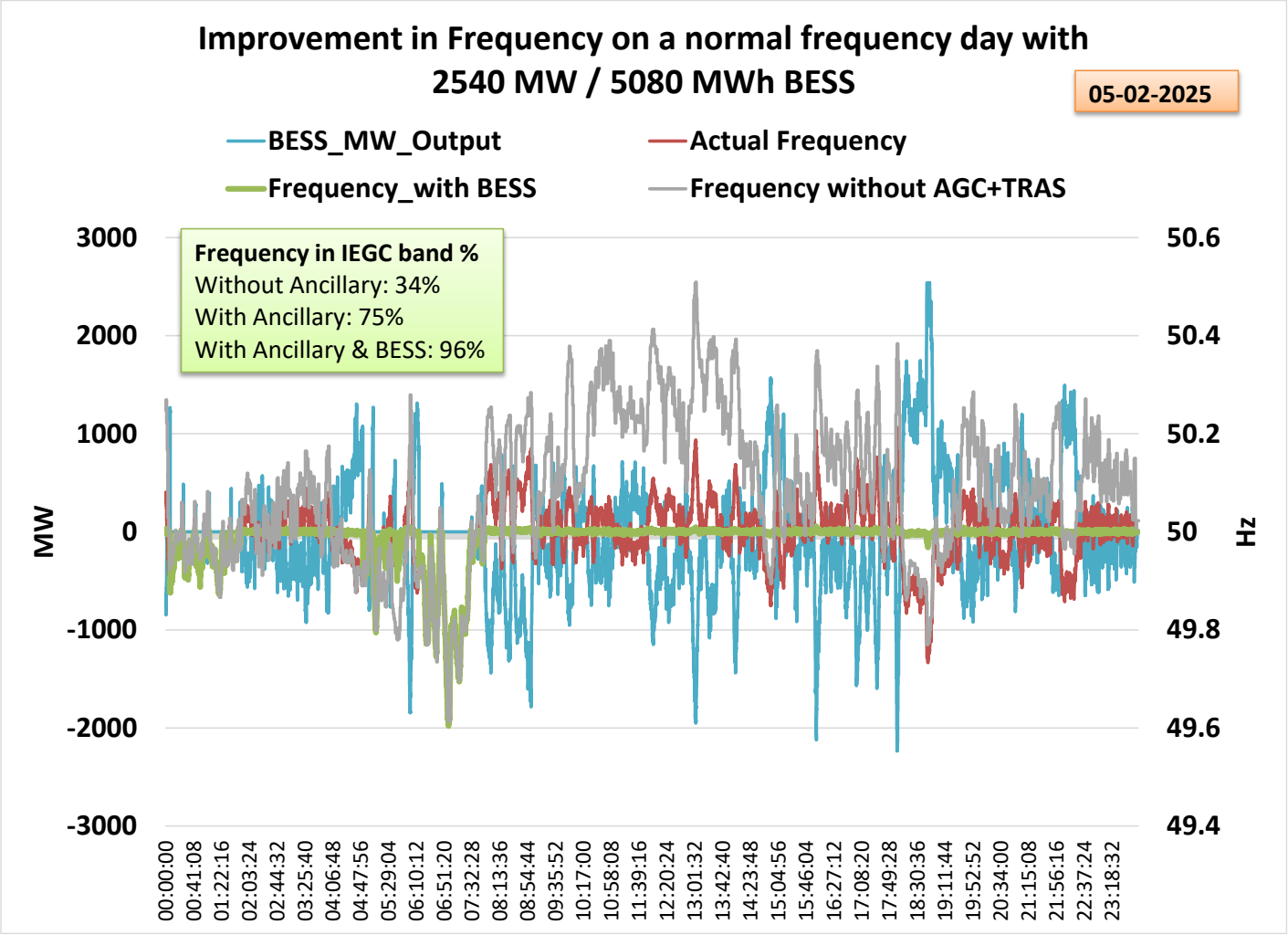


2 cycle BESS



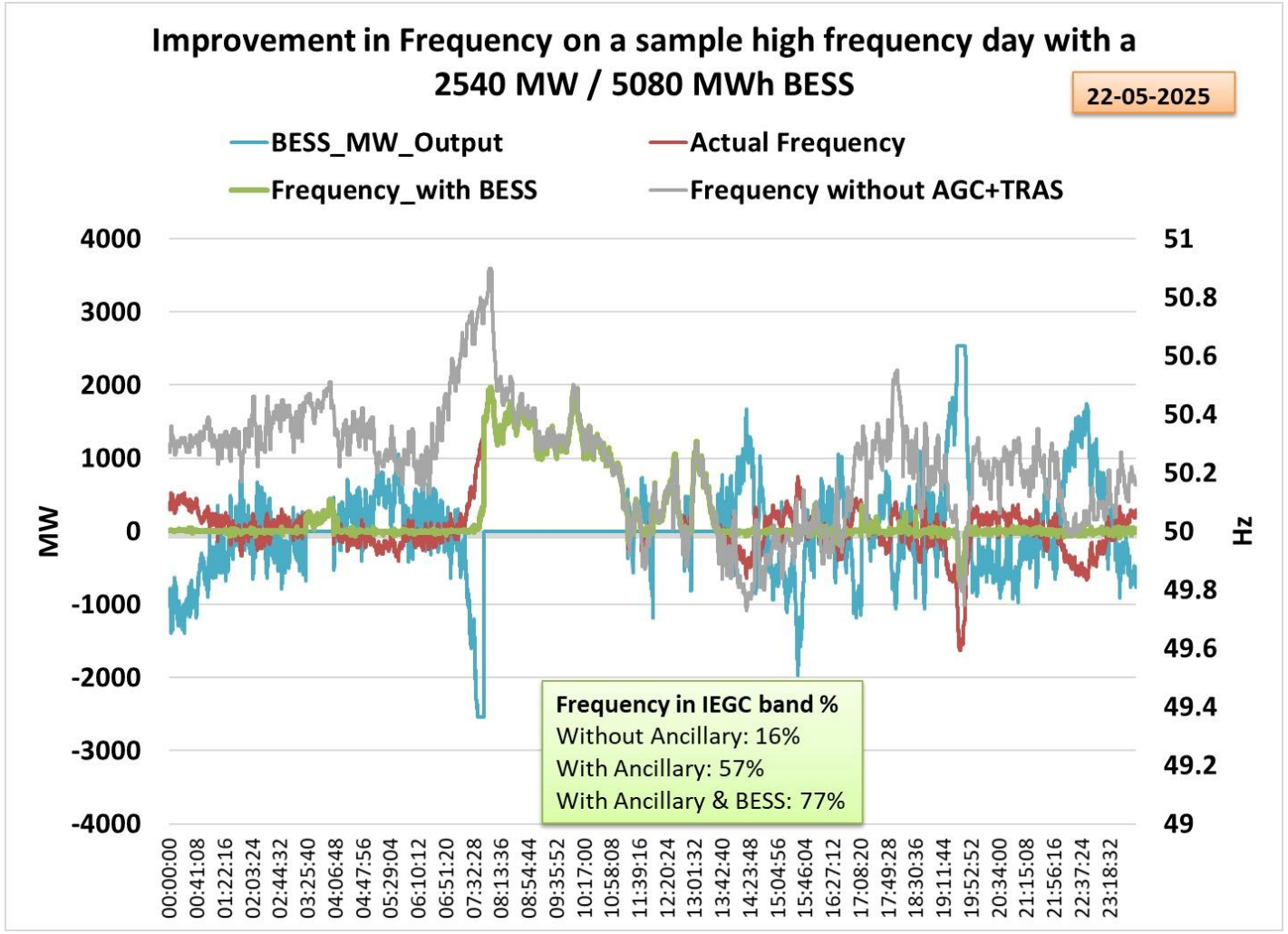
- Up to +/- 2500 MW utilized to control frequency excursions
- Immediate response by BESS in the opposite direction to frequency changes
- Less risk coverage in 1 cycle BESS

Frequency with and without BESS – Typical Day



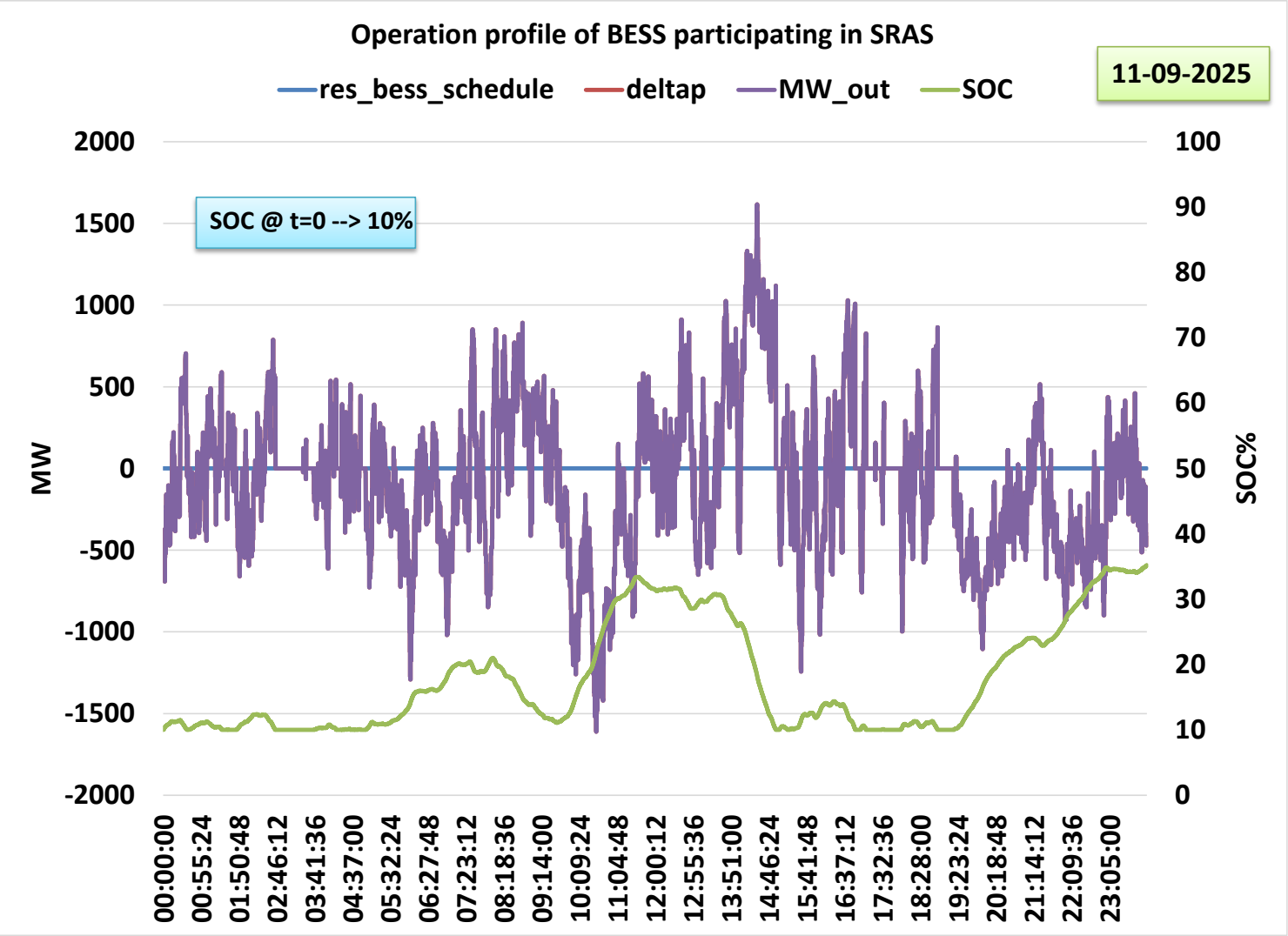
- Frequency would have remained 34% within the band without Ancillary Services
- Frequency was 75% within the band with existing Ancillary Services
- Frequency is expected to be >90% within the band with a 2540 MW/5080 MWh BESS on this day
- 0600 hrs-0730 hrs frequency still unmanaged due to energy insufficiency

Frequency with and without BESS – High Frequency Day



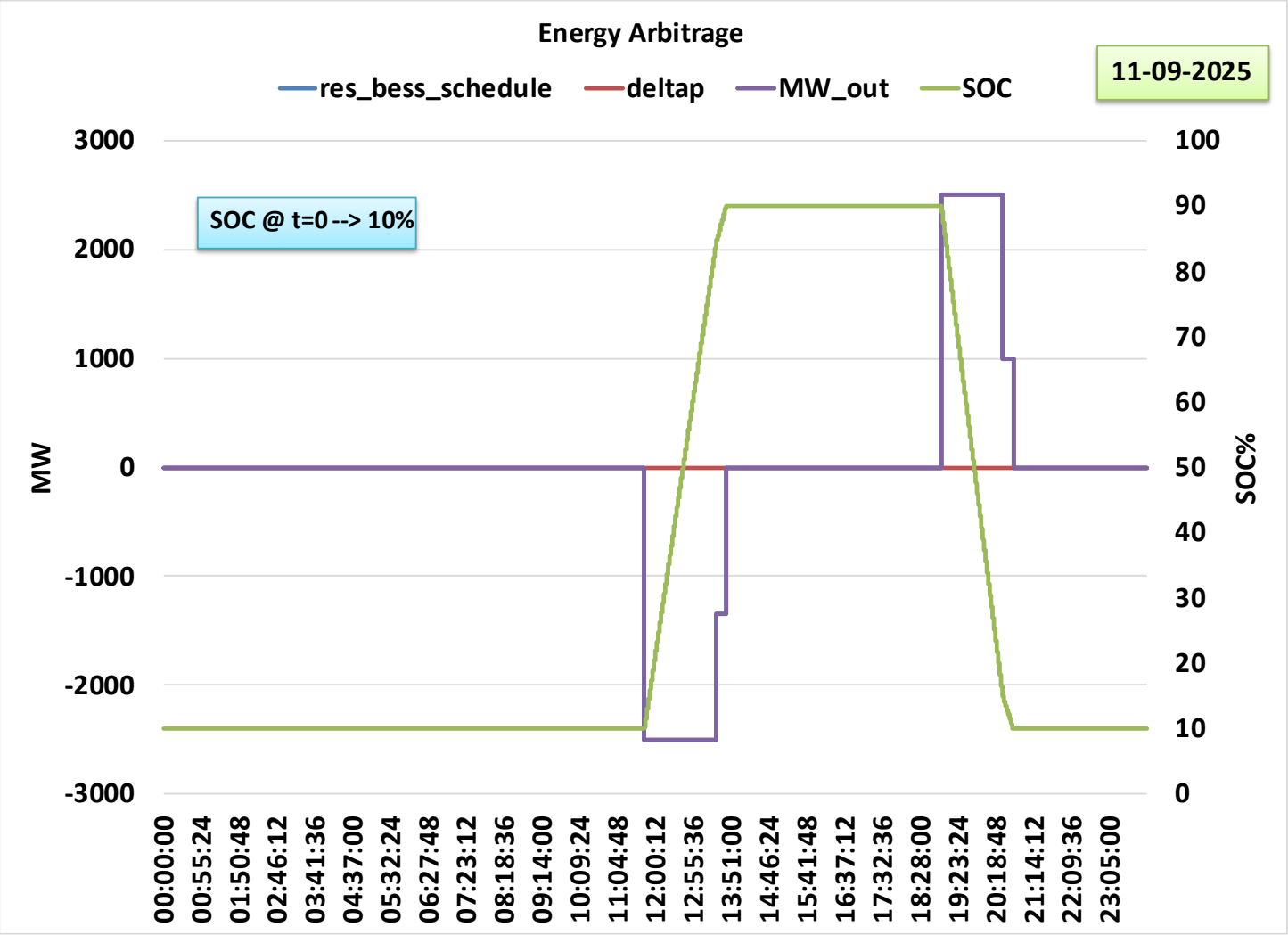
- Frequency would have remained 16% within the band without Ancillary Services
- Frequency was 57% within the band with existing Ancillary Services
- Frequency is expected to be 77% within the band with a 2540 MW/5080 MWh BESS on this day
- 0730 hrs-1130 hrs frequency still unmanaged as the BESS got fully charged

Operation of BESS participating only under AGC



- 24x7 availability of SRAS
  - Excellent for grid security
- Automatic SOC management
- Under recovery of fixed charges at the present level of incentive
- ₹ 3-4/kWh premium suggested

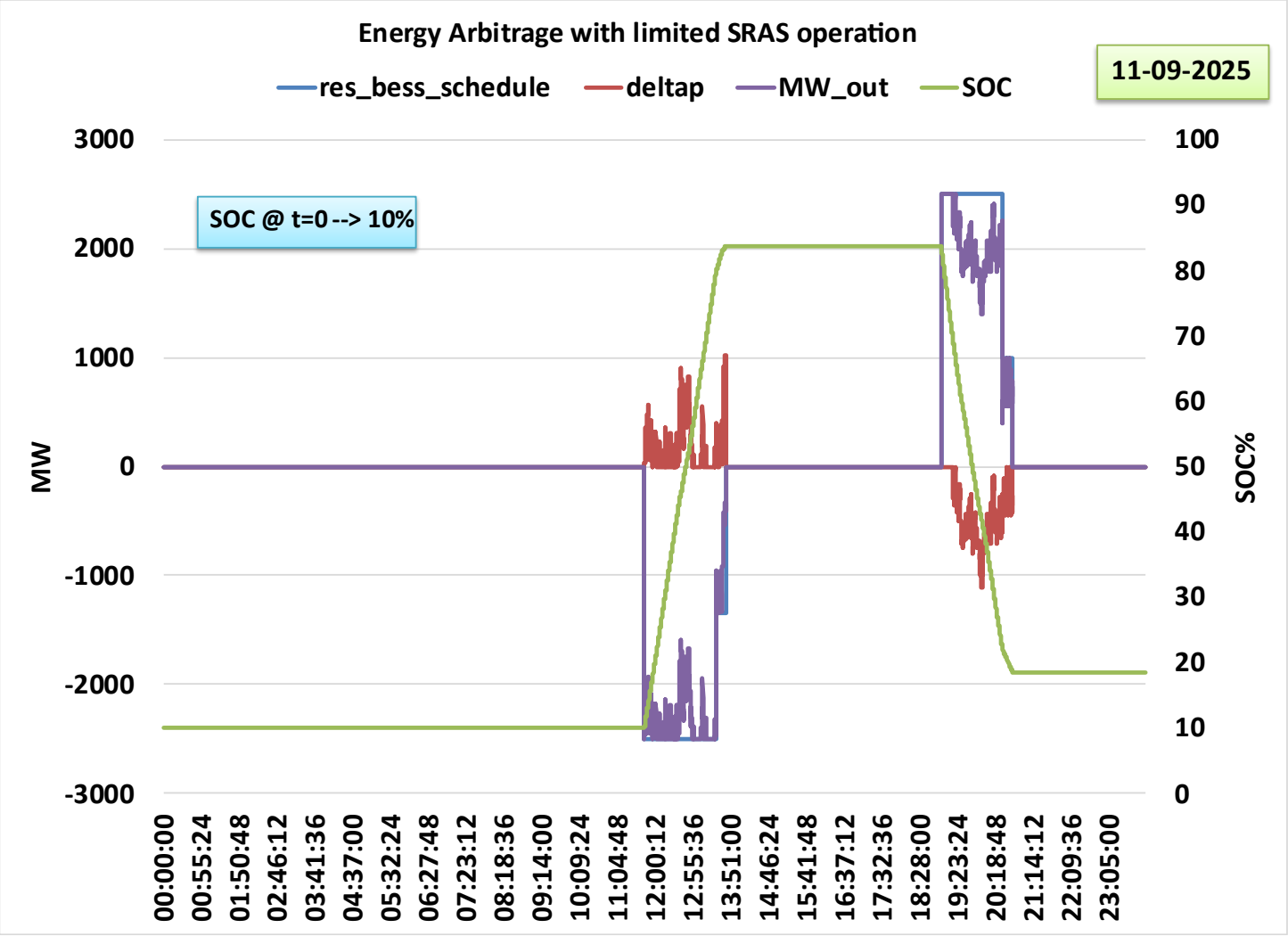
100% Energy Arbitrage – No SRAS



Not recommended from frequency control view point

- Useful to ensure Resource Adequacy – no SRAS
  - ~ Rs. 5/ kWh ECR @ 2.4 lakhs/MW/month
- No contribution to frequency control
  - ➢ All the BESS may follow the same EA strategy aligned with market prices, leading to sudden injection and withdrawl from the grid
- Missed incentive under SRAS

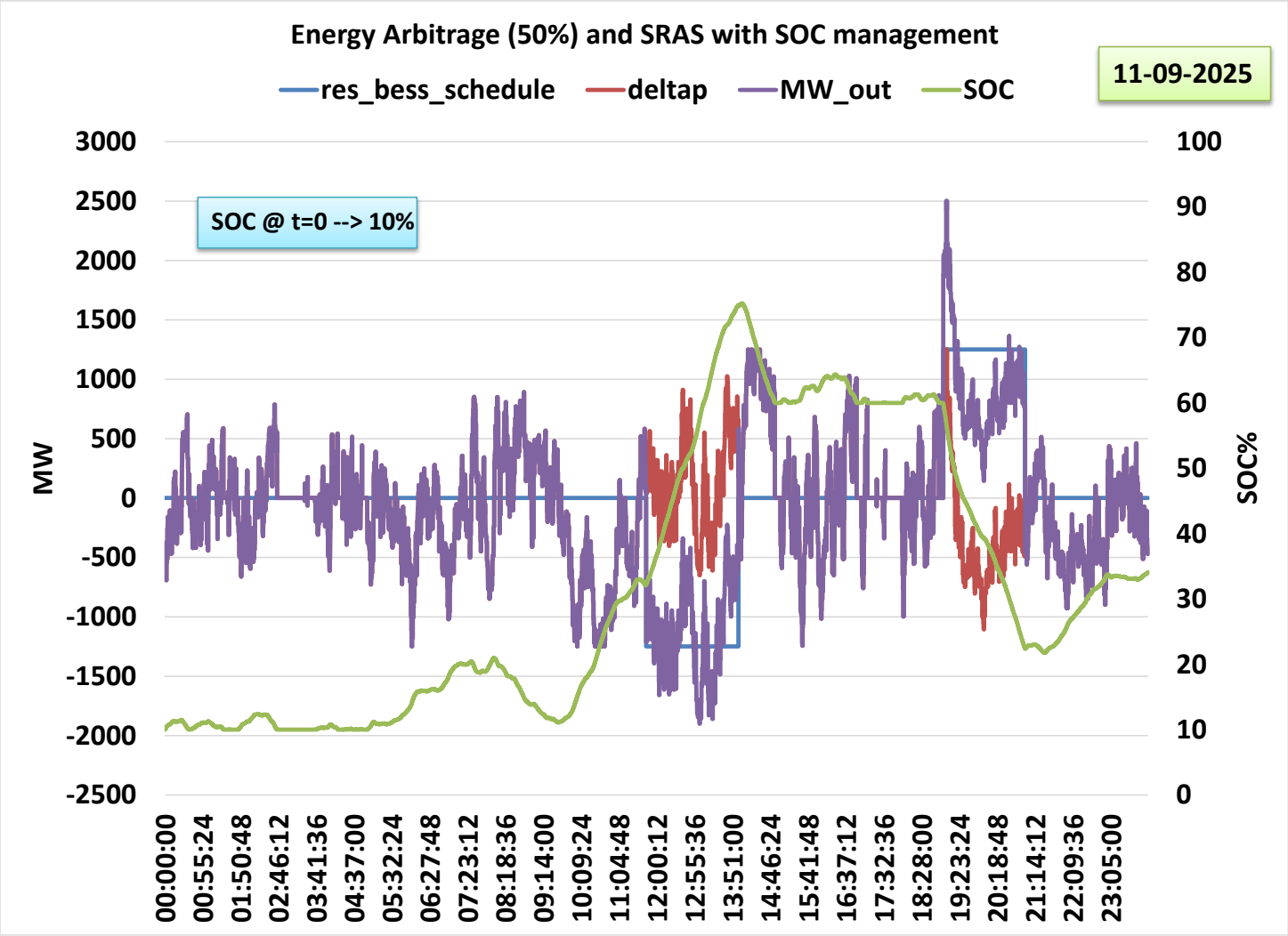
Energy Arbitrage (100%) & limited-time SRAS operation



Easily achievable for collocated BESS

- Limited time availability of SRAS
- Easy SOC management
- Earn incentive under SRAS
  - SRAS provides an additional revenue stream (~ extra 3% fixed cost recovery)
- Better utilization of BESS

Energy Arbitrage (50%) & SRAS with SOC management



- 24x7 availability of SRAS
- Saturation of SOC can lead to sudden withdrawl, i.e., zero output from BESS
  - ➢ SOC has to be managed actively by the BESS Developer
  - ➢ Use different strategies for SOC management

Recommended for colocated BESS. Stakeholder awareness needed.

Operation Strategies & Value Stacking – Sample Day

			Operation strategy on a sample day			
S.no.	Parameter	Indicative Formula	I - Only SRAS	II - Only Energy Arbitrage	III - 50% EA + 50% SRAS - 24hr	IV - 100% EA + 100%SRAS - 4hr
1	SRAS Discharging MWh	(a)	3114	0	3238	372
2	SRAS Charging MWh	(b)	5140	0	-5118	-732
3	SRAS Mileage (Net) MWh	(c') =|a|+|b|	8254	0	8356	1104
4	Cycles utilized by SRAS	(d) = (c')/(2500x2x2)	0.82	0	0.84	0.11
5	SRAS Total MWh	(e') = (a)+(b)	-2026	0	-1880	-360
6	Total BESS Discharging MWh	(f)	3114	4000	4428	3268
7	Total BESS Charging MWh	(g)	5140	-4706	-6621	-4341
8	Total BESS Mileage (Net) MWh	(h) = |f|+|g|	8254	8706	11049	7609
9	Total cycles utilized by BESS	(i) = (h)/(2500x2x2)	0.82	0.87	1.1049	0.76
10	Performance based Incentive under SRAS @ 50 paise/kWh (in Rs. Lakhs)	(j) = (c')*0.5*1000/10^5	41	0	42	6
11	Simulated Earning from Energy Arbitrage through RTM (in Rs. Lakhs)	(k) = ((f)-(a))xRTMUMCP1 - ((g)-(b))xRTMUMCP2	0	348	216	348
12	Total Simulated Earning from Energy Arbitrage & SRAS (in Rs. Lakhs)	(L) = (k)+(j)	41	**348**	**258**	**354**

Recent fixed cost: 2.4 Lakh/MW/month @ 2500 MW => 2.4*2500 Lakhs/30 = **200 Lakhs/day**

Policy and Regulatory Requirements

- Draft construction standards for REGS and BESS notified by CEA in October 2025.
  - ➢Stakeholder comments and suggestions being examined.

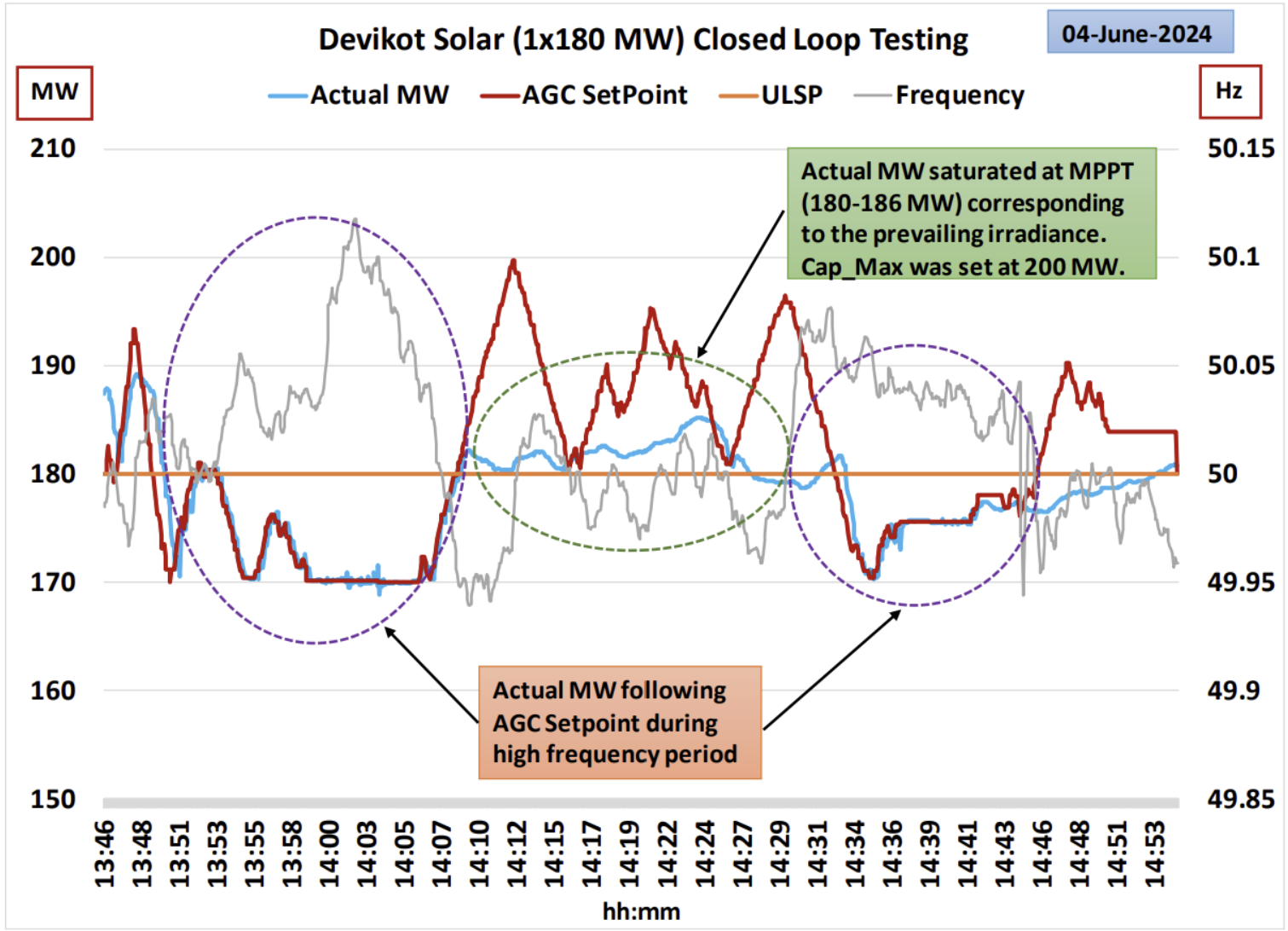
https://cea.nic.in/wp-content/uploads/notification/2025/10/Draft_Central_Electricity_Authority_Technical_Standards_for_Construction_of_Electrical_Plants_and_Electric_Lines_2nd_Amendment_Regulations_2025_Invitation_of_Public_Comments..pdf

- BESS specific requirements in grid connectivity standards under deliberation.
- Consultation paper by GRID-INDIA covering the pilot project, technical and commercial aspects of BESS operations
  - ➢Present incentives for the services provided by BESS under Ancillary Services needs review for value stacking
    - ○ Premium for BESS capabilities for higher ramp rates, multiple start/stop cycles, faster response and controllability

https://webcdn.grid-india.in/files/grdw/2026/01/Consultation%20Paper%20on%20AGC%20of%20RE_BESS_PSP_31122025_215.pdf

AGC Pilot project at Devikot Solar (180 MW)

- With high RE penetration, frequency control during high solar periods is a challenge
- Flexibility exhausted from thermal power plants
- Down regulation from Solar plants may be needed
  - Assist zone of operation triggered beyond a high value of ACE
- Efficient management mechanism based on grid requirements
- It is proposed to enable AGC/SRAS for REGS of 100 MW and above.

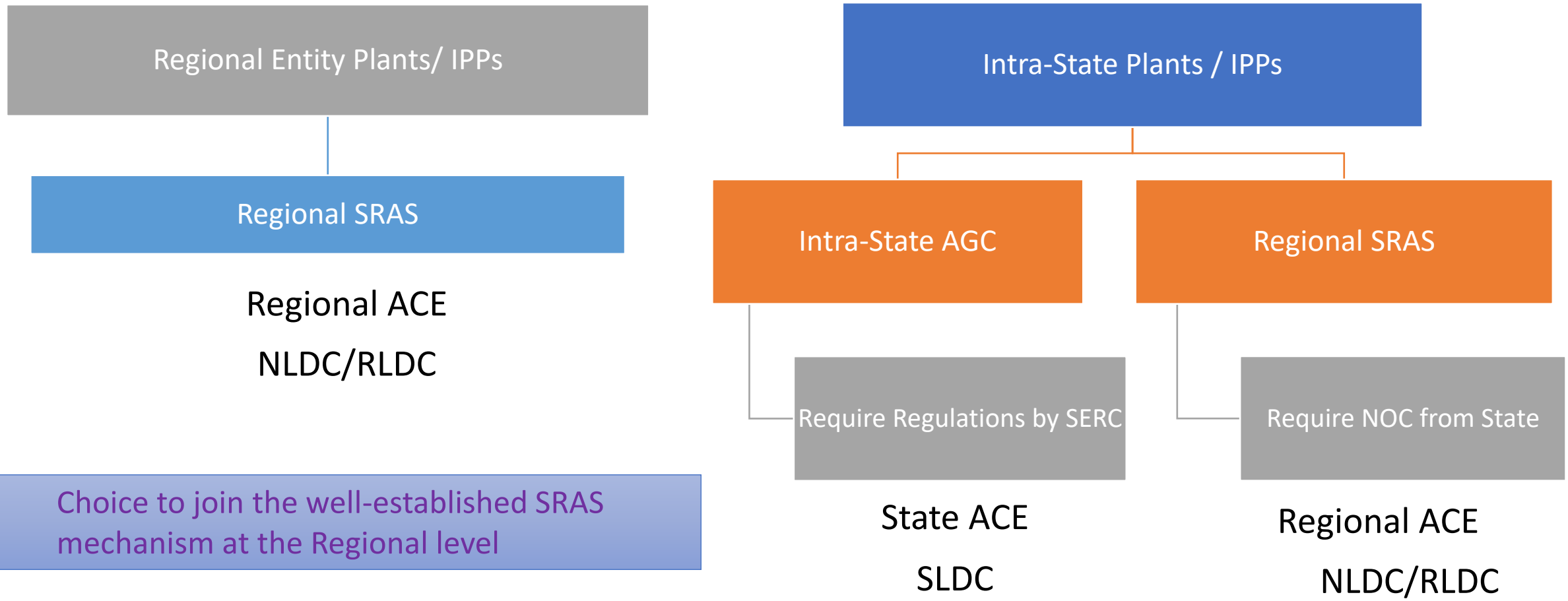


Intra-state plants under SRAS

SNo	Plant	IC	Units	State	Remarks
1	BRPL Kilokari	20	20	Delhi	BESS Pilot
2	Khurja	1320	2x660	Uttar Pradesh	First intra-state
3	PPGCL Bara	1980	1x660	Uttar Pradesh	IPP
4	Mejia	1000	2x500	DVC	
5	Durgapur	1000	2x500	DVC	
6	Koderma	1000	2x500	DVC	
7	Barauni	500	2x250	Bihar	100%
8	Patratu	800	1x800	Jharkhand	
9	Wanakbori-8	800	1x800	Gujarat	
10	Bokaro	500	1x500	DVC	
11	Ghatampur	1320	2x660	Uttar Pradesh	
12	Meja	1320	2x660	Uttar Pradesh	
13	Anpara Energy	1200	2x600	Uttarpradesh	
14	Dhariwal	600	2x300	Maharashtra	
15	CLP Jhajjar	1320	2x660	Haryana	

- 8200 MW intra-state generation under SRAS.
- Another ~7000 MW under pipeline.
- Expanding the ambit of AGC is a necessity to tackle the uncertainty introduced by Variable Renewable Energy.
- All the >100 MW REGS proposed to be integrated under AGC in the future.

Options for Participation under AGC

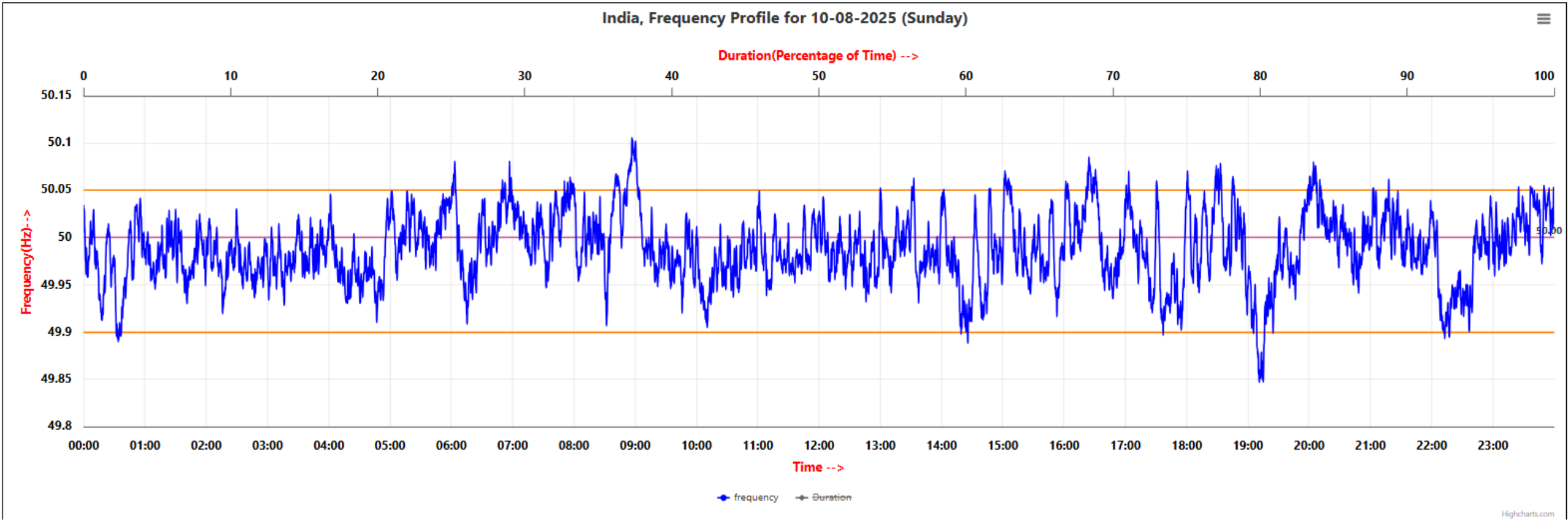


If basic infrastructure is created, switch/joint operation by LDCs can be explored !

Way Forward

- SRAS and TRAS as value stacking streams
- Recognize the premium capabilities of BESS through regulations
- BESS can deliver all the Essential Reliability Services
- Expand automation and control through wider AGC coverage including BESS & REGS
- Advantage for Pilots and First-movers !

Best frequency day : 10th August 2025 - Sunday



Frequency within the IEGC band for 94.5 % of time

We need to work to make it happen everyday

Thank You

ancillary@grid-india.in