MINUTES OF 95th MEETING OF FORUM OF REGULATORS (FOR)

Venue: Darjeeling, Kalimpong, West Bengal

Date /Day: 4th -5th April, 2025;

Timings: 10 A.M

List of Participants: Appendix-I

1. At the outset, Chairperson - WBERC, warmly welcomed the members of the Forum attending the 95th FOR Meeting in Darjeeling and provided a brief overview of the power sector in West Bengal, highlighting its substantial and sustainable growth. He also thanked FOR for providing the WBERC an opportunity to host the meeting in West Bengal.

2. Chairperson, FOR/CERC, in his opening address dwelt on the upcoming peak demand in summer months and highlighted the critical need for proactive measures from the States to accommodate the anticipated peak demand through sufficient Resource Adequacy Measures. Speaking on the agenda items for the meeting, Chairperson, FOR /CERC drew the attention of the members towards the budget position and noted that the reserves have dwindled to nearly Rs. One crore for FY-24. This would necessitate an increase in the membership fees from the current level of Rs. 10 Lacs to approximately Rs. 15 Lacs per annum, unless cost-cutting measures are taken. He also touched upon the other important agenda items, including on-demand response, references received from the Ministry of Power and the SERCs, and urged the members to discuss each of the issues in detail and evolve a consensus. He also recognized the contributions of outgoing members - Mr. Mohd Rafi Andrabi, Chairperson, JERC for UTs of J&K and Ladakh; Mr. Gajendra Mohapatra, Officiating Chairperson, Odisha ERC; and Mr. Rengthanvela Thanga, Chairperson, Manipur ERC, and wished them all the best for their future endeavors. He also warmly welcomed Mr. R. Manivannan, Chairperson, Tamil Nadu ERC; Dr. Rajesh Sharma, Chairperson, Rajasthan ERC;

Justice (Mr.) Umesh Kumar, Chairperson, Delhi ERC, and Mr. Ravinder Singh Dhillon, Member-Finance, CERC, who were attending their first FOR Meeting.

3. Thereafter, the agenda items were taken up for discussion.

AGENDA ITEM 1: DEMAND RESPONSE - BEST PRACTICES

4. Chief (RA), CERC, in his presentation **(Annexure-I),** gave a brief overview of the role of Demand Response (DR) in addressing India's growing peak demand crisis. It was highlighted that in recent years, peak electricity demand has risen sharply, with frequent instances of acute shortages, highlighting the urgent need for effective measures to manage high-demand scenarios. While the Ministry of Power (MoP) has been undertaking several supply-side interventions, past experience has shown that uncertainty in peak demand projections, as observed over the last two years, has led to inefficient resource planning. This has resulted in financial strain on Discoms, primarily due to the procurement of gas-based power at high prices. For the current year as well, Grid India has projected a peak demand of 277 GW and the likely shortfall of 15–20 GW, particularly during non-solar hours. In anticipation of this gap, 1,750 MW of gas-based capacity has been procured at the central level, committing an estimated cost of ₹2,208 crore, which may ultimately burden the States.

5. He added that CERC has also taken several steps to address this demand surge. Most of the existing interventions are on the supply side. However, focused demand-side measures offer a more cost-effective solution. The SERCs also have a crucial role to play in supporting the national-level efforts. Although SERCs have implemented several demand-side management (DSM) initiatives, a structured and targeted DR mechanism which can directly influence and reduce peak demand is currently lacking. Global examples also show that firm DR support could be guaranteed through various mechanisms.

6. In this context, representatives of RMI delivered a presentation **(Annexure-II)** on the global best practices of DR, and thereby focusing on scaling demand flexibility in India. The presentation highlighted the case studies based on demand response programs implemented in Hong Kong, California, New York, the United Kingdom, and Australia. Based on these case studies, recommendations were provided for adapting and scaling demand flexibility to meet the needs of India's power sector. The key recommendations included seamless enrolment and participation of DF technologies, aggregators, and consumers; incentives in order to ensure consumer participation; automating DF processes like enrolments, payments, M&V, and dispatch; and incorporating DERs into the distribution planning.

7. The Forum appreciated and noted the presentation.

AGENDA ITEM 2: CONFIRMATION OF THE MINUTES OF THE 94TH FOR MEETING HELD ON 10TH JANUARY 2025

8. The Forum was apprised of the action taken on the minutes of the 94th meeting of the Forum of Regulators held on 10th January 2025 in the Assam Electricity Regulatory Commission, Guwahati.

9. One of the action points was regarding the MoU between IIT-Roorkee and the Forum of Regulators, wherein the Forum decided that the draft MOU would be circulated to all the ERCs for their inputs and thereafter, the MOU will be signed after taking the approval of the Chairperson, FOR/CERC. It was also decided that a one-time payment of Rs 5 Cr would be made to IIT Roorkee by way of contributions from the members of the Forum. The proportionate contribution of each member would be decided with the approval of the Chairperson, FOR/CERC.

10. It was informed that the comments received from the SERCs have been examined, and the suggestions as relevant have been incorporated in the MOU. On the issue of the

contribution of one-time Corpus to the Centre at IIT-Roorkee, it was apprised that the States have been grouped under five categories based on their peak demand (as in 2023-24).

11. After deliberation, the Forum once again endorsed the FOR-IIT Roorkee MOU, as also the categorization and contribution from the SERCs, JERCs, and CERC as follows:

    i) CERC and States having peak demand > 25 GW: - Rs 30 lakh each
    ii) States having peak demand between 5GW- 25 GW: - Rs 20 lakh each.
    iii) States having peak demand < 5 GW: - Rs 15 lakh each.
    iv) North Eastern States: Rs 2 Lakh each.

12. Other agenda items with respect to minutes of the 94th FOR meeting were also confirmed after discussion.

AGENDA ITEM NO.3: ACCOUNTS -RELATED ITEMS - BUDGET FOR FY2025-26.

13. Joint Chief (RA), CERC apprised the Forum about the salient features of the FOR Budget for the FY 2025-26 with a proposal for increase in the annual membership fee from Rs.10 lakh to ₹15 lakh per Member in view of deficit budget and owing to increase in the activities of the FOR.

14. Further, the Members discussed the MoP assistance allotted to FOR for the FY2025-26. It was apprised that ₹1.30 crore has been allotted as BE to FOR for the FY 2025-26. In this regard, the Members advised that the amount should be optimally utilized towards the planned activities, and more funds may be sought from MOP if required. With respect to the policy of the GRPP programs for Chairpersons of ERCs, the Forum decided that, for the current FY, the Committee for coordination of logistics for the visit will comprise the Chairpersons of Assam ERC, Punjab ERC & Maharashtra ERC, and

the FOR Secretariat will explore engaging a knowledge partner to tie up the meetings and site visits. It was also decided that going forward, all such programs will be for a maximum of 4 nights ex-India (excluding journey time) and in one city in one country, with a ceiling cost of airfare of ₹ 5 lakh or actual airfare, whichever is less.

15. After discussion, the Forum approved the budget for the FY 2025-26 and the increase in the annual membership fee to ₹15 lakh per Member.

AGENDA ITEM 4: REFERENCE FROM SERCs:

a. Flexibility in grid operations by leveraging battery energy storage systems (BESS): addressing gaps to ensure flexible scheduling and mandating ancillary services for BESS"- reference from KSERC

16. Member KSERC, in the said reference emphasized that the Battery Energy Storage Systems (BESS) can play a critical role in enhancing grid flexibility, particularly in balancing intermittent renewable energy (RE) sources such as solar and wind, making it ideal for short-term reliability services like Primary Frequency Response (PFR) and Regulation, while the appropriately sized BESS can support longer-duration load-following and ramping requirements. It was argued that the current policy and regulatory framework, including the CERC's Ancillary Services Regulations (2022) and the CEA's Technical Standards, recognize BESS as a potential provider of ancillary services. Further, the guidelines for procurement and Utilization of BESS issued by the Ministry of Power (MoP) issued on 10th March, 2022, have made provisions for flexible operation of the BESS including for providing ancillary services, but the tender documents issued by the Renewable Energy Intermediary Agency (REIA)/ Intermediary Procurer for procurement of BESS/ ESS on behalf of the Discoms, emphasize only on 'firm' supply/energy shifting rather than on the flexible operation of BESS facility. Member KSERC emphasized the need for mentioning specific provisions in the tender document requiring the ESS to provide for ancillary services so

that the bidders could factor in the technical requirements for providing such services and the related costs in their bids.

17. The Forum, after deliberation, noted the need for suitable and specific provision in the bidding guidelines for the ESS to provide ancillary services. Accordingly, the Forum decided that the Ministry of Power be requested to incorporate provisions for flexible operation and ancillary services in all future bids involving ESS. It was also decided that the CEA be requested to incorporate adequate provisions in the Regulations on Technical Standards for Connectivity to the Grid.

b. Whether an open access consumer, who has exercised choice of supplier, can simultaneously receive electricity from the incumbent distribution licensee?

18. Chairperson, KERC while referring to clauses (2), (3), and (4) of Section 42 of the Electricity Act, 2003 raised the issue whether an open access consumer, who has chosen an alternative supplier, can simultaneously receive electricity from the incumbent distribution licensee, as per the said provisions in the Act.

19. Chairperson, KERC stated that an open access consumer may not receive simultaneous supply from both the incumbent licensee and alternative sources. In response, Chief (RA), CERC stated that the above sections must be read with the definition of "Consumer" as provided under Section 2(15) of the Electricity Act, 2003, and Section 43 of the Act providing for universal service obligation. Definition of 'consumer', as stipulated in the Act, includes "*a person whose premises are for the time being connected for the purpose of receiving electricity*" which implies that the supply obligation of the incumbent distribution licensee shall remain in respect of the open access consumers.

20. In this context, the Forum discussed the recent Supreme Court judgment, dated April 1, 2025 in the case of Ramayana Ispat Pvt. Ltd. Vs State of Rajasthan wherein the Court

ruled in favour of the State of Rajasthan, affirming that the State Commission has the mandate to regulate intra-State component of the inter-State transaction.

21. After extensive deliberations, the Forum concluded that the provisions related to open access and universal service obligation may be further examined from a legal perspective.

c. Model Regulations for utilization of Electric Vehicles for V2G (Vehicle to Grid) services

22. Chairperson, KERC, in this reference highlighted that Vehicle-to-Grid (V2G) technology presents a promising opportunity in the green transition of the energy sector in the country by providing various grid services to enhance grid flexibility, manage peak demand, and optimize energy utilization. He further emphasized that with India's push for EV adoption and its net-zero emissions commitment, a structured regulatory approach would be necessary to formulate State-specific policies that facilitate the adoption of V2G technology. He suggested, the Forum may take the lead in developing Model Regulations for establishing the framework for the utilization of electric vehicles in V2G services, as a structured regulatory framework establishing the roles and the incentive systems would provide clarity to the stakeholders like the distribution licensees, charging infrastructure providers, and EV owners and other service providers, ensuring the seamless integration of the V2G services.

23. The Forum agreed with the suggestions and decided that the Model Regulations for utilization Electric Vehicles for Vehicle-to-Grid (V2G) Services may be developed by the FOR Working Group on RE covering the key aspects including but not limited to the Bidirectional Energy Flow & Net Metering, Tariff Mechanism & Incentives, Grid Infrastructure & Technical Standards, Regulatory Support for Aggregators, Pilot Projects & Data Sharing, Consumer Protection, Awareness & dispute resolution and other aspects.

d. CEA Procedure on Verification of Group Captive Status

24. Chairperson, KERC, referred to CEA's final procedure for verification of Group Captive Status for the generating plants where the captive generating plant and its users are located in more than one State. It was noted that the final document outlines a comprehensive and detailed procedure.

25. Thereafter, the Members discussed the issue of verification of captive status for inter-State projects. During the discussion, it was informed that the FOR Working Group (WG) on "Harmonization of Rules and Regulations" in its 4th meeting had agreed that for the inter-State projects, the CERC should be the verifying authority in view of its jurisdiction in regulating the inter-state transactions. The WG had recommended that the Forum forward this recommendation to the Ministry of Power.

26. Following the discussion, the Forum agreed that while the decision on verifying the captive status of the intra-State projects rests with the respective State Regulators, the CERC should be assigned as the verifying agency for inter-State projects and suggested that the recommendation be forwarded to the MoP.

AGENDA ITEM 5: ACTION POINTS EMERGED DURING THE MEETING HELD UNDER THE CHAIRMANSHIP OF MINISTER OF POWER ON 'CER-IIT KANPUR POLICY RESEARCH TO IDENTIFY INTERVENTIONS TO REDUCE DISPUTES IN POWER SECTOR' ON 17TH DECEMBER 2024 - REFERENCE FROM MOP.

27. The Forum was apprised of the reference from the Ministry of Power with respect to identifying interventions to reduce disputes in Power sector; review of Model Regulations of FOR; creation of a unified IT webtool to track cases in ERCs and formulation of a mechanism for determining the treatment of power drawl during synchronization of wind power plants.

28. The Forum deliberated and decided as under;

a) Review of Model Regulations and updating the same every three years to incorporate the necessary amendments based on judgements and rulings of the Supreme Court and the APTEL.

29. The list of FOR Model Regulations issued by the Forum over the years was discussed, wherein it was noted that FOR had already updated certain Model Regulations, which included the MYT Regulations, Captive Users Regulations, and Regulations on Distributed RE. After detailed deliberation, the Forum decided that the FOR Secretariat will review all the Model Regulations every three years and propose amendments based on the judgements and rulings of the Supreme Court and APTEL, as and where applicable. The respective Working Groups may deliberate on such amendments and make recommendations to the Forum.

b) Development and implementation of an integrated platform for all SERCs/JERC to update the case lifecycle from filing and docket noting to final hearings and orders.

30. The Forum was apprised of the E-Court SAUDAMINI portal of CERC, which captured all its legal proceedings, right from the filing of petitions to the issuance of Orders. CERC has also shared its source codes with the interested SERCs. Additionally, the Forum was apprised that under the Govt of India – Govt of UK PSR program, a Regulatory webtool was developed which not only captured the State level regulatory information but also provided reports on aspects such as timeliness of tariff determination process, ACS-ABR gap, RPO targets, cases to CGRF & ombudsman, deviation in ARR, creation of regulatory assets, deviation in ARR, O& M expenses etc. This is aimed at enabling the SERCs to have informed decisions based on the practices in other States.

31. Secretary, FOR/CERC remarked that it would be desirable to create an IT system for SERCs to deal with petitions from the filing stage to the issuance of orders with standardized data formats so that the requisite information could be captured by the SERCs from petitions filed without the requirement of an officer of SERC keying in the input in each individual case. IT system would help in automating various activities such as automated filing/serving of petition reply/rejoinders to petitioners/respondents, and close monitoring of petitions etc. Standardized data formats across all SERCs would help to get the requisite information for generating various MIS reports and analyses.

32. The Forum appreciated the proposal and decided that a Committee of Officers be constituted with Secretary, MERC as Chairman and one IT Officer each from TSERC, PSERC, CSERC, MPERC, UPERC as Members. Deputy Chief (MIS), CERC shall be the Member /Convener.

c) Formulation of a mechanism for determining the treatment of power drawl during synchronization of wind power plants.

33. After deliberation, the Forum decided that since the matter is technical in nature, the same will be taken up by the FOR Standing Technical Committee.

AGENDA ITEM NO. 6: MODEL REGULATION ON DISTRIBUTED ENERGY RESOURCES

34. Senior Advisor, RE, CERC presented the Draft FOR Model Regulations on Interactive Distributed Energy Sources (DERs) **(Annexure-III)** recommended by the FOR Working Group on RE, highlighting the provisions related to Virtual Net Metering (VNM), Group Net Metering (GNM), Peer-to-Peer Provisions based on the recommendations of the WG. Member, KSERC suggested the incorporation of the implication of CEA advisory regarding the mandatory requirement of storage capacity

with renewable energy sources. It was also suggested that the applicable charges for virtual net metering specified in the model regulations for the subsidized consumer category be reviewed.

35. After the deliberation, the Forum suggested that the FOR members may send their comments on the Model Regulations within 30 days. It was also suggested that the FOR Working Group on RE may resubmit the updated Model Regulations after incorporating the comments received from the members of the Forum.

VOTE OF THANKS

36. Secretary – FOR/CERC in his Vote of Thanks conveyed his heartfelt appreciation to the Chairperson, WBERC, and his team for the hospitality and arrangements made for the meeting. He also expressed sincere thanks to the Chair of the Forum for effectively leading the discussion in the meeting and building consensus. The presentations and discussions provided valuable insights that will assist the Forum in making informed decisions and taking appropriate actions. Additionally, the conversations surrounding the Distributed Energy Resources highlighted the potential to reduce the need for Transmission Infrastructure, thereby lowering costs and providing a beneficial approach to address the growing demand. He also acknowledged the efforts of the Secretariat and staff in ensuring the smooth conduct of the meeting.

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Appendix – I

LIST OF PARTICIPANTS OF 95TH MEETING OF FOR HELD ON 04TH – 5th APRIL, 2025

AT DARJEELING, KALIMPONG (WEST BENGAL)

S.No.	NAME	ERCs
01.	Shri Jishnu Barua Chairperson	CERC/FOR – in Chair.
02.	Shri Kumar Sanjay Krishna Chairperson	AERC
03.	Shri Amir Subhani Chairperson	BERC
04.	Shri Hemant Verma Chairperson	CSERC
05.	Justice (Shri) Umesh Kumar Chairperson	DERC
06.	Shri Anil Mukim Chairperson	GERC
07.	Shri Nand Lal Sharma Chairperson	HERC
08.	Shri D.K. Sharma Chairperson	HPERC
09.	Shri Alok Tandon Chairperson	JERC for State of Goa & UTs
10.	Shri P. Ravi Kumar Chairperson	KERC
11.	Shri Sanjay Kumar Chairperson	MERC
12.	Shri Rengthanvela Thanga Chairperson	MnERC
13.	Shri Chandan Kumar Mondal Chairperson	MSERC
14.	Shri Benjamin L. Tlumtea Chairperson	MzERC
15.	Shri Khose Sale Chairperson	NERC
16.	Shri Viswajeet Khanna Chairperson	PSERC
17.	Dr. Rajesh Sharma Chairperson	RERC

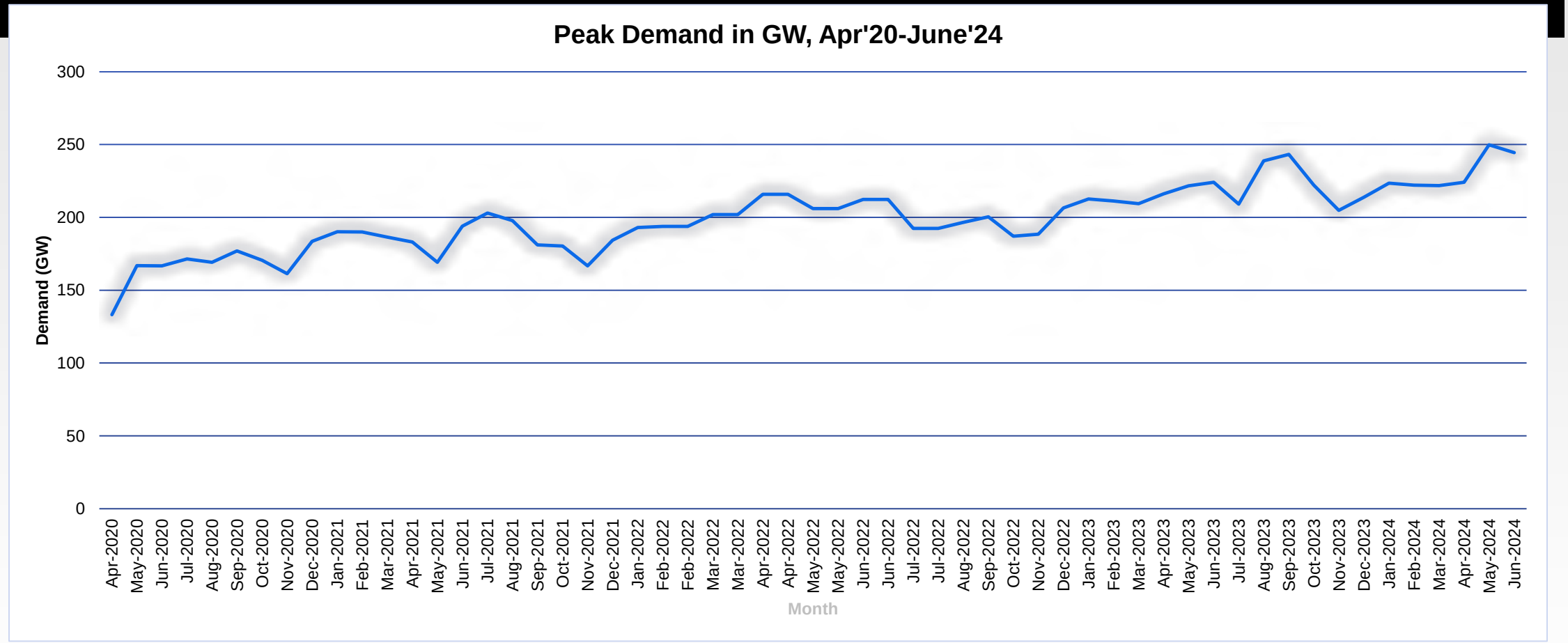
18.	Shri K.B. Kunwar Chairperson	SSERC
19.	Shri R. Manivannan Chairperson	TNERC
20.	Dr. (Justice) Devaraju Nagarjun Chairperson	TSERC
21.	Shri Arvind Kumar Chairperson	UPERC
22.	Shri Madan Lal Prasad Chairperson	UERC
23.	Dr. M.V. Rao Chairperson	WBERC
24.	Shri Mahendra Prasad Member	JSERC
25.	Shri B. Pradeep Member	KSERC
26.	Shri Prashant Kumar Chaturvedi Member	MPERC
27.	Shri Harpreet Singh Pruthi Secretary	FOR/CERC
28.	Dr. Sushanta Kumar Chatterjee Chief (Regulatory Affairs)	CERC
SPECIAL INVITEES		
29.	Shri Ramesh Babu V Member (Technical)	CERC
30.	Shri Harish Dudani Member (Law)	CERC
31.	Shri Ravinder Singh Dhillon Member (Fin.)	CERC
FOR SECRETARIAT		
32.	Ms. Rashmi Somasekharan Nair Joint Chief (RA)	CERC
33.	Shri Ravindra Kadam Sr. Advisor (RE)	CERC
34.	Ms. Sukanya Mandal Asst. Chief (RA)	CERC [Virtual]

35.	Shri Debasish Roy Asst. Chief (RA)	CERC [Virtual]
36.	Shri Pankaj Rana Asst. Secy.	FOR [Virtual]
37.	Shri Nilesh Diwan Accounts Officer	FOR [Virtual]
38.	Ms. Jijnasa Behra RO	FOR [Virtual]
39.	Ms. Medhavi Sarraf RA	CERC [Virtual]
OTHERS / GUESTS		
40.	Shri Jagabanta Ningthougam Principal	Rocky Mountain Institute, USA [Virtual]
41.	Shri Arjun Gupta Manager	Rocky Mountain Institute, USA [Virtual]
42.	Ms. Ananya	Rocky Mountain Institute, USA [Virtual]

Annexure-I

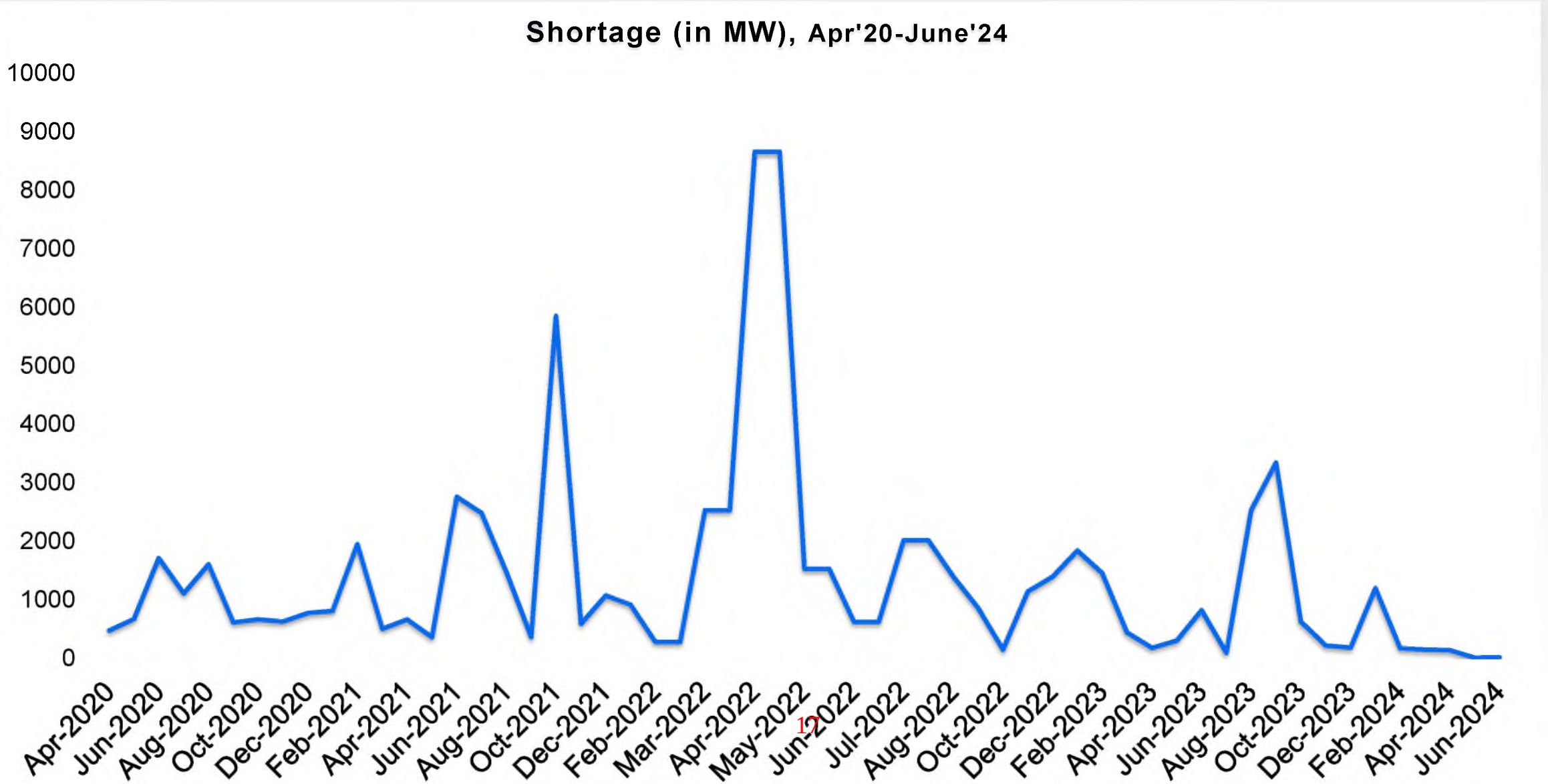
Role of DEMAND RESPONSE in addressing peak demand crisis in India

Growth of peak demand over the last 5 years



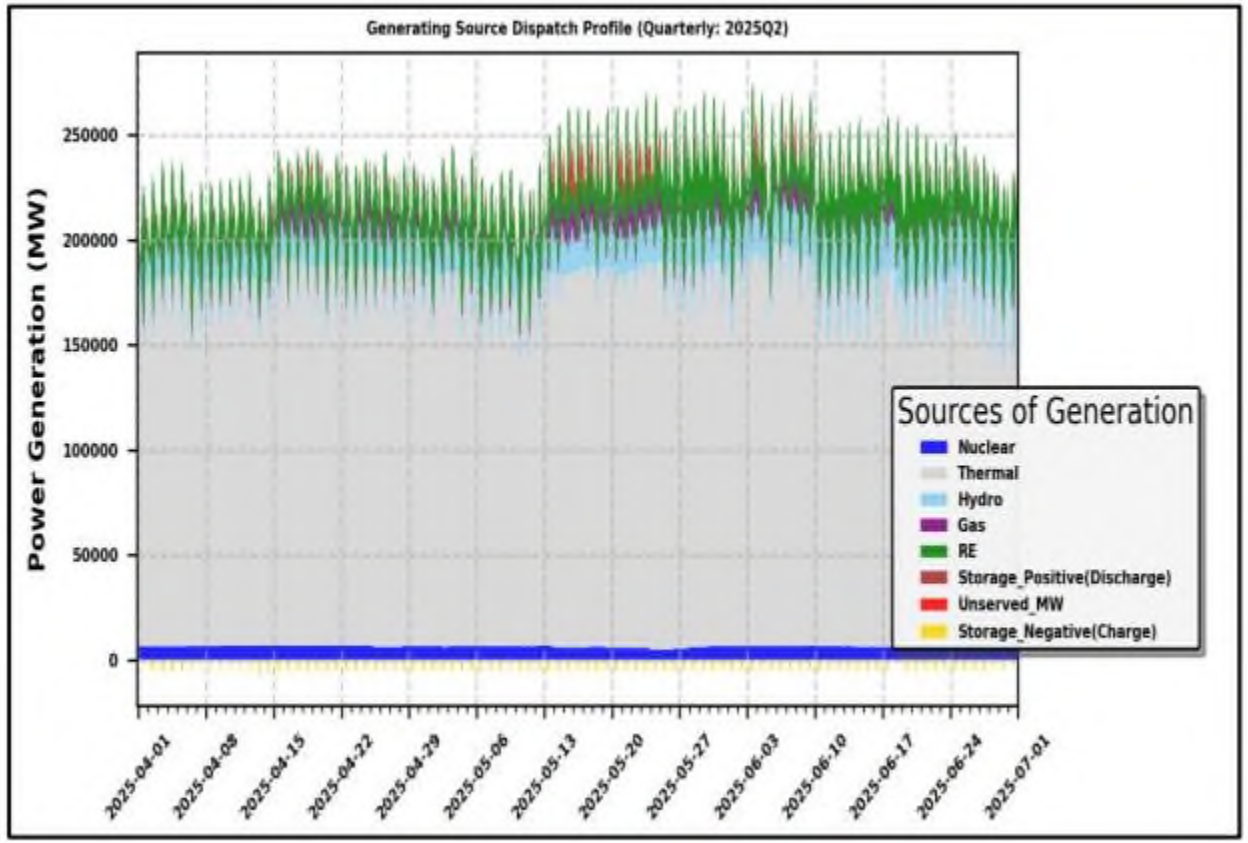
- The peak demand has surged from approximately 190 GW in FY 2020-21 to about 250 GW in FY 2024-25.
- The All India Peak Demand for 2024-25 (till February) was 249.856 GW, registered on May 30, 2024.

Shortage: (Peak demand-Peak met)

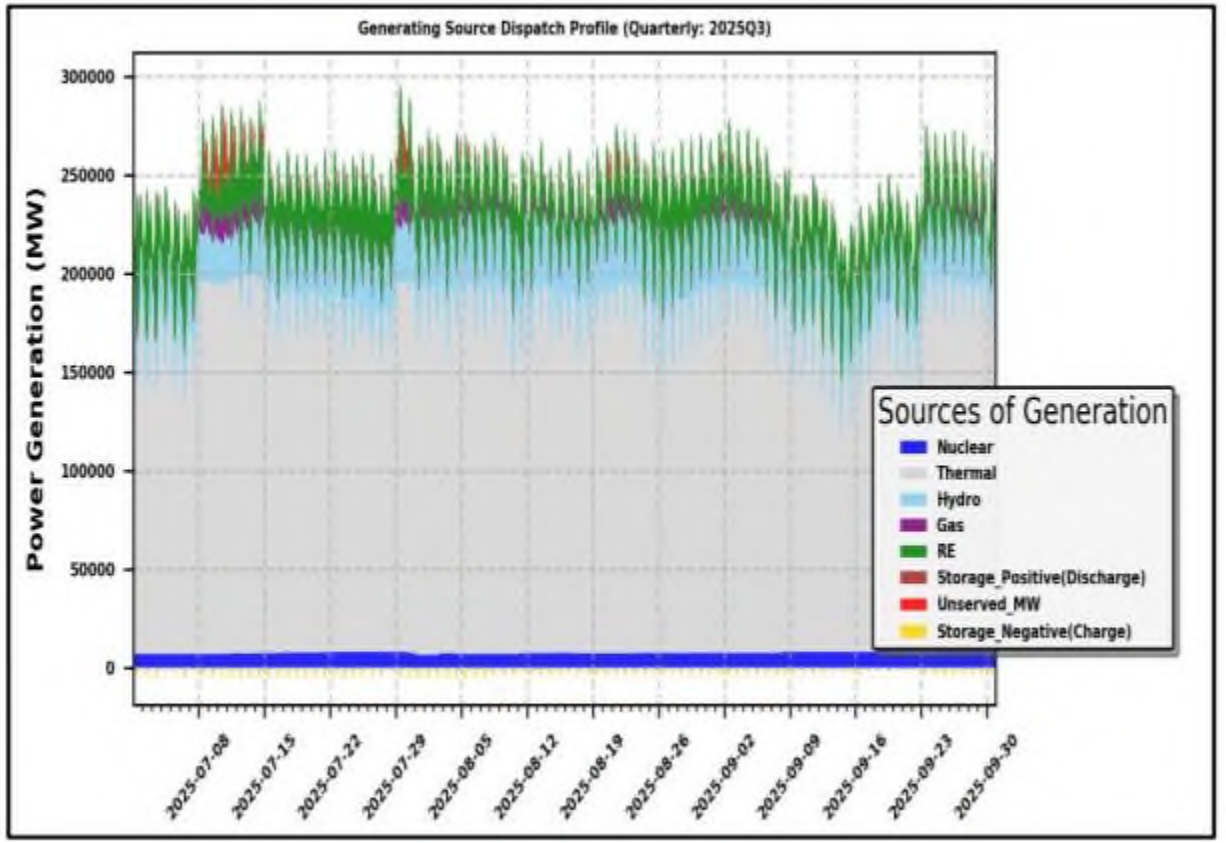


Projections by Grid India for 2025-26

Source Wise Generation Despatch for 2025-26



Apr 2025 – June 2025

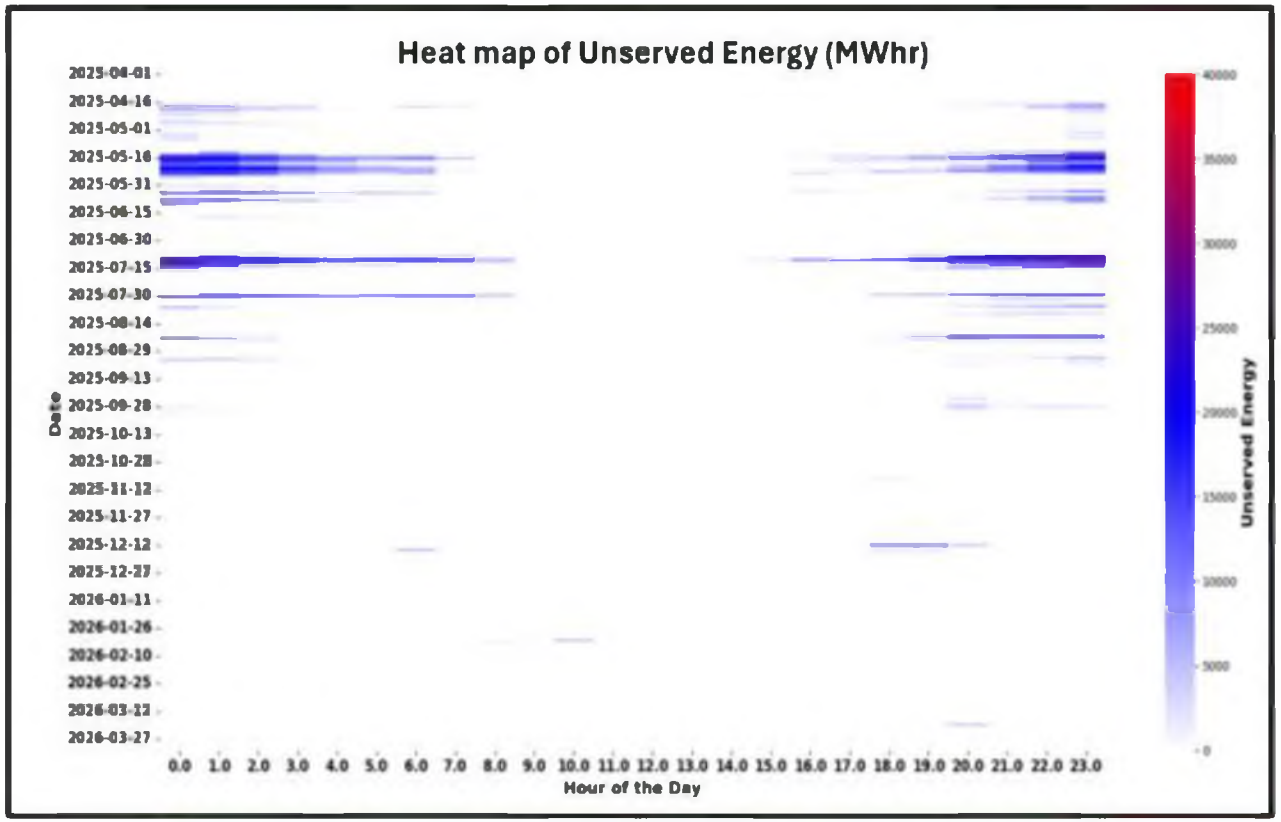


July 2025 – September 2025

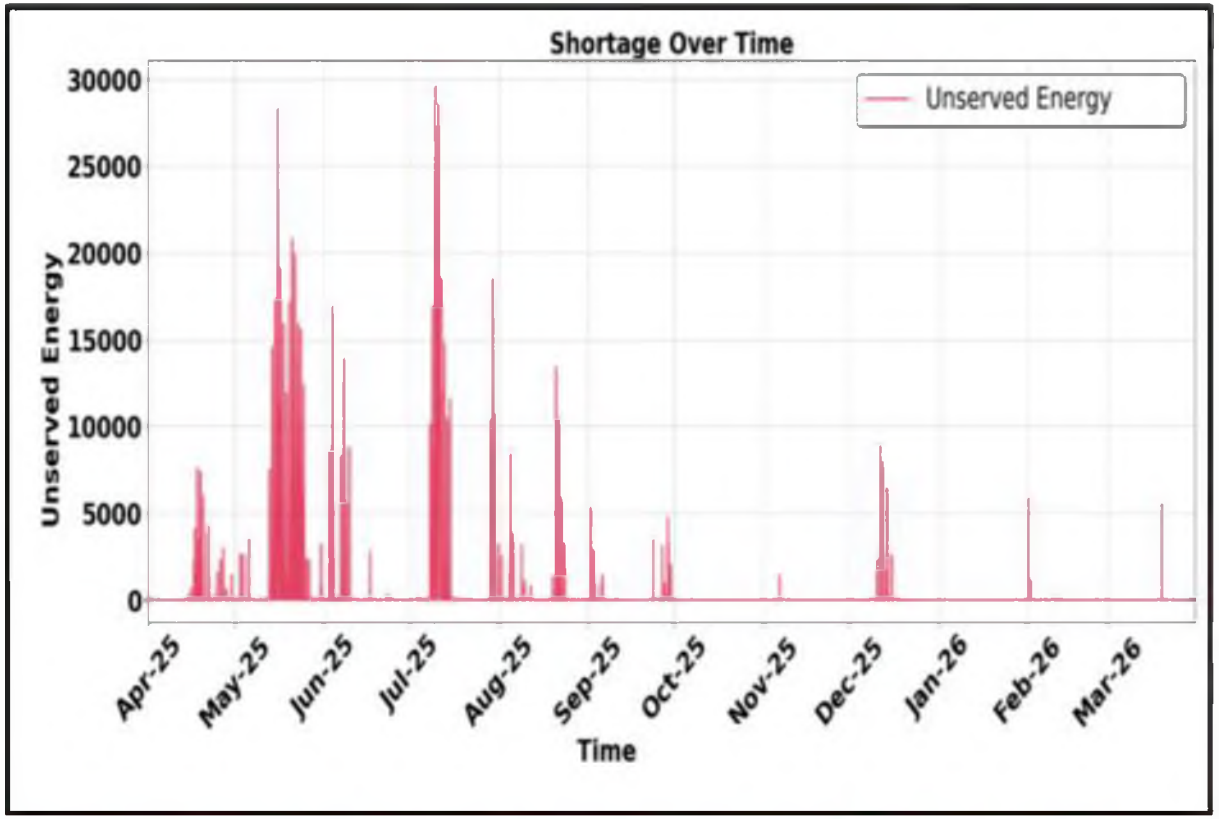
- NLDC, in its recent report, projected a 15-20 GW gap between electricity supply and demand, particularly during non-solar hours.
- The report estimated a 19% probability of power shortages in May 2025 of up to 31%, whereas for June, the probability ranges from 4.7% to 20.1%.

Projections by Grid India

Heatmap of Unserved Energy in each hour of the year



Line Plot of shortage in each hour of the year



LOLP(%)	5.8%
NENS(%)	0.17%

Shortages are more likely during non-solar hours in April, May & July 2025

19

Uncertainty in Projection of Peak Demand 2023-24

2023-24

Month	Energy Requirement (MU)					Peak Demand (MW)				
	Projected	Actual	Prj. Vs Act.	Met	Deficit/ Surplus	Projected	Actual	Prj. Vs Act.	Met	Deficit/ Surplus
Apr-23	1,42,097	1,30,414	-8.22%	1,30,082	-0.25%	2,29,018	2,16,142	-5.62%	2,15,972	-0.08%
May-23	1,41,464	1,36,846	-3.26%	1,36,504	-0.25%	2,18,609	2,21,718	1.42%	2,21,423	-0.133%
Jun-23	1,39,860	1,40,520	0.47%	1,40,276	-0.17%	2,24,173	2,24,106	-0.03%	2,23,292	-0.363%
Jul-23	1,33,967	1,40,618	4.96%	1,40,419	-0.14%	2,05,846	2,09,039	1.55%	2,08,952	-0.04%
Aug-23	1,37,992	1,52,176	10.28%	1,51,324	-0.56%	2,12,057	2,38,824	12.62%	2,36,295	-1.06%
Sep-23	1,33,159	1,41,827	6.51%	1,41,299	-0.37%	2,17,326	2,43,271	11.94%	2,39,931	-1.37%
Oct-23	1,21,305	1,39,832	15.27%	1,39,441	-0.28%	2,14,382	2,22,160	3.63%	2,21,539	-0.28%
Nov-23	1,17,049	1,20,653	3.08%	1,20,562	-0.08%	2,05,128	2,04,861	-0.13%	2,04,605	-0.12%
Dec-23	1,27,735	1,23,264	-3.50%	1,23,131	-0.11%	2,17,694	2,13,793	-1.79%	2,13,620	-0.08%
Jan-24	1,30,739	1,33,696	2.26%	1,33,188	-0.38%	2,27,236	2,22,737	-1.98%	2,22,327	-0.18%
Feb-24	1,22,093	1,28,083	4.91%	1,27,828	-0.20%	2,19,345	2,22,166	1.29%	2,22,003	-0.07%
Mar-24	1,42,413	139040	-2.37%	138951	-0.06%	2,28,403	221701	-2.93%	221684	-0.01%

- Higher demand was projected in April-June 2023, whereas actual peak demand was in August-September 2023, much higher than projected.

Uncertainty in Projection of Peak Demand 2024 25

Month	Energy Requirement (MU)					Peak Demand (MW)				
	Projected	Actual	Prj. Vs Act.	Met	Deficit/ Surplus	Projected	Actual	Prj. Vs Act.	Met	Deficit/ Surplus
Apr-24	1,47,641	1,44,403	-2.19%	1,44,280	-0.09%	2,37,611	2,24,181	-5.65%	2,24,052	-0.06%
May-24	1,51,960	1,55,346	2.23%	1,55,157	-0.12%	2,35,034	2,49,856	6.31%	2,49,854	-0.001%
Jun-24	1,51,153	1,52,650	0.99%	1,52,374	-0.18%	2,40,904	2,44,529	1.50%	2,44,520	-0.004%
Jul-24	1,48,911	1,50,030	0.75%	1,49,652	-0.25%	2,29,999	2,26,786	-1.40%	2,26,630	-0.07%
Aug-24	1,60,165	1,43,973	-10.11%	1,43,834	-0.10%	2,54,702	2,16,948	-14.82%	2,16,685	-0.12%
Sep-24	1,46,295	1,40,725	-3.81%	1,40,611	-0.08%	2,56,530	2,30,613	-10.10%	2,30,458	-0.07%
Oct-24	1,41,089	1,39,217	-1.33%	1,39,188	-0.02%	2,28,193	2,19,179	-3.95%	2,19,071	-0.05%
Nov-24	1,28,859	1,23,813	-3.92%	1,23,790	-0.02%	2,15,655	2,07,513	-3.78%	2,07,441	-0.03%
Dec-24	1,33,745	1,29,582	-3.11%	1,29,397	-0.14%	2,29,779	2,24,246	-2.41%	2,24,231	-0.01%
Jan-25	1,41,362	1,36,363	-3.54%	1,36,316	-0.03%	2,35,446	2,37,298	0.79%	2,37,284	-0.01%
Feb-25	1,33,438	1,31,384	-1.54%	1,31,348	-0.03%	2,32,005	2,38,140	2.64%	2,38,140	0.00%
Mar-25	1,49,744					2,40,137				

Source: CEA LGBR 2024-25 & Monthly PSP Reports

- Higher demand was projected in August and September 2024, around 254 GW, but actual peak demand was touched in May 2024.
- The actual peak in August was only 216 GW.

Buy to Sell ratio

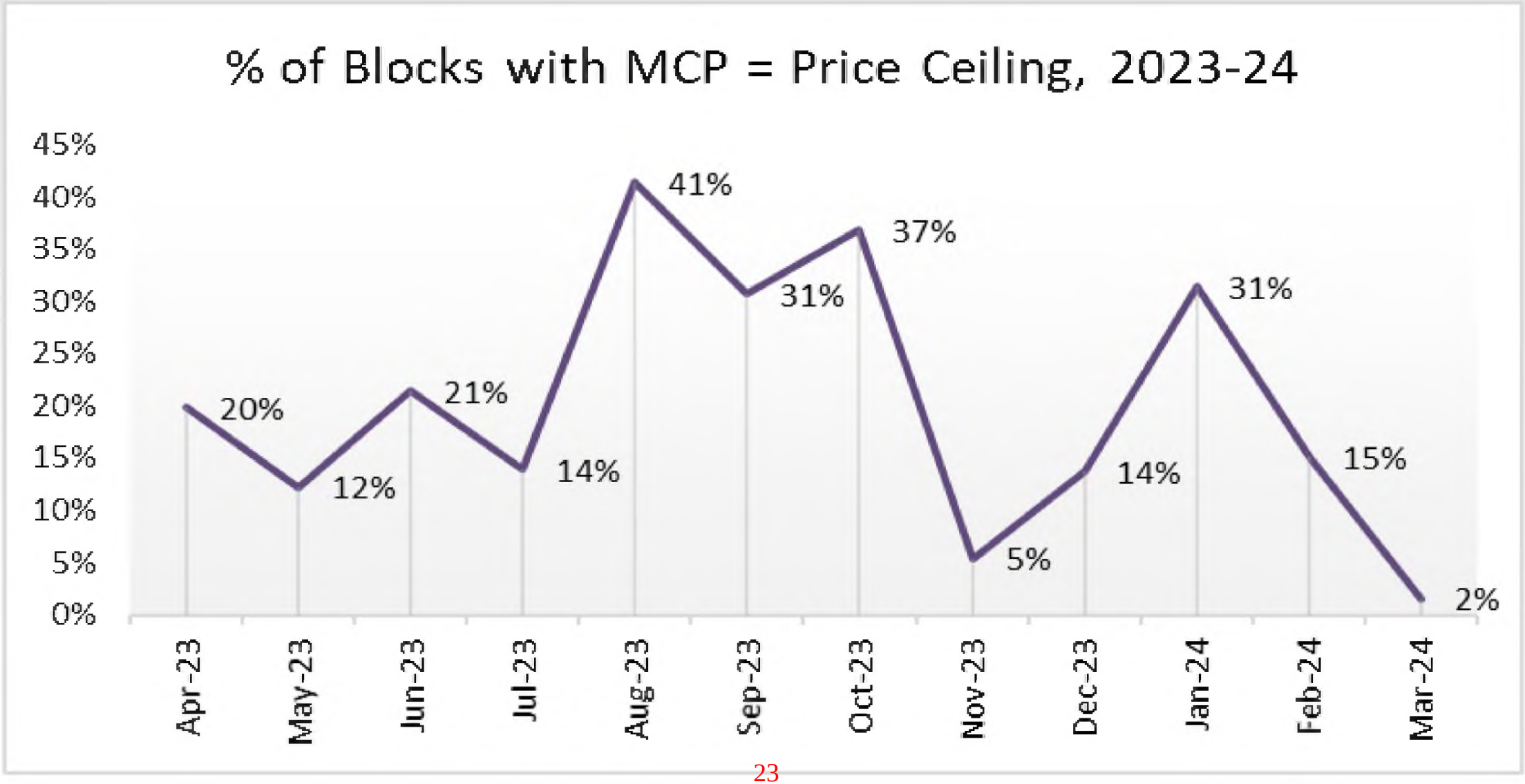
In DAM, from Jan 2024 to Feb 2025

(separately for Solar and Non-Solar hours)

1st Jan'24 - 28th Feb'25			
Hours	Buy to Sell Ratio		
	Average	Min	Max
Solar	0.88	0.09	5.86
6 am to 6 pm		27-10-2024	24-01-2024
		13:30 - 13:45	08:15 - 08:30
Non-Solar	1.47	0.20	17.56
6 pm to 6 am		13-09-2024	29-04-2024
		03:45 - 04:00	23:45 - 24:00

Not sufficient supply in non-solar hour in PXs[22] leading to high Buy to Sell Ratio

SHORTAGE SCENARIO IN POWER MARKETS



Gas Procurement for Crunch Period in FY 2025-26

- It has been expected that the country will face shortages during the high demand period 16th March 2025 till 15th October 2025.
  - Grid India on provisional basis has identified 111 crunch days.

- NVVN invited bids for 1800MW of Gas based power plants (GBP).
  - 1744 MW contracted with minimum offtake guarantee of 1452 Mus.
  - LOA issued on 03.03.2025

- GBP scheme envisaged gas procurement on Round the Clock (RTC) basis with assured fixed cost and variable charge.
  - Generation profile for these GBP would be 50% of contracted capacity during off peak hours and upto 100% of contracted capacity during peak hours (1800 Hrs – 24 Hrs)
  - Total Power purchase cost corresponding to Minimum Guaranteed Offtake and the tariff as shown in the table above is estimated as ₹ 2208 crores

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Impact on DSM Pool

- As per existing Regulatory provisions, all costs towards ancillary services/reserves are met out from the DSM Pool.

- DSM Pool Account net deficit of ~ ₹1000 crore as on March 2025, as informed by NLDC

- Based on NLDC's projections, this deficit is expected to worsen further, ultimately impacting the states.

Measures initiated by GOI

- All the GENCOs including IPPs and CGS have been advised to generate and maintain full availability on daily basis excluding the period of planned maintenance or forced outage.
- Hydro based generation is being scheduled in a manner so as to conserve water for meeting demand during peak period.
- Planned maintenance of generating units is being minimized during period of high demand.
- New power generation capacity is being monitored closely for timely addition.
- Steady supply of coal to all the thermal power plants is being ensured to prevent fuel shortages.

Measures taken by CERC

- CERC has facilitated power trading through regulatory framework whereby states with surplus generation can sell power to states which are in deficit through three (3) power exchanges viz. IEX, PXIL and HPX.
- CERC has created the framework of SCUC and Ancillary Services under which Gas-based power plants and other generators are being scheduled during high power demand period.
- The Commission vide order dated 7th October, 2024 in Suo-moto Petition No. 9/SM/2024 has appointed a single-member bench
  - to look into aspects relating to the preparedness of system operators and other stakeholders to meet the challenges arising on account of the sudden surge in power demand and
  - to make recommendations with regard to the remedial measures to be taken for the future.

Best Practices in States on Demand Side Measures

- Shifting of Agriculture load to day time in States
- Time of Use Tariff for C & I Consumers
- Segregation of agricultural and non-agricultural feeders to ensure efficient electricity use.
- Replaced inefficient agricultural pumps with energy-efficient ones to reduce power consumption.
- Mandating LED lighting and energy-efficient HVAC (Heating, Ventilation, and Air Conditioning) systems in government buildings.
- Deployed smart meters for real-time monitoring and consumer engagement.
- Implemented building energy audits and retrofitting for efficiency improvements.

Targeted DR: Missing

- While supply-side actions have been extensive, demand-side measures remain largely unexplored.
- Demand Response (DR) could bridge the supply gap by reducing peak load demand, mitigating the crisis without costly capacity additions.
- As compared to the measures taken on Supply side, DR is a more reliable and cheap option

All India peak vs State wise peak

All India Peak

249856 MW

May'24

States with peak demand in May & June	
States	**Peak Demand (MW)**
Uttar Pradesh	30618
Gujarat	25588
Tamil Nadu	20784
Punjab	16058
Andhra Pradesh	13712
Delhi	8656
Odisha	6905
Uttarakhand	2863
Jharkhand	2295
Goa	803
Puducherry	549
Chandigarh	449
Tripura	386

States with peak demand in rest of the months of the crunch period identified (i.e. Apr-Oct)	
States	**Peak Demand (MW)**
Haryana	14662
West Bengal	12645
Bihar	8078
Chhattisgarh	6367
Kerala	5904
UT of J&K and Ladakh	3236
Assam	2812
Dadra & Nagar Haveli and Daman & Diu	1390
Meghalaya	409
Nagaland	189

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Source- CEA

Demand Response : Recommendations

- **Energy Storage Integration**
  - Battery Storage: Stores excess energy when demand is low and discharges it during peak periods, reducing the need for peaking power plants.
  - Vehicle-to-Grid (V2G): Electric vehicles (EVs) can feed energy back to the grid when demand is high, acting as mobile storage units.

- **Virtual Power Plants (VPPs)**
  - Aggregation of Distributed Energy Resources (DERs): Combines small-scale resources like rooftop solar, wind power, battery storage, and flexible loads into a single controllable entity.
  - Participation in Energy Markets: VPPs can sell stored or flexible energy in wholesale and ancillary service markets, supporting grid resilience and reliability.

- **Automated Demand Response (ADR)- these methods include**
  - Smart Grid Integration: Uses IoT-enabled smart meters and sensors to automate load adjustments based on real-time grid conditions.
  - Building Energy Management Systems (BEMS): Automates lighting, HVAC, and industrial processes to optimize energy efficiency and demand response participation.
  - AI and Machine Learning: Predicts demand patterns and adjusts loads proactively, minimizing disruptions while maximizing grid stability.

- **Industrial and Commercial Demand Response**
  - Load Curtailment incentives: Large consumers commit to reducing their electricity consumption during peak times in exchange for financial incentives.
  - Process Optimization: Industries adjust production schedules and shift non-essential operations to off-peak periods, improving cost efficiency.

Recommendations….cont.

- A study conducted by ‘India Energy and Climate Center’ highlights that India will add an additional 130-150 million new room ACs, and without targeted interventions, this could alone contribute over 180 GW to India’s peak load by 2035.

- They have proposed an aggressive revision of Minimum Energy Performance Standards (MEPS)—raising the 1-star label to ISEER 5.0 by 2027 (equivalent to today’s 5-star level), ISEER 6.3 by 2030 (on-par with the most efficient ACs currently sold in India), and ISEER 7.4 by 2035 (on-par with the most efficient AC currently sold globally).

- The analysis shows that this strategy could reduce peak demand by over 60 GW by 2035, avoid ₹7.5 trillion in generation and grid investments, and deliver up to ₹2.2 trillion in net consumer savings.

- Drawing on empirical data from India and global markets, it is found that super-efficient ACs are already widely available and cost-effective.

Source: https://iecc.gspp.berkeley.edu/resources/reports/ac-efficency-standards-report2025/


THANK YOU!

Power Supply Position in India

Power Supply Position in India, 2008-09 to 2023-24

Year	Energy (BU)				Peak (GW)				
	Requirement	% Change (YoY)	Availability	% Change (YoY)	Requirement	% Change (YoY)	Availability	% Change (YoY)	Deficit (%)
2008-09	777.04		691.04		109.81		96.79		11.9%
2009-10	830.59	6.89	746.64	8.05	119.17	8.52	104.01	7.46	12.7%
2010-11	861.59	3.73	788.36	5.59	122.29	2.62	110.26	6.01	9.8%
2011-12	937.20	8.78	857.89	8.82	130.01	6.31	116.19	5.38	10.6%
2012-13	995.56	6.23	908.65	5.92	135.45	4.19	123.29	6.11	9.0%
2013-14	1002.26	0.67	959.83	5.63	135.92	0.34	129.82	5.29	4.5%
2014-15	1068.92	6.65	1030.79	7.39	148.17	9.01	141.16	8.74	4.7%
2015-16	1114.41	4.26	1090.85	5.83	153.37	3.51	148.46	5.17	3.2%
2016-17	1142.93	2.56	1135.33	4.08	159.54	4.03	156.93	5.71	1.6%
2017-18	1213.33	6.16	1204.70	6.11	164.07	2.84	160.75	2.43	2.0%
2018-19	1274.60	5.05	1267.53	5.22	177.02	7.90	175.53	9.19	0.8%
2019-20	1291.01	1.29	1284.44	1.33	183.80	3.83	182.53	3.99	0.7%
2020-21	1275.53	-1.20	1270.66	-1.07	190.20	3.48	189.40	3.76	0.4%
2021-22	1379.81	8.18	1374.02	8.13	203.01	6.74	200.54	5.88	1.2%
2022-23	1513.50	9.69	1505.91	9.60	215.89	6.34	207.23	3.34	4.0%
2023-24	1626.13	7.44	1622.02	7.71	243.27	12.68	239.93	15.78	1.4%

Source: CEA

- Gross Electricity Generation in India has increased at a CAGR of 5.4% from 2013-14 to 2023-24.

- Energy requirements (in BU) increased at a CAGR of 5% from 2013-14 to 2023-24, while energy availability (in BU) increased at a CAGR of 5.4% during this period.

- Peak requirement (in GW) increased at a CAGR of 6% from 2013-14 to 2023-24, whereas peak availability (in GW) increased at 6.4%.

Transactions in Power Exchanges

- As of March 2024, 87.5% of power was transacted through long-term contracts and about 12.5% through short-term contracts.
- Share of the short-term market during 2023-24 was 12.5%, out of which about 7.0% were power exchange transactions, followed by 2.4% of bilateral transactions through traders and about 1.7% direct bilateral transactions.
- Within the short-term segment in 2023-24, the share of power exchanges was 55.7%, followed by traders at 18.8% and bilateral trade between DISCOMs at 13.3%.
- In 2024-25 (Apr-Nov 2024), the share of power exchanges was 57.30%, followed by traders at 14.80% and bilateral trade between DISCOMs at 14.40%.

Year	Power Exchange		Through Traders		Direct Bilateral		DSM Volume		Total (Short-Term)	
	Volume (BU)	Share (%)	Volume (BU)	Share (%)	Volume (BU)	Share (%)	Volume (BU)	Share (%)	Volume (BU)	Share (%)
2023-2024	121.49	55.70%	41.02	18.80%	28.92	13.30%	26.78	12.30%	**218.21**	**100.00%**
2024-2025 (upto Nov '24)	92.7	57.30%	24	14.80%	23.26	14.40%	21.88	13.50%	**161.84**	**100.00%**

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Imported coal prices

- Prices in the imported coal market have significantly come down from their peak in 2022.
- The benchmark Indonesian coal price (ICI-3) has come down from its high of USD 170/ tonne on 10 March 2022 to USD 69.58/ tonne on 14 March 2025.
- Prices for imported coal in the coming months are expected to remain subdued.

Gas Procurement for Crunch Period in FY 2025-26

Table-2: Tariff of the GBP Scheme -2025

Gas Based plants	Capacity (MW)	Applicable Tariff (Rs/Kwh)					Minimum Guaranteed Offtake (Mus)
		Fixed Charges (FC)	Taxes & Other Component (T&OC)	Total of FC & T&OC)	VCGA*	Total Tariff	
1	2	3	4	5 = 3+4	6	7 = 5+6	8
SUGEN	150	1.83	2.40	4.23	10.91	15.14	125
DGEN	1150	1.88	2.35	4.23	10.91	15.14	957
GAMA	92	2.00	2.23	4.23	10.91	15.14	77
LANCO	352	2.00	2.55	4.55	10.91	15.46	293
Total	1744						1452

***VCGA (Variable Charges linked to Gas Actual) at WIM: 14.748 USD/mmbtu & USD@ 87.13 INR as on 16/02.2025. Shall be trued up every month for WIM and Dollar to INR conversion.**

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Time-of-Day (TOD) tariff status:

Sl. No.	State	Consumer Category	Peak hours rates ((Rs./unit))	Off-peak hours rates (Rs./unit)
1	Assam	LT Industrial; HT and EHT Industrial; HT and EHT Others: HT-VI Tea, Coffee & Rubber plantation/ production, HT-VII Installation of Oil & Coal sector	Normal tariff plus RS. 2/KWh	Normal tariff minus RS. 2/KWh
2	Bihar	LT Consumers (except Agriculture); HT Consumers	120% of normal rate of energy charges	80% of normal rate of energy charges
3	Delhi (BYPL, BRPL, NDPL-TPDDL, & NDMC)	All consumers (other than domestic) whose sanctioned load is 10 kW/11 KVA and above	20% surcharge on energy charges	20% rebate on energy charges
4	Jharkhand	HT Commercial; HT and EHT Industrial	120% of normal tariff	85% of normal tariff
5	Madhya Pradesh	HT Commercial; HT and EHT Industrial; HT and EHT Others: HV-2: Coal Mines, HV-5: Irrigation,PWW & Other than Agricultural	20% surcharge of Energy Charges	20 % of Normal rate of Energy Charge as Rebate. 10 % of Normal rate of Energy Charge as Rebate for night Off-peak hours (10 PM to 6AM next day) for entire year.
6	Maharashtra	LT Commercial; LT Industrial; HT Commercial; HT and EHT Industrial; HT and EHT Others: HT-IV: PWWB & STP, HT-VIII (A): GEI & Hospitals, HT-VIII (B): Others, HT-IX: EV Charging Stations; LT Others: LT-III: PWW & STP, LT-VII (A): GEI & Hospitals, LT-VII (B): Others, LT-VIII: EV Charging Stations	Normal tariff plus RS. 1.1/KWh	Normal tariff minus RS. 1.5/KWh
8	Tamil Nadu	HT Commercial; HT and EHT Industrial; HT and EHT Others:all HT consumers except HT-IIA, HT-IV and HT V, LT Others: LT-II (B), LT-III (B), LT-V	125% of normal tariff	95% of normal tariff (night consumption: 10 pm- 5am)
9	Punjab	LT Commercial; HT and EHT Industrial; HT and EHT Others: EV Charging Stations Bulk Supply	Normal Tariff (April-15th June)	Normal Tariff minus Rs.0.50/kVAh (1st April - 15th June)
			Normal Tariff plus Rs. 2.00/kVAh (16th June-15th October)	Normal Tariff
			Normal Tariff (16th October-31st March)	Normal Tariff minus Rs. 1.00/kVAh
10	Andhra Pradesh	HT Commercial; HT and EHT Industrial	115% of normal tariff	85% of normal tariff
11	Chhattisgarh	HT and EHT Industrial	120% of normal tariff	80% of normal tariff
12	Telangana	HT Commercial; HT and EHT Industrial; HT and EHT Others:HT-II (A): Others HT-IX: EV Charging Station	Plus Re.1/unit	Less Re.1/unit

Annexure-II

Scaling Demand Flexibility in India

A Summary of Best Practices

April 2025

Jagabanta Ningthoujam, Principal
Arjun Gupta, Manager

About RMI

A 43-year-old Think-Do-Scale Tank working at the cutting edge of clean energy transition

Electric Vehicles

Built Environment

RMI in India

Green Hydrogen & Industry

Climate Finance

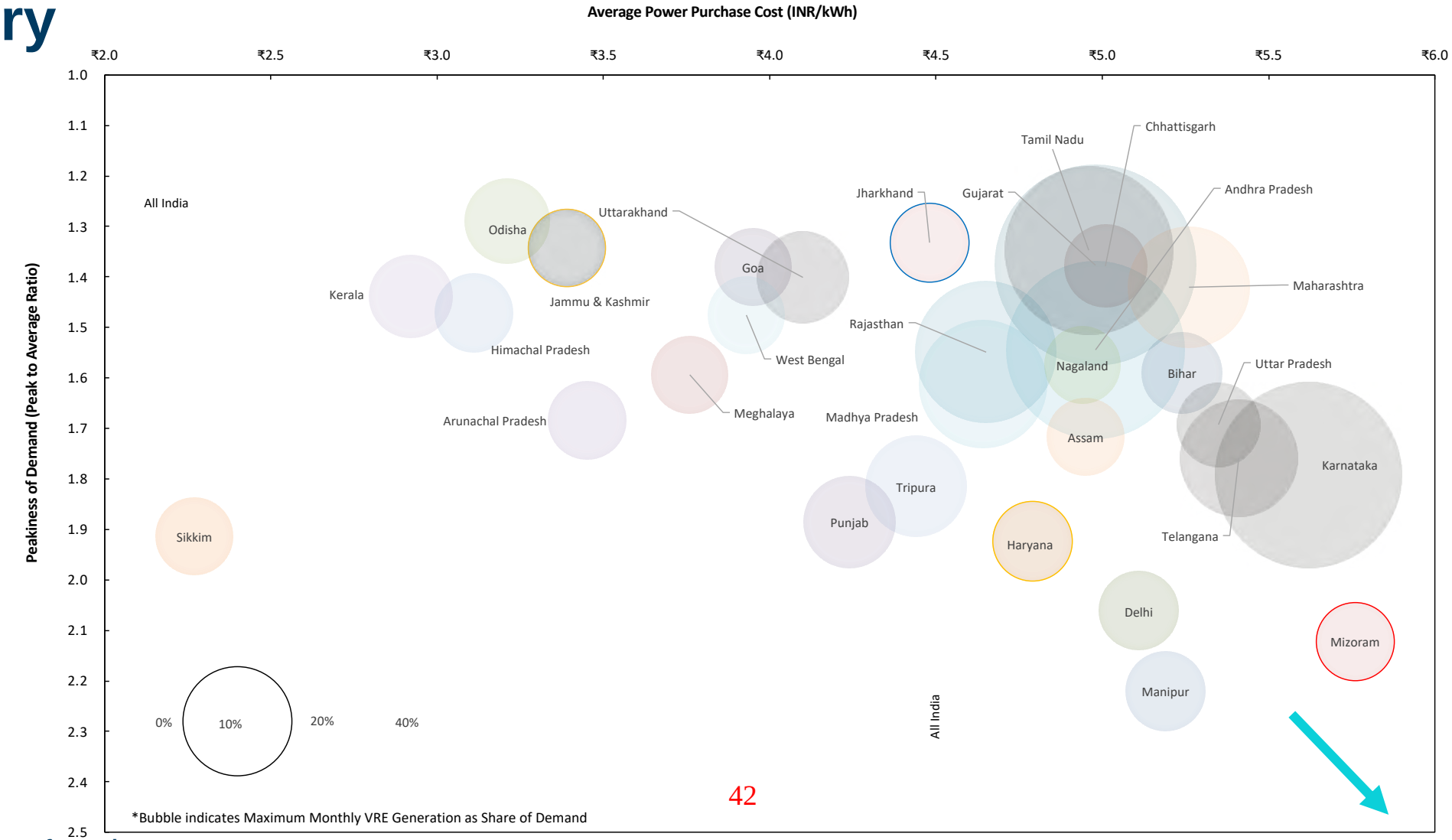
Electricity & Energy Storage

1. Bettering integrated planning to enable a higher share of RE
2. Enabling RE for All
3. Enabling RE Integration through Grid Flexibility
   - Advancing Demand Flexibility Solutions
   - Accelerating adoption of BESS

Agenda

1. Need for Demand Flexibility in India
2. Overview of Demand Flexibility
3. Global Case Studies: Hong Kong, California, New York, the United Kingdom, Australia
4. Key Lessons from Global Case Studies
5. Way Forward and Recommendations for Scaling Demand Flexibility in India

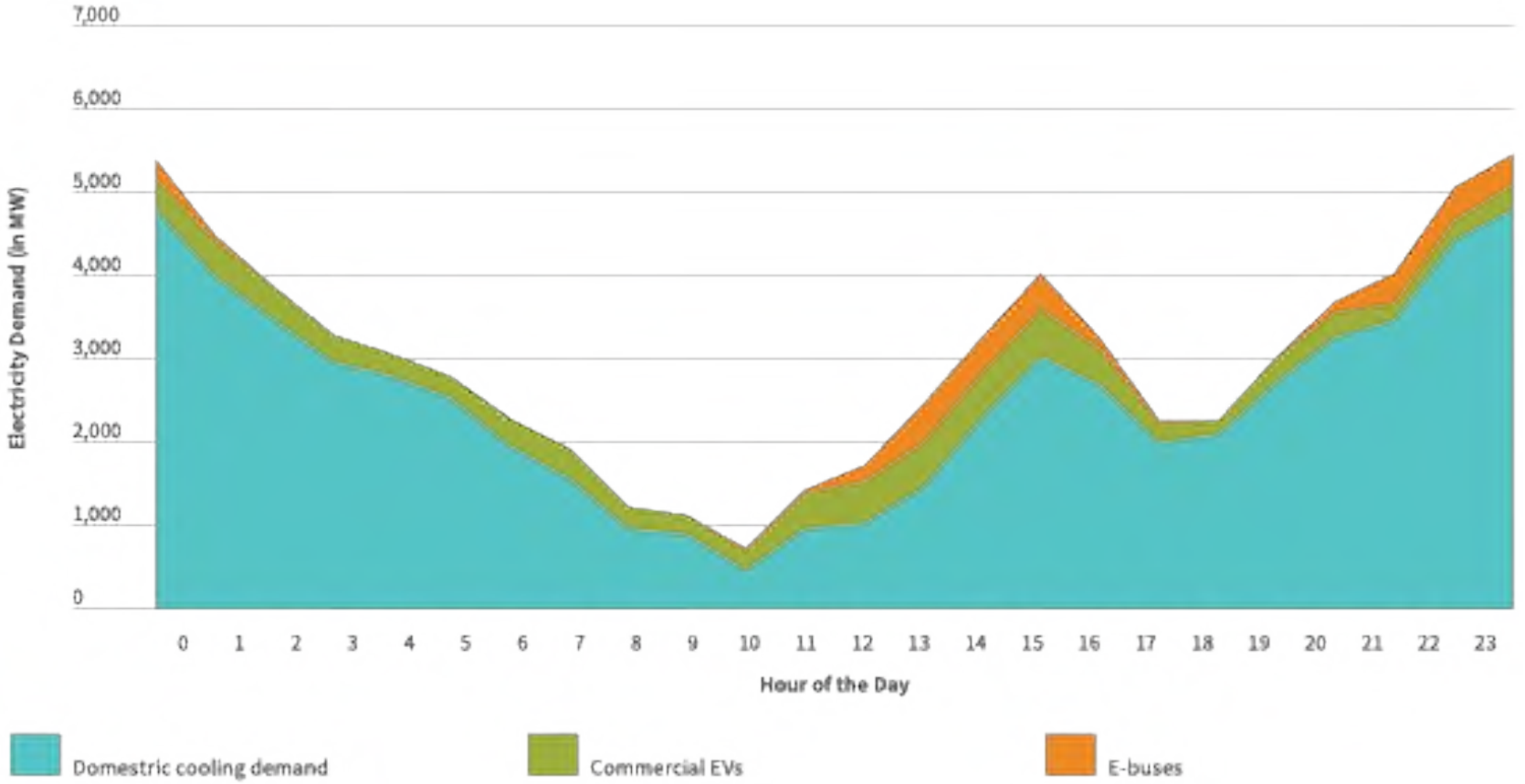
Challenges of unmanaged load and generation growth resulting in higher cost of power procurement affects majority of the country



Sources: CEA, PFC, RMI Analysis

Economic growth, climate change, and energy transition are reshaping energy demand

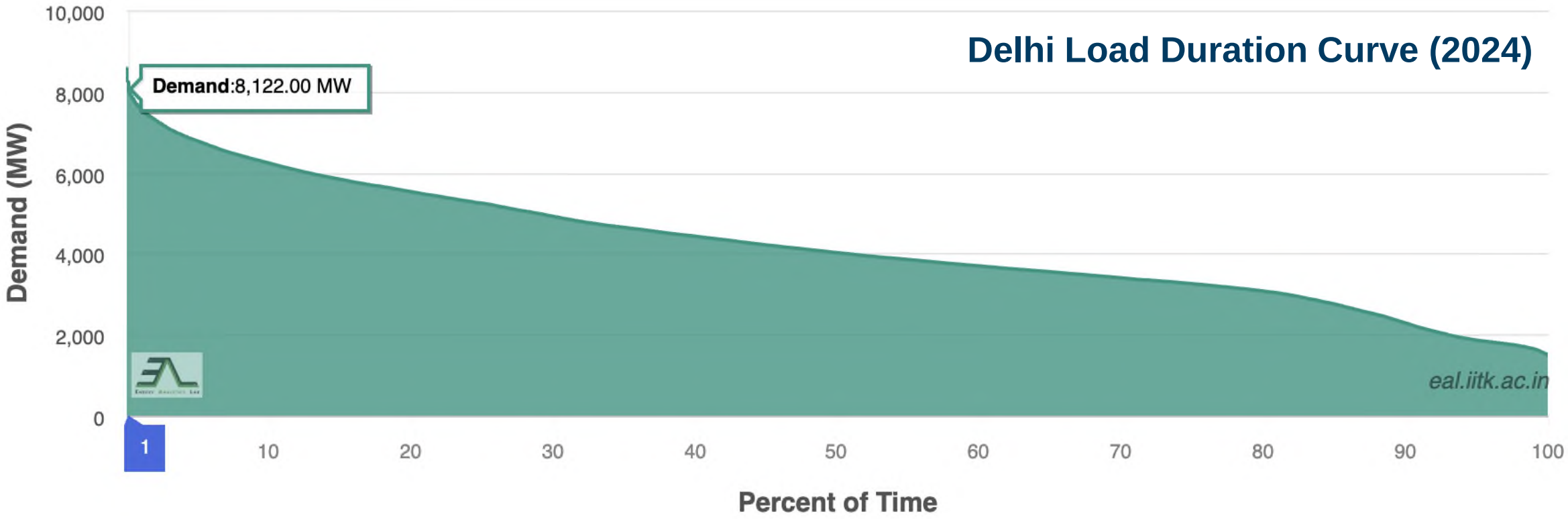
Projected hourly demand of domestic cooling, commercial EVs, and e-buses in Delhi in 2030



- AC and EV charging demand are expected to drive peak demand. In Delhi, our analysis suggests they could account for **40-50% of evening peaks** by 2030
- Nationally, AC demand is expected to reach **140 GW, one-third of India's peak** demand by 2030, while **EVs may add up to 17 GW, or 4%,** to the peak

Sources: CEA Power Supply Position – Peak Dashboard; CEA 20th EPS, IECC and Berkeley

Sharper peak demand necessitating costlier power

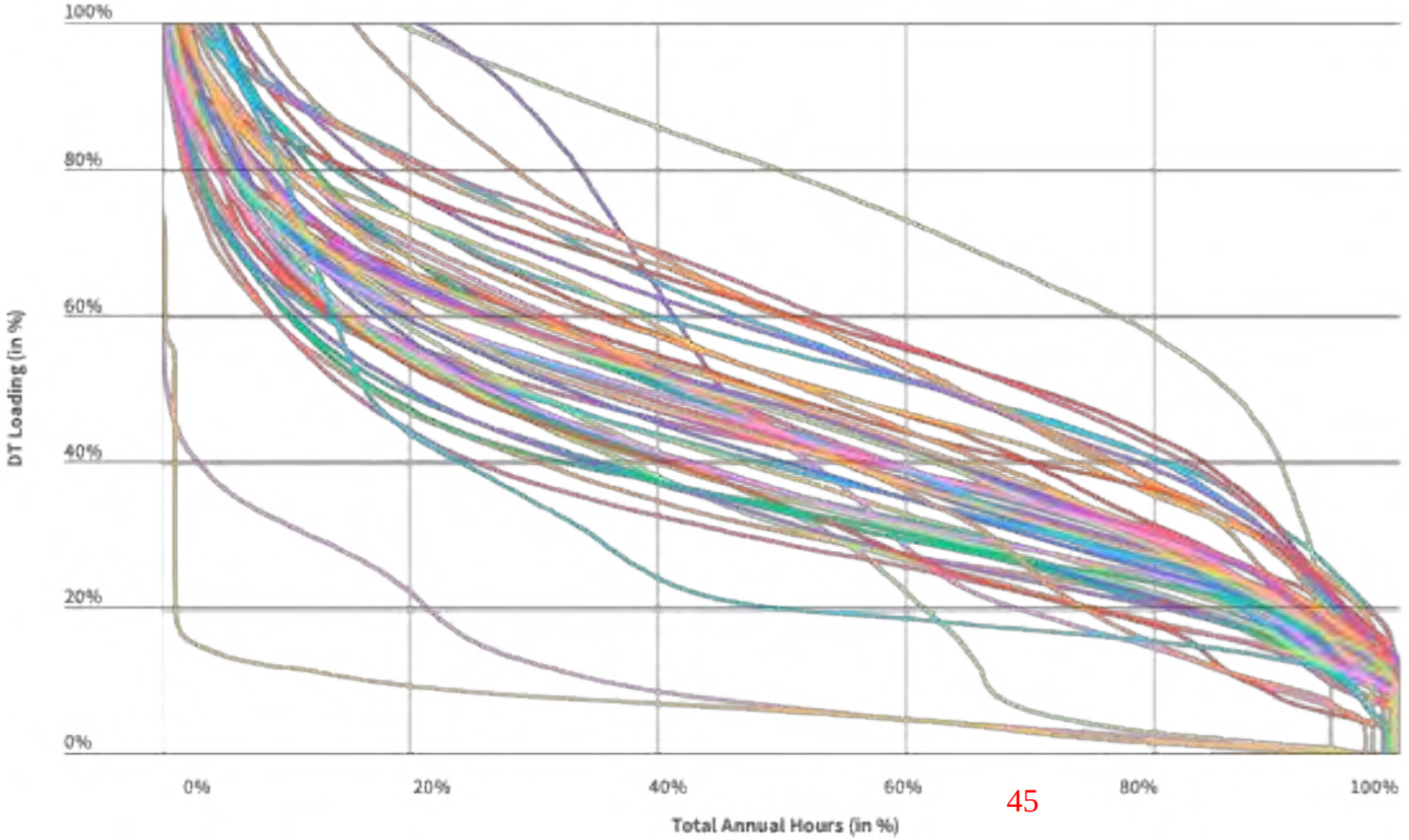


- Delhi's 2024 load profile highlights that **peak demand exceeded 8 GW for less than 1% of the year (<100 hrs).**
- Nationally, studies suggest that **16 GW of India's critical peak occurred only 1% of the time** in FY2024.
- **Procuring peak power is expensive**: Gas generators met only 10% of BSES's 2023 annual demand but

Sources: RMI Analysis, IIT-Kanpur Energy Analytics Lab, AEEE

Declining load factor of grid assets is adding to power procurement costs

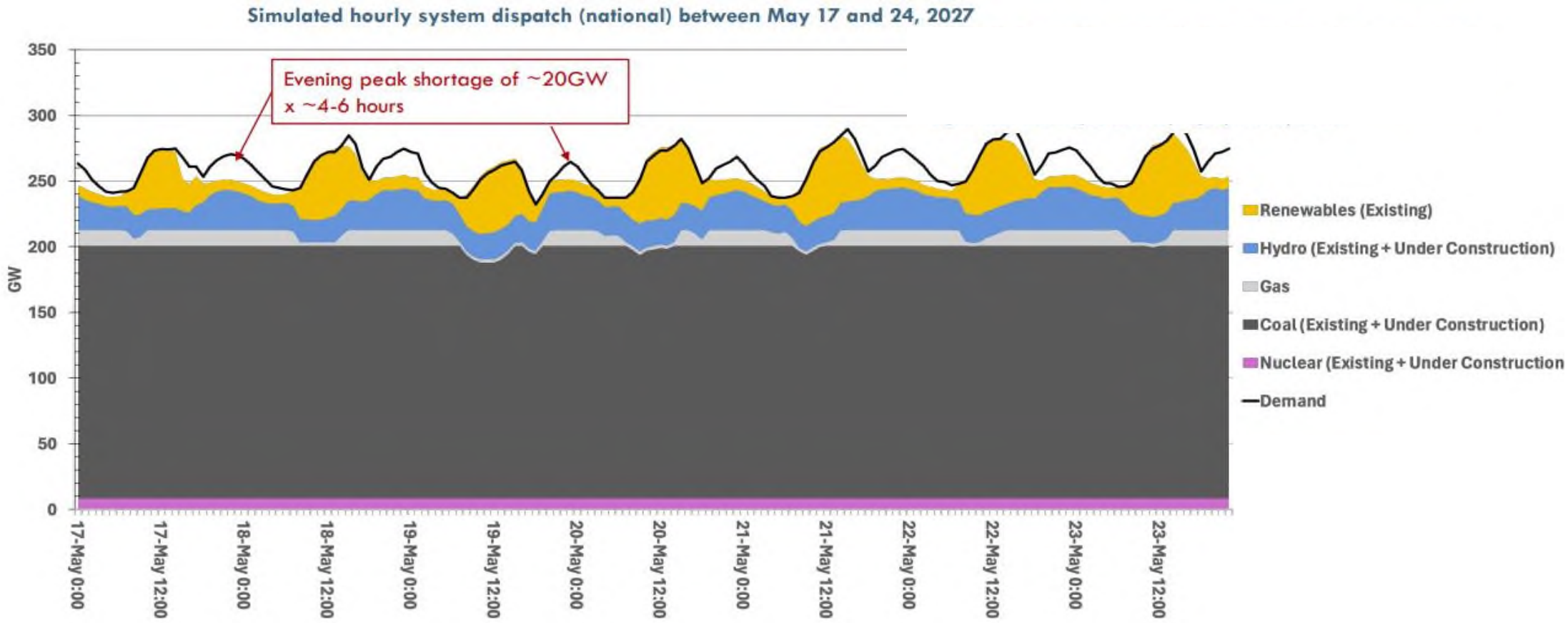
Load duration curve of BSES' distribution transformers (2023)



- An assessment of BSES's 50 overloaded distribution transformers reveals that they operated above 90% of their capacity for less than 5% of the year (approximately 450 hours).
- These necessitates upgrades which can increase the cost of operation of the power system

Source: RMI Analysis

Peak demand growth and RE generation are rising rapidly causing supply-demand mismatches

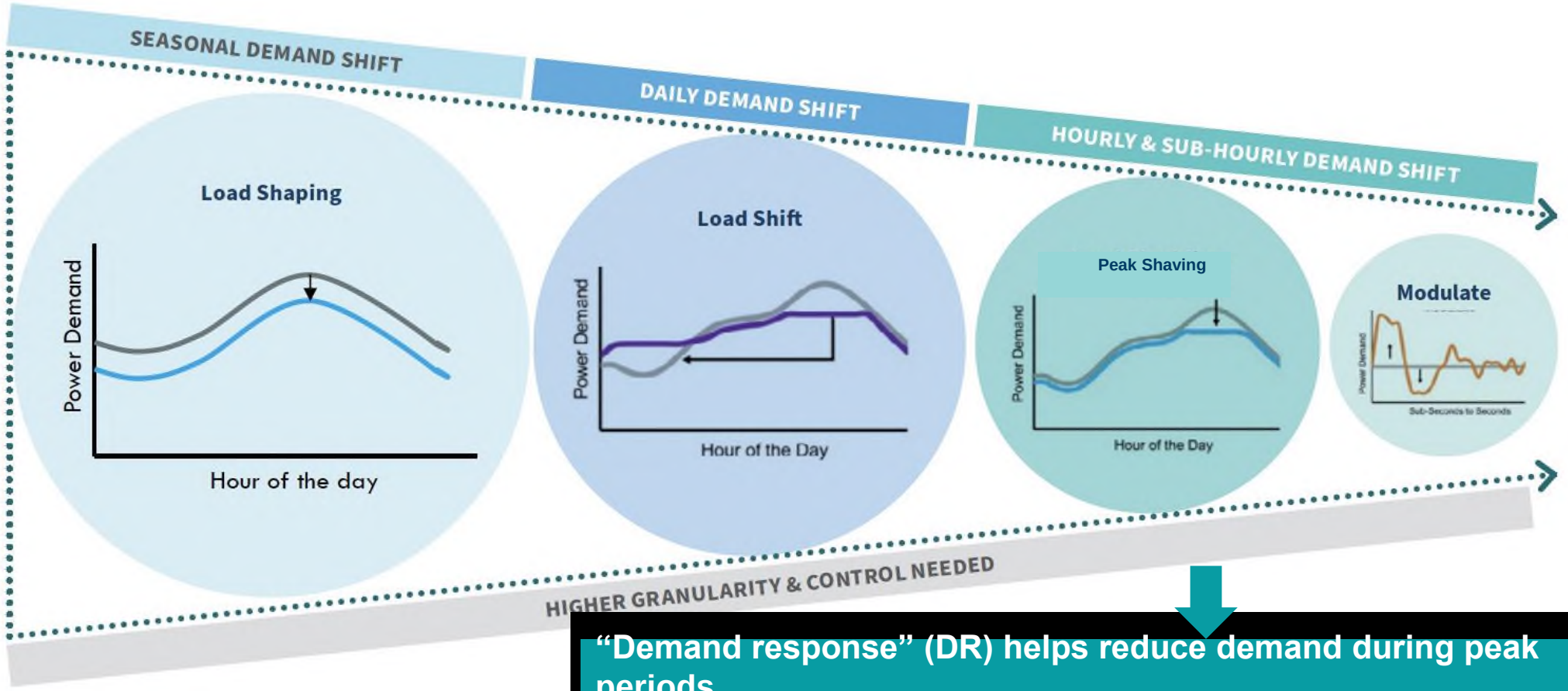


Studies suggest that despite an additional 100 GW of RE and ~40 GW of firm generation capacity by 2027-28, an **evening peak shortage of 15-20 GW** is projected during the summers

Sources: CEA Power Supply Position – Peak Dashboard; CEA 20th EPS, IECC and Berkeley

“Demand Flexibility” is the need of the hour

Demand Flexibility (DF) is the ability to shift, shave or shape demand patterns to maintain grid balance, mitigate high power procurement costs & integrate greater amounts of renewable energy.



“Demand response” (DR) helps reduce demand during peak periods

Overview of Demand Flexibility Levers

Demand Response (DR)
(modifying normal consumption patterns of demand-side appliances, such as ACs)

Behavioural Demand Response (BDR) encourages consumers to change electricity consumption based on signals or alerts triggered by Discoms to reduce demand during peak periods

Automated Demand Response (ADR) utilises advanced technologies, such as smart devices, sensors, and control systems, to automatically adjust electricity consumption in real time

Managed EV/E-Bus Charging

Managed EV charging programmes optimise the charging of EVs over time by minimising charging during peak hours and maximising charging during off-peak hours.

Battery Energy Storage Systems (BESS)

A BESS system can store electricity when low-cost electricity like RE is widely available, and discharge during periods of peak electricity demand

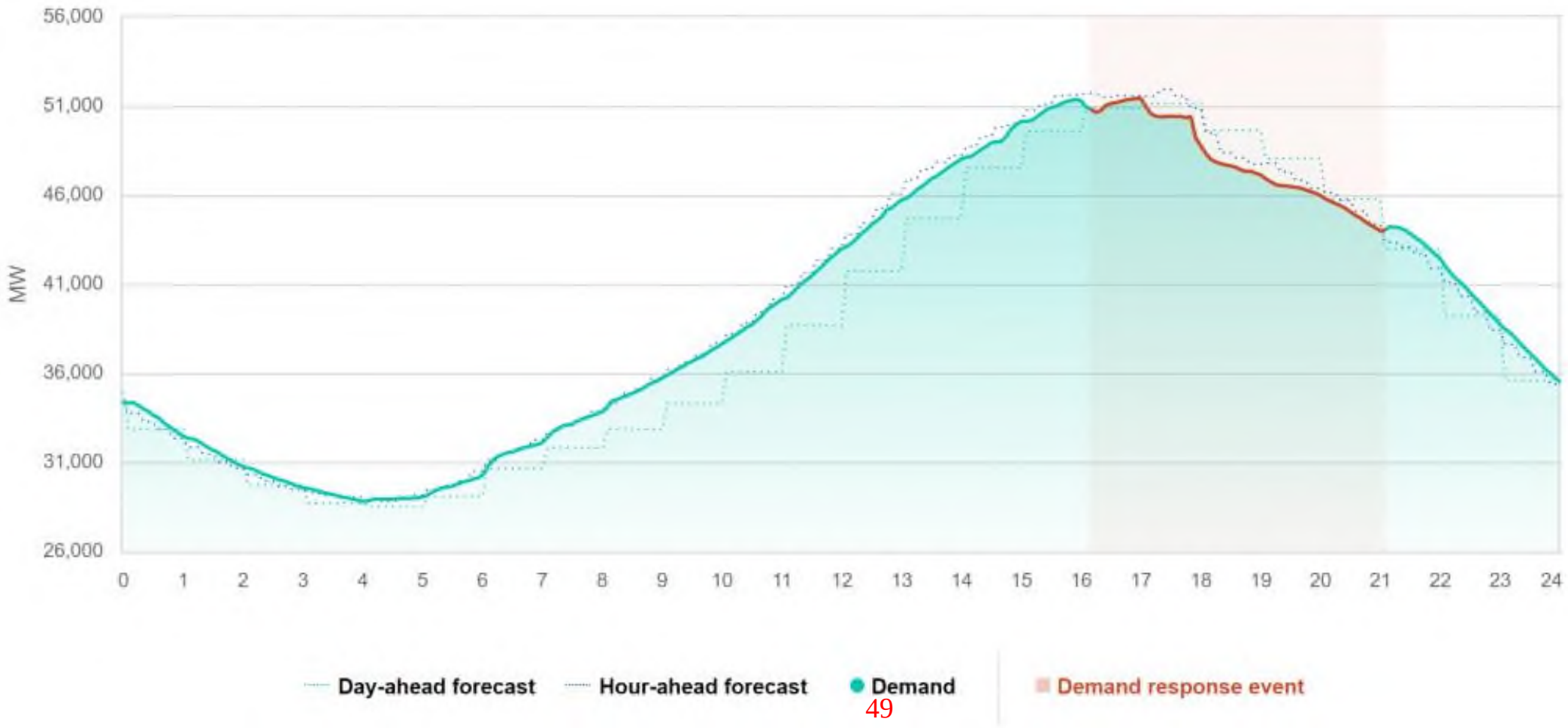
Virtual Power Plant (VPP)

A VPP is an aggregation of grid flexibility measures that can balance electrical loads and provide utility-scale and utility-grade grid services

Note: DF Levers also include – water pumping, industrial compressors/motors, HVAC units, water heaters etc

Demand flexibility in action

Example of California



Source: Canary Media

Examples are emerging of global success stories in DF

- Hong Kong implements an AC-based ADR+BDR programme, which helped shave more than 400 MWh during a 4 hr DR event in 2023

- California has enrolled >37 lakh consumers with a DF capacity of ~1 GW as of 2023
  - It was able to shave 2 GW of peak demand during an emergency DR event in 2022
  - It aims to unlock 7 GW of DF (~15% of peak demand) to meet the State's clean energy goals of 38 GW by 2030

- In Germany, a 250 MWh network of distributed batteries is in operation as of 2023

- The UK operates the world's largest DF market, ~4 GW, but its system operator estimates it would need 12 GW of demand side resources (~20% of peak demand) to achieve a fully decarbonised grid by 2030

Source: IEA

AC-based ADR in Hong Kong covering >6.5 lakh customers

China Light & Power (CLP) DR Programme

Programme Details

- CLP's Summer Saver Rebate programme aims to lower peak demand, reduce emissions, and aid Hong Kong's sustainability goals
- Program notifies participants 4-6 hours prior to peak events via CLP app, SMS, and email to reduce load
- Participants awarded for units of electricity saved using smart meter data. Customers with smart AC control can opt for ADR while others implement BDR
- Energy savings and rewards uploaded and viewable on CLP's online platform

Technical Details

- Baseline energy usage based on 3 out of 10 days prior to event day with highest usage during the specified event period (e.g. 6-10 PM)
- Hourly energy usage data available to participants with a time lag of 4 hours

Customer Incentives

- Reward points awarded for reducing load during specified hours. Extra rewards for top savers and for participating in smart product trials
- Points can be redeemed for food coupons, supermarket vouchers, new appliances, etc.

Technical Enablers

- Smart meters
- AI-based WiFi-connected smart AC control

CLP 中電

Impact

- CLP has installed 20 lakh smart meters and aims to cover all customers by 2025
- 6.5 lakh residential customers responded to a 4-hour DR event and helped save 410 MWh in summer 2023

Sources: CLP Media Release, CLP Programme Details, Smart Energy International

Emergency Load Reduction Program (ELRP) and Demand Side Grid Support (DSGS)

California DF Programmes

Programme Details

- ELRP initiated in 2021 after rolling blackouts in summer 2020; DSGS launched as a compliment to ELRP in 2022, expanding eligibility and incentive structures
- Both programs include BTM generation, DR aggregators, battery VPPs, and VGI; DSGS also allows aggregator-controlled despatch of battery based on system operator's signals (market-aware VPP)
- Peak event notified either day-ahead or day-of, including immediate onset; duration varies from 1 to 5 hours
- Aggregators can bid into wholesale market and earn energy and ancillary services revenues along with resource adequacy payments through capacity auctions

Technical Details

- Load reduction estimation based on baseline energy use (dependent on average usage in previous days) and on battery VPP discharge capacity

Customer Incentives

- ELRP has energy payment for load reduced:
  - $1/kWh to residential customers; $2/kWh to non-residential customers
- DSGS has 3 payment structures:
  - Option 1: $2/kWh energy payment for load reduced
  - Option 2: Capacity (resource adequacy) payment
  - Option 3 (only for battery VPP): energy payment based on day-ahead market + capacity payment

Technical Enablers

- Smart meters, thermostats, and water heaters
- Customer-sited generation and battery systems
- VGI with managed charging and vehicle-to-grid (V2G) dispatch
- VPP aggregators

Impact

- ELRP had 37 lakh enrolled customers with 790 MW of capacity in summer 2023
- DSGS had 1,300 enrolled customers with 142 MW of capacity in summer 2023

Sources: CPUC ELRP, CEC DSGS

Emergency Demand Response Program (EDRP) and Special Case Resources (SCR)

New York DF Programmes

Programme Details

- NYISO, the system operator, implements two reliability-based DR programmes – EDRP (voluntary participation) and SCR (mandatory participation)
- EDRP provides energy payments to aggregations, while SCR offers capacity payments in addition to energy for demonstrable load reduction. Aggregations must choose one of two
- SCR has dominated over EDRP since 2017: ~1.5 GW capacity enrolled in SCR in summer 2024, while none in EDRP
- NYISO will introduce a DER participation model in 2026 that will enable aggregations to offer all grid services in wholesale markets

Technical Details

- Capacity payment for SCR is calculated based on load curtailment vs. average coincident load from previous year
- Energy payment for SCR is calculated based on load reduction vs. baseline energy use from previous 30 days

Customer Incentives

- EDRP offers the greater of $500/MWh or the prevailing wholesale market price for energy curtailment
- SCR offers two payments for load reduction – capacity and energy
  - Capacity payment is based on market clearing price in the NYISO capacity market
  - Energy payment is based on a “strike” price offered by a resource or an aggregation prior to enrolment

Technical Enablers

- Smart meters
- DER and DR aggregators
- Smart thermostats, heat pumps, EV, etc.

New York ISO
Independent System Operator

Impact

- NYISO called 4 events in summer 2024, 3 were mandatory
- Response rate was 75-80%, meaning >1 GW flexibility was achieved

Sources: NYISO

The UK's Demand Flexibility Service (DFS)

A concerted push by the National Energy System Operator (NESO) to become a global DF leader

Programme Details

- Year-round flexibility market that lowers entry barriers for DER and DF aggregations to participate in electricity markets
  - Enables any customer with a smart meter to enrol
- Serves as a model for supporting aggregators, standardising grid codes, metering requirements, M&V, etc., and enabling interoperability
  - Octopus Energy, the largest retailer in the UK, participates in the DFS by providing innovate "smart tariffs" and aggregating DERs, EVs, and smart appliances
- In 2023, 4 GW of flexibility was contracted, making DFS the biggest flexibility market in the world

Technical Details

- DFS enables standard technical and regulatory requirements, open APIs for seamless integration, and clear price signals
- Leaves despatch of resources and customer engagement to aggregators, thus incentivising innovation in business and operating models

Customer Incentives

- Aggregators earn revenue by "selling" flexibility and grid services in the electricity markets
- They then pass along a portion of the revenues to customers
- Octopus Energy utilises dynamic tariff structures to incentivise energy bill savings
  - E.g., one of its tariffs provides half-hourly rates that reflect wholesale market prices
  - Customers receive real-time alerts for both manual and automated load shift/reduction

Technical Enablers

- Smart meters
- DER and DF aggregators
- Smart water heaters, heat pumps, thermostats, and EVs

NESO
National Energy System Operator

Impact

- In winter 2022/23, 16 lakh customers provided ~350 MW of flexibility and curtailed load by 2.9 GWh
- Octopus Energy, an aggregator, provided 108 MW of peak shaving from 2 lakh customers in Nov 2022 via smart tariffs

Sources: NESO DFS

Piclo Flex: Flexibility Marketplace-as-a-Service, 3+ GW of flexible capacity procured globally

A Flexibility Marketplace in Australia

Programme Details

- An independent marketplace for utilities or system operators to purchase flexibility services from DF aggregators
- Platform uses a competitive auction process to match system operator's flexibility needs with aggregators' DF bids
- Technology-agnostic platform integrates bids from aggregators of all DF and DER resources
- Piclo provides visibility of assets to utilities, communication of despatch schedules, and M&V of DF using smart meter data
- Main sources of revenue are platform fees for transactions and subscription fees for grid operators

Technical Details

- Publicly available APIs for seamless software integration with Piclo platform
- Customisable process automation and functional modules to suit utilities' flexibility needs and software capabilities

Customer Incentives

- Aggregators earn revenue through the competitive auction process of matching DF bids with utilities' flexibility needs
- They then pass along a portion of revenues to customers

Technical Enablers

- Smart meters
- DER and DF aggregators
- Smart water heaters, heat pumps, thermostats, and EVs

piclo®

Impact

- Piclo operates in 6 global markets – Australia, the UK, Ireland, Italy, Portugal, and USA
- Globally, it has facilitated flexibility contracts totalling ~$95 million and 3+ GW of capacity

Sources: Piclo Flex

Key Lessons from Global Case Studies

Effective programme design

Common Challenges	Leading Practices	Example
Technology-specific programmes lead to fragmented customer experience and increased management burden	**Seamless enrolment and participation** of DF technologies, aggregators and consumers. Empowers consumers to use the device and aggregator of their choice.	DFS in the UK National Grid Portland General Electric
Limited staff capacity or experience with demand flexibility	**Leverage third-party capacity** and complementary capabilities via partnerships. Third parties can manage enrolment and expedite new programmes	Pacific Gas & Electric Duke Energy
Upfront costs prevent equitable DF adoption	**Incentives ensure consumer participation**. Upfront payments incentivise DER purchases, while performance payments incentivises customers to maintain programme participation	ELRP and DSGS in California Green Mountain Power Holy Cross Energy

Source: RMI VP3 Flipbook

Key Lessons from Global Case Studies

Proactive engagement with policymakers and regulators and innovative discom practices

Leading Practices	Example
Proactively engage regulators and policymakers to structure DF programmes and policies. Pilots are an opportunity to test new regulations, such as through a regulatory sandbox, in addition to understanding the technology.	Connecticut regulatory sandbox – Innovative Energy Solutions Program
Automate DF processes like enrolments, payments, M&V and despatch to enable scale and minimise admin burden	**California's ELRP** automatically enrols residential customers in DR programmes Xcel Energy has an automated process to send the hourly dynamic rate schedule 24 hours in advance.
Incorporate DERs into distribution planning Consider the full value of DF such as capacity, ancillary services, energy, resilience, capex deferral and other DF benefits.	**PGE integrates DERs** into its distribution planning and anticipates impacts and synergies with existing utility practice **WPD (UK)** executes distribution assessment every six months.

Source: RMI VP3 Flipbook

What Next for Demand Flexibility?

Moving from siloed DF programmes to a holistic platform-based approach

Typical demand flex *programmes*

- Customised
- Complex
- Narrow

Leading demand flex *platforms*

- **Universal**
  - Limited integration requirements for new aggregators or utilities
  - Scalable across many states or utility territories
  - Common protocols, standards, and metrics
- **Simple**
  - One-step device enrolment, discovery, and integration
  - Automated and streamlined user experience
  - Standardised despatch coordination
- **Broad**
  - Supports multiple device types
  - Open access for diverse vendors and aggregators
  - Unlocks multiple use cases & value sources for demand flexibility

India has the opportunity to leapfrog and design a future ready “Demand Flexibility” platform

Source: RMI

The National Grid Flexibility Platform (NGFP)

A digital platform that enables aggregators to help scale DF effectively

A DF Platform Enables

- **Visibility and M&V** of DF assets for DISCOMs
- A **market for aggregators** to pool DF assets
- **Standardisation and interoperability** for replicability
- Transparent **price discovery and quick settlement** for DF services

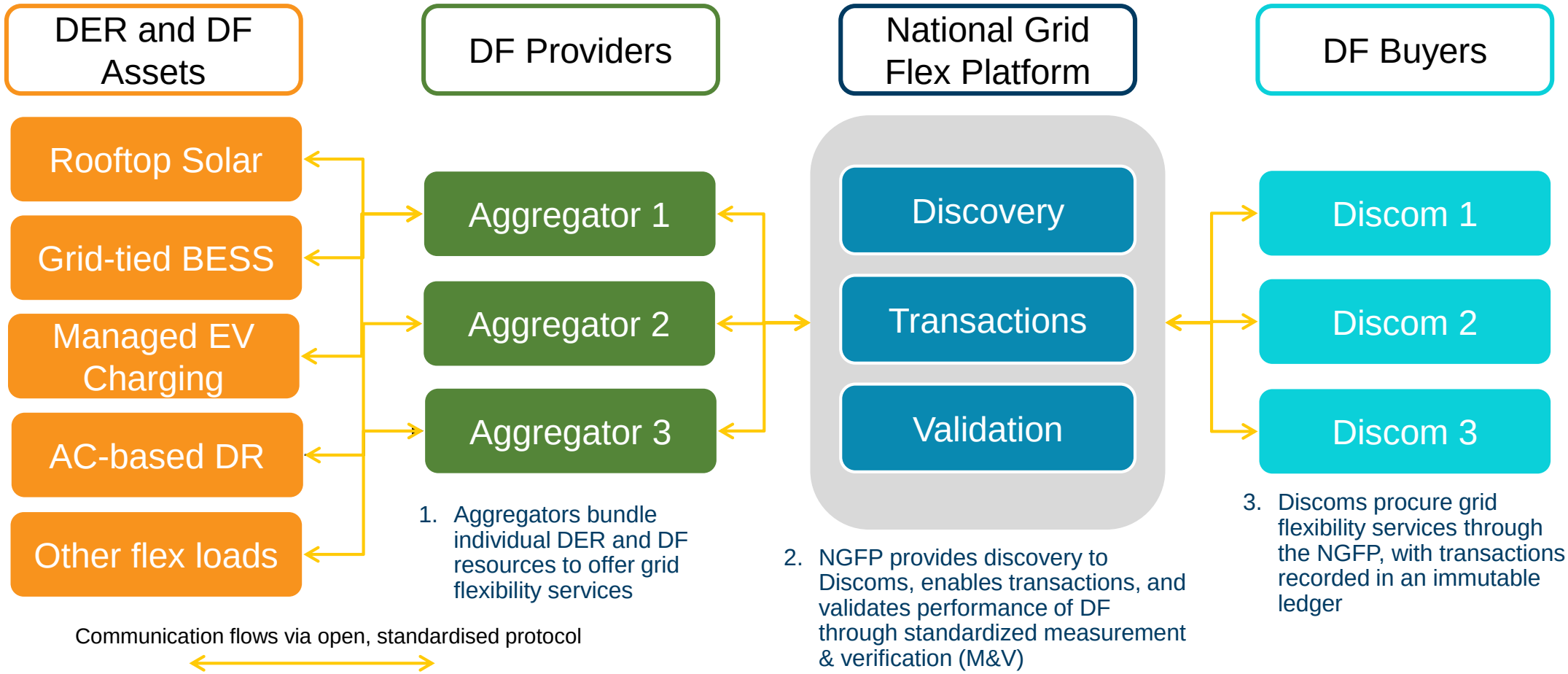
DF Aggregators Can

- **Enrol** and recruit customers
- **Bundle** sufficient "size" of demand for market participation
- **Provide technology** to smoothly carry out DF programmes
- **Manage financial settlement** with customers

Source: RMI

Operational Flow of the NGFP

A digital infrastructure layer that enables a marketplace for discovery and transactions of DF



Source: RMI

Recommendations for Scaling DF (1/2)

Near-term regulatory action items to help scale aggregator-based DF in India

Attribute	Description	Leading Example(s)
Resource classes/end-uses	Develop technology-agnostic DF regulations that enable all resource classes, e.g., smart EV charging, time-based irrigation pumping, etc.	Maharashtra, Andhra Pradesh, Assam
DF aggregator participation	Develop regulations that clearly define aggregators and enable their participation in DISCOM demand flexibility programmes	Maharashtra, Assam
DF Portfolio Obligations (DFPO)	Develop clear targets for demand flexibility, e.g., DFPO prescribed as a percent of peak load that ramp up over time	Maharashtra
Discom incentives/penalties	Develop incentives and penalties for DISCOMs to encourage DF adoption, e.g., in Maharashtra, there is an INR 0.2Cr/MW incentive for every MW in excess of DF target and INR 0.2Cr/MW penalty for every MW deficient of DF target	Maharashtra
DF cost-effectiveness tests	Develop standardised guidelines for cost-effectiveness estimation based on universal tests used globally, e.g., Total Resource Cost (TRC)	Maharashtra
Evaluation, measurement and verification (EM&V)	Develop methodologies for EM&V that utilise standardised baseline energy usage measurement, common data sharing protocols, and universal performance verification methods	AEEE & BSES Yamuna ADR pilot in Delhi
Customer awareness and incentives	Develop effective guidelines to foster awareness about financial benefits and increase local community involvement to build trust and participation	AEEE & BSES Yamuna ADR pilot in Delhi

Sources: MERC, AERC, APERC, AEEE

Recommendations for Scaling DF (2/2)

Non-regulatory action items to help scale aggregator-based DF in India

Attribute	Description	Leading Example(s)
Advanced Metering Infrastructure (AMI)	Explore pathways and models to increase adoption of AMI, or smart meters, as these are crucial for accurate performance verification of DF interventions	Bihar, Assam
Time-of-Day (TOD) Tariffs	Implement TOD tariffs that encourage customers to shift consumption to non-peak or high solar hours	Maharashtra (for residential)
Interoperability	Support standardisation of DF programmes, e.g., common communication protocols, standard programme design document (PDD) templates, etc. to encourage interoperability and integration of DF on the NGFP	OpenADR
Stakeholder Capacity Building	Build stakeholder capacity by conducting technical workshops for DISCOMs, policy roundtables for regulators, and education and outreach programmes for consumers	

Sources: MERC, NSGM

Thank you!

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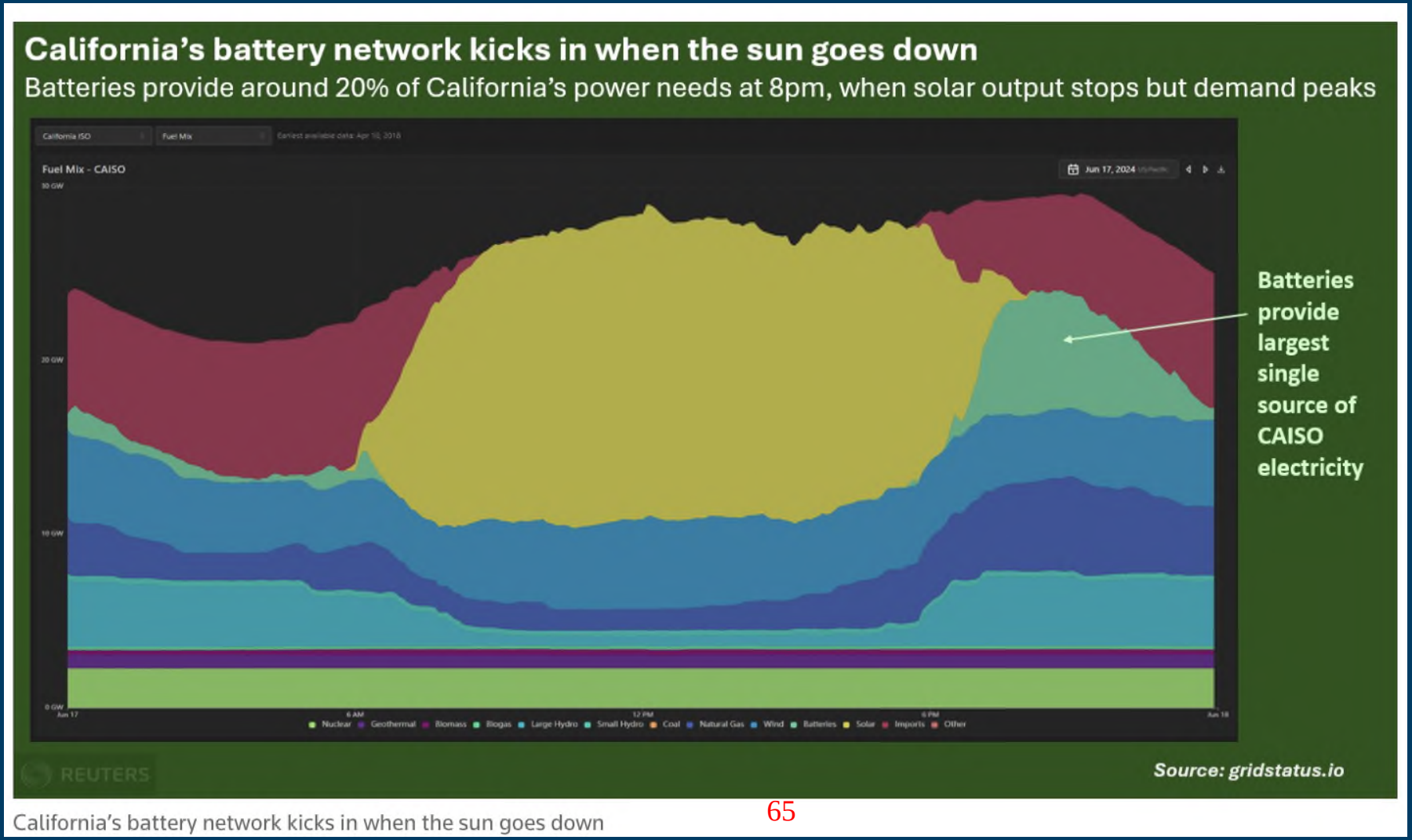
Appendix

Demand Flexibility in action



California's battery network kicks in when the sun goes down

Source: IEA

ADR Pilot in Delhi

AC-based ADR Pilot implemented by AEEE and BSES Yamuna with 30 customers in October 2023

- AEEE developed a simulated case of high AC usage during peak summer months to assess the DR impact
- Its analysis finds that assuming 20% co-incident usage of ACs, peak demand of a cluster of customers can be reduced by ~55%
- At a higher co-incident usage rate of 50%, i.e., 50% of all ACs in a cluster are operating at the same time, peak demand reduction potential rises to ~75%
- Further, AEEE finds that BSES Yamuna experienced an additional load of 192 MW for just 1% of the time in FY2022-23
- Scaling up AC-based ADR to 192 MW can help relieve distribution infrastructure overloading and increase cost-effectiveness of ADR

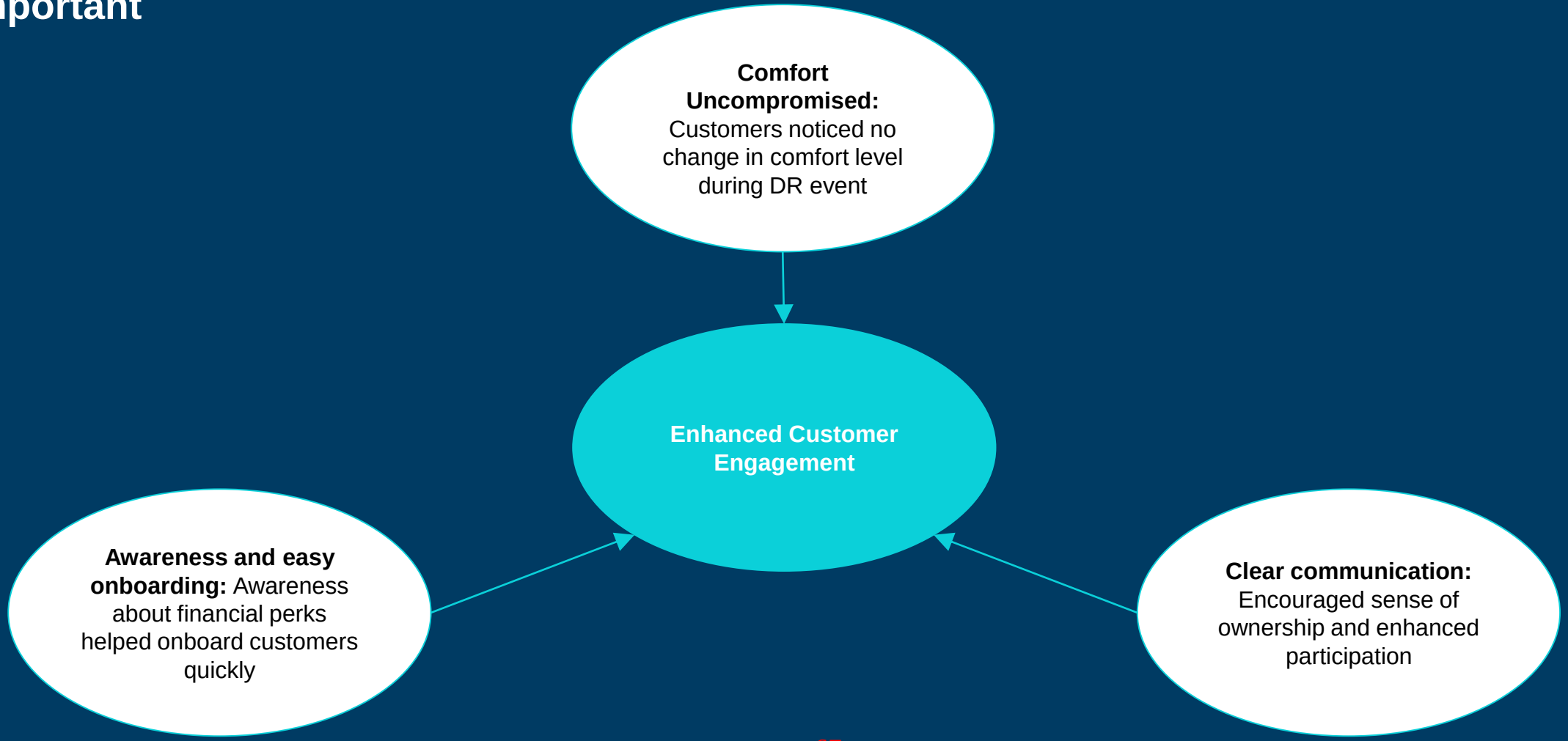
- Wi-Fi and Long Range (LoRa) wireless-enabled relays were installed directly on a customer's AC unit
- Smart energy measurement module (smart plug) was installed in the panel
- A LoRa gateway was installed to create a mesh network and enable individual devices to connect
- BSES Yamuna triggered ~15-minute DR events and increased temperature set point of ACs using LoRa

Desired Peak Reduction (MW)	AC Co-incidence Operation (%)	Average Demand Reduction (kW)	No. of ACs Required to Participate
192	20	0.3 kW/AC	6.4 lakh
192	50	0.75 kW/AC	2.56 lakh

Source: AEEE

Key Takeaways from ADR Pilot in Delhi

Awareness generation, easy onboarding, and customer engagement and incentives are important



Source: AEEE

Annexure-III

Open Access Consumer who exercise the choice of supplier can simultaneously receive supply from incumbent distribution licensee ?

Common practice by Open Access consumers

- Majority of the Open access consumers in India receive supply of electricity simultaneously from Distribution licensee and also from other sources
- State Regulations do not prohibit simultaneous use of multiple sources of supply by open access consumers
- Whether the Electricity Act allows for such multiple sources of supply simultaneously by open access consumers ?

Provisions in the Act

- Section 42(2)
  - *"The State Commission shall introduce open access in such phases and subject to such conditions, (including the cross subsidies, and other operational constraints) as may be specified within one year of the appointed date by it and in specifying the extent of open access in successive phases and in determining the charges for wheeling, it shall have due regard to all relevant factors including such cross subsidies, and other operational constraints:"*
- *State Commissions have the powers to specify conditions while introducing open access.*
- *Any ambiguity/gap in the provisions in the Act while rolling out the open access has to be cleared / filled up through regulations*

Simultaneous Supply as per the Act

- As per Section 42 (3), it is not envisaged that a person while receiving supply from other sources through open access, also receive supply from the incumbent licensee.
  - *"42(3) Where any person, whose premises are situated within the area of supply of a distribution licensee, (not being a local authority engaged in the business of distribution of electricity before the appointed date) requires a supply of electricity from a generating company or any licensee* ***other than such distribution licensee****, such person may, by notice, require the distribution licensee for wheeling such electricity in accordance with regulations made by the State Commission and the* ***duties of the distribution licensee*** *with respect to such supply shall be of a* ***common carrier providing non-discriminatory open access****."*

- The non-discriminatory open access means, availing supply from a person **other than the distribution licensee** through distribution /transmission system.
- If a consumer avails choice of supplier through the provision of open access, the incumbent distribution licensee is **no longer a supplier for such consumers**.
- Harmonious consideration of all the related provisions of the Act shows that USO under 43(1) is not applicable if a person exercises choice

- This issue can be further elaborated with following provisions
  - *"42. **Duties of distribution licensee and open access.–(1)** It shall be the duty of the distribution licensee to **develop and maintain** an **efficient, co-ordinated and economical distribution system** in his area of supply **and to supply electricity** in accordance with the provisions contained in this Act".*
- As per Section 42(1), the distribution licensee is entrusted with two duties namely,
  - (1) developing and maintaining the distribution system (that is providing the network service) and
  - (2) to supply electricity (providing content).

- As per Section 42(3), when open access is availed by a person ie., a person who opts to get supply from a person **other than the distribution licensee,** the duty of the distribution licensee with respect to such supply is **limited to that of a common carrier providing network services only**.
- In other words, the '***duty to supply***' is no longer vested with the distribution licensee as the consumer opts another person for the supply
- The duty of the incumbent distribution licensee is limited to the second function that is network services only

- Next Section 42(4)
  - *42(4) Where the State Commission permits a consumer or class of consumers to* ***receive supply of electricity from a person other than the distribution licensee*** *of his area of supply, such consumer shall be liable to pay an additional surcharge on the charges of wheeling, as may be specified by the State Commission, to meet the fixed cost of such distribution licensee* ***arising out*** *of his* ***obligation to supply***
  - That is, when a consumer receiving supply from a person other than the distribution licensee, distribution licensee only has an ***arising obligation to supply***

- The term **‘arising obligation’** is important in this context.
- The obligation arises, presumably only if such person binds the incumbent distribution licensee with such obligation (through agreement or by through legal enforcements) for supply. Ie., obligation arises out of an agreement or similar arrangement
- Duty Vs Obligation
  - Duty is typically derived from external sources such as societal norms, laws, or professional codes of conduct. It is an inherent part of one's role or position and is expected to be fulfilled regardless of personal desires or preferences.
  - Obligation, on the other hand, refers to a moral or legal requirement that one feels towards another person or entity. It could arise out of contractual terms.
    - For example, a police officer has a duty to protect and serve the community, a doctor has a duty to provide medical care to their patients,
    - On the other hand, a person may feel obligated to help a friend in need.

Summary

- As per Section 42(3) and 42(4), Open Access means a person avails supply from a person **other than the incumbent distribution licensee**.
- As per Section 42(3) the duty to supply no longer exists for incumbent distribution licensee when a person avail open access, and duty is limited to common carrier of supply
- Thus, simultaneous supply from incumbent distribution licensee and other sources is not envisaged in the Act.

THANK YOU

Annexure-IV

FOR 95th Meeting

4th April 2025

Context

- The FOR, in its 86th meeting held **on 26th June 2023** decided to constitute a Working Group for conducting a detailed examination of all RE related policy and regulatory issues. Chairman, KERC is the Chairperson of the WG.
- During the 4th FOR WG meeting held on **19th February 2024**, the WG discussed key design issues related to **VNM & GNM framework** as well as additional issues related to other metering mechanism. The WG expressed that the Model DRE Regulations (2019) can be updated covering the issues discussed & deliberated during the WG meetings.
- The WG also suggested following:
  - The existing structure of the Model Regulations is proposed to be retained.
  - New additions or modifications shall be accommodated within the existing structure, at suitable places within the Model Regulations.
  - A new Chapter for Peer-to-Peer Trading shall be introduced.
  - Suggestion to remove the existing Chapters on Independent Distributed Renewable Energy Systems (IDRES), Governance & Institutional Structure
- The WG also appraised the FOR on design and implementation aspects of VNM & GNM framework as well as other metering mechanism and it was discussed to update the Model DRE Regulations accordingly.

FOR Model Regulation for Grid Interactive DRE Sources (2024) – structure

1. Short title, and commencement
2. Definitions and interpretations
3. Scope and applicability
4. Control period
5. Metering Mechanism, eligible consumers allowed DRES capacities
   - 5.1 Net- Metering
   - 5.2 Net Billing
   - 5.3 Gross Metering
   - 5.4 Group Net Metering
   - 5.5 Virtual Net Metering
   - 5.6 Behind the Meter
6. Energy Accounting
   - 6.1 Net- Metering
   - 6.2 Net Billing
   - 6.3 Gross Metering
   - 6.4 Group Net Metering
   - 6.5 Virtual Net Metering
   - 6.6 Behind the Meter
7. Applicability of Charges
   - 7.1 Banking charges
   - 7.2 Group Net Metering
   - 7.3 Virtual Net Metering
8. Subsidies
9. Hosting Capacity
10. Interconnection with the grid: technical standards and safety
11. Metering infrastructure
12. Energy accounting during meter defect/failure/burnt
13. Application Process and procedure
14. Renewable Purchase Obligation for DRE
15. Peer-to-Peer Transactions
16. Power to Give Directions
17. Power to Relax
18. Power to Amend
19. Power to Remove Difficulties
20. Repeal and Saving

Important Features of Metering Mechanism

Metering Mechanism	Capacity that can be availed (kW)		Eligible consumer categories
	Minimum	Maximum	
Net Metering	1	Up to Sanction Load / Contract Demand	Domestic consumers, group housing, institutions run or managed by charitable organisations, government buildings including schools, building belonging to local authorities
Net Billing	1	Up to Sanction Load / Contract Demand	Commercial & Industrial Consumers (At all voltage level)
Gross Metering	1	Up to Sanction Load / Contract Demand	All Consumer Categories
Group Net Metering	5	Up to Sanction Load / Contract Demand of all participating service connections	All Consumer Categories
Virtual Net Metering	5	Up to Sanction Load / Contract Demand of all participating consumers	All Consumer Categories
Behind the Meter	5	Up to Sanction Load / Contract Demand	All Consumer Categories

Definitions and Interpretations ….. (1/2)

Term	Definition
Definitions Modified / Newly Added	• ***"Behind the meter" or "BTM"*** *means an arrangement in which the Distributed Renewable Energy System is connected behind the Consumers' meter, operating in parallel with the distribution licensee's grid, and not opting for any other metering or billing arrangement options and subject to other conditions mentioned in these Regulations;* • ***"Blockchain"*** *means digitally distributed, decentralized, public immutable ledger that exists across a network for recording transactions.* • *"**Distributed Renewable Energy System" or "DRES**" means an electricity generation system connected **at voltage level of 33 KV and below** using a distributed renewable energy source with or without energy storage;* • ***"Eligible Consumer(s)" or "Consumer(s)"*** *means a consumer of electricity in the area of supply of the distribution licenses, who uses or intends to use a DRES, installed at his premises or at any other location, depending on the metering mechanism, to meet all or part of or no part of his own electricity requirement.* • *"**Generation Meter"** means an energy meter installed to measure the electricity generated by the DRES;* • ***"Group Net Metering" or "GNM"*** *means an arrangement whereby surplus energy from a DRES is exported to the gird and the exported energy is adjusted in more than one electricity service connection(s) of the same name and same category of consumer located within the area of supply of the distribution licensee as specified by the Commission;* • ***"Gross Metering" or "GM"*** *means a mechanism whereby **the total energy generated from DRES** of a Prosumer and the total energy consumed by the Prosumer are accounted separately through appropriate metering arrangements and for the billing purpose, the total energy consumed by the Prosumer is accounted at the applicable retail tariff and total energy generated by DRES is accounted for at generic tariff determined by the Commission."* • ***"Hosting capacity"*** *means cumulative capacity of DRES allowed to be interconnected with the distribution network (feeder or distribution transformer) shall not exceed 100% of the feeder or distribution transformer capacity, as applicable.*

Definitions and Interpretations …… (2/2)

Term	Definition
Definitions Modified / Newly Added	• *"**Interconnection point"** means the interface point of the DRES with the network of the distribution licensee;* • ***"Net Billing" or "NB**" means a single bidirectional energy meter used for net-billing at the point of supply wherein the energy imported from the Grid and energy exported from DRES of a Prosumer are valued at two different tariffs, where -* ❖ *the monetary value of the imported energy is based on the applicable retail tariff;* ❖ *the monetary value of the exported renewable energy is based on on 75% of the last discovered SECI tariff for respective energy sources or reference rate as may be determined by the Commission;* ❖ *the monetary value of the exported energy is deducted from the monetary value of the imported energy to arrive at the net amount to be billed (or credited / carried-over)"* • *"**Net Metering" or "NM"** means a mechanism whereby energy exported to the Grid from **DRES of a** Prosumer is deducted from energy imported from the Grid in units (kWh) to arrive at the net imported or exported energy and the net energy import or export is billed or credited or carried over by the distribution licensee on the basis of the applicable retail tariff by using a single bidirectional energy meter for net-metering at the point of supply on the basis of the applicable tariff as determined by the Commission";* • ***"Peer-to-Peer Platform"** means blockchain based electronic platform provided by the Service Provider to sell energy generated through DRES.* • *"Renewable Energy Service Company" or "RESCO" means an energy service company which owns a DRES and **supplies renewable energy under different metering mechanisms provided under these Regulations.*** • ***"Virtual Net Metering" or "VNM"** means an arrangement whereby the entire energy generated from a DRES is exported to the grid and the energy exported is adjusted in more than one electricity service connection(s) of the participating consumers located within the area of supply of the licensee as specified by the Commission;*
Definitions Deleted	• *Definitions of "**Independent Distributed Renewable Energy System" , "IDRES Owner", "Prosumer Distributed Renewable Energy System", "Renewable Energy System", "Rooftop Solar PV**" are deleted.*

Scope and Applicability

Term	Definition
Scope and Applicability	• *These Regulations would apply to the **DRES installed in the area of supply** of the distribution licensee and owned by prosumer or RESCO.* • ***Consumers having pending arrears with the Distribution Licensee shall not be eligible to install DRES under these Regulations:*** *Provided that, where there is a dispute between the distribution licensee and the consumer, relating to any charge for electricity, such consumers shall be allowed to install DRES pending such resolution of dispute upon deposit of the disputed amount with the distribution licensee in accordance with Section 56 of the Act.* • *The consumer availing open access under Section 42(2) of the Act may also establish DRES in its premises under these regulations.*

Renewable Purchase Obligation

Term	Definition
Renewable Purchase Obligations	• *Distribution Licensee shall purchase certain percentage of its total energy requirement from distributed renewable energy sources in a year, as per the regulations issued by the Commission. The _____ (Name of State) Electricity Regulatory Commission may define quantum of purchase from distributed renewable energy sources*in alignment with the Renewable Energy Consumption Obligation (RCO) notified under the Energy Conservation Act, and amendment thereof.*

*The distributed renewable energy component shall be met only from the energy generated from renewable energy projects that are less than 10 MW in size and shall include solar installations under all configurations (net metering, gross metering, virtual net metering, group net metering, behind the meter installations and any other configuration) notified by the Central Government. The share of consumption of non-fossil sources as specified by MoP is mentioned in below table.

Year	Quantum of purchase (in %) from Distributed Renewable Energy sources (in terms of energy equivalent in kWh)
FY 2024-25	1.50%
FY 2025-26	2.10%
FY 2026-27	2.70%
FY 2027-28	3.30%
FY 2028-29	3.90%
FY 2029-30	4.50%

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Net Metering

Term	Definition
General Conditions	• *The prosumer may set up DRES under Net Metering framework to offset the prosumer's electricity consumption from the distribution licensee.*
Eligible Consumer Categories	• *Eligible consumer in the area of the distribution licensee may establish DRES under net metering arrangement on a first-come-first-serve basis, subject to the technical limitations as outlined in these Regulations.* • ***Domestic consumers, group housing, educational institutions or institutions run or managed by charitable organisations, government buildings, buildings belonging to local authorities shall only be eligible to establish DRES under net metering framework.***
Ownership Model	• *The prosumer may **own the DRES or may enter into a contract with the RESCO** on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES **shall not exceed the sanctioned load/contract demand** of the prosumer in case of net metering mechanisms.* *Provided further that minimum size of DRES that can be set up under net metering would **be 1 kW**.*
Surplus/Exported Energy Treatment at the end of settlement Period	• *The distribution licensee shall procure any excess energy generated by DRES at **DRES capacity wise generic/reference rate as determined by the Commission or at 75% of the last discovered SECI tariff** for respective energy sources.*
Interconnection Point	• *In case of net metering, the interface point shall be the appropriate meter as per CEA (Installation and Operation of Meters) Regulations, installed at consumer's premises i.e., **prosumer side of the meter.***
Applicable Charges	• *The quantum of electricity generated from the self-owned or the RESCO owned DRES under Net Metering arrangements, if installed on Eligible Consumer premises shall be exempted from **banking charges, wheeling charges, cross subsidy surcharge, and additional surcharge.***

Net Billing ……..(1/2)

Term	Definition
General Conditions	• *The prosumer may set up DRES under Net Billing to offset the prosumer's electricity purchase bill from the distribution licensee.*
Eligible Consumer Categories	• *Eligible consumer in the area of the distribution licensee may establish DRES under net billing arrangement on a first-come-first-serve basis, subject to the technical limitations as outlined in these Regulations.* • ***Commercial and Industrial consumers at all voltage level shall only be eligible to establish DRES under Net Billing framework.***
Ownership Model	• *The prosumer **may own the DRES or may enter into a contract with the RESCO** on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES **shall not exceed the sanctioned load/contract demand** of the prosumer in case of net billing mechanism.* *Provided further that minimum size of DRES that can be set up under net billing **would be 1 kW.***
Surplus/Exported Energy Treatment at the end of settlement Period	• *The distribution licensee **shall procure any instantaneous excess energy generated by DRES** at **DRES capacity wise generic/reference rate as** determined by the Commission from time-to-time for such systems or at **75% of the last discovered SECI tariff for respective energy sources***
Interconnection Point	• *In case of net billing, the interface point shall be the appropriate meter as per CEA (Installation and Operation of Meters) Regulations, installed at consumer's premises i.e., **prosumer side of the meter.***
Applicable Charges	• *The quantum of electricity generated from the self-owned or the RESCO owned DRES under Net Billing arrangements, if installed on Eligible Consumer premises shall be exempted from **banking charges, wheeling charges, cross subsidy surcharge, and additional surcharge.***

Net Billing ……..(2/2)

Term	Definition
Energy Accounting & Settlement	• *The distribution licensee shall undertake meter reading of both, the Renewable Energy Generation Meter and the Net Meter, for all Eligible Consumers, according to the regular billing cycle.* • *The energy generated by the **Renewable Energy Generating System shall be first used for self-consumption** and **surplus energy injected into the Grid or energy drawn from the Grid shall be billed as per following equation**:* • *Energy Bill of consumer = Fixed Charges + other applicable charges and levies + ($E_{DL} \times T_{RST}$) - ($E_{RE} \times T_{GC}$) – Billing Credit;* *Where :* ❖ *Fixed Charges means the Fixed/Demand Charges as applicable to the consumer category as per the applicable retail supply Tariff Order;* ❖ *Other charges and levies mean any other charges such as municipal tax, cess, etc.;* ❖ *EDL means the energy drawn from the Grid by the Prosumer ;* ❖ *TRST means the applicable retail supply tariff of the concerned consumer category as per the applicable retail supply Tariff Order of the Commission;* ❖ *ERE means the energy injected into the Grid by the Prosumer;* ❖ *TGC means the Generic Tariff approved by the Commission for that year ;* ❖ *Billing Credit is credit available from previous months;* • *The monetary value of the imported energy is debited based on the applicable retail tariff determined by the Commission from time to time. The monetary value of the exported energy is credited based on the generic tariff determined by the Commission from time to time. **The monetary value of the exported energy is deducted from the monetary value of imported energy to arrive at the net amount to be billed.*** • *If the cumulative credit amount exceeds the debit amount during any billing cycle, the net credit amount is carried over to the next billing cycle. At the end of a settlement period, the net credit balance (if any) shall be carried-over to the next settlement period.*

Gross Metering

Term	Definition
General Conditions	• *The prosumer may set up DRES to sell the entire electricity generated by DRES to the distribution licensee.*
Eligible Consumer Categories	• ***All consumer categories are allowed to set up DRES under gross metering framework.***
Ownership Model	• *The prosumer may own the DRES or may enter into a contract with the RESCO on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES **shall not exceed the sanctioned load/contract demand of the prosumer** in case of gross metering mechanism.* *Provided further that minimum size of DRES that can be set up under gross metering **would be 1 kW.***
Interconnection Point	• *In case of gross metering, the interface point shall be on the licensee side of the meter.*
Applicable Charges	• *The quantum of electricity generated from the self-owned or the RESCO owned DRES under Gross Metering arrangements, if installed on Eligible Consumer premises shall be exempted from **banking charges, wheeling charges, cross subsidy surcharge, and additional surcharge.*** • ***No parallel operation charges, grid support charges** should be levied on the quantum of electricity generated from the self-owned or the RESCO owned DRES under Gross arrangements.*
Energy Accounting & Settlement	• *The payment for energy exported from the DRES will be computed at **DRES capacity wise generic/reference rate determined by the Commission from time to time for such system.*** • *This shall be adjusted against the total billing demand for consumption of energy by the prosumer from the distribution licensee in every billing month.* • *In case gross energy exported from DRES billing amount exceeds the billing demand of the distribution licensee during any billing month, such an excess amount shall be paid by the distribution licensee to the prosumers.*

Group Net Metering ……..(1/2)

Term	Definition
General Conditions	• *The prosumer may set up DRES to* ***offset the electricity consumption of more than one electricity service connection(s) of the same name prosumer located within the area of supply of the distribution licensee.***
Eligible Categories	• ***All consumer categories are allowed t****o set up DRES under Group Net Metering framework.*
Ownership Model	• *The prosumer may* ***own the DRES*** *or may enter into a* ***contract with the RESCO*** *on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES to be installed by any consumer(s) under group net metering framework shall be up to* ***total sanctioned load/contract demand of all participating service connections.*** *Provided that the minimum capacity of DRES that can be set up under group net metering would be 5 kW.*
Interconnection Point	• *The power generated by DRES system shall be measured through a single net meter or smart meter by the distribution licensee.* • *The interconnection point of DRES with the distribution grid* ***shall be on the prosumer side of the net meter.***
Applicable Charges	• *The DRES (whether self-owned or third party owned) and participating service connections are connected on* ***the same DTL / same feeder / same S/S*** *(as decided by ……..(Name of State) Electricity Regulatory Commission),* ***no charges shall be applicable.*** • *The other service connections and the DRES* ***are not connected to the same DTL or same feeder or same S/S, all charges (except cross subsidy surcharge and additional surcharge) in accordance with Green Energy Open Access Regulations / Open Access*** *Regulations shall be applicable.* • ***No charges shall be applicable to the Cross-subsidized consumer categories*** *(i.e. consumer's where Average Billing Rate (ABR) is lower than Average Cost of Supply (ACoS)), implementing Renewable Energy System under GNM framework.* • *The ……..(Name of State) Electricity Regulatory Commission* ***may consider providing concession on applicable charges to the subsidized consumer categories*** *implementing Renewable Energy System under GNM framework.* • *The capital expenditure on account of Service Line cum Development (SLD) and network augmentations towards DRES*

Group Net Metering ……..(2/2)

Term	Definition
Energy Accounting & Settlement	• *The energy generated from DRES shall* ***be credited in the electricity bill of each participating connection(s),*** *for each billing cycle, as per* ***the priority indicated in the connectivity agreement*** *with the distribution licensee. The* ***sequence of priority for adjustment*** *shall be deemed to begin with the* ***service connection where the DRES is located.*** • *Where the export of units during any billing period exceeds the import of units at the connection where DRES is located, such surplus units injected into the grid shall be adjusted against the energy consumed in the monthly bill of service connection(s) in a sequence indicated in the priority list provided by the Consumer. The sequence of priority for adjustment shall be deemed to have begun with the service connection where the DRES is located;* • *The priority list for adjustment of the balance surplus energy against other electricity connection (s) may be revised by the Consumer once at the beginning of energy financial year with an advance notice of three months.* • *The* ***electricity consumption in any time block (e.g., peak hours, off-peak hours, etc.)*** *shall be* ***first compensated*** *with the electricity generation in the* ***similar time blocks*** *in the same billing cycle of the Consumer where the DRES is located, and any surplus units injected shall be adjusted against the energy consumed in the monthly bill of service connection(s) in a sequence indicated in the priority list provided by the Consumer, as if the surplus generation/ Energy Credits occurred during the off peak time block for Time of Day (ToD) Consumers and normal time block for Non-ToD Consumer.* • *Where during any billing period, the export of units either in Non-ToD Tariff or ToD Tariff exceeds the import of units by the electricity service connection(s), such surplus units injected by the Consumer shall be carried forward to the next billing period as energy credit and shown as energy exported by the Consumer for adjustment against the energy consumed in subsequent billing periods within the Settlement Period in the sequence indicated in the priority list.* • *The* ***unadjusted net credited units of electricity as at the end of each financial*** *year shall be considered as units purchased by the Distribution Licensee at* ***DRES capacity wise generic/reference rate determined by the ……..(Name of State) Electricity Regulatory Commission for the year or 75% of the last discovered SECI tariff*** *for respective energy sources. Provided that, at the beginning of each Settlement Period, the cumulative quantum of injected electricity carried forward will be re-set to zero.* • ***The service connection where Renewable Energy System is located****, shall* ***consume at least 20% of total energy generated by Renewable Energy System.*** *The* ***equivalent units (out of 20% of generated RE power), which are not consumed at source connections, shall be considered as lapsed energy.***

Virtual Net Metering ……..(1/2)

Term	Definition
General Conditions	• ***The group of two or more prosumer(s) may set up DRES to offset the electricity consumption of more than one electricity service connection(s) of participating consumers located within the area of supply of the distribution licensee***
Eligible Categories	• ***All consumer categories*** *are allowed to set up DRES under Virtual Net Metering framework.* • *The eligible consumers belonging to* ***the same consumer category and same tariff structure*** *shall only be allowed to install DRES system under virtual net metering framework.*
Ownership Model	• *The prosumer may own the DRES or may enter into a contract with the RESCO on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES to be installed by any consumer(s) under virtual net metering framework shall be* ***up to total sanctioned load/contract demand of all participating service connections****. Provided that the minimum capacity of DRES that can be set up under virtual net metering would be 5 kW.*
Inter-connection Point	• *The power generated by DRES shall be measured through a single renewable energy meter by the distribution licensee.* • *If installed within the* ***premise of any participating consumer*** *or within the premise of a non-participating consumer, the interconnection point of shall be on the* ***grid side of the consumer's energy accounting meter.*** • *If installed at any other location, other than the premise of a consumer of the DL, the interconnection point and metering point shall be determined according to CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 and subsequent amendments.*
Applicable Charges	• *The DRES (whether self-owned or third party owned) and participating consumers are connected on the* ***same DTL / same feeder / same S/S****, no* ***charges shall be*** *applicable. In other scenario,* ***all charges in accordance with GEOA/ Open Access Regulations shall be applicable****.* • ***No charges shall be applicable to the Cross-subsidized consumer categories*** *(i.e. consumer's where Average Billing Rate (ABR) is lower than Average Cost of Supply (ACo)), implementing DRES under VNM framework. However,* ***the same shall be applicable to subsidized and other categories of consumers implementing Renewable Energy System under VNM framework.*** • *The ……..(Name of State) ERC may consider providing concession on applicable charges to the subsidized consumer*

Virtual Net Metering ……..(2/2)

Term	Definition
Energy Accounting & Settlement	• *The energy generated from the DRES shall be* ***credited in the monthly electricity bill of each participating consumer(s) as per the ratio of procurement from DRES indicated under the agreement/MoU*** *entered by the Consumer(s) and submitted to the Distribution Licensee.* • *The Consumer(s) shall have the option to change the share of credit of electricity from DRES by submitting a fresh agreement/MoU subject to the ratio of procurement from DRES indicated under the agreement/MoU entered by the Consumer(s) once at the beginning of the financial year with an advance notice of three months.* • *Where the service connection of any participating consumer(s) is disconnected due to any reason under any law for the time being in force, the unadjusted units/remaining credits of that consumer shall be paid by the Distribution Licensee at the end of the financial year;* • ***The electricity consumption in any time block (****e.g., peak hours, off-peak hours, etc.) shall be* ***first compensated with the electricity generation in the similar time blocks in the same billing cycle of the participating consumer(s****). **Any surplus generation** over consumption in any time block in a billing cycle shall be accounted as if* ***the surplus generation/ Energy Credits occurred during the off-peak time block;*** • *Where the units credited during any billing period of any participating Consumer exceeds the import of units by that consumer, such surplus credited units shall be carried forward in the next billing period as energy credits for adjustment against the energy consumed in subsequent billing periods within the settlement period of each participating Consumer(s);* • *The* ***unadjusted net credited units of electricity as at the end of each financial year*** *shall be considered as units purchased by the Distribution Licensee at* ***DRES capacity wise generic/reference rate determined by the ……..(Name of State) Electricity Regulatory Commission for the year or 75% of the last discovered SECI tariff for respective energy sources****. Provided that, at the beginning of each Settlement Period, the cumulative quantum of injected electricity carried forward will be re-set to zero.*

Behind the Meter

Term	Definition
General Conditions	• *The consumer may set up **DRES for the self-consumption and not sell electricity generated by DRES to the distribution licensee**.* • *The DRES system shall be connected behind the Consumer's meter, operate in parallel with the distribution licensee's grid and not opt for any other metering arrangements defined in these Regulations.* • *The consumer **shall install reverse power flow relay to ensure that no energy is injected into the grid from such DRES installed behind the consumer's meter.***
Eligible Consumer Categories	• ***All consumer categories are allowed** to set up DRES under behind the meter framework.*
Ownership Model	• *The prosumer may own the DRES or may enter into a contract with the RESCO on mutual commercial arrangements for the establishment of the DRES under different metering mechanism provided under these regulations.*
Individual Project Capacity	• *The capacity of DRES **shall not exceed the sanctioned load/contract demand of the prosumer** in case of behind the meter mechanism.*
Interconnection Point	*In case of behind the meter, the DRES system shall be **connected behind the Consumer's meter.***
Energy Accounting & Settlement	• *The DRES connected behind the Consumer's meter, operating in parallel with the Distribution Licensee's grid, and not opting for any metering mechanism defined in these Regulations, shall be allowed only **after prior intimation to the respective distribution licensee*** • *The Consumer shall ensure **that no energy is injected into the grid from such DRES installed behind the Consumer's meter:*** *Provided that, any quantum of energy injected by such DRES connected behind the Consumer's meter shall be **considered as inadvertent injection and shall neither be paid for nor settled by the distribution licensee:*** *Provided further that, any quantum of energy injected by such DRES connected behind the Consumer's meter shall be considered as inadvertent injection and penalty shall be levied on such inadvertent injection as per the applicable relevant*

Additional Clauses

Term	Definition
Energy accounting during meter defect/failure/burn	• *In case of defective/failure/burnt condition of any meter, the prosumer shall report the failure, to the distribution licensee in the specified format of distribution licensee.* • *The distribution licensee shall replace the meter as specified in the Electricity Supply Code.* • *The electricity generated by the renewable energy system during the period in which the meter is defective shall be computed on normative basis.*
Subsidy	• *The eligible consumers are entitled to avail of the applicable subsidies as per MNRE's as well as State Government's notifications/guidelines issued from time to time.* • *The ……..(Name of State) Electricity Regulatory Commission may estimate Feed-in or generic Tariff after taking into account the subsidy provided by the MNRE or State Government.*

P2P Transactions through Block Chain Technology

- *The distribution licensee shall provide net metering or net billing or gross metering or virtual net metering or group net metering to the eligible consumers in its area of supply, as decided by the ……..(Name of State) Electricity Regulatory Commission from time to time on non-discriminatory and first come first served basis, subject to the technical limitations as outlined in these Regulations.* ***These DRES metering arrangements recognize only the sale of energy between consumers and the distribution licensee.***
- *The ……..(Name of State) Electricity Regulatory Commission* ***may allow prosumer to sale surplus power generated by DRES to another consumer at an agreed tariff through Peer-to-Peer transactions in a secured and reliable way with proper accounting and billing mechanism implemented with the help of Blockchain technology.***
- *Provided that such* ***sale of surplus power generated by DRES to another consumer will be allowed till cumulative capacity doesn't exceed 500 MW****, as may be decided by the ……..(Name of State) Electricity Regulatory Commission.*
- ***Domestic category consumers shall only be allowed to sale surplus power generated by DRES to another domestic consumer through this P2P based blockchain technology.***
- *The distribution licensee* ***shall design, develop and implement a few pilot projects on Peer-to-Peer transactions using blockchain technology*** *and share results/findings with the Commission. The distribution licensee shall take prior approval of the Commission prior to implementation of pilot projects.*
- *The ……(Name of State) Electricity Regulatory* ***Commission may issue separate regulations or guidelines on "Implementation of Peer-to-Peer DRES Transactions through Blockchain based technology" for the distribution licensee covering following:***
  - *Objectives & General Principles;*
  - *Trading Options;*
  - *Roles and Responsibilities of P2P participants, Service Providers and Distribution Licensee*
  - *Procedure for Implementation and Reporting*
  - *Energy Accounting and Settlement*
  - *Any other information that may be important*

- Thank you