Policy-Regulatory Challenges Integrating Renewables

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Outline

- Status of renewable energy and its characteristics
- Few technical and economic aspects of grid integration in the Indian context
- Addressing distribution sector concerns/challenges and looking at the medium-long term transformation imperative.

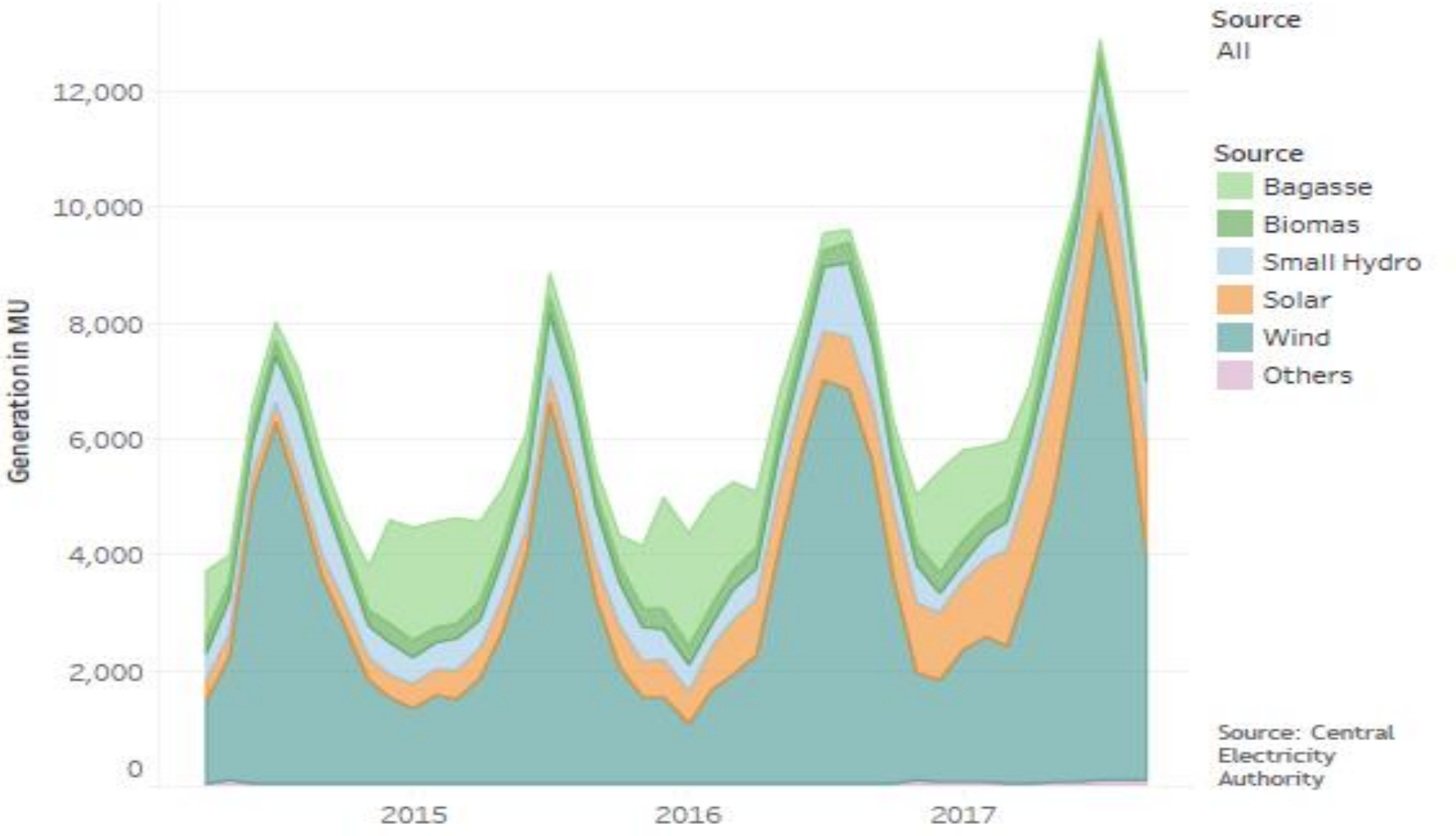
RE prices, targets and rapid deployment

- Direct generation price no longer seems a concern
  - Solar PV (Rs 2.44 - 2.97/kWh); Wind (Rs 2.64 - 3.42/kWh)
  - New coal power projects – Rs 4-5/kWh

- All India RE capacity and annual generation
  - 2017: 60 GW (18%) and 82 TWh (6.5%)
  - **2022: 175 GW (33%) and 327 TWh (21%)**

- **~ 3.5 x increase** in speed of deployment (~32 GW in last five years (2012-17), 115 GW expected in next five (2017-22))
  - Significant implications for policy-regulation; esp. grid integration

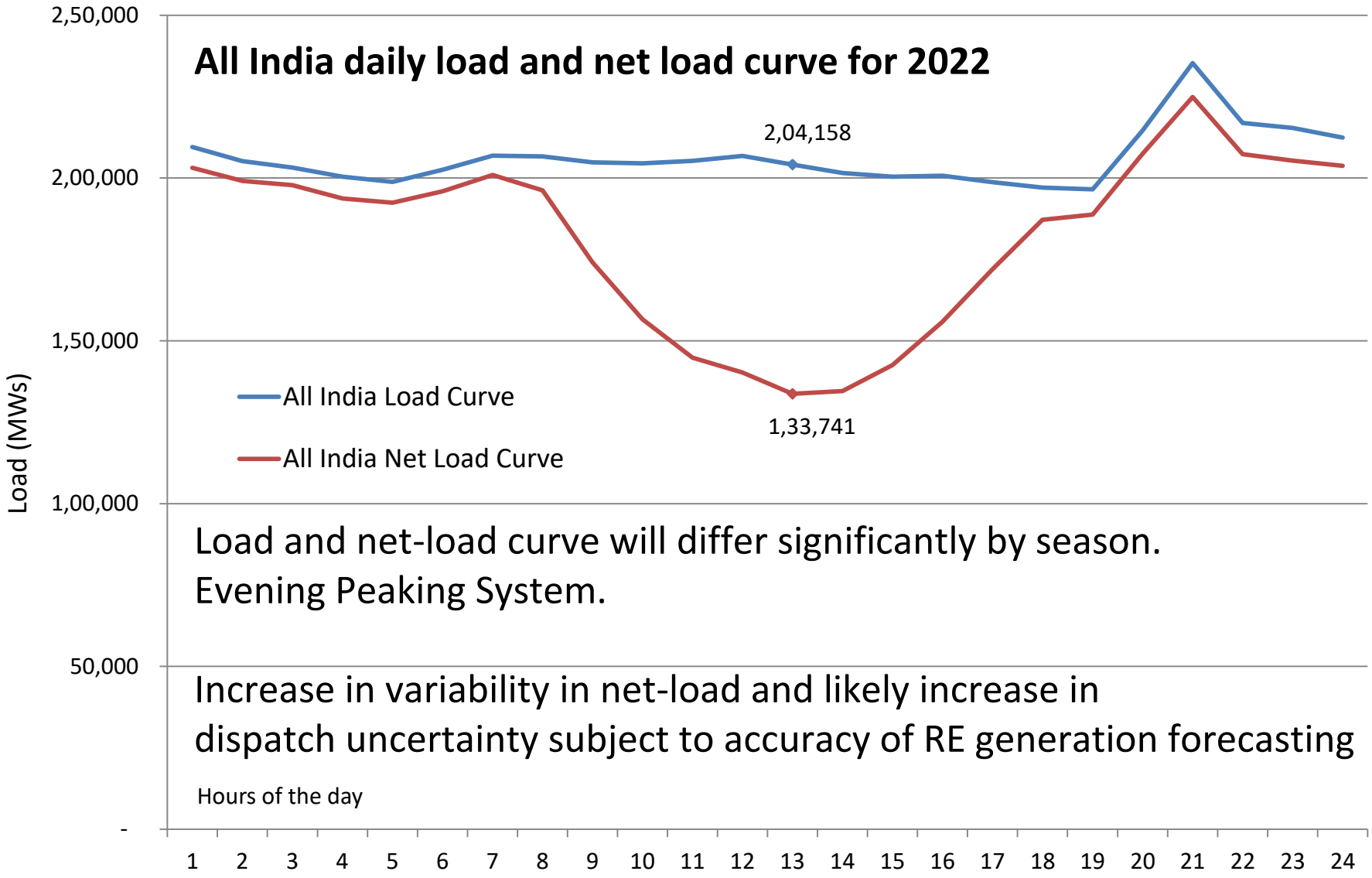
RE Generation characteristics: seasonality



Wind and small hydro linked to monsoon; bagasse picks up post monsoon

Source: CEA, interactive data visualisation from Prayas Renewable Energy portal

RE Generation characteristics: Diurnal variation



Source: CEA, 19th EPS, net load curve assumes 175 GW in place considering a typical day

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Scheduling generation and pricing deviations

- Forecasting, scheduling and deviation settlement regulations
  - Operational at regional level, states yet to implement.
  - 10-15% error band with no penalty; reducing tolerance over time.
  - Deviation settlement of intra-state projects with inter-state transactions.

- Possible system benefit charge: to cover funding deficit of state imbalance pool.
  - To address combination of RE's balancing costs, cost of additional reserves, backing down cheaper thermal power.
  - Need to strictly differentiate between RE and load variability.
  - Spread cost to all consumers or re-assign to RE generators.

Forecasting, scheduling and deviation settlement charges- Need to re-align DSM penalties for different OA transactions

Type of OA transaction	DSM penalty linked to	Percentage Deviation			
		0–15%	15–25%	25– 35%	>35%
		Deviation Penalty (₹/kWh)			
		0%	10%	20%	30%
Inter-state OA transactions	PPA tariff. We have assumed ₹2.65/kWh as the recently discovered solar price for this example.	0	0.265	0.53	0.8
Inter-state and intra-state OA transaction wherein buyer is not accounting for RPO (REC and captive projects)	National Average Power Purchase Cost as determined by CERC. It was ₹3.48/kWh for 2016–17(CERC, 2017b).	0	0.35	0.70	1.04
Intra-state OA transactions	Fixed absolute value penalty specified in ₹/kWh	0	0.50	1.00	1.50

Source: Prayas (Energy Group) analysis

Minimising RE integration costs

- National/Regional coordination of scheduling-dispatch
  - Increase balancing area; regional cooperation can minimise area control error due to RE.
  - sharing/banking of generation resources across states

- To integrate more RE, critical for system to respond appropriately
  - Schedule based accounting in states; intra-day trading, flexible coal operation, ancillary services, better demand forecasting by DISCOMs etc. These needed for effective grid operation, irrespective of RE.

- New technical requirements for wind/solar generators (LVRT, reactive power support, regulation of active power etc.) to support grid operation/ancillary services.

Low capacity value (wind/solar)- evening peaking system

- Curtailment very likely at high RE shares, esp. with surplus situation in many states
  - strongly linked to wind/solar mix and its prices. Need to value RE beyond mere generation price to include system value (eg: capacity value, need for reserves)
  - Future of RE targets (RPO) and its solar and non-solar categories
  - Compensation important as RE has single part tariffs unlike coal. Compensation for grid unavailability or backing down (for non grid security/safety reasons)

- Future of must run status
  - possible two part tariff for wind and solar similar to pricing of large hydro. Principle to apportion between fixed and variable tariff?
  - Will be aligned with national schedule based accounting system

- For more info on value of wind/solar see, Deshmukh R. et al, 2017. Cost and Value of Wind and Solar in India's Electric System in 2030

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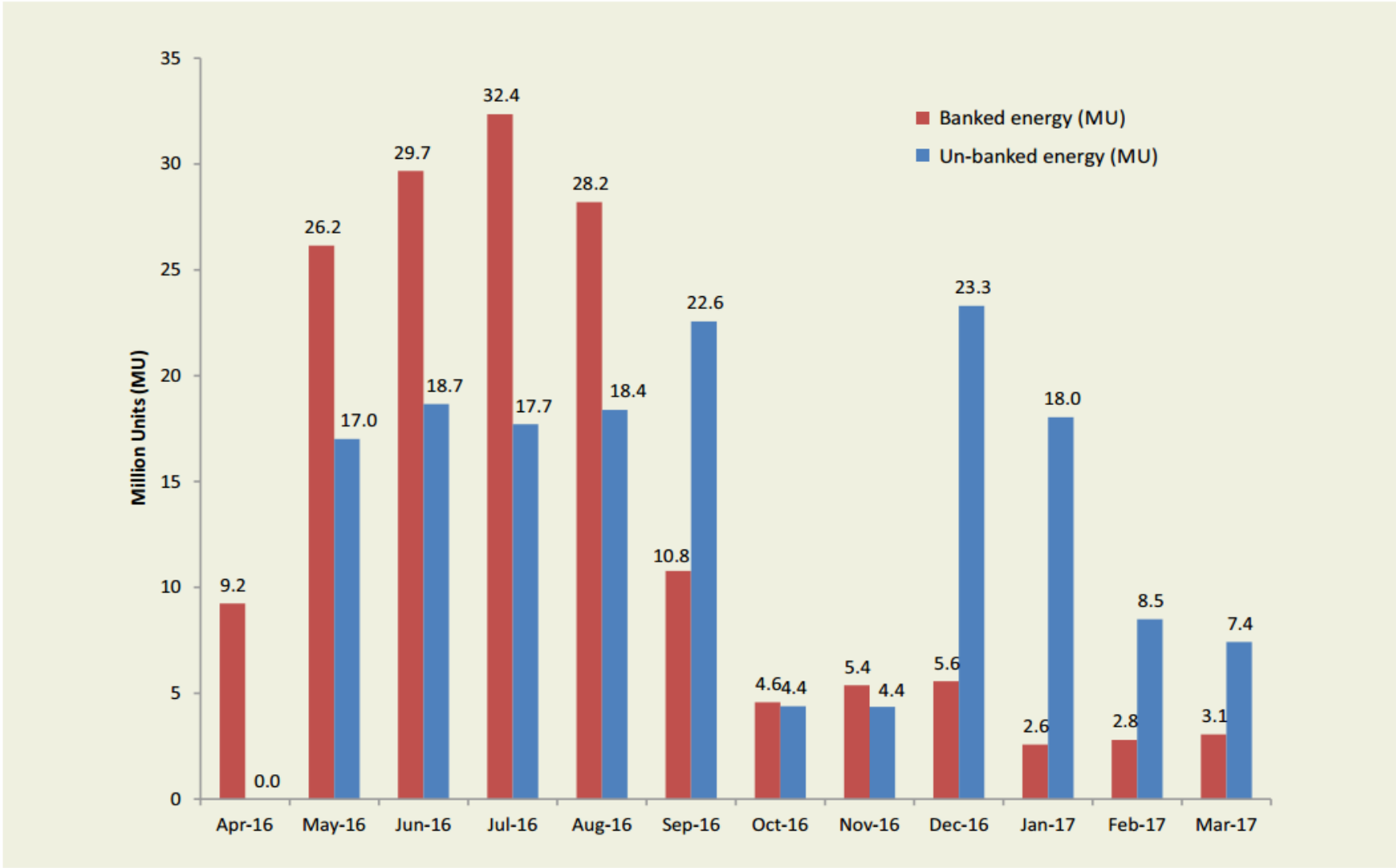
Energy Banking for RE-OA

- Need for energy banking: Seasonal and diurnal variations , low CUF, mismatch of generation and load in real-time.
- Broad characteristics of existing banking mechanism
  - Charge: 2% in-kind on banked/drawl of energy
  - Period: mostly one year
  - Buy-back rate - % of applicable wind tariff in state, APPC,% of energy charges for large industrial consumers
  - Restrictions on time of injection, and withdrawal of the banked energy: diurnal and seasonal
- Implications
  - Difference between the variable cost of power purchase at the time of injection and drawal of the banked energy
  - Difference passed on to the non-open access consumers of DISCOM

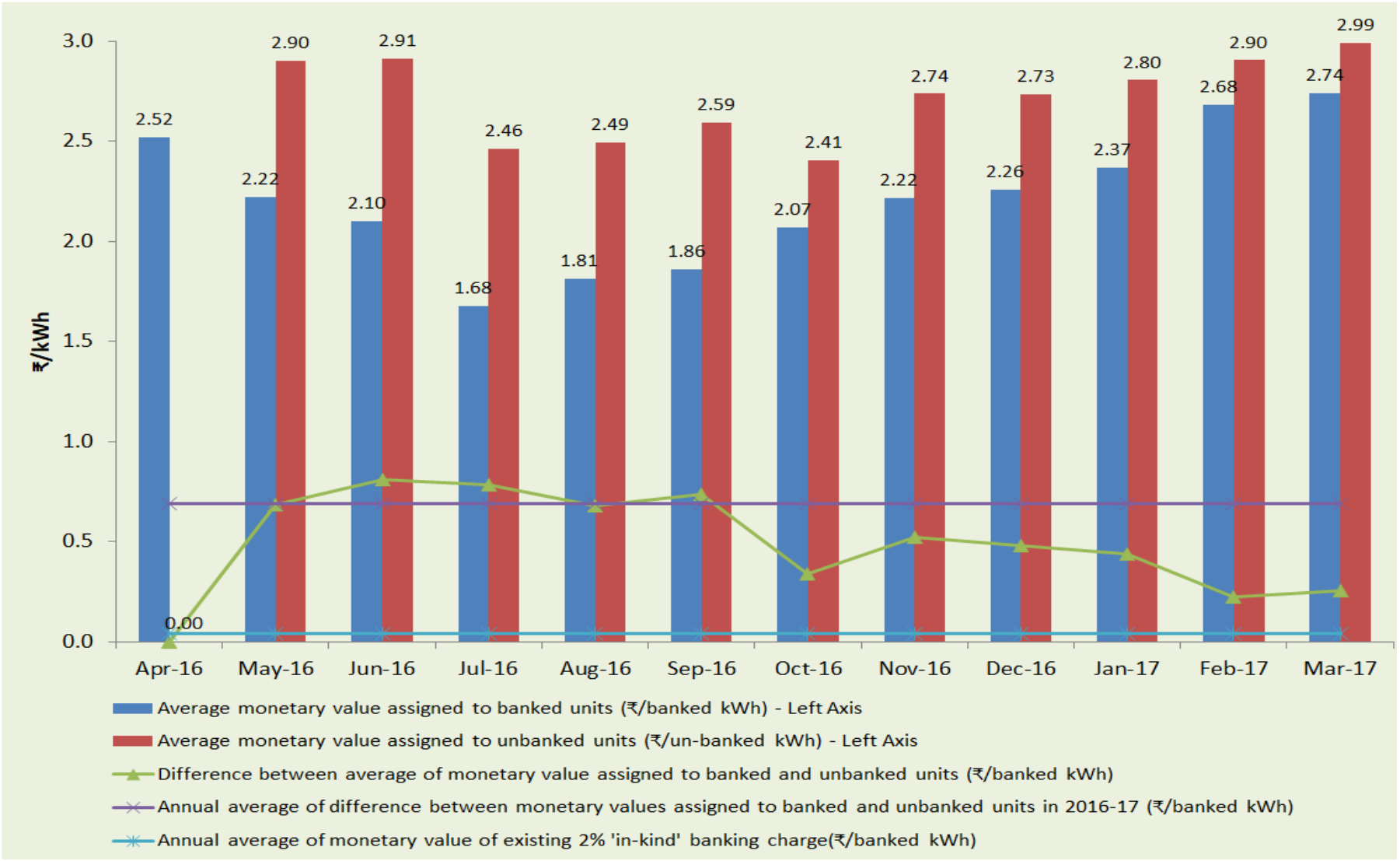
- MSEDCL proposal for new banking framework (case 85 of 2017 before MERC)

Monthly trend of renewable energy banking and un-banking in MSEDCL area in FY 16–17



Source: : Prayas (Energy Group) analysis based on MSEDCL petition in case 85 of 2017

Average monetary value of banked and un-banked energy (₹/kWh) in MSEDCL area in FY 16-17



Implications of new banking framework

- Data specific to MSEDCL, banking charge will vary across DISCOMs depending on DISCOM and consumers load and generation profile and costs.

- Banking Charge: Rs. 0.22-0.81/kWh of banked energy (Rs. 0.69/kWh on average)
  - If 40% of energy is banked, landed price of each unit will increase by Rs. 0.28/kWh; existing charge is Rs. 0.06/kWh (2% banking charge)
  - Hence price will increase by Rs 0.22/kWh, i.e. a 3% increase over landed price of Rs 7.69/kWh

Larger transformation imperative

- DISCOM's traditional role, political economy of sector changing
  - Old challenges remain: financial viability, poor QoS, high tariffs
  - New ones: Growing surplus, sales migration. Non-DISCOM supply options, esp. RE based becoming more economical. DISCOM may turn mainly into a wires utility for large consumers.

- Implications
  - Significant pressure to reduce inefficiencies across the value chain
  - Need for new consumer tariff designs (traditional levers of tariff and cross-subsidy will be ineffective);
  - Deepen/broaden power markets
  - Improve supply quality issues as they will become as political as tariff.
  - New challenges for addressing 'governance deficit'

- A robust grid and economically viable distribution sector is necessary for scaling up for RE.

Summary

- RE needs a broad long term vision, yet nimble policy-regulatory framework
  - Effective ongoing review and correction mechanism can bring agile responses to dynamic sectoral changes, rapid deployment
    - Significant institutional strengthening, data management etc.
  - RE planning/operation needs to take more cognizance of larger sectoral challenges, cannot remain insulated
    - For eg: surplus situation and increasing RPOs
  - Needs more consultative processes/coordination, taking states and DISCOMs concerns on board.
    - New net metering rules, gradual removal of OA concessions for RE
- Critical to understand, minimise and internalise grid integration costs to improve DISCOMs acceptance. Cost needs to be passed on to the RE sector over time and shared equitably among appropriate obligated entities.

THANK YOU

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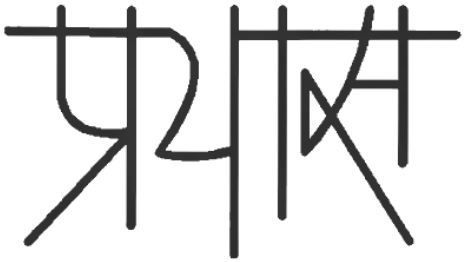

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