Comments on the Staff Discussion Paper

CERC - Shortening the Scheduling Timeline for Real Time Markets in India[1]

Executive Summary

The proposed movement of the Real Time Market (RTM) closer to delivery is directionally welcome. It can improve forecast quality, DISCOM portfolio balancing and renewable integration by reducing the time gap between the market decision and physical delivery. Some specific comments on the document and corresponding relevant recommendations are given below.

Specific Comments and Suggestions

1. RTM liquidity may not necessarily increase

Reducing the gate closure timeline can improve the usefulness of the Real-Time Market (RTM) by enabling participants to make decisions based on more accurate demand and renewable generation forecasts closer to the delivery period. However, an increase in RTM utility does not necessarily imply an increase in RTM traded volumes.

If DISCOMs and other market participants are able to revise long-term contractual schedules, bilateral transactions, or other procurement arrangements closer to real time, a portion of the residual imbalance that would otherwise be settled through RTM may be addressed before the RTM session itself. Consequently, RTM may evolve into a smaller but more efficient balancing market focused on managing genuine residual deviations rather than serving as a primary source of energy procurement.

Accordingly, lower RTM volumes should not be interpreted as a negative outcome if accompanied by reductions in DSM deviations, scheduling errors, renewable energy curtailment, and overall balancing costs.

2. RTM Price Volatility and DSM Implications

As market clearing moves closer to actual delivery, bids are likely to incorporate more accurate and timely information, including demand fluctuations, renewable generation variability, transmission constraints, generator outages, reserve scarcity, and weather-related events. Consequently, RTM prices may become more responsive to prevailing system conditions and may exhibit greater volatility compared to a market design with a longer gate-closure duration.

Such volatility should not necessarily be viewed as undesirable. In many mature electricity markets, short-term price movements provide valuable signals regarding the real-time value of flexibility, reserves,

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ramping capability, storage, and demand response resources. These signals become increasingly important as renewable energy penetration increases and system operations become more dynamic.

At the same time, the implications of RTM price volatility may extend beyond the RTM itself and influence the Deviation Settlement Mechanism (DSM). Under the existing DSM framework, the Normal Rate (NR) for deviation settlement is linked to market outcomes through the weighted average prices of the Integrated Day-Ahead Market (IDAM), Real-Time Market (RTM), and Ancillary Services. Therefore, any increase in RTM price volatility resulting from reduced gate closure timelines may also influence DSM settlement rates.

While shorter gate closure is expected to improve forecast accuracy and reduce overall deviation volumes, the corresponding impact on DSM price formation may require careful assessment. In situations where RTM prices reflect genuine scarcity, reserve shortages, congestion, or renewable variability, higher DSM settlement rates may strengthen incentives for schedule discipline and accurate forecasting. However, it is equally important to ensure that DSM charges remain aligned with actual system conditions and are not unduly influenced by temporary liquidity constraints or market concentration.

Accordingly, it may be useful for the Commission to assess whether the existing weighting of RTM and Ancillary Service prices within the DSM Normal Rate formulation remains appropriate under a shorter gate-closure framework. Such an assessment could examine the interaction between reduced forecast errors, lower deviation volumes, RTM price volatility, ancillary service deployment, and overall balancing costs.

Suggestion: The Commission may closely monitor:

- RTM price volatility trends;
- DAM–RTM price spreads;
- Congestion-driven market separation;
- Liquidity levels during stressed system conditions;
- Frequency and magnitude of DSM deviations;
- Impact of RTM prices on DSM settlement rates;
- Ancillary service deployment and associated charges; and
- Repeated strategic bidding behavior.
- The Commission may monitor RTM buy-sell depth by time of day and link timeline reform with the development of storage, flexible generation and demand response programs.

Such monitoring would help distinguish volatility arising from genuine system scarcity and operational conditions from volatility resulting from low liquidity, market concentration, or other structural market factors, while ensuring that both RTM and DSM frameworks continue to support efficient market outcomes, reliability, and renewable energy integration.

3. Need to Review of RTM Gate Closure and DSM Framework under High Renewable Penetration

The proposal for reducing the RTM gate closure timeline is a positive step toward improving market efficiency and operational flexibility. A shorter gate closure period would enable market participants to utilize more accurate demand and generation forecasts closer to the delivery period, thereby improving scheduling decisions and reducing forecast uncertainty.

Potential Benefits

- Improved demand and renewable generation forecasting accuracy
- Reduced DSM deviations and associated penalties
- Lower renewable energy curtailment
- Better grid balancing and operational efficiency
- Enhanced market liquidity and market participation
- Improved utilization of available generation resources
- More efficient reserve management and ramping support

However, in the Indian context, DISCOMs often rely not only on the RTM but also on the Deviation Settlement Mechanism (DSM) as an operational balancing tool. In situations where market procurement is insufficient or unavailable, DSM effectively allows overdrawal or underdrawal to manage demand-supply imbalances, albeit with applicable deviation charges[2] (Clause '*8. Charges for Deviation*'). Therefore, any reform in RTM gate closure timelines should also be evaluated alongside the existing DSM framework.

Further, the current DSM regulations already provide certain flexibility through Volume Limits for Super RE-Rich States and RE-Rich States. As renewable energy penetration continues to increase toward India's target of **500 GW of non-fossil capacity by 2030**, it may be appropriate to undertake a comprehensive study to assess whether additional operational flexibility is required within the DSM framework. Such a review may consider:

- Impact on renewable energy curtailment
- Transmission congestion management benefits
- Support for system ramping requirements
- Reserve adequacy and balancing needs
- Interaction between RTM participation and DSM deviations
- Operational requirements during stress hours and high-RE periods

Accordingly, a dedicated study may be undertaken to evaluate the combined impact of **reduced RTM gate closure timelines and DSM flexibility provisions**, ensuring that future market design supports reliability, renewable integration, efficient resource utilization, and overall grid security.

[2] **Central Electricity Regulatory Commission (CERC),** *Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related Matters) Regulations, 2024*, New Delhi, India, Aug. 2024. [Online]. Available: CERC DSM Regulations 2024. Accessed: Aug. 27, 2025

4. Adequacy of the Proposed 5-Minute RTM Bidding Window and Operational Readiness

The proposed reduction in the RTM bidding window to five minutes has the potential to improve market responsiveness and enable participants to make decisions based on more accurate demand, renewable generation, and system condition forecasts. Such a framework may be well suited for participants equipped with automated portfolio optimization tools, API-based bidding systems, advanced forecasting platforms, and predefined trading strategies.

However, the proposed timeline may present operational challenges for smaller DISCOMs, renewable energy generators, Qualified Coordinating Agencies (QCAs), captive consumers, open access consumers, and other market participants that may not yet possess comparable levels of automation and digital infrastructure. As market timelines become increasingly compressed, the ability to process updated forecasts, evaluate portfolio positions, submit bids, and communicate schedules within a short window becomes critical.

With increasing renewable energy penetration and the growing role of QCAs in managing large renewable portfolios, it may be useful to assess the interaction between forecasting obligations, DSM provisions, RTM participation, scheduling processes, and emerging flexibility mechanisms. A shorter gate-closure framework would require QCAs and renewable generators to operate with significantly enhanced forecasting and scheduling capabilities, including:

- Faster forecasting updates and revisions;
- Near real-time weather data integration;
- Automated bidding and scheduling systems;
- Enhanced communication and data exchange infrastructure; and
- Improved portfolio optimization capabilities.

While larger market participants may be able to adapt relatively quickly, smaller entities may face technology, resource, and operational capability constraints that could limit their effective participation in the market.

5. Storage and flexible resources may gain value

Battery energy storage systems and pumped storage have time chronological operating constraints because their bids depend on state of charge, expected future prices and future operating requirements. A storage owner bidding closer to delivery will have a better estimate of its actual state of charge before the delivery period. This allows better decisions on whether to charge, discharge or conserve energy for later periods. Similarly, hydro, gas based generation and demand response may become more valuable as RTM moves closer to real time.

Recommendation: Bringing RTM closer to delivery can make RTM a more meaningful flexibility market. However, this requires clear rules for storage and flexible resource participation across RTM, TRAS and other ancillary services.

6. Readiness Towards 5-Minute Scheduling and Dispatch

The proposed reduction in RTM gate closure timelines may be viewed as an important step toward the future evolution of the Indian power market, including the potential transition to 5-minute scheduling and dispatch frameworks. As renewable energy penetration increases, particularly from solar and wind resources, shorter scheduling intervals can help reduce forecast uncertainty, improve system balancing, and enhance overall operational efficiency.

From a system operation perspective, shorter scheduling intervals allow generation schedules to better reflect actual system conditions, particularly during periods of rapid renewable generation changes and steep ramping requirements. This is especially relevant during morning solar ramp-up periods, evening solar ramp-down periods, and periods of sudden weather-induced renewable variability.

A transition toward 5-minute scheduling may therefore provide several potential benefits:

- Improved demand and renewable generation forecasting accuracy;
- Reduced scheduling uncertainty and forecast errors;
- Lower DSM deviations and balancing costs;
- Reduced renewable energy curtailment;
- Better management of ramping requirements;
- Improved utilization of battery storage and flexible resources;
- Enhanced reserve management and ancillary service optimization; and
- More efficient real-time market price discovery.

In particular, improved visibility of short-term renewable variability may reduce the requirement for maintaining large balancing margins and may help optimize the deployment of Ancillary Services (AS), thereby reducing reserve scarcity under certain operating conditions.

However, successful implementation would require significant operational and technological readiness across the sector, including:

- Advanced forecasting systems;
- Automated scheduling and bidding platforms;
- Real-time telemetry and data acquisition systems;
- Faster communication infrastructure;
- Enhanced market management systems; and
- Readiness of SLDCs, RLDCs, generators, DISCOMs, QCAs, and market participants.

Accordingly, while reduced RTM gate closure may be an important intermediate step toward a future 5-minute scheduling framework, a detailed assessment of system readiness, cost-benefit implications, operational requirements, and international experience may be undertaken before considering a broader transition.