Comments of Karnataka SLDC on the Discussion Paper on "Shortening the Scheduling Timeline for Real Time Markets in India"

Karnataka State Load Despatch Centre (Karnataka SLDC) appreciates the initiative taken by the Hon'ble Central Electricity Regulatory Commission (CERC) in issuing the Discussion Paper on "**Shortening the Scheduling Timeline for Real Time Markets in India**", particularly the proposal to reduce the scheduling timeline from the existing 75 minutes to 50 minutes. The proposed framework is a significant step towards enhancing real-time balancing efficiency, improving renewable energy integration, reducing renewable energy (RE) curtailment, and strengthening grid discipline under increasing renewable penetration.

From the SLDC perspective, with the present level of automation available in NOAR, WBES, SCUC/SCED processes, telemetry systems and real-time market operations, the proposed timeline can be further optimized. Karnataka SLDC submits that the total scheduling timeline may be further reduced from the proposed 50 minutes to around 45 minutes or even less through suitable operational streamlining and parallel processing of activities by Grid-India, Power Exchanges, SLDCs and generators without compromising system security.

The Karnataka power system is presently experiencing very high penetration of Renewable Energy (RE) sources such as solar and wind generation. As per the present installed capacity, the total installed capacity in the State is about 37,927 MW, out of which Non-Conventional Energy (NCE) capacity is about 21,916 MW, accounting for nearly 58% of the total installed capacity. The installed RE capacity includes approximately 10,870 MW of solar and 8,232 MW of wind generation. While such large-scale renewable integration supports the State's clean energy transition goals, the intermittent and variable nature of RE

generation poses substantial operational challenges for real-time grid management.

From a system operation perspective, maintaining Area Control Error (ACE), grid frequency and Deviation Settlement Mechanism (DSM) limits within permissible operating range has become increasingly challenging due to sudden fluctuations in renewable generation, forecast errors, rapid weather variations, evening ramping conditions and dynamic load behaviour. In such scenarios, reducing the scheduling and gate closure timelines closer to actual delivery becomes essential for ensuring grid stability, improving balancing efficiency and minimizing DSM exposure.

Karnataka SLDC submits that with increasing renewable penetration across the country, the Indian grid is witnessing significant real-time variability and forecasting deviations. Such large-scale RE integration requires scheduling corrections much closer to real-time operation to effectively absorb renewable energy variations and demand fluctuations. Shorter scheduling timelines would help improve renewable energy absorption, reduce RE curtailment, improve balancing efficiency and support maintaining national grid frequency within the prescribed operating band.

Internationally, advanced electricity markets and balancing mechanisms operate much closer to real-time delivery. In several European markets, balancing and intraday market **gate closures are typically within 5 to 15 minutes ahead of delivery**. Considering the operational maturity achieved in India over the last five years of Real Time Market (RTM) implementation, along with the successful implementation of NOAR, SCUC/SCED and automation tools, the present Indian scheduling timeline may still be considered relatively conservative.

Further, Karnataka SLDC strongly supports the observations made by various stakeholders in the discussion paper regarding reduction of the "Revision of Schedule" **effectiveness timeline from the existing 7th/8th time block to the 3rd/4th time block ahead of delivery**. Such reduction is critically important for renewable-rich States, as the current scheduling framework does not adequately capture rapid changes in renewable generation and demand patterns. If schedule revisions are permitted closer to delivery, the majority of scheduling corrections can be addressed through schedule revision mechanisms itself, thereby reducing excessive dependence on the Real Time Market for balancing purposes.

Karnataka SLDC submits that the additional reduction of 5 minutes from the proposed 50-minute timeline may be achieved by optimizing the "SCUC/SCED and Ancillary Services Optimization" stage through higher automation and parallel processing, while retaining adequate preparation and ramp-up time for generators and balancing resources.

Karnataka SLDC Suggested Timeline (45 Minutes)

Stage	Proposed Duration
Bidding Window	5 Minutes
RTM Clearing	15 Minutes
SCUC/SCED + AS Optimization	**10 Minutes**
Preparation / Ramp-up	15 Minutes
Total Timeline	**45 Minutes**

Proposed Revised Scheduling Timeline

Block	Timeline	Phase	Activities
Block (T-45) to X-3 (T-40)	5 Minutes	Bidding Window for RTM	Processing of DC/revisions, exigency T-GNA applications and RTM bidding
Block (T-40) to X-2 (T-25)	15 Minutes	RTM Clearing	PX clearing, congestion checks, ATC validation and trade acceptance
Block (T-25) to X-1 (T-15)	10 Minutes	SCUC/SCED & AS Optimization	RTM-AS clearing, SCUC/SCED run and TRAS finalization
Block (T-15) to T	15 Minutes	Preparation Time	WBES incorporation, generator ramp-up and dispatch preparation
Delivery Block	T onwards	Power Delivery	Actual delivery

In view of the above, Karnataka SLDC humbly requests the Hon'ble Commission to kindly consider the following:

1. Further reduction of the overall RTM scheduling timeline from the **proposed 50 minutes to around 45 minutes or even minimum**; and
2. Reduction of the schedule revision effectiveness timeline **from the existing 7th/8th time block to the 3rd/4th time block ahead of delivery**.

The above measures would significantly strengthen real-time balancing capability, facilitate higher renewable energy integration, improve DSM and transmission congestion management, reduce RE curtailment, improve national frequency management.