

5 Minute Pricing Alignments and Examples

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MIC Special Session

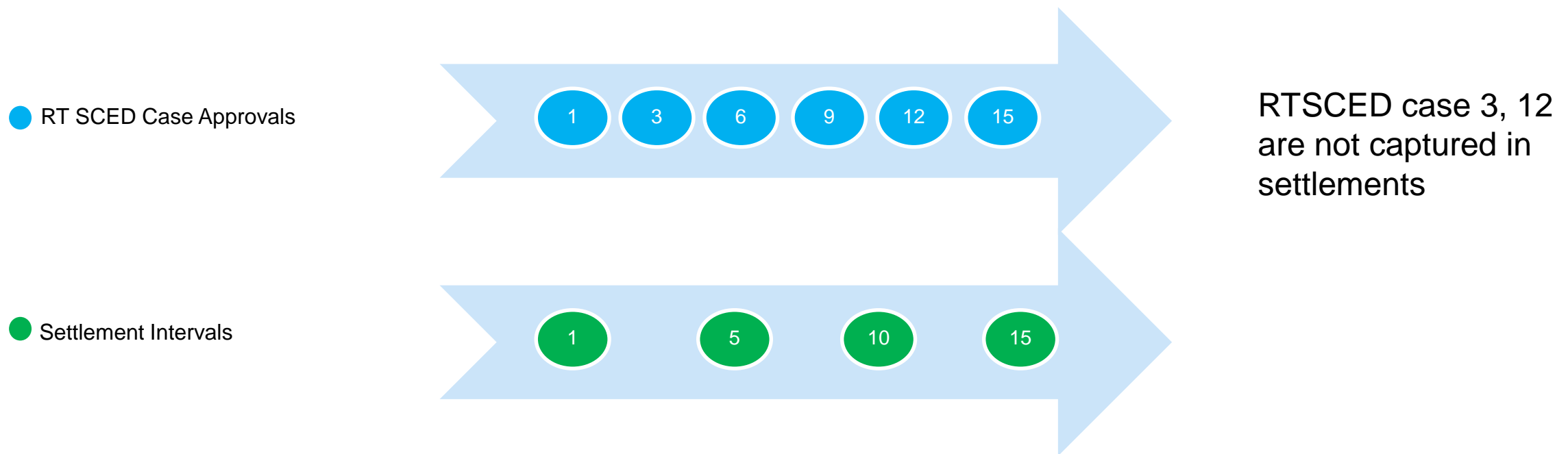
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- RTSCED
 - 10 Minute Look Ahead
 - Auto-executed every 3 minutes or manually on demand
 - Manual Case Approval
- LPC
 - LPC uses the latest approved RT SCED case as its reference case.
 - LPC is executed every 5 minutes in real time. Kicks off 90 seconds after the target interval for the respective target interval.
 - LPC case for 10:15 interval kicks off at 10:16:30

- 1) Dispatch & Settlement Alignment (DSA) – The frequency of Dispatch case approvals versus the frequency at which Settlement occurs
- 2) SCED/LPC Alignment (SLA) – Alignment of RTSCED case target time and the time to which the resulting LMPs are applied
- 3) Ramp Time Alignment (RTA) – The time between SCED case execution and SCED target time versus the ramp time that is applied to the SCED case for the target time

DSA - The frequency of Dispatch case approvals Vs. the frequency at which Settlement occurs

- Case Approved every ~3.5 minutes vs Settlements reconciliation at 5 minute increments

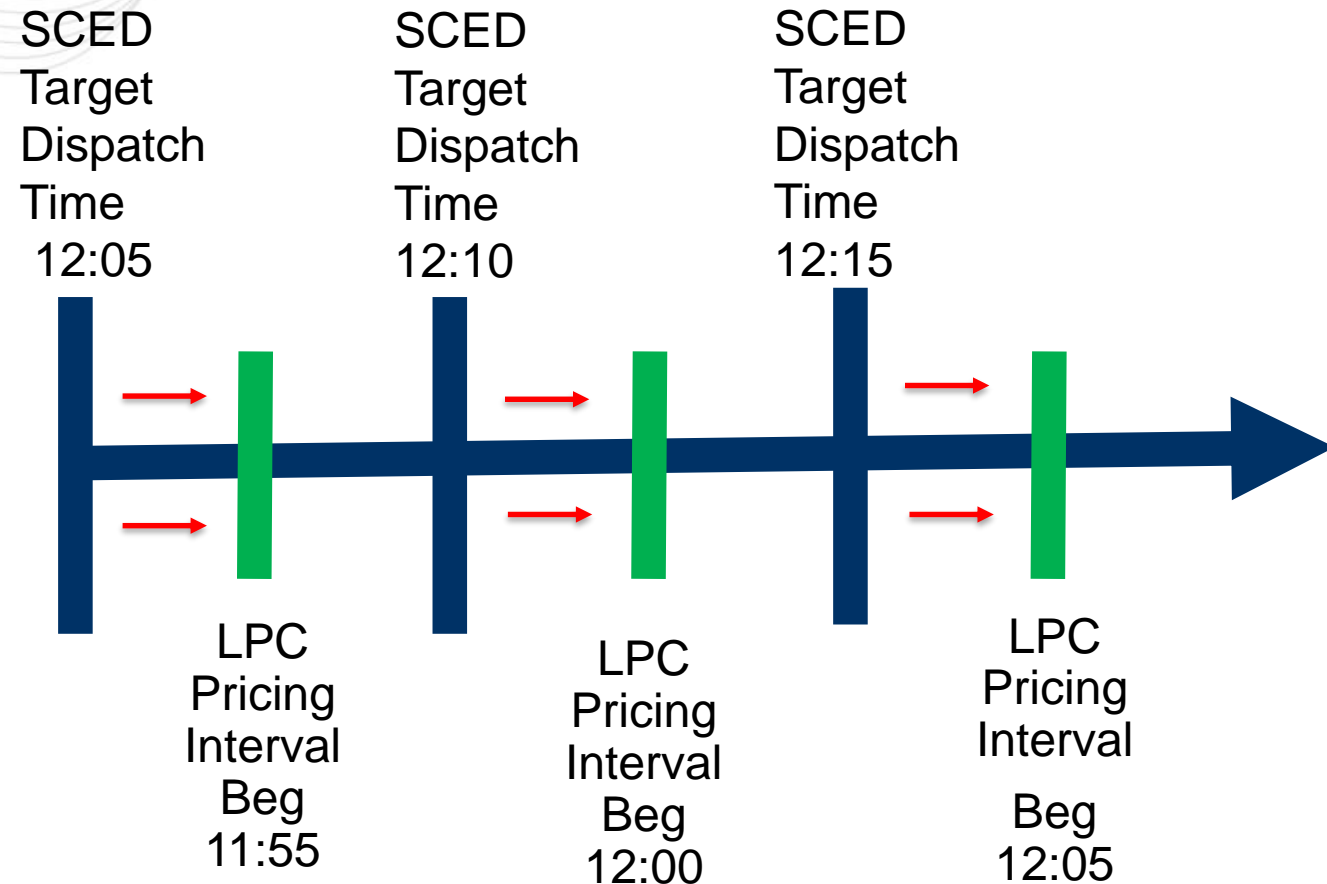


DSA - The frequency of Dispatch case approvals Vs. the frequency at which Settlement occurs

- Outcome of current design
 - Not every RTSCED case is reflected in Settlements
 - Not all dispatch instructions are priced
 - Perceived gap in Market transparency
 - Gap in adequate compensation and efficient pricing
 - Cleared Reserves that follow dispatch may not be compensated
 - Provides Dispatch flexibility to address system conditions
 - Allows for multiple SCED cases for the same target interval
 - Critical during load pickup and drop-off periods

SLA - Alignment of RTSCED case target time and the time to which the resulting LMPs are applied Today

- SCED Dispatches 10 minutes into the future
 - Known as target interval
- The next successive LPC case prices the latest approved RTSCED case
- LMPs are applied to the present 5 minute interval



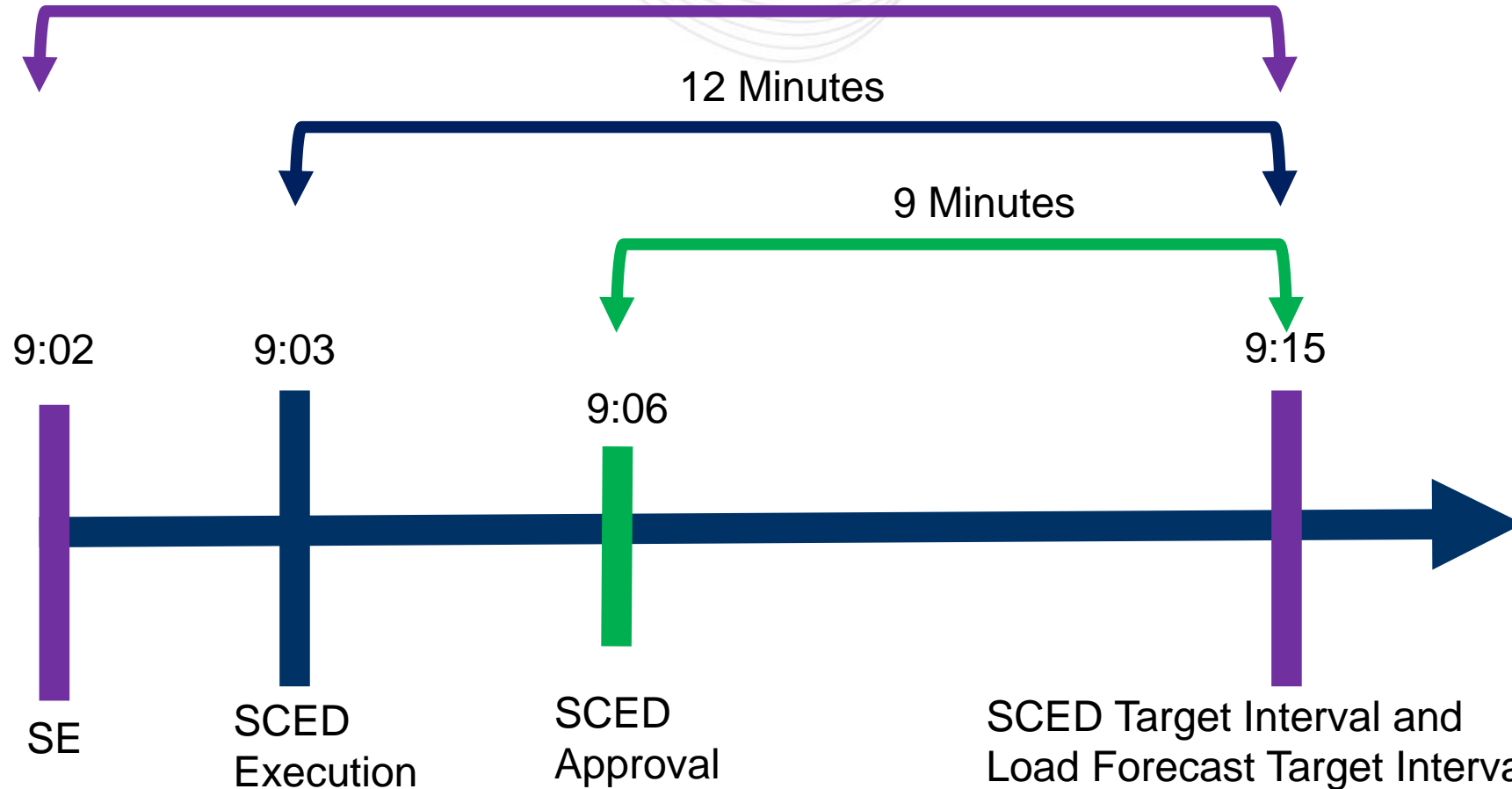
SLA - Alignment of SCED case target time and the time to which the resulting LMPs are applied Today

- Outcome of current design
 - LMPs are calculated instantaneously based on the 10 minute look ahead dispatch instruction
 - Disconnect between the timeframe to which LMPs are applied and dispatch target interval (SCED/LPC)
 - Disconnect between dispatch target interval and settlement interval where LMPs are applied (Dispatch/Settlements)
 - Both Energy and Reserves
 - If the dispatch is achieved at the target time, then the prices for the target time do not reflect the marginal costs of the marginal resources
 - Intent to lead generation

- The time between SCED case execution and SCED target interval
- SCED uses the latest SE solution available at the time of case execution for initial MW
 - Case target interval is case execution plus 10 minute ramp time to the next 5 minute target interval
 - Example: 9:03 RTSCED case execution will use a 10 minute ramp time for target interval 9:15
 - The ramp time used in the RTSCED case is 10 minutes, even though the desired MW for the RTSCED dispatch corresponds with the forecast for an interval 12 minutes away

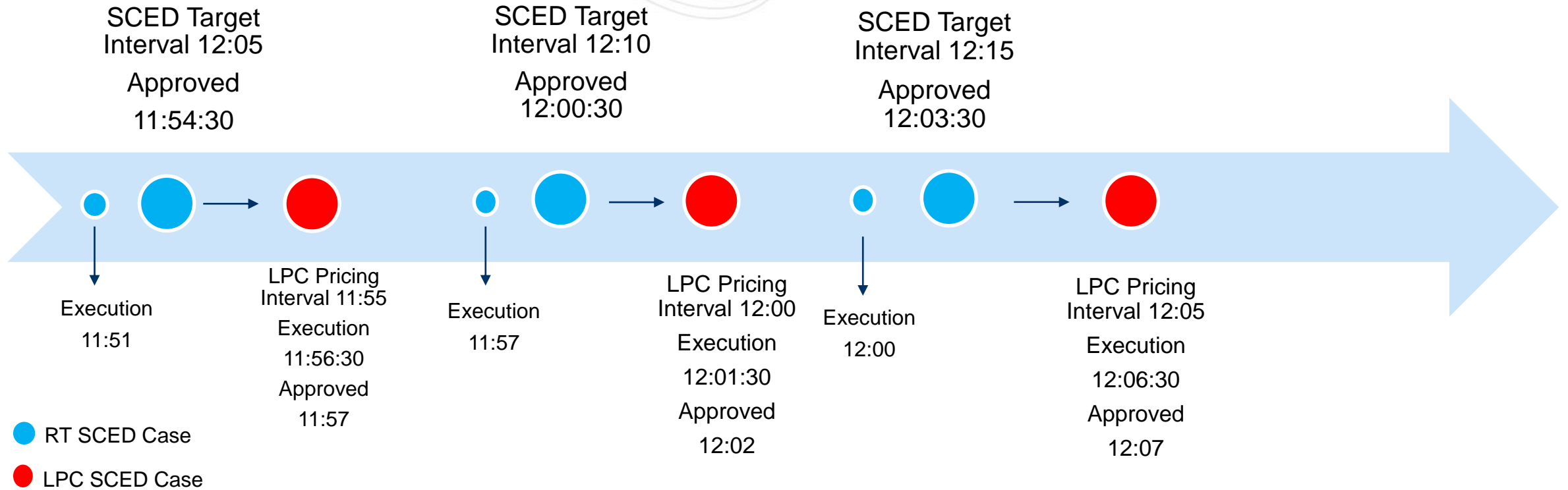
RTA - The time between SCED case execution and SCED target interval

Actual Ramp Delta between SE and Target Interval = 13 Minutes



- PJM Utilizes a 10 minute ramp for all cases
- Average RTSCED case takes ~2.5 minutes to execute
- Average RTSCED case is approved ~3.5 minutes after execution

- Outcome of current design
 - PJM may not be dispatching to the resources' actual ramp capability
 - Consistent ramp time (10 minutes) applied to each RTSCED case
 - Dispatch may not be achievable to meet the load by target time (Approval vs Target Time)
 - Time between SE snapshot and case approval does not account for previous dispatch instruction



#	Design Components	Type of Alignment
1a	LPC Approval / Price Posting Frequency	Dispatch and Settlement Interval Alignment (DSA)
1b	LPC Execution Frequency	Dispatch and Settlement Interval Alignment (DSA)
1c	RT SCED Approval / Dispatch Signal Frequency	Dispatch and Settlement Interval Alignment (DSA)
1d	RT SCED Case Execution Frequency	Dispatch and Settlement Interval Alignment (DSA)
1e	RT SCED Assumed Ramp Time	Dispatch and Settlement Interval Alignment (DSA) / Ramp Time Alignment (RTA)
1f	RT SCED Resource Initial MW	Dispatch and Settlement Interval Alignment (DSA) / Ramp Time Alignment (RTA)
1g	Dispatch MW (for uplift calculations) in settlements	Dispatch and Settlement Interval Alignment (DSA) / SCED/LPC Alignment (SLA)
1h	RT SCED case used for cleared MW (reserves)	Dispatch and Settlement Interval Alignment (DSA) / SCED/LPC Alignment (SLA)
1i	LPC Assumed Ramp Time	Ramp Time Alignment (RTA)
1j	RT SCED Forecast (load and wind)	Ramp Time Alignment (RTA)
1k	LPC Applicable Time for Settlements	SCED/LPC Interval Alignment (SLA)
1l	No RTSCED Case for Target Interval	SCED/LPC Interval Alignment (SLA)
1m	RTSCED case used for starting point of LPC case	SCED/LPC Interval Alignment (SLA)