

Wind/Solar Dispatch Solution Options

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- PJM supports and can implement these solution options.
- The following solution options do not represent a final proposal.
- PJM remains open to additional input and alternative options.
- Additional analysis is currently underway and will be presented in support of a proposal in future meetings.

- Currently there are three variables associated with renewable dispatch capability.
 - SE MW
 - Bid In Eco Max
 - Renewable Forecast
- The built in uncertainty associated with using Bid In Eco Max (not being updated) or Forecast (forecast error) has made it difficult to provide an accurate dispatch basepoint.
- SE MW is the best indicator of where the resource is currently operating and most likely be operating in the next 5 minutes.

Key Point: *Physical Characteristics of Renewable Resources Present Unique Challenges to PJM Dispatch*

Unlimited ramp capability

- Fast moving resources can lead to large MW swings from interval to interval
- Results in constraint volatility, potential ACE swings

Inconsistent bid-in parameters

- Resources operating outside their economic parameters creates discrepancies between SCED solution and reality
- Can lead to out-of-market actions

Design Component for RTSCED	Status Quo	Solution Option 1	Solution Option 2	Justification
Minimum dispatch MW signal	RTSCED is limited to dispatching resources based on submitted Economic minimum parameter	Bid-in Economic Minimum (Status Quo)		Continue to dispatch resource down to bid-in Economic minimum, eliminate any reliability concerns for resources not able to move down to 0 MW.
Maximum dispatch MW signal	RTSCED is limited to dispatching resources based on submitted Economic maximum parameter	1) If resource is not curtailed in the previous approved RTSCED case, then the effective Ecomax will be latest solved SE value. 2) If resource was curtailed in the previous approved RTSCED case, then an effective EcoMax will be the maximum of SE solution, Forecast for the target time or the bid-in Economic Maximum.	1) If resource is not curtailed in the previous approved RTSCED case, then the Effective Ecomax will be latest solved SE value. 2) If resource was curtailed in the previous approved RTSCED case, then Effective EcoMax will be either the minimum of PJM or participant forecast (Bid-in EcoMax).	Removes uncertainty of resource ability to achieve their forecast MW or SCED utilizing inconsistent bid-in parameters. Relies on utilizing forecast to determine optimal dispatchable range during transition periods.

Key Point: *There are limitations in RT SCED that prevent the optimal dispatch of Wind and Solar Resources*

IMW Solution

- Co-optimization of energy and reserves utilizing the latest SE solution, ramp, and load forecast values
- Assumes all resources reach basepoint at target time

IGD MW (Basepoint) Solution

- Economic basepoints are determined in a post process, based on the IMW solution LMPs
- Must respect bid-in economic parameters



Based on this current logic, SCED solutions and Basepoint signals diverge when resources are operating outside of their bid-in parameters.

Design Component for RTSCED	Status Quo	Solution Option	Justification
Dispatch basepoint calculation (IGD MW)	The dispatch basepoint, IGD MW, must be within the submitted bid-in parameters	Calculated basepoint to be within Economic Minimum and Effective Economic Maximum while accounting for ramp rate for target time. Internal MW and Basepoint to be same value.	Allow resources to be dispatchable to their effective capability and not limited by inconsistent bid-in parameters.
Curtailment Instructions	Curtailment Indicator currently set to be retired in March of 2025, resources expected to follow PJM dispatch signal	Provide curtailment flag to Wind and Solar resources. When the dispatch MW (and internal MW) is less than effective economic maximum, send the curtailment flag to resources.	Provide additional instruction to Wind and Solar resources to follow PJM basepoint when needed.
Solar Forecast MW utilization in RT SCED	Solar Forecast is not utilized in RT SCED	Will be utilized to determine the Effective Economic Maximum when resources are curtailed.	To be utilized within effective economic maximum calculation to determine where the resource can be dispatched when resource is no longer being curtailed.
Wind Forecast MW utilization in RT SCED	Wind Forecast is used in the ATM logic to determine the band for where a resource is dispatched within for internal MW (iMW) calculation.	Will be utilized to determine the Effective Economic Maximum when resources are curtailed.	To be utilized within effective economic maximum calculation to determine where resource can be dispatched when resource is no longer being curtailed.

Design Component for ITSCED	Status Quo	Solution Option	Justification
Minimum dispatch MW signal	ITSCED is limited to dispatching resources based on submitted Economic minimum parameter	Bid-in Economic Minimum	Continue to dispatch resource down to bid-in Economic, minimize any reliability concerns for resources not able to move down to 0 MWs.
Maximum dispatch MW signal	ITSCED is limited to dispatching resources based on submitted Economic maximum parameter	Utilized Effective Economic Maximum at all times using the greater of SE Solution, Bid-in Economic Maximum or Forecast MW	Additional information is needed to dispatch resources because ITSCED is solving for multiple hours into the future.
Solar Forecast MW utilization in ITSCED	Solar Forecast is utilized during sunrise/sunset times	Status Quo	
Wind Forecast MW utilization in ITSCED	Wind Forecast is not currently utilized in the ITSCED since there is no Achievable Target MW (ATM) calculation in ITSCED.	Utilize within Effective Economic Maximum calculation	Provide latest information to ITSCED for future intervals.

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Renewal Dispatch Paper Summary



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Appendix

Misalignment of iMW and IGD MW Example

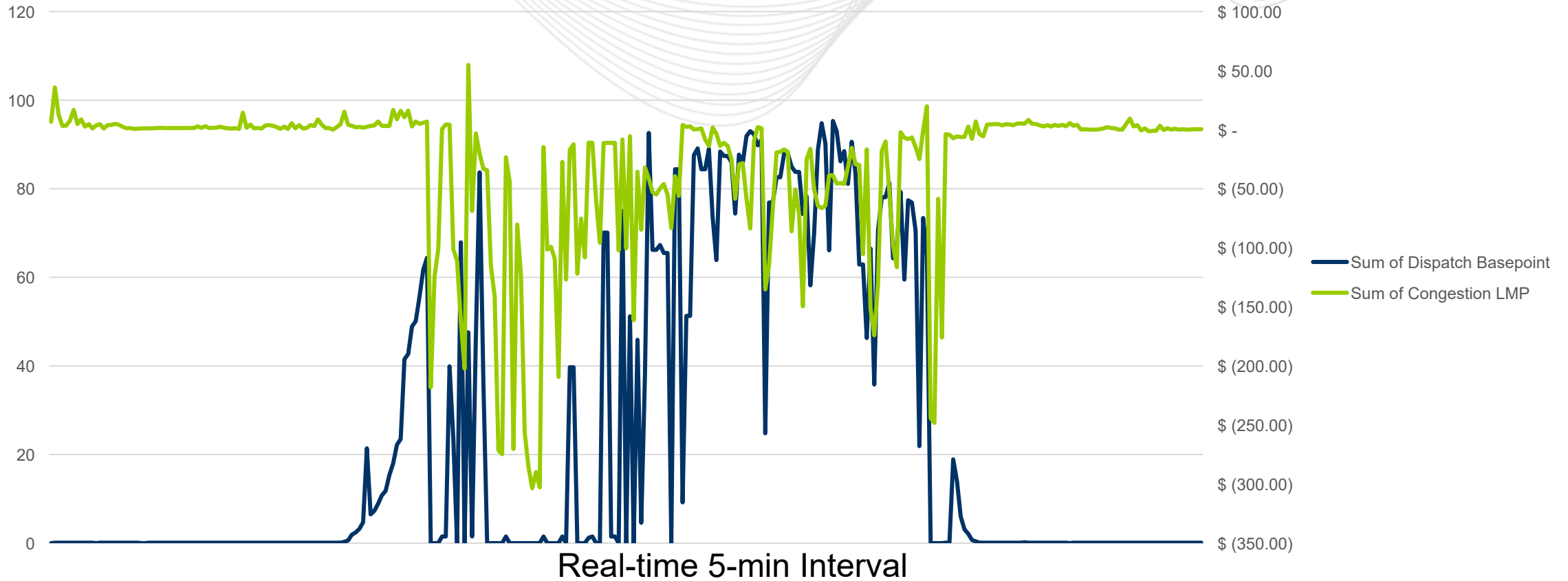
- Both resources operating above their bid-in ecomax

Wind Unit	MARGINAL COST	LMP	SE MW	iMW	IGD MW	ECONOMIC MIN BID IN	ECONOMIC MAX BID IN
A	\$0	\$10	150	150	90	0	90
B	\$0	\$10	125	125	100	0	100

Key takeaway: SCED Basepoint is limited by economic parameters. Outdated values can lead to out of market, manual actions by PJM Dispatch.

Example: Dispatch Basepoint vs Congestion LMP

Dispatch Basepoint vs Congestion LMP

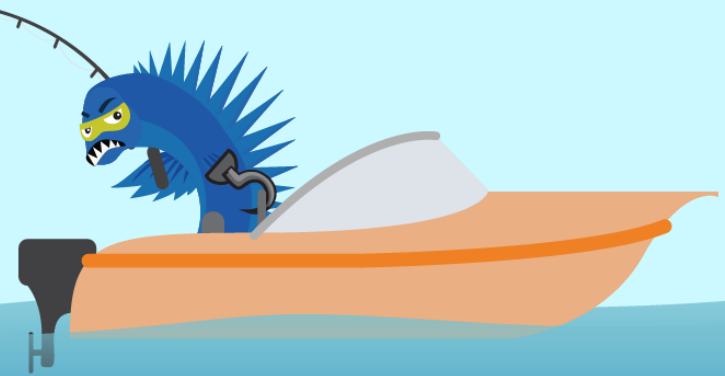


Key takeaway: Existing SCED dispatch logic and input parameters create volatile RT pricing and control issues for PJM Dispatch. This pattern on a larger scale can lead to ACE swings.

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POWER GRID**
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YOU CLICK!**



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