

PJM Proposal: Wind and Solar Dispatch

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June 2, 2025



Current Challenge

- Renewable resources are making up an increasing portion of the PJM generation mix
- It has become difficult to manage the dispatch of these resources using PJM's realtime market clearing engines
 - Refer to PJM's paper on <u>renewable dispatch in market clearing engines</u>
- There are three areas of primary focus for enhancements in this Issue Charge:
 - Reducing the volatility that renewable resources can have on constraint control
 - Improving the data PJM's security constrained economic dispatch (SCED) uses to dispatch these resources (to improve overall system dispatch)
 - Improving SCED ability to dispatch these resources, thus improving system dispatch and reliability



<u>Key Point:</u> 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

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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.



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
Α	\$0	\$10	150	150	90	0	90
В	\$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 Outdated values can lead to out of market, manual actions by PJM Dispatch.



Proposal Overview – PJM Package

- The proposal simplifies the concept of an "Effective EcoMax" for all Wind and Solar resource dispatch via RT SCED
- The Effective EcoMax will be defaulted to the PJM Forecasted Value for the effective target time
 - An option will be created for Market Sellers to choose to be dispatched based on PJM Forecasted value or the Resources Bid-In EcoMax.
 - Option can be updated 65 minutes prior to operating hour for the next hour.
- No changes to market settlement or intra-day offer rules, regardless of option selected
 - Make whole / deviation charges remain as-is
 - Effective EcoMax will be utilized instead of Bid-in EcoMax if PJM Forecast is selected
 - If not utilizing default PJM forecast option, the EcoMax can (and should) be updated anytime

<u>Reminder</u>: All dispatchable (Economic or Must-run) resources are expected to submit accurate bid-in parameters, including ramp rates, and follow PJM's dispatch signal for target time as closely as possible



- All wind and solar resource forecast values are provided to PJM in 5-minute increments, and updated every 10-minutes
 - This 5-minute increment goes 6 hours out, then hourly forecast goes out 1 week
- This improves RTSCED by utilizing an automatically updated EcoMax
 - More accurate representation of resource capability
- Does not require Market Seller to update Bid-In EcoMax



Analysis Takeaways

- The goal is to accurately account for how many MWs will be delivered at the target time
- At a system level the total amount of forecasted MWs for a specific target interval is more accurate to the MWs delivered than the total amount of bid-in economic max
 - Minimizing the difference between the basepoint and MWs delivered at the target time provides a better power balance solution



Wind Analysis Takeaways





Solar Analysis Takeaways





RT Example – Wind with Outdated EcoMax

Key Takeaway: Utilizing Forecast rather than Eco Max will give RT SCED a more accurate prediction of where the resource can operate in ten minutes. In this example, Dispatch may need to take manual action to correct power balance.





- Problem Statement and Issue Charge were brought to the OC in December of 2021.
- After over a year of committee meetings and special sessions, a joint IMM/PJM solution package was endorsed at the April 2023 MRC and manual revisions removing all references to the using the curtailment flag were endorsed at the December 2023 MRC.
- Curtailment flag scheduled to be removed July 1st, 2025



- Inconsistent performance seen from resources when following curtailments and/or basepoints.
- Curtailment flag was only available for wind resources not all renewable resource types.
- Lack of timely updates to bid in parameters leading to dispatch based on outdated or incorrect information.
 - SCED needs to evaluate if system can support maximum output
 - Frequent and accurate updates to operating parameters required
- Latest survey <u>results</u> indicate mixed results for resources updating their bid-in parameters or following PJM basepoint.





- Proposal addresses most of the identified interests but is not a perfect solution
 - Improves the data PJM's security constrained economic dispatch (SCED) uses to dispatch these resources
 - Constraint volatility remains an area of concern
 - Forecast, load uncertainty are larger, more complex issues





- "To the extent that a solution developed by this subcommittee impacts a PJM business manual that is solely the purview of either the PC or OC, endorsement of those revisions shall be handled by the relevant standing committee."
- Based on the above information, propose to separate curtailment flag design component from current packages
 - Move discussions regarding curtailment flag to OC
- Move forward with first read for remainder of the design components at the July 2025 MIC





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Wind and Solar Dispatch

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