PJM Proposal: Wind and Solar Dispatch

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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 real-time market clearing engines
  - Refer to PJM's paper on renewable dispatch in market clearing engines
- 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

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

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
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 Outdated values can lead to out of market, manual actions by PJM Dispatch.

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

Reminder: 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

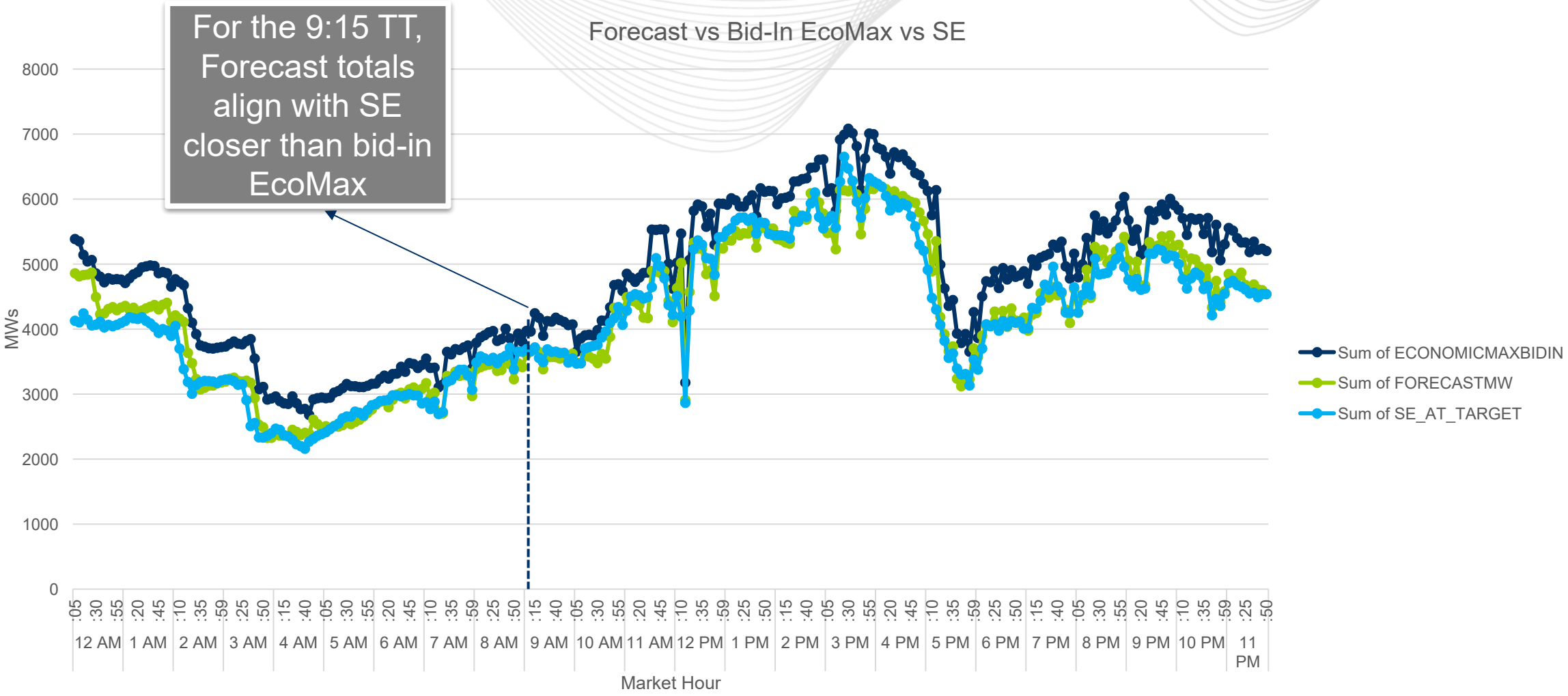
Benefits of Utilizing PJM Forecast in SCED

- 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

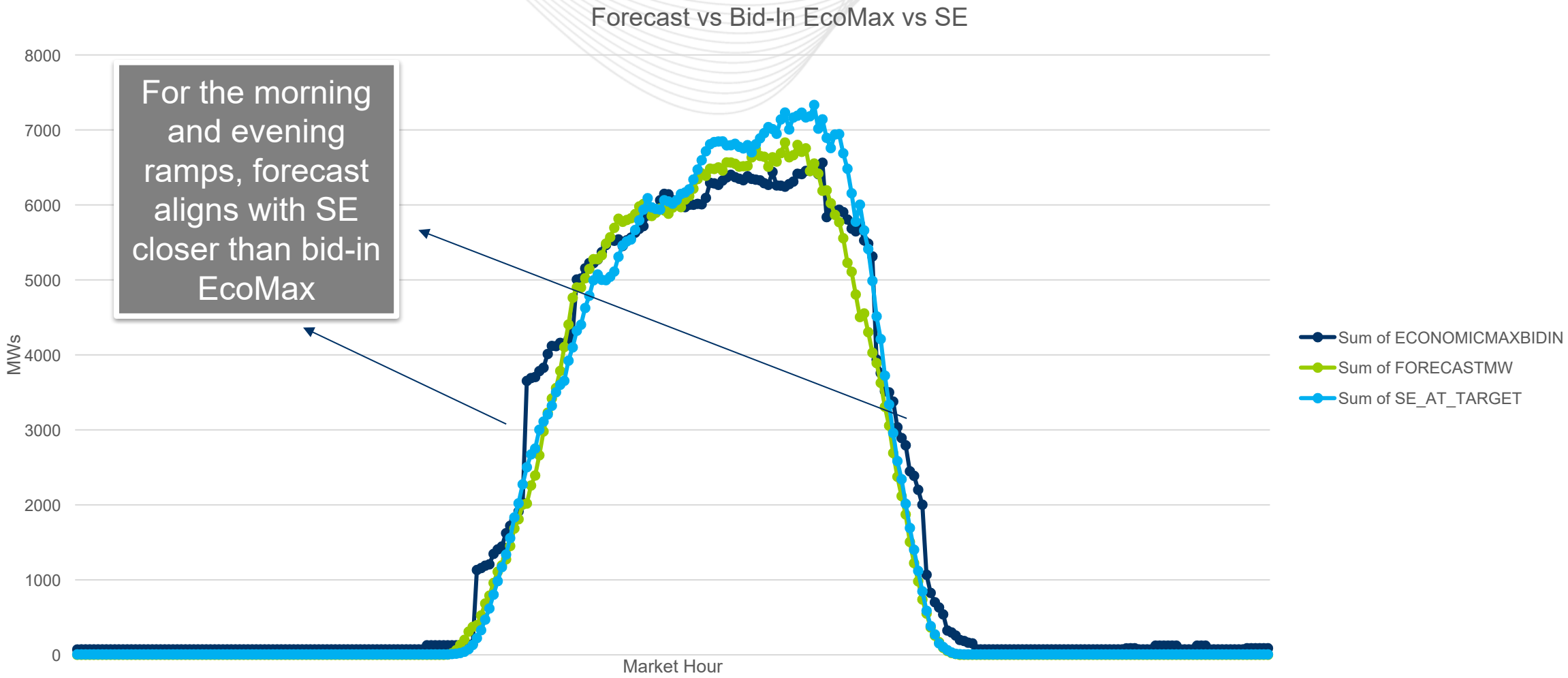
Analysis Takeaways

- 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.

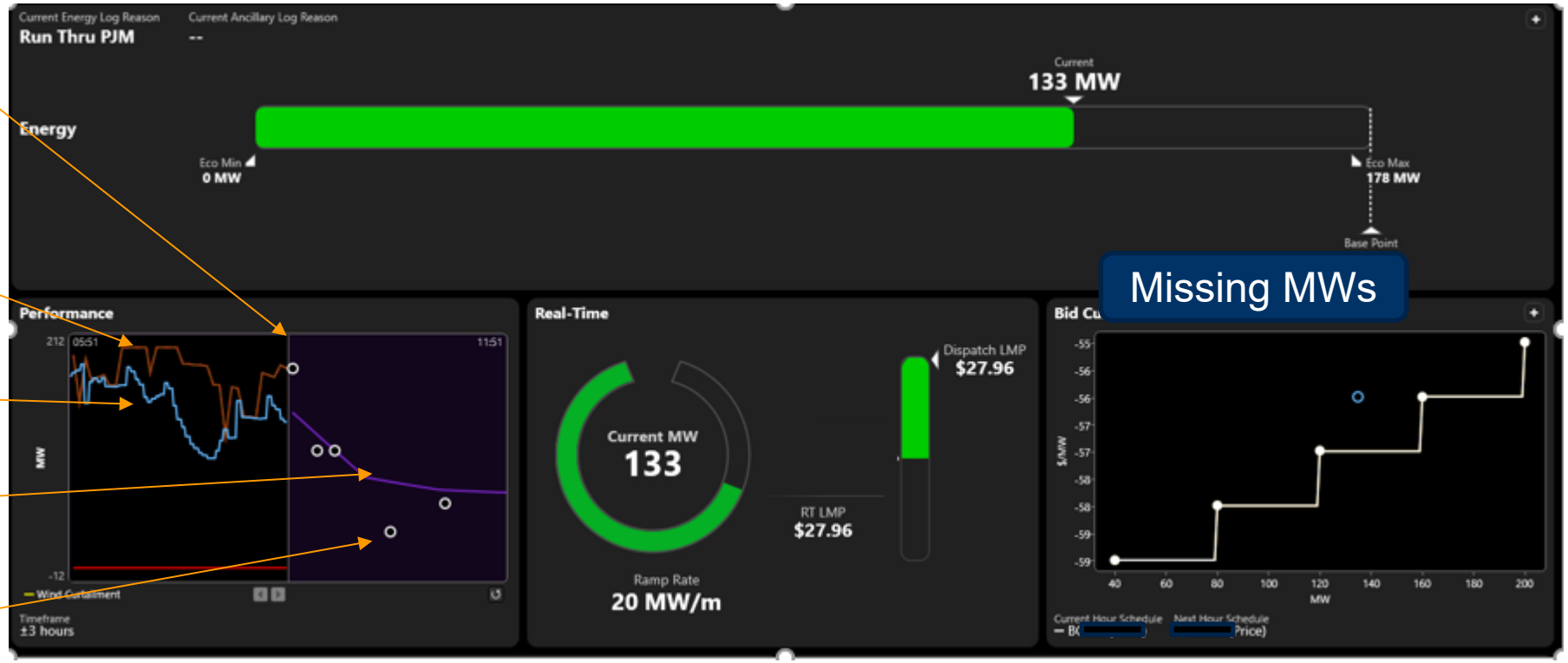
RT SCED Target Time (T+10 min)

Case Expected (based on bid-in parameters)

Actual output

Forecast

IT SCED Interval Solution



Background on Renewable Dispatch and Curtailment

- 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

PJM Concerns with Curtailment Flag

- 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 results indicate mixed results for resources updating their bid-in parameters or following PJM basepoint.

Recap

- 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

DISRS Charter

- “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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