



Renewable Dispatch PJM/IMM Joint Package

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1. Dispatch requirements
2. Curtailment indicator
3. Resource parameters to PJM
4. LOC
5. Requirements for ability to follow dispatch point
6. Governing documents
7. Metrics to provide insight into renewable operations
8. Modeling resource output / forecast submission requirements
9. Look-ahead tool to evaluate renewable impact
10. Implementation

- Status Quo: No PLS applied to dispatchable range for wind and solar units. Restrictions exist for minimum limits based on CIR.
- OA Schedule 1 Section 6.6 states that PJM must determine unit specific operating parameter limits for all Capacity Resources. PJM developed default operating parameter limits for several unit types to be used as proxies, these proxies can be adjusted on a unit specific basis with proper documentation submitted to PJM/IMM. Several unit types were not included in this process. Parameter limits were not developed for nuclear, run of river, solar and wind.

- The PJM/IMM proposal will require intermittent units to have an economic minimum of zero. Eco min does not have an explicit parameter limit. It is enforced via the turn down ratio limit. Turn down ratio is the difference between eco max and eco min. For intermittent units, the turn down ratio will be infinite.
 - Resources can still self-schedule and elect to be non-dispatchable
 - Exception process for resources that have physical limitations
- Ramp rates have to be accurate.

- Status Quo: Curtailment flag sent through ICCP points.
- Proposal: Remove curtailment flag and use existing basepoints to reflect desired dispatch.
 - Basepoints available through ICCP today, no change to calculation
 - Default dispatch for intermittent resource is not always maximum output
 - Dispatch instructions will reflect economic offers
 - SCED needs to evaluate if system can support maximum output
 - Frequent and accurate updates to operating parameters required
 - Curtailment indicator can be recreated using existing data like PJM ecomax

Excerpt from M14D Attachment M: Wind Unit Dispatchability Check List

Markets

1. All units should follow their Economic Basepoint, even when curtailed by SCED.

If the basepoint doesn't make sense,

- i Check EcoMin and EcoMax (see 2 below)
- ii Check Unit Availability status (economic, must run, not available)
- iii Check for manual overrides (fixed gen flag, unit output)
- iv Check data quality (wind forecast; other telemetry must be updating)

- Intent is to have resources follow economic basepoints, not only curtailments.
- “Inadvertent” curtailments can occur under the status quo and are mostly frequently due to bid in parameters/offers.
 - More timely updates and accurate representations of resource capabilities will minimize curtailments due to parameters
 - SCED needs to analyze updated parameters to see if system conditions can support and warrant a change in resource output
- Inconsistent practices leading to dispatch inefficiencies
 - 92% of wind farms have been curtailed, not all can follow curtailment flag
 - Solar curtailments on the rise with only manual curtailments

- Status Quo: Hourly updates of information provide to Market's Gateway for wind resources. Limited guidance on specific parameters.
- Proposal: Update critical parameters every 5 minutes for RTSCED cases. Update hourly parameters for ITSCED cases (2-hour look-ahead).
 - Economic/Emergency Limits, Ramp Rates, Fixed-Gen Flag
 - Guidance will be provided on optimal timing of parameter updates for SCED case usage
 - Stale parameters may result in undesirable dispatch and manual intervention

- Status Quo: Wind resources eligible for LOC when able to follow SCED dispatch instructions and have SCADA capability to transmit and receive instructions from PJM. LOC MW calculation based on desired output of wind resource, capped at PJM back-cast forecasted MW.
- Proposal: Maintain status quo for wind resource and expand rules to solar resources.
 - Solar resources to be eligible for LOC when able to follow SCED basepoint
 - SCADA capability to transmit and receive instructions from PJM
 - Back-cast forecasted MW for solar resources will be used in LOC calculations

- Status Quo: Limited instructions in M14D – Wind Dispatchability Checklist for wind resources.
- Proposal: Expand on requirements in existing wind checklist and establish guidance for solar.
 - Intermittent resources are expected to follow PJM dispatch through SCED basepoints
 - Ability to follow dispatch required for units to set LMP and be eligible for LOC

- Status Quo: Tariff and M14D language for treatment of wind resources.
- Proposal: Update Tariff and associated manuals to reflect proposed changes to wind and new rules regarding solar.

- Status Quo: None
- Proposal: Establish metrics regarding impacts of renewable.
 - Increase transparency by reviewing monthly metrics with stakeholders
 - Possible example metrics:
 - Renewable forecast accuracy
 - Curtailment frequency
 - Real-time performance vs. SCED expectations
 - Analysis on accuracy of bid-in parameters

- Status Quo: Committed capacity resources are required to offer DA (M11, 2.3.3.1).
- Proposal: Intermittent resources with capacity commitment are required to offer eco max MW equal to or greater than their hourly forecast. If the Market Seller develops or procures forecast with different confidence levels, the Market Seller must use the one closest to the median value (e.g. P50). Forecasts can be adjusted to account for expected equipment availability. If the Market Seller does not have a forecast or has technical issues developing or receiving a forecast, the PJM developed forecast is available.

- Status Quo: ITSCED looks ahead roughly two hours considering all resource types.
- Proposal: Evaluate adding a look ahead solution when renewable forecast accuracy reaches a threshold that will be determined based on metrics.

- Single cut-over date no earlier than Q3 2023.
 - Balancing the ongoing increase in renewable penetration and effort required to make technical and process changes
- Completed eDART data request to renewable resources to understand capabilities and challenges.
 - Results will provide insight into existing fleet and shape implementation timeline
 - Will look to aggregate and share high level data if possible
 - Great response rate

- Productive discussions at the DIRS to help increase awareness into various components of the package.
- PJM/IMM proposal is a first step in ensuring the reliable dispatch of renewable resources today and the future.
- Solutions for design components designed to work together and flexible enough to adapt to future needs.
- Implementation timeline will be determined based on feedback from ongoing Data Request. Once details are finalized, package will progress with Manual and Tariff language changes.

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