



# Renewable Dispatchability Education

## Peer ISO/RTO Policies and Procedures

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Renewable Forecast Integration

Dispatch Basepoint

Deviations in RT

Curtailments

## How are wind/solar integrated into real-time unit commitment and dispatch?

- In the past systems have dispatched around intermittents, treated intermittents as price takers
- PJM's current implementation
  - For RT unit commitment, PJM engines effectively assume units continue to produce at their current level
  - For RT dispatch, PJM considers offer price and bid-in parameters
  - PJM produces a forecast for all wind/solar resources and makes those forecast values available to units in Markets Gateway

Entity	How are forecasts integrated into RT (intraday) unit commitment?
ISO-NE	<b>ECOMAX</b> redeclared in current and upcoming hour to average of unit forecast maximum and ISO forecast as part of DNE Dispatch project
SPP	<b>Forecasts are preferred for intraday commitment</b>
MISO	
NYISO	
CAISO	Some differences exist depending on the ISO's intraday unit commitment study format and the status of solar dispatch implementation
ERCOT	

Entity	How are forecasts integrated into RT unit dispatch?
ISO-NE	<p><b>Forecast and persistence values are used to produce wind ECOMAX</b></p> <p>Market Participant and ISO forecasts have both been used in conjunction with persistence in a “highly automated” ECOMAX redeclaration process</p>
MISO	<p><b>Market Participant can elect either MP forecast or MISO forecast as ECOMAX</b></p> <p>MISO stakeholder effort afforded benefits to electing the MISO forecast</p>
SPP	<p><b>Forecast and persistence values are fed into RT 5 minute dispatch as ECOMAX</b></p> <p>Tendency is to rely more and more on persistence as the RT interval approaches</p>
NYISO	
CAISO	
ERCOT	

## **Do wind and solar units receive a dispatch signal or basepoint from the operator? Are these units required to follow it in RT?**

- Dispatch signal or economic basepoint indicates unit loading level and is a product of the dispatch solution and unit offer
- PJM's current implementation
  - All Bulk Electric System wind/solar resources are expected to be controllable and are sent a dispatch signal
  - PJM receives ramp rates in Markets Gateway, which can be updated hourly

Entity	Do wind and solar units receive a dispatch signal or basepoint?
ISO-NE	<p><b>Wind is sent the DNE limit and a dispatch signal</b> Resources can operate freely below the DNE limit</p>
SPP	
MISO	<p><b>Wind and solar units receive dispatch instructions in RT</b> Instructions are equal to their forecast unless curtailed</p>
NYISO	<p>Wind implementation tends to lead solar depending on the volume of utility-connected solar on each system</p>
CAISO	
ERCOT	

## **Are resources penalized for deviating from RT dispatch?**

- Consequences exist for resources who do not follow RT dispatch instruction (+/- threshold%) in certain cases
  - Penalties are almost always in the form of uplift allocation
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- PJM's current implementation
    - PJM pays generators for MWh generated
    - PJM allocates uplift payments to generators who fail to meet minimum threshold, dictated by the 10% tolerance band



Entity	Are resources penalized for deviating from RT dispatch?
ISO-NE	<b>DNE Dispatchable generators are exempt from undergeneration penalty</b> Resource can operate freely below the DNE limit
SPP	NA
MISO	<b>Exemption from penalties is based on forecast election</b> Units who elect to use the MISO forecast for ECOMAX are <b>exempt from over <i>and</i> undergeneration penalties</b> , except during curtailment
NYISO	<b>No undergen penalty, only penalized overgen while curtailed</b> Units are paid for overgeneration unless curtailment is in place, in which case they are penalized
CAISO	<b>No penalty for over or under generation unless curtailed</b>
ERCOT	

## How do ISO/RTOs communicate and handle curtailments?

- Curtailments are a downward dispatch of intermittent resources by operator instruction, for reliability and constraint control
  - Alternative is manual curtailment, can be necessary if reliability issue not reflected in price (i.e. voltage)
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- PJM's current implementation
    - Curtailment flag sent to wind resources in RT
    - Manual curtailment only for solar

Entity	How do ISO/RTOs communicate and handle curtailments?
ISO-NE	<p><b>Curtailments are effectively dictated via DNE limit</b>            When DNE Limit is reduced the unit cannot exceed</p>
SPP	<p><b>Curtailment flag is sent via dispatch for wind</b>            And solar on certain systems; implementations vary depending on its presence and volume in the ISO</p>
MISO	
NYISO	
CAISO	
ERCOT	

**Renewable Forecast Integration:** intraday unit commitment sees forecast integration, but 5-min dispatch often prefers persistence

**Dispatch Basepoint:** nearly universal adoption of some form of basepoint, with ISO-NE providing a novel model

**Deviations in Real-Time:** certain exemptions from deviation penalties have been accepted for dispatchable renewables

**Curtailments:** curtailment flags are often sent, however with a more informative basepoint can supplement the flag

The success of different solutions may depend on the region—what works for others may or may not work for PJM.

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## OC Special Session: Renewable Dispatch



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