

Market Monitor Report

MC Webinar

February 22, 2021

IMM



Monitoring Analytics

Ramping

- **OA Definition**
 - **Ramping Capability:** “shall mean the sustained rate of change of generator output, in megawatts per minute.”
- **Section 1.7.19**
 - **Ramping:** “A generator dispatched by the Office of the Interconnection pursuant to a control signal appropriate to increase or decrease the generator’s megawatt output level shall be able to change output at the ramping rate specified in the Offer Data submitted to the Office of the Interconnection for that generator.”
- **Ramp rates, either daily values or hourly values, must accurately represent the unit’s capability.**

Pool Dispatched Resources

- **(b)** The Office of the Interconnection shall implement the dispatch of energy from other pool-dispatched resource increments, including generation increments from Capacity Resources the remaining increments of which are self-scheduled, by sending appropriate signals and instructions to the entity controlling such resources, in accordance with the PJM Manuals. **Each Market Seller shall ensure that the entity controlling a pool-dispatched resource offered or made available by that Market Seller complies with the energy dispatch signals and instructions transmitted by the Office of the Interconnection.**

Dispatch Signals

- **PJM sends dispatch signals (basepoints) based on system conditions, offer data and operating parameters submitted by market sellers.**
- **One of those operating parameters is the ramp rate.**
- **PJM instructs resources, via the electronic dispatch signal, to ramp up or ramp down as fast as their submitted ramp rates allow.**
- **The expectation is that resources will follow the dispatch signals.**
- **Prices are set based on that expectation (ex ante pricing).**

Modeling Plant Transitions

- **Some generation technologies offer curves include transitions between operating modes.**
- **CCs move from one CT/HRSG to two to three.**
- **CCs use duct burners and/or peak firing.**
- **Coal units have different operating modes (mills).**
- **Issue is how to accurately represent these transitions to the PJM market clearing software so that units are dispatched correctly, so that PJM software correctly represents the expected response, and so that units respond correctly.**
- **Essential to accurate prices.**

Ramp Rates

- **PJM permits the use of ramp rates to reflect transitions.**
 - **Slow ramp rates are used to reflect delays in making transitions.**
- **Slow ramp rates are not an effective or appropriate way to reflect transitions between operating modes.**
- **The use of slow ramp rates in these cases can effectively result in physical withholding.**
- **Hourly ramp rates are an improvement over daily ramp rates but do not solve the problem associated with transitions between operating modes.**

Example

- Example:**

MW	MW/minute
200	5.0
300	10.0
310	0.1
400	10.0

- This unit ramp rate curve means that the unit can ramp at 5 MW/minute between eco min and 200 MW, at 10 MW/minute from 200 MW to 300 MW, at 0.1 MW/minute from 300 to 310 MW and at 10 MW/minute from 310 to 400 MW.**
- The 0.1 MW/minute ramp rate is used to reflect a transition between operating modes.**

Example

- Using a 0.1 MW/minute ramp rate means that the unit can only be ramped up by 6 MW in one hour in the Day-Ahead Energy Market and by 1 MW in every RTSCED case (10 minute look ahead).
- Issues:
 - The resource would be withholding in DA when it is physically capable of increasing output by more than 6 MW in an hour.
 - The resource would be withholding in RT when additional equipment is not brought online after receiving an RTSCED signal to ramp up.

Example

- **In real time, the unit could receive a constant dispatch signal to ramp up by 1 MW, the unit can ignore it and still be considered to be following dispatch without a requirement to submit a forced outage.**
- **In real time, the unit could be marginal and set prices on a MW segment on which it is not operating.**



Recommendations

- **The IMM recognizes the limitations of PJM's current generator modeling.**
 - **Operating transitions are not modeled.**
 - **Peaking operation is not modeled.**
 - **Soak time is not modeled.**
- **PJM has emphasized fast start pricing and ORDC over improvements to dispatch and modeling.**
- **The IMM recommends the development of best practices as soon as possible, given current limitations.**
 - **New generator modeling (nGEM) is expected but timing remains uncertain and years in the future.**

Recommendations

- **Resources should not use ramp rate curves to reflect transitions between operating modes.**
 - (The transitions are commitments of additional components.)
- **There are better alternatives for the commitment of additional components in CC, such as the pseudo unit model (model CCs as 1x1s).**
- **PJM should clearly document rules defining how units are required to operate once they are dispatched to MW ranges that include discontinuities in the ramp rate curve.**

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