M11 Reserve Price Formation (RPF)

MIC

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IMM

Monitoring Analytics

Issues with M11 Implementation of RPF

- **Need to document how hydro resources will offer all available reserve MW.**
- **Need to document all reserve deselection reasons and implications.**
- **Need to document details on the timing and communication for the creation of new reserve subzones.**
- **Language clarification also needed for**
  - **Use of spin max, types of inflexible reserves, the meaning of a reserve assignment, opportunity cost for condensers, and price additivity.**

Reserve Must Offer Requirement

- **The must offer requirement for reserves is an important aspect of the new market design.**
- **Ensures that all reserves are made available to PJM and accounted for in the market clearing.**
- **Link to original EPFSTF documentation of the new reserve must offer requirement:**
  - **https://www.pjm.com/-/media/committees-groups/task-forces/epfstf/20181012/20181012-item-07a-sr-must-offer-requirements.ashx**

Reserve Offer Calculations

- **PJM will automatically calculate reserves based on energy offer parameters for most resource types.**
- **An alternative was included in the OA to allow flexibility for hydros and storage to specify their available reserve MW.**
  - **PJM has implemented a process that still limits reserve MW to the calculation using energy offers for hydros. This is not explained in M11.**
  - **The OA states that PJM will not determine the offers for hydro and storage but will make it possible for them to offer their available MW.**
  - **The M11 process is not consistent with this requirement.**

Example Scenario

- **Energy limited hydro resource**
- **Multiple units are aggregated into one resource.**
- **Hourly eco max is submitted based on the energy limitation at less than the full UCAP of the resource.**
- **The rest of the resource is available to provide reserves in case of a spin event or emergency.**
- **The reserves beyond eco max cannot be captured using the standard reserve calculation that limits reserves plus energy to eco max.**

OA Schedule 1 1.10.1A(j)(ii)(1)

For each offer to supply reserves by a synchronized resource, the Office of the Interconnection shall determine the MW of available Synchronized Reserve capability offered in the Day-ahead Energy Market and Real-time Energy Market, in accordance with the PJM Manuals; except, however, that **the Office of the Interconnection will not make such determination for hydroelectric generation resources or Energy Storage Resources**. Hydroelectric generation resources and Energy Storage Resources **may submit offers for their available Synchronized Reserve capability** as part of their offer into the Synchronized Reserve market, provided that such offer equals or exceeds 0.1 MW; however, any such resource which is subject to the must offer requirements in section 1.10.1A(j)(i) above must submit a Synchronized Reserve offer which specifies the MW of available Synchronized Reserve capability in order to remain compliant with such requirements.

Manual 11 Language

- **Availability for reserves is set through energy offers, except for hydro and storage resources.**
- **Hydro, storage, and demand response submit their own MW calculation.**
- **Hydro, storage, and demand response that self schedule will use their submitted MW calculation.**
- **Pumped hydro cannot offer non-synchronized reserve unless they use the hydro optimizer and are fully offline. This is inconsistent with the OA.**
- **Aggregated units are considered online and eligible for synchronized reserves, not non-synchronized.**

Issue for Hydros Meeting Reserve Must Offer

- **Limiting reserves for hydros to eco min and eco max energy parameters prevents resources from providing reserves while still respecting their energy limitations.**
- **In some cases, PJM will not count available reserves for hydros.**
- **Loss of thousands of reserve MW unless corrected.**
- **M11 must explain how all types of hydro can meet offer requirements and make all reserves available.**

Reserve Deselection

- **PJM can deselect a resource from the ability to clear reserves.**
  - **This can be unit specific or based on how the unit is logged by dispatch.**
  - **Market Sellers can also request PJM to deselect their units during some predefined operating conditions at the site. PJM must approve ex ante.**
- **Deselection has market impacts:**
  - **Reserves cleared DA that are not available in RT because of deselection will have to buy back their position.**
- **Units deselected by PJM will fail the must offer requirement unless satisfy manual defined reasons.**

Reserve Deselection

- **M11 should include all relevant details related to the reserve deselection process:**
  - **More detailed criteria for PJM deselections**
  - **How long deselection remains in place**
  - **Process for removing deselection**
  - **Documentation of reason for deselection**
  - **Deselection impact on the must offer requirement**
- **M11 should clarify that deselection makes a resource ineligible for the Market Revenue Neutrality Offset.**
- **M11 should provide detailed requirements for Market Seller initiated deselection.**

Reserve Deselection

Section 4.4.3.21 PJM Reserve Deselection ~~of Reserve Resources~~ in Real-Time

To accurately account for reserves, PJM may temporarily deselect a resource from being eligible for reserves and if necessary deassign a current reserve commitment in certain market intervals. PJM Dispatchers are responsible for logging generating resources in the Dispatch Management Tool (DMT). Under certain operating conditions, resources cannot reliably provide reserves. These conditions are reflected in the DMT logs. Under the following operating conditions, resources will be deselected from clearing reserves synchronized, nonsynchronized and secondary reserves and exempt from the reserve must offer requirement::

- Cleared Regulation
- Testing
- Released / Tripped / Cancelled / Failed to Start

- Startup

Resources that do not respond to PJM's dispatch signal and therefore cannot reliably be counted towards providing reserves can also be deselected by PJM. Resources deselected from providing reserves due to failure to respond to PJM's dispatch signals will be in violation of the reserve must offer requirement. Market Sellers should update their Offer Data as practical as possible to reflect any limitation in their capability to provide energy or reserves. This includes updating their economic minimum, economic maximum and ramp rates.

Reserve Deselection

Section 4.4.3.3 Reserve Deselection in Real-Time Exception Process

Any Market Seller that believes its generating unit has operating modes, limits, or conditions where the unit would not be capable of providing Synchronized and/or Secondary Reserves in real time, can submit to PJM and the MMU a request for an exception from being assigned Synchronized and/or Secondary Reserves in the Real-time Reserve Markets during time periods in which the generating unit is in those operating modes, limits, or conditions. The request must be submitted to Reserves@pjm.com.

As part of the request, the Market Seller shall supply, for each generating unit, technical information about the operational modes, limits, or conditions to support the requested exception. Only actual physical operational limitations, environmental limitations and other actual constraints on a resource will be considered for an exception. The following list is not an exhaustive list, but provides examples of the types of information and documentation PJM would request to support adjusted unit-specific parameter limits requests:

- Original Equipment Manufacturer (OEM) documentation
- Control room data
- Operational procedure listing the required steps along with the time required to perform each step during ramping.

Reserve Deselection

PJM shall consult with the MMU, and consider any input received from the MMU, in its determination of a request for such an exception. Within 60 days of the submission of the request, PJM shall notify the Market Seller in writing, with a copy to the MMU, whether the request is approved or denied. The effective date of any approved request will be provided in the written notification.

If a Market Seller has an approved exception, the Market Seller must communicate via telemetry primarily (or via phone calls when telemetry is not available) to PJM when the unit cannot provide reserves.

An approved exception will remain applicable to the unit until such time as PJM determines that a change is needed or the Market Seller notifies PJM, with a copy to the MMU, that a change is needed based on changed operational capabilities of the unit. Market Sellers must notify PJM, with a copy to the MMU, within 30 days of any changed operational capabilities that necessitate a change in an approved exception.

Submarket Definition

- **M11 should document more details for the default process for the study of potential new subzones.**
- **M11 should include a timeline for the publication of the subzone definition under the default process.**
- **M11 should specify where PJM will publish the definition and what corresponding data will be included.**
- **M11 should explain how it will communicate an update to the subzone definition.**
- **The new subzone for October 1, 2022 has not been published.**

Use of Spin Max Parameter

Section 4.2.2.1 Communication for Reserve Capability Limitation

A generation resource owner may request a lesser synchronized reserve maximum or secondary reserve maximum than the economic maximum if a physical limitation exists that cannot be addressed using the multi-segmented hourly ramp rate or using the real-time reserve deselection exception process. Resource owners mustmay submit sucha request for this modification to Reserves@pjm.com. A copy of this email will be made available to the Market Monitoring Unit. The request mustshould include the Markets Gateway unit name, unit id, reason, and documentation to support the request. Examples of the types of information and documentation PJM would request to support adjusted unit-specific parameter limits requests:

- Original Equipment Manufacturer (OEM) documentation
- Control room data
- Operational procedure listing the required steps along with the time required to perform each step during ramping.

PJM will determine, with the advice and input of the Marketing Monitoring Unit, whether the request is approved or denied and provide a written notification to the generation resource owner no later than 30 business days from the date of data submittal supporting the request. If the request is denied, PJM will include in the notice a written explanation for the denial.

New Types of Inflexible Reserves Call for a Change to Manual 11

Section 4.4.3 Real-Time Reserve Market Clearing

Sixty (60) minutes prior to the operating hour PJM executes the Ancillary Services Optimizer (ASO). The ASO jointly optimizes Energy, Synchronized Reserves, Non-Synchronized Reserves, Secondary Reserves, and Regulation based on forecast system conditions to determine an economic set of inflexible reserve resources to commit for the operating hour. Inflexible resources are defined as those resources that physically require an hourly commitment due to minimum run time constraints or staffing constraints. Inflexible resources include: ~~but are not limited to s~~

- Synchronous condensers that are operating in condensing mode solely for the purpose of providing Synchronized Reserves ~~and~~
- Economic Load Response that are prepared to curtail in response to a PJM Reserve Event and that do not receive assignments via telemetry.

Clarification of Reserve Assignment Process

Section 4.4.3.1 Real-Time Reserve Assignment

Inflexible reserve assignments are initially determined by ASO. The inflexible reserve assignments are bridged from ASO to RT SCED. The assignments in RT SCED are modified during situations in which the inflexible reserve resource cannot provide synchronized reserves. These situations are captured by PJM in DMT.

Reserve MW assignments are derived from the latest approved Real-time Security Constraint Economic Dispatch (RT SCED) program solution for the target time at the end of the current five (5) minute interval. If there is not an approved RT SCED solution for the target time at the end of the current five (5) minute interval, the reserve MW assignments will use the most recent approved RT SCED solution prior to the target time as the reference case.

Price Additivity

- **M11 does not explain price formation for synchronized and nonsynchronized reserves when prices are additive.**
- **New language proposed for Section 4.4.5.1**
  - **The price for each reserve product will not exceed the greater of the price cap for the reserve product or the sum of the penalty factor and the prices for the lower quality reserve products for the same location.**
- **M11 should also include the specific math for additive reserve shadow prices.**

Opportunity Cost for Condensers

- **M11 includes language explaining an opportunity cost of synchronous condensers in the pricing section.**
- **Opportunity costs affect clearing in the ASO and in the Day-ahead Market. This process should be explained in detail.**
- **There are no opportunity costs for condensers that affect clearing prices. They should not be included in the section describing clearing prices.**

Monitoring Analytics, LLC
2621 Van Buren Avenue
Suite 160
Eagleville, PA
19403
(610) 271-8050

MA@monitoringanalytics.com
www.MonitoringAnalytics.com