

Real Time Value Overview

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Real Time Values Market Rules
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- Implemented for the 2016/2017 DY
- Goal: Incorporate stronger performance incentives and more operational availability and diversity during peak conditions – Improve resource performance and flexibility – Articulate fuel security and operational availability standards - Provide investment signals
- Capacity Performance Resources must be capable of sustained, predictable operation that allows resource to be available to provide energy and reserves during performance assessment hours throughout the Delivery Year
 - Non-Performance Charges are assessed during emergency conditions throughout entire Delivery Year

- Capacity Resources
 - Required to submit cost based and parameter limited price price based schedules (price PLS)
 - Based on technology type, resources are required to submit parameter limits that adhere to the established proxy parameters found in the Minimum Operating Parameter matrix
 - Three ways to communicate a change in the operational capability of a resource
 1. Unit Specific Parameter Adjustment
 2. Parameter Limited Exception
 3. Real Time Values

| Parameter Limits |
|-----------------------------------|
| Minimum Down Time |
| Minimum Run Time |
| Maximum Run Time |
| Maximum Daily Starts |
| Maximum Weekly Starts |
| Hot/Warm/Cold Start Up Time |
| Notification Time |
| Turn Down Ratio (Eco Max/Eco Min) |

1. Unit Specific Parameter Adjustment

- Proxy parameter limits are based on technology type (Minimum Operating Parameter matrix)
 - Exempt resources include: Solar, Wind, Run-of-River Hydro, and Nuclear resources
- Adjustment requests are due by February 28th prior to the delivery year in which the parameter adjustment would be in effect and require approval by PJM
- Resources may submit a parameter adjustment request if they are unable to operate according to the proxy parameters based on a physical constraint
- These are permanent adjustments
- Examples of possible reasons for adjustment approval: Compliance with air and emissions permits, required steps for start-up including OEM required hold points, and SCR minimum temperature limits

- If operating conditions changes such that a resource cannot meet its aforementioned proxy parameter or its unit specific parameter limits, the Market Seller can seek a non-permanent exception
- Parameter limited exceptions must be approved by PJM and allow a resource to be made whole if committed with less flexible parameters
- Three types of exceptions
 1. Temporary – One-time use lasting for ≤ 30 days
 2. Period – lasts 31 days < 1 year during the 12 month period from June 1 – May 31
 3. Persistent – lasts for ≥ 1 year
- Example of possible reasons for exception approval: Equipment defects that changes the physical operation parameters, Gas pipeline restrictions, and Short-term environmental restrictions

- Mechanism for a resource to communicate to PJM the current operating capability of a resource if it could not operate according to its unit specific parameter limits or approved parameter limited exceptions
- Do not require PJM approval and are non-permanent
- Resources using RTVs will not receive Operating Reserve Credits and will not be made whole unless the Market Seller can justify to PJM that operating outside of its unit specific parameters was the result of an actual constraint

Parameters Eligible for RTV Overrides

Minimum Down Time

Minimum Run Time

Maximum Run Time

Hot/Warm/Cold Start Up Time

Notification Time

Turn Down Ratio

- If PJM Dispatch determines any resources fails to meet a unit specific parameter during real-time dispatch and the Market Seller did not submit a parameter limited exception or a Real Time Value:
 1. PJM Dispatch will log a Generator Parameter Discrepancy
 2. PJM staff will investigate and follow up with the Market Seller
 3. PJM staff will recommend corrective actions to Market Sellers if appropriate and/ or potential referral to FERC for any potential Tariff violations

1. It has been observed that RTVs are being used to consistently override a resource's unit specific parameter limits or approved parameter limited exceptions
2. There have been operational impacts in real time when a resource is called on by PJM dispatch based on its unit specific parameter limits or approved parameter limited exceptions, and at that time the resource notifies PJM that they cannot physically meet their unit specific parameter limits and have not submitted a RTV

- Update PJM dispatch of resource constraints related to operating parameters discovered after the close of the DA Market window
- Notify PJM of a resource's inability to meet a unit specific parameter or approved parameter limited exception

- Lack of available staffing or remote operations capability
- Economic decisions on how to operate a unit
- A conservative operations approach to operating the unit or equipment to reduce equipment maintenance
- Marketing strategies to limit unit flexibility and maximize operating times during uneconomic periods

| Parameter | Requests |
|-------------------------|----------|
| Notification Time | 630 |
| Minimum Down Time | 541 |
| Cold Start Time | 134 |
| Intermediate Start Time | 136 |
| Hot Start Time | 129 |
| Maximum Run Time | 74 |

69 units over 12 month period (December 2018 – November 2019)

Appendix

- Manual 11 Section 2.3.4 and 2.3.4.4
<http://www.pjm.com/~media/documents/manuals/m11.ashx>
- CP Unit Specific Parameter Adjustment FAQs
<https://pjm.com/-/media/committees-groups/committees/elc/postings/20150715-cp-unit-specific-adjustment-request-faqs.ashx?la=en>
- PJM Operating Agreement Schedule 1 Section 6.6
<https://www.pjm.com/directory/merged-tariffs/oa.pdf>
- Capacity Performance at a Glance
<https://pjm.com/-/media/library/reports-notices/capacity-performance/20150720-capacity-performance-at-a-glance.ashx?la=en>
- Capacity Performance Training
<https://pjm.com/-/media/committees-groups/committees/elc/postings/20150709-capacity-performance-training.ashx?la=en>

Real Time Values Process

Why was the process implemented?

For Resources to communicate their current operational capabilities when the resource cannot operate according to the unit specific parameters (CP and uncommitted capacity) or exceptions based on a physical constraint.

Who can use Real Time Values?

CP and Uncommitted Capacity Resources

What parameters are included in the Real Time Value Process?

Turn Down Ratio
 Minimum Down Time
 Minimum Run Time
 Maximum Run Time
 Start Up Time (Hot/Warm/Cold)
 Notification Time

How can Real Time Values be submitted?

Day Ahead = Temporary Exception Process in Markets Gateway
 Real Time = Operational Restriction field in Markets Gateway or
 Use hourly updates tab (Notification Time, Eco Min/Eco Max) AND
 Communicate to dispatch

*See the following examples for details on the process steps (based on select scenarios)

Real Time Values Overview

Who Can Request Make Whole payments using Real Time Values?

A Generation Capacity Resource that operates outside of its unit-specific parameters due to an actual constraint.

*The constraint must be communicated to PJM BEFORE the unit is committed either in the Day Ahead Energy Market or in Real Time.

What is an Example of an Actual Constraint?

Please note the following is an example: Operational Flow Order (OFO) issued for ratable take for gas.

When Must Supporting Documentation Be Submitted By?

Within thirty calendar days following the issuance of billing statement for the Operating Day.

References to Process

M11 Section 2.3.4.4

A Generation Capacity Resource that operates outside of its unit-specific parameters will not receive Operating Reserve Credits nor be made whole for such operation when not dispatched by the Office of the Interconnection, unless the Market Seller of the Generation Capacity Resource can justify to the Office of the Interconnection that operation outside of such unit-specific parameters was the result of an actual constraint.

| | Day Ahead | | Real-Time | |
|------------------------------------|--|--|--|--|
| | Request Exception | Reflect RTV | Request Exception | Reflect RTV |
| Minimum Run Time Notification Time | Parameter Limits screen (Type - Real Time Value) | Schedule Detail screen (Generator > Schedule)* | Parameter Limits screen (Type - Real Time Value) | Detail Update screen (Generator >Schedule) |
| Turn Down Ratio | Parameter Limits screen (Type - Real Time Value) | Eco Min/Max on Schedule Detail screen | Operational Restriction Tab | Eco Min/Max on Unit Hourly Update screen |

*hourly differentiated Minimum Run and/or Notification Time not permitted to be entered until 1830 Day Before

| | Day Ahead | | Real-Time | |
|--|--|--|-----------------------------|-----------------------------|
| | Request Exception | Reflect RTV | Request Exception | Reflect RTV |
| Minimum Down Time Maximum Run Time Start Up Time (Hot/Warm/Cold) | Parameter Limits screen (Type = Real Time Value) | Schedule Details screen (Generator > Schedule) | Operational Restriction tab | Operational Restriction tab |

*These parameters are not hourly differentiated