



Working to Perfect the Flow of Energy

PJM Manual 11:

**Energy & Ancillary Services
Market Operations**

Revision: 8079

Effective Date: ~~December 17,~~
2015 TBD

Prepared by

Forward Market Operations

©PJM 20152016

2.3.4 Minimum Generator Operating Parameters – Parameter Limited Schedules

Below is the list of business rules to require units to submit schedules that meet minimum accepted parameters.

- Pre-determined limits on non-price offer parameters for all generation resources will define limits on generation resources' non-price offer parameters under the following circumstances:
 - If the three pivotal supplier test for the operating reserve market defined by transmission constraint(s) is failed, generation resources will be committed on their Parameter-Limited Schedule, as defined below.
- The Parameter-Limited Schedule that is utilized shall be the less limiting of the defined Parameter-Limited Schedules or the submitted offer parameters.
- In the event that PJM: (i) declares a Maximum Generation Emergency; (ii) issues an alert that a Maximum Generation Emergency may be declared ("Maximum Generation Emergency Alert"); or (iii) schedules units based on the anticipation of a Maximum Generation Emergency or a Maximum Generation Emergency Alert for all or any part of such Operating Day, generation resources will be committed on their Parameter-Limited Schedule.
- On an annual basis, PJM will define a list of minimum acceptable operating parameters, based on an analysis of historically submitted offers, for each unit class for the following parameters¹:
 - Turn Down Ratio
 - Minimum Down Time
 - Minimum Run Time
 - Maximum Daily Starts
 - Maximum Weekly Starts
- The following parameters² will be reviewed on an ongoing basis, via a stakeholder process, and may, at some future date, define limitations for:
 - Hot Start Notification Time
 - Warm Start Notification Time
 - Cold Start Notification Time
- [Turn Down Ratio is defined as the ratio of economic maximum MW to economic minimum MW.](#)

2.3.10 Operating Parameter Definitions

- **Notification time** - The time interval between PJM notification and the beginning of the start sequence (which includes any valve operation, startup of auxiliary equipment or beginning a checklist necessary for startup) of a generating unit that is currently in its cold/warm/hot temperature state.
- **Start-up time** - The time interval, measured in hours, from the beginning of the start sequence (which includes any valve operation, startup of auxiliary equipment or beginning a checklist necessary for startup) to the generator breaker closure for a generating unit in its cold/warm/hot temperature state. For a Combined Cycle unit it is the time interval from the beginning of the start sequence to first combustion turbine generator breaker closure.
- **Minimum Run time** - The minimum number of hours a unit must run, in real-time operations, from the time of generator breaker closure to the time of generator breaker opening (as measured by PJM's state estimator). For Combined Cycle units this is the time period between the first combustion turbine generator breaker closure and the last generator breaker opening.
- **Turn Down Ratio** - The ratio of a unit's economic maximum MW to its economic minimum MW.
- **Minimum Down Time** - The minimum number of hours between unit shutdown and unit startup, calculated as the shortest time difference between the unit's generator breaker opening and the unit's generator breaker closure, as measured by telemetry available to PJM. For Combined Cycles units this is the minimum number of hours between the last generator breaker opening and first combustion turbine generator breaker closure.
- **Maximum Daily Starts** - The maximum number of times that a unit can be started in a day under normal operating conditions.
- **Maximum Weekly Starts** - The maximum number of times that a unit can be started in one week under normal operating conditions (168 hour period starting Monday 0001 hour).
- **Maximum Run Time** - The maximum number of hours a unit can run before it needs to be shut down, calculated as difference between the time of generator breaker closure to the time of generator breaker opening.

- **Soak Time** - The minimum number of hours a unit must run, in real-time operations, from the time of generator breaker closure to the time the unit is at economic minimum or dispatch-able. For Combined Cycles units this is the minimum number of hours from the time of the first combustion turbine generator breaker closure and the time the unit is at economic minimum or dispatchable.
- **Cancellation fees** - The actual costs incurred by a Market Seller, that are typically included in Start-up Costs, when PJM cancels a pool-scheduled generation resource's start and the resource has not yet reached generator breaker closure. Cancellation Fees shall be capped at the appropriate Start-up Cost for the resource as specified in its offer data.

2.14 Balancing Operating Reserve Cost Analysis

Accounting for Operating Reserve is performed on a daily basis. A pool-scheduled resource of a PJM Member is eligible to receive credits for providing Operating Reserve in the day-ahead market and, provided that the resource was available for the entire time specified in its offer data, in the balancing market. The total resource offer amount for generation, including startup and no-load costs as applicable, is compared to its total energy market value for specified operating period segments during the day (including any amounts credited for day-ahead scheduling reserve in excess of the day-ahead scheduling reserve offer, any amounts credited for synchronized reserve in excess of the synchronized reserve offer plus opportunity cost, and any amounts credited for resources providing reactive services). If the total value is less than the offer amount, the difference is credited to the PJM Member.

Credits/Fees are also provided for pool-scheduled energy transactions, for generating units operating as synchronous condensers (not for synchronized reserve nor for reactive services) at the direction of PJM, for cancellation of pool-scheduled resources, for units whose output is suspended or reduced due to a transmission constraint or other reliability reason, for units performing an annual black start test, and for units providing reactive services at the direction of PJM.

6.3.5 **Credits/Fees** for Cancellation of Pool Scheduled Resources

At the end of each month, PJM calculates the credits due to each PJM Member for pool-scheduled resources that were selected to run as part of the reliability study, and that PJM canceled before coming on-line. The cancellation ~~credit/fee~~ equals and are defined as the actual costs incurred by a Market Seller, that are typically included in Start-up Costs, when PJM cancels a pool-scheduled generation resource's start and the resource has not yet reached generator breaker closure. Cancellation Fees shall be capped at the appropriate Start-up Cost for the resource as specified in its offer data.~~the actual costs incurred, capped at the appropriate start-up cost as specified in the generating resource's offer data.~~ Requests for such ~~credits/fees~~ must be submitted, in writing, to the PJM Manager of Market Settlement Operations Department, within forty-five days of invoice being received by participant for the month in question.