Updated Operating Parameter Definitions

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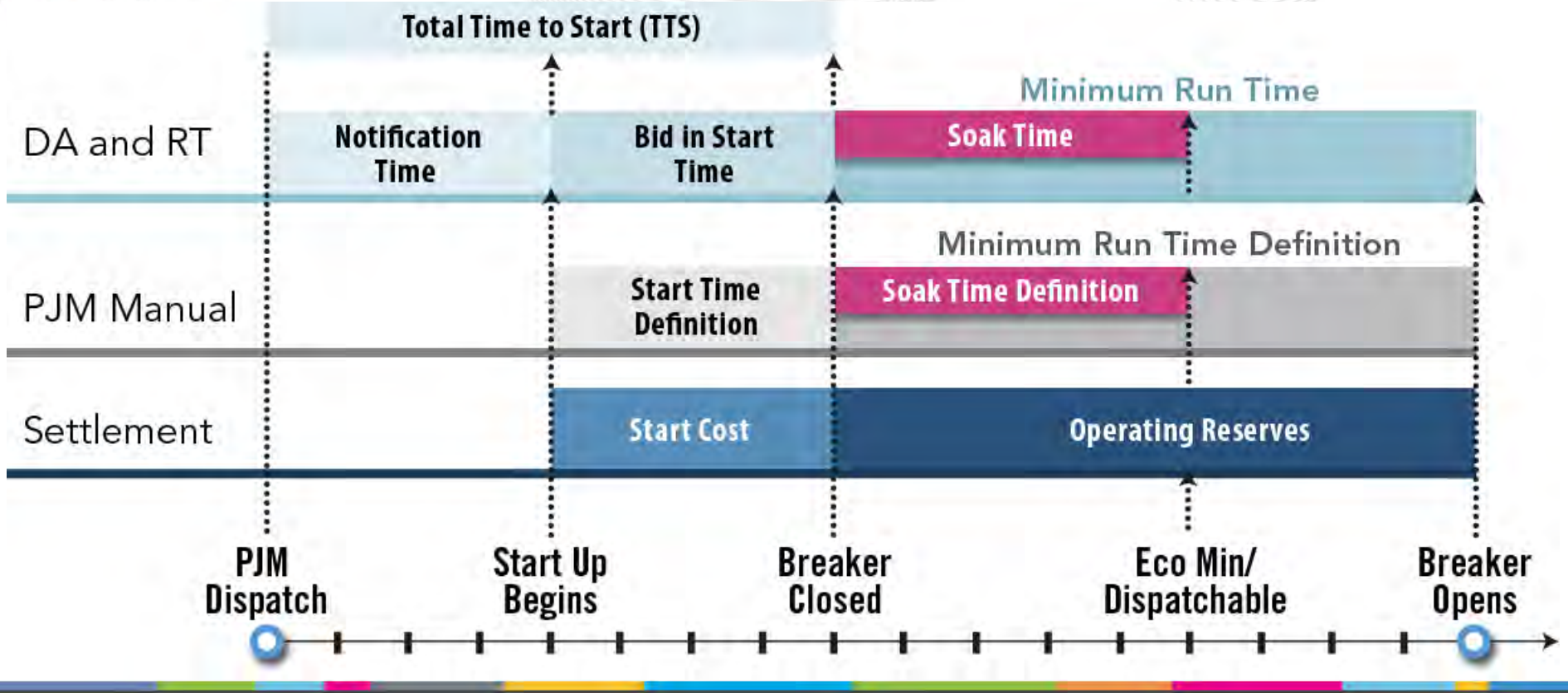
Why are we discussing?

A number of operating parameters that are only defined in the eMKT/Markets Gateway User's Guide have led to confusion among the members on what values should be entered into eMKT/Markets Gateway. PJM has also identified a few terms in Manual 15 that could be clarified.

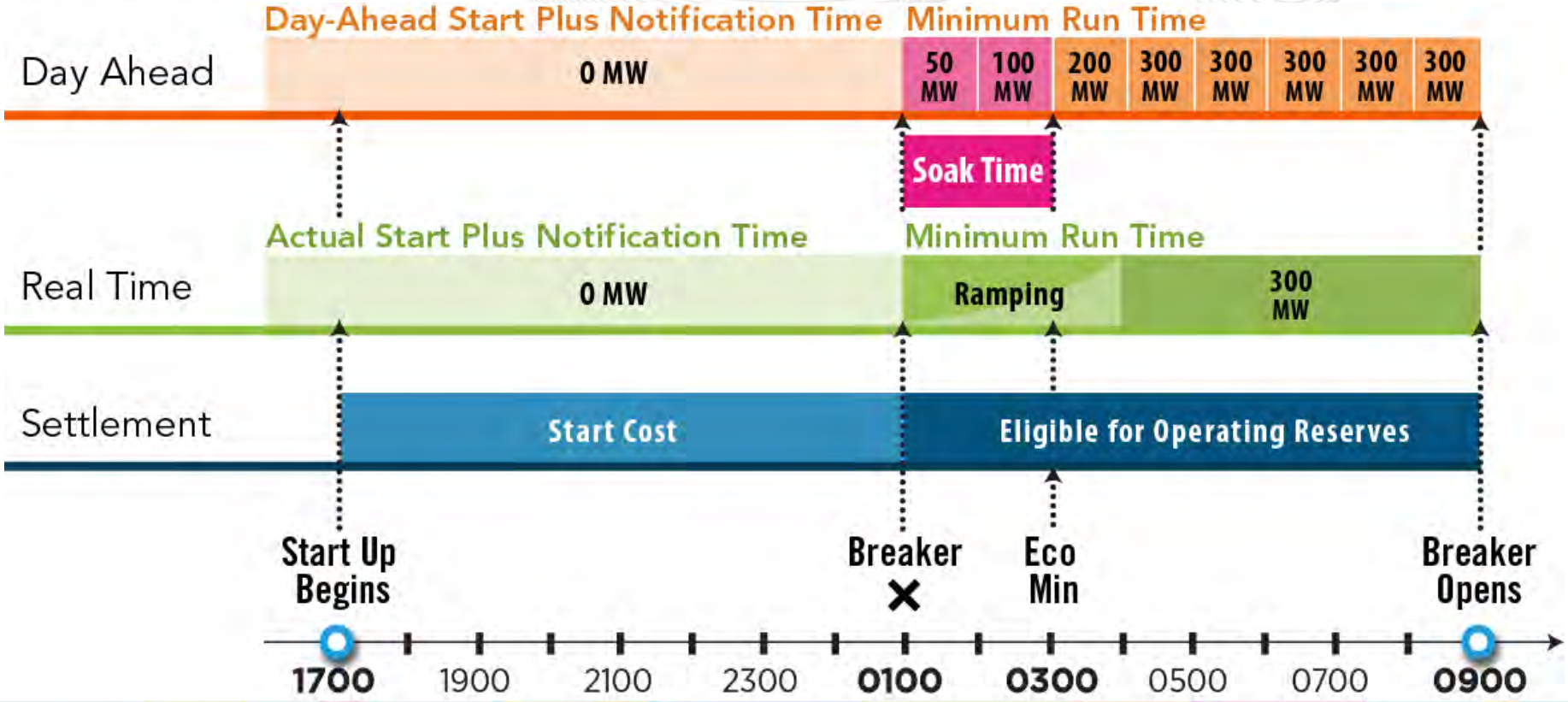
List of Parameters

Parameter	Current Location	Definition Location
Notification Time	User Guide	M-11
Start-up Time	User Guide	M-11
Minimum Run Time	User Guide	M-11
Turn Down Ratio	User Guide	M-11
Minimum Down Time	New/User Guide	M-11
Maximum Daily Starts	User Guide	M-11
Maximum Weekly Starts	User Guide	M-11
Maximum Run Time	User Guide	M-11
Soak Time (proposed new parameter)	New	M-11
Start-up cost	M-15	M-15
No-load cost	M-15	M-15
Cancellation fees (cancellation credit)	M-11/28	M-11/28

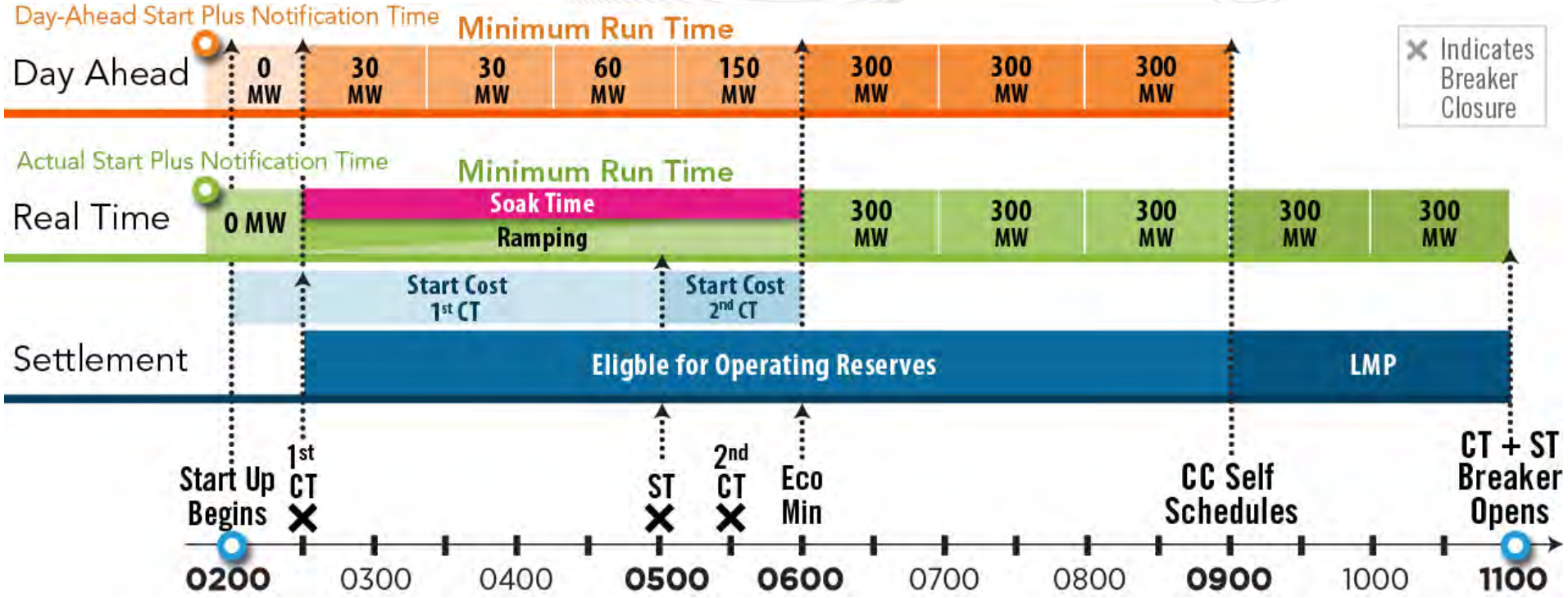
Proposed Operating Parameter Relationship



Operating Parameter Relationship – Steam Unit



Operating Parameter Relationship - Combined Cycle Example



Notification Time Definition

Cold/Warm/Hot Notification Time (hour) — *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.*

- *Added more detailed wording for beginning of start sequence*

Red text are the previously presented changes to definitions in the user guide or manuals

Yellow highlights incorporate additional changes due to stakeholder feedback

Startup Time Definition

Cold/Warm/Hot Startup Time (hour) — *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 ~~steam turbine~~ generator breaker closure.*

- *Added more detailed wording for beginning of start sequence*
- *Changed to CT breaker closure since it is difficult for PJM to see steam turbine breaker closure via telemetry*

Minimum Run Time Definition

Minimum Run Time (hour) — *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 ~~steam turbine~~ generator breaker opening.*

- *Changed to last breaker opening because it is difficult for PJM to see what breaker actually opened last*

Turn Down Ratio Definition

Turn Down Ratio — *The ratio of a unit's economic maximum MW to its economic minimum MW. (Manual 11 section 2.3.4)*

- *This definition has already added to M11*

Minimum Down Time Definition

Minimum Down Time (hour) — *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 ~~steam turbine~~ generator breaker opening and first combustion ~~steam~~ turbine generator breaker closure.*

- *Changed to last breaker opening and CT breaker closure since it is difficult for PJM to see steam turbine breaker opening or closure via telemetry*

Maximum Daily Starts Definition

Maximum Daily Starts — *The maximum number of times that a unit can be started in a day under normal operating conditions.*

Maximum Weekly Starts Definition

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).*

- *DA and RT use for scheduling units*
- *Settlements does not use*

Maximum Run Time Definition

Maximum Run Time (hour) — *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 Definition

- ***Hot/Warm/Cold*** Soak Time (hour) — *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.*
  - *Added hot, warm and cold states.*
  - *Added combined cycles*

Start-up Costs Definition

Start-up Costs ($) — *The costs incurred by a Market Seller to bring the boiler, turbine, and generator from shut-down conditions to the point of breaker closure ~~and synchronization to the Transmission System~~ and is determined based on the cost of start fuel, total fuel-related cost, performance factor, electrical costs (station service), start maintenance adder, and additional labor cost if required above normal station manning.*

- *changed to maintain consistent terminology*

No-load Costs Definition

No-load Costs ($/hour) — *The hourly fixed cost of a Market Seller, expressed in $/hour, needed to create the starting point of a monotonically increasing incremental cost curve (offer curve) for a generating unit.*

Cancellation Fees Definition

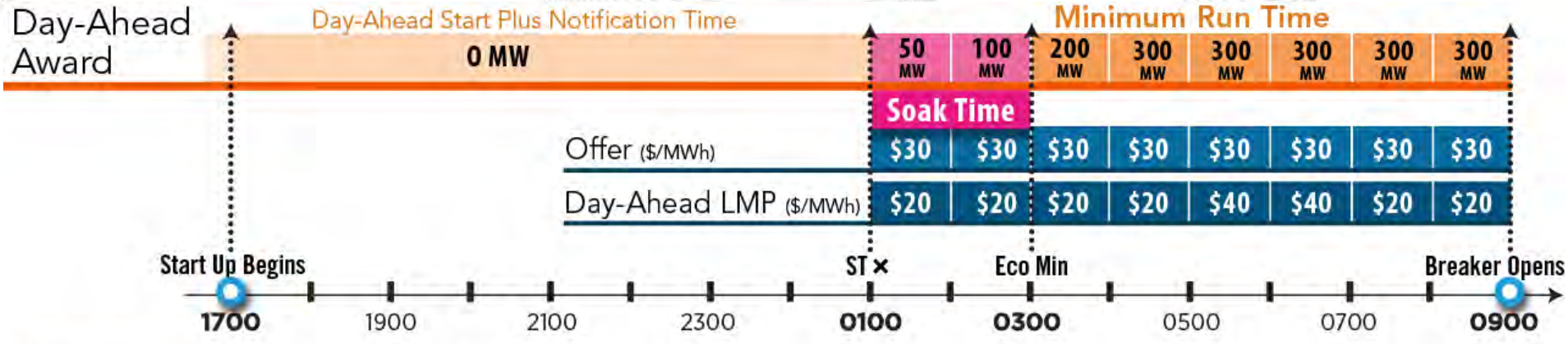
Cancellation Fees ($) — *The actual costs incurred by a Market Seller, that are typically included in Start-up Costs, when PJM cancels a pool-scheduled generation resource's start and the resource has not yet reached generator breaker closure ~~synchronized to the grid~~. Cancellation Fees shall be capped at the appropriate Start-up Cost for the resource as specified in its offer data.*

- *Changed for terminology consistency*

**Referenced in M-11 and M-28 as "cancellation credit" and "cancellation fees"*

- Steam Unit needed by PJM for 6 hours for a transmission constraint starting at 0300 with the following parameters offered in DA
  - 300 MW Economic Maximum, 200 MW Economic Minimum
  - 1 hour Notification Time, 8 hour Start Time, 2 hour Soak Time
  - 8 hour Minimum Run Time
  - Startup Cost $20,000
  - No Load $2000/hour
  - Incremental Energy Offer $30/MWh

Steam Turbine Settlement Example – Day Ahead



Energy Credits

$$= \Sigma\left(\frac{DA}{LMP} * \frac{DA}{MW}\right) = \$49{,}000$$

Operating Reserve (≥ $0)

$$= \left[\text{Start Cost} + \Sigma\,\text{No Load} + \Sigma\left(\text{Offer} * \frac{DA}{MW}\right) - \Sigma\left(\frac{DA}{LMP} * \frac{DA}{MW}\right)\right]$$

$$= \$20{,}000 + \$16{,}000 + \$55{,}500 - \$49{,}000$$

$$= \$42{,}500$$

Steam Turbine Settlement Example – Real Time

Balancing Credits

$$= \Sigma\left(\frac{RT}{LMP}\right) * \left(\frac{RT}{MW} - \frac{DA}{MW}\right) = (-\$7{,}800)$$

Balancing Operating Reserve Credits (≥ $0)

$$= \left[\text{Start Cost} + \Sigma\ \text{No Load} + \Sigma\left(\text{Offer} * \frac{RT}{MW}\right) - \Sigma\left(\frac{RT}{LMP}\right) * \left(\frac{RT}{MW} - \frac{DA}{MW}\right) - \Sigma\left(\frac{DA}{LMP} * \frac{DA}{MW}\right) - \text{DA Operating Reserve Credits}\right]$$

$$= \$20{,}000 + \$16{,}000 + \$46{,}800 - (-\$7{,}800) - \$49{,}000 - \$42{,}500$$

$$= \$0$$