



#	Proposed Operating Parameter Definition	Stakeholder Feedback
1	Cold/Warm/Hot Notification Time (hour) — The time interval between PJM notification and the beginning of the start sequence of a generating unit that is currently in its cold/warm/hot temperature state.	<ul style="list-style-type: none"> • Better define start sequence, including definitive events that would trigger a start sequence • Be careful not to overly define start sequence or be overly restrictive • Include graphic/chart describing how start sequence is used, including total time • Difference between startup time and how a plant operator would define startup; recognize disconnect between start time and breaker close
2	Cold/Warm/Hot Startup Time (hour) — The time interval, measured in hours, from the beginning of the start sequence 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 steam turbine generator breaker closure.	<ul style="list-style-type: none"> • Better define start sequence, including definitive events that would trigger a start sequence
3	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 steam turbine generator breaker opening.	<ul style="list-style-type: none"> • Start minimum run time at the end of soak time *preferred • For CC, start minimum run time when steam breaker closes • Add hot/warm/cold minimum run time parameter • Prefer un-nesting of parameters
4	Turn Down Ratio — The ratio of a unit's economic maximum MW to its economic minimum MW. (Manual 11 section 2.3.4)	<ul style="list-style-type: none"> • Taken through stakeholder process

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5	<p>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 steam turbine generator breaker opening and steam turbine generator closure. (from User Guide)</p> <p>Minimum Down Time (hour) —The down time following a shutdown that may be needed for inspecting and securing equipment to ready the plant for a subsequent startup. (from OC discussions)</p>	<ul style="list-style-type: none"> • End minimum down time at the beginning of start time • Add hot/warm/cold minimum down time parameter / Use hot time only as warm start time would be exhausted • Eliminate second definition due to inconsistency with min down time and startup time • Keep second definition (includes time for securing and inspecting equipment) • Rename second definition to Shutdown time – defined as the min down time between end of shutdown time and the beginning of the next start sequence • Define time from shutdown to next startup/impact on variability of startup due to expectation of next restart and minimum down time • Minimum Shutdown time - turnaround time from breaker close to open • Parameter definitions have become very narrowly focused • Shutdown Time is the period of time starting with opening the generator breaker (steam turbine for combined cycle) to the time in which all post-operating activities for inspecting and securing equipment is complete • Minimum Down Time The minimum number of hours between the end of Shutdown Time, and the beginning of the next unit startup. • Add additional terms to describe and demonstrate shutdown (ST Spindown, CT Disconnect, CT Spindown, Post-operation activities)
6	<p>Maximum Daily Starts — The maximum number of times that a unit can be started in a day under normal operating conditions.</p>	<ul style="list-style-type: none"> • What constitutes a start, does a failed start count? • Hot & Cold start times vary which impacts the amount of daily/weekly starts • Maximum starts according to unit or PJM; PJM counts total starts
7	<p>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).</p>	<ul style="list-style-type: none"> • Large Steam unit example, 3-4 starts in a week vs. 5 in a month; definitions not expansive enough • Hot & Cold start times vary which impacts the amount of daily/weekly starts •
8	<p>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.</p>	<ul style="list-style-type: none"> •



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9	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.	<ul style="list-style-type: none"> • Add hot/warm/cold soak time parameter • Not the only parameter to get unit ready to run at economic min, could use environmental limit • Capture known variability of Wet/Cold Dry/Cold shorter soak time that is more predictable • Keep definition
10	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.	<ul style="list-style-type: none"> • Refer to M-15 for detailed calculation if referenced in another manual • Why new language “by a Market Seller”?
11	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.	<ul style="list-style-type: none"> • Refer to M-15 for detailed calculation if referenced in another manual • Why new language “of a Market Seller”?
12	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 synchronized to the grid. Cancellation Fees shall be capped at the appropriate Start-up Cost for the resource as specified in its offer data.	<ul style="list-style-type: none"> • Why new language “by a Market Seller”?