



Opportunity Cost Calculator – Education Session



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- Opportunity Cost – when available run hours are limited, foregone profits associated with being run during one time period when it could have been more profitable to run in a higher valued time period within the same year or compliance period.

SCHEDULE 2 - COMPONENTS OF COST

(a) Each Market Participant obligated to sell energy on the PJM Interchange Energy Market at cost-based rates may include the following components or their equivalent in the determination of costs for energy supplied to or from the PJM Region:

For generating units powered by boilers

Firing-up cost

Peak-prepared-for maintenance cost

For generating units powered by machines

Starting cost from cold to synchronized operation

For all generating units

Incremental fuel cost

Incremental maintenance cost

No-load cost during period of operation

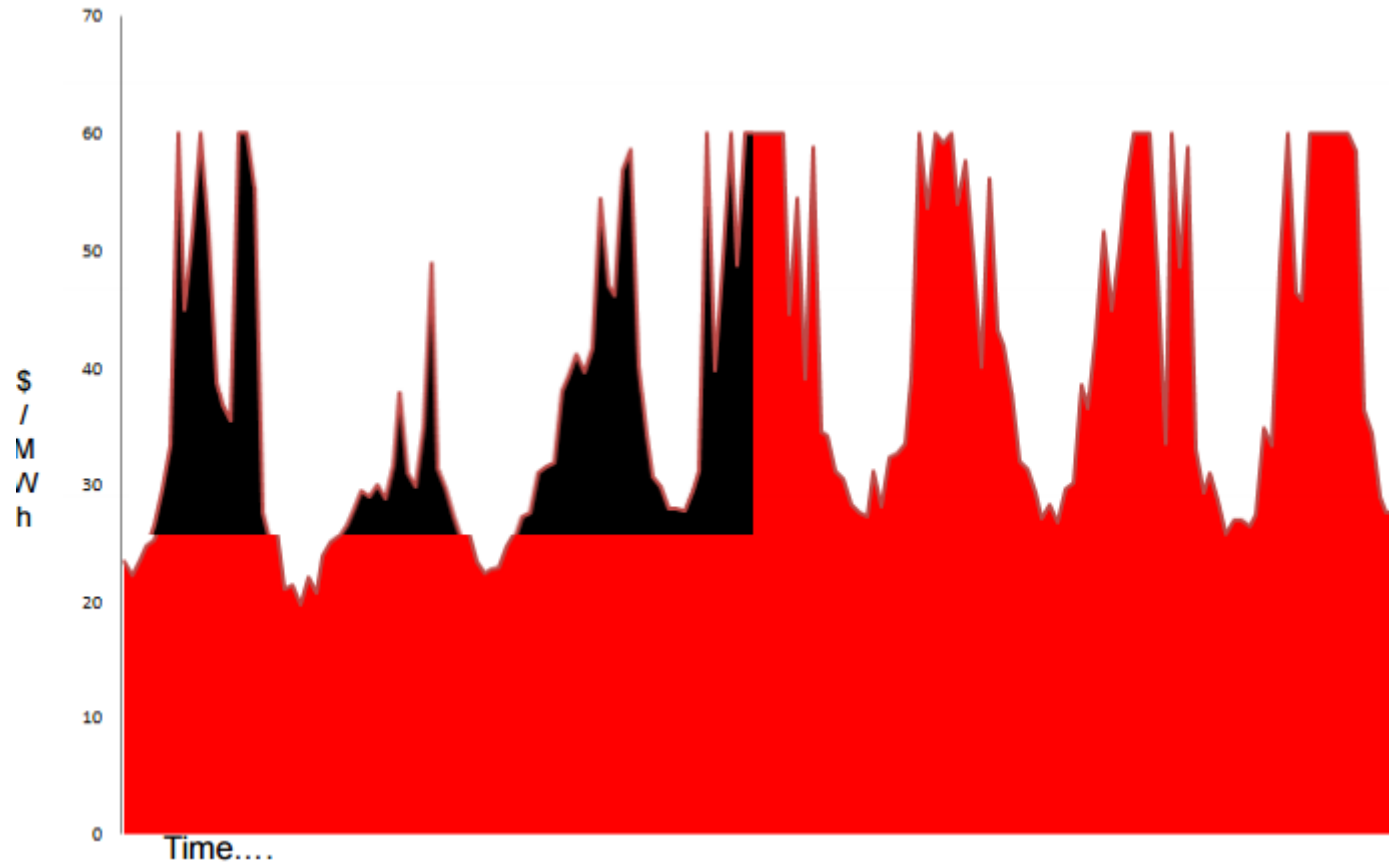
Incremental labor cost

Other incremental operating costs

- For a generating unit that is subject to operational limitations **due to energy or environmental limitations imposed on the generating unit by Applicable Laws and Regulations** (as defined in the PJM Tariff), the Market Participant may include in the calculation of its “other incremental operating costs” an amount reflecting the unit-specific Energy Market Opportunity Costs expected to be incurred.
- For a generating unit that is subject to operational limitations because it only has a limited number of starts or available run hours resulting from (i) **the physical equipment limitations of the unit**, for up to one year, due to original equipment manufacturer recommendations or insurance carrier restrictions, or (ii) **a fuel supply limitation**, for up to one year, resulting from an event of Catastrophic Force Majeure, the Market Participant may include in the calculation of its “other incremental operating costs” an amount reflecting the unit-specific Non-Regulatory Opportunity Costs expected to be incurred.

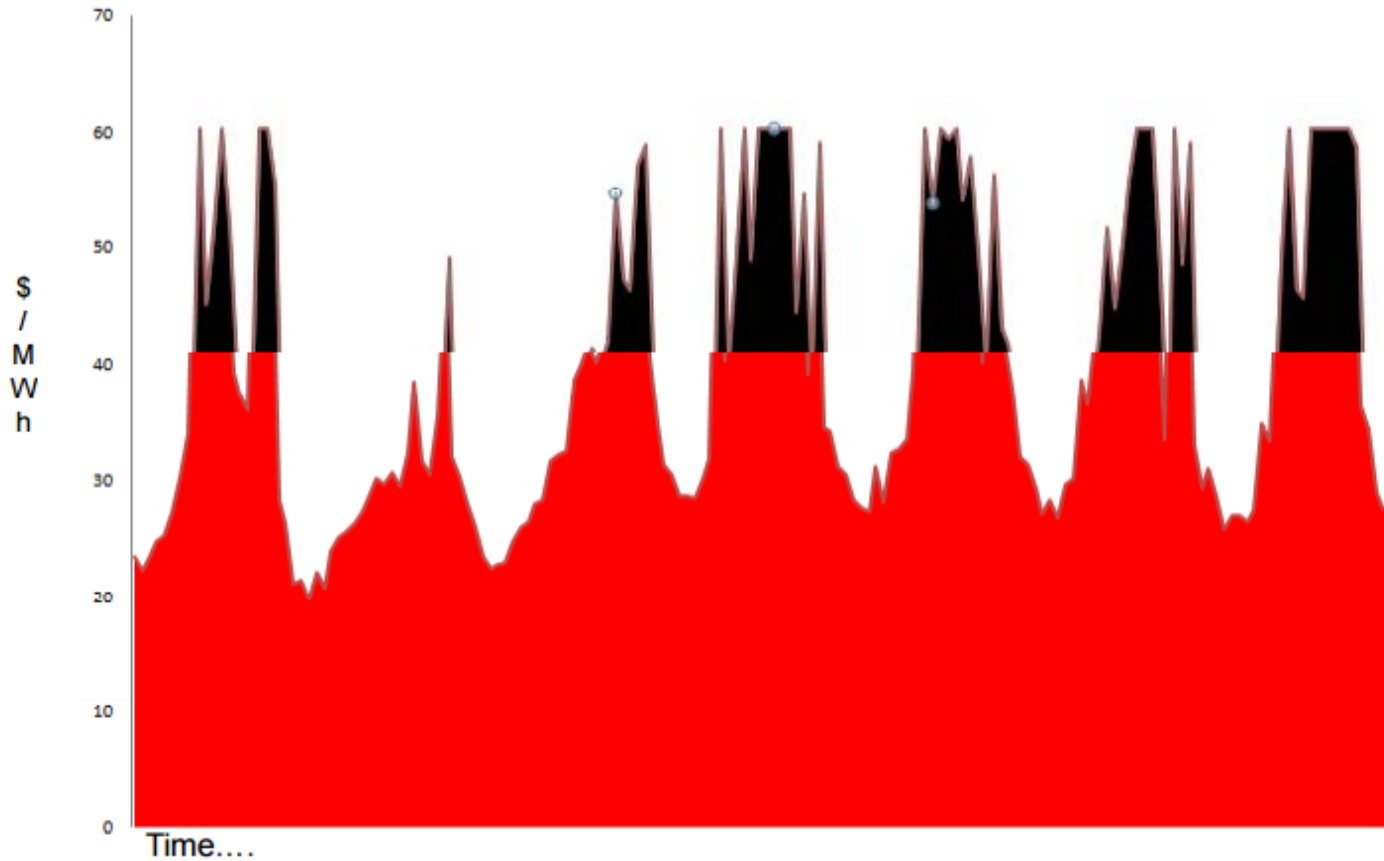
The need for an Opportunity Cost Adder

Dispatch without Opportunity Cost

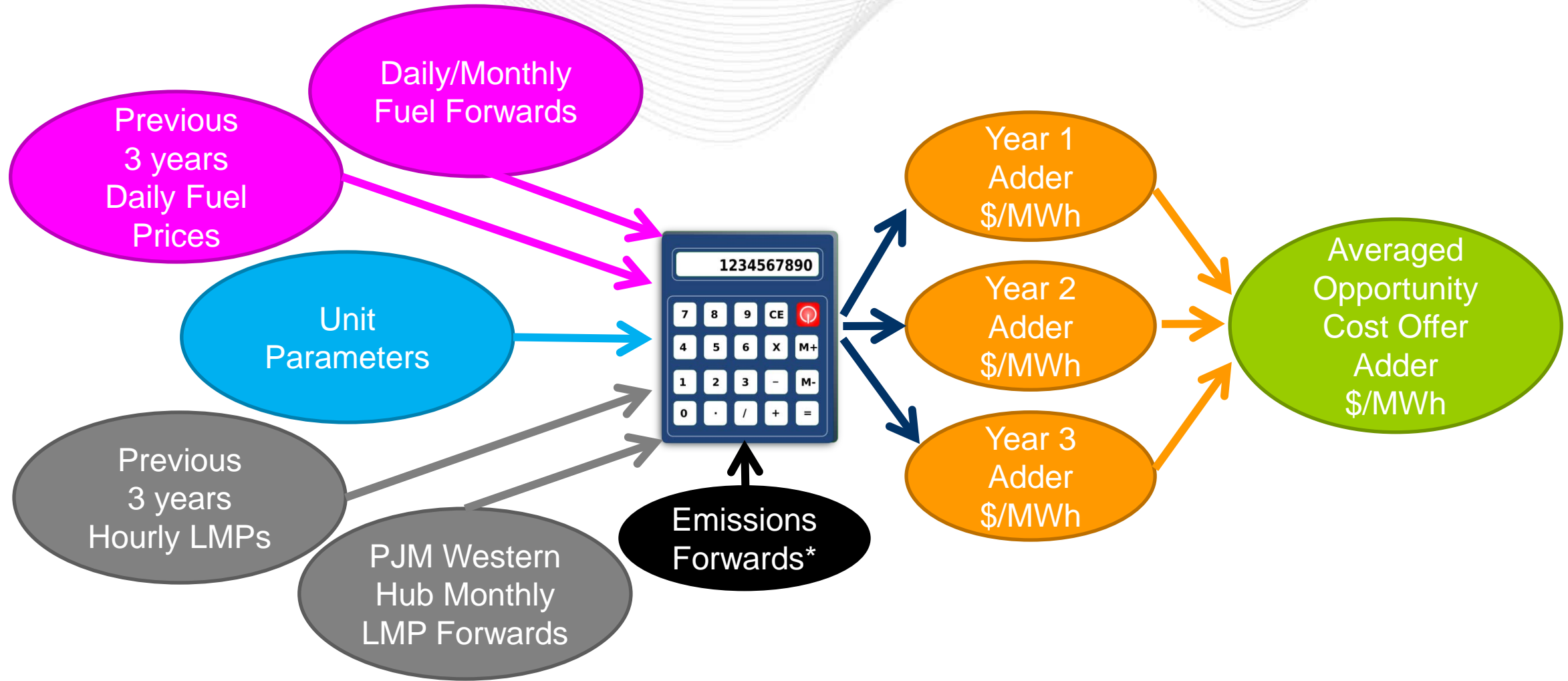


The need for an Opportunity Cost Adder cont.

Dispatch with Opportunity Cost



- Opportunity Cost is the value associated with a specific generating unit's lost opportunity to produce energy during a higher valued period of time occurring within the same compliance period, which compliance period is determined by the applicable regulatory authority and is reflected in the rules set forth in PJM Manual 15.
- More specifically, the Opportunity Cost shall mean the difference between (a) the forecasted cost to operate a specific generating unit when the unit only has a limited number of available run hours, and (b) the forecasted future hourly Locational Marginal Price at which the generating unit could run while not violating such limitations.



* Currently Emissions Forwards are not trading in any markets and their value is set to \$0.

- PJM Western Hub LMP futures are adjusted in two ways:
 1. Basis ratio to account for the **monthly** on-peak and off-peak difference between LMPs at Western Hub and LMPs at the pnode where the unit is located.
 2. Volatility ratio to account for the fact that LMP futures are static for the entire month, but in reality values will change every **hour**.
- The past three years of data are used to determine the basis differential and hourly shape to apply to the future values.

- Fuel futures are adjusted in one way:
 1. Volatility ratio to account for the fact that fuel futures are static for the entire month, but in reality values will change every **day**.
- Users can choose from select fuel pricing points (data provided by Platts) or upload their own fuel history for use in the calculator.

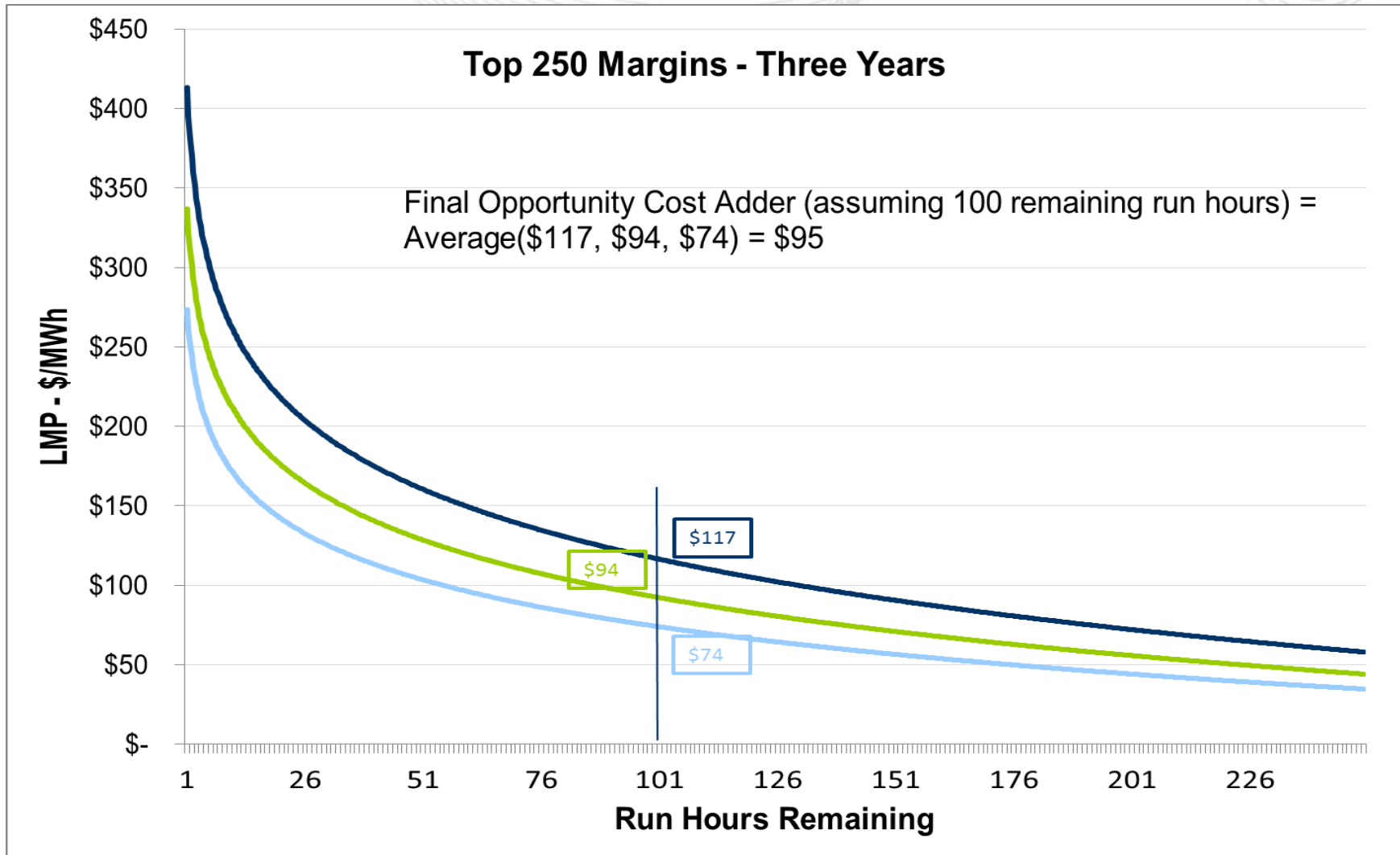
- Emissions futures, when available, are not adjusted in any way.
- Emissions futures are multiplied by the emissions rates that are input into the unit parameters part of the calculator.
- The following emissions rates are taken into account by the calculator:
 - CO₂
 - SO₂
 - NO_X

- The following unit parameters are taken into account by the calculator:
 - Economic Maximum
 - Minimum Run Time
 - Start Cost
 - Heat Rate (MMBtu/MWh)
 - FMU Adder (\$/MWh)
 - VOM Rate (\$/MWh)
 - Use 10% adder

LMP
Forecast - Dispatch Cost
Forecast

= Opportunity Cost or Margin

- Future prices are applied to the “shapes” of each of the past three years to arrive at three sets of forecasted values.
- $\text{Forecasted LMP} - \text{Forecasted Dispatch Cost} = \text{Margin}$
- Margins are ranked from highest to lowest, taking into account minimum run hour limitations.
- The number of remaining run hours determines the margin that will be selected.
- The final margins from the past three years are averaged to arrive at the Opportunity Cost Adder.



- If you run out of hours, even after using the calculator, you must take a forced outage.
- FERC Docket Nos. ER11-3384-000 and ER11-3384-001
 - “We do not find that PJM has sufficiently justified the proposed use of a 50 percent cut-off for determining when self-scheduled generation qualifies as an Outside Management Control Outage, and we cannot find that such a provision is necessary to make the Tariff just and reasonable under section 206 of the FPA. PJM is required to make a compliance filing removing these provisions from the definition of NonRegulatory Opportunity Cost and Energy Market Opportunity Cost in the currently proposed revisions, without prejudice to PJM making a properly justified filing under section 205 of the FPA.”

- Accounting for Performance Assessment penalties
- Differences between the IMM's and PJM's methodologies
- Protocols for calculator use
- Lack of Emissions forwards
- Treatment of immature units (not having three years of history)