Review of MMU Proposed Approach to Treatment of Negative Margins in Opportunity Cost Calculations

Opportunity costs are the value of a foregone opportunity for a generating unit. Opportunity costs may result when a unit: has limited run hours due to an externally imposed environmental limit; is requested to operate for a constraint by PJM; and is offer capped. Opportunity costs are the net revenue from a higher price hour that are foregone as a result of running at PJM's request during a lower price hour. The calculated opportunity cost adder applies only to cost-based offers and is only relevant when a unit is offer capped for local market power mitigation.

The purpose of the calculation method is to calculate the value of the opportunity cost. The method must calculate the margin (LMP minus cost) for every hour in the projected year. Those margins are the hourly opportunity cost.

For example, a unit is limited to 100 run hours for a year based on an environmental regulation. If the unit is required to run by PJM during a low price hour, it can add an opportunity cost to its cost based offer. The value of that opportunity cost adder is the margin from the 100th highest margin hours for the coming year.

In order to calculate the opportunity cost for each hour of the coming year, LMPs and costs must be estimated for each hour of that year. The calculation method uses published forward curves for the price of electricity at the PJM Western Hub and input fuel prices.

The forward energy prices are available by month for PJM's West Hub. The forward fuel prices are available by month or by season or quarter and multiple locations.

It is not possible to have margins for individual units at their specific buses using only forward data. In order to develop margins and therefore opportunity costs for individual units at their specific buses, historical data must be used. The historical relationships between hourly prices at the West Hub and the monthly prices at the West Hub are used as the basis for hourly margins. The historical relationships between individual bus prices and the West Hub price are used as the basis for bus specific margins. The historical relationships between daily real time fuel prices and the forward prices are also used to develop the basis for daily, bus specific margins, together with transportation basis differentials.

The result is an hourly LMP estimate for each generator bus, a daily fuel cost estimate for each generator bus and therefore an hourly margin for each bus. (The net margin also accounts for emissions costs, the ten percent adder, VOM and FMU adders.) The hourly LMP and the fuel costs are the result of using the historical ratios multiplied by the forward curve data. The margins which result from comparing these hourly LMP and fuel cost data reflects the forward data, adjusted using historical data, to the specific generator bus. The only purpose of using the historical data is to translate the forward curve data to specific hours and buses.

If the resultant margin is negative for a specific generator bus, it means that this calculation method results in a negative margin for that bus and hour, based on the forward data translated to specific hours and buses. A negative margin means that there is no opportunity cost associated with that hour. For a method that used a single historical year, the answer is clear. If the margin is negative, the opportunity cost is zero.

The approved method uses an average of three years on the basis of the assumption that it would be more representative to use an average of three years rather than a single year. For the approved method, which uses three years of data as the basis to calculate the margin for an hour at a specific bus, the same logic should hold that holds for a single year. If all three hours have calculated negative margins, there is no opportunity cost. If the average of all three hours is a negative margin, there is no opportunity cost. It is inconsistent with the basic method to ignore the results of individual hours in calculating the opportunity cost. The currently approved method would do exactly that by ignoring negative margins in the calculation of the average.

A negative margin results when the result for the calculation (Projected LMP minus Dispatch Cost) is a margin in which cost is greater than LMP. This does not mean the projected LMP was negative, nor does it mean a generator was or was not dispatched by PJM in this hour. Negative margins in a single hour simply mean that the projected LMP is lower than the projected dispatch cost of a unit for this particular hour, for the designated projected year.

Example 1, no negative margins:

Highest hour in 2007: $100 margin
Highest hour in 2008: $75 margin
Highest hour in 2009: $50 margin

(100 + 75 + 50) / 3 = 75

Average Margin and Final Opportunity Cost Adder: $75

Example 2, with negative margin:

Highest hour in 2007: -$100 margin

Highest hour in 2008: $75 margin
Highest hour in 2009: -$50 margin

(-100 + 75 + -50) / 3 = -25

Average Margin and Final Opportunity Cost Adder: -$25, becomes $0

Example 3, negative margins converted to zero margins:

Highest hour in 2007: -$100 margin, becomes $0 margin
Highest hour in 2008: $75 margin
Highest hour in 2009: -$50 margin, becomes $0 margin

(0 + 75 + 0) / 3 = 25

Average Margin and Final Opportunity Cost Adder: $25

The example above illustrates the substantial differences between rounding up to zero, and including a negative value in the calculation. Using a single year for the opportunity cost adder lacks the hourly fluctuations that an average of three year history might have. LMP being greater than dispatch cost should not be rounded to zero, as it is essential in coming to an accurate opportunity cost adder. Including negative margins in the average of three years, rather than rounding up to zero before calculating the adder is used to maintain the use of yearly projections to the final opportunity cost adder.

If a unit were to actually have a zero margin, it would mean:

LMP – Dispatch Cost = 0

Rounding any negative margin up to zero indicates projected LMP was equal to projected dispatch cost in a given hour, and a unit *should* run on economics for that yearly projection. However, including negative margins accurately indicates a unit *should not* run in that given hour, and it would not be economic to do so. A unit that would not be economic to run in a given projection year should reflect that when averaging three years of projections.