Energy Price Formation

Problem / Opportunity Statement

Since its inception, PJM Interconnection's wholesale energy market has driven efficient resource entry and exit, successfully managed the ongoing fuel transition from coal to natural gas and helped to maintain a reliable grid. Throughout its history, the PJM market has proven to be adaptable to the evolving industry as market rules have evolved to meet new needs.

The confluence of developments outside the markets has revealed an opportunity for enhancing energy market pricing. Energy market prices should:

- accurately reflect the true cost of serving load and thus minimize the need to recover those costs through out-of-market uplift payments,
- ensure price transparency,
- provide load-serving entities with the ability to hedge price changes,
- ensure efficient incentives to support an increasingly efficient commitment and dispatch solution, and
- address the needs of the system for increased flexibility given the advent of intermittent resources

Previously, shortcomings in the energy pricing mechanism were masked by the upward pressure on prices resulting from rising demand and the higher costs of marginal units. Low fuel prices and technological enhancements leading to reduced generator heat rates have resulted in a generation mix that is less differentiated by cost but more by physical operational attributes, and the issue of enhancing energy price formation for the market to send better price signals therefore has become more prominent and worthy of attention.[1]

The current locational marginal price (LMP) method was chosen partially because it was straightforward in both concept and implementation. There have always been circumstances where prices fail to reflect all elements relevant to sending the right market signals. Specifically, under the current market rules, inflexible units (those with declining average costs and unable to economically produce power output within a certain range, or requiring an economic minimum output that exceeds the amount of energy needed from that unit in order to serve demand) are not permitted to set price.[2] Therefore, currently, LMPs do not accurately reflect the true cost to serve load when the cost of an inflexible unit needed to serve demand is precluded from setting price.

Inflexible units committed by PJM could recover their costs through uplift payments, and being eligible to set price doesn't necessarily benefit those specific units. However, allowing these units to set prices at the margin reduces the price suppression effects resulting from their current ineligibility to set price, and further reinforces the incentives

[1] Many of these drivers have been recognized by the Federal Energy Regulatory Commission in its initiation of a series of price formation initiatives.

[2] "Inflexible units" can be of all fuel types, including coal, nuclear and large gas units, which are inflexible based on either their technology or the way they purchase natural gas.

for all units to offer into the energy market at their actual costs. Flexible units will benefit because energy prices do not currently reflect the resources actually needed to serve load when inflexible units are on the margin, and flexible units are therefore seeing lower prices than they otherwise would, and an incentive to be flexible is increased.

This LMP limitation on which units can set prices suppresses energy and reserve prices and inappropriately increases reliance on the capacity market. In the past, flexible, higher-cost units historically set price often enough to ensure that all needed resources could earn sufficient revenues in the energy market, when combined with capacity revenues, to drive efficient resource investments. More recently, the limitations that have always existed with the current LMP calculation have been exposed by flattening supply curves caused by shifting fuel mix along with the continuing penetration of zero marginal cost resources, declining natural gas prices, lower generator heat rates and reduced generator margins resulting from low energy prices.

The capacity market is driven by the resource adequacy requirement to support the reliability needs. With the Capacity Performance (CP) enhancements, reliability pricing has supplemented energy pricing as an increasingly important market construct to attract efficient resource investment to meet peak demand needs. Nonetheless, beyond the aggregate resource attributes such as maximum economic generation and forced outage rate, the CP construct is not intended to reward flexibility attributes such as short starting time, short minimum running time, low minimum economic generation, and a fast ramping rate that are essential to efficiently meet operational needs.

The energy and reserve markets remain the essential core market construct to send the right price signals that reflect the incremental cost of electricity and incent reliability attributes to maintain a reliable grid. All resources that are chosen to serve demands should have the opportunity to set price and earn their competitive returns in the markets. Inaccurate energy market pricing produces price signals that inappropriately reduce the energy market revenues earned by reliable and economical resources needed to serve load, and as a result, the markets will not reward useful resource attributes and drive efficient resource entry and exit. Moreover, it is important that the attribute of flexibility be appropriately valued and its costs allocated fairly given the underlying system conditions which give rise to the need for incentives for additional flexibility.

Further, the right price in the energy market should not only reflect the true incremental costs of resources required to serve demand, but also drive incentives for providing the flexibility needed to operate the system given the constantly changing nature of its conditions. Inaccurate energy market pricing that does not adequately value the reliability attributes provided by needed resources, regardless of fuel type, is likely to result in a less-efficient resource mix to maintain a reliable grid. PJM recommends investigating energy and reserve price formation enhancements, including how energy and reserve prices are calculated and how prices are formed during shortage conditions, which could more transparently reveal the true cost of meeting system reliability needs.