

**To:** NEPOOL Participants Committee, Markets Committee

**From:** Mark Karl, Vice President, Market Development

**Date:** December 19, 2014

**Subject:** Energy Pricing Enhancements: A Roadmap

Over the past year, many stakeholders have asked ISO New England (ISO) to focus greater market development efforts on pricing in the energy and reserves markets. These requests point to real-time pricing as the central means to ensure that the costs of the region's reliable electric power system are reflected in transparent, competitive markets. A commonly expressed desire is for pricing enhancements that would better enable market products and prices to signal the costs of operational requirements, rather than using Net Commitment-Period Compensation (NCPC) to pay these costs.<sup>1</sup> Stakeholders have categorized these concerns as a request for improvements to "price formation."

The ISO agrees that sound pricing is central to market efficiency and essential to the success of New England's competitive wholesale power markets. Efficient real-time pricing motivates cost-effective investments, and compensates investments—at the right times, in the right amounts, and in the right locations—for delivering the energy consumers demand and for the ancillary services that assure its reliability. All these outcomes are enhanced when market prices transparently signal the costs of operating the power system.

Over the last two years and looking forward to 2015 and beyond, the ISO has or will undertake many projects to improve price formation in the energy and reserve markets. This document summarizes a number of projects underway or in assessment in this area. It addresses projects recently implemented or underway in the stakeholder process. It also describes several market enhancements the ISO is developing and potential future projects under initial assessment that address pricing in the energy and reserves markets.

The descriptions of potential future projects aim to facilitate discussion among stakeholders over project priorities for the coming years. The ISO welcomes additional feedback and discussions with stakeholders on these topics.

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<sup>1</sup> NCPC is a "make-whole" payment to a resource that responds to the ISO's dispatch instructions but does not fully recover its start-up and operating costs in the energy and reserves markets.

## **Market Enhancements Recently Implemented or Underway**

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This section summarizes several major projects that will facilitate more efficient pricing in the energy and reserves markets. More details about these topics are available in other ISO reports.<sup>2</sup>

- **Energy Market Offer Flexibility.** In December 2014, the ISO implemented changes to the day-ahead and real-time energy markets that enable resources to submit time-varying energy price offers and to update these offers during the delivery day. This initiative enhances price formation by enabling the energy and reserves markets to reflect changes in sellers' fuel costs in a timely manner; more accurate pricing, in turn, improves incentives for resources to perform and assures appropriate compensation for the costs they incur to operate.

In addition, this major market initiative makes significant changes to resources' self-scheduling practices that increase their dispatchable operating range. The expanded dispatchable range of many resources increases the potential for the competitive energy supply offers of these resources to set price. This change will also improve pricing during low demand conditions because the marginal resource's offer price will more likely set the energy price rather than the administrative price floor setting the energy price.

- **Expanded Operating Reserve Requirements and Pricing.** During 2014, the ISO increased its overall reserve requirements to address resource performance concerns and employed a new constraint for replacement reserves in the real-time reserves market. The increase in overall requirements for reserves helps ensure that adequate reserves are available to operate the system reliably, and that the co-optimized energy and reserves markets send the appropriate price signals for the increase in reserves that additional resources provide. The new replacement-reserve requirement reflects an amount of generation capacity typically committed to operate after the close of the day-ahead market. The increased requirement sends higher price signals in the real-time energy and reserves markets when the system approaches tight operating conditions.

Also in December 2014, the ISO implemented a New England Power Pool (NEPOOL)-led proposal for higher scarcity pricing in the real-time energy and reserves markets during tight operating conditions (i.e., operating-reserve deficiencies). Combined, these changes to the reserve requirements and their prices will produce more frequent and stronger price signals for suppliers to deliver energy—and for consumers to reduce demand—during stressed system conditions; they may also help lower total NCPC/make-whole payments.

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<sup>2</sup> See the ISO's *Wholesale Markets Project Plan*, which is updated quarterly, at <http://www.iso-ne.com/markets-operations/markets-development/wholesale-markets-project-plan>.

- **Intermittent Resource Dispatch and Pricing (Do Not Exceed Dispatch).** The ISO has proposed a new methodology to enable wind power generators and certain other intermittent generation resources to be dispatched in real time, commensurate with their actual (real-time) generating capability and energy supply offer price. This new dispatch functionality will improve price formation by enabling these resources to set price at their locations on the basis of their economic offers and by allowing the Real-Time Energy Market to properly price congestion at their locations.

The ISO is evaluating developing similar price-setting functionality for other traditionally nondispatchable supply resources, such as solar generation and other “price-taking” (i.e., “settlement-only”) generators. By doing so, a wider array of resource types and market participants can offer their price—and set the market price—at the level the resource owner is willing to supply power in New England’s competitive Real-Time Energy Market. In effect, a greater assortment of resources will be able to make competitive price offers, rather than remaining as price takers with no role in price formation. Discussion on this topic is underway at the NEPOOL Markets Committee.

- **Subhourly Real-Time Markets Settlement.** The ISO has been developing and discussing with stakeholders changes to settle the real-time markets on a five-minute basis. Although the ISO calculates real-time energy and reserves prices every five minutes, payments to resource owners are currently based on the average hourly price at the resource’s location. This payment practice tends to undercompensate certain resources, particularly more flexible generation assets that respond quickly when system events result in tight operating conditions and there are significant midhour price changes.

Compensating resources at the more granular, five-minute price will help improve market signals for resource performance by better aligning prices and payments. This change helps improve price formation by ensuring that the price suppliers are paid for real-time performance is a more accurate market signal of the power system’s current operating conditions.

- **LMP Calculator Replacement.** The ISO is proposing revisions to the LMP calculator algorithm used to determine real-time energy and reserve prices. In limited circumstances, the current LMP calculator algorithm may produce LMPs that do not correctly reflect the costs of binding real-time reserve constraints, requiring price reviews or corrections after the preliminary prices are published and before market settlement.

The new LMP calculator algorithm will help improve price formation by producing prices that more closely reflect the locational nodal dispatch rates in the ISO’s security-constrained economic dispatch system. The improved pricing algorithm is expected to fulfill 2013 recommendations from both the external market monitor and the internal market monitor.<sup>3</sup>

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<sup>3</sup> *Ibid*, pp. 99-107; ISO New England, Internal Market Monitor, *2013 Annual Markets Report*, pp. 14-15, <http://www.iso-ne.com/markets-operations/market-monitoring-mitigation/internal-monitor>.

## Prospective Enhancements and Potential Future Projects

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This section summarizes several noteworthy planned projects and potential system enhancements.

- **Fast-Start Pricing Improvements.** The ISO is assessing solutions to improve the Real-Time Energy Market's pricing logic when fast-start resources are deployed to supply energy. Presently, the operating characteristics of most fast-start resources prevent them from setting the energy price, even though they may be the highest-cost resources supplying power. As a result, many of these units must be paid NCPC/make-whole payments whenever they operate.

Changes to this part of the pricing logic will help improve price formation by enabling fast-start resources to set price more frequently than at present and conveying the cost of fast-start deployments through transparent market price signals. Because fast-start units are generally among the highest-cost resources in the system, they tend to be economically dispatched primarily during tight operating conditions or to alleviate real-time network constraints. Accordingly, improvements to fast-start pricing can help improve the performance incentives for *all* resources during these system conditions, when reliability may be at heightened risk.

Addressing fast-start pricing logic is expected to fulfill one of the external market monitor's market recommendations from 2013.<sup>4</sup> The ISO plans to bring a proposal on this subject for discussion in the NEPOOL committee process in early 2015.

- **Multihour System Ramp Pricing.** The ISO is assessing the potential development of a new system ramping product to convey, through transparent prices, the costs incurred when the system must be redispatched in advance of a sustained, substantial load ramp (whether up and down). Presently, much of these costs are not reflected in the LMP but are paid in the form of make-whole payments to generators dispatched "out of merit" to ensure that system is adequately positioned to meet multihour load ramping conditions.

This project will help improve real-time price formation by enabling the markets to signal transparently the additional costs incurred to ensure that the system has adequate ramping capability for large changes in system load (as occurs in winter mornings and approaching peak summer afternoons). Accurately pricing system ramp requirements should also improve the markets' longer-term price signals for new investment in resources that can respond flexibly and for a sustained period to significant changes in the system's net load.

This project is under evaluation and assessment, and the ISO anticipates developing a proposal on this subject to discuss with NEPOOL technical committees in late 2015 or 2016.

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<sup>4</sup> See David B. Patton, *et al.*, *2013 Assessment of the ISO New England Electricity Markets*, pp. 87-95, <http://www.iso-ne.com/markets-operations/market-monitoring-mitigation/external-monitor>.

- **Day-Ahead Market Enhancements.** The ISO is assessing possible design changes to the day-ahead market to procure and price operating reserves in co-optimized day-ahead energy and reserves markets. The day-ahead market currently commits sufficient resources to cover cleared energy demand and expected operating reserve requirements. However, only the costs of suppliers' forward energy sales are remunerated in the day-ahead market. Any costs a supplier must incur to be able to provide spinning reserves, above and beyond its day-ahead energy schedule, are ignored in the current day-ahead market process.<sup>5</sup>

The ISO is concerned that, with the increasing prevalence of gas-fired generation in the New England system, many generators must make costly day-ahead fuel arrangements to provide reliable operating reserves the next operating day. For example, advance arrangements to burn additional fuel—fuel that may or may not be used, depending whether a unit's reserves are deployed the next day—may be necessary for a committed generator to convert its spinning reserves to energy for a sustained duration the next day. The markets presently provide no clear means for a supplier to cover the costs of these advance arrangements on days when its spinning reserve capability is not deployed.

Allowing suppliers to submit financially binding offers for reserves on a day-ahead basis, in addition to submitting their offers for energy, would help improve price formation by enabling market prices to transparently signal the costs suppliers must incur to provide reliable operating reserves. In addition, this design enhancement may decrease total make-whole payments: Because some of the unloaded capacity of any unit committed in the day-ahead market (that is, its capacity above its day-ahead energy schedule) would likely be paid as reserves in a day-ahead co-optimized market, all inframarginal suppliers of day-ahead reserves would have an additional market-based revenue stream that reduces its potential make-whole compensation.

By transparently pricing the costs of operating a reliable power system, a co-optimized day-ahead market can be expected to improve market efficiency and overall price formation. It will also help address a 2013 internal market monitor recommendation to improve incentives for meeting reliability objectives in the day-ahead and real-time energy markets.<sup>6</sup> Nonetheless, the ISO would need to expend considerable time and effort to develop the market design and software for a co-optimized day-ahead market for energy and reserves and present a specific design proposal to stakeholders. The ISO anticipates discussing an appropriate timeframe for this market enhancement in the context of broader annual discussions with stakeholders over future project priorities.

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<sup>5</sup> A *spinning* resource is on-line capacity electrically synchronized to the system.

<sup>6</sup> *Ibid*, pp. 7 and 83.

## **Conclusion**

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Many stakeholders have requested the ISO to make energy price formation a priority for market development. The ISO agrees that efficient real-time and day-ahead market pricing is important, as it serves to transparently convey to buyers—and to compensate suppliers appropriately for—the costs of operating a reliable power system. The ISO has undertaken many key projects recently to advance this priority area, and more still are under assessment for future projects. The ISO looks forward to stakeholder feedback and discussions to help prioritize these potential projects.