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June 16, 2010

VIA ELECTRONIC FILING

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Frequency Regulation Compensation in the Organized Wholesale Power Markets;
Docket No. AD10-11-000

Dear Secretary Bose:

Transmitted electronically for filing in the referenced docket are the Comments of ISO New England Inc.

If there are any questions concerning this filing, please call me at (202) 661-2212.

Respectfully submitted,

/s/ Daniel R. Simon

Daniel R. Simon
Counsel for
ISO New England Inc.

Enclosure

**UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION**

**Frequency Regulation Compensation
in the Organized Wholesale
Power Markets**

Docket No. AD10-11-000

COMMENTS OF ISO NEW ENGLAND INC.

In accordance with the May 27, 2010 Notice Establishing Date for Comments issued in this proceeding, ISO New England Inc. (“ISO-NE”) hereby submits these comments regarding the matters discussed at the May 26, 2010 Commission staff technical conference regarding frequency regulation in the organized wholesale power markets.

I. COMMUNICATIONS

All correspondence and communications regarding these comments should be addressed to the undersigned as follows:

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II. COMMENTS

ISO-NE is pleased to provide these comments regarding regulation markets, compensation for regulation services, and issues to be considered as part of ensuring that the range of technically capable new technologies starting to enter the marketplace are afforded a full and fair opportunity to compete to provide this necessary reliability service.

The agenda for the May 26, 2010 Technical Conference on Frequency Regulation

Compensation in the Organized Wholesale Power Markets posed a number of questions that addressed:

- the nature of the service actually required by an ISO to efficiently and reliably operate the grid;
- how resources that respond to regulation dispatch signals more quickly and with greater accuracy might affect reliability and the cost of providing regulation;
- an ISO's ability to accurately measure the services provided and quantify the benefits provided by each resource;
- alternative market and compensation designs that specifically address speed and accuracy of response; and
- how opportunity costs of regulation resources should be accounted for in the selection and compensation of resources providing regulation.

ISO-NE provided its views on these questions during the informative discussion at the Technical Conference. The comments that follow summarize key issues that should be considered by the Commission as it determines what future actions may be appropriate relating to the provision of regulation service in the competitive, organized wholesale markets.

A. Defining the Required Service

First, it is easy to confuse the discussion by inadvertently commingling two different reliability services: namely, primary frequency response and regulation. The potential confusion stems, in part, from the nomenclature commonly used to describe the service a Balancing Authority uses to respond to and control its Area Control Error ("ACE"). This service is widely referred to as "frequency regulation" but, in fact, frequency is a minor component of the ACE calculation, and primary frequency response is managed by Balancing Authorities through separate mechanisms from the "regulation" services provided to assist Balancing Authorities in their overall management of ACE.

Regulation, as used to manage ACE and ensure that ACE remains compliant with NERC criteria, is a very different service from primary frequency control. ACE is a single control area-wide measure that is not location-specific and is managed by the Balancing Authority sending Automatic Generation Control (“AGC”) signals to selected resources (i.e., providers of regulation service) every four seconds from the centralized control center. NERC compliance requirements are based on a 10-minute standard, with efforts currently underway to examine the impact of moving to a 30-minute standard. Regulation is primarily a product that balances load, generation, imports and exports over a time period of one or more minutes. It is not a source of primary frequency control. In New England, regulation is procured and compensated through a regulation market that clears on an hourly basis in real-time.

By contrast, primary frequency response is provided in most Balancing Authorities by a combination of the natural sensitivity of load to frequency and generator governor response. Most generators have been designed and constructed with automatic control systems that sense local frequency deviations and respond in a sub-minute timeframe to increase or decrease generator output in response, without communication or signals from any centralized control authority. Primary frequency response operates in a sub-minute timeframe, and is not a service that receives separate compensation through the ISO-NE markets or other Balancing Authority mechanisms at this time.

ISO-NE’s comments focus on regulation service as described above and avoid using the phrase “frequency regulation” because of the ambiguity that term brings to the discussion.

B. Evaluating the Performance of Alternative Technologies

In November 2008, ISO-NE began an Alternative Technology Regulation Pilot Program designed to meet two objectives: (i) allow ISO-NE to evaluate the technical capability of new technologies to provide regulation service; and (ii) create an opportunity for market participants

with resources not otherwise eligible to participate in the existing regulation market to provide regulation and receive compensation in a pilot program environment that closely simulates how the resources would be dispatched and compensated under ISO-NE's existing regulation market rules. The one difference between the existing market rules and the pilot program (discussed further below) is that the pilot program does not calculate or compensate for opportunity costs.

At the present time, flywheel storage and electric thermal storage load control technologies are participating in the ISO-NE pilot program. Additional technologies are expected to begin active participation later this summer. The technologies in the pilot program may ultimately include rechargeable electric vehicles, management of aggregated commercial/industrial loads, and battery storage systems. Experience with the technologies currently online indicates that, following a brief break-in period to resolve communications and control issues, resources are able to perform in accordance with their claimed parameters. In general, these parameters provide for more rapid ramp rates than most of the generation resources that have historically provided regulation in New England, and performance that is comparable to the existing pumped-storage hydro facilities located in New England.

ISO-NE's ability to operate the grid reliably depends upon having resources that provide realistic performance parameters and follow dispatch signals consistently in accordance with those parameters. When resources do not perform in accordance with the parameters specified in offers into the regulation market, reliability may be compromised under extreme circumstances and alternative actions may need to be implemented, which may well come at a higher cost. Accuracy of response relative to claimed performance is an important characteristic in terms of having resources perform in accordance with offered parameters, and may be more important

than having resources operate at their assigned AGC setpoint value with a very small error in absolute terms.

The New England regulation market typically selects resources at the start of each hour for the remainder of that hour. This means that resources that are not able to sustain their response to AGC signals for up to an hour may create additional operational challenges. Therefore, sustainability is an important characteristic that must be considered as part of any regulation market design. Regulating range¹ is also important when selecting resources to ensure that adequate regulating capability will be available to meet control objectives. Finally, and perhaps obviously, the cost for a resource to provide regulation is an important characteristic. The New England regulation market selects regulating resources every hour that are expected to provide the lowest total cost of regulation, including the energy market opportunity costs (i.e., the foregone energy market revenues or unprofitable energy produced as a result of following AGC signals) of the selected resources. In 2009, 26% of New England's annual cost of regulation is attributable to energy opportunity costs. It is possible that the new technologies participating in the ISO-NE pilot program, when compared with the thermal generation that provides most of New England's regulation today, will have lower operating costs and lower (perhaps even zero) energy market opportunity costs. In the long run, having lower-cost suppliers will drive down the cost of regulation.

It has been suggested that resources that can respond more quickly and more accurately may reduce the amount of regulation capacity that is required to operate the grid reliably. ISO-NE's pilot program has not yet provided sufficient experience to either support or refute this

¹ Regulating range refers to the capacity range within which the resource is willing or able to be dispatched for the purpose of providing regulation.

suggestion. Certainly, all other things being equal, faster is better, and more accurate is better, but the magnitude of a future reduction in requirements is likely to be small. The New England peak demand in 2009 was 25,081 MW, and the average hourly regulation requirement for the year was 89 MW, for a total cost of \$23.1 million.² Even a 10% reduction in requirements would produce only small savings, especially when considered in the context of the \$5.3 billion cost of electric energy during the same period. Reductions in regulation opportunity cost payments stemming from new technologies that may ultimately be able to displace the thermal generation providing most of the regulation service today may be a more significant source of savings.

C. Measuring Regulation Performance Accurately and Cost-Effectively

Existing communication and metering requirements for all resources participating in the regulation market provide detailed performance information at a four-second resolution. This is sufficient to measure and monitor the provision of regulation service. The monitoring was designed with utility-scale generation plants in mind, and works well for large-scale resources. It is possible that metering appropriate for a generating plant (or 20 MW flywheel installation, for example) may not be economically feasible for, as an example, an electric vehicle aggregator who may want to provide regulation through a fleet of 50 vehicles based in 30 separate locations that plug in at distribution-level facilities to recharge under retail tariffs. An aggregator of geographically-dispersed demand response resources might face the same issue.

D. Regulation Compensation Market Designs

The current New England regulation market includes three compensation elements:

² See ISO New England Internal Market Monitor, 2009 Annual Markets Report (May 18, 2010).

1. A “capacity” payment - paid to resources selected for the hour for providing regulation service as needed by responding to an AGC dispatch signal. This component is paid whether or not the resource is asked to regulate up or down, and is based on the hourly regulation clearing price.³ The clearing price is determined as the largest of the regulation offers from generators selected for regulation that were “pool scheduled”⁴ for regulation.
2. A “mileage” or “service” payment – compensates resources based on the absolute value of the regulation up and/or down movement requests that they received during the hour. These resources are paid the clearing price. The resources that move the most will receive proportionately more compensation. The AGC algorithm initially allocates the required regulation control response to resources based on their speed of response. Faster responding resources will generally receive a higher proportion of the total required mileage. A mileage payment generally compensates market participants for the additional wear and tear associated with regulation-related output changes and for increased production cost associated with more frequent output adjustments. The mileage payment also provides an incentive to ensure resources’ willingness to move.
3. An energy market opportunity cost – by participating in the regulation market, an energy market resource will be asked to operate at output levels both above or below its economic dispatch point, and consequently will miss the opportunity to produce some energy at prices that would have been profitable when regulating down, and will produce some energy at unprofitable prices when regulating up. Market participants would have to incorporate their expected energy market losses into their regulation offer in the absence of the opportunity cost component. The associated uncertainty creates risk, which the market participant will also price into its offer. By compensating market participants directly for their actual opportunity costs, regulation offers become less risky and need to reflect only the actual incremental cost of providing regulation. This design encourages market participants to bid their costs (which presumably they understand and over which they have some control) rather than their risks (for which they have at best only incomplete information).

These components work well to encourage competitive cost-based offers, accurate and sustainable performance, and provide a limited incentive for faster response rates. Together, they have contributed to New England’s low cost of regulation. The specific design for the

³ The regulation clearing price is attenuated by a factor of .1 when calculating the service component to produce approximately equal compensation on average for service and capacity.

⁴ A “pool scheduled” resource is one that is competitively selected to provide regulation based on its offer price. A “self-scheduled” resource is one that requests to provide regulation irrespective of the regulation clearing price, and participates in the regulation market as a price taker.

mileage payment and opportunity cost features utilized by ISO-NE are not the only designs that can be efficient and effective – somewhat different approaches may be better suited to other regions. However, strong pay-for-performance incentives and compensation for foregone economic opportunities have been essential to the functioning of the New England regulation market.

E. Considering the Role of Opportunity Costs

One particular aspect of the New England compensation design is relevant to new technologies that may not be participating in the energy market, and is presently under active review by ISO-NE: opportunity cost payments are made on a resource-specific basis.

In New England’s present regulation market, the clearing price determines the level of payment for the service and capacity components of regulation compensation. The opportunity cost payments are unit-specific for those generators that are pool-scheduled for regulation and zero for resources self-scheduled for regulation.

This design, where some market participants receive at least a portion of their total compensation in the form of resource-specific costs, has certain characteristics associated with pay-as-bid markets. It may not produce prices that provide appropriate long-run investment signals. That is because potential new entrants would not receive clearing prices set by higher cost (including opportunity costs) resources; they would receive payments that reflect only their low incremental costs. Without the incentive provided by higher prices and the ability to thereby recover only incremental costs, these new entrants will not invest and enter the market. As part of its current efforts to develop regulation market changes to accommodate alternative technologies, ISO-NE is evaluating a design that more closely replicates the characteristics of a uniform clearing price market, where all market participants will receive compensation based on

the regulation clearing price plus the highest level of opportunity costs per MW of regulating range associated with any resource selected for the hour.

III. CONCLUSION

ISO-NE respectfully requests that the Commission consider these comments in determining any future steps related to the compensation for regulation service in the organized wholesale electric markets.

Respectfully submitted,

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