



Comments of Andrew Ott, PJM Senior Vice President, Markets

Panel 1 Discussion:

Good morning my name is Andrew Ott, I am Senior Vice President of Markets at PJM. I appreciate the opportunity to speak to you today regarding frequency regulation compensation in organized wholesale electricity markets. Over the past several years, PJM has gained experience with alternative resources, such as storage devices and demand response technology in providing ancillary services in the PJM market. Our experience has indicated these resources can reliably provide these services to support reliable grid operation and enhance the competitive markets for these services.

Specifically in the frequency regulation market, PJM has gained experience with a 1MW advanced energy storage device response called project Barbados. This device has participated in the PJM regulation market since November 2008 and PJM's experience has demonstrated this new technology has the ability to respond to regulation signals much faster than traditional generation resources. This lithium ion battery device has the ability to respond nearly instantaneously to the signals received from PJM.

I believe that entry of greater amounts of technologies that respond to regulation dispatch signals faster and more accurately will result in improved frequency control. I also believe the introduction of such new technologies has the potential over time to reduce the amount of regulation reserves a balancing authority may need to procure in order to ensure reliable operations and thereby lower costs, but will likely not eliminate the need for traditional regulation resources in the near-term. PJM does not currently have concrete evidence that more fast-regulation resources would lower overall RTO procurement costs, but such benefits are likely to occur.

Larger amounts of faster and more accurate regulation resources should reduce the amount of large swings sometimes observed in balancing authority's ACE values. An additional benefit would be that slower response units, for example large steam units, which are needed for interchange balance, would not need to move up and down as quickly. This would result in less wear and tear on the physical equipment components in generation stations and provide lower operating costs over time. Unfortunately, these benefits are both difficult to predict and to quantify until actual operating experience has been obtained. PJM does believe that it should be possible, with some time and effort, to develop a study to quantify the potential benefits of these resources.

PJM supports the development of additional demonstration projects and/or pilot programs to collect additional information and to estimate the potential value of these new resources. While PJM has successfully incorporated several storage devices into the regulation market, we believe additional market rule changes within PJM are needed in order to appropriately compensate all regulation resources for services provided. One such rule change is currently being discussed within the PJM Stakeholder Process.

Panel 2 Discussion:

PJM's current market design does not currently provide compensation that would incent resources to respond faster and more accurately to regulation signals. PJM provides identical compensation to resources that follow the Regulation signal accurately, those that follow with the minimum amount of movement, and all those in between. In fact, PJM does not at present have a mechanism to measure how well a resource is following the signal it receives; a real time performance measurement mechanism is under development.

We believe an RTO can accurately measure how well a resource follows its Regulation signal. Since the signal itself is calculated based on the ACE, if a resource follows the signal more accurately, it by definition has a greater impact on eliminating the ACE than a resource that does not follow the signal as accurately.

PJM believes that it can measure the accuracy with which a resource follows the Regulation signal with a granularity of 2 seconds based on the periodicity of the real time telemetry signals by which the Regulation signal is distributed and resource output/consumption is communicated back to the PJM control system. PJM believes that the current practice of providing compensation for regulating capability committed to be available each hour is appropriate and required because many of the resources committed to provide regulation actually experience an opportunity cost with respect to the energy market. If such compensation were not provided, PJM believes we would experience shortages of regulating capability which would inhibit reliable grid operation. Additional compensation for changes in the level of power supplied may also be appropriate in order to provide the appropriate incentives for development of alternative resources that can follow the Regulation signal more accurately. Resources that follow the Regulation signal with greater accuracy than traditional resources can lower system costs by reducing the total amount of Regulation required and will also benefit reliability by increasing the Primary Frequency Response required to assist in recovery from contingency generation loss events.

I believe a "mileage" payment can provide some advantage because it is relatively easy for market participants to understand and it provides additional compensation to resources that provide greater changes in MW output/consumption in response to the Regulation signal, thereby providing incentives for development of resources that can adjust output/consumption more quickly. However, this payment approach has the disadvantage that it can potentially pay for changes in output/consumption that may not be in direct response to the Regulation signal itself. A better mechanism would be to provide additional compensation to resources that follow the RTO regulation signal more accurately or at least with a minimum level of accuracy.

I believe an accuracy-based compensation approach would provide more direct incentive for resources to follow the RTO regulation signal which would provide a more optimal incentive for resources to provide regulation response that matches what system operators require to maintain system control. Such a

mechanism would need to differentiate between different types of regulation signals but such requirements can be managed. One potential disadvantage of an accuracy-based system is that traditional generators may be simultaneously following an economic basepoint and a regulation signal which could complicate measuring its accuracy of response to the regulation signal.

I appreciate the opportunity to discuss these important issues and I would be happy to answer any questions you may have.