Creating Regulatory Structures for Robust Demand Response Participation in Organized Wholesale Electric Markets

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ABSTRACT

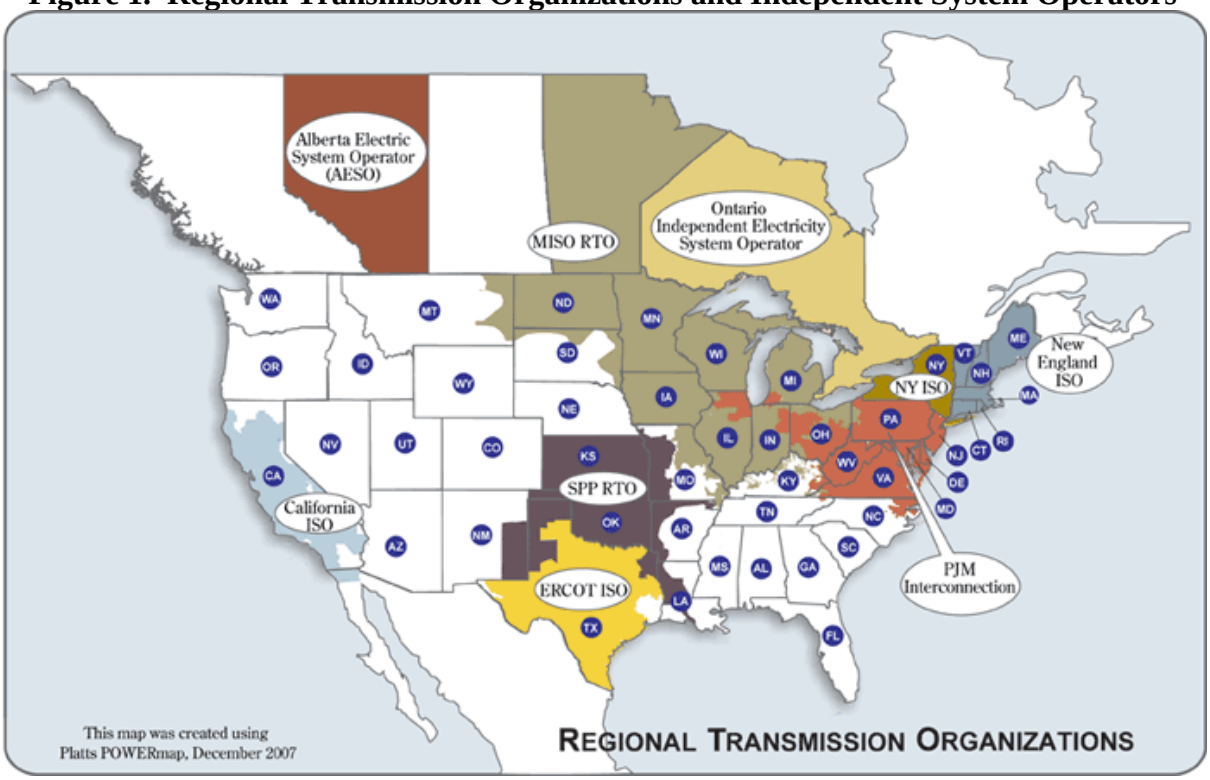
Organized wholesale electric markets serve two-thirds of electricity consumers in the United States. Independent entities known as regional transmission organizations (RTOs) or independent system operators (ISOs), most of which are regulated by the Federal Energy Regulatory Commission (FERC), operate these markets. The RTOs and ISOs administer trading of electricity services in real time (current day) and, in some instances, day-ahead markets for sales of electricity at wholesale, including sales to load-serving entities (LSEs) that then provide service to retail consumers. Recent studies and experience indicate that important benefits, including dramatic reductions in wholesale prices, can stem from planned reductions in consumer usage, or demand response.

A challenge to achieving these savings and benefits, however, has been enabling a robust industry to aggregate consumer demand and consistently and reliably deliver demand response to the organized markets. FERC is addressing that challenge by seeking to establish a federal regulatory framework that ensures that demand response has appropriate opportunities to participate in the organized markets and provides a stable base for the nascent demand response industry. This paper examines recent initiatives that FERC has undertaken in this area, as well as signs of progress that have coincided with FERC's increased interest in demand response. This paper also discusses possible further steps toward regulatory structures that reflect these goals.

The Organized Wholesale Electric Markets

Independent entities known as regional transmission organizations (RTOs) or independent system operators (ISOs) operate organized wholesale electric markets that serve two-thirds of electricity consumers in the United States (IRC 2007, 4). These RTOs and ISOs are depicted below in Figure 1.

Figure 1. Regional Transmission Organizations and Independent System Operators



Source: FERC Website

The Federal Energy Regulatory Commission (FERC) regulates six of the RTOs and ISOs reflected in Figure 1: ISO New-England, Inc. (ISO-NE); New York Independent System Operator, Inc. (NYISO); PJM Interconnection, L.L.C. (PJM); Midwest Independent Transmission System Operator, Inc. (Midwest ISO or MISO); Southwest Power Pool, Inc. (SPP); and California Independent System Operator Corp. (CAISO). These RTOs and ISOs administer trading of electricity services in real time (current day) and, in some instances, day-ahead markets for sales of electricity at wholesale, including sales to load-serving entities (LSEs) that then provide service to retail consumers. Among other responsibilities, the Congress has tasked FERC with ensuring that wholesale electricity rates, including rates in these organized markets, are just and reasonable and are not unduly discriminatory or preferential.

Demand Response and its Benefits

There is much evidence to indicate that dramatic reductions in wholesale electricity prices, as well as other important benefits, can stem from planned reductions in consumer usage. Planned reductions of consumer usage in the short term are known as demand response, which FERC and the U.S. Department of Energy have defined more specifically as follows:

> Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at

> times of high wholesale market prices or when system reliability is jeopardized (FERC Staff 2006, viii; DOE 2006, ix).

Modification of consumer demand in a longer timeframe would include implementation of energy efficiency measures, such as the installation of more energy efficient appliances and technologies. As FERC Staff has noted, national and state legislative and regulatory bodies, as well as utilities, have increasingly relied on energy efficiency as a tool to reduce system peak demand and meet capacity requirements (FERC Staff 2007, 3). Implementing both demand response and energy efficiency measures, each of which is an example of a demand resource, offers the greatest promise of achieving optimal efficiency, minimizing lost opportunities, and thus securing a wide range of benefits for consumers.

FERC has recognized a number of benefits associated with participation by demand response in the organized markets. Addressing one important benefit, FERC has stated that demand response helps to reduce prices in competitive wholesale markets in at least three ways. First, when demand response is bid directly into a wholesale market, the lower demand means a lower wholesale price. Second, demand response tends to flatten an area's load profile, thereby reducing the need to use more costly resources during periods of high demand and lowering the overall average cost to produce energy. Third, demand response reduces generator market power. The more demand response that is available during peak periods, the more downward pressure it places on generator bidding strategies by increasing the risk to a power supplier that it will not be dispatched if it submits too high a bid (FERC 2008a, P 29-31).

The benefits stemming from demand response, however, go beyond reductions in wholesale prices. For example, FERC has stated that demand response enhances reliability and supports the use of renewable energy resources (FERC 2008a, P 27). These benefits are well illustrated by the response of the Electric Reliability Council of Texas (ERCOT) to a sudden drop in the system frequency in February 2008. Preliminary reports indicate that the frequency decline was caused by a combination of events, including a drop in wind energy production at the same time that evening electricity load was increasing, accompanied by multiple power suppliers falling below their scheduled energy production. Activating a demand response program through which primarily large industrial and commercial loads are paid to curtail their electricity use as needed for reliable grid operation, ERCOT obtained approximately 1,100 MW of resources within a 10-minute period and saw no other consumers lose power due to the frequency decline (ERCOT 2008). Thus, the rapid deployment of demand response provided vital system flexibility, which supported the use of wind generation, and made an essential contribution to protecting the reliability of the system.

This example is striking, but far from unique. FERC Staff concluded in a recent study that in the summer of 2006 – a period of sustained, severe heat waves and record demand levels – demand resources were necessary to the reliable operation of electric markets (FERC Staff 2007, 4). Moreover, protecting system reliability translates into both consumer cost savings and reductions in emissions. This is due to the fact that restarting a system after a blackout is not only expensive, but also can result in increased emissions through the inefficiencies inherent in restarting and ramping-up generation.

FERC has also stated that demand response provides for more efficient operation of markets and encourages new technologies that support the use of distributed generation and advanced metering (FERC 2008a, P 27). In addition, consideration of demand response

promotes resource adequacy at least cost, and its development may defer or eliminate the need for more costly investments in generation or transmission facilities.

A common theme uniting all of these benefits stemming from increased deployment of demand response is the potential to save money for the consumers who benefit from and pay for electricity services. One recent study sponsored by PJM and the Mid-Atlantic Distributed Resources Initiative estimates that a 3 percent load reduction (which amounts to less than 1 percent of PJM's peak load) in the 100 highest priced hours would reduce locational marginal prices by 6 to 12 percent. This price reduction corresponds to approximately $330 million in savings per year, of which $20 million is estimated to be saved by the demand-reducing customers. Two to three times that amount would be saved by other customers in the Mid-Atlantic States due to lower market prices, and $8-12 million would be saved by customers outside the region (Felder and Newell 2007).

Taking a broader geographic view, another recent study projects that if U.S. peak demand were to be reduced by 5 percent, the long-term benefits to consumers over a twenty-year horizon would have a net present value of $35 billion (Faruqui, *et al*., 2007).

FERC Initiatives Involving Demand Response

A significant challenge to achieving these savings and benefits has been enabling a robust industry to aggregate consumer demand and consistently and reliably deliver demand response to the organized markets. To address that challenge, FERC recently has undertaken several initiatives to ensure that demand response has appropriate opportunities to participate in the organized markets and to otherwise contribute to protecting system reliability. It would be premature at present to judge the ultimate success of these initiatives, though some signs of progress that have coincided with FERC's increased interest in demand response are discussed in the next section of this paper. Nonetheless, these initiatives mark important steps toward establishing a federal regulatory framework that will provide a stable base for the nascent demand response industry.

Order No. 890: Preventing Undue Discrimination in Transmission Service

In February 2007, FERC issued Order No. 890, a final rule that reformed FERC's *pro forma* Open Access Transmission Tariff (OATT). In Order No. 890, FERC stated that the OATT had fostered greater competition in wholesale power markets in the ten years since its adoption by reducing barriers to entry in the provision of transmission service. FERC also stated, however, that experience had revealed flaws in the OATT that undermined realizing its core objective of remedying undue discrimination. Among other flaws, FERC found that it was no longer sufficient to rely on voluntary efforts by the industry to develop consistent methods of calculating the amount of additional capability available in the transmission network to accommodate requests for transmission service. FERC also identified other practices that discourage efficient use of the existing transmission grid, as well as deficiencies in the transmission planning process (FERC 2007a, PP 1-4).

The reforms that FERC adopted in Order No. 890 to correct such flaws included notable changes that involve demand resources. For the first time, FERC put demand response and other demand resources on an equal footing with other resources in directly contributing to the

reliability and efficient operation and expansion of the electric transmission system. For example, FERC had previously identified a number of ancillary services that are needed to accomplish transmission service while maintaining reliability. Among others, these ancillary services include Reactive Supply and Voltage Control, Regulation and Frequency Response, Spinning Reserves, and Supplemental Reserves Services (FERC 1996, 31,705). In Order No. 890, FERC found that where demand resources are capable of providing ancillary services, sales of those services by "load resources … should be permitted where appropriate on a comparable basis to service provided by generation resources" (FERC 2007a, P 888). In support of that finding, the Commission stated that "comparable treatment of load resources" is consistent with the Energy Policy Act of 2005 (EPAct 2005), which established a national policy to eliminate "unnecessary barriers to demand response participation in energy, capacity, and ancillary service markets …" (FERC 2007a, P 888; Wellinghoff and Morenoff 2007, 409-10).

FERC also put demand resources on an equal footing with other resources in another respect. Order No. 890 sought to promote efficient utilization of transmission by requiring an open, transparent, and coordinated transmission planning process (FERC 2007a, P 3). That process will provide a forum for stakeholders to come forward with demand resource project proposals that they wish to have considered in development of a transmission plan (FERC 2007a, P 487). Such proposals could include not only demand response, but also energy efficiency measures. FERC stated that customer demand resources should be considered on a comparable basis to the service provided by comparable generation resources where appropriate (FERC 2007a, P 494).

Order No. 693: Mandatory Reliability Standards

By enacting EPAct 2005, the Congress increased FERC's responsibilities with regard to protecting the reliability of the interstate electric transmission system. Among other changes, EPAct 2005 required a FERC-certified Electric Reliability Organization (ERO) to develop mandatory Reliability Standards subject to FERC's review and approval. Once approved, the Reliability Standards may be enforced by the ERO, subject to FERC oversight, or FERC may independently enforce the Reliability Standards.

Implementing these provisions of EPAct 2005, FERC has recognized the importance of providing adequate opportunities for demand response and other demand resources to contribute to protecting reliability. In March 2007, FERC issued Order No. 693 and approved 83 of 107 proposed Reliability Standards. FERC also directed the ERO to make modifications to several Reliability Standards to reflect capabilities of demand response and other demand resources. For example, FERC approved the ERO's proposal to define demand-side management as "all activities or programs undertaken by a Load-Serving Entity or its customers to influence the amount or timing of electricity they use," but also required a modification of that definition. FERC stated that load aggregators and industrial customers who do not take service through an LSE may play a role in meeting the Reliability Standards and, therefore, directed the ERO to modify its definition of demand-side management to cover not only activities undertaken by LSEs or their customers to influence the amount or timing of their electricity use, but also comparable activities undertaken by "any other entities." FERC also directed the ERO to make modifications such that demand response and other demand resources that meet certain criteria will be allowed to be used to comply with Reliability Standards governing contingency reserves,

reactive power, emergencies, and planning the reliable bulk power system (FERC 2007b, PP 330-333, 405, 573, 1232, 1879; Wellinghoff and Morenoff 2007, 410-12).

Rulemaking on Competition in Organized Markets

In February 2008, FERC issued a Notice of Proposed Rulemaking (NOPR) that proposed reforms to improve the operation of the organized markets. Several of the proposed reforms are geared toward ensuring that demand response has appropriate opportunities to participate in those markets. Building on its actions in Order No. 890, FERC proposed to require RTOs and ISOs to accept bids from demand response resources, on a basis comparable to any other resources, for ancillary services that are acquired in a competitive bidding process. FERC stated that this policy would increase the competitiveness of ancillary services markets, help reduce the price of ancillary services, and improve the reliability of the electric transmission system (FERC 2008a, P 56-57). In addition, FERC proposed to require RTOs and ISOs to amend their market rules as necessary to permit an aggregator of retail customers (ARC) to bid demand response on behalf of retail customers directly into the RTO's or ISO's organized markets, unless the laws or regulations of the relevant electric retail regulatory authority do not permit such participation by a retail customer. FERC stated that this proposal would reduce a barrier to demand response by permitting an ARC to act as an intermediary for many small retail loads that cannot individually participate in an organized market. FERC also stated that aggregating small retail customers into larger pools of resources increases the potential market and reliability benefits realized from demand response in wholesale markets (FERC 2008a, PP 86-93).

In addition, FERC stated in the NOPR that price is an important factor in encouraging demand response in that market prices can elicit demand response from certain customers who are equipped to respond (FERC 2008a, P 109). FERC proposed to require the RTOs and ISOs to propose any necessary reforms to ensure that the market price for energy accurately reflects the value of such energy during periods of operating reserve shortage (FERC 2008a, P 117). FERC further proposed that a primary criterion for approving such pricing proposals would be an adequate record demonstrating that provisions exist for mitigating market power and deterring gaming behavior, including, but not limited to, use of demand resources to discipline bidding behavior to competitive levels during periods of operating reserve shortage (FERC 2008a, PP 109, 118-19).

Finally, FERC recognized in the NOPR that the need for, and the focus on, demand response will continue to increase. Therefore, while proposing specific reforms like those noted above to eliminate barriers to demand response, FERC also observed that other reforms may be necessary in the future. Consistent with that observation, FERC took two additional actions. First, FERC stated its intent to direct its staff to convene a technical conference to consider at least the following issues concerning demand response participation in the organized markets: (1) if there are barriers to comparable treatment of demand response that have not previously been identified and, if so, what they are; (2) potential solutions to eliminate any potential barriers to comparable treatment of demand response; (3) appropriate compensation for demand response; and (4) the need for the ability to standardize terms, practices, rules, and procedures associated with demand response (FERC 2008a, PP 94-95). FERC staff subsequently scheduled this technical conference for May 21, 2008. Second, to build on that technical conference, FERC proposed to require RTOs and ISOs to submit a study on remaining barriers to comparable

treatment of demand response resources, including a timeline for implementation of proposed solutions (FERC 2008a, P 95).

Some of the issues identified for the above-noted staff technical conference may prove particularly important to establishing a federal regulatory framework that ensures that demand response has appropriate opportunities to participate in the organized markets and provides a stable base for the nascent demand response industry. For example, FERC will likely need to clarify its view of what constitutes "comparable" treatment of demand resources. FERC could usefully reiterate that comparable treatment of demand response must recognize the distinctive technical and operating characteristics of demand response resources. FERC previously made a similar point in its order on rehearing of Order No. 890, stating:

> We disagree with TDU Systems that comparability requires that generation resources and demand resources be subject to the same operational parameters in every circumstance. Treating similarly-situated resources on a comparable basis does not necessarily mean that the resources are treated the same. As part of its Attachment K planning process, each transmission provider is required to identify how it will treat resources on a comparable basis and, therefore, should identify how it will determine comparability for purposes of transmission planning (FERC 2007c, P 216).

Similarly, FERC will likely need to elaborate on what constitutes "appropriate" compensation for demand response. At and following the technical conference, it will be important to examine whether the full contributions made by demand response are being recognized in compensation or whether there are areas in which demand response remains undervalued.

Although not specifically identified as an issue for the technical conference, it will also be important for FERC to consider carefully proposals for measurement and verification of demand response participation in the organized markets. FERC proposed in the NOPR that the RTOs and ISOs must adopt reasonable standards necessary for system operators to call on demand response resources, and mechanisms to measure, verify, and ensure compliance with such standards (FERC 2008a, P 26). Such measurement and verification is critical, and the form of measurement and verification should reflect the function of the service being provided.

Progress toward Capturing Benefits of Demand Response

It would be premature to judge the ultimate success of the FERC initiatives discussed above. Nonetheless, coincident with FERC's increasing interest in demand response, there are signs of progress toward capturing the savings and benefits of demand response.

A FERC staff survey of utilities and LSEs in the United States found that as of the end of 2005, the annual resource contribution of demand resources was about 37,500 MW nationwide, including 29,655 MW of potential peak load reduction, or 4 percent of total projected demand for summer 2006. Approximately one-third of this potential peak load reduction was actually deployed in 2005 (FERC Staff 2006). In 2007, the North American Electric Reliability Corporation (NERC), which FERC has certified as the ERO, found that the nationwide application of demand resources had increased by almost 6 percent from the previous summer (NERC 2007a). NERC subsequently reported an even greater increase in demand resources

available for winter, up 12 percent from 2006 (NERC 2007b). In May 2008, NERC stated that demand response is increasing as a resource to meet electricity demands, and that a significant amount of demand response is being used as a resource to increase operational flexibility (NERC 2008).

The organized markets provide opportunities for demand resources. For example, demand resources are eligible to participate to varying degrees in the energy and ancillary services markets of the ISO/RTOs. In addition, demand resources have begun to play an important role in maintaining the adequacy of resources for long-term electricity service. PJM conducts auctions in its forward capacity market, called the Reliability Pricing Model (RPM), for resources that will be delivered in future planning years. Demand resources have participated in these auctions and have been accepted, beginning with almost 600 MW for the 2007/2008 planning year (Ott 2008). Following its May 2008 RPM auction for the 2011/2012 planning year, PJM announced that its total RPM results include 2,035 MW of demand response (PJM 2008). In ISO-NE's first Forward Capacity Market (FCM) auction, conducted in February 2008, 2,554 MW of Demand Resources cleared for delivery in the 2010 to 2011 timeframe. This included 1,188 MW of New Demand Resources, exceeding the amount of New Supply Resources (626 MW) that cleared. New Demand Resources are also showing a strong interest in participating in ISO-NE's second auction scheduled for December 2008 (Yoshimura 2008).

Amid these developments and FERC's above-noted actions in generic rulemaking proceedings, there are signs of an emerging demand resources industry. Distinct from demand response programs traditionally offered by vertically integrated utilities, there is a growing number of companies whose primary business plan is to assist and aggregate customers in provision of demand response.

Next Steps for FERC on Demand Response

Implementation of Order No. 890 is an ongoing process, to which FERC is devoting substantial attention. For example, in May 2008, FERC issued its first orders addressing proposals that respond to the transmission planning requirements of Order No. 890. FERC stated that the filing utilities had proposed tariff language providing that, as a general matter, demand response resources would be treated comparably. However, FERC directed each such utility to make a further compliance filing to address the requirement of Order No. 890-A to identify how it would treat resources on a comparable basis and how it would determine comparability for purposes of transmission planning (FERC 2008b, P 14, n.6).

The rulemaking proceeding on competition in the organized markets is another important forum for further FERC action with regard to demand response. Any final rule that FERC issues in that proceeding is likely to incorporate into FERC's regulations additional requirements intended to ensure that demand response has appropriate opportunities to participate in the organized markets. After FERC issues such a final rule, that action is likely to give rise to compliance proceedings in which each RTO or ISO proposes approaches to implementing the new requirements. Moreover, the FERC staff technical conference on demand response and the proposal for RTOs and ISOs to submit a study on remaining barriers to comparable treatment of demand response resources highlight FERC's commitment to continue to explore these issues.

As a corollary to these initiatives, FERC is actively participating in the National Association of Regulatory Utility Commissions (NARUC)-FERC Collaborative on Demand

Response. Established in the fall of 2006, the Collaborative reflects the joint recognition among state utility regulators and FERC of the need to coordinate federal and state efforts to eliminate barriers to demand response. The Collaborative is now undertaking a significant study of ways to overcome barriers to customer demand response participation through coordinated retail and wholesale regulatory policies.

All of these efforts are likely to intersect as the Commission fulfills its new responsibilities pursuant to the Energy Independence and Security Act of 2007 (EISA). In section 529 of EISA, the Congress directed FERC to conduct a National Assessment of Demand Response both to estimate the potential for demand response and to determine how to overcome the barriers to achieving that potential. The Congress also directed FERC to prepare a subsequent National Action Plan on Demand Response that will, among other objectives, develop analytical tools, information, model regulatory provisions, model contracts, and other support materials for use by customers, states, utilities, and demand response providers.

These next steps indicate a number of areas in which FERC can build on its recent initiatives with regard to demand response. These efforts have significant potential to establish the regulatory framework needed for a robust industry to realize for electricity consumers the full potential saving and benefits associated with demand response.

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