

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Demand Response in Wholesale Markets

Docket No. AD07-11-000

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I appreciate the Commission's holding this Technical Conference and providing this national focus on the integration of demand response into the wholesale market. My name is Andrew Ott and I am Vice President of Markets for PJM. My responsibilities include the integration of demand response into PJM's markets. PJM has been working on integrating demand response for a number of years and has evolved from Demand Response merely being an add-on "program" to it becoming a full and equal participant in PJM's energy, capacity and ancillary services markets as well as its planning process. Through this testimony, I will address the Commission's questions directed to this panel regarding our experience with Demand Response in the PJM markets. My colleague, Bill Whitehead, will address the treatment of Demand Response in the planning process.

The PJM Market provides opportunities for demand resources to realize value for demand reductions in the Energy, Capacity, Synchronized Reserve, and Regulation markets. The FERC authorized PJM to provide these opportunities as permanent features of these markets in early 2006. PJM completed the systems modifications required to enhance or implement these opportunities on June 1, 2006. This effort integrates demand response into the PJM wholesale market and provides symmetrical treatment for generation and demand resources. The following graphic, Figure 1, illustrates the evolution of revenue opportunities for demand response compared to generation resources in the PJM wholesale market. As illustrated in this figure, demand response has evolved over the past several years to provide revenue opportunities for this service in the PJM market that are comparable to the revenue opportunities for generation resources.

Figure 1 – Evolution of Demand Response Opportunities in the PJM Wholesale Market

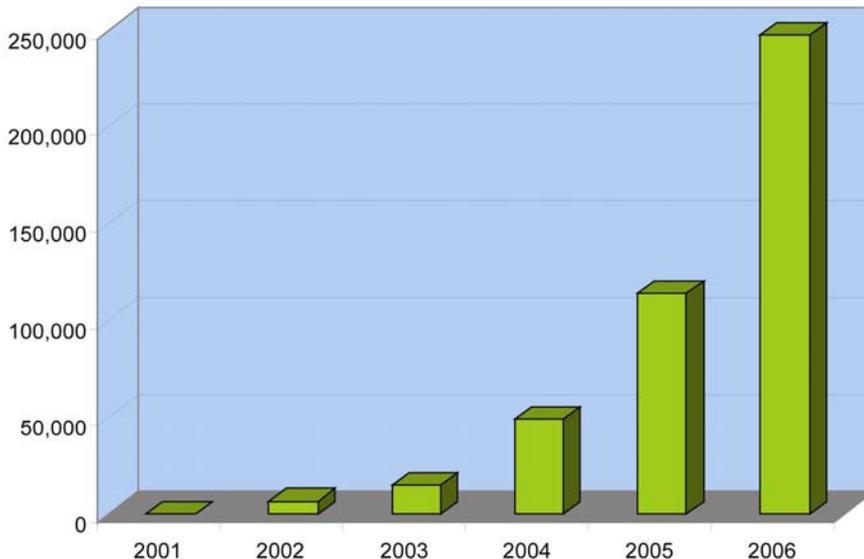
Revenue Opportunity	Central Station Generation (PJM)		PJM with RPM Approval	PJM with addition of Forward Energy
Real-Time/ Spot Energy Sales				
Day-Ahead Energy Sales				
Forward Energy Sales			No 	Forward Energy Reserve 
Forward Capacity Sales	RPM will enhance 		RPM Auction 	RPM Auction 
Energy & capacity payment for emergencies				
Ancillary Services	Spin, regulation, etc. 			

Energy Market

PJM Economic Load Response enables Demand Resources to voluntarily respond to PJM LMP prices by reducing consumption and receiving a payment for the reduction. The Day-Ahead alternative provides a mechanism by which any qualified market participant may offer Demand Resources the opportunity to reduce the load they draw from the PJM system in advance of real-time operations and receive payments based on day-ahead LMP for the reductions. The real-time alternative provides a mechanism by which any qualified market participant may offer Demand Resources the opportunity to commit to a reduction of the load they draw from the PJM system and receive payments based on LMP for the reductions. Economic Load Response provides direct access to the wholesale market to end-use customers through agent PJM members, Curtailment Service Providers (CSPs), to curtail consumption when PJM Locational Marginal Prices (LMPs) reach a level where it makes economic sense. Currently Economic Load Response includes incentive payments designed to encourage demand reductions. These incentives are paid to participants that reduce demand when the LMP is equal to or greater than \$75/MWh. The current incentive structure is set to expire at the end of 2007. PJM is working with stakeholders to revise the incentive structure design to continue to incent demand response through more directly targeted incentive payments to new demand response providers.

The growth of participation by end-use customers since 2002 is significant. The graphic in figure 2 shows the increase in total MWh of demand response provided through CSPs from year to year.

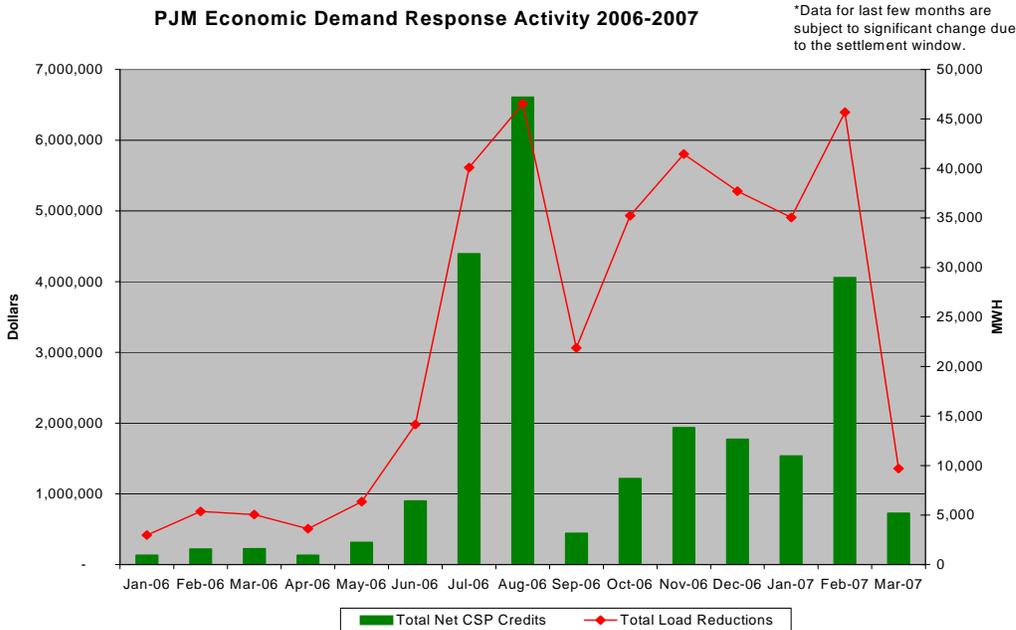
Figure 2 –Volume (MWh) of Demand Response Participation in the PJM Market



While demand response reductions are most significant in the summer peak period, the volume of demand response participation in other periods has increased. This trend is illustrated in figure 3 for the 2006/2007 period. Curtailment Service Providers add value to the market by providing end-use customers with pricing information

and tools that automate their decisions to change electricity usage. End-use customers that participate through Curtailment Service Providers include not only large industrials but also hospitals, colleges, and box retailers.

Figure 3 – Monthly Demand Response Activity in the PJM Market, 2006-2007



Capacity Market

With the Implementation of the forward capacity market, the Reliability Pricing Model (RPM), demand customers can offer demand response as a forward capacity resource. Under this model, demand response providers can submit offers to provide a demand reduction as a capacity resource into the forward RPM auctions. If these demand response offers are cleared in the RPM Auction, the demand response provider will be committed to provide the cleared demand response amount as capacity during the delivery year and will receive the capacity resource clearing price for providing this service. This is an important development for demand response providers because it provides the opportunity for them to obtain a commitment for a forward revenue stream up to four years in advance. Thus, the RPM provides a forward guarantee for a revenue stream which will enhance the business and investment model for further development of demand response. This feature of RPM is not only beneficial to the demand response providers that clear in the auction, it also provides additional depth and liquidity to the forward auctions because the planned demand response can compete directly with planned and existing generation resources which should lower capacity prices over time. In the first annual RPM auction which was held recently for the 2007/2008 planning period, 127.6 MW of demand response offers were cleared. The Demand Resources that bid into the first base RPM auction ranged from 0.1 MW to 17 MW.

In addition to the forward RPM auction, demand response can be committed as direct Emergency Load Response just before the delivery year begins in order to offset capacity payments. Both Load Serving Entities (LSEs) and CSPs can aggregate and register demand resources as Full Emergency Load Response on a nearer-term basis. PJM provides capacity credits to LSEs and CSPs for the MWs of load reduction registered as Full Emergency Load Response. The requirements for Full Emergency Load Response, called Interruptible Load for Reliability (ILR) under the RPM construct, are the same as those of the predecessor, Active Load Management (ALM). This ILR service is also an important component of the RPM because it allows demand customers who may not be able to commit to curtailments on a multi-year forward basis with the opportunity to continue to provide emergency load response on a shorter term commitment basis.

Synchronized Reserve Market

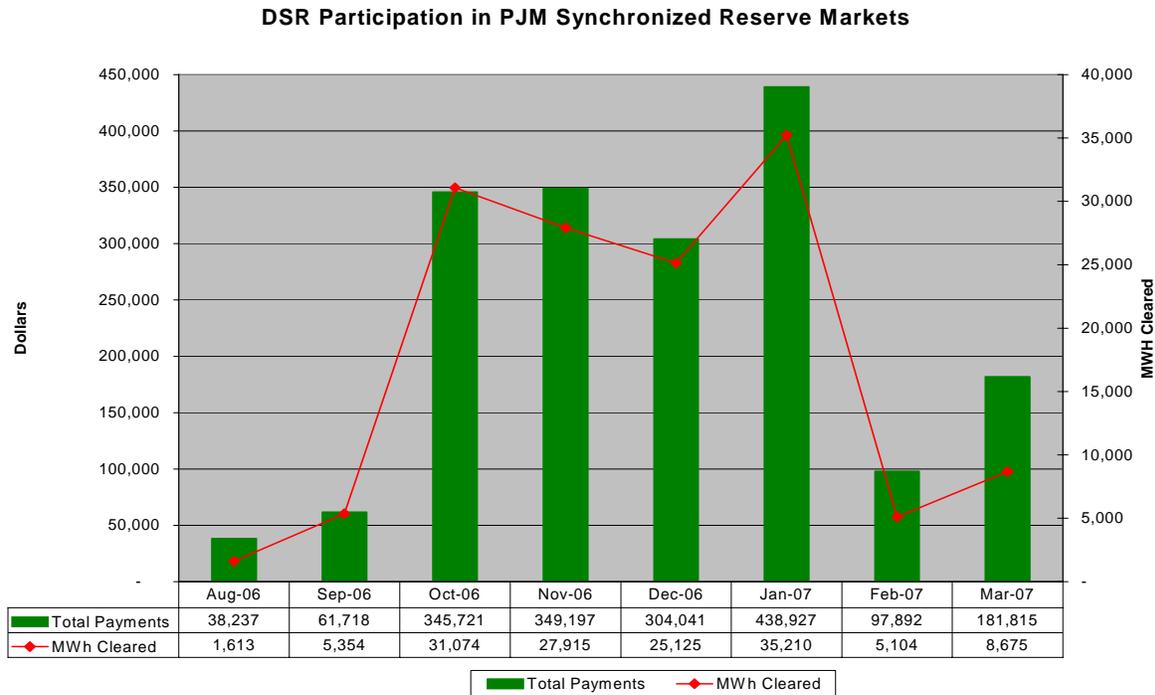
The PJM synchronized reserve market provides PJM participants with a market-based system for purchase and sale of the synchronized reserve ancillary service. Synchronized reserve is a quick-response service that is deployed by PJM when necessary to maintain reliable grid operation consistent with NERC control performance standards. Historically, this ancillary service was provided by any generation resource that is capable of increasing its output within ten (10) minutes following a PJM operator request for synchronized reserve response. In May 2006, PJM implemented changes to the reliability procedures and to the market rules to allow demand response to qualify as synchronized reserve resources. The market rule includes two major provisions concerning the addition of demand response: (1) that the demand response resource must dependably provide ten-minute response, and (2) that the demand response resource has appropriate metering infrastructure in place to verify response and compliance with reliability requirements and market rules. PJM's tariff incorporating these enhancements was approved by the Commission last year.

The synchronized reserve market is cleared every hour based on the offers that are submitted by various resources. The market clearing results establish the synchronized reserve assignments for each cleared resource in order to meet the synchronized reserve requirement for the entire market and for any constrained subregions of the market. Each assigned resource is paid the synchronized reserve clearing price for providing the service for the hour.

The synchronized reserve market provides a unique opportunity for competitive development and investment in demand response infrastructure. The payments to resources that clear in the synchronized reserve market are compensation for the resource to be available to respond within ten minutes. Therefore, while demand response resources must install infrastructure to allow them to curtail their consumption of electricity within ten minutes, they will only be requested to curtail when system conditions require the ten minute response. Since the PJM market operators have historically requested ten minute response, on average, once every six days, the demand response customer may provide the service with limited disruption to their business processes. Since the implementation of this market enhancement in June 2006, several PJM industrial customers have responded to the market incentive and have installed the infrastructure necessary to participate in the market. The volume of demand response participation in the synchronized reserve market is illustrated in figure 4. End-use sites that

have qualified to provide synchronized reserve include not only large industrials but also colleges and a hospital complex.

Figure 4 – Monthly Demand Response Participation in the PJM Synchronized Reserve Market, 2006-2007



Upon the initial consideration of market rule changes to allow demand response to provide ten minute reserve, PJM and its stakeholders developed principles that ensured demand resources would provide the same level of reliable ten-minute response as generation resources. Under the current market rules, Demand Resources must provide metering information at no less than a one minute scan rate surrounding a call for Synchronized Reserves. The metering information must be uploaded to eLoadResponse within 24 hours of the event to ensure compliance. The overall participation by demand resources is currently limited to 25% of the Synchronized Reserve requirement in each Reserve Zone as PJM and Reliability First Corporation gain experience with this demand response as synchronized reserve. To date, this limitation has not become a barrier to demand response participation. To ensure that proper reliability standards are maintained, there are mandatory training requirements for CSPs that desire to bid demand reductions in the Synchronized Reserve market. The mandatory training prepares the Curtailment Service Providers to bid demand reduction capability in the ancillary services markets and to comply with the operational requirements. Forty-eight participants completed the mandatory training offered by PJM on April 3, 2006. Additional participants have since completed the on-line training provided by PJM.

The PJM operators have indicated that the demand response resources have provided reliable response to PJM requests for ten minute reserves, no adverse impacts to PJM operations or to reliability standards have been identified as a result of deploying demand response as synchronized reserve.

Regulation Market

PJM added the capability of accepting demand reduction bids in the Regulation market on May 1, 2006. CSPs that bid demand reductions into the Regulation market must meet all of the requirements of Regulation including the real time telemetry requirement. Currently reliability council rules limit demand resources to 25 % of the regulation requirement in the ReliabilityFirst Corporation Council region. There are mandatory training requirements for CSPs that desire to bid demand reductions in the Regulation market. Up to this point, no demand response providers have offered Regulation service in the PJM market.

Demand Response During 2006 Summer Peak

As of September 30, 2006 there were 1,407 MWs (286 sites) active in Economic Load Response and 1,081 MWs (4,427 sites) active in Emergency Load Response (either Energy Only or Full Emergency). PJM's new eLoadResponse application went into production March 1, 2006. The web-services and other features of eLoadResponse provide CSPs as well as Electric Distribution Companies (EDCs), LSEs, and PJM with a more robust tool for processing the registration of demand resources and demand reduction activity and transactions in the PJM Market.

Demand Resources demonstrated value during the heat waves experienced during summer 2006. PJM performed analysis to determine which generation would have been deployed in the real-time dispatch had the demand response not been present during the heat wave from July 31, 2006 through August 4, 2006. The analysis method was based on utilizing the PJM dispatch software, in offline mode, to determine which generating units would have been dispatched to meet the increased hourly demand requirement that would have existed had the actual demand response not been present in each hour. The fuel displacement was then calculated by determining the fuel consumption that each incrementally dispatched generator would have consumed based on the generator's characteristics and on the incrementally dispatched MWh for the generator from the offline simulation. Figure 5 illustrates the results of this analysis and it illustrates the fossil fuels displaced by demand response during the August heat wave.

PJM also utilized the offline dispatch software to estimate the reduction in real-time electricity prices that resulted from demand response during the same period of extreme demand. The analysis method was based on the same technique described above but included the calculation of hourly real-time prices that would have resulted from the incremental generation dispatch that would have been required to meet the increased hourly demand requirement that would have existed had the actual demand response not been present in each hour. Figure 6 shows the LMP impact of demand response on August 2, 2006 that was calculated using this method.

As PJM has reported in other forums, the analysis was extended to calculate these price impacts over the entire week of the heat wave. This analysis included the calculation of equivalent energy payment reductions by multiplying the calculated price reductions times the hourly real-time demand which resulted in a total of \$650 Million in equivalent energy payment reductions. I must emphasize that this calculation does not represent actual savings because most customers are generally hedged against high real-time spot-market prices therefore only a small percentage of demand actually pays real-time spot prices. However, the price reductions are significant because spot prices do impact forward energy prices.

Figure 5 – Fuel Displaced by Voluntary Load Reduction, July 31, 2006 - August 4, 2006

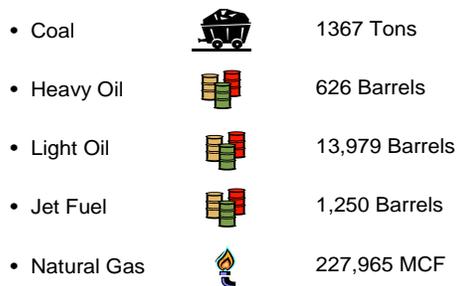
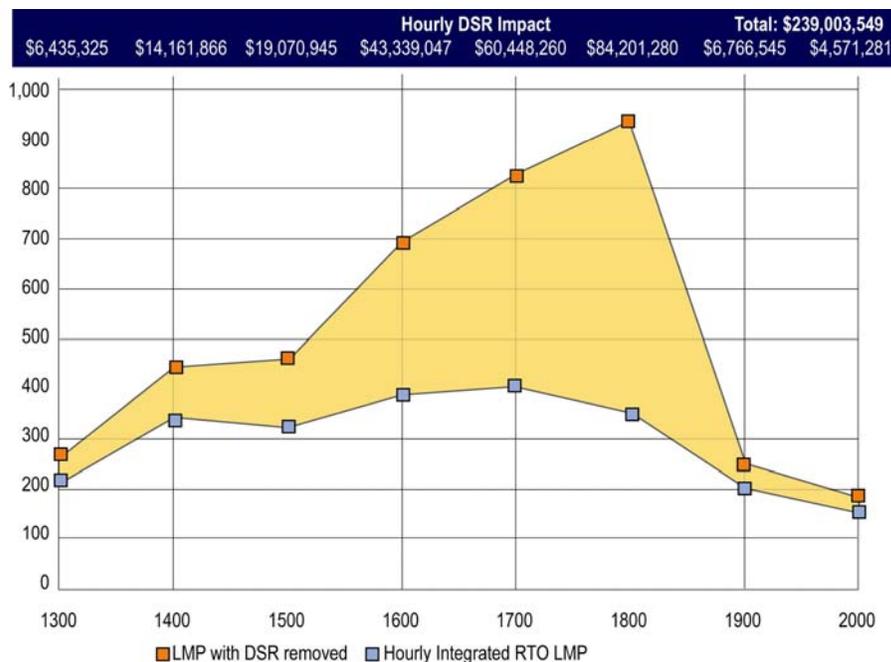


Figure 6 – Impact of Voluntary Demand Response on Real-Time Locational Prices – August 2, 2006



Ongoing Demand Response Development

The Mid-Atlantic Distributed Resource Initiative ("MADRI") began a regional effort to bridge the retail and wholesale aspects of demand response in June 2004. Sponsored by the Philadelphia office of the U.S. Department of Energy ("DOE") and led by a steering committee composed of representatives of DOE, the regulatory commissions of New Jersey, Pennsylvania, Maryland, Delaware, and the District of Columbia, the U.S. Environmental Protection Agency and PJM, MADRI identified several needs of and barriers to greater deployment of demand resources in the MADRI region. These barriers included: need for tools to measure the value of region wide demand response, financial disincentives for electric distribution companies ("EDCs") to strongly support demand response, lack of regional interconnection standards for distributed generation ("DG"), need for cost effective and timely access to end-use customer hourly usage data, and need to measure effectiveness of new demand response ("DR") technologies and advanced metering infrastructure ("AMI")

MADRI published a study, "Quantifying Demand Response Benefits in PJM," in early 2007 that documented annual energy savings from a 3% demand reduction in the highest priced hours of the year. MADRI has also produced model DG interconnection standards, a model tariff for decoupling EDC throughput and revenue and a web-based AMI tool box. MADRI has a 3% regional demand response goal under consideration.

The work of MADRI supports state regulatory DR efforts underway in Pennsylvania, New Jersey, and Maryland. Several state regulatory commissions in the PJM region are recognizing the critical role of AMI and new DR technologies to the bill management and consumption decisions of end-use customers. The Midwest Demand Resources Initiative (MWDRI), created by the Organization of MISO States and its state members, began an effort on February 9, 2007, to improve the way demand response and other demand resources are used and valued by electric customers and market participants. MWDRI plans to meet again on May 4, 2007.

PJM will sponsor a Demand Response Symposium in early May. The team planning this event includes representatives of federal and state regulatory commissions, of consumer advocates, of industrial end-users, and of Curtailment Service Providers ("CSPs"). The symposium will develop a framework for better integrating the retail and wholesale aspects of demand response. Hopefully the symposium participants will be able to use and build on the work of MADRI.

PJM, both independently and as a member of the Demand Response Coordinating Committee (DRCC), is participating in the efforts of NERC and NAESB to develop better tools to measure the impact of demand response on a national level. PJM will contribute 5 summers of experience measuring and verifying demand reductions in the wholesale energy market and 9 months of experience measuring and verifying the provision of synchronized reserve by demand resources.

As PM has evolved, the Demand response programs ended and integrated demand response began the PJM market in 2006 with the Commission's February order. PJM staff implemented in 2006 the integrated DR market design filed by PJM in late 2005 as subsequently authorized by the Commission. Curtailment Service Providers no longer must choose between an Emergency or an Economic Load Response registration. Not only can a

demand resource be registered simultaneously in both Emergency and Economic Load Response but qualified demand resources can provide both synchronized reserve and regulation. The rules that govern demand response participation in the energy, capacity, and ancillary services are interwoven into the PJM tariff and Operating Agreement. The treatment of the incentive payment when zonal LMP is equal to or greater than \$75/MWh, which expires in 2007, was deferred by the PJM stakeholders in the market design that fully integrated demand response into the wholesale market last year.

The Demand Side Response ("DSR") Working Group began a process earlier this year to provide long term market access for demand resources. What has emerged from the interest based discussions of the working group is a shared sense that there must be a level playing field for demand resources, a reasonable opportunity for demand resources to recover investment, as well as stable and straightforward market rules. These working group discussions have also recognized the importance of valid price signals and transparent incentives to the long term success of demand resources in the wholesale market. While incentives designed to overcome upfront investment hurdles may be advisable, demand resources must respond to valid market price signals or risk making consumption decisions that are distorted and inefficient.

Subcommittees of the DSR working group are also evaluating the customer baseline calculation ("CBL") and planning quicker PJM access to the meter data of participating end-use customers. The work of the DSR working group including the subcommittees will be reviewed by the higher level stakeholder committees and result in a filing with the Commission later this year.

As stated previously, the forward locational capacity prices revealed by RPM auctions should continue to attract both planned and existing demand resources and will target resource development, both demand resource and generation resource, in locations where needed the most. The other alternative, Interruptible Load for Reliability ("ILR"), lets demand response capture capacity payments by certification a few months before the delivery year.

My colleague Bill Whitehead will address how demand side response fits within the revised PJM planning process. We believe that each of these vehicles provides a platform for full integration of demand response into the PJM wholesale marketplace. We are committed to working with the Commission and stakeholders to further this development and appreciate the Commission's national focus on the issue.