



Market Monitoring Unit

REPORT
TO
THE FEDERAL ENERGY REGULATORY COMMISSION

PJM 2002 LOAD RESPONSE PROGRAM

PJM Market Monitoring Unit

May 31, 2003

In accordance with the Federal Energy Regulatory Commission's (FERC) directive in PJM Interconnection, L.L.C., 99 FERC ¶ 61,227, at p. 61,939 (2002), the Market Monitoring Unit of PJM Interconnection, L.L.C. (PJM) submits this report assessing the effectiveness of PJM's 2002 load response programs.

Background

During the summer of 2000, PJM implemented a Customer Load Reduction Pilot Program (2000 Pilot Program) designed to encourage the development of demand-side response during emergency situations by compensating end use customers for measurable load reductions made at the request of PJM. The 2000 Pilot Program responded to the FERC's Notice of Interim Procedures to Support Industry Reliability Efforts and Request for Comments, 91 FERC ¶ 61,189 (2000), and was in furtherance of the FERC's efforts to take advantage of distributed resources and stimulate demand side market responses during peak load conditions in the summer. The FERC approved the 2000 Pilot Program on July 26, 2000,¹ and it was in effect from July 8, 2000 until September 30, 2000. However, PJM did not experience any such high demand conditions during the summer of 2000, and participants were never requested to reduce load.

The 2001-2002 Customer Load Response Pilot Program was accepted in a FERC order dated May 30, 2001 and was implemented on June 1, 2001.² This Pilot Program consisted of two different options for load reduction, namely, the emergency option and the economic option. The emergency option was similar to the 2000 Pilot Program, with the only exception being that the PJM Active Load Management Program (ALM) participants were also eligible to participate in the 2001-2002 Pilot Program under the condition that such participation did not impact the fulfillment of their ALM commitment. The economic option was designed to provide a mechanism by which any qualified market participant could be compensated when it contracts with end-use customers to voluntarily reduce load during times of high price. Prior to implementation of the 2001-2002 Pilot Program, only the Load Serving Entity (LSE) serving the end-use customer was in a position to receive the savings associated with load reductions by that customer and to share the savings with that customer. The 2001-2002 Pilot Program was designed to facilitate the development of a market that can be served by other intermediaries.

During the 2001-2002 Pilot Program, the emergency option was implemented on three separate occasions, July 25, August 8, and August 9, 2001. The economic option was also implemented on these days, as well as August 7 and August 10, 2001. During 2001, the total load reduced under the Pilot Program was about 440 MW with an average payment of \$682/MWh. The economic option accounted for 50 MW with an average payment of \$283/MWh, while the emergency option accounted for about 390 MW with an average payment of \$732/MWh. On December 28, 2001, the PJM Market Monitoring Unit submitted a report to FERC detailing the 2001-2002 Pilot Program.

¹ PJM Interconnection, L.L.C., 92 FERC ¶ 61,059 (2000).

² PJM Interconnection, L.L.C., 95 FERC ¶ 61,306 (2001).

Development and Implementation Process of 2002 PJM Load Response Program

The Demand Side Response Working Group (Working Group) was formed in 2001. The purpose of this Working Group was to develop an ongoing demand side response program that would commence in the summer of 2002. The Working Group developed a load response program similar to the 2001-2002 Pilot Program in that it contained both emergency and economic programs. However, one of the main distinctions between the 2001 and 2002 programs is that the economic program in the 2002 Load Response Program has both real time and day ahead options, whereas the previous year's program only consisted of the real time option.

On February 14, 2002, the PJM Members Committee (MC) approved a permanent Emergency Load Response Program. On March 1, 2002, PJM filed amendments to the PJM Open Access Transmission Tariff (PJM Tariff) and the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (PJM Operating Agreement) to establish a permanent Emergency Load Response Program (Emergency Program). By order dated April 30, 2002, the FERC approved the Emergency Program effective June 1, 2002, but set a sunset date for the program of December 1, 2004.³

Similarly, on March 15, 2002, PJM submitted filing amendments to the PJM Tariff and PJM Operating Agreement to establish a multi-year Economic Load Response Program (Economic Program). On May 31, 2002, FERC accepted the Economic Program, effective June 1, 2002.⁴ Like the Emergency Program, the Economic Program is effective until December 1, 2004.

Pursuant to the May 31 Order, PJM is required to submit two reports to FERC evaluating the effectiveness of the Economic Program. The first report to be submitted after the program has been in effect for 12 months, or May 31, 2003. The second is due October 31, 2004, along with a report evaluating the effectiveness of the Emergency Program.⁵ The FERC ordered PJM, in its reports, to include an evaluation of its trial program for non-hourly metered customers, including whether this program is the best means of obtaining participation by small customers. Further, the FERC directed PJM to examine whether the level of compensation that is still necessary to induce customers to join and remain in the program is still appropriate, or whether PJM can implement compensation programs that more closely respond to and provide market signals. PJM also should estimate, as closely as possible, the costs and benefits of (a) implementing a compensation program with no incentive provision, (b) continuing the current incentive provision, or (c) enlarging the incentive provision. In addition, PJM should evaluate

³ PJM Interconnection, L.L.C., 99 FERC ¶ 61,139 (2002) (April 30 Order).

⁴ PJM Interconnection, L.L.C., 99 FERC ¶ 61,227 (2002) (May 31 Order).

⁵ In the April 30 Order, the FERC directed PJM to file, by October 31, 2004 a report evaluating the Emergency Program. April Order at p. 61,575.

possible methods of obtaining significant amounts of demand response other than by providing financial incentives.⁶

PJM Load Response Program Description

Participant Qualifications

Two types of distributed resources are candidates to participate in the Load Response Program (both in the Emergency Program and in the Economic Program)⁷: (1) participants that have the ability to supply required load reductions via local generators that can serve their load and that are either not synchronized to the grid or have no net export to the grid; and (2) participants that have the ability to reduce measurable and verifiable portions of load, without onsite generation.

Metering Requirements

Participants in the Load Response Program must have metering equipment that provides integrated hourly kWh values that either meet the Electric Distribution Company (EDC) requirements for accuracy or have a maximum error of two percent end-to-end (including Potential Transformers and Current Transformers).

PJM Emergency Load Response Program

Participant Qualifications

For PJM members wishing to participate in the Emergency Program, a special PJM membership is offered. For organizations that are not PJM members, the organization must apply for special PJM membership to participate in the Emergency Program. Those organizations that obtained special membership for participation in the 2001 Emergency Load Response Program must apply again for the current Emergency Program. The end user's registration information is then confirmed with the applicable LSE, EDC, and ALM party.

To participate in the Emergency Program, a distributed generation resource must (1) be capable of reducing at least 100 kW of load and (2) be capable of receiving PJM notification to participate during emergency conditions. Participants in the Emergency Program may reduce load upon notification from PJM. Participation in the Emergency Program is voluntary.

Implementation

PJM initiates a request for load reduction following the declaration of a Maximum Emergency Generation event as described in the PJM Operating Agreement and prior to implementation of ALM Steps 1 and 2. However, ALM may be called on before the load reduction program is requested, depending upon the time in which the load reduction is needed. This is due to the fact that ALM requires certain time duration between ALM reduction notification and the time in which the reduction must take place. For short-term

⁶ May 31 Order at p.61,939.

⁷ Load Response Program refers to the Emergency Program and the Economic Program collectively.

ALM, this lead-time is less than one hour, but long-term ALM requires a lead time of greater than one hour. ALM is available for up to ten PJM initiated interruptions at any time during the planning period. These interruptions may be up to six hours duration during the hours of noon to 8 p.m. on weekdays, other than PJM holidays.

The Load Reduction Program is implemented whenever generation is needed that is greater than the highest economic incremental cost. Maximum Emergency Generation is used to increase the PJM control area generation above the maximum economic level and is implemented whenever generation is needed that is greater than that available from economic offers to PJM.

Measurement

The measurement requirements for the Emergency Program are the same as those of the 2001-2002 Pilot Program. The Emergency Program participants must have metering equipment that provides integrated hourly kWh values on an EDC account basis, that either meets the EDC requirements for accuracy or has a maximum error of two percent over the full range of the meter. The meter may be either EDC-owned or Customer-owned. Customers measure their actual integrated hourly load for the hour prior to the event and for each hour during the event and then calculate the reduction for each hour as the difference between the two values.

Payment

Participants in the Emergency Program are compensated for reducing load based on the actual kWh relief provided, adjusted for losses. PJM pays the higher of the appropriate zonal Locational Marginal Price (LMP) or \$500/MWh to the PJM member that nominates the load reduction. Payment will be equal to the measured reduction adjusted for losses times the higher of the appropriate zonal LMP or \$500/MWh. An ALM Customer may participate in the Emergency Program during ALM events as long as the customer's ALM contract explicitly excludes payment or credit for energy not consumed during ALM events. If it is indicated by the LSE that the customer is not eligible for credit under both ALM and the Emergency Program, then payments will be made under the Emergency Program only for when ALM obligations are not in effect. In addition, any load response in excess of the contracted ALM amount is compensated under the Program for the entire duration of such response.

Allocation of Payments

All payments under the Emergency Program are collected from purchasers of energy, in proportion to their net purchases from the PJM energy market during the hour. Charges and credits related to the Emergency Program appear on the PJM members' monthly bills. This allocation method tracks the existing method for allocating costs relating to emergency conditions established under the PJM Operating Agreement.

PJM Economic Program

Participants in the Economic Program have the option to choose between the real time market and the day ahead market either directly or through an end users' Curtailment

Service Provider (CSP). The CSP must submit the offer or the LMP at which the end user will reduce load by noon of the day before the operating day. The ISO will then evaluate the offer using the shut down costs, minimum down time and other information submitted as part of the end user's offer. The Day Ahead market closes at 1200 each day, and cleared Load Response Bids are posted in eMKT. If a participant is not accepted in the Day Ahead Market and wishes to be dispatchable in real time, the PJM dispatcher will use operational information provided in the offer to dispatch in real time.

Participant Qualifications

The qualifications for participation in the Economic Program are the same as for the Emergency Program, except that the special membership provisions do not apply. CSPs and customers that desire to participate in the Economic Program must be full members of PJM. The registration process is similar to the process for the Emergency Program. An end user, however, may not participate in the Emergency Program and the Economic Program simultaneously. If the end user has participated in one of the two programs for at least 15 consecutive days, then that end user may switch from one program to the other with one day notice.

Measurement

The measurement requirements for the Economic Program include two methods for measuring load reductions. Under the first method, an end-use customer is required to continuously meter a specific process that could be shown to have been shut down in response to the program. The second method involves comparing metered load against an estimate of what metered load would have been without the reduction. In order to do this, end-use customers must calculate a Customer Baseline Load according to methodologies established by PJM.

Implementation/Operations

Unlike the Emergency Program, the Economic Program is not based on the declaration of a Maximum Emergency Generation in PJM, but rather on the economic decisions of the PJM market participants. In other words, participants in the program determine the conditions under which they will reduce load. The principal indicator of conditions that warrant economic load reductions are the locational marginal prices of energy faced by the participants.

To keep PJM informed of the amount of load expected to be reduced at various price levels (to maintain adequate system control), program participants are responsible for maintaining the load reduction information associated with each participating customer, including the amount and price at which the load will be reduced. Participants also are required to email such information to PJM immediately prior to, or concurrent with, accomplishing the load reduction.

Under the Day Ahead option, demand reduction bids are accepted from an end-use customer or its representative (LSE/CSP) for a specific MW curtailment (in minimum increments of 0.1 MW). These bids include the day-ahead LMP above which the end-use

customer would not consume, and could also include a start-up cost and/or a minimum number of contiguous hours for which the load reduction must be committed.

Payment

Payments under the Economic Program are made to the end-use customer or its representative (LSE/CSP). If the LSE/CSP is the party to be paid but is not the load reducer, the portion of the payment that will be transferred from the LSE/CSP to the end-use customer that actually reduced load is arranged between the LSE/CSP and the end-use customer.

Payments under the Day Ahead option of the Economic Program are the same as under the Real Time option, except that they are based on day-ahead rather than real time LMP. However, when a Day Ahead bid clears, the participant is obligated to provide load curtailment in Real Time. LSEs/CSPs that have load reductions committed in the day ahead market that do not provide the amount of load reduction in real time as specified in the day ahead offer will be charged real time LMP for the amount of the shortfall, plus any associated balancing operating reserve charges.

Reimbursement for load reduction is based upon the actual reduction provided in excess of committed day-ahead load reductions plus the adjustment for losses. If the real time LMP is less than \$75/MWh, the end-use customer that curtails load in real time will be paid the real time LMP less an amount equal to the applicable generation and transmission charges. If the real time LMP is greater than or equal to \$75/MWh, the end-use customer that curtails load in real time will be paid the real time LMP. If the load response is dispatched by PJM, payment will not be less than the total value of the load response bid, including any submitted start-up cost. If the total amount of recoverable charges reflecting the generation and transmission charges for the entire program exceeds \$17.5 million in a year, participants will receive LMP less an amount equal to the applicable generation and transmission charges regardless of the level of LMP.

ALM customers are allowed to participate in the Economic Program during ALM events as long as the customer's ALM contract explicitly excludes payment or credit for energy not consumed during ALM events. In addition, any load response in excess of the contracted ALM amount is compensated under the Economic Program for the entire duration of the response.

Results

Participation

A total of 22 members participated in the 2002 Load Response Program. Out of these members, 18 were full members and 4 were special members. These members covered over 170 end-use sites at which load could be reduced. The total available load reduction associated with these sites was 891 MW, a significant increase from the previous year's registered amount of 220 MW. Out of the 891 MW registered in 2002, 343 MW were

registered in the Economic Program, while 548 MW were registered in the Emergency Program. Table 1 displays these and other 2002 Load Response Statistics.

Table 2 shows the resource history for all load response programs. ALM participants accounted for 298 MW, or 33%, of the 891 MW participation in the 2002 Load Response Program. Of the 298 MW registered in ALM and Load Response, 154 MW were registered in the Emergency Program, 143 MW were registered in the Economic Program. This is an increase both in the level of joint participation and in the level of Load Response Program participation unrelated to ALM compared to the 2001-2002 Pilot Program, in which ALM participants accounted for 164 MW out of the 220 MW in the Load Response Program.

Implementation

During 2002, the Emergency Program was implemented on three separate occasions for a total of 14 hours (see Table 3). On July 3, 2002, the program was initiated at Hour Ending (HE) 1200 and terminated at HE 1800 hours, resulting in an average reduction of 49 MW and a maximum reduction of 76 MW over 7 hours. Average payment per MW during these hours was \$517. On July 29, 2002, the Economic Program was initiated at HE 1600 hours and terminated at HE 1800 hours, with the average emergency load curtailment amounting to 24 MW and the maximum load curtailment amounting to 34 MW. The average payment was \$508 per MW over a time period of 3 hours. On August 14, 2002, the program was initiated at HE 1600 hours and terminated at HE 1900 hours, averaging 34 MW with a maximum of 43 MW. Average payment per MW during these hours was \$508 over 4 hours. July 3, 2002 was the only time that the Emergency Program was used on a system-wide basis. On the other two occasions, the Emergency Program was implemented on a local basis. This is significant as it illustrates the fact that demand side resources are local and can be called on to solve local issues, as can generation resources.

In 2002, the Economic Program was implemented on the same days as the Emergency Program, in addition to 27 other days during the summer. This is an increase from the summer of 2001, when the economic option was implemented on 5 days, on 3 of which the emergency option was also implemented. ALM supplied load curtailment on 31 days during the summer of 2002, including the 3 days that the Emergency Program was called. Reductions on Emergency days in 2002 are detailed in Tables 3 and 4.

In the 2002 Load Reduction, the hourly maximum load reduction was 140 MW, which occurred on July 3, 2002. This drop represented 0.5% of load during that hour, an increase from the 2001 Pilot Program, in which maximum reduction in load represented 0.1%. The hourly maximum reduction in load under the Emergency Program was 76 MW on July 3, 2002, which represented about 0.1% of load in that hour. Under the Economic Program, the hourly maximum reduction in load was 101 MW on August 2, 2002 representing about 0.2% of load in that hour. Under the ALM program, the maximum hourly load drop was about 1,800 MW, which occurred on July 3. This represented about 3.0% of load in that hour. Table 4 highlights ALM reductions on Emergency days.

Table 5 highlights the comparisons between the 2001 and 2002 load reduction statistics. Total payments made under the Economic Program increased from about \$14,000 in 2001 to \$762,000 in 2002. However, the average payment decreased 58% from \$283 per MWh in 2001 to \$118 per MWh in 2002. Total payments made under the Emergency Program decreased slightly, from about \$288,000 in 2001 to about \$283,000 in 2002. The average payment in 2002 was \$514 per MWh, a decrease of 30% from 2001 in which the average payment was \$738 per MWh. Combined, total payments under the 2002 Load Response Program were about \$1,044,734, an increase from the 2001 total payment of about \$300,000. In 2002, the average payment was \$149 per MWh, which is a 78% decrease from the 2001 total average payment of \$682 per MWh. The reduced payments were primarily the result of lower overall PJM prices in 2002 and the fact that there were fewer high price hours in 2002 than in 2001.

Day Ahead

There was only limited participation in the Day Ahead component of the Economic Program in 2002. There were two offers in the Day Ahead market. However, only one of these bids was chosen.

Price Impacts

It is difficult to measure the price impacts of the Load Response Program exactly, as the result of the size and frequency of the actual load reductions under the program. As a general matter, the price impacts of the program depend both on the size of the program response, the system demand when elements of the program are implemented and the shape and location of the PJM supply curve when elements of the program are implemented.

The load reductions under the Load Response Program were not large in the context of PJM maximum load of 63,762 MW. The maximum reduction under the Economic Program was 101 MW and the maximum reduction under the Emergency Program was 76 MW.

July 3, 2002 serves as an illustration of the actual and potential price impacts of both ALM and the Economic and Emergency components of the Load Reduction Program. July 3, 2002 is chosen because it was the only day on which all programs were active on a system-wide basis.

Price impacts are measured in two ways here. Using supply curves, measured on a short term basis in real time, the upper bound of average price impact of the ALM program was about \$70 per MWh, the additional average price impact of the Economic Program was about \$50 per MWh and the additional average price impact of the Emergency Program was about \$40 per MWh. The upper bound price impact of the three programs together was thus about \$160 per MWh. These are averages based on short term impacts and overstate the actual impact of the programs. Using short term supply curves accounts only for resources that were actually on line during the short interval examined. If system operators had expected more load, the mix of resources would have been different and the measured impact of the programs would have been smaller. Using the system

aggregate supply for the day, which includes all available resources, the lower bound price impacts of the three programs together would have been about \$35 per MWh rather than \$160 per MWh.

Nonetheless, use of the short term impacts does illustrate the potential price impacts of demand side management programs when load is at the upper end of the supply curve. Using the average aggregate supply curve for the summer of 2002, the price impact of 200 MW of load reduction would have been about \$40 at the upper end of the supply curve. The impact of 2,000 MW of load reduction would have been about \$600 per MWh at the upper end of the supply curve. However, at the peak load for the summer of 2002, the impact of 2,000 MW of load reduction would have been only about \$30 per MWh, reflecting the underlying balance of supply and demand during the summer of 2002.

Impact of the Load Response Program on the Active Load Management Program

As noted above, 298 MW of ALM resources were also registered in the Load Response Program, compared to 164 MW in 2001. Table 2 highlights the Demand Side Response history of registered MW. ALM registration decreased from 2001 to 2002, dropping from 1,962 MW to 1,569 MW. Conversely, the Load Response Program registration increased between the two years, from 220 MW in 2001 to 891 MW in 2002. The ALM program was affected by several factors, including the value of ALM and the alternative uses of the ALM resources. The value of the ALM program to participants, or the LSE purchasers of ALM, is a function of the value of capacity resources in PJM's capacity markets. The value of capacity declined in 2002, as measured either by the monthly and multi-monthly capacity auctions or the daily capacity auctions. The longer term auctions are a better measure of the value of ALM as they reflect the opportunity cost of dropping participation in the ALM program. The average price of capacity was \$38.21 per MW-day in 2002 for monthly and multi-monthly auctions and \$33.40 per MW-day also including daily auctions. The breakeven hours of interruption, assuming the minimum payment of \$500 per MWh for the Emergency Program, were about 24 hours for the lower capacity price and about 28 hours for the higher capacity price. In other words, if a resource capable of interrupting load had evaluated the two options, using these parameters, the resource would have chosen the Emergency Program if expected hours of interruption had been between 24 and 28 hours. The ALM program includes significant penalties that must be paid if the designated load reduction is not achieved. The penalties provide an incentive to make conservative estimates of the available ALM. The penalties also make the Emergency Program appear more attractive, as it is voluntary and does not include any penalties for non performance.

Given the tradeoffs between the ALM program and the Emergency Program, PJM should carefully consider the costs and benefits of participation in each program and attempt to structure the incentives to participate in each program consistently with the costs and benefits to the system. The ALM resources are firm while the Emergency Program resources are not firm. It would make sense to structure the payments and penalties under the programs such that expected net payments under each program reflected the fact that firm resources have a higher value to the system than do non-firm resources.

Load Response Program Implementation Issues

July 3, 2002

On July 3, 2002, PJM operators anticipated the need for emergency energy from the period of 1200 hours through 1800 hours. This resulted in a call for reductions by the Load Reduction Program participants. During these hours, the amount of ALM reduction averaged 1,080 MW, with a maximum reduction of 1,775 MW, the amount of Economic Program reduction averaged 35 MW with a maximum reduction of 67 MW and the Emergency Program reduction averaged 49 MW with a maximum reduction of 76 MW. As explained above, using supply curves, measured on a short term basis in real time, the upper bound of the average price impact of the ALM program was about \$70 per MWh, the additional upper bound average price impact of the Economic Program was about \$50 per MWh and the additional upper bound average price impact of the Emergency Program was about \$40 per MWh. These are the averages based on short term impacts and overstate the actual impact of the programs. The price impact measures what prices would have been if demand had been higher by the amount of the demand side programs, holding everything else constant.

Although PJM system operators forecasted that there would be a need for response from the Emergency Program participants, actual load was less than forecasted load and, based on an after the fact evaluation, the Emergency Program was not needed. The estimated price impact of the Emergency Program probably significantly overstates the actual price impact. The \$40 per MWh is based on the actual resources used to meet load during every five-minute interval during these hours. If the system operators had not had the demand side resources available, the operators would have called on other supply side resources and the actual prices would probably not have risen by \$40 per MWh in the absence of the Emergency Program. Using the aggregate supply curve for the day, the lower bound price impact of the Emergency Program was about \$1 per MWh. The most likely price impact lies between \$1 and \$40 per MWh as the system operators would probably not have had all the resources reflected in the aggregate supply curve available to meet load during these hours.

Regardless of where in the range of \$1 to \$40 per MWh the price impact falls, it is clear that the marginal value to the system was less than the \$500 per MWh paid to the resources for reducing load. Actual system average hourly LMPs ranged between \$66 and \$147 per MWh during this period. The system operators made a reasonable decision to call on the Emergency Program, based on the facts available to them, although PJM could have done a better job of load forecasting on July 3, 2002. It was also reasonable that the system price did not reflect the \$500 per MWh paid to the Emergency Program resources, as that was not the value of the resources to the system, but was the required payment under the DSR tariff. The system price should reflect the value of demand side resources when they are the marginal resource.

Participant Reaction

An informal survey of the PJM Load Response Programs was conducted for 2002. The survey's limited response produced the following results:

- Most participants found the registration process not too difficult. They were satisfied with the PJM eTools, though some new participants experienced difficulty.
- Several concerns were raised by the survey. Participants felt that a training session is necessary in order to become educated in settlements, bidding, and PJM eTools. Many participants stated that they had difficulty submitting, verifying, and reporting data for settlement, as well as acquiring and using metered data. Concerns about participation in the Day Ahead Market were also expressed by participants.

It can be concluded from this feedback that participants were mostly satisfied, but felt that some improvements were needed in order to enhance the program. Some participants also had suggestions concern revision of some business rules. These comments were taken into consideration by the Working Group, which has started to address these concerns for the remainder of the program.

Current Working Group Initiatives

In March 2003, the Working Group provided a training session that was open to both current participants and those wishing to learn more about the Load Response Program. The course was designed to provide participants with enough knowledge of the program to enable them to instruct others on the merits of the Load Response Programs. The topics addressed in the course revolved around basic PJM market concepts and fundamentals that relate to the Load Response Program.

Also, revisions were made to the business rules for the Load Response Program. These revisions were based on the FERC order issued on December 19, 2002 concerning LMP-based contracts.⁸ An LMP-based contract is one by which an end-use customer has agreed to pay its LSE for the physical delivery of energy according to the hourly value of LMP as calculated by PJM. Under the previous business rules, if an end-use customer was on an LMP based contract with their energy supplier, then registration to the Economic Program would be denied. However, FERC ruled that the exclusion of LMP-based customers from the Economic Program would contradict the PJM principle that inducing load response at high LMPs provides system-wide benefits by lowering the LMP. Therefore, the revised business rules allow for LMP-based customers to participate in the Economic Program, dependent upon certain circumstances relevant to real-time operations.

⁸ PJM Interconnection, L.L.C., 101 FERC ¶ 61,308 (2002)

Evaluation of the Effectiveness of the Demand Side Resource Programs

The FERC ordered that PJM include an evaluation of the trial program for non-hourly metered customers. No evaluation is possible as there was no participation in that program in 2002. However, there has been substantial participation in 2003 and PJM will include an evaluation of the expanded trial program in its October 31, 2004 Report.

There was only limited activity in the Emergency Program in 2002. The experience in 2002 shows that only 76 MW of a total 341 registered MW responded when PJM called on Emergency Program participants on July 3, 2003. This is in contrast to the ALM Program where the actual MW response exceeded the MW registered in the program. PJM should attempt to evaluate the reasons that Emergency resources respond or do not respond to requests for load reductions.

Those registered in the Economic Program chose to participate on thirty days, although the maximum hourly reduction under the Economic Program was only 101 MW compared to the total 343 MW registered in the program. Again, PJM should attempt to evaluate the reasons for activity and lack of activity under the Economic Program. Clearly, part of the issue for Economic Program response in 2002 was that prices were lower in 2002 than in 2001 and that there were fewer high price hours in 2002 than in prior years. Targeted surveys and focus groups are essential to understanding program usage and therefore to improving program design.

PJM will evaluate the appropriateness of the current compensation levels in its annual report on the Load Response Programs to be filed after the summer of 2003 when two years of data under the program are available.

Table 1: Demand Side Response Statistics 2002

| Hourly Maximum | | | |
|---------------------------------|-----------------------|-----------------------|-------------|
| | Reduction (MW) | Date | Hour |
| Economic | 101 | 8/2/2002 | 15 |
| Emergency | 76 | 7/3/2002 | 17 |
| ALM | 1,775 | 7/3/2002 | 18 |
| Total | 1,833 | 7/3/2002 | 18 |
| Average Hourly Reduction | | | |
| | Reduction (MW) | | |
| Economic | 16 | | |
| Emergency | 39 | | |
| ALM | 282 | | |
| Total Resources | | | |
| | Resources (MW) | Sites | |
| Economic | 343 | 117 | |
| Emergency | 548 | 62 | |
| ALM | 1,292 | | |
| Total | 2,183 | | |
| Payments | | | |
| | Total Payments | Avg Payment/MW | |
| Economic | \$761,977 | \$118 | |
| Emergency | \$282,756 | \$514 | |
| Total | \$1,044,734 | \$149 | |

Table 2. Load Response Programs and ALM History

| | 1999 | 2000 | 2001 | 2002 |
|--|-------------|-------------|-------------|-------------|
| ALM Resources (MW) | 2,005 | 1,693 | 1,962 | 1,292 |
| Pilot Program Resources (MW) | NA | 80 | 220 | NA |
| Load Response Program (MW) | NA | NA | NA | 891 |
| Load Response MW also enrolled in ALM | NA | NA | 164 | 298 |

Table 3: Reduction Program Summary on Emergency Days

| Total Hourly Reductions (MW) | | | | | | | | | |
|-------------------------------------|---------------|-----------|-----------|----------------|-----------|----------|------------------|-----------|-----------|
| Hour | July 3 | | | July 29 | | | August 14 | | |
| | Economic | Emergency | Total | Economic | Emergency | Total | Economic | Emergency | Total |
| 1 | | | | 0 | | 0 | | | |
| 2 | | | | 0 | | 0 | | | |
| 3 | | | | 0 | | 0 | | | |
| 4 | | | | 0 | | 0 | | | |
| 5 | | | | 0 | | 0 | | | |
| 6 | | | | 0 | | 0 | | | |
| 7 | 0 | | 0 | 0 | | 0 | | | |
| 8 | 2 | | 2 | 0 | | 0 | | | |
| 9 | 4 | | 4 | 0 | | 0 | 0 | | 0 |
| 10 | 5 | | 5 | 17 | | 17 | 0 | | 0 |
| 11 | 20 | | 20 | 41 | | 41 | 1 | | 1 |
| 12 | 36 | 12 | 48 | 35 | | 35 | 25 | | 25 |
| 13 | 50 | 39 | 89 | 22 | | 22 | 35 | | 35 |
| 14 | 55 | 66 | 120 | 14 | | 14 | 43 | | 43 |
| 15 | 64 | 75 | 138 | 19 | | 19 | 61 | | 61 |
| 16 | 67 | 70 | 137 | 26 | 18 | 44 | 79 | 26 | 104 |
| 17 | 64 | 76 | 140 | 28 | 34 | 62 | 79 | 42 | 121 |
| 18 | 55 | 3 | 58 | 28 | 20 | 48 | 51 | 43 | 94 |
| 19 | 63 | | 63 | 72 | | 72 | 6 | 26 | 32 |
| 20 | 46 | | 46 | 38 | | 38 | 1 | | 1 |
| 21 | 20 | | 20 | 9 | | 9 | | | |
| 22 | 18 | | 18 | 1 | | 1 | | | |
| 23 | | | | 1 | | 1 | | | |
| 24 | | | | 1 | | 1 | | | |
| Maximum Reductions (MW) | | | | | | | | | |
| | 67 | 76 | 140 | 72 | 34 | 72 | 79 | 43 | 121 |
| Total Daily Reductions (MWh) | | | | | | | | | |
| | 568 | 341 | 909 | 353 | 72 | 425 | 381 | 137 | 518 |
| Total Payments (\$) | | | | | | | | | |
| | \$43,527 | \$176,580 | \$220,107 | \$61,031 | \$36,720 | \$97,751 | \$84,557 | \$69,456 | \$154,013 |
| Average Payment (\$/MWh) | | | | | | | | | |
| | \$77 | \$517 | \$242 | \$173 | \$508 | \$230 | \$222 | \$508 | \$297 |

Table 4: Total Hourly Reductions on Emergency Days

| Hour | July 3 | | | | July 29 | | | | August 14 | | | |
|-------------------------------------|----------|-----------|--------|--------|----------|-----------|-------|-------|-----------|-----------|-------|-------|
| | Economic | Emergency | ALM | Total | Economic | Emergency | ALM | Total | Economic | Emergency | ALM | Total |
| 1 | | | | | 0 | | | 0 | | | | |
| 2 | | | | | 0 | | | 0 | | | | |
| 3 | | | | | 0 | | | 0 | | | | |
| 4 | | | | | 0 | | | 0 | | | | |
| 5 | | | | | 0 | | | 0 | | | | |
| 6 | | | | | 0 | | | 0 | | | | |
| 7 | 0 | | | 0 | 0 | | | 0 | | | | |
| 8 | 2 | | | 2 | 0 | | | 0 | | | | |
| 9 | 4 | | | 4 | 0 | | | 0 | 0 | | | 0 |
| 10 | 5 | | | 5 | 17 | | | 17 | 0 | | | 0 |
| 11 | 20 | | 109 | 129 | 41 | | | 41 | 1 | | | 1 |
| 12 | 36 | 12 | 685 | 733 | 35 | | 70 | 105 | 25 | | 56 | 81 |
| 13 | 50 | 39 | 1,502 | 1,591 | 22 | | 512 | 535 | 35 | | 56 | 90 |
| 14 | 55 | 66 | 1,563 | 1,683 | 14 | | 1,024 | 1,038 | 43 | | 186 | 229 |
| 15 | 64 | 75 | 1,603 | 1,741 | 19 | | 1,350 | 1,368 | 61 | | 223 | 284 |
| 16 | 67 | 70 | 1,663 | 1,800 | 26 | 18 | 1,434 | 1,477 | 79 | 26 | 411 | 515 |
| 17 | 64 | 76 | 1,681 | 1,821 | 28 | 34 | 1,594 | 1,656 | 79 | 42 | 395 | 515 |
| 18 | 55 | 3 | 1,775 | 1,833 | 28 | 20 | 1,607 | 1,655 | 51 | 43 | 415 | 509 |
| 19 | 63 | | 168 | 231 | 72 | | 540 | 612 | 6 | 26 | 68 | 101 |
| 20 | 46 | | 55 | 101 | 38 | | 413 | 451 | 1 | | 6 | 7 |
| 21 | 20 | | | 20 | 9 | | | 9 | | | | |
| 22 | 18 | | | 18 | 1 | | | 1 | | | | |
| 23 | | | | | 1 | | | 1 | | | | |
| 24 | | | | | 1 | | | 1 | | | | |
| Maximum Reductions (MW) | | | | | | | | | | | | |
| | 67 | 76 | 1,775 | 1,833 | 72 | 34 | 1,607 | 1,656 | 79 | 43 | 415 | 515 |
| Average Reductions (MW) | | | | | | | | | | | | |
| | 35 | 49 | 1,080 | 732 | 15 | 24 | 949 | 374 | 32 | 34 | 202 | 194 |
| Total Daily Reductions (MWh) | | | | | | | | | | | | |
| | 568 | 341 | 10,803 | 11,712 | 353 | 72 | 8,543 | 8,968 | 381 | 137 | 1,815 | 2,333 |

Table 5: Program Comparisons

| Hourly Maximum Reductions (MW) | | | |
|---------------------------------------|-------------|-------------|-----------------|
| | 2001 | 2002 | % change |
| Economic | 6 | 101 | 1529.0% |
| Emergency | 62 | 76 | 23.2% |
| DSR Total | 62 | 323 | 418.1% |
| ALM | 1,796 | 1,775 | -1.2% |

| Total Load Reductions (MWh) | | | |
|------------------------------------|-------------|-------------|-----------------|
| | 2001 | 2002 | % change |
| Economic | 50 | 6,462 | 12954.7% |
| Emergency | 393 | 551 | 40.1% |
| Total | 442 | 7,013 | 1485.1% |

| Total Payments | | | |
|-----------------------|-------------|-------------|-----------------|
| | 2001 | 2002 | % change |
| Economic | \$13,994 | \$761,977 | 5345.0% |
| Emergency | \$287,514 | \$282,756 | -1.7% |
| DSR | \$301,508 | \$1,044,734 | 246.5% |

| Average Payment (\$/MWh) | | | |
|---------------------------------|-------------|-------------|-----------------|
| | 2001 | 2002 | % change |
| Economic | \$283 | \$118 | -58.3% |
| Emergency | \$732 | \$514 | -29.8% |
| DSR | \$682 | \$149 | -78.1% |

| Table 6: Total Reductions All Programs | | | | |
|---|--------------|---------------|---------------|----------------|
| 2002 Emergency Days | | | | |
| Hour | 3-Jul | 29-Jul | 14-Aug | |
| | Total | Total | Total | Average |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 2 | 0 | 0 | 1 |
| 9 | 4 | 0 | 0 | 1 |
| 10 | 5 | 17 | 0 | 7 |
| 11 | 129 | 41 | 1 | 57 |
| 12 | 733 | 105 | 81 | 306 |
| 13 | 1,591 | 535 | 90 | 739 |
| 14 | 1,683 | 1,038 | 229 | 983 |
| 15 | 1,741 | 1,368 | 284 | 1,131 |
| 16 | 1,800 | 1,477 | 515 | 1,264 |
| 17 | 1,821 | 1,656 | 515 | 1,331 |
| 18 | 1,833 | 1,655 | 509 | 1,333 |
| 19 | 231 | 612 | 101 | 314 |
| 20 | 101 | 451 | 7 | 187 |
| 21 | 20 | 9 | 0 | 9 |
| 22 | 18 | 1 | 0 | 6 |
| 23 | 0 | 1 | 0 | 0 |
| 24 | 0 | 1 | 0 | 0 |
| Maximum Reductions (MW) | | | | |
| | 1,833 | 1,656 | 515 | 1,333 |

| Table 7a: Daily Economic Reductions | | | |
|--|------------------------|-----------------|--------------|
| Day | Reductions (MW) | Payments | \$/MW |
| 6/24/02 | 8 | \$721 | \$89 |
| 6/25/02 | 39 | \$2,930 | \$75 |
| 6/26/02 | 92 | \$11,383 | \$123 |
| 6/27/02 | 242 | \$23,318 | \$96 |
| 7/1/02 | 100 | \$8,316 | \$83 |
| 7/2/02 | 445 | \$40,686 | \$91 |
| 7/3/02 | 568 | \$43,527 | \$77 |
| 7/4/02 | 0 | \$37 | \$76 |
| 7/5/02 | 1 | \$6 | \$11 |
| 7/9/02 | 9 | \$437 | \$51 |
| 7/17/02 | 52 | \$2,590 | \$50 |
| 7/18/02 | 212 | \$11,514 | \$54 |
| 7/19/02 | 220 | \$12,866 | \$58 |
| 7/22/02 | 252 | \$25,769 | \$102 |
| 7/23/02 | 935 | \$146,818 | \$157 |
| 7/29/02 | 353 | \$61,031 | \$173 |
| 7/30/02 | 627 | \$23,945 | \$38 |
| 7/31/02 | 244 | \$27,066 | \$111 |
| 8/1/02 | 278 | \$28,431 | \$102 |
| 8/2/02 | 746 | \$101,901 | \$137 |
| 8/5/02 | 62 | \$4,798 | \$77 |
| 8/12/02 | 21 | \$1,859 | \$88 |
| 8/13/02 | 374 | \$70,274 | \$188 |
| 8/14/02 | 381 | \$84,557 | \$222 |
| 8/15/02 | 120 | \$16,870 | \$140 |
| 8/16/02 | 9 | \$782 | \$92 |
| 8/19/02 | 43 | \$8,151 | \$190 |
| 8/22/02 | 3 | \$96 | \$31 |
| 9/4/02 | 9 | \$423 | \$49 |
| 9/16/02 | 15 | \$876 | \$57 |
| Average | 215 | \$25,399 | \$118 |
| Maximum | 935 | \$146,818 | \$222 |
| Total | 6,462 | \$761,977 | |

| Table 7b: Maximum Hourly Economic Reductions | | | |
|---|------------------------|-----------------|--------------|
| Day | Reductions (MW) | Payments | \$/MW |
| 6/24/02 | 3 | \$341 | \$107 |
| 6/25/02 | 14 | \$1,222 | \$86 |
| 6/26/02 | 25 | \$2,800 | \$113 |
| 6/27/02 | 47 | \$5,568 | \$118 |
| 7/1/02 | 26 | \$2,172 | \$85 |
| 7/2/02 | 90 | \$12,258 | \$136 |
| 7/3/02 | 67 | \$7,780 | \$116 |
| 7/4/02 | 0 | \$7 | \$88 |
| 7/5/02 | 0 | \$2 | \$18 |
| 7/9/02 | 2 | \$195 | \$95 |
| 7/17/02 | 12 | \$884 | \$73 |
| 7/18/02 | 54 | \$4,086 | \$76 |
| 7/19/02 | 50 | \$5,295 | \$107 |
| 7/22/02 | 50 | \$6,975 | \$139 |
| 7/23/02 | 96 | \$64,434 | \$675 |
| 7/29/02 | 72 | \$19,450 | \$271 |
| 7/30/02 | 80 | \$5,527 | \$69 |
| 7/31/02 | 49 | \$6,207 | \$126 |
| 8/1/02 | 60 | \$7,489 | \$126 |
| 8/2/02 | 101 | \$22,079 | \$219 |
| 8/5/02 | 13 | \$1,801 | \$134 |
| 8/12/02 | 5 | \$630 | \$137 |
| 8/13/02 | 87 | \$23,910 | \$276 |
| 8/14/02 | 79 | \$28,866 | \$364 |
| 8/15/02 | 32 | \$5,350 | \$165 |
| 8/16/02 | 2 | \$256 | \$127 |
| 8/19/02 | 26 | \$5,858 | \$225 |
| 8/22/02 | 0 | \$44 | \$124 |
| 9/4/02 | 2 | \$174 | \$88 |
| 9/16/02 | 2 | \$243 | \$98 |
| Average | 38 | \$8,063 | \$211 |
| Maximum | 101 | \$64,434 | \$675 |

| Table 8a: Daily ALM Reductions | |
|---------------------------------------|------------------------|
| Date | Reductions (MW) |
| 6/5/2002 | 51 |
| 6/6/2002 | 863 |
| 6/24/2002 | 322 |
| 6/25/2002 | 1,434 |
| 6/26/2002 | 4,138 |
| 6/27/2002 | 1,141 |
| 7/1/2002 | 218 |
| 7/2/2002 | 919 |
| 7/3/2002 | 10,881 |
| 7/9/2002 | 759 |
| 7/17/2002 | 1,200 |
| 7/18/2002 | 839 |
| 7/19/2002 | 878 |
| 7/22/2002 | 2,053 |
| 7/23/2002 | 2,151 |
| 7/29/2002 | 8,543 |
| 7/30/2002 | 8,835 |
| 7/31/2002 | 443 |
| 8/1/2002 | 2,621 |
| 8/2/2002 | 1,151 |
| 8/3/2002 | 439 |
| 8/4/2002 | 724 |
| 8/5/2002 | 308 |
| 8/12/2002 | 442 |
| 8/13/2002 | 3,499 |
| 8/14/2002 | 1,815 |
| 8/15/2002 | 869 |
| 8/16/2002 | 404 |
| 8/18/2002 | 753 |
| 8/19/2002 | 1,083 |
| 8/22/2002 | 491 |
| Average | 1,944 |
| Maximum | 10,881 |
| Total | 60,264 |

| Table 8b: Maximum Hourly ALM Reductions | |
|--|------------------------|
| Date | Reductions (MW) |
| 6/5/2002 | 14 |
| 6/6/2002 | 178 |
| 6/24/2002 | 86 |
| 6/25/2002 | 336 |
| 6/26/2002 | 663 |
| 6/27/2002 | 244 |
| 7/1/2002 | 56 |
| 7/2/2002 | 228 |
| 7/3/2002 | 1,775 |
| 7/9/2002 | 225 |
| 7/17/2002 | 331 |
| 7/18/2002 | 169 |
| 7/19/2002 | 297 |
| 7/22/2002 | 370 |
| 7/23/2002 | 421 |
| 7/29/2002 | 1,607 |
| 7/30/2002 | 1,304 |
| 7/31/2002 | 113 |
| 8/1/2002 | 368 |
| 8/2/2002 | 242 |
| 8/3/2002 | 159 |
| 8/4/2002 | 206 |
| 8/5/2002 | 66 |
| 8/12/2002 | 219 |
| 8/13/2002 | 647 |
| 8/14/2002 | 415 |
| 8/15/2002 | 207 |
| 8/16/2002 | 57 |
| 8/18/2002 | 131 |
| 8/19/2002 | 267 |
| 8/22/2002 | 57 |
| Average | 370 |
| Maximum | 1,775 |