Market Monitoring Unit

REPORT
TO
THE FEDERAL ENERGY REGULATORY COMMISSION

Docket No. ER02-1326-006

ASSESSMENT OF PJM LOAD RESPONSE PROGRAMS

PJM Market Monitoring Unit

August 29, 2006

This is the annual report on the status of Demand Side Response program submitted by the PJM Market Monitoring Unit (MMU) consistent with the Demand Side Response (DSR) business rules.[1]

The Emergency Program

Data on Emergency Program

The number of registered sites and associated MW in the Emergency Program for the past four years is shown in Table 1.[2,3] As of December 31, 2005, there were 1,451 MW of resources registered in the Emergency Program. This is a 4 percent increase from 1,395 MW at the end of 2004.[4,5]

Table 2 presents the zonal distribution of DSR capability in the Emergency Program as of December 31, 2005.[6] One zone, ComEd, includes 95 percent of all available sites and 59 percent of all available MW in the Emergency Program. In addition, 95 percent of sites and 67 percent of MW of Emergency Program capabilities are located in the Western Region of PJM.[7]

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1 "PJM Load Response Programs- Business Rules (Version 5, Revised 3.15.2006) <http://www.pjm.com/services/demand-response/downloads/documentation/load-resp-business-rule.pdf> (86 KB). "PJM will prepare an annual status report of the program. PJM will submit annual status report to the PJM Board of Managers, the Members Committee, the Reliability Committee, the Energy Market Committee, and the Operating Committee for review. PJM will file two reports evaluating the effectiveness of the program, one on May 31, 2003 and one on October 31, 2004."

2 All annual data in this report are based on 12-month 2005 calendar period. DSR data in the 2005 State of the Market Report were based on the 11-month period ended November 30, 2005 which was all the data available from PJM at that time. In the 2005 State of the Market Report, the number of currently registered sites enrolled in 2005 is 120, but should be 12.

3 In Table 1 and Table 4 the Registered by Year Enrolled column shows the number of sites that registered in each year. The Cumulative Total per Year Enrolled shows the number of sites that remained active at the end of the year. For example, 64 sites registered in 2002 and 103 in 2003 and at the end of 2003 only 160 sites remained active out of the 167 sites registered during 2002 and 2003. In the 2005 State of the Market Report, Tables 2-10 and Tables 2-13, the columns Currently Active by Year Enrolled show sites that were still active at the end of 2005 from the year enrolled.

4 The numbers of registered sites and the associated MW for Emergency and Economic programs are not available from PJM for 2001.

5 This report provides the number of registered participants in the Emergency and Economic Programs in 2005. Program rules have not required Curtailment Service Providers to re-register load sites on an annual basis. Thus cumulative totals have increased significantly and there have been few terminations of registrations.

6 In Table 2, Table 5 and Table 7 pricing zones include a UGI zone consistent with the practice of the PJM DSR department.

7 The Western Region includes the AEP, AP, ComEd, DAY and DLCO control zones. The Southern Region includes the Dominion control zone. All other PJM control zones are part of the Mid-Atlantic Region.

Results of the Emergency Program:

During the summer of 2005, activity under the Emergency Program occurred on five days: July 25, August 3, August 4, August 5 and August 14. All of this activity was associated with one participant; only one end-use site was dispatched by PJM.[8] The maximum hourly reduction was 205 MW. Activity occurred during hours when real-time LMPs were between $68 per MW and $206 per MW. There were Emergency Program reductions in 23 unique hours in 2005 and each such hour occurred between the hours ending 1500 EPT and 1900 EPT.[9]

The total MWh of load reductions and the associated payments under the Emergency Program are shown in Table 3.[10] Load reduction levels decreased in 2003 by 91 percent from 551 MWh in 2002.[11] There was no activity in the program during 2004 due to the mild weather conditions and associated prices. At 3,662 MWh, 2005 had the largest load reductions since the program began. In calendar year 2005, payments under the program were $508 per MWh. There were 3 MWh of actual load reduction per MW registered in the Emergency Program for 2005.

The Economic Program

Data on Economic Program

Table 4 shows the number of registered sites and corresponding MW in the Economic Program for the past four years. In 2005, there were a total of 2,280 MW registered in the Economic Program, an increase of 23 percent from the 1,847 MW registered in 2004.

Table 5 shows the zonal distribution of DSR capability in the Economic Program as of December 31, 2005. One zone, ComEd, includes 84 percent of total sites and 47 percent of total MW in the Economic Program. In addition, 85 percent of the sites and 64 percent of the MW in the Economic Program are located in the Western Region of PJM.

Results of the Economic Program:

Table 6 shows the actual load reductions and associated payments under the Economic Program from 2002 to 2005.[12] The level of load reductions increased from 58,352 MWh in 2004 to 142,498 MWh in 2005. Payments per MWh increased 175 percent from 2004

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8 Other sites were available but only one site was dispatched by PJM.

9 A unique hour is an hour with any load reductions, including load reductions of multiple participants in the same hour.

10 In Table 3 and Table 6, the MMU includes only data that have been confirmed by PJM.

11 Load reductions are measured by multiplying hourly MW reductions by their duration (expressed in number of hours). Thus a 1 MW reduction for one hour is 1 MWh. A 1 MW reduction in one hour and a 3 MW reduction in a second hour equal 4 MWh.

12 Performance of the Economic Program as reported in the 2005 State of the Market Report is different in this report because this report covers the whole year rather than the first 11 months. The performance of the Economic Program in 2005 reported here may change slightly in the next report as additional adjustments in the PJM settlements process may be made. Performance of the Economic Program reported in the October 31, 2004 report is different from the Economic Program performance in this report as a result of PJM data quality issues. Data for both reports were provided by PJM.

to 2005. The Economic Program's actual MWh of load reduction per registered cumulative total MW increased to 62 in 2005.[13]

In calendar year 2005, the Economic Program showed significant differences in activity among the PJM control zones. For example, 62 percent of MWh reductions, 40 percent of payments and 27 percent of curtailed hours under the real-time rate option occurred within a single zone, AP, while one pricing zone, UGI, saw no activity in any DSR program. (See Table 7.) The total number of hours of load reduction for the Economic Program was 18,232 participant hours and 4,148 unique hours. The total Economic Program payment amount was $14,268,961 of Settled credits or $12,856,474 of CSP credits.

Overall, 71 percent of the MWh reductions, 57 percent of the payments and 82 percent of the curtailed hours resulted from customers using the real-time option under the Economic Program. End-users that choose the real-time option of the Economic Program reduce the load they draw from the PJM system. Participants that choose this option are responsible for determining the conditions under which load reductions will actually take place and implementing the reductions under those conditions.

The dispatched-in-real-time option of the program resulted in 0.4 percent of the MWh reductions, 1 percent of the payments and 1 percent of the curtailed hours (Table 7). The real-time Economic Program allows end-users to submit a "strike" price at which a load reduction may be dispatchable in real time operations by PJM. In case where the load response is dispatched by PJM payment will not be less than the total value of the load response offer, including any submitted shutdown cost.

The day-ahead option resulted in approximately 29 percent of the MWh reductions, 42 percent of payments and 17 percent of curtailed hours. The day-ahead option of the Economic Program allows end-users to submit an offer in the day-ahead market to reduce the load they draw from the PJM system. End-users with real-time LMP-based contracts are not permitted to participate in the day-ahead option.[14]

Figure 1 shows that activity under the Economic Program when LMP was less than $75 was dispersed over all hours of the day with maximum activity spread fairly evenly over hours ended 0700 EPT through 2400 EPT.

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[13] In prior reports, the MMU has reported only Settled Credits because PJM has indicated that there was no difference between Settled and CSP credits. In this report, the MMU reports on CSP credits, for which data are available beginning in June 2005. CSP Credits are credits paid to curtailment service providers net of charges for noncompliance in Real-Time with the cleared Day-Ahead bid. The Settled Credit represents the sum of all credits prior to netting such charges. Thus, the CSP Credits are the final, accurate level of net credits paid.

[14] These are LMP-based contracts under which end users have agreed to pay their LSE for the delivery of energy according to the hourly value of LMP.

Figure 2 shows that activity under the Economic Program when LMP was greater than or equal to $75 with activity more narrowly concentrated in hours ended 1100 EPT to 2100 EPT with maximum activity concentrated in hours ended 1400 EPT and 1800 EPT.

Figure 3 shows the frequency distribution of Economic Program hourly reductions by real-time zonal LMP. Activity under the Economic Program occurred primarily when LMP was between $30 and $150 per MWh. A majority, 70 percent, of all hours in which reductions took place had an LMP greater than or equal to $75 per MWh.

There were 27 total end users that registered as LMP based customers, of which 1 also was registered as an ALM customer.

Analysis of Economic Program: Detailed Structure of Incentives

The goal of the incentives associated with PJM's Economic Program should be to replicate the price signal to load that would exist if load were exposed to the real-time wholesale price. The real-time hourly LMP is the appropriate price signal as it reflects the incremental value of each MWh consumed.[15] The hourly LMP would replace only the generation component of retail rates in order to provide the appropriate wholesale market price signal to load. The PJM Economic Program is a wholesale program and its goal should be to ensure that the appropriate wholesale price signal is provided to load but should not be to address retail rate issues. The design of retail incentives is a matter for state public utility commissions.

Incentives associated with the Economic Program are based upon the actual load reduction provided in excess of committed day-ahead load reductions plus the adjustment for losses. The actual payment depends on the level of zonal LMP.[16] If zonal LMP exceeds $75 per MWh, customers are paid the full LMP. If zonal LMP is less than $75 per MWh, customers are paid the LMP less the generation and transmission components of the applicable retail rate. The rationale for this difference, when implemented, was apparently based on an assessment of the total changes in load payments and LSE revenue losses associated with customer load reductions, including the impact of non-related components of retail rates.

LSEs pay load-reducing customers LMP less the generation and transmission components of the retail rate. When LMP is greater than or equal to $75 per MWh, customers are paid the full LMP and the amount not paid by the LSE, equal to the generation and transmission components of the applicable retail rate, is charged to all the LSEs in the zone of the load reduction (called "recoverable charges"). If the total amount of recoverable charges reflecting the generation and transmission payments 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 for the remainder of the year, regardless of the level of LMP. This threshold has not been approached in any year to

15 This does not mean that every retail customer should literally be required to pay the real-time LMP. However, it would provide the appropriate price signal if every retail customer were obligated to pay the real-time LMP as a default. That risk could be hedged via a contract with an LSE.

16 Relevant aggregate LMPs may also be used in some cases.

date. In 2005, the total charges reflecting the generation and transmission charges for the Economic Program were $7,975,012.

In the absence of an Economic Program, for an individual customer on a standard fixed retail rate, the savings that result from a load reduction equal the applicable retail rate. If the customer pays a total retail rate of $150 per MWh, the customer saves exactly $150 when consumption is reduced by 1 MWh. Standard retail rates include payments for generation, transmission and distribution. If the customer paid the LMP for each MWh used, rather than the generation component of retail rates, the savings to the customer, including both wholesale and retail components, would equal the LMP plus the transmission and distribution component of retail rates for a 1 MWh reduction. From a wholesale market perspective, the savings to the customer would equal the LMP. This is the appropriate price signal and this is the price signal that the Economic Program should be designed to replicate.

The situation is somewhat different, from a wholesale market perspective, if the LSE pays the LMP to purchase the energy required to serve the customer at a fixed retail rate. In this case, the savings to the LSE from a reduction of 1 MWh by the customer equal the difference between the avoided cost to the LSE, or the LMP, and the generation component of the retail rate. Thus, if the LSE pays the LMP to purchase energy to serve the customer, the wholesale-related savings received by the customer, paying a fixed retail rate, will be less than the amount saved by the LSE when the LMP is greater than the generation component of the retail rate.[17] In the absence of the Economic Program, the difference between the savings to the LSE and the savings to the customer equal the difference between the LMP and the generation component of retail rates.

The design of the Economic Program reflects a compromise between the benefits that would be received by a customer paying LMP plus a fixed retail rate covering transmission and distribution charges and the benefits received by an LSE serving a retail customer under a fixed retail rate covering generation, transmission and distribution. That compromise reflects the non-wholesale market related revenue losses by an LSE and the non-wholesale market related savings when a customer curtails. Optimally, the program design would reflect only the wholesale market incentives. When the LMP is less than $75 per MWh, customers that reduce load under the Economic Program receive a payment from the program equal to the LMP less the generation and transmission components of the retail rate. This design reflects a recognition of non-generation related savings related to retail rates that the customer achieves by reducing consumption and avoiding paying the retail rate. For a customer paying a fixed retail rate, when the LMP is less than $75 per MWh, the total benefit (payments and savings) under the program associated with reducing load equals the LMP plus the distribution component of retail

[17] The incentives and underlying resource savings are the same regardless of whether the LSE purchases power to serve load at hourly LMP or under a fixed price contract with a generator. In this case, the generator would incur the incremental cost equal to the LMP less the fixed rate charged to the LSE whenever the real time LMP exceeds that fixed rate.

rates. The calculation of total benefits reflects the fact that the customer avoids paying the generation, transmission and distribution components of the retail rate.[18]

When the LMP is greater than $75 per MWh, customers that reduce load under the Economic Program receive a payment from the program equal to the LMP. This is in addition to the direct savings that the customer achieves by reducing consumption and avoiding payment of the generation component of the retail rate plus the other components of the retail rate. Thus, when the LMP is greater than $75 per MWh, for a customer paying a fixed retail rate, the actual wholesale related benefits associated with reducing load equal the LMP plus the generation component of the retail rate. This is the case because the customer receives a payment under the Economic Program equal to the LMP and the customer also avoids paying the generation component of the retail rate. Total benefits, including retail rate savings, also include the avoided transmission and distribution related components of retail rates.

The optimal payment under the Economic Program whether LMP is above or below the $75 per MWh threshold would be the LMP less the generation component of retail rates, because the generation component of retail rates is a substitute for the LMP. If a customer is paying $40 per MWh for energy (generation component) in retail rates but by reducing load eliminates the need to purchase a MWh at $900 per MWh, the benefit is $900 per MWh. The customer receives $40 per MWh of that benefit by not paying the generation component of the retail rate and should receive the balance, $860 in this example, from the LSE payment.

The result of the payment structure in the Economic Program is that the LSE serving the curtailing load pays that load the LMP less the generation and transmission component of retail rates. The LSEs in the zone where the curtailing load resides pay the generation and transmission component of rates to the curtailing load when the LMP is greater than $75 per MWh. The result, when LMP is greater than $75 per MWH, is that load receives payments from both sources under the Economic Program and the total payment equals the LMP. Given that the optimal payment to curtailing loads would be the LMP, adjusted only for the generation component of retail rates, the payments by zonal LSEs represent a subsidy to curtailing loads to the extent that they cover the generation component of retail rates, but do not represent a subsidy to the extent that they cover the transmission component of retail rates. This assumes that the transmission and generation components of retail rates can be unbundled, which is a reasonable assumption.

As an example, assume that the LMP is $100 per MWh and the generation component of retail rates is $25 per MWh. A customer that reduces consumption by 1 MWh would pay $25 less if only the generation component of retail rates were avoided. If the full LMP value of the energy were avoided, the customer would avoid $100 per MWh. It is double counting the generation component of rates to reduce the customer’s bill by the LMP plus the generation component of retail rates. The current program pays the customer the $100 LMP and the customer avoids the $25 retail generation component for a total savings of

[18] It is frequently the case that a Curtailment Service Provider is the intermediary between the customer and the LSE.

$125. This represents a subsidy in the amount of the $25 generation component of retail rates. (The example excludes consideration of the transmission component of retail rates which should not be included in the optimal program design as they are a component of retail rates.)

The goal of the Economic Program incentives is to ensure that customers on retail rates with an embedded generation component that is not linked to the market LMP see the appropriate price signal. The Economic Program provides an accounting mechanism, managed by PJM, that requires the payment of the real savings that result from load reductions, or a share of them under a contract, to the load reducing customer. Such a mechanism is required because of the complex interaction between the wholesale market and the incentive and regulatory structures faced by LSEs and customers. The broader goal of the Economic Program is to transition to a structure where customers do not require mandated payments but where customers see and react to real-time wholesale market signals or enter into contracts with intermediaries to provide that service. The optimal design would be related solely to wholesale market incentives and would not distinguish between load reductions above or below $75 per MWh. Even as currently structured, the Economic Program represents a minimal and relatively efficient intervention into the markets.

Costs and Benefits of Economic Program

The quantifiable costs of the Economic Program include the direct administrative costs of operating the programs for PJM and LSEs as well as the cost of subsidies paid to market participants. The directly quantifiable benefits are based on the price impact of the load reductions that result from the Economic Program. Note that the costs and benefits are calculated from the perspective of the wholesale market. No attempt is made to assess the costs or benefits of individual participants.

The direct administrative costs of the Economic Program are difficult to calculate precisely but are estimated to be approximately $70,000 per year. When divided by the total 142,498 MWh of load reductions that resulted from the programs in 2005, the cost is about $0.50 per MWh of load reductions. The administrative cost was about $1/MWh of load reductions for 2004, 2003 and 2002.[19]

The costs of the Economic Program associated with payments by LSEs are the payments for the generation component of retail rates. The data show that of the $12,856,474 total payments to loads by LSEs under the Economic Program in 2005, $4,881,462 were payments made by the LSEs directly serving load and $7,975,012 were payments made by zonal LSEs and recoverable from zonal load.[20] The $4,881,462 represents payments

[19] Administrative costs provided by PJM.

[20] If zonal LMP is less than $75 per MWh, PJM recovers an amount equal to LMP less an amount equal to applicable generation and transmission charges from the LSE that otherwise would serve the load that was reduced. If LMP is greater or equal to $75 per MWh, PJM recovers an amount equal to applicable generation and transmission charges from all LSEs in the zone of the load reduction. PJM recovers the remaining amount, LMP less an amount equal to the generation and transmission changes, from the LSE that otherwise would serve the load that was reduced.

based on LMP less the generation and transmission components of retail rates. The $7,975,012 represents payments for both the generation and transmission components of retail rates. Under the assumption that these are approximately equal, the cost of the program is $3,987,506. When divided by the total 142,498 MWh of load reductions that resulted from the programs in 2005, the cost is about $28 per MWh of load reductions. In 2004, the cost per MWh of load reductions was $4 per MWh. In 2003, the cost per MWh of load reductions was about $6 per MWh of load reductions and was about $13 per MWh of load reductions in 2002.

The payments of the LMP savings transferred by the LSEs to the Curtailment Service Providers (CSPs) provide a direct benefit to curtailing customers although the exact payments to the customers depend on an allocation defined by a contract between the CSPs and their customers. In addition, curtailing customers save in the amount of the retail rates that they do not pay as a result of curtailing. As noted above, these customer-specific benefits are not the focus of this analysis, but serve to offset any customer-specific costs and provide an incentive for participation.

The maximum hourly load reduction attributable to the Economic Program was about 226 MWh in 2005. Using actual demand reductions and real-time supply curves, the maximum price impact of the Economic Program was approximately $1 in 2005. Maximum hourly load reductions for the last three years are shown in Table 8.[21]

The reduction in market clearing price affects the entire energy market. Thus the dollar value of the benefit is the change in market price multiplied by total load at the time. Thus, in 2005, even using an average $.50 per MWh of overall price reduction multiplied by the average hourly load during the load reductions of 87,811 MW equals $43,906 per hour, or about $182,122,088 for the 4,148 hours of load reductions.[22] Even if adjusted for the share of the spot market in total activity (about 40 percent) the market price benefits are about $72,848,835, still much larger than the direct costs of the program.

Based on the real-time supply curves for a representative day during the summer of 2005 and the summer peak load, a reduction of 1,000 MW would have resulted in a $4 reduction in LMP. This is demonstrated by the aggregate supply curve for the summer of 2005. (See Figure 4.)

In summary, direct administrative costs for the PJM Economic Program were about $0.50 per MWh of actual load reductions in 2005. It was about $1 per MWh in 2004, 2003, and 2002. The subsidy costs were about $13 per MWh of load reductions in 2002, about $6 per MWh of load reductions in 2003, about $4 per MWh of load reductions in 2004 and $28 per MWh in 2005. Thus, total program costs were approximately $14 per MWh, in

[21] The maximum hourly reductions for 2003 and 2004 are not equal to those reported in the State of the Market Reports for 2003 and 2004. The data in this report are based on the twelve month calendar year while the State of the Market Reports were based on data for the nine months of data available at the time of preparation.

[22] 4,148 is the number of unique hours of reductions in the Economic Program.

2002, about $7 per MWh in 2003, about $5 per MWh in 2004 and about $29 per MWh of load reductions in 2005. The benefits of the Economic Program when measured as the impact on overall market prices were much larger than the costs. These benefits are a direct function of prevailing market price levels and will thus increase if prices rise compared to 2005 levels or decrease if prices decrease compared to 2005 levels. The evaluation of the benefits associated with overall market price reductions must consider that these benefits do not necessarily represent an increase in market efficiency but represent a transfer from generation to load, in the short term. Whether this results in a lower overall market cost in the long run remains to be seen. Regardless, the potential benefits of increasing demand side responsiveness in improved efficiency of the market are large and certainly exceed the relatively small program costs by a wide margin. These benefit calculations do not include any calculation of reliability benefits of the demand side programs. It was not necessary to make such a calculation to demonstrate that there are substantial net benefits to the Economic Program.

Economic Program and the Demand Side of Markets: Strategy for the Future

On December 28, 2005 PJM filed amendments to the Operating Agreement and the PJM Tariff modifying the Economic Program and Emergency Program and facilitating the provision of ancillary services by demand side resources.[23] In the amendments PJM proposed to make Economic Demand Side Response a permanent feature of the PJM Energy Market. PJM also proposed rules which would permit demand side resources to provide synchronized reserve and regulation services in the PJM region. PJM also proposed revisions to the Emergency Program under which there would be two levels of the participation, a Full Program Option and an Energy Only Option. Participants with the Full Program Option would receive capacity and energy payments for load reductions in an emergency. The Full Program Option would incorporate the PJM ALM program into the Emergency Program and allow participation by both LSEs and CSPs. The Energy Only Option would permit entities to participate in the Emergency Program without receiving capacity credits and pay no penalty for nonperformance. In February of 2006 these amendments were approved by FERC.[24] The enhancements would also require demand side resources registered in the Emergency Load Response Program to provide a Minimum Dispatch Price. During emergencies PJM would dispatch demand resources (not already dispatched as Economic Load Response) based on the Minimum Dispatch Price. The Minimum Dispatch Price of a Full Program Option demand resource that reduces load may set the real time Locational Marginal Price (LMP) provided that the load reduction is needed to meet demand. The Minimum Dispatch Price of an Energy Only Option demand resource that reduces load may set the real time LMP provided that the load reduction is needed to meet demand and the demand resource satisfies PJM's telemetry requirements.

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[23] Docket No. ER06-406-000. Revisions of both programs were supported by PJM stakeholders. On September 29, 2005, the PJM Member's Committee voted in favor of these amendments to the Emergency Program. On November 17, 2005 the same committee endorsed proposed changes to the Economic Program.

[24] MMU will report in detail on the changes in its assessment of 2006 Load Response Programs.

Demand side resources are an essential part of the interface between wholesale and retail markets. Integrating and developing the demand side of wholesale power markets must rely to a significant extent on cooperation and coordination among the Commission, RTOs and state public utility commissions. In order for demand side resources to fully participate in the energy markets, the widespread installation of meters that permit the monitoring of real-time usage is essential. That is unlikely to occur without the referenced cooperation and coordination. The role of state public utility commissions is critical. The appropriate role for competition in the provision of meters and metering services must be considered and resultant changes implemented.

While PJM is engaged in the effort to fully integrate demand response into its markets, PJM should continue its efforts to educate market participants about current programs and opportunities. The current programs are an essential part of the transition strategy and together with efforts to integrate demand side resources into all PJM markets and to remove institutional barriers to demand side resources, constitute a portfolio approach to developing the demand side of the power markets. PJM should also consider appropriate modifications to the existing programs to ensure that they are providing price signals consistent with efficient outcomes as described above.

Active Load Management (ALM):
Active Load Management is the ability to reduce metered load after a request from the ALM provider which holds the ALM rights, or its agent. In return for turning over dispatch of its ALM to the ALM provider, typically an LSE, the customer generally receives a discounted retail rate and the ALM provider receives a reduction to its PJM capacity obligation. There are three types of ALM: direct load control, firm service level and guaranteed load drop. The direct load control occurs when load management is initiated directly by the ALM provider's market operations center or its agent, employing a communication signal to cycle equipment (typically water heaters or central air conditioners). Firm service level requires a customer to reduce its load to a pre-determined level, upon notification from the ALM provider's market operations. Guaranteed Load Drop requires a customer to reduce its load by a pre-determined amount upon notification from the ALM provider's market operations center. The load reduction may be achieved through running customer-owned backup generators or by directly reducing energy consumption.[25]

Overall there were 79 customers in the Economic and Emergency programs that selected the ALM option in 2005. PJM initiated ALM events twice in the summer 2005. On July 27, ALM was invoked in the Mid-Atlantic Region and the Dominion Control Zone. On August 4, ALM was invoked in the Mid-Atlantic Region only. Table 9 shows historically available capability of ALM and ALM MW that were also included in the Load Response Program. In addition, Table 9 shows the amount of total ALM MWh reductions during the ALM events. The maximum ALM reduction in 2005 was 818 MW. From 2004 to 2005, the amount of available ALM MW increased by 13 percent. Table 10 shows the ALM load drop during the 5 CP (Coincident Peak) for the last four years.

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[25] Detailed information on ALM can be founded in "PJM Manual 19: Load Data Systems".

Costs and Benefits of Economic Program: Survey Results

In evaluating the level of DSR activity, it is important to include not just the activity that occurs in direct response to PJM programs, but also other types of DSR activity. Both state public utility commission policies on retail competition and the programs of individual LSEs have had a significant impact on DSR activity. It has been difficult to acquire meaningful data on these programs. To address this issue, PJM conducted surveys of LSEs in June 2003, June 2004 and June 2005 to obtain information about price-responsive tariffs as well as load-response programs offered at the retail level by either electric distribution companies or competitive electric suppliers. Table 11 shows results from the 2005 survey.

The June 2005 PJM survey revealed that 3,653 MW of load in the PJM footprint is exposed to a price signal that is a direct or indirect function of real-time prices, because of actions by state public utility commissions.

The survey results identified 1,216 MW of load that is exposed to real-time prices and an additional 2,437 MW of load that is partially exposed to real-time prices either directly or through an intermediary competitive supplier.[26] The prices paid by these retail customers are based on tariffs approved by state public utility commissions in New Jersey and Maryland or on supply contracts entered into with competitive LSEs. A total of 2,012 MW or 55 percent, take retail electric service under a rate that changes regularly to reflect current market prices. These prices change less frequently than hourly and more frequently than monthly. A total of 1,216 MW of load purchase electricity at a tariff rate tied directly to the hourly LMP. This load has chosen to pay LMP rates directly rather than to enter into a contract with a competitive supplier. The remaining 425 MW pay prices determined by other contract provisions that link at least incremental usage decisions to hourly LMP prices.

The survey also identified a total of 907 MW enrolled in the programs administered by LSEs in the PJM territory. These programs provide incentives to reduce load during periods of high prices or system emergencies by means other than direct exposure to real-time LMP. Of the total, 289 MW or 32 percent were in direct load control programs under distribution LSEs that were not offered to PJM as ALM capability. Twenty-five percent or 224 MW are curtailable load. Twenty-three percent or 212 MW of load have a state approved regulated rate that provides incentives to curtail in response to market signals. Nineteen percent of the total was load that participated in the interruptible load programs of distribution LSEs and 2 percent was load subject to a distribution LSE's demand-response program and not offered to PJM as ALM capability.

The June 2005 PJM survey revealed that significant DSR activity has resulted from actions of state public utility commissions as they have implemented policies governing retail competition. The primary result has been that more load is exposed, at least partially, to real-time prices, either directly or via competitive supplier intermediaries. This is a critical prerequisite to an effective demand side of the wholesale energy

[26] Load-Response Survey data were provided by PJM's Demand Side Response department.

markets. In addition, individual LSEs have implemented independent DSR programs that parallel PJM programs in basic design and that have resulted in additional DSR activity.

Summary data for demand-side response programs in PJM are presented in Table 11**.** The programs include the PJM Emergency Load-Response Program, the PJM Economic Load-Response Program, the PJM Active Load Management Program (net of ALM resources participating directly in other PJM demand-side programs) and additional programs reported by PJM customers in response to a survey. [27]

Non Hourly-Metered Pilot Program

While it is essential to the full integration of the demand side of wholesale markets that appropriate metering technology be widely installed, the current lack of such meters should not be a barrier to participation in PJM's demand side programs, if adequate measurement and verification protocols are in place. The creation and extension of the Non-Hourly Metered Customer Pilot Program is an essential part of PJM's demand side resource efforts.

In 2005 there was no activity in the Non-Hourly Metered Customer Pilot Program. One participant that had been enrolled in the pilot to date did not accept the revised measurement and verification plan that would have allowed inclusion in the pilot to continue. In the December 28, 2005 filing, PJM requested approval of: an increase in the aggregate MW limit to 500 MW; PJM discretion to determine a time period for an entity during which it can participate in the pilot program; and PJM discretion to determine whether an alternative demand reduction measurement mechanism may become permanent, rather then this determination being made through the stakeholders' process. On October 26, 2005 the PJM Electricity Markets Committee endorsed this request. PJM's Members Committee approved these changes on November 17, 2005, endorsing the revisions of the PJM Open Access Transmissions Tariff. On December 28, 2005 these changes were submitted to FERC for approval.[28] In February 2006, these changes were approved by FERC.

27 The ALM MW reported here differs from that reported in the 2005 State of the Market Report because PJM provided non-levelized ALM MW for the 2005 State of the Market Report. The ALM MW reported here are levelized. More information on levelized credits can be founded in "PJM Manual 19: Load Data Systems".

28 Docket No. ER06-406-000.

Tables and Figures

Table 1: Registered participants in the Emergency Program				
	Registered by Year Enrolled		Cumulative Total per Year Enrolled	
	Sites	MW	Sites	MW
2001	NA	NA	NA	NA
2002	64	509	64	509
2003	103	151	160	510
2004	3,699	891	3,857	1,395
2005	12	61	3,865	1,451

Table 2: Current zonal capability in the Emergency Program: Calendar year 2005		
	Sites	MW
AECO	3	4
AEP	0	0
AP	12	75
BGE	15	113
ComEd	3,674	852
DAY	0	0
DLCO	2	41
Dominion	0	0
DPL	6	17
JCPL	7	3
Met-Ed	5	4
PECO	69	142
PENELEC	14	8
PEPCO	10	8
PPL	26	161
PSEG	21	25
RECO	0	0
UGI	1	0
Total	3,865	1,451

Table 3: Performance of Emergency Program participants				
	Load Reduction (MWh)	Total Payments	$/MWh	Load Reduction MWh per Registered Cumulative Total MW
2002	551	$282,756	$513	1
2003	49	$26,613	$543	0
2004	0	$0	$0	0
2005	3,662	$1,859,638	$508	3

Table 4: Registered participants in the Economic Program				
	Registered by Year Enrolled		Cumulative Total per Year Enrolled	
	Sites	MW	Sites	MW
2001	NA	NA	NA	NA
2002	105	359	105	359
2003	146	312	250	662
2004	2,218	1,186	2,466	1,847
2005	127	658	2,574	2,280

Table 5: Current zonal capability in the Economic Program: Calendar year 2005		
	Sites	MW
AECO	3	6
AEP	7	165
AP	15	185
BGE	142	119
ComEd	2,158	1,072
DAY	0	0
DLCO	4	43
Dominion	4	79
DPL	26	128
JCPL	42	80
Met-Ed	15	45
PECO	69	69
PENELEC	9	82
PEPCO	29	35
PPL	14	85
PSEG	36	87
RECO	1	1
UGI	0	0
Total	2,574	2,280

Table 6: Performance of Economic program participants				
	Load Reduction (MWh)	Total Payments	\$/MWh	Load Reduction MWh per Registered Cumulative Total MW
2002	6,727	\$801,119	\$119	19
2003	19,518	\$833,530	\$43	29
2004	58,352	\$1,917,202	\$33	32
2005	142,498	\$12,856,474	\$90	62

Table 7: PJM Economic program by zonal reduction: Calendar year 2005												
	Real time			Day ahead			Dispatched in Real Time			Totals		
	MWh	Credits	Hours	MWh	Credits	Hours	MWh	Credits	Hours	MWh	Credits	Hours
AECO	3,464	$300,855	813	0	$0	0	14	$3,215	18	3,478	$304,070	831
AEP	1,881	$104,606	227	0	$0	0	0	$0	0	1,881	$104,606	227
AP	62,707	$2,914,783	4,046	6,177	$778,752	546	336	$41,355	143	69,221	$3,734,890	4,735
BGE	11,118	$2,052,319	2,566	0	$0	0	0	$0	0	11,118	$2,052,319	2,566
ComEd	72	$4,052	183	0	$795	36	5	$467	29	77	$5,314	248
DLCO	2,719	$114,653	105	323	$27,704	14	183	$17,481	6	3,224	$159,838	125
Dominion	348	$35,452	22	0	$0	0	0	$0	0	348	$35,452	22
DPL	8,344	$1,014,013	2,657	32,884	$4,427,965	1,207	0	$0	0	41,228	$5,441,978	3,864
JCPL	45	$9,177	21	0	$0	0	0	$0	0	45	$9,177	21
Met-Ed	670	$36,558	720	0	$0	0	0	$0	0	670	$36,558	720
PECO	1,435	$232,344	1,225	0	$0	0	0	$0	0	1,435	$232,344	1,225
PENELEC	0	$0	0	0	$0	0	34	$3,695	29	34	$3,695	29
PPL	6,741	$365,095	636	274	$44,007	291	0	$0	0	7,015	$409,102	927
PSEG	1,780	$189,556	1,612	930	$135,130	1,005	11	$2,120	30	2,721	$326,806	2,647
RECO	3	$326	45	0	$0	0	0	$0	0	3	$326	45
UGI	0	$0	0	0	$0	0	0	$0	0	0	$0	0
Total	101,327	$7,373,787	14,878	40,588	$5,414,354	3,099	583	$68,333	255	142,498	$12,856,474	18,232
Max	62,707	$2,914,783	4,046	32,884	$4,427,965	1,207	336	$41,355	143	69,221	$5,441,978	4,735
Avg	6,333	$460,862	930	2,537	$338,397	194	36	$4,271	16	8,906	$803,530	1,140

Table 8: Maximum Economic Program Hourly Reduction (MWh)	
2003	124
2004	117
2005	226

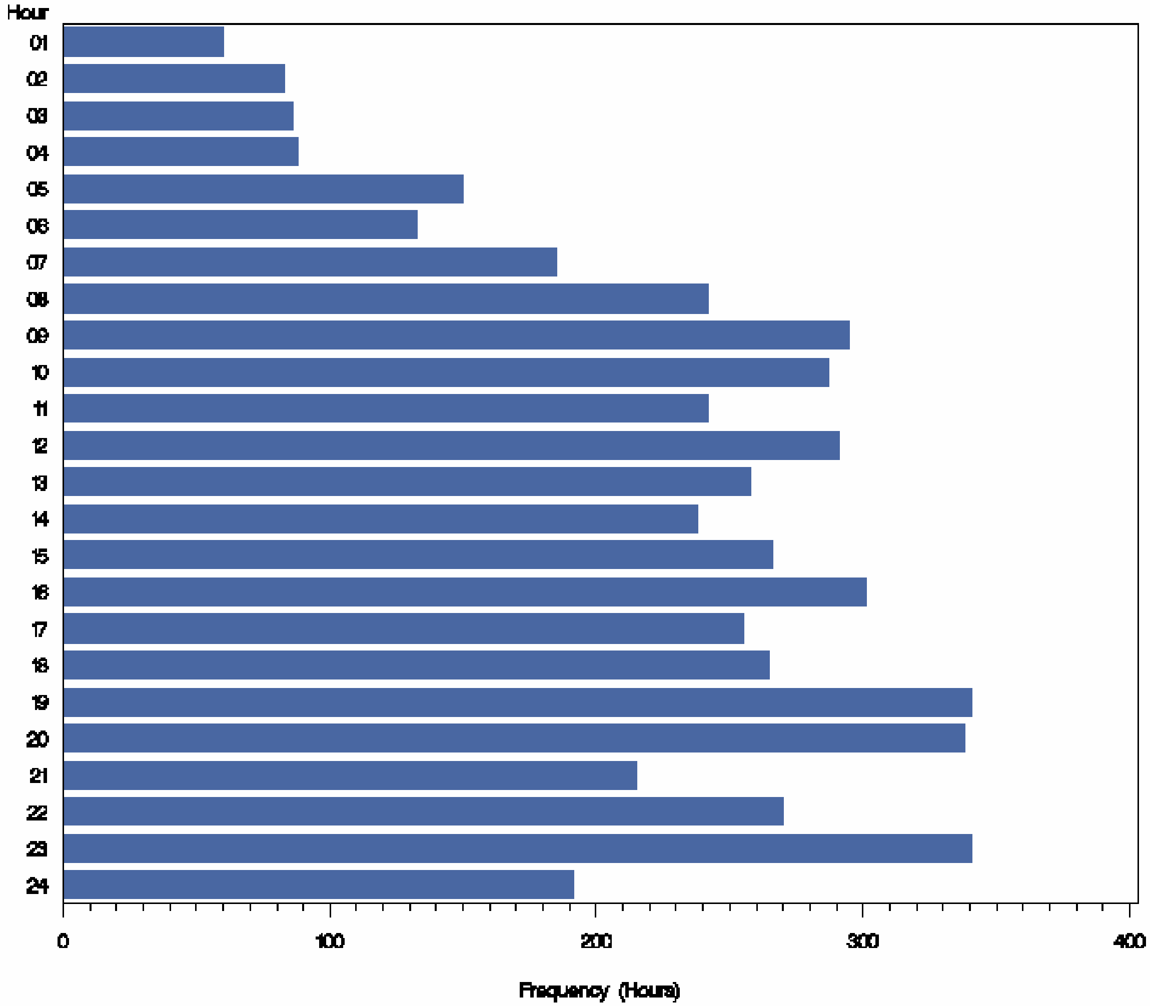
Table 9: PJM ALM Resources			
	Total (MW)	Included in Load Response Program (MW)	ALM Activity during events (MWh)
2002	1,292	298	20,170
2003	1,207	445	0
2004	1,806	317	0
2005	2,042	260	9,617

Table 10: PJM ALM Load Drop (MW) during 5 CP					
	1 CP	2 CP	3 CP	4 CP	5 CP
2002	200	1,282	0	301	1,181*
2003	73	130	140	127	69
2004	1	7	4	3	0
2005	458	264	288	808*	323

Note: * represents CP hours during which ALM events occurred

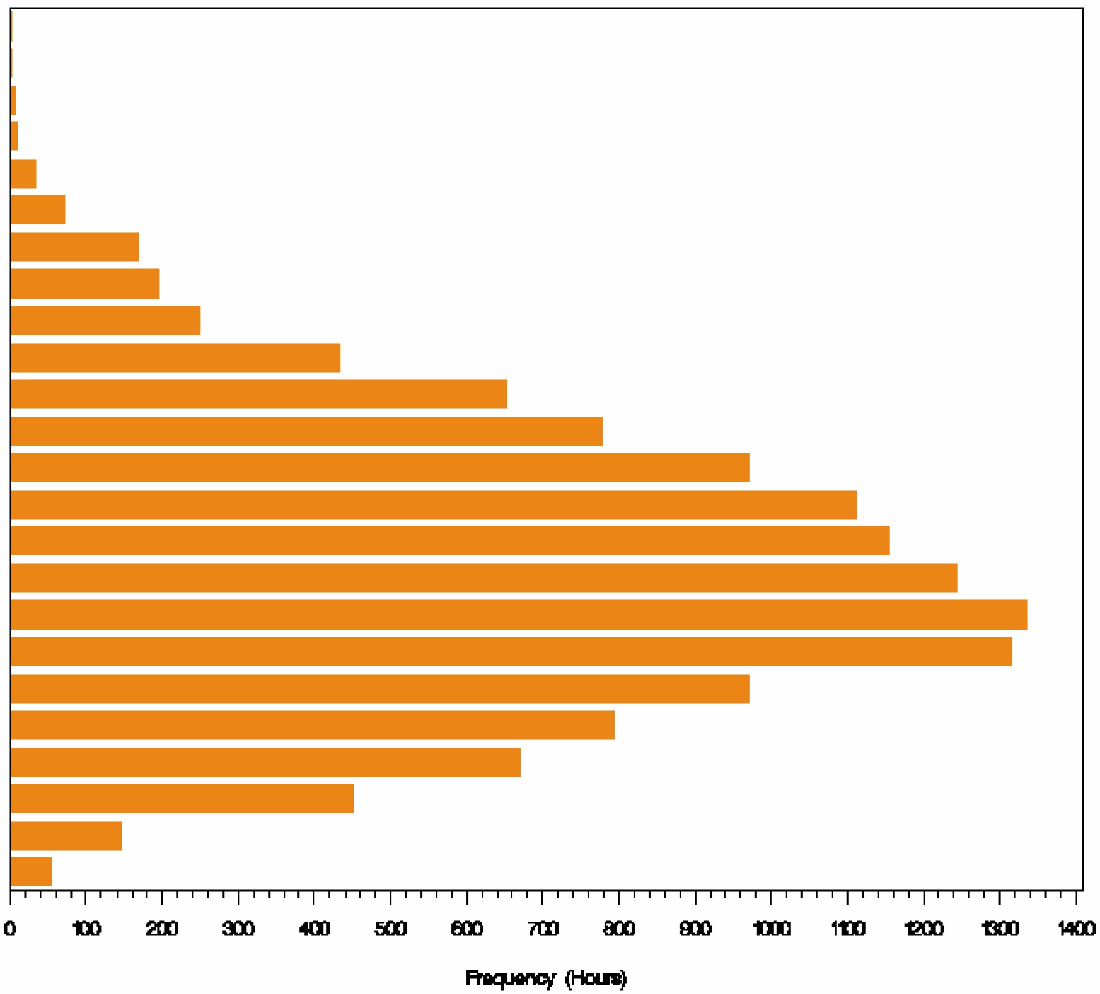
Table 11: Demand-side response programs: Calendar year 2005	
PJM Programs	MW Registered
PJM Economic Load-Response Program	2,280
PJM Emergency Load-Response Program	1,451
PJM Active Load-Management Resources	2,042
PJM ALM Resources Included in Load-Response Program	(260)
Total PJM Programs	5,513
Additional Programs Reported By Customers in PJM Survey	
MW under DSR Programs Administered by LSEs in PJM Territory	
Competitive LSEs Reported Curtailable Load	224
Distribution LSEs Reported Direct Load Control Load not in ALM	289
Distribution LSEs Reported Other Demand Response not in ALM	14
Distribution LSEs Reported Other (Price Sensitive) Regulated Retail Rate Load	212
Distribution LSEs Reported Regulated Interruptible Load	168
Total MW under DSR Programs Administrated by LSEs in PJM Territory	907
MW with Full and Partial Exposure to Real-Time LMP	
Competitive LSEs Reported Load - Partial Exposure to LMP	2,012
Competitive LSEs Reported Load - Other Contract Mechanism	425
Distribution LSEs Reported LMP Based Load	1,216
Total MW with Full and Partial Exposure to Real-Time LMP	3,653
Net Load, Including Survey Responses	10,074

Figure 1:Frequency distribution of Economic program hours when Zonal LMP less than $75/MWh (by hours): Calendar year 2005



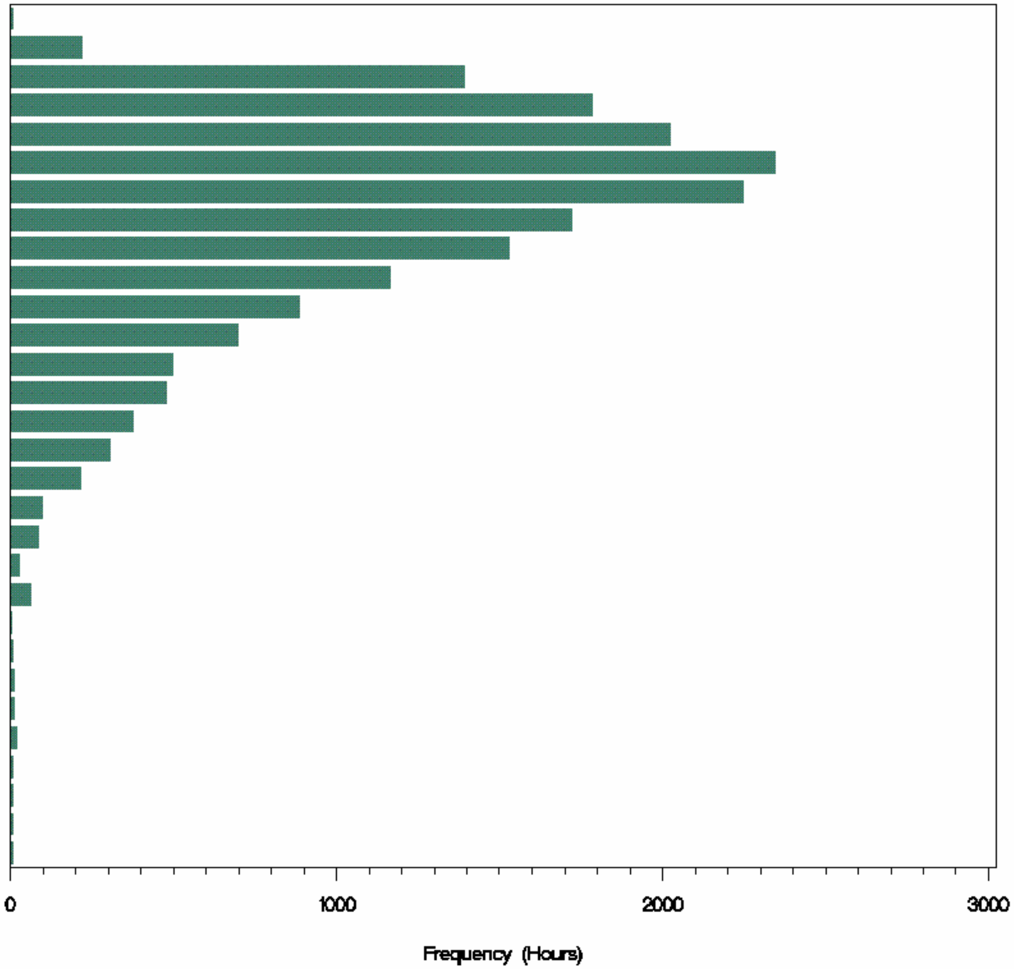
Hour	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
01	60	60	1.11	1.11
02	83	143	1.53	2.64
03	86	229	1.59	4.22
04	88	317	1.62	5.85
05	150	467	2.77	8.61
06	133	600	2.45	11.07
07	185	785	3.41	14.48
08	242	1027	4.46	18.94
09	295	1322	5.44	24.39
10	287	1609	5.29	29.68
11	242	1851	4.46	34.14
12	291	2142	5.37	39.51
13	258	2400	4.76	44.27
14	238	2638	4.39	48.66
15	266	2904	4.91	53.57
16	301	3205	5.55	59.12
17	255	3460	4.70	63.83
18	265	3725	4.89	68.71
19	341	4066	6.29	75.00
20	338	4404	6.24	81.24
21	215	4619	3.97	85.21
22	270	4889	4.98	90.19
23	341	5230	6.29	96.48
24	191	5421	3.52	100.00

Figure 2:Frequency distribution of Economic program hours when Zonal LMPs greater than or equal to $75/MWh (by hours):Calendar year 2005



Hour	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
01	3	3	0.02	0.02
02	3	6	0.02	0.05
03	6	12	0.05	0.09
04	10	22	0.08	0.17
05	33	55	0.26	0.43
06	71	126	0.55	0.98
07	168	294	1.31	2.29
08	194	488	1.51	3.81
09	249	737	1.94	5.75
10	432	1169	3.37	9.12
11	651	1820	5.08	14.21
12	777	2597	6.07	20.27
13	970	3567	7.57	27.84
14	1111	4678	8.67	36.52
15	1153	5831	9.00	45.52
16	1244	7075	9.71	55.23
17	1336	8411	10.43	65.65
18	1315	9726	10.26	75.92
19	970	10696	7.57	83.49
20	794	11490	6.20	89.69
21	670	12160	5.23	94.92
22	451	12611	3.52	98.44
23	146	12757	1.14	99.58
24	54	12811	0.42	100.00

Figure 3:Frequency distribution of Economic program Zonal LMPs (by hours): Calendar year 2005



LMP ($/MWh)	FREQ.	CUM. FREQ.	PCT.	CUM. PCT.
$0 to $15	7	7	0.04	0.04
$15 to $30	218	225	1.20	1.23
$30 to $45	1392	1617	7.63	8.87
$45 to $60	1782	3399	9.77	18.64
$60 to $75	2022	5421	11.09	29.73
$75 to $90	2344	7765	12.86	42.59
$90 to $105	2245	10010	12.31	54.90
$105 to $120	1722	11732	9.44	64.35
$120 to $135	1530	13262	8.39	72.74
$135 to $150	1166	14428	6.40	79.14
$150 to $165	886	15314	4.86	84.00
$165 to $180	696	16010	3.82	87.81
$180 to $195	497	16507	2.73	90.54
$195 to $210	479	16986	2.63	93.17
$210 to $225	375	17361	2.06	95.22
$225 to $240	304	17665	1.67	96.89
$240 to $255	216	17881	1.18	98.07
$255 to $270	98	17979	0.54	98.61
$270 to $285	87	18066	0.48	99.09
$285 to $300	28	18094	0.15	99.24
$300 to $315	62	18156	0.34	99.58
$315 to $330	4	18160	0.02	99.61
$330 to $345	9	18169	0.05	99.65
$345 to $360	10	18179	0.05	99.71
$360 to $375	11	18190	0.06	99.77
$375 to $390	17	18207	0.09	99.86
$390 to $405	6	18213	0.03	99.90
$405 to $420	5	18218	0.03	99.92
$450 to $465	7	18225	0.04	99.96
$480 to $495	7	18232	0.04	100.00

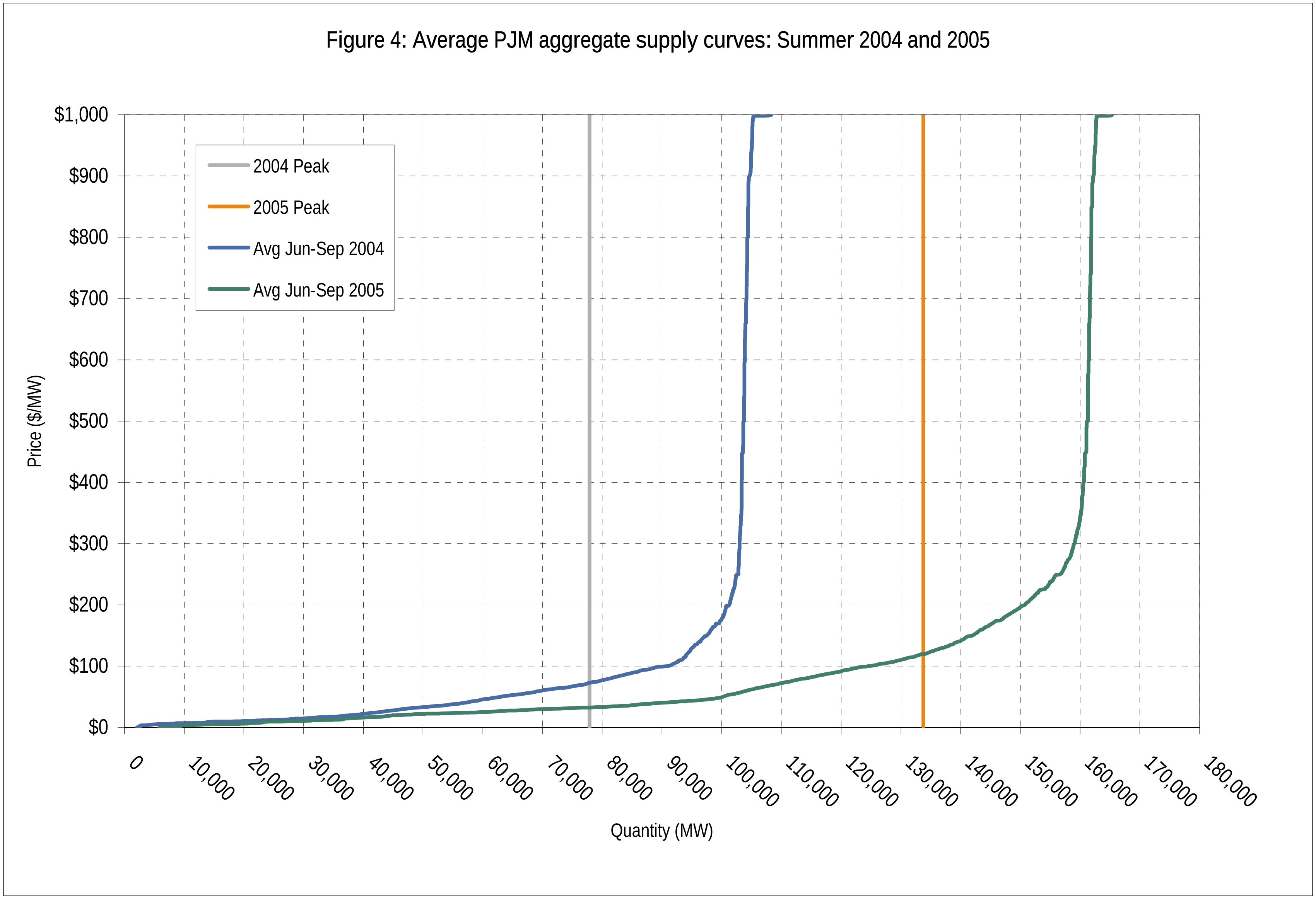


Figure 4: Average PJM aggregate supply curves: Summer 2004 and 2005
$1,000
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
Price ($/MW)
2004 Peak
2005 Peak
Avg Jun-Sep 2004
Avg Jun-Sep 2005
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
130,000
140,000
150,000
160,000
170,000
180,000
Quantity (MW)