



Demand Response – What’s Happening in PJM

Demand Response: Case Studies from the Summer of 2006

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Jeff Bladen, PJM
General Manager, Market Strategy

“ Customers in the 13-state PJM region set a new record for power consumption of 144,796 megawatts on Aug. 2. On that day alone, voluntary reductions in electricity use, known as demand response, resulted in price reductions estimated to be equivalent to more than \$230 million in payments for energy.”

- Calculate estimated Demand Response MW in each selected hour
- Retrieve dispatch case for the selected hour
- Revise the dispatch case to model load increase in each control zone based on the estimated amount of DSR reduction in the zone for the hour
- Solve the dispatch case with the increased demand to calculate LMP increase that would have occurred with higher demand

- The incremental LMP calculations were repeated for a selected set of hours in the study period representing 26 hours of operation over the peak periods
- Hourly Price reduction impact = $\Delta\text{LMP} (\$/\text{MWh}) * \text{hourly integrated load (MWh)}$
- DSR impacts in other hours were not included in the results

Quantity of fuel displaced by voluntary Load Reduction
July 31, 2006 through August 3, 2006

- Coal



1367 Tons

- Oil



15,855 Barrels

- Natural Gas



227,965 MCF

Electricity Price Reduction impact -

Equivalent Consumer savings = \$650 Million in reduced energy payments based on electricity spot price reductions due to voluntary demand response for period from July 31, 2006 through August 3, 2006

- Deployment of Advanced Metering Infrastructure including interval meters
- More timely access to meter data
- More dynamic pricing for retail customers
- Removal of electric distribution company disincentives
- Cost of enabling technology
- Overcoming jurisdictional sensitivities of federal and state regulators
- Broadening the focus on energy efficiency to include demand response

- Dynamic Pricing 4 %
- Reliability (100 peak hours) .16 %
- Customer feedback 10 %

*Delurey, D. and King, C., “Efficiency and Demand Response-Twins, Siblings, or Cousins,” Public Utility Fortnightly, March 2005, pp. 54-61

EMERGENCY

PJM Emergency event
PJM posts Emergency
Message
(Energy Only option and Full
Emergency option both became
available June 1, 2006)

ECONOMIC**

Day Ahead Market

- Customer Submit Day Ahead Bid in eMKT
- PJM Notifies Customer via eMKT
- Obligated in Real Time if Bid clears

Real Time Market

- Customer Notifies PJM via email one hour prior to reduction
- Voluntary Curtailment

Dispatched by PJM in Real Time

- Customer Submits operational info via eSuites
- PJM Notifies Customer via phone

****Except LMP Index price consumers**

Economic Load Response in the Energy Market:

- Permanent integration into the Energy Market (no longer a “Program”).
- Product rules largely unchanged from current.
- Treatment of incentive payments deferred until early 2007. Current sunset on 12/31/07.
- Pilot for non-interval metered customers enlarged and enhanced. Grants PJM flexibility to allow additional resources in.

New chance for demand side resources to provide synchronized (formerly spinning) reserves and regulation:

- Same payments as generators when resource is made available.
- Demand resources initially limited to 25% of synchronized reserve requirement.
- Additional training requirements for Curtailment Service Providers (CSPs)
- Endorsed by overwhelming majority of members
- Recent expansion to include “batch load” demand resources

Emergency Load Response enhanced:

- Preserves two options – energy only (voluntary) and energy and capacity (mandatory).
- Full Emergency Load Response made permanent.
- Expands aggregators of Full Emergency Load Response beyond LSEs to include CSPs.
- Aligns the deficiency charge more closely to the value of capacity as determined in PJM auctions.
- Allows demand resources to register simultaneously in Emergency and Economic Load Response.
- Links emergency payments to market prices with minimum dispatch price determined by resource not PJM.

Comparison of Revenue Opportunities for Demand Response Current vs. Revised

Revenue Opportunity	PJM (before)	PJM with new initiatives
Real-Time/Spot Energy Sales	Yes	Yes
Day-Ahead Energy Sales	Yes	Yes
Forward Energy Sales	No	Yes; Proposed Forward Energy Reserve Market
Forward Capacity Sales	Limited by small volume and to current planning year	Yes; Proposed RPM auction fixes problems
Energy & Capacity payment for emergencies	Not in all cases	Yes; Emergency program changes ensure payment
Ancillary Services	No	Yes; Spin & Regulation

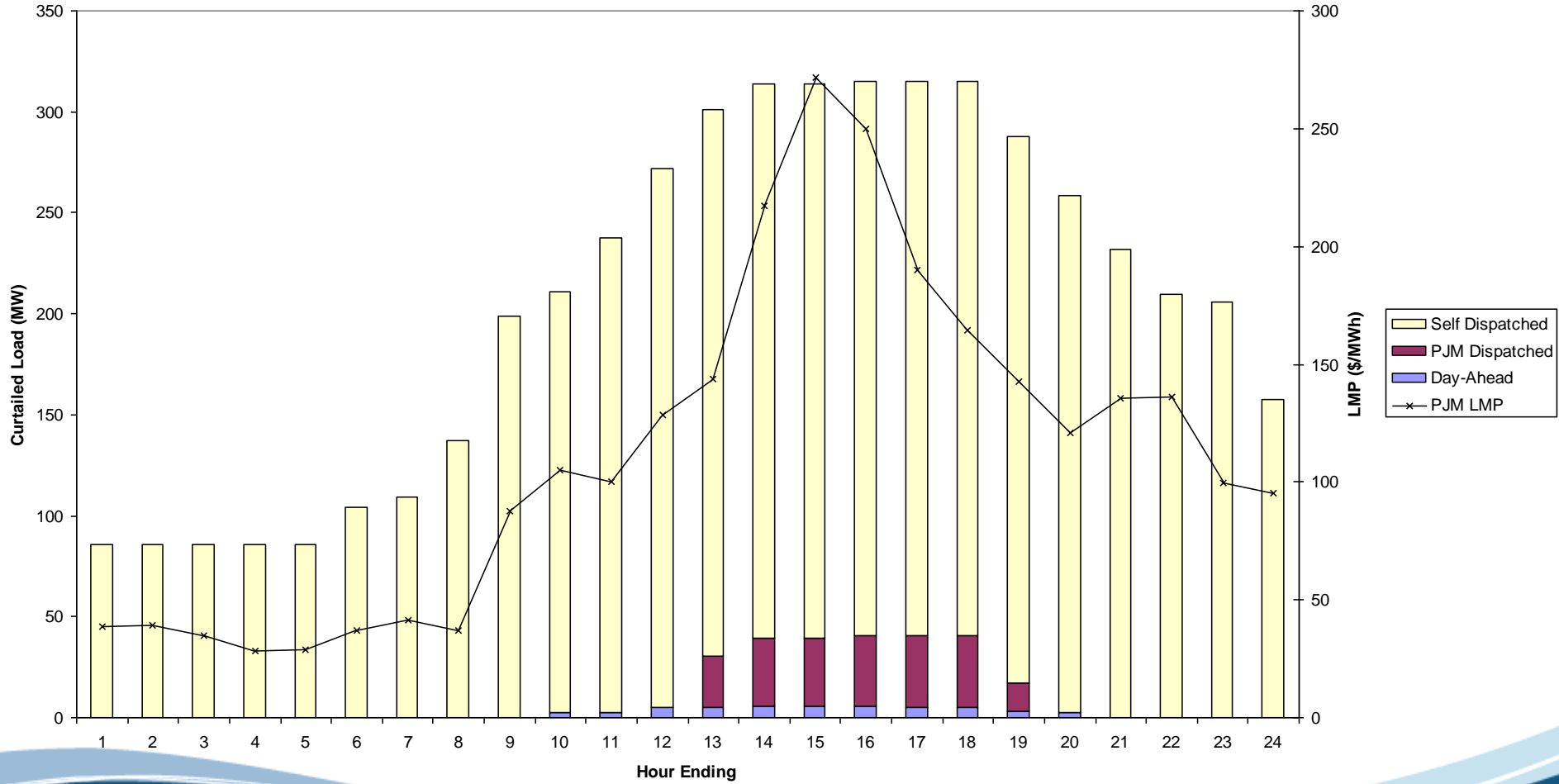
Comparison of Revenue Opportunities for Revised Demand Response vs. Generation

Revenue Opportunity	PJM with new initiatives	Central Station Generation (PJM)
Real-Time/Spot Energy Sales	Yes	Yes
Day-Ahead Energy Sales	Yes	Yes
Forward Capacity Sales	Yes; Proposed RPM auction fixes small volume problems	Yes, Bi-lateral market liquid up to 3 years
Energy & Capacity payment for emergencies	Yes; Emergency program changes ensure payment	Yes; always
Ancillary Services	Yes; Spin & Regulation	Yes; Spin, regulation, black start, etc...

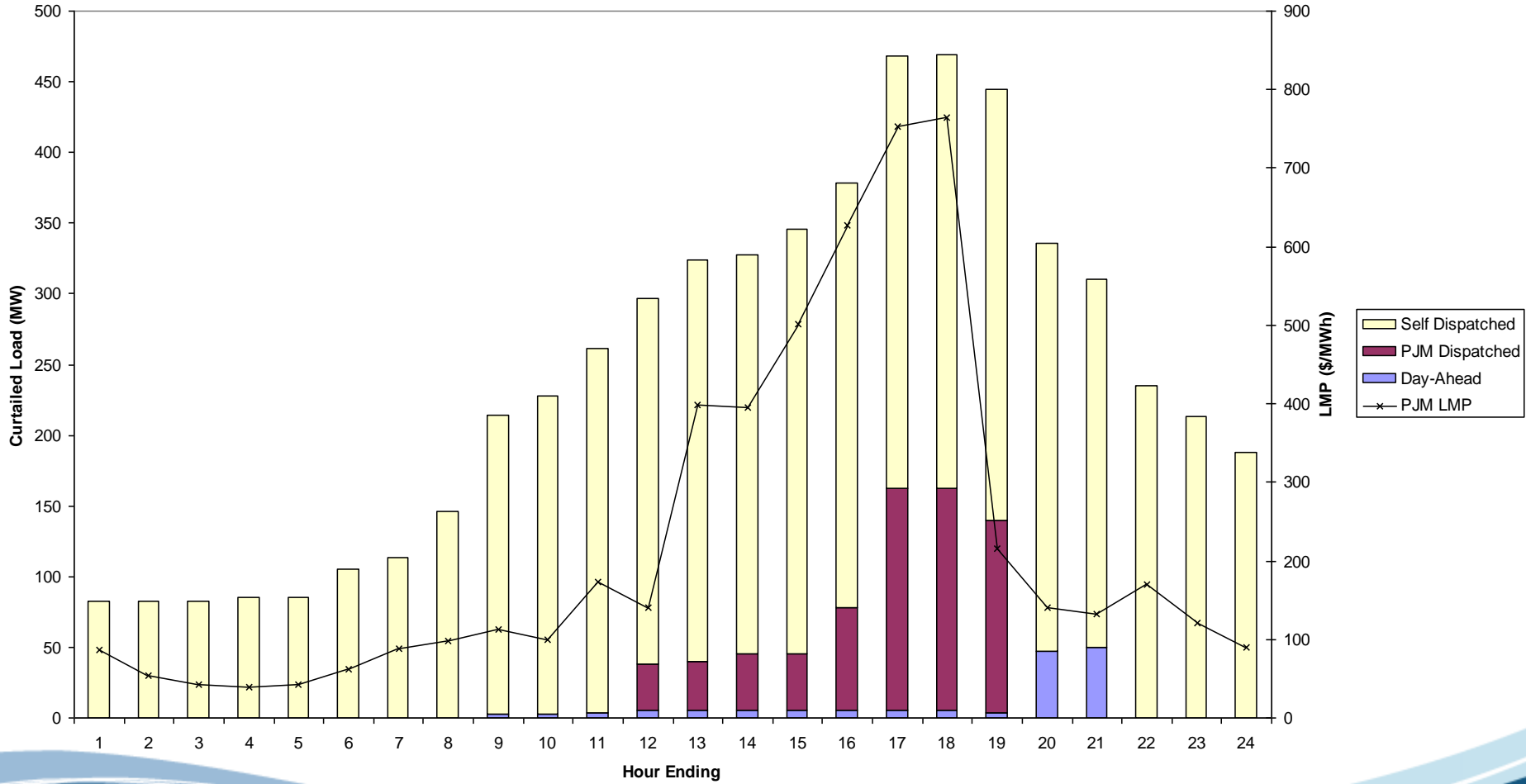
Snapshot of load served by Load Serving Entities on June 1. 2005 Survey identified:

- 3,653 MWs with full or partial exposure to Locational Marginal Prices
- 907 MWs of demand response administered by LSEs independently of opportunities in PJM's wholesale market.

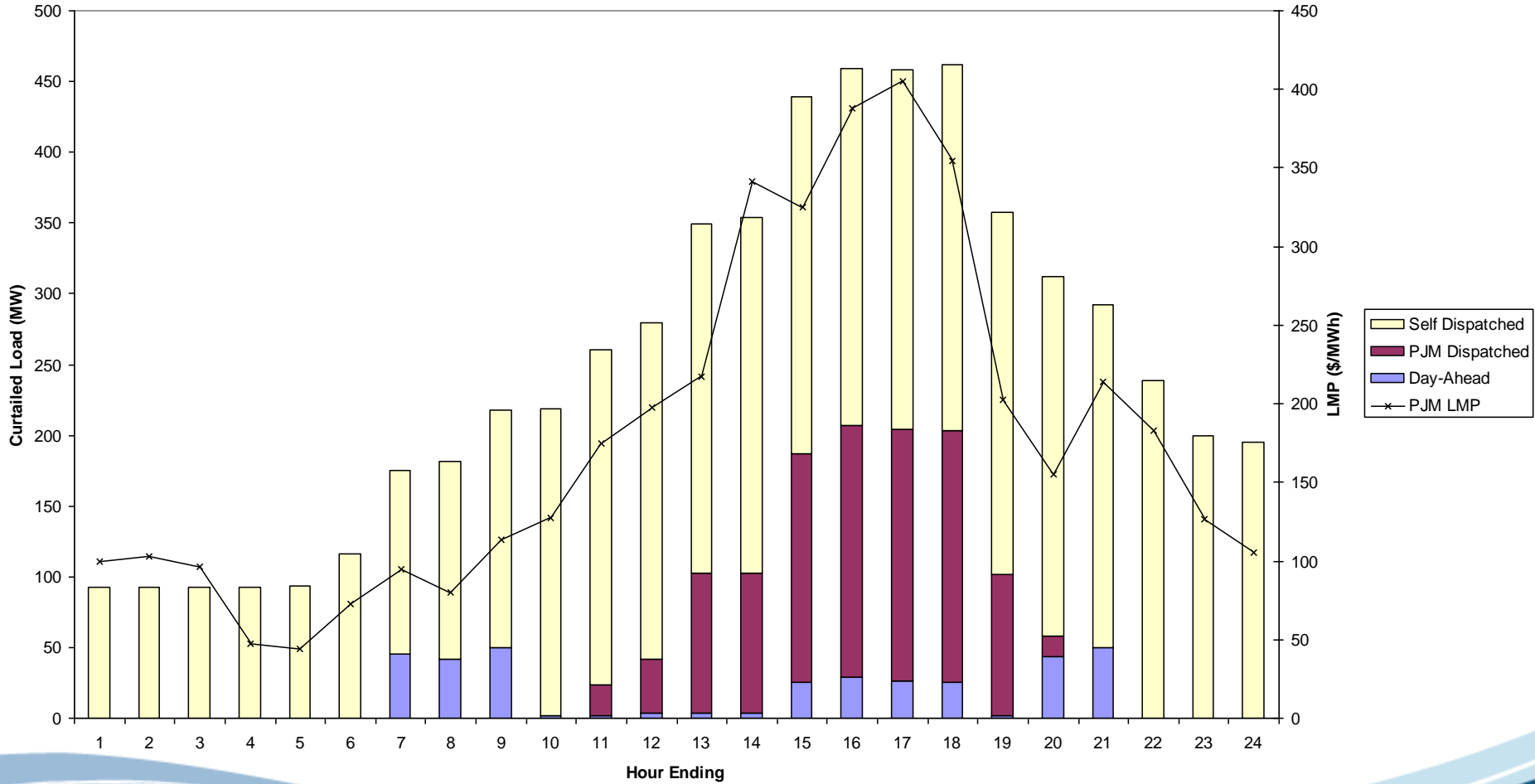
Dispatched and Cleared Demand Side Response Curtailments July 31, 2006



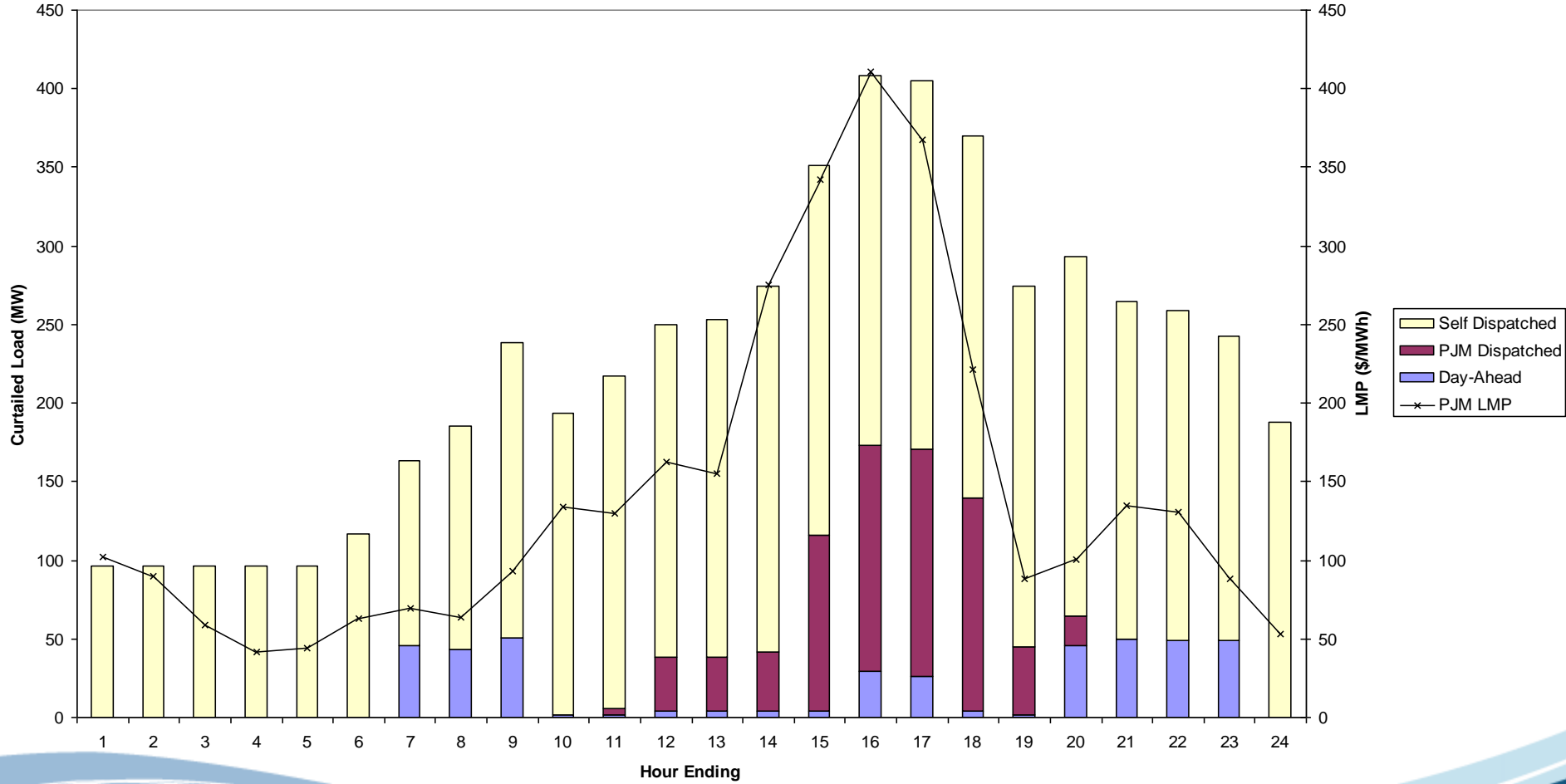
Dispatched and Cleared Demand Side Response Curtailments August 1, 2006



Dispatched and Cleared Demand Side Response Curtailments August 2, 2006



Dispatched and Cleared Demand Side Response Curtailments August 3, 2006





2006 Economic Demand Side Response

Monthly MWh Reductions

Zone	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
AECO							130	389		
AEP					1,895			135		
APS	1,536	3,096	2,640	273	1,523	4,736	10,459	7,482		
BGE					8	1,128	14,186	15,599	172	
COMED			252	1,220	1,088	729	1,552	2,361	37	
DAY							236	238		
DOM		12	4		410	4,481	7,004	102		
DPL	769	774	977	842	36	32	302	289		
DUQ							84			
JCPL		174	272	45			232	136		
METED							49	18		
PECO	11	293	156	142	911	2,052	1,335	6,018	3,645	
PENELEC					3		129	18		
PEPCO						336	792	1,030		
PPL	221	4		589	2	319	611	291	3	
PSEG	438	820	752	522	476	292	2,216	2,798		
Total	2,975	5,172	5,052	3,634	6,352	14,105	39,317	36,903	3,857	117,367



2006 Economic Demand Side Response

Monthly Net CSP Credits

Zone	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
AECO							\$16,065.68	\$59,002.91		
AEP					\$67,367.12			\$22,500.35		
APS	\$58,661.17	\$86,201.10	\$78,510.14	\$9,535.96	\$68,656.15	\$193,448.90	\$708,892.08	\$960,029.33		
BGE					\$4,093.04	\$126,597.09	\$1,936,139.29	\$3,310,205.99	\$7,294.50	
COMED			\$10,312.67	\$41,193.05	\$29,285.93	\$20,271.05	\$102,883.18	\$191,299.60	\$667.85	
DAY							\$22,947.18	\$29,825.96		
DOM		\$484.55	\$331.35		\$90,912.34	\$442,192.82	\$887,092.18	\$12,565.46		
DPL	\$36,225.51	\$30,913.12	\$39,965.67	\$29,879.50	\$3,739.02	\$3,308.69	\$64,160.86	\$76,391.57		
DUQ							\$9,502.79			
JCPL		\$17,242.48	\$24,388.07	\$3,709.50			\$33,353.91	\$52,347.17		
METED							\$4,236.58	\$4,615.57		
PECO	\$888.86	\$15,834.31	\$7,277.29	\$5,840.44	\$35,262.93	\$51,728.88	\$86,455.46	\$359,878.59	\$69,883.26	
PENELEC					\$708.63		\$7,145.98	\$4,665.60		
PEPCO						\$24,533.92	\$85,456.27	\$150,477.20		
PPL	\$13,303.93	\$138.48		\$21,778.97	\$178.53	\$10,662.36	\$78,224.46	\$86,593.38	\$30.97	
PSEG	\$24,958.79	\$62,359.44	\$65,477.39	\$21,586.83	\$15,070.02	\$24,347.25	\$255,321.59	\$418,115.02		
Total	\$134,038.25	\$213,173.48	\$226,262.58	\$133,524.25	\$315,273.71	\$897,090.96	\$4,297,877.49	\$5,738,513.70	\$77,876.58	\$12,033,631.00

