

# Load Management Performance Report 2014/2015

December 2015



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For additional detailed information on any of the topics discussed, please refer to the appropriate PJM manual which can be found by accessing: <http://www.pjm.com/documents/manuals.aspx>

## Contents

<b>Executive Summary.....</b>	<b>4</b>
<b>Overview.....</b>	<b>5</b>
<b>Participation Summary.....</b>	<b>6</b>
<b>Test Requirement Overview .....</b>	<b>9</b>
<b>Test Performance .....</b>	<b>10</b>
<b>Event Performance.....</b>	<b>12</b>

## Executive Summary

Load Management Demand Resources (DR) have the ability to participate as a capacity resource in the PJM capacity market (Reliability Pricing Model or RPM) or to support a Load Serving Entity’s Fixed Resource Requirement (FRR) plan. There were three DR products available during the 2014/2015 Delivery Year: Limited DR, Summer Extended DR, and Annual DR. This is the first Delivery Year that the Summer Extended and Annual products were available.

A Curtailment Service Provider (CSP) is the PJM member that nominates the end use customer location(s) as a capacity resource and is fully responsible for the performance of the resource. Load Management products are required to respond to PJM Pre-Emergency or Emergency Load Management events, based on the availability period for each product (see Table 2: DR product availability), or receive a penalty. PJM may declare Emergency Load Management events outside the required availability window but does not measure capacity compliance in such cases (resources are eligible for emergency energy revenue if they reduce load). Load Management that is not dispatched during its availability period must perform a mandatory test to demonstrate it can meet its capacity commitment or receive a penalty.

Table 1 shows both the mandatory event and test performance values for the past 6 delivery years. In the years where there was more than one event, the event performance is the event MW weighted average of all of the events. PJM Load Management events outside the mandatory compliance period are excluded from the results. There were two Load Management events in the 2014/15 delivery year; however, neither event was subject to mandatory compliance. Overall test performance was 144%. Historically, test performance has been substantially higher than event performance which is largely a function of the difference in the test requirements compared to what a resource must do when dispatched during Load Management Event.

**Table 1: Annual performance summary. Only events with mandatory compliance are included.**

<b>Delivery year</b>	<b>Event performance</b>	<b>Test performance</b>
<b>2009/10</b>	No Events	118%
<b>2010/11</b>	100%	111%
<b>2011/12</b>	91%	107%
<b>2012/13</b>	104%	116%
<b>2013/14</b>	94%	129%
<b>2014/15</b>	No Events	144%

Two Load Management events were called during the 2014/15 Delivery Year on April 21 and April 22, 2015 in the Penelec zone. The Load Management resources in Penelec zone did not have a mandatory compliance obligation and therefore responded on a voluntary basis to receive energy payments, if available.

## Overview

PJM Interconnection, L.L.C. procures capacity for its system reliability through the Reliability Pricing Model (RPM). The sources for meeting system reliability are divided into four groups:

- 1) Generation Capacity
- 2) Transmission Upgrades
- 3) Load Management (Pre-Emergency and Emergency Demand Resources)
- 4) Energy Efficiency

The 2014/15 Delivery Year<sup>1</sup> was the first year that there were three Load Management Products available: Limited DR (the only product available in previous years), Extended Summer, and Annual. The availability period for each of the products is in Table 2. The interruptions must be implemented within two hours of notification by PJM. Those resources that can be fully implemented within one hour of notification are considered Short Lead Time Resources, while those that require more than one hour but not more than two hours of notification are considered Long Lead Time Resources.

**Table 2: DR product availability window.**

DR Product	Max. interruptions	Max. event duration (hrs)	Availability period	Availability Hours (EPT)
Limited	10	6	June – September Non-NERC Hol. Wkdys.	12PM – 8PM
Extended Summer	Unlimited	10	June – October, May	10AM – 10PM
Annual	Unlimited	10	June – October, May November - April	10AM – 10PM 6AM – 9PM

DR compliance can be more complex to measure than compliance for generation resources meeting their capacity obligations. In order to ensure the reliability service for which a resource is paid has actually been provided, PJM utilizes three different types of measurement and verification methodologies. DR Resources can choose the most appropriate of the following measurement methodologies:

- Direct Load Control (DLC) – Load Management for non-interval metered customers which is initiated directly by a Curtailment Service Provider’s (CSP) market operations center, employing a communication signal to cycle HVAC or water heating equipment. This is traditionally done for residential consumers and requires the necessary statistical studies as outlined in PJM Manual 19 or other PJM approved measurement and verification methodology.

<sup>1</sup> The Delivery Year for the capacity construct corresponds to PJM’s Planning Year which runs each year from June 1 until May 31 of the following year.

- Firm Service Level (FSL) – Load Management achieved by a customer reducing its load to a pre-determined level upon the notification from the CSP’s market operations center. The customer must be able to reduce load below the pre-determined level which must be lower than the amount of capacity reserve for the customer as represented by the peak load contribution (PLC).
- Guaranteed Load Drop (GLD) – Load Management achieved by a customer reducing its load below the PLC when compared to what the load would have been absent the PJM event or test.

## Participation Summary

The capacity numbers in this report are in terms of either Installed Capacity (ICAP) or Unforced Capacity (UCAP) depending upon which is most relevant. PJM calculates the Resource amounts required to meet the reliability standard in terms of UCAP which is also utilized to measure compliance with a RPM commitment. PJM determines the UCAP value of different types of Resources based on methods described in the PJM manuals.

Figure 1 shows Load Management Commitments by Delivery Year from 2007/08 through 2018/19 based on what cleared in the RPM auctions (BRA, IAs, and Capacity Performance Transition Auctions) or as part of a LSEs FRR plan. Load Management participation in the PJM capacity market substantially increased from the 2007/08 Delivery Year through the 2011/12 Delivery Year, then declined, and has marginally increased since 2012/13. The final commitment values for the next three Delivery Years are uncertain since the values can still be adjusted in the Incremental Auctions and via Replacement Capacity Transactions and Transition Mechanisms. For the 2014/15 Delivery Year, Load Management capacity commitments represented 8,375 MW of ICAP while total registered Load Management represented 9,360 MW. Registered Emergency DR may be in excess of the commitment if the CSP has indicated they have the potential to deliver an amount that is higher than their actual commitment<sup>2</sup>.

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<sup>2</sup> For example, a CSP may clear 10 MW of resources in an RPM auction but register 11 MW load reduction capability by end use customers to fulfill such commitment.

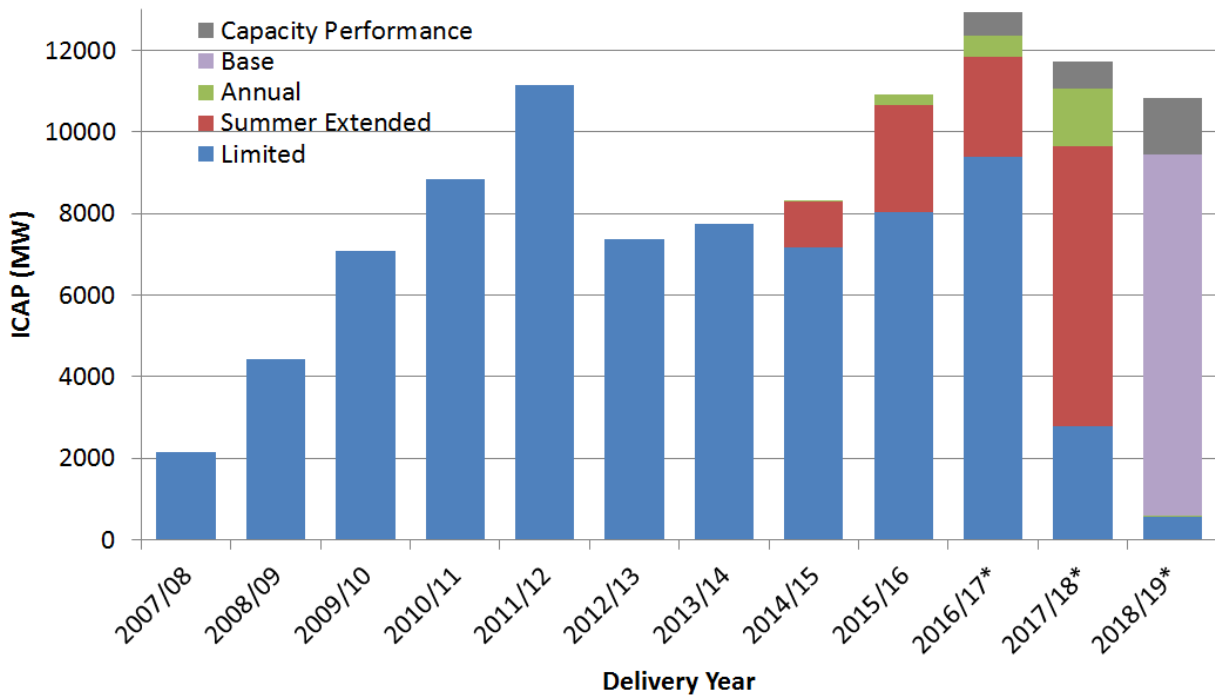


Figure 1: Load Management capacity commitment in ICAP (RPM and FRR) for each Product type. Asterisk indicates that future commitment may change based on replacement transactions, Incremental Auctions, etc.

Table 3 shows the committed ICAP by Product Type (Limited, Extended Summer, Annual) for each of the 20 PJM zones for the 2014/15 Delivery Year. 75 PJM members or affiliates operate as a Curtailment Service Provider and over 1 million end use customers across almost every segment (residential, commercial, industrial, government, education, agricultural, etc.) participate as Load Management resources.

**Table 3: Committed ICAP (MW) by Product Type and Zone for the 2014/15 Delivery Year.**

Zone	Annual DR	Extended Summer DR	Limited DR	Total
Atlantic City Electric (AECO)		50	44	93
American Electric Power (AEP)		55	1221	1277
Allegheny Power (APS)	0.3	110	451	561
American Transmissions Systems Inc. (ATSI)		44	640	684
Baltimore Gas and Electric (BGE)	4	66	666	736
Commonwealth Edison (COMED)		145	901	1046
Dayton Power & Light (DAY)		2	126	128
Duke Energy Ohio & Kentucky (DEOK)		3	243	246
Dominion Virginia Power (DOM)	7	25	731	763
Delmarva Power & Light (DPL)		89	120	209
Duquesne Light (DUQ)		6	76	82
East Kentucky Power Cooperative (EKPC)			123	123
Jersey Central Power & Light (JCPL)		14	121	134
Metropolitan Edison (METED)		20	188	208
PECO (PECO)		27	345	371
Pennsylvania Electric Company (PENELEC)		28	242	270
Pepco (PEPCO)		277	175	452
Pennsylvania Power & Light (PPL)		63	5 09	572
Public Service Enterprise Group (PSEG)	9	47	358	414
Rockland Electric Company (RECO)		2	2	4
<b>Total</b>	<b>20</b>	<b>1072</b>	<b>7282</b>	<b>8375</b>

Load Management resources are registered by Lead Time, Product Type, Measurement Method, Program Type, and Resource Type. Figure 2 shows the breakdown of Committed ICAP for each item. For the 2014/15 Delivery Year, each registration has the option to select a 30, 60, or 120 minute Lead Time. This is the first year that the 30 minute lead time was available, and while optional this year, will be mandatory for the next Delivery Year. The energy offer cap is \$1,549/MWh for 30 minute, \$1275/MWh for 60 minute and \$1,100/MWh for 120 minute. An overwhelming majority, 87%, of resources chose a 120 minute Lead Time.

The Product Type commitment level is determined by what is cleared in the RPM auctions. 87% of committed ICAP was Limited, less than 1% is Annual and the remaining 13% is Extended Summer (see Figure 2). The compliance measurement method is 91% Firm Service Level (FSL), 2% Guaranteed Load Drop and 7% Non-interval Direct Load Control (legacy direct load control without interval metering).

Figure 2 shows that 96% of committed ICAP is registered as Load Management DR Full. The remaining 4% is registered as Capacity Only. Load Management Full resources receive both a capacity revenue stream as well as an emergency energy revenue when there is Load Management event. Capacity Only means that resource receives capacity payments but is not eligible for emergency energy payments during Load Management events and is typically only used for some legacy EDC related tariff requirements or for registrations that participate with two different CSPs.



The 2014/15 Delivery Year is the first year that Load Management resource designations were split into Pre-Emergency and Emergency. The default designation is Pre-Emergency; Figure 2 shows that 81% of committed ICAP fell into this category. The Emergency classification is for those resources that use behind the meter generation and have environmental restrictions that permit them to run only during PJM emergency conditions. 19% of resources met this condition.

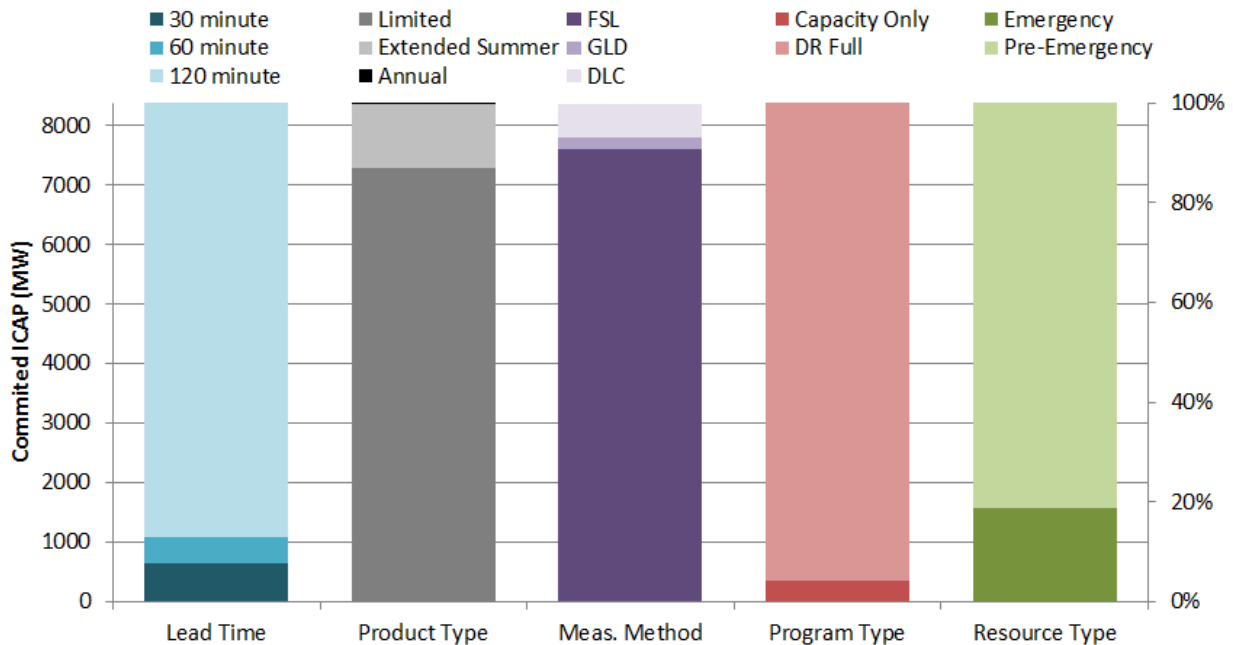


Figure 2: Committed ICAP for DR by Resource Type, Lead Time, Program Type, and Measurement Method for the 2014/15 Delivery Year.

## Test Requirement Overview

If a Load Management Registration is not called in a mandatory Load Management event, the CSP must test the Registration. The Load Management Test is initiated by a Curtailment Service Provider (CSP) that has a capacity commitment. The CSP must simultaneously test all Registrations of the same product type in a Zone if PJM has not called a mandatory event for those Registrations. If a PJM-initiated Load Management Event is called for those Registrations during the product availability period, there is no test requirement and no Test Failure Charges would be assessed to a CSP for those registrations.

The timing of a Load Management Test is intended to represent the conditions when a PJM-initiated Load Management event might occur in order to assess performance during a similar period. The Limited Product must be tested on a non-holiday weekday from June – September between 12PM and 8PM of that Delivery Year. The Extended and Annual Products must be tested on a non-holiday weekday in June – October or May from 10AM – 10PM. All of a CSP’s committed DR Registrations in the same Zone and Product that have not been called in a PJM

initiated event are required to test at the same time for a one hour period. The requirement to test all resources in a zone simultaneously is necessary to ensure that test conditions are as close to realistic as possible. It is requested that the CSP notify PJM of intent to test 48 hours in advance to allow coordination with PJM dispatch.

There is not a limit on the number of tests a CSP can perform. However, a CSP may only submit data for one test to be used by PJM to measure compliance. If the CSP's Zonal Resources collectively achieve a reduction greater than 75% of the CSP's committed MW volume during the test, the CSP may choose to retest the Resources in that Zone that failed to meet their individual nominated value.

Load Management Resources are assessed a Test Failure Charge if their test data demonstrates that they did not meet their commitment level. The Test Failure Charge is calculated based on the CSP's Weighted Daily Revenue Rate which is the amount the CSP is paid for their RPM commitments in each Zone. The Weighted Daily Revenue Rate takes into consideration the different prices DR can be paid in the same Zone. For example, a CSP can clear DR in the Base Residual and/or Incremental Auctions in the same Zone, all of which are paid different rates. The penalty rate for under-compliance is the greater of 1.2 times the CSP's Weighted Daily Revenue Rate or \$20 plus the Weighted Daily Revenue Rate. If a CSP didn't clear in a RPM auction in a Zone, the CSP-specific Revenue Rate will be replaced by the PJM Weighted Daily Revenue Rate for such Zone.

## Test Performance

Since there were no Load Management events with mandatory compliance during the 2014/15 Delivery Year, all resources were required to perform tests to assess their performance capability. 8,219 MW (ICAP) were committed as Load Management Resources<sup>3</sup>. The net result of the testing was 3,597 MW of over-compliance or a performance level of 144% across all zones. Table 4 shows the results by product. The zonal level results are in Table 5. The net result for each zone is over-compliance, however there were some individual CSPs whose tests resulted in under compliance.

**Table 4: Load Management commitments, compliance, and test performance (ICAP) by product, DY2014/15**

Product	Committed ICAP (MW)	Reduction (MW)	Over/under performance (MW)	Performance (%)	Re-test (%)
Limited	7155	9666	2510	135	1
Extended Summer	1043	2096	1053	201	0
Annual	20	54	33	265	0
<b>Total</b>	<b>8219</b>	<b>11,816</b>	<b>3597</b>	<b>144</b>	<b>1</b>

<sup>3</sup> Note that value in this section may differ from those in the Participation Summary. This is because Limited test performance is based on average commitment values over June – September, and the Participation Summary uses average values over the entire Delivery Year. These values may differ due to replacement capacity transactions.

**Table 5: Load Management commitments, compliance, and test performance (ICAP) for Limited Summer product, DY2014/15**

Zone	Committed ICAP (MW)	Reduction (MW)	Over/under performance (MW)	Performance (%)	Re-test (%)
AECO	93	117	24	126	2
AEP	1149	1742	593	152	0
APS	561	709	148	126	0
ATSI	684	938	253	137	0
BGE	736	1447	712	197	0
COMED	1046	1164	118	111	3
DAY	128	184	56	144	1
DEOK	246	294	47	119	1
DOM	764	998	234	131	0
DPL	209	392	183	188	1
DUQ	82	116	34	141	0
EKPC	123	132	9	108	0
JCPL	133	176	43	132	3
METED	209	264	55	127	0
PECO	367	443	75	121	1
PENELEC	269	307	38	114	0
PEPCO	457	1226	769	268	0
PPL	548	684	136	125	0
PSEG	412	478	66	116	0
RECO	4	6	2	144	0
<b>Total</b>	<b>8219</b>	<b>11816</b>	<b>3597</b>	<b>144</b>	<b>1</b>

Test Failure Charges for the Limited DR product for the 2014/15 Delivery Year are applied on an individual CSP/Zone basis for settlement purposes. However, the Test Failure Charges are reported on an aggregate basis here to preserve confidentiality. The weighted average Penalty Rate for the 2014/15 Delivery Year is \$140.13/MW-day (\$37.21 last year). The annual penalties for under-compliance total about \$2.7M which will be allocated to RPM LSEs pro-rata based on their Daily Load Obligation Ratio (\$429,600 last year). To better understand the order of magnitude, the under-compliance penalties compare to the total Load Management annual credits of just over \$685M (\$558.7M last year). Therefore, the under-compliance penalties are about 0.40 % of the Load Management credits in the RPM (0.08% last year).

## Event Performance

Load Management events were called on April 21 and April 22, 2015 in Penelec. Only the Limited and Extended Summer Products were committed in Penelec during the 2014/15 Delivery Year. April falls out of the mandatory compliance period for the Limited and Extended Summer products, so the response was voluntary.

The April 21 event had a notification time of 18:20 EPT and a release time of 21:30 EPT. On April 22 notification was at 05:30 EPT and release was at 12:30 EPT. On both days all available products and lead times were called for both Emergency and Pre-Emergency Load Management. Table 6 summarizes the event times for the available DR types during the April events.

**Table 6: Summary of timing for April events.**

Date	Type	Notification Period	Products	Notification	Start (EPT)	Release
<b>4/21/2015</b> <b>(Tues.)</b>	Pre-Emergency	Long (120 min.)	Limited, Extended	18:20	20:20	21:30
		Short (60 min.)	Limited	18:20	19:20	21:30
	Emergency	Long (120 min.)	Limited, Extended	18:20	20:20	21:30
<b>4/22/2015</b> <b>(Weds.)</b>	Pre-Emergency	Long (120 min.)	Limited, Extended	5:30	7:30	12:30
		Short (60 min.)	Limited	5:30	6:30	12:30
	Emergency	Long (120 min.)	Limited, Extended	5:30	7:30	12:30

Figures 3 and 4 show all active Demand Response in PJM on April 21 and 22, 2015. This includes all economically dispatched DR across PJM and voluntary Load Management called in Penelec. The maximum energy reduction from Load Management was 36 MW on April 21 and 59 MW on April 22. Total energy payments for Load Management were \$87k for April 21 and \$394k for April 22.

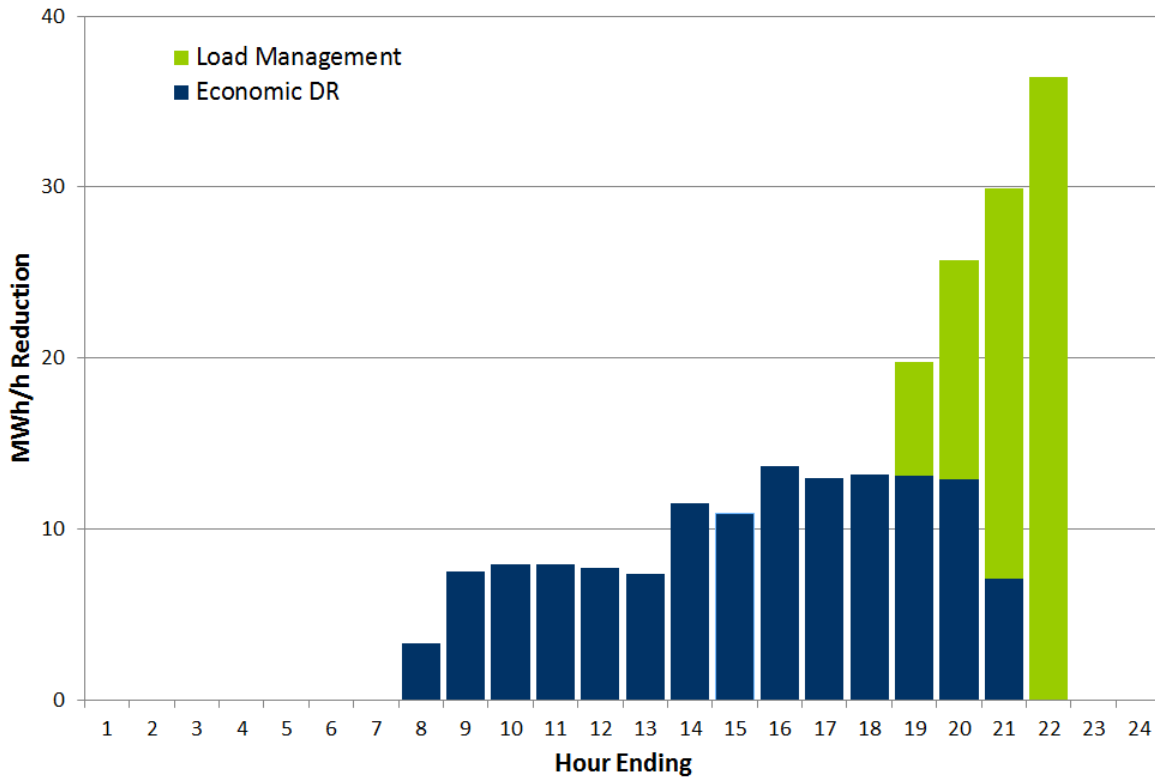


Figure 3: Demand Response in PJM on 4/21/2015. Includes DR economically dispatched across all PJM and Load Management in PENELEC.

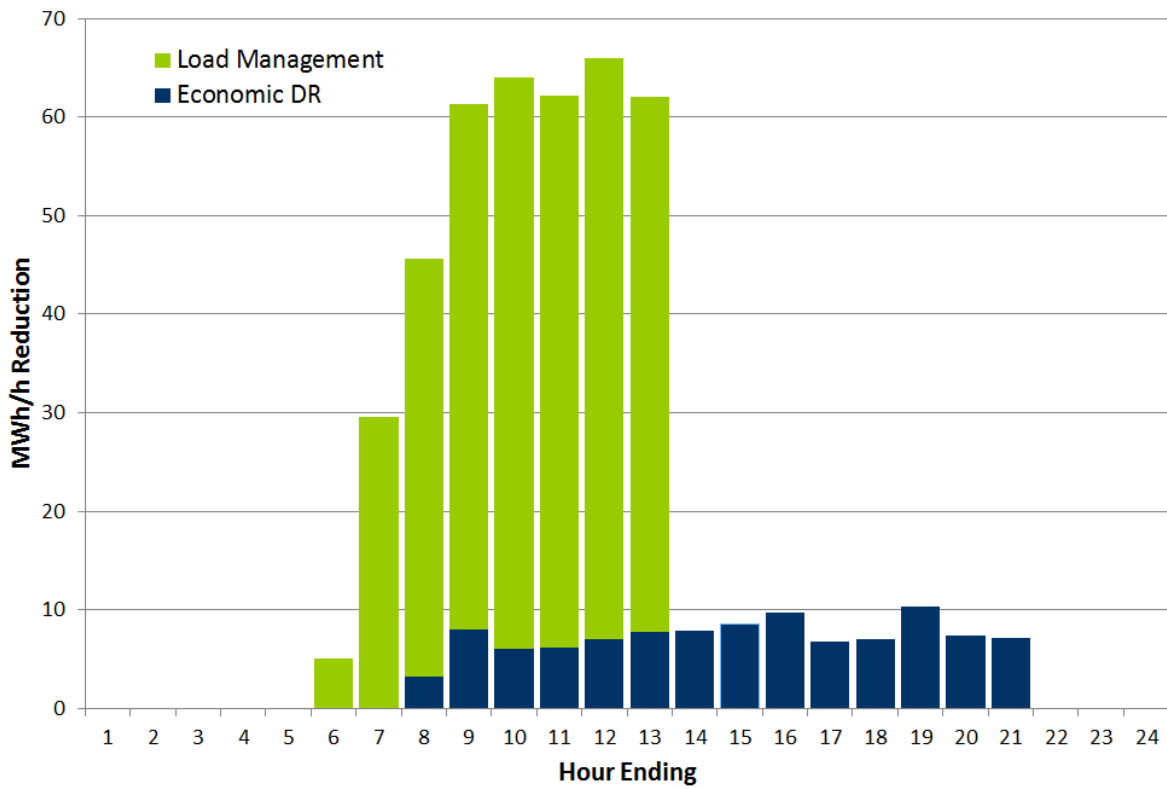


Figure 4: Demand Response in PJM on 4/22/2015. Includes DR economically dispatched across all PJM and Load Management in PENELEC.