

Load Management Performance Report 2015/2016

August 2016



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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>

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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 2015/2016 Delivery Year: Limited DR, Summer Extended DR, and Annual DR. This is the second 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 7 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 no Load Management events in the 2015/16 delivery year. Test performance was 134%. 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.

Delivery year	Event performance	Test performance
2009/10	No Events	118%
2010/11	100%	111%
2011/12	91%	107%
2012/13	104%	116%
2013/14	94%	129%
2014/15	No Events	144%
2015/16	No Events	134%

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

There were three Load Management Products available during the 2015/16 Delivery Year¹: Limited DR, Extended Summer, and Annual. The availability period for each of the products is in Table 2. By default, the interruptions must be implemented within thirty minutes of notification by PJM. Those resources that cannot be fully implemented within thirty minutes of notification and qualify for an exception may respond within either 60 or 120 minutes depending on their capabilities and the exception they qualify for.

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.
- 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

¹ 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.

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 CP 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 2015/16 Delivery Year, Load Management capacity commitments represented 10,927 MW of ICAP while total registered Load Management represented 11,635 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 commitment².

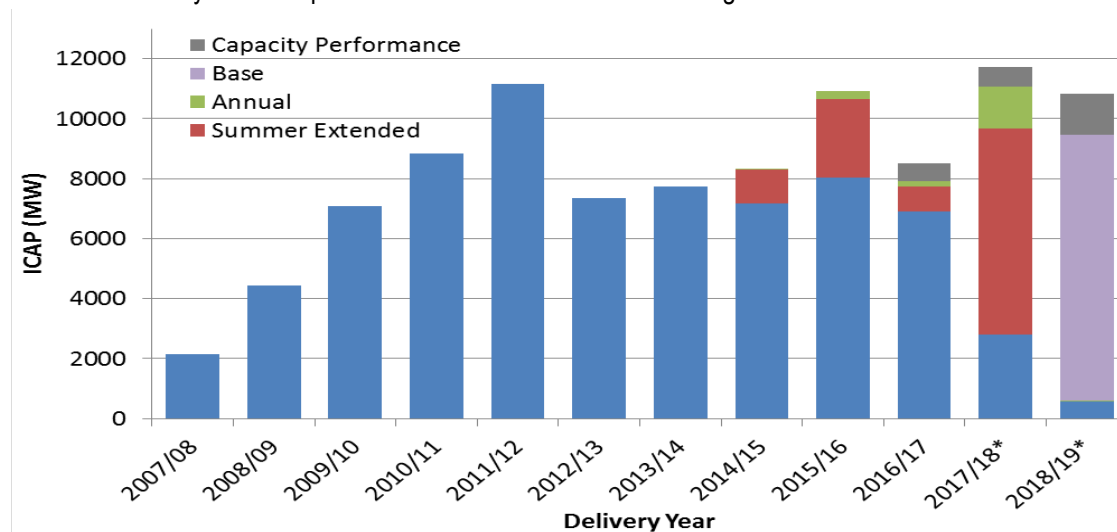


Figure 1: Load Management capacity commitment in ICAP (RPM and FRR) for each Product type. Asterisk indicates that future commitment may change based on replacement transactions, Incremental Auctions, etc.

² 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.

Table 3 shows the committed ICAP by Product Type (Limited, Extended Summer, Annual) for each of the 20 PJM zones for the 2015/16 Delivery Year. 69 PJM members or affiliates operate as a Curtailment Service Provider and over 2 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 2015/16 Delivery Year.

Zone	Annual DR	Extended Summer DR	Limited DR	Total
Atlantic City Electric (AECO)		72	58	130
American Electric Power (AEP)	82	84	1571	1737
Allegheny Power (APS)	13	184	550	746
American Transmissions Systems Inc. (ATSI)	52	440	554	1046
Baltimore Gas and Electric (BGE)	5	63	694	762
Commonwealth Edison (COMED)	16	534	1053	1603
Dayton Power & Light (DAY)	15	15	145	175
Duke Energy Ohio & Kentucky (DEOK)		96	210	306
Dominion Virginia Power (DOM)	57	90	740	887
Delmarva Power & Light (DPL)		91	207	298
Duquesne Light (DUQ)	1	34	135	171
East Kentucky Power Cooperative (EKPC)			132	132
Jersey Central Power & Light (JCPL)		48	126	173
Metropolitan Edison (METED)		82	190	271
PECO (PECO)		161	316	476
Pennsylvania Electric Company (PENELEC)		59	228	287
Pepco (PEPCO)		205	330	535
Pennsylvania Power & Light (PPL)	0	240	533	774
Public Service Enterprise Group (PSEG)	24	108	252	384
Rockland Electric Company (RECO)		0	7	7
Total	266	2603	8033	10902

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. This is the first year that the 30 minute lead time was mandatory. 60 or 120 minute lead times could be used if a resource qualified for an exception. The energy offer cap is \$1,849/MWh for 30 minute, \$1425/MWh for 60 minute and \$1,100/MWh for 120 minute. 63% of resources were able to respond in 30 minutes, while 32% qualified for a 120 minute exception, and the remaining 5% qualified for a 60 minute exception.

The Product Type commitment level is determined by what is cleared in the RPM auctions. 74% of committed ICAP was Limited, 2% is Annual, and the remaining 24% is Extended Summer (see Figure 2). The compliance measurement method is 94% Firm Service Level (FSL), 2% Guaranteed Load Drop and 4% Non-interval Direct Load Control (legacy direct load control without interval metering).

Figure 2 shows that 97% of committed ICAP is registered as Load Management DR Full. The remaining 3% 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.

Load Management resource designations are split into Pre-Emergency and Emergency. The default designation is Pre-Emergency; Figure 2 shows that 82% 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. 18% of resources met this condition.

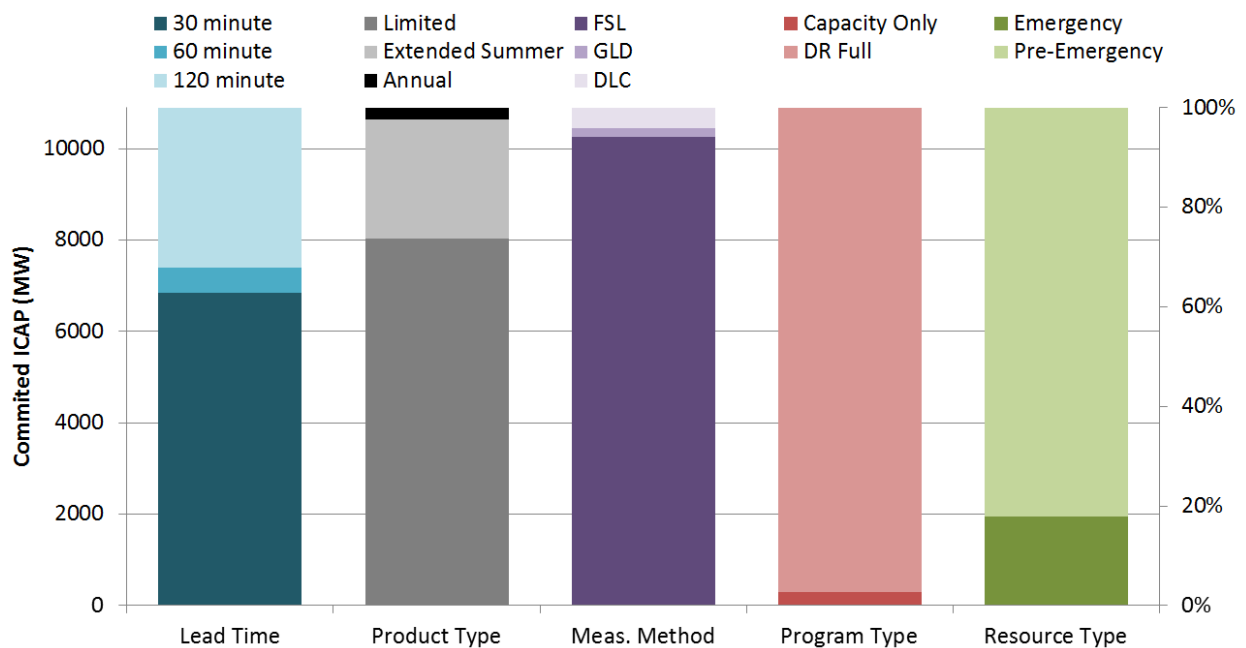


Figure 1: Committed ICAP for DR by Resource Type, Lead Time, Program Type, and Measurement Method for the 2015/16 Delivery Year.

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 during the 2015/2016 Delivery Year, all resources that are committed for the Delivery Year were required to perform tests to assess their performance capability. 10,902 MW (ICAP) were committed as Load Management Resources. The net result of the testing was 3,675 MW of over-compliance or a performance level of 134% across all zones. Table 4 shows the results by product. The zonal level results for all products combined 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, DY2015/16

Product	Committed ICAP (MW)	Reduction (MW)	Over/under performance (MW)	Performance (%)	Re-test (%)
Limited	8,033	10,691	2,658	133	3
Extended Summer	2,603	3,575	971	137	0
Annual	266	312	46	117	4
Total	10,902	14,577	3,675	134	3

Table 5: Load Management commitments, compliance, and test performance (ICAP by Zone, DY2015/16)

Zone	Committed ICAP (MW)	Reduction (MW)	Over/under performance (MW)	Performance (%)	Re-test (%)
AECO	131	144	14	111	6
AEP	1,737	2,051	314	118	1
APS	746	835	88	112	3
ATSI	1,046	1,451	405	139	5
BGE	762	1,611	849	211	1
COMED	1,603	1,813	210	113	0
DAY	175	219	44	125	0
DEOK	306	374	68	122	0
DOM	887	1,048	161	118	4
DPL	295	731	437	248	0
DUQ	171	210	40	123	0
EKPC	132	143	11	108	0
JCPL	173	200	27	116	1
METED	271	310	39	114	11
PECO	479	562	83	117	1
PENELEC	287	329	42	115	9
PEPCO	535	1,248	713	233	0
PPL	774	859	84	111	12
PSEG	384	429	45	112	1
RECO	7	9	2	125	0
Total	10,902	14,577	3,675	134	3

Test Failure Charges for the 2015/16 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 2015/16 Delivery Year is \$167/MW-day (\$140 last year). The annual penalties for under-compliance total about \$6.3M which will be allocated to RPM LSEs pro-rata based on their Daily

Load Obligation Ratio (\$2.7M last year). Therefore, the under-compliance penalties are about 0.69% of the total Load Management credits (\$900 M) in RPM this year compared to 0.40% (\$685 M of credits) last year. Table 6 below shows Penalties by Product for the 2015/2016 Delivery Year.

Table 6: Load Management Test Penalties by Product, DY2015/16

Product	Penalties \$	Shortfall (MW)	Average Weighted Penalty Rate (\$/MW-day)	Penalties as % of Total LM Credits (\$900M)
Limited	\$5,899,249	97	\$166	0.65%
Extended Summer	\$113,775	2	\$164	0.01%
Annual	\$250,620	4	\$185	0.03%
Total	\$6,263,643	103	\$167	0.69%