Load Management Report

2022/2023

September 2023

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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 (Emergency and Pre-emergency DR) has 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 was one DR product available during the 2022/2023 Delivery Year – Capacity Performance DR.

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 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 13 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. In 22/23 Delivery Year it was 125% and test performance was 410%. Only a very small number of resources representing about 5.5% of the overall commitment that hadn't participated in the Winter Storm Elliott and/or the AEP_MARION events had to test. 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 a Load Management Event. New testing rules that address this become effective in the 2023/2024 Delivery Year.

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

	Load Management	
Delivery year	**Event performance**	**Test performance**
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%
2016/17	No Events	153%
2017/18	No Events	163%
2018/19	No Events	146%
2019/20	78%	150%
2020/21	No Events	160%
2021/22	No Events	154%
2022/23	125%	410%

Overview

PJM Interconnection, L.L.C. procures capacity for its system reliability through the Reliability Pricing Model (RPM). Members may also meet their reliability requirement through a Fixed Resource Requirement ("FRR") plan. 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

Capacity Performance (CP) was the only Load Management Product in effect during the 2022/23 Delivery Year[1]. CP includes both annual and summer period DR. The availability period for is included in Table 2. By default, the interruptions must be implemented within 30 minutes of notification by PJM. Those resources that cannot be fully implemented within 30 minutes of notification and qualify for an exception may respond within either 60 or 120 minutes depending on their capabilities.

Table 2: DR product availability window

DR Product	Max. interruptions	Max. event duration (hrs)	Availability period	Availability Hours (EPT)
Capacity Performance	Unlimited	12 15	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 two different types of measurement and verification methodologies. DR Resources can choose the most appropriate of the following measurement methodologies:

- Firm Service Level (FSL) – Load Management achieved by a customer reducing its load to a pre-determined level. The customer must be able to reduce load to or below the pre-determined level which must be lower than the amount of capacity reserved 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.

[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.

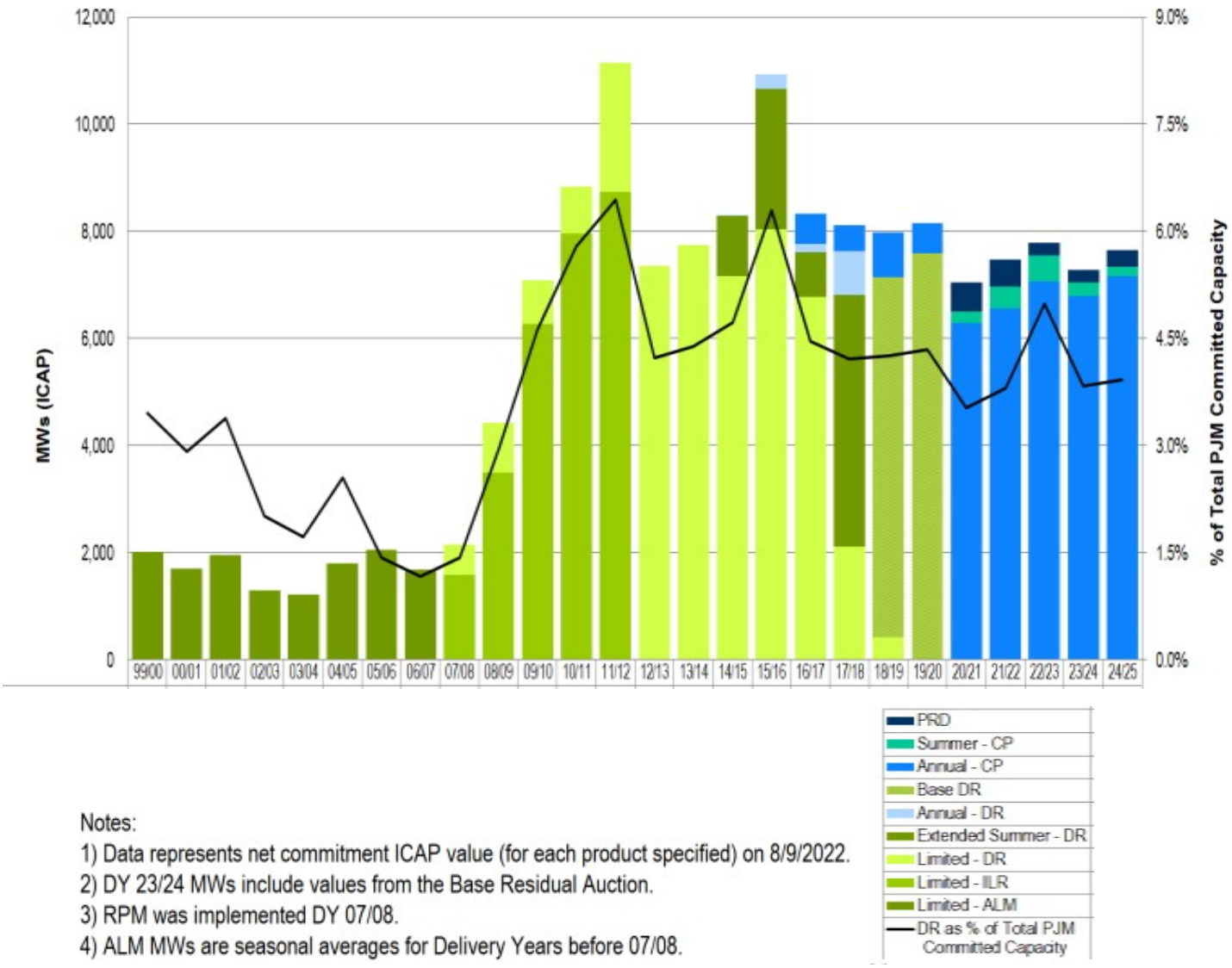
Participation Summary

The capacity values 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 of the 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 and Price Responsive Demand ("PRD") Commitments by Delivery Year from 1999/2000 through 2024/25 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 varied slightly since. The final commitment values for the next Delivery Year are uncertain since the values can still be adjusted in the Incremental Auctions and via replacement Capacity transactions. For the 2022/23 Delivery Year, Load Management capacity commitments represented 7,699 MW of ICAP while total registered Load Management represented 10,632MW. Registered Load Management 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[2].

[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.

Figure 1: PJM Demand Response Committed MWs by Delivery Year



Notes:
1) Data represents net commitment ICAP value (for each product specified) on 8/9/2022.
2) DY 23/24 MWs include values from the Base Residual Auction.
3) RPM was implemented DY 07/08.
4) ALM MWs are seasonal averages for Delivery Years before 07/08.

Table 3 shows the committed ICAP for the 2022/23 Delivery Year. Over thirty 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 Load Management ICAP, DY 2022/23

Area	Committed Load Management ICAP (MW)
MAD	2,950
Rest of RTO	4,749
Total	**7,699**

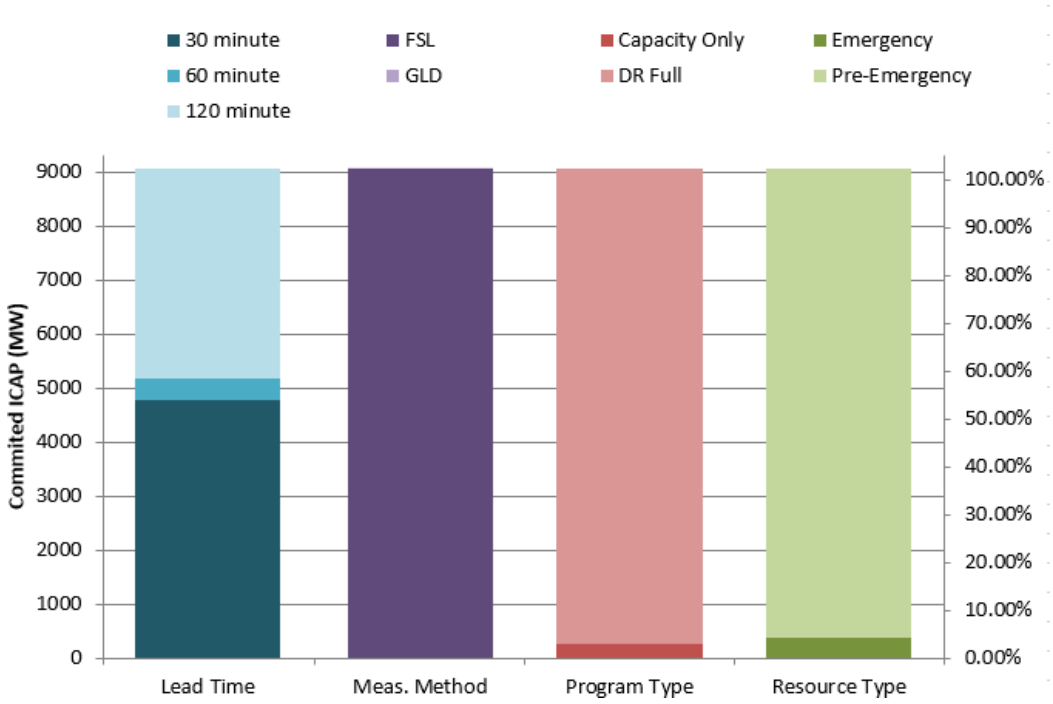
Load Management resources are registered by Lead Time, Product Type, Measurement Method, Program Type, and Resource Type. Figure 2 shows the breakdown of Committed ICAP for each item. 53% of resources were able to respond in 30 minutes, while 43% qualified for a 120 minute exception, and the remaining 4% qualified for a 60 minute exception.

The Product Type commitment level is determined by what is cleared in the RPM auctions or included in an FRR plan. There was only one product type available this delivery year – Capacity Performance – which represented 100% of commitment. The compliance measurement method is Firm Service Level (FSL) for 99.98% of the commitment and only 0.02% for Guaranteed Load Drop.

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 are eligible to receive both capacity revenue and emergency energy revenue when there is Load Management event. Capacity Only receives capacity revenue but is not eligible for emergency energy payments during Load Management events. Capacity Only registrations are typically only used for 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 96% of committed ICAP fell into this category. The Emergency classification is for registrations that use behind the meter generation with environmental restrictions that only allow them to run during PJM issued NERC EEA2 emergency conditions. Just 4% of resources met this condition.

Figure 2: Committed Load Management ICAP for DR by Resource Type, Lead Time, Program Type, and Measurement Method, DY 2022/23



Event Overview

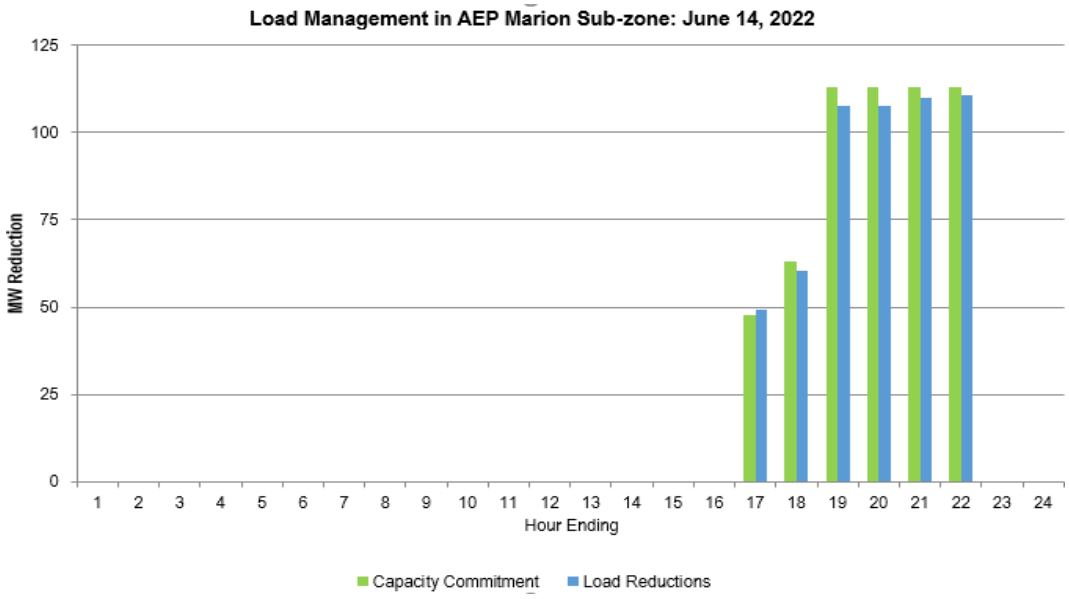
Table 4 below summarizes capacity performance compliance and expected energy load reductions reported by CSPs prior to the event compared to actual energy load reduction that were settled. PJM dispatched Capacity Performance DR resources June 14-16 and December 23-24, 2022 during their mandatory compliance period. For June events the resources were disptached in the AEP Marion Sub-zone only and for December events resources were dispatched across the full RTO. Overall event performance during the mandatory compliance period was 125%. Capacity compliance is measured based on FSL and GLD approaches which can be significantly different from real time energy load reductions. Capacity compliance is based on the load be at or below the committed level while real time energy load reductions are based on the difference between a customer specific hourly load forecast (customer baseline or "CBL") and actual load. Customers that have load reduced prior to an event may have low or no real time energy load reduction while they have met their capacity obligation (load is at or below a committed level). PJM uses the expected energy reductions reported by CSPs as part of the dispatch decision making process when DR resources are required to maintain system reliability. Expected energy reductions do not impact capacity performance.

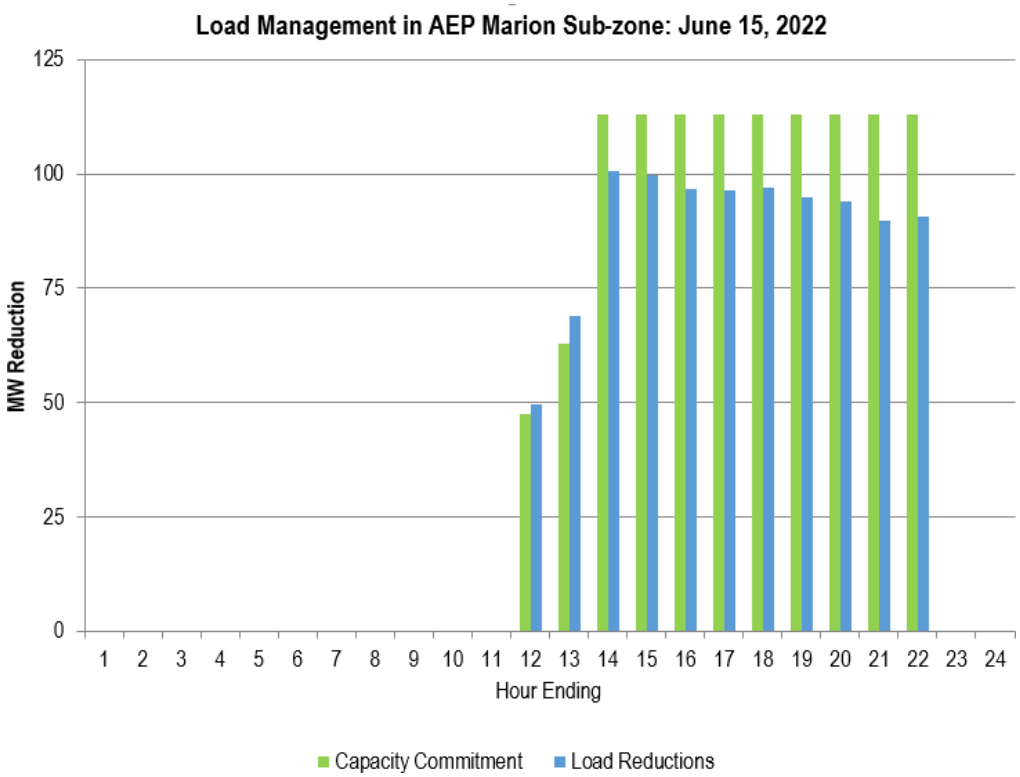
Table 4. Load Management Event Summary, DY 2022/23

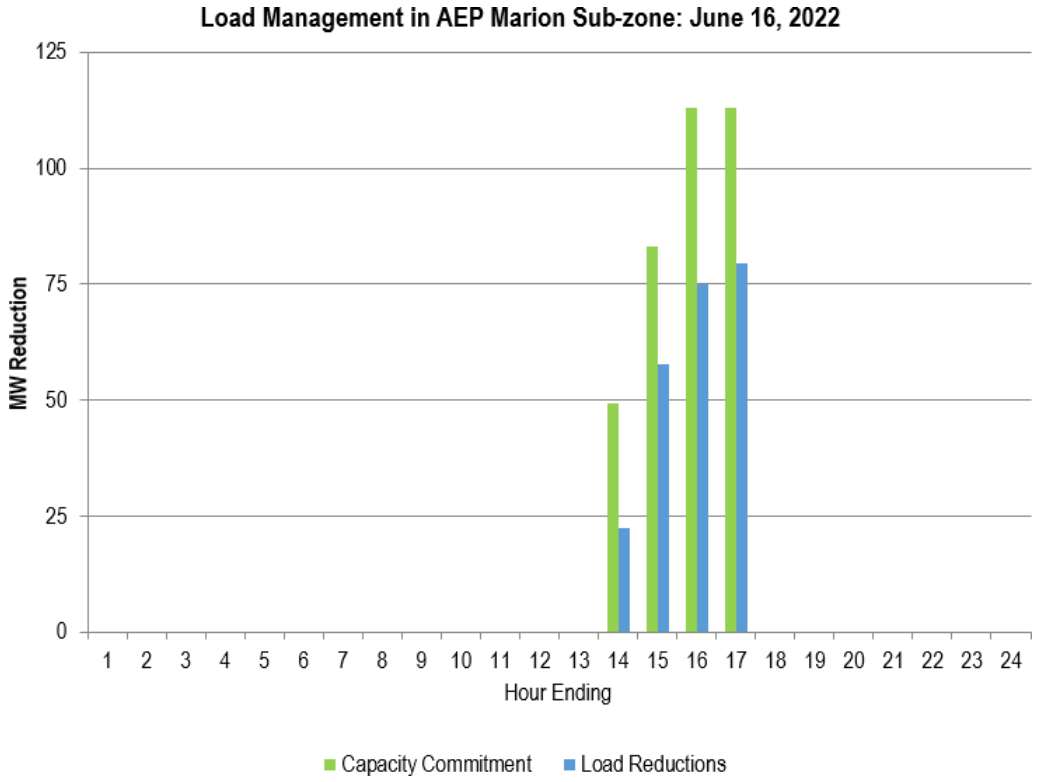
Dates	Area	Capacity Committed (MW)	Compliance reduction (MW)	Capacity Performance	Avg Hourly Expected Energy (MW)	Avg Hourly Settled Energy Reduction (MW)
6/14/2022	AEP Marion Subzone	94	91	97%	103	84.5
6/15/2022	AEP Marion Subzone	103	89	86%	103	91.5
6/16/2022	AEP Marion Subzone	90	59	66%	103	68.9
12/23/2022	MAD	1,488	1,833	123%	1,439	304
	Rest of RTO	2,764	3,241	117%	2,937	641
	Total	**4,252**	**5,074**	**119%**	**4,376**	**945**
12/24/2022	MAD	2,631	3,284	125%	2,626	830
	Rest of RTO	4,808	6,394	133%	4,697	1,328
	Total	**7,439**	**9,678**	**130%**	**7,323**	**2,158**

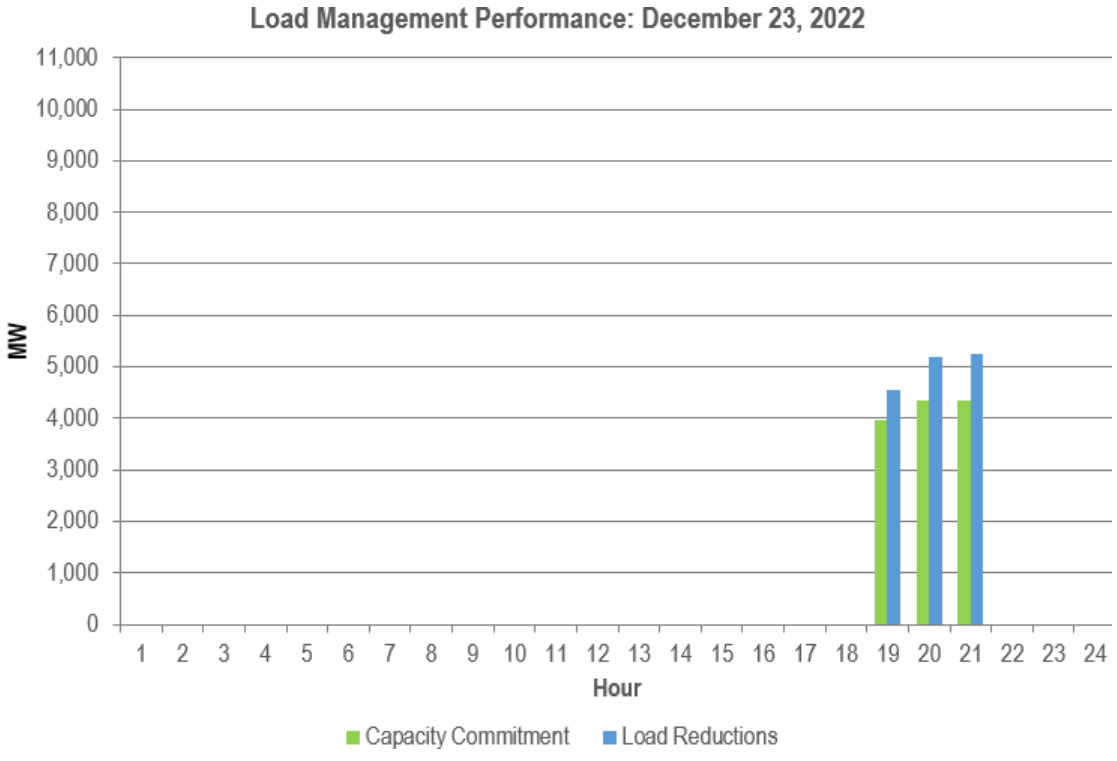
Past event performance and information can be found in the Historical Load Management Events report (https://pjm.com/-/media/planning/res-adeq/load-forecast/alm-history.ashx?la=en)

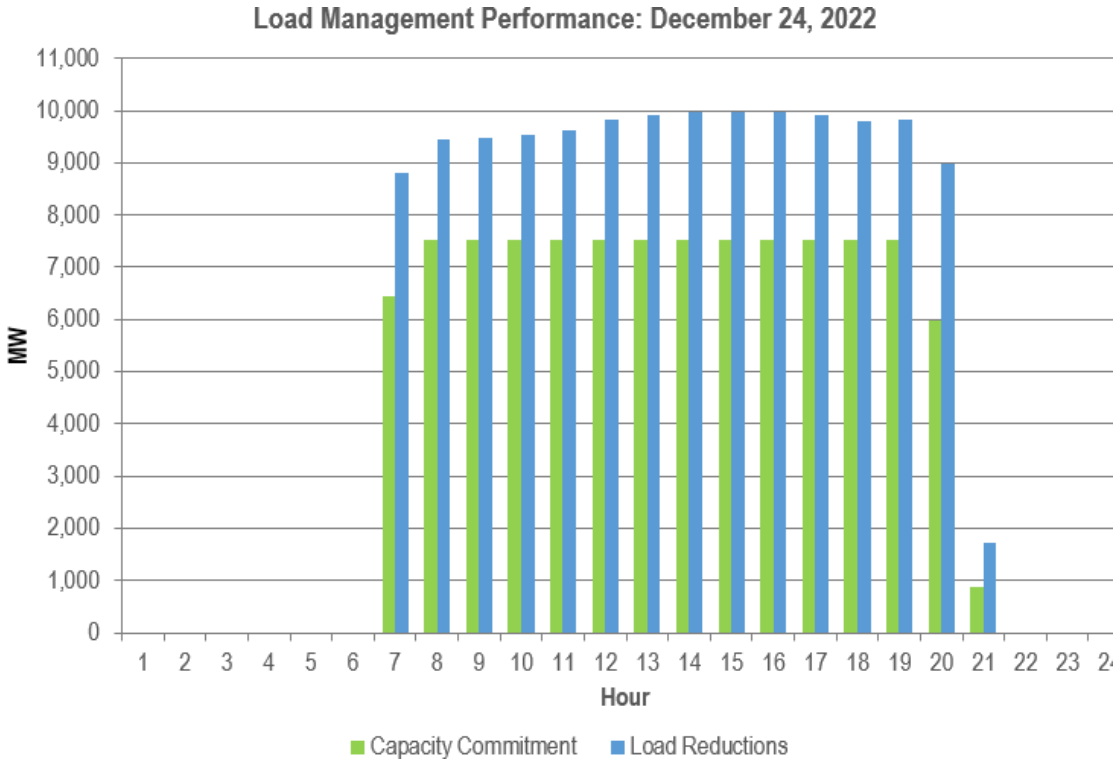
Figure 3. Load Management interval performance during the event (Hourly Capacity Commitment vs Hourly Capacity Load Reduciton)






Load Management in AEP Marion Sub-zone: June 16, 2022
MW Reduction
125
100
75
50
25
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour Ending
Capacity Commitment
Load Reductions


Load Management Performance: December 23, 2022
MW
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Capacity Commitment
Load Reductions


Load Management Performance: December 24, 2022
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
MW
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Capacity Commitment
Load Reductions

BONUS AND PENALTY PAYMENTS

Energy reductions from Load Management Economic DR and cleared Ancillary Services offers from Economic DR during the event intervals are eligible for Bonus payments. Total Bonus amount allocated to DR was $1.1M for June events and $86M for the December events. As the June events only impacted DR resources the DR performance penalties matched the DR Bonus payments. In December however performance shortfall for DR resulted in only $1.3M non-performance penalties as compared to $86M in Bonus payments. In aggregate, DR over-performed in December.

Table 5. Event bonus and penalties, DY 2022/23

Date	Type	Event penalty charges	Event bonus payments
6/14/2022	Load Mgt	$116,835	$55,132
	Economic DR	n/a	$61,704
	Total	**$116,835**	**$116,836**
6/15/2022	Load Mgt	$605,484	$374,665
	Economic DR	n/a	$230,818
	Total	**$605,484**	**$605,483**
6/16/2022	Load Mgt	$408,416	$189,362
	Economic DR	n/a	$219,054
	Total	**$408,416**	**$408,416**
12/23/2022	Load Mgt	$791,398	$16,114,390
	Economic DR	n/a	$2,548,749
	Total	**$791,398**	**$18,663,139**
12/24/2022	Load Mgt	$568,237	$62,067,381
	Economic DR	n/a	$5,771,102
	Total	**$568,237**	**$67,838,483**

EMERGENCY ENERGY SETTLEMENTS

Load Management DR Full type registrations are eligible to submit settlements for the energy reductions provided when dispatched for a Load Management event. The compensation is based on each registration's strike price, shutdown cost and the LMPs during the event. Energy payments consist of credits and make whole payments. Energy credits are calculated by multiplying the load reduction by LMP. Make whole payment is calculated based on the difference in expected daily revenue (based on strike price/shutdown cost) and actual daily revenue (based on LMP). Table 6 shows the settlement values for Load Management Events in 2022/23 delivery year.

Table 6. Emergency Energy settlement values, DY 2022/23

Date	Area	Energy Load Reduction	Energy Payments
6/14/2022	AEP Marion Subzone	512	$728,677
6/15/2022	AEP Marion Subzone	1,037	$1,420,669
6/16/2022	AEP Marion Subzone	317	$411,300
12/23/2022	MAD	1,428	$3,320,874
	Rest of RTO	3,055	$6,592,612
12/24/2022	MAD	13,431	$19,709,304
	Rest of RTO	20,683	$31,342,489

Test Requirement Overview

If a Load Management Registration is not dispatched 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 dispatched a mandatory event for those Registrations. If a PJM-initiated Load Management Event is dispatched 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. Rather, their performance will be based on the Load Management events.

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 Capacity Performance Product must be tested on a non-holiday weekday in June – October or May of the DY from 10AM – 10PM. 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 no 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

Only small portion of total committed DR resources that did not participate in mandatory emergency events had to test to assess their performance capability (summer only DR located outside of the AEP_MARION subzone). The testing result was 1,365 MW of over-compliance or a performance level of 410% across all zones. Table 7 shows the results.

Table 7. Load Management commitments, compliance, and test performance, DY 2022/23

Area	Committed ICAP (MW)	Test commitment (MW)*	Reduction (MW)	Over/under performance (MW)	Performance %
MAD	276.7	276.6	1,313	1,037	475%
Rest of RTO	164	164	492	329	301%
Total	440.7	440.6	1,805	1,366	410%

* *Test commitment = Commitment ICAP – Daily Deficiency MW – exempt MW – PAI MW*

Test Failure Charges for the 2022/23 Delivery Year are applied on an individual CSP/Zone basis for settlement purposes. The Test Failure Charges are reported on an aggregate basis here to preserve confidentiality. The weighted average Penalty Rate for the 2022/23 Delivery Year is $105/MW-day. The annual penalties for under-compliance total about $250K which will be allocated to RPM LSEs pro-rata based on their Daily Load Obligation Ratio.

Table 8. Load Management Test Penalties, DY 2022/23

Product	Penalties $	Shortfall (MW)	Average Weighted Penalty Rate ($/MW-day)
Capacity Performance	$ 250,346	6.5	$105

Resources that are short on Committed MWs face the deficiency charges. Deficiency charges are applied based on the amount of days in the year the resource is deficient of Committed MWs. Participants can make replacement transactions for future deficiencies which would change these values. For 22/23 Delivery Year there total deficiency charges equaled $275K.

Table 9. Load Management Deficiency Charges, DY 2022/23

Product	Average Weighted Deficiency Charge ($/MW-day)	Total charges ($)
Capacity Performance	$75	$275,022