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# DR Overview - PJM

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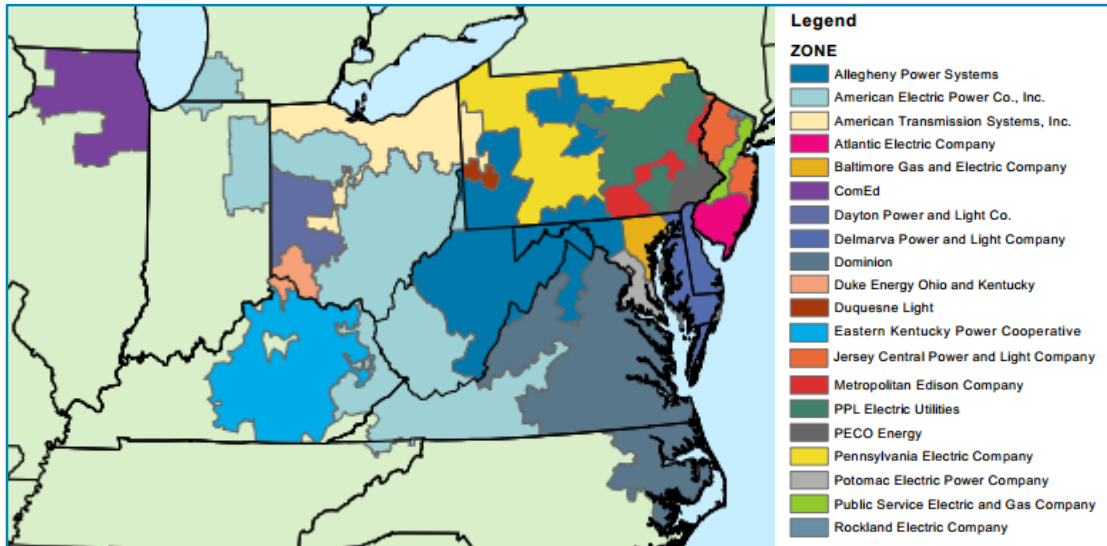
**Building Optimization and Demand Management:  
Challenges and Opportunities**

USGBC – July 25, 2018

# PJM Interconnection

Managing the world's largest electric grid and coordinating electricity transmissions to ensure grid reliability

## PJM Zonal Map



## Fast Facts

- People served: **>61 Million**
- States served: **13 & Washington, D.C.**
- Peak demand (2017): **146,595 MW**
- DR capacity (2017): **9,123 MW**
- DR payments (since 2010): **> \$1.2B**

# Program Guidelines

A rewarding way to earn money while being on standby as a resource for grid emergencies

	Base Capacity (BC)	Capacity Performance (CP)
<b>Demand Response Types</b>	Curtailment and permitted generation	
<b>Payments</b>	Capacity Payments (for being on stand-by) & Energy Payments (for event performance)	
<b>Costs</b>	No upfront, out-of-pocket costs to participate	
<b>Program Period</b>	Jun-Sep 2019	Jun 2019 – May 2020
<b>Program Days</b>	All days	All days
<b>Program Hours</b>	10:00 AM - 10:00 PM	Jun-Oct, May: 10:00 AM - 10:00 PM; Nov-Apr: 6:00 AM – 9:00 PM
<b>Dispatch Notification</b>	30 minutes – 2 hours	
<b>Dispatch Duration</b>	10 hours	Unlimited
<b>Maximum Dispatches</b>	Unlimited	Unlimited
<b>Testing Requirement</b>	1 test event per year only if no emergency event occurs	
<b>Availability</b>	DY 2019/20 only	From DY 2019/20 onward

# The Landscape of PJM's Emergency DR Program

ELRP's transition to a single year-round program is nearly complete

## How ELRP is Changing

- PJM's goal is to improve grid reliability with more operational availability and resource diversity during peak power system conditions throughout the entire year.
- By DY 2020/21, there will be only one year-round product - Capacity Performance (CP).
- PJM is also offering Base Capacity (BC), a summer-only product in DY 2019/20 to help participants adapt and transition.

## How You Benefit

- **Less risk of outages** due to a greater diversity of the capacity resources available throughout the year
- **Earn more** as prices for the extended-availability products have cleared higher than the average summer only products.
- **Lower energy prices** due to less use of high-cost generation resources (e.g. peaking power plants)

# PJM Emergency Dispatch History

## Mandatory Events By Zone (2007-2017)

- EnerNOC has successfully managed more than 70 PJM emergency dispatches since 2007

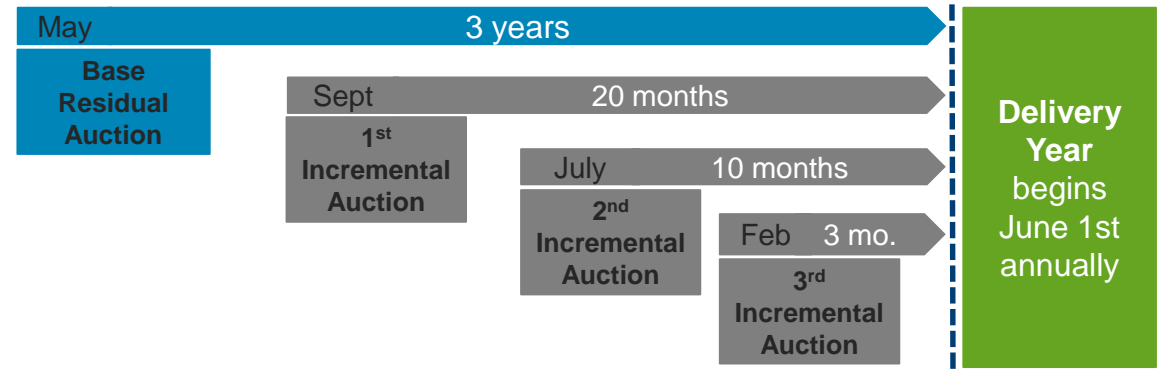
Zone	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg. Event
ACE	1	-	-	1	-	-	1	-	-	-	-	3h 13m
AEP	-	-	-	-	-	1	1	-	-	-	-	4h
APS	-	-	-	2	-	-	-	-	-	-	-	5h 30m
ATSI	N/A	N/A	N/A	N/A	-	-	5	-	-	-	-	3h 24m
BGE	1	-	-	3	1	1	1	-	-	-	-	3h 57m
ComEd	-	-	-	-	-	-	-	-	-	-	-	-
DAY	-	-	-	-	-	-	-	-	-	-	-	-
DEOK	N/A	N/A	N/A	N/A	N/A	-	-	-	-	-	-	-
DLCO	-	-	-	-	1	-	1	-	-	-	-	4h
DOM	1	-	-	1	-	1	1	-	-	-	-	3h 40m
DPL	1	-	-	1	1	1	1	-	-	-	-	3h 20m
DPL South	1	-	-	1	1	1	1	-	-	-	-	3h 20m
JCPL	1	-	-	1	1	1	1	-	-	-	-	2h 56m
MetEd	1	-	-	-	1	-	1	-	-	-	-	3h 33m
PECO	1	-	-	1	1	1	2	-	-	-	-	2h 57m
Penelec	1	-	-	-	-	1	1	-	-	-	-	2h 53m
PEPCO	1	-	-	4	-	1	1	-	-	-	-	3h 40m
PPL	1	-	-	-	-	-	2	-	-	-	-	2h 53m
PSEG	1	-	-	1	-	-	1	-	-	-	-	3h 13m
PSEG North	1	-	-	1	-	-	1	-	-	-	-	3h 13m
RECO	1	-	-	-	-	-	1	-	-	-	-	3h 20m

Note: Table excludes voluntary events: 1 in 2010, 2 in 2011, 2 in 2013, 6 in 2014, and 1 in 2015

# How EnerNOC Procures DR Capacity in PJM

EnerNOC secures all of its DR capacity in the Base Residual Auction (BRA), requiring millions of dollars in financial assurance 3 years in advance of the Delivery Year.

## Length of time between Auction and Delivery Year



**BRA capacity prices are typically 60-90% higher than Incremental Auction prices**

# PJM Zonal Pricing 2019-2022

<i>BRA Clearing Rates (\$/MW-year)</i>	2019/2020		2020/21	2021/22
<b>Zone</b>	BC	CP	CP	CP
Atlantic City Electric Company (ACE)	\$36,516	\$43,836	\$68,573	\$60,491
American Electric Power Co. Inc. (AEP)	\$29,280	\$36,600	\$27,933	\$51,100
Allegheny Power (APS)	\$29,280	\$36,600	\$27,933	\$51,100
American Transmission Systems, Inc. (ATSI)	\$29,280	\$36,600	\$27,933	\$62,535
Baltimore Gas and Electric Company (BGE)	\$29,390	\$36,710	\$31,405	\$73,110
Commonwealth Edison Company (ComEd)	\$66,894	\$74,214	\$68,664	\$71,376
The Dayton Power and Light co. (DAY)	\$29,280	\$36,600	\$27,933	\$51,100
Duke Energy Ohio Kentucky (DEOK)	\$29,280	\$36,600	\$47,450	\$51,100
Duquesne Light Company (DLCO)	\$29,280	\$36,600	\$27,933	\$51,100
Dominion Virginia Power (DOM)	\$29,280	\$36,600	\$27,933	\$51,100
Del Marva Power and Light Company (DPL)	\$36,516	\$43,836	\$68,573	\$60,491
Del Marva Power and Light Company South (DPL South)	\$36,516	\$43,836	\$68,573	\$60,491
Jersey Central Power and Light Company (JCPL)	\$36,516	\$43,836	\$68,573	\$60,491
Metropolitan Edison Company (Met-Ed)	\$29,280	\$36,600	\$31,405	\$51,100
PECO Energy Company (PECO)	\$36,516	\$43,836	\$68,573	\$60,491
Pennsylvania Electric Company (Penelec)	\$29,280	\$36,600	\$31,405	\$51,100
Potomac Electric Power Company (Pepco)	\$4	\$36,600	\$31,405	\$51,100
PPL Electric Utilities Corporation (PPL)	\$29,280	\$36,600	\$31,405	\$51,100
Public Service Electric and Gas Company (PSE&G)	\$36,516	\$43,836	\$68,573	\$74,566
Public Service Electric and Gas Company (PSE&G) - North	\$36,516	\$43,836	\$68,573	\$74,566
Rockland Electric Company (RECO)	\$36,516	\$43,836	\$68,573	\$60,491

# Historical PLC Hours

PLC hours typically occur in July and August, and on consecutive days

2012			2013			2014			2015			2016			2017		
Day	Date	Hour Ending	Day	Date	Hour Ending	Day	Date	Hour Ending	Day	Date	Hour Ending	Day	Date	Hour Ending	Day	Date	Hour Ending
Thu	Jul 5	16:00	Mon	Jul 15	18:00	Tue	Jun 17	18:00	Mon	Jul 20	17:00	Mon	Jul 25	16:00	Mon	Jun 12	18:00
Fri	Jul 6	17:00	Tue	Jul 16	17:00	Wed	Jun 18	17:00	Tue	Jul 28	17:00	Wed	Jul 27	17:00	Tue	Jun 13	17:00
Mon	Jul 16	17:00	Wed	Jul 17	17:00	Tue	Jul 1	18:00	Wed	Jul 29	17:00	Wed	Aug 10	17:00	Wed	Jul 19	18:00
Tue	Jul 17	17:00	Thu	Jul 18	17:00	Tue	Jul 22	18:00	Mon	Aug 17	15:00	Thu	Aug 11	16:00	Thu	Jul 20	17:00
Wed	Jul 18	15:00	Fri	Jul 19	15:00	Fri	Sept 5	16:00	Thu	Sept 3	17:00	Fri	Aug 12	16:00	Fri	Jul 21	17:00

Your PLC is calculated as your average demand during PJM's 5 coincident peak summer hours



# Historical WPL Days

WPL days typically occur in December and January, and on consecutive days

2015/16	
Day	Date
Tue	January 5, 2016
Wed	January 13, 2016
Mon	January 18, 2016
Tue	January 19, 2016
Wed	January 20, 2016

2016/17	
Day	Date
Thu	December 15, 2016
Fri	December 16, 2016
Sat	December 19, 2016
Sun	December 20, 2016
Mon	January 9, 2017

- Your WPL is calculated as your individual facility's peak demand between 6:00 a.m. - 9:00 p.m. EST on the 5 days when PJM's grid peaked the prior winter.
- Your WPL calculation is more advantageous than your summer PLC calculation, which looks at your facility's demand during PJM's peak summer hours, regardless of the time of day your facility peaks.

# Comparison of Demand Management Programs in PJM

	ELRP	Economic DR	SRM	System Peak Predictor
Seasonality	June 1 to September 30	Year-round	Year-round	June 1 to September 30
Effort Required	<p><b>LOW</b></p> <ul style="list-style-type: none"> <li>0-2 dispatches, varies by zone. Last mandatory dispatch was in 2013.</li> <li>Dispatches range from 4-6 hours. Audit dispatch is &lt;2 hours.</li> <li>Get notified 30 minutes - 2 hours in advance.</li> </ul>	<p><b>HIGH</b></p> <ul style="list-style-type: none"> <li>You choose when and how long to participate. More participation yields higher earnings, but you need an optimized participation strategy to make it worthwhile.</li> <li>You choose when to be notified - by 1:30 pm day-prior or 2 hours ahead.</li> </ul>	<p><b>HIGH</b></p> <ul style="list-style-type: none"> <li>5-15 dispatches. Need deep expertise to develop a bidding strategy in which you'll see a return from your participation.</li> <li>Dispatches are 12 minutes, on average, 30 minutes maximum.</li> <li>Get notified 10 minutes in advance.</li> </ul>	<p><b>HIGH</b></p> <ul style="list-style-type: none"> <li>8-12 "high alert" days, but no guarantee right days are identified.</li> <li>Dispatches range from 3-4 hours.</li> <li>Get alerted up to 1-week ahead, with 10:00 am day-of notice.</li> </ul>
Reward Potential	<p><b>MEDIUM</b></p> <p>Earn \$30-\$70K per year for agreeing to reduce 1 MW. Earn even if there are no dispatches.</p>	<p><b>LOW</b></p> <p>Earn \$20K or more per year for reducing 10 MW of demand for up to 20 hours a year.</p>	<p><b>LOW</b></p> <p>Earn \$15-\$30K per year for agreeing to reduce 1 MW, 24x7. Earn even if there are no dispatches.</p>	<p><b>VARIABLES</b></p> <p>Save \$15-77K next year on capacity/PLC charge by reducing 1 MW on all 5CPs.</p>