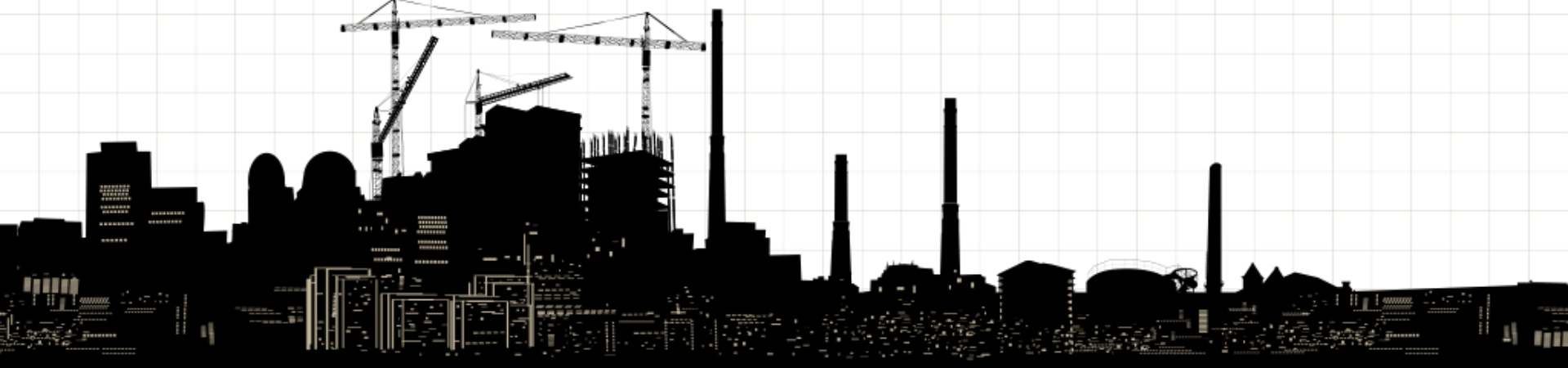




# PJM Demand Response Spring 2017

4/6/17



# Discussion Topics

CPower Introduction (Curtailment Service Provider Role)

Demand Response Overview

PJM Capacity Market Demand Response Program

- Capacity Based Program

  - Program Parameters

  - Payment Summation

PJM Synchronized Reserve Program

PJM Energy Efficiency Program

- Permanent Load Reduction

Next Steps/Timing



# Who is CPower?

CPower is an energy management company focused on demand response programs that will help you maximize revenue, achieve sustainability goals and minimize business interruptions. We will work to provide you the best strategy to meet your energy goals.

- 100+ Dedicated Resources
- National Markets and Coverage
- Decades of Energy Experience
- DR Focused
- End-to-End, Full Service Operations
- Strategic Partnerships with Leading Energy Efficiency Companies.



# What are the Benefits?

CPower provides:

## A Focus on Demand Response

- CPower does not sell energy, we sell curtailment solutions that pay you.
- CPower has hundreds of years of collective energy management knowledge & experience.

## The best solution, not a solution

- Minimize your implementation costs, business impact and operational disruption.
- Maximize your revenue potential.
- Strategic partnerships that match your facility needs with your energy goals.

## An experienced team dedicated to hitting your energy & sustainability goals

- From Engineering assessments to dispatch, CPower offers a fully integrated team which will clearly communicate all objectives, regulations and requirements – start to finish.

## A mobile-responsive application with up-to-the minute energy usage

- The CPower App gives you mobile flexibility to access the data you need - when you need it.

## Continuous education and evaluation

- It does not stop at the contract. CPower will regularly provide feedback and recommendations to maximize your revenue and energy goals while continually educating you on new regulatory information.

Know More, Earn More



# CPower Team



Dailey Tipton  
VP & GM, PJM



Bill Oosterom  
Account Executive



Donna Karas  
Account Manager



Ray Berkebille  
Engineering



Jim Disabato  
Project Manager



Dann Price  
Market Development



Cathy Smith  
Operational Readiness



Rory Caster  
Operations

# The CPower App

Energy Management at your fingertips

## Real-time data

- Combined with real-time metering, the CPower app can show your min-to-min changes in your energy usage, bidding and revenue.

## Fully-mobile application

- The CPower app's responsive design layout allows for you to carry over full desktop functionality into the palm of your hand.

## Easy-to-use interface

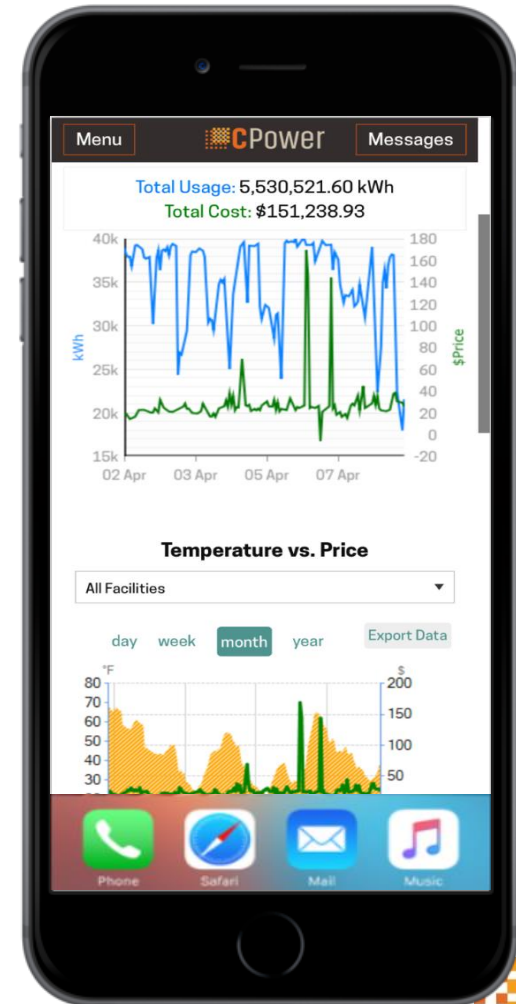
- Easily toggle between financial, usage and comparison data from one drop down.
- Intuitive charts make data easier to consume.

## Make faster decisions

- React to events and dispatches more quickly by implementing your curtailment activities while on the go or away from your facility.

## No Cost

- Unlike most energy management technologies, our app is free and has unlimited usage when you are a CPower customer.



# CPower

## Curtailment Service Provider (CSP) Role

### PJM Membership

- Required to participate in Demand Response programs
- Carries membership obligations and risks
- Represent customer interests in stakeholder settings
- Secure MW position via Auction Process three (3) years in advance

### Enrollment/Registration

#### Assess/Qualify Potential Participant Capabilities

Energy Engineers deployed to identify curtailment strategies and quantify potential program revenue

Assess optimal risk profile for customer based on operational needs

Register load response assets with PJM

### Operational Procedures and Responsibilities

Initiation and termination of events

### Settlement





# Demand Response Overview

## ➤ Definition

- Measurable reduction in electrical usage by customers in response to market conditions
- Customers participate in a curtailment program that provides an incentive to reduce load during critical periods

*“Demand response is one of many resources needed to satisfy the increasing demand for electricity in North America.”*

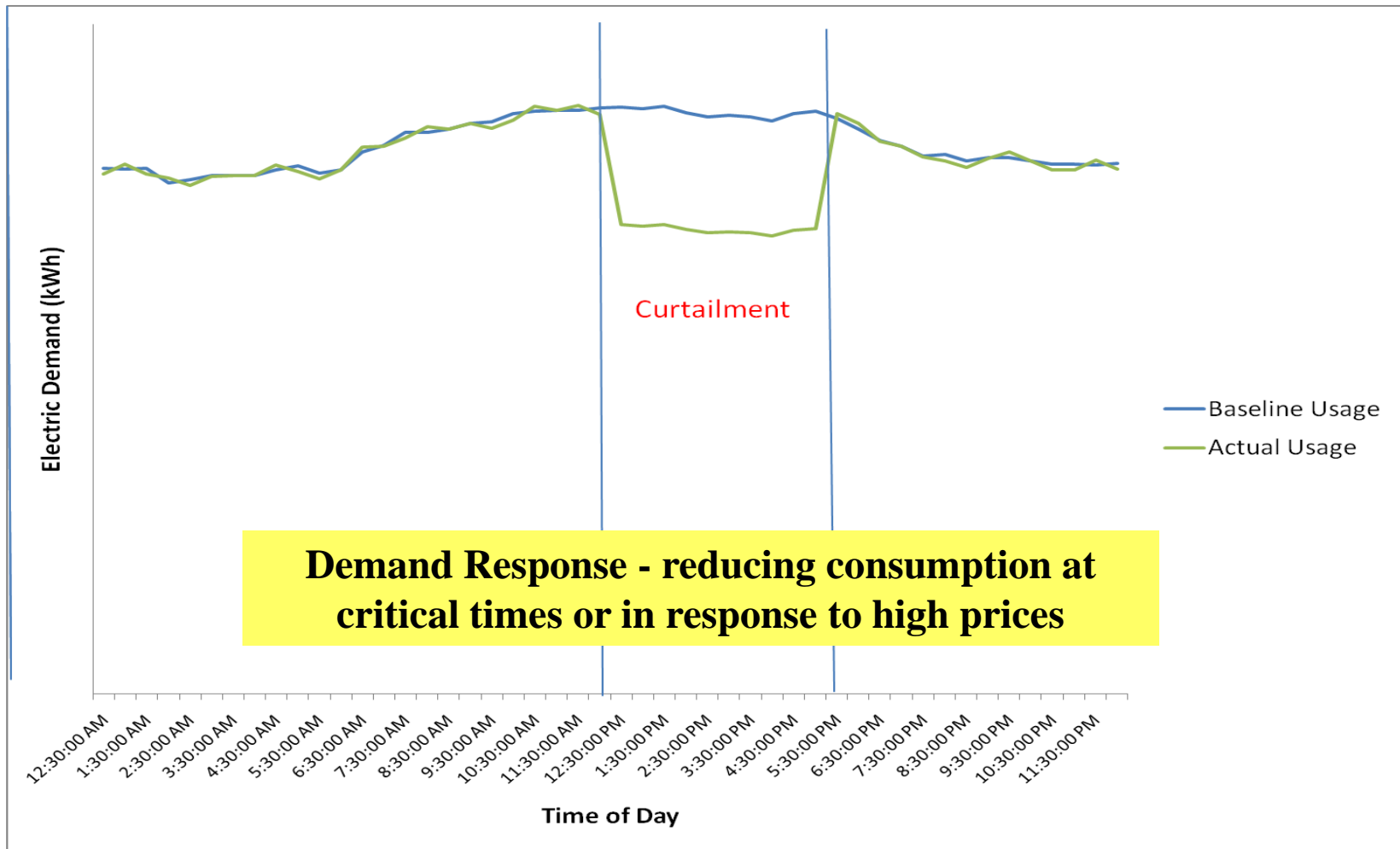
- North American Electric Reliability Corp.

## ➤ Benefits

- Provides a significant source of new revenue
- Helps ensure local electric grid reliability
- Benefits environment by reducing the need for new peaking power plants



# Demand Response Proposition



# What Resources are used for Demand Response?



Lighting Reduction



AC Strategies



Backup Generation



Elevator Cycling

- Manual or Automatic Load Drop
- Energy Management Systems
- Load Shedding Schemes
- Lighting Control Schemes
- Backup Generation
- Ice Storage Systems

# Program Commitment Definition

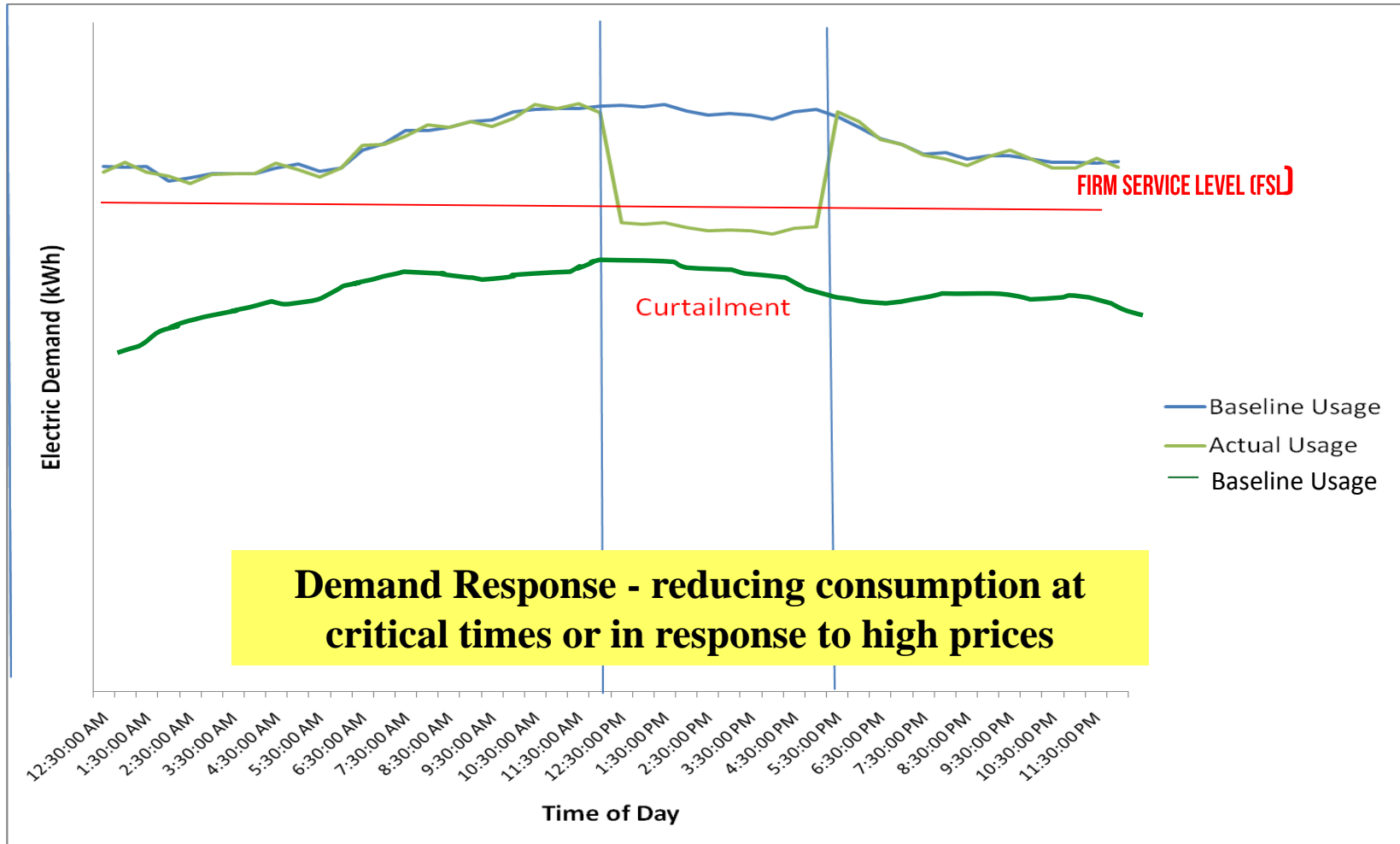
## Firm Service Level (FSL)

Each PJM Capacity Program Registrant will agree to a Firm Service Level (FSL) kW value which represents the kW level that the specific site will agree not to exceed during either a PJM-initiated curtailment event or the one (1) hour test, if applicable.

If, during an event as described above, the site kW load is above the agreed-upon FSL level, the program participant agrees to curtail kW load down to or below said level during the duration of the event in order to be deemed program compliant.

If, during an event as described above, the site kW load is at or below the agreed-upon FSL level, the program participant agrees not to increase the site kW load above said level during the duration of the event in order to be deemed program compliant.

# Demand Response Proposition





# PJM Capacity Market Demand Response Program

Designed to prevent grid failure/interruptions during periods  
of high summer usage



# What Is PJM?

Fully functioning regional transmission organization (RTO) and independent system operator (ISO)

Operates the world's largest wholesale electric market

350 members/customers (market buyers, sellers, and traders)

PJM serves approximately 51 million people and coordinates the movement of electricity through all or parts of 14 states (DE, IL, IN, KY, MD, MI, NJ, NC, OH, PA, TN, VA, WV and DC)

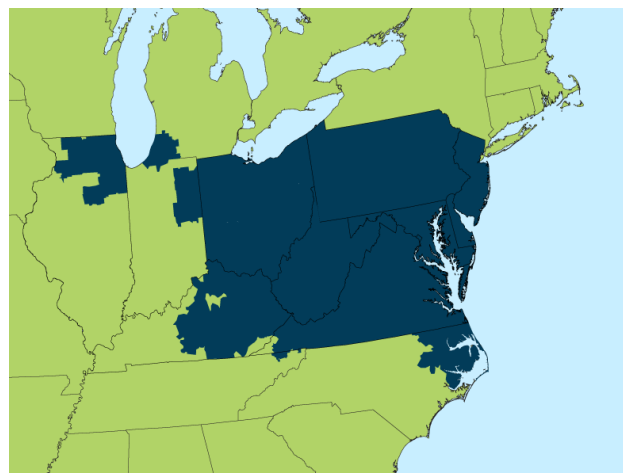
## Statistics

163,806 MW generation sources

144,644 MW peak demand

1,082 generating sources

56,070 miles transmission lines



# PJM Capacity Market Programs

Limited (Summer)

- June through September
- Weekdays, excluding holidays, from 12:00 pm – 8:00 pm
- Available for interruption for up to 10 times during curtailment period
- Each event could last up to six (6) hours in duration; 60 hours aggregate maximum
- Thirty (30) Minute Response
- 100 kW minimum commitment
- One (1) Hour Test Event minimum, if no actual PJM-initiated events are called
- Events outside of parameters above will be communicated, but are voluntary

Extended

- June through October and the following May
- 7 days/week between the hours of 10:00 am – 10:00 pm
- Available for an unlimited number of interruptions during an extended curtailment period
- Each event could last up to ten (10) hours in duration
- Thirty (30) Minute Response
- 100 kW minimum commitment
- One (1) Hour Test Event minimum, if no actual PJM-initiated events are called
- Events outside of parameters above will be communicated, but are voluntary



# Historical Emergency Events

<u>Year</u>	<u># of events</u>	<u>Event Durations</u>	<u>Yearly Totals</u>
2005	2 events	2.8 hrs / 4.2 hrs	7 hours total
2006	2 events	4 hrs / 5 hrs (2-MidAtlantic only)	9 hours total
2007	1 event	5 hrs (SW & Eastern MAAC)	5 hours total
2008	0 events		0
2009	0 events	1 one-hour test event	1 hour total
2010	3 events	4 hours/4 hours/4 hours	12 hours total
2011	1 event	5 ½ hours	5 ½ hours total
2012	1 event	3 hours; Not all zones	3 hours total
2013	1 event	3.5 hours	3.5 hours total
2014	0 events	1 one-hour test event	1 hour total
2015	0 events	1 one-hour test event	1 hour total
2016	0 events	1 one-hour test event	1 hour total

# Non-Performance – PJM Events

## **PJM-Initiated Curtailment Event (Limited)**

- No “out of pocket” penalty – Revenue Forfeiture Only
- Forfeiture of expected annual capacity payment commensurate with missed curtailment amount
- Based on # of events
- No response/partial response to an event will not result in any out of pocket cost
- Paid for the curtailment level achieved up to enrollment commitment

## **PJM-Initiated Curtailment Event (Extended)**

- No “out of pocket” penalty – Revenue Forfeiture Only
- Same as above for Limited Events
- Forfeiture of 1/52<sup>nd</sup> of annual expected revenue for each Extended event
- Pro-rated by amount and duration of under compliance

## **Potential Test Event (if an actual event is not called)**

- If there are no PJM initiated-events, a one (1) hour mandatory test event will be held
- Forfeiture of annual expected revenue for missed amount, plus a potential 20% payment penalty



# Looking Forward

Beginning with the 2018-2019 program year, the Limited Product will be discontinued and will be replaced with the Base Capacity and the Capacity Performance products for the 2018-2019 and 2019-2020 program years

## Base Capacity

- June through September; 7 days/week
- 10:00 am – 10:00 pm; 10 hour max duration
- Unlimited # of events

## Capacity Performance

- Year-Round
- Jun-Oct, then following May: 10 am – 10 pm; 7 days/week
- Nov – April: 6:00 am – 9:00 pm; 7 days/week
- No limit on event duration and # of events

•Beginning in the 2020-2021 program year, only Capacity Performance program will be available

# PJM Capacity Market Values

## 2017-2018 through 2019 - 2020

2017/18						2018/19				2019/20		
\$/MW-day						\$/MW-day				\$/MW-day		
Zone	Limited	Extended Summer	Annual	Capacity Performance		Zone	Base Capacity	Capacity Performance		Zone	Base Capacity	Capacity Performance
AECO	\$106.02	\$120.00	\$120.00	\$151.50		AECO	\$210.63	\$225.42		AECO	\$99.77	\$119.77
AEP	\$106.02	\$120.00	\$120.00	\$151.50		AEP	\$149.98	\$164.77		AEP	\$80.00	\$100.00
APS	\$106.02	\$120.00	\$120.00	\$151.50		APS	\$149.98	\$164.77		APS	\$80.00	\$100.00
ATSI	\$106.02	\$120.00	\$120.00	\$151.50		ATSI	\$149.98	\$164.77		ATSI	\$80.00	\$100.00
BGE	\$106.02	\$120.00	\$120.00	\$151.50		BGE	\$59.95	\$164.77		BGE	\$80.30	\$100.30
COMED	\$106.02	\$120.00	\$120.00	\$151.50		COMED	\$200.21	\$215.00		COMED	\$187.77	\$202.77
DAY	\$106.02	\$120.00	\$120.00	\$151.50		DAY	\$149.98	\$164.77		DAY	\$80.00	\$100.00
DEOK	\$106.02	\$120.00	\$120.00	\$151.50		DEOK	\$149.98	\$164.77		DEOK	\$80.00	\$100.00
DOM	\$106.02	\$120.00	\$120.00	\$151.50		DOM	\$149.98	\$164.77		DOM	\$80.00	\$100.00
DPL	\$106.02	\$120.00	\$120.00	\$151.50		DPL	\$210.63	\$225.42		DPL	\$99.77	\$119.77
DUQ	\$106.02	\$120.00	\$120.00	\$151.50		DUQ	\$149.98	\$164.77		DUQ	\$80.00	\$100.00
EKPC	\$106.02	\$120.00	\$120.00	\$151.50		EKPC	\$149.98	\$164.77		EKPC	\$80.00	\$100.00
JCPL	\$106.02	\$120.00	\$120.00	\$151.50		JCPL	\$210.63	\$225.42		JCPL	\$99.77	\$119.77
METED	\$106.02	\$120.00	\$120.00	\$151.50		METED	\$149.98	\$164.77		METED	\$80.00	\$100.00
PECO	\$106.02	\$120.00	\$120.00	\$151.50		PECO	\$210.63	\$225.42		PECO	\$99.77	\$119.77
PENELEC	\$106.02	\$120.00	\$120.00	\$151.50		PENELEC	\$149.98	\$164.77		PENELEC	\$80.00	\$100.00
PEPCO	\$106.02	\$120.00	\$120.00	\$151.50		PEPCO	\$41.09	\$164.77		PEPCO	\$0.01	\$100.00
PPL	\$40.00	\$53.98	\$120.00	\$151.50		PPL	\$75.00	\$164.77		PPL	\$80.00	\$100.00
PSEG	\$201.02	\$215.00	\$215.00	\$151.50		PSEG	\$210.63	\$225.42		PSEG	\$99.77	\$119.77
RECO	\$106.02	\$120.00	\$120.00	\$151.50		RECO	\$210.63	\$225.42		RECO	\$99.77	\$119.77

# PJM Capacity Market Program Payments

## Delmarva Power Zone

Two (2) year revenue projection for the participant per 100 kW curtailment commitment and program compliance

### Limited/Base Capacity Program

- 2017/2018 Program    \$3,018.39/year    6/1/17 through 5/31/18
- 2018/2019 Program    \$5,996.64/year    6/1/18 through 5/31/19

### Extended/Capacity Performance Program

- 2017/2018 Program    \$3,416.40/year    6/1/17 through 5/31/18
- 2018/2019 Program    \$6,417.71/year    6/1/18 through 5/31/19



# PJM Synchronized Reserve Demand Response Program

Payment from PJM for the ability to quickly shed load in  
response to short-term reliability needs



# PJM Program: Synchronized Reserve

<b>Program highlights</b>	<ul style="list-style-type: none"><li>• Reserve market service is a year-round program whereby the PJM RTO occasionally needs immediate assistance with system reliability.</li><li>• If the participant's nominated curtailment is accepted by PJM, payment is earned regardless of whether an event is called.</li><li>• Event notification: 10 minutes prior to the event.</li><li>• Number of events: Estimated 40 events per year.</li><li>• Duration: Up to 30 minutes</li></ul>
<b>Timing</b>	<ul style="list-style-type: none"><li>• Program is available 24/7/365.</li></ul>
<b>Requirements</b>	<ul style="list-style-type: none"><li>• 100kW minimum load commitment.</li><li>• 10-minute response time.</li><li>• Load will be curtailed for a maximum of 30 minutes per event</li><li>• One-minute interval metering is required</li></ul>
<b>Payments</b>	<ul style="list-style-type: none"><li>• Amount based on Synchronous Reserve Market Clearing Price (SRMCP).</li></ul>





# PJM Energy Efficiency Demand Response Program

Payment from PJM for permanent load reduction (kW)  
provided via energy-efficiency retrofits/projects



# What is PJM Energy Efficiency (EE) Program?

The installation of more efficient devices, equipment, processes, and/or systems

New Construction: exceeding ASHRAE energy code

Retrofit: reduction from current demand baseline

- Permanent & Continuous Peak kW Demand Reduction during Performance hours
- June thru August, Weekday, Non-Holiday, 3-6pm

Non-dispatchable, non-operator intervention

NOT Demand Response (DR)

Measurement & Verification Requirements

# What Projects Qualify?

- Lighting
- Refrigeration Equipment
- HVAC
- Motors
- VFD's
- Weatherization / Building Envelope
- Process Improvements
- Any Electrical Reduction Improvement

# What does not Qualify for EE?

Installations that are NOT a permanent load reduction during EE Performance Hours

- Dispatchable Resources
- Load shifting
- Behavior change, Programmable Thermostats
- Generation:
- Generators, Solar, Wind, Cogeneration
- Fuel Switch (ex: conversion to natural gas)

# Installation Period

Installation Period	Fully Installed for Summer	Eligible Delivery Years
June 2013 - May 2014	2014	2014/15, 2015/16, 2016/17, 2017/18
June 2014 - May 2015	2015	2015/16, 2016/17, 2017/18, 2018/19
June 2015 - May 2016	2016	2016/17, 2017/18, 2018/19, 2019/20
June 2016 – May 2017	2017	2017/18, 2018/19, 2019/20, 2020/21

# Information Required

## Preliminary Information Required

### Description of Measures Completed

- What type of project?
- When completed?
- Estimated kW reduction

### Have rebates been received for this project?

- If yes, copy of rebate application

### Client Name, Address, PJM Zone, Utility Account Number(s)

After initial evaluation to ascertain whether the project is qualified and the potential revenue estimated, additional detail information may be required.

# Path Forward

- Customer Usage Authorization Form
- Identification of Curtailment Strategies and Resultant Commitment
  - Demand Response Questionnaire
  - Discussions with Facilities and CPower Energy Engineer
  - Access to Requisite Interval Meter Data
- Program Revenue Projection based on identified curtailment level
- Program Registration (April 2017)



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