



Operator Training Committee of Ohio

Presentation for December 11 workshop
2015



Managing Energy Costs

On Both Sides of The Meter



Supply Side



Demand Side



Explore Options

5 Major Things to do to Manage Energy costs

Explore Demand Response

Manage Your Peaks

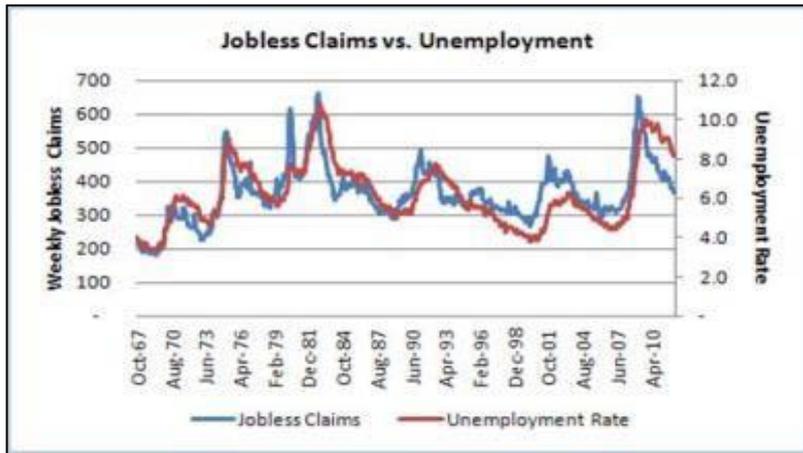
Shop while markets are low – use competitive process

Implement Energy Efficiency

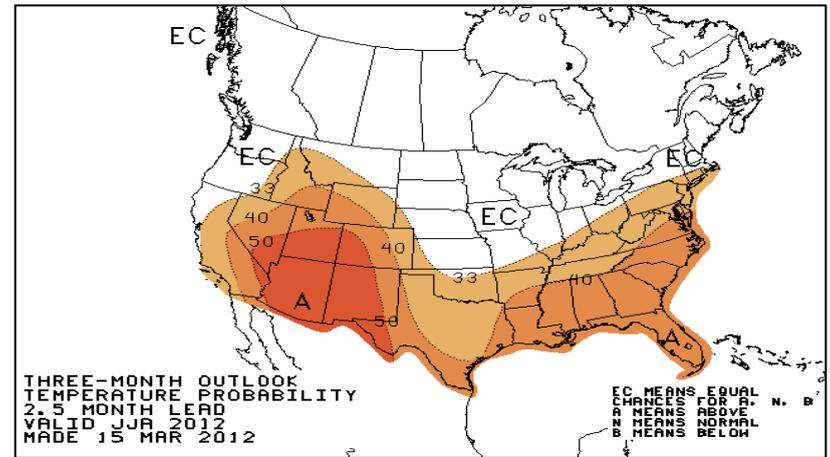
Consider Renewables – Solar

Energy Market Forces

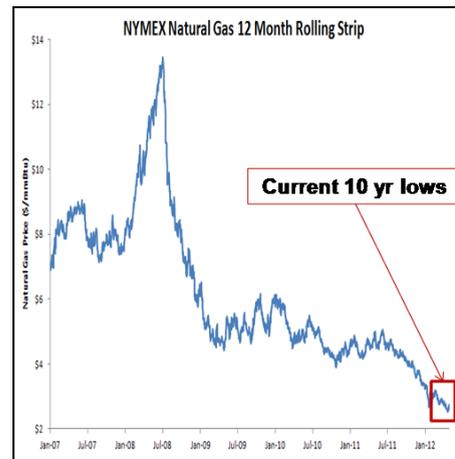
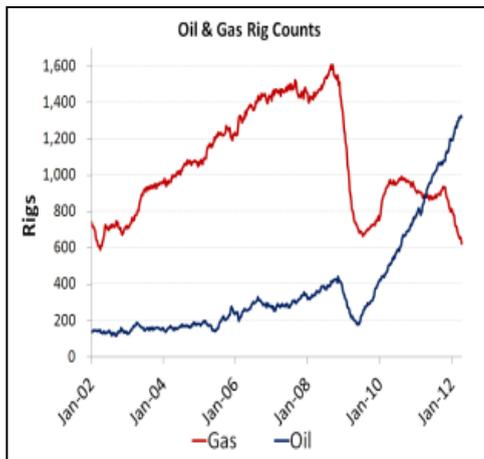
Macroeconomic



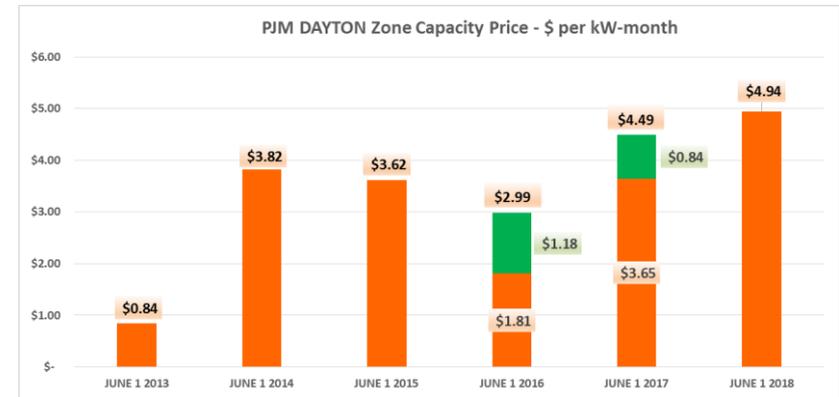
Weather



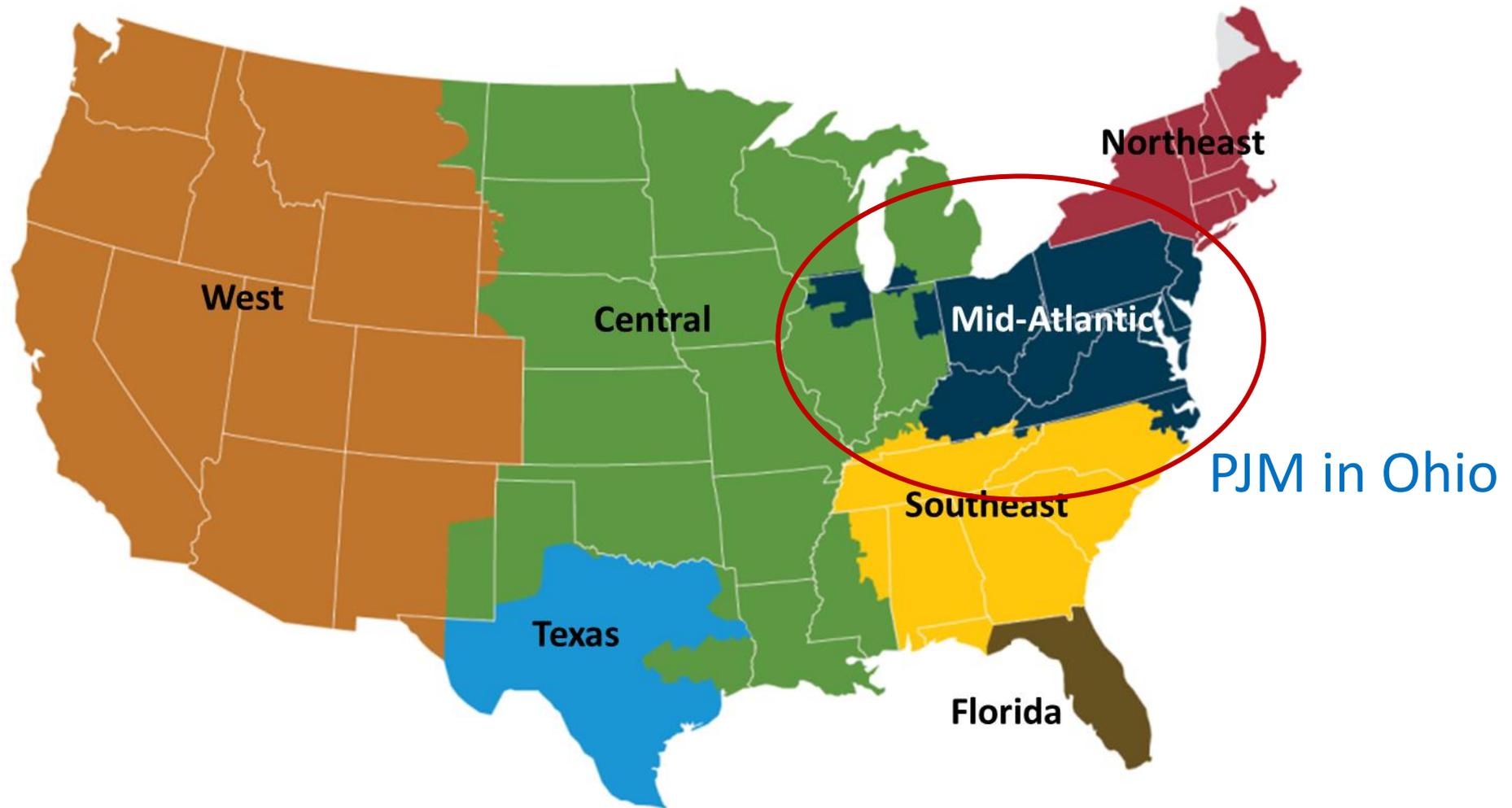
Energy Fundamentals



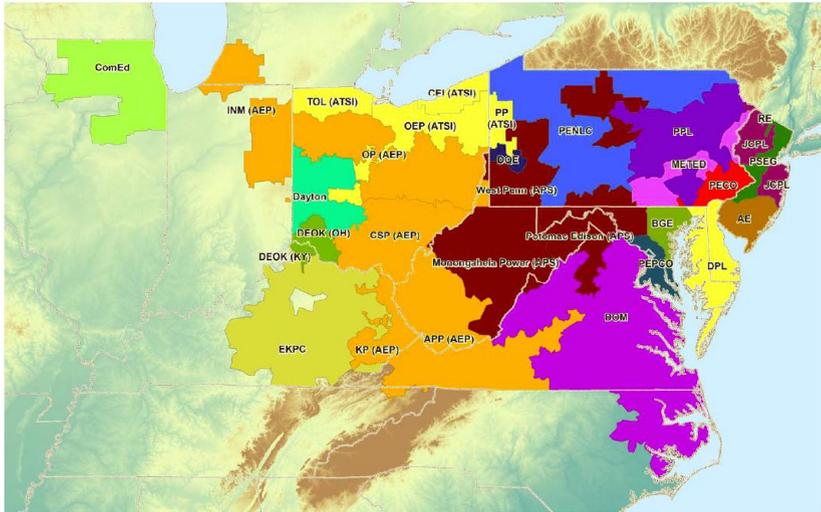
Regulatory Policy



USA – multiple grids manage electricity & transmission



PJM Interconnection – our grid operator



- Founded in 1927, non-profit
- Serves 61 million people
- Ensures the reliability of the high-voltage electric power system in all or parts of Ohio, DE, IL, IA, KY, MD, MI, NJ, NC, PA, TN, VA, West VA and the District of Columbia.
- PJM coordinates and directs the operation of the region's transmission grid, which includes 62,556 miles of transmission lines -
 - administers a competitive wholesale electricity market
 - plans regional transmission expansion improvements to maintain grid reliability and relieve congestion

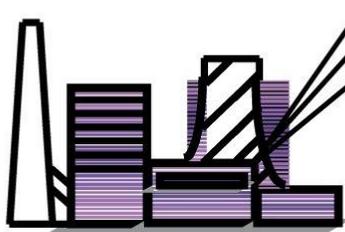
Electric System from Generators to your Facility

PJM manages the flow

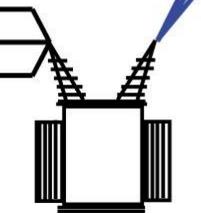
Basic Structure of the Electric System

Color Key:

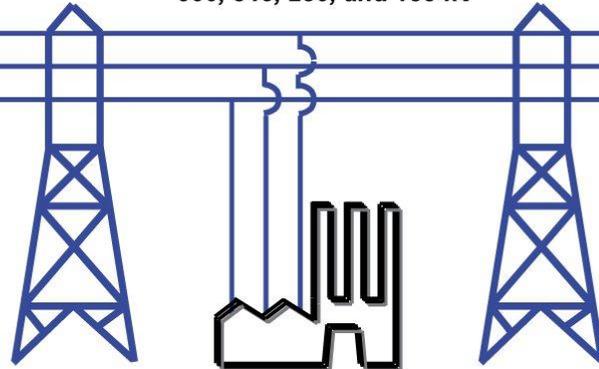
- Blue: Transmission
- Green: Distribution
- Black: Generation



Generating Station



Generator Step Up Transformer

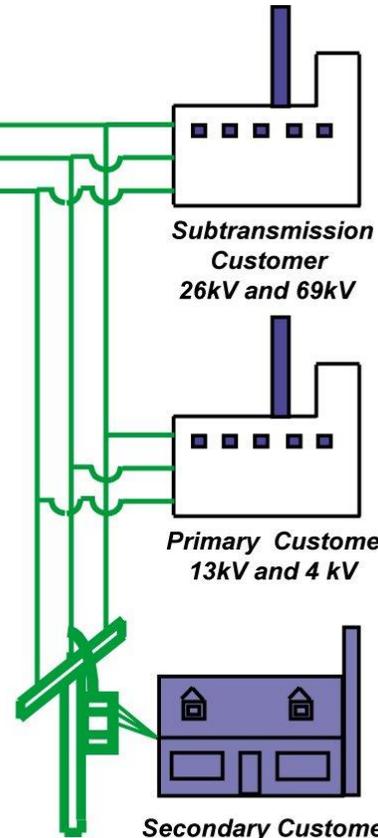


Transmission Lines
500, 345, 230, and 138 kV

Transmission Customer
138kV or 230kV



Substation Step-Down Transformer



Subtransmission Customer
26kV and 69kV

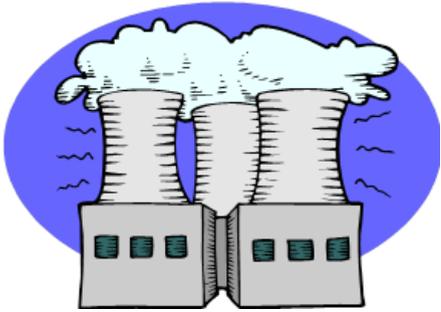
Primary Customer
13kV and 4 kV

Secondary Customer
120V and 240V

PJM collects

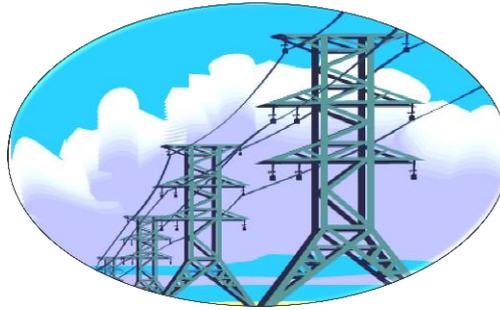
Suppliers

Guttman Energy, GDF Suez,
Direct Energy, Constellation



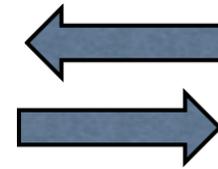
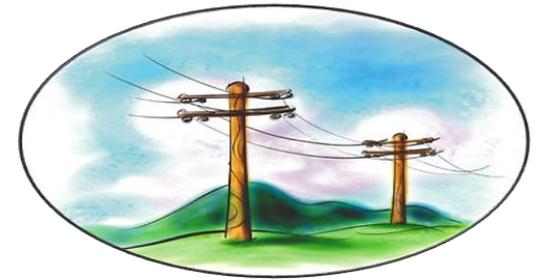
PJM Interconnect

Capacity & Transmission



Distribution Company

CEI / Ohio Edison, Toledo
Edison AEP, Duke, DPL



- Suppliers & Distribution Company must pay PJM for transmission & capacity
- Both transmission and capacity costs are affected directly by your peak load contribution (PLC)



PJM Administers Capacity Auction

Auctions held in May

Sets pricing 3 years into the future

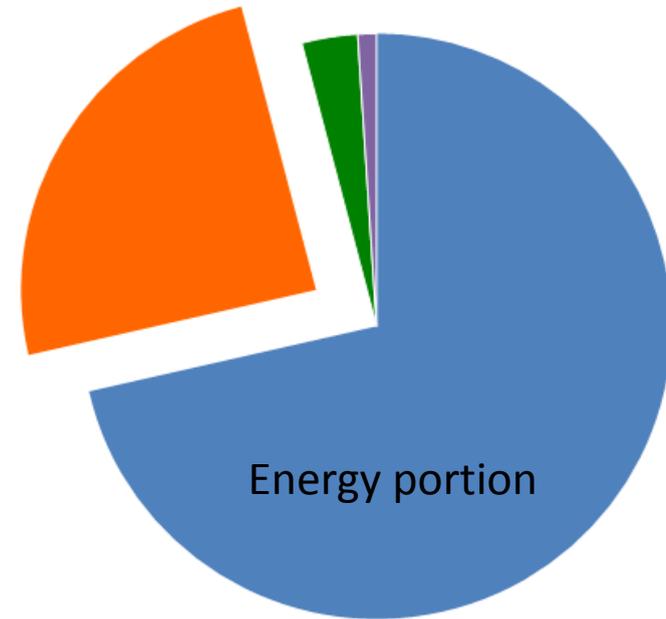
Generators bid in resources

2015 Auction held in August – delayed for new capacity product called CP – Capacity Performance

Capacity

2nd largest component of your contracted supply price

- Capacity
- Wholesale Commodity Price
- Ancillary services
- Supplier, agent, credit, admin, tax



Supplier Price is the Whole

Capacity refers to the grid’s ability to deliver the maximum required power at any moment. Maximum required power is the total power demanded by all customers at any given moment.

PJM Auction determines the price of capacity

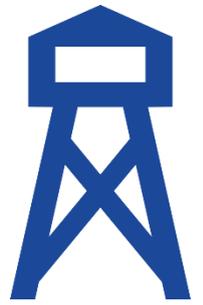
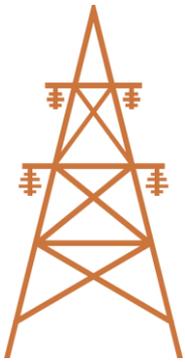
Fixed Pricing Components

Some or all are subject to risk premiums*

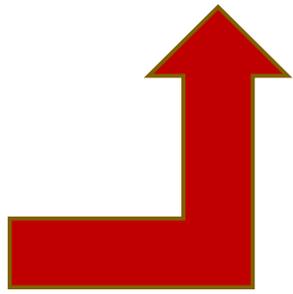
- **Fixed Components Of Price Category Floating Components Of Price Category**
- Volumetric Swing Provision Energy
- Zonal Basis (Basis from Hub to Load Zone) Energy
- Imbalance Energy
- Losses (Transmission Losses and Distribution Losses to meter) Energy
- Hub Energy (Energy at the applicable Hub) Energy
- Locational Reliability / Installed Capacity / Reliability Pricing
- Model (RPM)
- Capacity
- Future Change in ISO Capacity Tag (Charge/Credit) Capacity
- Day-Ahead Scheduling Reserve Ancillary
- Marginal Loss Over-collection Credit Ancillary
- Auction Revenue Rights Credit Ancillary
- Reactive Services Ancillary
- RTO Start-up Cost Recovery Ancillary
- Reactive Supply and Voltage Control from Generation and other
- Sources Service
- Ancillary
- Renewable Portfolio Standard (RPS) Charges Ancillary
- ISO Administrative Charges Ancillary
- Marginal Loss De-rate Credit Ancillary
- Operating Reserves Ancillary
- Synchronized Reserves Ancillary
- Transmission Enhancement Charges (TECs) Ancillary
- Black Start Service Ancillary
- Transmission owner Scheduling, System Control, & System Dispatch
- Regulation and Frequency Response Service Ancillary
- Expansion Cost Recovery Ancillary
- Synchronous Condensing Ancillary

*These components are published by GDF Suez in their pricing proposals

Current Forces on Prices



- Capacity costs increasing for 2016, 2017 & 2018
 - PJM Capacity Performance
- Stable, low cost coal being replaced by natural gas
 - sometimes lower prices but more volatility
- Natural gas is the dominant fuel for electric generation nationally
 - MATS caused switch from coal to gas for power generation
- Shale gas economics uncertain
 - Moratoriums; future fuel scarcity; future *Black Swan* event?
 - Fuel scarcity as demand increases and LNG exports increase



Future of Electricity Prices - uncertainty price forecasts higher

June 2015 -- FERC approves PJM's Capacity Performance product that is fully implemented by 2018.

- Increases for 2016 & 2017 already published prices
- Higher cost of 2018 capacity

December 2015 -- FirstEnergy's Power Purchase Agreement accepted by PUCO staff for 8 years but not 15. Final approval pending. AEP has similar PPA pending.

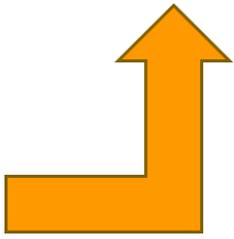
- FE claims it needs income guarantees to support aging plants
- Rate payers will pay to subsidize old coal plants & Davis Besse nuclear plant through higher distribution charges
- FE says its essential to maintain reliability
- Cost \$3.9 billion over 8 years



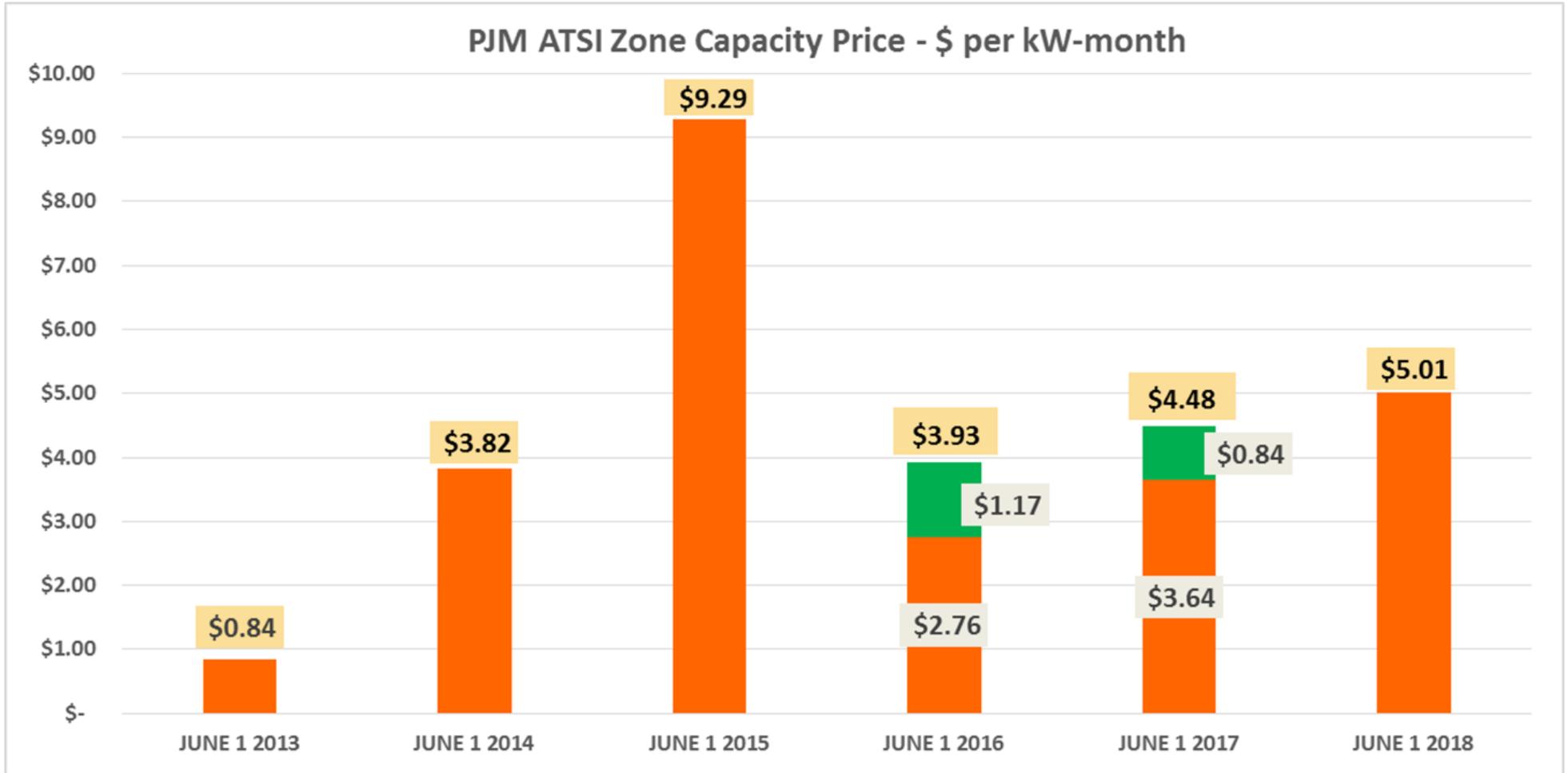
PJM Capacity Performance

new product introduced

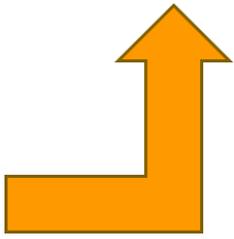
- Polar Vortex weather events of Jan 2014 and Feb 2015 prompts PJM to review overall capacity rules
- New product – “Capacity Performance” pays generators additional monies to perform under extreme weather conditions.
- Generators bidding in CP product must perform when PJM calls or incur severe penalties
- Proposal required PJM hold incremental auctions for 2016/2017 and 2017/2018 to phase in new product
- Auctions held in August 2015 that re-set prices
- Auction results raise the capacity rates for 2016/2017 and 2017/2018



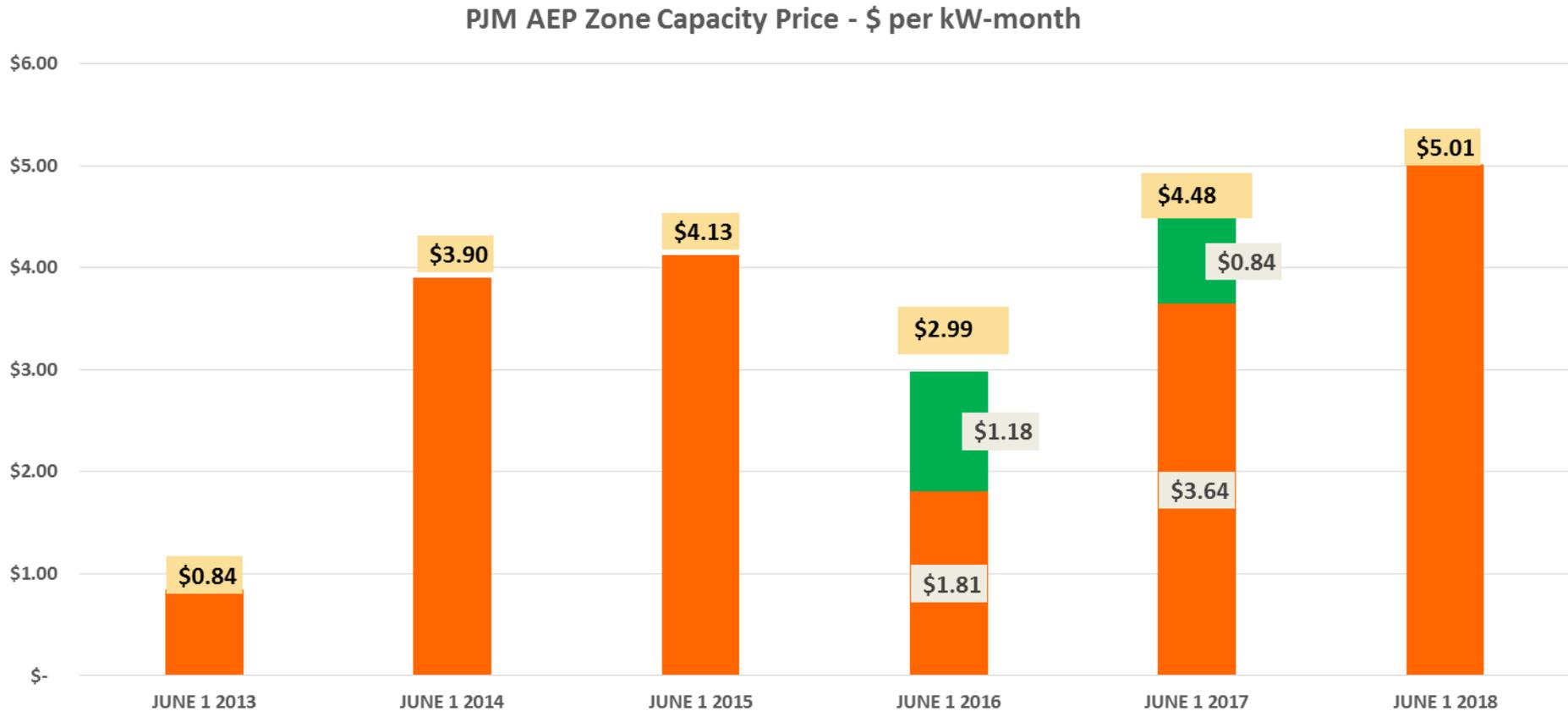
PJM Capacity Prices increasing - FirstEnergy



PLC X Capacity cost X PJM factor 1 X PJM Factor 2 = Your Capacity obligation (\$)



PJM Capacity Prices increasing – AEP, Dayton, Duke



PLC X Capacity cost X PJM factor 1 X PJM Factor 2 = Your Capacity obligation (\$)



Impact of PJM changes

- All customers in the PJM footprint are affected
- Supplier contracts have provisions that allow them to pass through costs that are a result of “Change in Law” and/or “Regulatory Events” to customer
- Incremental Auctions are Regulatory Events
- Suppliers still determining how they will handle the additional charges
- Increased cost will probably be calculated as a line item charge with your PLC
- DR paid out in BRA not incremental

Peak Load Contribution Tag (PLC)

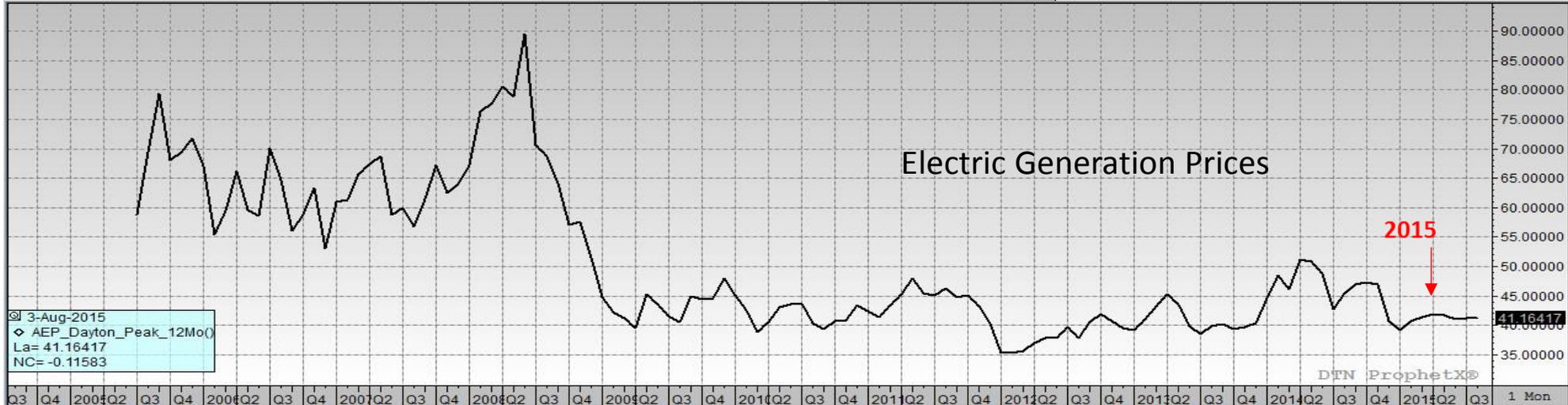
Cost of capacity based on PLC

2015 Peak Measurement Days				
Day	Date	Hour ending	Time	MW Peak
Tuesday	7/28/2015	17:00	5pm	143,496
Monday	7/20/2015	17:00	5pm	142,897
Wednesday	7/29/2015	17:00	5pm	142,291
Thursday	9/3/2015	17:00	5pm	141,228
Monday	8/17/2015	15:00	3pm	139,468
*eastern standard time				

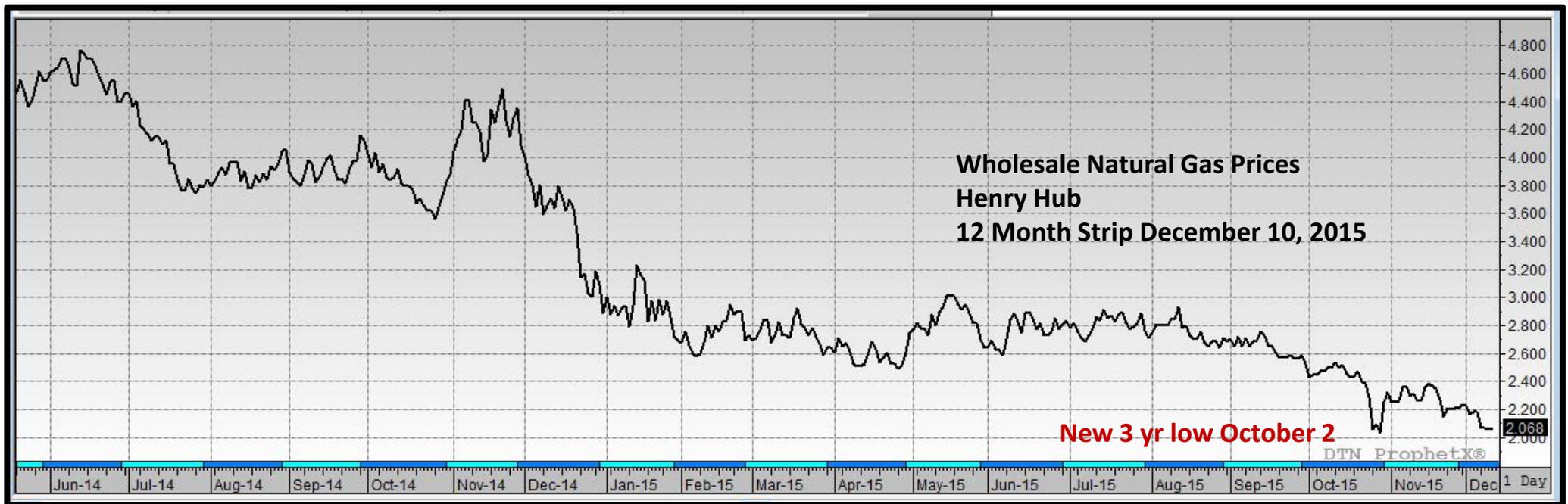
On these days PJM records customer's peak at the precise times of the system peak called Coincidental Peak and averages them for the 2015 PLC

Historic Wholesale Energy Prices

2005 to current



Current Natural Gas Markets down

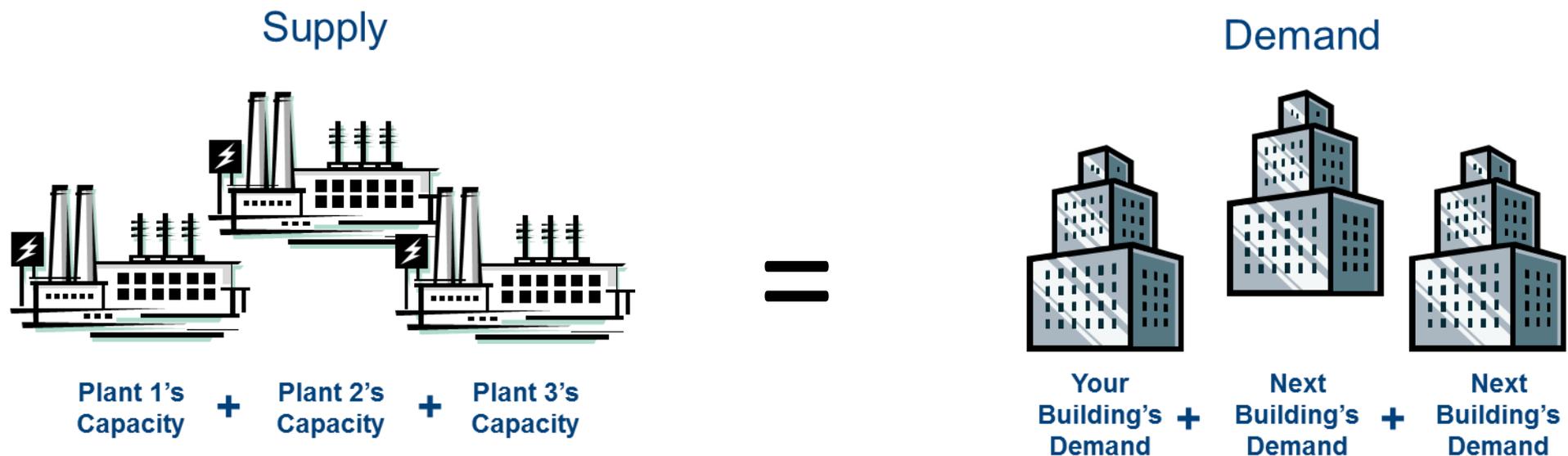


Current Wholesale Electricity Prices down



The Electrical Grid Challenge

- Because electricity can't be stored, supply must equal demand at all times. Demand Response provides the grid with a 'line of last defense' for preventing blackouts. Avoids using ancillary power generation.



Demand Response

Protecting the Grid



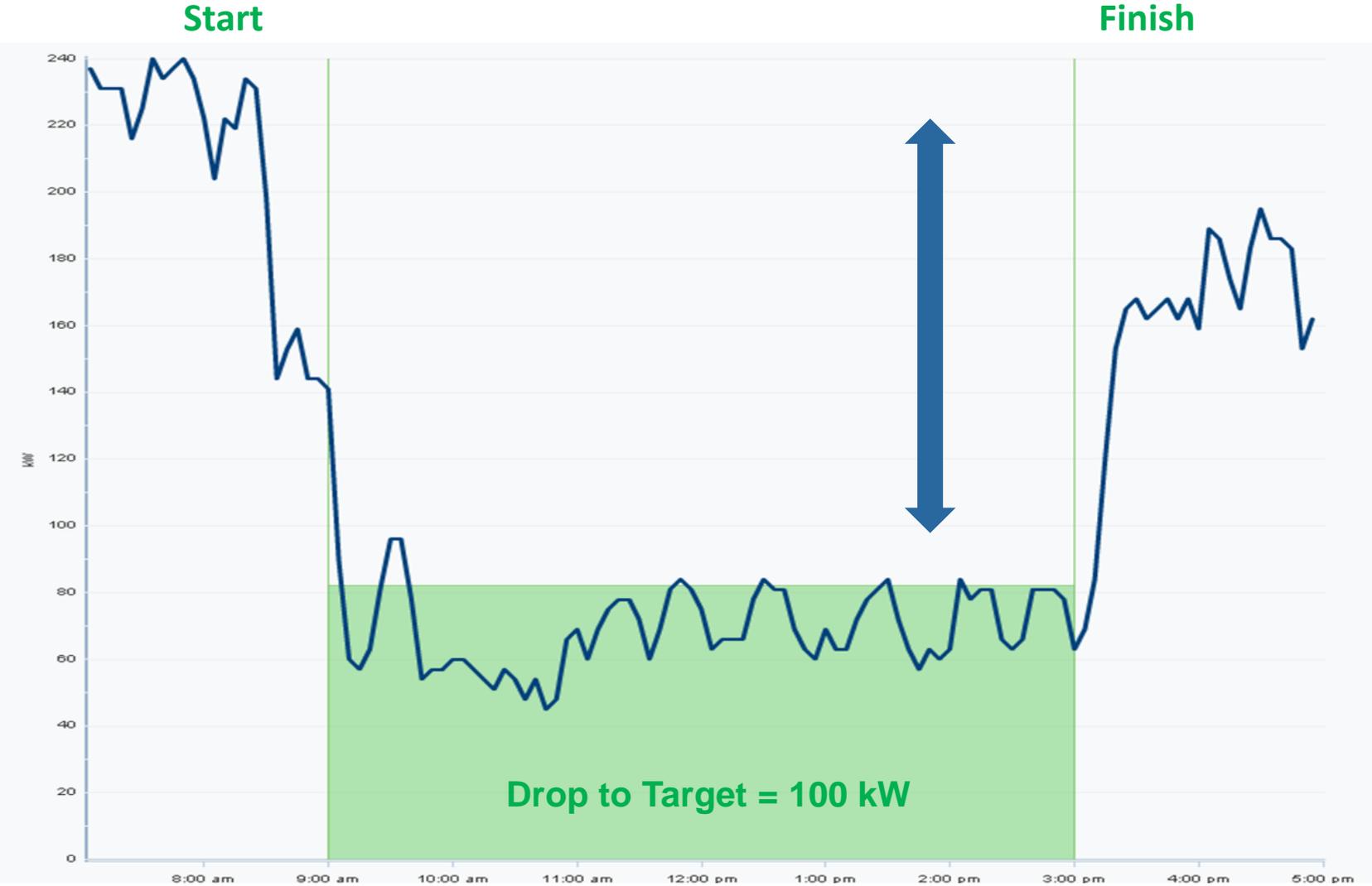
- **Participate to offset cost of electricity**
- **Runs June 1 – Sept 30**
- **PJM determines hours**
- **Noon- 8pm or 10 – 10**

- When PJM is in short supply of excess electricity (often in extreme weather) DR is a way for the grid to avoid brownouts & blackouts
- In return for your commitment to be on stand-by (as a last line of defense) users are rewarded with capacity payments based on their Peak Load Contribution Tag.

Confidential & Proprietary

Curtailment Event

Tools that help monitor the drop



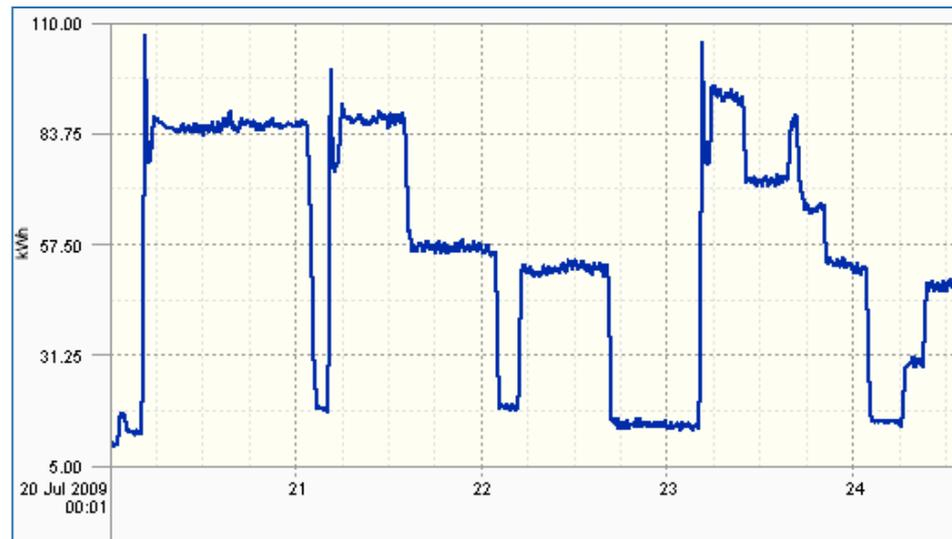
Goal – Drop to 100 kW

Reducing peaks

Peak demand charges determined monthly by the single highest peak that occurs in that month. Demand is measured during a 15-30 min period in that month. Affects distribution charges and PLC.

Reduce usage during peak times to limit consumption, lower monthly peak demand and PLC

Subscribe to Peak Measurement Alert Emails and create mini curtailment plan



DR Benefits

- **Operational Reliability**
 - Advanced notification of energy emergency—when grid is compromised
 - Equipment protected from compromised power quality
 - Contribution to the stability of the power grid—helps prevent power failures
- **Economic Benefit**
 - EARN revenue from commitment to curtail if requested by PJM
 - SAVE energy dollars from increased usage knowledge and optimum operation
 - Utilize existing resources as a revenue-generating opportunity
- **Peak Management**
 - Demand response is a gateway to peak management



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Explore Products – what's best ?



- ✓ Risk tolerance
- ✓ Purchasing preferences – standard or green
- ✓ All-in Fixed product – removes risk
- ✓ Load Following Index Pricing – more risk more reward
- ✓ Partial hedges based on usage (similar approach as gas purchasing)
- ✓ Capacity pass through – if actively managing PLC through peak alert system
- ✓ Defined Bandwidth or MAC may be difficult to accept given usage swings

Review Purchasing preferences

➤ Operations & Energy Buying

- ✓ Electricity
- ✓ Natural gas



➤ How do you like to buy

- ✓ Risk tolerance
- ✓ PLC management – active or passive
- ✓ Term preferences
- ✓ Product preferences
- ✓ Contract needs
- ✓ Early contract review & revise if needed

Best fit Products

- ✓ Purchasing preferences – standard or green
- ✓ All-in Fixed product – removes risk
- ✓ Load Following Index Pricing – more risk more reward
- ✓ Partial hedges based on usage (similar approach as gas purchasing)
- ✓ Capacity pass through – if actively managing PLC through peak alert system
- ✓ Defined Bandwidth or MAC may be difficult to accept if year over year monthly usage swings