Changes in FirstEnergy-Ohio Capacity Costs:

How Pricing, Contracting, and Consumption of Electricity Will Be Affected

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Now Updated with 2016/2017 Base Residual Auction (BRA) Results.
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Introduction

High capacity costs for the 2015/2016 delivery year will increase electricity prices for FirstEnergy-Ohio utility customers. Though many dollars are at stake, most FirstEnergy-Ohio customers are unaware of these impending costs, and even fewer understand this complex issue.

This report explains what capacity is, how the capacity market works, how capacity costs impact FirstEnergy-Ohio customers' electric bills, and what steps customers can take to mitigate the impact of these escalating costs.

Understanding Capacity Costs

Electricity is different from many commodities because it cannot be economically stored in large quantities. Electricity has no shelf life; it must be produced and consumed simultaneously. For this reason, there must be sufficient generation – enough "capacity" – to produce electricity when demand on the grid is at its peak. If the amount of electricity generated is insufficient to meet demand during these peak times, the lights go out.

In order to ensure there is sufficient capacity, all FirstEnergy-Ohio utility customers pay capacity costs, either directly or indirectly, as a component of their electric bills. Though they vary from year to year, capacity costs have been depressed and constituted a very small portion of electricity costs in recent years. At a fraction of a penny per kWh, it has been easy to discount this relatively minor expense.

However, on June 1, 2014, capacity charges in FirstEnergy-Ohio territory will increase over 600% from 2013 levels. Increases become even more pronounced on June 1, 2015 when costs will spike more than 1300% from current levels. From June 2015 through at least May 2016, capacity costs will become the second largest expense in the electric bills of many FirstEnergy-Ohio customers.

How Capacity Costs Are Determined

Capacity costs are determined using a market-based approach called the Reliability Pricing Model (RPM). PJM Interconnection, LLC (PJM) is the wholesale electric market that serves FirstEnergy-Ohio.[1] Under the RPM, PJM conducts periodic auctions to obtain sufficient generation capacity. Generators – like FirstEnergy Solutions and American Electric Power (AEP) – with the ability to generate during peak times, and users with the ability to curtail during peak times, participate in the auctions.

PJM procures initial capacity for a particular delivery year using a Base Residual Auction (BRA). Though smaller incremental auctions are held, the BRA is by far the largest driver in establishing capacity costs. Table 1 below shows the result of the BRAs for the delivery years June 2011 to May 2012, through June 2015 to May 2016.

Higher Capacity Costs for FirstEnergy-Ohio

Under ideal circumstances, each BRA would have a single clearing price for the entire PJM region. However, sometimes PJM identifies impending intra-region transmission constraints. A constraint arises when PJM forecasts congestion on the grid due to price. In these instances, PJM will carve out the constrained zone and potentially set a separate clearing price for the zone to ensure adequate supply.

As a result of aggressive Environmental Protection Agency (EPA) regulations, several coal-fired power plants in Northern Ohio and Northwest Pennsylvania are being deactivated. Following these announced plant closures, PJM realized import capacity into the region would be constrained. Therefore, PJM carved out an independent zone that includes much of Northern Ohio and a small portion of Northwest Pennsylvania for the 2015/2016 BRA. This zone, known as the American Transmission Systems, Inc. (ATSI) zone, includes all of FirstEnergy-Ohio territory. The cities of Cleveland, Toledo, Akron, and Youngstown fall within the zone.

Table 2 below lists the ATSI zone auction results for the delivery years June 2011 to May 2012, through June 2015 to May 2016. While there are some minute differences in the 2011/2012 and 2012/2013 delivery years,[2] the auction results for the ATSI zone have been essentially the same as the rest of the PJM region. However, the zone independently cleared at an unprecedented price for the 2015/2016 delivery year.

Comparing Tables 1 and 2, while the rest of PJM cleared at a price of $134.62 for the 2015/2016 period, the ATSI zone cleared over two times higher at $294.03. ATSI zone customers will exclusively shoulder this significant disparity in capacity costs. Additionally, because capacity costs are based upon a customer's individual contribution to peak demand on the grid, there will be a wide variance in how these costs are reflected in individual customers' bills.

Higher capacity prices work as a market incentive to encourage energy and transmission providers to build facilities to address constraints. In theory, such investments should drive capacity prices lower in subsequent auctions.

Table 1: BRA load clearing price for delivery years 2011/2012 - 2015/2016

Auction Results	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Resource Clearing Price per Megawatt per day (MW-Day)	$110.04	$16.46	$27.73	$125.94	$134.62

Table 2: ATSI Zone load clearing price for delivery years 2011/2012 - 2015/2016

Auction Results	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Resource Clearing Price per MW-Day	$108.89	$20.46	$27.73	$125.94	$294.03

1 PJM Interconnection serves all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. The Federal Energy Regulatory Commission (FERC) regulates PJM. PJM falls outside the jurisdiction of the Public Utilities Commission of Ohio (PUCO).

2 The reason for the differences is because the ATSI zone did not join PJM until June 1, 2010. The BRAs for the 2011/2012 through 2013/2014 delivery years had already been conducted. Therefore, prices for capacity in FirstEnergy-Ohio for these delivery years were set by transition auctions conducted by FirstEnergy, not PJM's BRAs. Table 2 lists the results from these auctions, not BRA results, for these years.

How a Customer's Capacity Costs Are Calculated

In FirstEnergy-Ohio territory, the capacity costs for an interval-metered[3] customer that is generation shopping[4] are based on its Peak Load Contribution (PLC). A PLC is a customer's billed electric consumption during the five 1-hour intervals of the year when demand on the electric grid is at its highest. Each of these five 1-hour intervals is called a Coincident Peak (CP). PJM identifies these intervals at the end of each summer in which they occur.

A customer's PLC for the following delivery year will then be calculated as an average of the five CPs. Once a customer's PLC is calculated, it is then multiplied by two factors[5] to determine a customer's capacity obligation. The capacity obligation is then multiplied by the auction clearing price to determine the customer's capacity costs.

The table below shows the five CP hours for the PJM region for years 2008 through 2012. Although we cannot predict when these peak-demand intervals will occur, it is interesting to note some trends. During the past five years, 83% of PJM's highest peak-demand intervals occurred from 4:00 PM to 5:00 PM. In addition, all twenty-five intervals occurred on a weekday during the months of June, July, or August.

Table 3: Top five peak-demand intervals for the PJM region for 2008 through 2012

Year	Peak 1	Peak 2	Peak 3	Peak 4	Peak 5
2008	Mon, 6/9/08 4-5 pm	Thu, 7/17/08 4-5 pm	Fri, 7/18/08 4-5 pm	Mon, 7/21/08 4-5 pm	Tue, 6/10/08 4-5 pm
2009	Mon, 8/10/09 4-5 pm	Tue, 8/18/09 3-4 pm	Mon, 8/17/09 4-5 pm	Tue, 8/11/09 4-5 pm	Thu, 8/20/09 4-5 pm
2010	Wed, 7/7/10 4-5 pm	Tue, 7/6/10 4-5 pm	Fri, 7/23/10 4-5 pm	Tue, 8/10/10 4-5 pm	Wed, 8/11/10 4-5 pm
2011	Thu, 7/21/11 4-5 pm	Fri, 7/22/11 2-3 pm	Wed, 7/20/11 4-5 pm	Tue, 7/19/11 4-5 pm	Wed, 6/8/11 4-5 pm
2012	Tue, 7/17/12 4-5 pm	Wed, 7/18/12 2-3 pm	Fri, 7/6/12 4-5 pm	Thu, 7/5/12 3-4 pm	Mon, 7/16/12 4-5 pm

Estimating Your Capacity Costs

Customers are often confused about how PLCs are determined. To reiterate, a customer's individual five highest peak-demand intervals are irrelevant in determining a customer's PLC. It is only how the customer's usage coincides with PJM's peaks – hence the term 'Coincident Peaks' – that matters for determining capacity costs.

Load factor is a useful tool to estimate capacity costs. Load factor is a measure of electric consumption consistency. It is the ratio of your average hourly electric consumption to your highest hourly peak usage over a billing period.[6]

- As an extreme example, a 100% load factor indicates that a customer's electrical draw remains constant every hour of every day throughout the billing period. An example of a high load factor customer is a manufacturing plant that runs three shifts, seven days a week and has processes with consistent electric draw. A 24-hour McDonald's restaurant could also be a high load factor customer.
- In comparison, a low load factor customer has tremendous variance in its electrical draw throughout the billing period. Examples of low load factor customers are a foundry whose electrical draw spikes when a furnace is turned on or a bank that is only open eight hours a day, five days a week.

3 An interval meter takes snapshots of usage in intervals, and then sends the information back to the utility. In contrast, a standard meter only records total consumption and highest demand (regardless of what time of day it occurred) for the billing period.

4 In Ohio, electricity customers have the option to purchase their electric generation from third-party competitive retail electric service (CRES) providers. Customers that elect to do so are "generation shopping."

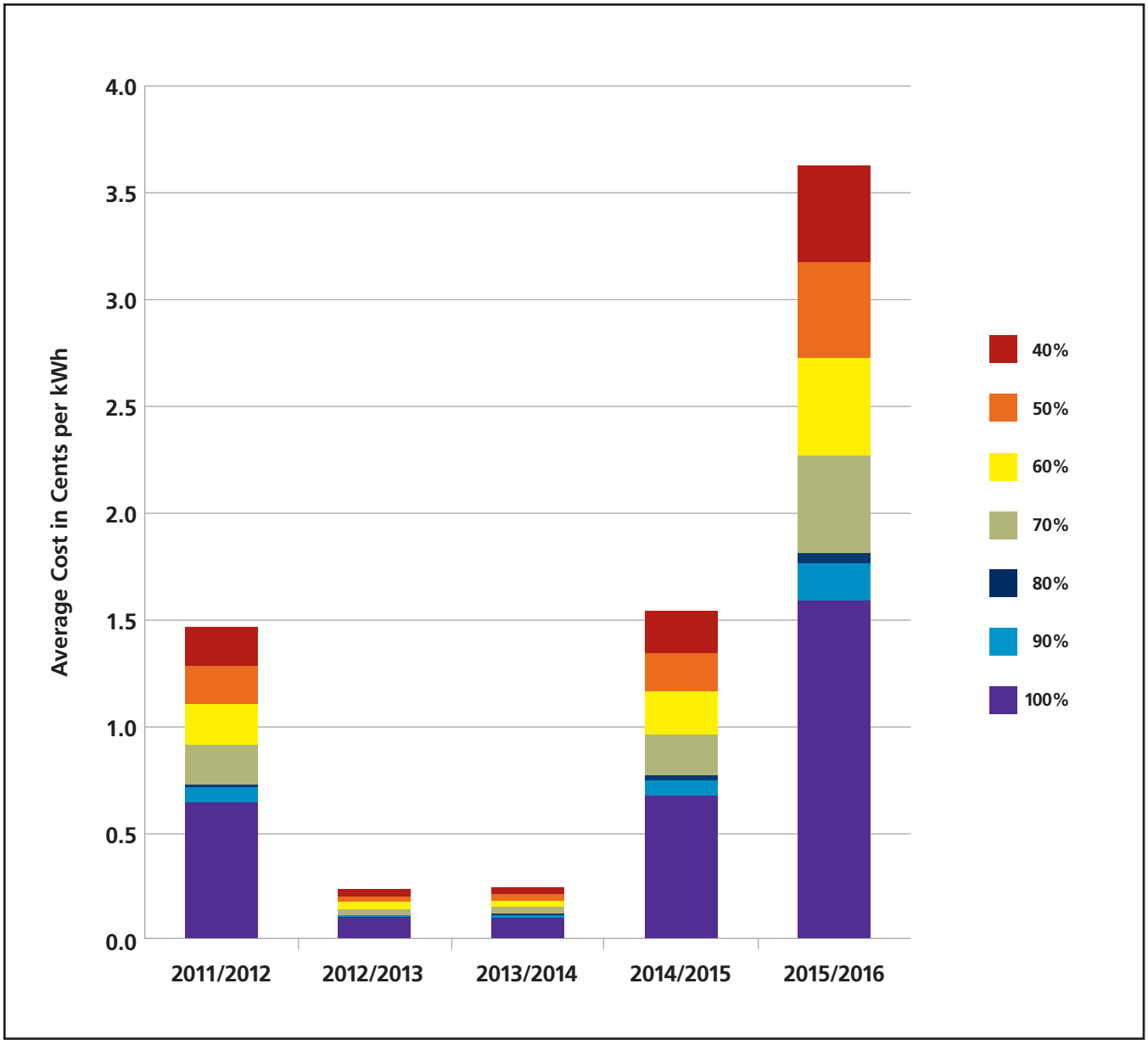
5 These factors are the Forecast Pool Requirement and the Zonal Scaling Factor. They account for the zone's desired amount of reserve capacity and forecasted load growth, respectively.

6 Load factor is calculated by dividing the kilowatt hours consumed by the product of the billed load (in kilowatts), the number of days in the billing period, and the number of hours in a day. Stated mathematically, Load factor = kWh ÷ (kW x days x 24 hours).

Though load factor can be a useful tool for estimating capacity costs, it is only accurate if your highest hourly peak usage coincides with PJM's Coincident Peaks. If it does not coincide, this analysis will likely overestimate your capacity costs – sometimes significantly so. Detailed analysis of your historical consumption during past CPs is required for more precise estimates.

Using load factor, Brakey Energy has estimated the ATSI zone's retail capacity costs for customers in cents per kilowatt-hour (kWh) for the 2011/2012 through 2015/2016 delivery years. For customers with load factors less than 40%, generation shopping may not be an economic option. The next section will discuss this in greater detail.

Figure 1: Capacity costs per kWh for 2011/2012 - 2015/2016 delivery years based on load factor



Recommendations:
How to Mitigate the Impact of Capacity Costs on Your Business

If you are a FirstEnergy-Ohio customer, there are several strategies you can use to limit exposure to high capacity costs. All of these strategies require understanding how your organization consumes electricity, when your individual peaks occur, and how these peaks coincide with PJM's CPs. The following steps may help you mitigate impending capacity costs.

1. *Installing an Interval Meter*

If you have a favorable load profile, it is important that you install an interval meter. Without an interval meter, the utility determines capacity costs based on pool averages, not actual usage. Brakey Energy has seen capacity quotes for non-interval metered customers around 3¢ per kWh for the delivery year beginning June 2015.[7] Installing an interval meter can dramatically reduce certain customers' capacity costs. For example, analysis has shown a 24-hour McDonald's restaurant could save well over 1¢ per kWh. A foundry that melts off-peak can virtually eliminate its entire capacity costs.

However, installing an interval meter can have the opposite effect for a customer with a load profile less favorable than the pool average. For example, a tanning salon has especially high air conditioning usage during CP times to counteract not only the hot weather, but also the waste heat from the tanning beds. This customer should not install an interval meter.

Still, for many customers, an interval meter is the easiest and least expensive step to minimize exposure to high capacity costs.[8]

2. *Peak Demand Curtailment in Response to Capacity Alerts*

You cannot know the date and time of the five CPs until the summer is over. However, peaks typically coincide with hot weather. Furthermore, careful monitoring of PJM's wholesale market allows you to track demand on the grid minute by minute. Combining these and other indicators, you can identify 10 to 15 days during the year when CPs will most likely be set. Curtailing or rescheduling load for a few hours during these identified days can significantly minimize capacity costs for the following delivery year. As an extreme example, if interval meter readings indicated you had no consumption during the five CPs, your capacity costs for the following delivery year would be zero.

Your capacity costs are calculated as an average of the five CPs. Thus, even if you are able to curtail during only a few of the five occurrences, you can still benefit.

3. *Shifting Electric Load to Natural Gas Powered Processes*

Fracking has placed significant downward pressure on natural gas prices. You should investigate the cost-effectiveness of offsetting electric usage with natural gas.

4. *Energy Efficiency Measures*

Energy efficiency measures that decrease consumption potentially have the additional benefit of decreasing capacity costs. This would be true if the measures offset consumption during CPs. However, for those energy efficiency measures that do not reduce consumption during CP times, such as outdoor lighting, payback analysis should account for no reduction in capacity costs.

5. *On-Site Generation*

You can reduce capacity costs through on-site generation during CP times. You should investigate installing natural gas, diesel, or other fuel-driven generators. Even more importantly, you should leverage any existing on-site generation capabilities. Beware of environmental permitting issues.

6. *Demand Response Programs*

Demand response programs provide payment to customers in exchange for the willingness to curtail electric consumption when the electric grid is under extreme stress. These programs are available in FirstEnergy-Ohio territory.

7 Actual quotes will vary on a customer-by-customer basis.

8 In FirstEnergy-Ohio territory, it costs approximately $1,500 for a digital meter and $500 for an analog meter. Contact your distribution utility if you are interested in installation.

Payment varies based on (1) the demand response program; and (2) the total amount of demand the customer is willing and able to curtail relative to the PLC it set during the previous summer. Payment is generally split with the customer's Curtailment Service Provider (CSP).[9]

If your business successfully minimized load during CPs, then the opportunity to participate in a demand response program is minimal. Although minimal consumption during the five CPs means low capacity costs, it also means there is minimal ability for you to further curtail against your established PLC.

It is typically more lucrative to curtail usage during CPs than it is to participate in a demand response program. Your capacity costs will likely be greater than what you would be paid for participation in a demand response program. Furthermore, you have to share your demand response program payment with your Curtailment Service Provider. Still, if you have not successfully managed your CPs, or are not able to invest the necessary time and resources to do so, a demand response program is a viable alternative.

Beware: If you fail to curtail the agreed upon load when called upon, you may forego all program payments and potentially even be responsible for damages.

7. Defaulting to Standard Offer Service

FirstEnergy recently obtained approval to extend its Electric Security Plan (ESP) for its Ohio utilities. One aspect of this plan establishes default electric generation rates through a series of auctions. FirstEnergy is cost-averaging the higher 2015/2016 capacity prices with lower front-year prices. This design will insulate customers defaulting to the Standard Service Offer (SSO) from the significant capacity price spikes they would otherwise incur.

If a customer with a poor load profile is unable to take any of the previously mentioned actions to effectively mitigate its capacity costs, generation shopping may prove to be uneconomic. Savvy customers may choose to generation shop until May 2015, default to the SSO until June 2016, and then reassess the viability of generation shopping depending on future capacity auctions.

8. Generation Contract Negotiation

If the wrong generation contract is selected, many of the above recommendations will have no impact on your capacity costs. Capacity costs are assessed by PJM to a customer's generation supplier. Most suppliers pass on these costs to the customer as a bundled component within their contracted price. Suppliers formulate their offers by looking at a customer's historical PLCs. If a customer takes action to minimize its usage on CP days during the term of the contract, the price to the customer remains unchanged. Therefore, if you intend to minimize usage on CP days, you should negotiate a generation contract with a capacity pass-through provision. A capacity pass-through provision results in your organization paying the actual Peak Load Contribution (PLC) it incurs, not the PLC estimated by a supplier pricing formula.

Taking proactive steps to mitigate capacity costs results in other savings opportunities. High wholesale generation prices coincide with CPs. If consumption is minimized during these CP days, high wholesale prices and transmission costs can be offset. Therefore, it is critical that the generation contract you negotiate allows you to capture these ancillary benefits.

Conclusion: Simple Steps Will Result in Big Savings

High capacity costs for the 2015/2016 delivery year will significantly impact electricity prices for most customers in FirstEnergy-Ohio territory.

If your organization is in FirstEnergy-Ohio territory, you must become knowledgeable about capacity costs. By identifying how and when you presently consume electricity, you can take proactive steps that will significantly reduce your future capacity costs.

9 A CSP implements the necessary equipment and systems to enable demand response for customers. The CSP is responsible for managing a portfolio of customers to meet capacity obligations and avoid creating an operation problem on the transmission grid.

Glossary of Terms

American Transmission Systems, Inc. (ATSI) Zone:
This zone, which includes Northern Ohio and Northwestern Pennsylvania, set a separate clearing price from the rest of PJM during the 2015/2016 capacity action.

Base price of electricity:
The base price of electricity is the price of the commodity – the electron – plus ancillary services. It does not include capacity charges. At the time this report was authored, many customers could secure the commodity and ancillary services for under 4¢ per kWh.

Base Residual Auction (BRA):
Auction that allows for the procurement of resource commitments to satisfy the region's capacity obligation and sets the costs customers will pay for capacity.

Capacity:
The amount of electricity available on the grid at any one time, measured in megawatts (MW).

Certified Retail Electric Service (CRES) provider:
A person or entity that is certified by the Public Utilities Commission of Ohio to offer and to assume the contractual and legal responsibility to provide competitive electricity supply to customers.

Coincident Peak (CP):
The unrestricted load of a customer, coincident with one of the five highest 1-hr peak demand intervals for PJM.

Curtailment Service Provider (CSP):
A CSP is responsible for managing a portfolio of customers to meet capacity obligations and avoid creating an operation problem on the transmission grid. A CSP implements the necessary equipment and systems to enable demand response for customers.

FirstEnergy-Ohio:
FirstEnergy's Ohio electric distribution utilities: the Illuminating Company, Ohio Edison, and Toledo Edison.

Generation shopping:
In Ohio, electricity customers have the option to purchase their electric generation from a third-party retail supplier. Customers who elect to do so are generation shopping.

Interval meter:
An interval meter takes snapshots of usage in intervals, and then sends the information back to the utility. In contrast, a standard meter only records total consumption and highest demand (regardless of what time of day it occurred) for the billing period.

Kilowatt (kW):
Unit used to measure electric load, equal to 1,000 watts.

Kilowatt hour (kWh):
Unit used to measure electric consumption, equal to 1,000 watt hours. It is the billing unit of electricity delivery to consumers and is the product of power, in watts, and time, in hours.

Load factor:
Measure of electric consumption consistency. It is the ratio of your average hourly electric consumption to your highest hourly peak usage over a billing period. Load factor is calculated by dividing the kilowatt hours consumed by the product of the billed load (in kilowatts), the number of days in the billing period, and the number of hours in a day. Stated mathematically, Load factor = kWh ÷ (kW x days x 24 hours).

Megawatt (MW):
One million watts.

Megawatt Day (MWD):
One megawatt of electricity used in one day.

Peak Load Contribution (PLC):
A customer's load contribution to PJM's five 1-hour intervals of the year when demand on the electric grid is at its highest. An average of these five peak-demand intervals determines PLC.

PJM Interconnection, LLC (PJM):
The wholesale electric market that serves all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. The entire state of Ohio is served by PJM.

Reliability Pricing Model (RPM):
A capacity market model used by PJM to manage the availability of capacity. The RPM provides procurement of capacity for each delivery year, three years in advance, through a competitive auction process called the Base Residual Auction (BRA). This long-term RPM approach includes incentives that are designed to stimulate investment in maintaining existing generation and to encourage the development of new sources of capacity.

Standard Service Offer (SSO):
The default rate charged by the utility for generation and ancillary services to customers that do not contract with an alternative supplier.

UPDATE: 2016/2017 Capacity Auction

On May 24, 2013, PJM announced the results of the 2016/2017 Base Residual Auction (BRA). The BRA results are the main factor in determining what end users will pay in capacity costs.

The 2016/2017 BRA cleared at $59.37 per MW-Day for most of PJM. This was 56% lower than the 2015/2016 clearing price of $134.62 per MW-Day. This was also far lower than the expectations of Wall Street analysts, who almost universally predicted a clearing price at or above the previous year's result. According to PJM, the significant price decrease is the result of increased supply and relatively flat forecasted demand. The increased supply came in the form of new generation, upgrades, and inter-regional imports. Table 4 below shows the BRA load clearing prices for delivery years 2012/2013 through 2016/2017 for the majority of PJM.

Contrary to predominant expectations, constraints again caused the ATSI Zone to set a load clearing price higher than the rest of PJM. However, at $90.54 per MW-Day, this price is significantly lower than the 2015/2016 clearing price. The lower price is due to increased supply and flat demand, as well as transmission line investments. Table 5 below shows the load clearing prices for delivery years 2012/2013 through 2016/2017 for the ATSI zone.

The price gap between the ATSI Zone and the rest of PJM narrowed from last year's BRA, but still remains sizeable on a percent basis. Until these constraints are alleviated and the zone sets a clearing price in line with the rest of PJM, FirstEnergy-Ohio end users must remain particularly vigilant in their capacity cost management.

Table 4: BRA load clearing price for delivery years 2012/2013 - 2016/2017

Auction Results	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Load Clearing Price per MW-Day	$ 16.46	$ 27.73	$ 125.94	$ 134.62	$ 59.37

Table 5: ATSI Zone load clearing price for delivery years 2012/2013 - 2016/2017

Auction Results	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Load Clearing Price per MW-Day	$ 20.46	$ 27.73	$ 125.94	$ 294.03	$ 90.54

About the Author

Matt Brakey is an expert on energy markets and securing and negotiating third-party energy contracts and a frequent speaker and seminar presenter on Ohio energy issues.

As President of Brakey Energy, Matt directs the delivery of all services provided to the company's clients and oversees all operations.

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Matt has a B.A. from Miami University. He is pursuing a J.D. evenings at Cleveland Marshall College of Law.

About Brakey Energy

Brakey Energy is the energy management partner of Ohio's largest energy users. We provide comprehensive energy management services to commercial and industrial businesses in Ohio, helping companies identify and implement energy-saving measures to reduce energy costs.

Brakey Energy has unmatched knowledge of Ohio's complex energy regulatory environment. We can help you determine how changes in capacity costs will affect your business and how to reduce the impact on your bottom line.

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