

POWERING AMERICA: A REVIEW OF THE OPERATION AND EFFECTIVENESS OF THE NATION'S WHOLESALE ELECTRICITY MARKETS

HEARING
BEFORE THE
SUBCOMMITTEE ON ENERGY
OF THE
COMMITTEE ON ENERGY AND
COMMERCE
HOUSE OF REPRESENTATIVES
ONE HUNDRED FIFTEENTH CONGRESS

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WEDNESDAY, JULY 26, 2017

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:00 a.m., in room 2123 Rayburn House Office Building, Hon. Fred Upton (chairman of the subcommittee) presiding.

Members present: Representatives Upton, Olson, Barton, Shimkus, Murphy, Latta, Harper, McKinley, Kinzinger, Griffith, Johnson, Long, Flores, Mullin, Hudson, Cramer, Walberg, Walden (ex officio), Rush, McNerney, Peters, Green, Doyle, Castor, Welch, Tonko, Loeb sack, Schrader, Kennedy, Butterfield, and Pallone (ex officio).

Staff present: Elena Brennan, Legislative Clerk, Energy/Environment; Jerry Couri, Chief Environmental Advisor; Wyatt Ellertson, Research Associate, Energy/Environment; Tom Hassenboehler, Chief Counsel, Energy/Environment; A.T. Johnston, Senior Policy Advisor, Energy; Alex Miller, Video Production Aide and Press Assistant; Brandon Mooney, Deputy Chief Energy Advisor; Mark Ratner, Policy Coordinator; Annelise Rickert, Counsel, Energy; Dan Schneider, Press Secretary; Sam Spector, Policy Coordinator, Oversight and Investigations; Jason Stanek, Senior Counsel, Energy; Madeline Vey, Policy Coordinator, Digital Commerce and Consumer Protection; Evan Viau, Staff Assistant; Andy Zach, Senior Professional Staff Member, Environment; Priscilla Barbour, Minority Energy Fellow; David Cwiertny, Minority Energy/Environment Fellow; Jean Fruci, Minority Energy and Environment Policy Advisor; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; and Tuley Wright, Minority Energy and Environment Policy Advisor.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. UPTON. The Subcommittee on Energy will now come to order and the chair would recognize himself for an opening statement.

So good morning. Last week, the subcommittee embarked on its first hearing in our Powering America series where a panel of witnesses shared their diverse perspectives regarding the state of the wholesale electricity markets. And during that hearing, we heard

directly from market participants who operate in all seven of the nation's RTO and ISO markets. Today, I would like to welcome representatives from the nation's grid operators and invite them to share their thoughts regarding the current issues and the challenges in their respective regional markets.

Americans have come to expect that electricity will always be available when it is needed and it is the role of the grid operators to make sure that this expectation is always met. RTOs and ISOs play a vital role in the delivery of power from the generator to the consumer, but it is a role that is largely outside the public's view.

By operating and dispatching the transmission systems 24/7, the grid operators must ensure that supply and demand is continually kept in balance. In addition, they are responsible for conducting long-term planning to reduce congestion on existing transmission lines and to ensure that there is adequate transmission capacity to reliably serve future electricity demand.

So as we sit in the committee room today, the grid operator responsible for coordinating the movement of electricity in D.C. is known as the PJM. In addition to serving the needs of 13 other states including Michigan, and serving 65 million folks, PJM also operates over 82,000 miles of transmission lines. And that should provide a sense of the size and the importance of these grid operators.

Along with the other six grid operators at the table today, these RTOs and ISOs combined serve two-thirds of the nation's population. However, as we heard from our witnesses last week, there are concerns regarding the state of our nation's competitive electricity markets. Some of the testimony focused on a specific RTO function such as the complexities of the capacity market, but we spent much of the time focused on broader issues involving grid reliability, market competition, generator fuel diversity, and whether certain baseload resources should receive financial assistance to remain viable.

As our witnesses are aware, there are many involving challenges currently facing the electricity industry. In a very short period, we have witnessed significant changes in the market supply and demand fundamentals and specifically weak growth in electricity consumption combined with the availability of large supplies of inexpensive natural gas. In turn, wholesale electricity prices are now at near-record lows around the country and these low prices have resulted in some generators being unable to recover their costs. Notably, several states are advancing proposals to support at-risk nuclear plants that are unable to survive on revenues from the energy and capacity markets alone.

The witnesses before the subcommittee today all operate competitive markets, the dispatch generation across the country based on lowest cost. They also now find themselves in the middle of this policy debate involving changing technology, environmental goals, and the effects of out-of-market actions. Many are questioning whether the RTO and ISO markets can remain competitive and perform all of their existing essential functions while still tackling the new challenges in the faces of these emerging trends.

So as our Powering America series continues, I look forward to learning more about what is occurring in each of your regions,

hearing your thoughts regarding what, if any, reforms could assist your efforts to achieve greater efficiencies, reliability, and competition in your organized market.

And I yield the balance of my time to the gentleman from Oklahoma, Mr. Mullin.

[The prepared statement of Mr. Upton follows:]

PREPARED STATEMENT OF HON. FRED UPTON

Good morning. Last week this subcommittee embarked on its first hearing in our “Powering America” series, where a panel of witnesses shared their diverse perspectives regarding the state of the wholesale electricity markets. During that hearing, we heard from directly from market participants who operate in all seven of the nation’s RTO and ISO markets. Today, I’d like to welcome representatives from the nation’s grid operators and invite them to share their thoughts regarding current issues and challenges in their respective regional markets.

Americans have come to expect that electricity will always be available when it’s needed, and it is the role of the grid operators to make sure that this expectation is always met. RTOs and ISOs play a vital role in the delivery of power from the generator to the consumer, but it’s a role that is largely outside the public’s view. By operating and dispatching the transmission system 24/7, the grid operators must ensure that supply and demand is continually kept in balance. In addition, they are responsible for conducting long-term planning to reduce congestion on existing transmission lines and to ensure that there’s adequate transmission capacity to reliably serve future electricity demand.

As we sit in this Committee room today, the grid operator responsible for coordinating the movement of electricity to Washington D.C. is known as “PJM”. In addition to serving the needs of 13 other states (including Michigan) and serving 65 million people, PJM also operates over 82,000 miles of transmission lines. That should provide a sense of the size and importance of these grid operators. Along with the other six grid operators at the table today, these RTOs and ISOs combined serve two-thirds of the nation’s population.

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The witnesses before the subcommittee today all operate competitive markets that dispatch generation across the country based on lowest-cost. They also now find themselves in the middle of this policy debate involving changing technology, environmental goals, and the effects of “out-of-market” actions. Many are questioning whether the RTO and ISO markets can remain competitive and perform all their existing essential functions, while also tackling new challenges in the face of these emerging trends.

Mr. MULLIN. Thank you, Chairman Upton, for yielding. I just want to take a quick moment to recognize those that are here. One of the witnesses today is Mr. Nick Brown who represents the Southwest Power Pool. Southwest Power Pool is a regional transmission organization whose members like Oklahoma Gas and Electric and GRDA operate in my state and help provide power to millions of Oklahomans.

I want to thank all the witnesses for being here and look forward to hearing your testimony as this committee evaluates the state of our wholesale electricity markets and I yield back.

Mr. UPTON. The time is expired, you yield back. I recognize the ranking member of the subcommittee, Mr. Rush.

OPENING STATEMENT OF HON. BOBBY L. RUSH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. RUSH. I want to thank you, Mr. Chairman, for holding this important hearing today examining the operation and effectiveness of the nation's wholesale electricity markets. I must also commend you, Mr. Chairman, for following up last week's very informative hearing where we heard from industry insiders, with today's discussion consisting of regional grid operators as these are the people responsible for administering the nation's wholesale electricity market and managing the day-to-day operations of the respective transmission systems.

Mr. Chairman, it has been some time since this subcommittee has held comprehensive hearings on the Federal Power Act, and I think these informative discussions greatly benefit all of our members and will also help us make better, more informed decisions when determining whether we need to update the Federal Power Act or leave it as it is.

Mr. Chairman, one of the points that every one of our industry panelists from last week's hearing agreed upon was the fact that the nation's electricity grid has changed in recent years and will continue to undergo dramatic transformations in the near future. Whether spurred by state and federal policy, marketing forces, or consumer demands and behavior, we have seen significant new trends taking place in the electricity market.

Mr. Chairman, consumers are driving many of these changes as they demand new tools to more responsibly use energy both as a way to save money and as a way to save their environment. Some of these trends include greater demand for cleaner, renewable sources of energy to compete with traditional fossil fuels, an increase in distributed generation and demand response resources, more energy efficiency initiatives and all the while demanding lower energy costs. With all of these consumer-driven changes there is also the debate as whether issues such as fuel diversity and distributive energy make the grid more or less reliable, and I look forward to hearing from our witnesses on this important topic.

There is also the important issue of grid modernization and grid security. As new and different sources of energy are absorbed into the grid, it is important that we have the infrastructure in place to get this new, cleaner energy from the places where it is produced to the places where it is needed. Congress should not only focus on streamlining regulations in an environmentally safe and responsible way, but also, Mr. Chairman, we should be making sure that we provide adequate investment into modernizing and securing the grid.

Mr. Chairman, the American people want to feel confident that our energy infrastructure provides secure, reliable, sustainable energy while also understanding that the grid is safe from attacks,

whether those attacks mean cyber or physical, natural or man-made.

So Mr. Chairman, I look forward to engaging today's distinguished panelists on what they identify as the greatest opportunities as well as the most difficult challenges that we see in ensuring that we have a greener, cleaner, more integrated 21st century grid. And with that Mr. Chairman, I thank you and I yield back the balance of my time.

Mr. UPTON. Thank you. The gentleman yields back. The chair would recognize the chair of the full committee, the gentleman from Oregon, for an opening statement, Mr. Walden.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. Well, good morning, Mr. Chairman and members of the committee and our distinguished panelists. As you will recall, last week we held our first hearing on the Powering America series where we received testimony from a wide range of electricity sector stakeholders. That hearing provided this committee with the perspective, concerns, and ideas from the individuals who participate in the electricity markets.

So today, we pick up where we left off and continue our review of America's electricity system by hearing from individuals who operate, actually operate, the electricity markets known as regional grid operators, so thank you all for being here. Regional grid operators, or RTOs and ISOs, are one of the options Americans have to access reliable and affordable electricity. They accomplish this by performing a variety of functions ranging from long-term transmission planning services to overseeing competitive energy markets where wholesale electricity is bought and sold.

Now in my home State of Oregon and neighboring state of Washington, similar grid operator functions are performed for various consumer-owned utilities by the Bonneville Power Administration or the BPA. BPA is a nonprofit, federal power and marketing administration based in the Pacific Northwest and is part of the Department of Energy. Past attempts have failed to form an RTO for the states of Oregon and Washington which encompass my Eastern Oregon district. That opposition, I should tell you, remains strong today.

But given the size and scope of America's electricity system, it is safe to say that the job of regional grid operators has never been easy, and looking at recent developments within the nation's power sector, it is apparent that the job is becoming even more challenging. Thousands of different stakeholders participate in the U.S. electricity system and many of these stakeholders have differing and competing desires for how wholesale electricity markets should be administered.

The RTOs and ISOs regulated by FERC have the difficult task of deciding how to best manage and oversee energy markets in order to provide power in the most affordable and reliable way for the consumers they serve. RTOs and ISOs do not own any physical grid assets and they do not exist to create a profit. They act as an independent, nonprofit entity and their goal is to effectively orchestrate the generation and delivery of affordable electricity across the

bulk power grid by instantaneously matching power supply with power demand for customers.

Today, we have a panel of RTO executives who bring a wealth of experience operating organized electricity markets, and I look forward to their ideas on how we can best serve the needs of the consumers we all need to take care of. Additionally, I look forward to discussing other important issues with our witnesses such as how RTOs and ISOs can accommodate state policies in the areas they serve while preserving the competitive nature of markets and how RTOs and ISOs can incorporate new forms of generation onto the grid without compromising system reliability.

Even though many Americans may not understand the complexities of wholesale electricity markets, one thing most Americans do understand is the electricity bill that arrives in their mailboxes each month. This is especially true for American businesses who rely on affordable power to succeed and grow our economy and jobs.

The goal of this committee and I think of the operators is to make sure that consumers are always coming out as winners. If we keep the consumer at the front and that is our goal when making important policy decisions, I am confident that the U.S. electricity system will continue to thrive and flourish and meet the needs of all Americans. With that in mind I am eager to discuss how we can ensure affordable energy for consumers across the country while also maintaining system reliability now and in the future.

So Mr. Chairman thanks for the hearing. To our witnesses, thank you all for participating. I got your testimony here. We have a couple of subcommittees meeting at the same time as you might imagine, so I will be in and out. With that if there are other members on the committee that would like the balance of my time I am happy to yield to them and, if not, I will yield back to the chairman and thanks again.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

As you will recall, last week we held our first hearing in the Powering America series where we received testimony from a wide range of electricity sector stakeholders. That hearing provided this committee with perspectives, concerns, and ideas from the individuals who participate in electricity markets. Today, we pick up where we left off and continue our review of America's electricity system by hearing from the individuals who operate the electricity markets, known as regional grid operators.

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Today, we have a panel of RTO executives who bring a wealth of experience operating organized electricity markets and I look forward to their ideas on how we can best serve the needs of the customers they serve.

Additionally, I look forward to discussing other important issues with our witnesses, such as how RTOs and ISOs can accommodate state policies in the areas they serve while preserving the competitive nature of markets and how RTOs and ISOs can incorporate new forms of generation onto the grid without compromising system reliability.

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Mr. UPTON. The gentleman yields back. The chair will recognize the ranking member of the full committee, Mr. Pallone, for an opening statement.

Mr. PALLONE. Thank you, Chairman Upton. This is the second hearing on this subject in the subcommittee this month and just like last week's hearing, Ranking Member Rush and I worked in partnership with Chairman Upton and Walden to set up today's hearing in order to provide us important and unbiased background for future decisions.

I am pleased we have an opportunity to hear from those who are entrusted to run the grid, the regional transmission organizations, or RTOs. While versions of these independent system operators have existed for decades, it was the Energy Policy Act of 2005 that enshrined these organizations as central to the wholesale markets and these markets have yielded us many benefits including some of the lowest prices we have ever seen for electricity.

However, that doesn't mean that we should just turn a blind eye to the question of whether these organizations are properly positioned to address the many changes that are underway in the electricity sector. RTOs make decisions every day that greatly affect the market, its participants, and consumers. In some ways they are more powerful on a day-to-day basis than the Federal Energy Regulatory Commission, which is why we need to ensure that RTOs are providing unbiased management of their systems and not veering into the kind of policymaking that is the responsibility of Congress and the states.

Today, RTOs have their work cut out for them. New technologies, evolving policies, fuel market changes, and aging infrastructure all influence the operation, reliability, and resiliency of the grid, so too do changes in patterns and distribution of electricity demand. All of these factors have called into question the most basic tenets of ratemaking and challenged the longstanding financial model for utilities. They are also having an impact on wholesale markets

with implications for the competitive position of more traditional grid assets, and I am sure we are going to hear more about these issues from our witnesses today.

The growth of distributed generation and these new technologies are also creating opportunities for consumers and their advocates to have a more active role in the electricity sector. Consumers are driving policies at the state level through the Public Utility Commissions and seeking input on decisions that impact generation, distribution, and transmission of electricity. Although consumers have not played a role in RTO decisionmaking, it may be time to put in place formal mechanisms to facilitate direct communication between consumer advocates and the RTOs.

And each of the organizations we will hear from today operates differently. While they are all administering wholesale markets, their governance structures, market rules, state and regional policies, and relationships to market participants and consumers are different. This hearing gives us the opportunity to compare and contrast the different approaches and to evaluate whether some approaches offer advantages in managing the grid.

And keeping the electric grid operating is essential to our economy and our safety, so the RTOs' focus on grid reliability and resiliency is understandable, but these concepts are evolving along with the new technologies and tools that have emerged over the past decade. Reliability and resiliency are no longer defined solely by transmission and baseload generation assets. In some cases, I have seen transmission projects needlessly rubberstamped in the name of reliability.

There are certainly other ways to address reliability than just gold plating the transmission system. Newer and bigger transmission lines are no longer always the best or most cost effective answer to the question of how we improve reliability. It is time for the RTOs to begin to adapt to this new reality. Distributed energy resources, renewable and otherwise, along with efficiency and demand response are equally important. And of course we certainly do need more interstate and interregional transmission, particularly from the Great Plains to the rest of the Eastern Interconnection. The lack of progress in this area leads me to ask whether the approval process between regions is working as effectively and efficiently as it should and whether regions have become too balkanized and unable to work together for the greater good.

So Mr. Chairman, I am pleased that we have been able to work together on this hearing series evaluating our nation's electricity markets. Last week, we learned about the perspectives of market participants and today have an experienced panel representing our nation's RTOs. But what we have been missing so far is an analysis of consumer perspectives. And there are number of important issues impacting consumers that we must consider including governance structure, cost recovery models, and appropriate transparency, and I hope that we will commit to holding such a hearing from the consumer perspectives in the near future.

That said, I look forward to hearing from the panel and I yield back, Mr. Chairman.

Mr. UPTON. Thank you. With that, all member statements have been completed. We are joined by great witnesses today and we

will start with 5 minutes for each one with Gordon van Welie, president and CEO of ISO New England.

Welcome. You need to hit the mike button there.

STATEMENTS OF GORDON VAN WELIE, PRESIDENT AND CEO, ISO NEW ENGLAND; NICK BROWN, PRESIDENT AND CEO, SOUTHWEST POWER POOL; BRADLEY C. JONES, PRESIDENT AND CEO, NEW YORK ISO; RICHARD DOYING, EXECUTIVE VICE PRESIDENT, MIDCONTINENT ISO; CHERYL MELE, SENIOR VICE PRESIDENT AND CEO, ERCOT; KEITH CASEY, VICE PRESIDENT, MARKET & INFRASTRUCTURE DEVELOPMENT, CALIFORNIA ISO; AND, CRAIG GLAZER, VICE PRESIDENT, FEDERAL GOVERNMENT POLICY, PJM INTERCONNECTION, LLC

STATEMENT OF GORDON VAN WELIE

Mr. VAN WELIE. Good morning, Chairman Upton, Ranking Member Rush, and members of the subcommittee. Thank you for the opportunity to appear before you this morning. As you said, my name is Gordon van Welie. I am the CEO of ISO New England. And the ISO was established back in 1997 and led to the creation of wholesale electricity markets and the subsequent investment in the region of some \$30 billion in electricity supply and transmission infrastructure.

This has caused a dramatic change in how electricity is produced and consumed and I believe this transformation is accelerating. Wholesale markets have produced demonstrable benefits for New England electricity consumers. For instance, in 2016, New England's wholesale electricity markets cleared \$5.4 billion in revenues. This was the lowest since 2003 and down from high water mark of nearly \$14 billion in 2008. During this period, emissions have decreased substantially, and since I last appeared before this subcommittee the forward capacity market has driven investment in approximately 5,600 megawatts of additional generation in demand resources including energy efficiency.

I last appeared before the subcommittee in March of 2013 to discuss the transformation of our power system resources. At the time, I noted a pair of key issues. First, the critical need for accurate price formation and performance incentives in our wholesale markets to ensure reliable electricity supply, and second, I stressed the importance of adequate fuel infrastructure and supply arrangements. We now have had an additional 4 years of experience to underscore the importance of both issues.

I would like to update the subcommittee on these issues and also speak to cybersecurity challenge. First, I would like to comment on the issue of state-sponsored resources and their impact on wholesale markets. The region is preparing to accommodate an influx of state-sponsored, carbon-free resources. ISO New England has proposed changes to our forward capacity market to ensure appropriate price formation and to accommodate the states' policies. These changes will allow existing resources that are seeking to retire to swap their capacity obligations with state-sponsored resources. We believe that this is innovative way to continue to utilize the wholesale market to ensure reliability while gradually

transitioning the region towards an energy supply with lowered carbon emissions.

We are currently discussing this proposal with our stakeholders and intend to file the market rules with the FERC in January of 2018. This proposal will likely accelerate the retirement of uneconomic non-gas generators which are the resources we currently rely upon when the region's gas pipelines are constrained and unable to supply gas generators.

This leads me to the issue of fuel security, which continues to be a top priority for ISO New England. The region is experiencing a major shift in the generation mix and we anticipate this ongoing transition could lead to the retirement of approximately a third of the generation fleet within the next decade. The shift away from generators with onsite fuel to gas generators relying on just-in-time fuel delivery has exposed the limitations of New England's fuel infrastructure.

As I have previously testified, the constraints on the natural gas transportation during very cold winters can lead to reliability risks and price volatility in the wholesale market. The transformation of the resource mix will continue to drive additional retirements among gas generators and likely exacerbate the effects of these pipeline constraints. In order to mitigate the risk, New England market participants or the states will have to invest in sufficient infrastructure and fuel arrangements and the ISO may have to make additional improvements to the wholesale market rules to incent these investments. The ISO is studying this fuel security risk and will report preliminary results in October of this year.

Finally, the ISO is working to improve the safeguards for our control center and business system infrastructure. We recognize the volume and sophistication of the threats against the electric grid are rising. I can assure the subcommittee that we also recognize the importance of critical cybersecurity assets that we operate and are constantly working to identify and address these dynamic and evolving challenges.

Since I last appeared before the subcommittee, ISO New England has made many operational and market-based changes to meet the needs of our region. Market forces and public policy decisions are impacting both operations and markets and the region continues to require innovative solutions to ensure reliable, environmentally responsible, and competitive electricity supply. I believe that the collaborative governance and risk management structures in place in New England will keep us on course to navigate and meet these challenges. Thank you and I look forward to your questions.

[The prepared statement of Mr. Van Welie follows:]

SHORT SUMMARY OF TESTIMONY

GORDON VAN WELIE, PRESIDENT & CEO, ISO NEW ENGLAND
BEFORE THE HOUSE ENERGY & COMMERCE COMMITTEE, SUBCOMMITTEE ON ENERGY

***“POWERING AMERICA: A REVIEW OF THE OPERATION AND EFFECTIVENESS
OF THE NATION’S WHOLESALE ELECTRICITY MARKETS.”***

WEDNESDAY, JULY 26, 2017

- ISO New England operates New England’s *wholesale* electricity markets, including Day-Ahead and Real-Time energy markets, the Forward Capacity Market (FCM), and markets for ancillary services. These markets continue to operate efficiently and provide significant benefits to customers.
- Total expenditures in these wholesale electricity markets in Calendar Year 2016 fell to \$5.44 billion (down from a high of \$13.96 billion in 2008). However, the region is challenged with natural gas pipeline constraints that cause reliability concerns and price volatility. From December 2013-February 2014, wholesale energy markets reflected these shortages with costs of roughly \$5.05 billion (with natural gas averaging over \$19/MMBtu) over the winter months.
- The Forward Capacity Market is achieving the objective of ensuring an adequate supply of capacity (both electric generation and demand resources) and investment in new capacity resources was incentivized when capacity was short. Competition between existing and new capacity resources in the most recent auction returned prices to their lowest level in the last four auctions.
- Wholesale energy market prices have decreased due to the lower prices of fuel (when gas pipelines are not constrained) and increasing amounts of state-sponsored, low marginal cost energy resources. This trend is expected to continue as more state-sponsored resources are added. As a result, all wholesale resources in New England will gradually become more dependent on capacity market revenues, which consequently will increase over time.
- New England is preparing for the impact of significant additional quantities of state-sponsored resources. The ISO is working with stakeholders to propose changes to the FCM to ensure appropriate price formation and allow the substitution of existing resources with state-sponsored resources.
- The region is experiencing a major shift in the generation mix due to the steady retirement of uneconomic, non-gas generation (we expect this ongoing transition could lead to the retirement of approximately a third of the generation fleet within the next decade). Non-gas generators that are good performers are crucial to maintaining power system reliability during the winter due to gas pipeline constraints. The lowered energy market revenues and changes to the FCM to accommodate state-sponsored resources will likely accelerate the retirement of those resources – exacerbating the negative effects of gas pipeline constraints during the winter. The ISO is studying this fuel security risk and will report preliminary results in October of this year.
- The ISO is working to safeguard our control center and business system infrastructure from an ever-increasing cyber threat that is growing in sophistication.

TESTIMONY OF
GORDON VAN WELIE
PRESIDENT & CHIEF EXECUTIVE OFFICER, ISO NEW ENGLAND

BEFORE THE HOUSE ENERGY & COMMERCE COMMITTEE
SUBCOMMITTEE ON ENERGY

*"POWERING AMERICA: A REVIEW OF THE OPERATION AND EFFECTIVENESS
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Chairman Upton, Ranking Member Rush, and members of the subcommittee, thank you for the opportunity to appear before you this morning. I'd also like to express my appreciation to Congressmen Welch and Kennedy, as well as their staffs, for their ongoing interest and attention to the challenges facing the New England region.

My name is Gordon van Welie, and I am the president and chief executive officer of ISO New England (ISO-NE). ISO New England is the independent system operator of the New England power grid and wholesale electricity markets. We have three major areas of responsibility: We operate the bulk electric system on a 24-hour, seven-day-a-week basis, we administer the region's wholesale electricity markets, and we are responsible for long-term planning of the transmission system.

2017 marks the 20th anniversary of ISO New England. During the last two decades, the region has undergone (and continues to undergo) a monumental change in how electricity is produced and consumed. Since the ISO was created, New England has invested approximately

\$30 billion in capacity and transmission infrastructure.¹ Perhaps most relevant to my testimony today is the region's commitment to investing in critical capacity resources. Since Forward Capacity Auction #7 was conducted in February 2013 (for commitments to provide capacity starting June 2016), over 3,600 megawatts (MW) in new generation and over 2,000 MW in new demand resources (including energy efficiency) have taken on capacity supply obligations (CSO). This investment has been critical as older oil, coal and nuclear plants continue to retire.

In addition, wholesale markets continue to harness the benefits of low cost natural gas, and combined with regional investments in energy efficiency and behind-the-meter solar/photovoltaic resources, have returned demonstrable benefits for New England electricity consumers. For instance, in 2016 New England's *wholesale* electricity markets (\$5.44 billion) fell to their lowest level since 2003² -- down from a high-water mark of nearly \$14 billion in 2008. During this period, emissions have decreased substantially.

In prior testimony before the subcommittee, I highlighted "serious operational challenges facing New England's power system."³ Specifically, I called attention to "a major shift that has occurred in the region's generation mix" and the reliability concerns stemming from "limitations of the current market design and the consequent inadequate fuel arrangements." I submitted that testimony on March 19, 2013.

¹ This investment includes approximately \$14 billion in natural-gas fired generation, \$12 billion in existing and upcoming electric transmission, and state-sponsored investment in energy efficiency, solar/photovoltaic resources and wind (\$4 billion).

² New England's wholesale electricity markets include the region's energy markets (Day-Ahead and Real-Time), the Forward Capacity Market, and ancillary services markets.

³ ISO New England testimony before the US House Energy & Power Subcommittee on March 19, 2013

Since that time, ISO New England has undertaken many improvements to address specific reliability concerns. Most significantly, ISO New England has filed, and the Federal Energy Regulatory Commission (FERC) approved⁴, changes to the Forward Capacity Market (FCM) known as Pay for Performance (PFP). Under PFP, resources are required to provide energy during times of system stress. Failure to perform (regardless of the reason) will dramatically reduce a resource's capacity payment while performance in excess of the obligation is rewarded. In addition, we have made energy market changes to strengthen resource performance (including hourly offers, sub-hourly settlements, and increased scarcity pricing); new situational awareness and forecasting tools; improved communication with pipeline operators; and the winter reliability programs to boost fuel inventories.

Moving forward, ISO New England is focused on initiatives that address three distinct challenges: The impact of greater levels of state-sponsored resources on wholesale markets, identifying and quantifying the shortcomings of the fuel delivery system in New England and the continued strengthening of cybersecurity staffing, systems and controls at the ISO.

Challenge 1: State Sponsorship for New Resources Drives the Need for Capacity Market Changes

The New England states have aggressive goals with respect to de-carbonization of their economies. Consequently, they have been focused on reducing emissions from existing fossil-fired generation, increasing the efficiency of energy usage and adding non-carbon-emitting forms of electric energy, typically referred to as "renewable energy." Although state-sponsored resources currently represent a small portion of the overall energy production, the New

⁴ FERC regulates wholesale markets and thus must approve any changes to our markets.

England states are planning to accelerate their efforts as they strive to meet their renewable portfolio standards, greenhouse gas reduction and environmental goals, and other specific policy objectives. With many of these resources having the potential to provide capacity to the region, markets need to accommodate their presence while still providing just and reasonable rates for other new and existing resources needed to ensure reliability. We expect that an anticipated influx of energy resources with very low operating costs will lower prices in the wholesale energy market, thereby gradually making all wholesale resources more dependent on revenue from the Forward Capacity Market. This makes appropriate price formation in the capacity market crucial to ensuring regional resource adequacy.

In response to this challenge, in August 2016, the New England Power Pool initiated a process known as *Integrating Markets and Public Policy* (IMAPP). The IMAPP process focuses on the integration of greater levels of state-sponsored energy projects into the New England markets and the potential for adverse impacts on price formation critical to maintaining a high-performing fleet of power system resources (including both generation and demand resources).

One of the more prominent challenges is that the FERC-approved capacity market rules that govern minimum bids for new resources in order to protect price formation (known as the Minimum Offer Price Rule) may result in some new state-sponsored resources failing to clear Forward Capacity Auctions. However, since these resources will nonetheless be built (having already entered into long-term contracts with utilities driven by state clean energy mandates), there is concern that some New England ratepayers may pay to “over-procure” capacity –

paying both for resources that clear the capacity market as well as for the resources developed to meet public policy requirements.

Competitive Auctions with Sponsored Policy Resources (CASPR) Solution

For several years, ISO New England has voiced support for pricing carbon as an efficient means to meet carbon reduction goals while continuing to harness the benefits of competition through wholesale markets. However, through participation in IMAPP and discussions in other forums, the New England states have clearly articulated significant concerns with this approach.

Given the pressing need to accommodate state public policy priorities in the near-term⁵ while the IMAPP process plays out, in April 2017, the ISO introduced a concept for changes to the Forward Capacity Market. We call this concept *Competitive Auctions with Sponsored Policy Resources (CASPR)*.⁶ Under the CASPR proposal, the primary capacity auction would operate much as it does now. However, CASPR creates a secondary, or “substitution” auction following the primary auction to bring together new, state-sponsored resources that did not clear the primary auction with capacity resources that cleared the primary auction but, given the opportunity, would choose to retire.⁷ The Minimum Offer Price Rule would not apply in the substitution auction, potentially allowing a retiring resource to transfer its capacity supply

⁵ In addition to market changes to accommodate the states’ near-term goals, New England stakeholders continue to discuss longer-term options to potentially achieve state policies through wholesale markets (e.g., a Forward Clean Energy Market).

⁶ https://www.iso-ne.com/static-assets/documents/2017/04/caspr_discussion_paper_april_14_2017.pdf

⁷ These resources are likely to be aging oil- and coal-fired resources that have signaled that they wish to permanently retire from the capacity market if the capacity price clears below a level that allows them to remain economic.

obligation to a new state-sponsored resource and dividing the capacity payment in a mutually-beneficial manner.

The substitution auction will accommodate state-sponsored resources over time (thereby reducing over-procurement) and likely help the New England states achieve their carbon-reduction goals by incentivizing older, higher-emitting resources to retire sooner. (As I discuss below, this will likely accelerate the need for a solution to New England's fuel security challenges.)

We are working through our stakeholder process to further develop the CASPR proposal and we plan to file the proposal with FERC in the December–January timeframe. Our goal is to have the tariff changes in place by March 2018 for resources seeking to qualify in the 13th Forward Capacity Auction (which will be run in February 2019 to secure capacity for the capacity supply obligation year beginning in June 2022).

Challenge 2: The Transformation of the Resource Mix is Creating a Fuel Security Risk

New England relies on the Forward Capacity Market to ensure an adequate supply of capacity and thus far, has allowed the region to continue to meet its capacity needs while facilitating the transformation of the resource mix. In the past few years, the capacity market has incentivized – through a market-based investment signal – a substantial amount of new

capacity resources, including highly efficient natural-gas fired power plants, as well as investments in renewable energy and demand resources, including energy efficiency.⁸

In 2000, oil- and coal-fired generators produced a combined 40% of New England's electricity, while natural gas produced 15%. Since that time, the shale gas revolution has lowered gas prices resulting in a much heavier reliance on relatively cleaner and cheaper gas-fired resources in New England. In 2016, natural gas produced nearly half of the electricity in New England (49%); by contrast coal and oil combined only produced 3% of the regional electricity needs – mostly during peak winter and summer days – while still representing over a quarter of the production capacity in the region.

As the regional grid continues to evolve, low fuel prices have led to lower wholesale energy prices. Wholesale prices are further reduced by injections of energy from state-sponsored resources that typically have very low production costs, as well as lower overall demand stemming from investments in energy efficiency and behind-the-meter solar-photovoltaic (PV) resources. While low wholesale energy market prices certainly benefit consumers, they eventually lead to economic stress on power plants that were designed to operate on a near continuous basis and garner the majority of their revenues from the energy market (such as steam generators powered by oil, coal and nuclear). And as expected, we have seen retirements in these classes of resources.

⁸ For Calendar Year 2016 (CY16), \$1.16 billion in Forward Capacity Market payments translated to roughly .9-cents/kWh (\$.009) on a retail bill. To put that in context, the all-in *wholesale* electricity price for CY16 was 6-cents/kWh (which includes supply costs and transmission costs). Capacity payments will increase in coming years in order to pay for the increased investment in new resources and the reduction in revenues in the wholesale energy market.

This trend will accelerate significantly in the coming years as New England states contract for substantial amounts of policy driven resources (primarily carbon-free, low marginal cost resources). This acceleration will have a pair of consequences: First, it makes the remaining merchant generation fleet in New England, which is needed for reliability, more dependent on revenues from the Forward Capacity Market and consequently on appropriate pricing in that market. Second, it increases dependence on gas-fired generators, thereby exacerbating regional concerns relating to reliable system operations in the winter, in particular due to constraints on the transportation of natural gas to the region.⁹

In my March 2013 testimony, I noted that for “power-grid reliability to be maintained, we need to have adequate levels of fuel inventory within the region, either through storage or reliable transportation arrangements so that the electric sector is ready to respond whenever called on by the ISO.” We now have an additional four years of operational experience to further underscore how important fuel security is to New England.

As New England has increased its reliance on natural gas, we have not seen a corresponding increase in the region’s natural gas transportation and storage infrastructure, which is currently stressed to meet demand for natural gas for both home heating and power generation during the coldest weeks of the year. The shift from power plants with on-site fuel supply (e.g., oil, coal and nuclear) to plants relying on the natural gas transportation network to deliver fuel when needed has exposed the limitations of New England’s fuel infrastructure

⁹ In addition to reliability concerns, constraints on the natural gas pipeline network result in price increases as well. From December 2013-February 2014, cold weather resulted in constraints on natural gas pipelines and wholesale markets reflected these shortages with costs of roughly \$5.05 billion (with the cost of natural gas averaging over \$19/MMBtu) over these three months.

system and highlights the challenge of securing fuel in advance of power system demands. New England's inability to reliably and consistently import sufficient levels of natural gas leads to several consequences, in particular reliability risks, price volatility and an increased use of oil- and coal-fired resources that are traditionally more carbon-intensive, less efficient, and more expensive to operate than most natural gas plants.

For several winters, ISO New England has implemented (with FERC's approval) short-term winter reliability programs to incentivize more robust fuel security arrangements heading into the winter season. From Winter 2018 onwards, we will be relying on market rules that incentivize generator performance, notably the abovementioned Pay-For-Performance incentives. However, when the PFP incentives were developed in 2013, they were structured to incent gas-fired generators to install dual-fuel capability (to make it economic for gas generators to switch from pipeline gas to locally stored oil when gas pipelines become constrained) and phased in over multiple years. Since that time, additional changes have occurred that cause us to be concerned that the PFP incentives, as presently formulated, may not be sufficient to ensure fuel security during the winter. These changes include significant opposition to the siting and permitting of new dual-fuel facilities and additional emission limits that restrict the amount of time generators can operate on oil, which is likely to create greater dependency on imported liquefied natural gas (LNG).

While we have had the ability to rely on non-gas generators (including oil, coal and nuclear resources) when gas pipelines become constrained, we have seen a large number of

these resources retire in recent years. We expect that many more of these resources will retire in the coming years due to the aforementioned economic realities and environmental policies.

To add some detail – since 2013, about 4,200 megawatts (MW) of oil, coal and nuclear capacity have either already retired or signaled retirement plans through our Forward Capacity Market. Beyond the retirements we have already seen, we believe an additional 5,500 MW of oil- and coal-fired facilities remain “at-risk” of retirement in the coming years and the owners of the larger of the two remaining nuclear facilities (the 2,100 MW Millstone Power Station) are evaluating the long-term viability of that facility. Although the precise timing of future retirements is uncertain, we know New England is on a course to turn over nearly one third of its generating capacity.

Any region that experiences a similarly dramatic shift – whether the region utilizes the competitive benefits of wholesale markets or remains vertically-integrated – must bring forward new investment in power system resources to replace those resources that are retiring. To ensure that power system reliability is not compromised, further investment is required in fuel infrastructure and supply, which includes investments in both physical infrastructure and in forward arrangements for the supply of these fuels. Investments in variable forms of renewable energy will help offset overall energy production from fossil generators *on average* during the course of the year, but cannot be relied upon to produce energy *in the moment, or over extended periods*, when the sun does not shine and the wind does not blow. Currently, there are no technologies that can provide large scale, seasonal

electricity storage, which is what would be required to avoid the additional fuel arrangements (LNG, natural gas or oil) needed to supply the natural gas and remaining oil generation fleet.

ISO New England is Undertaking a Fuel Security Analysis

To better understand and quantify this risk, the ISO is conducting a fuel security analysis to study the ability of generators to obtain the fuel they need to produce electricity during the winter peak season.¹⁰ The study is examining more than twenty cases of generating resource and fuel-mix combinations in the year 2025 and will quantify each case's fuel security risk. In particular, we want to examine the reliability risks resulting from additional non-natural gas generator retirements, with the addition of more renewable resources and the assumption that no new additional gas infrastructure is built.

Fuel security risk will be measured by the number and duration of operating reserve and energy shortfalls that could occur during the entire winter period in 2025 and that would require implementation of emergency procedures to maintain reliability. Completion of the study is expected in October, and in consultation with stakeholders, the ISO will determine whether further operational or market design measures will be needed to address the region's fuel security risk. While not an exhaustive list, options for mitigating fuel security risk can range from creating market incentives to incent individual generators to make adequate fuel storage and resupply arrangements (essentially creating a virtual pipeline to supply oil and/or LNG to the gas generation fleet), to investing in new pipelines, to investing in additional transmission

¹⁰ https://www.iso-ne.com/static-assets/documents/2017/05/20170522_fuel_security_study_update_final.pdf

to access greater amounts of dependable clean energy from our neighbors (with corresponding contractual arrangements to ensure deliveries when needed).

Challenge 3: Continued Vigilance on Emerging Security Threats

As this subcommittee is well aware, the volume and sophistication of the digital and physical threats to the bulk power system are steadily increasing. We are the only industry that owns and operates critical digital infrastructure that is subject to mandatory and enforceable security standards – the North American Electric Reliability Corporation’s Critical Infrastructure Protection (CIP) standards. The industry has already undertaken several updates since the advent of these standards a decade ago (with CIP Version 5 being the current baseline).

Beyond CIP, I would like to highlight several steps taken by ISO New England in this regard. To be able to detect, withstand, and recover from cyberattacks, the ISO has implemented an extensive system of process controls, advanced detection and response systems, and redundancy in systems and control centers. Building on existing tools, we launched the 24/7 Security Operations Center in 2015 to provide round-the-clock monitoring of the ISO network, and a 2017 project will apply best practices for isolating access to internal networked services and systems. In compliance with revised CIP standards, we’ve tightened security controls for cyber assets and visitors to ISO facilities. We’ll also be tightening security controls for hardware, software, and services associated with system operations, in response to anticipated NERC standards for supply-chain management.

ISO New England will again participate in the NERC-led GridEx exercise on cyber and physical security in November. This is in addition to the annual cybersecurity training undertaken by all ISO New England employees.

For security reasons we do not discuss the details of our cyber and physical defenses publicly, although I can assure you that we are actively engaged with other grid operators and the appropriate state and federal authorities to share information in this area. We recognize the importance of the infrastructure we operate and are constantly working to identify and address these dynamic and evolving challenges.

Conclusion

Since I last appeared before the subcommittee, New England has made many operational and market-based changes to meet the needs of the region. However, we are fully immersed in a major transformation of how electricity is produced and consumed in New England. Market forces and public policy decisions are impacting both operations and markets, and require solutions in order to fully realize their reliability, economic and environmental potential. However, I believe that the collaborative wholesale market and power system governance and risk management structures in place in New England will keep us on course to navigate and meet these challenges.

Thank you.

Mr. UPTON. Thank you.

Next, we are joined by Nick Brown, president and CEO of Southwest Power Pool. Welcome.

STATEMENT OF NICK BROWN

Mr. BROWN. Thank you and good morning, Chairman Upton and Ranking Member Rush and all the members of the subcommittee. My name is Nick Brown. I am president and CEO of Southwest Power Pool, an organization for which I have worked 32 years. The title of today's topic, Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets, I appreciate your interest in that topic and I am here to tell you the wholesale markets are functioning very well and very effectively.

In Southwest Power Pool we are focused on end use customers and we focus a great deal of our attention in ensuring that our benefit to cost ratio is large and increasing. Today it is greater than 11:1 versus the cost of operation of our organization across all reports of 14 states in the central part of the U.S. We have over 83,000 megawatts of generation and our footprint serving just shy of 55,000 megawatts of load, so obviously our reserve margins are multiple of our minimum criteria and we are very blessed that that portfolio is very diverse.

We have significant coal, gas, nuclear, a huge amount of wind and continuing to grow, and hydro. In fact, this morning I pulled up our web site in real time, a typical summer day, and our footprint was 46 percent coal, 28 percent wind, 19 percent natural gas, 6 percent nuclear, 4 percent hydro, a very diverse portfolio.

Very important to understand that the wind in our footprint has grown significantly over the past decade to nearly 17,000 megawatts. Nearly 17,000 megawatts. Also important is that half of that came on line in the last 2 years. It operates extraordinarily reliably and does so for a multiple of reasons.

I will tell you as an engineer with training in operations and planning, if you had asked me 10 years ago if we would have been able to reliably accommodate even half of that I would have said no. Period. End of discussion. So how are we able to do that today? There are specific reasons that we are able to accommodate that magnitude of wind in a very reliable fashion.

First and foremost, over the last 10 years, we have invested in nearly \$10 billion in transmission across our 14-state footprint and that has been paid for under policies developed by our regional state committee who is comprised of a commissioner from each of our states who, collaboratively, through our committee and their committee processes, determined a cost allocation process to pay for that transmission. But for that transmission we would not be able to accommodate in a reliable fashion that magnitude of wind.

Second, a day-ahead energy and day-ahead unit commitment market, we are able to commit generating units across those 14 states in a very, very reliable fashion. And then third, we consolidated all of the balancing authorities, more than 20, in our 14-state footprint, but for any one of those being pulled out of the equation we would not be able to accomplish. Reliability is job one. We can accommodate managing the system in a reliable fashion and we

can mandatorily from a reliability unit commitment perspective maintain whatever generation is needed to protect reliability.

Second, I want to go on to cybersecurity. It is an interest. It is a very, very high risk for our organization, but we are subject to the standards of the North American Electric Reliability Corporation. They require us to mandatorily comply with those. We are heavily audited against those. They are backstopped by the Federal Energy Regulatory Commission as are our market rules and we are subject to penalties of up to a million dollars a day per violation.

I believe we are in good hands, but the reliability standards are a threshold. We focus on security far above minimum reliability standards. I appreciate your time today.

[The prepared statement of Mr. Brown follows:]

Testimony of Nick Brown
President and Chief Executive Officer
Southwest Power Pool, Inc.
Chairman, ISO/RTO Council

Before the House Committee on Energy and Commerce
Subcommittee on Energy

“Powering America: A Review of the Operation and Effectiveness of the
Nation’s Wholesale Electricity Markets”

July 26, 2017

Executive Summary

- ***Southwest Power Pool:*** SPP is one of seven independent system operators (ISO) and regional transmission organizations (RTO) in the United States. We are a nonprofit corporation with a diverse membership of 95 companies, and on their behalf we manage a network of more than 65,000 miles of high-voltage transmission lines and dispatch nearly 800 generators across a 546,000-square mile footprint stretching from Louisiana to the Canadian border. We are designated by FERC to ensure the reliability of the nation's electric grid, direct construction of transmission upgrades, and facilitate the purchase and sale of electricity in a wholesale energy market.
- ***History of Success:*** SPP has successfully coordinated the electric reliability since 1941, largely on the strength of our relationships with stakeholders. SPP received FERC's RTO designation in 2004, grew our footprint from eight to 14 states between 2009 and 2015 and expanded our duties to include real-time and next-day energy markets and a consolidated Balancing Authority.
- ***Value of SPP's Markets:*** SPP's Integrated Marketplace is the mechanism through which we facilitate the sale and purchase of electricity to ensure cost-effective electric reliability throughout our region. Our market is the product of more than two decades of development and refinement and is subject to oversight by the ISO/RTOs themselves, independent market monitors, and FERC. For the last five years the cost of energy in the SPP region has been among the lowest in the nation. In its first year of operation, SPP's markets delivered \$380 million in net savings to our members and their customers, paying for themselves in just four months. They now provide market participants nearly \$500 million in benefits annually, and to date they have reduced the cost of electricity by more than \$1.25 billion in our region.
- ***Renewable Energy:*** SPP has overcome significant operational challenges and proved experts' assumptions false by successfully integrating substantial amounts of wind power into our system. Wind is now the second most prevalent fuel source in the SPP region, making up over 25 percent of our energy generated this year, behind only coal, and serves continually more and more of our load without any undesirable impacts to reliability.
- ***Challenges of Wind Integration:*** Rapid and substantial integration of wind comes with challenges, such as dramatic swings in wind output upward of 10,000 MW in less than 24 hours, and significant and sudden loss of wind generation due to icing and uncertainties inherent to wind forecasting.
- ***Markets and transmission as enabling resources:*** Successful integration of wind and other renewable and variable energy resources is dependent on enabling transmission infrastructure, consolidated balancing authorities, and effective market processes. High levels of wind and other variable energy resources could not be reliably dispatched without sufficient transmission to move energy from where it's generated to where it's needed, and our markets facilitate the real-time dispatch of variable and other generation resources to ensure reliable, affordable power for more than 17 million people in SPP's region.

Good morning. Let me begin by thanking Chairman Upton, Ranking Member Rush, and the members of the Energy and Power Subcommittee of the House Committee on Energy and Commerce for inviting me to testify before you this morning. My name is Nick Brown. I am the president and CEO of Little Rock, Arkansas-based Southwest Power Pool (SPP): the Federal Energy Regulatory Commission (FERC)-designated Regional Transmission Organization for all or part of 14 states including much of the Midwest. I also serve as the current chair of the ISO/RTO Council (IRC).

SPP is one of seven independent system operators (ISO) and regional transmission organizations (RTO) in the United States. Among other responsibilities, we are designated by FERC to ensure the reliability of the nation's electric grid, direct the construction of transmission upgrades, and facilitate the purchase and sale of electricity in a wholesale energy market, and we do so for two-thirds of the U.S. We are a nonprofit corporation with a diverse membership of 95 companies, and on their behalf we manage a network of more than 65,000 miles of high-voltage transmission lines and dispatch nearly 800 generators across a 546,000-square mile footprint stretching from Louisiana to the Canadian border. Our membership includes independent transmission companies, independent power producers, marketers, municipalities, state and federal agencies, electric cooperatives, and investor owned utilities. Additionally, we provide contract services to the Southwestern Power Administration, a federal agency.

SPP has coordinated the reliability of the bulk electric grid for over 75 years. We formed in 1941 when eleven regional power companies pooled their resources to keep Arkansas' Jones Mill aluminum plant powered around the clock in support of critical, national defense needs during World War II. From then until our incorporation in 1994 and based entirely on the strength of our relationships with stakeholders, we facilitated interstate commerce, wrote standards to ensure

nationwide reliability, and ensured the lights stayed on across our footprint. Our tariff, responsibilities, and staff size have grown significantly, but our values and commitment to serving our members have remained the same.

SPP received FERC's RTO designation in 2004 and our footprint expanded into Nebraska in 2009 and to the Canadian border in 2015 with the addition of the Integrated System, which includes the Upper Great Plains Region of the Western Area Power Administration, a federal agency under the U.S. Department of Energy. Each milestone is evidence of our commitment to doing the right thing for the right reason in the right way. That we've accomplished these things while also expanding our footprint from eight to 14 states and our duties to include real-time and next-day energy markets and a consolidated Balancing Authority is proof our strategy works.

We and our peers are among the most highly regulated businesses in the U.S., subject to regulation and audits by FERC and required to operate strictly under a FERC-approved tariff. We are likewise regulated and audited by NERC, the reliability compliance enforcement authority, and as part of the Energy Policy Act of 2005, NERC has the authority to fine us more than \$1 million dollars per day per compliance violation.

As SPP works diligently to ensure the supply of the most reliable and cost-efficient electric power for our entire region, we create value for our members through our expertise and the economies of scale afforded by our business model. Major services included in SPP membership include facilitation of a rigorous, proven stakeholder process; reliability coordination; tariff administration, scheduling and transmission settlements; reserve sharing; transmission system planning and coordination; operation of our Integrated Marketplace, including market settlements and congestion hedging; operations training; and compliance monitoring. SPP membership reduces members' requirements associated with Balancing Authority, Transmission

Service Provider, Planning Coordinator, and Reliability Coordinator functions. As SPP assumes administration of these services and compliance responsibilities, costs that would otherwise be incurred by individual entities or associated with third-party provision of these services decrease or are eliminated.

SPP's regional approach to transmission planning optimizes the existing transmission system while determining the best opportunities for transmission expansion needed to ensure reliability, make SPP's markets more efficient, and meet public policy objectives. SPP and its stakeholders have long considered a robust transmission grid to be a prerequisite to reliable, efficient operations. It was not until 2016, though, that we first published transmission infrastructure's value to our region.

Whereas previous studies projected the expected future value of transmission construction based on available forecast data, the 2016 Value of Transmission study undertaken by SPP used actual historical operating data obtained during the first year of operation of SPP's Integrated Marketplace to document transmission value already realized. In addition to fuel cost savings, the study used metrics accepted by the industry to quantify other benefits associated with the transmission expansion upgrades, including reliability and resource adequacy benefits, generation-capacity cost savings, reduced transmission losses, increased wheeling revenues and public policy benefits associated with more optimal wind development facilitated by the transmission upgrades. The net present value of all quantified benefits is expected to exceed \$16.6 billion over a 40-year period, resulting in a benefit-cost ratio of at least 3.5-to-1. This means the investments are expected to produce more than \$3.50 in overall benefits for every \$1 in transmission-related costs.

SPP's Integrated Marketplace is the mechanism through which we facilitate the sale and purchase of electricity to ensure cost-effective electric reliability throughout our region. It does not include a capacity market, and it is agnostic to fuel sources. Market algorithms dispatch the most reliable and least cost generation to meet demand. When we launched the Integrated Marketplace in 2014, arguably the biggest and most impactful single effort in our organization's history, we did so on time and under budget with the highest degree of quality. Along with our fellow ISO/RTOs across the U.S., our markets are the product of more than two decades of development and refinement. They are subject to a comprehensive structural and behavioral regulatory framework that includes oversight by the ISO/RTOs themselves, independent market monitors, and FERC. I urge great care to anyone considering changes to proven market rules.

The Integrated Marketplace has provided our members and their customers' tremendous value. For the last five years, from 2012-2016, the cost of energy in the SPP region has consistently been among the lowest in the nation, considering both ISO/RTO markets and other wholesale trading locations. In its first year of operation, SPP's markets delivered \$380 million in net savings to our members and their customers, paying for themselves in just four months. Analysis has shown their continued value: they now provide market participants nearly \$500 million in benefits annually. To date, SPP's Integrated Marketplace has reduced the cost of electricity by more than \$1.25 billion in our region.

Savings from SPP's markets and transmission planning efforts make up just a portion of the overall value we afford our members. These and other services, including reliability coordination, training, and more, provide net benefits to our members in excess of \$1.7 billion annually at a benefit-to-cost ratio of 11- to-1.

Today, we continue to demonstrate the successful evolution of our organization, evidenced particularly by our maturation of our cyber security practices and the effective management of a grid that's increasingly proliferated with renewable generation sources. SPP acknowledges the risk of a cyber attack as one of our top corporate risks, and with the other North American ISO/RTOs we support our collective resiliency efforts and the advancement of the cybersecurity posture of the power grid. We have and will continue to partner with state, local, regional, provincial and federal governments in Canada and the United States, NERC, the Electric Sector Coordinating Council, utilities, and academia to stay ahead of continuously advancing threats.

SPP collaborates with organizations including NERC's Electricity Information Sharing Analysis Center (E-ISAC) and local, state, regional, provincial and federal agencies in Canada and the United States, including Public Safety Canada, the FBI and Homeland Security, to ensure all ISOs/RTOs are secure and prepared to act in a cyber emergency. NERC biannually directs coast-to-coast GridEx drills which give all utilities the opportunity to coordinate responses to simulated cyber and physical attacks on electric and other critical infrastructures across North America. (GridEx is planned and executed with input from local, state, regional, provincial and federal government agencies in Canada and the United States, including the FBI and Homeland Security on the federal level and appropriate state and local agencies with which ISOs/RTOs coordinate on cybersecurity matters, as well as ISACs and supply chain organizations.) On a more frequent basis, individual ISOs/RTOs are routinely involved in regional, provincial or statewide exercises conducted throughout North America, thus ensuring opportunities for organizations to verify their readiness to respond to and recover from cyber and physical attacks.

Regarding renewable energy, it bears noting that the areas of our nation with the greatest potential for wind energy fall predominantly within SPP's footprint. In 2016 particularly, we

overcame significant operational challenges and proved many experts' assumptions false by successfully integrating substantial amounts of wind power into our system. It was assumed a decade ago, when wind comprised less than one percent of SPP's generation mix, that an ISO/RTO could never serve more than 20 to 30 percent of its load reliably with a variable resource like wind. Today, it's the second most-prevalent fuel source in the SPP region, making up over 25 percent of our energy generated this year, behind only coal, and serves continually more and more of our load without any undesirable impacts to reliability.

Installed wind-generation capacity increased in 2016 alone by more than 30 percent: from 12,000 MW to more than 16,000 MW. And we anticipate an additional 1,000 MW of wind generation to come online this year. As a result, and thanks to the continued maturation of SPP's market processes and the expertise of its operations staff, we are able to serve an ever-increasing percentage of our total load with wind. SPP's maximum simultaneous wind-generation peak rose from 9,948 MW in 2015 to 13,342 MW in February of this year. Also, wind penetration, the amount of total load served by wind at a given time, has increased from a 38 percent peak in 2015 to 54 percent in April of this year, setting a new ISO/RTO record for North America.

Such rapid and substantial integration of wind into our system comes with many challenges, including dramatic swings in wind output upward of 10,000 MW in less than 24 hours, and significant and sudden loss of wind generation due to icing and uncertainties inherent to wind forecasting. SPP also experienced an increase in congestion and congested flowgates with additional wind during the year: at high wind levels the SPP transmission system experiences approximately double the number of congested flowgates compared to periods with moderate levels of wind. Despite these challenges, SPP's staff works diligently to mitigate impacts and stay ahead of contingencies that could threaten the reliability of the system, and efforts like our

forward looking 2016 Variable Integration Study clarify SPP's operational focus to keep the lights on today and in the future.

Successful integration of wind and other renewable and variable energy resources is dependent on enabling transmission infrastructure, consolidated balancing authorities, and effective market processes. Such high levels of wind and other variable energy resources could not be reliably dispatched without sufficient transmission to move energy from where it's generated to where it's needed. Additionally, state regulators across the SPP region, like those that participate in the SPP Regional State Committee, deserve much credit for thinking regionally with regard to cost allocation and seeing the value in our continued evolution. A robust transmission system enables our markets to facilitate the real-time dispatch of variable and other generation resources to ensure reliable and affordable power for the 17 million people who we serve.

Thank you for giving me the opportunity to provide you an update on SPP and its markets. I look forward to your questions.

Mr. UPTON. Thank you.

Next we are joined by Bradley Jones, President and CEO of New York ISO. Thank you.

STATEMENT OF BRADLEY JONES

Mr. JONES. Thank you. Chairman Upton, Ranking Member Rush, members of the subcommittee, thank you for having me here. I am the chairman and CEO of the New York ISO. Prior to my position as CEO of the New York ISO, I was the chief operating officer of the Electrical Reliability Council of Texas.

New York has gone through significant changes much of the country has. Social, economic, policy changes are driving significant changes among each of these ISOs, and each of these ISOs here before you have responded to those changes and have built systems to ensure that they have the capability to maintain reliable, safe operations of their systems as well as do so at the lowest possible economic cost for their consumers.

I would like to highlight three of the critical functions of the NYISO. First, the NYISO operates the bulk electric system and does so under reliability rules that are set by the nation, by the state, and by our regions. Second, we operate competitive electricity markets throughout our regions to attain that lowest possible cost for consumers. And third, the NYISO conducts planning studies to ensure that we can guarantee reliability out into the future not just for today.

Since 1999, the competitive markets in New York have delivered consistently for consumers. Over \$7.8 billion over the last several years have been returned back to consumers through the efficient operation of our systems. Now beyond efficiency, since 1999, the creation of the NYISO, we have also seen a significant reduction in air emissions. Carbon is down by 43 percent from our generation fleet. Nitrogen oxides are down by 87 percent and sulfur dioxide down by 98 percent in that same period, significant track record. Yet, New York State continues to be a national leader on the environment and clean energy.

And at the NYISO we see a recognition as we move forward to ensure this clean energy future that we have something we must address. In our state we are beginning to recognize that we have a state which is characterized by a tale of two grids, a grid in Upstate which is primarily clean energy, nuclear energy, hydro, wind, solar, all components that have low emissions and yet in the south where much of our load is, over two-thirds of our load, Downstate we have a grid which is characterized by over 75 percent fossil fuel generation.

In order to achieve our low emissions and clean energy objectives we must be able to transport that power. To move renewable power throughout our grid we have to focus on the transmission system in New York. Now I need to applaud FERC. FERC passed, several years ago, an Order 1000 which has given the great opportunity to move forward on transmission projects within our region.

We have two major transmission projects that are currently underway and under consideration. One that moves power a thousand megawatts from left to right across the state and will enable us to get more of our power out of the hydro resources we have in the

west as well as the wind resources we have in the west. We also have another transmission project that is moving from Central New York down into our load centers of the Lower Hudson Valley, New York City, and Long Island.

Third, under consideration we are looking forward to working with the Public Service Commission in New York to drive one additional policy improvement. That is transmission from our north country into the central part of the state so that we can capture again renewable resources in that region. Achieving our renewable future, which is set by our governor as a goal of achieving 50 percent renewables by 2030, depends upon building transmission in the state. We are making great progress thanks to the work of the FERC so far and we will be making more progress as we go forward.

In addition, we are working very closely with the state of New York as an effective partner on analyzing the possibility of integrating carbon directly into our markets. What I mean by that is pricing carbon into the market dispatch, something that at this time that I don't believe any other state is doing, but certainly something that I believe most economists would suggest is the best way to accommodate low carbon resources in our markets.

We are very much at the beginning of this process. We have been working very closely with our state in a collaborative way. Our market participants requested that we hire a consultant. We hired the very renowned Brattle Group in to study this issue. We hope in the next several days to release a major report on the possibility of integrating carbon into our markets.

We think it is an extraordinary way that could, is very promising for our future not only at keeping costs down for our consumers, but also in doing so in a way that reduces carbon even further than the current programs in place. So New York ISO, much like these ISOs before you, have accommodated change, they have led change. We will continue to do that in the future. Thank you.

[The prepared statement of Mr. Jones follows:]

**STATEMENT OF BRADLEY C. JONES
PRESIDENT AND CHIEF EXECUTIVE OFFICER
NEW YORK INDEPENDENT SYSTEM OPERATOR, INC.
Before the
U.S. House of Representatives
Committee on Energy and Commerce
Subcommittee on Energy**

July 26, 2017

My name is Bradley C. Jones. I serve as the President and Chief Executive Officer of the New York Independent System Operator, Inc. ("NYISO"). I have over 30 years of experience in the electric industry, including power system operations and planning and wholesale electricity markets. Prior to assuming my position at the NYISO, I served as Senior Vice President and Chief Operating Officer at the Electric Reliability Council of Texas ("ERCOT"), which is the system operator responsible for electric system operations across most of Texas. In this position, I was responsible for Operations, Grid Planning, and Commercial Operations. My comments address the interaction between New York State energy policies and the NYISO-administered wholesale electric markets.

On behalf of the NYISO, I would like to thank Chairman Upton, Vice Chairman Olson, Ranking Member Rush, members of the Energy Subcommittee, and staff for your invitation to discuss the challenges and opportunities faced by the electric energy industry and the important roles that Independent System Operators and Regional Transmission Operators play in providing reliable and cost effective electricity to consumers.

The NYISO is an independent, not-for-profit organization that began operation in 1999. It is regulated as a public utility by the Federal Energy Regulatory Commission ("FERC") under the Federal Power Act and as an electric corporation by the New York State Public Service Commission under the New York State Public Service Law. As the independent operator of New York's bulk electric system, the NYISO, its directors, and its employees have no financial interest in its market participants or the outcomes of the energy markets it oversees. The NYISO has a legal obligation to provide open, non-discriminatory access to the electric system. We do not advocate for or against any electric industry entity, and we maintain a balanced, unbiased perspective on generation, transmission and demand-side resources.

Technological, social, economic, and policy trends have combined to make this a time of exciting innovation for America's electric system. In the Empire State, the NYISO is at the heart of those changes, serving the needs of consumers, addressing public policy goals, and ensuring that the power to drive New York's economy is where it is needed, when it's needed.

I would like to highlight three of the NYISO's critical functions. First, the NYISO operates New York's bulk electric system in accordance with mandatory national, regional, and state reliability requirements. Second, the NYISO administers competitive wholesale markets enabling generators and other resources to sell power to utilities and other load serving entities which,

in turn, supply it to New York consumers. Third, the NYISO conducts comprehensive system planning to maintain the long-term reliability of the State's bulk electric system. In that capacity, the NYISO participates as a non-voting member of the New York State Energy Planning Board.

Since 1999, the NYISO's competitive markets for wholesale electricity have maintained reliability, increased efficiency, and supported the secure operation of the grid. NYISO markets saved an estimated \$7.8 billion in fuel costs for New Yorkers, increased the operational efficiency of New York's grid by 300% over the national average, and saved nearly \$613 million by reducing energy reserves needed to maintain reliability. In the period since competitive wholesale markets have been in place, New York's power sector has reduced Carbon Dioxide emissions rates by 43%, Nitrogen Oxide emissions rates by 87%, and Sulfur Dioxide emissions rates by 98%.

CULTIVATING CLEANER, GREENER POWER

New York State continues to be a national leader on clean power and environmental quality initiatives. The Regional Greenhouse Gas Initiative, and New York's Clean Energy Standard and Reforming the Energy Vision initiatives will shape the future emission profiles of the state's electric generation and the mix of resources used to produce power.

NYISO's competitive markets have a proven track record of adapting to changes in technology, demand, fuel supply economics, and public policy while supporting New York's economy and providing savings to consumers. Markets will continue to be the platform for achieving progress, meeting policy goals, advancing technology, and maintaining reliability.

Specifically, competitive wholesale electricity markets have complemented environmental efforts to expand and integrate renewable power resources and have fostered efficiencies that have reduced emissions. NYISO's markets and open access to the transmission system have a clear track record of facilitating the development of renewable resources. These markets have been refined to address the unique characteristics of wind power. The NYISO's systems enabled wind power resources in New York to grow from 48 MW of supply in 2005 to 1,827 MW today. Energy produced from wind is up from 101 GWh in 2005 to 3,943 GWh in 2016. Looking ahead, the NYISO has another 4,807 MW of wind projects in its interconnection queue.

The NYISO is applying its experience with wind generation to solar resources. The NYISO's 2015 Solar Study developed and tested solar forecasting tools and prepared 15-year forecasts of solar capacity in each region of the state. The NYISO will soon integrate behind-the-meter and grid-connected solar forecasts into its real-time generator dispatch and commitment process. In terms of growth, in March 2016, there were 233 MW of grid-scale solar projects in the interconnection queue. By March 2017, the NYISO had 35 grid-scale solar projects representing 881 MW of capacity seeking to interconnect. Since March, the number of proposed solar projects in the interconnection queue has increased rapidly to more than 1,600 MW.

TALE OF TWO GRIDS

As the NYISO looks to a cleaner energy future in New York, the NYISO sees the emerging story of New York's electric system as one of a grid characterized by stark regional differences that

can be thought of as a tale of two grids. New York has an abundance of renewable energy resources and generation capacity in upstate, yet relatively low demand. In contrast, the downstate region has a higher concentration of fossil fuel generators and significantly higher demand, using 66 percent of the state's electric energy annually. In fact, nearly 75 percent of the electricity generated in the downstate region last year was produced by fossil fuel resources, while about 85 percent of electricity generated upstate came from nuclear, hydro, and wind resources with no carbon emissions.

The NYISO's recently-released Power Trends report highlights a fundamental burgeoning challenge for New York: longstanding transmission constraints prevent more clean energy produced in the upstate grid from reaching the downstate grid. Energy from growing clean resources is unable to reach downstate load centers, suppressing upstate wholesale prices to the point where the economic viability of generation needed for reliability is jeopardized.

TRANSMISSION EXPANSION TO MEET PUBLIC POLICY NEEDS

A cleaner, greener, integrated grid – one that includes both central power station and distributed resources will depend on a modernized, upgraded, and expanded transmission system. Well planned transmission investments will enable upstate resources to better serve a broader market– providing benefits such as a more resilient grid, access to more diverse energy resources and more efficient market competition. Upgraded transmission capability is vital to meeting the state's renewable public policy goals and efficiently moving power to address regional power needs.

New York State and the NYISO are working together to make progress on the transmission front through the Public Policy Transmission Planning Process. This process, embedded in the NYISO's FERC-regulated tariff, provides an opportunity for the State of New York to identify transmission expansion needs based upon public policy needs. The NYISO administers this public policy process with stakeholders, developers, the New York Public Service Commission, and the Federal Energy Regulatory Commission to select transmission projects that will be built and paid for through NYISO's tariffs. Two such public policy planning processes are currently well underway, while a third effort is in the early stages of development.

First, the NYISO is in the final stages of a detailed evaluation of ten projects that will address public policy needs in western New York State identified by the New York State Public Service Commission. Specifically, these transmission projects are expected to relieve congestion in western New York to allow access to increased output from the Niagara Power Project and additional imports of renewable energy from Ontario. The NYISO has issued a draft Western New York Public Policy Transmission Planning Report for review by developers and our stakeholders, and we expect Board action on a final report in early autumn 2017.

Second, the New York State Public Service Commission has identified a public policy need for transmission to relieve congestion between western and northern New York state and southeastern New York. Referred to as the "AC Transmission" public policy initiative, these projects are expected to improve the flow of power from upstate renewable resources to meet downstate demand. The NYISO is conducting detailed evaluations of thirteen projects designed

to provide additional transmission capacity to move power from upstate to downstate. A final report is expected to be ready for consideration by the NYISO Board in the first quarter of 2018.

While progress on the western New York and AC Transmission proceedings is good news, there is still more work to be done if we are going to meet the state's public policy goals. In the current cycle of Public Policy Transmission Planning, stakeholders have stated that the Clean Energy Standard, in combination with New York's Reforming Energy Vision initiative and the New York State Offshore Wind Master Plan will drive the need for more transmission to bring renewable energy from constrained regions in upstate, Canada and from offshore wind to New York City and Long Island. These potential needs are actively being reviewed by state policy makers.

CYBERSECURITY

As the systems that control and monitor the power grid become more advanced and interconnected, the scope of physical and cyber security concerns expands. Mandatory federal reliability standards for owners and operators of the bulk electric system include Critical Infrastructure Protection (CIP) standards. Developed by NERC and approved by FERC, these standards cover a wide range of risk areas, including identification and classification of cyber assets to physical security, personnel and training, event monitoring and communication, incident response, protection and isolation of network architecture, access and change control, and system recovery.

The NYISO implements the cyber and physical security standards as part of a layered "defense in depth" posture that seeks to defend its critical infrastructure assets from incursions. The NYISO actively participates in the development of standards and remains engaged in enhancing cyber and physical security practices to address evolving risks. We actively collaborate with various New York State and federal government agencies, other ISOs and RTOs, and other industry entities, to maintain rigorous security protections. For just one example, we conduct annual desk-top Grid-Ex cyber attack simulations to test our coordinated response capability with other grid operators and our partners in national security and law enforcement.

PRESERVING THE COMPETITIVENESS AND EFFICIENCY OF WHOLESALE MARKETS

The NYISO markets have proven to be an effective partner in achieving the State's environmental goals. Building upon that success, the NYISO is exploring opportunities to further harmonize wholesale energy markets with New York State clean energy policies.

At the request of its stakeholders, the NYISO commissioned the Brattle Group to explore whether New York State environmental policies may be pursued within the existing wholesale market structure at a reasonable cost to consumers. The Brattle Group is investigating a method to incorporate the social cost of carbon into generation offers and reflect that cost in energy clearing prices. Generating units that emit carbon would incur a penalty based on their level of carbon emissions and the social cost attributed to carbon. The penalties collected by the NYISO would then be returned to customers in some equitable manner.

The NYISO is in the initial stages of exploring that potential with the Brattle Group, our market participants, and New York State. The NYISO will collaborate with stakeholders and New York State to examine the feasibility of modifying NYISO's market design to complement New York's ambitious environmental policies.

CONCLUSION: LIGHTING THE WAY

Together, we are transforming the power grid to achieve the goals of cleaner energy, improved efficiency and strong economic growth. However, these goals will be difficult to achieve if we do not address the physical limitations of our transmission system.

The NYISO will continue to adapt to the rapidly changing energy landscape while ensuring continuity and reliability. Working closely with utilities, generators, regulators, and industry stakeholders, the NYISO is confident that we can transform New York's power grid for the better – both upstate and downstate. Together we will maximize the potential of renewable and distributed energy resources to benefit our economy and consumers.

Mr. UPTON. Thank you.

Next, Richard Doying, executive VP for Midcontinent ISO. Welcome.

STATEMENT OF RICHARD DOYING

Mr. DOYING. Good morning, Chairman Upton, Vice Chairman Olson, and Ranking Member Rush, and the rest of the subcommittee members. I appreciate the opportunity to talk to you today about the important topic of energy markets and their effectiveness and efficiency.

I started at MISO in 2002 as we were developing the energy markets, and we have seen significant change in the markets and the resources since that time and I look forward to discussing those changes with you and how the markets have adapted to deal with those changes. I know the committee is interested in hearing about retirement of generation coal and nuclear units as well as increases in gas, increases in renewable energy, and I intend to focus my remarks here today on just those issues.

As a brief introduction to MISO we are, as noted earlier, a 501(c)(4), a public interest organization, so we exist for the benefit of the consumers in our region to reliably operate the system as well as to ensure the lowest cost delivered prices to those customers. We operate about 175,000 megawatts of generation across 15 states, serving about 42 million people. As part of that we annually generate about \$3 million in benefits for all of our consumers.

The industry is being impacted by a combination of regulatory, political, and economic factors and we have already experienced a dramatic shift and changes in the MISO region. While coal-fired generation supplied about 75 percent of the energy consumed in the MISO region in 2005, it now accounts for less than 50 percent, about 46 percent. While gas resources generated about 7 percent of the energy consumed in the MISO region in 2005, that number is now at 27 percent. And while renewables generated and accounted for almost zero percent of our energy in 2005, it now accounts for about 7 percent and it continues to grow rapidly.

The changes in that generation profile are due both to reduction in coal and the retirement of about 13,000 megawatts of coal within the region, but it is also driven by economic factors, primarily the reduction in natural gas prices. If you looked at the natural gas prices in 2005 and considered how far they would reduce by 2015 and the fact that gas would be a more economic fuel source than coal, no one would have believed that that could possibly be the case. But it has led to considerable change in the generation resource mixes as well as the operation of the grid.

So how do markets adapt to those changes? We innovate. We create new market products and new market services in order to accommodate those changes in the resource mix and we continue to innovate in order to address particularly renewables and the increase in gas generation. So I will note three different areas where that occurs.

One is we partner with our states as they conduct their resource planning to evaluate the generation portfolio that they plan to bring forward in the future and to provide our planning and oversight to make sure that they understand in an aggregate basis

across the broader region the implications of changes they may be making in their portfolio and how that will affect the operation of the grid in the market. We also facilitate infrastructure investment and reliable grid planning. That process has resulted in over \$26 billion of new transmission infrastructure. An original portfolio of about \$5.6 billion approved in 2011 resulted in 28,000 direct construction jobs and about 50,000 jobs total.

We also work continuously to improve our markets, to innovate the market design and products and services. We have a market roadmap process where we work with all of our stakeholders including states, including the load-serving entities, generators as well as all other interested stakeholders, and that includes changes that are directly related to the changes that I noted in the generation mix in the region.

And I will give you just a couple examples of those. Previously we introduced a new product that would allow wind generators to participate in the market on the same basis as thermal generators offering into the market and allowing dispatch within the region in order to assure the most operationally reliable as well as market efficient outcomes. More recent examples of additional changes to address both the changing fuel mix as well as increasing gas would be new market capabilities for combined cycle units which are very flexible and can offer in multiple configurations into the market and that will allow us to optimize the uses of those resources.

Finally, we work closely with other sectors such as the natural gas sector and we will continue to do so as we go forward and gas becomes more important. I hope my written comments and introductory comments have been helpful to the committee in terms of introducing these topics and I look forward to the conversation.

[The prepared statement of Mr. Doying follows:]

Testimony of Richard Doying

Executive Vice President and Chief Operations Officer
Midcontinent Independent System Operator, Inc. (MISO)

Before the House Committee on Energy and Commerce
Subcommittee on Energy

“Review of the operations and effectiveness of the nation’s wholesale
electricity markets”

July 26, 2017

Executive Summary

- ***Midcontinent Independent System Operator, Inc. (MISO) Overview:*** MISO is a 501(c)(4) not-for-profit social welfare organization established to ensure the reliability of the high-voltage electric transmission system to deliver low-cost wholesale energy to consumers. MISO manages about 66,000 miles of high-voltage transmission lines and 175,000 megawatts of electricity-generating capacity and serves about 42 million people across all or parts of 15 states. This regional platform creates \$3 billion in annual benefits for members and consumers.
- ***Experienced in the Changing Energy Landscape:*** The electricity industry is being impacted by a combination of regulatory, political and economic factors. The MISO region has already experienced a dramatic shift. While coal-fired generation supplied 76% of the region's electricity production as recently as 2005, that figure has fallen to just 46% today. Conversely, while gas supplied just 7% of the region's energy in 2005, it supplies about 27% today. And renewables, which were essentially at 0% in 2005, are at 8% and growing rapidly today.
- ***Navigating the Evolving Portfolio:*** MISO continues to innovate as we execute on the processes and functions that have allowed us to successfully and reliably navigate the significant change to-date.
 - We have partnered with our States and utilities to survey the resource needs of our footprint and the most recent results in June 2017 indicate that there are sufficient resources to meet demand through 2022.
 - We facilitate infrastructure investment through regional grid planning. This process has resulted in the approval of over \$26 billion in grid investments, including a \$5.6 billion portfolio of projects approved in 2011 as the first Multi-Value Projects, which were estimated to create about 28,000 direct construction jobs and around 50,000 total jobs. We will continue to identify solutions today that provide benefits regardless of the actual future state, so called no-regrets investments, well out in the future.
 - MISO also works to continuously improve our markets, driving efficiency and reliability through innovative market design features and services. Through our market roadmap process we work with stakeholders to identify, prioritize and plan future changes that foster wholesale electric markets that deliver reliable and economically efficient outcomes. We have also been working closely with the natural gas industry to address issues associated with the region's increasing reliance on gas-fired power generation.

Good morning Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and members of the Subcommittee. I am Richard Doying, executive vice president and chief operations officer at the Midcontinent Independent System Operator, Inc., or MISO. It is a pleasure to be with you today as you examine the operations and effectiveness of our nation's wholesale electricity markets. I hope the insights I share with you today about how MISO manages wholesale markets and operates a regional electrical grid will be useful to your work of shaping U.S. energy policy.

I know this committee is interested in hearing about how factors such as environmental regulations, the retirement of coal-fired power plants and the increasing use of natural gas and renewables are affecting our nation's electricity industry. Before I discuss MISO's perspective on these matters, I'd first like to provide a little background about our organization.

The Federal Energy Regulatory Commission's (FERC) Order 2000, issued in 1999, established Regional Transmission Organizations (RTO) to be independent entities that plan and operate the electric grid on a regional basis to maintain reliability and maximize efficiency. MISO was the first RTO to receive FERC approval in 2001.

MISO is a 501(c)(4) not-for-profit social welfare organization with responsibility to ensure the reliability of the high-voltage electric transmission system to deliver low-cost wholesale energy to consumers. The wholesale markets that MISO manages are the largest in North America in terms of geographical scope, serving about 42 million people across all or parts of 15 states, stretching from the Canadian border to the Gulf of Mexico. They are also among the largest in the world as measured by transactional value, with more than \$25 billion in annual gross market charges. MISO also serves as the reliability coordinator for the Canadian province of Manitoba.

Currently, the MISO market region contains about 66,000 miles of high-voltage transmission with an aggregate value of approximately \$38 billion, as well as 175,000 megawatts of electricity-generating capacity. MISO does not own any of these assets. Instead, with the consent of our asset-owning members and in accordance with our FERC-regulated tariff, MISO exercises functional control over the region's transmission and generation resources with the aim of utilizing them in the most cost-effective and reliable manner possible. MISO has a robust and strong stakeholder process that allows asset owners, state regulators and all stakeholders to provide input and guidance to MISO on a regular and ongoing basis.

MISO's mission is to facilitate the reliable delivery of low-cost wholesale energy to the end use customers in our footprint. We achieve this through innovative wholesale market operations and transmission grid planning. Through execution of those functions and a focus on affordable energy we generate substantial benefits for the end-use consumers served by our member utilities. MISO performs an annual study, called the Value Proposition, to measure these benefits. In 2016 benefits totaled approximately \$3 billion. Over the last decade, the cumulative value created is about \$18 billion. A significant portion of these benefits come from the region's resources being pooled and shared, which results in the deferral/avoidance of additional asset build by individual utilities. This value creation has continued even in the face of a significantly changing energy landscape.

The electricity industry is in the midst of a profound transformation due to a combination of regulatory, political and economic factors. These include environmental regulations targeting emissions from coal-fired power plants; state policies promoting renewables; and the abundance of low-cost natural gas spawned by advances in hydraulic fracturing and horizontal drilling. Additionally, energy-efficiency initiatives and "demand-side" programs that compensate

customers for reducing their electricity use are growing in popularity, as are emerging technologies such as energy storage and distributed-energy systems like rooftop-mounted solar panels that allow homeowners to generate their own energy and sell their excess power back to the grid.

In the MISO region, which has historically been heavily reliant on coal-fired electricity generation, the impacts have been notable. For example, while coal-fired generation supplied 76% of the region's electricity production as recently as 2005, that figure has fallen to just 46% today. Conversely, while gas supplied just 7% of the region's energy in 2005, it supplies about 27% today. And renewables, which were essentially at 0% in 2005, are at 8% and growing rapidly today.

Due to the ongoing nature of the factors driving these changes, MISO expects the trends to continue into the future. I understand many people are very concerned about how these changes are affecting energy prices, wholesale markets and the reliability of the nation's electrical grid. While the changing landscape presents some challenges, MISO continues to evolve and innovate as we execute on the processes and functions that have allowed us to successfully navigate the significant change that we have already experienced in our footprint.

One impact of the transitioning fleet is declining reserve margins. The MISO region is predominately comprised of traditionally structured and state regulated utilities. Under this regulatory regime, the responsibility for ensuring that enough resources will be available to meet the demand for electricity while maintaining an adequate supply of reserves—a concept known as achieving “resource adequacy”—rests with load-serving entities (LSEs) and state regulatory agencies where applicable. However, MISO has partnered with those entities on an annual survey mechanism that creates visibility and transparency into the near- and mid-term regional

supply and demand picture that has facilitated actions needed to ensure ample resources continue to be in place to maintain long-term grid reliability. The latest iteration of the survey, conducted during the first half of 2017, demonstrates that generating capacity in the MISO region will exceed demand plus reserve margin requirements through at least 2022.

Our regional grid planning and facilitation of infrastructure investment has also been a key contributor to the region's ability to effectively manage the resource portfolio evolution. This process, which is driven by input from MISO stakeholders, is designed to maximize value for consumers while minimizing the costs of transmission, generation and the energy on the system. As a part of this process, MISO identifies essential transmission projects that will improve the reliability and efficiency of energy delivery in the region over the next 10 years and beyond – ensuring transmission is available where needed to transmit energy from new resources to where it is consumed. These projects are included in the MISO Transmission Expansion Plan (MTEP), an annual publication that is the culmination of 18 months of collaboration between MISO planning staff and stakeholders.

Through this process MISO has facilitated the approval of over \$26 billion in grid investment. This includes a \$5.6 billion portfolio of projects approved in 2011 as the first Multi-Value Projects. The portfolio is made up of 17 projects, with each state in MISO's North and Central Regions being home to at least one. These projects provide reliability and efficiency benefits, and were primarily designed to support and accommodate different state renewable energy policies. This group of projects is expected to generate benefits that exceed costs by 2.5 times. In addition, they were estimated to create about 28,000 direct construction jobs and around 50,000 total jobs.

Our long-term planning process that identified this portfolio is a scenario-based approach that uses a range of potential outcomes to “bookend” the uncertainty associated with the different factors that can influence future system needs and thus transmission system design. Those assumptions include things such as coal and natural gas prices; the demand for electricity; generation retirements; and state mandates for certain amounts of renewable energy. We will continue to utilize this process to identify solutions today that provide benefits regardless of the actual future state, so called no-regrets investments, well out in the future.

As the industry continues to evolve, planning across RTO borders to improve our ability to fully maximize and optimize collective resources will be more crucial. FERC Order 1000 contains a component that directs interregional coordination between neighboring RTOs. While this has helped to spur efforts between entities, regional differences in approaches and methodologies can mute progress. Given the increasing importance of maximizing existing resources in the future to meet customer needs, this is an opportunity for improvement.

MISO also works to continuously improve our markets, driving efficiency and reliability through innovative market design features and services. Our Market Enhancement Program team works closely with our stakeholders and the Independent Market Monitor to identify, develop and implement market design improvements. Through our market roadmap process we work with stakeholders to identify, prioritize and plan future changes that foster wholesale electric markets that deliver reliable and economically efficient outcomes. A couple of examples include:

- An enhanced pricing structure that better reflects the total cost of generation, reducing out-of-market costs and allowing more resources to participate in the market, thus improving market outcomes.

- A market product that creates a reserve of energy resources capable of rapid output changes that can quickly respond to short-term demand variations, thus improving reliability and reducing price volatility.

We have also been working closely with the natural gas industry to address issues associated with the region's increasing reliance on gas-fired power generation. While this trend is being driven by economics, it can also pose challenges for the power industry. For example, gas-fired power plants could find it difficult to procure all the fuel they need to operate during extreme winter weather, when large amounts of gas are used to heat homes. MISO has launched numerous efforts to ensure that gas-fired units can operate reliably during extreme winter conditions and other circumstances, including:

- Establishing direct communications with gas pipeline operators.
- Aligning our Day-Ahead electricity market with the gas industry's timelines for scheduling next-day pipeline deliveries of gas.
- Administering a voluntary "Winter Generator Fuel Survey" that increases our awareness of the gas-delivery arrangements in our region.

RTOs have a unique role in the industry and bring a unique perspective to the challenges we face. We are policy takers – we don't advocate for any particular policy, but instead work with the states, utilities and all other stakeholders in our regions to ensure any policy is implemented reliably and in the most efficient manner. MISO has utilized this role to create nearly \$18 billion in benefits for its region while positioning it to navigate the continuing evolution of the industry. We appreciate the opportunity in front of us to help our region through this change and to inform the discussions that will shape the path forward.

Mr. UPTON. Thank you.
Cheryl Mele, senior VP and chief operating officer of ERCOT, welcome.

STATEMENT OF CHERYL MELE

Ms. MELE. Good morning, Chairman Upton, Ranking Member Rush, and members of the subcommittee. Thank you for the opportunity to address you today and offer ERCOT's perspective on the wholesale competitive markets. My name is Cheryl Mele and I am the senior vice president and chief operating officer for the Electric Reliability Council of Texas.

ERCOT manages the flow of electric power to about 24 million Texas customers. This represents about 90 percent of the load in Texas. We are a membership-based 501(c)(4) nonprofit corporation governed by a board of directors and subject to the oversight of the Public Utility Commission of Texas as well as the Texas legislature. ERCOT is the only non-FERC jurisdictional power market in the continental United States. We are subject to the reliability and security standards set by NERC, and maintaining this regulatory structure is vital and will continue to bring the benefits of a reliable grid and vibrant market with the lowest cost to the consumers of Texas that we serve.

ERCOT has an energy-only market. With limited exceptions, generators are paid only for the energy they actually put onto the grid. A number of enhancements have been made to ERCOT's market since it was launched, but the core energy-only principles have not changed. We continue to discuss further refinements with stakeholders and regulators and to consider the appropriate role for the ERCOT market and operations in accommodating newer technologies that may offer different characteristics whether they are storage, additional renewables, flexible thermal units or distributed generation.

Contrary to the national trend, we project an annual average of 1.5 percent load growth over the next 5 years, and in recent years the energy use in ERCOT has grown by an average of about two percent annually. The generation fleet in ERCOT features a diverse fuel mix including more wind than any other state. We currently have over 18,000 megawatts of wind installed and operating in ERCOT.

In 2016, the energy produced in ERCOT was predominantly from natural gas plants at about 43 percent, followed by coal at just under 29 percent, wind at 15 percent, and nuclear at 12 percent. That continued load growth and new generation investments support continued investment in transmission in the region. With natural gas playing such a large role in our generation fuel mix, commodity price of natural gas is the primary driver of the wholesale prices in ERCOT. With consistently low gas prices and ample reserve margins, the average wholesale price of power in ERCOT has been very low in recent years. We recognize these low prices effect generation owners' revenues and we are always attuned to the reality and possibility of generation unit retirements that could affect our reserve margin outlook.

Like all independent system operators, reliability is our primary measure of performance. We have successfully updated our oper-

ations and market rules to reflect a changing grid and we will continue to work with stakeholders as technologies evolve or issues emerge. Through innovation, our staff and stakeholders have shown an enormous capability to solve new and challenging problems today and in the future. While not a market issue, we are appreciative of and remain committed to our external collaborations with relevant federal and state governmental agencies, the industry, and national labs to enhance everyone's cybersecurity posture.

In conclusion, with healthy reserves and low prices in ERCOT's energy-only market, continuing with the current, predictable regulatory structure is important. This allows us to be responsive to all of our regulators as well as the consumer and market participants. We will continue to collaborate to address future challenges and opportunities in the ERCOT region and we will continually investigate the inputs and tools needed to support reliability as the grid continues to change. Thank you for your time today and opportunity to appear before you.

[The prepared statement of Ms. Mele follows:]

Testimony of Cheryl Mele
Sr. Vice President and Chief Operating Officer
Electric Reliability Council of Texas, Inc.

Before the Subcommittee on Energy
Committee on Energy & Commerce
U.S. House of Representatives

"Powering America: A Review of the Operation and Effectiveness of the
Nation's Wholesale Electricity Markets"

July 26, 2017



Summary of Statement

- ERCOT is the only non-Federal Energy Regulatory Commission (FERC) jurisdictional power market in the continental United States. We are subject to reliability and security standards set by the North American Electric Reliability Corporation (NERC). Maintaining this regulatory structure is vital and will continue to bring the benefits of a reliable grid and vibrant market at a low cost to the consumers of Texas.
- We manage the flow of electric power to 24 million Texas customers — representing about 90 percent of the state’s electric load. ERCOT is a membership-based 501(c)(4) nonprofit corporation, governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas Legislature.
- Contrary to a national trend, we project an annual average of 1.5 percent load growth over the next five years. Meanwhile, overall energy use in ERCOT has grown by an average of about 2 percent annually in recent years.
- ERCOT’s generation fleet features a diverse fuel mix, including more wind generation than any other state. In 2016, energy use in ERCOT was predominantly natural gas at 43.7 percent, followed by coal at 28.8 percent, wind at 15.1 percent, and nuclear at 12 percent.
- ERCOT has an energy-only market. With limited exceptions, owners of generation resources are paid only for the electricity they put onto the grid. While a number of enhancements have been made to the ERCOT market since it launched, the core “energy-only” principles have not changed.
- We continue to discuss with stakeholders and regulators the appropriate role for the ERCOT market and operations in accommodating newer technologies that have different characteristics — whether they are storage, renewable, flexible thermal units, or distributed generation.
- We remain committed to external collaborations with relevant government agencies, the industry, and national labs to enhance everyone’s security posture.

Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and members of the Subcommittee, thank you for the opportunity to address you on the operation and effectiveness of the nation's wholesale electricity markets. My name is Cheryl Mele, and I am the Senior Vice President and Chief Operating Officer for the Electric Reliability Council of Texas, Inc. (ERCOT). ERCOT is the independent system operator (ISO) for the ERCOT Interconnection, which encompasses approximately 90% of electric load in Texas. As a region, ERCOT covers most, but not all, of Texas, with portions of the Texas Panhandle, Far West Texas, and the eastern edge of the state in the other interconnections. We are the only non-Federal Energy Regulatory Commission (FERC) jurisdictional power market in the continental United States. Maintaining this regulatory structure is key to fostering reliability and our unique market at a low cost to the consumer.

ERCOT manages the flow of electric power to 24 million Texas customers and schedules power on an electric grid that connects more than 46,500 miles of transmission lines and more than 570 generation units. We also perform financial settlement for the competitive wholesale bulk-power market and administer retail switching for 7 million premises in competitive choice areas. Smart meters are ubiquitous in ERCOT and support customer choice, new technologies, and reliability.

Starting in the mid-1990s, the Texas Legislature and the Public Utility Commission of Texas restructured the ERCOT electricity system to create the competitive wholesale and retail markets that exist today. While we operate as the only non-Federal Energy Regulatory Commission (FERC) jurisdictional power market in the continental United States, ERCOT is subject to reliability and security standards set by the North American Electric Reliability

Corporation (NERC). Our highly engaged state and federal leadership, regulators, board, market participants, and a diverse group of expert employees have been the keys to ERCOT's successes. We believe maintaining our current regulatory structure, relationships, and partnerships will continue to bring the benefits of a reliable grid and vibrant market at a low cost to the consumers of Texas.

ERCOT continues to project an annual average of 1.5 percent load growth over the next five years. Meanwhile, overall energy use in the ERCOT region has grown by an average of about 2 percent annually in recent years. Texas' strong economy, vigorous population growth, and a significant industrial base are all contributing factors to this growth. While the hot summers continue to drive up peak demand in our growing region, a winter peak demand record of 59,650 (MWs) was set this past January, and an overall peak demand record of 71,110 (MWs) occurred in August of 2016.

ERCOT's fuel mix is also distinctive. While it has evolved over time, the region's energy use in 2016 was predominantly natural gas at 43.7 percent, followed by coal at 28.8 percent, wind at 15.1 percent, and nuclear at 12 percent. With the completion of the Competitive Renewable Energy Zone, or CREZ, transmission projects in 2014, wind generation has been able to set significant new records, topping out most recently at 16,141 MWs of output on March 31, 2017. Wind generation served 50% of total load of 28,780 MWs at one point on March 23, 2017. As we integrate these and other emerging and evolving technologies, fuel diversity will continue to be a main component in keeping our system reliable as well as flexible.

In a growing system with a diverse fuel mix, transmission planning remains a key component in maintaining a reliable system, as well as an efficient market that is responsive to consumers. The CREZ projects mentioned above began as a Texas legislative initiative and moved quickly through administrative processes and construction. We field questions and host visitors from all over the world who seek to understand and learn from that alignment of leadership and process to determine whether it can be replicated in their respective systems.

We continue to have active discussions with regulators and stakeholders about the appropriate parameters for transmission planning in the future — bringing more granular information related to economics, consumer location and behaviors, and distributed resources to bear on policy questions. This information is increasingly important as we work to ensure reliability on a changing grid while managing the shared consumer costs associated with this important infrastructure.

As you have heard in previous hearings, ERCOT has a distinctive market design. With limited exceptions, owners of generation resources in our energy-only market are paid only for the electricity they put onto the grid. While ERCOT has made a number of enhancements to its market since it launched, the core principles have not changed. ERCOT is an “energy-only” market in which both power plant operations and investment decisions are driven primarily by energy price signals.

With natural gas playing such a large role in our generation fuel mix, the commodity price of natural gas is the primary driver of power prices within ERCOT. Within the context of consistently low gas prices and ample reserve margins, the average wholesale price of power in ERCOT has been very low in recent years.

We recognize these low prices affect generation owners' revenues, and we are always attuned to the reality and possibility of generation unit retirements, which would affect our reserve margin outlook. ERCOT's future outlook continues to show sufficient reserve margins to support system reliability. Our most recent Capacity, Demand and Reserves (CDR) report, which we produce twice every year, shows planning reserve margins well above 16 percent for the next five years and exceeding 18 percent for four of those years.

Our CDR also shows that we continue to integrate a very large amount of wind on our system and are seeing significant interest in building utility-scale solar. The ERCOT market, reduced costs, and federal incentives are helping drive continued growth of renewables. The state's renewable portfolio standard was met long ago.

We observe challenges with cost of new entry and the pressures on existing thermal and nuclear units in a context of low energy prices. We also have seen that, for several years, investors and unit owners of every type of generation were watching to see if there would be federal environmental policies that would materially affect their investments or retirement strategies. That conversation has since changed. Nevertheless, aside from regulatory concerns, ongoing changes in the generation resource mix and market dynamics may have major impacts on potential unit retirement decisions.

ERCOT has processes in place to address concerns that may arise when a unit's retirement impacts transmission system reliability. Rather than rely only on those types of out-of-market processes, ERCOT works with the Texas PUC and stakeholders to align market design with the realities of managing a changing grid.

We continue to discuss with stakeholders and regulators the appropriate role for the ERCOT market and operations in accommodating newer technologies that have different characteristics — whether they are storage, renewables, flexible thermal units, or distributed generation.

While this is not strictly a market issue, we also are focused, as you are, on security issues. ERCOT maintains a dedicated and integrated cyber/physical security organization and an established strategy for prevention of security breaches— and for response and resilience if they occur. We prepare our employees to respond to a disruption of the system for any kind of emergency, and employ layered cyber and physical security architectures, known as a defense-in-depth strategy, along with careful monitoring. Cyber-threats are fast moving and increasingly sophisticated. Because of these characteristics, information sharing is key in assessment and response. ERCOT's grid security collaborators include the Electricity Subsector Coordinating Council (ESCC), Electricity Information Sharing and Analysis Center (E-ISAC), federal and state law enforcement agencies, as well as NERC in developing standards. In addressing these modern and ever-evolving threats, ERCOT remains committed to external collaboration with relevant government agencies, the industry, and national labs to enhance its and the industry's security posture.

Although there is a significant amount of data we — and all independent system operators — must protect, either for security or competitive reasons, we also are committed to data transparency. We manage a vast repository of information that is helpful to market participants, investors, researchers, and consumers in their ongoing electricity-related decisions.

ERCOT creates and posts more than 100,000 data products per day, and these are consumed at a rate of more than 25 million downloads per month. Meanwhile, real-time wholesale prices, grid conditions and a plethora of other information is readily accessible for online viewing.

Like all the independent system operators, reliability is our primary measure of performance. We have successfully changed our operations and market rules to reflect a changing grid, and will continue to work with stakeholders as technologies evolve and issues emerge. Through innovation, our staff and stakeholders have an enormous opportunity to solve new and challenging problems today and for the future.

Conclusion

In conclusion, with healthy reserves and low prices in ERCOT's energy-only market, continuing with the current, predictable regulatory structure is important. This allows us to be responsive to all our regulators, as well as the consumer, as we continue to investigate input and tools needed to further our collaborative efforts and address future challenges and opportunities in the ERCOT region. Thank you for your time today and the opportunity to appear before you. We would be more than happy to host a tour of our facilities and briefing any time you may come to Texas. I would be happy to answer any questions.

Mr. UPTON. Thank you.

Dr. Casey, Keith Casey, vice president of Market & Infrastructure Development, California ISO, welcome to you as well.

STATEMENT OF KEITH CASEY

Mr. CASEY. Good morning, Chairman Upton, Ranking Member Rush, and members of the subcommittee. As you noted my name is Keith Casey. I am vice president of Market & Infrastructure Development at the California ISO, and I want to thank you for the opportunity to be here to discuss the operation and effectiveness of the organized wholesale markets in California. We appreciate the committee's attention to this important issue and my comments today will focus on what is working well in our markets and, frankly, some candid discussion around some of the challenges we are having.

Since the ISO started operations in 1998, we have almost 20 years of operating experience and have been evolving our markets considerably since the Western Energy Crisis occurred 17 years ago. Our markets are in far better shape now than they were then, and over the past 15 years have been yielding significant benefits to our market participants. They have been very stable and competitive.

In recent years, as I am sure many of you know, California has established itself as a global leader in environmental energy policies that are dramatically transforming the resource mix on the grid. Today, renewables comprise about 30 percent of the total energy produced in our markets and are on track to meet 50 percent by 2030, if not sooner. This transition from large station power to a more diverse and decentralized system has created a new value proposition for the California ISO.

Our centralized energy markets are proving to be highly valuable if not essential for successfully integrating and managing a diverse fleet of grid resources. Indeed, our success has encouraged other transmission providers in the West to join our real-time market and form the Western Energy Imbalance Market. That market currently serves five entities comprising approximately eight western states and serves half the electric load of the Western Interconnection. And we have seven other entities that are planning to join the Western Energy Imbalance Market over the next several years.

Since its inception in 2014, the Western Imbalance Market has created significant benefits not just for California, but for all the participating entities. In addition to the wholesale market, California provides significant value to market participants through facilitating new resource interconnections to the grid and developing long-term transmission planning. Both of these functions have evolved significantly over the years to meet the changing needs of the industry and ISO has used these processes to connect 20,000 megawatts of renewables to the grid and approve over \$7 billion in transmission investments.

So notwithstanding these successes, there remain significant challenges to enabling the transformation of the grid. I will highlight two of them. The first is to maintain the resources we need for essential reliability services during the transformation of the electric grid; and secondly, to ensure the transmission infrastruc-

ture needed to support the diverse set of resources across the West can one day be developed.

Reliably integrating high levels of renewables into the power system represents a significant challenge that requires a complement fleet of resources that are highly dispatchable and flexible to balance the system and balance the ramping challenges that we face. We also need to make sure we maintain essential reliability services like voltage support, frequency response, and the ability to have a resilient grid that can respond reliably to contingencies.

In the near future, California will need to rely primarily on the natural gas fleet to provide these essential grid services. However, as you have heard in testimony last week, the gas fleet in California is under financial duress due to lower energy prices, surplus capacity, and minimal bilateral contracting, and as a result, conventional power plants are beginning to seek some sort of backstop procurement from the California ISO to keep them financially viable or indicating they will otherwise retire. Currently, the ISO is working with the California Public Utilities Commission and our stakeholders to explore regulatory market options for addressing this problem.

Just quickly on the second issue which is with respect to tapping the benefits of an expanded Western region. To date, the majority of California renewable resources are located within state and are predominantly solar photovoltaic and relying too heavily on one particular technology like solar PV exacerbates renewal integration challenges and essentially can create oversupply conditions at certain parts of the day and increase ramping challenges for the ISO to manage.

So as California looks to achieve a 50 percent RPS it could take advantage of the opportunity to tap into other high quality renewables across the West. Ultimately, having a more diverse mix of renewables to meet the RPS goal will lessen the integration challenges, and may ultimately prove more cost-effective for California.

But of course building transmission across multi-states has challenges. There has to be agreement on what the benefits are to each state and ultimately how the costs of that transmission will be shared. That is a significant challenge. It is one best left to the states to resolve, but a major challenge nonetheless.

So in summary, I believe the market and grid services provided by the ISO are continuing to provide high value by enabling the transition to a low-carbon, modern grid and we will continue to look for opportunities to enhance our market and address the challenges I mentioned to you so we can continue to yield the benefits. I thank you for your time and look forward to your questions.

[The prepared statement of Mr. Casey follows:]

Testimony of Keith Casey, PhD
Vice President, Market and Infrastructure Development
California Independent System Operator Corporation

Committee on Energy and Commerce
Subcommittee on Energy
United States House of Representatives

July 26, 2017

Chairman Upton, Vice Chairman Olson, Ranking Member Rush, and Members of
the Committee:

My name is Keith Casey. I am the Vice President of Market and Infrastructure Development at the California Independent System Operator Corporation. Thank you for the opportunity to appear before you today to discuss the operation and effectiveness of the organized wholesale electricity markets in California. We appreciate the Committee's attention to this important issue. My testimony today will focus on what is working well in our markets as well as the challenges we face.

For the past eight years, I have been responsible for developing market design and infrastructure policies and overseeing the transmission planning and generation interconnection process for the California ISO. Prior to that I served as the Director of the California ISO's Department of Market Monitoring and have been with the California ISO since its inception in 1997.

The California ISO is a nonprofit, public benefit corporation chartered under the laws of the State of California for the purpose of ensuring efficient use and reliable operation of the electric transmission grid under its operational control. The California ISO operates wholesale energy and ancillary services markets to reliably manage the high-voltage transmission system that serves approximately 80 percent of California

electric load as well as a small portion of Nevada's electric load. We currently have over 180 entities participating in our markets and 18 entities that have made the transmission they own subject to our operational control. The California ISO monitors over 70,000 megawatts of electricity from more than 900 generators that serve 30 million customers. The California ISO is one of thirty eight balancing authorities in the Western Interconnection and represents about 35 percent of the electric load in the West. In the past 15 years, we have seen the development of significant new generation as well as new transmission lines and upgrades. These investments have ensured that the California ISO has sufficient supply margins to meet peak demand.

Since start-up, we have almost 20 years of operating experience and have evolved our markets since the Western Energy Crisis occurred 17 years ago. Without question, the Western Energy Crisis shook public confidence in the integrity and value of an organized market in California and cost ratepayers billions of dollars. The experience triggered significant market design and regulatory rule changes, such as the development of a year-ahead resource adequacy framework with rules that require resources procured for resource adequacy purposes to offer their supply into the market. The crisis also triggered much stronger rules and enforcement against market power and manipulation enabled largely through the Energy Policy Act of 2005. Over the many years that have passed since the crisis, we have continually evolved our market design to ensure we can efficiently balance supply and demand and meet the changing needs of the system.

Consequently, the California's ISO's electricity markets have matured significantly, and are in far better shape now than they were then to serve electric

demand in an efficient and reliable manner. Indeed, our success has encouraged other transmission providers in the West to join our real-time energy market and form the Western Energy Imbalance Market. That market currently serves five entities comprising approximately 8 western states and half the electric load in the Western Interconnection, and seven additional entities are planning to join the Western Energy Imbalance Market over the next three years. Since its inception in 2014, the Western Energy Imbalance market has created significant benefits, both by allowing economic transfers of energy among participating entities and by enabling greater integration of renewable resources by using a larger geographic footprint to balance oversupply conditions. The California ISO's work to help foster the Western Energy Imbalance Market has also resulted in greater situational awareness of grid reliability and greater ability to respond to major contingencies.

In recent years, California environmental energy policies are dramatically transforming the resource portfolio that serves electric load. California's renewable portfolio standard, greenhouse gas emission reduction goals, policies concerning the use of ocean and estuary water for power plant cooling, as well as distributed energy resource and rooftop solar goals have all contributed to a dramatic shift away from conventional power plants and to the deployment of new technologies such as battery storage and demand response. Today, renewables comprise about 30 percent of total energy produced in our markets and are on track to meet 50% by 2030 – if not sooner. The dramatic growth in renewables has improved fuel diversity by reducing our reliance on natural gas plants from 40% in 2015 to 32% in 2016.

This transition -- from large central station power model to a more diverse and decentralized system -- has created a new value proposition for the California ISO. Our centralized energy markets can successfully integrate and manage a diverse fleet of grid resources. The market efficiently commits and dispatches all types of resources (including gas-fired generation, demand response, as well as renewable resources to balance the system and maintain reliability. The markets also provide transparency on what is happening on the electric system by setting energy prices that reflect supply needs across an operating day and identifying transmission congestion.

In addition to operating the wholesale market, the California ISO has provided and continues to provide significant value to its market participants as the transformation of the electric grid occurs. We have developed a transparent and effective process for interconnecting new resources to the transmission system. In addition, as part of its responsibilities, the California ISO performs transmission planning functions for its planning area. These processes examine forecasts of electricity use and changes in resource portfolios to ensure sufficient infrastructure is available to serve electric customers. The California ISO has used these processes to approve over 7 billion dollars of transmission infrastructure to help facilitate the development of a large increase in renewable resources in its planning area while maintaining electric grid reliability.

Since 2011, the California ISO's transmission planning process has included criteria to approve new transmission to support federal and state policies. This feature was reinforced by the final rule of the Federal Energy Regulatory Commission involving regional transmission planning and cost allocation, known as Order No. 1000. This rule

requires that transmission planning processes consider transmission needs driven by public policy requirements established by state or federal laws or regulations.

Order No. 1000 also included requirements to allow for competition for building new transmission. Pursuant to Order No. 1000, the California ISO has conducted nine competitive solicitations in which it has evaluated competing project sponsors' proposals to build a needed transmission solution and selected an approved project sponsor. The California ISO has awarded four projects to independent transmission developers, two projects to incumbent utility participating transmission owners, two projects to collaborations between incumbent utility participating transmission owners and independents, and one project to a public power entity that was not an existing participating transmission owner. The ISO has applied the lessons it has learned to improve its competitive solicitations.

Notwithstanding the success of the California ISO's markets and infrastructure development processes, there remain significant challenges to enable the transformation of the electric grid. Two significant challenges are 1) to maintain resources needed for essential reliability services during the transformation of the electric grid and 2) to ensure the infrastructure needed to access a more diverse set of resources across the West to satisfy state renewable portfolio standards.

Reliably integrating high levels of renewables into the power system represents a significant challenge. The changes in make-up of the generator fleet has created some operational challenges for us. Not only must the ISO focus on meeting peak load, but it now must also ensure sufficient ramping capability, both upwards and downwards, is available over relatively short periods to meet the sudden swings associated with

variable energy resources. To this end, the California ISO has focused on resource adequacy enhancements to ensure that sufficient flexible resources are procured and offered into its market. The California ISO has also made significant investments to improve its real-time market to provide accurate price signals for resources to follow energy dispatch instructions and meet expected ramping needs. In addition, the California ISO still needs essential reliability services such as voltage support and frequency response to support a reliable electricity grid. The California ISO must ensure it has adequate dispatchable resources to provide these essential reliability services. For the near future, the California ISO expects these resources will primarily be natural gas-fired generation.

Notwithstanding the need for gas-fired dispatchable resources, several factors have placed economic pressure on these resources. First, the proliferation of renewables pursuant to California's Renewable Portfolio Standard has depressed energy market prices during certain operating hours of the day and their output has displaced many conventional plants. Second, the success of behind-the-meter solar and the growth of community choice aggregation in California have made large load serving entities reluctant to enter into long-term bilateral contracts with independent power plants that provide payments for the resource capacity. These utilities are facing the prospect of an eroding customer base, which has created the risk of stranded costs. As a result, conventional power plants are beginning to seek some form of backstop contract from the California ISO to keep them financially viable. Currently, the California ISO is working with the California Public Utilities Commission and market

participants to explore regulatory and market options for addressing this procurement problem.

Ultimately, we will need a new regulatory or market framework to ensure the system not only has the energy it needs but also the essential reliability services to meet ramps, maintain voltage levels and ensure the system can recover from contingencies such as a frequency disturbance. Successful integration of renewable resources at the high levels that California and other Western states are pursuing will require a resource mix with the capabilities that conventional synchronous resources have typically provided to the electric system.

We have another significant challenge: how to tap into the benefits of an expanded western region. To date, the majority of California's renewable resources are located within the state – and the vast majority of new projects going forward are solar photovoltaic resources located in the California ISO's system. Relying too heavily on these resources will exacerbate renewable integration challenges because the California ISO must balance demand with supply in real-time. When the California ISO system has too much supply during peak solar hours and cannot export its excess to other entities through the Western Energy Imbalance Market it has to curtail renewable energy. As California looks to achieve a 50 percent renewable portfolio standard and beyond, it could take advantage of the opportunity to tap into other high quality renewable resources in the West, such as wind in Wyoming and New Mexico or solar in Arizona and Nevada . Having a more diverse resource mix of renewables will lessen the integration challenges and may be a more cost effective solution to meeting California's policy objectives. Any such procurement will need to be consistent with

California's renewable portfolio standard and will likely require new transmission across multiple states. New transmission options will also provide benefits to different states across the region, but reaching agreement on what those benefits are and ultimately how the costs can be shared will be an extremely complex process. Ultimately, this is an issue best left to the states within the region to resolve but it is a major challenge for the future.

The benefits of an organized market in the California and other western states have included both economic savings and help in meeting ambitious clean energy goals. Going forward, we continue to look for opportunities to enhance our markets and services and to work with policymakers and all stakeholders to overcome the challenges and further realize the benefits I have highlighted for you.

Thank you for the opportunity to be here today and I look forward to your questions.

Mr. UPTON. Thank you.

Our last panelist is Craig Glazer, VP of Federal Government Policy, PJM Interconnection, welcome.

STATEMENT OF CRAIG GLAZER

Mr. GLAZER. Thank you, Mr. Chairman and Ranking Member Rush. I am Craig Glazer on behalf of PJM. We operate in 13 states from Chicago to North Carolina up to the New York border. I want to start with a personal promise. That is to—we have operators who have been keeping the lights on in your district, Mr. Chairman, and Mr. Rush's district, Mr. Griffith's, Mr. Johnson's, Mr. McKinley's, Mr. Doyle's district, and I will just give you my personal promise. We will continue to work as hard we can to keep those lights on and keep prices low.

Now it was the author Stephen Covey who instructed us in his book, *The 7 Habits of Highly Effective People*, it is sort of a favorite quote of mine where he says the main thing is to keep the main thing the main thing. It is sort of a favorite quote, the main thing to keep the main thing the main thing. And in the case of PJM, Mr. Chairman, Steve Covey's main thing can be summarized in a couple of words. Investors are investing in new, innovative generation in our region. It is funding the all-of-the-above strategy that many people in Congress have talked about. And the generation fleet as a result is more diverse than it has ever been, more reliable than it has ever been, and prices are lower than they have ever been.

But I am not asking you to take my word for it. If you had a chance, if we could take a drive around the region we could start out to show you some of this diversity. We would start out in Mr. McKinley's district.

[Photo shown.]

Mr. GLAZER. This is the new coal facility known as the Longview Power Station using state-of-the-art coal technology. OK. Then as we continue that drive around we would find we could go to Cecil County, Maryland.

[Photo shown.]

Mr. GLAZER. This is an example of a natural gas plant that is self-supplying municipal load. I know we heard a lot about that. This plant is doing that very thing and depending on the PJM market to do it.

[Photo shown.]

Mr. GLAZER. We then drive over to near Mr. Latta's district, the Fremont Energy Center, another new, another state-of-the-art natural gas facility that is self-supplying another municipal customer.

Just to show you the diversity, we could then take a trip to Laurel Mountain, West Virginia.

[Photo shown.]

Mr. GLAZER. You would find a major wind facility there as well as a new, innovative battery facility all of which are depending and selling their output into the PJM market.

And frankly, as part of the sort of "expect the unexpected," we could end up near Mr. Rush, near your district at the Shedd Aquarium in Chicago.

[Photo shown.]

Mr. GLAZER. That is actually studying using its pumps at the aquarium to sell into our frequency regulation market as well as they vary the pumps. So a lot of innovation and a lot of diversity that is out there.

Now I don't want to mislead you. We at PJM have challenges like everybody else and I hope we can talk about some of them in this hearing. They include enhancing grid resilience, reforming price formation rules, determining and rewarding the attributes of what has come to be called baseload generation, accommodating state policies that was mentioned before, and as was also mentioned before, continually being on the top of our game when it comes to cybersecurity.

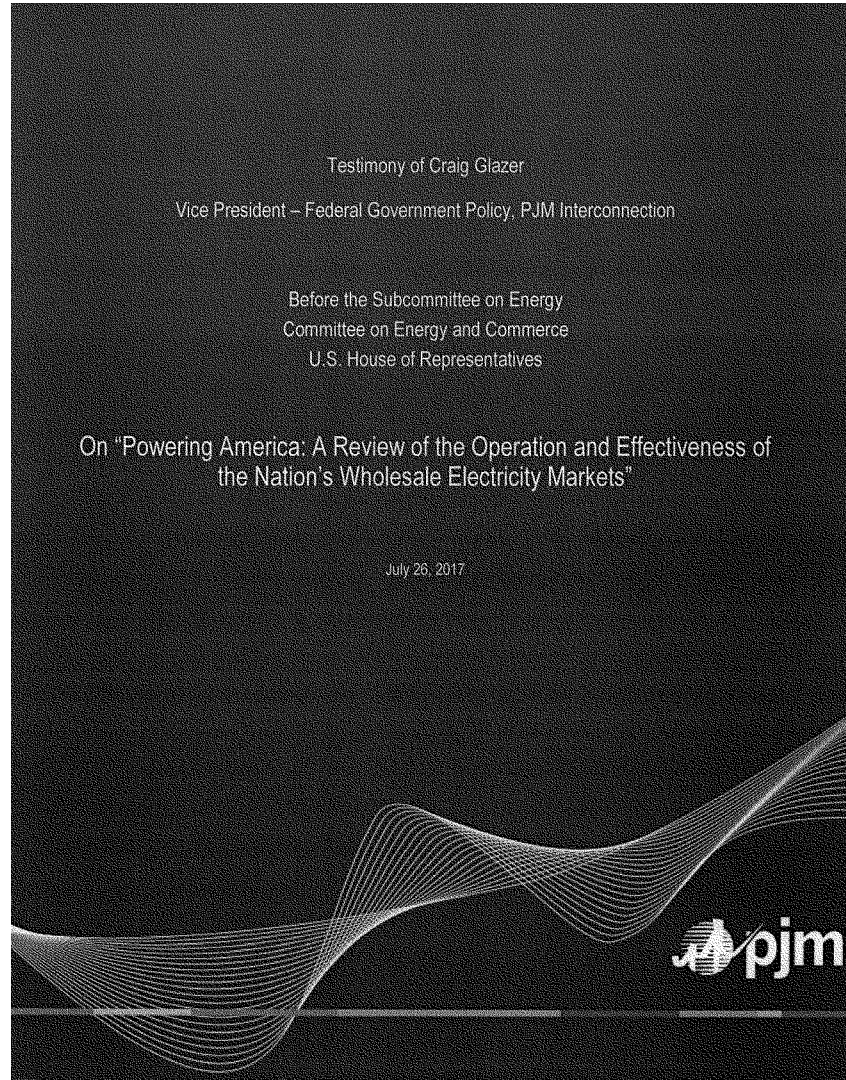
But the bottom line or, as Mr. Covey said, the main thing is investors are investing, consumers are enjoying the lowest electricity prices, and our system is more diverse and reliable than it has ever been. That is a testimonial to a lot of people. One is those operators that were there this morning when your constituents woke up and will be there tonight when they go to sleep to ensure that the lights stay on. It is also a testimonial to our stakeholders and to our regulator.

I want to give a shout-out to the Federal Energy Regulatory Commission. It is a very professional regulatory agency. I was a former regulator myself. I wish I had some of the staff that we had at the Federal Energy Regulatory Commission. And a shout-out to the Congress which in this very room devise policies that have enabled this nation to move to a competitive market model which I would posit to you with all kinds of issues around it, but I think overall has served this nation well.

We can argue about this market rule with that market rule and legitimately have those discussions and frankly we are our own harshest critics in PJM many times on these issues. But I think when I go back and reflect on the hearings, as many witnesses have stated, the Federal Power Act and the competitive market model have served the nation well and would urge everybody to keep that in mind as we debate some of these other issues.

So thank you and I look forward to your questions.

[The prepared statement of Mr. Glazer follows:]





Executive Summary

As the Regional Transmission Organization serving all or parts of the states of Illinois, Indiana, Michigan, Ohio, Kentucky, Tennessee, West Virginia, North Carolina, Virginia, Maryland, Delaware, Pennsylvania, New Jersey and the District of Columbia, PJM has brought reliable electric service and competitive wholesale electricity prices to over 65 million Americans. In addition, PJM and its markets have been widely and independently recognized by the investment community as a region whose market structure strongly supports investment in new generation, the upgrading of existing generation and the deployment of new innovative technologies. Given the capital-intensive nature of the electric industry, our combination of low competitive rates along with continued investment in generation and demand response resources is a sound testimonial that the markets have achieved much of what Congress intended when it first introduced competition into the wholesale electric industry through the Energy Policy Act of 1992.

The markets that PJM and other RTOs operate can be analogized to a kitchen blender. Like your kitchen blender, the markets produce the most efficient and cost effective results based on the ingredients put in. As a result, we need to continually examine the parameters surrounding the ingredients we put into the blender to ensure that those are designed to produce the outcomes that we seek. The RTO markets can then be counted upon, as they have in the past, to produce efficient and competitive outcomes consistent with the policy choices (i.e. the ingredients) that have been chosen.

PJM concurs with many of the past witnesses who have pointed out that portions of the generation fleet including coal and nuclear resources are challenged as a result of very low natural gas prices, limited growth in the demand for electricity and the impact of various environmental and safety requirements. The question however, is not *whether* these issues should be addressed but instead *how* they are addressed. Consistent with the move toward competition in the Energy Policy Acts of 1992 and 2005, the PJM model has shown that thoughtful market-based solutions, rather than policymakers at the state or federal level picking winners and losers, remains the best means to address such challenges. Consistent with its proactive philosophy, PJM is 'seizing the moment' to propose various initiatives to address these issues including:

- operating and planning the system to enhance the resilience of the grid;
- proposing to the Federal Energy Regulatory Commission ("FERC") reforms to its price formation rules so as to better recognize the attributes that key generators (including those which have come to be labelled 'baseload generation') bring to the grid; and



- working with our stakeholders on proactive rule changes that would ensure that the market can continue to accommodate individual state policies but do so in a manner which still preserves competitive outcomes and does not burden neighboring states that may not have endorsed that particular state policy.

In this testimony, PJM urges consideration by the federal government for these reforms, almost all of which appropriately are within the FERC's jurisdiction.

Our testimony outlines various steps that would be helpful for the federal government to take and some which would not be helpful. In this latter category of what would not be helpful, we note that this is a critical time when we need to encourage investment in new generation and new technology as well as existing generation. On this issue, words do matter. As a result, although debate on various market rules is perfectly appropriate, we caution against the potential to add greater uncertainty to the markets by signaling some kind of wholesale retreat from the competitive market model that has been in place since the mid-1990's and has worked well to keep prices low and investment certain. The PJM markets have weathered many challenges to the industry ranging from the impact of EPA's Mercury and Air Toxics rule on the coal fleet to the threats of cyberattacks on the grid itself. We are stronger as a result and are confident that innovative market-based solutions, which have been the hallmark of PJM since its inception, can continue to serve us well in addressing our new set of 21st century challenges.



Introduction

On behalf of PJM Interconnection, L.L.C. ("PJM"), I want to thank Chairman Upton, Ranking Member Rush and members of the Subcommittee and its staff for calling this important hearing today. My name is Craig Glazer. I serve as Vice President of Federal Government Policy for PJM. Based in suburban Philadelphia, Pennsylvania and honored to be a constituent of Rep. Ryan Costello of this Committee, PJM operates one of the nation's largest competitive wholesale electricity markets and ensures reliability of the bulk electric grid in all or parts of Illinois, Indiana, Michigan, Kentucky, Tennessee, Ohio, West Virginia, North Carolina, Virginia, Maryland, Pennsylvania, Delaware, New Jersey and the District of Columbia. Thank you for the opportunity afforded to PJM in offering our perspective on this topic and to participate in the subcommittee's *Powering America* series. By way of personal background, I came to PJM after having served for a decade as Chairman and Commissioner of the Public Utilities Commission of Ohio during a critical period when competition was successfully introduced into the state's electric, natural gas, telecommunications and transportation industries.

Turning to this morning's testimony, my comments are divided into three parts.

- First, I will offer a brief background concerning PJM. I will discuss the formation and role of PJM with a focus on (a) why policymakers, including this Congress, sought to restructure the industry and (b) how that process has worked;
- Second, I will cover the benefits delivered by PJM's wholesale electricity markets. There have been over \$2.8 billion in savings to customers as a result of the efficiencies gained by operating the system more reliably and utilizing competitive markets as a tool to ensure that electricity is delivered at the lowest reasonable cost for consumers. As an aside, you don't have to take my word on these issues. In real dollars, at an average price of \$29 per megawatt-hour, wholesale electricity prices are the lowest they have ever been in our region and the system is operating more reliably and efficiently than it ever has before the formation of Regional Transmission Organizations ("RTO");
- Third, and finally, I will outline some of the future challenges we all face. In the Energy Policy Act of 2005 Congress defined bulk electric system reliability as compliance with standards promulgated by the North American Electric Reliability Corporation ("NERC"). Under these criteria, and using our own market rules, PJM is extremely reliable and has enjoyed a strong reserve margin that has enabled us to get through the most recent incidence of hot weather without incident. Similarly, PJM managed the change-out of over 20,000 MW of generation that retired as a result of both low gas prices and EPA's Mercury and Air Toxics ("MATS") rule without reliability being degraded. But whether we are talking about potential cyber-attacks or



natural gas pipeline interruptions, we are undertaking a number of initiatives to make this *already reliable* system more *resilient* in the future. In this vein, I will briefly list on pages 10 to 14 those actions by the federal government that would be helpful to these efforts and, will outline a few actions which, quite candidly, would not be helpful.

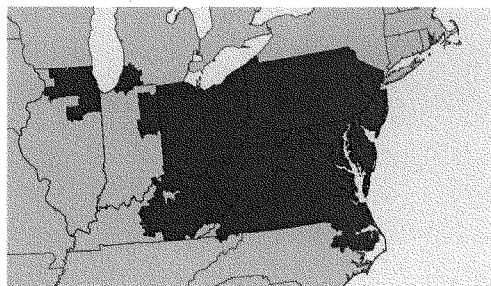
Background

The Role of PJM and Regional Transmission Organizations

This year marks PJM's 90th anniversary as an organization. In 1927, three contiguous utilities in Pennsylvania and New Jersey interconnected their respective transmission systems; for the first time allowing power to flow across their coordinated networks. The Pennsylvania – New Jersey Interconnection, an independent organization and the original name of PJM, was established to oversee the operation and planning of this coordinated system. In operating three distinct systems on a coordinated basis, reliability enhanced as costs decreased. As nearly a century passed, the industry evolved and so too did PJM's role and membership.

Today, PJM is officially classified as an RTO regulated by FERC. As shown on **Figure 1**, today PJM is responsible for the reliable operation of the power grid for all or parts of 13 states and the District of Columbia. The region serves over 65 million people with 21 percent of the nation's Gross Domestic Product being produced within our footprint. Our headquarters are located in Valley Forge, Pennsylvania and we are grateful for the work of Rep. Costello whose District includes the PJM campus.

Figure 1. PJM Service Territory & Evolution

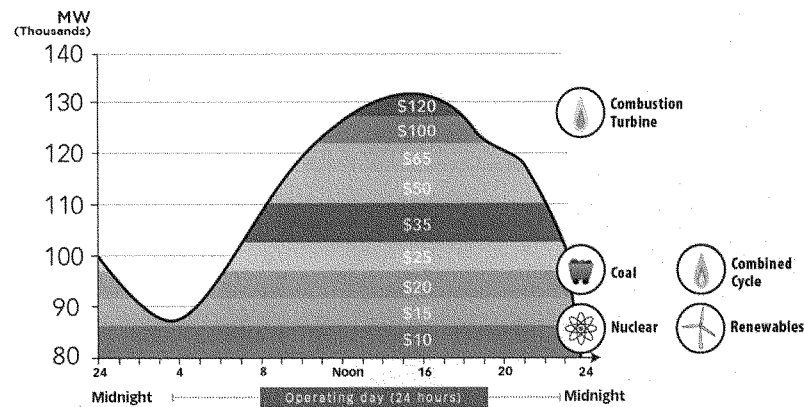


RTOs are voluntary organizations, entered into by the owners of high-voltage transmission assets – such as Pepco, Dominion Power, or AEP. Since I have been at PJM, our footprint has doubled in size as more utilities have seen value in being members of an RTO and through it, the value of coordinated system operations. *Value* is reflected as



cost savings for customers. *Value* is reflected as enhanced reliability. And *value* is also reflected in RTO markets serving as an effective platform for incenting deployment of new innovative technology. RTOs also enable the Congress' vision of open, non-discriminatory access to the transmission system by all parties to promote the nation's policy of enhanced electric supply competition. By way of example, **Figure 2** depicts PJM's energy market working in real-time operation to meet customer demand. As demand for electricity increases throughout the day, PJM utilizes a function - *economic dispatch* – to procure the most cost effective resources that will reliably serve demand at any five-minute increment of time. That supply can consist of any combination of power generation resources available at that time.

Figure 2. Economic Dispatch – Matching Supply with Demand



The benefits of coordinated system operations are as true today as they were when PJM was established 90 years ago. By leveraging economies of scale and diversity of footprint, utilities decrease their operating costs. Today, PJM's regional grid and market operations produce annual savings of \$2.8 billion to \$3.1 billion by ensuring reliability and least cost supply across the region served.

The Proven Track Record: Benefits Of PJM Wholesale Markets

In deregulating the wholesale electricity industry, Congress sought to use competition as a means to drive efficient pricing for customers. Competition would place downward pressure on electricity prices in two regards. First, with competition, plant operators would be incented to operate their plants as efficiently as possible to remain competitive. Second, easing both entry and exit of generating resources would yield the most economic portfolio of assets which are available for dispatch to meet demand in a given hour.



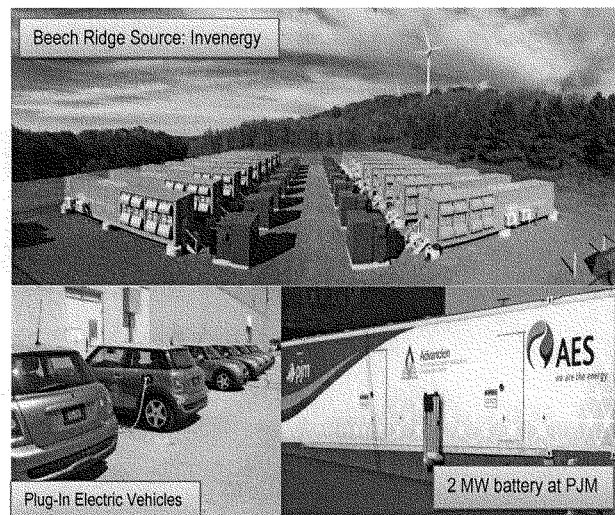
PJM's market enables electric energy to be exchanged economically and automatically when less expensive resources in one area can be used to meet consumer electricity demand in another area. Through managing lower energy production costs, minimizing costly reserve margins and attracting new investment, the PJM market accounts for nearly \$2 billion of PJM's annual savings to customers.

Technology Innovation

Markets determine whether the theoretical promise of a new innovation is realized under real-world operating conditions. Through providing open, non-discriminatory access to the transmission system; through allowing all megawatts to evenly compete to supply demand; and, through the display of a transparent price signal, the wholesale markets attract investment and foster technology innovation.

Moreover, PJM developed the world's largest market for demand management technologies. To serve demand, the market has attracted annual commitments as high as 1,700 megawatts and 14,000 megawatts for energy efficiency and demand response, respectively. These technologies have the opportunity to economically compete against power generation as a measure to offset customer demand.

PJM has also been recognized as a leader in serving as a testbed for new technology deployment. PJM alone accounts for almost half of the nation's 724 megawatts of non-pumped hydro, grid-scale energy storage resources.





Market Pricing

When adjusting for inflation, market prices for energy were at an all-time low of \$29 per megawatt-hour in 2016. This continues the general downward trend of energy prices experienced over the last six years in PJM.

Although some witnesses at the July 18 hearing criticized the PJM capacity markets, that market has worked well to attract new investment even in the face of low energy prices. Since its inception in 2007, the PJM capacity market has resulted in the development of over 49,000 megawatts of new, iron-in-the-ground power generation. The market has also brought in tens of thousands of megawatts of demand management technologies, as noted above.

Similarly, PJM's most recent auction for system capacity – a forward market for all supply resources – procured the RTO's largest reserve margin at a price that is up to 66 percent of the net cost to build a new facility. This represents high levels of reliability at extremely competitive pricing outcomes for customers both today and into the future. I view this generation as a key 'down payment' on ensuring a resilient infrastructure that will serve the American economy well for many years.

The Facts Concerning 'Self-Supply' Opportunities for Public Power Entities

At the July 18 hearing, witnesses for public power may have created a number of misimpressions on the issue of whether these entities can 'self-supply'. A review of the facts on this subject is in order:

- For one, we do appreciate that ODEC witness Jack Reasor acknowledged in response to questions that PJM had put through rule changes that allowed public power entities in PJM the right to "self supply". Mr. Reasor referenced a recent Court of Appeals decision which overturned certain other parts of FERC's ruling on that matter but which did not overturn the specific agreed-to arrangement that PJM and its stakeholders worked out with public power entities. As a result, the right to self-supply in our capacity market and energy market has been negotiated with public power and fully honored by PJM and its stakeholders. To suggest otherwise, is simply not consistent with those facts.
- In addition, public power entities have been availing themselves of their ability to self supply and have been building new generation in PJM as a result. Since the inception of our capacity markets, we have seen public power develop and bring into commercial operation over 1,375 MW of new generation or upgrades to existing public-power owned generation in order to "self supply" their own customers. Recent public power generation additions include:
 - Meldahl Hydro Electric Plant; OH (American Municipal Power)
 - Willow Island Hydro Generation Project; WV (American Municipal Power)



- Belleville Hydro Electric Plant; WV (American Municipal Power)
- Smyrna Natural Gas 1 – 2; DE (Delaware Municipal Electric Coop.)
- Orchard Hill Renewable Energy Station; IL (Hoosier Energy Rural Electric Coop.)
- Livingston Landfill Gas; IL (Hoosier Energy Rural Electric Coop.)
- Louisa Natural Gas 1 – 5; VA (Old Dominion Electric Coop.)
- Rocksprings Natural Gas 1 – 2; MD (Old Dominion Electric Coop.)
- Wildcat Point Natural Gas; MD (Old Dominion Electric Coop.)
- Kerr Dam Hydro; VA (Southeastern Power Administration)
- Vineland Oil Unit 9; NJ (Vineland Municipal Electric Utility)
- Down Natural Gas Power Plant; NJ (Vineland Municipal Electric Utility)
- Clayville Natural Gas Unit 1; NJ (Vineland Municipal Electric Utility)
- Elkhart Landfill Gas; IN (Wabash Valley Power Association)
- Jay Landfill Gas; IN (Wabash Valley Power Association)

Challenges

Just as in days past, the industry continues to face challenges. This period of sluggish growth in demand and low natural gas prices brings both benefits to customers and the grid but also a new set of challenges. Some of those are outlined below.

The Impact of the Evolving Resource Mix

Although the term 'baseload generation' connotes images of large nuclear and coal generators, today we are seeing efficient natural gas combined cycle units being dispatched often as 'baseload generation'. The economic challenges that some (but not all) nuclear and coal plants face are largely caused by a number of interrelated factors, each of which has an impact on retaining existing resources and incenting investment in new resources:

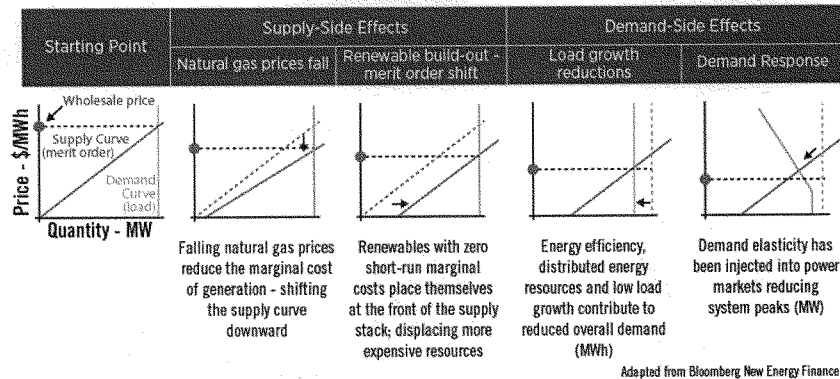
1. Intense competition from low gas prices and new, highly efficient gas resources, when coupled with sluggish demand growth have combined to drive wholesale power prices to some of their lowest levels—an obvious short term benefit for consumers. This competition, however, has reduced revenue for certain resources like coal and nuclear.
2. Although one can argue about degrees of impact, there is no doubt that federal tax policies and state subsidies to particular generating units have had their own distorting impacts on competitive market outcomes.



3. Increasing environmental / emission mitigation costs for coal resources and increasing Nuclear Regulatory Commission compliance costs for nuclear generation all have worked to increase economic pressures on these resources.

Figure 3 is a graphical illustration of how each specific trend combines to put its own downward pressure on wholesale prices in addition to competition among generators itself.

Figure 3. Trends Affecting Lower Wholesale Market Energy Pricing



Some have raised concern that traditional resources are not being properly valued for their beneficial attributes such as zero emission attributes of nuclear units and on-site fuel security attributes for coal and nuclear. With FERC's support, PJM took a giant step forward in this area in 2014 by establishing a new "Capacity Performance" model which recognized (and rewarded through pricing mechanisms) the importance of generating resources having fuel available for immediate use upon call.

We at PJM agree that more can be done (and we intend will be done in the PJM region) to address these issues.

The key question is therefore not whether these issues should be addressed but instead how they are addressed. At PJM, we believe that **market-based solutions** are a preferable means to address these issues rather than regulators or legislators guessing as to the ideal energy mix for the future, picking winners and losers and potentially creating new 'stranded costs' to be paid by customers if those regulatory guesses don't pan out. As a former regulator, I have seen the pitfalls of that old regulatory-heavy paradigm and urge that we do not end up stumbling into that paradigm again by default.



I like to view the markets working like my prized kitchen blender—they blend together all the inputs to produce the most efficient and cost effective outcome for the consumer. But as there are no specific policy directives for attributes such as low carbon resources or generation diversity, it would be unreasonable to blame the blender (in this case the market) if the recipe does not come out to one's liking. It is for this reason that we need to focus on the inputs to the market in order to diagnose the challenges going forward and devise appropriate solutions.

Addressing the Challenge

Given this state of the industry, the question then comes what can the federal government do that could be helpful and what would not be helpful. Let me posit lists of each:

Helpful Federal Actions

Energy Price Formation Reforms: PJM has recently posted a proposal which builds on an existing FERC Notice of Proposed Rulemaking but which goes further to ensure that all resources needed to serve load are able to set wholesale prices. Today's rules inadvertently limit the ability of large generating plants which are needed in the dispatch order to set prices given their relative inability to cycle their output up and down on very short notice. To be clear, those generators do recover their costs when called upon by PJM but their costs are not reflected in wholesale clearing prices. This has a suppressive effect on prices overall and fails to appropriately value these needed resources. PJM believes this very narrow and targeted reform would help to ensure that all generators, even those which have come to be referred to as 'baseload' generation, are treated fairly in the marketplace. As part of this package of reforms, PJM has proposed development of a new load following product that would incent the development of new innovative and flexible resources (including wind resources) needed to meet varying load demands throughout the operating day.

State and Federal Roles: Although certain states have taken action to subsidize particular generating units (including nuclear units), individual state action that has the effect of distorting wholesale competitive market outcomes is not fair to anyone—neither consumers in state A that pay the subsidies nor consumers in neighboring states that are deprived of other generating options due to the inevitable 'exporting' of the negative effects of state A's unit-specific subsidy. Because the grid is interconnected and because electrons do not respect state borders, there clearly is an interstate commerce aspect of electricity sales. After all, the very fact that electricity is bought, sold and transmitted across state lines (and therefore affects interstate commerce) was the original basis of the need for passage of the Federal Power Act in the first place. Unfortunately, this entire matter has ended up in the Courts which are struggling to define the limits of state versus federal authority in this area.



Addressing state policy choices in a nondiscriminatory way cannot be a zero sum game. Instead it requires a degree of cooperative federalism between the FERC and the states rather than any one set of state policymakers imposing their choice of winners and losers on neighboring states and regions. In PJM's view, (and my own view as a former state regulator) **accommodation** of state policies in a federally regulated market *should* happen but must happen in a way that recognizes the interstate nature of the grid and respect Congress' national call in the Energy Policy Act of 1992 as well as 2005 for the development of wholesale markets to ensure competitive outcomes. We have put forward a proposal that respects individual state actions affecting the generation fleet and demand response resources but avoids the impact of that policy choice affecting market prices in the rest of our large 13-state region.

In the broadest sense, "accommodation" of individual state policies (and especially conflicting environmental policies among states) is a two way street. Accordingly, "accommodation" of state policies will require action at the state level as well as at the RTO/ISO and FERC levels to ensure that one state's policy is not 'exported' to another state that has not adopted that policy choice. Our proposal is presently before our stakeholders and may ultimately result in a filing at FERC. But in the interim, we would urge Congress to recognize that this is not a black or white area and encourage both the states and the FERC to work on constructive and balanced **market-based** solutions.

Resilience: PJM has embarked on a number of initiatives to promote resilience of the power grid. These resilience efforts are anchored in, but give more teeth to, many of today's reliability standards. For an effective grid resilience plan to be developed, effective information sharing and assistance with identifying long term threats must continue to better help us sort through what constitutes credible threats vs. those which are remote enough to not pass a reasonable cost/benefit analysis. This Committee can help to ensure that DHS, DOE and FERC all continue to work with the RTOs/ISOs as we embark on developing a more resilient grid, so that the credible threats are validated by those in the federal government with access to intelligence information to which the RTOs, by definition, are not privy.

PJM has embarked on an effort to incorporate resilience into our three core processes of planning, operations and markets. PJM's plan is underway and extends beyond 2018. The effort will evaluate our moving toward conservative operations when credible threats to fuel supplies or the grid itself are identified. The effort will also focus on the price formation issues I addressed previously as well as steps to build even more redundancy into the grid itself. As the system is reliable today and will remain so for the near future, these initiatives are designed to be proactive and forward-looking to ensure that the grid is not only reliable but resilient to address extreme events.

Continued attention to these issues by this Committee would be helpful as these initiatives will require a level of coordination and cooperation between the electric and natural gas pipeline systems that goes beyond what we enjoy today. And, as reliability oversight is split between FERC for the electric industry and TSA for the natural gas pipeline



industry, a level of cross-agency coordination will be needed as today the two industries operate under vastly different regulatory regimes.

Actions That Would Not Be Helpful

Although I've outlined certain actions that would be helpful, I would be remiss if I did not briefly flag some items that would not be helpful to the considerable work that RTOs/ISOs face. These include:

Imposing Greater Market Uncertainty By Calling for a Wholesale Reversal of the Competitive Market Model:

This is a critical time when the generation fleet is getting older and new investment will be needed to retain critical 'baseload' facilities and attract the development of new facilities. It also is a time to incent financing of new technologies such as energy storage technologies to better manage the variable output resources we have on the grid such as wind and solar. As detailed above, the markets have proven themselves to be able to respond nimbly and efficiently to changing policies and system conditions. Moreover, the policies that both investors and consumers have come to rely upon were set by Congress some 25 years ago through the Energy Policy Act of 1992.

Of course, individual market rules as well as RTO operations should continue to be scrutinized. However, calls to simply reverse gears (assuming that is even possible) only sends a chilling effect on the market and makes needed new investments and technology innovation more costly and harder to bring to the market. As a result, we would caution against loose calls to 'reregulate' the market or blame the market itself for some of the issues outlined above that are simply the result of inputs into the market 'blender' I referenced previously.

Picking Winners and Losers Either By Technology or Even By Specific Generating Units: Prior to EPACT 1992 and much of the restructuring of the industry at the retail level, regulators at the state and federal level would be called upon to pick winners and losers—either adding to rate base or disallowing the costs of particular generators one by one after long and contentious hearings. Inevitably, the regulators sometimes got it wrong and saddled the investor or the consumer with billions of dollars in uneconomic costs.

There may be a temptation to selectively go back to that model to either "promote" or "save" a particular generating unit or type of generating unit in the name of 'reliability' or 'diversity'. Both reliability and diversity has and can continue to be maintained through the market itself. In fact, PJM's generation mix is far more diverse today than it has ever been. We are concerned about potential retirements of additional coal and nuclear resources. The relevant question is how best to respond. For policymakers to simply try to 'outguess' the market or supplant it with their particular policy choice is simply a recipe for building an unsustainable market outcome that no investor would seriously consider and for which no consumer would ultimately benefit. As a result, we urge holding our feet to the



fire' to devise **market-based solutions** to these challenges such as those I have outlined above while resisting the temptation to step in to "choose" a particular generator class or type of generator for special treatment.

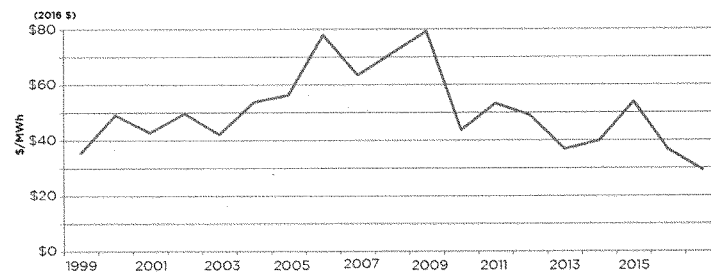
I thank you for this opportunity to testify and look forward to your questions.



Appendix

The following section outlines, in detail, each how each market fundamental – outlined in **Figure 3** – is influencing the PJM wholesale market price, specifically. Annual average PJM-wide energy prices, in real dollars, are at an all-time low.

Figure 4. Annual Average Real-Time PJM Energy Prices (\$/MWh, 1998 – 2016, 2016 USD\$)

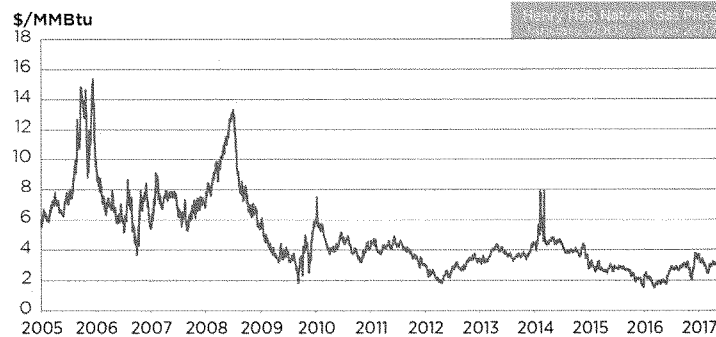


Natural Gas Prices Fall

Historically, natural gas as a fuel and power technology was more expensive than other forms of power generation. In a single clearing price market, like wholesale power, this meant the price of natural gas would have a large influence on wholesale pricing to all generation types. Brought on by shale development in the late 2000s, however, natural gas prices reaching historically low levels have influenced current wholesale electricity pricing trends.

Figure 5 displays the trend in natural gas prices at natural gas trading bellwether, Henry Hub.

Figure 5. Henry Hub Natural Gas Prices

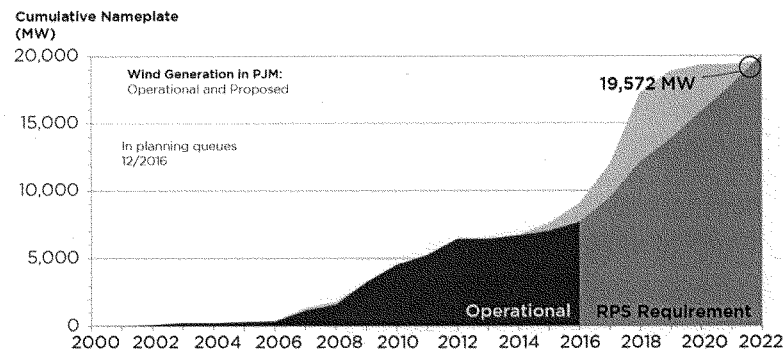




Renewable Build-Out – Merit Order Shift

Renewable generation such as wind and solar, with zero short-run marginal costs, oftentimes place themselves at the front of the supply stack in the economic dispatch of energy markets. This displaces otherwise more expensive resources at the margin. While system operators like PJM are seeing these resources as a relatively small portion of the overall resource mix, **Figure 6**, shows the projected deployment of these resources to meet existing state renewable policies. Moreover, federal tax policy, such as the production tax credit incentivizes wind resources to bid negative prices into the market since the federal production tax credit makes up the 'delta' between the negative price offer and positive profitability in a given hour. Although over the entire PJM footprint, negative pricing has not had a major impact, it has in select locations on the grid where the production tax credit has worked to incentivize wind units to operate in low load periods and compete through negative pricing with nuclear units which do not have that same ability to cycle their output.

Figure 6. Operational and Projected Wind Capacity in PJM

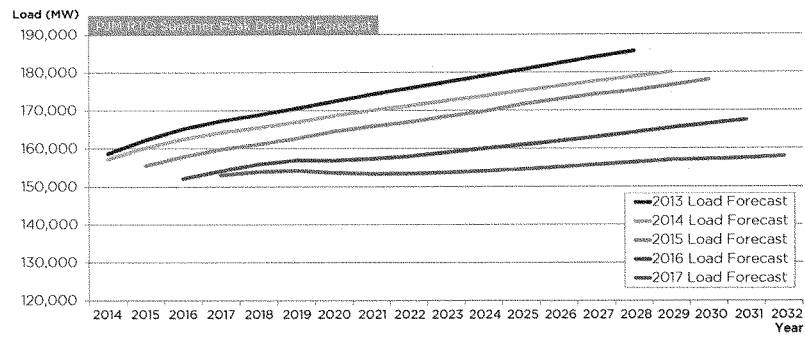


Load-Growth Reductions & Demand Elasticity

Electricity consumption is uniquely influenced by the economy, weather and the efficiency of energy-intensive devices. Historically, demand for electricity increased annually at a rate of 2 - 4 percent. Given a variety of factors – including macroeconomic trends as well as enhanced energy conservation measures – demand for electricity in PJM, and most of the nation, has remained flat or has declined for about eight years. **Figure 7**, illustrates just the last five years of PJM's annual load forecast. In PJM's latest annual load forecast report, by 2027 PJM projects an aggregated increase across the entire RTO of 0.2 percent. Anemic demand obviously influences prices through generally lower around-the-clock prices.



Figure 7. Declining Electricity Demand Growth



Mr. UPTON. Well, thank you all. And at this point we will go to members with questions and we will try to keep to a strict 5-minute Q&A to try and get done by early this afternoon.

I want to focus a little bit about the participation on cybersecurity efforts. Mr. Van Welie, you talked a little bit about it. I would like to follow up to see the participation with the grid exercises as well as cybersecurity training for ISO New England employees.

And Mr. Brown, your comment that you thought your operations were far above the standards, which is great, but what can we do to try and help prevent a cyber attack?

And Mr. Van Welie, we will start with you.

Mr. VAN WELIE. Well, so I think what—

Mr. UPTON. What else can we do constructively to help?

Mr. VAN WELIE. Constructively, well, I think with the establishment of the oversight over the NERC by the FERC, the establishment of cybersecurity standards, I think we set a very important baseline in the industry with regard to managing cybersecurity, but those are what I would call a minimum baseline.

Ultimately, all of the ISOs in front of you here today employ a defense-in-depth strategy and it is about deploying automated systems to detect issues. It is about training your employees which are often the weakest link in the chain. And I think that if I sort of look back over the past decade, I have seen the electric industry really lift its game with regard to cybersecurity.

And that is not to say there is more to be done. I think there is a lot more to be done. I think the risk is shifting a lot from whereas we were previously concerned about cyber in the control centers, I think there is a greater risk out in the field. And so I see that utilities are going to have to invest money in this space and I think what Congress can do is to be supportive of the cost recovery of those investments and I think it is a necessary investment.

The other thing I worry about, to be honest with you, it is true and I heard a number of the members today mention the proliferation of distributed energy resources. The issue with distributed energy resources is they often are relying on the internet for communications back to the control centers. And I think that is a weak link in the chain that we need to pay some attention to.

If we are going to rely on those resources to be a substantial part of the capacity to keep the grid going and reliable, we need to make sure that those resources which are often in private hands are practicing safe cybersecurity practices as well.

Mr. UPTON. Mr. Brown?

Mr. BROWN. So what can you do, certainly support the standard development process, but as Gordon indicated that is minimum. Policy can never keep up with technology, so we are constantly communicating among our regions and with the government entities on attacks that are occurring in real time.

And that is why I emphasize the standards are important because we are all in this together, highly interconnected, highly interdependent, so we must all operate at a minimum threshold. But in order to keep up with the attacks that are very real-time we have to go above and beyond the standards because again policy can never keep up with technology.

Mr. UPTON. Anybody else want to comment? Oh, Mr. Jones.

Mr. JONES. Yes, thank you. One additional thing that I think is important and Nick touched on that as well is threat identification. So from the federal side that is the most important element for us, threat identification and dissemination of that information. That allows us to prepare for these threats and defend against them. Thank you.

Mr. UPTON. Let me go to my next question and that is, it is a good thing that with all of the things that have been going on that harmful emissions from the power sector have been reduced, I think, rather significantly. I know, Mr. Jones, in New York we have seen the NYISO achieve a 98 percent reduction in SO₂ emissions since the markets began operation in 2000. So with all these changes that are going on whether it be RPS standards by states, reduction in coal, tell us a little bit about how you expect to see that continue in the next decade or so.

Mr. JONES. Excellent, thank you. New York State is currently undergoing a strong push toward reduction of carbon emissions, so CO₂ emissions in the environment from our generation fleet. The goal is currently to achieve a 40 percent, 50 percent, rather, reduction in carbon emissions from 1990 levels by 2030 and an 80 percent reduction by 2050.

In order to achieve that, there are a number of steps that the state has already taken. Number one, to drive more renewables in the state to achieve these high renewable penetrations, but they have also stepped forward recently to preserve the low carbon emissions associated with a portion of the nuclear fleet in New York. And we have supported that but we have also supported moving that into the competitive market environment.

So to the degree that we can do that, the best way to control emissions of carbon throughout our state would be to integrate it directly into our dispatch in the energy market side. We are currently working on that with the state of New York, as I said. We will have a report coming out very shortly which will identify the opportunities and the very promising nature of that approach. We will begin discussing that with our market participants as well and we hope to have something in the very near future.

Mr. UPTON. When you get that report we will be anxious to take a look at it.

Mr. JONES. Thank you.

Mr. UPTON. My time is expired, so let me go to Mr. Rush for 5 minutes.

Mr. RUSH. I want to thank you, Mr. Chairman. My question is to Mr. Glazer. In your written testimony you state that PJM works with its stakeholders on proactive rule changes in order to ensure that the market can continue to accommodate individual state policies in a manner that still preserves competitive outcomes without burdening neighboring states that may not have the same state policy.

As you are aware, to the consternation of some stakeholders states like Illinois and New York have implemented policies that take into account the social cost of carbon by giving credit to their nuclear fleets as safe, reliable, zero-carbon sources of energy.

Mr. Glazer, how would you address the assertion that adding value to nuclear fleets unfairly distorts the market? In other words, how do we incorporate the social cost of carbon in a way that reflects that cost in energy clearing prices? And on this question I would also like to hear from Mr. Jones on this issue.

Mr. GLAZER. Thank you, Mr. Rush. I appreciate the question. This whole question about accommodating state policies, of course we need to accommodate state policies and we do that. It is not a question of whether we should do it, there is no question we should do it. It is a how do you do it question and that is the difficult part. Let me give you just an example.

Maryland may have one state policy supporting renewable generation. West Virginia borders Maryland. They have a completely different policy. It is all an interconnected grid, the electrons don't respect state borders. So the trick is to find a way to ensure that Maryland's policy or Illinois policy is not exported to West Virginia in my example that may not buy into that same policy.

So how do we do it? There was a discussion, we are working on sort of almost like, if you will, firewalls, that would ensure that the market prices are protected, that we don't export to an unwilling state what that policy is, but at the same time allow states like Illinois to go forward with what it wants to do.

So that is the rub here. It is an interconnected grid, electrons, we don't want to force other states to absorb that policy, but we want to respect what Illinois did. And that is what we have got proposals out to accomplish.

Mr. RUSH. So do you have a more definitive example of how you would do that because you have illuminated the problem?

Mr. GLAZER. Yes, we are looking at, for example, potentially running the market two times, if you will. Running the market once that would allow the Illinois nuclear units in this case to participate in the market, but also almost running it a second time to correct any sort of price-oppressive effects of the fact that there is a subsidy going to certain nuclear units in Illinois but not the same equivalent nuclear units, in Ohio or Maryland or anyplace else.

So it is a technique that we are looking at. We have actually got a proposal to do that and it is a vigorous subject of discussion.

Mr. RUSH. Thank you. Mr. Jones?

Mr. JONES. So the proposal in our region is different than most of the other ISOs. As Mr. Glazer had mentioned, multi-state ISOs have a difficult time of getting all of the states onto the same policy position.

In the three ISOs that are led by a single state—California, Texas, and New York—it is much easier to implement state policy directly since we have a single state. In the State of New York we want to approach this issue through the energy market. To best say this, in states that are approaching it through a capacity market the vernacular that is used is to accommodate state policy into the market. In our state, by using the energy market we are actually helping to achieve the goals of the state. It is a rather significant difference but it is one that we hope to deliver on.

Mr. RUSH. I yield back, Mr. Chairman.

Mr. UPTON. Thank you. Dr. Murphy?

Mr. MURPHY. Thank you, Mr. Chairman.

Mr. Glazer. So I am from southwestern Pennsylvania and represent an area right in the heart of the PJM area. And as we are talking about this mix of state and federal regulations, can you give a little more detail of how they run into, interfere with each other, and then I will follow up from there.

Mr. GLAZER. OK. And it is, a prime example is Pennsylvania has a renewable portfolio standard that includes, as I understand it, clean coal technology as one attribute of a portfolio standard. Maryland doesn't have that. But the electrons don't really care. They are moving across the border, they don't really care.

So the question is: How does Pennsylvania's policy not get exported to Maryland and vice versa? So what we are looking at as how do we, in a multi-state market how do we accommodate what every state can do, but in the absence of a national federal policy on any of these subjects how do we make this all fit together? We think we can. We think this is very achievable but it does take some work.

Mr. MURPHY. So let's talk about how this is achievable because states and federal regulators there is this bright line in some places. But does this take on our part some large overarching legislation? Do we recognize any of the state preferences there at all? Because obviously I represent coal country, every square inch of my district has coal under it, has Marcellus shale natural gas in multiple layers, Westinghouse nuclear is, part of it is in my district. We have got it all. So, but another area may not have that or prefer that so what is the solution?

Mr. GLAZER. Mr. Murphy, I think it is a great question. There is no question that the more direction on these issues that can come from this Congress or from the Administration the better, because then it is federal policy whatever that policy is.

And I like to say the markets are like a blender. They are only as good as the ingredients you put into the blender. But they do, once you put those ingredients in they produce the most efficient answer, so the more direction we can get from this Congress I think that helps. It is when states as Mr. Jones indicated start going in different directions that it gets complicated. But your district is a perfect example of having rich in all of these resources, and I think the PJM market appreciates it and we all benefit from the richness of those resources.

Mr. MURPHY. Which these electrons get mixed up, so we can't put a filter at the border. So if a state doesn't like coal we can't keep the coal electrons out?

Mr. GLAZER. That is right. That is right, because electrons follow—

Mr. MURPHY. Are you sure we can't do that because if they don't want coal I am glad to say, all right, you don't get to have them. You have a brownout then.

Mr. GLAZER. Right.

Mr. MURPHY. Can't do that?

Mr. GLAZER. Can't do that.

Mr. MURPHY. All right, too bad.

Mr. GLAZER. They follow the laws of physics and they go where they go. Yes, that is the problem.

Mr. MURPHY. Mr. Jones, do you have a comment on that too? I am just curious. He made reference to you there, what we need to do on the federal side in ironing out these state-federal differences.

Mr. JONES. Why are there state and federal differences?

Mr. MURPHY. Well, how, what we need to do to help overcome if there is some problems between them.

Mr. JONES. So in multi-state ISOs the difficulty, of course, is to figure out how to accommodate each individual state with their particular policy positions. The PJM has issued a very short white paper that described one way that it could be done. For example, I think their white paper describes that each energy market could carry its own price of carbon. Those states that do not want to have a price of carbon would be adjusted as the power flows across those interfaces.

So there are ways to do it, it is just much more difficult than what we might be able to achieve in New York.

Mr. MURPHY. Anybody else have a comment on that because it is part of what we—Dr. Casey?

Mr. CASEY. Yes, I would just note that in California we have a cap and trade program for carbon allowances within state and we have the issue of particularly when we run our Western Energy Imbalance Market we are dispatching resources all over the West. How do we attribute which resources are supporting imports into California that would—

Mr. MURPHY. What is it you trade?

Mr. CASEY. Well, we are trading energy. So we are optimizing—

Mr. MURPHY. But it has to do with carbon too, right?

Mr. CASEY. Yes.

Mr. MURPHY. So if something like a nuclear power plant or a solar plant doesn't generate carbon they trade what?

Mr. CASEY. Well, they wouldn't have a compliance obligation for purposes of cap and trade if they are not emitting GHG. But to the extent we are dispatching resources outside of California that have a carbon emission and they are supporting transfers into California, we have developed in our market a method to attribute that that resource in Arizona is supporting a transfer into California and is subject to a GHG price and ultimately a compliance obligation for compliance with California's cap and trade.

So I just mentioned it as it is a market mechanism where through the dispatch you can try to tease out which resources are being dispatched to support transfers to another state and can enforce a carbon price to it.

Mr. MURPHY. I think, Mr. Chairman, that is part of the complexity that we need to figure out on all of that. It sounded very convincing, but I have no idea what you just said. Thank you very much.

Mr. UPTON. We will give you 3 days to write a written statement, OK. Mr. McNerney is recognized for 5 minutes.

Mr. MCNERNEY. Well, thank you, Mr. Chairman. I appreciate how business loves stability and predictability especially utility markets, so I am sort of going to leave that. But I would like to ask a question and ask each one of you to answer it in about 15 or 20 seconds starting with Mr. Glazer and moving this way. What changes, if any, are needed in federal policies to encourage invest-

ment needed for utility companies to manage the challenges you are facing with the rapidly changing marketplace?

Mr. GLAZER. Very quickly, we are moving beyond reliability standards to look at a more resilient grid. And there is a lot of attributes of a resilient grid. It will require support. It is not going to be inexpensive to do, we have to do it wisely. I think this committee's focus on these resiliency efforts would be very, very helpful.

Mr. MCNERNEY. OK.

Mr. CASEY. I think in the case of California we have a very robust investment environment with the integrated resource planning that goes on at the Public Utilities Commission and the direction and renewable procurement and the supporting transmission. So I don't see, really, a need for anything beyond what we have. I think we have adequate investment incentives there.

Ms. MELE. From an ERCOT perspective, I think that as I stated in my comments is that predictability is what we need to guide the future there and so I don't think there is anything that we really need. I think that some of the focus on NERC standards and making sure cybersecurity standards continue to develop in that sharing of information is probably largely the most impactful thing to us from here.

Mr. DOYING. I guess I would tend to agree with the other commenters and that is we do have federal support from NERC for CIP standards and for resiliency standards. Markets as I noted are able to adapt to the changes in the underlying market, the composition of the generation fleet, and I think the most important thing for us is regulatory stability. We largely have that through FERC, but to the extent that you have policies that come out that go in different directions over different periods of time that that is not beneficial to market participants or the marketplace.

Mr. MCNERNEY. Mr. Jones?

Mr. JONES. Thank you. From New York's perspective we have a great deal of investment. We are very comfortable. We have investment in solar, wind resources, investment in natural gas field facilities. As I had mentioned to you earlier though, we have a great deal of need for additional transmission investment. And I don't believe anything additional from this body needs to move forward, but we do need to have continued focus by the FERC on moving our transmission projects forward. Thank you.

Mr. BROWN. No additional policy changes are needed in our region from this body. I would say though it would help if we had a quorum at FERC.

Mr. MCNERNEY. All right.

Mr. VAN WELIE. I agree with the previous speakers that regulatory certainty is very important. I think that I have watched the industry struggle with what is the long-term trajectory on carbon pricing, so from an investment point of view as one is investing in new long-lived assets that are 30 to 40 years in terms of their economic life, having some certainty around that question would be very beneficial.

And I think as a nation we have struggled with that one and I doubt we are going to resolve it any time soon, but that certainly

would help us achieve that objective through the market if we could get it more clearly stated at a federal level.

Mr. MCNERNEY. Thank you.

Mr. CASEY, one of my priorities has been to support technologies and projects that are making the electric grid smarter and more reliable, more resilient, flexible, and secure. As California ISO meets the challenges of renewable energy integration and other state policy objectives, what is ISO doing to support advanced grid technologies?

Mr. CASEY. I would say, in short, a lot. I think in many ways we are leading the world in advancing new technologies into the power grid. There is a lot happening on the distribution network with, as you know with microgrids, energy storage, demand response, many of those resources are behind the customer meter. They are not connected to the transmission system. But we have put forward market models to enable those resources to actively participate as a grid resource so that we can be able to dispatch them to help meet the system needs.

Demand response is an area in California that I think there is a huge untapped potential to really more fully develop. We have been a big advocate with that working with the Public Utilities Commission to really get to the technology capability to what demand response can really do. We have a lot of old programs out there that really you can only call once in a while. We need more advanced programs in demand response that we can call every day and it is seamless to the customer, they don't even know it is happening.

Those are just some examples of what we are trying to do on the customer side. There are other things we are doing on the transmission side as well.

Mr. MCNERNEY. Thank you, Mr. Chairman.

Mr. UPTON. Mr. Barton?

Mr. BARTON. Thank you, Mr. Chairman. Thank you for holding this hearing. We want to welcome Cheryl Mele who is from ERCOT in Texas. We are always glad to have you here. I just have one question, Mr. Chairman. Several years ago, in the Energy Policy Act of 2005 we had a very small section, section 1222, get authorized, the Southwestern Power Administration to build several new transmission lines. One of those projects has been approved, the Plains & Eastern Clean project line. It starts in either Texas and/or Oklahoma, crosses through Arkansas and goes into Tennessee.

The State of Arkansas has filed a lawsuit, and I don't know if it is the state itself or stakeholders in Arkansas against that project. I would like to ask the head of the Southwest Power Pool if he is familiar with this project and, if so, what your position is on it.

Mr. BROWN. So yes, I am very familiar with the project. It is not a product of a regional planning process that involves all of our diverse constituents, both regulatory commissions and all of our very diverse membership, it is a market-driven solution to delivering wind from the western part of our footprint to load centers in the East. We are not opposed to the line, I would just say it is not a product of a regional planning process.

The question is, do load centers in the East want to use that particular DC line as a transportation facility that is constructed solely for the benefit of the wind generators in the West and the load centers in the East, or do those load centers in the East prefer an AC solution that becomes a product of our regional planning process? The costs can be comparable.

The utilization of a DC line is limited again to benefit the buyer on one end and the seller on the other end. An AC solution benefits everyone in the footprint. Both can reliably accommodate the same mission. Again it is, you know, what solution do you prefer.

Mr. BARTON. All right. What about the representative of the MISO, it goes through your territory too. What is your position on it?

Mr. DOYING. I would concur with Nick that it is not part of the regional planning process. I think this is a great example of somewhere where the RTOs have the ability to accommodate the policy decisions that are made by states or by bodies such as this one. If it doesn't go through the planning process it is not eligible for cost allocation throughout the rest of the footprint, which means that to the extent it is approved by states or other entities and they are willing to pay the bill then it can certainly go forward and we would certainly accommodate the transmission within our system. So I certainly don't object to it and we will wait to see how the litigation plays out.

Mr. BARTON. Well, I am told that one of the Arkansas objections is that they don't receive any of the power, but I am also told that the line is willing to, and it maybe even has planned in a connection point in Arkansas that if they wanted, if Arkansas wanted to it could receive power. Are you familiar with that?

Mr. DOYING. No, sir. I am not.

Mr. BROWN. And yes, I am, and certainly it could be accommodated. The real question is, are there loads in Arkansas that want that choice of delivery system, a DC line versus an AC solution that can provide other benefits to the state.

Mr. BARTON. I doubt that anybody on the panel understands the difference between DC and AC. Well, Mr. Shimkus, we will say Mr.—OK, Mr. Flores says he does. Mr. Morgan, I stand—and I am sure Mr. McKinley does, so I stand corrected. I will say I am the only one that doesn't understand the difference. Anyway thank you, Mr. Chairman.

Mr. UPTON. Mr. Peters?

Mr. PETERS. Thank you, Mr. Chairman. I want to thank all the witnesses. I also want to thank the staff for the excellent work that they did together to prepare us for this.

Dr. Casey, I wanted to ask you about distributed generation and maybe you could describe for me what are the challenges in terms of reliability to the proliferation of distributed generation and whether the state is looking at weighing in terms of what is the most efficient way to provide, say, solar power? Is it large-scale solar farms or is it rooftop? Is the state taking a position on that and moving it one way or another or are we just kind of letting that happen?

Mr. CASEY. Well, with respect to reliability issues with distributed energy I think it deals mainly with modernizing the distribu-

tion network to accommodate it. As you know, these systems were designed with one-way flow of power from large central stations to consumers that were static consumers. The grid of the future is going to be much more dynamic. You are going to have bidirectional flows, you are going to have a lot of automation on the system.

So I think from a reliability standpoint, the distribution utilities are really struggling to keep pace with how they need to upgrade the distribution network to provide the safety and controls to make sure that that dynamic can be reliably managed. As a transmission grid operator, that is really not our issue. That is the issue for the distribution utility. But as I mentioned, we are trying to leverage those distribution networks as a resource for the transmission network.

On your question around going forward, is California going to rely more on large central station renewables versus distribution, my sense it is going to be both. I think what is happening on the distribution system is, it is not policy driven, it is consumer driven. People want more control. I know you are very involved with the naval bases in San Diego. They want more resiliency with their system with their microgrids. Other companies are doing the same. So a lot of that is just happening and we are enabling it, but to achieve ultimately the environmental policy objectives California has you are going to need more large central station solar and wind.

Mr. PETERS. I would just ask the panel a question on cybersecurity and maybe ask it in an overly provocative way is why should I trust you to take care of cybersecurity? Is there a federal role for that? What interests you in having federal participation? What scares you about that? Does anybody want to offer me some advice about why I should get involved or why I should sit back?

Mr. GLAZER. Mr. Peters, I would be happy to address that. This is joint effort. We are the people on the front lines. It is our systems that people are trying to hack into in many cases. But what the Federal Government has is the authority through this Congress to require standards. That is very important. Also, the Federal Government has information as to threats that we don't have. We are not an intelligence agency. So I think this is not an either/or proposition, it is really a partnership.

Mr. PETERS. OK. I think that makes sense to me. I think that information, best practices, setting standards makes a lot of sense. And I know we have taken some steps to make sure that an outage in one place doesn't so greatly affect the whole country, so I think there is protection. But if you have any thoughts after this on that I would love to hear it.

And then Mr. Jones, I am not as familiar with the regulatory regime in New York. I assume that that is what is driving investment in renewables and the reduction in emissions that you described. Can you just tell me a little bit about whether that is the case and what it is about the regulatory framework in New York that is helping?

Mr. JONES. So the regulatory framework coupling with the efficiencies that are driven out of the markets within our systems itself is really what has contributed to those reductions, so more ef-

ficient generation has come to our markets to compete. That more efficient generation has lower emissions than the less efficient generation. And as the new generation comes to market, much of the older generation has left that had higher heat rates and higher emissions, so it has been a combination of both.

On top of that the State of New York has been a driver for decades in trying to improve the environment throughout New York and throughout the country for that matter. There are a number of initiatives in place, as I had mentioned earlier. They are achieving a high renewables penetration, achieving significant reductions in carbon emissions that are driving changes in our markets as we attempt to achieve that through the NYISO itself.

Mr. PETERS. Thank you very much again to the witnesses. And Mr. Chairman, I yield back.

Mr. UPTON. Mr. Shimkus?

Mr. SHIMKUS. Thank you, Mr. Chairman. I apologize for being in and out. Members do that all the time especially when you have competing hearings and other legislation you are working on.

This is an area that I love to talk about and it is evolving and you all are managing a system that—I think FERC was here. I mentioned to some of you who came to visit my office that FERC was here a year or 2 ago and they basically said, the Federal Power Act has not been rewritten. It has been vague enough for us to evolve over time.

So for that I want to thank Mr. Glazer and Mr. Doying for visiting the office, and Mr. Brown, I am sorry you got Mike Ross with you. You seemed to be successful even with him there, so we will keep cheering on—and a pharmacist dealing in electrons.

So Mr. Glazer, in the last hearing of maybe last week and we talked about a little bit self-supply debate and issue, can you talk about that from the aspect of our munis and our co-ops and especially in the MISO generating area and then the PJM area? This is an Illinois kind of specific issue. Can you just talk about if they, if you were asked do you allow self-supply what would your answer be?

Mr. GLAZER. Thank you for the question. And you may have been out when I said not only do we allow self-supply, in fact I think I showed some examples. These are some power plants that in fact are self-supplying.

Mr. SHIMKUS. My apologies for not being here.

Mr. GLAZER. No, no. I understand that. Just so you are aware, I actually brought pictures of plants that actually today are exactly doing that. The particular situation with regard to the IMEA—

Mr. SHIMKUS. Well, as long as you have addressed it, I am good.

Mr. GLAZER. OK, OK. Yes. The short answer is there are—I was a little concerned about the panel because there was this impression on the last panel that there is some rule against self-supply, and as I tried to show absolutely we have self-supply today. We have shaken hands with the public power entities and worked out those arrangements. So it is happening today as we speak and we have no intention of changing that.

Mr. SHIMKUS. Thank you. I want to really dovetail a little bit on Joe Barton's question because that line also goes through southern Illinois and it is really more of a siting fight versus—and I think

the AC and the DC argument is really kind of the critical debate of what can be used locally versus what is being used, because the local landowners, in essence eminent domain fights are like we are not seeing it and they are just forcing their way through. And I always can blame the Public Utility Commission of Illinois and FERC without taking direct responsibility for that.

But it is a difficult process that makes you wonder if public policy needs to be involved somehow in addressing—well, Mr. Glazer, we were talking about this yesterday. When you look at the maps, and Mr. Doying, when you look at the maps, sometimes your RTO, the ISO areas look like political gerrymandering to some extent. And that is not positive. That is really a negative comment.

And sometimes because of the engineering aspects they make more sense than just a visual, but that is why we grapple with this. That is why I am glad the chairman has these hearings. Not a question, I guess, just a comment.

I want to also raise to Mr. Jones, you are with the New York ISO. So it just popped in my mind, and I have a new legislative staffer who wasn't here, but I raised a couple years ago a concern of my alma mater which is West Point and their ability to get a new, some additional transmission into the Academy. I think I had a meeting or two after that. I don't know the status of that and I can ask them. I was on the board of visitors at that time which is the responsibility of that board is to kind of take a look at the Academy and see if it is accomplishing its mission. It is training our young men and women to be the best leaders of our other young men and women.

But also part of that is facilities and the ability of them to have the opportunity with the electricity and their needs, so if you would have some people go back and check that on my behalf I would appreciate it.

Mr. JONES. I would be happy to.

Mr. SHIMKUS. No other questions. Again I apologize for not being here. I yield back my time.

Mr. UPTON. Mr. Doyle?

Mr. DOYLE. Thank you, Mr. Chairman. Thank you to all the panelists.

Mr. Glazer, I want to ask you about PJM's report on the evolving resource mix and system reliability. It sort of received considerable attention especially for the claim that PJM's resource portfolio could feature up to 86 percent natural gas and maintain operational reliability.

I note also in the report though that you acknowledge that this hypothetical resource portfolio raises questions about electric system resilience and additional risks were not captured in the analysis including gas deliverability during polar vortex type conditions and to go on to include uncertainties associated with economics and public policy.

And we have seen an incredible increase in the share of natural gas in the markets and I am a big supporter of natural gas, I am not speaking against it because it has its benefits. But I want to know how you view this trend going forward? Do you think we are going to continue to see greater shares of natural gas in our markets and are you concerned about that from a resiliency standpoint

and what does it mean for the long-term perspective in terms of infrastructure investment?

Mr. GLAZER. Mr. Doyle, thank you very much for that question. First off, the good news is particularly in your district you have the strong natural gas pipeline infrastructure in that district and in many of the districts that we serve. That particular report was one of a number of reports that we have done.

It was looking at the equivalent of if you went to shop for a car it was asking the question just like you would ask, what is the size of the gas tank? What is the miles per gallon? What is the ability to go from zero to 60? We were looking at different fuels and how they perform as part of a generation mix and gas served very well in that context as did coal as did a number of other fuels.

But it is just one part of the puzzle and I think you put your finger on it. The system is strong. We have tested individual pipeline dependencies and we look at those. But the next thing we need to do and we are focused on is resiliency, which is that sort of high-risk, low-frequency event, what if a lot of pipelines go out, what happens?

And so that is sort of the next generation. That is where we are now. We are beyond just the NERC reliability standards and that is the focus, a big at PJM initiative.

Mr. DOYLE. Thank you. I want to talk about price formation too. You mentioned energy price formation reforms basically saying that the existing rules fail to appropriately value large generating plants. And I want to say that I appreciate PJM's response to a notice of proposed rulemaking from FERC earlier this year and share the concern that current energy pricing mechanisms fail to fully transparently and accurately value an array of resources in our markets.

So I am interested in PJM's proposal of a load following product that encourages the development of new, innovative, and flexible resources. Could you describe what type of issue this product would address and what type of generation resources would qualify?

Mr. GLAZER. Great, thank you. First of all, let me just very quickly just sort of analogize to what this problem is because it gets very wonky very quickly. But imagine you go in the supermarket. You want to get a can of beans. You want to make sure that that can of beans, the price you are paying for that is reflected right there on the shelf, you know what you are buying.

And because of some ways, the way price formation has happened, actually what happens is you can see an artificially low price, then you get to the checkout counter and suddenly there is an add-on price you never knew about. That is not a great system. So we need to find ways to both price that so you know what you are buying and frankly the manufacturer can keep making the beans, if you will. So that is one aspect of our price formation.

The second aspect is the load following product. Who can benefit from this? Wind technology, energy storage, batteries, anybody that can be flexible it is a way to reward them directly and so we are beginning those discussions with FERC. I think it can be very promising for new technology.

Mr. DOYLE. Great. And I want to ask you this question and the rest of the panel too. Congress is looking at, I don't know if we are

looking at it as we speak, but there is a lot of talk about passing a carbon tax. And I am curious. Would PJM have any issue in implementing this policy? Do you think reliability or resilience would suffer if given the fact if you were given adequate time to adopt it? What are your thoughts if we were to enact a carbon tax?

Mr. GLAZER. Again the market is a blender. This would be an ingredient and we could easily absorb that into the market and it would be reflected in the prices that people pay. Obviously we continue to ensure the system is reliable, but it would work. And the market, it actually is adaptable to that kind of proposal.

Mr. DOYLE. OK, just down the line real quick, yes or no. Would you be able to, do you think resiliency or reliability would be affected or could you adapt to it?

Mr. CASEY. Well, in the case of California, we are—

Mr. UPTON. Want it to be just a yes or no. His time is expired, so just answer his question yes or no as he asked.

Mr. CASEY. OK, yes.

Ms. MELE. It could be accommodated, yes.

Mr. DOYING. Yes.

Mr. JONES. Yes.

Mr. BROWN. Yes, but not the preferable way.

Mr. VAN WELIE. Yes.

Mr. DOYLE. OK. And Mr. Chairman, thank you.

And I just want to say hello to my friend Mike Ross, a former member and colleague of ours and a great member of the Energy and Commerce Committee regardless of what Shimkus says.

Mr. UPTON. He was indeed a very good member and still remains a friend.

Mr. McKinley?

Mr. MCKINLEY. Thank you, Mr. Chairman.

And Mr. Glazer, I think I am going to direct most of my comments to you with PJM. I appreciate you using Longview as one of your models, but you are well aware that the current regulations in this country prevent us from building into the Longview 2?

Mr. GLAZER. Well aware of that, yes.

Mr. MCKINLEY. So why I think it is so important that if we are serious about developing baseload we have to be able to take that into consideration on how we are going to be able to replicate the success that occurred at Longview.

Mr. GLAZER. And it is a success story, I agree.

Mr. MCKINLEY. Yes, absolutely it is. And I had the pleasure with Secretary Perry there touring the plant just a few weeks ago and then he went over to NETL to look at some of the fossil fuel research facilities and what is underway on that. So just for the record, we can't do what you want us to do.

The secondly is that you said in your testimony you want to keep prices low. That is one thing that you said—you are helping to try to keep prices low. But yet we have perhaps conflict and maybe you can help clarify that in keeping prices low. West Virginia now has lost its stature of being number two in lowest cost energy costs to now the 26th, just in 10 years. Pennsylvania and Ohio are also in that 25 to 28 range on that so I don't think the utility rates in the PJM market are particularly low. Do you want to comment about that?

Mr. GLAZER. Mr. McKinley, I think it is not a question of are they, further, we don't see our mission keeping them low as much as making sure the prices are right, that they are sending the correct price signals for new investment just like we just talked about for a future Longview. That is really the goal is to make sure the prices are fair and right, attract investment—

Mr. MCKINLEY. Then at the same time we are—and I support the chairman's mission for nuclear facilities. For example, in Illinois we know that the state is going to subsidize or has already started to subsidize their rates for nuclear. But when they bid into the PJM market that means that they have a competitive advantage over coal and gas fired in the East. Do you want to respond to that?

Mr. GLAZER. And that is exactly the concern with sort of just a state sort of subsidizing a plant, because it has the effect of crowding out other plants in the state like West Virginia that didn't adopt that particular policy because you don't have any nuclear plants in West Virginia.

So you are absolutely right. It is a concern. That is why we are looking at some mechanisms to—

Mr. MCKINLEY. So you are trying to develop something that does that?

Mr. GLAZER. We are trying to do something that prevents the harm, if you will, Illinois doing something that hurts West Virginia coal plants.

Mr. MCKINLEY. Should regulators be rewarding baseload production and should they be rewarding lowering carbon emissions as part of their rate base?

Mr. GLAZER. Yes, one of the problems, and I am a former regulator. One of the problems in this whole area, if you start picking winners and losers inevitably as a regulator we got it wrong and then we just create stranded costs and we create problems.

Mr. MCKINLEY. Would trying to protect our baseload be something that is subjective?

Mr. GLAZER. What I am saying, Mr. McKinley, is picking out particular power plants.

Mr. MCKINLEY. I am not trying to—

Mr. GLAZER. Right. But in terms of a mix of resources we agree, but the way to get at it is not to say I need x amount of coal, x amount of nuclear, x amount of gas, because who decides that question? To us, the best way to look at it is what are the reliability attributes of those? And frankly our study, as Mr. Doyle pointed out, the study actually identified many reliability attributes of coal that are very valuable to it.

Mr. MCKINLEY. And I want to be very supportive of natural gas because obviously the Marcellus is in Utica, the possibilities that come forth from that.

Mr. GLAZER. Right.

Mr. MCKINLEY. But we look at that and we see during the polar vortex in 2014 we saw what happened that they went from about a hundred dollars per megawatt hour up to what, it went from the average of \$30 up to \$1,800 for a megawatt hour during that polar vortex.

What savings could we have had if we had been using base price back on coal and, you say coal, for example, coal and nuclear?

Mr. GLAZER. Well, to be honest, we saw power plants that were not producing during the polar vortex and some cases were coal and some cases were gas. Overall, the extreme weather hit the entire fleet pretty hard. So we have actually changed our system to award that good performance of all those units, coal and natural gas, and that helps to moderate the fluctuations and the energy prices as well.

Mr. MCKINLEY. I have 20 more questions so I guess we will have to have a meeting.

Mr. GLAZER. I will be happy to follow up with you.

Mr. MCKINLEY. Yes, we will, please. Thank you, Mr. Glazer.

Mr. GLAZER. Yes, thank you.

Mr. UPTON. Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman, and thank you and our ranking member for holding this hearing particularly after last week's hearing we had on electricity and power.

Coming from Texas, I have to admit when—Ms. Mele, your testimony said that our natural gas is 43 percent followed by coal at 28 percent and wind at 15 and nuclear at 12 percent. Do you expect our baseload to change? Are we seeing more wind power coming to the market? And by the way, everybody on the committee is used to us in Texas bragging. I was happy a number of years ago when the Public Utility Commission to get that wind power from West Texas to the Dallas-Fort Worth, San Antonio, Austin, and of course the Houston market where I am from, made a decision and spent, was it \$5 billion?

Ms. MELE. Yes, sir. Actually it was a little bit more than that. About \$6.9 billion was invested under the legislature's direction to really—

Mr. GREEN. To make sure that wind could get to the urban areas where the customers are.

Ms. MELE. Correct. And so today we have about 14,400 megawatts of wind taking advantage of those CREZ lines, and actually in the queue of potential interest being shown is an additional 23,000 megawatts of wind. So we assume that will not all get built, but that interest in developing wind in Texas in the western region and the Panhandle continues.

Mr. GREEN. ERCOT is the only RTO in the nation that is not regulated by FERC. You offer a perspective of what we are discussing today. In your testimony you mentioned Competitive Renewable Energy Zones, CREZ, was mandated by the state legislature. How has this program evolved since its inception and do you believe it could be replicated across other RTOs present today?

Ms. MELE. I don't know if I can offer comment to the other RTOs. They can probably add their own. But I do think that that certainty of having a resource like the CREZ lines built certainly has enabled the interest of wind to develop, but also is serving some of our industrial loads in West Texas associated with our natural gas and oil businesses. And it also is starting to show a value for the solar development that is beginning to grow in that western region as well.

Mr. GREEN. What are ERCOT's projections for the incorporation of large-scale solar projects and how the additional solar impact on your current fuel generation mix under ERCOT jurisdiction?

Ms. MELE. Yeah, today we have just over 700 megawatts of utility-scale solar installed in ERCOT. As we look down the road at what is in the cue for development we are seeing significant interest in solar. It is in the thousands of megawatts over the next several years. When we did our long-term system assessment and really looked at what resources are likely to be developed in Texas based on the resource that we do have in solar and wind and natural gas and those, that tends to be where the interest is being expressed in the applications that we see for interconnection requests, so we believe that will continue.

But just looking at the solar development, we have an expectation of about 850 megawatts in 2018, over 7,000 megawatts is expressed interest in 2019, and 8,000 megawatts-plus the following year, so this is going to be another big resource that can take advantage of those CREZ lines.

Mr. GREEN. And so you see these numbers in your testimony shifting over the years because solar is not part of it now but there is growth. And I go home every weekend and I love when I drive to South Texas to see grandchildren, starting about north of Corpus with those windmills and then they skip a little bit of the urban area, but then between King Ranch, from King Ranch to Raymondville almost in the South Texas area there that—is it potential for any offshore? I have heard of offshore wind power also being developed, but again on the Texas coast it is all land-based.

Ms. MELE. Yes, it continues to be land-based, and the virtues of that southern and coastal wind that we have is that it tends to be there and available during the peak consumption hours in the afternoon. And so that resource development has really been valuable to our state.

Mr. GREEN. What is the difference in the wind power, say, in South Texas as compared to West Texas and the megawatts that they deliver?

Ms. MELE. The actual installations in South and coastal Texas are quite a bit lower. I don't have those exact numbers, but I would say it is probably over in maybe 3- to 5,000 megawatts.

Mr. GREEN. OK.

Ms. MELE. I can certainly confirm those numbers for you.

Mr. GREEN. So the wind blows more in West Texas than it does in South Texas.

Ms. MELE. Well, the wind blows predictably in South Texas, but it blows more in West Texas.

Mr. GREEN. OK. Thank you, Mr. Chairman.

Mr. JOHNSON [presiding]. I thank the gentleman for yielding back. I recognize Mr. Griffith for 5 minutes.

Mr. GRIFFITH. Thank you very much, Mr. Chairman. I appreciate it. As you may realize if you watch this committee very often, you have entered into the coal sector of this panel starting with Mr. McKinley, or Mr. Shimkus, then Mr. McKinley, myself, and Mr. Johnson, and others.

Coal fueled power is still critical to our electrical supply. It provides about 30 percent of the power we use and is a workhorse that

if we don't kill it is always available. It helps prop up intermittent wind and solar and uninterruptable natural gas without a hundred percent firm guaranteed contract power sources, yet it has been under severe regulatory assault and victimized by generous subsidies, e.g., wind, PTC and solar ITC, and mandates, e.g., state renewable portfolio standard requirements offered to competing power sources.

We have lost about 60,000 megawatts of coal generation over the last 5 years and the remaining coal plants in competitive markets are very much at risk. In my understanding of how power markets work, and I want to clarify some of that if I am wrong. But my understanding is, is that those generators don't get compensated for the resiliency they provide the grid. So it is a perfect storm for fuel secure baseload generators like coal units and each of the individual clouds in that storm is the result of a policy decision.

Now earlier, Mr. Glazer, you said something about rewarding those that are available and I interpreted that as resiliency. So tell me how that works because that ought to be helping my coal-fired plants.

Mr. GLAZER. Thank you, Mr. Griffith. And we actually see this initiative as doing just that. It was one of my supermarket analogies with the price of a can of beans making sure that the full price is reflected in what you buy. And in the case of coal to the extent it is providing a service to customers, ensuring that that is reflected in the price, absolutely.

Mr. GRIFFITH. Well, I hope, and if you can give me some more information on that I would appreciate it.

Mr. GLAZER. Sure.

Mr. GRIFFITH. And I hope you will continue with that because when you start talking about resiliency I don't think there is anything better than coal. I too have natural gas. I don't have as much as Mr. Shimkus or Mr. McKinley have, but it is important that we have a mix.

Now one of the other things that you said earlier that intrigued me when you were talking to Mr. McKinley about cost is you said, of course we don't want to have stranded costs. But in my district alone there have been several facilities that still had life that were shuttered because of regulations. And when those are shuttered and there is a stranded cost, isn't it the ratepayer that ends up picking up that cost in the long run?

Mr. GLAZER. Well, and we—

Mr. GRIFFITH. I just need a yes or no because of time.

Mr. GLAZER. Yes, yes. And we moved to a market to try to not put it all on the backs of the customers, to be honest with you.

Mr. GRIFFITH. And I appreciate that but I think it ends up pretty much on their backs, notwithstanding your good efforts. Now I have got to get something straight because I don't understand.

Mr. GLAZER. OK.

Mr. GRIFFITH. So when we had our previous hearing the folks were talking about, you know, the payment for self-supply and self-supply. And you are here today and you have pictures of some self-supply facilities and I think it is great and we have got some great coal plants out there that are working on some of this type of stuff.

Clearly there is a disconnect so I need your help in filling in the gaps. Is it what they get paid if they sell back to the PJM or others? I mean where is the disconnect? Because I think both sets of witnesses are honest brokers trying to do the best they can, but clearly there is something that doesn't fit.

Mr. GLAZER. Yes, and it is a fair point.

Mr. GRIFFITH. I have your position, I have their position, but where is the disconnect?

Mr. GLAZER. Yes, yes. No, and it is a fair point, so two things very quickly. One is, I think they were referring to a court of appeals decision that puts some uncertainty around the various rules that we have. Embedded within that was the self-supply exemption we worked out with public power. The court didn't overturn that but it did overturn the rest of it, so there is a little bit of uncertainty going forward but not for lack of wanting to honor that deal or even FERC wanting to honor that deal. So I think that is really part of what we were talking about.

And the public power says we should just have a totally different model in terms of how we buy capacity. I don't want to take a lot of time, but that has got its own set of problems with it, one of them being there is no price transparency. If everybody can just do bilateral deals it is like going to the supermarket. There is no prices. You just wait until the checkout line and then you have to negotiate what the price is and you don't know what the person—it just doesn't work very well. So that is, I think, the essence of the beef.

Mr. GRIFFITH. All right, so, is it something that we ought to resolve? I personally think it is much better if we let you all figure it out, but at the same time if we need to resolve that so that we guarantee that both the urban markets and the more rural markets are being served and getting a fair rate, I am happy to wade into that if that is necessary.

Mr. GLAZER. And we will keep the dialogue going. I think in a large part it has been worked out. We have got to work out what is the impact of this court decision and we will keep you posted on that.

Mr. GRIFFITH. Thank you very much and I yield back.

Mr. JOHNSON. I thank the gentleman for yielding back. I now recognize Mr. Kennedy for 5 minutes.

Mr. KENNEDY. Thank you, Mr. Chairman. Thank you to the witnesses. Thank you to the committee for calling an important hearing. Thank you, Mr. Van Welie, for coming down. Thank you for the time to speak with the New England delegation yesterday, and your team as well.

I am going to echo some of the comments of my colleagues I think, first and foremost, to say this is really a complex area of a critically important market and so I think you have seen from the folks on this side of the dais anyway a real effort to understand it. Some obviously do better than others.

In that I haven't been around Congress too long, but I do know that the greater the complexity the harder it is, one, to oversee, and the more likelihood is that incentives aren't perhaps structured quite as well as, or there is opportunities there for incentives to skew to folks that happen to know this industry really well, par-

ticularly if those that are overseeing it don't have that same degree of expertise.

Mr. Van Welie and his team has been generous with their time in walking us through some of the challenges that we face in New England including a conversation yesterday and I wanted to further engage in that conversation. ISO New England has been very effective in driving down those wholesale market rates to very low levels and those prices have come down.

One of the challenges that we face again that we talked about yesterday is that while those wholesale rates are low, those retail rates aren't and that once the energy comes out from that wholesale marketplace because of a whole bunch of factors that is not under ISO's control, some of which isn't directly under Federal Government or Congress's control, all of a sudden the price that the end user gets is not cheap. And that is something that I hear actually from constituents and particularly as they are trying to bring back a manufacturing industry in the Northeast when those energy costs start to be a driving factor for their own businesses.

We ran into some problems here with FERC, obviously an FCA 8, without having a sufficient quorum. What is the best way and do you have any suggestions to ensure that there is some sort of, whether it is a public advocate or some way to make sure that the public has a way, a seat at the table and some method to push back on a system, the price increase? Because understanding that the wholesale rates are low trying to explain this at a town hall, not all that productive from somebody that has tried and failed. And with due respect it is not all that great to say, well, the wholesale rates are low but da-da-da-da-da. They don't care what the wholesale rates are. They care what they are having to pay.

So how do we get to a point where we can address some of these concerns where the public actually feels like they have a seat at the table?

Mr. VAN WELIE. So yes, a great question. I would say that there are some well-established structures for the public to have a voice both the wholesale and at the retail levels. So just to describe briefly what happens with the structure around the ISO, we are compelled to take every rule change through a stakeholder process. There are six sectors in that stakeholder process, one of which is end users. There is another sector for public power.

So public is represented right at the table when we are discussing all the market rule changes at the wholesale level. We also, several years ago, established something called the Consumer Liaison Group and so that is a place where consumer advocates and the public can have a voice with directly to the ISO as well. So the states are also represented through their regulatory commissions.

Mr. KENNEDY. Can I push you to get to the retail level because we have about a minute left.

Mr. VAN WELIE. OK. And well, at the retail level I think you have a similar structure in place around the Public Utility Commissions in each of the six states, so I think there are many opportunities for the public to engage in this discussion.

I think the issue that you started this with though is the complexity. And so getting an understanding of how wholesale affects retail prices and what is in the retail price and what has been

added in there, I think is a very daunting task for somebody who is uneducated. And I would be happy to talk more offline about how we can perhaps improve upon that.

Mr. KENNEDY. Well, I would certainly appreciate it. As we look at the focus, in 30 seconds, ISO is focused on reliability, obviously stems from the reason for your work. The challenge then comes on that cost side if the issue on reliability ends up being, well, we can make it reliable at a certain price point where generators will come in and say we are willing to enter this marketplace but at a set price, would those prices then get passed along to consumers?

And again we have seen those wholesale rates come down, but at a retail level that anger ends up getting channeled in certain levels, town halls are a great place for that anger to get channeled. But there is a tension there that is going to break at some point particularly given the resource-constrained environment that we might find ourselves in. So let's continue the conversation. And sorry for going over, thank you.

Mr. JOHNSON. I thank the gentleman for yielding back. The chair will now recognize himself for 5 minutes.

Mr. Glazer, in your testimony you stated PJM is concerned about potential retirements of additional coal resources and that the relevant question is how best to respond to that. You asked to have your feet held to the fire to devise market-based solutions to address these challenges. What can and should Congress do to play a role in this process? Anything else you would like to expand on in relation to this issue?

Mr. GLAZER. Thank you, Mr. Johnson, for that great question. Really is the subject as we are going to look at what the future is we have got to focus on this question of resilience. And part of resilience is who decides? Who decides what is a credible threat and who decides as many consumers argue it is gold plating the system. Where is that balance? We need input from the federal government with that. We need oversight from this committee on those kinds of questions. It is a whole new area for all of us.

Mr. JOHNSON. OK. All right, well, I thank you for that. Perhaps you have already touched on this next issue with some of your previous answers, but as you know, FERC began a stakeholder process to reform the process at which market prices are determined and paid back. Does PJM believe that these price formation rules have been successful thus far?

Mr. GLAZER. We think what they have done has been very helpful, but we need to and we have been, frankly, pushing on the Commission to move on this next level which is what I talked about before how we do a load following product, how we focus on these inflexible units that ought to be able to set price.

My supermarket example with the can of beans, that is the kind of stuff, frankly, we are asking the new Commission when it gets seated to take this to the next level. What they have done has been helpful. This is a big issue and might help a lot of those issues that you have raised.

Mr. JOHNSON. OK, all right. Well, what remaining areas of price formation reform are of greatest concern to your RTO?

Mr. GLAZER. This one is probably the largest, which is do we let these large block loaded units, which in some cases are coal units

or large natural gas units, could even be nuclear units, to set price? That is a very big issue. I think if we truly got our hands around that it is not a panacea but would help to take some of the pressure off this whole question about baseload.

So we are just beginning that dialogue, in fairness to FERC, but this committee's oversight over that would be appreciated.

Mr. JOHNSON. OK. And you mentioned the word resiliency just a few minutes ago and you also touched on it in your testimony, a very important topic that has been receiving a lot of increasing attention. So what steps are PJM taking to promote a resilient power grid especially in the context of extreme events?

Mr. GLAZER. And great question. We have got, actually we just outlined for the stakeholders literally a complex map of things we are doing, some of it is just done in the control room operating the system more conservatively at times when we are seeing issues on pipelines, for example. Some of them are operational. Some of them are these price formation type issues. Some of these are planning.

We have got some critical transmission substations. How do we make them less critical so that in fact something happens they don't have this big impact? Those are the kind of things we are looking at. We have got a whole map that we have outlined of those initiatives which I would be happy to share with the committee.

Mr. JOHNSON. OK, great. Well, let it be noted that the interim chairman yielded back over a minute of his time. Yes, I will recognize Mr. Pallone.

Mr. PALLONE. Thank you, Mr. Chairman. I have to get to a couple of things here, so for the first question if I could just ask all the panelists to just answer either yes or no, otherwise I am not going to get to the other question.

So the question for everyone yes or no is does your RTO or ISO have a designated body responsible for consumer input or advocacy? Just yes or no.

Mr. VAN WELIE. Yes.

Mr. BROWN. Yes.

Mr. JONES. Yes.

Mr. DOYING. Yes.

Ms. MELE. Yes.

Mr. CASEY. The answer no to that.

Mr. PALLONE. You said no, Dr. Casey, okay.

Mr. GLAZER. And I would say yes.

Mr. PALLONE. OK, so everyone was a yes except for Dr. Casey. Thank you. All right, so let me move on. This is more specific to my congressional district.

In my congressional district, Jersey Central Power and Light, a subsidiary of First Energy, has proposed the Monmouth County Reliability Project, a 10-mile, 230 kilowatt transmission line and substation enhancement project. But a lot of questions have been raised about the necessity of the project for meeting its proposed goal of increasing reliability of the push into the grid serving Monmouth County. I have raised these myself at public hearings. And this project was recommended by PJM's Transmission Expansion Advisory Committee and approved by its board of managers.

So Mr. Glazer, assuming you understand what I asked, if not I will repeat it, critics say that the process for approval of transmission projects lacks transparency, consumer advocate input, and true independent oversight. What can PJM do to address some of those concerns, if you will?

Mr. GLAZER. Mr. Pallone, I appreciate the question. I do not agree with the premise of it because these meetings are open, the material is published, and we don't just passively do that. We reach out to the consumer advocates, they are very active in our process—to the states as well, the BPU in New Jersey, so people are there.

The problem comes in then you go to a siting process months later and people, the public is hearing about it for the first time. So maybe we need to do more, admittedly, to sort of reach out to the public on these things than we do and that is a fair point that we will talk about to address some of those issues. We are not the deciding authority here, but people do need to understand what the need is and there probably is more we could do, to be honest.

Mr. PALLONE. So what you are saying to me is that it is not, you believe that there is opportunity for consumer input and oversight, but the problem is they just may not be aware of what those opportunities are.

Mr. GLAZER. Right, and in fairness we need to do more in that area.

Mr. PALLONE. All right. Well, again, I appreciate that and if we can work together on thinking about better ways of doing that I certainly appreciate it. I just wanted to say, I understand the need to prepare so there is enough electricity generation to cover the needs of the market, but I also worry that drastically overestimating load forecasts on a regular basis can lead to unnecessary build-out that ultimately has to be paid for by the ratepayers.

And to that point some are peak load forecasts for PJM's annual reliability planning have been consistently and significantly overestimated for the past 8 years even as the actual use of electricity in my state has declined. So some projects that have been approved by PJM and have been constructed based on what I consider overly optimistic forecasts have resulted in underutilized transmission lines.

So Mr. Glazer, what checks and balances are in place to encourage PJM not to overexaggerate forecasts?

Mr. GLAZER. Thank you for the question. This is a Gordian knot, because if you overestimate consumers would pay too much; if you underestimate you could run short and then be in a serious reliability problem. So it is a Gordian knot to find the right mix. It has been very tough over the past couple of years, not an excuse but a reality, because we have seen the economy, the impacts of the recession, and we have seen energy efficiency. As the economy picks up we are not seeing the load picking up, which is showing us that maybe there is some permanent energy efficiency changes which are then affecting the load forecast. But it is kind of a difficult area to ping it exactly right, but we are trying to work very hard on getting this more sophisticated.

Mr. PALLONE. All right, let me just throw in one more thing. What can PJM do, in your opinion, to minimize transmission

projects that are approved, built, and then underutilized resulting in unnecessary high cost to ratepayers? Is there any recommendation you would have?

Mr. GLAZER. We generally don't have a problem of underutilized transmission lines, they are pretty utilized at this point. As I was talking about with Mr. Shimkus, a situation where I can't get power into Chicago because the system is too tight, so generally they are well utilized once they are built.

This whole question of do you build it just in time or do you look forward a little bit and predict is a very tough one because it takes a couple years to get a transmission line built, so it is difficult. If anything, we have canceled a whole bunch of transmission lines in response to let's not overbuild the system. Sometimes I worry maybe we canceled too many, but in fact we have canceled a bunch of lines. So we have tried to be responsive to the changing needs of the system, very much so.

Mr. PALLONE. So you don't have any suggestions about trying to minimize that problem?

Mr. GLAZER. The way we do it is to continuously question—

Mr. JOHNSON. If you can answer that quickly, Mr. Glazer, the time is expired.

Mr. GLAZER. Yes, to continually question what we have done, to look at it year by year and cancel projects we don't need any longer.

Mr. PALLONE. All right, thank you.

Thank you, Mr. Chairman.

Mr. JOHNSON. I thank the gentleman, his time has expired. I now recognize Mr. Flores from Texas.

Mr. FLORES. I thank the chairman. By the way Mr. Chairman, I want to share the news with you that a member of this committee, Steve Scalise, has been released from the hospital, so we look forward to him joining us soon. Prayers for his continued recovery.

I have a couple of micro questions just because I am a little bit of a nerd on some of these things, and then I want to come back out to the macro. I was just checking my home solar system, we are producing about 86 percent of my daily needs right now. We will go up to about 130 percent, maybe less, because my wife is home with the thermostats under her sole control.

In any event, Ms. Mele, this raises sort of an issue. Do you have an idea in ERCOT how much distributed power is behind the meter like what I am doing? Do we have a way to measure that?

Ms. MELE. That is something that we are currently discussing with our stakeholders and we recognize that as an important thing for us to keep our eyes on. So really, with something like your rooftop solar we have proposed in a white paper to the stakeholder community and market participants that we start to talk about how we get a view of that perhaps through aggregation.

As the transmission operator and wholesale market operator, we don't really want to get down into the distribution system, but we do think it is important where they start to see a significant amount of that building up at a transmission load point that there would be some visibility to come back to ERCOT. That is for our operational readiness as well as for our planning. Not different

than the conversation we just had about transmission resources, we need to consider how we use that information in our transmission planning process.

So at this time we don't have a exact picture of how much is out there. There are some reports that are filed to the Public Utility Commission that do give us some insight into that.

Mr. FLORES. OK. I was just curious, because I mean implied in your answer is that it does have an impact on distribution and reliability or dispatch and reliability.

And so that sort of I want to come out to just another level up, in Texas, because of the tax credits for certain types of power, we have had negative pricing enter into the market and so that seems to be disruptive to being able to dispatch with transparency and reliability.

Can you tell us what the challenges are because this has to do with wind primarily and some solar. What has that done to your job?

Ms. MELE. So I think the important thing to think about for our job as the people who are responsible to forecast and procure the resources that we believe are going to be needed to get through the day as well as the ancillary services to close the gap between the load forecast and the operational difference in real time, what we have focused on is really the accuracy of forecasting. We have done a lot of work, especially with wind, to look at how accurate we can get that forecast, considering where we are, and looking at what that net load ramp potential is. So here is what might change based on where we currently are with wind and here is load is going and trying to really focus in on that.

We have actually added a new operating desk in our control room. It has been in place now for about 8 months, and some of their primary responsibilities are really looking at that, looking closely at forecast. We use some pretty sophisticated software to do both our load forecasting and monitoring our wind. In addition to that they are looking at what is the inertia on the grid as we have this changing resource mix.

Mr. FLORES. Right, right. Well, that takes us to the next area I wanted to go and I welcome comments from any of you on this and I want to start with Ms. Mele. We have got the challenges in managing baseload and also renewables which by the way they are structured are intermittent.

Recently in Australia there was an incident that was weather related that caused their wind energy, wind resources, to drop off line in southeast Australia and putting 1.7 million people in the dark. And they really hadn't factored in that type of an event and so they didn't have enough baseload ready, enough inertia, if you will, to be able to back the system up and bring people back on line.

What are each of you doing about that particular issue? And I only have about 49 seconds. We will start with you, Mr. Glazer.

Mr. GLAZER. This is one of those resilience issues. It deals with things like black start to be able to—resilience isn't just preventing things but restoring the system rapidly. Those are some of the things that we are digging into.

Mr. FLORES. OK. Dr. Casey?

Mr. CASEY. A couple of things, one, carrying reserves.

Mr. FLORES. Quickly.

Mr. CASEY. To make sure when that happens we have backup so at least they can step in. And secondly, making sure the inverter technologies with these new technologies can ride through events on the system.

Mr. FLORES. Right.

Mr. CASEY. It is a relatively new technology. We are learning as we go, but we are discovering issues and we are trying to fix them.

Mr. FLORES. Let me just quickly, through the rest of you, are each of you familiar with this incident and are learning from this incident? OK, thank you. I used up all my time. Thank you, I yield back and I will submit additional questions for the record.

Mr. JOHNSON. I thank the gentleman for yielding back and recognize now Mr. Tonko for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair. Because of a conflict I apologize for missing the beginning of the hearing and for hitting any topics that may have already been covered. And I thank all of you for participating this morning, it is a wealth of talent to have at the table.

And if I might do my hometown, or home state shout-out to Mr. Jones, thank you for being here and for all of the great work that you do to guarantee great reliability throughout my home State of New York and for your work to keep our state on the cutting edge of our nation's energy transformation.

So we are very happy with the results. New York has launched a number of ambitious state policies, including environmental and fuel diversity goals, the Reforming the Energy Vision, the REV concept, and clean energy standards are keeping the state at the forefront of our changing energy system. ISO clearly benefits from dealing with a single state government so there are not competing state interests or goals to balance.

Mr. Jones, based on your testimony it sounds like RTOs can play a role in achieving state policy goals. How has NYISO been involved in New York's REV initiative?

Mr. JONES. Thank you, Mr. Tonko. REV initiative is primarily directed at animating our customers in a way that the customers can participate in both the retail and the wholesale markets. From NYISO's perspective we have gotten engaged on that issue and that we launched last fall a DER roadmap. A roadmap provided some clarity to our approach going forward to individuals that are proposing to invest in distributed resources.

Those resources now we are bringing into a pilot program. The pilot program is intended for us to develop the types of communications that we will communicate both price and dispatch these individuals and the settlement process is to make sure that happens. We hope in a 3-year period to be able to solidify all of the wholesale market interactions. We are currently also working with our distribution companies within the State of New York to assist them in developing their systems.

Mr. TONKO. Thank you. Obviously that effort with distributed resources provides great value to the grid.

Mr. JONES. Yes, sir. We see great opportunity to by animating those customers to reduce overall needs for both transmission and

new generation resources to provide significant value to our customers.

Mr. TONKO. Super, thank you. And at the market participants' hearing last week we heard complaints from some witnesses about out-of-market subsidies. Now New York's ISO recently commissioned a study from the Brattle Group to explore the potential to pursue state environmental and other goals within its market structure. You have suggested that this could incentivize cleaner generation, provide proper price signals in the competitive markets, and help achieve state policy goals. How might that work?

Mr. JONES. Just to put it as simply as I can, the way it would work is that we would charge generators that produce carbon emissions. We would charge them for the value of those carbon emissions. That money then we would return to customers. But because those individuals are being charged for that cost, that cost would be reflected into the marketplace, the price, and low carbon emissions resources then would benefit by that higher clearing price.

Mr. TONKO. And is there a timeline that you have for considering the possibility of adopting these types of changes?

Mr. JONES. Yes. We are about to launch the Brattle report or Brattle, rather, will launch it on our behalf within the next several days. At that point we will begin to engage our market participants as we have been working closely with the PSC, the Public Service Commission of New York, throughout the last several months. We will engage our market participants. I would hope that in a period of 3 years we could have that implemented within our markets.

Mr. TONKO. Thanks a lot. And your 2017 Power Trends Report identifies transmission constraints as a limitation for New York to get clean energy resources to some high demand areas. We are also seeing this on a larger scale throughout the nation where renewable resource potential is high in the Midwest. Can you explain how New York's ISO's role in overcoming these constraints is working?

Mr. JONES. It is working quite well. We need to continue to drive the process to improve it and speed the process up. We currently have two projects that are well underway, one from Western New York to Central New York, one project that will take power from Central New York down into New York City and Long Island. We see additional needs going forward and we proposed those to the Public Service Commission. They are currently evaluating those. We hope to move those forward very quickly.

Mr. TONKO. Thank you. And just for those in the eastern portion of our nation that are here as witnesses, you have created capacity markets. Do you think that the capacity markets are the optimal in least-cost means to determine the mix of generation resources that we need to serve our customers? Mr. Glazer?

Mr. GLAZER. Nothing is perfect, but I think they have accomplished the goals of in getting new investments very efficiently, retiring inefficient investments, so I think they are overall working well.

Mr. TONKO. Mr. Van Welie, please?

Mr. VAN WELIE. Yes, I do think so.

Mr. TONKO. And Mr. Jones?

Mr. JONES. Yes, very much so.

Mr. TONKO. Thank you. Again thank you for the work you do. It is so valuable in this given transformation period, so thank you. I yield back, Mr. Chairman.

Mr. JOHNSON. I thank the gentleman for yielding back.

And seeing there are no further members wishing to ask questions, I would like to thank all of our witnesses once again for being here today. In pursuant to committee rules, I will remind members that they have 10 business days to submit additional questions for the record and I ask that witnesses submit their response within 10 business days upon receipt of the questions. Without objection, the subcommittee is adjourned.

[Whereupon, at 12:22 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
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COMMITTEE ON ENERGY AND COMMERCE
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Majority (202) 225-2927
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August 29, 2017

Mr. Gordon van Welie
President and CEO
ISO New England
1 Sullivan Rd
Holyoke MA 01040

Dear Mr. van Welie:

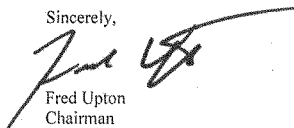
Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, September 13, 2017. Your responses should be mailed to Elena Brennan, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Elena.Brennan@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



Gordon van Welie
President and Chief Executive Officer

September 13, 2017

The Honorable Fred Upton
Chairman, Subcommittee on Energy
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Chairman Upton:

Thank you again for the opportunity to appear before the Energy Subcommittee on July 26, and I appreciate the opportunity to respond to the questions below.

Please be in touch with any further questions or if I can provide additional information.

Sincerely,



Gordon van Welie
President and Chief Executive Officer

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy
The Honorable Peter Welch
The Honorable Joseph Kennedy III

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The Honorable Fred Upton

1. *It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as "Order 1000 transmission planning regions." Now that you have had real-world experience with these reforms, do you think FERC's efforts at reforming transmission planning and cost allocation have succeeded, failed, or landed somewhere in between?*
2. *In your testimony, you state that the "forward capacity market is achieving its objective of ensuring an adequate supply of capacity and investment in new capacity resources." Are you concerned, however, that resources are coming to rely more and more on capacity payments as energy payments decline?*
3. *Your RTOs and ISOs play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe that FERC is appropriately engaged in overseeing wholesale electricity markets?*
 - a. *Are there additional areas of regulatory oversight that requires the attention of this Subcommittee?*

Response:

As the Regional Transmission Organization, ISO New England is required to identify transmission solutions that are essential for maintaining power system reliability in New England. We accomplish this through an open stakeholder process – the end result of which is the development of long-range plans to address future system needs over the ten-year planning horizon. This planning process is governed by our Tariff and approved by our regulator (the Federal Energy Regulatory Commission (FERC)), and was modified over the last few years to come into compliance with Order 1000.

ISO New England received final approval on its Order 1000 proposal in May 2015. However, prior to that date, several major transmission studies and projects were completed. New England has made a substantial (and critical) investment in reliability-based transmission over the last 15 years. Since that time, the region has invested \$8.4 billion in transmission to improve reliability and another \$4 billion in investment has been approved and will be built in the coming years. This follows a period of very little transmission investment, which resulted in the U.S. Department of Energy (following a study directed by the *Energy Policy Act of 2005*) to identify New England as a Congestion Area of Concern. However, New England was removed from that list after further study in 2009, and at present, transmission congestion has been all but eliminated. The transmission investment has also reduced (or outright eliminated) out-of-market costs (such as Reliability Must Run Agreements or Uplift charges), improved market competition, and is helping to facilitate the transformation of New England's energy landscape.

ISO New England launched the process for studying transmission needs driven by public policy earlier this year. During that process, the New England States (through the New England States Committee on Electricity (NESCOE)) indicated that the identified state statutes and regulations are not driving a need to build new transmission in the regional planning process.¹

In addition to the Order 1000 changes, we amended our Tariff to improve our process for Elective Transmission Upgrades (ETUs), and have a substantial number of these projects in our interconnection queue. The developers proposing ETUs are competing to meet public policy goals in state procurements.

The combination of previous and ongoing regional investment in transmission, the Order 1000 processes now in place, and the ETU's in the interconnection queue lead us to believe that the region will develop any needed transmission and, where appropriate, competition driven by Order 1000 will incent efficient transmission development.

To your second question, I am not "concerned" that capacity resources are deriving greater percentages of their revenue from the Forward Capacity Market (FCM). However, as I mentioned in my testimony, this shift does underscore the tremendous importance of ensuring proper price formation in the FCM.

As I noted in my submitted testimony, the wholesale energy market and the Forward Capacity Market work in tandem to provide the revenue requirements of resources needed for reliability. As the energy market prices fall and resources have less opportunity to recover their fixed costs, the capacity market serves as a revenue balancing mechanism. As I highlighted in my testimony, the demand for electricity is leveling off in New England (in part due to the New England states' commitments to energy efficiency and behind-the-meter solar/photovoltaic resources). The lack of growth in demand as well as lower natural gas prices (for the majority of the year) and increased supply from renewable energy (which has no fuel costs) are driving down wholesale energy prices. The purpose of the FCM as a resource adequacy mechanism is to ensure the continuation of a viable capacity fleet – especially as wholesale energy prices are lower.

We continue to work on price formation efforts in both the energy and capacity markets. In the Forward Capacity Market, we have recently tightened up expectations on performance (known as "Pay for Performance") and are currently undertaking regional stakeholder discussions (through the Integrating Markets and Public Policy (IMAPP) process) in order to integrate greater levels of state-sponsored, low-carbon resources into the capacity market without being exposed to adverse impacts on price formation.

Finally, I do believe that the Commission is appropriately engaged in overseeing wholesale electricity markets.

¹ <http://nescoe.com/resource-center/ppts-submission-may2017/>

The Honorable John Shimkus

1. *If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.*
 - a. *Is that correct? Is that what's happening?*
 - b. *If not, how do you explain other generation sources entering the market?*

Response:

To a certain extent you are correct – the bulk of new power plants being built in New England are being powered by natural gas. However, the region has seen growth in demand resources (e.g. energy efficiency) as well as behind-the-meter solar, which is generally outside of the wholesale markets. The Forward Capacity Market is designed to reward the most efficient capacity resources, and it is achieving its objective of ensuring an adequate supply of capacity (both electric generation and demand resources). Although some of the new natural-gas fired power plants are dual-fuel capable, the region has not built (and I would not expect it to build) a new oil, coal, or nuclear power plant in many years.

However, public policy initiatives are driving an increase in non- or low-carbon energy as well. We anticipate a sizable influx of state-sponsored resources (including wind, solar, large-scale hydro, etc.) coming on our system as state procurements are finalized. Integrating these resources into the FCM while avoiding adverse impacts on price formation for other resources needed for reliability is the basis for the Integrating Markets and Public Policy initiative noted in my submitted testimony.

The Honorable Billy Long

1. *RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado, and other western states? Should it be an RTO or an ISO?*
2. *How are you planning to manage the growing surplus of generation in your respective regions?*

Response:

The decision to form an ISO/RTO is best left to the governors, utility commissioners, and elected officials within those states, as they best understand the needs and priorities of their residents.

New England's Forward Capacity Market procures a supply of capacity (both generation and demand resources) for a 12-month period three years in the future. The amount of capacity to be procured in each annual auction is guided by reliability requirements and prices. The "target" amount to procure is set prior to each auction and is a function of many variables, including the load forecast and the amount of behind-

the-meter solar projected to be installed in the region. In the most recent capacity auction held in February, 2017, the region procured sufficient resources to meet resource adequacy needs in the June 2020-May 2021 period.

However, the New England region is currently discussing the ISO's Competitive Auctions with Sponsored Policy Resources (CASPR) proposal, in part to ensure that an expected increase in state-driven renewable resources (that may have difficulty clearing the Forward Capacity Market) does not lead to an over-procurement of capacity. For more information on the CASPR proposal, I would refer you to my submitted testimony.

The Honorable Frank Pallone, Jr.

1. *Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?*
2. *You indicated at the hearing that ISO New England had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.*
 - a. *Do consumer advocates have voting representation on the Board?*
 - b. *Do consumer advocates participate actively in the development and approval of grid planning?*
 - c. *Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?*

Response:

Stakeholders of all types in New England have multiple channels to share their viewpoints.

As I discussed with Congressman Kennedy at the July 26 hearing, the Consumer Liaison Group (CLG) is a forum for sharing information between ISO New England and those who ultimately use and pay for electricity in New England. Through this forum, the ISO develops a better understanding of consumer issues, needs, and concerns relative to the electric power system and its costs. (Similarly, consumers and their representatives gain a better understanding of regional electricity issues.) The CLG is governed by a Coordinating Committee that sets the agenda for quarterly meetings each year, and selects the topics and speakers featured at these meetings. ISO New England facilitates the meetings and communications among CLG participants.

CLG Participants generally include consumers and consumer representatives (including state consumer and ratepayer advocates), state business and industry associations, chambers of commerce, individual businesses, trade groups, nonprofit organizations, and other end-users. The CLG and the ISO have worked collaboratively to identify issues of importance to end-use consumers and have provided information at the quarterly CLG meetings that include a range of cost implications for certain regional initiatives.

While CLG meetings provide a forum to share information on regional electricity issues, they are not intended to be a substitute for end-user or consumer groups that wish to weigh in on items under discussion at the Planning Advisory Committee or the New England Power Pool (NEPOOL) committees. (A representative from the Massachusetts Attorney General's Office chairs the CLG Coordinating Committee, and joins the Connecticut Office of Consumer Counsel, the Maine Public Advocate Office, and the New Hampshire Office of Consumer Advocate as members of NEPOOL's End User sector.)

ISO New England provides information to consumer advocates through quarterly meetings and monthly memoranda posted to a dedicated portion of our website. In conjunction with the CLG Coordinating Committee, we draft an annual report of CLG activities as well as important regional information. A member of the ISO's senior management attends each CLG meeting to provide an update on regional activities and hear from stakeholders (and report back to the Board of Directors).

Regarding the Board of Directors, ISO New England strongly values its independence and believes that additional, mandatory qualification criteria for Board membership would erode the independence that is critical to the ISO's fulfillment of its mission. Furthermore, the addition of mandatory criteria could lead to similar requests (e.g., generation owners seek a slot for someone who has operated large generation plants; transmission owners may want a former transmission executive), reducing the Board to a series of dedicated seats for special interests. While the board has included former utility regulators over the years (who have brought forward cost-consciousness and perspectives of consumers), ISO New England strongly believes that a well-balanced Board with a broad range of backgrounds and expertise provides the best leadership for the ISO.

The Honorable Peter Welch

1. *Climate change poses serious threats to public health and safety – and to our power systems. In Vermont and other parts of the Northeast, we've seen the devastation that storms like Hurricanes Irene and Sandy can cause to lives and property, while leaving millions without power. We need to address both reliability and climate change, not one or the other.*

A 2016 ISO New England economic study, conducted at the request of the region's electricity stakeholders, suggests that to meet greenhouse gas targets, New England must integrate significantly higher levels of renewable energy. In that study, only scenarios with high levels of renewables were consistent with achieving emissions targets that Vermont and other states are contemplating as part of an update to the Regional Greenhouse Gas Initiative.

- a. *Mr. van Welie, in your testimony, you discussed ISO New England's Competitive Auctions with Sponsored Policy Resources (CASPR) proposal as a way to enable states, such as Vermont, to bring in more renewable energy. My understanding, however, is that while CASPR creates the possibility for state-supported renewables to enter the capacity market, it does not guarantee that they can enter at the rates we need to reach our climate goals. In fact, as part of CASPR, ISO New England is proposing to do away with a mechanism that guarantees space for at least 200 megawatts of wind and solar projects to enter the market each year. It appears this proposal could represent a step backwards for the states because it removes certainty and makes the ability of a state-sponsored resource to clear in the capacity market dependent on the decisions of generators rather than states. Has ISO New England done any analysis that shows CASPR is consistent with meeting state renewable energy and climate goals? If so, can you share this with the Committee?*
2. *The latest installment of the Department of Energy's Quadrennial Energy Review highlighted a number of reforms needed to improve the operation of the nation's electricity system, including a number of changes needed to the Federal Power Act. Should the Committee consider changes to the Federal Power Act, are there specific reforms ISO New England believes should be made?*
3. *Similarly, could you please name one federal policy that you think should be changed to improve grid reliability and one change to improve grid security?*
4. *ISO-NE has always pursued a fuel-neutral approach to its wholesale markets. The markets in New England appear to be pushing toward the inclusion of more gas-fired generation, and one of the few counter-balances to that is the desire of states to increase the amount of renewables. The number of renewable resource technologies that can currently address the fuel security issue is fairly limited.*
 - a. *Given these developments, would ISO-NE consider solutions that are not fuel neutral – for example, special provision for baseload imports of Canadian hydro or increased support for battery storage technologies?*

Response:

It is important to note that the Integrating Markets and Public Policy (IMAPP) process and the ISO's Competitive Auctions with Sponsored Policy Resources (CASPR) proposal are still under discussion in New England (with hopes of sending a proposal to FERC by the end of the 2017). As such the structure and details of any final proposal are still very much in flux.

However, we believe that the substitution auction concept proposed by ISO New England as part of CASPR has several benefits for New England states focused on clearing greater levels of state-sponsored resources through the Forward Capacity Market. First, the substitution auction is technology-neutral – resources (be they renewable or demand-side) that sign long-term contracts with utilities driven by state public policy goals may be eligible to participate in the substitution auction regardless of their fuel or technology type. The substitution auction idea provides far greater flexibility than the current FCM design to clear a variety

of capacity resources favored by state policies. Second, the substitution auction does not cap the amount of new state-driven resources at an arbitrary 200 megawatts (MW) – the substitution auction could clear well beyond 200 MW in a given year under certain conditions. Finally, the substitution auction moves away from administratively-designed constructs and instead allows for greater competition and market benefits to flow to the region.

Of course we will keep your office informed as the process develops and certainly as we get closer to filing a proposal in late 2017.

ISO New England is required by our FERC-approved Tariff to administer the New England wholesale markets according to the principle of resource neutrality, accommodating participation by all technology types that can meet the specific performance requirements for each market. Accordingly, the ISO's Tariff does not explicitly identify storage, baseload or other specific technologies; instead, the Tariff organizes the rules by the relevant market or service.

As I have previously noted, the wholesale markets are designed to select the most economic resources to ensure power system reliability, without regard to fuel type. We have seen a wide range of merchant development, ranging from demand side resources to renewable resources and gas-fired generation. The ISO does not select the resource mix; rather it is an outcome of the market. That said, the New England states are actively seeking to move the resource mix towards renewable energy and we expect that these resources will gradually displace conventional generation over time. Our primary concern is to ensure that the resources that clear our markets are able to perform when needed.

In that regard, we substantially tightened performance expectations in the Forward Capacity Market several years ago (known as "Pay for Performance"). These FERC-approved changes now more closely link capacity payments received by a capacity resource (on a technology-neutral basis) with their performance (relative to their obligation) during stressed system conditions.

New England has a long history with energy storage resources due to its large pumped-storage hydropower facilities. These resources were built in the 1970s and can supply almost 2,000 MW of capacity within ten minutes. New England's market rules allow these resources to shift from energy consumption to energy production and participate across all markets and services (and we believe our market rules can accommodate new storage technologies that are being introduced into today's evolving electricity system). For more information on the ability of energy storage to participate in our markets, please refer to the paper linked to in the footnote below².

###

² https://www.iso-ne.com/static-assets/documents/2016/01/final_storage_letter_cover_paper.pdf

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
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COMMITTEE ON ENERGY AND COMMERCE
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Majority (202) 225-2927
Minority (202) 225-3641

August 29, 2017

Mr. Nick Brown
President and CEO
Southwest Power Pool
201 Worthen Drive
Little Rock, AR 72223

Dear Mr. Brown:

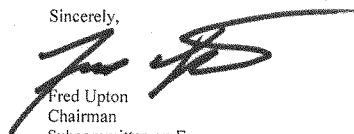
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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE

Nicholas A. Brown
President & Chief Executive Officer

September 8, 2017

The Honorable Fred Upton, Chairman
Subcommittee on Energy
House Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Chairman Upton:

Thank you for the opportunity to appear before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, please find the attached responses to the questions submitted by Members.

Thank you again for your time and for allowing me the opportunity to delivery my testimony before the Subcommittee.

Take care,



Nick Brown
President and Chief Executive Officer
Southwest Power Pool, Inc.

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment

The Honorable Fred Upton

1. **It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as “Order 1000 transmission planning regions.” Now that you have real-world experience with these reforms, do you think FERC’s efforts at reforming transmission planning and cost allocation have succeeded, failed, or landed somewhere in between?**

The Commission’s stated intent in Order No. 1000 was to increase the coordination and joint planning in and between regions, and to introduce competitive options for transmission expansion. SPP has identified four areas of opportunities to facilitate achievement of the intended benefits of Order 1000 and competitive transmission development. These include: 1) interregional issues; 2) multiple region planning; 3) thresholds for competitive transmission solicitation procedures; and 4) Order 1000 implementation metrics.

To date, interregional planning efforts have had little, if any, success in terms of project development. Regional planning rules that exclude projects from regional cost allocation make those same types of projects ineligible for interregional cost allocation. This effectively precludes such projects from even consideration for development, despite the incremental operational and/or economic benefits they could provide.

Other rules do not allow a comprehensive set of benefits to be calculated or considered. Minimizing the types of projects and/or benefits reduces the likelihood that project costs can be overcome and an equitable cost allocation can be obtained. SPP knows that only agreeable and equitable cost allocation will get projects built. Projects considered should be driven by a full range of operational and economic benefits, not other criteria, such as the physical or cost characteristics of projects – e.g. voltage, mileage or project cost. While the objective nature of these criteria for determining projects to develop are attractive from an administration perspective, they may not be meaningful to the comprehensive benefits of a project, or may create artificial barriers to beneficial projects but fall outside of these criteria.

The value of competitive transmission solicitations is the potential economic benefit of identifying a more efficient and cost-effective solution that meets the system needs. However, the cost of the project is not the only relevant cost in assessing the benefits of this process. The administrative costs to create a competitive proposal and the costs to administer and evaluate these competitive proposals raises questions as to whether the relative costs and benefits justify the application of a competitive solicitation. Based on recent experience, SPP believes that for some smaller projects, when selected for development, the benefits intended to be achieved by the competitive solicitation process may not be justified in light of the total costs incurred by all parties to achieve those benefits. One way to mitigate this concern would be to apply regionally appropriate

thresholds to the competitive solicitation process. Threshold examples include the requirement of regional funding, physical characteristics of the project and projected costs of the upgrade. In essence, the premise of such a threshold would justify the use of the competitive solicitation process, but not for the project to be developed.

Of note, several states in the SPP footprint have adopted Right of First Refusal laws which require that incumbent transmission owners have a right to build facilities to serve their load. Other have considered such laws. So while FERC has found competition to be in the public interest, many states via their legislative and executive branches have enacted legislation to ensure that incumbent utilities have the right to build transmission facilities in their states.

The benefits of the novel and complex rules imposed by Order No. 1000 have yet to be fully evaluated in any meaningful way. In order to assess the benefits achieved, it may be helpful to consider the development of objective, transparent metrics while accounting for the regional differences in specific implementation rules.

2. Your RTO stretches all the way from the Gulf of Mexico to the Canadian border and your footprint has grown more dramatically than any other RTO during the past few years. To what do you attribute your rapid expansion and addition of new service territories?

SPP celebrated its 75th anniversary last year and we have certainly evolved in our functions, responsibilities and size of our region. As you know, ISO/RTO membership is voluntary and our growth has come from utilities that were not part of an ISO/RTO. These utilities, in their due diligence, consider the costs and benefits of participation in a larger regional organization that include production cost savings, more efficient transmission planning and expansion, economies of scale for necessary functions of utilities, training, FERC and NERC compliance costs and a host of other considerations.

In 2009, we integrated Nebraska, which consists of public power, further diversifying our membership. In 2014, we added the Integrated System (IS), which consists of public power and electric cooperatives, primarily located in all or part of North Dakota, South Dakota, Montana, Wyoming, Minnesota and Iowa. This included the integration of the first federal agency to join an ISO/RTO: the Western Area Power Administration (WAPA) Upper Great Plains Region.

While markets provide the largest monetary benefit to joining an RTO, other factors are important to new members. While Nebraska and the IS considered membership in other ISO/RTOs, I believe they selected SPP primarily because of our geographical location to them, our governance structure, culture and member-driven approach.

Additionally, we are currently in discussions with the Mountain West Transmission Group located in the western interconnection, which consists of public power, electric

cooperatives and investor-owned utilities, located in all or part of Montana, Wyoming, South Dakota, Nebraska, Colorado, Utah, Arizona and New Mexico. It should be noted that we already cover parts of Montana, Wyoming, South Dakota, Nebraska, and New Mexico.

3. **Unlike some of the other RTOs, Southwest Power Pool does not have a capacity market, and hence does provide resources with a capacity payment.**
 - a. **How do resources that compete in your markets recover costs?**
 - b. **How do you ensure that your real-time and day-ahead energy markets send accurate price signals that incentivize investment in existing and new generating and transmission resources?**

SPP is unique in that there are no states in its footprint that provide Retail Open Access. As a result, the obligation to serve has remained with the utilities and is managed through the requirements of the local regulatory authorities. SPP has analyzed the need for capacity and is able to reduce each utility's requirements based on coordination and cooperation as well as the diversity within the SPP footprint. These obligations result in the utilities entering into contracts for capacity or to build generation. These costs are paid directly by the end-use customers of each utility in their base rates. These local regulatory obligations decrease the need for capacity payments as the vast majority of capacity in SPP's footprint is funded by local utilities via their state regulatory constructs. As a side issue, the SPP region has significant excess capacity which is a further disincentive to the need or development of capacity and a capacity market.

4. **Your RTOs and ISOs play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe that FERC is appropriately engaged in overseeing wholesale electricity markets?**
 - a. **Are there additional areas of regulatory oversight that requires the attention of this Subcommittee?**

Yes, FERC provides appropriate oversight of wholesale electric markets, as well as all other aspects of an ISO/RTO. We operate based on a FERC approved tariff and are regulated and audited by FERC. Additionally, we are regulated by the North American Electric Reliability Corporation (NERC) for enforceable reliability standards. There does not currently appear to be additional areas for regulatory oversight that would require the attention of the Subcommittee.

The Honorable John Shimkus

1. **If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.**

- a. Is that correct? Is that what's happening?
- b. If not, how do you explain other generation sources entering the market?

The objective of current market designs is to minimize the electricity costs to reliably serve the end-use customers. Although the lowest cost energy is from variable renewable energy sources, the need to maintain the reliable delivery of energy to end use customers requires the addition of more traditional generation, for backup when variable energy sources are not available, for voltage support, frequency support, blackstart, and other reliability needs. Although SPP is not engaged in generation siting and decisions, we understand that the speed and construction costs of gas generation is lower than other traditional generation. Additionally, the gas generation fuel costs have remained low in the SPP region. Because of the abundant wind and potential for solar in the SPP region, generation growth has mostly been in the variable renewable energy. Growth in gas generation anecdotally has been due to low fuel cost and the flexibility to provide a reliability counterpoint to the variable energy.

The Honorable Billy Long

1. **RTO development began in late 1999 with ISO development soon to follow, Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado, and other western states? Should it be an RTO or an ISO?**

While ISO/RTO membership is voluntary, nearly all utilities in the eastern interconnection are a member of an ISO/RTO. However, with the exception of California, there is presently no ISO/RTO presence in the western interconnection. SPP is currently in discussions with the Mountain West Transmission Group located in the western interconnection, which consists of public power, electric cooperatives and investor-owned utilities, located in all or part of Montana, Wyoming, South Dakota, Nebraska, Colorado, Utah, Arizona and New Mexico. It should be noted that we already cover parts of Montana, Wyoming, South Dakota, Nebraska, and New Mexico. We believe joining an already existing ISO/RTO is more cost effective than creating a new ISO/RTO. And because of the alignment with our geographical region as well as our managing the existing seven DC ties that connect the east to the west, SPP seems the logical choice to serve the western interconnection.

2. **How are you planning to manage the growing surplus of generation in your respective regions?**

The growth in generation in SPP provides SPP with several opportunities as well as challenges. First, exports from the SPP region continue to expand and SPP is examining

and cost effectively removing barriers to that growth. Secondly, there are continuing reviews for new products within the SPP markets to value the needed reliability and flexibility of generators. Third, it is expected that each utility is examining their generation economics which could result in their re-evaluation for retirement of generation.

The Honorable Frank Pallone, Jr.

1. **Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?**
2. **You indicated at the hearing that Southwest Power Pool had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.**
 - a. **Do consumer advocates have voting representation on the Board?**
 - b. **Do consumer advocates participate actively in the development and approval of grid planning?**
 - c. **Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?**

Each ISO/RTO has a different governance structure. FERC has approved and even praised SPP's commitment to transparency and stakeholder engagement. SPP Board and Members Committee meetings, as well as meetings of our Market and Operations Policy Committee (MOPC), are open for the public and press to attend, either in person with no registration fee, or by dialing into the meeting via a toll free number. And when the public or consumers request to speak or ask a question, they are recognized.

SPP governance structure has numerous avenues for consumer minded entities to participate in our stakeholder processes. These avenues range from participating in SPP meetings to filing in FERC dockets in support of or in opposition to RTO filings. Encompassing in these avenues are two specific organizations that consumer minded entities can participate in as specified by SPP's FERC approved by laws – SPP's Regional State Committee (RSC) and SPP Members Committee.

One of the most important organizational groups in SPP's governance structure is the SPP RSC. The RSC consists of a state utility regulator from the states in our region, who are provided specific authorities as part of our FERC approved bylaws. These authorities include cost allocation for transmission upgrades; approach for regional resource

adequacy; and allocation of transmission rights in SPP's markets. SPP's RSC has more than a decade of experience influencing SPP's policies in a manner that are designed with end-use consumers in mind. As just a couple of examples, the RSC takes leadership roles in comprehensive studies to analyze the rate impacts transmission buildout has on consumers. These studies are conducted on a routine basis and are publicly discussed and published. Once these studies are published, they are used to influence SPP's planning processes and any policy adjustments needed to mitigate any inequities.

SPP, through its membership, funds the RSC and its SPP employed support staff, which meets the day before board meetings. We are a non-profit organization whose only income is generated by the fees paid by our member companies and market participants. These state regulators also participate in board meetings. The very duties of a state utility regulator include being an advocate for consumers. While the RSC does not have voting representation on our 10 member independent board, they participate actively in the development and approval of grid planning, including determining the cost allocation for such projects. The RSC often bring proposals to the SPP Board of Directors which are implemented.

In addition to the RSC, SPP's governing structure includes two positions on our Members Committee designated specifically for small and large retail customers. However, SPP has never received a request from eligible retail customers to join SPP that would then allow them to fill these positions. Because SPP has an Independent Board, only board members can vote. However, because the Members Committee meets with the SPP Board, these two retail customer designated positions have the right to participate in a Members Committee advisory vote immediately before the Board votes. These votes are on all RTO policy matters.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
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Minority (202) 225-3841

August 29, 2017

Mr. Bradley C. Jones
President and CEO
New York Independent System Operator
10 Krey Boulevard
Rensselaer, NY 12144

Dear Mr. Jones:

Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, September 13, 2017. Your responses should be mailed to Elena Brennan, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Elena.Brennan@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



Bradley C. Jones
President & CEO

September 13, 2017

The Honorable Fred Upton, Chairman,
Committee on Energy and Commerce
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, DC 20515-6115

Re: July 26, 2017 Hearing – Response to Additional Questions for the Record

Dear Chairman Upton:

Please accept our thanks to you, your fellow Subcommittee members, and your staff, for the opportunity to testify before the Subcommittee on Energy of the Committee on Energy and Commerce of the U.S. House of Representatives on Wednesday, July 26, 2017 at the hearing entitled, "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets".

We also thank you for your August 29, 2017 letter which offered an additional opportunity to address questions of subcommittee members. Attached are responses to those additional questions, per your letter.

Should you have any questions with regard to the attached, please do not hesitate to contact me.

Sincerely,

Bradley C. Jones

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy
Ms. Elena Brennan, Legislative Clerk at U.S. House of Representatives



Attachment-Additional Questions for the Record

The Honorable Fred Upton

1. It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as "Order 1000 transmission planning regions." Now that you have had real-world experience with these reforms, do you think FERC's efforts at reforming transmission planning and cost allocation have succeeded, failed, or landed somewhere in between?

NYISO Response:

New York State and the NYISO are working together to make progress on transmission expansion through the Public Policy Transmission Planning Process implemented under FERC Order 1000. This process provides an opportunity for the State of New York to identify transmission expansion needs based upon public policy needs. The NYISO administers this public policy process with stakeholders, developers, the New York Public Service Commission, and the Federal Energy Regulatory Commission to select transmission projects that will be built and paid for through NYISO's tariffs. As further detailed below, the Order 1000 process has produced two important public policy initiatives that are currently underway in New York, and a third effort considering further public policy initiatives has begun.

The NYISO believes that it is premature at this time to draw any actionable conclusions regarding the effectiveness of Order 1000, or suggest any specific revisions to the public policy transmission planning processes associated with the Order. FERC should continue to monitor each of the regions' progress and refrain from proposing any major changes at this time. Such efforts could be premature in nature and could add uncertainty to interregional planning processes currently underway, potentially resulting in delay in the implementation of these processes.

2. You describe the diversity of the fuel portfolio upstate versus downstate as a "tale of two grids." What steps is NYISO taking to ensure that cleaner power sources from upstate can access downstate markets with higher demand?

NYISO Response:

The Public Policy Transmission Planning Process in New York has been focused on expanding downstate markets access to renewable energy sources located in upstate regions. As discussed on July 26th, two such public policy planning processes are currently well underway, while a third effort is in the early stages of development.

- *First, the NYISO is in the final stages of a detailed evaluation of ten projects that will address public policy needs in western New York State identified by the New York State Public Service Commission. Specifically, these transmission projects are expected to relieve congestion in western New York to allow access to increased output from the Niagara Power Project and additional imports of renewable energy from Ontario, and increase operational flexibility and efficiency in the region. The NYISO has issued a draft Western New York Public Policy Transmission Planning Report for review by developers and our stakeholders, and we expect Board action on a final report in early autumn 2017.*
- *Second, the New York State Public Service Commission has identified a public policy need for transmission to relieve congestion between western and northern New York state and southeastern New York. Referred to as the "AC Transmission" public policy initiative, these projects are expected to improve the flow of power from upstate renewable resources to meet*



downstate demand. The NYISO is conducting detailed evaluations of thirteen projects designed to provide additional transmission capacity to move power from upstate to downstate. A final report is expected to be ready for consideration by the NYISO Board in the first quarter of 2018.

The NYISO is also active in a new Public Policy Transmission cycle currently underway which is considering additional public policy needs, including potential needs for further actions to enable upstate renewable resource access to downstate markets.

3. Your RTOs and ISOs play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe that FERC is appropriately engaged in overseeing wholesale electricity markets?
 - a. Are there additional areas of regulatory oversight that requires the attention of this Subcommittee?

NYISO Response:

The NYISO has a very positive level of engagement with FERC Commissioners and staff in all matters associated with oversight of New York's wholesale energy markets. The NYISO looks forward to continuing our collaborative efforts with existing and new Commissioners and staff. The NYISO does not have specific suggestions to offer at this time regarding additional areas of regulatory oversight that should be considered.

The Honorable John Shimkus

1. If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.
 - a. Is that correct? Is that what's happening?
 - b. If not, how do you explain other generation sources entering the market?

NYISO Response:

As discussed in the NYISO's 2017 edition of Power Trends, the NYISO continues to see an investment in wind generation resources in the upstate regions of the State where wind generation sites are most attractive from an investment perspective, while downstate, proposed generation is predominantly natural gas-fired or dual-fuel capable (natural gas and oil). This is a reflection of state environmental policy goals associated with the integration of renewable energy sources, and market and investment signals associated with projects under development in the southeast region of the State that are investing in natural gas and dual-fuel capable generating resources.

The Honorable Billy Long

1. RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado, and other western states? Should it be an RTO or an ISO?



NYISO Response:

The NYISO does not have a position on the potential creation of new ISOs or RTOs, or the expansion of existing ISOs and RTOs, in Nevada, Arizona, Colorado, or the other western states.

2. How are you planning to manage the growing surplus of generation in your respective regions?

NYISO Response:

While continuing to meet stringent reliability standards, the NYISO's 2017 edition of Power Trends reports that the NYISO has seen progressively more narrow margins of generation surplus excess. Effective market designs and operations have incented more efficient operation of the generation resources and the grid since NYISO inception, resulting in over \$7.8B in reduced fuel costs due to improved grid efficiencies and \$600M in savings from reduced energy reserve needs, all while meeting or exceeding operational requirements and reliability standards.

The Honorable Frank Pallone, Jr.

1. Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?
2. You indicated at the hearing that New York ISO had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.
 - a. Do consumer advocates have voting representation on the Board?
 - b. Do consumer advocates participate actively in the development and approval of grid planning?
 - c. Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?

NYISO Response to Questions 1 and 2:

Consumer interests in the NYISO's markets are supported through the establishment of a "Consumer Liaison" department at the NYISO. The NYISO's Consumer Liaison is fully funded as part of the NYISO's overall annual budget. The Consumer Liaison is responsible for regular and ongoing dialog with consumer interests, including advocates for consumer interests, to communicate and inform interested parties on key issues being addressed by the NYISO, address questions and take feedback from consumer interests, and provide an annual report to the NYISO Board of Directors and



stakeholders on activities engaged to support of consumer-focused interests. Further, the Consumer Liaison office is responsible for conducting consumer impact analyses of various initiatives under consideration in the NYISO's shared governance process.

Further, the NYISO's shared governance process has, since inception of the NYISO, included a sector of participants focused on consumer issues. This "End Use" Sector holds a fixed 20% voting share in the NYISO's shared governance process.¹ Eligible members of the End Use sector may be "(i) a Large Consumer, (ii) a Small Consumer, (iii) an organization that represents Small Consumers, (iv) a governmental agency that advocates on behalf of Small Consumers, or (v) a governmental agency that acts as a retail Load aggregator primarily for Small Consumers; or (vi) a Large Energy Using Governmental Agency".

The annual membership fees for members of the End Use Sector are significantly discounted from the fees charged to members of the other four shared governance sectors, and governmental agencies representing small consumers are not charged annual membership fees at all. The New York State Utility Intervention Unit (UIU), charged with representing consumer interests, is an active member of the End Use sector. Currently, the UIU's technical advisor for NYISO matters is funded through a multi-million dollar allocation of funds under a settlement agreement between FERC and Constellation. In addition, the New York State Public Service Commission is an active participant in the NYISO's shared governance process as a non-voting member.

The NYISO Agreement, which is filed with FERC and serves as our organization's foundational document, has included since inception of the NYISO language addressing the experience and background of NYISO Board of Directors members. Sections 5.02 and 5.04 of the NYISO Agreement call for the Board of Directors to include a "cross-section of skills and experience" including consumer advocacy experience. Since the inception of the NYISO, the Board of Directors has included at least one member with experience serving on a state Public Service or Public Utility Commission. Further, the NYISO Agreement has required the NYISO Board of Directors to select and appoint a consumer advocate. The New York State UIU is the currently-appointed consumer advocate.

¹ Each sector in NYISO's shared governance process holds a fixed percentage voting share. The Generator Owners sector is allocated 21.5% of the total votes; the Other Suppliers sector is allocated 21.5% of the total votes; the Transmission Owners sector is allocated 20% of the total votes; the End-Use Consumer sector is allocated 20% of the total votes; and the Public Power/Environmental Parties sector is allocated 17% of the total votes.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
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August 29, 2017

Mr. Richard Doying
Executive Vice President, Operations
Midcontinent Independent System Operator, Inc.
720 City Center Drive
Carmel, IN 46032

Dear Mr. Doying:

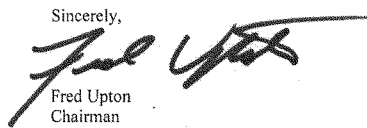
Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, September 13, 2017. Your responses should be mailed to Elena Brennan, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Elena.Brennan@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



September 13, 2017

The Honorable Fred Upton, Chairman
Committee on Energy and Commerce
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, D.C. 20515

Re: July 26, 2017 hearing – response to additional questions for the record

Dear Chairman Upton,

Thank you for the opportunity to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets," that the Subcommittee on Energy held on July 26, 2017.

Attached are my responses to the additional questions for the record that you and other members of the subcommittee posed in your letter of August 29, 2017.

MISO appreciates the subcommittee's interest in wholesale electricity markets. Please do not hesitate to contact me should you have any questions regarding the attached responses to the additional questions for the record. You may also contact Kurt Bilas, MISO's executive director of government relations, in our Washington, D.C., office, at [REDACTED]

Sincerely,

[REDACTED]

Richard Doying
Executive Vice President, Operations
Midcontinent Independent System Operator, Inc. (MISO)
720 City Center Drive
Carmel, IN 46032
(317) 249-7983

cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy
Ms. Elena Brennan, Legislative Clerk, Committee on Energy and Commerce

Attachment: Richard Doying, MISO, questions for the record

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1700 Centerview Drive
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Testimony of Richard Doying
Executive Vice President and Chief Operations Officer
Midcontinent Independent System Operator, Inc. (MISO)

Responses to Members' written questions for the record
for the House Committee on Energy and Commerce Subcommittee on
Energy's hearing entitled "Review of the operations and effectiveness of
the nation's wholesale electricity markets," held on July 26, 2017

These responses submitted on September 13, 2017

Questions from the Honorable Fred Upton

1. **It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as "Order 1000 planning regions." Now that you have had real-world experience with these reforms, do you think FERC's efforts at reforming transmission planning and cost allocation have succeeded, failed, or landed somewhere in between?**

While MISO is aligned with the ultimate goals of Order 1000 and believes its regional planning principles largely reflect MISO's historical planning approach, MISO is still assessing the impact of the interregional requirements and the elimination of the Right of First Refusal on the overall transmission planning process in the region.

On the interregional front, Order 1000 did help bring different RTOs/ISOs together for enhanced inter-regional planning, and it also provided a more standardized forum for planning opportunities with our non-RTO/ISO neighbors. However, the apparent metric used for determining effectiveness—number of interregional projects—does not tell the whole story, and has the potential to drive unintended consequences, including the selection of an interregional project over the more cost-effective regional alternative. Additionally, regional differences in how regions plan, operate, and share the costs of transmission upgrades remain a challenge.

In MISO we have found that big regional projects tend to be cyclical. That means that on the regional front, we are just now beginning to observe the practical impacts the elimination of the Right of First Refusal is having on stakeholder alignment and consensus-building in the planning process.

The largest challenge to regional transmission planning is developing a robust business case that aligns and accurately allocates the costs of a given project to its beneficiaries. Order 1000 did not change that fundamental need, but did create new business interests and create different paradigms for projects with cost allocation versus those without. In so doing, Order 1000 may have made it more challenging to achieve the type of stakeholder consensus that RTOs/ISOs desire and need for region-wide transmission projects.

It was this type of consensus that was crucial to the achievement of the Multi Value Projects, a group of transmission projects whose benefits exceed \$20 billion—more than three times their costs. The MVP process was launched before Order 1000 took effect, and we achieved great success in collaboration with our stakeholders in planning numerous projects that enhanced reliability, reduced energy costs and created a host of other benefits across our region.

FERC has an ongoing proceeding evaluating the impacts of Order 1000, and we look forward to continuing to participate in that process to help ensure our policies support the development of transmission investment that can bring value to customers.

2. You mention that MISO has a robust process for engaging with stakeholders. Can you elaborate more on this?

MISO places a high value on an effective stakeholder process, which gives energy companies, regulators, advocacy groups and other interested parties a voice in how MISO designs and manages the wholesale electricity markets and the transmission system. The ideas that flow from the stakeholder process have helped MISO to fulfill its mission enabling the reliable delivery of low-cost energy through efficient, innovative operations and planning.

a. How does MISO make sure they are receiving input from stakeholders in a meaningful way?

The importance of our stakeholder process is evidenced by the fact that its origins lie in one of our foundational governing documents: the Transmission Owners (TO) Agreement. The agreement established several of our original stakeholder groups, including the Advisory Committee, which is at the center of our governance structure and reports directly to our Board of Directors. The TO Agreement established the Advisory Committee as a “forum for its members to be apprised of MISO’s activities,” and directed it to provide the Board with “information and advice” on “policy matters of concern” to its members and industry constituents.

As defined in the TO Agreement, 25 representatives participate in the Advisory Committee from the following diverse sectors: State Regulatory Authorities, Independent Power Producers, Transmission Owners, Transmission Dependent Utilities, Power Marketers, Public Consumer Advocates, Environmental/Other Stakeholder Groups, Eligible End-Use Customers, Coordinating Members, and Competitive Transmission Developers.

Long-term Subcommittees reporting to the Advisory Committee focus on Resource Adequacy, Markets, Reliability, Cost Allocation, and Transmission Planning. Each Stakeholder group, referred to as an Entity, has a specific charter and work plan. The Steering Committee also reports to the Advisory Committee and ensures that each Entity remains relevant to Stakeholders and adheres to the scope of its charter. MISO’s effective Stakeholder process is agile; short-term and longer-term Entities are created to address specific issues currently impacting MISO members, market participants, and stakeholders. These Entities sunset when they accomplish their goals.

MISO is committed to facilitating an effective process and incorporating stakeholder input by:

- Publicly posting meeting agendas in advance to allow participants to determine if and how best to participate.
- Nearly all Stakeholder meetings are conducted by video conference, WebEx or similar technology, and with conference call capabilities.
- Meeting presenters and hosts are available in multiple locations across the footprint for most meetings.

- Stakeholders may ask questions during all Stakeholder meetings and in public comment portions of all open Board of Director meetings.
- MISO invites feedback from Stakeholders on many presentations, and that feedback is posted and recapped at ensuing meetings.
- MISO hosts an "Informational Forum" eight times per year to share MISO information and operational data with Stakeholders, and to solicit feedback on current topics of interest.
- All 10 Stakeholder Sectors are encouraged to participate in a "Hot Topic" discussion three times per year. Stakeholders can suggest topics for discussion and write white papers to explain their views in detail. The topic is then discussed with the Advisory Committee and directly with the MISO Board of Directors.

3. Lately there has been a lot of discussion about States providing financial assistance to support specific generator units. Is MISO currently working on any changes to its markets to accommodate State policies?

MISO's markets reflect the longstanding role of States with respect to energy, environmental, and policy choices regarding generation. While States have myriad policy interests, MISO is continuing to work proactively with States and Stakeholders to ensure regional resource adequacy needs are achieved in the changing landscape. For example, MISO is currently working the State of Michigan as it proactively develops State planning processes that will support Michigan's long-term resource adequacy needs. In addition to supporting Michigan's energy legislation, MISO remains committed to helping the State as it develops and refines its resource adequacy policies through State regulatory proceedings.

As another example, Illinois recently introduced zero-emission subsidies to help nuclear plants that were struggling to compete to remain viable, which our process will respect and enable. Ongoing coordination between MISO and the States is critical to continue to accommodate various State policies and meet long-term regional reliability needs.

a. How does MISO accommodate various, or even conflicting State policies in its market design or planning?

Because MISO's region encompasses all or part of 15 States and part of Canada, and includes both traditionally regulated and retail choice areas, this is a challenge we regularly face. Part of our market enhancement process is to work closely with State regulators and other Stakeholders to understand the various policies, requirements and needs that must be accommodated through our market design. Through this collaborative process we are able to navigate the complexities of multiple jurisdictions to achieve our goal of reliable, non-discriminatory operation of the electric system.

MISO's Tariff calls for the integration of State-sponsored policies into its wholesale markets. It is MISO's role to recognize policies enacted by the States and develop the wholesale mechanisms required to assure resource adequacy and reliability in a complementary manner. This may include any unique features a State deems appropriate due to policy considerations. Because

the vast majority of utilities in MISO's footprint arrange for supply resources to serve their demand well in advance of MISO's residual capacity auction, State policy programs designed to serve each State's consumer needs are common initiatives that MISO's market processes are designed to accommodate.

We also have experience accommodating state policy in the planning horizon. After several years of planning primarily for reliability and market efficiency, it became clear that certain State policies—specifically, the adoption of renewable portfolio standards in the Midwest—were leading to new requirements for generation resources, specifically wind. In 2007 MISO began collaborating with Stakeholders to enhance our planning process to account for project benefits beyond those driven by reliability and/or market efficiency, including public policy requirements. Four years of study and analysis work culminated in the first portfolio of Multi-Value Projects being approved by MISO's Board of Directors in 2011, at a cost of \$5.6 billion. Multi-Value projects are transmission projects which deliver reliability, public policy and economics benefits across the MISO region and under a range of potential resource mix scenarios.

4. Your RTOs and ISOs play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe that FERC is appropriately engaged in overseeing wholesale electricity markets?

FERC's sworn commissioners and its career staff are very knowledgeable about the wholesale electricity markets and the challenges they face. The issues confronting the energy industry are multi-faceted and complex, so it should not be surprising that our views sometimes differ from FERC's. Nevertheless, we appreciate the high levels of professionalism, preparedness and attention to detail that FERC commissioners and staff bring to their work. FERC demonstrates its engagement in overseeing the wholesale electricity markets in numerous ways, such as by convening technical conferences on key issues, and by issuing Notices of Proposed Rulemakings (NOPRs) that allow RTOs/ISOs and other industry stakeholders to express their views on matters of concern. MISO appreciates FERC's engagement on those and other fronts.

a. Are there additional areas of regulatory oversight that requires the attention of this subcommittee?

We very much appreciate the role that Congress played in laying the groundwork for the establishment of RTOs and ISOs, and this subcommittee's ongoing interest in fostering reliable and efficient wholesale electricity markets. We hope the subcommittee will continue to support the regional market model, and we stand ready to come before you again as you go about your work of improving U.S. energy policy.

Questions from the Honorable John Shimkus

1. If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but gas plants right now.

- a. Is that correct? Is that what's happening?

Although a large amount of new natural gas-fired generation is being built in the MISO region, other types of generation are also being built, such as wind projects and other renewable-energy resources. Energy-efficiency initiatives and "demand-side" programs that compensate customers for reducing their electricity use are also growing in popularity. And while the MISO region does not yet have a high penetration of emerging technologies such as energy storage and distributed energy, we expect more of those types of resources to be built in the future.

- b. If not, how do you explain other generation sources entering the market?

As I discussed at the July 26 hearing, in the MISO region, load-serving entities (LSEs) and State regulatory agencies (where applicable) are responsible for ensuring that enough resources will be available to meet demand while also maintaining an adequate supply of reserves. MISO's markets are structured to incentivize reliability at the least cost, without regard to resource type. Thus, decisions about what kinds of new generation to build are made by LSEs and States, not MISO.

There are several reasons why LSEs and States may choose to build new generation resources that are something other than gas-fired units. For example, some States have adopted policies to obtain a certain amount of their total generation from renewables. Similarly, some utilities have voluntarily embarked on corporate initiatives to add more renewables to their fleets. States and LSEs may also decide to build non-gas resources in an effort to increase the diversity of their assets in terms of fuel mix and technology, which they may view as enhancing the overall reliability of their fleets. States and LSEs may also see various financial opportunities from building non-gas resources.

As a reminder, MISO does not favor certain fuels or generation technologies over others, as we are required by FERC to provide equal and non-discriminatory access to the electric transmission system. But importantly, MISO's markets do implicitly place value on different generators based on their offered cost and the requirements of the system at any point in time. Under the provisions of its Tariff, MISO dispatches resources in order of their "economic merit," meaning the lowest-cost resources are called up first, followed by the next-lowest cost, etc., until demand is met. In practice, this means certain resources may run almost all the time, while others, such as renewables, run when they are available, and still others may run only once or twice a year, when they are needed to meet peak load.

Questions from the Honorable Billy Long

1. **RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado and other western states? Should it be an RTO or an ISO?**

As a general matter, we believe that the nation's RTOs and ISOs have created tremendous value for their members and the States in which they operate, and, by extension, the tens of millions of homes and businesses within those states. Given the strong track record that the nation's RTOs/ISOs have compiled since the late 1990s, it is reasonable to conclude that the establishment of another RTO in the Western U.S. could foster those same types of benefits.

As I mentioned at the July 26 hearing, MISO created about \$3 billion in benefits for its members in 2016 alone, and about \$18 billion in cumulative benefits over the course of the last decade. Those benefits come from operating the grid on a regional basis, which results in enhanced reliability, more efficient use of the region's existing transmission and generation assets, and a reduced need to build new assets. Theoretically, the Western U.S. could realize those same kinds of benefits if another RTO/ISO was established there, although obviously, the particular members and states involved in any such effort would have many details to work out. That would include determining whether the new regional grid operator should function as an RTO or an ISO, or both simultaneously, as MISO does.

That said, MISO also recognizes that some electricity-industry entities and governmental jurisdictions may not want to join an RTO or an ISO, and we respect that view. MISO believes that RTO/ISO membership should remain voluntary, which is one of the reasons why we work so hard to address the needs of our members.

- a. **How are you planning to manage the growing surplus of generation in your respective regions?**

There is currently a "surplus" of generation in the MISO region that exceeds the minimum level of resources needed to serve load. But even though this surplus did increase slightly between 2016 and 2017, it has generally been shrinking in recent years compared to its historical levels, not growing.

We partner with the State regulatory agencies in our footprint on an annual survey of Load-Serving Entities to obtain visibility into the future supply and demand picture. The 2017 iteration of that survey indicates that in the 2018-2022 timeframe, the MISO region as a whole will have about 0.5% to 6% more generation capacity than we need to serve expected load while also maintaining adequate reserves for emergency situations. The survey also indicates that while some parts of the region may not have enough local resources to serve their needs, they will be able to acquire excess capacity from elsewhere in the footprint—which is one of the chief benefits of ISO/RTO membership.

For many years, the reserve margin in the MISO region was significantly larger than it is today. But in recent years, our reserve margin has generally been declining due to plant retirements driven largely by low natural gas prices, environmental regulations and other factors. We did see a slight uptick this year compared to 2016, but that was driven largely by a reduction in forecasted electricity demand as opposed to new generation coming online.

But importantly, despite ongoing evolution of the region's mix of generating resources, our reserve margin continues to exceed all regulatory and industry benchmarks for system reliability. Specifically, our regional reserve margin projections for the next five years range from 16.3% to 21.6%, which is higher than our minimum reserve margin requirement of 15.8%.

MISO works closely with its Stakeholders to ensure reliability as the region's mix of generating resources evolves. The ability to maintain adequate reserve margins reflects the good job the region's energy providers and State regulatory authorities are doing in planning for the future and building sufficient capacity to meet regional reliability targets, while also realizing the benefits to consumers of avoiding adding too much generation capacity. Overbuilding the system in that way would increase electricity prices for consumers, because in the MISO region, States allow utilities that build new generation to recover their costs by raising their rates. A smaller reserve margin that still ensures system reliability helps to keep power prices in our region as low as possible.

Questions from the Honorable Frank Pallone, Jr.

- 1. Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?**

MISO is committed to its stakeholder process and providing multiple ways in which all Stakeholders and the public can and do participate in meetings. As mentioned above, nearly all meetings are held by conference call and hosted in all four MISO regional locations. WebEx or similar technology and conference capabilities allow participants to be remote and yet fully engaged in discussions. Our Stakeholders can be a part of the meeting while saving travel time and expense and maximizing productivity.

- 2. You indicated at the hearing that MISO had a formal structure (e.g., committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.**

a. Do consumer advocates have voting representation on the Board?

Pursuant to its governing documents, MISO's Board of Directors is independent of any of MISO's Stakeholders. However, the Board receives input from the Advisory Committee, which is comprised of representatives from MISO's 10 stakeholder sectors—one of which is the Public Consumer Advocates Sector. Two of the Advisory Committee's 25 members come from the Public Consumer Advocates Sector, allowing them to provide direct input to the Board.

Consumer advocates can also influence the composition of the Board by being selected to serve on the Board Nominating Committee. Two of the nominating committee's five members are chosen from the Stakeholder community, which, as noted above, includes the Public Consumer Advocates Sector.

b. Do consumer advocates participate actively in the development and approval of grid planning?

The Planning Advisory Committee is one of the primary sub-committees reporting to the Advisory Committee in the Stakeholder governance process. This committee provides guidance and input on MISO's transmission planning activities and reviews and recommends transmission plans for approval by MISO's Board of Directors. Within the Planning Advisory Committee, all 10 sectors of Stakeholders have equal weighting, including the Public Consumer Advocates.

c. Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?

MISO's annual budget includes travel funds for members of the Public Consumer Advocate sector. In addition, MISO provides extensive training opportunities for staff and senior consumer advocate leadership, policy/issue support, and access to our subject-matter experts to support the work of the sector, all paid from the MISO operating budget. MISO also provides financial and issue support to the State Regulatory Authorities sector (the retail regulators for each jurisdiction).

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
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WASHINGTON, DC 20515-6115
Majority (202) 225-2927
Minority (202) 225-3641

August 29, 2017

Ms. Cheryl Mele
Senior Vice President and Chief Operating Officer
Electric Reliability Council of Texas
7620 Metro Center Drive
Austin, TX 78744

Dear Ms. Mele:

Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, September 13, 2017. Your responses should be mailed to Elena Brennan, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Elena.Brennan@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment

Cheryl Mele Sr. Vice President and Chief Operating Officer ERCOT

"Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets".

Energy and Commerce Subcommittee on Energy

Additional Questions for the Record - September 13, 2017

The Honorable Fred Upton

1. **At our July 18, 2017, Energy Subcommittee hearing, Calpine submitted testimony stating that while the Texas' market is working well, some improvements are needed. Interestingly, Calpine state that while Texas currently has an energy-only market, it was confident that this decision will be revisited to consider a capacity market. Will you be considering establishing a capacity market in the future?**

- a. **If not, why?**

In 2014 the Public Utility Commission of Texas (PUCT) opted to maintain an energy-only structure with an operational demand curve, which adjusts real-time energy prices in response to scarcity conditions. Currently, no project is open or legislation being discussed at the state level pertaining to a capacity market.

- b. **The Texas PUC recently opened a proceeding to examine improvements to your energy market structure. What do you expect to come of this review?**

ERCOT is active in this proceeding in evaluating adjustments to the operating reserve demand curve as well as conducting cost and time estimates to implement real-time co-optimization and marginal losses, as requested by the PUCT. The commission has held one workshop, and another is planned for October 13.

The Honorable John Shimkus

1. **If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.**
 - a. **Is that correct? Is that what's happening?**

While natural gas plays a key role in our fuel mix, we are seeing other low- or no-fuel cost resources being built in ERCOT. In 2016, our installed capacity was 52 percent natural gas, 22 percent coal, 20 percent wind and 6 percent nuclear. We currently have about 15,000 MW of natural gas, 28,000 MW of wind and 23,000 MW of utility-scale solar under study in our interconnection queue.

The Honorable Billy Long

1. **RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creating of another RTO that could include the states of Nevada, Arizona, Colorado, and other western states? Should it be an RTO or an ISO?**

We believe both ERCOT and Texas benefit from our current structure. We view the decisions for other areas of the US to be the purview of local regulators and elected officials.

2. **How are you planning to manage the growing surplus of generation in your respective regions?**

Our most recent Capacity, Demand and Reserves report shows that planning reserve margins are healthy, and we continue to see load growth in our region. Over the last several years, there has been significant discussion about the possibility of generation retirements for various reasons, and we continue to monitor that issue.

The Honorable Frank Pallone Jr.

1. **Consumer Advocates have identified the resource imbalance between the stakeholder members of RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in cost of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?**

Consumer viewpoints are represented at ERCOT in a variety of ways. We endeavored to answer all of the follow up questions in one place.

By Texas statute, small commercial and residential consumers have a seat on the ERCOT board. That role is carried out by the Public Utility Counsel, who is a voting ex-officio member. The Office of the Public Utility Counsel (OPUC) is a state agency created in 1983 and is funded through the Texas appropriations process. Staff from OPUC participates in ERCOT stakeholder meetings at many levels.

Also by statute, the Chairman of the Public Utility Commission of Texas is an ex-officio member of our board. The ERCOT board chairman is joined by four other members who are unaffiliated with any interest or market segment on the ERCOT board. Large commercial and industrial consumers also each have a seat on the board representing their consumer segments.

Consumer advocacy groups have joined ERCOT in the small commercial membership segment. They participate actively at the stakeholder committee and task force level.

ERCOT executive leadership and staff provide information to, and receive feedback from, the entire stakeholder community and maintain lines of communication with consumers, both within their market segments and also with consumer advocacy groups.

ERCOT board and stakeholder meetings are open to the public, and most have a WebEx option online for anyone who cannot attend in person. ERCOT board meetings, board committee meetings and Technical Advisory Committee meetings are broadcast and archived on the Internet and are available for anyone to access free of cost.

2. **You indicated at the hearing that ERCOT had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision making at your RTO/ISO.**
 - a. **Do consumer advocates have voting representation on the Board?**
Yes.
 - b. **Do consumer advocates participate actively in the development and approval of grid planning?**
Yes.
 - c. **Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?**
Yes. As mentioned above, the Office of the Public Utility Counsel is funded by the Texas appropriations process.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
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Minority (202) 225-3641

August 29, 2017

Dr. Keith Casey
Vice President
Market and Infrastructure Development
California Independent System Operator Corporation
250 Outcropping Way
Folsom, CA 95630

Dear Dr. Casey:

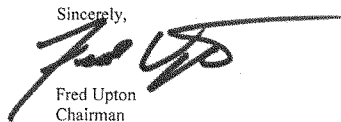
Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



California Independent System Operator Corporation

Keith E. Casey, Ph.D.
VP, Market and Infrastructure Development

September 12, 2017

The Honorable Fred Upton
Chairman, Subcommittee on Energy
Committee on Energy and Commerce
U.S. House of Representatives
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Chairman Upton:

Attached are my responses to the additional questions submitted for the record from the July 26, 2017 Subcommittee on Energy hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

I very much appreciated the opportunity to represent the California Independent System Operator Corporation at this important examination of wholesale electricity markets in the U.S. and would be happy to provide any additional information that would be helpful to the Subcommittee.

Respectfully submitted,



Keith E. Casey, Ph.D.
Vice President, Market and Infrastructure Development
California Independent System Operator Corporation

cc: Elena Brennan

The Honorable Fred Upton

1. **It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as "Order 1000 transmission planning regions." Now that you have had real-world experience with these reforms, do you think FERC's efforts at reforming transmission planning and cost allocation have succeeded, failed or landed somewhere in between?**

Overall, we believe the Order No. 1000 reforms have resulted in a more effective transmission planning process. The California ISO comprehensively revised its transmission planning process prior to the adoption of Order No. 1000. The revised planning process included conducting competitive solicitations for economic and policy-driven transmission projects, which was subsequently expanded under Order No. 1000 to include reliability projects. As a result of Order No. 1000, planning regions formed to take on the functional role of planning and coordination at the regional and interregional levels. The California ISO is an Order No. 1000 planning region. To date, as I noted in my July 26 testimony to the Subcommittee, the California ISO conducted numerous competitive solicitations as part of our regional planning process that evaluated competing project sponsors' proposals and selected approved transmission project sponsors. The California ISO has awarded several projects to project sponsors that proposed cost containment measures. Based on our experience, we acknowledge that the project selection process is complex and requires a holistic approach that considers numerous factors. After each competitive solicitation, the California ISO has evaluated its competitive solicitation process, and conducted an extensive "lessons learned" stakeholder process to share these lessons and provide opportunities for stakeholder input. These efforts have resulted in process enhancements and improvements. With respect to inter-regional coordination, we have adopted a common cost allocation process for inter-regional transmission projects with neighboring planning regions in the West and continue to coordinate with them to identify potential transmission projects that will provide benefits to the region. As of this date, the planning regions have not yet approved any inter-regional projects.

2. **In your testimony you mention that California ISO intends to rely on natural gas-fired generation in the near future for reliability services such as voltage support and frequency response. You also describe how California's natural gas power plants are being displaced due to economic pressure caused by depressed energy market prices.**
 - a. **Do you have concerns that California's electricity system will face reliability challenges in the future due to the early retirement of natural gas power plants?**

As stated in my July 26 testimony before the Subcommittee, one of the California ISO's most significant challenges is to maintain the resources needed to provide essential reliability services during the transformation of the California ISO's resource mix to include a larger percentage of variable energy resources.

b. Does California ISO have any tools to ensure that essential natural gas power plants will continue to operate and provide needed ancillary services?

The California ISO has tariff rules that support implementation of California's resource adequacy program. The California ISO plays a central role in determining local capacity and flexible capacity requirements, and also has backstop capacity procurement authority under its tariff. If necessary for reliability, the California ISO may also designate a resource as a reliability must run unit and contract with that unit to provide necessary electric service. Under specified circumstances to maintain reliability, the California ISO can procure backstop capacity pursuant to its capacity procurement mechanism. In particular, the California ISO can procure capacity that is needed in the next resource adequacy year but is at risk of retirement in the current resource adequacy year if it does not have a contract to remain economically viable. The California ISO is currently working with stakeholders and state agencies to evaluate regulatory and market options to ensure resources needed to maintain reliability remain in service.

We also continue to explore means to evolve our markets to value resource capabilities to support reliable grid operation. For example, the California ISO has implemented a flexible ramping product that compensate resources for their capability to support the increasing ramping requirements associated with supply and load variability.

3. Your RTOs and ISO play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe FERC is appropriately engaged in overseeing wholesale electricity markets?

The California ISO operates its wholesale market pursuant to a tariff approved by the Federal Energy Regulatory Commission. In our experience, FERC undertakes thorough review of revisions we propose to our tariff and closely monitors the performance of our market. As part of these efforts, FERC has facilitated the implementation of enhancements that have improved the efficiency of our markets and reduced the need for out of market resource commitments. In addition, FERC has supported the development of a well-functioning energy imbalance market in the West for which the California ISO serves as market operator. FERC has initiated comprehensive reviews, such as those involving price formation, across all wholesale markets and adopted targeted reforms. We believe these efforts have led to all RTOs and ISOs assessing how to improve the efficiency and transparency of their markets.

a. Are there additional areas of regulatory oversight that requires the attention of this Subcommittee?

The Subcommittee on Energy plays a critical role in developing national energy policy, as well as ensuring that energy infrastructure, security and reliability receive appropriate attention. In the case of wholesale electricity markets, we do not believe there are specific issues that require immediate attention of the Subcommittee at this time.

The Honorable John Shimkus

1. If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.

- a. Is that correct? Is that what's happening?

In the case of the California market, the spot energy market operated by the California ISO is not the primary driver for new generation investment. State policies and procurement mandates are the main drivers and have led to most new resource investment being zero emission technologies (e.g., renewables, demand response, energy efficiency, storage) though some new gas-fired generation is being built to address local reliability needs in constrained areas of the grid. Natural gas-fired plants continue to provide significant value to the California ISO, particularly in their ability to help manage ramps related to variability of supply and load. However, the need for development of new gas-fired generation has been impacted by a number of factors, including flat demand and the influx of increasingly affordable, zero-carbon resources such as solar and wind generation. We anticipate that technology advancements providing greater flexibility, such as state-of-the-art storage, plug-in electric vehicles, and dispatchable demand response will also reduce the need for significant new conventional generation.

- b. If not, how do you explain other generation sources entering the market?

California's Renewables Portfolio Standard requires load-serving entities to procure specific percentages of energy from renewable resources. The CPUC has also adopted a storage procurement policy that requires a total of 1325 MW of small-scale energy storage by 2020. These procurement directives have supported market entry by new resources. The California ISO is working with utilities and policy makers to ensure they can achieve their procurement targets in a manner that preserves reliable operation of the electric grid.

The Honorable Billy Long

1. RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado and other western states? Should it be an RTO or an ISO?

Wholesale regional electricity markets administered by an ISO or RTO provide important reliability and cost benefits to consumers. As a requirement of California Senate Bill 350, the Clean Energy and Pollution Reduction Act of 2015, the California ISO has evaluated the potential effects of creating a multi-state, regional electric market in the West. The studies were conducted by leading experts in energy, environment and economics. The studies found that establishing a regional market and interconnected electric grid in the West would be expected to lower power purchasing costs, optimize transmission planning, increase market and operation efficiency, improve the utilization of renewable resources west-wide, reduce carbon emissions

and greatly reduce the redundancies needed to meet reliability requirements. Full grid and market integration could potentially save billions of dollars in energy costs to consumers and improve reliability throughout the region as compared with the current structure that includes 38 separate balancing authority areas.

The Western Energy Imbalance Market (EIM) provides a partial view of the benefits that could be obtained from a wider regional bulk power market. EIM participants engage in a broad real-time dispatch across multiple states, but retain their role as separate balancing authorities. The EIM uses the ISO's advanced, automated system to select the most efficient dispatches in the real-time balancing market, considering resources, congestion, outages and economic costs. Initial participants have included PacifiCorp which operates in six states, NV Energy of Nevada, Puget Sound Energy of Washington, and Arizona Public Service. Through the second quarter of 2017, the estimated total benefits of the Western EIM have exceeded \$200 million. Work is underway to enable seven more utilities in the West to join the EIM by 2020, serving consumers in California, Arizona, Oregon, Washington, Utah, Idaho, and Wyoming with the most efficient real-time power sources. To support this regional market and with the support of a broad range of stakeholders, the California ISO enhanced its governance structure to allow for a governing body with delegated authority over EIM-specific matters.

Each of the nation's wholesale electric market operators has a number of unique features including market design, resource adequacy practices, regulatory requirements, and stakeholder participation. As a practical matter, there does not seem to be any functional distinction between whether such an organization is constituted as an ISO or an RTO.

2. How are you planning to manage the growing surplus of generation in your respective regions?

The California ISO is refining its strategies to address oversupply conditions and has identified an array of specific, proactive mitigation strategies to help deal with over supply and managing the evolving power mix. These strategies include:

- Designing market rules changes to obtain more flexible resources to increase overall generation availability and ramping capability. This effort targets participation by all resources, including natural gas fired plants, variable energy resources, electric storage and demand response.
- Obtaining more accurate load, wind and solar forecasting in both the day-ahead and real-time.
- Increasing coordination with other grid balancing areas in the region, including providing support to entities seeking to join the Western Energy Imbalance Market

The Honorable Frank Pallone, Jr.

- 1. Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major**

barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?

The California ISO is a not-for-profit, public benefit corporation that was established to ensure efficient use and reliable operation of the state's electricity transmission system on behalf of California consumers, with the goal of ensuring reliable electricity service with lowest cost dispatch. The California Public Utilities Commission and its Office of Ratepayer Advocates regularly participate in the ISO's stakeholder process. In addition, individual consumers and their representatives can fully participate in the ISO stakeholder process. In the context of the Western EIM and other regional efforts, we have had participation from other state consumer interests as well.

The California ISO's board and stakeholder meetings are open and transparent to all stakeholders. This allows all stakeholders, including consumers, to participate in the policy development and approval process. The California ISO has taken several steps to facilitate meaningful participation in its stakeholder and board processes, while reducing the cost of participation. To keep stakeholders informed, the California ISO publishes market notices at each stage of the stakeholder process and for all board meetings. The California ISO posts all materials for board and stakeholder meetings, including meeting dates and agendas, on its website in advance of the meeting. This ensures that remote participants have access to the same materials as in-person attendees. Stakeholders can participate in board and stakeholder meetings in-person or remotely. Stakeholders who are unable to attend a board meeting can listen to the meetings either through a conference call number or through streaming audio on the internet. Streaming audio of Board proceedings is available via both internet and phone, and audio recordings are available on the California ISO website for 30 days. All interested parties may address the board during open meetings. Further, persons who cannot attend a board meeting are able to submit their positions to the board in writing if they desire. The Board accepts and considers written comments from any interested party, and consumer advocacy groups participate in informing their deliberations. This ensures that the Board considers all stakeholders' input. Similarly, every step of the stakeholder process typically involves an in-person meeting or conference call. For in-person stakeholder meetings, the California ISO facilitates remote participation via a conference call with web-conferencing. Thus, stakeholders that are not physically present can actually participate in the meeting, not just listen. Today the majority of stakeholders participate in California ISO stakeholder meetings by phone. Even if stakeholders are unable to attend a stakeholder meeting in person or participate by tele-conference or web-conference, they still have an opportunity to inform the process by submitting written comments on issue papers, straw proposals, and proposed tariff language. The California ISO posts all written stakeholder comments to its website; so stakeholders are aware of others' positions and can respond. The California ISO takes all written comments into account in crafting proposals and responds to all written comments through a stakeholder comments matrix. As a result of these practices, taking time to travel to or participate in a stakeholder meeting is not necessary for a stakeholder to stay abreast of developments with a particular initiative or inform the California ISO's policy development. More information about the

California ISO's stakeholder process is available on the following website:
<http://www.caiso.com/informed/Pages/StakeholderProcesses/Default.aspx>

2. You indicated at the hearing that California ISO had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.

I want to note that, at the Subcommittee hearing on July 26, I testified that the California ISO does not have a formal structure for obtaining consumer views, specifically. We do, however, have open, transparent, and easily accessible Board and stakeholder processes as described above. As stated in the ISO's Bylaws, any member of the public may attend and observe Board of Governors meetings. The Board also provides an opportunity for the public to comment on any general and decisional matters at these meetings.

a. Do consumer advocates have voting representation on the Board?

The Board of Governors of the California ISO is appointed by the Governor of California and subject to approval by the California State Senate. Board positions are filled by highly expert individuals selected from a nationwide pool and have no specific sector affiliations and no financial interests in market participants' operations or policies. Both California ISO management and its Board of Governors incorporate the perspectives of consumers in their decision-making process.

b. Do consumer advocates participate actively in the development and approval of grid planning?

Yes, representatives of the CPUC's Office of Ratepayer Advocates and other consumer interest groups provide input through the California ISO's stakeholder and Board processes as they determine appropriate.

c. Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of these funds?

The California ISO does not provide specific funding support dedicated to consumer interests. However, the California ISO maintains a robust, full-time office of Customer and Stakeholder Affairs, which provides support to all interested parties, including consumer advocates.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6115
Majority (202) 225-2927
Minority (202) 225-3841

August 29, 2017

Mr. Craig Glazer
Vice President, Federal Government Policy
PJM Interconnection, LLC
Suite 600
1200 G Street, N.W.
Washington, DC 20005

Dear Mr. Glazer:

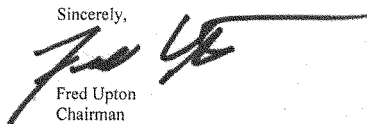
Thank you for appearing before the Subcommittee on Energy on Wednesday, July 26, 2017, to testify at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, September 13, 2017. Your responses should be mailed to Elena Brennan, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to Elena.Brennan@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,


Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



Craig A. Glazer
Vice President, Federal Government Policy

PJM Interconnection, L.L.C.
Suite 600
1200 G Street, N.W.
Washington, D.C. 20005

September 13, 2017

The Honorable Fred Upton, Chairman
Committee on Energy and Commerce
Subcommittee on Energy
2125 Rayburn House Office Building
Washington, DC 20515-6115

Re: July 26, 2017 Hearing – Response to Additional Questions for the Record

Dear Chairman Upton,

Thank you for the opportunity to testify before the Subcommittee on Energy of the Committee on Energy and Commerce of the U.S. House of Representatives on Wednesday, July 26, 2017 at the hearing entitled "Powering America: A Review of the Operation and Effectiveness of the Nation's Wholesale Electricity Markets," and for the opportunity to address additional questions of subcommittee members.

Attached are my responses to those additional questions per your letter dated August 29, 2017. Thank you and the Subcommittee for your continued time, effort and consideration of perspectives offered. Should you have any questions with regard to the attached, please do not hesitate to contact me.

Sincerely,

A black rectangular redaction box covering the signature of Craig A. Glazer.

Craig A. Glazer

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy
Ms. Elena Brennan, Legislative Clerk at U.S. House of Representatives
Jason Stanek, Committee Staff
Richard Kessler, Committee Staff

Attachment: Reply of Craig Glazer, Additional Questions for the Record

Attachment
Responses of Craig A. Glazer, PJM Interconnection, L.L.C. to
Additional Questions for the Record Dated August 29, 2017

THE HONORABLE FRED UPTON

Question 1: It has been more than 7 years since FERC embarked on its efforts to promulgate new transmission planning reforms which resulted in Order No. 1000. Your RTO is designated as "Order 1000 transmission planning regions." Now that you have had real-world experience with these reforms, do you think FERC's efforts at reforming transmission planning and cost allocation have succeeded, failed, or landed somewhere in between?

Response: PJM believes that Order No. 1000 has helped to advance certain aspects of grid planning and infrastructure development but has fallen short in other areas. PJM's response below addresses two of the larger initiatives within Order No. 1000, the first dealing with competitive solicitations for new transmission projects, and the second involving interregional planning. Our response will further address those areas where, in PJM's view, Order No. 1000 has fallen short of its original billing.

(a) Competitive Solicitation Provisions of Order No. 1000 – On the positive side, particularly in the case of market efficiency projects, the competitive solicitation provisions of Order No. 1000 have led to a notable increase in the number and variety of solutions to reduce congestion on the grid through transmission projects. In this specific area (known as "market efficiency projects"), PJM has received over 100 proposals under our first "market efficiency" competitive solicitation issued pursuant to Order No. 1000 when, in contrast, it received very few such proposals prior to the issuance of Order No. 1000. Although many of the submittals involved smaller incremental transmission upgrades, the PJM Board of Managers has also approved two significantly larger market efficiency projects since the inception of Order No. 1000. On another positive aspect of Order No. 1000, although cost caps have been controversial, PJM does believe that Order No. 1000 has worked to more fully inject cost discipline into proposed project submissions. Concerns with aspects of the implementation of the competitive solicitation provisions of Order No. 1000 are outlined below.

(b) Interregional Planning Provisions of Order No. 1000 – The track record of Order No. 1000 relative to interregional planning has been far more mixed. With the support of FERC, the level of interregional coordination through the identification of "quick hit" beneficial projects with the Midcontinent Independent System Operator ("MISO") has been promising although this has only occurred after directives from FERC to eliminate some of the original limitations on interregional coordination that some of our neighbors included in their original Order No. 1000 tariffs. Interregional planning with other regions has been far more limited given the:

- (i) regional differences in planning regimes across the nation;
- (ii) significant reduction in load growth across the Eastern Interconnection; and,
- (iii) lack of willingness of states to promote or pay for major interregional "public policy projects."

In short, given Order 1000's embrace of "bottom-up" planning and maintenance of regional differences in the determination of benefits, we believe a metric which looks for the development of major interregional transmission projects covering hundreds of miles may be unrealistic and an inappropriate metric of success.

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Responses of Craig A. Glazer, PJM Interconnection, L.L.C. to
Additional Questions for the Record Dated August 29, 2017

(c) FERC's Implementation of Order No. 1000 – Order No. 1000 has suffered from FERC's extreme focus on documentation of processes at a level of detail that can stifle the flexibility and discretion needed in the complex area of transmission planning. Requirements for tariffing the minutiae of the planning process has the potential to create new grist for litigation and compliance challenges in a process which, in the past, recognized the need for the exercise of discretion and judgment by RTO transmission planning experts. As an example and with no disrespect to the practicing Bar, we are increasingly seeing lawyers attending and participating at our stakeholder meetings where the results of competitive solicitations are being discussed. The potential for litigation and 'compliance traps' associated with the tariffing of the minutiae of our planning process can potentially work, over the long run, to delay moving forward in a timely manner on needed reliability projects.

Moreover, there has clearly been an inconsistent roll-out of Order No. 1000 across the country. While PJM is now on its 13th opening of competitive solicitation windows, as a result of inconsistencies in tariff provisions, various exceptions approved by FERC and other reasons, some other regions have yet to undertake their first competitive solicitation. Such inconsistent roll-out of what was supposed to be a national rulemaking has made PJM begin to question the reasonableness of moving forward in light of this slow and inconsistent roll-out.

Question 2: Your RTOs and ISOs play a central role in operating the wholesale electricity markets and (with the exception of ERCOT) your primary regulator is the Federal Energy Regulatory Commission. Do you believe that FERC is appropriately engaged in overseeing wholesale electricity markets?

Response: FERC's job is complex as market design is as much an art as a science. We believe that overall, FERC has been quite supportive of ensuring fair and balanced rules that are consistent with its long-stated goal of promoting competition while ensuring reliability in a fuel-neutral manner. Because the electricity industry is one of the most capital-intensive industries in the nation, consistency in those basic approaches is extremely important if the nation is to incent and sustain the needed level of infrastructure investment. PJM has found FERC's Commissioners and staff to be true professionals who have undertaken their responsibilities with dedication and fairness.

Question 2a: Are there additional areas of regulatory oversight that requires the attention of this Subcommittee?

Response: As I indicated at the July 26 hearing, PJM believes there is value in having additional hearings and Sub-Committee oversight in two areas:

(a) Grid Resilience – Although PJM is actively moving forward in this area, it would be helpful for those in government with access to intelligence information to be able to assist grid operators in verifying and validating the nature of threats which require additional build-outs for resilience, which could be costly. As a result, although information sharing is occurring today on an incident basis, it would be helpful if the RTOs can receive some verification from officials with access to intelligence information as to the reasonableness of the RTO's choice of which threats require additional build-out versus which potential threats are remote enough to not justify the same degree of build-out from a cost/benefit viewpoint. The Sub-Committee's oversight as to

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the degree of coordination between agencies such as Department of Homeland Security and Department Of Energy with the grid operators in this area could be helpful to the overall effort.

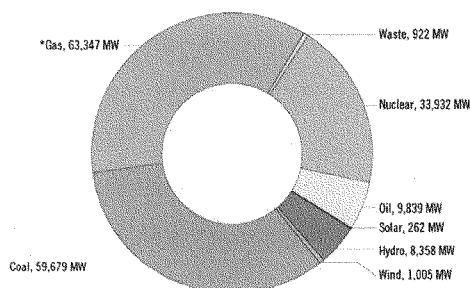
(b) Gas-Electric Coordination – As overseen by FERC, as a result of Congress' directives in the Energy Policy Act of 2005, the electric industry is the only industry with mandatory cyber and physical security standards. By contrast, the natural gas pipeline industry is subject to an entirely different and far more voluntary regulatory regime under the regulatory oversight of the Transportation Security Administration (TSA). As the two industries become more inter-dependent, it would be helpful for this Committee to continue its oversight as to whether this disparate regulatory regime is becoming an impediment to ensuring the effective consideration of threats to each other's systems.

THE HONORABLE JOHN SHIMKUS

Question 1: If, as we learned at the hearing, markets were structured to build only the least expensive generation, we would build nothing but natural gas plants right now.

Question 1a: Is that correct? Is that what's happening?

Response: Although PJM has seen significant development of natural gas facilities, the PJM generation profile today is more diverse than it has ever been as evidenced by the chart below.



PJM Installed Capacity as of 12/31/2016

*Gas is made up of 'Natural Gas' (62,941 MW) and 'Other Gas' (405 MW) such as landfill gas, biomass, etc.

In addition to the increase in the interconnection of new natural gas-fired facilities, PJM has seen a significant increase in the interconnection of renewable facilities and innovative new technologies such as energy storage resources. For example, at the end of 2016, PJM had active interconnection requests of nearly 30,500 megawatts of nameplate capacity evenly split from wind and solar resources. Energy storage resource requests comprised 680 megawatts of nameplate capacity.

PJM believes the nation's policy focus should not be on defining an acceptable percentage of different fuel types. Rather, as PJM detailed in its Spring 2017 whitepaper, *PJM's*

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Evolving Resource Mix and System Reliability,¹ we believe a focus on ensuring that we are obtaining resources which provide key reliability attributes is preferable to choosing investment in particular fuel types. PJM's capacity market reforms, approved by FERC in June 2015,² and PJM's new price formation initiative focused on developing a compensation mechanism to reward and incent flexible load following services are examples of the kind of initiatives which will ensure a cost-effective and reliable grid going forward.

Question 1b: If not, how do you explain other generation sources entering the market?

Response: See response 1a above. As a matter of regulatory policy, FERC has described its regulatory policy as remaining fuel-neutral but not reliability neutral. We believe this long-standing policy, and the Commission's support for some of the initiatives referenced in our response to Question 1a, will serve to ensure a healthy mix of resources that ensure long term reliability at reasonable prices to consumers.

THE HONORABLE BILLY LONG

Question 1: RTO development began in late 1999 with ISO development soon to follow. Both organizations help to monitor our electric power system. There are still a number of gaps in our electric system where problems could occur. What are your thoughts about the creation of another RTO that could include the states of Nevada, Arizona, Colorado, and other western states? Should it be an RTO or an ISO?

Response: PJM believes that RTOs have provided significant benefits to customers in driving greater grid efficiencies and more reliable operations. PJM does not take a formal position on what actions should be taken by the states identified in this question other than to note the efficiencies which have been demonstrated across the nation through the operation of RTOs.

Question 2: How are you planning to manage the growing surplus of generation in your respective regions?

Response: Although principally as a result of sluggish load growth, reserve margins in PJM have grown most recently, these higher reserve margins should not, in PJM's view, be a basis for complacency. Although reserve margins and "iron in the ground" is certainly one measure of reliability of the grid, PJM is increasingly focusing on low probability/high impact events, which could range from extreme weather events to physical or cyber-attacks, to ensure that today's reliable grid is resilient to withstand and/or recover from these extreme events.

Thus, although PJM will continue to procure capacity resources to meet its reserve margin using traditional NERC analyses and standards, our focus is increasingly moving toward

¹ *PJM's Evolving Resource Mix and System Reliability*, March 30, 2017, PJM Interconnection; <http://www.pjm.com/~media/library/reports-notice/special-reports/20170330-pjms-evolving-resource-mix-and-system-reliability.ashx>.

² *PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,208 (2015), *order on reh'g*, 155 FERC ¶ 61,157 (2016) (Capacity Performance proceedings).

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encompassing grid resiliency in our overall planning and operations to ensure that today's surplus is truly available to meet both normal and extreme operating conditions.

THE HONORABLE FRANK PALLONE, JR.

Question 1: Consumer advocates have identified the resource imbalance between the stakeholder members of the RTO/ISO Boards and the small consumer community as a major barrier to having meaningful representation of consumer viewpoints included in decisions about grid operation and capital project evaluation and approvals. What mechanisms, reductions in costs of stakeholder participation, or other support does your RTO/ISO provide to the small consumer community to facilitate their participation in RTO/ISO governance?

Response: PJM and its stakeholders have taken significant steps to ensure that consumer viewpoints, including the viewpoints of residential consumers, are represented in the PJM stakeholder process and are presented directly to the PJM Board of Managers. Some of the specific steps taken by PJM to enhance Consumer Advocate participation in the PJM stakeholder process include the following:

- (a). One of PJM's foundational documents, the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (Operating Agreement), requires a permanent stakeholder group – the Public Interest, Environmental Organization User Group. Consumer Advocates and environmental organizations comprise this group. The group has periodic teleconference meetings with PJM management and staff and meets annually with the PJM Board of Managers.
- (b). Established in 2013, the Consumer Advocates of PJM States, Inc. (CAPS) is a collection of all organizations in PJM that are mandated by law to represent the interests of their respective utility consumers before regulatory and judicial bodies. The organization is funded through a schedule line item on PJM's FERC-approved Tariff. Through the facilitation of a full-time Executive Director, the funding allows those organizations that are mandated to represent consumer interests to further their mission by allowing for meaningful engagement in the PJM stakeholder process and education on emerging issues.
- (c). PJM itself is dedicated to effective Consumer Advocate relationships through the full-time employment of a Consumer Advocate liaison. This role advances Consumer Advocates' engagement with PJM by providing formalized access to PJM personnel and knowledge.
- (d). PJM, including attending members of the PJM Board of Managers, meet with the Consumer Advocates at least twice a year at industry-wide meetings, such as NARUC and NASUCA.
- (e). The Consumer Advocates in PJM's region are voting members of PJM (technically called Ex Officio Voting Members). This gives them the same voting privileges as all other Voting Members of PJM. In fact, representatives of several jurisdictions' Consumer Advocate offices as well as representatives of CAPS participate regularly at all levels of PJM's stakeholder process, including frequent representation on the Liaison Committee when it meets directly with PJM's Board of Managers.

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(f). Dues for membership in PJM are reduced significantly for Consumer Advocate offices. Specifically, annual dues for Consumer Advocates are \$500 versus \$5000 for other voting members.

Question 2: You indicated at the hearing that PJM had a formal structure (e.g. committee or liaison position) for obtaining input on consumer views and concerns on grid management. Please provide detail about how consumer views are incorporated into decision-making at your RTO/ISO.

Response: PJM employs a full time Consumer Advocate liaison who works directly with the Consumer Advocates to ensure that they have full access to PJM subject matter experts and have direct access to the PJM Board of Managers through regularly scheduled meetings.

As to decision-making at the RTO/ISO, as noted above PJM stakeholders fund the CAPS organization so that the official state consumer advocates can be represented through a full-time dedicated CAPS official, at all PJM stakeholder meetings. PJM meetings are open to the public and consumer advocate offices can participate individually as well as through CAPS and can vote either in person or by telephone.

As noted above, the Consumer Advocates formally have a vote on matters which are then presented to the PJM Board of Managers as recommendations from PJM stakeholders. The Consumer Advocates' votes are equal to the vote of market participants in PJM irrespective of the size of the different companies or organizations.

Question 2a: Do consumer advocates have voting representation on the Board?

Response: As noted previously, the Consumer Advocates, like all other market participants, have voting rights in the PJM stakeholder process. The stakeholder votes concerning changes to the PJM tariff rules are, by design, advisory to the Board. Stakeholders retain rights as a group, through the sector-weighted voting process, to seek a Federal Power Act, Section 205 change to the Operating Agreement. Nevertheless, the Board still retains its rights to petition FERC for changes in the Operating Agreement pursuant to Federal Power Act, Section 206.

PJM has an independent Board rather than a Board made up of stakeholders. The 10-member PJM Board of Managers is tasked with retaining PJM's independence as an organization in carrying out its role of executing non-discriminatory wholesale markets, reliable operations, and prudent transmission planning. As a result, the PJM Board of Managers is independent of the members and can hold no interest—financial or otherwise—in any member organization.

RTOs were designed to be independent of stakeholders in order to ensure unbiased decision-making on key issues associated with the reliability of the grid, ensuring the competitiveness of the PJM markets, providing a robust and transparent planning process and ensuring the physical and cybersecurity of essential PJM grid operations.

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Question 2b: Do consumer advocates participate actively in the development and approval of grid planning?

Response: Yes. The meetings of PJM's Planning Committee as well as its Transmission Expansion Advisory Committee are open. Consumer Advocates, acting through CAPS and also on their own behalf, are active in these meetings as are public interest organizations.

Question 2c: Are there funds available to support full-time staff that serve the interests of consumer advocates? If so, what is the source of those funds?

Response: As outlined above, PJM, with the support of its stakeholders, submitted to FERC an amendment to the PJM Open Access Transmission Tariff to permit the funding of the CAPS organization. FERC approved that request on Feb. 29, 2016. The funding supports the hiring of an Executive Director for CAPS and allows the CAPS organization to cover its costs in participating in PJM stakeholder processes.

Question 3: What quality control measures does PJM have in place to ensure that cost estimates for proposed transmission projects are reasonably accurate and inclusive of all expenses that a project is likely to incur?

Response: There are a number of facets to this answer. PJM requires the timely submittal of estimated cost information, which includes projections of all costs associated with the siting and construction of transmission facilities, and considers this information prior to the PJM Board of Managers' approval of a given project. The project developer has the initial responsibility to estimate these costs as they are in the best position to negotiate contracts and manage their costs associated with a given project. PJM uses this information in determining which project meets the standard of being the more cost effective and efficient solution to the particular identified problem – whether it be resolving a foreseeable reliability violation or improving the efficiency of market results by reducing congestion costs on the system with cost-effective transmission solutions. The evaluation of costs is a component used by PJM to decide whether, in a given situation, PJM should approve smaller upgrades versus development of a larger "greenfield" solution as the more cost-effective solution.

For projects which are subject to Order No. 1000's competitive bid process, project developers have the option of submitting cost caps as part of their bid submittals. This process can provide a further check on project costs depending on the specific provisions of the proposed cost cap. PJM evaluates proposed cost caps as one component of its determination of the more cost-effective or efficient proposal among the various submitted proposals.

PJM posts project costs as project construction proceeds. The PJM Board of Managers retains the right to re-evaluate or cancel projects for a number of reasons including whether the projected costs of completion of the project when weighed against the updated needs analysis, justifies reconsideration, reconfiguration or even cancellation of a project.

Finally, although PJM considers costs at each of the stages of the planning process outlined above, FERC continues to hold primary responsibility for the determination of the reasonableness of costs of individual projects. Any customer can challenge the reasonableness of costs being included in rates either at the time the utility seeks recovery of those costs

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pursuant to Federal Power Act, Section 205 or through a separate complaint filed by the customer pursuant to Federal Power Act, Section 206.

Question 4: When PJM approves a project with its associated cost estimate, is the project re-evaluated if the cost increases significantly? Does the approval include cost containment measures or a cap on cost increases?

Response: See response to Question 3 above. The PJM Board of Managers retains the right to re-evaluate projects if the costs of the project when compared to the need no longer justify its construction. Pursuant to FERC regulations, transmission owners may be allowed to recover abandonment costs of cancelled projects, which is another factor that is considered as the PJM Board of Managers determines whether to re-evaluate, reconfigure or even cancel a project.

As noted above, the PJM Board of Managers considers any cost cap proposals that have been submitted by project developers. If that project proposal is selected by the PJM Board of Managers, the cost cap proposal is inscribed in a binding agreement known as the Designated Entity Agreement (DEA), which is filed for approval at FERC. Any customer can challenge the cost cap proposal that is submitted to FERC as part of the DEA filing.

Question 5: The Consumer Advocates of the PJM States have raised questions about PJM's process for planning transmission projects relative to the cost estimates and consumer impacts of proposed projects. A specific project in my district, Jersey Central Power and Light's proposed Monmouth County Reliability Project, has been questioned by members of the community that would be directly impacted by the project's construction and also by the Rate Counsel because of the high cost of the project and its projected impact on consumers. Intervenors in this case presented a non-transmission option at a cost estimated to be 70 percent less than the cost of the transmission project. Transmission operators, voting members of the Board of PJM, are likely to favor new transmission as a solution to reliability issues. How does PJM account for this bias within its membership when evaluating alternative approaches for addressing reliability issues?

Response: PJM wishes to separately address the specific references in the question above as to the alternative presented by intervenors to the Monmouth County Reliability Project as well as to the part of question referencing an alleged "bias within its membership when evaluating alternative approaches for identifying reliability issues."

As to the specific reference to the Monmouth County Reliability Project, there is no evidence of bias in this case. The hearing relative to the siting application for the Monmouth County project has been completed and briefed by the parties as we await a decision of the New Jersey Board of Public Utilities. During the final day of evidentiary hearings, the RAGE witness, Jeffery Palermo, introduced a new technical solution alternative to the proposed project during his oral sur-rebuttal testimony. Mr. Palermo admitted in both his Sur-Rebuttal Report, and while on the witness stand, that a NERC Category 7 violation currently exists and must be addressed. Mr. Palermo also proposed (for the first time in his sur-rebuttal testimony) an alternative that would involve installation of major pieces of voltage stabilization equipment (two static synchronous compensators) and significant reinforcements to Jersey Central Power & Light Company's (JCP&L) 34.5 kV distribution system, including new 34.5 kV transmission lines.

Attachment
Responses of Craig A. Glazer, PJM Interconnection, L.L.C. to
Additional Questions for the Record Dated August 29, 2017

In the first place, this alternative was never presented at the various PJM stakeholder meetings regarding this project. Nevertheless, based on the analysis performed by JCP&L, and reviewed by PJM, Mr. Palermo's alternative to the Monmouth County Reliability Project would be more expensive to construct, more disruptive to JCP&L's customers in Monmouth County, and result in a less robust system than the proposed project.

On the larger question concerning alleged bias in decision-making, decisions on the choice and need for transmission projects are made by the PJM Planning Division staff and then are submitted to the independent PJM Board of Managers for final review and approval. Those decisions are informed by the consideration of alternatives that have come forward as generation, demand response or energy efficiency solutions through the PJM markets or are otherwise identified by parties when the proposal is first vetted. As a result, whether there is "bias" among individual member companies is irrelevant to the decision being reached by the PJM Board of Managers – a decision which is informed by market results and the transparent and independent analysis of the PJM Planning Division staff, which has been thoroughly vetted through the public stakeholder planning process.

Question 5a: Do consumers or consumer advocates have representation on the Board?

Response: See response to Question 2a. The PJM Board of Managers is independent of all stakeholders. As a result, no stakeholders, including consumer advocates, have designated representatives on the PJM Board of Managers.

Question 5b: Do they vote or have other formal input to decisions on transmission projects?

Response: Yes. See responses to Question 2, 2a, 2b and 2c. Consumer Advocates, acting through CAPS and as individual offices, have both formal and informal input to proposed decisions of PJM on whether to authorize specific transmission projects. All projects which PJM Planning Division staff is considering presenting to the PJM Board of Managers are first vetted through the Transmission Expansion Advisory Committee where Consumer Advocates and other stakeholders can provide comment. In addition, CAPS, individual Consumer Advocate offices and even individual consumers are able to correspond with the PJM Board of Managers prior to its decision whether or not to approve a specific projects that has been vetted at the Transmission Expansion Advisory Committee.