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

WEDNESDAY, JULY 26, 2017

House of Representatives

Subcommittee on Energy

Committee on Energy and Commerce

Washington, D.C.

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, Loebsack, 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.

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 share 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.

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.

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 -- but also on 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.

The Chairman. 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 transition 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 we 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.

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 is 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 market. 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:]

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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 website in real time, a typical summer day, and

our footprint 46 percent was 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 that 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:]

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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:]

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609 Mr. Upton. Thank you.

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

611 Welcome.

STATEMENT OF RICHARD DOYING

Mr. Doying. Good morning, Chairman Upton, Vice President Olson, I guess, in absentia, 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, 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 changes in the generation portfolio that reduction in coal is due in part to 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:]

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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 operations 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:]

**********INSERT 5**********

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 infrastructure 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 to 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:]

**********INSERT 6**********

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 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 it has 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.]

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

[Photo.]

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.]

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.]

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 that the Shedd Aquarium in Chicago.

[Photo.]

Mr. Glazer. That is actually using, 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 go to sleep to ensure that the lights stay on. It is also a testimonial to our stakeholders, to our regulator.

I want to give a shout-out to the Federal Energy 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 has served the nation well and would urge everybody to keep that in mind as we debate some of these other issues.

971 So thank you and I look forward to your questions.

972 [The prepared statement of Mr. Glazer follows:]

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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 operation 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? Let me -- 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, you

know, 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 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, if you will 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. Yeah, 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 sort of 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 nuclear units, 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. Okay. 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. So the question is -- 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 as how do we, in a multi-state market how do we accommodate what every state can do, but not -- 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. Yeah, 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 on the federal 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 what 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. Yeah.

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, okay. 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 investment 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. Okay.

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, you know, 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 some of them 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. -- okay, 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 distribution 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 kind of 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. I think from a transmission, as a transmission grid operator that is really not our issue. That is the issue for the

distribution utility. But as I mentioned, you know, we are trying to leverage those distribution networks as a resource for the transmission network.

On your question around going forward, you know, 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. Okay. 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 in the last 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 efficient 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 is 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, you know, 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. Okay, okay. Yeah. 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

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 kind of was looking at the equivalent of if you went to shop for a car it was asking the question just like you would ask, you know, 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. You know, 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. Okay, 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. Okay, 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. Okay. 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. Yeah, 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 in your -- 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, of the export -- 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. Yeah, 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?

1789 And by the way, everybody on the committee is used to us in Texas
1790 bragging. I was happy a number of years ago when the Public
1791 Utility Commission to get that wind power from West Texas to the
1792 Dallas-Fort Worth, San Antonio, Austin, and of course the Houston
1793 market where I am from, made a decision and spent was it $5 billion?
1794 Ms. Mele. Yes, sir. Actually it was a little bit more than
1795 that. About $6.9 billion was invested under the legislature's
1796 direction to really --
1797 Mr. Green. To make sure that wind could get to the urban
1798 areas where the customers are.
1799 Ms. Mele. Correct. And so today we have about 14,400
1800 megawatts of wind taking advantage of those CREZ lines, and
1801 actually in the queue of potential interest being shown is an
1802 additional 23,000 megawatts of wind. So we assume that will not
1803 all get built, but that interest in developing wind in Texas in
1804 the western region and the Panhandle continues.
1805 Mr. Green. ERCOT is the only RTO in the nation that is not
1806 regulated by FERC. You offer a perspective of what we are
1807 discussing today. In your testimony you mentioned Competitive
1808 Renewable Energy Zones, CREZ, was mandated by the state
1809 legislature. How has this program evolved since its inception
1810 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 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. Yeah, it continues to be land-based, you know, 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. Okay.

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. Okay. 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. Glazier, 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 analogy 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. Yeah, yeah. 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. Okay.

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. Yeah, and it is a fair point.

Mr. Griffith. Help me understand what -- I have your position, I have their position, but where is the disconnect?

Mr. Glazer. Yeah, yeah. No, and it is a fair point, so two things very quickly. One is, I think they were referring

to there is a court of appeals decision that puts some uncertainty around this self 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, you know, 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, where the essence of the beef.

Mr. Griffith. All right, so, you know, is it something that we ought to resolve? I mean 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 it actually, 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.

But 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, particularly 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 of 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. And so what is the best way -- 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. Okay. 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. Okay. 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. Okay, 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. Okay. 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. Okay, 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. Okay, so everyone was a yes except for Dr. Casey. Thank you. All right, so let me move on. This is a 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 ten-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. Glazier, 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 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, you know,

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. Glazier, 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, got 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. We are trying to -- 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. Yeah, 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, you know, 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. Okay. 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, you know, 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, you know, 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. Okay. 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? Okay, 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. I think, you know, 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 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.]