Summary of Presentations and Comments
At the
Quadrennial Energy Review

Stakeholder Meeting #12: Newark, NJ
Electricity Transmission and Distribution – East
September 8, 2014

Opening Remarks

Dr. Karen Wayland, Deputy Director for State, Local and Tribal Cooperation, Energy Policy and Systems Analysis, United States Department of Energy

The goal of the Quadrennial Energy Review (QER) is to identify threats, risks, and opportunities to the nation's energy infrastructure and make recommendations for federal action to enhance our national security and economic productivity, and protect our environment. We are working on the first installment of the QER, which focuses on energy infrastructure, such as transmission, storage, and distribution. President Obama issued a Presidential Memorandum directing the Administration to conduct extensive stakeholder outreach. This is our twelfth meeting and we have several more that we will do before we wrap-up of the first year of the QER's public comments on October 10, 2014. Today, we are very fortunate to have the New Jersey Institute of Technology (NJIT) hosting this twelfth public QER meeting.

I would like to introduce Dr. Joel Bloom, who is the President of NJIT. He joined the Institute in 1990 and has served in a variety of capacities; from Vice President of Academic and Student Services, to Dean of the very prestigious of the Albert Dorman Honors College, and now as President. He has also been an educator and administrator in New York City's public schools. I would like to thank you for hosting us, and we look forward to hearing your remarks.

Dr. Joel S. Bloom, President, New Jersey Institute of Technology

Main Points:

1. Welcome to NJIT and the City of Newark. The City of Newark is home to higher education institutions. On a daily basis we have 55,000 students, staff, and faculty in the city. We all work in partnership, which is the theme of today's meeting. NJIT has been on a growth trajectory for several years, with an enrollment of 10,500 students. Students graduate with three-plus job offers and very nice compensation packages. NJIT was founded in 1881, in response to industrial needs for an educated workforce. We are growing our institution with $110 million in research funds. The Massachusetts Institute of Technology (MIT) leads in research expenditures but, with a very large dollar gap, we are 4th or 5th of the polytechnic institutions. Our areas of research primarily focus on the convergence of science and technology and life sciences.
2. Another area of our research is the internet of everything, and a 3rd area is the issue of sustainability. We have a history of working in that area. In 2011, we competed in the U.S. Department of Energy's (DOE's) Solar Decathlon and we were one of the finalists with a unique and concrete solar house. We feel that was a great way to introduce our students to the area of energy. Other areas of energy we focus on are resilient infrastructure, solar cell technology design, control delivery, and battery development.
3. NJIT is also home to one of the largest and oldest technology incubators in the country. This past year, we launched a separate corporation to work with business and industry. We are currently partnering with Panasonic, Cisco, and JP Morgan Chase, among others, to help bring technology to commercialization. We are also finishing a brand opportunity with the U.S. Department of Defense (DOD).
4. I learned in a meeting with PSE&G that 30 percent of the citizens in the City of Camden do not have power today, due to issues of affordability. About two billion people in the world do not have access to power. Our challenges are great. Thank you Mr. Secretary for being here.

The Honorable Ernst Moniz, Secretary of Energy

Main Points:

1. Thank you, President Bloom, for the hospitality of hosting this meeting. It is great to be back in the academic environment. NJIT started out as the Newark Technical School and the Massachusetts Institute of Technology (MIT) started as the Boston

Technical School, before moving to Cambridge, early in the 20th Century. MIT and NJIT were both products of the mid-to-late 19th Century, a period of industrialization and tremendous innovation in the educational system. The polytechnic schools focused on science and engineering to solve real problems.

2. I presume you all have seen the white paper about this meeting but let me say a little more about the QER and its origin. The QER was committed to by the President's Climate Action Plan. It is not just about addressing climate issues but also about modernizing and updating our approach to energy. Of course, energy security is another critical area. There are energy security issues around what is happening today in the Ukraine and Russia, and there are also domestic risks such as cybersecurity attacks and extreme weather events, such as what this part of the country experienced during Super Storm Sandy. It is also about the issues of energy and the economy, such as jobs and manufacturing. All these elements must come together in this QER. The motivation of the QER is that every department in the federal government has major equities in energy. DOE serves in the "Executive Secretariat" capacity of the QER process and provides the analytical capacity to address the various issues.
3. Addressing those issues cannot be done just at the federal level. Our energy challenges are regional. That is the reason why we have been going around the country. This is the twelfth meeting in which we go out and collect information on these topics. Regional issues are extremely important and a lot of the authorities in the energy sector reside at the state level. While we are interested in what the federal government can do, we emphasize that what we can do is not simply to support technology development and develop federal policies, but also to work cooperatively to provide technical assistance to the states and regions as they each develop their energy response to the challenges the country faces.
4. The choice was made that although the process is called "quadrennial," we want to have focus areas along the way. Specifically, for this year, the choice was made to focus on energy infrastructure. We have infrastructure challenges that have proven to be extremely timely and that is what we are focusing on.
5. In the year 2000, the National Academy of Sciences labeled electrification as the major engineering achievement of the 20th Century. This leads us to expect that electrification will be even more important, over time. We also know that the 21st Century challenges are different than the 20th Century challenges. It is not easy to change a massive electric system of technologies and policies. We are here to talk about moving into an electric system of the 21st Century that is resilient to an integrated set of risks, like extreme weather, cyber threats, physical threats, geo-magnetic threats, and the interdependencies of various infrastructures.
6. So, what can the federal government do? Transmission is a technical challenge, such as delivering wind or solar energy over large distances. It is also faces regulatory issues, such as crossing seams. How do we get smart distribution systems and how do we get transactional capacity? What about distributed generation? We have technical and cost barriers but also have state-by-state, variable regulatory barriers for consumers. In many states, we have seen tensions between utility models and

distributed solar, for example. What about real affordable distributed storage? Only one to two percent of today's generation capacity is what we have as storage. What about affordable distributed storage?

7. These are really big issues and we would like to get your input. I will end by saying that regardless of these challenges, we should remember that we are in a major period of opportunity in the energy sector. We see that in the production of natural gas and oil; a lowering dependence on oil imports; and gas prices where they were not expected, driving industrial growth while reducing carbon emissions. We are also seeing dramatic increases in wind and solar power, driven by innovation and cost reduction. Efficiency is also growing. On the supply side we are seeing dramatic improvements driven by innovation, from renewables to fossil fuels, but the challenge is how are we going to provide the infrastructure to enable all these good outcomes?

Audience Questions to the Officials Panel

Name: Jimmy Glotfelty, Clean Line Energy Partners
State: TX
Commenter's Main Points
Thank you, Mr. Secretary and Dr. Bloom. Having served at DOE, I understand the importance of these meetings. A few nuggets of gold can do really good things. I would like to point to synchrophasors, as a really good nugget. They started at Pacific Northwest National Laboratory, and they have been a great technology to understand reliability of the grid. I will talk about high-voltage direct current (HVDC) technologies. My company is trying to build HVDC transmission lines to move large amounts of wind energy across large distances. It is pretty much the technology of choice, globally. Our competitors around the world including China, Canada, and India, have all adopted these technologies and are actually leading the revolution to lower the costs and allow the technology to continue to grow. My question to the Secretary and Dr. Bloom is: What does the U.S. need to do to become the leader in HVDC technologies?

Dr. Joel S. Bloom

- Unfortunately, this nation is an under producer of scientists and engineers. The National Academies developed a report titled *Rising Above the Gathering Storm*, which focused on the crisis we are in because we are not producing the workforce. To my knowledge, not much has been done since that report was issued. We do not see any increased movement for females and minorities into the fields of science and engineering. So, it is a workforce issue.
- As I learned this morning when talking with the Secretary, energy is very local and very regional. You are not going to see the wind farms you see in other parts of the country, such as Nevada and parts of California. The workforce, the partnerships, and the incentives are needed. We have to produce more scientists and engineers in this country.

Less than seven percent of U.S. college students choose engineering, while in some of the countries you mentioned that number is upwards of 30 percent.

Secretary Ernst Moniz

- In terms of HVDC, I would agree with you that this is an area in which we need to investigate more strongly and aggressively. You mentioned synchrophasors, which we were able to deploy in large numbers with funding from the American Recovery and Reinvestment Act (Recovery Act). These devices provide a new level of understanding of what is happening in the grid. We need to advance our whole high-voltage grid, sensor technology, and data integration. The major challenges with HVDC are cost reduction and conversion of direct current to alternating current (AC) and vice-versa.
- The President has established national manufacturing institutes which focus on technology development that will underpin the future of manufacturing. The first institute is a joint effort between DOE and DOD, which is an institute on additive manufacturing. The first fully-funded center focuses on wide-band-gap semiconductors, which look into these issues of power conversion and high-power.
- As President Bloom mentioned, we have a serious manpower challenge. There have been decades in which energy was not viewed as attractive as it is today. Now, we have several opportunities, but we need to have education and training. I also wanted to mention that DOE has had, for a few years, an initiative called Women in Clean Energy (http://c3enet.org).
- In the fiscal year 2015 budget, we are starting traineeships that will be analogous to the National Institute of Health traineeships, for areas in which we do not see enough people being employed. One of those areas is in power electronics. We feel that we can get traineeships to support students and curriculum development that can be distributed.

Name: William White, Energy Future Coalition
State: DC
Commenter's Main Points

Thank you for hosting these meetings. The Energy Future Coalition's focus is on the HVDC transmission system that we believe we are going to need. We focus on the policies that allow us or prevent us from building those systems quickly, move them to populations, balance them, and deploy these great new technologies. The QER is a four-year cycle. One of the challenges we see is that the timeline for building high-voltage transmission is much longer than the timeline for deploying large-scale renewable energy. We see a correlation between places that have made the decision to invest in putting the high-voltage transmission in place and large-scale deployment of renewables. What is the DOE thinking in terms of longer-term of levels of renewables and the infrastructure needed to support large deployment of renewables? How can we work with you to help speed up the process of getting that infrastructure in place, so that we can get that energy deployed?

Secretary Ernst Moniz

- The short answer is that the QER is how we are addressing this, but there is more. I also want to mention that DOE has hired Dave Foster, formerly of the Blue-Green Alliance. He is helping us with coalition building.
- About the longer-term issues you mentioned, one major part of DOE's strategy is to encourage a variety of technology developments to handle very large-scale variable resources. One of the areas DOE is pushing is storage, such as utility-scale storage. Last fall, DOE produced a report on utility-scale storage. Secondly, we are looking at hybrid systems and how to integrate them (for example renewables and gas). Thirdly, in the Fiscal Year 2015 budget, we started something called a transformation-of-the-grid crosscutting budget.
- This is a very important topic. We do expect a continued and substantial growth of renewables. On the storage side, one very specific storage mechanism is concentrated solar. The DOE loan guarantee program supported a concentrated solar plant in Arizona. In 2015, we expect a very large concentrated solar power plant in Nevada, with about six hours of molten salt storage. These are just some particular examples of how we address these issues.

Panel I: Transmission – Can We Build and Operate the Appropriate Amount for Future Needs?

*NOTE: All speaker presentations are posted on the QER webpage at: **www.energy.gov/qer***

Presenter Name: Michael J. Kormos
Affiliation: Executive Vice President – Operations, PJM Interconnection

Main Points:

1. PJM has what is called a *Regional Transmission Expansion Plan*. It is a 15-year planning process in which we look at the future needs of the transmission grid and recommend projects to those boards and transmission owners that would build and site them. A lot of what we do really depends on having clear and concise technical requirements or criteria about how we define the need. PJM is an independent neutral party and we do not own any assets, but we are responsible for defining the needs. We have good criteria when it comes to reliability, but two challenges we have are the following:
    a. Public policy – Order 1000 issued by the Federal Energy Regulatory Commission (FERC) has not given us clear criteria. Our process is state-centric, mainly because we do not have clear federal policy. Without clear federal policy regarding where we should be taking the transmission system, it is difficult to bring projects forward; especially when you look at potential multi-state projects.
    b. Resiliency – There are new North American Electric Reliability Corporation (NERC) standards in place, but we have been working with transmission owners to look at the criticality of substations. From a technical perspective, we are pretty good at figuring out which are the critical substations. One of the best ways to increase substation resiliency is to make the substation less critical. The best way to do that is to move less power through it, and the way to move less power through it is to put up other transmission systems to run parallel.
2. Transparency about the criticality of substations is another challenge. Our processes are very transparent and state processes are very transparent.

Presenter Name: Kurt W. Bilas
Affiliation: Executive Director, Government Relations, Midcontinent Independent System Operator

Main Points:

1. The Midcontinent Independent System Operator (MISO) is a coast-to-coast independent system operator. We have a maximum demand of about 133 gigawatts and a maximum generation capability of 201 gigawatts.
2. I want to talk about three concerns we have:
    a. Resource adequacy and changing fleet – We have coal plant retirements, more gas-fired generation coming online, 13 gigawatts of wind power already in our system, and more to be added.
    b. Gas-electric coordination – With the increasing amount of gas that will be used for generation, we are looking at upcoming needs for infrastructure.
    c. Seams optimization – we have to work with a lot of different people.

3. Regarding resource adequacy, we are seeing many coal retirements and reductions in reserve margins, and increases in wind power and renewables. There are environmental regulations going on as well, such as the Clean Water Rule, and the Environmental Protection Agency's (EPA) proposed Clean Power Plan (CPP), which could result in additional coal retirements. All of these regulations are going to impact generation and PJM's footprint. We see gas demand continuing to grow across the U.S. We did some studies looking at natural gas, which show that the traditional flows of natural gas are changing as well.
4. We are working on gas coordination and we are working on seams optimization.
5. We do have some recommendations for DOE:
    a. Expand the coordination and consultation among EPA, FERC, and DOE. There are many things going on and they all impact each other, so these collaborations could be expanded.
    b. The rulemaking processes and their timelines should allow for ample time to explore and address the unintended consequences.

Presenter Name: Joseph L. Welch
Affiliation: Chairman, President and Chief Executive Officer, ITC Holdings Corporation

Main Points:

1. ITC is the nation's first and largest independent transmission company in the U.S. People do not plan to fail, they fail to plan. We have serious problems in the U.S. transmission grid. We have poles with average ages of 65 years and breakers that we could not give away to third world countries because they are so obsolete. I used to wake up every morning to a plethora of incidents that happened in the system. We have spent hundreds of millions of dollars just rebuilding what we had, to fairly good operating standards. When you start to address inter-state and inter-regional transmission projects, we realize that we are behind the eight ball. We have over-politicized transmission.
2. I hear people talking about high-voltage systems. I went to China and visited six high-voltage labs. They are moving power 3,000km across their nation. They have quit building wind turbines because they do not have transmission.
3. The most robust grid is a stable grid, and is also the most secure for the country. However, we are failing to recognize where we are at. When we talk about the security of the grid, we are all excited to talk about cybersecurity. If someone hacks into our system, we can regain control in 24 hours; however, we may not be able to recover from a physical attack for years. We do not have the physicality to protect they system from such a threat. We are not where we need to be. If we cannot maintain the security of our grid, and we are not committed to building a more robust grid, we have problems.

Presenter Name: David Mullett
Affiliation: Chief Executive Officer, Vermont Public Power Supply Authority

Main Points:

1. I appreciate that today's meeting is about sharing experiences. We have 12 municipal member systems with 31,000 total meters, and we account for six percent of Vermont's load. There are exceptional commonalities in the challenges that we share. Much of that commonality encompasses transmission more than any other subject. We all have interests in the same reliable and secure grid, built cost-effectively. We all recognize that the blend of coordination among physical construction, financing, and regulation is imperative.
2. The joint-ownership of transmission facilities model is one that could work. Our experience leads us to believe that the joint ownership model should be used to address the planning, siting, and financing of transmission facilities throughout the country.
    a. Joint ownership promotes planning and results in better transmission systems.
    b. We know the landscape and having all transmission companies in planning and siting helps.
    c. Access to capital and sharing of risks are key to transmission projects and common to all of us.
3. I believe that the joint ownership can, will, and has to work.
4. I would like to talk about the FERC's November 2012 policy statement relative to transmission adders. It has a project-specific focus and it does not make adders automatic. The implementation of the policy statement will be vital.
5. The transmission rate of return on equity, subject of litigation in the Northeast, is a step in the right direction for transmission.

Presenter Name: Honorable Betty Ann Kane, Chairman
Affiliation: District of Columbia Public Service Commission; Board Secretary, Eastern Interconnection States Planning Council

Main Points:

1. The District of Columbia (DC) is unique in the sense that we are completely dependent on transmission. We have no generation in DC. We decommissioned our last plants two years ago. We were pleased to receive the grant for Eastern Interconnection planning by state utility regulators. It was a $14 million DOE grant with Recovery Act funds.
2. The state regulators planning grant provided funding to establish the Eastern Interconnection States Planning Council (EISPC) made up of state regulators and policymakers. EISPC works collaboratively with the Eastern Interconnection Planning Collaborative (EIPC), made up of utilities and planning authorities. The purpose of the DOE grant was to provide positive input to the EIPC on inter-state transmission issues in the Eastern Interconnection.

3. The most important tools produced by EISPC are the studies and white papers. They provide practical information and practical solutions for states to help them with their decision making.
4. The real deliverable DOE wanted out of this was an inventory of clean energy zones for the Eastern Interconnection. We decided to do this primarily using a web-based Geographic Information System (GIS) mapping. It includes nine clean energy resource categories. It is a searchable policy and regulations database. Information comes from military installations, fish and wildlife, airports, and other sources.

Panel Questions and Answers

Q: We heard that one of the challenges for transmission planning is that there is no federal policy on transmission. We heard the need to maintain stability of the grid. We heard that joint ownership is a good business model, and that sharing of information and tools are critical to planning. As the Secretary said, all those issues are moving towards driving innovation. What is your opinion about how we can get to the point where infrastructure will enable innovation? How do we get there? What is the federal role in terms of enabling infrastructure?

Michael J. Kormos

- On the innovation side, at PJM we looked at the ability to modernize technology into our markets. In storage, we found a way to look at the value that it brings to the transmission grid.
- On the transmission side, it is a little harder because a lot of it comes down to the ability to get things sited. That is why we need to know what the future looks like. We do scenario planning, but we cannot use scenarios to raise money.

Kurt W. Bilas

- As far as innovation, we also try to eliminate barriers. New technologies have to be economic. We have done studies on compressed air storage and we saw geologic problems, we also found cost issues with batteries.
- If you use one technology more than another, it might make the other technology uneconomic. Therefore, there is a balancing challenge as well as technology integration barriers.

Joseph L. Welch

- I find it interesting to hear that we do not have an energy policy because we absolutely have an energy policy in this country. We just do not like it. We have what are called "markets." We try to superimpose regulation on top of the market. However, then we do not like the outcome because we cannot get the market to be efficient because the regulations cross multi-state lines and distort the market. We just do not have a political will to change our energy policy.

- Batteries will probably not become cost effective in my lifetime, but the fact is that pumped hydro is very efficient. I was very interested in battery technology and looked at battery installations in Hawaii – (1MW of battery storage consumes the equivalent of one oil tanker.) The parasitic losses and control mechanisms to run these batteries are enormous and the system has low thermal efficiencies. So, while I would like to put them in, I do not really see them ready for primetime.

David Mullett
- Technological innovation is influencing all aspects of the grid, including transmission, irrespective of regulatory regimes.
- Understanding the federal role, having a conversation, and finishing that conversation is very important. All conversations are iterative. Financing options, how we think about construction, how we site transmission, etc., is intertwined with what the federal role is.
- We have a responsibility to continue to develop what join ownership looks like.

Chairman Betty Ann Kane
- When it comes to innovation, states do not create technology. However, states do have a role in policy, when implementing technology like microgrids, smart meters, and distributed generation. They also encourage conservation and home-grown electricity.
- The states also intersect with the consumer and have statutory obligations to ensure the costs put in these systems are reasonable. State regulators need to be concerned about the impact to the consumer of technology development and costs.

Q: What policies need to be put in place to address system vulnerabilities? Are policies needed?

Joseph L. Welch
- The grid is vulnerable. We never built the grid to withstand all kinds of attack; we just raised the bar over the years. Now we have people that want to take the grid down. Although we focus on cybersecurity, physical security is the one issue that keeps me up at night. If you talk to the people in Ireland and Israel about their systems, they are in a different planet than we are. I find it amazing that we think the grid is secure and one can buy a map of the grid which identifies generators, for $25, and it does not take any hardcore analysis to identify which are the critical assets; in fact, we make all this information public.
- We do not need rules and regulations. What we need are the policies that allow grid operators to take action. I look forward to that discussion.

David Mullett
- I wrote two words: 1) depoliticize and 2) educate.
    - Depoliticize – because this is a matter of technical expertise. Cybersecurity, for example, is a complex issue that requires expertize, not politics.

- Educate – We have to educate the core consumer and make sense of the core message for people to understand security.

Chairman Betty Ann Kane

- Education and growing awareness are important. The National Association of Regulatory Utility Commissioners (NARUC) has guidelines for working with utilities on cybersecurity, which we have used in the District of Columbia. It is a checklist.
- At the regulator level, there is growing awareness about what the cybersecurity challenges are. In DC, we are putting about 50 feeders underground, primarily for reliability but also for security purposes.

Michael J. Kormos

- The questions are: What are the criteria we should be looking at? What do you want us to protect? How much are we willing to spend?
- There is an interesting dilemma between technology and resiliency. Technology allows us to operate closer to the edge, which is a good thing. However, the problem is that we do operate closer to the edge. One of the reasons PJM was not affected by the 2003 blackout is because we were not operating closer to the edge. Today we do not have that headroom. The more technology we put in place, the closer we operate to the edge.

Kurt W. Bilas

- Industry and the government are doing a lot of work together, such as the Electric Subsector Coordinating Council. There are a lot of people within the industry working with DOE and the U.S. Department of Homeland Security (DHS). They work on cybersecurity, resiliency, how to recover, how to protect, etc., and there is a lot being done without getting a lot of publicity.

Q: Is there a change in policy needed on regional transmission planning? Where do you think transmission planning is headed and what fixes might or might not be needed?

Michael J. Kormos

- We are very much market driven; but, the biggest issue is cost allocation. A project does not get done unless it is a no-brainer, which is unfortunate because we are missing some great opportunities. Some of these costs have to be shared.

Kurt W. Bilas

- One thing that needs to be recognized is that regional and inter-regional planning is hard work.
- With regard to inter-regional planning, MISO did multi-value projects. There were 17 projects at a cost of $5 billion. Some of them are in operation and others contracted, but that process took six years to get done. The cost allocation, alone, took two years. To be able to do that, 13 states worked together with multiple meetings to come up with a

process. Eventually, it got approved by FERC. What we have to recognize is that none of that could have happened quickly, especially the cost allocation.

Joseph L. Welch

- First, we have markets, then we regulate them, and then we politicize it. This is not a problem of whether or not we can build it or design it. The problem is how to get it through the process.
- We are running a system on the edge, which is not a substitute to building a robust grid. We do not know how robust we need until we have a failure. If we have the same set of effects of August 14, 2003, we would have the same exact result we had. We do not have a robust grid, we just do not.

David Mullett

- We are often changing to the new thing before we tried the old one. When you think about FERC Order 1000, you think it might be around forever, but that may not be the case. We often react without knowing what the next thing is going to be. I do know the process is complex and lengthy.

Chairman Betty Ann Kane

- States recognize that this is a regional problem and it is getting more complex. We have all these mandates coming down from agencies such as the EPA. So, it is a moving target.
- Five years ago we were not thinking about how natural gas impacts transmission. Because a transmission system is a big physical thing, it is going to be a difficult thing forever. There is increased awareness from the states about working together and collaborating, but every time you turn around there is something new to consider.

Panel II: How Do We Cope With New Challenges and Opportunities?

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Presenter Name: Sean Trauschke
Affiliation: President, OG&E Energy Corporation (OG&E)

Main Points:

1. OG&E has about 800,000 customers and we are the largest utility in Oklahoma. I will focus on three things:
    a. The value of the grid
    b. The changing dynamics of the business
    c. The actions we have taken and the opportunities going forward
2. It is important to accept that there will be customers regardless of the economics. Utilities are responsible for providing safe, reliable energy to customers. Our rates at OG&E are 20 percent lower than the national average. We want to keep our rates low to support continued economic growth in our region.
3. Traditionally, customers were looking for price and reliability. Going forward, they are looking more for services and control of their energy usage.
4. If you think about the opportunities for the grid, it is more than just an integrator. It is an enabler with the use of technologies that optimize reliability and performance, as well as customer engagement. The way forward is to bring together traditional generation resources, renewable resources, distributed generation, and demand response.
5. In the year 2007, we had a goal of avoiding incremental fossil generation. We accomplished that goal by adding wind power and also deployed our smart grid program. Accomplishing those two deployments shifted 150 MW off the grid. It is appropriate to thank DOE for the grant provided under the DOE Smart Grid

Investment Grant program (SGIG). We have launched several initiatives as part of that investment and we saved our customers money. We have 100,000 customers signed up in a program, in which we send them price signals indicating when to turn their appliances on and off.

6. Continued innovation is required and we are looking forward to that journey.

Presenter Name: Scott Prochazka

Affiliation: President and Chief Executive Officer, CenterPoint Energy, Inc.

Main Points:

1. The electric industry is undergoing a rebirth, evolving into a dynamic energy network transformed by digital communications, distributed generation, competition, and innovation.
2. Customers are changing from receiving one-way electricity flows to being an active participant, sometimes providing energy for the grid from their solar panels. At CenterPoint, we embrace this future and see enormous potential for environmental and consumer benefits.
3. We do not generate or sell power. Our focus is to provide safe, reliable, resilient energy in a rapidly changing market and industry. While participating in DOE's SGIG program, we invested over $750,000 in advanced metering systems, grid automation, and supporting systems. Two years ago, we completed the installation of 2.3 million smart meters and 750 automated grid switches on distribution lines. These investments are making a big difference.
4. Since 2009, we conducted 10 million service orders remotely, saving 8,000 metric tons of CO_2. We saved one million gallons of fuel. Using smart meters and power-off notification features, we restored power to 800,000 customers without them needing to place an order. We are also dispatching crews faster than we had ever been able to do previously.
5. Since 2011, thanks to the fault localization and remote switching capabilities we installed, we have avoided 100 million customer outages and improved reliability by approximately 35 percent. Our power alert service notifies customers by email or phone call. Next year, we will have paid of our investment in smart meters and our initial investment in grid automation.
6. In addition to directly helping consumers, the smart grid investments are providing infrastructure to allow other companies in the market to develop and sell value-added services.
7. We believe these investments are also essential to preparing for the future. Emerging technologies require a robust and resilient grid, capable of managing two-way energy flows. New technologies require new training and operating standards. We are collaborating with DOE, states and local government, standards boards, technology partners, and others on numerous grid-modernization issues. We are sharing the knowledge from these collaborations with stakeholders around the world.

8. We need financial recovery mechanisms that recognize the importance of the electric grid. We are committed to investing in the grid and plan to invest $800 million this year, and several billion over the next five years.

Presenter Name: David Hallquist
Affiliation: Chief Executive Officer, Vermont Electric Cooperative
Main Points:

1. Electric cooperatives serve 75 percent of the U.S. landmass. We serve areas that are difficult to serve from an economic standpoint, and we have customers that spread over large areas. We serve Northern Vermont, with 74,000 members. Our citizens still trust our government and we all work together and are rarely misaligned.
2. We consider ourselves a technology leader. Thanks to technology, we have reduced outages by 75 percent, over the last ten years. We are committed to Vermont. We met our 2017 renewable energy goals in 2013.
3. During the Clinton Administration, we started adding global positions systems (GPS) and smart grid technology into our system. We implemented two-way metering without public investment and had less than a five-year payback. In 2008, we implemented our outage management system. In 2009, we designed an in-house software to allows our members to see their usage. In 2010, the entire State of Vermont applied for a SGIG grant, and we were part of it. In 2011, we conducted a DOE-funded consumer behavior study under the SGIG program, which was a disaster due to the polar vortex.
4. In 2012, we hit our net metering cap of 4 percent. As a result, we agreed to increase our net metering cap to 15 percent, as long as we were allowed to do some pilot projects. We have an ongoing pilot on community-scale solar. We can install solar power for about half the price of rooftop solar.
5. Lesson learned: We have been looking internally and we are now looking externally. We are going to exceed our member expectations. Any business can be what the customers tell them they want the business to be. The smart businesses are figuring out what the customers want before they know what they want.

Presenter Name: Wes Kelley
Affiliation: Executive Director, Columbia (TN) Power & Water Systems
Main Points:

1. The electric utility industry is facing unprecedented challenges. We are about to witness a radical change to the business model that has powered our industry for the last 100 years. I believe that utilities must actively manage this change if we are to continue to provide affordable and reliable electric service.
2. I would like to make two points:
    a. Firstly, the development of distributed energy resources (DERs) has initiated a significant transformation of the electric industry. The integration of these technology-enabled resources requires a thoughtful transition so that existing

utilities are not merely reacting to these changes, but rather are able to actively plan and participate in their development.

   b. Secondly, any transformative policy proposals must maintain safety, reliability, and the lowest possible rates for all customers.

3. The bulk electric grid was designed for central station power plants to provide electricity to transmission and then distribution systems for delivery to customers. Recent changes make it possible for industrial, commercial, and even residential customers to supply at least a portion of their own electricity needs. This disaggregation will continue because there is a drive by consumers to adopt distributed generation technologies and because central station assets face an ever-increasing array of environmental regulations, creating uncertainty and making it difficult to plan and build these assets.
4. Columbia Power, and my peers in the Tennessee Valley, appreciates these advances. In the Tennessee Valley, the Green Power Provider program has been a model for promoting and integrating small-scale solar into the distribution grid.
5. We have also pioneered energy efficiency measures and demand response programs. Since 2008, we have avoided over 700 MW in additional generation.
6. The central challenge before us can be captured in the following question: How do we, as public power systems and utility regulators, provide stable rates and ensure electric reliability as DER adoption increases?
7. We cannot simply install new DERs and ignore the inevitable shift that utilities must make to accommodate: a) the variability of the new resource; b) the need to recover existing infrastructure costs; and c) deliver reliable backup power when DER resources are not operating.
8. Utility rates reflect not just the price of the energy consumed, but the recovery of costs associated with building and maintaining the physical distribution assets needed to deliver power every day and all night. It is essential that the intermittent nature of DERs be accurately valued in retail rates.
9. In closing, I would like to make the following recommendations to DOE for inclusion in its QER report:
   a. The DOE should work with utilities to promote and encourage the development of innovative energy efficiency and demand response products and services that enable the efficient and effective management of the electric grid.
   b. The DOE should encourage communication among state regulators, utilities, and DER developers to ensure that DER benefits are not over-incentivized and that existing distribution assets and reliability continue to be adequately valued, especially avoiding undesirable cost-recovery models that disadvantage non-DER customers.
   c. To facilitate the transition to a new model, DOE should provide equivalent assistance (in the form of grants, loans, technical guidance, and otherwise) to utilities working to integrate DERs in their territory, as well as to developers and installers.

d. DOE should recognize that public power systems, serving more than 2,000 communities across the country, are locally-governed organizations. Therefore, monolithic and top-down solutions are difficult to implement and may be unrealistic.

Presenter Name: Damir Novosel
Affiliation: President, Quanta Technology; President-Elect, IEEE Power and Energy Society

1. Our industry is in a transition phase. The QER efforts are crucial for the future of the grid. IEEE provides unbiased and independent technical leadership to the electrical power and energy industry.
2. The electrical power and energy sector will continue evolving as consumer expectations and options change, technology breakthroughs happen, and energy sources and their usage is transformed.
3. I want to emphasize the importance of having multiple solutions. We need all sources of energy; we cannot push for an individual solution.
4. Aging infrastructure is an issue. In the last few decades we have had an expansion of infrastructure but, in the last few years that focus has not been very strong. You cannot look at the age of a particular facility in isolation. The system must be considered through holistic asset management. All issues are related, to achieve reliability and security (cybersecurity, storm hardening, and other efforts).
5. The business model has changed. Some people believe that microgrids will be the way of the future and others do not. Both sides have a case. When the grid first started it was essentially a microgrid, but from then on it turned into a large, interconnected system. Neighbors can help neighbors with reliability. Technology has changed, so microgrids now are helpful. There is a balance.
6. With regard to transmission, we need to have a grid to move renewable energy from the source to the consumer.
7. Microgrids need to be integrated. Our policy should support value creation and reward results. To achieve efficiency and reliability, make sure you do not see the grid as “free storage.”

Presenter Name: The Honorable Dianne Solomon
Affiliation: President, New Jersey Board of Public Utilities (BPU)

1. New Jersey has had it challenges, such as Super Storm Sandy, which have resulted in lessons learned. Super Storm Sandy shut down 75 percent of New Jersey’s electric distribution system, and 2.8 million people were without power. It was the largest mutual aid response - 17,000 workers spent 14 days to restore 90 percent of the grid.
2. After Super Storm Sandy, New Jersey’s four electric distribution companies were asked to submit storm preparedness and response plans, including infrastructure hardening, enhanced communications, and smart grid plans. I am happy to say that we did participate.

3. In 2013, the New Jersey BPU opened a generic proceeding for all utilities to file mitigation and hardening proposals. Utilities responded to the request with infrastructure projects, including PSE&G's Energy Strong proposal, which is the largest infrastructure investment program ever approved by the New Jersey BPU..
4. Unfortunately, we do not have an infinite supply of resources. As regulators, we must also be cognizant of the consequences of the economic vitality of our State, its businesses, and its residents, all of which shoulder the cost of infrastructure improvements.
5. Super Storm Sandy also presented us with a number of opportunities. We recognized the benefits of having distributed resources on the grid. There were locations throughout the State that were able to generate their own power and remain operational. We are interested in making these technologies available to the most critical facilities in our State, beginning with water and waste water facilities. The BPU has partnered with our Economic Development Authority and the Department of Environmental Protection to develop an energy resiliency bank for funding. The bank's purpose is to fund distributed energy resources at critical facilities and fund combined heat and power capabilities. One hundred percent of the financing is through a combination of grants and low-interest loans.
6. New Jersey has some of the highest electricity rates in the nation and we are looking for ways to reduce our costs, reduce congestion, and provide resiliency.
7. We recognize there are challenges along the way. However, we are very encouraged by the interest that we have already generated with these programs.

Panel Questions and Answers

Q: All of you have been innovators in transforming the distribution system sometimes with the help of the federal government, sometimes privately funded, and sometimes due to extreme weather events. What is one of the major lessons you learned? What lesson can you give the QER Task Force that could be applied at other distribution systems?

Sean Trauschke

- One size does not fit all. Innovation of the distribution grid comes in many forms. OG&E has installed 150 smart reclosers by which we can isolate many faults on the system, but that does not fit for the whole system. We also looked at being able to analyze and control fault indications to dispatch crews during an outage, and we do that on certain circuits. My point is that there are a lot of opportunities across the system; it is not one-size-fits-all.
- Consumer expectations are driving more forward momentum and we have to keep being innovative. There are many opportunities based on social issues, geology, and climate. We have to listen to our customers because they are our best voice.

Scott Prochazka

- The use, value and criticality of information technology are not for back-office system anymore. We have evolved to the point where information technology systems have become operation technology systems. They provide and conduct front-line activities. They make things happen in the field and if they do not work properly, then field activities are not being executed on time.
- The other key lesson is that this all has to be done with the customer in mind. It has to be done to better connect to the customer, allow them to make their own decisions about energy management, and we need to make them see the value added.

David Hallquist

- We are looking at the world through our lens and our lens is command and control, which is outdated. I love our youth because they are not loyal to us. They do not care about us. They just want it done right. Vermonters are committed to climate change, but we also want to keep our rates low.
- Consumers today are expecting things to be different.

Wes Kelley

- We should not forget to communicate and educate, especially to the local rate payer. We have to provide value to them. If we do not do that, they have a legitimate reason to be concerned. Smart meter deployments required a lot of continued customer education.
- When we talk about distributed generation, such as solar-powered generation, education is a big part so that when we communicate to rate payers, we can tell them the value it provides. We cannot forget low-income rate payers and we need to show them the value of our investments.

Damir Novosel

- In California, after installing smart meters, some of the consumers' bills went up. There was a real need to communicate with them about this.
- I want to emphasize that we need to make it simple for consumers. There are three factors that are important to communicate when improving the grid: simpler, cheaper, and comfortable. That is what consumers want to see at the end of the day.
- It is also important to think about how we treat various consumers. It is important to emphasize the need to be connected to the grid. Poor people pay for what the rich people are able to accomplish, so you have to be very careful with this issue.
- The grid is complex and requires modern technology, such as synchrophasors for transmission. We need better models and monitoring.
- If a transformer is old, there is no way any smart grid technology can help out.

Dianne Solomon

- We always need to consider improving communication, cooperation, and transparency.

- I urge utilities and businesses interested in moving these technologies forward to be able to communicate, cooperate, and present their proposals in a transparent fashion.

Q: We discussed the deployment of new technology on the grid such as microgrids, electric vehicles, energy storage, and distributed energy resources. What are your recommendations to deploying those new technologies in the Eastern half of U.S.?

Sean Trauschke

- It is important to recognize that regardless of economics or technology, there will be customers using this type of resource. Our job is to make sure that we have done some pilots ahead of time and we really understand the dynamics of what will occur.
- Each system and community is different; so it is important to understand that there is not one solution, but rather multiple solutions.
- The goal has to be about increasing value of product and expanding our services to customers.

Scott Prochazka

- We should consider some larger-scale pilot activities to combine technologies on a set of circuits, to see how they behave when we stress the system. We can use it as a test bed. There could possibly be a federal supportive role, such as through R&D funding.

David Hallquist

- When we talk about new load sources, such as heat pumps, electric vehicles, and advanced grid technologies, we need to look for integration opportunities because they allow us to optimize load factors. The needs of the customers can be met through distributed generation as well as new electricity technologies.

Wes Kelley

- Distributed energy resources is a big concept that captures anything on the distribution side that is behind the meter, pushing power the opposite of the traditional way. Demand response programs have capabilities almost everywhere. In our area, for example, we have many electric water heaters which we are using as energy storage devices. There are regional innovative opportunities.
- In terms of distributed generation, siting is a big issue. For example, in our area, the best place to put a wind turbine is on top of the Smokey Mountains. People are obviously not very excited about that idea. For that reason, we do not have much wind power in the Tennessee Valley. We buy it and transport it in.
- In terms of solar power, I think that utility-based solar and community-based solar power makes more sense than rooftop solar, in some cases.

Damir Novosel

- When Super Storm Sandy occurred, people bought diesel generators. Is it better for each house to have a diesel generator, or is it better to have a neighborhood community-based solution? The latter is cheaper for the consumer. If we extrapolate that to microgrids, a few microgrids can cooperate and work together to provide resiliency.
- We often forget safety. During the lifecycle, the system gets old and starts failing. If the microgrid is not maintained, it could be dangerous.
- In addition to resiliency, distributed generation has other benefits, such as cost benefits.

Dianne Solomon

- Bringing new technologies to the State of New Jersey relies on a lot of people. We need to be informed by industry, consumers, staff, and others.
- In order to employ new technologies, all those considerations need to be evaluated.

Q: What is one specific recommendation for the QER Task Force for inclusion in this year's report on infrastructure?

Dianne Solomon

- Be willing to have all parties and states involved. Many times these recommendations do not have the type of input that the states would like to have. These are complex issues with competing interests. The states have a unique role to play in integration. I encourage the federal government to talk to states that are innovative and get their input.

Damir Novosel

- Sometimes, technical issues are muddied with political aspects. It is best to separate the technical aspects from the policy aspects. Make regulatory recommendations based on technical aspects.

Sean Trauschke

- It is important to have sufficient engagement in this process and that implementation is at the local level. It is a function of not losing sight of who the end user is and which consumer is looking for more and more services.
- It is important to increase value of the grid, making it more dynamic, including more technology.

Scott Prochazka

- Over the last decade, discussions about investment have been at the transmission level. We have to recognize that we need to make investments at the distribution level.

David Hallquist

- It may be impossible, but we really have to keep the politics out.

Wes Kelley

- Focus on value of the local rate payer. Safety and reliability are obvious priorities. Rates are different across the country because we have different power supply realities and sources of power. Our focus must be to keep the local system strong and our rates low.

Panel III: Business Models and Regulation of Regulated Utilities- Do They Need to Change, and if so How?

*NOTE: All speaker presentations are posted on the QER webpage at: **www.energy.gov/qer***

Presenter Name: Ashley Brown
Affiliation: Executive Director, Harvard Electricity Policy Group

1. I was asked to set-up this discussion. Let me mention the characteristics of the old regime. In the old model, for utilities the characteristic had very limited upside potential. Pricing was such that the customers could not do much about it other than pay their bills. There was a limited spectrum for socializing and privatizing risks.
2. Current challenges are rapidly changing technology, such as the smart grid, distributed generation, microgrids, and new ways of managing technologies. Consumers have more options and resource options are greater than they were before; and the public is much more aware than ever of externalities. We also have to deal with the legacies of the old regime.
3. The biggest challenge of all is the emergence of competition. Generation is now a competitive industry. The transmission business has changed fundamentally, and the public does not entirely understand that these are fixed costs and does not understand the full value of the distribution grid. In many jurisdictions, energy sales

are now separated from generation. Metering and billing could, in theory, be open to the market place.

4. So, one has to look carefully at the services utilities have to provide. Basically, the "wires" business is a core business. Just about everything else is a non-core business.
5. The public policy question is: who is in the best position to perform core and non-core business?

Presenter Name: Ralph Izzo
Affiliation: Chairman and Chief Executive Officer, Public Service Enterprise Group Inc.

1. The topic is: do utilities and the industry's regulation need to change? On the demand side, the answer is emphatically "yes."
2. I am a strong believer in, in the economies of networks, and in the value of universal service. I will focus my comments on three areas:
    a. Transmission and distribution: The need for change is of a regulatory nature – allow for greater predictability of capital deployment.
    b. Carbon constrained future and the need to be more efficient in the use of electricity: The U.S. ranks 13 out of 16 in the utilization of energy resources. Approximately 50 percent of what we get paid by customers goes to fuels, but my company is not in the fuels business. The key is that the revenue decrease that my company sees from reduction in energy use, as long as it is less than the decrease in cost of goods sold, is a win for the consumer, environment, and the company. Energy efficiency, if properly regulated, can be a triple-win for all parties involved.
    c. Renewable energy technology and distributed energy: The median household income in the U.S. is $48,000. The median household income in New Jersey is $69,000. The median income of net-metered customers in New Jersey is $130,000. We need to focus on subsidized technologies such as grid connected solar power, which allows utilities to deploy these subsidized technologies, resulting in more power to customers. The role of the utility is to capitalize on economies-of-scale and the ability to focus on universal access. We need to be careful about subsidies to customers and focus on the utility, which can deliver benefits to all customers.

Presenter Name: Steve Corneli
Affiliation: Senior Vice President, Policy & Strategy, NRG Energy (NRG)

1. NRG has 3 million retail customers and is the third largest developer of renewables in the U.S. power sector. We have solar and wind power, microgrids, carbon capture technologies, backup generation, electric vehicle charging networks, and more.
2. My prospectus is slightly different from my colleagues who have regulated assets. The key thing to keep in mind is that distributed energy resources are becoming widely available, increasingly cheap, and increasingly attractive to consumers. At the

same time, the costs of transmission and distribution, and in particular distribution, are going up. This is a recipe for a business model change.

3. This is a challenge for all of us in the power sector because we all depend on selling through wires. In a sense, we are seeing the economies-of-scale being eroded by the emergence of competitive alternatives. This has the potential to put revenue requirements at risk, above where the utility can charge more.
4. The bad news is that right now we do not have a good regulatory system to sort what the utility can do and what the competitive market can do.

Presenter Name: Thomas A. Fanning
Affiliation: Chairman, President and Chief Executive Officer, Southern Company

1. The U.S. is in a position where we can set energy policy based on abundance, and if we can develop a position of energy security, the U.S. can be energy secure by 2020. Energy security brings national and economic security.
2. The right policy needs to balance clean, safe, reliable, affordable energy for America.
3. In the Southeast, we have an integrated, regulated business model. We bring value to the customer every day. Our transmission and distribution business is at a 12-year low in terms of frequency of interruptions. We just received the latest customer satisfaction surveys and the top four were Southern Company companies. Our prices are also significantly below the national average.
4. Regarding models, we should all first think of these questions: what are you trying to fix? Who matters at the end of the day? The answer is the national economy and the customer.
5. When I think of electricity policy, I put it into three buckets:
    a. What is the kind of model that would take advantage of America's portfolio of energy resources?
    b. I do not think of energy efficiency as a threat to reduce sales. We are in the digital economy and we will continue to use electricity.
    c. There is a lot of innovation and the game changer will be in storage.

Presenter Name: Greg Starheim
Affiliation: President and Chief Executive Officer, Kenergy Corp.

1. We serve 56,000 members and offer some of the lowest electric rates in the country. As a result, we have a very strong commercial and industrial base. We are very pleased to support some very energy-intensive businesses.
2. Rural electric cooperatives (coops) share a common business model, which is the primary objective of serving our members.
3. We would like to share a few comments about offering distributed energy services. Coops take our business seriously. As a result, we provide our members with information about smart grid technologies, software, and ways to analyze energy usage and make informed decisions. We feel that we have an obligation to help

consumers with programs such as demand response, or to create community solar opportunities to create economies-of-scale for consumers to buy into these projects.

4. I would like to make a point about rate design. Whether or not current rates are designed to allow coops to recover their fixed costs and if it is true that we will see an increase in energy efficiency renewable penetration, then revenues and sales should go down for electric utilities. It is therefore paramount for utilities to have the ability to recover their fixed costs.
5. Members participating in our energy efficiency programs are the consumers that are most able to afford those programs. Serious thought needs to be considered to socializing the costs of some of these programs for those who are least able to pay for them.

Presenter Name: The Honorable Garry A. Brown
Affiliation: Commissioner, New York Public Service Commission (PSC)

1. Last April, the New York PSC launched a proceeding called Reforming the Energy Vision (REV) initiative. We have 259 parties participating. We are looking at the utility delivery system and all pressures that exist, whether we like them or not, which are changing the traditional model. Unidirectional power flow has been the model.
2. The PSC is looking at a series of events that might be changing these dynamics. We have seen a greater desire for power reliability and power quality. There is a lot of additional equipment being put into the system.
3. We see cyber- and physical- threats and the bi-directional system makes it more vulnerable.
4. We have seen more extreme weather events. Renewables are providing more power to the system. We heard of all the technologies that may be employed, such as storage, solar power, smart grid, and electric vehicles.
5. The PSC is trying to align the regulatory practices with these changes. Why can utilities not make money by running their utilities extremely well? We are looking at the regulatory paradigm to see if there are changes that should be made to make things happen.
6. We have to be concerned with safety and costs. We believe you can achieve a lot without jeopardizing costs and safety.

Panel Questions and Answers

Q: We discussed the desirable characteristics of the grid in this changing environment. Please give your opinion on whether or not new regulations are needed to incentivize these characteristics of the new business model. If so, should they be at the federal or state level? Or should the government step out?

Ashley Brown

- Regulations are always going to change. There is nothing predictable about regulations. A lot of these changes are going to occur anyway.
- The real focus of regulators should be: what are the incentives we need to put in place? Are we putting incentives to make things more efficient? Often, regulators do not look at the implications of their regulations.
- Socializing the costs might be politically easy to do, but it is the wrong thing to do from an economic and an efficiency standpoint.

Ralph Izzo

- At the state level, we need more predictable, less time consuming, and faster recovery of investments for core infrastructure.
- The highly-educated customer knows what their rate is, but few know what their consumption is.
- At the federal level, stop picking winners and losers. Create a block grant program with clear policy objectives and work with the states to come up with the metrics.

Steve Corneli

- Discussions about incentives tend to overlook something important. As the cost of distributed energy comes down, no rate design or incentive is going to be sufficient from preventing the substitution of large amounts of distributed energy production.
- There has to be a better way to identify how the regulated infrastructure we depend on better integrates and supports consumer choices.

Thomas A. Fanning

- Socializing costs is a terrible idea. It is short-term gratification at the expense of long-term wisdom.
- In general, we are much better off not having any new federal regulations. However, DOE has been a terrific partner.
- When the American Clean Energy and Security Act was being proposed, the Electric Power Research Institute (EPRI) produced a solution from its Prism model. Very quickly we realized that every part of the U.S. was different. EPRI responded with Prism 2.O which came up with regional optimizations to decarbonizing the nation's energy future. The EPRI model and its updated 2.0 version of the model is a perfect example where regional, local approaches are much better than a national, one-size-fits-all strategy.

Greg Starheim

- How do we deliver electricity safely, and reliably, at the lowest possible cost? If there are technologies and business models, Kenergy would be interested in providing that service if the cost has been evaluated and it truly represents a service to our members.
- I would also like to emphasize the issue of subsidization. I believe that those who participate in these programs should be those that fund the costs associated with these programs and not socialize costs across all consumers.

Garry Brown

- We need to look at the regulatory paradigm and the way it has traditionally been used. New York has increased from 25,000 MW to 35,000 MW peak load. However, we have not grown that much in population and manufacturing has gone down. We spend billions to maintain these peak loads. The average load is under 23,000 MW; so we maintain 12,000 MW capacity for a couple hours of peak load every other summer. It is time to look at other approaches that deal with some of these issues.

Q: We heard about the business model that incorporated microgrids to hedge against threats and vulnerabilities. What do you think are the vulnerabilities and threats to the utility business model, if any? What is the most optimal way to address those issues?

Ashley Brown

- Microgrids are good for people that need an added level of reliability and voltage fluctuations. But, in the case of a hurricane how much good does it actually do the system? In terms of having backup generation, gas and diesel generators provide backup.
- Storage has huge reliability implications. However, it is at its embryonic stages and is expensive; and batteries, for example, have environmental issues.

Ralph Izzo

- There are places where microgrids and combined heat and power make sense. There are no impediments to those technologies being deployed in places where it makes sense.
- I think where policymakers go astray is when developers come to them and say "if you only give me this grant…" They do not say "to overcome the natural economic advantages of the grid, then I can make this work." Policymakers then fail to recognize what they have done. They create an economic dislocation that removes the most preferential customers.

Steve Corneli

- What is a motivating resiliency solution is consumers' desire to have reliability. We are seeing lots of interesting resiliency solutions, such as smart inverters.
- What is missing is the notion that consumers are more and more dependent on electricity and resiliency solutions are as mundane as keeping your basement from flooding.
- To me, this has nothing to do with subsidies, but giving customers what they want. It does work and it is not only driven by subsidies but people wanting to have reliable electricity service.

Thomas A. Fanning

- I would argue that microgrids can be more of a problem than a solution. There are areas where microgrids make sense. Otherwise, you are much better off having the resiliency

of a networked grid. Even in the event of distributed generation, if all you had on your house was a solar panel, you would burn all your electronics due to the fluctuation in power quality.
- I do not think microgrids are disruptive, but a long-term storage solution is disruptive.

Garry Brown
- Princeton had a microgrid because they did not want to lose their research and as a result, they maintained power during Super Storm Sandy. It was not done because it was a cost-effective option.
- Regulators and utilities can be a roadblock. Many years ago we saw examples of gold-plating interconnections that discouraged microgrids.
- Microgrids are not the be-all or end-all. Having a microgrid means that when the system goes down- you go down, unless you spend a lot of money to maintain the reliability of the system.

Q: What specific recommendation do you have for the QER Task Force?

Ashley Brown
- We need to contemplate the role of energy efficiency.
- We need to enable innovation, but be aware of the subsidies you use and the reason behind them.
- Using market mechanisms means that regulators are always going to look at equity.
- There needs to be an overlying discipline in the industry – a market discipline.
- Do not ignore the value of the basic infrastructure; look at its intrinsic value.

Ralph Izzo
- We do not spend enough time thinking about how to make energy efficiency the centerpiece of our energy policy. The role of the federal government is the granting of funds, policy pronouncements, and creation of standards towards reducing energy demands of this country.

Steve Corneli
- We want cheap distributed and grid-scale energy resources, more transmission, more distributed resources, and harder and more resilient distribution systems. The issue is that there are positive and negative trade-offs. When distributed energy is cheap and successful, it will be harder to pay for the regulated infrastructure and there needs to be more thinking about how to integrate both those kinds of energies and the business models necessary to pay for them.

Thomas A. Fanning
- The U.S. has an opportunity to grow the economy and create jobs, but to do that we must not rely on single-issue politics; but rather balance the notion of clean, safe, reliable, and affordable.

- We are going to have to take advantage of the portfolio approach and set as a national priority the reinvestment and "re-energization" of innovation in this business. We need to allow the states flexibility to decide what is best for their state and their region.

Greg Starheim

- Regulators should consider the true costs of these programs and allow coops to work with third parties on implementing them.

Garry Brown

- The paradigm shift, from the unidirectional shift to something a little more complex, is going to happen at different paces in different areas.
- We need to understand that as a more diversified grid becomes a reality, the ramifications are system reliability, safety, costs, and customer satisfaction. Times are changing.

Public Comments

The public is allowed to sign up to provide comments, and each commenter was allowed five minutes in which to make them. Commenters were asked to approach one of the standing microphones as their name was called to introduce themselves, their organizations and make their comments. On the stage representing the DOE's Office of Energy Policy and Systems Analysis were Dr. Karen Wayland, Matt McGovern, and Larry Mansueti.

The U.S. Department of Energy encourages everyone to file written comments at QERcomments@hq.doe.gov to ensure a wide variety of public input into the QER process.

Public Commenter Name: Jennifer Chen
State:
Commenter's Main Points

1. Good afternoon, my name is Jennifer Chen and I am an attorney with a project that is a coalition of state, national, regional environmental and public interest organizations working to expand deployments of cleaner and more efficient resources into America's electricity transmission grid.
2. Our nation's energy usage patterns and resource generation portfolios are evolving to embrace more lower-carbon and renewable resources as well as market mechanisms to encourage smarter energy use. The EPA's proposed Clean Power Plan will further this progress. This QER meeting on transmission, storage, and distribution is an important step in understanding how electric grid infrastructure and related markets should adapt to facilitate our continuing adoption of cleaner and more efficient energy sources. This will benefit consumers, businesses and the environment.
3. The QER has the opportunity to help us transition to clean energy more cost-effectively by providing a comprehensive roadmap for the electricity sector. Our recommendations today for the QER pertain to three points: expanding access to renewable energy, broadening the geographic scope of regional transmission planning, and including and leveling the playing field for demand-side resources (DSR) in the transmission planning process.
4. First, investing in and modernizing the transmission system is critical to expanding clean energy resources such as wind and solar power. A well connected, diverse grid is also vital to reliability and the efficient operation of wholesale electricity markets over large regions. So as long as transmission is smartly sited, there is broad stakeholder support of transmission expansion to integrate renewables onto the grid.
5. FERC Order 1000 is an important step in the right direction because it requires grid planners to incorporate grid needs driven by public policy requirements, such as state renewable portfolio standards and the pending CPP into their system plans. However, FERC Order 1000 can and should go further.
6. FERC Order 1000 requires that the regions develop a plan for themselves, but that neighboring regions only coordinate with each other; not necessarily develop an interregional plan. FERC could require more interregional planning that will enable transmission projects necessary to integrate renewable energy to move forward in a timely manner. The Eastern and Western Interconnection Planning Collaboratives, for example, have demonstrated the value and potential of interconnection-wide planning, which should be continued.
7. The misalignment between the political boundaries of state and regional policies and the geographic boundaries of the interconnected transmission grid is also a problem worth emphasizing. The QER could complement FERC Order 1000 planning by providing guidance on how planners and policymakers can reconcile state renewable portfolio or carbon pollution standards with grid and RTO footprints that do not respect state boundaries.

8. The QER also should recognize the value of DSR in not only distribution but also transmission system planning. Demand response, energy efficiency, energy storage and other energy-saving non-transmission alternatives (NTAs) can often enhance grid flexibility and reliability just as well and at equal or lower cost than traditional transmission. Reducing and optimizing demand not only reduces the amount of energy that needs to be generated and capacity maintained, but also the amount of transmission capacity that needs to be built. For example, energy efficiency in the Northeast has saved hundreds of millions of dollars in avoided transmission investments in only a few years. Also, NTAs can help provide flexibility to the grid needed to integrate higher penetrations of renewable energy.
9. Currently, most planning processes are biased in favor of transmission solutions, giving demand side solutions short shrift. In order to fully take advantage of NTAs, DSR, distributed generation and other technologies, NTAs must receive comparable treatment in the markets and planning process. Regional planning must more accurately account for load reduction from DSR in load forecasts.
10. In conclusion, we respectfully request that the QER emphasize NTAs as a means of providing flexibility and reliability benefits that will enable efficient use of existing transmission, in addition to allowing electricity demand to be met at lower cost. We also ask that the QER recommend further study into interregional planning issues.

Public Commenter Name: Jimmy Glotfelty, Clean Line Energy Partners
State: TX
Commenter's Main Points

1. We have three high-voltage distributed current transmission projects in the East. The goal of these projects is to move low-cost wind energy. If the goal of the QER is to get lower-cost, cleaner energy to load centers, then transmission system needs to be built, because the alternating current transmission system is not there.
2. Another goal of the QER is to reduce CO_2. Moving wind energy through a DC line can reduce a huge amount of CO_2, by moving huge amount of power quickly. If successful, our three projects will be reducing 31 million tons of carbon.
3. Because HVDC lines allow for moving huge amounts of power, huge economies-of-scale result.
4. DC lines are also important when it comes to rights-of-way management. If a lot of wind energy in an AC system needs to be moved, much bigger rights of way are needed.
5. Using DC lines helps the manufacturing base in the U.S., not only for wind and solar power, but also for conductor manufacturers, insulation manufacturers, concrete, rebar, and steel. The majority of HVDC installation is home based. HVDC is not an international business.
6. As the QER report is written, citations are needed. I wanted to point you to the Joint Coordinated System Plan and the EIPC, which were both DOE funded. DOE has done a lot of this work. The EIPC said that six lines need to be built to move as much wind power as needed. The Joint Coordinated System Plan said seven DC lines are needed.

The Southwest Power Pool said DC lines are more economic. It just makes sense. We are not a global leader in this space, but we can be. We do not need to follow China.

Public Commenter Name: William White, on Behalf of Americans for Clean Energy Grid Project of the Energy Future Coalition
State:
Commenter's Main Points

1. The Americans for Clean Energy Grid Project supports clean power policies.
2. The value of the network is important to recognize. Electricity is a necessity in modern life. Any of us who have been through an extreme weather event, who have lost power for several days, know how different our life is without electricity, and it will become more important going forward.
3. We hope DOE is supportive of state regional and local efforts to promote energy efficiency, distributed generation, storage, smart grid technologies, demand response and all the demand-side resources proliferating around the country. That said, we are looking to the Administration and the DOE to deliver a national vision for what that network should look like. The future will include HVDC technology and smart technologies. However, we need to achieve reliable, clean electricity going forward and the value of the network is an indispensable investment. We look to DOE to deliver that message as part of the QER.

Meeting Conclusion

Dr. Karen Wayland expressed appreciation to everyone who took the time to present their views and participate in the process. She announced the next series of meetings which can be found at www.energy.gov/qer.

Dr. Wayland mentioned that the panelists' written statements from the meeting will be posted on the web within the next 24 hours. She recognized the hard work of her staff and the Energetics Inc. staff, thanked the panelists and attendees, and adjourned the meeting.

To provide written comments to the process please send all emails to: QERComments@hq.doe.gov.

The next series of meetings can be found at www.energy.gov/qer.