QER Public Stakeholder Meeting

Salt Lake City

April 25, 2016

Takeaway Summary

Panel 1

- It is difficult to plan for transmission with the uncertainty of what the loads and resources will be in the future.
- Fuel security is declining and is weather dependent.
- Natural gas infrastructure is a large single point of failure that should be considered in grid planning.
- Cost recovery and siting issues must be addressed to enable expansion of transmission system to tap New Mexico's renewable generation potential.
- Data availability versus security is a really hard balance, but we should lean towards availability because benefits of data sharing are high.
- Better data analysis and visualization tools will improve planning.
- The best planning will require an assessment of alternative futures under differing assumptions.

Panel 2

- It is important to determine value of grid technologies and price appropriately. Energy companies need to recoup fixed costs.
- Information technology systems could be the most important change component.
- Focus on balancing new technology with affordability burden.
- Incentivize energy diversity but not through mandates. Don't pick winners and losers.
- Consumer education is key and educate them on issues that affect rate.
- Native American communities cannot take advantage of incentives because they do not pay taxes. The only way to do so is to develop complex arrangements with those with tax incentives.
- Rural entities that do not have resources to invest in cybersecurity capabilities. Who pays?
- Smartening the grid requires a communication infrastructure overlay.

Panel 3

- Adversaries have proven the ability to get into systems, utilities need safeguards to detect and mitigate damage.
- More regulation will not result in better cyber or physical security position. Standards should be viewed only as the minimum.
- The notion of regulation compliance needs to be decoupled with the notion of fear of disclosing that a mistake was made. The Industry needs to learn from these mistakes.
- A key to overcoming cybersecurity challenges is through peer, state and national partnerships and information sharing.

Contents

Opening Panel

Panelists

- Karen Wayland, Deputy Director for State and Local Cooperation, Office of Energy Policy and Systems Analysis (EPSA), U.S. Department of Energy
- Dan Utech, Deputy Assistant to the President for Energy and Climate Change
- Joshua Cohen, Deputy Administrator Rural Utilities Service, Rural Development, U.S. Department of Agriculture
- Melanie Kenderdine, Director, EPSA, DOE

Karen Wayland, Deputy Director for State and Local Cooperation, EPSA

- Highlighted importance of stakeholder engagement; 20+ agencies involved in QER effort.

Dan Utech, Deputy Assistant to the President for Energy and Climate Change

- Provided background on the Quadrennial Energy Review: Part of President Obama's June 2013 Climate Action Plan; is an interagency report; installments on key facets of the U.S. energy system.
- First installment on infrastructure developed during 2014-2015: Covered capital intensive components of the energy system, published April 2015. Provided 63 recommendations.
- Second installment: A deeper dive on electricity sector and the interdependence of critical infrastructure on affordable, reliable electricity. Considers elements of the system as well as players.
- Framing Topics for Meeting: Key questions include: How will the future accommodate greater fuel diversity, DER, and storage and demand response strategies? Will we see blurring lines between bulk power and distribution systems? How are new technologies integrated? To what degree should we look at telecom advances in the context of electricity?

Joshua Cohen, Deputy Administrator Rural Utilities Service, Rural Development, USDA

- Overview of USDA's work in energy—Mainly in rural development; success story for federal government and partnership with the private sector; USDA has grant authority given by Congress.
    - USDA has 80 years of experience financing power to the people: Began with Rural Electrification Act (REA) under President Franklin Delano Roosevelt through rural cooperatives.
    - Now USDA also provides fiber and telecommunication loans as well as water and sewer loans.
- What does RUS do?
    - Policy planning and finance: Finance for all aspects of energy system to include generation transmission, distribution, energy efficiency, and smart grid technology.
    - Types of energy generation financed: Coal, natural gas, nuclear, renewables (solar, wind, hydro, biomass, geothermal, landfill gas, and finance for storage).
    - Lends to co-ops, municipal utilities, tribal utilities, IOUs, and non-profit lenders.

- Current snapshot: USDA has invested $120 billion total since its inception. More than 40% of U.S. electricity infrastructure funded through REA/RUS. Current portfolio: $46 billion in loans, almost 600 current borrowers, with a 0.04% delinquency rate. Rates are at Treasury plus 1/8 of a percent.
- RUS finances Smart Grid, offering many benefits but also introduces vulnerabilities for the system.
- Partner with local TeleCom utilities so that remote areas can access broadband which is "as essential to economic development as electricity was 80 years ago" [paraphrase of President Obama quote].
- Looking ahead: Supports cleaner, greener, fuel. Expanding activities, strengthening system, and using smarter technologies.

Melanie Kenderdine, Director, EPSA

- The focus of the Salt Lake City meeting is on western markets and emergency preparedness and seams of urban and rural systems.
- Overview of QER 1.1: Had 63 recommendations, with 43 that are in process or completed; Congress has in part or in its entirety passed legislation supporting 14 recommendations.
- Linking QER 1.1 and 1.2: QER 1.1 covered the critical TS&D infrastructure; QER 1.2 covers all aspects of electricity. The QER Task Force is now developing baselines for QER 1.2.
- Framing the day's discussion on the electricity grid and national and energy security, Ms. Kenderdine highlighted two quotes and sought industry perspectives:
  - ADM Mike Rogers, NSA director, before the House Select Intelligence Committee, 11/14: "There shouldn't be any doubt in our minds that there are nation states and groups out there that have the capability to shut down or forestall our ability to operate our basic infrastructure, whether it is generating power across this nation, or moving water or fuel."
  - Center for Naval Analysis, 11/15: "Reliable electricity underpins every facet of our lives. The design of the grid and its inherent vulnerabilities, are known to our enemies--foreign and domestic."

Panel 1: Bulk Power Generation and Transmission: How Can We Plan, Build, and Operate the Appropriate Amount for Future Needs?

Panelists

- Jim Robb, Chief Executive Officer Western Electricity Coordinating Council (WECC)
- Ron Darnell, Executive Vice President for Public Policy, PNM Resources, Inc.
- Doug Hunter, Chief Executive Officer and General Manager, Utah Associated Municipal Power Systems (UAMPS)
- Julia Souder Prochnik, Director of Western Renewable Grid Planning, Natural Resources Defense Council (NRDC)
- Bryce Freeman, Administrator, Wyoming Office of the Consumer Advocate

Generation: Resource Mix and Capacity Issues

- Fuel security declining: 40% of resource base is hydro, wind, or solar and 40% is natural gas—all are susceptible to changing weather patterns. (Jim Robb)

- Transition of natural gas from a supplemental resource to a primary resource creates challenges. Infrastructure has been extremely reliable, but not designed to meet electric sector reliability sectors. There are large single elements; problems could majorly disrupt the power system. (Jim Robb)
- Coal provided reliable baseload power. Upcoming reductions in the use of coal are creating challenges for utilities. They may need to rely on natural gas combined cycle technology or improvements in the cost and capability of technology such as storage or smart inverters. (Rob Darnell)
- Smaller, scalable and modular systems will help avoid having to overbuild capacity. Investing in small modular reactors to serve as a reliable power supply. (Doug Hunter)

Transmission

- Because load centers are not located near the sources of renewable energy generation, transmission planning becomes much more important. Utilities need to be willing to share data to enable good planning. Look at good mechanisms/models for sharing data. (Julia Souder Prochnik)
- Cost allocation in transmission investments is a challenge. WestConnect is a good model to investigate for taking a regional approach at transmission planning and investment. (Julia Souder Prochnik)
- Both cost recovery and siting issues must be addressed to enable the expansion of the transmission system necessary to tap New Mexico's renewable energy generation potential. With expansion of the electric transmission system, NM could link the wind resource with the larger markets in the West, but the PUC will not approve it since it does not create a clear benefit for PNM's ratepayers. (Rob Darnell)

Regulations and Jurisdictions

- WECC's unique characteristics: Generate power where resources are and transmit over long power lines. Has 38 balancing authorities, creating tremendous seams issues. Water resources are scarce. (Jim Robb)
- Need for better coordination between the regulatory bodies, something akin to the National Environmental Policy Act (NEPA) for the electrical sector. For instance, NERC could serve this role not only on rates and access but reliability of the system. (Doug Hunter)
- There is growing complexity and uncertainty at the intersection of policy, planning and operations of the bulk electric system in the West. Today, we must make decisions in an environment in which disparate state energy and regulatory policies are often in conflict and occasionally overlap and conflict with Federal energy policies. Uncertainty is only heightened by Federal Regulations related to greenhouse gas reductions, criteria pollutants and ash disposal, clean water standards, etc. (Bryce Freeman)

Analytical Tools and Planning

- Areas for Help from DOE:
  - Need better planning tools to assess system flexibility, weather models, and rethinking of resource adequacy.
  - Need better analytics and computing power to deal with terrabytes of synchrophasor data.
  - Need better integration of gas and electric planning and operating protocols and policies. (Jim Robb)

- Better data analysis and visualization tools will improve planning. For example, a Recovery Act investment by DOE led to the development of a tool for better visualizing culturally sensitive areas as part of infrastructure planning. (Julia Souder Prochnik)
- Need to balance access to data with security measures. Good planning requires data. (Julia Souder Prochnik)
- Decisions should be at the community level. This can enable better use of distributed generation, energy efficiency, and improve security. There needs to be community level planning and diversity in fuel resources. Over-dependence on any one resource type presents too much volatility. (Doug Hunter)
- The best planning that can be achieved, until the broader policy issues are addressed, is an honest evaluation of alternative futures under differing assumptions. (Bryce Freeman)
- Priority is ensuring safe, adequate, reliable, and affordable energy for Wyoming customers. To do this, we need robust and analytical tools and datasets that will inform policymakers regarding the economic and reliability implications of the various policy choices. (Bryce Freeman)

Permitting

- The DOE initiative to define national interest energy corridors is a good approach to reduce permitting risk across Federal lands. (Rob Darnell)

Q&A

Question on transmission planning—increasingly challenging because of more distributed generation and renewable utility scale generation is coming online. Also the siting and permitting process could be lengthy and challenging. Do you agree? And can expand on this?

- All panelists agreed that there are complexities in planning for transmission. They had varying degrees of concern on whether it is prudent to invest in transmission given the rapidly changing characteristics of load.
- Mr. Hunter expressed that lots of transmission and infrastructure exist, and we should utilize them rather than overinvesting on the backs of consumers.
- Ms. Prochnik cited FERC orders 890 and 1000 and the IRP process in trying to make the best of what we have. She also called for the utilization of other existing tools such as energy efficiency.
- Mr. Robb and Mr. Freeman agreed that it is hard to plan for transmission with the uncertainty of what the loads and resources will be in the future. Jim Robb highlighted the need for flexibility and optionality in planning. Bryce added that we need more data and time to maintain reliability while policy issues are worked out.
- Mr. Darnell reinforced his view that NM needs to build out transmission, but FERC Order 1000 must address how to de-risk the capital investment.

Question: With increasing investment and variety and forms of generation, whether solar, wind, SMRs, do you expect these generation types, together with maybe fossil generation types to remain a part of ensuring adequacy and reliability in the future? And is this feasible given the intermittent nature of renewables for instance?

- Mr. Freeman and Mr. Darnell agree that there will need to be a large baseload like coal or something like it. Mr. Darnell added that it is harder to economically justify coal; for them, the future looks like it will be combined cycle gas.
- Ms. Prochnik disagreed, saying renewables are variable but not intermittent; renewables, combined with tools available, can help flatten the duck curve and provide reliable services. Doug Hunter added that we need to treat renewables like a real generation source and focus on integrating them.
- Mr. Robb and Mr. Hunter both emphasized the need to maintain a diversified system. Jim Robb stated that reliable streaming power is the lifeblood of the economy, and outages are not acceptable. There is a need for planning, insight, and foresight to build grid that accommodates all kinds of resources, particularly those that the public wants more of—renewable and low carbon emission resources.

Question on data and tools like robust analytical tools, whether it is planning for integrating different generation types, etc. This sounds like a lot to accomplish. Where do you see the biggest need?

- Mr. Robb cited two areas of opportunity.
  - First, modeling the flexibility of the system is important, but takes time. Being able to analyze resource deployment more quickly would be valuable.
  - Second, they need to have the ability to use synchrophasor data to create a predictive analytics model for equipment failure that could create a disruption to the power system.
- Ms. Prochnik: Need to have good data for planning, and there are gaps in the data. Regulatory agencies need to ask for it first before utilities will provide it. Utilities need this data too.
- Mr. Freeman commended WECC's work on creating data sets and tool, but resources are limited.
  - He urges continuing work to develop a common data set to facilitate power flow modeling in addition to production cost modeling.
  - Modeling for economic implications of policy and the capital costs of various policy choices is needed. DOE has been very helpful, and I hope they can continue to support us.

Question on cyber and physical security—how important do you think this is here in the West, specifically in generation and transmission? Where do you think it applies?

- Speakers all agreed that cyber and physical security is critical, but they expressed different concerns related to the cost and coordination in preparing for such events.
- Mr. Hunter cited example of how CEOs of utilities convened on a call within 30 minutes in response to the Ukraine black energy situation.
- Mr. Robb made three points.
  1) Security key here in the west because of the very large substations and critical transmission paths. WECC is working on FERC standards to protect critical infrastructure.
  2) Small rural entities that do not have resources to invest in cybersecurity capabilities.

3) NERC's Grid X exercise demonstrated how many people have a partial role but not a central role. Encouraged DOE/NERC/FERC/WH to focus on roles and responsibilities of players.

- Mr. Freeman reinforced that customers want safe, secure service, but not at any cost.
- Ms. Prochnik: Need to find the fine line so data is still made available to build the grid of the future.

Question about distributed generation and to what extent is that changing the way you have to do business from interconnecting the transmission operations with distribution out of operations? Is it a non-issue, or are there a lot of changes that need to be made?

- Mr. Hunter: At the substation level, they need to know what is out there in the system. You can disconnect from the system onto a microgrid, a concept for having a more reliable, safe, and cost-effective system.
- Mr. Robb: The lines between transmission, O Power system, and distribution and load management is blurring. From an operational standpoint, we have to manage what we have as an integrated system.
- Mr. Darnell: This transformation is not going to be inexpensive.
- Mr. Freeman: Rate design is a big issue. How do you accommodate those with generation behind the meter and but limit the extent that the costs are imposed on customers who choose not to?

Final closing comments

- Mr. Robb: We did not focus on the harmonization of natural gas policy with electricity policy. Recalls Aliso Canyon situation—consider fuel sources and fuel infrastructure. Also, we did not touch much on weather dependency of the fuel mix.
- Mr. Darnell: Urged close examination on how to fairly allocate costs. How can states like NM with small populations deal with increases that do not directly impact them? Also, we have to get away from recovering fixed costs on a volumetric basis and stop subsidizing net metering.
- Mr. Hunter: Thank you to DOE. I deal with them on technologies, data collection, and I am a big follower of EIA. We need to make data digestible for customers and the broader community.
- Ms. Prodchnik: On data, urged DOE not to build a steel wall around what you are trying to promote.
- Mr. Freeman: Physics of system do matter. We need to design a system that is affordable, reliable, and safe. You have to pay attention to details, including the physics.

Panel 2: Electricity Distribution and End-Use: How Do We Manage Challenges and Opportunities?

Panelists

- Paul Radakovich, Rocky Mountain Power
- Leonard Gold, General Manager, Gila River Community Utility Authority
- Colin Jack, Chief Operating Officer and Enineering Manager, Dixie Power
- Roger Woodworth, Vice President, Avista Corp, and President, Avista Development
- Mark Case, Principal and President ETC Group

- Laura Nelson, Director, Utah Office of Energy Development

Planning and Design

- We are revamping planning tools to model load and response characteristics. Grid is becoming more digital to allow for optimal configuration of assets for consumers at the least cost. (Paul Radakovich)
- Performing proactive studies to understand the distribution grid's hosting capacity for DER. Results will inform where Smart Grid investments will be needed to integrate additional DER. (Paul Radakovich)
- Encouraged DOE and others to look more at design principles. Underscored three principles:
    1) Importance of setting context—electricity is the most empowering invention of all time;
    2) Importance of aligning efforts as they relate to policy;
    3) Leverage and integrate assets—utilities are allies, and new technology is integral. (Roger Woodworth)
- Energy burden: today, 1 in 5 people struggle to pay their energy bills. Thirty years ago, it was 1 in 7.
- Need to balance new technology with affordability burden. (Roger Woodworth)
- DG is a more expensive way to get solar. There is a misalignment in policy. Focus on locational value. (Roger Woodworth)
- Governor's Office of Energy Development formed as a result of Governor's 10-year strategic energy plan. We are policy implementers and advisors informing policy for Utah's vast array of energy resources. We engage in planning and developed the state energy efficiency and conservation plan. (Laura Nelson)
- GRICUA needs to rely on third parties for load following scheduling and for transmission. (Leonard Gold)
- Coal is "taken off the menu" without a currently viable alternative. (Colin Jack)
- Our office provides some incentives to support the diversity of our energy portfolio, which is important for having a robust energy future and maintaining affordability and reliability. (Laura Nelson)

Technology and Innovation

- IT systems could be the most important change component to be considered. Also, policymakers could help by providing open architecture standards for grid and grid edge information technologies. (Paul Radakovich)
    - Opportunities and challenges: What data to store and for how long? How to think about open architecture versus proprietary systems? And cybersecurity related to protecting customer data. (Paul Radakovich)
- Technology investments provide opportunities. Purchase power represents 60-70% of their budget. (Leonard Gold)
- GRICUA used 2G cellular metering to do remote connect and disconnect and capture 24-hour interval data. With sun-setting of 2G, upgrading to a new cellular system will cost close to $1 million. But customers will have opportunity to use data to manage utility bills and energy use. (Leonard Gold)

- Leveraging innovations: Dixie has meters that transmit remotely and has the ability to remotely disconnect and reconnect. Dixie has fiber optic lines along with our transmission lines. (Colin Jack)

Affordability

- GRICUA is a tribal utility and sovereign with a limited customer base; needs to keep the costs low. (Leonard Gold)
- Integrates energy storage for renewables, but cannot afford to offer customers subsidies for renewables. Also, they cannot do net metering. (Leonard Gold)
- Electric co-op serving SW Utah and NW Arizona; has long lines and low consumer density. Enjoys some of the lowest retail rates in the country and 99% reliability year after year. (Colin Jack)

Cost Allocation and Valuation

- Need to determine value of grid technologies and price appropriately. Energy companies needs to recoup fixed costs and credit DG at wholesale rates. (Paul Radakovich)
- Challenge posed by net metering as fixed cost gets shifted to neighbors that cannot afford solar PV. (Colin Jack)

Permitting

- Federal land management procedures effectively block all new power lines and even upgrades and maintenance required to keep up with our growing population and aging facilities. Co-op's service territory is islanded between public property. (Colin Jack)

Customer Engagement

- Customer education is what we used to do; now we do engagement to hear about customer needs. (Roger Woodworth)
- We work to engage directly with all stakeholders and with industry. (Laura Nelson)

Demand-side Management

- What is happening on the customer side is having a large impact on the other side. (Mark Case)
- There is great untapped potential to reduce the amount of energy that we use. I'm talking 20-30% reductions. If you look at demand-side management studies, the theme is that there is a tremendous amount of demand side potential. (Mark Case)

Q&A

Question: Affordability is key. Can you comment? What other things may be more important?

- Speakers universally agreed that affordability is the number one concern for customers.
- Mr. Gold reiterated that technology is key for them to stay efficient in what they do.
- Ms. Nelson added that they partner with Quest Star and Rocky Mountain Power to advance EE programs, and RMP is meeting 84% of load growth through EE, which helps with affordability.

Question addressed to Mr. Jack—You commented on solar and questioned CO2 reductions associated with it. Can you expand on that?

- Mr. Jack: With intermittent energy of any size, you have to back it up with simple cycle generation. The simple cycle gas has the same CO2 emission/ kWh as coal, and your net CO2 reduction is zero.

Question addressed to Ms. Nelson on Utah's stance on solar

- Ms. Nelson: We really believe in incentivizing energy diversity but we do not believe in achieving that through mandates. There is a solar boom, and we think we have achieved that through a carrot approach by providing incentives, and they have to meet the avoided cost rates provided by the state energy commission. We have not seen that in RPS states where they create artificial price points.

Additional comments on solar

- Mr. Woodworth: [Rooftop solar] is the most expensive way to do solar, but that's what we incent. We should rethink the incentive structure to focus on utility scale solar.
- Mr. Gold: Native American communities cannot take advantage of incentives because they don't pay taxes. The only way to do so is to develop complex arrangements with those with tax incentives.

Question on communication and outreach—You all arguably have closer connection with customers. What should be done to educate customers?

- Speakers generally agree that education is key. Mr. Radakovich states that you should let people know about programs and options and educate them on issues that affect rate. Mr. Jack notes that Dixie Power has an annual meeting. Ms. Nelson mentioned her office developed an energy primer as well as an energy curriculum from the elementary school level through university.
- Mr. Woodworth highlights that customer education is what utilities used to do but now the emphasis is on dialogue.

Final comments and recommendations for QER task force

- Ms. Nelson: We can set an example by not picking winners and losers but looking at a robust energy portfolio for a quality of life that can be delivered globally.
- Mr. Case: Think about the impact of a 30% reduction in energy and power. Also, there are traditional business models that just don't really work with utilities delivering demand side resources.
- Mr. Woodworth: Three principles of design: examine and critically review policy and incentive structure so we can align our efforts to maximum impact; leverage what we have into what can be; and we need to smarten the grid, which requires a communication infrastructure that overlays it.
- Mr. Jack: Three concerns: 1) Intrusion into power supply market by picking winners and losers. Eg. Coal was initially mandated. Now, we are shutting down coal before costs are fully recovered. Long-term financing arrangements rely on long-term regulatory stability. Utilities cannot abandon projects or project financing mid-life. Creates significant rate shock for rate payers—need to be consistent and predictable; 2) Mandating alternative energy projects without power supply or econonomic benefit; 3) small islands in a sea of federal lands—you can see why this is a challenge.
- Mr. Gold: We need to build homes and businesses that are energy efficient. Retrofits are costly and inefficient. Technology is great to control demand, but real issue is that we need real people to do it. This has a cost. Storage is the game changer on the distributed energy side. We've seen that with cellular phones on the telecommunications side. What does that mean for our infrastructure?
- Mr. Radakovich: Continue cooperation and collaboration with all the stakeholders. Stick with proven technologies. Ensure we are delivering services our customers really want and are ready to pay for.

Panel 3: Cyber and Physical Security Resilience

Panelists

- Mark Gabriel, Administrator and Chief Executive Officer, Western Area Power Administration (WAPA)
- Michael Ball, Director, Corporate Security and Risk, PacifiCorp
- Mike Moon, Vice President, Compliance, Western Electricity Coordinating Council (WECC)
- Tim Roxey, Vice President and Chief E-ISAC Operations Officer, North American Electric Reliability Corporation (NERC)
- Phil Jones, Commissioner, Washington Utilities and Transportation Commission

Increasing Preparedness

- Look beyond trying to repair, replace, and rebuild. Look to the future and consider new technologies that are out there. Think in a different way, beyond just more guards, more guns, and more fencing. (Mark Gabriel)
- Look at how our asset management allows us to look at our cyber and physical situations. (Mark Gabriel)
- Strategic Transformer Reserve: We have an inability to get large power transformers in time and of the same level quality that we need. The issue of an SPR was called out in the first QER, and we have some action in Congress on this. (Mark Gabriel)
- It is not just a game of keeping the bad guys out, but about detection, response, and resiliency. (Michael Ball)
- Need good security hygiene: Each of our utilities are a node on a series of networks that make up the critical infrastructure of this nation. It is no longer just about protecting our assets. Need to transcend beyond our silos. What about security of suppliers? And how can we share information with our partners? (Michael Ball)
- We are making progress on cybersecurity, but there is a lack of consistent application. The bad guys are only getting better. Focus should be on neutralizing them and building resiliency. (Phil Jones)
- Grid X provides important forums for information sharing and lessons learned. (Tim Roxey)

Access to Information

- How can we have real-time access to information not just on our system but on everyone's systems? (Mark Gabriel)
- We get information distilled by intelligence sources that we can rapidly respond to, but it needs to be more timely and actionable. (Michael Ball)

Interconnectedness of the Grid and Cybersecurity Challenges

- Information technologies and operator technologies have merged. Think about security, quality, availability, and reliability of our changing system. (Mark Gabriel)

Cost Allocation

- Challenges: Who is going to pay for cybersecurity efforts? (Mark Gabriel)
- As mentioned by Jim Robb, we have a lot of small utilities in the Western Interconnection. How can we help them? Who pays for their cyber security investment? What is the governance model? (Phil Jones)

Increasing Stakeholder Cooperation

- We have a lot of stakeholders—customers, states, regions, or as participants in our nation's critical infrastructure. How do these pieces work together harmoniously? (Michael Ball)
- Key recommendations: 1) Need more board involvement from IOUs, co-ops, and munis. 2) Ukraine event demonstrated dangers of phishing. Utilities need to continue training efforts on this. 3) Supply chain management is really difficult. FERC has a technical workshop, but we need to do better. (Phil Jones)

Regulatory Challenges and Mandatory Standards

- We have seen mandatory and voluntary standards in our industry. Mandatory standards are also a minimum. We can't fall into the trap of saying, "If I'm compliant, then I'm secure." (Michael Ball)
- NERC efforts: Mandatory standards, improved information sharing, and exercises to increase learning. NERC has worked closely with DOE, DHS, FERC, and the friendly FYVEYs. (Tim Roxey)
- Standards are but one step in a comprehensive approach. NERC's E-ISAC is an essential information-sharing hub. Efforts complimented by research and technologies supported by DOE laboratories. (Tim Roxey)
- Three overarching points:
  1) CIP standards present unique opportunities and challenges to how we regulate.
  2) We need not to underestimate a determined adversary.
  3) We need information to do our job well. (Mike Moon)
- Lessons from regulators: Regulators and industry partners need to understand and assess risk. We can cooperate with industry and want people to admit mistakes without fear. Need more disclosure from industry. The purpose of regulation is not enforcement, it is compliance. (Mike Moon)
- Rapidly changing technology is a challenge for regulators. Technology will far outpace the ability of regulator to make new standards. Overly prescriptive standards create problems in how to comply. (Mike Moon)

Q&A

Question on concept of securing the supply chain—you mentioned the need for suppliers to have security built into the supply chain. Is your sense that the vendors are taking this seriously? Are they providing you with secure products?

- Mr. Jones: We have a lot of software vendors, such as Microsoft, that have good, basic standards.

- Mr. Ball: Refer to DOE guidelines for industrial control systems procurement. It looks at the entire acquisition chain. Good design criteria, good testing criteria, and when you bring these assets in, you want to have assurance that the security integrity is intact.
- Mr. Gabriel: Vendor challenges and security of the supply chain. Eg. With transformers, we are forced by law to select the least expensive transformer, and they are produced internationally. We do not understand yet what the long term implication is when our technology is produced abroad.
- Mr. Moon: We have to be careful not to get into business practices and commercial endeavors.
- Mr. Roxey: If you need to test software that you are suspicious about, you can have it tested through the National Laboratories. Also, the Department of Homeland Security has a counterpart document to the DOE guide on industrial control systems procurement.

Question: Some of the threats mentioned are presented by foreign states. Is this a national security imperative to look at this threat?

- Mr. Ball: With a very significant event, there is going to be a role for national agencies to play.
- Mr. Jones: There are many potential actors, and it is a partnership. Restoration of power happens at the local and state level. A Strategic Transformer Reserve could be a national responsibility, and it is something Congress should review. The game of attribution is difficult, and the longer an event goes on, the more national security implications it has because it cascades into other grids.
- Mr. Roxey: Four layers of responsibility--There are standards and good practice that are the foundation. There are baseline risk controls. There is information sharing and analytic work that bring together the government and the private sector. And there is the top layer where the government steps in and executes posse comitatus.
- Mr. Gabriel and Mr. Moon agreed that the weak link is information sharing, and government can help. We are dealing with a commodity that moves at the speed of light and we are getting information that moves at the speed of weeks. Mr. Moon--government can invest in innovation.

Question on the cost for all of this. In your opinion, who should bear those costs?

- Mr. Jones: We should think about tax payer assets such as the Strategic Transformer Reserve. Electric ratepayers should not bear all the burden.
- Mr. Ball: Most security-based investments are embedded in the technologies we deploy. Costs should be embedded in your investments cycle.
- Mr. Gabriel: Analyze the physical threats and start with the "dumb, easy stuff." Maintain good hygiene and design criteria for cyber and physical security to account for new challenges. Provide training.
- Mr. Moon: The more prescriptive your standards, the more it ties the hands of utilities.

Question on resilience—Is enough being done for overall resilience regardless of the threat factor?

- Mr. Gabriel: To increase resilience the grid needs to become a more flexible tool. It needs to operate such that if one node is eliminated the entire system is not crippled. This will require a lot of cooperation across the industry.

- Mr. Roxey: There is a large lag, estimated to be 200+ days, between when a system is compromised and when the perpetrator is detected.
- Mr. Jones: Our metrics are poor. NARUC and DOE could come to work on a new metric or a series of metrics whereby State Commissions and state policymakers could determine how much resilience should be built into the system. Also, it is unclear how much rate payers will be willing to pay to build resilience into the system for a one in 500 or 1 in 1,000 or 1 in 250-year event.

Final comments for QER Task Force

- Mr. Gabriel: Data-sharing is hard. Need good security hygiene and spirit of compliance. Work with customers and educate them.
- Mr. Ball: Take steps to work beyond our silos and work with our peers within the industry. Strengthen public-private partnerships.
- Mr. Moon: We can and have to collaborate across for a. When we have the regulatory construct, we have an obligation to provide reasonable assurance and have to operate within our civil construct.
- Mr. Roxey: Excessive classification of information should be removed.
- Mr. Jones: Work within boards. States need to work with federal authorities and define roles and responsibilities. DOE should do more with states, national guard, etc.

Public Comments

John Chatburn from Idaho Governor's Office of Energy Resources

- Look at regulations that slow down siting of transmission lines: In the West there is an overabundance of federally managed land. I encourage federal agencies to get together and look for places within the regulations that can be streamlined.