

Summary of Presentations and Comments At the *Quadrennial Energy Review*

Stakeholder Meeting #5: Portland, OR Electricity Transmission, Storage and Distribution - West July 11, 2014

Opening Remarks



Dr. Karen Wayland, Deputy Director for State, Local and Tribal Cooperation, Office of Energy Policy and Systems Analysis, U.S. Department of Energy

The Presidential memorandum on the Quadrennial Energy Review (QER) directs the U.S. Department of Energy (DOE) to engage in a significant and robust stakeholder engagement on issues of importance. This is one of 16 meetings that DOE is hosting around the country.

The Honorable Daniel Poneman, Deputy Secretary, U.S. Department of Energy

Main Points:

1. President Obama's climate action plan set in action the Quadrennial Energy Review:
 - a. Pillar 1 – Mitigation: It is essential that we continue efforts to bring more renewable and clean resources of energy to the floor.
 - i. We doubled solar and wind power between the years 2008-2012 and are charged to do so again by 2020.

- ii. We will double improvements to our nation's energy efficiency by 2030.
- 2. Recently I visited Lawrence Berkeley National Laboratory (LBNL), the first-of-its-kind "flex lab" that will integrate multiple systems (heating, ventilation, and air conditioning-HVAC, windows, different plug loads) so people can know as they build/retrofit buildings what the actual energy efficiency savings will be.
 - a. Pillar 2 – Adaptation: We are already suffering effects of climate change. The drought in California (a declared state of emergency) and Super Storm Sandy (8 million customers without power) are two prominent examples of the local and dramatic climatic effects of climate change.
- 3. The DOE is supporting the QER which is mandated by President Obama and co-chaired by the White House Domestic Policy Council and Office of Science and Technology Policy and includes all of the other federal agencies that play a role in the energy sector, as well as input from industry and the public. It is critically important that we get all of the input that each group has to offer.
- 4. This is an issue that impacts all Americans and citizens across the globe.
 - a. Hydrocarbon production has skyrocketed over the past 10-15 years.
 - i. We produced 8.4 million barrels of oil production per day in May of this year.
 - ii. We are the leading natural gas producer in the world; the shale gas share of our national economy has increased from 1% (2000) to 40% (2014).
- 5. The first year of the QER focuses on infrastructure, which is the point where all of the different systems come together. We have a need to transform to a grid that is suitable to the challenges of the 21st century.
 - a. We are moving from a one-way transmission of electricity to a system in which there are two-way flows from consumers and generators (communication) as well as electric vehicles (charges) back into grid.
 - b. There are many balancing challenges associated with distributed generation that must be addressed.
 - c. The upgrades to the grid will take trillions of dollars of investment in the years to come.
- 6. We need to find out where the current connections work and where they do not work.
 - a. For example, during Super Storm Sandy we saw how the difficulty of getting diesel fuel into service vehicles impacted the ability of crews to fix downed lines.
- 7. We will learn a lot in this session today and will take your thoughts back to everyone in Washington, DC. Thank you for taking time out of your busy schedules to share your opinions with us.

Audience Questions and Answers

Q: Hareh (Electric Power Research Institute) – Question on funding levels for DOE, and specifically for research projects; with the shrinking budget and loss of American Recovery and Reinvestment Act (Recovery Act) funding, how do you see the funding levels going forward?

Mr. Poneman

The new term that is being used around government is “flat is the new up.” We are also working on doing more, faster, with less. We are still the largest funder of the physical sciences. We have very important investments taking place through the DOE Office of Energy Efficiency and Renewable Energy (EERE). The Recovery Act was a one shot opportunity to utilize \$35 billion not only get people to work/keep people in their jobs, but to also put a down payment on investments that we understood would need to be then taken to the next level by the private sector.

DOE has a loan guarantee program that took a \$30 billion capital investment and leveraged another \$50 million in private investment, and out of this program came the first five grid scale photovoltaic (PV) projects in the country. The private sector, seeing these as financeable deals, backed up by long term power purchase agreements, financed the next 10 PV projects. In the Pacific Northwest is one of the largest wind farms, also constructed using DOE loan guarantee funds. We have significant geothermal, biomass refinery, concentrated solar power and solar thermal assets that have been funded by the DOE loan guarantee program. The goal now is to continue to show the private sector that they can scale up projects and utilize standardized power purchase agreements to make such projects profitable.

Through a \$4.5 billion grant, the DOE Office of Electricity Delivery and Energy Reliability, the industry installed a significant amount of synchrophasors. These projects have spurred a lot of activity in the private sector, in attempting to develop applications to take the data and improve the efficiency and reliability of the electric grid. Our investment (\$15.8 million) in the flex lab at LBNL is already collecting private sponsorship in their efforts to bring cheaper, more effective solutions to electric consumers in the region.

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: James Robb

Affiliation: Chief Executive Officer, Western Electric Coordinating Council

Main Points:

1. The Western Electric Coordinating Council (WECC) is unique in its role because it looks across the entire Western Interconnection in planning activities which are executed through stakeholder committees.
2. There is not a uniform market across the Western Interconnection. It is characterized by vertically integrated utility markets. Generation and transmission planning are done at the regional level, not the utility level.
3. The Western region is different from the Eastern region in that it has evolved around diverse resources. This has shaped the region into a transmission system with long lines.
4. The fuel mix in the West is dependent upon the weather. Hydro, wind, and solar power all vary according to weather patterns. Natural gas is also dependent upon weather. This is evident with interruptions of supply occurs, which is then replaced with coal. These factors create a supply in the West that is not secure.

Presenter Name: Steve Berberich

Affiliation: Chief Executive Officer, California Independent System Operator

Main Points:

1. We have to build transmission to bring reliable supply to the region.

2. A lot of money has been spent to bring renewables to the market. 18 months ago there was 1000 MW of renewables, and today there is 4700 MW available at peak times. We expect 3500 MW of renewable in the coming months.
3. Transmission is key to getting renewable energy onto the system.
4. There is a need for speedy and agile transmission development. We need to be able to quickly respond to maintain renewable energy in large population centers.
5. Growth in consumer-produced energy will have to be taken into account when considering new transmission. Consumer-owned systems are partially or fully disconnected from the grid, but these consumers are also reluctant to cut their power. We need to understand how to not only build transmission, but how to strike a balance between building transmission and building transmission that is stranded.
6. Regionalism is an important factor in the West. We can no longer operate 38 balancing areas in the West; it is not efficient and not reliable. We need to develop solutions to this issue also.

Name: Patrick Reiten

Affiliation: President and Chief Executive Officer, Pacific Power

Main Points:

1. As an integrated utility, Pacific Power shares a lot of the same problems as the other panelists at today's meeting.
2. A common challenge is the changing landscape of transmission and its regulations. We expect independent transmission to have a growing role due to the FERC Order 1000 and that competition will play a role in regional transmission planning.
3. Federal permitting has historically proven to be very time intensive. Problems in the past have had a big impact on reliability and planning. This permitting process, coupled with a rapidly changing regulatory landscape, leads to a fear of stranded assets and a fear of committing capital to projects.
4. On the issue of transmission siting and permitting, we ask the federal government to work together to ensure consistent siting and permitting practices take place, including clear communication between federal agencies and state offices on policy matters. Solutions include identifying a single project coordinator, strong inter-agency coordination, and strong and clear guidance from the government to the private sector.

Presenter Name: Elliott Mainzer

Affiliation: Administrator & Chief Executive Officer, Bonneville Power

Administration

Main Points:

1. Transmission has been an important topic in the West over the last 10 years.
2. Transmission investments are capital intensive, and these decisions are based on the business case and incorporate cost recovery with clear cost allocations. "Who bears the cost?" is a very important question. The federal government can support transmission investment with cost recovery assurances.

3. In the case of siting and permitting, it is the responsibility of utilities to work with affected stakeholders and to make sure that permitting does not negatively impact resources.
4. Non-wires transmission solutions, including demand response and distributed generation, make the best use of transmission resources.
5. In 2002 we had 175 MW of wind power on the system; now there is 4500MW of wind power. By adding more wind power, there is an increase in variability and need for system flexibility. Traditional planning focuses on capacity and energy, but this third dimension of flexibly needs to be also considered.
6. Coordination among utilities is important. By coordinating balancing areas, operators can spread the impact of reliability across a wider range. The West should build on its legacy of regional cooperation since 1970.
7. Real-time situational awareness is a critical requirement in transmission planning. The Bonneville Power Administration has installed largest network of synchrophasors in the country.
8. We are working closely to develop new tools to respond to conditions and to forecast loads across the system.
9. The Western U.S. faces significant opportunities and challenges in designing its system. This design must enhance reliability, flexibility, and include a technical sophistication.

Presenter Name: Carl Zichella

Affiliation: Director of Western Renewable Transmission, Natural Resources Defense Council

Main Points:

1. A changing resource mix is occurring rapidly in the West.
2. We are seeing a combination of the lowering resource cost for natural gas and renewable energy, but also new characteristics of an operating system that has variability in it.
3. Changes are needed to make the system more reliable. The situation awareness needed for renewable energy is the same awareness needed to avoid disruption or to bring the system back from disruption. A more consolidated, coordinated system is a less vulnerable system.
4. From an environmental perspective we need to efficiently use what we have, build what we need, and not build what we do not need. Instead, we should look at non-wires solutions.
5. Challenging questions need to be answered. How do new investments reduce greenhouse gas emissions? What does the 21st consumer want? They want reliability, low cost, and also a clean system. Transactional relations between utilities and consumers are new. How we control the distribution grid includes how we handle the bulk system of the future.
6. We can use resource zoning to help optimize location of transmission resources.

7. Key takeaways that need to occur include more renewable energy, a more diverse fuel mix, flexibility, coordination, and involving key stakeholder groups.

Presenter Name: Joel Bladow

Affiliation: Senior Vice President, Tri-State Generation & Transmission Association, Inc.

Main Points:

1. Colorado is part of the Western Interconnection. What the West does directly impacts the State.
2. The fact that Colorado's terrain is rural and its population is spread out is a big cost challenge. How do we deliver reliable power under these circumstances?
3. The electric grid has done a good job of adapting over the years, given the size of investments that have been made. We must move forward, but be cautious.
4. There is complexity in how we move forward. What are the key fundamentals?
 - a. Cost. Not every great idea is economical. Electricity is a public asset and a public good. We have to remember that someone pays for that in the bill.
 - b. What we project today will be mostly wrong in the future. The more certain that we pretend we are, without allowing for flexibility, we will put pieces in place that do not allow multiple benefits.
 - c. I see a lack of coordination among federal agencies in siting and permitting. There needs to be more consistency among agencies.

Presenter Name: Honorable John Savage

Affiliation: Commissioner, Oregon Public Utility Commission and Chair, Committee on Regional Electric Power Coordination, Western Interstate Energy Board

Main Points:

1. The West will build the transmission that is needed. New transmission could take a decade or more to complete. This means that in the short term, we will not see long-distance lines. Overtime we will see two forces at work: 1) less demand for big transmission as load flattens; 2) more local distributed generation.
2. The biggest challenge is adapting to a changing mix of power resources. We expect to see more variable resources, more distribution, more natural gas, and less coal. I do not see any change in federal policy to disrupt this trend, but see a continuation of transitioning to low or no carbon resources.
 - a. We can do more to address ramping challenges and integrating renewable energy.
 - b. We need to assess the reliability impacts of changing the resource mix.
 - c. We should recognize that the line between distribution and bulk power is blurring and that a seamless two way flow of information is needed.
 - d. We need to clarify jurisdiction between the states and the Federal Energy Regulatory Commission.

3. We may underinvest in grid transformation.
 - a. Many transmission and distribution investments have the quality of a public good, so we cannot invest when we cannot claim benefits. This is a need that federal funding can fill.
4. Federal funding in this region has made a difference. Federal agencies should keep doing what they have been doing well - drive innovation, fill gaps in necessary analysis and support projects that would not be undertaken without federal intervention.

Panel Questions and Answers

Q: There has been a divergence of opinion- should transmission go slow, or should it be able to adapt rapidly? What federal guidance is needed to balance these opposing opinions?

James Robb

- We need a good understanding of what the future will look like to plan for any scenario. The risk of stranded assets is high if this is not done correctly. One question that must be addressed is what has implications for transmission investment. There is an interplay between replacing facilities and the expansion of solar and wind power that needs to be understood and studied. DOE has been a good partner in funding studies on these issues.

Steve Berberich

- The system is changing dramatically fast. The 10-year transmission planning horizon is still appropriate, what happens in California in the short term will affect the rest of the West in the short term also. The California system is transforming very fast. The system flows will change, and they will change dramatically (i.e. - retirement of coal, more natural gas, and renewable energy integration.)

Patrick Reiten

- Yes to both. These are not in conflict; permitting and siting can be done more quickly while still being deliberate about planning. As the policy landscape and requirements evolve there will be changes in the diversity mix. These changes require nimbleness in delivering transmission solutions.

Elliott Mainzer

- These two thoughts are not opposing. Once the need for a new line is identified, utilities need to be sensitive to local issues. There is a need for coordination on the permitting side.

Carl Zichella

- We do not have the luxury of a lag. Changes are happening in real time. We need to pay more attention to the use of all resources to meet needs. If we can better use the existing system to meet needs, then this will lead to less costly and faster changes. We

should think about sharing of lines when upgrading lines. We should look at lessons learned about where to locate equipment. We can design transmission to renewable energy zones to get power to the load center more efficiently, and therefore get better use of the lines. We can balance markets to share resources, which has not been done before (i.e. - bilateral contracts).

- The role for DOE to take is one of leadership in research and development and with grid control infrastructure. ARPA-E and other research and development programs within DOE can help to fill this gap as well.

Joel Bladow

- There is some technology that is not high cost that can be implemented to bring benefits. But when planning happens broadly, it takes a long time. We have to be willing to change plans as technology changes, and not get locked in on planning.

John Savage

- We should set standards with regard to the siting process. Once you have met the standards, you should qualify for the license. Right now the problem is the uncertainties in siting and it is not clear what steps have to be taken. When you plan for the long term, you can look at all possible alternatives and state public utility commissions will look on it more favorably.

Q: Looking forward, what additional technologies needs to be considered? What role is there for DOE in investing in technologies?

Steve Berberich

- Synchrophasors are good, but this is not a new technology. The question is how to handle situational awareness. This is the first gap to close. Next, should we integrate this with energy magnet systems? DOE can deploy the technology and fill the gap with its use, but what is the business case for it?

James Robb

- We have to keep investing in advanced storage technology. Storage softens the burden on the system that is instantaneously ramping and allows for effective performance of resources. Secondly, we cannot spend enough money developing safe, reliable and secure nuclear technology. Nuclear facilities can replace coal plants that provide frequency stability and inertia. Natural gas is not a fuel ready to burn sitting in front a power plant. A politically and publically acceptable solution is needed.

Patrick Reiten

- The first priority is to use what we have more efficiently, before we build more. We have a responsibility to increase the efficiency of the grid first. This includes automating investments, integrating technologies and using situational awareness from a reliability perspective.

Carl Zichella

- I am not bullish on nuclear power. Nuclear plants take too long to build, technology is expensive, and this does not even include calculating fuel cycle costs. Creating accessible nuclear energy will take many years to accomplish because we do not have a nuclear supply chain.
- We need to focus on optimizing the system by locating resources efficiently. We can fix some of the problem by forecasting to use and deploy resources, and by taking advantage of geographic diversity and their load shapes. We are doing this now in Colorado. If we can do it, others can as well.
- We need reciprocating engines that can ramp to full power in 5 minutes; this provides a flexibility tool. Storage is a good place for DOE to conduct research. DOE should research specific storage technologies for specific needs, as well as power electronics, control architectures, and automating controls.

Q: Do you have any closing comments for the QER Task Force?

John Savage

- We must drive innovation and follow up on the results.

Joel Bladow

- We should not focus only on technology; this is a siting and permitting problem as well. This is a political and local issue.

Carl Zichella

- DOE should drive innovation and follow up. Business models, regulation and policy also have important roles in the big picture.

Elliott Mainzer

- There is a lot of collaboration in the West. Keeping these relationships among stakeholders, the federal government and utilities is important.

Patrick Reiten

- Agreed.

Steve Berberich

- These conversations are important for sharing issues and ideas. We appreciate DOE's support.
- Technology investments and storage will have to be part of the solution. DOE can take a lead in this.
- We need an advocate for power market agencies; they need more flexibility to make investments happen.

James Robb

- Yes, agree on the technology outlined.
- The West is different, and we need to keep this in mind in terms of national energy policy. Partnering with DOE is a big advantage to the West.

Panel II: Distribution – How Do We Cope with New Challenges and Opportunities?



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Presenter Name: Jim Piro

Affiliation: President and Chief Executive Officer, Portland General Electric

Main Points:

1. Through integrated resource planning, Portland General Electric (PG&E) is able to provide reliable supply of power to customers at an affordable price.
 - a. Integrated Resource Planning: Integration of generation, transmission and distribution.
2. Our energy efficiency programs, creation of a renewable portfolio standard, retirement of coal fired plants, deployment of smart meters, distributed generation programs, demand response programs and innovative projects like the Salem Smart Power Project are all part of the PG&E integrated resource plan.
3. The first step in undertaking projects like those listed above is to study the technology and identify all of the costs and benefits associated with that technology.
 - a. Build a business case.
 - b. Make sure the technology is cost effective.
 - c. Make sure the technology makes sense for the customer.

4. The next step is to collaborate with all of the stakeholders and make sure that they are all supportive of the project before deployment and implementation.
5. The DOE can help support the industry in the area of smart appliances.
 - a. We need code changes. Electric water heaters are a great opportunity for the industry. If there are changes to the codes to allow smart water heaters which can act in a storage capacity, we would see many more installations of these types of devices.
6. We need to increase the density, reduce the weight, and lower the cost of storage devices.
7. DOE can assist in the area of data analytics. The industry is obtaining a lot of information from smart meters; now it needs to find ways to take that data and turn it into useful information.

Presenter Name: Patricia K. Vincent-Collawn

Affiliation: Chairman, Chief Executive Officer & President, PNM Resources Inc. & Co-Chair, Chief Executive Officer Policy Committee on Energy Delivery, Edison Electric Institute

Main Points:

1. PNM Resources, Inc. is in a vertically integrated market (has generation, transmission and distribution). New Mexico has significant renewable potential; it is ranked number two in the nation by the National Renewable Energy Laboratory for renewable energy potential. It will require hard work to facilitate the increase in the amount of distributed energy without impacting reliability or the price paid by the customer.
 - a. We will be shutting down 137 megawatts of coal generation and anticipate putting a significant amount of distributed generation on the grid.
 - b. We are investing in distribution system upgrades and enhancements and are adopting advanced technologies.
2. The grid must be fairly valued and compensated. Everyone who benefits from the grid should pay for the use and maintenance of the grid.
 - a. Net metering policies allow customers to sell power at retail prices to utilities while not having the burden to pay for any of the fixed costs of transmission, distribution or generation.
3. The grid must be properly integrated.
 - a. The Electric Power Research Institute (EPRI) is investigating emerging technologies and grid integration through a study titled "The Integrated Grid."
4. The industry is prepared to make the significant investment to transition the system to the energy needs of the future. Regulators can help by providing regulatory certainty and fair and timely cost recovery.
5. We cannot compromise reliability. Utilities have a unique knowledge of the distribution system and have a proven track record of meeting their responsibilities in operations. Utilities should continue to plan, build and operate the distribution system.

Presenter Name: Ronald L. Litzinger

Affiliation: President, Southern California Edison

Main Points:

1. Southern California Edison has noticed four trends over the last several years.
 - a. Demand for utility power is flattening. There is more self-generation and more energy efficiency, leading to the reduction in demand.
 - b. Regulators and customers alike are pushing for a sustainable grid. It is up to the industry to find out how to provide one.
 - c. Costs for alternatives, while high, are trending down.
 - d. Customers are looking for more choice.
1. The distribution grid will be the facilitator for the new customer trends. While investing in the grid, we must ensure that it is ready for a distributed energy resource future, which Southern California Edison believes is likely to occur.
2. Given the challenges for siting and permitting large-scale renewable generation and transmission lines, it is not surprising that the focus has moved toward distributed resources and storage.
3. California is requiring utilities to file a distributed resource plan by 2015. Southern California Edison, through engineering work of its plan, found that our urban circuits are much better suited than rural circuits to accommodate larger penetration of distributed resources at a lower price.
4. The new grid must be designed to accommodate two-way power flows with intermittent power flows. The system requires advanced system controls and situational awareness and will also require advanced protection. Simple overcurrent systems used to isolate faults will not be adequate in the future.
5. Utilities must plan proactively for the transition to the new distribution grid.

Presenter Name: Jorge Carrasco

Affiliation: General Manager and Chief Executive Officer, Seattle City Light

Main Points:

1. Seattle City Light is the only net carbon neutral utility in the country and has been so since 2005.
2. Seattle City Light is already noticing the impacts of climate change on its watersheds, hydropower facilities and on its energy delivery infrastructure.
3. The Federal Energy Management Agency recently proposed funding for planning and hardening utility infrastructure. If there are funds available, this would be a big help to the industry.
4. The federal government has an opportunity to help the industry share best practices on how to deal with both regional and national climate impacts. Creating a forum to advance this type of conversation would be of great value.
5. Over the next six years, Seattle City Light plans to spend \$6 billion on infrastructure, 2/3 of that amount dedicated to distribution-related infrastructure. While replacing aging infrastructure, we will look for opportunities to make our network smarter.

- a. The federal government can assist in this area through basic and applied research into smart grid technology.
6. In Seattle, customers want more control over their energy use and they want more control over who provides their energy service.
 - a. Solar installation and participation in energy efficiency measures are increasingly popular in Seattle. Seattle City Light saves about 1.4% of its load every year from energy efficiency.
7. One of the significant issues Seattle City Light is facing is the difficulty of recovering the cost of our investments through our rate structure.
8. The electrification of vehicles is one other area that the federal government can help industry. The federal government is well suited to help industry figure out how to develop, finance and deploy a charging infrastructure to ensure that this electrification of the transportation sector can be successfully accomplished.

Presenter Name: Dave Markham

Affiliation: President and Chief Executive Officer, Central Electric Cooperative

Main Points:

1. I am here today to stress the importance of local decision making and local control.
2. It is difficult to maintain electric infrastructure on federally managed lands. The wait time for approval for routine maintenance and upgrades to projects is significant.
3. We need to ensure that we use common sense when looking at implementing federal policies.
4. The Administration should continue to seek out incentives to support rural electric cooperatives in its effort to deploy renewable energy as the cost for deploying these alternatives is still quite high.
5. The Administration should continue to promote energy efficiency and conservation.
6. Rural electric cooperatives will continue to support and drive the transition to the new grid as long as they are not overburdened by regulations. We would like the DOE to work with coops so that they can gain a better understanding of how the policies can impact the electric rates charged to customers.

Presenter Name: Honorable John Savage

Affiliation: Commissioner, Oregon Public Utilities Commission and Chair, Committee on Regional Electric Power Coordination, Western Interstate Energy Board

Main Points:

1. Our focus at the Oregon Public Utilities Commission (PUC) is shifting toward the distribution system. The Oregon PUC requires utilities to submit modernization plans for distribution systems. We investigated and adopted policies with regard to smart grid and electric vehicle technology, and recently the Oregon PUC completed an assessment of the impacts of Oregon solar photovoltaic programs on customers and on the system.

2. Oregon's residential and large industrial customers are both interested in having renewable energy powering their homes and businesses.
3. The Oregon PUC is noticing the possibility to lower costs and improved system operation through new distribution automation techniques and enhanced demand response programs.
4. DOE should complete the 2012 draft of the publication "Addressing the Electric Distribution System" and should continue to take the long view.

Panel Questions and Answers

Q: Customers want a sustainable and reliable grid, but also want increased renewables. How can DOE help with this?

Jim Piro

- We need more demonstration projects to help assist the development of energy storage.

Patricia Vincent-Collawn

- DOE should recognize that utilities know how to operate the distribution grid. The industry needs help in developing commercially available and cost effective storage.

Ronald Litzinger

- DOE can and should assist with the electrification of the transportation sector.

Jorge Carrasco

- DOE should invest in areas that utilities are not able to, for example charging stations for customers (not in homes). An EPRI study about the integrated grid puts forth the concept that there could have positive impacts for utilities and customers. Customers want more independence, but utilities feel that they are not fully paying the costs that the utility faces to service their network. If the correct technologies can be developed, it is possible to find a balance and can be a win-win for both the utilities and customers.

Dave Markham

- DOE should continue to assist smaller rural electric cooperatives with the deployment and implementation of advanced technologies. Storage is going to be key for the industry, as it is needed to take renewables to the next level.

John Savage

- Utilities should act as "fast followers." DOE should utilize its organizing power to create industry groups to promote best practices and lessons learned.

Q: What are your thoughts on the federal government's role in cybersecurity?

Ronald Litzinger

- The federal government has the expertise to be a leader on this significant issue facing the industry. DOE should assist in getting industry leaders together to share information and best practices.

Patricia Vincent-Collawn

- This is the only industry that is regulated and can be penalized for cybersecurity negligence. Creating standards for the vendors that are producing the new smart grid projects would be one big way the DOE can help the industry. DOE should not only look to create an environment of sharing within the industry, but should also bring together cyber experts from the other federal agencies to harness the full potential of the federal government.

Dave Markham

- Information and best practices sharing would be a great way for DOE to help the industry. In an age where transformations are happening so quickly, this is very important.

Jim Piro

- What is the credible threat that we must defend against? We need to continue to work on resilience; the spare transformer program is a good way to do this.

Jorge Carrasco

- Information sharing is key. The more sharing of information, the better. There has been an extensive amount of North American Electric Reliability Corporation/Federal Energy Regulatory Commission (FERC) work on protocols. I urge DOE and the federal government to build upon this work rather than create additional requirements.

Q: From a regulatory perspective, what challenges are associated with conflicts between the federal government, state and local regulation? How does the federal government help with this?

John Savage

- A blurring between transmission and distribution leads to FERC/state regulatory agencies overlapping and has the potential to cause issues down the road.

Ronald Litzinger

- The blurring between transmission and distribution can lead to a situation where FERC & state regulatory agencies overlap. This has the potential to cause issues down the road and should be addressed sooner rather than later.

Patricia Vincent-Collawn

- I would encourage the federal government to respect local circumstances and regulations, differences in renewable potential, different income levels of customers and the difference of having rural versus urban customers. Be flexible.

Jim Piro

- Prices are set at the state level. Every jurisdiction is different in how it is going to work. DOE can bring the necessary parties to the table and have a conversation about costs and benefits.

Dave Markham

- Allow local decision making for rural electric cooperatives. Having to wait for years for permits from federal land agencies to perform routine maintenance on system causes issues.

Q: What technologies do you see in the future and what is the federal government's role in advanced metering infrastructure (AMI) and distributed automation (DA)? Is it an investment in technology or utilizing the current technology to the fullest?

Dave Markham

- I would like to be able to implement storage technology alongside solar programs. I would like to pilot load shifting and see the benefits of that. DOE can help in implementing the renewable energy projects.

Jorge Carrasco

- A federal government role is needed in addressing aging issues in the distribution system. This is the time when we can take advantage of "smart" technologies. Demonstration projects can help utilities take advantage of the opportunities that exist from the vast array of smart technologies.

Ronald Litzinger

- As we prepare our distribution resource plan, we are focused on technology issues. Our review of technology issues that we have looked at since smart meter installations began has concluded for the need for interoperability standards for devices. Communications network must be fast enough to move large amounts of information and must be able to collect, analyze and use this information (and send back information to end use devices) quickly.

Patricia Vincent-Collawn

- We cannot make a business case argument for this type of technology in my service area. Our main goal is still to deliver reliable electric service at the lowest possible price.

Jim Piro

- DOE can help with research into battery cycling.

Q: What is the role of the QER Task Force and DOE going forward?

Jim Piro

- DOE needs to continue to drive innovation; focus on the economic value and strive for market transformation through codes and standards.

Patricia Vincent-Collawn

- We are all in the business of delivering a public good. We need to keep this obligation in the forefront of our minds.

Ronald Litzinger

- The distribution grid must remain flexible. Rate design is critical; all costs must be allocated fairly across all customers. DOE should ensure that technology development continues to move forward.

Jorge Carrasco

- DOE has a great opportunity to work in tandem with organizations such as EPRI on creating solutions to the new energy future. DOE should work on educating customers on what is behind keeping the lights on, especially with all of the new technology that is now on the distribution system.

Dave Markham

- DOE can help streamline regulations going forward.

John Savage

- DOE should finalize the distribution plan mentioned earlier and work on creating standards for the new technologies.

Panel III: Storage – Is it Finally Coming of Age?



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

Presenter Name: Haresh Kamath

Affiliation: Program Manager, Energy Storage, Electric Power Research Institute

Main Points:

1. When we look at how the grid operates today, it is designed to operate without a lot of storage on it. The question is -- do we really need storage? What we do know is that the amount of storage out there now is very valuable (@2.5% pumped hydropower). This need will increase as renewable energy penetration and distributed generation increase.
2. How can we do it? Where can we get it? Energy storage is expensive, and relatively difficult to implement. New technologies are being developed and research and development is taking place by both the federal government and the private sector. Energy storage is becoming an important technology for other battery-related industries and technologies.
3. On the grid side, we do not have an established vendor solution. There are a few, but there is not an energy storage industry. We need to bring the players together and build up the industry to deliver the product.
4. EPRI is working to create an Energy Storage Integration Council forum to discuss technical issues in integrating energy storage to the grid.
5. As with any other distributed resources, installation needs to be done according to planned operating and scheduling strategies.

Presenter Name: Honorable Carla Peterman

Affiliation: Commissioner, California Public Utilities Commission

Main Points:

1. The California Public Utilities Commission (CPUC) adopted targets of 1.325 GW for California's investor-owned utilities (IOUs) through 2020. Energy storage is one tool that can be used to conduct energy management. We can get similar results from distributed generation, faster ramping, and forecasting.
2. We have not invested a lot in energy storage in California currently. AB 2514 is energy storage legislation in California that mandates energy storage.
3. IOUs are over 70% of the California load, throughout a wide geography. Customer, distribution and transmission storage can help with reliability, integrate renewable energy and reduce greenhouse gas emissions. This has to be cost effective and reliable.
4. We have performed analysis of use cases for storage. There are many types of use categories; each technology has its own costs/benefit- so it matters which type of energy storage one uses.
5. Our study allowed for multiple business models, encouraged competition by capping utility ownership at 50%, but could defer 80% ownership in a period if viable technology does not emerge.
6. Pilot projects can be used to learn only so much. We have to integrate technology and see how it performs in the world. California is at the point where we have demonstrations, but we need more operational data. We need to connect pilot projects to their targets.
7. How effective storage is depends on the rate structure and what you do in other fields. Transportation electrification is important and you can also use second generation distributed generation bidirectional flow, as a storage asset.
8. California has seen a lot of interest in energy storage bidding into the California renewable portfolio standard. There are providers not familiar with the procurement process that will need help during the process.
9. The CPUC and the California Independent System Operator are undertaking an energy storage roadmap.

Presenter Name: Geisha Williams

Affiliation: Executive Vice President for Electric Operations, Pacific Gas & Electric

Main Points:

1. Over the next 3 years, \$8 billion will be invested to modernize our electric infrastructure, and to install low-carbon clean energy. \$1 trillion over a decade is the estimate for the rest of the industry's investment.
2. The grid was originally viewed as a one-way power flow from central power plants to end users on power lines. Today we need to accommodate intermittent power and allow for two-way power flows for rooftop solar power.

3. Grid operators need to be able to rapidly increase and decrease the amount of energy on the system depending upon demand and supply conditions; the grid still has to be able to work in real time. Energy storage provides a promise of balancing supply and demand.
4. Pumped hydropower storage systems can provide high energy over a long duration. Compressed air energy storage can provide short discharge and high power. These technologies are new and have challenges to making them commercially viable.
 - Economics: we need to make the service affordable.
 - The federal government should play a role in making the technologies more affordable. For example, the California mandates will spur investment, research, and activity in the industry. With this comes a reduction of prices over time.
 - Permitting: this currently takes a long time. The government can help to align schedules and procedures, and allow permitting to happen simultaneously, not just sequentially.
 - Batteries: There are environmental challenges in disposing and managing hazardous materials. Knowing up front what the rules are for this will inform participants of the risks and costs associated.
 - Increased funding for research and a better understanding of how to better integrate all resources to operate on a real time basis is necessary.

Presenter Name: Arlen Orchard

Affiliation: General Manager and Chief Executive Officer, Sacramento Municipal Utility District

Main Points:

1. Wide scale storage is trying to be a reality for the transmission and distribution grid.
2. Our goal is to have an integrated generation portfolio with 50% of demand via renewable energy (hydropower, PV and wind power) and the rest of demand met through power contracts and natural gas.
3. Energy storage provides operational and system reliability, and also meets emissions reductions goals.
4. In California the majority of future sources are wind and solar power. But these resources are intermittent and non-dispatchable. This creates a need more grid flexibility. Currently we are seeing natural gas, but to meet greenhouse gas emission reductions, other strategies have to evolve. Pumped hydropower can bridge this gap by providing ancillary services and resource dispatchability.
5. DOE should continue to support energy storage.
6. California has adopted a 33% renewable energy portfolio standard by 2020. These goals will require a significant expansion in renewable energy. The bulk of this energy is expected to come from wind and solar power. Overbuilding generation is likely. Energy storage, flexible generation, and local demand response programs can lessen the impacts of overbuilding generation.

7. From a cost competitive standpoint, the installed cost for energy storage needs to drop below \$400kwh before the technology can become viable. This can be accomplished in the next 5 years. DOE's storage projects play a role in showing this cost viability potential.

Presenter Name: Steve Klein

Affiliation: Snohomish County Public Utility District

Main Points:

1. There is no fossil fuel or natural gas in Snohomish's portfolio and we only add resources that are not fossil fuel. Snohomish currently has the most aggressive local distributed solar program in the country. Snohomish is the living use case today for energy storage. Without energy storage, using renewable energy sources is not possible.
2. It is expensive to do what Snohomish has undertaken and there are operational problems. How can we make more it operable and still drive down costs? Energy storage has to be standardized or commoditized to get costs to come down. A non-proprietary software system linking all these together is also needed.
3. There is a lot more investing, research and development and optimizing of efficiency for energy storage; these efforts need to be driven toward standardization to drive down costs.

Panel Questions and Answers

Q: A benefit of using storage for reliability is also its low carbon impact. In a low cost economy, what do we see as the role of energy storage technologies?

Haresh Kamath

- Storage is not a low carbon technology in and of itself. It is neutral. It can be used to integrate renewable energy technologies. Historically storage systems have been successful when baseload power plants are turned into operating plants. Storage helps renewable energy become dispatchable by smoothing and firming renewable energy, and enhancing the reliability and flexibility of the grid. Storage is a tool to achieve more renewable energy penetration. It is part of the whole package, not just to be used on its own.

Carla Peterman

- Energy storage also helps to reduce renewable energy waste. Energy storage solves the question of where to store the excess energy. We can use the storage for PV during day, and wind power at night. Stand-alone storage can also be paired with PV. This excess energy can be an alternative to natural gas. There is interest in customer side storage.

Geisha Williams

- Without storage, integrating renewable energy will require increased levels of ramping fossil fuels and natural gas. Storage has the potential to displace some, maybe all of it. In the short run, we expect storage to replace some of natural gas powered generation at the least.

Arlen Orchard

- Storage shifts the timing of energy delivery. In California over supply of generation does not coincide with peak demand. Energy storage can shift this renewable energy generation produced off-peak to on-peak, and will reduce greenhouse gas emissions as fewer of the dirtiest units are used to meet this peak.

Steve Klein

- There is an opportunity in the areas of the distribution and transmission system where transmission capacity is not sufficient at times. Storage can fill this niche in terms of adding capacity while also having a good environmental impact.

Q: Can the government provide guidance on other energy storage initiatives?

Steve Klein

- The Mathematics, Engineering, Science Achievement (MESA) Alliance is not successful if it does not involve a lot of stakeholders. The government should do things like ARPA-e; not just examine use cases, but also look at the optimization of energy storage (battery efficiencies and placement) and continue to support the improvement of batteries.

Arlen Orchard

- DOE has a powerful role as a convener and should use this role to help create standards. DOE funding of projects is important in getting the industry to plan and commit to undertaking energy storage projects. DOE funding can also shorten the timeframe of development and in doing more than is anticipated. DOE should continue to support storage along the entire value scale from the end user technologies to the utility scale energy storage.

Geisha Williams

- Storage is one component of integrated solutions that are necessary; we also need smart grid standards. DOE can take a convening role in developing these standards.

Carla Peterman

- DOE should support standardization work. There are many developers, but we still need more integrators and more private sector involvement. There is a need for standards around safety and DOE is already working on this. Safety concerns can set back the industry. Compared to other energy storage, pumped hydropower has barriers such as cost barriers in the sense that they are big cost projects and involve several multiple

utilities. California cannot tackle all these issues. DOE can help to answer where we need pumped hydropower in the nation, and where it can be supported.

Haresh Kamath

- With regard to safety, major efforts are being undertaken to address this issue. We are working with the DOE Office of Electricity Delivery and Energy Reliability's energy storage program deploying energy storage under the American Recovery and Reinvestment Act (Recovery Act). This data is directly feeding efforts for standardized approaches to specification and test plans and requirements definitions that can be used across the industry. DOE's foundational work is beneficial in attempts to build the storage industry.

Q: Do you have any closing comments for the QER Task Force?

Steve Klein

- DOE should continue to be what it has been in the past- attentive, challenging and supportive. We need to involve the utilities more directly. Mandates come out from the government, but development of energy storage works better if the utility industry is engaged in the development of the solutions. We ran into problems with money and efforts being spent on use cases and pilot cases, when some utilities wanted to start doing energy storage operationally. We must not duplicate this mistake and produce the same results. Some want to integrate this into their energy management system and DOE should take advantage of it this and support these actions.

Arlen Orchard

- Standards are important. The utility industry is facing challenges because of numerous new technologies being introduced into the system that are responsible for reliability of the grid; but there are no common standards for this. There are also no standards associated with plug-and-play technologies. This presents a challenge.

Geisha Williams

- Convene, engage, and invest. DOE's role in research and investment cannot be over emphasized.

Carla Peterman

- DOE needs to keep spending time out in the West. The West wants to be more engaged in the national conversation. Due to travel restrictions, we cannot travel back East. DOE's convening function internationally is also important. DOE can use existing relationships to get best practices shared widely.

Haresh Kamath

- We need someone to bring together a large number of stakeholders to address these problems. It will be hard to move forward without this.

Public Comments

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

DOE 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: Kevin Owens

Affiliation: GM Columbia River Public Utility District

Commenter's Main Points:

1. Speaking on behalf of the Northwest Public Power Association (NWPPA).
2. The federal government can help public power utilities:
 - a. Individual solar projects are not paying the full cost of using the grid. Firming capacity for the member utilities is a real cost. We need to be proactive in developing new cost recovery models. DOE is in a key position to deliver best practices and lessons learned to this section of the industry.
 - b. It is unfair for all customers to bear the burden of the firming costs that are associated with the individual solar projects.
 - c. NWPPA believes that DOE should provide help by:
 - i. Publishing white papers and “lessons learned” on a timely basis.
 - ii. Coordinating with other agencies to provide tax incentives.
 - iii. Streamlining the grant process.
 - iv. Continuing to hold competitions (similar to microgrid competition).
 - v. Continuing research on smart grid demonstration program projects.
 - vi. Ensuring regional public power representation in all debates.

Public Commenter Name: Cameron Yourkowski

Affiliation: Renewables Northwest

Commenter's Main Points:

1. I am representing a nonprofit advocacy group, promoting renewable energy development in the Northwest.
2. We would like to stress the importance of climate resiliency; there is a need to harden the grid against the negative effects of climate change.
3. DOE should focus on the grid operational reforms and the 15 min operational plan debate.

Public Commenter Name: Gerald Deiver

Affiliation: Excel Energy

Commenter's Main Points:

1. DOE has been helpful by funding research and development of tools that will help reliability and efficiency.
2. We are developing a situational awareness tool that will attempt to evaluate how individual contributing flows on elements of the grid may contribute to congestion problems. The current system cannot reflect real time conditions of the grid. With this tool, we will be able to calculate flows and curtailment needs over any point of receipt or delivery of energy.
3. DOE should continue to fund planning efforts such as the funds given to the Western Electricity Coordinating Council to perform interregional 10 and 20 year plans.

Public Commenter Name: Fred Heutte

Affiliation: Northwest Energy Coalition

Commenter's Main Points:

1. The QER should help provide policy coherence between climate and clean energy goals.
2. DOE can help bring all of the various groups to the table so that decisions and potential answers are not made in silos.

Public Commenter Name: Ann Fischer

Commenter's Main Points:

1. Thank you to DOE for coming to Portland.
2. Engagement with the West Coast is truly important. Further engagement will be helpful going forward and will lead to a better understanding of how things work out West.

Public Commenter Name: Kelley Tillford

State: National Hydropower Association, Pumped Storage Development Council

Commenter's Main Points:

1. Thank you to DOE for the hydrovision initiative, and hydropower pumped storage task force.
2. Pumped storage is the only proven grid scale pump storage technology.
3. DOE's efforts to better analyze and present unbiased data on the benefits of pumped storage have been appreciated.
4. The CPUC's implementation of storage capacity is a good start.
5. We encourage DOE to continue to fund research in grid scale energy storage.
 - a. Availability of models, such as Argonne National Laboratory's grid scale models of pumped storage would be beneficial to the industry.

Public Commenter Name: Roger Weed

Affiliation: One Energy Systems

Commenter's Main Points:

1. DOE should focus on the importance of standards, as they will decrease cost and increase choice of new technologies for the industry.
2. DOE should help support (both strategically and financially) this conversation and adoption of standards.

Meeting Conclusion

DOE's Dr. Karen Wayland expressed appreciation to everyone who took the time to present their views and to participate in the process. She announced the next QER meeting will be held in Pittsburgh, Pennsylvania on July 21, 2014. Dr. Wayland noted that the panelists' written statements from the meeting will be posted on the QER website (www.energy.gov/ger) within the next 24 hours. She thanked Lewis and Clark University for hosting the meeting. She also thanked the DOE and Energetics Inc. staff, the panelists and attendees, and the adjourned the meeting.

To provide written comments to the QER process please submit your comments to: QERComments@hq.doe.gov.