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Electricity Advisory Committee Meeting
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Summary of Meeting

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Wanda Reder, EAC Vice Chair, called the meeting to order.

Presentation: Mutual Assistance Agreements Evolution

John Adams introduced Dave Bonenberger, Vice President of Transmission and Substations at PPL Electric Utilities, to speak about mutual assistance and lessons learned since the previous experience with substantial mutual assistance for Superstorm Sandy. Mr. Adams noted that Mr. Bonenberger and all the panelists on the next panel were involved with the restoration efforts of recent hurricanes.

Mr. Bonenberger said he would focus on the 2017 hurricane season and talk about lessons learned, particularly the practices that worked best. First, he introduced the Edison Electric Institute (EEI), which he said has a long history of supporting mutual assistance amongst investor-owned utilities. He said this practice of mutual assistance is unique to the utility industry and that the advantage lies with the multiplier around the workforce. Mr. Bonenberger explained that in the aftermath of Sandy in 2012, there were governors who would not allow utility workers out of their states because they did not think they had enough resources allocated. However, there were not enough resources in general. Thus, CEOs were quick to realize that they needed to do something to address this, particularly how to scale up mutual assistance programs during these large national events.

Mr. Bonenberger said improvements were made to consolidate mutual assistance groups and be more effective. They developed a National Response Event (NRE) Framework, which would serve as a guide of how to respond during these national events and support transparency and equitable distribution of resources during events. They organized seven mutual assistance groups. The NRE Framework is essentially a playbook developed over time from lessons learned from all different events. EEI conducts a drill each year with various scenarios, from earthquakes to hurricanes. Experiences with earthquakes in California offered a big lesson learned because that is not typically experienced on the east coast. They are working to continuously evolve this guide.

Mr. Bonenberger explained that an NRE is defined as an event that is expected to, or has impacted, two or more Regional Mutual Assistance Groups (RMAG), where the resource requirements are greater than what the RMAGs can provide, or when there are multiple events that create a resource constraint or competition between RMAGs. When an NRE is activated, all available EEI member emergency restoration resources will be allocated to the needs of impacted areas. The resource focus is on workers, equipment, etc. Assistance also includes supporting physical restoration in a cyber incident. They also support non-member areas such as Puerto Rico. Mr. Bonenberger shared that during Sandy each mutual assistance region was contracting their own resources. After this experience, EEI members convened and developed one tool so that there is consistency and available for all to use, not just during unusual events, but also in their day-to-day operations. They are also supporting transportation needs by working with various organizations so that, when an NRE occurs, organizations from various states can send resources to support efforts. This would greatly improve communication.

Mr. Bonenberger explained that the Electricity Subsector Coordinating Council (ESCC) serves as the principal liaison between industry and the federal government. They conduct daily industry/federal government coordination, which provides a great opportunity for receiving consistent requests from industry, and deliver unity of messaging for the public. This also allows unity of effort, whereas three federal agencies – DOE, FEMA, and DHS – coordinate with cross-sector industry to determine needs of resources. Mr. Bonenberger shared a few examples of unity of message. During NREs, EEI would release high-level messaging, and provide safety perspective to progress. Individual utilities would provide messaging of their own issues and updates. EEI would not get into specific utilities' issues, as there are clear areas of responsibility between EEI and utilities in terms of messaging. Messages also are amplified through the use of social media. However, EEI also ensures that the information released is accurate and

timely.

The biggest impact since the experiences from Sandy was from an increase in investments in infrastructure. Since 2016, investor-owned utilities (IOU) invested $52.8 billion in transmission and distribution (T&D); smart grid technologies, such as advanced meters and sensors; unmanned aerial devices; substation hardening; and line hardening. Utilities consider drones helpful in accessing areas that are hard to reach due to disasters, such as flooding. In these incidences, drones can give workers a view of the impacted areas so they can determine what needs to be done. Compared to previous events, the 2017 season had a lower amount of impacted customers. The recovery process was also shorter and more efficient than prior years. This could partly be attributed to the fact that fewer poles were down due to the infrastructure investments, and thus fewer infrastructure repairs were needed.

Mr. Bonenberger gave an overview of the 2017 hurricane season. There were three major hurricanes in 2017. Some of the most important things the NRE Framework brings are executive sponsorship and relationship-building opportunities through personal interactions, which helps stakeholders build trust and better understand each other's capabilities. Mr. Bonenberger expanded on his experiences from the restoration efforts in Puerto Rico, which he said was a unique challenge for the industry. Puerto Rico has a public power utility that has the ability to fund restoration efforts, which presented new challenges for the industry. The damage in Puerto Rico was primarily on the distribution and transmission levels, although generation capacity was also impacted. Puerto Rico did not actually request assistance from the IOUs until October 2017. Once it was requested, crews were sent to support the restoration efforts, as well as supplies and other resources. Crews divided up the island to tackle. Mr. Bonenberger shared a few pictures from the restoration efforts.

Mr. Bonenberger said that, after each event, every utility examines their lessons learned. They determined that the infrastructure investments made previously paid off because the damage was minimized in 2017 and the time of restoration showed improvement. Utilities also learned that decentralized management teams and organizing various command centers also helped connect the work flow to the line crew. This meant that crews were never waiting for jobs, which can be real bottlenecks during large events. Utilities were also able to achieve unity of messaging by getting on social media early and improving communication. They reached agreements on how best to allocate and share resources and streamline processes.

Marilyn Brown asked about the level of investment made in smart grid technology, and whether the $52.8 billion in investment is across the country. Mr. Bonenberger said that number came from all EEI-member companies. Dr. Brown said that is a large investment, however more still is needed and asked Mr. Bonenberger what else can be done to unleash further investment. Mr. Bonenberger said that sometimes investments in transmission become FERC jurisdictional, which can increase the time it takes to develop the project. These projects typically experience a lot of risk and require significant amounts of upfront capital. Thus, it is important to have the support of public utility commissions and federal regulators so that project developers are able to recover costs and minimize regulatory lag.

Laney Brown mentioned that there was discussion on the improvements that were made, particularly when comparing previous experiences with the 2017 experience. She noted that regulatory bodies sometimes question the cost of these improvements, and asked Mr. Bonenberger whether they examined metrics that could provide justification for certain costs for the improvements. Mr. Bonenberger explained that prudence is important when investing in infrastructure because utilities need to answer to ratepayers. EEI conducts a lot of analysis on the return on investment, so they have a list of items to consider, but rate shock is an important consideration.

Chris Shelton asked how the cyber personnel exchange works and whether there is cross-training of cyber

experts. Mr. Bonenberger explained that there is a mutual assistance program for cyber NREs. It entails information sharing, but he is unsure if there is cross-training. If a large cyber event occurs, they will leverage the skill sets of their member IOUs to provide adequate responses.

Mladen Kezunovic asked how utilities captured technological issues in their lessons learned and the implications for future research and development. Mr. Bonenberger explained that EEI has different working groups, which share expertise and lessons learned on drones, smart grid technologies, and other technologies. These working groups conduct monthly phone calls to share progress and develop best practices. However, he clarified that EEI is more of a policy committee, while the Electric Power Research Institute (EPRI) does more R&D.

Panel: Emergency Response and Resilience in Recovery Efforts

Mr. Adams introduced the panelists: Steve Greenley of CenterPoint Energy, Charles Brower of AEP Texas, and Tom Gwaltney of Florida Power and Light.

Mr. Greenley began by saying every storm is different. He gave a brief introduction to CenterPoint Energy, which has a small electricity footprint, but has lots of customers. CenterPoint has a very large industrial load, as its jurisdiction serves as a hub for the oil and gas industry. Hurricane Harvey had significant impacts on the gas business there. CenterPoint's electric and natural gas businesses all have emergency operations plans. There is a lot of advance preparation, which can be in the form of drills, mock setups, planning, etc. CenterPoint works with a mutual assistance network, so they help other companies even when they are not impacted.

Mr. Greenley provided a high-level timeline of CenterPoint's efforts for Hurricane Harvey, which was unique in that it rained for so long and in such large quantities. Thus, they were in restoration mode for several days. For CenterPoint, the experience was not a wind event, but a water event, which is different than the experiences in Corpus Christi and Florida. For example, Hurricane Ike was a tree event because of the large amount of damage from vegetation. Harvey was different because of its record-breaking rain, with a maximum rainfall of almost 52 inches. The restoration efforts focused on key facilities first. Repairing individual electric drops to homes took the longest time. After Hurricane Ike, there was conversation on undergrounding amongst the partners in Texas. However, there was no such conversation after Harvey because Houston experienced so much flooding that undergrounding would not make strategic sense.

Mr. Greenley said that grid modernization efforts made a significant impact in this event. Deployment of smart meters and other smart grid technologies allowed CenterPoint to quickly isolate problems on the grid and restore service to customers. The challenge during Harvey was accessing hard-to-reach areas. Mr. Greenley said that smart grid technologies, particularly automation, helped do the switching for workers. They were able to restore electricity without sending crews physically, which worked well because the water was rising to such high levels in many neighborhoods. The river and the bayous were also flowing into the Gulf, and water kept rising into Houston. CenterPoint used lots of data analytics, which helped crews visualize and record information, and helped them quickly build dashboards based on the real-time scenarios. Mr. Greenley further noted that CenterPoint used drones during their restoration efforts. They did not operate or own them, but used vendors and other third-party companies to fly them into locations that were hard to reach in order to gather damage assessments.

CenterPoint also used the Power Alert Service (PAS) to keep customers informed. PAS is a service that customers can enroll in to receive information on outages and other electrical events. Mr. Greenley said that PAS was helpful during Harvey. CenterPoint's PAS is tied into their call center and the meter data is

also tied to the customer's account. Mr. Greenley noted that one of the most interesting efforts is the Memorial mobile substation. He explained that during restoration, a church shared a section of its parking lot with CenterPoint to build a mobile substation to replace the Memorial substation, which was impacted by flooding. Transmission infrastructure was brought in to set this up. The substation was able to provide service to more than 9,000 customers. It is still running and will continue until a permanent site can be developed. Mr. Greenley also shared that after the experience with Tropical Storm Allison in 2001, a flood wall was built at the Grant substation. This flood wall ended up protecting the nearby medical center during Harvey. CenterPoint also worked with customers to elevate their electrical equipment.
In closing, Mr. Greenley shared some statistics about Hurricane Harvey and its impacts. He said that CenterPoint used mutual assistance programs to get airboats and other equipment. In terms of customer service, meter data was helpful in assessing information. Most customers were able to receive help through digital services, which freed up the call agents to help with the most extreme cases. Many CenterPoint employees also saw significant damage to their homes, so CenterPoint helped them so they could get back to work as soon as possible.

Ann Delenela asked whether CenterPoint already had these different technologies in their plans and drills, or they had to acquire them. Mr. Greenley responded that most of these technologies were already in use. Prior to Harvey, there were a couple of major flooding events that provided opportunities to see how these technologies could be scaled and utilized.

Bryan Olnick noted that some of the EAC Subcommittees are discussing the topic of resiliency, and asked whether hardening equipment would be effective, or if people also should start thinking about mobility. Mr. Bonenberger shared from his experience that one of the most important lessons learned is that hardening can be helpful, but they also need to be flexible. Mr. Olnick concurred that deploying mobile substations was a big lesson learned.

Jeff Morris asked about social analytics and social media, and the use of drones. Mr. Bonenberger responded that EEI did do a social analysis on social sentiment and what would be the most effective messaging. He also noted that the approval process to use drones did take a few days. Billy Ball said that he has testified before the House of Representatives on drone use in the utility industry and relayed that the permitting process can be a huge challenge and barrier. During this past hurricane season, Southern Company was able to learn from Houston's experience with the approval process and apply those lessons learned to their restoration efforts in Georgia. Mr. Ball said that he would like the Federal Aviation Administration (FAA) to understand that, although drone use in general is controversial, its use in the utility industry can be critical, but is often delayed by an inefficient approval process and bogged down by larger issues with drones. Mr. Shelton noted that alleviating this regulatory barrier might be easy for the Administration when considering ideas for regulatory reform.

The second panelist, Charles Brower, started by saying that Harvey was not a typical storm, and that he would discuss it specifically and the experience with mutual assistance in general. Mr. Brower noted that people typically focus on the landfall of a storm, but storms can continue to be highly active even after landfall. He said that initially they believed Harvey was only going to impact the Corpus Christi district. Hurricane Harvey impacted about 71% of AEP Texas' customers. After Harvey made landfall, it moved inland. Mr. Brower noted that there are still some 3,000 customers today without power, with some likely to never have power again.

Mr. Brower continued by providing a timeline of Harvey's movements. On August 21, 2017, the prediction was that Harvey would impact Mexico as a tropical storm. They did not request resources at this point. By August 22nd, Harvey reached the south of Corpus Christi as a category 1. At this point, AEP believed that they would see some impacts in their service territory but they were not yet worried. By

August 23rd, they noticed that Harvey was following a unique pattern. The prediction on August 24th was that the storm would move inland but then turn back. Mr. Brower explained that they do not typically evacuate unless the storm reaches a category 3. On August 25th, Harvey made landfall as a category 3 storm. At this point, it was predicted that it would move inland and then exit the same way out. However, its actual track showed that it moved inland, and then made a loop. The use of trucks was limited because the wind sustained in a good portion of AEP's service territory. Mr. Brower recalled that they had to significantly increase their requests for equipment, and had 78 other groups providing support.

Next, Mr. Brower explained some challenges during restoration. He said that the high water table posed a significant challenge. There was not a lot of damage to trees or buildings, but miles of poles were laid over due to the high winds. He noted that 95% of activity on social media was positive. He also showed pictures of the recovery process, including one showing the mosquito masks that were needed. Similar to previous panelists, Mr. Brower also said that it took a while before they were given permission to use drones, which observed point-to-point status on substations without transmission networks. They offered to reconstruct these lines with other companies. He also shared that many of the older buildings were demolished and the newer buildings were less impacted.

Dr. Kezunovic asked whether the weather forecasts were accurate. Mr. Brower responded that they utilized internal and external meteorologists, who agreed that Harvey would make landfall in Corpus Christi, but did not expect such sudden change in intensification, which is very uncommon. Dr. Kezunovic clarified that he asked because one of the EAC subcommittees is considering various predictive measures. He followed his comment to ask whether AEP's control centers were impacted. Mr. Brower said that their control centers are located in Corpus Christi and were designed to withstand great intensities. Had Harvey been greater than a category 3, AEP would have relocated their control centers.

The third panelist, Tom Gwaltney, provided insight from Florida Power and Light's (FPL) experiences. Mr. Gwaltney began by saying that no utility has the capability to handle these large disaster events by itself. He provided background on FPL, which services 4.9 million customers, 20% of whom live on the coast. Mr. Gwaltney noted that FLP typically buys equipment and other needed items in bulk before a hurricane season starts, where they would be ready to be deployed at any moment. FLP has lots of history with hurricanes, where Wilma was the most significant in terms of restoration days and Irma was most significant in terms of impacted customers. After experiencing seven storms in two years, FLP began implementing its Storm Secure Program, which includes four main pillars: hardening, pole inspections, vegetation management, and underground conversions. Hardening looks at the entirety of the infrastructure, including its design criteria and whether the distribution system is built to withstand extreme wind. Following events, they also take efforts to ensure that they have emergency response facilities and services in place. They also organize community areas, acknowledging that some of the most critical needs are groceries, pharmacies, and gas. Next, they conduct pole inspections. Many were lost due to high winds during the last hurricane season. Next are vegetation management and underground conversions. In recent years about 37,000 customers moved to an underground system. FPL also installed flood monitors on substations. All of these resilience measures were implemented based on not only FPL's experiences with disaster events, but also experiences from others. He noted that FPL participates in national drills and also works closely with local co-ops toward the same goals.

Mr. Gwaltney discussed Hurricane Irma and its impact. He said that Irma impacted all 35 counties served by FPL. Irma was a slow-moving and huge storm; as it was moving through Cuba, its winds were already impacting Miami-Dade County in Florida. It also had impacts in Georgia and South Carolina, essentially the entire Southeast region. Mr. Gwaltney said that CenterPoint and AEP were not even finished with their responses to Hurricane Harvey when they released their crew and equipment to support FPL's efforts in the Southeast. Mr. Gwaltney said winds alone were not the biggest problem from this event, as there also was major damage from flooding and storm surge. FPL had to move staging sites from the east

coast to the west coast of Florida. Their building structures can withstand a category 5 event at some of their centers, and they work with community facilities, such as hotels, for their crews to use during large events. When comparing Hurricane Wilma to Irma, Irma was more impactful in terms of number of customers, where 90% were impacted, and was a 4.3 on the cyclone damage index. However, the restoration for Irma was much quicker than it was for Wilma, which can be partly attributed to the implementation of automation on their systems.

Mr. Gwaltney also showed video footage captured by a drone. He noted that FPL relied heavily on sister utilities to bring in equipment, such as drones. They recorded 1,300 drone flights during the entire event. Mr. Gwaltney also shared that underground systems were not indestructible during the event. The uprooting of trees and flooding affected some transformers, and FPL had to wait for the water to recede before energizing. He said that local partners were key to recovery efforts. FPL had to send people to emergency operations centers to support the efforts. He gave one example in which they partnered with local police departments to help navigate traffic and clear the roads so that FPL's crew and equipment could get to their destinations in a timely manner. Looking forward, Mr. Gwaltney said FPL will continue to make key improvements, including working to enhance restoration information, educating communities about vegetation management and placement, and building on proven hardening investments.

Moving on to Puerto Rico, Mr. Gwaltney said that FPL provide support for Puerto Rico in a number of ways. He noted that 85% of customers in Puerto Rico have restored power now. In San Juan, which has the largest population, the restoration rate is about 98%. Overall, he said that significant progress has been made since EEI was called in for support.

EAC Discussion of Panel: Emergency Response and Resilience in Recovery Efforts Panel

After the panel presentations, Ms. Reder asked EAC Members for their thoughts, and began by asking the panelists about supply chain issues. She asked if there was an area where proactive agreements helped the restoration efforts, and whether they worked to make sure they had the right materials and that they were managed properly throughout the whole process. Mr. Bonenberger responded that the issue was not material in Florida and Texas; however, there is opportunity to streamline bureaucratic processes in these unique situations to get materials to the crews. He suggested that utilities should be allowed more latitude to do what they do best. Mr. Greenley said that availability of materials is not the biggest issue, but the main issue is transportation and ensuring that items can get from point A to point B. Utilities and local entities will need to coordinate to determine which roads are open and how to get escorts to support the process. Mr. Brower concurred that waiting for shipment was an issue in AEP's experience since the flooding in Houston was so devastating. Mr. Gwaltney said it also is important to get crews to where they need to be, so local areas should consider closing interstates.

Dr. Kezunovic asked whether any of the panelists could name a technology that they found helpful. For example, there are different types of sensors that could have predictive capabilities so that people know where issues are located. Mr. Gwaltney said that FPL has the automated feeder switches, which had a very positive impact on their efforts. They also use pole sensors, which can notify them when a pole is leaning or down, as well as high resolution surveillance on their system. They would compare before and after images, and the computer will be able to show them any deviations. Mr. Bonenberger said that leveraging imaging technology is important. He said that using satellites to get more high definition imagery so that they can see the differences before and after an event is very helpful. Vegetation is usually the number one driver for outages, so if they can also conduct growth recognition, they can properly schedule trimming cycles.

Rep. Morris noted that moving people and crew across the border from Canada can sometimes be a

challenge, which can delay restoration efforts. He asked the panelists whether that is an issue they have experienced. Mr. Bonenberger concurred that that is an opportunity for improvement because utilities all rely on contractors for support.

Flora Flygt turned the conversation to Puerto Rico and asked why they did not ask for assistance earlier and whether that is another area for improvement. She was interested in seeing what their situation would have been if they had acted sooner. Mr. Bonenberger noted that EEI struggled with determining under what framework they should bring crews to Puerto Rico. There was more scrutiny around cost. There is no profit in mutual assistance, so investor-owned utilities have agreements in how they can support public utilities in getting resources. Mr. Greenley shared that CenterPoint has learned through experience that mutual assistance has grown over the years. For PREPA, it was likely a matter of learning to ask for crew and supplies. From this experience, they learned that help can be provided as long as they ask for it.

Rolf Nordstrom noted that there are FEMA rules that determine what can be replaced and at what cost. He asked about the national agreements made after storms and if the panelists experienced any barriers. Mr. Greenley responded that FEMA rules are not necessarily a barrier. Utilities are financially independent, so FEMA is not always needed.

Anjan Bose noted that smart grid technologies seemed particularly helpful. DOE has been instrumental in smart grid development, but Dr. Bose believes that the general public does not necessarily recognize that. Now that there is so much focus on resiliency, Dr. Bose asked the panelists if they have any recommendations for the EAC to make to DOE. Mr. Bonenberger concurred that smart grid technologies proved to be very helpful and successful. DOE grants have provided support in these developments in the past. He believes that the key is to develop criteria that allows infrastructure to be built so that those with the need to know have access to such information. However, there is certain information that the public should have access to.

In summarizing the panel discussion, Mr. Adams reiterated key topics mentioned during the discussions, such as movement of crews across borders, vegetation management, satellite imagery for assessing conditions, utilizing drones, automatic feeder switches, and addressing flying debris.

Presentation: FERC Update

Ms. Reder introduced FERC Commissioner Cheryl LaFleur and shared the thanks and appreciation of the EAC for Commissioner LaFleur taking the time to contribute remarks to the Committee. Commissioner LaFleur thanked Ms. Reder and noted it was nice to see new and old faces. She noted that the Commission is very dependent on the research and other work done in partnership with the Department of Energy, and she expressed that the EAC is a very important Committee. Commissioner LaFleur introduced two members of her team, Becky Robinson, a technical advisor, and Cat Gilgojan, a legal advisor. She provided the disclaimer that she speaks for herself and not for the Commission or any of the other Commissioners, and she would not be discussing pending adjudicated dockets.

Commissioner LaFleur said that 2017 was an unusual year at FERC because it lost quorum of Commissioners, but during that time the staff focused on two items: drafting orders for later Commission consideration, and shaping options for numerous open policy dockets before the Commission. In 2018, she shared that FERC is looking to tackle a lot of those policy issues, and she foresees it being a very productive year. Commissioner LaFleur shared a sampling of some of the big issues that FERC is facing and areas that overlap with the work of the EAC.

The first topic was FERC's work on resilience, and how 2018 started off with FERC's response to the

Secretary of Energy's Resilience proposal. She went on to describe the definition of resilience as it relates to the critical infrastructure: the ability to anticipate, prepare for, and recover from events to keep providing service to customers, and in that sense it is part of reliability. The key to being resilient is identifying what risks you are making yourself resilient against. Commissioner LaFleur explained that there was not a case made in the record under the Federal Power Act for the specific proposal that the Secretary of Energy put forward to pay costs to service certain onsite fuel plants to protect reliability, and the Commission did not think that it had been shown that it was just and reasonable. She explained that the Commission used the overture from the Secretary to start a focused regional look at resilience and figure out next steps, so a new proceeding was initiated on the resilience of the bulk power system more broadly – not just the fuel risk that the proposal was about, but resilience of all types. Additionally, questions were asked by FERC of the regional grid operators as a starting point: how do you define resilience, what kind of testing and assessments do you do, what are the primary risks in your area, and how do you assess them? All of the information collected was used to evaluate those risks and the steps being taken, and then FERC will decide if there is more action to take or order. Reports were requested back from RTOs in 60 days, with a plan to put them out for comment for 30 days. Chairman McIntyre indicated FERC will act promptly. Commissioner LaFleur expects that the responses will vary and very much looks forward to receiving them.

The statement Commissioner LaFleur put out at the time of the order on resilience indicated that, in her view, this is something the Commission has been working on broadly for a long time. Since being at FERC, a lot of the work has been focused on how to adapt the nation's energy markets, energy infrastructure, transmission and pipelines, and the reliability and security rules to all the changes that are roiling the grid. She provided examples of adapting to the new world and protecting resilience: there was an order put out on frequency response, requiring changes in the interconnection agreements. FERC also looked at frequency regulation, reactive power, low-voltage ride through, and orders on capacity performance largely focused on the gas-electric nexus. All of these examples were shared as part of keeping the grid resilient, and FERC will continue on this path.

The next focus area that Commissioner LaFleur shared is the adaptation of the wholesale competitive markets to state policies. More than two-thirds of the country is served by competitive markets. She explained that in the Northeast (Maine to Chicago and down to the bottom of PJM and Kentucky), there are many states that have disaggregated the vertically integrated utilities and are relying on a competitive market for resource adequacy. In those states where they have capacity markets, ISO-NE, NY, and PJM are where the issues of state policies and the markets have been most prominent. Increasingly, some states are indicating they are not happy with the choices that the market is making for them, and either choosing to purchase new resources that the market would not otherwise have signaled as the next marginal resource, like the Massachusetts proposal to buy a lot of offshore wind, or to subsidize existing resources that are not thriving in the competitive market, such as the Illinois and New York systems in place to pay nuclear to stay online and which are now being discussed in several other states. That is causing a problem in the three big regions where their markets are using a centralized capacity auction to decide how much to pay to keep the lights on in the future because you have a system where some people are relying just on the revenues from the market as the system was designed, and others are getting exogenous revenues. Commissioner LaFleur shared that last year, when there was no quorum, FERC held a two-day technical conference and heard from hundreds of people on ideas about what to do about state policies and the markets. The three biggest options were (1) should we adapt the markets so they could still run and somehow take into account the state policies; (2) should we redesign the markets to achieve the state policies by baking them into the dispatch stack or revenue model; or (3) should we do some form of reregulation and move away from centralized choice of resources? At that time, partly because the Commission had no quorum and partly because she believed it was a good way to move forward, Commissioner LaFleur said she prevailed on the regions to go back and figure out a regional solution. In turn, ISO-NE filed Competitive Auctions for State Policy Resources (CASPR), which is a pending

proposal to feather subsidized resources into the market through a second run of the capacity market, where subsidized resources would displace other resources that had cleared in the market. It is a strategy to accommodate some of the resources in the market while allowing others to clear at an undiluted price. That is pending before FERC on a 60-day clock.

Commissioner LaFleur discussed the pending court cases and complaints at FERC about the Zero Emission Credits in Illinois and New York. The press reports have shared that there are two 205 complaints from PJM with two separate ideas, both developed through the stakeholder process: the MOPRx extending the minimum offer pricer rule, and the capacity repricing from PJM. She shared that New York is working on a program looking at carbon pricing that is intended to replace the zero emission credits down the road, and FERC is closely monitoring. As these dockets start to be decided, Commissioner LaFleur believes that this is a pivotal point for the wholesale markets and she is a big advocate of undertaking market redesign to continue the benefits of markets for customers, which is a big part of what is going on this year.

Commissioner LaFleur talked briefly about the pricing work at FERC. There has been a lot of talk at FERC about how to accommodate their rates and adapt to the tax bill that Congress passed at the end of December. In 1986, when the Reagan-era tax reductions were passed, they were very courteous to FERC and gave seven months of notice, so FERC put out a notice of proposed rulemaking, and a couple of days before the new taxes went into effect a final rule went out explaining how they will be reflected in rates. This time they only had 8 or 9 days of notice, and thus did not make it in time before the new taxes went into effect. But, there have been many requests from consumer advocates and state attorneys general asking about what FERC is going to do to reflect the taxes in various pipeline and oil rates, so they are looking at that right now.

Next, Commissioner LaFleur discussed the nearly complete price formation in the wholesale markets, which was started in 2014. FERC started this by asking all of the regions what their biggest price formation issues are. From that, FERC settled on a list of several dockets and voted out final rules on settlement intervals and shortage pricing, offer caps, fast-start pricing, and uplift allocation and transparency docket, which is still open and pending action. While discussing price formation, Commissioner LaFleur briefly discussed the PJM price formation proposal which was mentioned in the DOE market report last summer. The PJM proposal is similar to fast-start pricing in the sense that it would expand the universe of resources that could set marginal price, but it is focused on allowing inflexible resources to set marginal price. She believes that this is something FERC needs to think very hard about because it is the fundamental energy market of how things are priced, and not something that should be changed lightly. Should FERC get a proposal from PJM it will be given serious thought.

Finally on pricing, Commissioner LaFleur referenced Arnie Quinn's presentation on Day 1 of the EAC meeting where he talked about storage. She shared that storage is a focus for FERC to make sure a whole new set of storage resources, like batteries, flywheels, compressed air, thermal, etc., are gaining commercial scale and viability, and the goal of the prior week's final rule was to make sure the tariffs in the different regional markets allow those resources to bid on any service that they are technically capable of providing. She noted that this is a huge effort, but it is work that has to happen because the progress seems to be that there will be more resources and FERC will have to figure out how to utilize them. FERC did not issue a final rule on the Distributed Energy Resources part of the notice of proposed rulemaking, where DER is not limited to storage, but also includes distributed generation resources, rooftop solar panels, car batteries, and other various types of distributed resources that are behind the distribution meter and need an aggregation model to participate in the wholesale markets. FERC received a lot of comment on the notice of proposed rulemaking and decided to hold a two-day technical conference to focus on some of the tougher issues that will help FERC figure out how those distributed resources can best participate in the wholesale markets. The focus is on two broad sets of issues: (1) all of

the money issues – who pays what to whom for what; (2) all of the operational issues – if there will be a lot of resources behind the distribution meter, how does the distribution control center running the feeders coordinate with the transmission control center or RTO?

Commissioner LaFleur suggested that market activity in the West could end up being a big story of 2018. The energy imbalance market that CAISO runs will soon have half of the Western Interconnection load in it. Companies and public power entities are always joining and it is becoming a very significant part of what is going on in the West. The Mountain West has said they are ready to make a regional transmission tariff and join a market. They selected the Southwest Power Pool. That is potentially very different for what's gone on in the Western Interconnection.

On pipelines, Commissioner LaFleur shared that FERC soon will be looking at the natural gas pipeline permitting process in a generic way for the first time in about 20 years. She explained that the central purpose of the Natural Gas Act of 1938 was "only a few parts of the country have gas, they can't lock it up and need to find a way to share it with other people." In the last 10-15 years, with the growth of hydraulic fracturing, gas is coming from vast regions of the country where it wasn't previously believed to exist, and FERC is seeing a great burgeoning of pipeline proposals, a lot more controversy around them, and a lot of consideration about continuing to do things the same way as they were done in the past. In the 1999 policy statement, at a time when pipelines were difficult to get built and gas was much more expensive, FERC said they were no longer looking at reports for regional need. If someone is able to sign up for the gas long term so that when the pipeline is built it is not taking it away from all of the other customers of the pipeline system, the market will be demonstrating need, which is how FERC has been determining need since. Commissioner LaFleur explained that once need is identified, the next part of the equation is environmental. Under the Natural Environment Policy Act, FERC does a thorough look at all of the environmental impacts of the pipeline – species, water, water crossing, wetlands, cultural, and increasingly climate impacts, etc. FERC has always looked at the impacts of the construction project, but it is now being called upon by parties in their dockets to look at and broaden their understanding of the upstream, downstream, indirect impacts of the pipeline to include the climate impacts of burning the gas that the pipeline would transport. Commissioner LaFleur noted that it is difficult to do that downstream balancing if you don't know where the gas is going, or why the pipeline is being built. You don't know if it is for end use in the home, or LDC, generation, export, etc. – if the goal is trying to balance the need and environmental, in her view, it might be sensible to take a broader look at need and understand what is really driving the pipeline. She shared that Chairman McIntyre announced that FERC plans to open a generic docket.

Commissioner LaFleur briefly covered FERC's work on reliability. Cybersecurity continues to be a major focus for FERC. They voted out a standard on supply chain cybersecurity last month, ordering some changes that will start to become effective. All aspects of the geomagnetic disturbance reliability standards, both the operating procedures and the mitigation, have now gone final and companies are trying to figure out how to do their mitigation and assessment. FERC asked for additional work on what the benchmark event is, and they have now received it and will be acting on the proposals received.

Finally, Commissioner LaFleur shared that FERC is closely following the work on electromagnetic pulse that is being done at DOE, the National Labs, and EPRI. For the first blast of an electromagnetic pulse that potentially impacts communications infrastructure, EPRI is researching how to protect the electric grid, and whether there are sensible mitigation measures that FERC needs to order, potentially as an EMP standard. FERC is hoping that the study at EPRI and the Labs will give them that next step so that they can make the grid more resilient to that systemic threat.

EAC Discussion of Commissioner Cheryl LaFleur's Presentation

Rep. Morris raised two concerns about the imbalance market: that 1) because it's the first tool to address energy distribution and balancing, it may not be the most efficient tool if bypassing the distributed energy resources planning process; and 2) different utilities may have different situational viewability on their distribution system because of the different regulatory regimes – e.g., if PacifiCorp across ten states has on average 40 minutes of situational viewability on their distribution system because of the different regulatory regimes, while Southern California Edison has 12 minutes in a 15 minute market, that's not a fair market in the end – so there may be a situational viewability standard needed before you can get into play. Commissioner LaFleur said this was a great point, and it is similar to what she said earlier on distributed resources more generally and how to integrate the different types of value they provide.

Tom Weaver asked if there is anything FERC would see in Assistant Secretary Bruce Walker's five goals that might be informative for the EAC to pursue as work products and recommendations for the Department. Commissioner LaFleur shared she is very excited about the integrated grid model that Mr. Walker mentioned on Day 1 of the EAC meeting. She discussed the importance of energy storage. She shared that there are two competing trends: one toward greater regionalization which would tend to argue for more of a high voltage grid and making sure transmission is in place for that, and the second toward localization and microgrids, etc. She said a key question is: how do we assess the need for new transmission in a time where there is going to be so much more localization going on? She said that there is a value in a larger transmission grid that would enable all these new technologies and enable sharing between different regions of the country, and the EAC could identify the potential for benefits of transmission, or how to evaluate the need for transmission in the future. On a recent trip to Yale, Commissioner LaFleur was asked how to value transmission in the future, and she explained that nothing will change unless there's a perception of the value of sharing those resources, and she believes this Committee is one of that could take a broader look.

Dr. Bose mentioned that the press is talking about the fact that Commissioners have mostly turned over except for Commissioner LaFleur, and he asked if there are new ideas or directions she expects FERC will take on this year. Also, on resiliency, and now that NERC is taking some interest in coming up with standards, Dr. Bose asked to hear more on FERC's position on resiliency and what NERC is doing. Commissioner LaFleur addressed Dr. Bose's second question, and said that in looking at the resilience needs of the system, there are three tools in the toolkit. One is to set up a market structure saying we need more "X" so use a market to provide "X," which is what was done with capacity performance. The second tool is to put it in general rules, like in the interconnection agreements, which is what was done with frequency response. The third tool, other than pricing and contracts, is reliability standards. If there are opportunities for NERC to act in this area, Commissioner LaFleur believes FERC should seriously consider that. She said she would be open to using all three tools as appropriate. In addressing Dr. Bose's first question, she said Chairman McIntyre has not said much regarding things that need to be done now that have not been done before, but she encouraged the Committee to stay tuned.

Heather Sanders raised a point about the interconnection of the DER under the wholesale distribution access tariffs which are FERC jurisdictional and controlled by the utilities, and said they are important but remain largely unaddressed. She described the scenario in which energy storage systems are being installed behind customer meters in order to export to the grid because the wholesale distribution access tariffs don't address the exporting behind a customer meter. What then happens is they get all set with their business case and financing, and then the utility rejects their interconnection because they do not know how to study it. Ms. Sanders recommended to Commissioner LaFleur to include a review of distribution access tariffs, and ask the utilities how they are going to connect DERs for multi-use – state jurisdictional, FERC jurisdictional, or both. Commissioner LaFleur thanked Ms. Sanders for her helpful suggestion. She added that when looking at where the distribution companies are, and whether they are driven by commercial or driven by what's really electrical, it is important to take care of what's actually electrical but not lose opportunities for customers because of commercial motivations.

Ms. Reder asked Commissioner LaFleur, in thinking about DER, to share her thoughts on process in order to create alignment between the distribution and transmission worlds. Commissioner LaFleur said that there may be a couple levels of engagement, one being the FERC Technical Conference on April 10-11 where there will be a state regulator panel, which is very broad. For states like CA or NY, there might be a need for more one-on-one involvement. FERC held a technical conference in New York City several years ago and one of the topics was how to adopt to REV. Commissioner LaFleur reminded the Committee that FERC is not just the five Commissioners, but it's the entire team, so there might be opportunities to work more on-on-one with states. She expanded on that point by noting that the penetration of DER is not equal in all 50 states, so there is opportunity to have more targeted pilots. These could start with the April FERC Technical Conference to identify the issues, then general rules of the road could be set up, and then there might be ways to work closely with states on more detailed work.

Reflections on Today's Panel and Presentations

Ms. Reder opened the floor to the Committee for feedback and thoughts for the future. Mr. Weaver reflected on Assistant Secretary Bruce Walker's goals, which he suggested would help the Committee with their focus and in defining work products. Ms. Reder said it will be helpful to shape work products in motion to make them more meaningful and relevant. She encouraged DOE to have their liaisons be available for some dynamic exchange and interactions with the Subcommittees so that everyone is better educated and more productive. Reflecting on the two days, Mr. Adams commended EEI's efforts after Hurricane Sandy and improving the process. Mr. Adams asked if there is an appropriate role for the EAC in that, or if the other participants should be carrying it forward. Katie Jereza responded that it was hard to see something obvious for the EAC to look at during that discussion. She noted that the Electricity Subsector Coordinating Council (ESCC) is focused on those particular issues, so having a Subcommittee call to discuss what the ESCC is focused on, or identify areas for the EAC to look at, may be appropriate. Ms. Jereza also noted that there may be an amplification role, where the ESCC has a message and the EAC can amplify that message.

Mr. Weaver shared a couple of items mentioned during the emergency response panel that might be helpful, but may not rise to the level of needed regulatory reform – things like making it easier to use drones, and better escorting paths and transportation for getting resources and materials to the sites. Ms. Jereza responded by pointing out that this is where DOE can help with liaison involvement. OE has the Infrastructure Security and Energy Restoration (ISER) Division that is deeply steeped in these topics in trying to remove the barriers, so they will get involved in this conversation.

Ms. Reder asked Ms. Jereza about the vision for the new Office of Cybersecurity, Energy Security, and Emergency Response (CESER), and to share any thoughts on where the EAC could fit in an advisory capacity. Ms. Jereza said the new group is being formed to recognize the importance of cybersecurity and to grow that area. She reiterated that the EAC is not just an advisory group to OE, it is a Department-wide advisory committee. Ms. Jereza envisions that OE will still tightly coordinate with CESER, which will take on a more holistic view of security and involve fossil energy, nuclear, petroleum reserve, etc. She did not have specifics on where the EAC could fit in exactly, but pointed out the many difficulties in standing up a new office, and perhaps the EAC may have a place to provide advice on pitfalls to look out for. Getting the governance and structure together is crucial, and the people standing up the new group may be open to hearing from the EAC.

On the regulatory reform topic, Mr. Adams reiterated the request for case studies and places where there may be opportunity for investment – some barrier, regulatory or otherwise, that prevented that good investment from taking place.

Public Comments

There were no public comments.

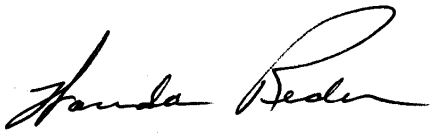
Wrap-up and Adjourn Day Two of February 2018 Meeting of the EAC

Ms. Reder, EAC Vice Chair, thanked the Committee and DOE participants for their engaging discussions over the two days and formally adjourned the February 2018 meeting of the EAC.

Respectfully Submitted and Certified as Accurate,

Michael Heyeck
The Grid Group
Chair
DOE Electricity Advisory Committee

6/7/2018
Date



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Grid-X Partners
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Designated Federal Official
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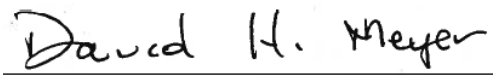

David Meyer
Office of Electricity
DOE Electricity Advisory Committee

6/7/2018
Date