U.S. Department of Energy

Electricity Advisory Committee Meeting

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Meeting Summary

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Meeting Summary

This was the second Electricity Advisory Committee (EAC) meeting of 2020 and was held virtually, given the COVID-19 pandemic. On Day 1 of the meeting, Assistant Secretary Bruce J. Walker of the Department of Energy (DOE) Office of Electricity (OE), and Deputy Assistant Secretary Chuck Kosak of DOE OE, spoke at length of the newly signed Bulk Power System Executive Order before discussing other relevant initiatives within OE. Kimberly Denbow of the American Gas Association moderated a panel composed of Don Chahbazpour, from National Grid; Ron Kent, of Southern California Gas Company; and Francesca Spinelli, from Trane Energy Services. The panelists presented about the electric industry experience with long-term energy storage and power-to-gas storage. This was followed by Neha Rustagi of DOE's Office of Energy Efficiency and Renewable Energy (EERE), who spoke about the Department's efforts regarding hydrogen and power to gas. Ms. Rustagi's presentation led into a roundtable discussion between the panelists and EAC members about the outlook and integration of hydrogen as a tool for long-term energy storage. The day concluded with Ramteen Sioshansi providing an update on the Energy Storage subcommittee and John Adams providing an update about the Smart Grid subcommittee.

Welcome, Introductions, and Developments Since the February 2020 Meeting

Mr. Lawrence, EAC Designated Federal Officer (DFO), began by introducing himself; then all the EAC members introduced themselves. Mike Heyeck outlined the day's agenda and reviewed etiquette for the virtual meeting. He noted that public comments will be addressed at the end of the second day. Mr. Heyeck then invited Assistant Secretary Walker to provide an update on OE programs and initiatives.

Update on Office of Electricity Programs and Initiatives

Assistant Secretary Walker's presentation centered on President Trump's Bulk-Power System Executive Order (BPS EO). Deputy Assistant Secretary Chuck Kosak provided an in-depth introduction of the BPS EO. Mr. Kosak began with outlining background strategic determinations and rationale about the Order to give the members context. He pointed out that the 2017 National Security Strategy document dedicated its first section to "protect the homeland." A subsection of this is critical electric infrastructure. Mr. Kosak proceeded to describe the threat at hand becoming more complex due to adversarial asymmetric cyber-attacks occurring more often and with higher sophistication. He mentioned the "surge" layer. This is the means by which the Department of Defense (DoD) flows forces and projects power to protect the nation's assets, networks, systems and platforms, and executes functions to protect national security. Near-peer adversaries continue to attempt to degrade DOD's capabilities by targeting the critical infrastructure DoD relies on to complete its critical missions. These adversaries are attempting to exploit single points of failure or vulnerable locations to slow DoD communications and actions. This is the reason DOE works closely with DoD, specifically on defense-critical electric infrastructure.

Electricity is the overall backbone across every sector, so if something impairs the electric sector, cascading effects would inevitably occur. That led Mr. Kosak to highlight pages 5–6 of the Worldwide Threat Assessment report of vulnerabilities within the electric sector and the fact that adversaries are

capitalizing on this. He spoke about the need to prepare for the future and get ahead of the curve for technology development, especially regarding cyber-attacks and national defense. This is a federal government effort in which departments and agencies across the government are leading and supporting each other on various projects. Mr. Kosak concluded that integrated planning and partnering with private industry is especially important for the energy sector, because 87% of critical infrastructure is industry owned.

Assistant Secretary Walker continued by saying the BPS EO is a tool that can be used by the Secretary of Energy to deal with threats and vulnerabilities. Mr. Walker noted that DOE is a national security agency, specifically citing the nuclear weapons complex.

There are four pillars making up the BPS EO. The first enables DOE to take information the Department is aware of and leverage it to inform decision making. This allows the Secretary to prohibit the acquisition or use of bulk-power equipment from adversarial countries that could lead to catastrophic or unacceptable risk. Mr. Walker clarified this is not a "rip and replace strategy." The second pillar allows for the prequalification of certain equipment and for manufacturers to work with industry and government to get equipment prequalified. An example is black start corridor assets. The Assistant Secretary noted that shortly after the BPS EO was announced, the U.S. Department of Commerce undertook a Section 232 review of supply chain bulk power components. He used this to highlight how DOE is working with other agencies and across industry to cover all aspects and have the EO go smoothly for stakeholders. The third pillar requires that if something is identified as prohibitive to the system, it enables review of that equipment and for it to be monitored or remediated. DOE has the capability to work with asset owners, and if DOE cannot fix the asset, they will work on replacing the piece with the owner and the North American Electric Reliability Corporation (NERC). The fourth pillar makes sure everything can be utilized moving forward. It establishes a task force that will develop policies and procedures to be used across federal government. The Electricity Subsector Coordinating Council (ESCC) and Oil and Natural Gas Subsector Coordinating Council (ONGSCC) will also be used through the duration of standing up the Order.

Mr. Walker shifted to addressing COVID-19 and associated industry challenges along with standing up the PMEF-3 ICS team. Broadly, it brings in the entire energy industry along with NERC, the Federal Energy Regulatory Commission (FERC), and several program offices. Mr. Walker explained that the pandemic only reaffirmed OE's priorities. Mr. Walker suggested that the EAC consider working through essential and nonessential personnel at utilities to better figure out how to optimize operations to ensure normal capabilities. For example, control center operators and personnel are a small, finite number. A solution is to look at the level of automation used in control centers in the future and the use of backup control centers. Mr. Walker highlighted the work of NERC and FERC along with PMEF-3 responses.

The Assistant Secretary wrapped up by highlighting some programs within OE. He discussed the Energy Storage Grand Challenge being a priority for the Secretary. There is a growing need in the energy sector for megawatt-scale storage to further address resilience. The Grid Storage Launchpad through the Pacific Northwest National Laboratory should be moving forward. Lastly, expanding R&D of nonlithium solid state batteries is a focus point to add resilience and capability to the grid.

Questions and Answers

Q1. Delia Patterson asked whether Mr. Walker believes the BPS EO empowers DOE's 6 gHz initiative.

Assistant Secretary Walker responded that, given the focus of communication, this could fall into the scope but is not specifically targeted.

Q2. Tom Bialek asked how critical infrastructure delegation play a role in the EO. Specifically, the request for data and making Critical Energy Infrastructure Information (CEII) data available.

Mr. Walker responded with letting the Committee know the CEII rule became effective May 15. The rule is a classification used for information requested by DOE to designate something as CEII. This would allow for an exemption under a FOIA request. The aim is to improve partnerships with the private sector so companies will not have to worry about their private information being published.

Q3. Mr. Heyeck asked how the EAC can help with providing advice for the BPS EO.

Assistant Secretary Walker replied that Mr. Kosak is the lead, so he recommended setting up a meeting with him. He emphasized the importance of people being knowledgeable about the topic and able to understand and articulate the interconnection of the energy sector. He added that energy is the lifeline of all critical infrastructure. Mr. Walker noted that the success of the industry is also its Achilles heel because of the extreme reliability, so people take their electricity for granted. It is imperative to be cognizant of different sectors that overlap with the energy industry, such as communications. Lastly, he asked the members to share the information they acquire through the EAC to other various boards or committees they are a part of.

Electric Industry Experience With Long-Term Energy Storage and Power-to-Gas Storage

Kimberly Denbow then took the floor, shifting the focus to her panel. Ms. Denbow overviewed the panel topics about what industry is doing for hydrogen storage and hydrogen as an electric resource. She then introduced each panelist and passed the presentation to Don Chahbazpour.

Don Chahbazpour of National Grid began by giving a high-level overview of hydrogen utilization. He said power to gas is taking renewable electricity and running it through water to perform electrolysis. Water then splits and at that point can isolate hydrogen that will be paired with carbon to create renewable methane gas. This is known as renewable natural gas, or biomethane. He noted there are several types of hydrogen sources and pathways. In the United States, 95% of hydrogen derives from natural gas through steam methane ventilation. Mr. Chahbazpour described the differences between grey, blue, and green hydrogen. For context, when talking about power to gas, discussions of hydrogen usually refer to green hydrogen.

He noted that power to gas is compelling because it solves duration, storage, and capacity barriers for other types of renewables. Carbon dioxide can be pulled from a plethora of sources to create synthetic fuels. The gas sector is particularly interested in this. A positive externality is that it would close the carbon cycle. To provide context, Mr. Chahbazpour then explained how vast the gas network is in Rhode Island compared to Tesla's battery in Australia. Rhode Island's gas network can store 25 times Tesla's Australia battery.

Discussions regarding the use of hydrogen have been happening for decades, but little to no action was taken. There is currently a major shift of high development within the European Union where utilities are beginning to offer hydrogen blends for customers. Mr. Chahbazpour overviewed National Grid's vision for integrating hydrogen in the gas network. The 2020s will entail neighborhoods and universities, the 2030s will grow to the city and county level, and lastly the 2040s–2050s will be widespread at the state and regional level. The main question is whether hydrogen will be green or blue. The industry is toying with whether to blend hydrogen or transition to a pure network. Mr. Chahbazpour's vision is a deeply decarbonized gas and electric system simultaneously. This outcome would allow networks to become integrated. He concluded by saying the current hurdles are supportive policy and regulatory frameworks, system integration, and education to policymakers and regulators.

Ron Kent of SoCal Gas followed up and began his presentation by giving context to SoCal Gas and shared the company's vision statement. The utility is the largest natural gas distribution utility in the United States. It is facing a 40-million-ton challenge of decreasing CO2 and have committed to serving its customers 5% renewable energy by 2022 and 20% by 2030. The California ISO has curtailed one terawatt hour of electricity in 2019 and is on pace for nearly two in 2020. Mr. Kent noted these are prime opportunities to deploy power-to-gas initiatives. The advantage of converting CO2 to methane as opposed to hydrogen is it is about three time denser. He concluded by saying the gap holding this technology back is a viable business model along with electric and gas grid integration.

Francesca Spinelli of Trane Energy Services presented next, and she focused on the case study of thermal storage at 11 Madison Avenue in New York City. She started by giving an overview of the building tenants and its accolades. Ms. Spinelli then laid out challenges with their solutions. For example, one challenge is the aging infrastructure. Their solution was to install two high-efficiency thermal batteries that would charge during the night and be used during the day. She proceeded to

highlight a long-term trend of load factors decreasing. This means more energy is used during peak hours opposed to being spread throughout the day. Trane had to figure out how to leverage existing infrastructure with new technologies.

Ms. Spinelli then explained the differences between thermal and chemical storage. She pointed out there are many challenges associated with chemical storage in densely populated areas due to fire hazards. Thermal storage solves many of the challenges associated with chemical storage. For thermal storage, there is no inverter or coordination with utilities, and it allows the building owner to use storage while chemical storage is still developing. Further, this can create storage opportunities at the commercial level without putting any occupants in a potentially hazardous situation. Ms. Spinelli noted that chemical and thermal storage can complement each other because when one type is charging, the other can be deployed, and vice versa. She concluded by highlighting some of the outcomes from the Madison Avenue case study. These included massive reductions in summer peak demand, reduced CO2 pollution into the atmosphere, and reductions in the cost of utility bills.

Questions and Answers

Q1. Tom Bialek began by asking if Mr. Chahbazpour and National Grid have thought about the education process of getting hydrogen online.

Mr. Chahbazpour replied that this is an ongoing effort with many challenges. Depending on the audience, there will be vastly different mindsets due to the strong feelings about gas development. He did note that development is occurring overseas, so he is optimistic that eventually this trend will reach the United States. Lastly, Mr. Chahbazpour observed that some environmentalists are starting to see that 100% clean energy is not possible through only solar and wind, so they are becoming open-minded about hydrogen integration.

Sheri Givens followed up that many regulators and external stakeholders are approaching them to find out more about this subject. National Grid is also creating outreach initiatives to present to chambers of commerce, national groups, and legislators.

Q2. Rick Mroz asked the panelists if they could give insight to incremental additional costs.

Mr. Kent said they have been working with the University of Illinois Urbana-Champaign simulating hydrogen integration scenarios and have seen positive results. The pipeline infrastructure is in a good position, but the major transition will come with end-use equipment.

Mr. Chahbazpour replied that the gap lies with a lack of higher-level strategic studies addressing this topic. There are many in-depth studies in the EU and Australia that look into holistic approaches for feasibly getting to carbon-neutral by 2050.

Ms. Spinelli said thermal storage at the building level will differ everywhere across the country due to the dollar value per square foot. She emphasized the importance of incentive programs in densely populated areas.

Q3. Wanda Reder asked Mr. Kent about his vision for market development and innovation for this technology coming online.

Mr. Kent said allowing access of hydrogen to wholesale markets would be a good first step. Work also has to be done with modeling large-scale storage integration to the grid.

Mr. Heyeck capped off the session, saying if he were in charge there would be a Manhattan Project about advanced nuclear and hydrogen development. He asked what DOE can do to get the ball rolling with hydrogen.

Mr. Chahbazpour said the first thing the Department can do is to raise awareness by publicly backing hydrogen development. Cost-sharing would also be a major help, along with creating cross-sector incentives.

Mr. Kent said another need is sophisticated modeling to help utilities and researchers, because hydrogen development is expensive and time consuming. Showing how to integrate the gas and electric grids would show the value of hydrogen.

Department of Energy Research and Development Strategy Related to Power-to-Gas Research and Development

Neha Rustagi of DOE's Hydrogen and Fuel Cell Technologies Office (HFTO) shifted the presentation to discuss DOE's efforts in addressing power to gas and hydrogen. She began with an overview about current hydrogen use within the United States and its breakdown. Ms. Rustagi provided an outline of fuel cells, highlighting the benefit of electrical efficiency because they do not cause combustion, the only output is water, and they are 10%–30% more efficient than conventional combustion engines. Hydrogen fuel cells are currently being used for powering data centers, forklifts, buses, and some forms of transportation in California. Hydrogen pipelines are mainly located around the Gulf region, with potential to grow across the country.

Ms. Rustagi then discussed current ongoing projects and initiatives across the world that are using electrolysis. For example, Orkney Island, Scotland experiences large sums of curtailment, so the excess wind power is diverted to hydrogen fuel cells, which in turn power auxiliary equipment at ports on the islands. In the United States, the Los Angeles Department of Water and Power is funding installation of a combustion turbine in Utah that will run on 30% hydrogen gas. This project will lead to at least a 10% decrease in emissions at the point of combustion.

She then turned to DOE-specific programs. HFTO leads DOE's H2@Scale initiative. The idea is to integrate the current grid with hydrogen for storage, heating, and many other uses in the industrial and transportation sectors. Some of the associated R&D activities include testing of electrolyzers under dynamic conditions representing dynamic responses on the grid, electrolysis with nuclear power, and DOE partnerships with industry between national labs and utilities interested in co-producing hydrogen. HFTO funded an H2@Scale analysis project characterizing the technical and economic potential of hydrogen supply and demand in various future scenarios. This work will be published in the fall of fiscal year 2020.

Ms. Rustagi showcased three ongoing H2@Scale projects funded by HFTO. The first aims to demonstrate use of hydrogen and renewable natural gas at data centers, vehicle fueling stations, and aerial drones in Texas. The hydrogen will be sourced from on-site electrolysis. In this collaboration, the hydrogen will be used for various applications including powering data centers through a fuel cell, a fueling station, and aerial drones, among other things. A second project aims to demonstrate the ability of electrolyzers to follow simulated solar profiles, and to then use the hydrogen for backup power. The third project aims to produce hydrogen nuclear power and to then use hydrogen as a coolant within the blend. Ms. Rustagi also described a collaboration with DOE's Bioenergy Technologies Office (BETO) and the utility Southern California Gas, wherein researchers at NREL are working with the company Electrochaea to advance biomethanation technology to product renewable natural gas. Ms. Rustagi wrapped up the presentation by highlighting international partnerships in the area of hydrogen technologies, such as the International Partnership for Hydrogen and Fuel Cells within the Economy, the Center for Hydrogen Safety, and the Hydrogen Council.

Moderated Roundtable Discussion Between DOE and EAC Regarding Power-to-Gas Research and Development

Sunita Satyapal, the Director of HFTO, moderated the roundtable discussion. For the first part, EAC members asked the panel questions, then DOE asked the panel for guidance.

Q1. Jeff Morris asked if fourth generation pebble bed reactors put out less hydrogen than Gen-III.

Ms. Satyapal was not familiar enough with this particular reactor to answer. She mentioned the nuclear industry is interested in utilizing electrolyzers.

Q2. Darlene Phillips asked what is driving hydrogen demand potential and what factors are considered, such as displacing other forms of energy.

Ms. Rustagi replied that one of the major factors is regional emissions reducing goals. Hydrogen can reduce emissions in sectors with few alternatives, such as building heating. Another factor is that the cost of electrolyzers has fallen dramatically in the past decade.

Ms. Satyapal followed this up saying major fields interested in hydrogen are steel manufacturing, ammonia/fertilizers, and heavy-duty commercial transportation.

Q3. Mr. Bialek asked DOE what they are doing for broader outreach and education. His observation is that most people are unaware of how hydrogen is used and do not understand the electric utility industry. He notes people have to be educated about an all-of-the-above approach that includes natural gas and energy storage.

Ms. Satyapal replied they have a technical advisory group and are part of the International Partnership for Hydrogen in the Economy, which includes over 20 countries across the world that have teams dedicated to outreach; more information is available on iphie.net. She emphasized the importance of outreach and how hydrogen technologies are aligned with the Energy Storage Grand Challenge. She asked about how DOE can better provide the right education level and reach the right stakeholder base.

Q5. Artie Kressner asked if there is any estimate for what some gas-to-energy technologies would cost. He then asked if there is a way to compare to batteries that are online. Mr. Kressner concluded by asking about how this could transition to a carbon credit and, if so, what the cost would be.

Ms. Satyapal said DOE is funding an analysis project to address this topic and will present to the Committee once it is complete.

Mr. Kent answered the second question, saying SoCal Gas has been doing studies, and he will share the paper published in a peer reviewed journal.

Q6. Clay Koplin asked two questions. The first was, what is the state of storage for portability? Second, are there any applications that support aviation?

Ms. Satyapal said there is growing interest in hydrogen use in aviation for short distances, specifically drones or a small four seater. DOE is looking at materials-based storage technologies that can achieve higher density than gaseous hydrogen, but the tradeoff is that this method of hydrogen storage is heavier. They are now beginning to explore the optimal method hydrogen storage in aviation applications. Regarding microgrids, there is a lot of interest and the United States has historically been a

leader with stationary fuel cells. Ms. Satyapal mentioned that tri-generation technologies can take natural gas or bio gas and supply it to high temperature fuel cells to produce heat, water, or hydrogen. She noted that cross-sector development will be important. Ms. Satyapal also mentioned DOE is creating an "H2 Rescue" initiative. This is a truck that can go to a disaster area and provide power coming from a fuel cell.

Q7. Lola Infante asked the question: Compared to other technologies, when do you think hydrogen will be cost-competitive compared to other forms of electricity and for what applications?

Mr. Kent said they are putting hydrogen at refineries to do rehydrogenation and there are credits available for this today. Steel manufacturing would be an effective market, and fertilizer manufacturing has a huge market. For the grid, it can be used for grid resilience through microgrids and can used in disaster zones. Hydrogen is currently cost-effective for disasters.

Ms. Satyapal reiterated the need for cross-sector coordination because that is where results and development will be maximized. She specifically mentioned pairing with nuclear. The heavy duty transportation sector—marine shipping and trucks—has massive potential.

Q8. Mr. Adams asked about what the parameters and constraints are for identifying the lowest common denominator for a given policy goal.

Ms. Satyapal said the duration of storage and one way vs. two way are the two key issues to identifying the appropriate storage technology for a given scenario. There are also the issues of citing and regulatory barriers. HTFO is funding development of a tool that characterizes costs of hydrogen energy storage and will share with the committee for feedback.

Ms. Rustagi replied that the duration of the storage is most important, and other significant factors include the penetration of renewable and capital investment.

Mr. Kent said California has a lot of wind and solar energy in the summer, but it decreases in the winter so they have a need for long duration storage. The biggest problem is that people are unaware of hydrogen energy, so there is not a marketplace.

Ms. Spinelli added that chemical storage currently has high upfront costs and the costs decrease afterward, while the opposite is true for thermal energy. A limiting constraint is each "zone" within a given area, because there is broad variance. Next-generation technology will entail artificial intelligence communicating across batteries and storage devices to optimally power a building.

Q9. Ms. Denbow asked, what is an acceptable percentage for hydrogen to be mixed in current gas pipelines without putting the integrity of the pipelines at risk?

Mr. Kent said 5% now but 20%–30% is doable in the future. The reason for the major difference is due to the risk factor and taking things cautiously.

Ms. Rustagi replied that it depends largely on the pipeline makeup and its current condition. Hawaii is currently at about 12% hydrogen; the UK has permission for up to 20% (polyethylene pipes). Ms. Rustagi let the committee know that HTFO is funding R&D with utilities to address the compatibility of current and emerging pipeline materials with hydrogen blends in natural gas, given varying concentrations of hydrogen, conditions of pipe, and constituents of natural gas.

Bob Cummings said electric infrastructure is already established in California with wind and solar farms, and it does not need to further attach to the grid. There is already an electricity source for creating hydrogen, and the next step is to co-locate these sources so building additional pipelines or transmission lines will be unnecessary.

Ms. Satyapal agreed with the idea of co-location and said it will be a point of emphasis moving forward. She reiterated cross-sector coordination and engagement. Ms. Satyapal added that offshore wind to hydrogen is gaining traction in the EU.

Q10. Drew Fellon asked how scalable a project similar to the Madison Avenue project would be. He also asked, what is needed to get a more commercially usable option?

Ms. Spinelli said Trane NYC has been doing projects similar to this for 15 years and has 30 thermal storage facilities in the NYC metropolitan area. A challenge is that asset owners do not understand that these storage devices can also be used for heating and cooling. They are currently moving from very early adopters to mass market adoption. Ms. Spinelli foresees that storage components could be used for engineering and construction sectors. She also envisions the next frontier as thermal storage being a complement to high-heat systems. Ms. Spinelli noted there is no degradation over time, so this is a huge selling piece and will increase the technology's scalability.

DOE Asking EAC Questions

Q1. Ms. Rustagi began this part of the session by asking for committee insight on the ongoing Advanced Research on Integrated Energy Systems (ARIES) project at NREL. She gave context that the goal of the project is to expand the facility to use power to gas via hydrogen. What should they be testing?

Mr. Bialek said to look at the combination of how to black-start an island system and incorporate excess solar and wind into an electrolyzer fuel cell. He suggested to also look into how electrolyzers can assist with high-speed ramping. Lastly, he said to compare hydrogen with lithium ion storage or other compounds.

Q2. Tom Weaver asked if there is a possibility of a remote application for rural areas to create an island, assuming there is no pipeline. Is there a tank that can make this practical?

Ms. Rustagi responded to Mr. Weaver, saying that prototype demonstrations of reversible fuel cells have been conducted to date by the DOD. She added that megawatt-scale electrolyzers are being deployed across the world and that fuel cells at that scale are uncommon, but they have growing potential.

Q3. Ms. Rustagi then asked about regulatory barriers: What is the process for getting batteries access to wholesale markets?

Ms. Phillips responded that when talking about market reform, it can come from several outlets directly from stakeholders, ISOs and RTOs, or the marketplace. She said the education piece of power to gas is an integral point and needs to ramp up. Ms. Phillips noted that value proposition is an integral factor. She concluded by saying jurisdictional issues must be taken into account.

Mr. Koplin said Cordova's system spills three to four gigawatt hours of excess hydropower in the summer, and that is when their system is peaking. He said that heating costs about three to four times

more than electricity. Mr. Koplin then provided background to Cordova's system and how it works with the surrounding area water system. He noted there are virtually no regulations for Cordova.

Flora Flygt suggested thinking about resiliency and national security aspects when doing educational outreach because there is value there.

Q4. Ms. Rustagi said her team has looked at two scenarios—fixed capacity factors for hydrogen technologies, and capacity factors that vary as a certain function of operating cost (consistent with today's grid). She asked the panelists how they expect the hydrogen market to grow moving forward.

Mr. Bialek responded there are a variety of technologies available to grid operators. The question becomes centered around value stacking, and the challenge is interplay between wholesale markets and state activities. This topic is still evolving. He said combined heat and power applications have now been well-explored around the world and have been determined to work well. He believes the future will see more frequency response generation. Mr. Bialek believes the central issue to complexities are that each region and even some states operate differently and have different regulations, so they are all on a different playing field. He foresees the lowest cost application winning.

Mr. Cummings commented that a system that can do frequency regulation and frequency response to a disturbance will be far more valuable. He said the industry has to get past the idea that a megawatt hour is just a megawatt hour and take into account what else the battery or tool can do.

Rick Mroz suggested reaching out to the National Association of Regulatory Utility Commissioners, National Association of State Energy Officials, and other similar organizations that can help form solutions.

Mr. Bialek emphasized the importance of this point. He said the conversation has to change from "no fossil fuels," because sometimes fossil fuel infrastructure (pipelines) is needed to move forward to alternative energy sources.

Q5. Ms. Rustagi asked the panelists what duration of energy storage do they believe is necessary in the next 10–15 years, and what emerging technologies are they are looking at?

Shaun Mann replied that 4–6 hours is a fair assumption. He said models suggest the grid load can hit ~50% renewables with 4–6 hours of storage if it is mostly solar. The projections would be different with wind.

Mr. Bialek said the assumption of 4–6 hours works for now, but as penetration increases there will be a need for longer duration, especially because of seasonal shifts. California is currently exacerbating a curtailment issue with a mandate that new homes have to have rooftop solar. He said there is a gap in California for long-duration storage because some areas do not have natural gas, and the cost to use a solar-powered battery for multiple days is massive. The state also faces safety concerns in the event there is a fire and a circuit becomes disconnected from the grid because there is a still a charged battery sitting in a container. A major step is designing the device to ensure it is fire resistant.

Mr. Cummings asked what is needed to equal a 95% capacity factor combustion turbine for annualized energy. He pointed out that solar will need four times the current capacity and wind will require at least three times the capacity. Energy storage for higher penetration will be crucial for this reason. He said clarification of what is actually meant by penetration is critical.

Mr. Koplin concluded the session by suggesting the need for storage on all time scales. He said portability will change the entire value proposition, and there is also a need for stability.

Energy Storage Subcommittee Report and Vote on 2020 Biennial Storage Assessment Work Product

Mr. Sioshansi presented the update for the Energy Storage subcommittee. He started by presenting the 2020 Biennial Storage Review. This report is the second of two congressionally required reports that must be developed by the Energy Storage Subcommittee. Mr. Sioshansi discussed the growth of this report over time, beginning with only OE and expanding across the Department and to other government agencies.

He then walked through the process of drafting this report to present day. He noted some of the stakeholder groups included the energy storage industry, the utility industry, consumer advocates, state regulators, energy officials, and legislators. The report found that program goals are appropriate and ongoing activities are beneficial to the Department, the Department is effective in handling low and high TRL but challenged with mid-level TRL, energy storage modeling tools are helpful to inform and engage stakeholders, and the Energy Storage Grand Challenge (ESGC) is a great process for the Department due to its cross-cutting scope. From this, the EAC came up with several recommendations to the Department. These included the following: continuing the ESGC; focusing more on the dissemination of RD&D products to state-level and industry stakeholders; expanding the RD&D portfolio to include economically viable technologies for long-duration and seasonal energy storage, and pursuing tailored stakeholder input to RD&D; and expanding the dissemination of tools that can be used for modeling the value and performance of different applications and energy-storage technologies in different energy-system contexts. The EAC voted unanimously to approve the 2020 Biennial Storage Review.

Ms. Infante then took over to discuss the 2021 Energy Storage Review. This is the first statutory requirement and needs to be published every five years. She said the only change from February is the schedule has shifted because this report is tied with the ESGC schedule. The subcommittee will provide comments once the RFI comes out. Ms. Infante noted that at this point, they are mainly relying on EAC member engagement.

Smart Grid Subcommittee Report

Mr. Adams walked through the subcommittee's ongoing projects. The first project is Big Data Analytics in the Utility Setting: The Experience, Barriers, and Future Needs. This October panel will be the third and final presentation of the "Big Data" series and is centered around the idea of how a utility can use data techniques to produce value for themselves. The core topics include business issues, data management issues, application opportunities and challenges, barriers and gaps, and research needs. He pointed out that Mladen Kezunovic and Mr. Bialek are leading the effort. Next is State-Federal Coordination, led by Ms. Phillips. This topic has been an ongoing discussion through the subcommittee, with the conversation now coming to the front. The goal is to find out how to avoid unnecessary litigation between states and the federal government for policy decisions. The outcome will be recommendations to DOE in the hopes of setting up a mechanism for how stakeholders can be connected beforehand. Ms. Phillips commented that there is a working group that is currently identifying the high-priority needs before reaching out to external stakeholders.

Mr. Adams then spoke about the advanced grid design effort being led by Mr. Bialek and Joe Paladino. This effort is in the early planning stages and will address how regulators, distribution, and transmission operators must coordinate as new types of technology are added onto the grid. There is a need to educate regulators and legislators. Mr. Adams then discussed the upcoming EAC review of the Smart Grid System Report. Lastly, Mr. Adams said the subcommittee is interested in engaging with DOE about the BPS EO and COVID-19 impacts on the industry.

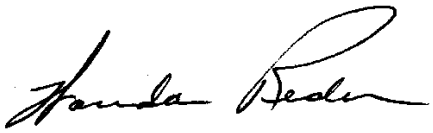
Wrap-Up and Adjourn Day 1

Mr. Heyeck wrapped up the day and thanked Mr. Sioshansi and Mr. Adams for their service to the EAC. Mr. Heyeck announced that Mr. Bialek will become chair of the Smart Grid subcommittee, Ms. Infante will become chair of the Energy Storage subcommittee, and Ms. Reder will become EAC Chair beginning July 1. With that, Mr. Heyeck concluded the first day.

Respectfully Submitted and Certified as Accurate,

Michael Heyeck
The Grid Group, LLC
Chair
DOE Electricity Advisory Committee

09/28/2020
Date



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