



**U.S. Department of Energy  
Electricity Advisory Committee Meeting  
Hosted Virtually Via WebEx  
June 10, 2021**

**Meeting Summary**

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## **Meeting Summary**

The second day of the Electricity Advisory Committee's (EAC) June meeting began with a presentation by Chris Irwin, U.S. Department of Energy's (DOE) Office of Electricity (OE), and Lee Slezak, DOE's Office of Energy Efficiency and Renewable Energy (EERE). Their presentation provided EAC members with context for the joint OE-EERE Electric Vehicle Integration Report. A moderated roundtable with pointed questions from DOE followed the presentation.

Rick Mroz, Resolute Strategies, LLC, moderated a panel titled, "Current Efforts on Emerging Resilience Frameworks and Assessment Tools." The panelists included speakers from Sandia National Laboratory, Lawrence Berkeley National Laboratory, and the Electric Power Research Institute. The day concluded with Joe Paladino, OE, presenting about how OE is addressing the Section 8008 Voluntary Model Pathways project.

All presentations and recordings from this meeting can be found at <https://www.energy.gov/oe/june-9-10-2021-meeting-electricity-advisory-committee>

## **Day 2 Opening Remarks**

Wanda Reder, Grid-X Partners, shared the glowing feedback she received about the zero-carbon emissions panel from the first day. She was pleased with EAC participation, noting that the diverse backgrounds of the members led to a thorough, all-encompassing conversation. Ms. Reder outlined the agenda for the day.

## **Electric Vehicle Integration Report**

Mr. Irwin and Mr. Slezak are drafting a congressionally mandated report about the Vehicles to Grid Integration Assessment. Their presentation briefed the EAC members about current technologies and DOE programs. DOE is focusing the report on five areas of interest. The first is looking at how electric vehicles (EVs) can be an asset for maintaining grid reliability. The second is the impact of grid integration on EVs. The third area is studying how increased penetration of EVs will affect the electric grid. The fourth area is researching standards for integrating EVs with the electric grid. The research includes communications systems, protocols, and charging stations. The fifth area of interest is cybersecurity challenges and needs associated with electrifying the transportation sector. Mr. Irwin followed up after each of the interest areas with a contextual explanation about how DOE views these themes.

Mr. Slezak emphasized that the electric grid and EVs each have their own priority purpose/mission. It is DOE's role to find the areas of overlap where the grid and EVs can operate as assets to each other while fulfilling their primary missions. The presentation was followed by a roundtable session for the EAC members to provide input to DOE. This feedback will be used to shape the final assessment.

## **Discussion Between EAC Members and Panelists About Electric Vehicle Integration**

Mr. Irwin and Mr. Slezak asked the EAC members four discussion questions. Each question was followed by several minutes of pointed conversation.

**Q1.** If there are long-term grid design and policy implications of transportation electrification, what disciplines, processes, and tools could be used to anticipate the future in time to adapt?

**A1.** Mike Heyeck, The Grid Group LLC, compared large and small utilities. He mentioned several unique challenges smaller utilities face because of resource constraints. Small electric utilities are more beholden to vendors, which can lead to less standardization. Mr. Heyeck said that there are challenges at the institutional level as well.

**A2.** Delia Patterson, American Public Power Association, said that many of the American Public Power Association's members have time-of-use rates. They have put out papers and case studies about their members using this technology. Many members also have advanced metering infrastructure.

**A3.** Bob Cummings, Red Yucca Power Consulting, cautioned that there needs to be a form of standardization for chargers. Otherwise, there will be several different types of chargers on a single feeder and this will lead to problems.

**A4.** Sharon Allan, Smart Electric Power Alliance, suggested that there be more collaboration with the Department of Transportation as electric and transportation infrastructure become more intertwined. There also needs to be increased coordination across utilities, third-party vendors, and local governments.

**A5.** Tom Weaver, American Electric Power Company, Inc. (Ret.), encouraged DOE to get real numbers and data while doing modeling. He said that a smooth integration of EVs into the electric grid relies on early, sound planning. Mr. Weaver suggested that infrastructure be built with room for expansion.

**A6.** Jay Morrison, ElectriCities of North Carolina Inc., commented about the different types of data utilities have and discussed the functions of utilities. He said that they are missing data and technology on the vehicle side. Mr. Morrison discussed the need for data integration.

Mr. Slezak replied that they have been running several models to plan for charge management.

**A7.** Artie Kressner, Grid Connections, LLC, highlighted the idea of battery swapping for certain vehicles/fleets. He discussed how battery swapping would lead to different implications for the grid than individual charging options.

**Q2.** How can the long-held conventions of the electric grid (obligation to serve, load planning, blackstart planning, etc.) adapt to a transportation electrification future?

**A1.** Ms. Patterson asked when DOE expects to see significant EV penetration for medium- and heavy-duty vehicles.

Mr. Irwin replied that penetration forecasts are highly variable. He said that there has to be more edge case planning than normal because of the combination with policy, behavioral, and economic trends. Mr. Irwin said that there are already some studies showing that it is more economical to operate heavy-duty EVs than combustion engines.

Mr. Slezak said that it is realistic that 100% of car sales by 2035 are EVs. Medium-duty vehicles will be led by fleet investments. Heavy-duty vehicles will begin at the regional level because there are higher

levels of electricity needed. He said to expect several hundred thousand heavy-duty vehicles on the road within the next decade.

**A2.** Tom Bialek, San Diego Gas & Electric Company, said that the challenge is to use holistic approaches that align common goals. He suggested that it would be useful for DOE to exercise its power as a convener to encourage collaboration across stakeholder groups during the planning process. Regarding blackstart, Dr. Bialek said that independent system operators and regional transmission organizations are responsible for blackstart capabilities. Widespread distributed energy resources (DERs) lead to less control and visibility, which is the opposite of what is needed for blackstart. This causes the blackstart process to become more complex.

**A3.** Ms. Reder referenced the Federal Energy Regulatory Commission's Order 2222, noting that EV integration will lead to new crop of issues for the electric grid. She emphasized the importance of grid visibility for utilities, and said that historical EV stakeholders and utilities need to collaborate. She suggested the report place greater emphasis on load forecasting.

**A4.** Mladen Kezunovic, Texas A&M University, reiterated that the electric sector and transportation sector each have their own purpose; they are not designed to be coupled. He said that policy, technical, behavioral, and economic considerations are four buckets that were initially identified to address these two sectors. Dr. Kezunovic spoke about the complexities of having the previously mentioned buckets align and eventually making them come together in reality. He suggested that it would be useful to put questions into buckets.

**A5.** Joy Ditto, American Public Power Association, said that many of her members (specifically in the middle of the country) are heavily reliant on diesel generation during unstable times. She is concerned that the electric grid will become heavily strained as more EVs come online. Ms. Ditto spoke about the potential cascading impacts of being too heavily reliant on the electric grid.

**Q3.** As Extreme Fast Charging (XFC) reaches 1-megawatt to 3.5-megawatt charging in the pursuit of operational efficiency, what are the potential local (nodal) and regional (network) challenges and opportunities? Public transit, local fleets, and long-haul fleets will all create variations.

**A1.** Clay Koplín, Cordova Electric Cooperative, said that the current rise of EVs on the grid represents an inflection point. There is a transition from a command-and-control grid to an interactive and transactive electric grid. Mr. Koplín spoke about a bright, dynamic future with more consumer interaction with the grid.

**A2.** Mr. Mroz brought up the security standards required to ensure a secure EV-grid ecosystem. He also discussed the complexities of getting stakeholders on the same page.

**A3.** Darlene Phillips, PJM Interconnection LLC, raised the issue of who pays for all these grid upgrades. She agreed with Mr. Koplín that the grid is starting to shift away from the historical command-and-control operational paradigm. Ms. Phillips cautioned that there is still some level of utility control needed compared to a completely decentralized system.

**A4.** Mr. Cummings raised a concern about XFC at truck stops, noting the large electricity demands there would be at remote locations. Mr. Cummings discussed the logistical and infrastructure challenges that electrified heavy-duty EVs will cause.

## Current Efforts on Emerging Resilience Frameworks and Assessment Tools

Mr. Mroz provided introductory remarks to the panel that gave context to how this panel came about. He spoke about the challenges of incorporating resilience planning within the electricity sector.

Mr. Mroz said that the panel is supposed to look at resilience in the context of defense critical electric infrastructure (DCEI). He discussed the broad definition of resilience and how its definition changes depending on the stakeholder. The first step is to define the circumstances under which a given resilience conversation is discussed—what are intended outcomes from the discussion? Mr. Mroz highlighted the focus on resilience and the many different entities both within DOE and externally that are trying to tackle/incorporate resilience.

**Bobby Jeffers**, Sandia National Laboratories (SNL), presented about how SNL is measuring and valuing resilience. He began by addressing the inevitable tradeoffs when doing resilience planning—it is impossible to cover everything due to resource constraints. Mr. Jeffers said that the Biden-Harris administration has made equity a top priority. In terms of the energy sector, this can be looked at as a three-legged stool, with equity being the seat held up by efficiency, resilience, and sustainability.

There are two types of characteristics for resilience metrics: attribute-based and performance-based metrics. Performance-based metrics are typically harder to plan for because they can only be tested during an event. Mr. Jeffers walked through some of the factors SNL uses when creating models for resilience. He said that social resilience metrics have become relevant over the past few years and are becoming more prominent. Mr. Jeffers clarified that their resilience metrics consider reliability.

Paul Stockton, Paul N Stockton LLC, asked if SNL is looking at how adversaries might target specific assets; specifically, the capability of those assets to do mission-essential tasks when a given piece of infrastructure is taken offline.

Mr. Jeffers replied that they are looking at this type of modeling, but it has not gained a significant amount of traction.

**Peter Larsen**, Lawrence Berkeley National Laboratory (LBNL), discussed how utilities and policy makers use economic metrics to plan for and recover from natural hazards. He is focusing on the economics side of long-duration, widespread power interruptions (LDWIs). Mr. Larsen walked through how LBNL shaped its study. Their two areas of focus were economic information related to cost recovery and economic information related to mitigating future impacts.

Mr. Larsen highlighted the difference between cost-effectiveness analysis and cost-benefit analysis. He pointed out that each utility in their study provides information about cost-effectiveness, but only half address cost-benefit analysis. LBNL is still working on how to put dollar values on resilience investments. There are two main key findings from their study. The first is the missing valuation of resilience investments. The second is that utilities and regulators refer to resilience as a reliability investment.

Mr. Larsen discussed real-world examples of LBNL valuing LDWIs. He spoke about a project partnership with ComEd. LBNL is helping create a tool where ComEd can run various scenarios that will provide direct and indirect economic impacts from power interruptions. ComEd will use this tool to justify future resilience investments. LBNL is working with DOE, Edison Electric Institute, and utilities to update the Interruption Cost Estimate Calculator.

Mr. Mroz asked how LBNL's resilience efforts tie into DCEI initiatives.

Mr. Larsen referenced a Frontier project that is partnered with the territory of Guam. This directly ties into Guam's public utility, which connects to DCEI sites.

**Daniel Brooks**, Electric Power Research Institute (EPRI), highlighted six frameworks for investment decisions or assessing performance that EPRI uses to factor in resilience. Mr. Brooks discussed EPRI's climate adaptation model. The model looks into cascading impacts from given events. The next step after the model is completed is to calculate a monetary value if a certain system fails. After this, EPRI looks at the potential impacts and costs if mitigating actions were taken. This approach will ultimately help put dollar values on resilience investments.

Mr. Brooks walked through each of EPRI's frameworks. He provided insight into the variables that go into developing each framework and how it can be used. Mr. Brooks gave an overview of other EPRI resilience research and development initiatives. These included poll design, communications under black-sky conditions, and overall grid hardening.

**Q1.** Mr. Mroz asked the presenters how their tools can be used to quantify human-caused threats to DCEI sites. He also asked how these tools can be implemented into planning processes.

Mr. Jeffers replied that their models revolve around consequences and probability. Probability is often brushed aside when looking at planning for DCEI sites. Mr. Jeffers suggested that research should mainly focus on addressing scenarios that grid operators and utilities face. There should still be a small aspect of investment going toward lower-probability events.

**Q2.** Dr. Bialek asked how the panelists address resilience tradeoffs and incorporate risk thresholds into their planning. He also discussed the importance of resource adequacy.

Mr. Brooks replied that EPRI incorporates loss of load expectation as a metric. Mr. Brooks spoke about incorporating climate resilience into grid planning and the importance of firm generation.

Mr. Jeffers agreed with Mr. Brooks' comments. He added that existing resource adequacy approaches are outdated in the context of a decarbonized grid. This is because of the increase in variability and uncertainty of load generation and the need to maintain storage.

**Q3.** Kimberly Denbow, American Gas Association, noted that resilience is a major factor being incorporated into planning, yet there is a lack of understanding of resilience due to its ambiguous meaning for different stakeholders.

Mr. Jeffers replied that a lot of investments proposed to regulators contain the phrase "in the public interest." Resilience investment will be accounted for differently depending on whether it is viewed as a necessary public service.

Mr. Larsen replied that resilience investment often has a high cost and it is difficult to put a price on the proactive improvements it leads to. Mr. Larsen looks at investment as a public good. He said that economists typically look at public good investments as something where a bystander receives some sort of benefit. In this context, the investments would be coming from ratepayer and taxpayer dollars. These are conversations that should occur between regulators, the private sector, and policymakers at the local and state level.

Mr. Brooks agreed with the previous two panelists. He emphasized the difficulty in quantifying resilience investment until an event occurs. Mr. Brooks said that models need to get to a point where they can consider investments that hedge risk from resiliency.

**Q4.** Dr. Kezunovic asked how the panelists deals with short-term versus long-term mitigation investments. He also asked how cascading impacts from events can be incorporated into investment proposals.

Mr. Larsen replied that resilience investments should be funded with a combination of ratepayer and taxpayer dollars. The tricky aspect of this is deciding how the share is allocated between the two.

Mr. Brooks replied that restoration optimization (sufficient blackstart) and existing distribution technology needs to be better utilized during outages and disturbance events.

**Q5.** Dr. Stockton asked Mr. Larsen to elaborate on ripple effects from outages.

Mr. Larsen said that the first step is to address direct and indirect consumer impacts of outages. These issues are addressed by survey outreach to business customers. LBNL then incorporates these data to make models about outage impacts.

**Q6.** Mr. Koplín asked if there should be a focus on building resilience into infrastructure and how it should be looked at in grid architecture.

Mr. Larsen replied that it is easier to build something correctly the first time than to go back and retrofit existing infrastructure. This might lead to higher up-front costs but will save money in the long term.

Mr. Jeffers spoke about the services that are indirectly provided by the electric grid. He brought up the importance of considering unintended consequences on the path toward electrification.

Mr. Brooks agreed with the previous comments. He said that resilience cannot be planned in isolation.

### **Discussion on Pathways Development Project**

Mr. Paladino discussed his vision for addressing transformational challenges to the electric grid. He provided context that this program comes from Section 8008 of the Energy Act of 2020. Mr. Paladino walked through the requirements of the legislation. He discussed grid trajectory considerations. He said that DOE is not advocating for a specific grid design; rather, DOE can help provide factors that need to be considered when shaping the electric grid. A core aspect of the model pathways program is to institute a process with stakeholders that examines technical requirements and institutional challenges.

Mr. Paladino outlined the different phases of decarbonizing the electric grid. The U.S. electric grid is currently experiencing a shift in stage one (current status) to stage two (microgrids, moderate to high DER integration, grid service markets). He spoke of areas where the federal government can play a role, highlighting transmission deployment.

Mr. Paladino provided the EAC with an update on DOE's status implementing the Section 8008 requirements. Mr. Paladino brought up the idea of having a panel session on regional planning. He sees planning as the centerpiece of building the next generation of the electric grid. The immediate next step is to establish consistent meetings between DOE and a subgroup of EAC members to form the model pathways steering committee.

Dr. Bialek said that the role of state-federal coordination is at the forefront of the Section 8008 model pathways implementation. The Smart Grid Subcommittee's ongoing advanced grid design topic aligns with the 8008 model pathways effort.

Mr. Heyeck suggested that it would be beneficial to have a brainstorming session to narrow the focus of addressing a few pathways.

Mr. Cummings commented about the definition of "regional planning." He and Mr. Paladino agreed that it refers to interconnection points.

### **Public Comments**

No public comments were received.

### **Wrap-Up and Adjournment of the June 2021 Meeting of the EAC**

Ms. Reder reiterated her thanks to the panelists, EAC members, and DOE for a terrific meeting. She said that the panels were on point for emerging topics.

The next full EAC meeting will take place October 20–21, 2021.

Chris Lawrence, EAC Designated Federal Officer, officially adjourned the meeting.

Respectfully Submitted and Certified as Accurate,



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Wanda Reder  
Grid-X Partners, LLC  
Chair  
DOE Electricity Advisory Committee

8/11/2021

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Date



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

8/11/2021

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Date



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Christopher Lawrence  
Office of Electricity  
Designated Federal Officer  
DOE Electricity Advisory Committee

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Date