U.S. Department of Energy

Electricity Advisory Committee Meeting

Hosted Virtually Via WebEx

May 29, 2020

Meeting Summary

PARTICIPANTS

Electricity Advisory Committee (EAC) Members:

JOHN ADAMS
Electric Reliability Council of Texas

CHRISTOPHER AYERS
North Carolina Utilities Commission Public Staff

TOM BIALEK
San Diego Gas & Electric Company

PAUL CICIO
Industrial Energy Consumers of America

ROBERT CUMMINGS
Red Yucca Power Consulting

ANN DELENELA
Entergy

KIMBERLY DENBOW
American Gas Association

DREW FELLON
Trane Energy Supply Services

FLORA FLYGT
American Transmission Company (Ret.)

SHERI GIVENS
National Grid

MICHAEL HEYECK
The Grid Group LLC

PAUL HUDSON
General Infrastructure LLC

LOLA INFANTE
Edison Electric Institute

MLADEN KEZUNOVIC
Texas A&M University

CLAY KOPLIN
Cordova Electric Cooperative

ARTHUR KRESSNER
Grid Connections LLC

CHARLOTTE LANE
Public Service Commission of West Virginia

SHAUN MANN
Tri-State Generation and Transmission

JEFF MORRIS
Washington State House of Representatives

RICHARD S. MROZ
Resolute Strategies LLC

DELIA PATTERSON
American Public Power Association

DARLENE PHILLIPS
PJM Interconnection LLC

WANDA REDER
Grid-X Partners LLC

RAMTEEN SIOSHANSI
The Ohio State University

DAVID WADE
Electric Power Board of Chattanooga

TOM WEAVER
American Electric Power Company Inc.

Registered U.S. Department of Energy:

MATT ARONOFF
Department of Energy

GIL BINDEWALD
Department of Energy

MICHAEL COE
Department of Energy

PATRICIA CRUMLEY
Department of Energy

PAUL DONOHOO-VALLETT
Department of Energy

RAJ GAIKWAD
Department of Energy

JACOB HERBERS
Department of Energy

ANDREW HLASKO
Department of Energy

PAT HOFFMAN
Department of Energy

JOYCE KIM
Department of Energy

CHUCK KOSAK
Department of Energy

CHRISTOPHER LAWRENCE
Department of Energy

DOUGLAS LITTLE
Department of Energy

JOHN MCINTOSH
Department of Energy

DAVID MEYER
Department of Energy

JOE PALADINO
Department of Energy

MELISSA PAULEY
Department of Energy

MATT PIGGINS
Department of Energy

BHIMA SASTRI
Department of Energy

MERRILL SMITH
Department of Energy

CYNDY WILSON
Department of Energy

GUOHUI YUAN
Department of Energy

JOHANNA ZETTERBERG
Department of Energy

Registered Speakers, Guests, and Members of the Public:

SONYA BASKERVILLE
Bonneville Power

DANIELLE BYRNETT
National Association of Regulatory Utility Commissions

JUAN PABLO CARVALLO
Lawrence Berkeley National Laboratory

JANICE CEPERICH
U.S. Government Accountability Office

LELAND COGLIANI
Lewis-Burke Associates

PAUL DE MARTINI
Newport Consulting

JOHN GROSH
Lawrence Livermore National Laboratory

JUDITH HAFNER
Vantage Point Strategies

JOHN HOWES

Redland Energy Group

DAVID HUNTER
Electric Power Research Institute

CHRISTOPHER KELLEY
Beam Reach Consulting Group

ABIGAIL KNAUFF
CFTC

MARK KNIGHT
Burns & McDonnell

PETER LARSEN
Lawrence Berkeley National Laboratory

GARETH LEES
AP Sensing

JOCELYN MACKAY
National Energy Technology Laboratory

CELIA MENDIVE
U.S. Government Accountability Office

JUSTIN MEYERS
Nelson Mullins

JAY MORRISON
National Rural Electric Cooperative Association

LEE PEDOWICZ
Northeast Power Coordinating Council

LUKE ROSE
Malta Inc.

FEIFEI SHI
Penn State University

JOSH SHIODE
Battelle

JOE SOWELL

Georgia Transmission Corporation

FRANCESCA SPINELLI
Trane Technologies

DANIEL STEINBERG
National Renewable Energy Laboratory

JENNIFER STENGER
Duke Energy

SAMIR SUCCAR
ICF

JEFFREY TAFT
Pacific Northwest National Laboratory

MARY TOLER
Battelle

MARK UNCAPHER
Fiber Optic Sensing Assn.

SANTOSH VEDA
National Renewable Energy Laboratory

JUD VIRDEN
Pacific Northwest National Laboratory

BRIGGS WHITE
National Energy Technology Laboratory

ARI ZEVIN
Google

Registered ICF/Support:

DANIEL GRAY
ICF

MEEGAN KELLY
ICF

RAY LONG
ICF

JOSH SMITH
ICF

* * * * *

Meeting Summary

Day 2 of the meeting began with Gil Bindewald of the Department of Energy (DOE) Office of Electricity (OE) and Guohui Yuan of the DOE Office of Energy Efficiency and Renewable Energy (EERE) giving an update about the North American Energy Resilience Model (NAERM). This was followed by a panel session moderated by Joe Paladino of OE about DOE activities related to grid planning with significant penetration of renewables and distributed energy resources (DERs). The panel consisted of presentations by Paul De Martini of Newport Consulting, Inc., Jeffrey Taft of Pacific Northwest National Laboratory (PNNL), Daniel Steinberg of the National Renewable Energy Laboratory (NREL), Peter Larsen and Juan Pablo "JP" Carvallo of Lawrence Berkley National Laboratory (LBNL), and Johanna Zetterberg of OE and Samir Succar of ICF. A brief question and answer session followed each presentation. This led into a moderated roundtable between the Electricity Advisory Committee (EAC) members and the presenters. There was one public comment, and it was about fiber optic sensing. The EAC Chair and Vice-Chair provided closing remarks before concluding the May 2020 meeting.

Day 2 Opening Remarks

Mike Heyeck began the day by noting there is one public comment registered, and he went through the process for leaving public comments.

Update on the North American Energy Resilience Model

Mr. Bindewald and Mr. Yuan presented about NAERM. Mr. Bindewald began by giving context that the environment the grid is facing is evolving, whether this be from natural or manmade threats. He said NAERM is designed to look through a wide array of threat scenarios. Mr. Bindewald noted his team used the definition for "resilience" based on Presidential Policy Directive 21, which says it is the "ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions."

NAERM focuses on "low probability, high risk" scenarios. He said this model is different because it focuses on interdependencies (multiple layers) and takes into account the electric and gas grids along with communications. This way, the model will show how these infrastructures relate to one another through cross-sector analysis. Mr. Bindewald noted that NAERM is widespread throughout the agency, including multiple offices and eight national labs. He clarified that this is not an operations-focused tool; it is used strictly for situational awareness. Since his last presentation, the project has added underlying capabilities while also increasing data granularity to improve threat assessments and modeling. Mr. Bindewald said his team is looking to improve visualization capabilities by the end of the fiscal year, including having real-time data in place and while integrating the natural gas transient work. He concluded by saying the top three priorities are integrating real-time situational awareness, infrastructure modeling, and software architecture.

Mr. Yuan highlighted the importance of grid architecture because that is what holds the project together. He also mentioned how the future grid is vastly changing, with many unknowns due to DER integration.

Questions and Answers

Q1. Rick Mroz asked if NAERM contemplates any particular methods to value aspects of resilience. He said this becomes important for investments, cost recovery, and prudency issues.

Mr. Bindewald replied that this falls under the Threat and Economic Modeling (TEM) scenarios within NAERM that also capture metrics and investments. He said NAERM focused on physics in the system and at potential indirect impacts. He mentioned the Resilience Distribution program that further looks into investments.

Q2. Delia Patterson asked whom NAERM will be available to.

Mr. Bindewald said it is being developed to separate the model from system-specific data so the model can be shared on a broader scale. The intent is for the model software to be shared on a big scale, but the data would not be shared and users will enter their own data.

Q3. Mladen Kezunovic had a series of comments and questions. First, he suggested the model is missing the discussion of high probability, low-impact events. He then commented that he would like to see identifying constraints taken into account for the modeling. Lastly, he asked what changes can be made to the physical modeling to make it more interactive.

Mr. Bindewald agreed with all three points. He said data driven compared to the fundamental model piece is a central point driving NAERM. The opportunity regarding "high probability, low impact events" is tied up in the ability to mine data to characterize events and apply machine learning AI to understand the impacts. Overall, his team is trying to address Mr. Kezunovic's last point over time and eventually scale them.

Mr. Yuan reiterated the importance of system architecture. There are certain sets of rules connecting the capabilities and tools into NAERM to add more insight into analysis. He said this process will be time consuming.

Q4. Flora Flygt asked two questions: Do you have an overall plan for timeline and milestones? Second, where are you getting data?

Mr. Bindewald replied that their approach has been an emphasis on the Western Electricity Coordinating Council (WECC), and they are looking to incorporate the eastern United States in September with real-time data. Regarding data, they are having ongoing discussions with industry and data owners. DOE has to build a level of respect and trust with clear intentions.

Bob Cummings commented that the progress of layering between the natural gas and electricity system has taken major strides. It will be important for NERC and the EAC to monitor what is happening in the long run.

Clay Koplin said a lesson he has learned is that resilience resides with people. He suggested there be further emphasis on workforce development.

Q5. Mr. Koplin then asked how DOE is looking at person-machine interface and putting NAERM in the hands of decision makers.

Mr. Bindewald replied that DOE is beginning to look at how human behavior affects resilience. In the western United States, they have been more focused on collecting data, whereas the east is looking to get the model in the hands of decision makers and practitioners.

Mr. Yuan added that visualization plays a big role when discussing human-machine interface. He said the use case definition is a starting point because the model can be adapted to certain uses for optimal results. Mr. Yuan noted that workforce development has seen a major push within the Department.

Q6. Ms. Phillips asked how DOE gets NAERM in the hands of decision makers to use as a tool to inform this process.

Mr. Bindewald replied they are first focusing internally within DOE. He said NAERM was not developed for a regulatory purpose; rather, it was to be used for planning. His team is currently exploring the idea of how it can branch out from its current focus and is open to suggestions.

Q7. Jeff Morris asked two questions. He asked whether DOE plans on using fusion centers because it allows government-owned critical infrastructure to see data but not possess it. He then asked about the relationship with Canada in terms of working with them to get data.

Mr. Bindewald replied they have not looked into fusion centers too much, but they seem like a great idea. In response to the second question, he said that there have been ongoing conversations and they are working to emphasize the North American partnership.

DOE Activities Related to Grid Planning With Significant Penetrations of Renewables and DERs

Joe Paladino then shifted the focus to take a deep dive into programs DOE is pursuing that address grid planning with respect to renewables and DERs. Mr. Paladino was the moderator for the next several presentations and kicked off the session doing the first presentation. His presentation tackled integrated planning for the electric grid. Mr. Paladino began his presentation by noting that the purpose of the session is to take an in-depth look at DOE efforts addressing a future grid of mass DER integration from the perspective of security, resilience, and reliability objectives.

He then showcased how renewables are becoming more competitive as costs have decreased substantially over the past several years while the cost of natural gas has remained constant. Further, the cost of storage has dropped about 70% during the previous seven years. He noted that the U.S. energy storage market is expected to grow from 523 megawatts in 2019 up to 7.3 gigawatts in 2025. This growth is mainly driven by utility companies and residential markets. Mr. Paladino said these technologies are not only changing the supply of energy but also the load shape, which will become less predictable. He mentioned that 25 states currently have integrated distributed system plans or are in the process of setting these plans up. The plans help with developing technology implementation strategies that will address grid modernization, utilization of DER, and resilience and reliability objectives. The plans specifically help with investment strategies. Mr. Paladino concluded his presentation with an overview of remaining challenges. Some of these included incorporating resilience into the planning processes, planning for uncertain futures and risk, and predictable technology adoption pathways.

Paul De Martini's Presentation: Integrated, Resilient Distribution

Paul De Martini, of Newport Consulting Inc., followed up Mr. Paladino by presenting about Integrated, Resilient Distribution Planning. He said the three main areas of the distribution system planning process entail safety and operational efficiency, DER integration and utilization, and resilience and reliability. Mr. De Martini believes that, in terms of grid modernization, society is moving into the final stage of community microgrids and distributed markets. He noted the shift in California, with DER integration being required by law in the coming years. He then presented his take about how to explain distribution investment to broad audiences. Mr. De Martini used a pyramid model to show that as one moves up the pyramid, that characteristic's success relies on the one below. The point is to demonstrate how many steps or "behind the scenes" decisions are required before the end goal. He followed this up by mentioning policy, customer choice, and reliability and resilience are all factors that must also be taken into account.

Mr. De Martini said the next step for grid modernization is getting regulators and stakeholders to understand how utilities are crafting their deployment plans. This initiative aims to bring all parties together so they can collaborate together early in the planning process, with the anticipation that less problems will arise along the way. Each party will be educated about various steps throughout the process and will have a stake in the conversation. For example, if regulators are involved in the conversation from the beginning, then they will better understand the utility's vision and utilities will better know their boundaries.

He then transitioned to discussing different cost-effectiveness frameworks. The first being "best-fit reasonable cost." This is the most used method for utilities. It prioritizes their goals through an all-of-the-above approach to addressing different factors while avoiding "least cost" options. The "benefit-cost analysis" focuses solely on economic efficiencies. It is often the most difficult because rates, programs, or procurements will be implemented across different proceedings, making it hard to connect the outcomes of the two proceedings. Customer "self-supporting" is the final framework and puts the cost on the customer because they are the one initiating action. He noted that threat assessment is an especially tricky subject because there is no clear way to plan for events and impacts. As an event grows, so do the correlating economic and societal impacts along with duration. Mr. De Martini said that inputs into planning processes have long been forgotten and now complications are occurring. He went on to discuss the modern challenges associated with the grid because now threat assessment is taking a front-row seat as a focal point crafting the overall vision. He concluded by saying the introduction of DERs is leading to overall uncertainty of operations because these system are not always running. For example, a wind turbine cannot be used on a still day.

Questions and Answers

Tom Bialek commented that the continuation of information sharing with NASEO and NARUC is important because people outside of those developing the new grid do not understand what is going on.

Paul De Martini agreed with this comment. He replied that, when discussing threats, at some point all the policy objectives converge so people need to be on the same page. He has already observed policies clashing with one another. He said the planning process will facilitate these conversations and is figuring out how to be more proactive.

Q1. Mr. Kezunovic asked Mr. De Martini how he reconciles the notion of an integrated distribution system versus coordinated risk-based concepts that are not optimal but still hold everything together.

Mr. De Martini responded that he does not see these as opposing options and would like to achieve both. He's been hearing from stakeholders, commissions, and utilities there are several dimensions: the need to address affordability, how to address resilience and reliability needs in a particular area, and, from a system standpoint, if integrated resource planning is looking at their specific objectives then distribution has to understand this and account for it in the plan. Mr. De Martini has observed that states are starting to realize they need a convergence that takes into account risk analysis and integrated resource planning.

Jeffrey Taft's Presentation: Energy Storage as Core Grid Infrastructure

The next presenter was Jeffrey Taft, from Northwest National Laboratory, who presented about energy storage as core grid infrastructure. Mr. Taft began the presentation saying grid architecture is a strategic level activity that is a transition between planning and designing or implementation. Grid architecture is a methodology used to look at the whole grid in all of its interactions and properties across the multiple structures of the grid simultaneously. Grid architecture is about structure, and it is important to remember components are treated as black boxes in the sense that researchers are agnostic to technologies. He noted that this presentation will focus on using storage to improve structural properties. Mr. Taft said grid architecture is divided to a three-part system of abstract components, structures, and systems with specific qualities and properties.

He then spoke about the role of buffering in complex systems. Buffers add resilience to the grid by maintaining a steady state, power grids lack springs/shock absorbers. Mr. Taft said bulk energy storage is viewed in a conventional context (that it can do lots of functions) or a systemic perspective (that it has a specific function). He believes it should be seen as a core grid component with the option of operational flexibility. Key characteristics that make a storage device successful are that it can do reflexive operations, has fast symmetrical power flow in and out, has fast switching from input to output flow, and has high level flexible control and grid interface. Mr. Taft sees a future with energy storage devices being deployed on a mass scale located at the substation and operating as a coordinated network of storage devices. This would provide distributed flexibility that improves the grid's resilience. He highlighted the impending benefit of managing volatility exchange between bulk natural gas and electric generation systems. Combining the storage of existing infrastructure in gas with Mr. Taft's vision would lead to a new kind of control system coming online. The operational requirements would have to be designable, dispatchable, securable, and service-assured (reliable).

Mr. Taft proposed three types of control structures for the deployment of energy storage devices. The first is through a central transmission system operator which controls all of the devices directly. The second is through a distributed system operator. He believes that as distribution and generation blur together, more people may prefer this alternative. The last structure would be decentralized (autonomous). This is an important characteristic for full resilience in the event the device cannot be reached. Mr. Taft concluding by summarizing his presentation. He said people should think of energy storage as a core system structure and want to deploy a large number of small units opposed to few large central devices. These devices should be put at transmission/distribution (T/D) interface substations and controlled as groups of storage units for a coordinated network fashion. It is imperative that control is fast, effective, and tied to elements of the grid state.

Questions and Answers

Bob Cummings commented that he is working on DER Management Systems for IEEE. They are looking at DERs at both transmission and distribution levels. He said the concept of virtual power plants has arisen. Mr. Cummings emphasized the importance of locating grid storage that is controlled by the utility at T/D interfaces.

Mr. Koplin said he believes the EAC is already in the right direction because the Smart Grid and Energy Storage subcommittees are already looking at T/D interfaces along with controls and applications to

move electricity. He noted the missing piece is the regulatory challenges. Mr. Koplin said Cordova converted its lines from overhead to underground power lines. Plenty of positive externalities came from this, and he emphasized that the cost of installing underground lines was less than installing overhead lines. He used this example to show that it is possible to push policy that presents lower costs approaches while being more flexible.

Mr. Paladino tied this back to Puerto Rico's grid overhaul. Puerto Rico has the opportunity to make a vast change similar to Cordova's. Mr. Paladino ended by asking the rhetorical question, "How much centralized planning should there be to simplify downstream?"

Q1. Wanda Reder commented that energy storage needs to be used as a planning tool. She said dynamic solutions with energy storage and DER tools are currently challenged. Ms. Reder then asked how Mr. Taft suggests addressing challenges associated with pairing energy storage and DER tools. She followed this up by asking how he sees the bridge of planning tools with real-time domains unfolding.

Mr. Taft responded that the process would be simplified if a more general architecture strategy was used as opposed to pointed solutions.

Q2. Jeff Morris asked Mr. Taft if he sees other examples of utilities expanding their digitization of sensors to the extent of SDG&E. Mr. Morris noted this type of project requires substantial capital investment but leads to huge benefits for circuit level value.

Jeffrey Taft replied that he has seen point-to-point solutions, and there are some utilities that use storage for black start situations. Historically, distribution systems are not well instrumented or highly observable, meaning there is not data to prove the benefits are really occurring. Mr. Taft said fundaments layers with a focus on observability need to be implemented, then advanced technology can be applied to the system.

Ms. Flygt emphasized the importance of cost-benefit analysis schemes. When going in front of a board of executives, a case that demonstrates the needs and discusses benefits, even if they cannot be exactly quantified, needs to be put forth.

Mr. Taft clarified that affordability always needs to be taken into account, but when looking at large capital projects there is more to the story than the upfront price tag. He noted that often the benefits will end up paying for the project.

Mr. Paladino added that DOE is working with regulators to develop objectives. After this, point strategies will be developed to achieve said objectives.

Daniel Steinberg's Presentation: Modeling the Evolution of Transforming Power System – Methods and Tools

Daniel Steinberg of National Renewable Energy Laboratory (NREL) was the next to present. His presentation discussed Modeling the Evolution of Transforming Power System: Methods and Tools. Mr. Steinberg began by overviewing some key power system trends. Electricity markets are expanding, leading to evolving market structures. There is an increase in customer adoption of distributed generation and storage, and self-provision of energy by large customers. He has observed that electricity demand is evolving due to electrification, efficiency improvements, and developing communication technology. There is also a growing risks of system damage from severe weather as well as physical and cybersecurity threats.

Mr. Steinberg then discussed the current state of integrated and coordinated workflow between models. VRE development consists of a four-step plan that first looks at what is being built, then asks whether it works, then addresses adequacy, and lastly stability under normal and adverse conditions. NREL has put together an integrated model and workflow to apply this process to systems. Mr. Steinberg proceeded to walk through the model using specific resources and tools they use at each step. He discussed a model that looks at the capacity credit of storage and how it changes with PV integration. During the daytime, the credit has relatively low value but as evening comes along, the value of the credit increases. At a certain point as more PV comes online the credit itself will become diluted. Mr. Steinberg's team is trying to figure out different factors that impact the price.

Mr. Steinberg then presented his plan moving forward. The Scalable Integrated Infrastructure Planning Framework will play a significant role. The idea is to develop a framework within which one can develop all different types of models that are operating at different scales. He noted that all the pieces will need to be using the same data and language and that their planning tools assume a perfect market. They are in the process of developing a model that takes into account imperfect markets and "bad actors" to simulate real-world settings (Electricity Market Investment Suite [EMIS]). Resiliency modeling efforts are also a point of emphasis. These models are trying to figure out what particular hazards or concerns should be prioritized and how to quantify them. Mr. Steinberg added that the resiliency models go a step further by looking at how to change current investment models to represent the need for additional investments or alternative operations to meet required resilience standards.

Questions and Answers

Q1. Darlene Phillips asked how Mr. Steinberg's team is making the translation between various types of modeling used to types of analysis.

Daniel Steinberg replied this is especially difficult because they are facing technological and human problems. He said that the human problem is transparent communication, so they are using automated tools to help mitigate this. Mr. Steinberg recommended using automation as much as possible if there is poor communication.

Peter Larsen and Juan Pablo Carvallo's Presentation: Research Related to Western U.S. Resource Planning and Adequacy

Peter Larsen and Juan Pablo "JP" Carvallo, both of Lawrence Berkeley National Laboratory (LBNL), presented next about Research Related to Western U.S. Resource Planning and Adequacy. This presentation was centered around the five research questions they use to push their research. Mr. Larsen discussed the first question, how utilities are reporting and disseminating their long-term planning assumptions. He showcased data from Integrated Resource Plans (IRPs) showing whether or not there was even data on this topic. It showed what grid capabilities utilities were tracking, and the conclusion is there were a lot of gaps. At the time of this survey (~4 years ago), only one out of the 38 utilities surveyed (which represents 90% of WECC) had energy storage in their plan. The data went a step deeper because it had the ability to take into account risk for each category. This led them to create the Resource Planning Portal with DOE OE that has data from over 130 IRPs filed by 45 utilities. Mr. Larsen said regulatory staff and utilities use this tool.

Mr. Carvallo then took over and began with discussing the second research question of how long-term planning assumptions compare to actual outcomes. Their research found a trend that utilities often overestimate consumption and peak demand load. This is because utilities were using outdated data that did not reflect most recent information. It also found that complexity and accuracy were not correlated—more complex forecast methods did not necessarily lead to more accurate results. Mr. Carvallo noted that sensitivity and risk analysis were not well integrated. His team found that a key way to determine success in forecasting is by comparing its procurement, because procurement relies on the most recent data.

The third research question was, how much are electric utilities relying on the market to supply future resources. This led LBNL to develop another project to track market purchases and their use with IRPs. The conclusion was that recent IRPs are relying on long-term purchases for the earlier years of the forecast and focusing on short-term purchases for the later years of the forecast. This left the question whether the expected capacity will materialize or not. Mr. Carvallo said resource adequacy obligations may drive for asset ownership, and they revealed a trend of disconnection between asset ownership and market ownership.

The fourth question from their presentation was, what is the value of integrated planning and centralized coordination of distributed energy resources? They modeled the evolution of a power system with an integrated planning of utility scale operation to address this. The model can run as vertically integrated or one that has no capacity from behind the meter and responds based on distribution and transmission. Mr. Carvallo's team found that integrated decision making will lead to substantially more distributed storage than centralized storage opposed to a decentralized (consumer) decision making paradigm. He noted that an integrated planning approach will save 7%–37% on total system costs over a 15-year period (based on using a western U.S. utility as a case study. Lastly, how might utility planning need to change to integrate with regional resource adequacy assessments? Mr. Carvallo said there is a need for regional resource adequacy processes, but there are doubts about how a process will relate to existing resource planning jurisdictional processes. Mr. Carvallo's team is partnering with Western Interstate Energy Board (WIEB) and the University of Texas at Austin to solve this.

Questions and Answers

Q1. Ms. Flygt asked if they investigate why planning indicators were different from what was ultimately procured.

Mr. Carvallo replied they found that utilities with larger industrial customers had more divergence in their procurement because some customers drop off or move away. This would cause a single entity to have a greater impact on the system, which they did not necessarily find a problem. He noted there was not find a specific reason for this.

Johanna Zetterberg and Samir Succar's Presentation: Integrated Planning and Supporting Analysis Requirements

Johanna Zetterberg of DOE OE and Samir Succar of ICF capped off this portion of the day by presenting about Integrated Planning and Supporting Analysis Requirements. Johanna Zetterberg began by providing an overview of the NARUC-NASEO Joint Task Force on Comprehensive Electricity Planning (https://www.naruc.org/taskforce), saying the presentation is about a forum covering state-led pathways toward a more resilient, efficient, and affordable grid. She explained this is a joint task force between NARUC and NASEO, and the motivation for the task force stemmed from increased demands and expectations of the electricity system. As on benchmark, Ms. Zetterberg noted that according to industry data analyzed by EEI, there are approximately $130 billion in annual capital expenditures being invested in the grid. There is heightened interest about how these investments can provide value in multiple ways, helping to overcome increasing system complexity along with avoiding unnecessary costs associated with operating the grid.

The task force is taking an electricity system wide view when looking at key drivers. This is made of the three big themes of "transmission needs," "distribution system," and "resource planning." They are using matrix approaches to see how a decision in one category will affect the other categories. This can help increase visibility across systems, optimize resources, and improve reliability and resilience. She noted the purpose of the task force is to support innovation to develop new ways to align electricity planning processes across the system, and there are 15 states participating. The states have been divided into 5 cohorts (teams) for this exercise, and each team represents a fictitious scenario. This allows the participants to think outside any specific activities going on in-state. The 15 participating states are diverse in terms of geography, regulatory structure, and marketing participation. Ms. Zetterberg then walked through an example team listing the characteristics and strategic decision process.

They are at the point now where the cohorts are considering what it takes to operationalize their planning innovations, which includes receiving input from utility engineers and planners, RTO representatives, modeling and analytical tool experts, and others. Over the fall and winter, participating states will be considering taking steps toward greater electricity system planning process alignment within their jurisdictions. Supporting material will be made publicly available to specifically help states that did not participate once the task force concludes.

Mr. Succar's part focused on some of the insights the task force has gained. He gave background context to the decision making process by highlighting a few points that consisted of stakeholder input, connecting generation, transmission, and distribution entities, exploring solutions, and implementing solutions. The task force is starting to look into existing planning tools to support current objectives while identifying gaps. Mr. Succar said planning tools are constantly adapting due to the rapid innovation in technology and current grid transformation that is occurring. He backed this up with examples of vendors that are moving beyond their initial scope to broaden their footprint, such as the operations vendor Opus One moving into planning.

Questions and Answers

Chris Ayers said that he participates in the Task Force and that from a consumer advocate perspective, he found this especially helpful because it brought so many different backgrounds together and allowed him to see in the mind of a planner or someone that does distribution. He noted it would be great to see this on a bigger scale and have more regulators participate in programs like this.

Q1. Mr. Kezunovic asked if the task force has talked about new tools based on data-driven models. He commented that these tools are interesting because they require both engineering and data. Mr. Kezunovic also inquired about gaining access to data.

Mr. Succar replied they are at a hard point because they do not want to provide a marketing platform but at the same time want to stay up to date with technology. They strike this balance by focusing on what new solutions the tools provide, new problems they solve, and what new questions they can answer.

Q2. Mr. Morris prefaced his question by giving context to actions that Washington State has taken for the DER transition and overall energy planning changes. He commented that a key takeaway from his experience is there needs to be a true market signal to adjust the planning assessments of value. For IRP, this is the call for power of resources, but in the DER process something that mimics a market signal has to be created. Mr. Morris asked if the task force takes this function into account.

Mr. Succar replied they look at it slightly differently by using the perspective of value and not market because the desired value might not be tied to market products that exist today. He was trying to allude to this while discussing system needs to incorporate a holistic view of available solutions to meet system needs in the context of IRP, while also closing the feedback loop. They are starting to map out system flows that go both ways.

Q3. Mr. Bialek asked about the future for tool development and streamlining tools to be affordable for utility utilization. He said that as of now tools like this are only accessible at the National Laboratories.

Mr. Succar replied this highlights the fact that scalability is an important point when thinking about applicability of solutions. He noted simplicity is an important objective.

Moderated Discussion with DOE and EAC Regarding Grid Planning Activities

The session then shifted to an in-depth moderated discussion between the EAC members and the panelists. Joe Paladino kicked off the discussion by presenting remaining challenges that he would like the EAC to give feedback about. He asked if these are the right challenges, what is missing, and what DOE should be doing with respect to developing guidance (guidance documents) and mechanisms (providing technical assistance and to whom, facilitating discussion/ongoing dialogue).

Mr. Mroz commented that the end product has to be managed by DOE. He said that due to the complexity of this topic, it is easy to go down a rabbit hole, and he emphasized the importance of staying focused. Mr. Mroz then asked a series of questions: Has DOE thought about externalities and not trying to do too much? Who is responsible to take this product and implement it? Given that the planning process in the Northeast has largely been privatized, who is the target audience?

Mr. Paladino responded they do not have a roadmap that outlines specific issues, deliverables, audience, or a timeline. His team is trying to target regulators and policymakers. Mr. Paladino said he struggles with getting regulators and utilities to agree on a common framework.

Mr. De Martini followed up that he has been thinking about getting different entities involved at local and state levels. The major push in sustainable, resilient legislation has left out distribution. Mr. De Martini said they are starting to explore the right people to collaborate with at the local level and figure out who is doing what analysis. Historically, emergency agencies have led resilience efforts, but now this process needs to be integrated with energy offices.

Ms. Reder said there is an element of data in the WECC and a separate element of process and responsivities. On the data side, the aspect of voltage is becoming more prevalent in the distribution side and the tools are lagging behind. This issue is only becoming more complex as new technologies are put online. Ms. Reder noted she liked the T/D portrayal in the final presentation and would like to see that further defined. She asked if there is an opportunity for standards on the data side and how to make the process of data aggregation more efficient. Ms. Reder sees DOE's role more on the "how" than "what" side regarding process.

Daniel Steinberg agreed there is a major issue right now addressing data concerns.

Mr. Succar agreed about voltage information and said this is relevant in certain cases. He said it is important to recognize when this information is relevant because there are instances where it is not. Mr. Succar noted that a lot of non-wired T/D deferral has been around distribution capacity and thermal constraints. Mr. Succar believes DOE should also address "why" so there are clear objectives and it can make sure everyone is heading in the same direction.

Ms. Flygt commented that the presentations missed adding energy storage and EV charging to the planning process in a systematic way. She said these processes should be better defined in order to capture capabilities.

Mr. Kezunovic suggested tailoring products to specific stakeholder groups. He suggested the EAC should form a task force to get inputs from members to provide more structured recommendations.

Mr. Adams asked for clarification about what the IRT is more effective than. He then commented that the efficiency of the market paradigm is not as high as many believe it is. Mr. Adams noted this gets back to a "what" or "why" question.

Mr. Carvallo said his team compared a sectional utility that could make decisions behind the meter with a different utility that can make decisions in front of the meter. This modeling result was compared with an alternative model that replicated the current vertical integration situation. He said the calculated cost difference was found when comparing these two models. They found that the centralized entity is able to produce systems that meet demand with 7%–37% lower costs.

Jeff Morris suggested more emphasis to be put in customer up vantage points. He said 97% of utility costs are for T/D and not energy. The tools to asses load curve management are inconsistent, causing the entire sector to be held back. Mr. Morris concluded with the thought that there are inconsistencies with current levelized costs for technology solutions. He believes "tools to asses active load-curve management" and "consistent valuation practices" are the highest priorities.

Ms. Flygt reiterated that a road map is a great idea to lay out a clear future vision. She sees this presentation as the start of a longer dialogue that will bring in utilities, markets, transmission planners, and stakeholders that do not always fit into the paradigm directly. Ms. Flygt suggested creating an opportunity to bring all the information together for informative scenario discussions to look at a wide range of future planning conditions. Ms. Flygt envisioned these scenarios being high level, such as looking 15 years down the line at what energy storage will look like.

Mr. Paladino replied that they are looking at providing future scenarios that are architecturally based. For example, what does it take for microgrid and energy storage devices to function properly with the grid and also one another in a highly controlled and observable way?

Mr. Heyeck commented how massive and outdated transmission and distribution infrastructure is. This means a lot of investment is required and will most likely not be affordable due to such a large scale. Mr. Heyeck said the load duration curve has to be beyond ~50% so assets can be used effectively. The continental United States capacity for electrical use is currently about 1,100 gigawatts with it projected to reach 1,750 gigawatts in 2050. He believes micro storage elements at the consumer and substation level are the key in order for the modern grid to work.

Drew Fellon agreed with Mr. Morris that customer opinion should be better taken into account. He followed up to Mr. Kezunovic and Ms. Flygt's point that the conversation should continue after this panel with more formal recommendations. Mr. Fellon sees "predictable technology adoption pathways" and "consistent valuation practices" being the highest priority of Joe's challenges.

Chris Ayers said it would be helpful if DOE developed a document or toolkit addressing guidance and mechanisms. He believes it would help utilities, regulators, consumer advocates, and various stakeholders think through this from a nonlitigation perspective. Mr. Ayers then asked the panel what barriers or limitations are preventing them from doing more work like this.

Johanna Zetterberg replied that an entity has to start by identifying the work that needs to be done that DOE is appropriately positioned to help advance. The right format should then be considered to address

the need. She said the strategy for how the need can best be met for greatest impact is the hardest part and where things stall.

Mr. Paladino emphasized the importance of developing a roadmap. Beyond resource constraints, there are internal communication constraints that are the bigger issue. He said the Department needs to get to a place where it is no longer ad-hoc work and allocating the right resources full time.

Mr. Bialek said when he asks commissioners what type of load curve they would like to see, the commissions have no idea. He noted that the energy use and capacity both increased for customers who installed solar panels. The takeaway is that people will do what they want, to the extent it allows them to manage their bill. Mr. Bialek believes the missing piece is figuring out what it will take for legislators and regulators to understand the implications of a utility doing a given project.

Ms. Phillips suggested developing specific use cases.

Mr. Koplin said he is interested in Mr. Carvallo's scenarios about reaching beyond the meter for a whole system view, which is similar to Cordova. Mr. Koplin said there is a certain critical threshold of mass where good automation and integration tools are needed along with an open mind that unexpected positive externalities will occur. This was said about grid scale batteries. He sees the current portfolio as appropriate and is most concerned about the regulatory piece because of its lack of flexibility and agility. Mr. Koplin shared that Cordova's key takeaways from the last few years are that regulators have different vocabulary so presenters have to be creative with the language they use, governance and regulatory bodies need to have early information and signaling, governance and regulatory bodies like to consider options and not just be presented with a decision, and there is a need to explain the outcomes of different decisions. Mr. Koplin suggested the Department expand its conversations beyond just DOE and converse among different departments to have cross-cutting solutions and new ideas.

Mr. Cummings commented that as society moves to more dependence of DERs on the distribution system, the loss of resources may outreach the loss of load during storms. He is concerned that putting fast chargers on distribution systems will cost a lot of money, and once they are above a certain threshold, they will start disrupting the grid. He is also concerned that DERs will come in large packages at times, leading the planning interfaces between distribution and transmission to become more complex with a more unpredictable load.

Public Comments

Mark Uncapher, representing the Fiber Optic Sensing Association, provided the EAC with a public comment. He explained fiber optic sensing as a technology that rides over fiber optic cables and picks up events that are significant to T/D systems. He wanted to make the members aware of this technology and the association.

Wrap-Up and Adjournment of May 2020 Meeting of the EAC

Christopher Lawrence then began wrapping up the meeting. He thanked everyone for adjusting to the virtual setting and noted it went well given the circumstances. Mr. Lawrence highlighted the BPS EO, NAERM, DCEI, CEII initiatives within OE moving forward. He thanked the outgoing EAC Members—especially John Adams, Ramteen Sioshansi, and Jeff Morris, for 6 years of service. Mr. Lawrence noted that all the presentations and the public comment will be available on the website.

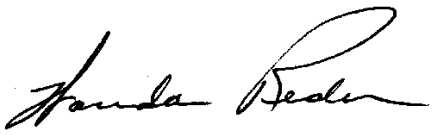
Ms. Reder thanked everyone for adapting to the virtual setup and said it went well. She started looking toward the future, mentioning the October meeting and BPS EO. Ms. Reder concluded by saying this meeting was the beginning of many future conversations.

Mr. Heyeck said that Ms. Reder will be new chair beginning July 1. He commented there is an enormous task at hand tackling distribution issues, with state-federal being a subset of that. He also spoke about future issues, specifically mentioning COVID-19 and the BPS EO. He concluded by thanking Mr. Sioshansi and Mr. Adams for their service to the EAC. Mr. Heyeck adjourned the meeting.

Respectfully Submitted and Certified as Accurate,

09/28/2020
Date

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



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

09/28/2020
Date

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

09/28/2020
Date