



NATIONAL COUNCIL
ON ELECTRICITY POLICY

NCEP 2019 Annual Meeting Recap & Summary

The National Council on Electricity Policy (NCEP) held its 2019 Annual Meeting on Evolving Transmission, Distribution, and Customer System Coordination on September 11-12, 2019, in Austin, TX. During the meeting, NCEP members continued to examine leading-edge ideas for grid operations in a coordinated transmission and distribution system, and how operational needs influence planning and markets. See the final agenda at <https://pubs.naruc.org/pub/3771ED7A-A082-28DD-E1E0-6C694CC6F448>.

NCEP President Paul Kjellander (also President of the Idaho Public Utilities Commission) opened the meeting and guided attendees through the agenda throughout. To begin the 2019 annual meeting, NCEP awarded the inaugural Jan Brinch Award Recipient, Cheryl LaFleur. Texas State Energy Conservation Office Director, Dub Taylor, welcomed NCEP to Austin, TX.

Coordination topics that were addressed by experts Paul de Martini and Jeff Taft (PNNL) included:

- Managing the complexities of an ultra-large-scale system
- The purpose of grid architecture and the relationship between grid architecture and grid design
- The types of structures in building a grid: electric infrastructure, digital infrastructure, control structure, industry structure, regulatory structure, and convergent networks.
- Distinguishing a distributed system from a decentralized system: a distributed system is designed to be coordinated.
- The guiding principles of enabling future-proofing, scalability, coordination through controls or prices, and efficiency of investments
- Structural problems to avoid, including tier bypassing, coordination gapping, and hidden coupling
- Non-Wires Alternatives (NWA) and implications on the system
- Integrated system operation designs and responsibilities
- Considerations for coordination: desirable and undesirable attributes
- Example coordination models

Case studies from Texas and Duke Energy demonstrated considerations for regulators as they examine the evolving transmission and distribution system interface. Attendees were able to think outside the office box and take a trip to Pecan Street, Inc., where we discussed granular electricity, water, and natural gas use data.

On Day 2, a panel of experts discussed a critical aspect of operating the grid: communications. The communications network is key to enhancing coordination between grid edge and customer devices, through the distribution system, and to the transmissions system. Panelists shared their expertise and experience in designing and implementing sound communication paths on the grid.

Both days including a facilitated discussion on what NCEP members – individuals (leaders and staff) from energy offices, commissions, legislatures, environmental regulators, governors' offices, and

consumer advocates – would like to understand better and what resources may exist to address their known-unknowns. The T&D Resource Catalog includes resources named at the 2019 Annual Meeting.

More information on the sessions is below. Please be sure to see the presentation deck ([day 1](#), [day 2](#)) and the recording of the meeting ([day 1](#), [day 2](#)) for more detailed information.

DAY 1 PRESENTATIONS

Dub Taylor, Texas State Energy Conservation Office

Dub Taylor discussed the unique aspects of the Texas energy picture, including its energy-only market and several “firsts,” including ranking first in the country for the production of electricity, crude oil, and gas, installed wind capacity, electricity consumption, and energy efficiency potential. He highlighted some impressive figures with wind and solar, including that solar developers are building as far west as possible in the ERCOT footprint to capture that additional hour of sun. After a bill from the Texas Legislature, the Public Utility Commission of Texas established a program, Competitive Renewable Energy Zones, which helped to spur transmission development for the incoming utility-scale wind and solar projects. Taylor highlighted several collaborations between NARUC and NASEO, including the NARUC-NASEO Task Force on Comprehensive Electricity Planning and the NASEO-NARUC Grid-Interactive Efficient Buildings Partnership.

Physical System, Operating Essentials, and Coordination Principles:

- **Jeff Taft, Pacific Northwest National Labs**
- **Paul De Martini, Newport Consulting**

Jeff Taft and Paul De Martini discussed managing complexities of the ultra-large-scale system of the electricity grid and the principles of grid architecture and system mapping. Architecture is “an abstract depiction of a system, consisting of black-box components, structure, and externally visible properties.” Taft spent time discussing the various types of structures as an input to grid architecture: electric infrastructure, digital infrastructure, control structure, industry structure, regulatory structure, and convergent networks.

Taft notes that “architecture is not design” (and later states that design and architecture are intertwined) and lists eight purposes of grid architecture in his presentation:

- “Identify legacy constraints
- Remove barriers and refine essential limits
- Help manage complexity (and therefore risk)
- Support early stage modernization processes
- Identify gaps in the structure, technology
- Assist communication among stakeholders
- Define platforms
- Inform interfaces and interoperability.”

Taft showed numerous examples of structural models (electricity market, industry structure) to map the complexities of electricity systems into (semi) usable forms. Taft encouraged organizations to build an organizational model for electricity delivery in their jurisdiction.

Importantly, Taft differentiated between decentralized systems and distributed systems. Decentralized systems are made up of multiple separate entities operating independently with at most some small amount of supervision. A distributed system is a decentralized system, where the parts cooperate to solve a common problem. Coordination is how a set of decentralized elements cooperate to solve a common problem, thus becoming a distributed system. Coordination structure is a key aspect of distributed systems and distributed control.

Taft highlighted general principles that enable future-proofing, scalability, coordination through controls or prices, and efficiency of investments. Structural problems to avoid include tier bypassing, coordination gapping, and hidden coupling.

De Martini reviewed some concepts, such as the DER adoption curve and integrated system operations evolution. There are three possible primary designs (conceptual reference models) of the T-D interface and the respective responsibilities of the operators: a total Transmission System Operator (TSO), a total Distribution System Operator (DSO), or a hybrid DSO.

For TSO-DSO coordination, Taft laid out architectural considerations, four that are desirable:

- Observability – operational visibility
- Scalability – the ability of the system to support large quantities of DER
- Cybersecurity vulnerability protection – architectural structure can influence how data flows, and a well-constructed structure can reduce vulnerability
- Layered optimization – the system is deconstructed to examine sub-problems

And three considerations to avoid:

- Tier Bypassing – when flow or paths skip around a tier
- Hidden coupling – when two controls operate separately on an overlapping section of the grid
- Latency cascading – creating delays in information flows due to the buildup of how information needs to flow

To avoid the undesirable considerations and promote the desirable ones, Taft elaborated on the responsibilities of each of the entities. Taft discussed some of the coordination models under discussion in the United Kingdom, New York ISO, and California ISO.

Taft and De Martini took questions from the audience.

State Examples: Advancing Transmission, Distribution, and Customer System Coordination

- **Constance McDaniel Wyman, PUCT**
- **Mark Oliver, Duke Energy**

To demonstrate a regulatory perspective, the Public Utility Commission of Texas (PUCT) Director of Electric utility Engineering, Constance McDaniel Wyman, shared that the PUCT and ERCOT have various investigations underway regarding the better management of DERs and coordination between distribution and transmission system operators. McDaniel Wyman also highlighted several concrete challenges that aggregators are finding connecting to the grid, as well as the value of commission staff mediation. Short-Term Planning Manager, Mark Oliver of Duke Energy walked the audience through Duke Energy's vision for an Integrated System Operations and Planning (ISOP) process. The process will incorporate new modeling capabilities to more holistically look at resource benefits and options at the distribution, generation, and transmission levels for Duke's 2022 integrated resource plan.

Pecan Street Site Visit

Pecan Street, Inc. is a nonprofit research institute that engages in state-of-the-art demand-side management research in electricity, water, and natural gas. Scott Hinson described the granular data that they could capture and applications of the data. Scott was able to discuss their experience with

water leak detection, rooftop solar, battery storage, and aggregator programs, including electric vehicles. Scott was able to demystify aggregated systems and left us with a note to get in touch with him:

Pecan Street is actively looking for partners to engage with us on the scoping and implementation of research projects on optimizations of distributed energy resources. Pecan Street is currently seeking partners to support two classes of research projects that have the goal of improving grid hosting capacity for DERs by reducing the volatility and variability they can introduce onto a grid while demonstrating value propositions for grid services. The first project will research and test out solutions for high-speed, low-latency aggregated control paired with autonomous operation of DERs through advanced grid edge computing on smart inverters. The second project will characterize power quality impacts at the feeder level from high densities of distributed solar, field-test and validate solutions to correct power quality. Any interested parties that would like to discuss engaging in these research efforts and/or other research or demonstration projects related to optimization of DERs can contact Pecan Street CTO Scott Hinson at shinson@pecanstreet.org.

DAY 2 PRESENTATIONS

Communications Across the Grid

- **Chris Villarreal, Plugged In Strategies**
- **Paul Duncan, MPR Associates**
- **Paul Alvarez, WiredGroup**
- **Mark Knight, Burns & McDonnell**
- **Lorenzo Kristov, Independent Consultant**

Paul Duncan reviewed the problems we are trying to solve and commonalities between the problems: visibility, information limitations, observability, and scalability. Duncan emphasized the need for standardizing the interconnection and how the industry is making progress with standardization.

Paul Alvarez described considerations for regulators when working with investor-owned utilities' communication networks and introduced some new public network technologies that are available. He demonstrated that a communication networking investment plan could fall short of the public interest. He discussed coverage area, the price per customer, and the costs between proprietary communication networks and publically accessed networks.

Lorenzo Kristov discussed the changes that are occurring and the range of possibilities for grid modernization with communication networks. The electricity market is no longer just a commodity market, but technologies are creating value beyond a commodity market. Lorenzo noted that urban planning is becoming a focus of the energy transition; more local-decision making is taking place. Lorenzo encourages states to get ahead of this and enable customers to participate to avoid defection. By developing clear policy around operating and planning, states can allow participation and a sound grid.

Mark Knight described interoperability as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged.” He reviewed the Gridwise Architecture Council “stack” of interoperability that lists drivers (organizational, informational, and technical) and layers of interoperability. Knight emphasized starting from the beginning to have an effective and least expensive systems. He described links between the Energy

Independence and Security Act of 2007 and how it aims for interoperability. Knight was a part of the US DOE Grid Modernization Lab Consortium Interoperability Project.

State Examples of Communication Network Coordination

- **Ted Ko, Stem**
- **Tricia DeBleeckere, Minnesota PUC**
- **Marcus Hawkins, Organization of MISO States**
- **Jason Allnutt, IEEE**

In the last panel for the NCEP Annual Meeting 2019, attendees heard multiple perspectives on two case studies from regions that have been working to tackle communications network coordination challenges - California-ISO and the Midcontinent ISO – and from IEEE on their updated standard.

Stem is an aggregator in California that has been able to bid into the wholesale markets for a few years. He described an example of communication with DERs and then described the California Rule 21 process. In developing the rules and regulations, he urges states to consider the perspective and requirements of product design engineers for obtaining and distributing data. Ko also clarified the difference between capability and operational requirements: does the device need to communicate with the utility today or sometime in the future? Additionally, Ko helped the audience better understand the constraints in developing standards for hardware and software.

The Organization of MISO States (OMS) developed an approach to DERs in June 2017: to facilitate the exchange of information between MISO, utilities, and stakeholders to ensure reliability. Currently, DERs can participate at the retail and wholesale levels through indirect participation, directly through a utility, directly through an aggregator, retail only, or a mix. Recently, in January 2019, MISO experienced a Max-Gen event and was alerted to a communication breakdown with the MISO Market Communication System (MCS): over-commitment issues, situational awareness, and lack of knowledge of the location of load modifying resources (LMRs). Hawkins listed changes in development to address concerns.

Jason Allnutt described IEEE Standards Association, the standards development lifecycle, and specifically the IEEE 1547 Conformity Assessment. Allnutt described several projects and case studies for how DERs have conformed to the IEEE 1547 standard.

Tricia DeBleeckere described the Minnesota process for updating the statewide interconnection standards and some considerations for implementing IEEE1547-2018. DeBleeckere noted that the simplicity of standards has better chances for a successful system, but Minnesota found that timing the standard with where the market is in Minnesota was tricky. DeBleeckere's advice to her state colleagues is that interoperability standards help, but do not solve every issue.