



**U.S. Department of Energy
Electricity Advisory Committee Meeting
NRECA Conference Center
Arlington, VA
September 30, 2015**

Summary of Meeting

PARTICIPANTS

EAC:

JOHN ADAMS
Electric Reliability Council of Texas

AKE ALMGREN
Orkas Energy Endurance Inc.

WILLIAM BALL
Southern Company

ANJAN BOSE
Washington State University

MARILYN BROWN
Georgia Institute of Technology

MERWIN BROWN
California Institute for Energy & Environment

PAULA CARMODY
Maryland Office of People's Counsel

PAUL CENTOLELLA
Paul Centolella & Associates LLC

CARLOS COE
Millennium Energy

RICHARD COWART
Regulatory Assistance Project

PHYLLIS CURRIE
Pasadena Water and Power

CLARK GELLINGS
Electric Power Research Institute (EPRI)

PAUL HUDSON
Stratus Energy Group

MARK LAUBY
North American Electric Reliability Corporation

JANICE LIN
California Energy Storage Alliance, Strategen Consulting, Inc.

GRANGER MORGAN
Carnegie Mellon, Engineering & Public Policy

JEFF MORRIS
Washington State House of Representatives

SONNY POPOWSKY
EAC Vice Chair

ANNE PRAMAGGIORE
Commonwealth Edison

WANDA REDER
S&C Electric Company; IEEE

PAUL ROBERTI
Rhode Island Public Utilities Commission

HEATHER SANDERS
California Independent System Operator

CHRIS SHELTON
AES Energy Storage

RAMTEEN SIOSHANSI
Ohio State University

ROY THILLY
Independent

SUSAN TIERNEY
Analysis Group

DAVID TILL
Tennessee Valley Authority

GORDON VAN WELIE
Independent System Operator of New England

REBECCA WAGNER
Nevada Public Utilities Commission

DOE:

HONORABLE PATRICIA HOFFMAN
Department of Energy

CAITLIN CALLAGHAN
Department of Energy

MEGHAN CONKLIN
Department of Energy

LIZ DALTON
Department of Energy

ELI MASSEY
Department of Energy

DAVID MEYER
Department of Energy

JOSEPH PALADINO
Department of Energy

MATT ROSENBAUM
Department of Energy

Speakers, Guests and Members of the Public:

PHIL ASSMUS
National Association of Clean Air Agencies

STEPHANIE AYERS
IMCORP

DAVID BOYD
Midcontinent Independent System Operator.

KEVIN CULLIGAN
U.S. Environmental Protection Agency

DEREK DE BANDERA
Midcontinent Independent System Operator

EMILY FISHER
Edison Electric Institute

VINSON HELLWIG
Michigan Agency for Energy

CYNTHIA HSU
House Community Science, Space and Technology

PATRICK HUGHES
National Electrical Manufacturers Association

BEN LONGSTRETH
Natural Resources Defense Council

MARY ELLEN PARAVALOS
National Grid

JOHN SHELK
Electric Power Supply Association

ERIK TAKAYESU
Southern California Edison

ICF/Support:

RACHEL FINAN
ICF International

MAUREEN MALLOY
ICF International

SAMIR SUCCAR
ICF International

ANDREA WAGNER
ICF International

* * * * *

Mr. Richard Cowart welcomed everyone back for the second day of the meeting and noted that a meeting transcript is being prepared. He announced that, due to pending EAC retirements later this year, Paul Centolella and Marilyn Brown will become the Smart Grid Subcommittee chair and vice-chair, respectively.

Clean Power Plan System Impacts and Interactions Panel

Ms. Susan Tierney introduced the Clean Power Plan System Impacts and Interactions panelists including: Mark Lauby, North American Electric Reliability Corporation, David Boyd, Midcontinent Independent System Operator, Erik Takayseu, Southern California Edison, and Mary Ellen Paravalos, National Grid.

The first panelist, Mark Lauby, North American Electric Reliability Corporation (NERC), presented on the Clean Power Plan (CPP) from NERC's perspective. NERC is mainly focused on reliability around the bulk power system, which has generally been locationally developed in areas with the greatest loads. However, the resource mix connected to the grid has been transforming, which is reflected by the changes seen in bulk power system planning models. The CPP is accelerating this transformation towards increased renewables and natural gas and decreased coal.

The CPP sets CO₂ emissions performance standards, known as the best system of emission reduction (BSER), for affected power plants, with the goal of 22% reduction in carbon emissions by 2030. Mr. Lauby explained how EPA used three "building blocks" to translate each state's mix of 2012 power plants into state mass and rate based goals for carbon emission reduction. Mr. Lauby explained some of the changes made to the original plan proposal, including the addition of the interim period from 2022-2029 that addressed concern about making the necessary system changes before compliance deadlines and reliability measures.

Mr. Lauby explained some of the state compliance options and requirements, including the option to participate in state, regional, and federal implementation plans; trading mechanisms; and EPA's Clean Energy Incentive Program. CPP will likely result in addition of new technology (e.g. renewables and microgrids) onto the distribution system; this will create the upfront need to balance generation with load, which raises additional considerations, including frequency response, voltage support, and operator needs, in order to maintain reliability and operability. Mr. Lauby suggested that research and development needs be met; controls be evaluated to ensure coordination, restoration and recovery options after an event; and assessment of key scenarios around these assumptions continue so areas that need to be monitored for reliability issues during this distributed and bulk power system transformation are identified.

The second panelist, David Boyd, Midcontinent Independent System Operator (MISO), presented on the implications of CPP on regional energy delivery and the best compliance paths forward from an analytical perspective. As analytical work to find the optimal CPP compliance strategies that maintain reliability continues, it is important to keep in mind that the grid system is already absorbing initiatives, such as MATS, CSAPR & CWIS, and Ozone rules, that should be considered to avoid undoing their positive effects. Additionally, the wide range of impacts from CPP must also be considered.

Mr. Boyd reviewed the differences between EPA's final rule and the originally proposed rule. He explained some of the key findings and lessons learned that came from analyses of the originally proposed rule. MISO found that regional compliance is more economical than single state compliance, with about \$4-11 billion dollars in savings; a significant build-out of the transmission system will be needed; and generation dispatch will likely change and need to be built into prices.

If states choose a regional compliance option, they could use a state-by-state platform, delay or half their compliance, or reduce carbon emissions beyond the CPP requirements. States are also permitted to choose between growth-based or mass and rate-based compliance approaches and will select a goal based on economic gain. As states look for the best goal and plan for their particular energy profiles, Mr. Boyd suggested states consider anticipated load growth, multi-state and regional emission trading options, and preservation of regional economic dispatch benefits. Mr. Boyd added that monetization of carbon emissions may be advantageous but would be very challenging to achieve.

The third panelist, Erik Takayseu, Southern California Edison (SCE), presented on the impacts of CPP on distributed energy resources (DER) from a planning perspective. Mr. Takayseu explained that California already has aggressive climate change rules, such as AB 32, in place; thus, SCE has already conducted analysis on the impacts of adding renewable resources onto their electric power system that could help prepare

states for CPP compliance. Mr. Takayseu explained that the majority of people applying for generation are located in rural areas, which adds generation to already congested transmission lines and impacts the ability of the bulk transmission system to bring this generation to load centers. SCE used models to characterize the distribution system and found that higher voltage distribution increases integration capacity and closer proximity of line segments to substations increases DER accommodation capacity.

Mr. Takayseu explained that the More than Smart Stakeholder Working Group was composed of various representatives that discussed grid conditions, their vision of the grid, and how that can inform DER (particularly from a control and design perspective). The group's current consensus is that the grid will be more interactive, which will require balancing transmission and reliability. In order to achieve an interactive grid, grid modernization initiatives around grid assets, communications and interoperability, and technology solutions will be required. Mr. Takayseu suggested opportunities for further exploration, including modernization of: planning methodologies and forecasting tools; metrics that account for reliability, resilience, and environmental benefits; optimization of DER portfolios; grid architecture and design standards to ensure grid control and flexibility; protection schemes to ensure reliability; and high speed communications.

The fourth panelist, Mary Ellen Paravalos, National Grid, presented on clean energy transformation in the Northeast and how DOE can support efforts as regions go through energy transformations. Ms. Paravalos explained that the Northeast already has strong and aggressive carbon emission goals and procurement standards in place, well positioning them to comply with CPP. RGGI is a cap and trade policy that was implemented in 1990 and has already reduced carbon emissions in the Northeast by 30 percent. RGGI also provides funding mechanisms that could help the Northeast reach their carbon emission reduction goals for 2030, which are higher than the CPP targets. However, Ms. Paravalos noted that the Northeast is still faced with the same drivers and impacts from CPP as the rest of the country and will need assistance with compliance. The big drivers include natural gas demand, interconnecting and integration of renewables, reliability concerns from generation retirements, and impacts from growing solar PVs. Grid components that will be impacted include: changing load patterns, reliability, costs, grid infrastructure and capabilities, and energy technology needs. Ms. Paravalos underscored the need for understanding and planning for the system impacts.

Ms. Paravalos explained that DOE is in a great position to drive dialogue about the policy landscape and state compliance options. She suggested DOE support efforts to: improve reliability of the transmission system from a national perspective to enable the coming changes to the distribution system; conduct and sponsor system impact modeling to assist grid management and planning efforts at all regulatory levels; and continue to focus on advancing technology development and deployment that includes consideration of using utilities as early test sites.

EAC Members Discussion of Clean Power Plan System Impacts and Interactions Panel

Ms. Tierney began the CPP Impacts and Interactions Panel discussion by comparing SCE's topology situation, where much of the load is far from where resources are being developed, to a state situation involved in trading regimes that does not have as much renewable generation opportunities as neighboring states. She asked how this generation decentralization intersects with power system planning, reliability, and operation issues. Panel members agreed that the current transmission system does not have the capacity to move large amounts of power. However, the planning process already includes long term transmission needs and there are existing plans to invest in DC lines so as to ensure grid reliability through the distributed resources mix transition. Panelists discussed additional solutions to expanding the transmission system, including using a trading regime where source states sell to sink states, developing regional interconnections to add renewables and offset fossil fuel generation, and developing pricing mechanisms that allow storage to play a role in capturing renewable generation.

Ms. Tierney asked the panelists for ideas about institutional or non-analytical activities DOE should be considering, such as citing, early notice of retirements from RTOs, or notice of new system operational controls. Mr. Lauby and Mr. Boyd explained that there are jurisdictional issues around states, federal agencies, and the gas and electric industries that DOE must consider before engaging in CPP related activities, however the rule is federal and therefore federal agencies should provide dynamic support and collaborate with states to align state and federal policy as closely as possible.

Mr. Popowsky and Mr. Boyd discussed that, from a regional perspective, the mass-based approach appears to have enormous advantages over the rate-based approach, specifically in terms of the ability to calculate the cost or value of carbon, the available trading regimes, and economic dispatch. There are current efforts to determine a bridge between the two approaches and, if this is not possible, how to monetize carbon emissions. However, the implementation approach selected is ultimately up to the states.

Mr. Centolella noted that participation in a carbon emissions trading regime would be advantageous to states and raised the issue of conducting transactions between states that have selected mass versus rate-based approaches and the implications this would have on the power system planning and operations. Mr. Boyd, Ms. Paravalos, and Ms. Tierney discussed the difficulty around modeling and analysis for state planning and the ability of states to understand their CPP compliance options. It is critical for states to appropriately account for social aspects and predict where state sub-allocations will occur in these analyses. These planning issues have large implications for power flow and gas demand modeling on a macro scale. Mr. Boyd suggested looking for transmission lines that are robust in as many future scenarios as possible when investing in transmission system expansion. Mr. Centolella and Ms. Paravalos

discussed DOE's role in facilitating conversations on the national impacts from the rule so states can understand their regional risk and opportunities. Ms. Tierney added that DOE could convene stakeholders to share best practices and advance compliance methods.

Mr. Morgan raised the point that a 30 percent reduction in carbon emissions is a fraction of what is needed and explained that emphasizing trading regimes in the final rule is a step in the right direction towards addressing the challenge of scaling these reductions beyond what is required by the CPP. He asked how widespread adoption of trading regimes will be and how regulated nuclear generation plays into climate change from a national perspective. Ms. Tierney and Mr. Boyd observed that a number of states are interested in protecting particular plants and turning CPP requirements into a job creation program. The majority of states are open to finding the best solution; a trading regime is the most economically efficient compliance option so there is a strong pull towards trading and, as states are trying to financially understand this option, it is likely that states will participate in the near term or evolve towards trading regimes later on.

Mr. Thilly asked, with so much coal generation retiring and questions surrounding nuclear, what is the practicality of a state plan relying on distant renewables when there is a large risk that construction of DC lines across multiple states will not be permitted. Mr. Boyd, Ms. Paravalos, and Mr. Takayseu agreed that building a transmission line has become much more challenging due to the change in national attitude towards their construction and the increased difficulty for citing and obtaining permits. Stakeholders need more insurance that building transmission lines will be a reliable option before discussion about construction can begin, yet there are no mechanisms in place for achieving this. Furthermore, aligning state integrative resource plans around transmission resources will also be a challenge and transmission building and providing power flow to areas that need it should be included in procurement conversations. Ms. Tierney added that the current delivered resource models require resources to be physically delivered in order to count them towards that system, but the CPP anticipates a larger gap between generation and physical delivery of supply, which would allow injection of supply into a local area without physical delivery of long distance transmission.

Ms. Phyllis Currie asked if there is a sense of CPP cost impacts and the public reaction to changing rates. Ms. Paravalos agreed that customers often cannot make the connection between changes to the electric system and cost increases. Although Northeast customers have not yet experienced a lot of price increases, renewables and the associated costs are expensive, which will likely drive up rates and present the challenging task of explaining price increase to customers. Ms. Tierney explained the analysis conducted on the GHG initiative and noted that, in the Northeast, their auction had large implications on consumer impacts; if states reinvest in energy efficiency at the tail end of GHG initiatives, then consumers will actually have lower bills overtime.

Clean Power Plan Compliance Options Panel

Mr. Cowart introduced the Clean Power Plan Compliance Options panelists including: Kevin Culligan, U.S. Environmental Protection Agency, Phil Assmus, National Association of Clean Air Agencies, Vinson Hellwig, Michigan Agency for Energy, and Derek Murrow, Natural Resources Defense Council.

The first panelist, Kevin Culligan, U.S. Environmental Protection Agency, presented an overview of the CPP. The CPP is a three step process which began with EPA putting forth and finalizing guidelines. The second step is to involve states and the third step is compliance at the human level; the third step is the most important because it will create requirements that ultimately reduce greenhouse gas (GHG) emissions. The federal plan will be published in October, which will provide an opportunity for public comment, and compliance will be focused on the 2022-2030 timeline. Mr. Culligan noted that states are required to submit a plan as early as September 2016, but EPA recognizes that states may require additional time, so there is an opportunity for states to get a two-year extension (to September 2018).

Mr. Culligan explained the two state plan designs. The emission standards plan allows states to place federally enforceable emission standards on affected electric generating units (EGUs) that fully meet the emission guidelines. Under the state measures plan, the state includes, at least in part, measures implemented by the state that are not included as federally enforceable emission standards and backstop measures that would be federally enforceable (if needed).

Mr. Culligan highlighted several carbon dioxide (CO₂) reduction opportunities. Examples included heat rate improvements, fuel switching to lower carbon content fuel, combined heat and power, and electricity transmission and distribution improvements.

The second panelist, Phil Assmus, National Association of Clean Air Agencies (NACAA), presented on implementing the CPP. Mr. Assmus explained that states have two general categories of implementation decisions to make; what technologies and policies to rely on to meet the state emission targets and how to incorporate those strategies into an approvable state plan.

Mr. Assmus provided an overview of NACAA's publication Implementing EPA's Clean Power Plan: A Menu of Options (the Menu) in May 2015. The Menu is a 26-page report summarizing best technologies, policies, and programs to reduce GHG emissions in the power sector. The Menu provides a common core of information for each option including description, costs, examples, GHG reduction potential, and additional resources. Mr. Assmus noted that the Menu is available on the NACAA website and explained that it was published before the final CPP ruling. The Menu includes mitigation options that fall both within and beyond EPA's three building blocks. Mr. Assmus highlighted implications of changes in the final rule, but noted the Menu remains a useful tool.

The third panelist, Vinson Hellwig, Michigan Agency for Energy, presented on Michigan's plan for reducing carbon emission so as to comply with the CPP. Mr. Hellwig noted that Michigan will be providing EPA with comments before and after the final rule is published. The state has been developing its own state plan that will include input from stakeholders and is holding workshops to

focus on how to make the CPP work in their state.

Mr. Hellwig explained that the state of Michigan has increased renewable use, with coal use at less than 50 percent compared to 56 percent in 2008, and has the lowest amount of carbon intensity of any neighboring states. He noted that renewables are the cheapest form of energy (except on peak day). However, Michigan is a split state. Michigan is one of four states to receive a grant that conducts modeling to determine what would be most beneficial state plan and they have used these models as a platform for open discussions on the direction in which the state is headed. Mr. Hellwig noted that Michigan Agency for Energy is looking at both rate- and mass-based options but it will be several years before trading is feasible within the state. He summarized that Michigan is still in the planning process.

The fourth panelist, Ben Longstreth, Natural Resources Defense Council, presented on mass-based compliance options. Mr. Longstreth began his presentation with a graph that illustrates the projected national carbon emissions under the CPP. Mr. Longstreth showed the difference between the emission rates of the proposal and the final rule, noting that the trajectory is achievable for both plans. He explained that each power plant would use a combination of its own actions and emission rate credits to meet the applicable state-specific emission rate limit. The state-specific emission rate limits establish consistent and fair targets for power plants in all states, ranging between the national emission rate limits for coal and gas plants. The limits in the final CPP respond to state and industry concerns that the state limits in the original proposal varied too widely and treated plants and states inconsistently. The final plan treats similar plants and similar states alike.

Mr. Longstreth explained the two “mass-based” plan options. First, the “existing only” plan is where emission reduction limits only apply to existing generators (e.g. running or under construction in 2012). In this case, the state will need to include additional provisions that address leakage or a shift of emissions from covered to uncovered (new) sources. This may shift generation (and emissions) to fossil plants that are not covered, resulting in higher than anticipated emissions. Second, the “existing plus new” plan is where emission reduction limits apply to both existing and new fossil fuel generators. In this case, EPA includes a new source complement, which provides states with additional emissions to meet forecasted increases in load demand. Mr. Longstreth noted that this plan is more straightforward.

Mr. Longstreth explained the economic benefits of including new sources, such as the creation of a fair market and the capacity to consider prices as a marginal cost in the wholesale power market. He stated that under “existing only,” new generators will not need to include allowance costs in their bid. This will allow new sources to bid lower than the affected existing sources. However, this could have market implications, such as reducing the competitiveness of existing NGCC plants despite having similar emissions profile to new plants.

EAC Members Discussion of Clean Power Plan Compliance Options Panel

Mr. Cowart commented that the CPP emission reduction trajectory of 2030 is small and asked if the country is in danger of deceiving itself into thinking that this plan will solve the carbon problem when it will not. Mr. Culligan and Mr. Longstreth acknowledged that the CPP is not

going to solve the whole problem but it is an important first step that will set essential actions into motion. EPA's focus is to work with states and sources to achieve this first step and, once the first step is achieved, a second step can be larger.

Mr. Cowart asked if there is any argument against trading on a plant-by-plant basis. Mr. Longstreth responded that if extensive trading occurs, then there will be shifting of "hot air" into other states. He noted that there would be a stronger national outcome if each state had their own plan.

Mr. Cowart commented on the electrification of transportation and building, which are being sourced by fossil fuel. He asked if there is anything in the CPP rule that would help states get credit for switching fuel to electricity. Mr. Hellwig explained that Michigan addressed this issue through building codes. Mr. Culligan noted that the rate-based path does not have this sourcing issue but, with a mass-based approach, states have three options: to include existing sources; use the mass with the new source compliments; or make a demonstration of why it does not work.

Ms. Brown expressed concern over the quality of the analytics and inconsistencies from modeling. She asked for feedback on the argument that the CPP creates a disincentive for states to implement technology until they receive credit. Mr. Culligan confirmed that states do not receive credit for actions taken today. However, he argued that energy efficiency actions taken today are not necessarily the ones that states would take in the future so it is important to continue taking action despite receiving credits. He noted that modeling alone is not enough. Mr. Cowart agreed that if there is an additional benefit available, then states should not wait a decade to implement that technology for credit.

Mr. Brown asked if the utility industry is overstating or understating the clean air program. Mr. Hellwig responded that the clean air program is based on regional issues.

Ms. Janice Lin, Mr. Hellwig, and Mr. Culligan discussed the incorporation of energy storage and enabling technology into rate- and mass-based targets. Mass-based system results are solely focused on environmental outcomes while rate-based systems focus on credits, so these two approaches pose different challenges. Utilities hope that storage technology will improve but more national information on the use and competitiveness of storage is needed. DOE could include storage with distributed connectedness. In addition to storage, other technologies are in process but have not been examined by utilities on a large scale due to cost. Mr. Shelton added that there is more storage today that people realize and cited various storage facilities across the country (e.g., CA, IN, MD, WV). Ms. Lin noted that there are currently no tools that can measure and quantify impacts of storage credits and suggested that DOE work with EPA and other agencies to create tools for modeling that can be used in conjunction with the CPP.

Ms. Tierney commented on the two state trading options within a mass-based approach and highlighted the Regional Greenhouse Gas Initiative (RGGI). She asked what action the Midwestern states plan on implementing. Mr. Hellwig responded that some RGGI states do not trade outside of RGGI because it would reduce the amount of revenue they acquire. Michigan is still determining the feasibility of trading within these states. Mr. Cowart added that the success of RGGI is dependent on the success of the states creating policies outside the RGGI regime.

EAC Member Discussion of Clean Power Plan Working Group Plans

Ms. Tierney, EAC Member, facilitated a discussion of the Clean Power Plan Working Group's plans. She noted that Carl Zichella (with others) volunteered to create a working group that focused on CPP issues that are helpful to DOE. Ms. Tierney highlighted the two potential working group topics including (1) interaction between system planning of operations and institutional issues related to the CPP and the electric system and (2) actions DOE might take to provide technical assistance on compliance issues and costs. She welcomed EAC members to suggest additional topics for the working group. Ms. Caitlin Callahan explained that DOE does have technical assistance options available. She noted that the CPP is an EPA rule and DOE's role is to assist where possible.

Mr. Brown expressed concern that policy makers do not understand the magnitude of the climate change issue or fear of overstating an issue, which results in minimizing it. He suggested researching technical and institutional solutions. Mr. Anjan Bose highlighted the importance of studying the bigger picture and addressing plans for 20 years in the future. He stated the need for one entity to look at system interconnection as a whole and Ms. Tierney added the need to establish a connection between the institutional and technical sides of the market.

Mr. Morris commented that DOE should create tools that provide as much information for stakeholders as possible. He cautioned that if stakeholders wait too long to update the system, there will be no low-cost options available. He encouraged DOE to provide transparent data. Ms. Reder stated that DOE has the opportunity to provide a technical overlay. She commented that it is the responsibility of DOE to examine the reliability and resiliency of the process. Any tools that can increase transparency are necessary. Mr. Centolella supported the idea of providing tools and suggested tools to act as a liaison between DOE and EPA.

Public Comments

No public comments were made.

Wrap-up and Adjourn of the June September Meeting of the EAC

Mr. Cowart, EAC Chair, thanked everyone for their comments and adjourned the September 2015 meeting.

Respectfully Submitted and Certified as Accurate,



Richard Cowart
Regulatory Assistance Project
Chair
DOE Electricity Advisory Committee

11/18/2015

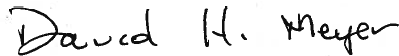
Date



Irwin "Sonny" Popowsky
Pennsylvania Consumer Advocate
Vice-Chair
DOE Electricity Advisory Committee

11/18/2015

Date



David Meyer
Office of Electricity
Designated Federal Official
DOE Electricity Advisory Committee

11/18/2015

Date



Matthew Rosenbaum
Office of Electricity
Designated Federal Official
DOE Electricity Advisory Committee

11/18/2015

Date