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FEDERAL ENERGY REGULATORY COMMISSION

Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure

Docket No. AD15-4-000

Prepared Statement of

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Thank you for the opportunity to provide comments to the Federal Energy Regulatory Commission ("Commission" or "FERC") as part of its inquiry into the potential implications of the Environmental Protection Agency's ("EPA's") Clean Power Plan, for electric system reliability, energy infrastructure, and wholesale electricity markets.

As the Commission well knows, the matters under discussion in this Technical Conference are extremely important for Americans and for the U.S. economy. Americans demand world-class electric reliability at reasonable prices. The U.S., as the world's largest economy and the world's historically largest emitter of carbon dioxide (CO_2) emissions that contribute to climate change,[1] is poised to take seriously its role in controlling such emissions.

In that context, the proposed power plant regulations by the EPA under the Clean Air Act are critically important for the U.S. The Supreme Court has held that "greenhouse gases fit well within the [Clean Air] Act's capacious definition of 'air pollutant'."[2] The American power sector represents the nation's largest source of greenhouse gas emissions ("GHG").[3] Americans are already feeling the damaging effects of climate change.[4] The U.S.'s cumulative CO_2 emissions exceed those of any other country,[5] and our power sector produces one out of every 15 tons of energy-related CO_2 emissions produced anywhere in the globe.[6] Taking action to reduce emissions from the U.S. power sector will have a material impact on reducing global emissions and mitigating the impacts of climate change.

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[1] This is based on cumulative fossil-fuel CO_2 emissions (1751-2013) by country. D*ata sources: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, and British Petroleum, last updated August 8, 2014.* http://www.columbia.edu/~mhs119/UpdatedFigures/

[22] 549 U.S. 497 (2007).

[3] Power plant emissions contribute 32 percent of total GHG emissions in the U.S. in 2012. See: http://www.epa.gov/climatechange/ghgemissions/sources/electricity.html

[4] See: National Climate Assessment, http://nca2014.globalchange.gov/

[5] Cumulative emissions matter to climate change because of the long-lived nature of greenhouse gases, with concentrations of GHG in the atmosphere reflecting decades of historical emissions. See also: http://www.pbl.nl/en/publications/countries-contributions-to-climate-change

[6] Calculation based on 2010 data from the World Bank on energy-related CO_2 emissions by country, http://data.worldbank.org/indicator, and, and from Energy Information Administration on CO_2 emissions in the power sector compared to all energy-related CO_2 emissions. January 15, 2015 Monthly Energy Review, Tables 12.1 and 12.6.

Just as important are the laws, policies, and expectations surrounding electric system reliability. The Commission's efforts to ensure a reliable and efficient wholesale electric system are grounded in the sober realization that Americans do not and will not tolerate disruptions in the nation's bulk power system. Fortunately, the Commission has multiple roles and responsibilities in ensuring both reliable and efficient wholesale electric markets, and has exercised those responsibilities for decades as the nation's environmental laws have introduced one or another set of conditions that reflect protection of Americans' public health and environment.

My remarks[7] today reflect the results of an analysis I have recently conducted with colleagues at Analysis Group.[8] Our new report focuses on the Clean Power Plan's implications for electric system reliability in the U.S. I have attached our Executive Summary and list of recommendations to this statement. The final report will be posted at our website today, February 19th.

After reviewing a significant number of stakeholder comments which addressed reliability issues, we examined the character of EPA's proposal in the context of the regulatory tools and the industry's reliability practices, and identified many reasons why carbon pollution at existing power plants can be controlled without adversely affecting electric system reliability. We concluded overall that in light of the significant shifts already underway in the electric system, the industry would need to adjust its operational and planning practices to accommodate changes even if EPA had not proposed its carbon-control regulation.

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[7] I am a Senior Advisor at Analysis Group in Boston and provide consulting services to clients in various sectors of the electric and natural gas industries, including state governments, large electricity consumers, electric utilities, non-utility owners of power plants, Regional Transmission Organizations, natural gas pipeline companies, environmental groups, Indian tribes, foundations, energy efficiency providers, financial institutions, early stage energy technology companies, and others. I am providing these comments on my own behalf. Prior to becoming a consultant, I held several senior policy-making positions as: Assistant Secretary for Policy at the U.S. Department of Energy; and in Massachusetts state government, I was Secretary of Environmental Affairs, Commissioner of the Department of Public Utilities, and Executive Director of the Energy Facilities Siting Council.

[8] Susan Tierney, Paul Hibbard, and Craig Aubuchon, "Electric System Reliability and EPA's Clean Power Plan: A Primer," Analysis Group, February 19, 2015. http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Electric_System_Reliability_and_EPAs_Clean_Power_Plan.pdf This new report focuses on national issues; the authors are also preparing several region-specific reports.

Even so, we identified some of the "business-as-usual" tools that might support proactive planning to comply with the EPA's Clean Power Plan. Some of the tools are in the hands of the states, while others are responsibilities of grid operators (including Regional Transmission Organizations ("RTOs") and electric balancing authorities), other electric utilities, other owners of fossil power plants, fuel-delivery companies, reliability organizations like the North American Electric Reliability Corporation ("NERC"), and many others. Clearly, market participants have a strong role to play – as they always do – in bringing new infrastructure, investment and services to the table.

Importantly, we identified ways in which FERC itself might channel its existing authorities to support markets, infrastructure additions, and reliable outcomes in the context of the Clean Power Plan. Our recommendations to FERC are that it consider:

- Requiring NERC, Regional Reliability Organizations, and system operators/ balancing authorities to periodically assess potential reliability impacts of the Clean Power Plan with geographic scope appropriate to the reliability entity. The assessments could identify specific concerns, and develop backstop solutions that ensure flexibility in near-term compliance schedules while also strictly adhering to equivalent levels of CO_2 emissions reduction over the course of a decade.
    - Preliminary assessments starting at end of 2015/early 2016, to inform state action taking into account known policy, practices, resources in the relevant area
    - Reliability assessments at the time of proposed state plans
    - Reliability assessments annually up through early 2020s
- Continuing to evaluate the adequacy of current FERC gas/electric coordination policies in light of *incremental* changes resulting from Clean Power Plan relative to trends already underway in the industry
- Eliciting filings from RTOs and other transmission companies about any new planning tools, notice provisions for potential retirements, information reporting, new products, and minimum levels of capability providing valuable attributes into the market (e.g., on-site fuel or capability to dispatch on-site resources; inertia; voltage support)

- Inquiring into new natural gas policies to support wider interdependence with electric system reliability (e.g., further incentives for development of gas delivery/storage infrastructure)
- Working with states to consider mechanisms to afford bulk-power system grid operators with greater visibility into generating and demand-side resources on the distribution system
- Providing guidance outlining compliance strategies that would require approvals of the FERC under the Federal Power Act (versus approaches that might not require such approvals).

We think that the Clean Power Plan actually provides states and power plant owners a wide range of compliance options and operational discretion (including various market-based approaches, other means to allow emissions trading among power plants, and flexibility on deadlines to meet interim targets) that can prevent reliability issues while also reducing carbon pollution and cost.

EPA's June 2014 proposal made it clear that the agency will entertain market-based approaches and other means to allow emissions trading within and across state lines. Examples include emissions trading among plants (e.g., within a utility's fleet inside or across state lines), or within the boundaries of an RTO. A state with generating facilities in multiple RTOs and/or industry structures may even develop a plan that relies upon different approaches in the different footprints. In this respect, the Clean Power Plan is fundamentally different from the Mercury and Air Toxics Standard (MATS) and is well-suited to utilize such flexible and market-based approaches. Experience has shown that such approaches allow for seamless, reliable implementation of emissions-reduction targets.

Moreover, EPA has stated repeatedly that it will write a final rule that reflects the importance of a reliable grid and provides the appropriate flexibility. We support such adjustments in EPA's final rule as needed to ensure both emissions reductions and electricity reliability.

Finally, some of the reliability concerns raised by stakeholders about the Clean Power Plan presume inflexible implementation, are based on worst-case scenarios, and assume that policy makers, regulators, and market participants will stand on the sidelines until

it is too late to act. There is no historical basis for these assumptions. Reliability issues will be solved by the dynamic interplay of actions by regulators, entities responsible for reliability, and market participants with many solutions proceeding *in parallel*. Starting to plan now, adopt market-based CO_2-emissions pricing mechanisms[9] that dovetail seamlessly with wholesale power markets and electric systems' normal economic dispatch practices, will send appropriate signals to the utilities and non-utility players in markets and will help ensure reliable outcomes.

In the end, the industry, its regulators and the States are responsible for ensuring electric system reliability while reducing carbon emissions from power plants as required by law. These responsibilities are compatible, and need not be in tension as long as all parties act in a timely way and use the many reliability tools at their disposal.

[9] Examples include existing models (such as the Regional Greenhouse Gas Initiative), and emerging institutions and frameworks to allow states and/or power plant owners to opt in to emission-trading models (e.g., as being discussed by Great Plains Institute; Georgetown Climate Center; the 'Reliability Dispatch Safe Harbor' proposal by Exelon).

ANALYSIS GROUP
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Electric System Reliability and EPA's Clean Power Plan: Tools and Practices

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February 2015

Executive Summary

Since the U.S. Environmental Protection Agency (EPA) proposed its Clean Power Plan last June, many observers have raised concerns that its implementation might jeopardize electric system reliability.

Such warnings are common whenever there is major change in the industry, and play an important role in focusing the attention of the industry on taking the steps necessary to ensure reliable electric service to Americans. There are, however, many reasons why carbon pollution at existing power plants can be controlled without adversely affecting electric system reliability.

Given the significant shifts already underway in the electric system, the industry would need to adjust its operational and planning practices to accommodate changes even if EPA had not proposed the Clean Power Plan.

In the past several years, dramatic increases in domestic energy production (stemming from the shale gas revolution), shifts in fossil fuel prices, retirements of aged infrastructure, implementation of numerous pollution-control measures, and strong growth in energy efficiency and distributed energy resources, have driven important changes in the power sector. As always, grid operators and utilities are already looking at what adjustments to long-standing planning and operational practices may be needed to stay abreast of, understand, and adapt to such changes in the industry.

The standard reliability practices that the industry and its regulators have used for decades are a strong foundation from which any reliability concerns about the Clean Power Plan will be addressed.

The electric industry's many players are keenly organized and strongly oriented toward safe and reliable operations. There are well-established procedures, regulations and enforceable standards in place to ensure reliable operations of the system, day in and day out.

http://imgkid.com/checklist-icon.shtml

Among other things, these "business-as-usual" procedures include:

- Assigning specific roles and responsibilities to different organizations, including regional reliability organizations, grid operators, power plant and transmission owners, regulators, and many others;
- Planning processes to look ahead at what actions and assets are needed to make sure that the overall system has the capabilities to run smoothly;
- Maintaining secure communication systems, operating protocols, and real-time monitoring processes to alert participants to any problems as they arise, and initiating corrective actions when needed; and
- Relying upon systems of reserves, asset redundancies, back-up action plans, and mutual assistance plans that kick in automatically when some part of the system has a problem.

http://www.bls.gov/ooh/installation-maintenance-and-repair/line-installers-and-repairers.htm

As proposed by EPA, the Clean Power Plan provides states and power plant owners a wide range of compliance options and operational discretion (including various market-based approaches, other means to allow emissions trading among power plants, and flexibility on deadlines to meet interim targets) that can prevent reliability issues while also reducing carbon pollution and cost.

EPA's June 2014 proposal made it clear that the agency will entertain market-based approaches and other means to allow emissions trading within and across state lines. Examples include emissions trading among plants (e.g., within a utility's fleet inside or across state lines), or within a Regional Transmission Organization (RTO) market. In this respect, the Clean Power Plan is fundamentally different from the Mercury and Air Toxics Standard (MATS) and is well-suited to utilize such flexible and market-based approaches. Experience has shown that such approaches allow for seamless, reliable implementation of emissions-reduction targets. In its final rule, EPA should clarify acceptable or standard market-based mechanisms that could be used to accomplish both cost and reliability goals.

Moreover, EPA has stated repeatedly that it will write a final rule that reflects the importance of a reliable grid and provides the appropriate flexibility.[1] We support such adjustments in EPA's final rule as needed to ensure both emissions reductions and electricity reliability.

Some of the reliability concerns raised by stakeholders about the Clean Power Plan presume inflexible implementation, are based on worst-case scenarios, and assume that policy makers, regulators, and market participants will stand on the sidelines until it is too late to act. There is no historical basis for these assumptions. Reliability issues will be solved by the dynamic interplay of actions by regulators, entities responsible for reliability, and market participants with many solutions proceeding *in parallel*.

Some of the cautionary comments are just that: calls for timely action. Many market participants have offered remedies (including readiness to bring new power plant projects, gas infrastructure, demand-side measures, and other solutions into the electric system where needed).[2] Indeed, this dynamic interplay is one reason why a recent survey of over 400 utility executives nationwide found that more than 60 percent felt optimistic about the Clean Power Plan and either supported EPA's proposed current emissions reduction targets or would make them more stringent.[3]

We note many concerns about electric system reliability can be resolved by the addition of new load-following resources, like peaking power plants and demand-side measures, which have relatively short lead times.[4] Other concerns are already being addressed by ongoing work to improve market rules, and by infrastructure planning and investment. A recent Department of Energy (DOE) report found that while a low-carbon electric

[1] See, for example, the January 6, 2015 blog post of Janet McCabe, EPA's Acting Administrator for Air and Radiation, "Time and Flexibility: Keys to Ensuring Reliable, Affordable Electricity," http://blog.epa.gov/epaconnect/2015/01/time-and-flexibility/. Also, see EPA's October 2014 Notice of Data Availability (NODA) that sought comments on, among other things, the potential to change the phase-in of emissions reductions to accommodate, for example, any constraints in natural gas distribution infrastructure, or how states could earn compliance credits for actions taken between 2012 and 2020.

[2] Although we think it is ultimately a good thing that the industry is paying close attention to reliability issues – so that any potential problems can be avoided through planning and infrastructure – we do note that serious questions have been raised about the assumptions used in recent reliability assessments performed by the North American Reliability Corporation (NERC). For example, Brattle Group's February 2015 report found that NERC failed to account for how industry is likely to respond to market and operational changes resulting from the Clean Power Plan. See Jurgen Weiss, Bruce Tsuchida, Michael Hagerty, and Will Gorman, "EPA's Clean Power Plan and Reliability: Assessing NERC's Initial Reliability Review," The Brattle Group, February 2015.

[3] The same survey found that utility executives believe that distributed energy resources offer the biggest growth opportunity over the next five years, and more than 70 percent expect to see a shift away from coal towards natural gas, wind, utility-scale solar and distributed energy. Utility Dive and Siemens, "2015 State of the Electric Utility Survey Results," January 27, 2015. The survey included 433 U.S. electric utility executives from investor-owned and municipal utilities, and electric cooperatives.

[4] Our report provides typical timelines for various types of resource additions in Section II.

system may significantly increase natural gas demand from the power sector, the projected incremental increase in natural gas pipeline capacity additions is modest (lower than historic pipeline expansion rates), and that the increasingly diverse sources of natural gas supply reduces the need for new pipeline infrastructure.[5]

Some other comments raise the reliability card as part of what is – in effect – an attempt to delay or ultimately defeat implementation of the Clean Power Plan. We encourage parties to distinguish between those who identify issues and offer solutions, and those who (incorrectly) suggest that reducing carbon pollution through the Clean Power Plan is inconsistent with electric system reliability.

In the end, because there are such fundamental shifts already underway in the electric industry, inaction is the real threat to good reliability planning. Again, there are continuously evolving ways to address electric reliability that build off of strong standard operating procedures in the industry.

Entities with roles to play as part of ensuring electric system reliability and timely compliance with EPA's Clean Power Plan	
Electric Reliability Entities	Federal Energy Regulatory Commission (FERC)
	North American Electric Reliability Corporation (NERC)
	Regional Reliability Organizations
	Electric System Operators and Balancing Authorities
Other public entities	Environmental Protection Agency (EPA)
	States (air agencies, public utility commissions, energy offices, state legislatures)
	Other federal agencies (Department of Energy, Energy Information Administration)
Entities involved with markets, resource planning, procurements	Wholesale market administrators
	Electric utilities (investor-owned, municipal utilities, cooperatives, joint action agencies
Other organizations that have a role to play	Non-utility generating companies and providers of other technologies
	Interstate natural gas pipeline companies (and storage suppliers)
	North American Energy Standards Board (NAESB)
	Energy efficiency program administrators
	Others

There are many capable entities focused on ensuring electric system reliability, and many things that states and others can do to maintain a reliable electric grid.

First and foremost, states can lean on the comprehensive planning and operational procedures that the industry has for decades successfully relied on to maintain reliability, even in the face of sudden changes in industry structure, markets and policy.

Second, states should take advantage of the vast array of tools available to them and the flexibility afforded by the Clean Power Plan to ensure compliance is obtained in the most reliable and efficient manner possible. Given the interstate nature of the electric system, we encourage states

[5] U.S DOE, "Natural Gas Infrastructure Implications of Increased Demand from the Electric Power Sector," February 2015.

to rely upon mechanisms that facilitate emission trading between affected power plants in different states. Doing so will increase flexibility of the system, mitigate many electric system reliability concerns, and lower the overall cost of compliance for all.[6]

In this report we identify a number of actions that the Federal Energy Regulatory Commission (FERC), grid operators, states, and others should take to support electric system reliability as the electric industry transitions to a lower-carbon future. We summarize our recommendations for these various parties in tables at the end of our report.

In the end, the industry, its regulators and the States are responsible for ensuring electric system reliability while reducing carbon emissions from power plants as required by law. These responsibilities are compatible, and need not be in tension as long as all parties act in a timely way and use the many reliability tools at their disposal.

We observe that, too often, commenters make assertions about reliability challenges that really end up being about cost impacts. Although costs matter in this context, we think it is important to separate reliability considerations from cost issues in order to avoid distracting attention from the actions necessary (and feasible) to keep the lights on. There may be "lower cost" options that reduce emissions some part of the way toward the target reductions, but that fail to meet acceptable reliability standards. We do not view such 'solutions' as the lowest cost solution precisely because they fail to account for the cost of unacceptable system outages to electricity consumers.

Any plan that starts with consumer costs and works backward to reliability and then to emission reduction is one that fails to consider the wide availability of current tools that have served grid operators for more than a decade to meet reliability needs. There is no reason to think that cost and reliability objectives cannot be harmonized within a plan to reduce carbon pollution.

[6] As we will discuss in a series of regional reports, others have already identified that regional strategies will minimize overall compliance costs. For example, the Midcontinent Independent System Coordinator (MISO) estimated that a regional carbon constraint approach could save up to $3 billion annually relative to a sub-regional or individual state approach. MISO, "Analysis of EPA's Proposal to Reduce CO_2 Emissions from Existing Electric Generating Units," November 2014. See also, "Statement of Michael J. Kormos, Executive Vice President – Operations, PJM Interconnection, FERC Docket No. AD15-4-000, Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure," February 19, 2015.

This paper is designed to:

- Describe the changes underway in the industry which set the stage for the continued evolution of reliability tools and practices;
- Provide a "reliability 101" primer to describe what "electric reliability" means to system planners and operators, and why specific standard practices are so important to assuring electric reliability;[7]
- Summarize reliability concerns expressed by various stakeholders;
- Explain the ways that standard operating procedures can address these concerns; and,
- Recommend actions that can be taken by various actors in the electric industry to assure that the Clean Power Plan's goals do not undermine reliable power supply.

Our recommendations can be found in tables following the Executive Summary.

[7] This report also includes a glossary of acronyms used in our report.

Recommendation Tables

Table 1
Key Players in the Clean Power Plan and Available Tools

Entities	Roles and Responsibilities
Entities with direct responsibility for electric system reliability	- FERC (under the Federal Power Act (FPA)) - NERC (as the FERC-approved Electric Reliability Organization under the FPA) - Regional Reliability Organizations (RROs) - System operators and balancing authorities (including Regional Transmission Organizations (RTOs) and electric utilities) - States (for resource adequacy)

Other public agencies with direct and indirect roles in the Clean Power Plan	- U.S. Environmental Protection Agency (EPA)
	- State executive branch agencies:
	  - Air offices and other Environmental Agencies
	  - Public Utility Commissions (PUCs)
	  - Energy Offices
	  - Public authorities (e.g., state power authorities)
	- State governors and legislatures
	- U.S. Department of Energy (DOE)
	- Energy Information Administration (EIA)

Owners of existing power plants covered by 111(d) of the Clean Air Act	- Electric utilities
	  - investor-owned utilities
	  - municipal utilities
	  - electric cooperatives
	  - joint action agencies
	- Non-utility power plant owners

Markets and Resource Planning/ Procurement Organizations	- Organized markets administered by RTOs (CAISO, ERCOT, ISO-NE, MISO, NYISO, PJM, SPP).
	- Electric utilities with supply obligations & subject to least-cost planning processes:
	  - Many utilities (including joint action agencies) operate under requirements to use a combination of planning and competitive procurements (with or without self-build opportunities
	  - Transmission owners also have transmission planning requirements
	- Private investors (including non-utility companies) responding to market signals and seeking to develop/permit/construct/install/operate new resources (including new power plant projects, demand-response companies, merchant transmission companies, rooftop solar PV installation companies, etc.)

Others	- North American Energy Standards Board (NAESB) for setting electric & gas standards - Administrators/Operators of CO_2 allowance-trading systems - Administrators/Operators of energy efficiency programs - Fuel supply and delivery companies (gas pipeline and/or storage companies; gas producers; coal producers; coal transporters) - Energy marketing companies - Emerging technology providers – including, e.g., storage system providers, companies providing advanced communications and "smart" equipment, etc.

Table 2
FERC, NERC, and RROs' Potential Actions to Address Reliability Issues

Electric Reliability Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)
FERC: - Adoption of federally-enforceable reliability requirements and standards - Oversight of NERC and all bulk power system operators - Oversight of interstate natural gas pipeline owners/operators, with authority to approve interstate pipeline expansions - Authority over transmission planning, tariffs, open-access - In organized markets, authority over market rules (including capacity markets, provision of ancillary services providing various attributes to system operators) - Interagency coordination with EPA, DOE	**Consider:** - Requiring NERC, RROs, and system operators/balancing authorities to periodically assess potential reliability impacts of CPP with geographic scope appropriate to the reliability entity. The assessments could identify specific concerns, and develop backstop solutions – Preliminary assessments starting at end of 2015/early 2016, to inform state action taking into account known policy, practices, resources in the relevant area – Reliability assessments at the time of proposed state plans – Reliability assessments annually up through early 2020s - Continuing to evaluate the adequacy of current FERC gas/electric coordination policies in light of *incremental* changes resulting from CPP relative to trends already underway in the industry - Eliciting filings from RTOs and other transmission companies about any new planning tools, notice provisions for potential retirements, information reporting, new products, minimum levels of capability with various attributes - Inquiring into new natural gas policies to support wider interdependence with electric system reliability (e.g., incentives for development of gas delivery/storage infrastructure) - Working with states to consider mechanisms to afford bulk-power system grid operators' greater visibility into generating and demand-side resources on the distribution system - Providing guidance outlining compliance strategies that would require approvals of the FERC under the FPA (versus approaches that might not require such)
NERC – Reliability Standards, compliance assessment, and enforcement – Annual & seasonal reliability assessments – Special reliability assessments	**Consider:** – Continuing to conduct special assessments of impact of CPP on reliability (as it periodically does for other developments in the industry) – Preliminary assessments in parallel with final rule development,(in 2015) and development of State Plans (2015/2016) – Final assessments upon finalization of State Plans (2016+) – Assess whether any new standards relating to Essential Reliability Services need to be modified in light of electric system changes occurring as part of the industry's response(s) to CPP
Regional Reliability Organizations – Annual & seasonal reliability assessments – Special reliability assessments – Coordination with neighboring RROs	Consider: – Conducting special assessments of impact of CPP on reliability – Preliminary assessments in parallel with final rule development,(in 2015) and development of State Plans (2015/2016) – Final assessments upon finalization of State Plans (2016+)

Table 3
Grid Operators' Potential Actions to Address Reliability Issues

Electric Reliability Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

System Operators and Balancing Authorities
– On-going annual & seasonal reliability assessments, including transmission planning
– Special reliability assessments
– Coordination with neighboring systems
 	
Note: Some of these entities also fulfill market, resource planning and procurement functions (described further below)
	Consider
	– Conducting special assessments of impact of CPP on system reliability
	  – Preliminary assessments in parallel with final rule development (in 2015) and development of State Plans (2015/2016)
	  – Final assessments upon finalization of State Plans (2016+)
	– Identifying specific areas of concern (e.g., notice period for potential unit retirements; need for more routine anticipatory analyses in transmission planning to explore "what if" changes occur on the system; identification of zones with violations of reliability requirements and any specific units needed for reliability pending resolution of the violation)
	– Working with stakeholders (including environmental agencies in relevant states) to develop proposals for reliability safety value to ensure mechanism to fully offset CO_2 emission impacts when use of a safety valve is triggered
	– Working with counterparts in natural gas industry to harmonize business practices, develop improved inter-industry forecasting tools, coordinate operating days/market timing, share information, identify specific natural gas infrastructure needs
	– Refreshing policies and practices to assure technology-neutral and competitively neutral means for providing reliability services (both resource adequacy and system operations)
	  - Technology neutrality should recognize the different attributes needed for essential reliability services, but be supportive of generation, transmission and demand-side solutions for providing such attributes
	– Working with state officials and distribution utilities within their relevant geographies to explore ways to expand the visibility (e.g., through communications and information systems) of the system operator into distribution system resource operations (i.e., distributed variable resources such as solar PV); incorporate into planning activities
	– Continuing to improve meteorological forecasting capabilities

Table 4
Other Federal Agencies' Potential Actions to Address Reliability Issues

Other Public Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

EPA
- **Issuing the final Clean Power Plan regulation**
- **Responsibility for finalizing standards for new power plants (Section 111(b))**
- **Responsibility for administering federal air, water, and waste pollution standards**
	Consider:
	- Clarifying acceptable standard market mechanisms that could be used to accomplish emission-reduction and reliability goals in economically efficient ways
	- Providing guidance on allowing one or more forms of a reliability safety valve, *with the condition* that overall emissions over the interim period (e.g., 2020-2029) are equal to or better than the plan without a triggering of the reliability safety valve. Examples might include:
	  - Allowing the reliability safety valve as proposed by the RTO/ISO Council (with the noted CO_2 emissions offset condition)
	  - Requiring/allowing temporary exemptions/modifications of timing/quantity requirements in State Plans
	  - Providing guidance about how states may propose to alter compliance deadlines/requirements where needed for reliability, should such issues arise over time
	- Requiring States to include reliability assessments in final State Plans (not for EPA to review/approve, but rather to ensure that such studies are conducted)

Other federal agencies - **DOE** - **EIA**	**Consider:** - Investigating additional reporting requirements by members of the industry - Conducting studies and analyses that examine physical capabilities of more integrated gas and electric system - Identifying CPP compliance issues as qualifying for DOE Critical Congestion Areas and Congestion Areas of Concern, and/or "national interest electric transmission corridors" under the Energy Policy Act of 2005

Table 5
States' Potential Actions to Address Reliability Issues

Other Public Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

States
– Air agency:
  – obligation to submit State Plans to EPA
  – reviewing/approving any modification to air permits of affected generating units
– Executive and legislative responsibility for energy, environmental laws and regulations
– Oversight over regulated electric and natural gas utilities (public utility commissions) – including ratemaking, programs (e.g., energy efficiency), planning and resource procurement
– Coordination with neighboring states
– Engagement in regional planning, operational, and market rules and procedures
– Siting/permitting of electric energy infrastructure and local gas distribution facilities
	Consider:
	– Proactively (i.e., now) engaging with state utilities and state/regional system operators in evaluation of potential CPP reliability impacts, and identification of reliability solutions (including supporting preliminary assessments in parallel with development of State Plans (2015/2016), and final assessments upon finalization of State Plans (2016+))
	– Establishing as part of the State Plan an annual state reliability evaluation, and identification of/commitment to take steps and measures in the future in response to any identified reliability concerns. This could include a framework for allowing compliance waivers and extensions in the early years in the event that reliability issues arise circa 2020, combined with requirements on state and/or compliance entities for provisional CO_2 reductions over transition period to make up for waivers/extensions in early years (e.g., to arrive at same cumulative emissions over the period)
	- Incorporating conditions in air permits to reflect operating limits (e.g., total emissions within an annual period)
	- Creating flexible implementation plans (e.g., mass-based models) and multi-state programs (e.g., regional cap/trade) to mitigate potential reliability impacts and operational flexibility across regions that reflect the normal operations of interconnected electric system
	  - State or regional cap and trade programs
	  - "Bubbling" of requirements across units owned by common owner (e.g., within one state or across states through bilateral state agreements/MOUs)
	– Developing statewide policies and measures for compliance that support reliability (energy-efficiency/renewable energy programs, including measures beyond Investor Owned Utility funded programs), for example:
	  – Clean energy standards
	  – Investment in emerging or early-stage technologies (*e.g.*, storage), public-private partnerships, tax and investment credits
	  – Protocols for counting Energy Performance Savings Contracts in State Plans
	– Reviewing need to modify permitting/siting regulations to accommodate dual-fuel capability of gas-fired power plants
	– Reviewing need to modify administrative or procedural measures to expedite siting, zoning, permitting of needed energy infrastructure (renewables, other power plants, transmission, LNG storage)
	– Instituting new entities (e.g., natural-gas buying authorities) to serve as contracting entity to support long-term commitments that may be necessary for gas system expansion
	– Requiring longer advance notice of power plant retirements

Table 6
Organized Markets' & Electric Utilities Potential Actions to Address Reliability Issues

Entities Involved with Markets, Resource Planning, and Procurements	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

Wholesale Market Administrators (Generally, Bulk Power System (BPS) Operators in Competitive Market Regions)
– **Markets designed and administered to minimize costs *subject to the constraint* that all reliability requirements of the system are met**
	Consider:
	– Adding technology-neutral and competitively neutral market rules/products to add incentives for new reliability attributes.
	  – Local (zonal/load pocket) capacity and energy market pricing; changes to scarcity pricing
	  – Reliability attributes for system security (greater quantities of spinning or non-spinning reserves; AGC; ramping/load-following; reactive power; on-site fuel; frequency response; black start capability)
	– Establishing or clarifying, where necessary, expectations around unit performance during shortage or scarcity conditions
	– Clarifying how normal dispatch processes incorporate current restrictions on unit operations (including emissions limits, ramping periods, etc.), and how similar operational restrictions (if any) resulting from Clean Power Plan compliance would be incorporated in system operations
	– Establishing or clarifying, where needed, provisions for the creation of reliability must run (RMR) contracts for generators needed for reliability that would otherwise retire – conditioned upon permit restrictions that account for CO_2 emissions offsets
	– Establishing or clarifying, where needed, procedures to minimize duration of RMR contracts through development of utility or market responses (generation, transmission)
	– Identifying any changes in forward capacity markets for the period starting in 2020

Vertically-Integrated Utilities, Cooperatives, Municipal Light Companies
– **Long-term resource planning**
– **Obligation and opportunity to develop and obtain cost recovery for necessary demand, supply, and transmission investments and expenses**
– **Obligation to maintain power system reliability**
– **In some states, integrated resource planning and/or resource need/procurement processes**
– **Coordinated operation of systems with neighboring utilities**
	Consider:
	– Conducting forward-looking assessments of potential impacts on system reliability of CPP implementation
	  – Preliminary assessments prior to and during final rule development and SIP implementation
	  – Final assessments upon finalization of SIP
	– Developing or expanding long-term integrated resource planning processes for timely and practical incorporation of CPP compliance requirements
	– Incorporating all potential short- and long-term measures (supply and demand; generation and transmission) to address significant changes during CPP transition period
	– Engaging in coordination with neighboring utilities around local reliability concerns tied to CPP implementation

Table 7
Other Organizations' Potential Actions to Address Reliability Issues

Other Organizations that have a Role To Play in Assisting in Reliable and Effective Industry Compliance	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)
Non-Utility Generating Companies	**Consider:** - Responding to signals in organized wholesale markets and in response to competitive solicitations by electric utilities
Interstate Natural Gas Pipeline Owners/Operators – Coordination among NGP owners/operators – Coordination with BPS operators – Development of new pipeline capacity	**Consider:** – Improving coordination with system operators – e.g., harmonize standards and practices, coordinate operating days/market timing, share information, etc.
NAESB - Working with industry stakeholders to develop standards for operations in electric and gas industry	**Consider:** – Periodically convening industry sector discussions about continuing need to harmonize standards in the electric and gas industries
Administrators of Allowance Trading Programs (e.g, RGGI, California, new ones)	**Consider:** - Establishing new "plug and play" programs that allow states to join with relatively administrative ease
Administrators of Energy Efficiency Programs	**Consider:** - Establishing products to offer to generating companies to 'purchase' program credits to offset emissions, subject to strict measurement and verification
Energy Service Companies (ESCOs)	**Consider:** - Working with State agencies to develop mechanisms to incorporate energy-savings-performance contracts into State Plans

FEDERAL ENERGY REGULATORY COMMISSION

DENVER REGIONAL TECHNICAL CONFERENCE ON ENVIRONMENTAL REGULATIONS AND ELECTRIC RELIABILITY, WHOLESALE ELECTRICITY MARKETS, AND ENERGY INFRASTRUCTURE
February 25, 2015

Docket No. AD15-4-000

Comments Submitted by
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Western Grid Group
And
John Jimison, Managing Director
Energy Future Coalition

And endorsed by a coalition of Public Interest Organizations
Written Statement Submitted February 23, 2015

The undersigned public interest organizations,[1] who share a direct interest in the Western area electricity grid, have joined to submit the following comments in advance of the Federal Energy Regulatory Commission's Technical Conference on the Environmental Protection Agency's (EPA) proposed rule under Section 111(d) of the Clean Air Act, as amended, and the relationship of FERC-jurisdictional activities to that proposed rule. We appreciate this opportunity to provide comments to FERC on questions of electric reliability, wholesale electricity markets, and energy infrastructure related to EPA's proposed rule. We applaud the Commission for its leadership in fostering aggressive and early communication among regulators and stakeholders on these critically important issues, as we believe that addressing them effectively will require cooperation and coordination among a large number of organizations.

Our collective assessment shows the goals of the proposed EPA rule are achievable, with the proposed rule maintaining key elements of the draft provisions as released by EPA on June 2, 2014, while maintaining electric reliability.

[1] Energy Future Coalition, Island Energy Coalition, Natural Resources Defense Council, Northwest Energy Coalition, Renewable Northwest, Sonoran Institute, Sustainable FERC Project, Utah Clean Energy, Vote Solar, Western Grid Group and Western Resource Advocates

Our main conclusions are:

- Reliability assessments of specific compliance plans must be performed, but models, data, institutions, and processes are largely in place at Western Electricity Coordinating Council (WECC) and in regional transmission planning organizations.
- Initial western interconnect-wide assessments of cleaner system futures by National Renewable Energy Laboratory (NREL) and General Electric (GE) examine key aspects of reliability, and results are favorable for higher penetrations of renewable energy and more coal retirement than anticipated under the proposed EPA rule.
- High voltage transmission expansions, upgrades, and optimization have proven to be highly effective and economic bringing renewable energy to market (Building Block 3 in the proposed EPA rule)
- As the federal agency responsible for regulating high-voltage transmission, FERC's actions will exert an enormous influence over the role of transmission in state and regional implementation plans. Without active and ongoing engagement and input from FERC, EPA and state environmental regulators will be far less likely to incorporate cost effective transmission investments into their compliance plans. FERC should not approve regional transmission plans submitted under Order 1000 if plans to not reflect consideration of EPA's proposed and final rule.
- Improvements in and modernizations of the system's physical capabilities to ensure reliability requires institutional and market reform, with or without consideration of the proposed EPA rule.
- Regional transmission planning entities under Order 1000 can assist states in planning by prioritizing the proposed EPA rule in their evaluation of complying with public policy requirements. This should be done as states are developing their compliance plans.
- Planning and building new infrastructure, and more efficient use of existing infrastructure has the potential to lower consumer costs for compliance with the proposed EPA plan.
- Reliability will be supported by anticipating future system needs, and beginning now to design-in flexible grid, infrastructure, and market solutions to challenges. However, the magnitude and timing of the future needs allow careful evaluation to proceed. There is no need to reduce or delay targets or provide easy-out backstops.

Our comments are in three sections, based on the technical conference agenda. We address electric reliability considerations, followed by infrastructure needs, then implications for wholesale markets and bilateral trading, particularly as they apply to the Western Interconnect.

I. Electric Reliability Considerations

U.S. electric systems have a history of high reliability, which have been maintained through major system changes as a result of evolving technology and economics. Utilities and grid operators have laudably "kept the lights on" through associated regulatory and market changes as well. This context is important as we consider today's situation and on-going grid evolution with numerous technological

improvements, changing economics, and policy and regulatory priorities. The electric system in the West continues to transform, independent of the proposed EPA rule, toward a cleaner, more dynamic, interactive grid. Specifically, resource changes already underway include: less reliance on large coal plants; increasing amounts of distributed and utility-scale renewable energy generation; additional cost effective energy efficiency and demand response; and further development of natural gas-fired generation. Within the period addressed by the proposed rule, trends including the emergence of energy storage; electrification of the transmission sector and the development of vehicle-to-grid services are also likely.

As a result of resource changes, utilities, Balancing Authorities (BA), and regional planning organizations in the Western Interconnection continually evaluate and study the key reliability aspects of resource adequacy, normal grid operational balancing, and contingency disturbance response to ensure that the grid can be reliably operated. As is detailed below, a significant amount of modeling and study work has been completed which has built a body of evidence that the electric system can be reliably maintained and lower-carbon resources increased, but ongoing changes in operation and management, and studies of yet to be determined compliance plan specifics will require continued effort.

For electric utilities maintaining reliability is the highest priority as an inability to provide reliably electric service can have enormous economic, health and safety impacts.[2] However, as we note below, determining the "reliability" of the electric system requires sophisticated study of different aspects of the system. While the proposed EPA rule may further change the resource mix in the West, and that understandably can raise reliability concerns,

We urge FERC and others to identify specific issues and evaluate those issues to understand the exact nature and extent of reliability impacts.

We appreciate that FERC has asked specific questions related to reliability to more fully understand the implications of the EPA proposed rule.

Institutional Capabilities

Western Electricity Coordinating Council

For modeling of the electric system, the West has adequate institutional capabilities. The WECC and sub-regional planning groups of WestConnect, Columbia Grid and Northern Tier Transmission Group provide forums for, and have processes in place to conduct modeling of the transmission system to ensure reliability.

[2] Synapse Energy Economics calculated the Value of Lost Load attributable to the Southwest blackout in 2011. See: "Balancing Market Opportunities in the West: How participation in an expanded balancing market could save customers hundreds of millions of dollars." Prepared for the Western Grid Group October 10, 2014 Paul Peterson, Spencer Fields, Melissa Whited. http://www.westerngrid.net/wp-content/uploads/2014/10/EIM-Synapse.pdf

Over the past five years, in part due to availability of stimulus funding, WECC has expanded and improved its modeling capabilities. WECC is the logical and qualified entity to lead west-wide analysis on reliability for state and utility decision makers. WECC maintains the only region-wide data base that features planning assumptions that are vetted by broad groups of stakeholders from a variety of perspectives, so the region has values for modeling that can be relied on and are consensus-based. This data can serve as a common starting point for studies and analysis across the region. WECC's improved study processes include scenario planning, ten year production cost modeling and twenty year least cost of energy modeling.

The WECC data and modeling provide common starting points and minimum levels of modeling sophistication, which, if used by others in the region, can provide for consistency that will be required to achieve regional reliability outcomes. Using these improved data and planning methods, WECC has already performed several assessments related to EPA's proposed rule and is currently assessing flexibility needs and sources with respect to high renewable energy futures.

WECC's Transmission Expansion Policy Planning Committee (TEPPC) planning study processes are set up to accept study requests on a two-year cycle from coalitions of sponsors. This established mechanism has studied, and is currently studying, future grid scenarios pertinent to the potential EPA rule including high coal retirement, high distributed generation (including rooftop solar photovoltaic), high energy efficiency, and high central station wind and solar power.[3]

We encourage WECC to follow through with their intent expressed in their September 2014 Preliminary Technical Report on the Clean Power Plan to perform independent studies and provide analysis on compliance options, and to provide well-vetted planning data and assumptions, improved and improving planning and modeling methods, including scenario planning, and regional level, objective perspectives to decision makers and stakeholders in the West. These analyses should be coordinated with PEAK, the reliability coordinator, and use best available appropriate data, and to continue the WECC tradition of transparent, openly inclusive processes. When stakeholders are involved up front, fewer disputes follow.

FERC should support continued improvement of WECC's planning capabilities, including data flow from PEAK to WECC, that is absolutely essential for planning.

Sub-regional planning groups

As a result of FERC Order 1000, the West also has coordinated sub-regional transmission planning organizations that can conduct reliability assessments for states.

[3] WECC Regional Transmission Expansion Planning web site: http://www.westerngrid.net/regional-transmission-expansion-planning-rtep/

Sub-regional planning groups should coordinate closely with and use the data developed by WECC and employ study methods that are at least equal to, and consistent with those WECC uses.

It is also extremely important that sub-regional groups, utilities and state regulators have access to WECC data for their planning purposes. (Refer to Section II of these comments on Infrastructure for details on the role of Order 1000.)

Coordination of Environmental Regulators and Electric Entities

State Implementation Plans (SIPs) to meet the proposed EPA rule will be developed and submitted by a designated state agency responsible for air regulation. This state agency is responsible for working with a wide range of stakeholders to develop programs and plans that demonstrate compliance. However, the breadth and depth of stakeholder engagement will be determined by each state.

Western air regulators coordinate regionally through the Western States Air Resources Council (WESTAR). WESTAR covers approximately the same territory as WECC. WESTAR and state agencies are the key forums to ensure that stakeholders can engage in the process. However, these organizations, alone will not be sufficient.

Development of plans to comply with the EPA's proposed rule will require careful and close coordination between air and energy regulators. States have some experience with this type of coordination as a result of the Regional Haze Rule of the 1990s. States in the West formed the Western Regional Air Partnership to provide a forum for collaboration between air and energy regulators. For the proposed EPA rule, the West does not yet have organizational structures in place for collaboration among air and energy regulators or for multistate SIP development. However, several groups are gearing up to assist in state and regional compliance plan coordination and development efforts.

- The Western Interstate Energy Board's (WIEB) State and Provincial Steering Committee (SPSC) has developed the project: Exploring the Modular Approach to Multi-state Compliance with EPA's proposed rule in the West. WIEB has hired a contractor to complete a study (due in April) to inform states. The advisory committee, formed in November 2014 is made up of energy offices, public utility commissions and air regulators.

- The U.S. Department of Energy has initiated a two-year project (through December 2016) that will explore opportunities for multi-state and regional collaborations on strategies to address critical energy challenges in the West. One key focus of the project will be compliance with EPA's proposed rule. WIEB is a principal investigator and staff for the project. Meetings in the spring of 2015 will bring together energy offices, public utility commissions and air regulators.

Analysis Tools

Generally, we believe that the West does possess tools necessary to evaluate impacts of changes to the current electric system and to plan for future conditions. Standardized tools are available and are used to evaluate power systems aspects of resource sufficiency, reliability, including resource adequacy, normal operations and load balancing, and disturbance response.

While well established, care must be exercised when applying these tools to new generation technologies, the expanding roles of efficiency and distributed generation, and other aspects of postulated future clean grid scenarios. As the West's energy mix changes to include more distributed generation, renewable energy, and demand response, models, data, and protocols need to change to accurately reflect the capabilities of these technologies and their impacts on the transmission system. Many of these new technologies are changing rapidly and there are impressive rates of market penetration for some of them. This makes it very important for stakeholders who are expert in these emerging technologies and markets to be involved and for utility planners and analysts to listen carefully to these stakeholders so that rapid changes can be included in planning and implementation.

For example, to more accurately study the electric system in the Western Interconnection the following changes are suggested:

- For resource adequacy determinations, use Effective Load Carrying Capacity (ELCC) methods. It is important to incorporate site specific, accurate historic weather patterns for wind and solar resources and correlate this data with electric demand.

- For normal operations and load balancing using production cost modeling, accurate representation of geographic diversity of wind and solar resources is essential, along with sub-hourly power system evaluations to capture more granular wind and solar variability and uncertainty. Evaluation of alternative operational practices, as well as system physical capabilities is also necessary.

- For disturbance response (which includes load flow, frequency response and dynamic stability study), control settings of conventional plants must be captured to validate them against actual disturbance events. Gas and hydro units should be accurately represented when evaluating the absence of large coal units, and advanced grid features of inverter-based generation must be captured (as is being done by the WECC Renewable Energy Modeling Task Force).

There are several studies, highlighted below, that have incorporated best modeling practices.

FERC, NERC, regional reliability organizations, and Order 1000 regional planning entities and processes should take advantage of these studies and modeling expertise (within Department of Energy's (DOE) national laboratories, among university and academic research organizations, and from the real world experience of industry consultants) to prepare for modeling grid reliability aspects of specific implementation plans.

Successful Integration of Increasing Amounts of Renewables

There are many success stories regarding integration of increasing amounts of wind and solar power throughout the Western Interconnect, in other parts of the U.S. and in Europe, that are instructive as policy makers consider the impacts of EPA's proposed rule.

Experience with wind and solar power in Colorado shows that carbon reductions can be achieved quickly and at low cost. Colorado's experience supports EPA strengthening its proposed rule, since wind and solar is being added to Xcel's Colorado system **at costs that save consumers' money**. At the end of 2013, Xcel had about 2,427 megawatts of renewable energy capacity in its Colorado portfolio, of which 250 megawatts are from solar power systems and 2,177 megawatts are from wind.

When Xcel Colorado adds the 450 MW of wind and 170 MW of solar photovoltaic that the Colorado Public Utility Commission has already approved, it will have 2,627 MW of wind and 420 MW of solar on its Colorado system.[4] In 2014, it served about 14% of its customer's total annual electric demand from wind power sources, and has seen instantaneous load share reach above 60%. Along with early coal retirements, efficiency programs, and other efforts, Xcel has reduced carbon dioxide emissions by about 16 percent from 2005 levels.[5] To accomplish their renewables record, Xcel has:

- Proactively studied future high penetration scenarios using state of the art data, tools, methods, and technical review processes;[6]
- Partnered with National Center for Atmospheric Research (NCAR) and NREL to improve forecasting science and apply these improvements to their forecasting practices for wind;
- Incorporated improved forecasts into control policies, trained operators, and used their policies in control room operations;
- Inventoried and adapted operating parameters of existing resources (including coal, gas, and pumped hydro generation) to provide increasing flexibility, and to include flexibility as a criteria in new resource acquisition;
- Examined gas delivery issues, and increased Front Range gas storage, in part to address wind variability and uncertainty;
- Required wind providers to install communications and control systems on wind plants that allow the utility to include wind in their Automatic Generation Control (AGC) system;
- In curtailment situations, selectively signal wind plants to provide advanced power control regulation service while their dispatched conventional generators are parked at minimum generation; and
- Pioneered a joint dispatch arrangement with other load serving entities within the BA.

[4] http://www.xcelenergy.com/Company/News/News_Releases/Xcel_Energy_proposes_adding_economic_solar,_wind_to_meet_future_customer_energy_demands

[5] http://connect.xcelenergy.com/colorado/xcel-energy-on-track-to-surpass-co2-reduction-goal-by-2020/

[6] For example, see: https://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/11M-710E_2G-3GReport_Final.pdf

All these laudable measures have helped Colorado reach those stated penetration levels of renewable energy. Xcel Colorado is producing wind power well above their state renewable portfolio standard mandates, and is currently acquiring 450 MW of wind and 170 MW of additional solar power at costs lower than their current system average generation cost. This is a prime example of the steps a utility can take to ensure reliable integration of renewable energy and carbon reductions.

Study Results and Implications

Southwest Area Transmission Study

In 2013 and 2014 the sub-regional planning group, Southwest Area Transmission (SWAT) examined four coal reduction scenarios to identify any dynamic stability issues that might arise. Three of the four scenarios studied were found to be reliable and *did not* reveal any specific limitations on coal reduction. Only one scenario (replacing ~5000 MW of coal with 100% renewable resources in a 10,000 MW system) showed some dynamic voltage stability issues. The analysis was limited because it did not consider any potential mitigation steps that could be taken to resolve issues found in that scenario. Among other options, these mitigation steps might include: using modern inverter-based generation technologies to provide reactive power and voltage control from wind and solar power plants; targeting renewable resources towards locations that could minimize impacts of disturbances; and converting the existing generators into synchronous condensers. This type of study is important because it demonstrated that the Southwest system could handle large amounts of coal retirements with large renewable energy additions before having stability issues, even without considering proven mitigation technologies. The study is an initial step in identifying the full potential to reduce fossil fuel generation in the electrical system in the Southwest.

Western Wind and Solar Integration Studies

With DOE funding, NREL and GE consulting have performed several keystone analyses of the Western Interconnect examining future generation mixes up to 35% annual electricity from wind and solar sources. **These analyses reflect higher use of renewables foot-print wide, than those targeted in EPA's proposed rule. The studies provide direct analysis on issues associated with decreased use of coal.**

The Western Wind and Solar Integration Studies (WWSIS) studies are groundbreaking. These studies were performed by a national laboratory, NREL, and a U.S. leading manufacturer's consulting service, GE. The studies included representatives of utility staff and industry experts in an open and transparent Technical Review Committee process. A variety of public and investor owned utilities in the west, WECC, NERC, and industry experts brought perspectives, ensured valid model inputs, and consequently ensured consensus interpretation and acceptance of results.

These analyses, models, data, and processes should be utilized to inform policy makers and as they are best practice examples for WECC and regional planning entities going forward. Engagement with DOE,

national labs, academic and university and industry experts can ensure timely development of similar reliability analyses of specific implementation plans related to the proposed EPA rule.

The WWSIS Phase 1[7] and Phase 2[8] examined resource adequacy and normal operations balancing through production cost modeling. Phase 2 set the pattern for many other studies (California Independent System Operator, PJM, Midwest Independent Transmission System Operator) by using a commercial security constrained unit commitment and dispatch model, called Plexos from Energy Exemplar. The study used Western Interconnection generation and transmission data from WECC. The modeling effort performed multi-year simulations with high sub-hourly granularity. The assessments included examining key renewable energy future issues, including net-load ramp needs, fossil plant cycling wear and tear and emissions impacts, and operational reforms to incorporate forecasting with shorter unit commitment and dispatch intervals. The study postulated efficient transfer of energy through broad regional cooperation, well beyond the level of cooperation among the BAs in the Western Interconnection.

The report concluded that there was no increase in unserved load, curtailment of renewable energy was minimal, and the system would see a net savings of $7-8 billion from a reduction in annual fuel and emissions production costs. Additionally, demand response was found to be a very effective way of maintaining reserve margins during periods of extreme weather events and grid situational stress. It should be emphasized that the regional coordination assumed in the study requires a significant change from the current operating practices of 38 separate BAs.

Drawing from the WWSIS 2 analysis, The Western Governors' Association commissioned the Regulatory Assistance Project to examine key actions needed to accommodate the 33% annual electric demand from wind and solar scenarios analyzed in the study. Their 2014 Meeting Renewable Energy Targets in the West at Least Cost: The Integration Challenge report[9] recommends possible state actions to reduce costs to the region's electricity consumers for integrating wind and solar.

With respect to contingency event disturbance response reliability, even though load flow tools (like PSS/E and PSLF) are well established, capturing accurate existing system disturbance response has been challenging. The recently released WWSIS Phase 3[10] by NREL and GE, showed that careful tuning of generator control settings and calibration against historic disturbance responses from recent "events" is necessary to accurately capture system response.

Using the calibrated model, that study examined frequency response and dynamic stability aspects of disturbance response for the most challenging dispatch and load seasonal situations found in the high wind and solar WWSIS 2 simulations. **GE concluded that Western Interconnect disturbance response appears adequate, and meets reliability standards for the high (33%) wind and solar scenarios,**

[7] http://www.nrel.gov/docs/fy13osti/55588.pdf
[8] http://www.nrel.gov/docs/fy13osti/55588.pdf
[9] http://www.westgov.org/images/dmdocuments/RenewableEnergyTargets2012-13.pdf
[10] http://www.nrel.gov/docs/fy15osti/62906-ES.pdf

including substantial coal displacement, provided relatively minor, localized system modifications are identified and made using good, established planning and engineering practices and commercially available technology.

In addition, advanced solar and wind grid support service options such as voltage and frequency ride through, inertial and governor primary frequency response, and secondary frequency response and regulation, were modeled in WWSIS 3, and shown to provide significant improvement in system disturbance response.

Based on the studies completed to date, we believe the advanced controllability options of inverter-based commercial wind and solar generation can be viewed as demonstrating *better* grid support than traditional synchronous generators.

As FERC and NERC evaluate the implications of the EPA's proposed rules and develop policy and regulation to govern the Western electric system,

We urge FERC to examine and evaluate the advanced grid reliability capabilities of wind and solar technology, and to begin examining potential mechanisms (including markets, grid codes, and standards) for valuing and acquiring appropriate levels of key reliability services from all sources.

Evaluations should include traditional synchronous generation, inverter based generation, demand response, and storage.

Grid stakeholders should also be aware of the technical resources addressing renewable energy grid issues available through the Utility Variable Generation Integration Group,[11] the Power Engineering Society of the IEEE and its wind committee, and the International Energy Agency Wind Task 25 on Design and Operation of Power Systems with Large Amounts of Wind Power.[12]

II. Identifying and addressing infrastructure needs

Our comments on infrastructure focus directly on FERC's responsibility under the Federal Power Act to promote and encourage transmission investments needed to ensure the cost-effective and reliable implementation of the proposed EPA rule, and to ensure that those projects are identified, evaluated, and constructed in a timely manner. EPA is responsible for implementing the proposed rule, but FERC and the regional planners working pursuant to FERC regulations cannot ignore the rule's implications for transmission, or the large potential for transmission to reduce the cost of meeting the proposed emissions goals. As Order 1000 requires, regional and interregional grid planners must plan for system needs driven by EPA's final rule, which is a public policy requirement. Failing to do so would result in the unduly discriminatory results Order 1000 intended to preclude, reducing the potential for renewable

[11] www.variablegen.org
[12] http://www.ieawind.org/task_25.html

energy to expand its compliance share, with what are probably among the lowest-cost compliance options for the EPA proposed rule.

For FERC to approve regional transmission plans submitted under Order 1000 , regional planning entities should fully reflect the potential for transmission expansions, upgrades, and optimization to facilitate compliance with the proposed EPA rule. In addition, FERC should require all regional transmission-planning entities under Order 1000 to review their implementation plans and processes in light of the proposed EPA rule, and to prioritize the rule under their evaluation of complying with public policy planning requirements.

Regional transmission planning and inter-regional coordination under Order 1000 is the best mechanism available for identifying regional electric infrastructure needs with potential to facilitate and reduce costs of compliance with the proposed EPA rule. The proposed EPA rule constitutes a major new public policy requirement that, when considered by planners as required under Order 1000, can result in significant changes to transmission projects, capacities, and routes.

FERC should also ensure that regional planners, as required under Order 1000, to fully consider the impacts on transmission plans of energy efficiency, demand response, distributed generation, storage, and other distribution level and demand-side measures included in state plans under Building Block 4 of the proposed rule.

Transmission expansions and upgrades are critical to accessing large, high quality renewable resources in remote areas, smoothing and balancing their variability over large regions, and delivering them to customers over the planning period of the rule. Successful and cost-effective renewable energy deployment has occurred in states where proactive steps to ensure adequate transmission capacity have *preceded* commitments to build generation, notably Texas, California, MISO, and Southwest Power Pool (SPP). These successful programs include innovative tariff provisions, early recovery of construction-work-in-progress charges, or other means of financing transmission construction ahead of commitments of renewable energy producers to use it.

There are no secrets about the areas where the best clean energy resources await harvest by the increasingly cost-effective generation technologies we are deploying. The much longer lead times for transmission projects than for that deployment mean that FERC and regional planners should facilitate the proactive planning of transmission to those areas to evaluate potential expansion of near-term compliance, and to address longer term needs. This is an instance where it is actually true that “if you build it, they will come.”

Federal and state programs to identify low-conflict, high resource value renewable energy zones and plan for and develop transmission access to those areas are underway, most notably the BLM solar programmatic environmental impacts statement implementation (which establishes solar zones across six western states), the California federal-state Desert Renewable Energy Conservation Plan (which establishes development focus areas in the California Desert on both public and private lands and plans transmission to serve them), and the similarly focused Arizona federal-state Restoration Design Energy

Project. These approaches have in common a goal of both identifying promising resource areas and designing transmission to match their expected outputs over time. A similar approach was taken to design and build the Tehachapi transmission project by Southern California Edison (nearing completion), which facilitates the build-out of the Tehachapi Wind Resource Area. This approach can expedite single state or multi-state compliance schedules under the proposed EPA rule. It makes renewable energy and transmission development both orderly and predictable.

FERC and transmission planners must also fully explore numerous cost-effective opportunities to optimize use of the existing transmission system. Many paths in the Western Interconnection are fully subscribed by contract. However, in studies of actual flows, few transmission paths are 100% constrained. Of those which are fully utilized, a great majority are only constrained a few hours per year. While challenging, institutional reforms to unlock this unused transmission capacity could yield big benefits for states developing compliance plans. In addition, path rating procedures are antiquated, overly conservative, and deterministic. Re-examination of path rating procedures is imperative. The WIEB project aimed at identifying alternative rating methods, and eventual implementation of revisions opening up reliable, additional use of existing paths, should be viewed as a high priority for the Western Interconnection.

FERC should take steps to ensure that analyses of potential regional and inter-regional transmission needs driven by the proposed EPA rule are available to states as they begin to develop their compliance plans. Further, FERC should support states by providing additional and updated analyses as needed throughout the compliance plan development process.

There is a huge mismatch in design, permitting, and construction timelines for new utility transmission projects – typically ten years or more – versus those for utility scale wind and solar generating facilities – less than two years on average. New renewable energy generating capacity will not be developed without certain knowledge that transmission capacity will be in place to deliver it to market. FERC and regional planners have already recognized that proactive transmission planning processes are crucial to the successful implementation of renewable energy policies.

Deadlines for state and regional implementation plans in the proposed EPA rule make evaluation of transmission options even more important, since state regulators will likely need this information to make critical decisions like whether to join regional compliance strategies, the role of renewable resources in compliance, and the most cost effective and least risky strategies.

Numerous transmission reforms enacted by FERC over the past two decades have recognized that utilities have an incentive to protect their equity earnings on generation plants they own from disruptive entry by new generation technologies that they may not own, by limiting and denying transmission access. FERC must remain vigilant in regulating this central utility incentive in the public interest in order to ensure that states retain maximum flexibility to exercise all of the compliance options enumerated in the proposed EPA rule. FERC must recognize these incentives and redouble its efforts to

prevent them from resulting in undue discrimination against the new technologies like renewable energy.

FERC and regional planners should not wait for a final rule to complete necessary analyses. Although EPA's final rule may change the specific requirements proposed for the states to reduce carbon emissions from existing power plants, the array of cost-effective options to do so will not change – regardless of the need to put them into action. Transmission planners can proceed to determine and list the most cost-effective options for accessing clean energy without knowing how many of them will be adopted in the end to meet the final EPA rule, given other clean energy strategies. States and others required to comply with EPA's rule, on the other hand, cannot select the most cost-effective options unless they have information that offers the new transmission capacity options to compare with other clean-energy alternatives.

FERC should communicate the well-established effectiveness of transmission in bringing large amounts of renewable generation to market at minimal cost or at net economic benefit.

A strong and growing body of evidence suggests that regional compliance with the proposed EPA rule will be less expensive than state-by-state approaches. Transmission opens development of higher quality renewable energy resources and also helps balance variable resources like wind and solar over large regions – both of which reduce the cost of adding zero-carbon energy to the electric system and complying with the proposed rule while increasing reliability. It is now clear that a broadly integrated grid can bring renewable energy up to higher levels of availability with increased reliability by transmitting over-generation to areas otherwise served by renewable resources experiencing temporary lack of wind or sunshine.

The Texas CREZ program built 3600 circuit miles of high voltage transmission at a cost of $6.8 billion with the expressed goal of developing wind energy. By the end of 2016, ERCOT expects more than 28,000 MW of wind and solar to be operating on its system, far exceeding the initial goal, and more than double the total wind and solar generating capacity of any other state. The new resources have *improved* reliability and will pay for themselves within a few years, generating billions in net economic benefits to ratepayers for decades – even before any environmental benefits are taken into account.

The Texas experience and similar strategies in California, MISO, and SPP provide powerful evidence that regional compliance plans incorporating transmission expansions up front are likely to yield low costs of compliance with the proposed EPA rule, and will also put infrastructure in place to allow states to add even more renewable energy cost-effectively to further reduce emissions in the future. FERC and transmission planners can inform state decisions on whether to join regional efforts by providing relevant analyses of the potential benefits of regional transmission investments in a timely manner. While efforts in the West to plan and build transmission to identified renewable energy zones has been slower to occur than other areas of the country, states in the West can benefit from regional compliance planning that incorporates regional transmission expansion.

The benefits of transmission-centered regional compliance strategies are large enough to justify their broad adoption in the 2030 timeframe, but even greater when steeper long term emissions targets – e.g. 80 percent by 2050 – are considered. Although EPA's time frame may be limited to 2030 for this proposed rule under the Clean Air Act,[13] FERC should act from its own perspective under the Federal Power Act. When planning transmission projects expected to be in service for 40 years at a minimum, FERC and transmission planners should take these increasingly likely longer term public policy goals into account to avoid unjust, unreasonable, and unduly discriminatory outcomes for ratepayers.

III. Potential implications for wholesale markets and bilateral trading

The Western Interconnection is operated by 38 balancing areas (BA) and two organized markets - California Independent System Operator (CAISO) and Alberta Electric System Operator (AESO). Energy is traded largely through bilateral contracts within and outside of the organized markets. This fragmented structure results in: lack of real time grid awareness; a patchwork of interconnection rules; uneconomic pancaking of transmission rates; manual, hourly suboptimal dispatch; and seams issues between BAs. The current system does not provide the coordination and access to flexibility that would be needed to most cost effectively and reliably manage the future expected resource mix. Without new cooperation and services, customers throughout the West will pay more than necessary for electric service. Additionally, opportunities for states to most reliably and economically fully utilize Building Block 3 (renewable energy) under the proposed EPA rule may be limited.

Fortunately, the West is adopting reforms that include but are not limited to: BA coordination and consolidation creating larger BAs, operational tools that enable better visibility, situational awareness and faster dispatch and scheduling; as well as centralized forecasting for variable generation. These market developments and coordination efforts will increase efficiencies and reduce operational costs for compliance with EPA's proposed rule for states developing individual and multi-state plans.

The ongoing trend to better regional coordination of the grid, better and more flexible utilization of the system, and enhanced capacity for situational awareness will be especially important for multi-state coordination, and state implementation plan development and compliance.

It is anticipated that BAs will continue to rely on bilateral contracts until systems and markets are in place that allow procurement of resources on a real-time basis or until they participate in coordinated dispatch systems. Seams issues, which are a result of the current fragmented electric system in the Western Interconnection, will lessen as the transmission system becomes more coordinated and

[13] Based on the endangerment finding supporting the proposed rule, which is not facing legal challenges, EPA is obliged to take steps to reduce electric sector carbon emissions significantly in the 2030 timeframe, and also likely to propose additional steps to further reduce emissions by 2050. Given the long life of transmission lines (40 years or more), the long lead times for utilities building them (10 years), and the stable geography of low carbon resources like wind and solar, the basic parameters of any analyses of transmission needs for compliance are likely to remain unchanged, regardless of how federal courts rule on legal challenges to the proposed rule.

consolidated. The current seams issues among the 38 BAs cause well-understood reliability challenges related to poor situational awareness and event response, as was experienced September 8, 2011 in Arizona and California. The processes for creating a more coordinated system will provide an opportunity to address and mitigate seams issues.

Below we provide a summary of the activities and reforms that will support building a lower-carbon electric sector in the West, consistent with the EPA proposed rule.

Transmission Planning

In the area of planning, the Western Electricity Coordinating Council (WECC) has provided a Western regional planning forum. With ARRA funding, WECC has pioneered stakeholder engagement through the Scenario Planning Steering Group, State Provincial Steering Committee, and broad stakeholder participation in its transmission expansion process. WECC provides modeling for study requests on ten year production costs and twenty year levelized cost of energy (LCOE) modeling tools.

WECC and its stakeholders have invested significant time and effort to develop vetted, mostly consistent data that form the basis of planning assumptions. **This data represents "best practice" material and should be used throughout Order 1000 and Order 890 sub-regional and utility planning efforts.**

Use of consistent data in west-wide and sub-regional planning will assist states in studying and understanding implications of different resource choices.

Regional Coordination

Increased and improved regional coordination is happening in a number of areas. Efforts noted below will provide new services and platforms to coordinate efficient exchange of energy by Western grid operators. These efforts are important first steps for what may someday be a fully coordinated and organized market in the West. At the present time, however, efforts are at the BA, multi-BA or sub-regional level, with none being interconnection-wide.

Of note in improving regional coordination is the development of the Northwest Power Pool's Security Constraint Economic Dispatch (SCED) market reform. This effort, when implemented, will affect resource sharing and dispatch of the major utilities serving the Pacific Northwest, Alberta and British Columbia. Another effort, in Colorado, has three utilities voluntarily joining together to operate under joint dispatch. Participating in SCED or joint dispatch requires a high degree of coordination, but in the West utilities are concerned about potential loss of control and autonomy resulting from joint dispatch arrangements. However, economic and reliability benefits of such coordination are well proven in other areas of the country. These arrangements develop significant coordination capacity and integrate a number of operational reforms that aid in reliable compliance with the provisions of III(d).

Another nascent effort to improve coordination among BAs in the West is the "Joint Initiative." The Joint Initiative of the three sub-regional planning groups - Columbia Grid, Northern Tier Transmission Group and WestConnect - are evaluating the benefits of inter-hour and dynamic scheduling, information sharing links, and "Area Control Error (ACE) sharing." The aim of all these efforts is to increase the

efficient use of the transmission system. Unfortunately, these coordination efforts are voluntary, with their implementation timelines and effectiveness dependent on dedication of utility staff and prioritization by participating utilities[14].

Energy Imbalance Market

The Energy Imbalance Market now includes six states in the Western Interconnection and will include a seventh when Nevada joins in 2015. The EIM has expanded beyond the CAISO footprint to improve reliability in the electric system by increasing accesses to low-cost imbalance energy and to aid in the integration of ever-increasing amounts of variable generation. The EIM is an important tool for compliance with the proposed EPA rule.

By its very nature, the market platform will make energy available to utilities that are unable to keep their system in balance with their own resources. This safety net goes beyond current reserve sharing agreements for participating utilities and makes available economically more attractive energy. While reserve sharing groups have limits on the number of times a utility can request energy resources, and limits the amount of energy available, the main constraint on the EIM is available transmission capacity. As the market expands and more BAs join the EIM, available transmission capacity will inevitably increase.

As the benefits of energy imbalance and SCED regimes become more apparent in the West, these improvements will likely lead to other products for participants including better operation coordination, BA consolidation, greater reserve sharing and better system utilization across the WECC footprint. This in turn facilitates lower CO2 emissions by reducing system congestion and making lower cost resources available to a wider array of entities seeking to comply with the proposed EPA rule. The Southwestern Power Pool is an example, as their EIM platform was followed by development of a day-ahead market across the SPP footprint.

The greatest benefit for compliance with EPA's proposed rule will come from multi-state plans in which all utilities and their BAs are participating in efficient energy exchange and broad grid cooperation. However, as only a few BAs currently participate in the EIM, it is anticipated that states may submit plans that include a mixture of participating and non-participating BAs. While this is not optimal from a costs and reliability perspective, we know of no impediments to compliance with EPA's proposed rule as a result of mixed participation.

In February, 2013, before the CAISO EIM market was expanded beyond California, FERC released the white paper "Qualitative Assessment of Potential Reliability Benefits from a Western Energy Imbalance Market." This white paper postulated that an EIM could improve reliability through:

> "security constrained economic dispatch across the market footprint, which provides better management of imbalances and enhanced ability to manage flows within system operating limits, as well as enhanced opportunities to deliver energy from a diverse set of

[14] http://www.oatioasis.com/NWMT/NWMTdocs/7_22_09_NTTG_Stakeholer_Briefing_JOINT_INITIATIVE_FINAL_071609_1040A.pdf

> conventional and emerging technologies, such as demand response resources, for balancing; enhanced situational awareness; potentially fewer Energy Emergency Alerts; faster identification, dispatch and delivery of replacement generation after contingency reserve sharing assistance ends and for contingencies beyond reserve obligations; and assisting with the integration of variable energy resources."[15]

The FERC white paper on EIM reliability benefits was formative in understanding myriad potential benefits of participation in an EIM. As part of implementation of the new market platform, CAISO has been diligent in collecting and reporting cost savings and other data for use by decision-makers.

As actual data on the operation of EIM market platform exists, we suggest FERC should prepare an update to this paper and focus on how the EIM could support compliance with the proposed EPA rule.

California's Cap and Trade

California is successfully implementing its cap and trade program and expects to hit its economy wide cap by 2020. The electric sector, including imports, is regulated under the cap, but unlike under the Clean Power Plan proposal, trading can occur between the electric sector and other sectors, including unregulated sectors with approved offset protocols. The most challenging element of California's cap and trade program related to the electric sector is the interstate emissions regulations: California freely allocated emissions permits to in-state load serving entities (LSEs) including emissions permits for out of state generation. Most significantly these included a few large out-of-state coal facilities. As California LSEs exit contracts for that power (as required under a separate CA law), it is not certain that there will be concurrent and equal emissions reductions from those facilities. This would create "leakage" (the appearance of emissions reductions where none exist).

Parties to these comments have recommended to EPA that it address the issue of emissions "leakage" in its final rule to ensure state plans account for possible leakage and state plans across a region do not create unintended leakage opportunities.

As the regional electric market is created and expands issues of emissions leakage must be contemplated and imbedded in market trading platform rules and policies.

Conclusion

The undersigned public interest organizations appreciate the opportunity to respond to questions and present these comment for the FERC Denver technical conference. The proposed EPA rule presents tremendous opportunity to speed necessary modernization of the electric system and development of lower-carbon energy resources. The system of the future is on track to achieve the flexibility needed to integrate more renewable energy than is required by the Clean Power Plan. This flexibility will come from developing new resources, systems, operating models and market services. Ground breaking studies of the West system indicate that, with modifications, the Western Interconnect can reliably

[15] http://www.caiso.com/Documents/QualitativeAssessment-PotentialReliabilityBenefits-WesternEnergyImbalanceMarket.pdf.

accommodate much greater penetrations of clean generation and coal plant retirements. Actual experience, like that in Colorado, shows that compliance with the EPA rule can be accomplished at low costs, consistent with maintaining reliability. Effective transmission planning, which leads to investment and construction is crucial to bringing down the cost of renewable energy resources in Western markets. FERC's role to ensure implementation of Order 1000 will assist states in their efforts to comply with EPA's proposed rule. We appreciate FERC inquiry into the impact of the EPA proposed rule and encourage FERC to continue to support state compliance efforts.