FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

2125 Rayburn House Office Building
Washington, DC 20515-6115
Majority (202) 225-2927
Minority (202) 225-3641

August 13, 2014

The Honorable Tony Clark
Commissioner
Federal Energy Regulatory Commissioner
888 First Street, N.E.
Washington, D.C. 20426

Dear Commissioner Clark:

Thank you for appearing before the Subcommittee on Energy and Power on Tuesday, July 29 2014, to testify at the hearing entitled "FERC Perspectives: Questions Concerning EPA's Proposed Clean Power Plan and other Grid Reliability Challenges."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member who question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, August 27, 2014. Your responses should be to Nick Abraham, Legislative Clerk, Committee on Energy and Commerce, 215 Rayburn House Office Building, Washington D.C. 20525 and e-mailed to Nick.Abraham@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Ed Whitfield
Chairman
Subcommittee on Energy and Power

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy and Power

Attachment

Additional Questions for the Record

The Honorable Ed Whitfield

1. How many times did you or your staff meet with EPA to discuss the Clean Power Plan proposal?

Answer: Zero, as it relates to me and my advisors.

2. Do you view EPA's proposed Clean Power Plan as an "energy plan" or a "pollution control" rule? Please explain your response.

Answer: It is clearly an energy plan, albeit one promulgated in the name of limiting carbon emissions. In my mind, a pollution control rule would specifically seek to limit a pollutant from an emission source. It would define the scope of the problem and be able to quantify specific health benefits associated with a certain reduction in the pollution. A pollution control plan relies on data to enumerate precisely what is an environmentally acceptable amount of a pollutant to be released, and then sets about to reduce the emission of that pollutant accordingly. In short, a pollution control rule focuses on the pollutant itself.

A comprehensive energy plan is a much different creature. An energy plan is marketed to the public as a means to achieve any number of public policy goals, which could include, but are not limited to things like: job creation, affordability, energy security, price stability, reliability, and economic efficiency. Environmental benefits can be a part of an energy plan, but they are typically just one of many outcomes considered in a comprehensive package of proposals.

The Clean Power Plan looks much more like the latter than the former. It goes far beyond merely controlling pollution at its emission source, as has traditionally been the case in EPA power sector rules. Instead, EPA's proposed targets rely on assumptions regarding state (or regional) programs such as cap-and-trade schemes, carbon taxes, renewable portfolio standards, system dispatch, energy efficiency standards and codes, and state public utility commission decisions related to integrated resource plans and rate designs, all of which are outside the EPA's pollution control jurisdiction. By filing a state plan that includes these components, a state may be required to seek EPA approval for any changes that it makes to the energy programs included in the plan. The catch is EPA appears to lack authority to compel such action by the states. Thus, the Clean Power Plan offers suggestions of things that it would find acceptable in a state implementation plan. This is what the EPA has termed as state "flexibility." As I noted in my original testimony, this leaves states with a true dilemma. A state can choose to voluntarily submit a state implementation plan to the EPA and thereby forfeit future energy policy decisions and regulatory control over their utilities. Or it can roll the dice and see what a federal implementation plan will look like. Because EPA has failed to provide guidance to the states by outlining a federal implementation plan, I can only imagine the difficult decision states will face when trying to decide what course to take.

3. Would you agree that the proposed Clean Power Plan gives EPA a certain amount of control over State decisions regarding the generation, supply and consumption of power, particularly if State renewable energy and energy efficiency programs are included in an EPA-approved State Implementation Plan?

Answer: Yes, I agree with that statement.

4. As the D.C. Circuit Court recently held, FERC lacks authority to dictate how States plan and operate their energy systems. Are you aware of any statutory authority that permits EPA to mandate that States restructure their electric systems and subject State energy decisions to federal oversight and control?

Answer: I am not aware of any such direct statutory authority. Of course, any power sector regulation, even those properly promulgated, will have some level of indirect impact on what actions a state may take.

5. To what extent does FERC have authority over State utility and resource planning? Are you aware of any statutory authority giving EPA greater authority in this area than FERC?

Answer: I am unaware of any statutes giving EPA greater authority than FERC in these areas. FERC authority is limited by the powers granted to it by Congress under the Federal Power Act, and other controlling statutes. Because the electricity delivery system is so interconnected, FERC decisions in areas in which it does have clear authority (such as bulk electric system reliability, wholesale electricity markets or interstate electricity transmission) can sometimes have an indirect impact on matters that are reserved to the states (and vice versa).

6. EPA projects nearly 180 gigawatts of generation capacity will retire between 2010 and 2020 in response to the Clean Power Plan and other factors, such as EPA's previously finalized Mercury and Air Toxic Standards (MATS) rule. What do you view as the potential reliability impacts resulting from the loss of 180 gigawatts of generation over the next 6 years?

Answer: This is a very real challenge, especially in certain parts of the country, such as the Midwest. FERC has already seen an uptick in System Support Resource (SSR)[1] filings before it, but system planners are pointing to a greater challenge over the next few years. As of June 2014, MISO was projecting a 2.3 GW shortfall in its planning reserve margin for its North/Central subregions for the 2016/2017 timeframe, and this is prior to accounting for EPA's proposed section 111(d) regulations. Using data gathered through survey efforts with the Organization of MISO States, MISO projects that its planning reserve margin will shrink to 12.5% by 2016, which would fail to meet the industry reliability standard of only encountering a reliability event 1 day in 10 years.[2] A 12.5% reserve margin would double the probability of a loss of load to 2 days in 10 years. Should margins shrink further, the danger of loss of load would grow exponentially. For example, were reserve margins to dip as low as 4.8%, MISO calculates 3 reliability event days **per year** (without emergency procedures being implemented). As a point of reference, MISO's historical planning reserve margin has been over 20%, which more than meets the 1 day in 10 years standard. Utilities and their regulators (state and FERC) are attempting to address these challenges so that capacity needs are met, but I would not suggest this will be a simple task.

Beyond the difficulties associated with meeting reliability challenges in such a short timeframe, maintaining grid reliability over the next few years, in light of environmental regulations, will require significant investment and out of market expenditures (such as SSR agreements). Utilities and their regulators loathe letting reliability suffer, so the issue ultimately becomes one of keeping the lights on and the furnaces running, sometimes at significant expense. Unfortunately, that could come at a very high consumer cost, absent a willingness to curtail load.

7. Would you be supportive of EPA including in its final Clean Power Plan a "reliability safety valve" that provides FERC greater authority to prevent the retirement of reliability critical generating units? What might such a safety valve look like?

Answer: I would support a reliability safety valve. One way to effectuate a safety valve would be to ensure that no state, federal, or regional implementation plan shall take effect until such time as FERC certifies that the implementation plan, taken together with other implementation plans, will not have a detrimental effect on

[1] Generally, SSRs are defined as generation resources in the region of the Midcontinent Independent System Operator, Inc. (MISO) that seek to retire for various reasons, but that are compelled to enter into out-of-market agreements to remain in operation for reliability purposes.

[2] *See* MISO's 2016 Resource Adequacy Forecast, located at: https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/SAWG/2014/20140605/20140605%20SAWG%20Item%2003%202014%20OMS-MISO%20Survey%20Update.pdf.

bulk electric system reliability. In making its certification decision, FERC would need to employ an open and transparent process, and avail itself of information that resides with institutions such as the North American Electric Reliability Corporation and the various regional planning entities and RTOs/ISOs. Furthermore, as I noted in my answer to question 6, because reliability and cost are so intertwined, I believe an important part of a reliability safety valve would be an associated cost safety valve, so that the impact on both reliability and cost could be considered as a package.

8. Has EPA advised you about how the Clean Power Plan would work in states with multiple Regional Transmission Organizations (RTOs) or states with RTO members and non-RTO members or states with no RTO members? If yes, how would the plan work according to EPA?

Answer: EPA has not provided me with any such information.

9. EPA analyzed a set of compliance scenarios referred to as "Regional" scenarios. The regional scenarios allow emission rate averaging across affected sources within six multi-state regions, informed by North American Electric Reliability Corporation (NERC) regions and Regional Transmission Organizations (RTOs). What role docs FERC see for itself in overseeing such regional compliance efforts?

Answer: Without knowing more about the specifics of the various plans that might emerge, that is a difficult question for me to answer. But as a general matter, FERC authority derives from the Federal Power Act and other applicable statutes, not the environmental laws that EPA is charged with implementing. As I noted in my previous testimony, there is a risk the Federal Power Act and the Clean Air Act could be drawn into conflict.

10. EPA's proposal specifically encourages States to consider the following strategies to reduce GHG emissions: demand-side energy efficiency programs; renewable energy standards; efficiency improvements at plants; dispatch changes; co-firing or switching to natural gas; construction of new Natural Gas Combined-Cycle plants; transmission efficiency improvements; energy storage technology; retirements; expanding renewables like wind and solar; expanding nuclear; market-based trading programs; and energy conservation programs.

a. Would you agree the above items relate more to energy planning than to environmental protection?

Answer: Yes. This is especially true given the fact that, barring action from other GHG emitting nations, the proposed rule itself would do little to appreciably address the overall amount of carbon in the atmosphere.

b. Do you believe EPA has the expertise to be in the energy planning business?

Answer: No, and I have become increasingly concerned that the EPA does not fully appreciate the complexities, difficulties, and costs associated with electricity reliability.[3] As I stated in my previous testimony, while it is too early for FERC to be able to model or know exactly what the proposed rule will mean for reliability and costs, the trend line is clear. Our electric system is becoming "tighter" with each passing year; that is to say, the margin for error is becoming slimmer as our energy grid is forced to make a rapid transition. Climate activists often note that we should not ignore the scientists who are raising red flags about

[3] "In proposing the draft rule last month, Environmental Protection Agency Administrator Gina McCarthy said concerns about reliability were overblown, especially in connection with extreme weather. "I'm tired of people pointing to the polar vortex as a reason not to act on climate," she said." *Wall Street Journal*, July 30, 2014. http://online.wsj.com/articles/energy-regulators-say-epas-climate-rule-poses-grid-challenges-1406659902

carbon emissions. I would ask EPA to not ignore the engineers and system planners who are raising red flags about reliability. It would be an act of hubris to suggest that we should disregard what these experts are telling us about how the system is performing during "stress tests" such as periods of cold weather. The New England region, which has arguably gone further than any other in already adopting what EPA envisions in its Clean Power Plan, is a case study in the pitfalls associated with making this transition rapidly. Electricity prices in New England far exceed the national average, and reliability is a very real challenge during critical portions of the year. The fact that we have not yet had a major loss of load event in this region has as much to do with good fortune as good planning. But counting on continued good fortune is a poor long-term strategy.

c. Is there anything on this list that would be within the jurisdiction of States?

Answer: Yes. Many of the items on the list are state jurisdictional, especially those things that are directly tied to the retail or end-use consumer markets.

d. Is there anything on this list that may directly or indirectly impact FERC jurisdiction?

Answer: Yes. Items that relate to interstate transmission of electricity and wholesale energy markets, to name a few, implicate FERC. To the degree an EPA rule directly attempts to change FERC jurisdictional market dispatch rules, there could be a clear conflict between the Federal Power Act and the Clean Air Act.

11. In July, the National Association of Regulatory Utility Commissioners (NARUC) approved a resolution seeking to:

> **preserve States' authority to decide the type, amount and timing of new or existing generation facilities that will be constructed or maintained within the State to achieve legitimate State policy objectives;….to safeguard and guarantee States' continued right to operate programs to procure new generation or maintain existing generation for reliability, affordability and environmental purposes….; and to ensure that nothing in the Federal Power Act be deemed to preempt or prohibit such activity by the States.**

Do you view EPA's Clean Power Plan as impacting any of these areas which NARUC has expressly resolved to preserve? How so?

Answer: Being that the resolution quoted specifically refers to the Federal Power Act, which is administered by FERC, I have been under the assumption that the resolution is primarily related to state concerns over FERC itself potentially encroaching on state authority. As with regard to the opinion of NARUC or its individual state members related to the Clean Power Plan, I can only speculate. However, I would note that the Clean Power Plan goes much further in implicating traditional state authority over the energy sector than anything that has been promulgated to date by FERC under the auspices of the FPA.

12. EPA estimates that its existing power plant carbon standards "will not raise significant concerns over regional resource adequacy or raise the potential for interregional grid problems." Yet, the L.A. Times, in an article entitled "U.S. electricity prices may be going up for good," recently concluded that EPA's power plant retirement projections for its Mercury and Air Toxic Standards (MATS) rule "turned out wrong almost immediately." Do you believe EPA could be again underestimating the reliability impact of its regulations?

Answer: Yes. Please refer to my answers to questions 6 and 10(b).

13. EPA says that "central" to its proposed rule is "[t]he fact that generation at one EGU can be substituted for generation at another." EPA seems to suggest that a megawatt generated in Illinois can substitute for a megawatt generated in New York. This seems like a simplified understanding of how the grid

functions. Would you agree?

Answer: It would be a sweeping, and incorrect, assumption to simply say that all megawatts are equal when it comes to reliability within or across regions. Beyond transmission and fuel constraints (such as lack of available pipeline capacity) that can impact the deliverability of electricity, there are numerous other factors to consider. For example, certain generators may be located in exceptionally important areas for matters such as voltage support or reactive power. For purposes of reliability, there are many factors to consider beyond gross generating capacity for a region. This is why transitions in the energy grid necessitate rather long lead times and granular analysis.

14. In order to offset reductions in actual capacity, EPA appears to assume that there will be a significant reduction in load through energy efficiency programs sufficient to offset any resource adequacy issues that may result from such retirements. Given that EPA cannot mandate that individual citizens reduce their energy consumption, do you think EPA can reasonably rely on such reductions to ensure reliability?

Answer: I would be uncomfortable simply assuming that energy efficiency itself will be enough to reduce demand to a level that retirements are not an issue. While energy efficiency is an important tool for using electricity wisely, I can envision many situations where it is unlikely that it alone would be enough to overcome a large raft of retirements or native load growth. For regions that are experiencing larger than average load growth due to strong economic growth, this will be a particular challenge. No amount of energy efficiency would be able to overcome the thousands of megawatts of load growth in my home state of North Dakota due to the Bakken oil boom, to use just one example. In addition, energy efficiency itself can reach a point of diminishing returns, whereby the costs of energy efficiency measures begin to outstrip the value of the load reductions associated with it. This is why, traditionally, regulators have encouraged only "all cost effective" energy efficiency measures be undertaken.

The Honorable David B. McKinley

1. **This January, during the "Polar Vortex", electricity customers in the PJM region experienced significant abrupt increases in their electricity costs, with bills rising to several times their normal levels. These price spikes were caused, in part, by significant generation outages during January, despite these generation resources receiving billions of dollars a year in advanced payments in exchange for their being available to provide energy during peak periods, whether in the extreme heat of the summer or the extreme cold of the winter. I am concerned that the causes of this situation have not been understood well enough to prevent it from happening again. Do you think you fully understand what happened and can assure us it isn't going to happen again? Has the Commission conducted a comprehensive root cause investigation and analysis of the situation, or directed PJM or the PJM Independent Market Monitor ("IMM") to do so?**

   a. If yes, have those results been released publicly?

   Answer: Please refer to my answer in b.

   b. If no, why not?

   Answer: The Commission and the RTOs/ISOs continue to analyze January market operations and generation outages. As discussed in detail in Chairman LaFleur's response, the Commission held a technical conference on April 1, 2014 to explore the impacts of the season's cold weather events on the RTOs/ISOs, and discuss actions taken to respond to those impacts.[4] PJM conducted an investigation of last January's extreme weather events in its region, and issued a public report on May 9, 2014.[5] The Commission and the RTOs/ISOs are currently investigating ways to enhance the RTO/ISO markets to ensure reliable and cost-effective resource performance, especially during constrained periods such as those seen in January. Our Office of Enforcement's regular surveillance program also continues to analyze market participant behavior to guard against manipulation and uncompetitive market outcomes.

   The environmental conditions experienced this past winter stressed the supply/demand balance in the PJM region to levels not previously seen by PJM. Demand for electricity in January hit an all-time winter peak and PJM experienced eight of its ten highest winter demands within a matter of weeks. At the same time, supply reserves were deflated as generation outages occurred at levels much higher than normal outage rates. During the all-time winter peak on January 7th, PJM experienced a 22% forced outage rate, with a total of 40,200 MW unavailable due to forced outages. PJM reports that this was far above the historical forced outage average rate of 7%. According to PJM, outages were caused by a variety of factors, including the cold, the stress of extended run times, natural gas interruptions and fuel-oil delivery problems. Specifically, PJM states that 42% of forced outages on January 7th were due to equipment failures, while 24% of the forced outages were attributed to a lack of fuel to start up and/or run generating units. During this time, natural-gas-fired generators accounted for 47% of the unavailable megawatts and coal-fired generators were 34%. While PJM maintained reliability through emergency procedures and enhanced communications, market prices escalated to over $1,800 per megawatt-hour to reflect the constrained operating conditions. PJM also reports that natural gas scheduling issues caused most of the $597 million in out-of-market make-whole charges for January 2014.

   The extreme weather events in January tested grid reliability and market performance. I cannot provide complete assurance that measures will be implemented by the RTOs/ISOs before next winter that will prevent

[4] *See* Winter 2013-2014 Operations and Market Performance in RTOs and ISOs, located at: http://www.ferc.gov/CalendarFiles/20140401083844-Staff%20Presentation.pdf.

[5] *See* PJM's Analysis of Operational Events and Market Impacts During the January 2014 Cold Weather Events, located at: http://www.pjm.com/~/media/committees-groups/task-forces/cstf/20140509/20140509-item-02-cold-weather-report.ashx.

price spikes under similar extreme weather events as those seen in January. Besides the prolonged periods of bitter cold, market operations in the RTOs/ISOs were affected by generator performance and procurement, fuel security and flexibility, and communications. The Commission and RTOs/ISOs are actively addressing each of these issues, with the hope of strengthening system operations on an expedited basis. A list of some of these activities can be found in Chairman LaFleur's responses to questions 2, 5, and 7.

2. What efforts has the Commission undertaken, or directed PJM and the IMM to undertake, to identify potential solutions to the generation performance problems that occurred during January 2014 in the PJM region?

Answer: Please refer to the response submitted by Chairman LaFleur.

3. Has the Commission determined whether any generation outages were reflective of attempts to manipulate market-clearing prices?

Answer: Please refer to the response submitted by Chairman LaFleur.

4. We understand that the delivered price of natural gas rose to historic highs in the PJM region during January 2014, and that these unprecedented delivered prices for natural gas were primarily the result of extraordinarily high prices for capacity on interstate natural gas pipelines in the PJM region. Has the Commission conducted a comprehensive root cause investigation and analysis, or directed PJM or the PJM Independent Market Monitor ("IMM") to conduct a comprehensive root cause investigation and analysis, of the unprecedented natural gas prices that surfaced in the PJM region during January 20 14?

a. If yes, have those results been released publicly?

Answer: Please refer to the response submitted by Chairman LaFleur.

b. If no, why not?

Answer: Please refer to the response submitted by Chairman LaFleur.

5. What efforts has the Commission undertaken, or directed PJM and the IMM to undertake, or directed interstate natural gas pipeline operators to undertake, to identify potential solutions to the natural gas deliverability problems that occurred during January 2014 in the PJM region, either by better optimizing the use of existing assets or by constructing new assets or both?

Answer: Please refer to the response submitted by Chairman LaFleur.

6. Has the Commission determined whether any natural gas deliverability problems were reflective of attempts to manipulate natural gas prices or electricity market clearing prices?

Answer: Please refer to the response submitted by Chairman LaFleur.

7. Price increases for natural gas and electricity in the PJM region, and elsewhere, are very concerning to me. My constituents in the PJM region have asked me to ensure that markets have been, and are, functioning properly and that prices have not been increased by speculation or manipulation. It is now July, can you assure me that FERC intends to have answers to these questions about natural gas and electricity pricing BEFORE next winter?

Answer: I, too, am concerned about the impacts of manipulative behavior on the price of natural gas and

electricity prices. While I have reviewed the response submitted by Chairman LaFleur and concur with it, I also provide you with the assurance that I will do my part to promote efforts that further the proper functioning of markets and support investigations into the effects of speculation and manipulation on market prices.

8. **In the Clean Power Plan proposed rule's Regulatory Impact Analysis, EPA notes that the Integrated Planning Model (IPM) was used to project the impact of the rule on electricity prices. The documentation for the IPM on EPA's website explains that the model assumes both perfect competition and perfect foresight. The former means that "IPM does not explicitly capture any market imperfections such as market power, transaction costs, informational asymmetry or uncertainty." The latter "implies that agents know precisely the nature and timing of conditions in future years that affect the ultimate costs of decisions along the way." Does FERC agree that such a model can accurately capture how the proposed rule will impact prices? What are some likely differences in the actual implementation of the rule and this model?**

   Answer: I can only speculate about whether this model is suited to accurately capture the price impacts of the rule. Based on the description you provided above, the model appears to be based on theoretical assumptions and not the practical realities of market operations. If this is correct, the result could be an inaccurate estimate of the impact of the rule on electricity prices.

9. **Achieving compliance with the proposed rule will require a replacement of higher carbon dioxide emitting resources with new lower or zero-emitting units. Yet a recent study by Christensen Associates commissioned by the Electric Markets Research Foundation concluded that the RTO markets "do not and cannot address long-term capacity needs." The study also found that "[b]ilateral forward contracting remains key under any market design for locking in revenues and facilitating financing of new resources. Contrary to this key necessity, however, the RTO markets include some design elements that impede long term investments and long-term bilateral contracts." What steps does FERC intend to take to ensure that RTO markets do not impede bilateral contracting needed for new resource development that will be required for state compliance with the rule?**

   Answer: Please refer to the response submitted by Chairman LaFleur.

10. **Within the retail access states, most of the generation is no longer owned by vertically-integrated utilities and instead is under merchant ownership. There is no state or local jurisdiction over these merchant generation owners regarding whether to continue to operate or close a plant or what types of generation technology should be built. Does FERC see any difficulties in implementation of the proposed rule in states with large amounts of merchant generation?**

    Answer: For those states that have chosen to enact retail restructuring, merchant generators will decide whether their operations can remain economic under new environmental regulations. To the extent the Clean Power Plan results in further retirements of baseload resources such as coal-fired generation, additional investment and/or demand-side initiatives may be necessary to maintain reliability. Market prices would be expected to respond accordingly. As I indicated in my response to Question 7 submitted by Chairman Whitfield, I strongly believe the Clean Power Plan should include reliability and cost safety valves.

    While generators participating in FERC-regulated markets are permitted to recover costs incurred to comply with environmental regulations, I am reluctant to accept the proposition that FERC should redesign the wholesale electricity markets to accommodate EPA regulations. FERC authority derives from the Federal Power Act and other applicable statutes, not the environmental laws that EPA is charged with implementing. As I noted in my previous testimony, there is a risk the FPA and the Clean Air Act could be drawn into conflict if FERC finds it necessary under the FPA to alter or reject a proposed EPA compliance mechanism.

The Honorable Gene Green

Mr. Clark, EPA's rule seems to assume our transmission grid will not require much, if any, changes as a result of retirements, decreased margins, or renewable sources whether they be large scale or residential.

1. **Commissioner Clark, in different regions of the country, what entities are responsible for building and maintaining new and existing transmission? What challenges do they face?**

   Answer: In practice, until this point, the large majority of electricity transmission in the country has been built and maintained by incumbent utility providers. In some regions this is done under the umbrella of independent grid operators like RTOs and ISOs. In other parts of the country, it is done within the context of a state regulated, vertically integrated monopoly utility company operating in a "non-market" region. Recent years have seen a few different business models emerge beyond just traditional incumbent providers. The nation now has a number of either merchant transmission companies or standalone independent transmission providers that see the building and maintenance of transmission as a potentially profitable line of business. The challenges transmission-owning companies face is as numerous as the regions in which they operate. The siting of large regionally beneficial projects is often raised as a challenge, especially if lines cross multiple siting jurisdictions. Access to adequate returns on equity when compared to less logistically difficult distribution assets is often raised as another challenge. Non-incumbent providers will often discuss the challenges of breaking into a business in which the incumbent providers have a number of advantages such as access to exiting rights of way and, in some states, a right of first refusal to construct.

2. **Is EPA's assumption reasonable given existing challenges?**

   Answer: While I cannot speak to EPA's entire set of assumptions, to the degree it contemplates a heavy reliance on intermittent sources of energy; I believe it would be unreasonable to assume there will not be necessary changes. Whether large-scale renewables or small-scale residential installations, to the degree variable sources of energy become an even larger portion of our energy mix, there will need to be significant investments and changes made to accommodate their integration. In the case of large renewables like utility-scale wind and solar, transmission investments are likely to be needed to hook-up remote generation to the existing transmission grid, and to diversify the grid so that congestion and energy deliverability are improved. Similarly, large net increases in small-scale intermittent distributed resources like rooftop solar can have a major effect on the workings of the bulk electric system. In both cases, the parameters by which system operators maintain the reliability of the grid will need to be taken into consideration. Voltage support and reactive power needs must be accounted for when considering the addition of renewable generation and the retirement of existing thermal generation. While these obstacles may not ultimately prove to be insurmountable, neither should we minimize the challenges they present in terms of time, cost or implementation. Both state and federal regulators will be grappling for some time with issues related to reliability, operability and cost causation/allocation as they relate to variable energy resources.

3. **Are there potential reliability issues that EPA could have missed in their transmission assumptions?**

   Answer: In my experience, one of the most challenging issues transmission developers face is the long lead times involved. From concept to completion, large transmission projects are years in the making. Any energy plan that rests on the assumption that these upgrades will be made in a short timeframe is probably underestimating the reality of what it takes to get transmission built. Furthermore, there is at least some reason to be concerned that actions FERC itself has taken related to Order No. 1000 compliance filings could exacerbate this problem. As I have noted in a number of separate statements I have attached to FERC Order No. 1000 compliance determinations, to the degree FERC mandates an unrealistic bureaucracy in the planning processes, the counterproductive effect could be an increase in litigation and construction lead times.