RELIABILITY CONSIDERATIONS FOR INCLUDING ENERGY EFFICIENCY IN STATE COMPLIANCE PLANS

Barriers and Solutions: Strategies for Effectively Leveraging Energy Efficiency as an Environmental Compliance Tool

SEEA
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About This Resource Paper Series

Energy efficiency is widely recognized as a cost-effective, rapidly deployable resource for air pollution reductions from the electric sector. However, with the release of the U.S. Environmental Protection Agency's (EPA) proposed Clean Power Plan (CPP) in June 2014, southeastern states and utilities have voiced concerns regarding a number of barriers and challenges to using energy efficiency as a pollution control strategy within state compliance plans, both under existing air programs and forthcoming regulations, such as the CPP, once finalized (expected in August 2015). This SEEA Resource Paper Series identifies resources, strategies and solutions to help states and utilities address these barriers and effectively utilize energy efficiency as a compliance strategy, where appropriate and cost-effective.

Disclaimer

SEEA recognizes that the EPA is finalizing the CPP; many unknowns exist until the final guidelines are released. The materials provided on the SEEA 111(d) web portal, along with the resources and discussion contained in this Resource Paper are provided for informational purposes only, and do not constitute legal advice. Contact your attorney for advice with respect to any particular legal issue.

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I. Introduction

A. Implementation of EPA's Proposed Clean Power Plan May Present Unique Challenges and Opportunities for Southeastern States

Implementation of EPA's proposed Clean Power Plan (CPP), if it moves forward, will shape the evolution of the nation's electric power system. The numerous moving parts and entities responsible for generation, transmission and distribution of electricity must coordinate effectively to support compliance with the CPP, while continuing to supply adequate, reliable and affordable electricity. Within this context, energy efficiency may play a supportive role, both as a carbon reduction tool and non-generation, non-transmission solution to support grid adequacy and reliability goals. This paper provides a snapshot of the potential reliability benefits of energy that may come into play as southeastern states and other stakeholders consider the suite of compliance options that best meet their needs.

The paper is divided into three sections. The first section provides background information and context for conversations on reliability in the Southeast. The second section provides a high-level discussion of the role energy efficiency can play to support system reliability. The final section provides takeaways for states and other southeastern stakeholders, with the goal of spurring continued conversations on energy efficiency as a solution to reduce carbon emissions from the electric sector while supporting overall system reliability.

II. Reliability in a Regional Context

A. Unique Characteristics of Electric Power Systems

The unique characteristics of electric power systems necessitate long-term, strategic planning to ensure that a system can consistently operate in real time and meet anticipated future demand. At the same time, power grid conditions are dynamic and can change from hour to hour—sometimes even within minutes. Demand for electricity can change quite rapidly as well; if a sudden demand change occurs unexpectedly, a mismatch in supply and demand in the system can threaten integrity over large areas of the grid. These factors, alongside many others, must be effectively managed in order to maintain reliability of an electric power system.

Electric power systems have three primary characteristics that are critical to any discussion of reliability, as outlined in Table 1 below.

Table 1. Unique Characteristics of Traditional Electric Power Systems

Characteristic	Detail
Operation in Real Time	Currently, storage technologies are uneconomic, so the supply of and demand for electricity must be maintained in balance in real time.
Long-term, Capital-Intensive Investments	The electric system is highly capital-intensive; traditional generation, transmission and distribution system investments have long lead times and multi-decade economic lifetimes.
Dynamic Balance of the Grid	The grid must transport and deliver electricity from generation source to end user under dynamic conditions.

B. Unique Characteristics of the Southeastern Electric Power Sector

Southeastern states vary with regard to their generation portfolios, energy regulatory structure, resource mix and availability, utility structure and governance, historic energy-related investments and a variety of other consideration. Implementation of EPA's proposed CPP will present distinct opportunities and challenges, as states set out to implement the guidelines based on their specific administrative, legislative, regulatory, resource and utility market characteristics.

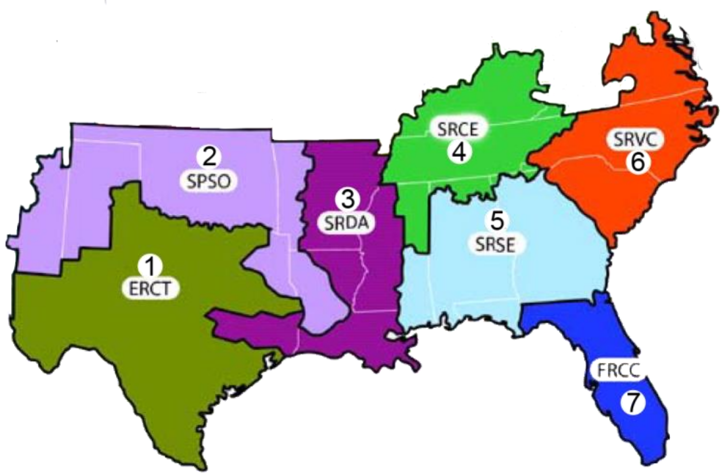
The Southeast is distinct in the heavy prevalence of public power, inclusive of municipal and cooperative utilities. Specifically, the presence of the Tennessee Valley Authority (TVA) and its 150-plus distributors is a distinguishing feature of the Southeast.

Power systems in the Southeast are predominately vertically integrated, where one utility handles all functions of generation, transmission and distribution within a certain geographical area. However, multiple electricity sector market types often exist within a single state.

The North American Electric Reliability Corporation (NERC) is the electric reliability organization for North America, responsible for developing, assessing and enforcing reliability standards. NERC falls under the jurisdiction of the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada.[1] In the U.S., NERC is divided into regional territories, each of which has delegated authority to monitor and enforce compliance.

Figure 1 provides a snapshot of North American Reliability Corporation (NERC) regional territories across the Southeast.[2]

Figure 1. Southeastern NERC Regions



Source: EIA.[3]

1. Texas Reliability Entity (ERCT)
2. Southwest Power Pool Regional Entity / South (SPSO)
3. SERC Reliability Corporation / Delta (SRDA)
4. SERC Reliability Corporation / Central (SRCE)
5. SERC Reliability Corporation / Southeastern (SRSE)
6. SERC Reliability Corporation / Virginia-Carolina (SRVC)
7. Florida Reliability Coordinating Council (FRCC)

C. Southeastern Stakeholders Have Voiced Concerns Regarding Reliability Impacts of EPA's Proposed Clean Power Plan

This paper considers three major reliability concerns voiced by southeastern state air regulators, utility commissions and balancing authorities in regard to CPP compliance. It does not seek to prove or disprove the validity of these concerns, but instead, speaks to the impact of energy efficiency in these areas of concern. Table 2 presents a summary of these issues.

Table 2. Southeastern Stakeholder Concerns Regarding Reliability Impacts of CPP Compliance

Area of Concern	Detail
Resource adequacy and reserve margins	CPP compliance may require additional, costly investments in resources to ensure that there is resource adequacy and sufficient capacity to meet reserve margins.
Grid infrastructure development and transmission constraints	CPP compliance may cause utilities to rethink how they dispatch electricity from traditional sources of baseload generation and necessitate additional investments in grid infrastructure; states need assistance understanding the costs of different compliance options.
Resource mix and price volatility	CPP compliance may lead to significant additional investment in natural gas generation capacity and infrastructure, leading to an overly homogenous resource mix and increasing exposure to price volatility.

III. Reliability Benefits of Energy Efficiency

The challenges and uncertainties mentioned above can make energy efficiency a particularly valuable strategy in supporting carbon emissions reductions while addressing reliability challenges over the short and long term.

Energy efficiency encompasses a number of non-generation, non-transmission compliance options for states, and presents a wide variety of demand-side solutions that can support reliability goals. Energy efficiency options considered in this paper generally fall into one of two categories, as outlined in Table 2 below: end-use energy efficiency policies and programs, and demand-response policies and programs.

Table 3. Demand-Side Energy Efficiency CPP Compliance Options

Category	Detail
End-use energy efficiency policies and programs	Energy end-use efficiency—providing more service per unit of delivered energy consumed—encompasses a number of policies and programs that save energy where an energy service is being delivered. It includes both utility and non-utility options, energy-efficient equipment rebate programs, energy-efficient building codes and appliance standards, and energy-saving performance contracting (ESPC), among others.[4]
Demand-response policies and programs	Reduction in electric consumption by customers in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity usage at times of high market prices or when system reliability is jeopardized.[5]

Both electricity and natural gas efficiency programs have consistently remained low-cost resources over the past decade, demonstrating the role of efficiency as a long-term resource.[6] See the previous paper in this series, *Energy Efficiency Cost Considerations for State Compliance Plans*.[7]

A. Energy Efficiency Can Support Resource Adequacy by Maintaining Reserve Margins

"Resource adequacy" is a term used to describe having sufficient electric supply to meet peak demand, with the expectation that some components of the generation pool may be offline due to outages, and therefore, excess capacity may be needed.[8] A "reserve margin" is a term used to describe this additional capacity, which is generally in the range of 10 to 20 percent of peak load.[9] The higher the peak demand, the greater the absolute amount of reserve margins are needed to ensure that the system can reliably operate.

Without proper planning, CPP compliance obligations may result in the need for new capacity to ensure that there is resource adequacy. In the short term, additional capacity may be necessary to ensure the system has sufficient reserve margins. A reserve margin is created when system operators allocate available generation resources to serve as reserves to cover real-time load-serving requirements and avoid outages. Reserve margins can always be maintained through additional capacity builds, but can be expensive and take time to deploy.

Energy efficiency and demand response can be used to lower demand over time, and thus keep the necessary amount of megawatts in the reserve margin from increasing. In the long term, demand response and energy efficiency policies and programs that reduce peak demand growth may directly avoid or defer the need for utilities to build more power plants, power lines and other capacity-driven infrastructure, or to purchase new capacity and energy from other suppliers.

Greater utilization of energy efficiency and demand response can be effective at reducing the need for new capacity builds.[10] Energy efficiency can also help states deal with peak load challenges in the region. In summer-peaking areas, like much of the Southeast, increased demand for air conditioning on hot summer days can lead to shortages.[11] Energy efficiency may be geographically targeted to reduce peak demand in particular areas.

In discussions about CPP compliance and its impact on resource adequacy, timeline and regulatory lag are prominent concerns. Many resources require long lead times for the planning and approval process, and if additional capacity is necessary, these could result in insufficient resource adequacy in the near term. However, several capacity resources can be deployed in less than two years, including energy efficiency. Further, as discussed more below, energy efficiency is not limited by the same infrastructure constraints as other resources included in EPA's best system of emission reduction (BSER) as proposed. Energy efficiency projects do not rely on additional transmission infrastructure. The use of efficiency as an interim measure to offset additional capacity builds in the early compliance years can be balanced with longer term planning processes, such as capacity markets and integrated resource planning decisions.[12]

B. Energy Efficiency Can Address Transmission Constraints and Support Grid Infrastructure Development Goals

In transmission-constrained areas, energy efficiency may represent a viable non-transmission alternative to meeting electricity demand, and can support smart development of necessary transmission infrastructure. New transmission lines are often needed when the transmission capacity serving a region becomes congested – so fully utilized that it cannot sufficiently or economically serve load – or when new generation sources require new wires to transport electricity to the intended destination. In considering the need for new transmission, however, it is important to consider alternative, non-transmission methods or technologies that bring energy services to customers and moderate transmission congestion. Here too, energy efficiency can play a supportive role.

In some cases, demand-response and end-use energy efficiency programs can be targeted to certain locations to reduce load when transmission becomes congested or strained. Geographic targeting of end-use energy efficiency and demand response programs may be used to minimize risk of disruptions to the system.[13] Because power system and market circumstances change quickly, a variety of price-based and incentive-based demand response programs can help resolve challenges, such as the extended time required to site, approve and build generation and transmission assets to serve uncertain demand growth. ConEd in New York provides a good example of using end-use energy efficiency in a geographically targeted manner to address transmission challenges.[14]

Most options for improving transmission system capacity are likely to be capital-intensive. The permitting process for replacement of an existing line with a higher-capacity material may be easier than that for installation of a new line, but it will still carry a substantial cost.[15] Energy efficiency deployment may, in certain circumstances, delay the date when new lines are needed in service, deferring the need for expensive investments, and could maintain reliability margins and operating flexibility before new lines are commissioned.

Even where transmission improvements are essential, determining opportunities to improve the delivery of electricity services to customers is still beneficial. Exploration of energy efficiency may even help determine the urgency of building new transmission.[16] A good example of how energy efficiency improvements can defer the need for transmission expansion is in Vermont, where energy efficiency investments have avoided the need to spend $416 million in regional transmission system upgrades to date. Reduced demand in response to system reliability problems enhances operators' ability to manage the electric grid – the network that transmits electricity from generators to consumers – and reduces the potential for forced outages or full-scale blackouts.[17]

CPP requirements may necessitate additional investments in grid infrastructure. Entities working together across jurisdictions may be able to address such issues. Where the costs of compliance are included in market prices, there may be less of a barrier.

C. Energy Efficiency Can Help Maintain a Diverse Resource Mix

Resource diversity is important in managing risk in the power system and promoting stable electricity prices. At any given point in time, the nature of new generation resources that are being brought online is determined by a number of factors, with economics figuring heavily into planning decisions, and, ultimately, driving resource mix. For example, the shale gas revolution has driven down natural gas prices, and increased natural gas-fired capacity additions dramatically. In 2014, these units comprised nearly half of utility-scale capacity additions.[18]

From a practical perspective, reliance on any given generating fuel exposes the industry to risk, whereas fuel diversity can promote stability in the event of market fluctuations. End-use energy efficiency offers a variety of diverse options that, by decreasing demand, can reduce the need for new generation resources. In this sense, energy efficiency can avoid "lock in," in the case that a single fuel is dominating capacity additions.

In general, energy efficiency options available under the proposed CPP encompass more options than have been considered in many of the recent studies modeling compliance options under the CPP. EPA provided states considerable flexibility to employ emission reduction technologies not included in the BSER as proposed. These options were not explicitly considered in NERC Reliability Report, which has driven many of the reliability conversations regarding reliability and the CPP to date, and include demand-response programs and non-utility efficiency measures.[19] Incorporating these and other emission reduction options may lower the emission reductions that states need to achieve under the four building blocks, addressing possible reliability concerns that may result from the strict application of BSER.

IV. Conclusions

Energy efficiency presents an opportunity to reduce air pollution and to build a more reliable energy system while boosting efficiency of system operation as a whole. This analysis addresses a number of the reliability benefits of energy efficiency, as follows:

- Energy efficiency represents a broad array of compliance options available to states.
- In some cases, energy efficiency may help states avoid early and unnecessary retirements and reduce the need for expensive capacity builds otherwise necessary to maintain reserve margins. Energy efficiency may also help states maintain resource adequacy within possible constrained time periods after plant retirements and reduce expensive capacity builds over the longer term.
- Energy efficiency can support strategic development of necessary transmission infrastructure projects over the long term.
- Energy efficiency offers a variety of diverse options that, by decreasing demand, can reduce the need for new generation resources. In this sense, energy efficiency can avoid “lock in.”

This paper provides a snapshot of the potential reliability benefits of energy efficiency policies and programs for consideration as states, utilities and other stakeholders consider compliance options that meet local needs and priorities. It also provides an opportunity for states to consider the role of energy efficiency in reliability goals, while delivering economic and quality-of-life benefits to the Southeast.

End Notes

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[14] Ibid.

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