Policy and Research Opportunities for Grid Resilience

Recommendations for the U.S. Department of Energy

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EAC

ELECTRICITY ADVISORY COMMITTEE

1 Introduction

Numerous federal and regional entities are in the process of formulating definitions on "resilience" as it relates to the bulk power and distribution systems.

In July 2017, responding to a congressional request, the National Academies released its report *Enhancing the Resilience of the Nation's Electricity System*.

In August 2017, the U.S. Department of Energy (DOE) published the *Staff Report to the Secretary on Electricity Markets and Reliability,* which assessed the reliability and resilience of wholesale electricity markets.

In September 2017, DOE proposed the *Grid Resiliency Pricing Rule* to the Federal Energy Regulatory Commission (FERC), which would have had FERC use its authority to require regional transmission operators (RTOs) and independent system operators (ISOs) to "establish just and reasonable rates for wholesale electricity sales" for power plants that show "reliability and resiliency attributes."

In January 2018, FERC rejected DOE's request and instead opened a docket to evaluate the resilience of the bulk power system in RTO/ISO-operated electricity markets. The White House is currently reviewing DOE's recommendations for any future actions on bulk power system resilience that would use DOE's own legal authorities.

During the February 2018 meeting of the Electric Advisory Committee (EAC), DOE's Office of Electricity Assistant Secretary Bruce Walker announced his top five priorities to address resiliency, reliability, and security of the North American electricity system. The Assistant Secretary's "first priority" is the creation of a North American Energy Resiliency Model.

In September 2018, the North American Electric Reliability Corporation (NERC) CEO announced that NERC is considering establishing a mandatory fuel assurance reliability standard. The same week, PJM's CEO announced his intention for PJM to require and pay for greater fuel assurance. Both proposals address the generation component of bulk power resilience, though efforts are underway to consider grid resilience in the transmission planning process.

At the state level, state utility commissions continue to exercise their authority to adjudicate the proper level of resilience investments by jurisdictional electric utilities, either proactively or after a major incident at the distribution level of the electric power system.

More generally, the concept of resilience is now a major topic of discussion and debate at electric power system-related conferences and meetings.

Nationwide, utilities, utility regulators, advocates, and elected officials are discussing and determining what might constitute grid resilience in their respective states and regions. Depending on the entity, areas of focus include resilience at all or some levels of the electric power system, including bulk power, distribution, customer end-use, and distributed energy resource (DER) utilization.

The electric power system has been and remains quite resilient. However, current and looming challenges exist that should be better understood, ultimately leading to decisions on whether utilities should take actions to preserve or increase resilience.

Growing electricity system interdependency with other critical sectors; national security threats from foreign actors; cybersecurity challenges from increased digitalization at the bulk power, distribution, and consumer end-use parts of the electric system; weather pattern changes; policies and environmental advocacy; increased economic development in higher risk locations prone to wildfires and flooding; and the increased penetration of variable generation and distributed energy resources alongside the retirement of controllable resources introduce new operational challenges. These challenges call for a holistic view of resilience to be adopted and may also provide opportunities to improve resilience.

Even if a specific threat to resilience is agreed upon, what is the appropriate level of investment for ratepayers, investors, or taxpayers to bear to address that threat? Are appropriate resilience level and associated funding amounts being approved? Are there adequate mechanisms for regulatory or legislative consideration of these questions?

On October 17, 2018, panelists presented suggestions to improve resilience to DOE's EAC. Panelists included a utility representative, a state utility consumer advocate, a state legislator, and a former state utility regulator.[1] The EAC considered these suggestions while making the recommendations in this paper.

2 Approach

EAC members and panelists engaged in a robust discussion following the individual presentations, sharing viewpoints on resilience at the October meeting. The panelists addressed questions including:

1. How does each entity view or define "resilience?" Do we need to develop a consistent definition of resilience?
2. What type of work is each entity currently conducting or contemplating in this area (e.g., workshops, rulemakings, docketed proceedings, legislation, white papers, resolutions, or filings)?
3. Would an analytical framework be a useful tool to enable decision makers to develop strategies to address resilience (i.e., to enable decision makers to develop cost-effective investment strategies to address their risks)? Do they exist and do the panelist's institutions apply them? What are the requisite components of an analytical framework?
4. What types of investments should be made for resilience? What are the barriers to investments in resilience? Who should pay for these investments?
5. If there is a demand by jurisdictions at any level to develop resilience strategies, what is the role of DOE (or the federal government) to support their capability to craft such strategies?
6. How much can the customer pay? How can we value the benefits? Will resilience help spread annual costs given presumed longer asset lives? Should grants be available for national security? How can national security be used institutionally to site transmission and other infrastructure? Are non-wire solutions worthy?

[1] See the agenda for the October 2018 EAC meeting for more information: https://www.energy.gov/oe/downloads/electricity-advisory-committee-meeting-presentations-october-2018-wednesday-october-17

3 Recommendations

The EAC members developed these recommendations to DOE by capturing the suggestions of the panelists and the opinions of the EAC members, and ranked them in order of greatest to least priority. The EAC has prioritized recommendations based on the level of benefit, the ability to reach a broad audience, and the complexity of implementation.

Recommendation Title	Detailed Recommendations	Stakeholders Impacted
1. DOE should develop a comparison of bulk power and distribution resiliency standards and methodologies utilized across the country and, if appropriate, a list of best practices.	DOE should use the expertise and analytical capability of its National Laboratories to develop a methodology to compile a regional or state list of the most cost-effective resiliency and reliability improvement projects, ranked from highest to the least effective for risk reduction, including potential costs. The comparison should compare values of various methodologies and potential efficacies. This comparison should distinguish different resiliency and reliability risks for the bulk power and distribution system; the improvement projects that address the risks to each system, including the impact of customer choice and a high penetration DER environment; and incorporate a holistic view of sector interdependencies. DOE, if possible and appropriate, should develop a "promising practices" document for distribution to interested stakeholders with methodology, standards, recovery techniques, mitigation options, and other pertinent information for recovery from or preparing for a resiliency event.	Utilities Grid Developers ISOs/RTOs State Utility Commissions State Utility Consumer Advocates
2. DOE should direct Lawrence Berkeley National Laboratory to modify its Interruption Cost Estimate (ICE) Calculator tool to evaluate costs of power outages beyond 24 hours and make evaluation of	DOE should prepare a version of the ICE Calculator or similar planning tool specifically designed to calculate the long-term expected value and prudency of alternative resiliency improvements. Ensure the tool(s) accounts for the potential social value of technologies, costs contributing to customer rate fatigue, affordability issues, and other relevant	Utilities ISOs/RTOs State Utility Commissions State Utility Consumer Advocates

alternative resiliency investments more appropriate.	concerns, such as regional differences contributing to the value of lost load at the industrial, commercial and residential levels. DOE should investigate resilience solutions through the Grid Modernization Lab Consortium, targeted Funding Opportunity Announcements, its research portfolio, and other ongoing initiatives.	
3. DOE should make certain that tools (including the ICE Calculator) appropriate for grid decision-making are known to state utility commissions, consumer advocate offices, and legislatures nationwide.	DOE, working in conjunction with the National Association of Regulatory Utility Commissioners, should prepare a directory of all state utility commissions' technical staff members and commissioners responsible for resilience matters. DOE and the National Laboratories should use this list as a resource for consulting commission technical experts. DOE should identify the entity responsible for updating the document as well as the frequency with which it is updated considering the high turnover at the commission level. DOE should also consider creating and publicizing broad training webinars on resilience-related tools and inviting state utility commission staff to these webinars. Attendees should be tracked and trained, with lists updated annually to keep regions with insufficient training identified and apprised of the latest methodologies and tools. DOE should also consider workshops to discuss the output of the ICE Calculator, including how to appropriately balance the impacts of the output, rate fatigue, and value of lost load for different rate classes.	State Utility Commissions State Utility Consumer Advocates State Legislatures
4. DOE should develop a resiliency framework handbook.	DOE should develop a handbook that details the process by which a state or region can rigorously develop resiliency standards and metrics which includes regional values and weightings. DOE should benchmark costs of alternative technologies so regulators have	Utilities Grid Developers ISOs/RTOs

	an objective data set to measure against rate impacts. In the development of this handbook, DOE should consider the risks of cyber-attacks on power electronics (inverters) and the difficulties in restoring a blacked-out grid with a large quantity of voltage-following inverters. Absent grid forming capabilities in some inverters, it may be impossible to provide the voltage reference required to restore the grid. If possible, the handbook should include sets of regional resilience metrics for different geographic regions. The handbook should include recommendations on coordinating with other entities to leverage work, avoid duplication, and efficiently use resources.	State Utility Commissions State Utility Consumer Advocates State Legislatures

4 Conclusion

The EAC's recent panel presentation on resiliency policy provided a basis for the EAC's recommendations on this topic. These recommendations, if implemented by DOE, have potential to improve grid resiliency. The EAC respectfully presents these recommendations to DOE for consideration.