UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Grid Resilience in Regional Transmission Organizations and Independent System Operators	**Docket No. AD18-7-000**

COMMENTS OF AMERICANS FOR A CLEAN ENERGY GRID

I. Introduction

Americans for a Clean Energy Grid ("ACEG")[1] is a diverse coalition of organizations and stakeholders gathered to promote cost-effective investments to ensure that our high-voltage backbone transmission grid is capable of meeting the needs of a sustainable and fully electrified society in the United States. ACEG is pleased to have this opportunity to comment in response to the Federal Energy Regulatory Commission ("Commission") *Order Terminating Rulemaking Proceeding, Initiating New Proceeding, and Establishing Additional Procedures* ("Order") issued on January 8, 2018.[2]

II. Summary

Resilience is often invoked to describe the ability to withstand and recover from high-impact low-frequency events. However, a definition of resilience that clearly distinguishes how it is distinct from or overlaps with reliability, particularly on the bulk electric system under the Commission's jurisdiction, is not clear to ACEG and is beyond our ability to offer.[3] We therefore bypass the issue of an appropriate definition of resilience to focus on the role a robust transmission grid plays to cost-effectively support reliability during the events relevant to resilience discussions, such as high-impact low-frequency severe weather events.

ACEG respectfully submits that the smart, cost-effective expansion of high-voltage transmission networks, especially on an interregional basis, is a largely untapped means of enhancing the reliability **and** the resilience of the electric grid. Along with modernizing its technologies to improve its capacity

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[1] ACEG was formed in 2009 as a project of the Energy Future Coalition, and was separately incorporated in 2017 as a Virginia non-stock corporation, currently applying for 501(c)(3) status. Further information about ACEG can be obtained at www.cleanenergygrid.org. The ACEG Coalition does not have formal "members," but its diversity can be understood from the affiliations of its Board of Directors: Natural Resources Defense Council; American Electric Power, Inc.: CTC Global, Inc.; ITC Holdings, Inc.; National Electrical Manufacturers Association; David Gardiner and Associates; and WIRES (a nonprofit association of transmission-related companies and stakeholders).

[2] 162 FERC ¶61,012 (2018).

[3] The Commission should consider whether it can assess bulk power system "resilience" issues under its reliability framework and improve that framework to effectively tackle "resilience" issues to the extent that it does not already. Electing the option of introducing a new set of rules or policies for resilience clearly requires defining how it overlaps with or is separate from those already governing reliability. Failure to drawing clear distinctions as to what should be addressed under reliability versus resilience could create confusion for industry in complying with two separate sets of standards and could put consumers at risk of duplicative cost exposure.

and flexibility, and mounting defenses against cyber intrusions, the high-voltage system should be further extended and integrated to optimize its critical contribution to our economy. Nothing within the Commission's authority would do more to ensure interconnection-wide and cost-effective reliability and resilience. Outdated planning practices, however, limit the extent to which those benefits may be realized.[4] Such benefits of an improved bulk power system are not necessarily traditionally accounted for in cost allocation of transmission rates to load-serving entities and their customers.[5] Unless these benefits are appropriately reflected in the economics of improving and operating transmission systems, they will not be achieved over coming decades to the extent required by our increasingly electrified society.

Therefore, the Commission should take steps to require the Regional Transmision Organizations to conduct interregional transmission planning and development on a basis comparable to their obligation to do so for their own regions and ensure that modern transmission technologies are taken into account. It should also require planners to account for all quantifiable benefits from transmission. These actions are well within the Commission's jurisdictional authority.

All of the respondent RTOs and ISOs noted in their comments that the transmission system plays a key role in resilience as well as in reliability:

- The California Independent System Operator (CAISO) stated: "Regarding transmission facilities, the bulk power system includes a network of substations, overhead and underground transmission lines, transformers, flow control elements, reactive devices and high voltage direct current facilities. The design of each of these physical elements directly affects the resilience of the system."[6]

- The Electric Reliability Council of Texas (ERCOT) stated: "When planning new transmission projects, ERCOT strives to build greater resilience into the system. This includes considering the geographic diversity of transmission lines serving a load center."[7]

- The Midcontinent Independent System Operator (MISO) incorporates resilience considerations into transmission planning: "MISO seeks to identify the set of local and regional transmission solutions that, when taken together ensure the reliable and resilient operation of the transmission system; support achievement of state and federal energy policy requirements; and enable a competitive electricity market to benefit all customers…MISO uses its value-based planning approach to proactively identify infrastructure that is valuable under a number of long-term future scenarios."[8] Making clear that its transmission planning seeks to ensure resilience, MISO further stated: "As a part of the annual planning process, MISO evaluates approximately 6,500 extreme events impacting loss of multiple facilities on the transmission grid."[9]

- The New England Independent System Operator stated: "The continuous analysis of the system pursuant to ISO-NE's planning role has resulted in the identification of transmission solutions

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[4] National Academy of Sciences, *Enhancing the Resilience of the Nation's Electricity System*, July 2017, p. 12.

[5] The Brattle Group for WIRES, *The Benefits of Electric Transmission: Identifying and Analyzing the Value of Investments*, July 2013.

[6] CAISO filing in FERC Docket No. AD18-7, p. 51

[7] ERCOT filing in FERC Docket No. AD18-7, p. 8

[8] MISO filing in FERC Docket No. AD18-7, page 15

[9] MISO filing in FERC Docket No. AD18-7, page 18

and helped guide the development of transmission investments that are essential to maintaining reliability. Since 2002, New England has invested approximately $10 billion in reliability-based transmission, with another $2.3 billion in planned investments in the coming year. These investments have strengthened weak areas of the system, eliminating costly congestion, and enabled electricity to flow freely around the region, so the most-cost-effective resources can be used to serve load no matter where they are located, providing significant cost savings for consumers. As a result of these investments, the region has a robust transmission system that has the ability to operate reliably under myriad operating conditions. The system's ability to withstand various transmission facility and generator contingencies and move power around without dependence on local resources under many operating conditions, in turn, results in a grid that is, as defined by the Commission, resilient."[10]

- The New York Independent System Operator (NYISO) notes that "…resiliency is closely linked to the importance of maintaining and expanding interregional interconnections, the building out of a robust transmission system…"[11]

- The PJM Interconnection stated: "Robust long-term planning, including developing and incorporating resilience criteria into the RTEP, can also help to protect the transmission system from threats to resilience... System resilience should be a consideration in the evaluation of planning solution alternatives so that PJM can select solutions that enhance the resilience of the system and address other system needs. Examples of this can include building redundancy into Black Start cranking paths, reducing the criticality of substations through transmission line siting, and power flow diversity for areas with load congestion or high concentrations of Critical Restoration Units."[12]

- The Southwest Power Pool's (SPP) comments signal a full consensus that transmission has a critical role in resilience as well as reliability: "The transmission infrastructure requirements that are identified through the ITP process are intended to ensure that low cost generation is available to load, but the requirements also support resilience in that needs are identified beyond shorter-term reliability needs. For example, the ITP identified the need for a number of 345 kV transmission lines connecting the panhandle of Texas to Oklahoma. These lines were identified as being economically beneficial for bringing low-cost, renewable energy to market, but their construction has also supported resilience by creating and strengthening alternate paths within SPP."[13]

In light of these recognitions by all respondent ISOs and RTOs that transmission capacity and operations play a critical existing role in ensuring resilience as well as reliability, the Commission should not ignore the potential for that role to be enhanced in order to meet future resilience challenges.

III. Interregional Grid Expansion and Integration Can Cost-Effectively Ensure Reliability During Stressful Events

While this proceeding has been prompted by concerns over generation availability under extreme conditions, incidents on the transmission and distribution systems are the source of almost all lost load.

[10] ISO-NE filing in FERC Docket No. AD18-7, pp. 14-15
[11] NYISO filing in FERC Docket No. AD18-7, p. 4
[12] PJM filing in FERC Docket No. AD18-7, p. 49-50
[13] SPP filing in FERC Docket No. AD18-7, p. 8

Indeed, most disruptions may be attributed to distribution outages. While transmission-related failures certainly can occur, in general "transmission projects can increase the resiliency and reliability of the system by increasing flexibility, reducing the risk of load shed, and increasing options for recovering from interruptions to supply."[14] In 2013, the White House and Department of Energy concluded "Additional transmission lines increase power flow capacity and provide greater control over energy flows. This can increase system flexibility by providing greater ability to bypass damaged lines and reduce the risk of cascading failures."[15] Planning and operating transmission to help address potential loss of load at the distribution level is therefore one strategy likely to offer cost-effective help with any reliability and resilience issues.

From 2012 to 2016, disruptions to the electrical grid caused 96 percent of electrical outages in the U.S., whereas generation inadequacy caused only 0.865 percent of grid disruptions and only 0.00007% have been fuel supply related.[16] The recent "Bomb Cyclone" event also shows that the focus should be on the power lines and equipment that deliver electricity to customers. While no customers lost power during the Bomb Cyclone because of generation shortages, hundreds of thousands did lose power when electricity distribution lines and equipment failed in the extreme weather.

The Bomb Cyclone showed that the bulk power system had to rely on more expensive generation because access to less expensive generation was limited: coal generation increased 36% during the Bomb Cyclone event relative to December and oil and dual fueled generation increased by over 1000% versus a 14% increase for gas.[17] Had there been access to cheaper resources like wind, customers would not have had to resort to more expensive resources. Indeed, renewable energy output was well above average during the Bomb Cyclone event, with wind output higher than both average winter and average annual output across the Northeast throughout the event.[18] Renewables provided an above-average 11% of on-peak generation during the Bomb Cyclone event across the grid operators it examined.[19] Wind output, however, is limited by the ability of the transmission system to transport wind energy from where it's most available to load centers.[20] Thus, while wind power can be more reliable than other resources during extreme winter weather, it is limited by interregional transmission contraints.

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[14] London Economics International LLC for WIRES, *Market Resource Alternatives: An Examination of New Technologies in the Electric Transmission Planning Process,* October 2014, p. 34.

[15] White House Council of Economic Advisors and Department of Energy Office of Energy Efficiency and Renewable Energy, *Economic Benefits of Increasing Electric Grid Resilience to Weather Outages,* August 2013, p. 14.

[16] Rhodium Group, "The Real Electricity Reliability Crisis," October 3, 2017.

[17] National Energy Technology Laboratory, *Reliability, Resilience, and the Oncoming Wave of Retiring Baseload Units,* March 2018.

[18] Also worth noting is that renewable output was several times higher than the level that grid operators plan for and compensate renewable resources for under their capacity markets. Wind's output was three times greater than what PJM plans for and compensates wind for in its capacity market.

[19] National Energy Technology Laboratory, page 22. During the most challenging periods of the Bomb Cyclone, wind output was more than 40 percent above average in PJM. In New England, wind output was more than twice its normal level.

[20] See, e.g., Wind Energy Foundation, *Transmission Upgrades & Expansion: Keys to Meeting Large Customer Demand for Renewable Energy*, January 2018, p. 7;

California faces a severe shortage of transmission capacity needed to tap potential New Mexico and Wyoming wind resources that would help the state meet its 50% renewable portfolio standard.

Limitations arising from interregional transmission constraints can be in part inferred from limitations on imports when the grid is stressed. ISO-NE data shows that as imports were decreased, the expected energy shortages significantly increased.[21] This means that to the extent transmission constraints limit imports, removing them through new transmission or operations methods would increase reliability.

Transmission expansions also help ensure the reliability of the bulk power system cost-effectively through improving market functioning—"transmission projects increase access to generation resources including resources in neighboring regions, which helps ensure resource adequacy and reduces required capacity reserves/margins,"[22] and provides customers with access to lower cost resources. This is particularly important during times of grid stress, as most recently witnessed during the Bomb Cyclone.

If the transmission is built efficiently, building it to bring in low variable-cost resources would reduce delivered power costs. Studies show that additional transmission capacity from currently remote resources could lower electricity prices for consumers in MISO and PJM, even after factoring in the costs of the incremental transmission investments required to make the incremental energy supply available. For example, expanding transmission delivered electricity in PJM would lower consumers' net costs by $6.9 billion annually by 2026.[23] In MISO, adding 50 Gigawatts of transmitted electricity leads to an average energy price decline of $8.11/MWh in 2030.[24]

ACEG recognizes that ISOs and RTOs are organized and governed with principal attention to issues that arise within their regions, must reflect the interests of the entities that serve load within those regions, and therefore may naturally be disinclined to seek out-of-region solutions if there are in-region solutions proposed by key regional players to potential challenges to reliability or resilience. However, the most cost-effective solution may well involve resources or flexibility that exists in an adjacent region, and the Commission should require that such solutions be identified and implemented in the interest of ensuring just and reasonable rates. Customers can have genuine concerns about excess investments being made within RTO and ISO regions if lower-cost solutions are not being sought and selected when found outside them.

Ensuring reliability should be examined and coordinated at all scales, not just within RTOs/ISOs.[25] In its report on resilience of the electric system, the National Academy of Sciences noted

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California ISO, *ISO 2016-2017 Transmission Planning Process Interregional Transmission Project Evaluation and 50% RPS Out-of-State Portfolio Assessment*, January 2018, p. 8.

See also: Bipartisan Policy Center, *Capitalizing on the Evolving Power Sector: Policies for a Modern and Reliable U.S. Electric Grid,* February 2014, p. 23.

[21] ISO-New England, *Operational Fuel-Security Analysis*, March 2018.

[22] London Economics International LLC for WIRES, Market Resource Alternatives*: An Examination of New Technologies in the Electric Transmission Planning Process,* October 2014, p. 34.

[23] Synapse Energy Economics, Inc. for the Energy Future Coalition, *Benefits of Wind and Transmission in PJM,* July 2013.

[24] Synapse Energy Economics, Inc. for the Energy Future Coalition, *The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region,* February 2012.

[25] CAISO Comments at p. 8 ("The Commission should also recognize that any risks to the resilience of the electric system are not limited to Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs); they can affect all jurisdictional entities and all regions.").

that much regulation of the electric system is decentralized at the state or regional level but also noted that "a coherent strategy [for resilience] will not emerge without stewardship at the federal level,"[26] and that "the benefits are diffused more broadly across multiple industries and society as a whole."[27]

ACEG recognizes the enormous role that localized resilience measures such as demand management, efficiency improvements, distributed generation, microgrid development, and electricity storage development can play in enhancing resilience, but this should not minimize the importance of the Commission's responsibility to take appropriate national actions which it is tasked to take, such as better interregional planning to ensure a robust transmission backbone.

IV. Recommendations

The Commission can and should enhance reliability by promoting better planning and interconnection between the RTOs and ISOs by:

- Strengthening Order 1000 through mandatory interregional planning and the objective consideration of resulting transmission projects originating in other regions;
- Including in such planning, project review, and approval, analysis of all the benefits available from greater interregional transmission access, capacity and integration; and
- Appraising those benefits and their contributions to cost-effective reliability and resilience when allocating costs for those projects.

Respectfully Submitted,

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[26] National Academy of Sciences, p. 15.

[27] National Academy of Sciences, p. 13.