ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Washington Office
25 Massachusetts Ave., N.W.
Suite 500
Washington, D.C. 20001
(202) 789 -7850
Fax: (202) 789-7859
Web: http://www.asce.org

Statement for the Record of

The American Society of Civil Engineers

on

"Keeping the Lights On: Strategies for Grid Resilience and Reliability"

Select Committee on the Climate Crisis

U.S. House of Representatives

February 15, 2022

Introduction

The American Society of Civil Engineers (ASCE)[1] appreciates the opportunity to submit our position on the importance of maintaining an electric grid system which is both resilient and reliable. We also thank the House Select Committee on the Climate Crisis for remaining focused on critical issues, including the impact of climate change on our nation's critical infrastructure. ASCE is eager to serve as a resource for the select committee, its Members, and staff as they examine ways to highlight the drastic effects of climate change as well ways to mitigate its negative impacts.

The passage of the Infrastructure Investment and Jobs Act (IIJA) provided a much needed down payment to modernize the nation's transmission infrastructure. This should, however, serve as just a first step toward ensuring a more resilient and reliable grid. As storms become increasingly severe, rainfall levels continue to increase, and conditions such as drought and cold become more extreme, the grid becomes increasingly more likely to fail and leave millions without service. This will ultimately lead to increased energy rates in the short term and pose significant economic challenges and worse in the long term. A sustained commitment to grid resilience is necessary to ensure reliability, and to better meet and respond to the demands of ratepayers.

ASCE's *2021 Infrastructure Report Card*

Infrastructure is the foundation that connects the nation's businesses, communities, and people, serves as the backbone to the U.S. economy, and is vital to the nation's public health, safety, and welfare. Every four years, ASCE publishes the *Infrastructure Report Card*, which grades 17 major infrastructure categories using a simple A to F school report card format. Last March, ASCE released its *2021 Infrastructure Report Card*[2], giving the nation's overall infrastructure a grade of "C-," and identified an investment gap of $2.2 trillion. While the overall GPA increased into the "C" range for the first time since ASCE began grading the nation's infrastructure in 1998, the nation's energy infrastructure also saw improvement from our 2017 report card, increasing from a "D+" to a "C-".

To further increase this grade, ASCE recommends adopting strategies to meet current and future needs, adoption of consensus-based codes and standards, implementing grid modernization and hardening plans, ensure more efficient review and permitting processes, and account for full life-cycle costs in project development. ASCE also encourages Congress to build on the successes of

[1] ASCE was founded in 1852 and is the country's oldest national civil engineering organization. It represents more than 150,000 civil engineers individually in private practice, government, industry, and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE is a non-profit educational and professional society organized under Part 1.501(c) (3) of the Internal Revenue Code. www.asce.org.

[2] https://www.infrastructurereportcard.org/

the IIJA and continue to support investing in modernization and resilience measures such as increasing energy storage, building microgrids, and hardening of energy facilities. Failure to make these needed investments will result in billions of dollars in lost revenue for businesses, a significant drop in Gross Domestic Product (GDP), and hundreds of thousands of lost jobs.

Solutions

With the enactment of IIJA, the nation has a historic opportunity to address challenges to the nation's energy grid which are exacerbated by climate change. Significant investments in grid modernization will allow for further progress in addressing these challenges. Future strategies should focus on implementing resilience measures, best practices in infrastructure planning and design, and full life-cycle cost assessment of implementing projects.

Building on Progress

The IIJA provided a significant, and historic down payment on modernizing the nation's electric grid. The law provides $73 billion to rebuild the grid. This includes $10 billion for a new Transmission Facilitation Program to support the construction of thousands of miles of new power lines. It also provides needed investment in grid resilience. Key provisions include $5 billion for grid reliability programs that support activities, technologies, equipment, and hardening measures to mitigate the effects of power disruptions; and $1 billion for rural grid resilience and modernization, which includes upgrades for transmission lines, improved energy efficiency, and emissions reduction.

These investments are important because, according to the Edison Electric Institute (EEI), increased spending by utilities on transmission infrastructure has been shown to reduce congestion, improve demand response, and lower cost in service.[3] Between 2012 and 2017 spending on transmission infrastructure in the U.S. increased from $15.6 billion to $21.9 billion, and was shown to expand access to clean energy, and increased the resilience, reliability, and security of the grid.

However, despite increased spending in recent years, ASCE found an expected investment gap of $35.4 billion through 2039 in its most recent Failure to Act economic study. This gap, which was assessed prior to the passage of IIJA, has been compounded by the need to accommodate new renewable energy generation. Additionally, current data indicates that not only are service disruptions increasing, but these disruptions are becoming increasingly more expensive. Addressing these challenges will require an increase in physical infrastructure (poles, meters, transformers, etc.), which will in turn create an increased need to ensure continued reliability. Further investment for maintenance will be needed to ensure this infrastructure remains reliable and can continue to stand up to the increasingly severe effects of climate change.

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[3] https://www.eei.org/issuesandpolicy/Finance%20and%20Tax/Financial_Review/FinancialReview_2018.pdf

Failure to make needed investments in generation, transmission, and distribution infrastructure will have significant long-term consequences. Increased energy rates are projected cost American households an average of $5,800 in disposable income over the next two decades. Businesses are projected to lose nearly $637 billion in sales, which will be coupled with a loss of 287,000 jobs, all by the end of this decade. This will result in in overall reduction in GDP of $394 billon by 2029, and more than $1.7 trillion by 2039.[4]

National Hardening Plan

Recent natural disasters such as Hurricane Ida and the 2021 winter storms in Texas show that extreme weather events exacerbated by climate change pose significant challenges to the reliability of the nation's electric grid. In Texas the failure of the state's grid left more than 4 million homes without power. In New Orleans, Hurricane Ida left more than one million residents without power in large part due to state regulators and power providers refusing to make necessary upgrades to ensure grid resilience in the face of climate change. While these are among the more extreme examples, weather has always been a top challenge energy reliability. The Department of Energy estimates that power outages cost the U.S. economy between $28 billion and $169 billion each year.[5]

Federal investment is needed to implement a national hardening plan to strengthen the resilience of the nation's grid. Throughout the nation, utilities are taking proactive steps to strengthen the grid through implementation of resilience measures to help the grid withstand the effects of climate change. Policy makers must develop a national hardening plan that strengthens systems to withstand the effects of storms and allows for rapid restoration of service following significant weather events.[6]

A dynamic approach is needed to ensure the nation's grid is able to withstand increasingly harsh conditions brought on by the effects of climate change. A recent report by ASCE's Texas Section on assessing the state's utility needs following the 2021 winter storms highlighted several policies which would enhance resilience and reliability. These include regular economically sustainable maintenance, use of robust microgrid technology, and notably, seasonal simulator exercises. According to the report, Texas has historically relied heavily on model solutions to address reliability problems which failed to account the reality of changing conditions. A key recommendation in the report is to conduct seasonal simulation exercises on

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[4] https://infrastructurereportcard.org/wp-content/uploads/2021/03/Failure-to-Act-Energy-2020-Final.pdf

[5] Ibid.

[6] https://www.asce.org/advocacy/policy-statements/ps484---electricity-generation-and-transmission-infrastructure

critical infrastructure prior to Winter and Summer in order to “sharpen skills in response to system emergencies, identify process and risk areas.”[7]

Consensus Based Standards

One of the most effective ways to ensure grid resilience is by incorporating consensus-based standards into the planning and design process. ASCE engages in standard setting on a large scale. ASCE Standards provide technical guidelines for promoting safety, reliability productivity, and efficiency in civil engineering. ASCE standards are subject to a rigorous and formal process overseen by a Codes and Standards Committee, and are accredited by the American National Standards Institute.

Adoption of these standards for overhead transmission and distribution infrastructure improves the physical strength of systems, which increases their resilience to disasters, protects against loss of life, and can be implemented at a reasonable cost.[8] The following documents provide examples of the types of standards that should be incorporated into transmission infrastructure design and construction:

- ASCE-7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-22), currently an integral part of U.S. building codes, describes the means for determining design loads including soil, flood, tsunami, snow, rain, atmospheric ice, earthquake, and wind loads, and their combinations for resilient structural design. The latest update to ASCE-7 also includes a new chapter on tornado loads;
- ASCE 48: *Design of Steel Transmission Pole Structures,* which provides a basis for design, detailing, assembly, fabrication, testing, ad erection of steel tubular structures for transmission poles;
- ASCE 10: *Design of Latticed Steel Transmission Structures*, which provides requirements for design of guyed and self-supporting latticed steel electrical transmission structures;
- ASCE Manual of Practice 74: *Guidelines for Electrical Transmission Line Structural Loading,* which provides most relevant and updated information related to transmission line structural loads and has been updated to address the impacts of climate change;
- ASCE Manual of Practice 104: *Recommended Practice for Fiber-Reinforced Polymer Products for Overhead Utility Line Structures,* which details best practices for use of fiber-reinforced polymer (FRP) composite poles and crossarms in resilient conductor support applications;

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7 https://www.texasce.org/wp-content/uploads/2022/01/Reliability-Resilience-in-the-Balance-Executive-Summary.pdf

8 https://infrastructurereportcard.org/wp-content/uploads/2020/12/Energy-2021.pdf

- ASCE Manual of Practice 123: *Prestressed Concrete Transmission Pole Structures,* which is a complete engineering reference on static-cast and spun-cast prestressed concrete poles for electric distribution and transmission lines;
- ASCE Manual of Practice 140: *Climate-Resilient Infrastructure: Adaptive Design and Risk Management,* which provides guidance for and contributes to infrastructure analysis/design in a world in which risk profiles are changing due to climate change per the Fourth National Climate Assessment; and
- ASCE Manual of Practice 141: *Wood Pole Structures for Electrical Transmission Lines: Recommended Practice for Design and Use,* which provides comprehensive knowledge for the principles and methods for the design and use of wood poles for overhead utility line structures.

ASCE has furthered its standard development efforts by creating the ASCE-7 Hazard Tool. The tool provides quick, reliable way to look up hazard data for seven environmental hazards including wind, seismic, ice, rain, snow, flood, and tsunami, to determine multiple types of hazard loads for buildings and other structures.

Life Cycle Cost Analysis

The ASCE encourages engineers to implement performance-based standards, resilience, innovation, and life cycle cost analysis (LCCA) in all projects. LCCA is assessing the total cost of ownership and considers all costs of acquiring, owning, and disposing of an energy system. The goal is to significantly enhance the performance and value of infrastructure projects over their life cycles and to foster the optimization of investments. LCCA factors in technological improvements, as well as the best and most sustainable practices for replacing aging infrastructure, and therefore can effectively balance affordability and access to energy products like electricity with maintaining reliable and resilient service and a minimized carbon footprint.[9]

The use of LCCA will raise the awareness of owners, clients, and the public to a more accurate cost of infrastructure. The systematic use of LCCA will promote innovative, resilient, sustainable, and cost-effective engineering solutions. ASCE recommends appropriate use of LCCA principles in planning and design processes, as well as construction, operation, maintenance and decommissioning in order to evaluate the total cost of projects.

Conclusion

ASCE appreciates the House Select Committee on the Climate Crisis's focus on the resilience and reliability of the nation's electric grid, and we thank you again for the opportunity to provide input. While climate change continues to place added pressure on the nation's electric grid, there is an opportunity to strengthen resilience, improve reliability, and deliver better service to customers. The investments in the Infrastructure Investment and Jobs Act are an important first

[9] Ibid.

step to address these challenges, but the effort must be sustained. Every year temperatures become warmer, rainfall becomes greater, and storms become more severe. Absent a sustained commitment to modernizing and hardening the nation's grid, power disruptions will become more frequent and widespread. This will result in increased financial costs, degradation of the natural and built environment, and increased risk to the safety and wellbeing of the population.