

Statement for the Record of

The American Society of Civil Engineers

on

**“Science and Energy Research Infrastructure Needs of
the U.S. Department of Energy”**

**Committee on Science, Space, & Technology’s
Subcommittee on Energy**

U.S. House of Representatives

April 27, 2022

Introduction

The American Society of Civil Engineers (ASCE) appreciates the opportunity to submit a statement to the House Science, Space, & Technology’s Subcommittee on Energy for the hearing “Science and Energy Research Infrastructure Needs of the U.S. Department of Energy” held on April 27, 2022. ASCE is eager to work with the subcommittee, as well as the full committee, on strengthening research and development programming at the Department of Energy and across the Federal Government in order ensure more resilient and reliable infrastructure.

Civil engineers are responsible for the planning, design, construction, operations, and maintenance of physical infrastructure, including energy generation and distribution facilities, industrial buildings, transportation networks, and water supply and sanitation systems. Most infrastructure is built to provide long service lives (50 - 100 years), and are expected to remain functional, durable, and safe. However, the increasing frequency and intensity of natural disasters, combined with increasing population densities, and system interdependencies have demonstrated vulnerabilities in the nation's infrastructure. This, coupled with the fiscal challenges of rebuilding, highlights the importance of research to develop new materials and innovative processes that can increase help communities become more resilient.

The passage of the Infrastructure Investment and Jobs Act (IIJA) provided a much needed down payment to revitalize the nation’s infrastructure. As implementation of this historic legislation continues, it is important to ensure that momentum continues to build to address the ongoing challenges to the nation’s energy infrastructure. This includes supporting effective resilience measures, meeting future energy demands, and reducing carbon emissions. Addressing these challenges will be advanced by supporting robust investment in research, development, and demonstration programs which spur innovation and bring the use of new technologies to the forefront.

ASCE’s 2021 Report Card for America’s Infrastructure

Every four years, ASCE publishes the *Report Card for America’s Infrastructure*, which grades the nation’s major infrastructure categories using a simple A to F school report card format. The Report Card examines the current infrastructure needs and conditions by assigning grades and making recommendations to raise them. The 2021 *Report Card for America’s Infrastructure*¹ was released on March 3, 2021, and graded 17 categories with the cumulative grade of “C-.” This grade represents the first time in 20 years that our infrastructure is out of the “D” range. The 2021 Report Card demonstrates that we have made some incremental progress toward restoring our nation’s infrastructure, however much work is left to be done.

The Report Card also clearly illustrates that we are still only paying about half of our infrastructure bill, as the total investment gap has gone from \$2.1 trillion over 10 years to nearly \$2.59 trillion over 10 years. As ASCE discovered in its 2021 study, *Failure to Act: Economic Impacts of Status Quo Investment Across Infrastructure Systems*¹, failing to close this infrastructure investment gap brings serious economic consequences. Challenges to the energy sector like an aging electric grid and inadequate transmission and distribution infrastructure

¹ https://infrastructurereportcard.org/wp-content/uploads/2021/03/FTA_Econ_Impacts_Status_Quo.pdf

make utilities unreliable. Problems like these translate into higher costs for businesses to manufacture and distribute goods and provide services. These challenges have resulted in ASCE giving the nation’s energy infrastructure a “C” grade on the 2021 report card.

A recent ASCE study highlighting the nation’s energy infrastructure investment gap² found an expected energy infrastructure investment gap of \$35.4 billion through 2039. This gap, which was assessed prior to the passage of IJJA, 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.

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 an overall reduction in GDP of \$394 billion by 2029, and more than \$1.7 trillion by 2039.

Ongoing Challenges and New Opportunities Through Infrastructure Law

Over the past several decades, federal research and development (R&D) has declined both in terms of the percentage of the overall federal budget and relative to other nations. Since 2000, U.S. R&D has been driven primarily by industry, which continues to fund most of the nation’s overall R&D. Inadequate federal funding for R&D during this time period significantly limits the nation’s ability to leverage the talents and resources of industry and academia nationwide to address long term needs. The decline in federal R&D is also notable as federally funded R&D is an important source of support, particularly for the higher education sector and for the nation’s basic research enterprise.

The effects of climate change also highlight the need for greater investment in R&D but have also provided opportunities for innovation. Increasingly severe weather events place increasing strain on the nation’s energy sector, and according to the Department of Energy, cost the economy up to \$169 billion per year due to power outages. This, however, has encouraged utilities to be more proactive in strengthening the electric grid by incorporating consensus-based standards, and increasing the use of microgrid technology and battery storage. Climate change has also spurred utilities to invest in innovations that support decarbonization, remote pipeline inspections, and use of smart grid technology.

IJJA provides a significant investment in Federal energy research. The law provides \$21.5 billion to establish a new Office of Clean Energy Demonstrations to spur innovation in several clean energy fields and encourage even further private follow-on investment. It also includes \$5 billion for projects demonstrating innovative approaches to enhance the nation’s electric grid, which

² <https://infrastructurereportcard.org/wp-content/uploads/2021/03/Failure-to-Act-Energy-2020-Final.pdf>

will play a critical role in supporting new measures to harden the grid against the effects of climate change and improve the overall resilience and reliability of the grid which will lead to fewer service disruptions. It also supports more than \$8 billion to establish research hubs for the development of clean hydrogen fuel, which has potential application as a clean fuel source.

The investments made in IJA have the potential to represent a turning point in federal R&D investment. These investments can not only revitalize the federal research sector, but can also lead to new technologies that will enhance climate resilience, create more reliable sources of energy, and support the development of more effective and longer lasting infrastructure systems. It will be critical in the coming months and years to build on this success and ensure the future of the Federal R&D sector.

America COMPETES Act

ASCE urges swift action to conference the America COMPETES Act (H.R. 4521). We believe that this legislation will provide for the research needed to help create the next generation of materials and approaches to building sustainable infrastructure systems for the 21st Century. It is critical that we design for the future using innovative materials and not trying to continue using the materials, design approaches, or construction methods from a previous century.

We encourage final legislation that would significantly expand funding at the Department of Energy Office of Science as well as at the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). All three of these agencies are critical to further the U.S. research and development needs in energy. Additionally, each of these agencies is critical to the nation's research and development agenda and should be prioritized if the United State is going to remain competitive in the future.

The America COMPETES Act, as approved by the House, provides the first ever comprehensive authorization for DOE's Office of Science, which operates ten of DOE's national laboratories and manages 29 national scientific user facilities. In total, the House bill authorizes a total of \$50.2 billion over five years for the office, starting at \$8.8 billion in FY22 and increasing to \$11.1 billion in FY26. This is compared to just \$7 billion for the office in FY21. The bill also establishes the mission of the Office of Science and directs the Secretary of Energy to coordinate the office's activities to support advancements in research areas shared between federal agencies and DOE program.

ASCE supports the America COMPETES' provision for the inaugural comprehensive authorization for the DOE's Office of Science. ASCE policy notes the need for continued economical, reliable, and environmentally responsible energy development and production in the United States. This is critical to industrial and commercial expansion, economic growth and stability, and enhanced energy security.

The U.S. research enterprise has been tremendously successful over the decades. This success has been guided by the scientific and engineering communities through a robust system of merit review and advisory committees, trust, and respect. ASCE supports efforts to enhance and revitalize these efforts.

Codes and Standards

ASCE strongly encourages Congress to continue to support U.S. domestic standards setting agencies. Research and development conducted by the DOE's Office of Science is critical in providing advances in knowledge that find their way into standards and building codes. One of the strongest roles the federal government can play in support of U.S. standards development and implementation is funding the necessary research that leads to innovation and more resilient, sustainable, and cost-effective materials and processes.

In addition to DOE's Office of Science, Congress should focus additional investments at the National Institute of Standards and Technology (NIST) on the traditional standards setting and support work that the agency oversees. The research conducted by NIST is a crucial component of energy standards as well as building standards such as *ASCE-7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, which serve as the basis for U.S. building codes. One of the most daunting challenges faced by standards setting bodies is the lack of technical data. While standards like ASCE-7 keep buildings safe and resilient, there is a pressing need for research into changing conditions that impact the built environment. Such basic information as rainfall and wind data is out of date and requires renewed federal support and funding to ensure that standard setting bodies have reliable data available to inform standards setting. Such standards and building codes, when properly adopted and enforced, are the single best method for ensuring the nation's infrastructure is safe and resilient.

Conclusion

We thank the Subcommittee for holding this important hearing and highlighting the importance of energy research and development. We urge Congress to continued and enhanced support for energy research and the infrastructure necessary to efficiently conduct such research. ASCE stands ready to work with you to ensure U.S. leadership in energy research in order to protect the nation's health, safety, welfare, and economic prosperity. Please consider us as a resource going forward.