United States Senate

COMMITTEE ON
ENERGY AND NATURAL RESOURCES

WASHINGTON, DC 20510–6150

WWW.ENERGY.SENATE.GOV

July 15, 2016

Dr. Marcia McNutt
President
National Academy of Sciences
500 Fifth Street, NW
Washington, DC 20001

Dr. C. D. Mote, Jr.
President
National Academy of Engineering
500 Fifth Street, NW
Washington, DC 20001

Dear Dr. McNutt and Dr. Mote:

Congress is currently considering legislation in conference committee that seeks to enhance the ability of America's electric grid to respond to rapidly changing conditions impacting the electricity sector, including changes in technology costs, consumer expectations, climatic conditions, and environmental standards at various levels of government.

Just as the nature of telecommunications and that sector's business models changed dramatically over the last quarter century, the electric grid is undergoing a fundamental transformation. From a largely analog system of one-way communication, centralized electric generation, and a radial design, the grid is moving toward two-way communication, distributed electric generation and storage, and a network design both at the transmission and distribution levels. These changes hold the promise of a more efficient and clean grid that empowers consumers.

Beyond numerous benefits at home, Americans also have a tremendous opportunity to convert our domestic experience with grid modernization into a global commercial opportunity. According to the International Energy Agency, the power sector globally will need to invest more than $16.4 trillion over the next 20 years, with nearly 90 percent of that investment occurring outside the United States. Bloomberg New Energy Finance has reported double digit growth in global annual smart grid-related spending in most years recently. GTM Research forecasts that annual worldwide spending on smart grid-related infrastructure will nearly double from $36 billion in 2013 to $63 billion in 2020. According to the U.S. International Trade Administration, American transmission and distribution equipment exports have grown on average 12 percent annually to a total of $2.3 billion in 2013.

The Energy and Natural Resources Committee held a hearing on March 17, 2015, about the changing nature of the grid. One witness from the Pacific Northwest National Laboratory described the types of technologies that will be crucial to the future of the grid. The combination of fast flexible bulk electric storage, high voltage power electronics, and advanced control methods stands out as "a new grid component, as fundamental as a power transformer or circuit breaker." Examples like these point to the rapid emergence of a new grid architecture, new technologies, new planning and operating techniques, and new business models. These developments have convinced me that government policy needs to be updated in response.

Thomas Edison, reflecting on his continuing motivation to invent, said: "One might think that the money value of an invention constitutes its reward to the man who loves his work. But [...] I continue to find my greatest pleasure, and so my reward, in the work that precedes what the world calls success." I am confident that American entrepreneurs will continue in the footsteps of Edison, bringing innovative inventions to market. But I also believe strongly that the public sector must help provide a reliable platform for this innovation.

The government will not be the primary driver of changes to the electric grid. The transformation occurring is an endogenous development. But I believe the government does have the capacity to fill gaps, smooth bumps, accelerate changes that have broad benefits, and spread benefits geographically to jurisdictions that may welcome them but lack capacity to support them. Because the electric industry is large, balkanized, and by its nature often pursuing a profitable rate of return, the federal government is best positioned to focus on a more general public good and perform system-wide analysis and simulations of the electric grid. The federal government should be looking at the "big picture" that cannot be the focus of individual industry participants. In that spirit, I hope to enlist the expertise of the Academies to help the nation "in the work that precedes what the world calls success."

Building on smart grid-related legislation passed in 2007 and 2009, the legislation pending before Congress this year would increase federal funding for grid modernization programs. These programs include public-private partnerships, planning and technical assistance to state energy offices and regulators, and technology research, development, and deployment with an emphasis on grid storage, distribution-level investments, and micro-grids. I view these policies as important foundational support that should lead to further steps.

The National Academies could provide critical assistance in identifying those further steps, including:

1. In the medium and long term, how is the electric grid likely to evolve in the United States and what end-state architecture, particularly with respect to the distribution network, should consumers and policymakers anticipate?

2. In terms of federal spending, what are the key "no-regret" investments and other strategic investments with a high probability of success that will help create a platform for a more efficient electric grid? For example, what kinds of analytical and simulation tools are needed to understand the evolving nature of the grid?

3. Given a set of plausible development scenarios for wide deployment of distributed generation coupled with energy storage, to what extent should federal policy focus on (a) behind-the-meter technology and services, (b) grid design issues, including planning and operating techniques, to help accommodate utility-scale generation and storage services, or (c) both?

4. Without presupposing the types of business models that may prove successful in the future, what gaps exist in federal policy (such as poorly designed incentives or a lack of investment in a particular technology, planning and operating technique, or type of analysis) that will make it more difficult for utilities to recover costs or generate a competitive rate of return in operating, maintaining, upgrading, interconnecting, or utilizing the electric grid to buy or sell energy?

5. Given the increasing integration of advanced communications systems and the electric grid, how can the United States ensure a simultaneous integration of cybersecurity measures so that the medium-term and long-term benefits of modernizing the grid include maintaining system security? How can policymakers ensure that consumers don't have to accept greater vulnerability as the price of greater connectivity?

My hope is that the work of the Academies will complement and not repeat the work being completed in the Department of Energy's second iteration of the Quadrennial Energy Review this year. Your response will help inform Congress about how best to respond to the changing nature of the electricity sector.

I look forward to your consideration and to evaluating your work.

Sincerely,

Maria Cantwell
United States Senator