



ENERGY INNOVATION: DEVELOPING THE TECHNOLOGIES FOR DECARBONIZATION

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We are the American Energy Innovation Council, 11 business and innovation leaders who share a common interest in increasing America’s commitment to energy innovation as a fundamental driver of economic growth and national security, and as a key to addressing environmental challenges. We speak as executives and innovators who, in the course of our careers, have made difficult decisions in the pursuit of building great American companies and a more innovative and stronger U.S. energy sector.

In the decade since AEIC’s founding, the political, economic, and energy landscape has changed dramatically, at home and abroad. The need to create a low-carbon and, over time, zero-carbon energy system has become more urgent, even as our economic competitors are increasing their energy innovation investments. Meanwhile, the specter of climate change has moved from a distant threat to a problem that is exacting significant costs on people and the economy today. Fortunately, new and enhanced technologies and processes—such as large-scale energy storage, advanced nuclear reactors, the use of renewable and low-carbon hydrogen as an energy vector and transportation fuel, affordable battery electric and fuel cell vehicles, carbon capture and removal, and many others—are poised to join low-cost renewable energy in transforming how the nation produces and consumes energy while upending traditional business models.

But despite recent promising technology developments, the U.S. needs far more innovation in energy to maintain a position of global economic strength, create new jobs at home, and reassert our leadership in international efforts to address environmental and security challenges. For all these reasons, the Council is today reaffirming and updating the policy recommendations we first put forward a decade ago. We believe that action on these recommendations is more urgent than ever. Specifically, we call for:

- **Tripling U.S. investment in clean energy innovation to \$25 billion per year;**
- **Funding Advanced Research Projects Agency–Energy (ARPA–E) at \$1 billion annually;**
- **Establishing a New Energy Challenge Program to build large-scale pilot projects;**
- **Creating an independent national Energy Strategy Board; and**
- **Expanding centers of excellence with strong domain expertise.**

America’s leadership in energy is at risk today. Competitors, including China, are rapidly increasing their investments in science and technology broadly, and clean energy technologies specifically, as the race for global technology leadership picks up speed. By comparison, U.S. research and development investments are sluggish. China’s recent announcement that it intends to completely decarbonize its economy by 2060 should be viewed as a new “Sputnik moment.”

Fortunately, the U.S. has important strengths and advantages in innovation, together with a track record of rising to difficult challenges. U.S. industries, universities, and national labs remain the envy of the world, and researchers from these institutions continue to lead the world in many technologies. The U.S. also has unique strengths in translating scientific and technological advances into successful products and companies.

Speaking from a business perspective, we are acutely aware of the need for balanced investments from both the public and private sectors in this area. But we also know that federal funding fills crucial gaps where the private sector cannot profitably invest, and that the U.S. government played a direct role in facilitating some of the greatest energy advances of the past century.

We are also well aware of the potential payoffs to the nation from such investments. Technology innovation improves productivity across industries and creates entirely new ones. Economists agree that innovation is the key engine of long-term economic growth and stability—it has been estimated that at least 50 to 85 percent of U.S. annual GDP growth can be traced to innovation. And we note that the number of economists, industry leaders, and officeholders of both parties who support increased innovation spending has also grown dramatically in the decade we have been advocating for these crucial investments.

In short, we are calling for a return to strong federal investment in energy R&D, and we are committed to working with lawmakers and other stakeholders to build support for an energy innovation agenda that can help ensure our nation's long-term economic growth, security, environment, and prosperity.

RECOMMENDATIONS

Since 2010, the Council has called for a considerable increase in federal funding for energy innovation and more effective strategies for supporting energy innovators and entrepreneurs. Over the last decade, we have identified priority areas for investment and examined how the U.S. compares to other nations in energy research and development and overall resources directed to innovation. In our most recent report, *Energy Innovation: Supporting the Full Innovation Lifecycle*, we emphasized the importance of federal support for the later stages of the innovation lifecycle, meaning not just research and development, but demonstration and deployment as well. While federal funding for the early phases of research and development has increased over the last several years, the later stages of demonstration and deployment continue to lag in resources and prioritization. Closing this gap is essential to successfully commercialize breakthrough technologies.

As AEIC looks forward to 2021 and the 117th Congress, we have recast our original 2010 recommendations to reflect recent progress and underscore the work that still needs to be done.

Recommendation 1: Triple federal funding for clean energy innovation to \$25 billion per year over the next five years.

In fiscal year 2020 (FY20), Congress appropriated roughly \$9 billion for energy research, development, and demonstration. This is no small investment, and it has the potential to deliver profound economic and environmental benefits. But U.S. *research intensity*—that is, the ratio of R&D investments to overall GDP—has stagnated such that we are in danger of losing ground to others, including China, which saw a three-fold increase in research intensity between 1995 and 2019 and continues to grow its innovation investments at a faster rate than the U.S.

A funding increase of this magnitude has support from other innovation experts and is well justified by the long-term economic benefits it will deliver for U.S. taxpayers.¹ We believe support at this level is essential if the U.S. is to reclaim its leadership position in energy innovation globally.

Recommendation 2: Fund ARPA-E at \$1 billion per year.

Over the 11 years since it was established, ARPA-E has provided \$2.4 billion in funding for more than 950 projects, 166 of which have attracted more than \$3.3 billion in private-sector follow-on funding. Despite ARPA-E's proven effectiveness, funding for this agency remains modest (at \$425 million per year) relative to its potential. We continue to recommend that appropriations for ARPA-E be increased to \$1 billion/year, with most of this increase directed to top-performing technology pilots and full-scale demonstration projects.

Recommendation 3: Establish a "New Energy Challenge Program" to build large-scale pilot projects.

A weak link in America's energy innovation system is the transition from demonstration-scale ideas or prototypes to commercial-scale facilities. Without better mechanisms to bridge this gap, many innovative technologies will struggle to reach commercial viability. To develop a new federal program that squarely addresses this need, the AEIC, as part of our Scaling Innovation Project, has convened an expert working group to diagnose challenges and develop policy recommendations. Results from this effort will be released in early 2021.

Recommendation 4: Create an independent national "Energy Strategy Board."

Without a national energy strategy, it is difficult to assess the overall effectiveness of energy policies or to implement a coherent framework for the development and deployment of new energy technologies.

We recommend the creation of a congressionally mandated "Energy Strategy Board" that would be charged with: (1) developing a long-term national energy plan and reporting to Congress and the executive branch about progress toward that plan, and (2) overseeing the "New Energy Challenge Program" described in the previous recommendation. The board should be external to the federal government, include experts in energy technology and energy markets, and be politically neutral.

¹ Including the recent [Energizing America](#) report and recent findings from Breakthrough Energy on the [economic impact of R&D spending](#).

Recommendation 5: Expand centers of excellence with strong domain expertise.

Technology innovation requires expensive equipment, well-trained scientists, multi-year time horizons and flexibility in allocating funds. This can be done most efficiently and effectively if the institutions engaged in innovation are located in close proximity to each other, share operational objectives, and are accountable to each other for results. Resources should not be spread thinly across many institutions working on the same problem.

Over the past decade the U.S. Department of Energy has successfully created a number of institutions along these lines, notably Energy Hubs, Energy Frontiers Research Centers, and Lab Embedded Entrepreneurship Programs. We call for continued merit-based expansion of these programs to other technology areas as part of an expanded innovation budget.

CONCLUSION

Energy is the lifeblood of modern society. The impacts of energy production and utilization touch all aspects of our economy and are the chief driver of global climate change. It is clear that a profound energy transition is needed—and that this transition will have enormous economic, political, and environmental implications. The countries that lead this transition will be positioned to thrive in a low-carbon global economy. Historically, the U.S. government made deliberate investments to unleash profound innovation in defense, health, and information technology. As a result, our country is a global leader in these sectors. The same bold commitment must now be made for energy and climate. We cannot wait another decade to act.

AEIC WHO WE ARE

The American Energy Innovation Council, originally formed in 2010, is a group of 11 corporate leaders who share a common interest in increasing U.S. commitment to energy innovation.

AEIC MISSION STATEMENT

The mission of the American Energy Innovation Council is to foster strong economic growth, create jobs in new industries, and reestablish America's energy technology leadership through robust public and private investments in the development of world-changing energy technologies. The AEIC is a project of the Bipartisan Policy Center.

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