

Innovation Brief

Energy Security and Expanding the Clean Energy Economy

Overview

Access to affordable energy is critical to human well-being and advancement. For over a hundred years, the United States and other developed nations have relied on power supplied by greenhouse gas emitting fossil fuels to advance their economies. As we face the simultaneous challenges of avoiding climate catastrophe and lifting millions out of energy poverty, a move to a global clean energy economy is critically important. The revolutionary shift required in the energy sector will require innovative policies, ideas and technology developments in the public and private sectors. One example of such innovation is the development of more affordable electricity storage. Achieving this goal can be a game changer for decarbonizing our electricity grid, addressing resilience in our electricity system and enabling people around the world to have access to electricity. However, the innovation journey – taking a technology from lab to marketplace – takes time and money, and is often high-risk. We need a mechanism for private entities to share the risks, costs and rewards of innovative technologies.

Problem Statement

With climate change and related impacts accelerating and millions lacking access to electricity, there is a need to expand the clean energy economy.

The Facts

As population and a strong middle class have grown, so has our demand for energy. Until now, that energy has been derived primarily from fossil fuel sources. Continuing to rely on these fuels is unsustainable because of the need to mitigate impacts from a changing climate. Consequences are already evident in the occurrence of increased storm intensities, the spreading of tropical diseases and historical droughts and floods. This points to a need to move quickly to decarbonize the energy system in a fashion that allows for continued economic growth.

While energy services are essential for human well-being and economic development over 1.5 billion people – mainly in rural areas of Asia and Africa – remain without access to electricity. Providing access to affordable energy for these people would not only allow individuals to better fulfill basic human needs, but would improve the wealth of their countries as a whole, which could raise global – and U.S. – GDP growth in turn. The United States should serve in a leadership role to decarbonize our energy system, and enable access to energy worldwide. To do this, we need policies to spur innovative technologies and a renewed process in which the technologies are introduced and adopted. New technologies can be disruptive and

include risks, but they can eventually reduce costs, lead to better performance and provide new services. The government, through research and development initiatives and ARPA-E, has given life to innovative technologies – often developed by universities and government – of private labs, where funding for risk-filled projects was previously lacking. The private sector plays an important role in scaling up new technologies and adapting supply chains. Larger corporations, in particular, help with deployment.

Recent initiatives following the Paris Climate Agreement have increased the possibility of a clean energy future. Mission Innovation, which includes 20 member countries, was initiated to accelerate global clean energy innovation. Breakthrough Energy Coalition, which consists of 28 investors from 10 countries, is committed to investing in public-private partnerships for clean energy technologies. The top oil and gas companies formed the Oil and Gas Climate Initiative to strengthen actions and investments to reduce greenhouse gas emissions and diversify global energy.

The Challenges

- Initiatives, such as Mission Innovation and Breakthrough Energy Coalition are important, but they do not address the technology innovation journey from idea to commercial viability.
- The innovation journey for a promising technology requires around \$1 billion and over 10 years.
- The federal government could potentially afford a \$1 billion budget for 10 years for a new technology, but federally sponsored projects require rules and regulation.

The Recommendations

Support a mechanism in which multiple private sector entities share the risks, costs and rewards of bringing promising technologies to commercial use.

- The “10-10-10 mechanism” suggests that each private entity would commit around \$10 million a year for 10 years, as an example.
- The 10 entities would select a board and a chief executive officer to lead a team to carry out the 10-year program.
- Each entity would have different development paths (e.g., forming partnerships with universities and small businesses).
- Each entity would own the resulting intellectual property, know how it works and individually decide whether to pursue deployment.
- The mechanism should supplement, not replace, action of the government or individuals in technology creation.

This brief is based on research by Arun Majumdar, Co-Director of the Precourt Institute for Energy; Jay Precourt Professor; Professor of Mechanical Engineering; and Professor, by courtesy, Materials Science and Engineering.