



REPORT TO THE PRESIDENT ON
ACCELERATING THE PACE OF
CHANGE IN ENERGY TECHNOLOGIES
THROUGH AN INTEGRATED
FEDERAL ENERGY POLICY

Executive Summary

Executive Office of the President
President's Council of Advisors
on Science and Technology

NOVEMBER 2010



About the President's Council of Advisors on Science and Technology

The President's Council of Advisors on Science and Technology (PCAST) is an advisory group of the nation's leading scientists and engineers, appointed by the President to augment the science and technology advice available to him from inside the White House and from cabinet departments and other Federal agencies. PCAST is consulted about and often makes policy recommendations concerning the full range of issues where understandings from the domains of science, technology, and innovation bear potentially on the policy choices before the President. PCAST is administered by the White House Office of Science and Technology Policy (OSTP).

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EXECUTIVE OFFICE OF THE PRESIDENT

PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY

WASHINGTON, D.C. 20502

President Barack Obama
The White House
Washington, DC 20502

Dear Mr. President,

We are pleased to send you this report, *Accelerating the Pace of Change in Energy Technologies Through an Integrated Federal Energy Policy*. This report addresses one of the greatest challenges facing our country: how to transform the energy system within one to two decades, through leadership in energy technology innovation, for reasons of economic competitiveness, environment, and security.

In this report, the President's Council of Advisors on Science and Technology (PCAST) calls for the development of a coordinated government-wide Federal energy policy. This will be a major undertaking given the large number of Federal policies that affect the development, implementation, and use of energy technologies. For that reason, we recommend that the Administration initiate a process analogous to the Quadrennial Defense Review undertaken every four years by the Department of Defense. A Quadrennial Energy Review (QER) could establish government-wide goals, coordinate actions across agencies, and identify the resources needed for the invention, translation, adoption, and diffusion of energy technologies. The development of such a policy would enhance our energy security and create jobs as well as mitigate the risk of climate change.

Our report, which was informed by the deliberations of a working group consisting of PCAST members and prominent energy experts from the public and private sectors, makes several other important recommendations. It urges a substantial increase in Federal support of energy-related research, development, demonstration, and deployment and suggests exploration of several new revenue options to provide this support. This increase will provide the U.S. with the potential to leapfrog over other countries also investing in the development of energy technologies. We recommend that the Secretary of Energy should prepare and implement the DOE component of the full interagency QER focused on energy technology innovation, promptly. In addition, it recommends organization and process changes that would accelerate progress toward energy innovations. Our report also contains recommendations in the areas of workforce development, social science research, use of the government's procurement capacity, and international cooperation.

Responding to the energy-related challenges of competitiveness, climate change, and security will require leadership across the energy innovation chain – from invention to diffusion – but with a dramatic acceleration relative to the half century that has been the norm to move new energy systems from initial development to thorough integration in the economy. Unleashing this innovation could be one of the most important and enduring accomplishments of your Administration.

Sincerely,


John P. Holdren
Co-Chair


Eric Lander
Co-Chair



The President's Council of Advisors on Science and Technology

Executive Summary

Accelerating the Pace of Change in Energy Technologies Through an Integrated Federal Energy Policy

A clean, secure, safe and affordable energy future is among the preeminent challenges facing the United States, and a major acceleration is needed in the pace of energy technology innovation – invention, translation, adoption, and diffusion. The U.S. must be at the forefront of energy technology innovation over the next decade for reasons of:

- **economic competitiveness:** renewal of our own energy infrastructure and access to rapidly growing global markets for clean energy technology;
- **environment:** rapid progress towards lower-carbon energy in this decade as a prudent response to global warming risks; and
- **security:** scaling-up of technologies that reduce oil dependence and thereby improve both our balance of payments and our security posture.

Meeting this challenge will require extraordinary actions at the Federal level, in concert with the private sector that owns and operates the vast majority of the energy supply, distribution, and use enterprise.

In the fall of 2009, the Secretary of Energy asked the President's Council of Advisors on Science and Technology (PCAST) to review the energy technology innovation system to identify and recommend ways to accelerate the large-scale transformation of energy production, delivery, and use to a low-carbon energy system. In response, PCAST formed a working group of PCAST members and energy experts from the public and private sectors that met twice in the first half of 2010 to address the charge and formulate recommendations. Informed by the working group's deliberations, PCAST has developed this report to provide advice to the Administration about Federal actions that can promote energy technology innovation.

Our most important recommendation is that the Administration establish a new process that can forge a more coordinated and robust Federal energy policy, a major piece of which is advancing energy innovation. Many Executive Branch agencies and departments must be engaged, with leadership from the Executive Office of the President. This is needed because "energy policy" is an amalgam, and often derivative, of policies for environment, competitiveness, security, finance, land use, and more. **The President should establish a Quadrennial Energy Review (QER) process that will provide a multiyear roadmap that lays out an integrated view of short-, intermediate-, and long-term energy**

objectives; outlines legislative proposals to Congress; puts forward anticipated Executive actions coordinated across multiple agencies; and identifies resource requirements for the development and implementation of energy technologies. The Secretary of Energy should provide the Executive Secretariat for the QER. While the QER will be a product of the Administration, substantial input from the Congress, the energy industry, academia, NGOs, and the public at large will be essential to the process. A staged process should be implemented now so as to provide some elements of a QER during each of the next four years.

We recommend that the Secretary of Energy prepare and implement a DOE-Quadrennial Energy Review, focused on energy technology innovation, as a component of the full interagency QER on a shorter timescale. The DOE-QER should include roadmaps for key energy technologies, an integrated plan for the involvement of the national laboratories in energy programs, portfolio assessments that lay out the optimal deployment of resources, identification, and projections of demonstration projects, and identification of funding needs for each technology. This QER will also be prepared with strong input from many sources inside and outside of the Administration including industry, business, state and local governments, non-governmental organizations, and consumers.

A complete and integrated QER will take longer to mature. While a good start should be made in 2011, the full government-wide QER should be targeted for delivery in early 2015. PCAST encourages Congress to use the QER as a basis for a 4-year authorization process that guides annual appropriations. The Federal investment in energy research, development, demonstration, and deployment (RDD&D) is incommensurate with the objective of leadership in energy technology innovation. **We recommend a substantial increase – to \$16 billion per year – in Federal support for energy RDD&D.** Given the difficulty of increasing appropriated funds to this level and the importance of “front-loading” the required investment to jump start innovation, we recommend an alternative approach. **The President should engage the private sector and Congress so as to generate about \$10 billion per year of additional RDD&D funding through new revenue streams. This increase will provide the U.S. with the potential to leapfrog to development and deployment of the advanced energy technologies that will define a robust 21st century energy system.**

In addition, the Federal Government should catalog the existing energy subsidies and incentives as a first step to realignment with QER priorities, enhance its opportunity to advance energy innovation through its purchasing power, and leverage international collaboration to advance energy technology innovation.

DOE needs to implement existing authorities over its organization, administration, and processes by extending to all DOE energy programs the review, contracting, funding, and organizational reforms implemented successfully¹ by Advanced Research Projects Agency – Energy (ARPA-E); managing demonstration projects so as to adhere to private sector practices to the maximum degree possible; working with the Office of Management and Budget and the Treasury Department to eliminate barriers to DOE’s expeditious implementation of its responsibilities in such areas as loan guarantees and cost sharing; and creating separate Offices of International Affairs and of Energy Policy.

1. Although the ultimate success of the research funded by ARPA-E is unknown, it is clear, as evidenced by the three solicitations managed by ARPA-E, that they have been successful in their peer review of proposals, quick negotiation of contracts, and rapid hiring of high caliber personnel.

For workforce development, DOE should establish a new traineeship program to address critical skill areas for its energy science and technology mission. Finally, DOE should initiate, along with NSF, a multidisciplinary social science research program that will provide critical information and support for policy development that advances diffusion of innovative energy technologies.

An overview of PCAST’s recommendations is provided in the box below.

**OVERVIEW OF PCAST RECOMMENDATIONS
TO ACCELERATE THE PACE OF CHANGE IN ENERGY TECHNOLOGIES
THROUGH AN INTEGRATED FEDERAL ENERGY POLICY**

Recommendations to Administration and Department of Energy:

2-1 Establish a full interagency Quadrennial Energy Review (QER) led by the Executive Office of the President.

2-2 Develop and implement the DOE component of the full interagency Quadrennial Energy Review promptly.

Recommendations to Administration:

3-1 Increase annual energy RDD&D funding to about \$16B.

3-2 Generate \$10 of the \$16 billion through new revenue streams.

3-3 Realign energy subsidies and incentives.

3-4 Enhance the Federal Government’s ability to advance energy technology innovation through its purchasing power.

3-5 Reestablish the Committee on International Science, Engineering, and Technology within the National Science and Technology Council.

Recommendations to Department of Energy:

4-1 Direct \$12 billion of the \$16 billion to Research, Development, and Demonstration (RD&D) funding, with an emphasis on DOE competitive programs.

4-2 Exercise authorities to align internal processes and organization with energy objectives.

4-3 Establish a DOE training grant program.

4-4 Initiate a multidisciplinary social science research program.



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“I don’t think there’s anybody in America who thinks that we’ve got an energy policy that works the way it needs to And that gives opportunities for Democrats and Republicans to come together and think about ... ‘How do we move forward on that agenda?’ ”

- President Barack Obama
November 3, 2010





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