

**STATEMENT OF
PATRICIA HOFFMAN
PRINCIPAL DEPUTY ASSISTANT SECRETARY
FOR ELECTRICITY DELIVERY AND ENERGY RELIABILITY
U.S. DEPARTMENT OF ENERGY
BEFORE THE
UNITED STATES HOUSE OF REPRESENTATIVES
HOUSE APPROPRIATIONS SUBCOMMITTEE ON
ENERGY AND WATER DEVELOPMENT
MARCH 17, 2010
FY 2011 APPROPRIATIONS HEARING**

Mr. Chairman and Members of the Committee, thank you for the opportunity to appear before you today to discuss the President's Fiscal Year (FY) 2011 budget request for the Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE).

Today, the availability and access to electricity is something that most Americans take for granted. It is vital to our economic prosperity and security. It pervades nearly every aspect of our lives from powering our electronics and heating our homes to supporting transportation, finance, food and water systems. Our electrical grid is a critical element of our energy infrastructure, but today it is being asked to provide dynamic response under mounting stresses. It is the mission of this office to lead national efforts to modernize the electricity delivery system, enhance the security and reliability of America's energy infrastructure, and facilitate recovery from disruptions to energy supply, which are vital to achieving Secretary Chu's goal of building a low-carbon economy to secure the Nation's energy future.

Modernizing the Nation's electrical grid through technical innovation, however, represents just one side of our efforts to work towards America's energy independence. Building the elaborate network of wires and other facilities needed to bring energy to consumers reliably and safely is perhaps one of the energy industry's greatest challenges today. This is especially true since renewable energy will become a substantial generation source that will require transformational technologies to enable integration into the electric grid.

Our work today supports energy and climate security through investments in grid modernization to develop critical technology to enable large penetration of renewables, utilizing new technologies in storage, communications and power electronics; advance breakthroughs in electric transmission and distribution technologies; and enhance the security and reliability of the grid amidst the pressures of increasingly aggressive threats. At the same time, we are working with our stakeholders to develop strategies and next-generation technologies that can overcome the challenges facing the Nation's power grid. The FY 2011 budget request of \$185.9 million for this program will help put us on the right trajectory to meet these objectives.

The President's FY 2011 budget request of \$185.9 million for OE, an 8 percent increase from the FY 2010 request, reflects the commitment in energy research and development to transition to a clean energy economy. Specifically, \$144.3 million will fund Research and Development activities, while \$6.4 million will continue to support Permitting, Siting and Analysis work that is critical to advancing the development of a modern grid; and \$6.2 million will allow us to enhance the reliability, resiliency and security of the Nation's critical infrastructure and facilitate its recovery from energy supply disruptions. The remaining \$29.0 million will provide the executive management, program oversight, analysis, and information required for the effective implementation of these activities.

A more detailed explanation of the FY 2011 budget request is provided below. Before moving on to the details of the FY 2011 request, I would like to speak briefly about our progress in implementing the programs funded under the American Recovery and Reinvestment Act and their relationship to the FY 2011 request.

STATUS OF RECOVERY ACT INITIATIVES

The Recovery Act provided \$4.5 billion to support strategic investments in a stronger, smarter, more efficient electricity infrastructure. We have allocated more than \$4 billion, matched by more than \$5.5 billion in private sector funding, to invest in the deployment of Smart Grid technologies to increase efficiency (environmental and economic), increase reliability, and give consumers more choice and control over their energy use.

Our Recovery funds also support other important initiatives, including long-term, coordinated transmission planning within the three interconnections across the country; work with the National Institutes of Standards and Technologies, the development of interoperability standards that will enable smart grid devices to communicate in an efficient and secure way; and workforce development support to community colleges, universities and businesses to build the skilled electric power system workers essential to modernize the grid. The funds also provide assistance to state and local governments to improve planning and emergency preparedness to minimize impacts of energy supply disruptions, and providing additional resources to state public utility commissions to help with the increased workload they face in regulating and overseeing new electricity and energy projects. To date we have announced selections of awardees for all initiatives except workforce development, which we hope to announce by mid-Spring.

The Recovery Act has provided an unprecedented infusion of funds that has enabled us to jumpstart the modernization of the Nation's electrical grid through increased deployment of smart grid technologies, technologies that are currently available but not yet in widespread use. Our FY 2011 request continues modernization efforts by supporting development of the next generation of technologies that can go beyond what can currently be found on the shelf. The activities supported in our budget request through our research and development efforts, ongoing state and regional assistance, and energy

restoration activities are distinct from those funded through the Recovery Act, but will continue to build on and learn from the progress that has been made.

RESEARCH AND DEVELOPMENT

OE collaborates with industry, government, universities and the public in the pursuit of technologies that reduce greenhouse gases; and contributes to the Nation's energy independence by improving the reliability, efficiency, flexibility, functionality and security of the electric grid. Our Research and Development (R&D) program is OE's largest program and accounts for almost 75 percent of the FY 2011 request. Our R&D activities support the goal of building a competitive, low-carbon economy by promoting the development of an efficient, "smart" electricity transmission and distribution network. These activities sustain continued development of smart grid technologies, tools and techniques; energy storage systems; and power electronic devices for grid modernization and integration of renewable and clean energy systems.

The FY 2011 budget request of \$144 million for the R&D program, an increase of approximately \$19 million from FY 2010, supports four program areas: Energy Storage, Clean Energy Transmission and Reliability, Smart Grid Research and Development, and Cyber Security for Energy Delivery Systems.

The FY 2011 request reflects an increased focus on development of transformational technologies and innovative tools that will enable the integration of renewable resources. A clean energy future depends on the development of such renewable resources, but variable and intermittent nature of the resources like solar and wind present a challenge for an electric grid designed for an electricity supply that is relatively fixed.

Our FY 2011 request of \$40 million for the Energy Storage program represents almost a tripling or a \$26 million increase from FY 2010. The large increase will support expanded efforts to enable successful integration of renewables into the grid. Large grid-scale, megawatt-level energy storage systems, or multiple, smaller distributed storage systems, have the potential to significantly reduce transmission system congestion and manage peak loads, increasing the overall reliability of the electric grid. Storage technologies also facilitate the integration of variable and intermittent renewable energy resources by enabling the storage of electrical energy so that it can be available whenever it's needed. FY 2011 activities include bench-scale and field testing with renewable energy developers, including Compressed Air Energy Storage (CAES) studies for wind applications and advanced batteries for solar uses, as well as feasibility studies for bulk storage systems to support high renewable penetration. Energy storage research in FY 2011 also includes electrochemical and materials research and system-level development, engineering, and analysis, including tools to guide utilities' application. Development of a new outreach program for regulators and non-technical stakeholders will highlight energy storage uses and benefits. OE, with its focus on applied research for the electric grid, works collaboratively across the Department on energy storage research with the

Offices of Science and Energy Efficiency and Renewable Energy, and the Advanced Research Projects Agency - Energy.

The FY 2011 request highlights \$10 million for Advanced Modeling Grid Research, an activity within the Clean Energy and Transmission Reliability Program. This initiative will enable the Department to interpret and analyze newly-available, real-time data from the electrical system to anticipate modeling and engineering challenges resulting from grid modernization activities. This research, done in partnership with universities and industry, focuses on applying new scientific insights to electric system data for improvements in grid planning and operations, including modeling of resource generation, energy markets and electricity flow. We anticipate that this research will improve grid reliability through real-time system dynamics, which incorporates the variability of renewable resources and compares actual data to modeling predictions for irregularities in grid operations. In FY 2011, we will competitively solicit projects with universities and national laboratories that focus on the technical challenges and gaps identified by technical experts.

In FY 2011, \$10 million is also included to support Power Electronics, which are flow control devices that play a pivotal role in improving the reliability, security and flexibility of the grid. Research efforts will expand in FY 2011 to include development of advanced semi-conductor materials and devices for faster grid switching, flexible power conversion and improved two-way flow control in order to reduce energy disruptions and decrease power costs. This work will focus on wide bandgap semi-conductors, advancing promising new material system toward commercialization, and working with universities, materials producers, device manufacturers, systems providers and utilities.

The FY 2011 request also provides a sustained effort for other research areas. This includes \$29 million for Smart Grid Research and Development, which focuses on adapting and integrating the use of digital technologies, tools and techniques to enhance operational intelligence and connectivity to improve the grid's reliability, efficiency and security. Efforts in FY 2011 will focus on four key technology areas—Advanced Control Methods, Improved Interfaces and Decision Support, Advanced Components, and Integrated Communications. Our ongoing R&D work will build on the Smart Grid investments supported by the Recovery Act, which greatly accelerated deployment of smart meters and other elements of smart grid. For example, in FY 2011, we will launch technology development projects that address critical gaps identified in Recovery Act funded demonstration projects and conduct field tests to validate critical communications standards for grid interoperability identified through the National Institutes of Standards and Technologies framework.

This budget request also continues support for development of advanced transmission-based sensors, tools and capabilities. \$20 million supports Transmission Reliability and Renewables Integration activities, which are a part of the Clean Energy and Transmission Reliability program. More sophisticated transmission technologies and power system information are essential as the demand for more reliable electricity and the integration of renewable resources grows. Work focuses on providing real-time data to improve electric transmission and distribution planning and operations, including the development of innovative analysis tools for North American wide-area monitoring system (WAMS).

Enhanced cyber security to protect against the exploitation of high-risk vulnerabilities in the electrical system is critical to the development of a reliable, resilient and secure modern grid. The FY 2011 request provides \$30 million for Cyber Security for Energy Delivery Systems program (CS-EDS) to continue initiatives that reduce potential energy disruptions by cyber attacks with the development of modeling and simulation capabilities that quickly assess the risk of newly discovered vulnerabilities and cyber attack techniques. CS-EDS works with the energy industry, system vendors, academia and federal agencies to secure energy communications and control systems against cyber attacks by implementing protective measures and response strategies to sustain the grid's cyber security over time. In FY 2011, we will conduct test bed assessments of two control systems typical of those used in the energy sector; continue advanced training courses in control systems security; and develop a prototype for a wide-area routed communication network that provides enhanced security for the smart grid. Our request reflects a \$10 million decrease from FY 2010, as several industry-led projects are nearing completion, and no funding for the National Energy Sector Cyber Organization is included.

The FY 2011 request winds down DOE's involvement in high temperature superconductivity research (HTS). After investing over \$600 million over the past 20 years, the Department believes that the HTS wire research has reached a point that provides meaningful technical value. This will mark a successful transition of second generation HTS wire technology developed at the DOE National Laboratories to a U.S. manufacturing base. The FY 2011 request includes \$5 million in its Cables and Conductors activity to provide for an orderly closeout of OE-sponsored work with its laboratory and industry partners. Ongoing demonstration projects of HTS technologies in grid applications, which include power cables, fault current limiters and transformers, were fully funded under the Recovery Act. These Recovery Act-funded projects will continue to completion through 2014.

PERMITTING, SITING, AND ANALYSIS

With level funding of \$6.4 million in FY 2011, we continue to build on efforts to assist States, regional entities, and other federal agencies in developing policies and programs aimed at modernizing the power grid. We expect to see increased requests in FY 2011 from public utility commissioners and other state agencies for technical assistance on electricity policy, focusing on ratepayer-funded energy efficiency and Smart Grid efforts.

We will also continue to coordinate all Federal authorizations for new transmission facility siting and authorize new international transmission lines that provide access to economic sources of electricity from Canada and Mexico. Lastly, we will capitalize on the investment initiated through Recovery Act awards to further expand the assistance to States and regions as they continue interconnection transmission planning efforts and accelerate reviews of electric utility investments in projects such as Smart Grid, energy storage, demand response, renewable energy, energy efficiency and electric and hybrid vehicles.

INFRASTRUCTURE SECURITY AND ENERGY RESTORATION

The request of \$6.2 million in FY 2011 continues support of activities to enhance the reliability, resiliency and security of U.S. critical infrastructure and facilitate its recovery from energy supply disruptions. We will improve our situational awareness and response capabilities to power outage and restoration through visualization and modeling tools. In addition, we will complete and maintain a grid monitoring capability with the private sector. Our work will continue in identifying, monitoring and responding to threats and process control systems that may affect the reliable delivery of energy to the Nation, as well as collaborate with industry to identify and implement mitigation solutions. Expanding infrastructure reliability activities continue through a robust system analysis process designed to identify critical assets and key interdependencies within energy systems.

This office has close relationships with the energy infrastructure owners and operators, as well as state and local governments, allowing us to fully understand their perspectives on protection, mitigation, and response options for quick technology deployment in a tailored, systems approach. This places OE in a unique role of defining the technology needs of the energy infrastructure, helping discover potential technical solutions, and facilitating deployment of new technology into the energy sector. Additionally, we will continue our emergency support responsibilities by undertaking preparedness, response, recovery and mitigation activities with other Federal agencies, the States and local governments.

PROGRAM DIRECTION

Our FY 2011 budget request asks for \$29 million for Program Direction, which covers the cost of sustaining Federal staff and other services required to provide overall direction, management, and support for OE. The request supports 113 Full Time Equivalents (FTEs) in FY 2011. The funding increase primarily reflects support for an additional 30 FTEs that were funded through the Recovery Act in FY 2010. Although Recovery funds expire at the end of FY 2010, the grants and agreements awarded under the Act will continue for several years. Federal staff provides critical technical project management and monitoring of ongoing Recovery Act grants and agreements.

CONCLUSION

Our work in OE contributes to our Nation's energy health, by facilitating a reliable, efficient, secure and resilient electricity grid. Through our research and development and other efforts, we will work to increase grid efficiency, and enhance the viability of clean energy resources by addressing issues such as intermittency, controllability, and environmental impact.

Federal investment in the research, development, and deployment of new technology combined with innovative policies and infrastructure investment, is essential to improving grid performance and ensuring our energy security, and environmental well-being.

This concludes my statement, Mr. Chairman. I look forward to answering any questions you and your colleagues may have.