Electricity Delivery and Energy Reliability

(discretionary dollars in thousands)

	FY 2010 Current Approp.	FY 2011 Annualized CR	FY 2012 Cong. Request	FY 2012 vs. FY 2010	
				$	%
Research and Development	121,402	0	192,817	+71,415	+58.8%
Permitting, Siting and Analysis	6,400	0	8,000	+1,600	+25.0%
Infrastructure Security & Energy Restoration	6,187	0	6,187	0	0
Program Direction	21,420	0	31,217	+9,797	+45.7%
Congressionally Directed Projects	13,075	0	0	-13,075	-100.0%
Subtotal, Electricity Delivery & Energy Reliability	***168,484***	***171,982***	***238,221***	***+69,737***	***+41.4%***
Use of Prior Year Balances	0	0	-504	-504	N/A
Total, Office Electricity Delivery & Energy Reliability	**168,484**	**171,982**	**237,717**	**+69,233**	**+41.1%**

PROGRAM DESCRIPTION

The **Office of Electricity Delivery and Energy Reliability (OE)** leads national efforts to modernize the electric grid, enhance security and reliability of energy infrastructure, and facilitate recovery from disruptions to the energy supply. Reliable, affordable, efficient, and secure electric power is vital to expanding the economic recovery, protecting critical infrastructures, and enabling the transition to renewable energy sources. OE consists of three programs: Research and Development (R&D), Permitting, Siting and Analysis (PSA), and Infrastructure Security and Energy Restoration (ISER).

The **Research and Development (R&D)** program works with industry, academia, and government to develop technologies that enhance the electric grid. It consists of the following subprograms:

- **Clean Energy Transmission and Reliability** includes activities to develop advanced transmission-driven technologies to improve grid reliability, efficiency, and security. It supports the development of methodologies to better integrate variable and intermittent renewable resources, and of tools to enhance the understanding of the power system and enable responses to changing systems. It promotes the advancement of modeling and analytical capabilities that improve grid operations and predict adverse grid situations, as well as novel research that will lead to dynamic, adaptable and self-diagnostic grid components.

- **Smart Grid Research and Development** promotes the development of an efficient, fully integrated "smart" grid through the adaptation and integration of digital information and communication technologies into the Nation's electricity delivery system. The program supports the development of utility-scale power electronics that provide faster switching capabilities, flexible power conversion, and better flow control resulting in improved grid performance and increased grid efficiency.

- **Energy Storage** conducts research and development efforts to lower the cost and improve the performance of stationary energy storage technologies for utility-scale applications. It works to develop energy storage technologies that can reduce power disturbances, and improve system flexibility to better incorporate variable and intermittent renewable resources and reduce peak demand.

- **Cyber Security for Energy Delivery Systems** conducts research and development activities that address vulnerabilities within the Nation's electricity delivery system to reduce the risk of energy disruptions due to cyber attacks, a fundamental need with the increased deployment of smart grid technologies and the growing sophistication of cyber threats.

The **Permitting, Siting, and Analysis (PSA)** program provides expert technical assistance to states, tribes and regions on electricity policies, programs and market mechanisms that increase access to reliable, affordable and sustainable energy sources. PSA provides analysis for the long-term, interconnection-level planning required for the continued growth and integration of renewable and other clean energy resources. In addition, the program implements the transmission provisions of the Energy Policy Act of 2005, and administers the international electricity regulatory program through cross-border permitting.

The **Infrastructure Security and Energy Restoration (ISER)** program leads national efforts to secure the Nation's critical infrastructure against threats and hazards. It ensures the reliability, survivability and resiliency of the energy infrastructure by coordinating the Department's response to energy emergencies, providing assistance in securing critical energy infrastructure, coordinating technical and policy support for control systems security, and collaborating with all levels of government and industry to facilitate recovery from energy supply disruptions and national security incidents. This program carries out the Department's responsibilities as the lead Energy Sector Specific Agency for protecting the nation's critical energy infrastructure.

Program Direction funds federal staff and support services for the management, oversight and technical direction of OE.

PROGRAM HIGHLIGHTS

The FY 2012 budget request represents a strong commitment to bringing the next generation of grid modernization technologies closer to deployment and commercialization. The increased investment will emphasize the integration of renewable energy sources, focus on long-term system planning, expand analytical capabilities, and promote aggressive approaches to next-generation grid technologies. It also supports a new Smart Grid Technologies and Systems Energy Innovation Hub.

Energy storage has gained importance in the energy field as a potential answer to many of the problems being experienced on the electric grid. Successful Recovery Act demonstrations are showing the ability of these technologies to provide stability and consistency to the intermittent nature of renewable generation, making usage of energy from these sources on a larger scale more feasible. The funding increase supports demonstrations for a new suite of cost-shared grid level storage projects, as well as the acceleration of research and development studies that will enter into a second phase to develop and test prototype materials. Analysis will start on new methods for identifying promising locations for pumped hydro and compressed air energy storage systems. Research will also expand ongoing activities supporting successful integration of renewable energy resources into the grid by modifying their variability, and collaborations with utilities and renewable developers to field test promising technologies. Aggressive support of storage deployment will provide the basis of commercialization and the market pull for development of more effective storage technologies.

FY 2012 will feature expanded analysis and collaboration with state, local and regional bodies on interconnection-level advanced transmission system approaches. Of primary focus is continued evaluation of the effects that the transition to a low-carbon energy future will have on the operation and planning of the electric system, especially from the regulatory perspective. Target areas for expanded discussion include efficient ways for balancing areas to increase cooperation, design and evaluation of offshore transmission, and the system requirements to integrate growing amounts of renewables into the grid.

In support of the President's clean energy goals, FY 2012 expands research efforts in advanced modeling of the grid into other system layers, creating comprehensive, integrated models that provide a more in-depth system understanding, as opposed to using separate, "isolated" models that only answer specific questions. The program will include investigations into, among others, the effects of a communications layer overlaying the electric system model, and the integration of distribution models into higher-level transmission system models.

FY 2012 will also mark the establishment of a new Energy Innovation Hub, providing a fully integrated approach to accelerating the development and commercialization of the next generation of grid technologies. The Hub focuses on the development of next-generation grid technologies and systems, and will tackle the tough technological, economic, and policy factors that affect modernization of the grid.

SIGNIFICANT FUNDING CHANGES – FY 2010 to FY 2012 Request ($ in millions)

Research and Development

Clean Energy Transmission and Reliability (FY 2010 $37.4; FY 2012 $60.8)…… +$23.4
The increase in funding represents the expansion of the Advanced Modeling Grid Research initiative and the establishment of a new Energy Innovation Hub, offset by a reduction due to the closeout of the Advanced Cables and Conductors subprogram. Advanced Modeling Grid Research develops the capabilities and mathematical models to analyze the large volumes of data on grid behavior collected through the deployment of advanced sensor technologies (PMUs) and increasing deployment of smart grid technologies. The new Smart Grid Technology and Systems Hub will bring together experts from across the electricity industry to explore the use of newly developed technologies to provide dynamic, adaptable characteristics to components and increase overall grid resiliency.

Smart Grid Research and Development (FY 2010 $31.5; FY 2012 $45.0)…….. +$13.5
The increase in funding supports the Power Electronics activity and the expansion of research to understand the effects of plug-in electric vehicles on grid performance. The Power Electronics activity invests in the development of solid-state devices that give utilities the ability to more effectively and quickly deliver power to their customers while increasing reliability, security and flexibility to the Nation's electric grid. Working closely with universities, efforts in FY 2012 will focus on development of wide bandgap semiconductors based on silicon carbide and gallium nitride materials.

Energy Storage (FY 2010 $13.6 FY 2012 $57.0) …….. +$43.4
The funding increase supports demonstrations for a new suite of cost-shared grid level storage projects, as well as the acceleration of research and development studies that will enter into a second phase to develop and test prototype materials. Analysis will start on new methods for identifying promising locations for pumped hydro and compressed air energy storage systems. Research will also expand on current activities supporting successful integration of renewable energy resources into the grid by modifying their variability, and collaborations with utilities and renewable developers to field test promising technologies. Aggressive support of storage deployment will provide the basis of commercialization and the market pull for development of more effective storage technologies.

Cyber Security for Energy Delivery Systems (FY 2010 $38.9; FY 2012 $30.0)……. -$8.9
The reduction in funding levels from FY 2010 reflects the one-time funding for the National Energy Sector Cyber Organization in FY 2010 and the successful completion of several industry-led projects.

Permitting, Siting and Analysis (FY 2010 $6.4; FY 2012 $8.0)……. +$1.6
Additional funding supports expanded analysis of advanced transmission system approaches, including the balancing areas' effect on variable renewables integration, off shore resources, and the system requirements to integrate them.

Program Direction (FY 2010 $21.4; FY 2012 $31.2)……. +$9.8

The increase supports 87 FTEs at Headquarters and thirty-one FTEs at the National Energy Technology Laboratory. The majority of new FTEs since 2010 are associated with the management of Recovery Act projects.