OFFICE OF
ELECTRICITY DELIVERY &
ENERGY RELIABILITY

Achieving Energy Reliability **TOGETHER.**

2010 STRATEGIC PLAN

June 2010

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This plan reflects OE's ongoing development of a strategy to achieve the Secretary's vision of an affordable, reliable, secure and sustainable national energy supply. OE will continue to improve this plan through stakeholder input and senior management leadership.

Empower the Energy Consumer

WITH...

KNOWLEDGE

DIVERSITY

INDEPENDENCE

CHOICE

DEPENDABILITY

POWER TO GENERATE ELECTRICITY

JOIN OE IN THE STRATEGIC JOURNEY TO TRANSFORM OUR ENERGY FUTURE.

OE's Declaration:

Apply Science and Technology Breakthroughs to Empower Consumers and Achieve an Affordable, Reliable, Secure and Sustainable National Energy Supply

A modern, reliable, secure, affordable and environmentally sensitive national energy infrastructure is fundamental to our quality of life and energy future. Yet since 1982, growth in peak demand for electricity has exceeded the growth and development of our electric grid. This demand growth will continue due to a growing population; larger homes with burgeoning IT requirements and more elaborate appliances; and the growth of electric vehicles; as well as, the day-to-day energy required to power our hospitals, schools, industries and other necessities of life. The electricity we use today is delivered via an electric infrastructure built with 19th and 20th century technologies which are inadequate to keep pace with, or accelerate the growth of a 21st century economy, as well as accommodate two-way power flows and renewable energy. Historically, underinvestment in the electricity transmission and distribution systems has weakened not only the supply, efficiency and reliability of the Nation's electricity, but also power quality which costs American business more than $100 billion on average each year. Furthermore, severe weather and other events persistently disrupt electricity, particularly at the local level. These constraints and the continual vulnerability to disruptions — from severe weather and a variety of other causes — impact more people and cost more money today than at any time in our history. For these and other reasons, a long-term commitment to expanding and improving the energy infrastructure is integral to our Nation's progress.

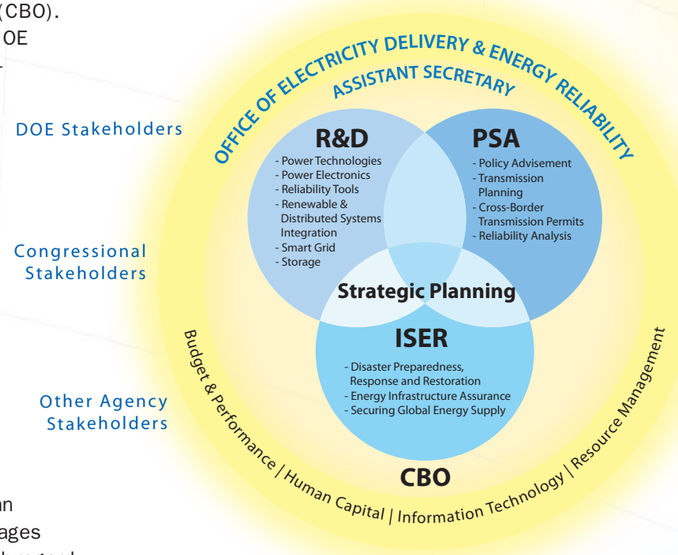
With the passage of the American Recovery and Reinvestment Act on February 17th, 2009, President Barack Obama declared America's commitment to moving toward a new, clean energy future. Under the Recovery Act, the Office of Electricity Delivery and Energy Reliability (OE) will make historic strides in the development and deployment of new, primarily Smart Grid technologies that will better equip our energy infrastructure to manage current and future demands. OE will help lead efforts that will not only ensure greater reliability and capacity of the grid, but also ensure the security and resiliency of our energy supply against natural disasters and man-made threats.

America's new energy economy, based upon scientific discovery and innovation, emphasizes the preservation of a healthy environment and better management of available resources, including greater integration of renewable energy sources, thereby reducing our dependence on foreign oil. Equally important, this new economy will foster expanded partnerships and collaboration with a wide range of stakeholders and encourage participation of the American public, through progressive policy development, education, expanded energy-related choices and the creation of a green energy workforce that will advance jobs of the future and our Nation's global competitiveness.

Achieving Energy Reliability TOGETHER.

OE's Mission is to lead national efforts to modernize the electric grid; enhance security and reliability of the energy infrastructure; and mitigate the impact of, and facilitate recovery from, disruptions to the energy supply.

To pursue this mission, the office is organized into three programmatic divisions — Research and Development (R&D), Permitting, Siting and Analysis (PSA), Infrastructure Security and Energy Restoration (ISER) as well as a support division, Corporate Business Operations (CBO). This collaborative structure, as illustrated in the figure to the right, uniquely enables OE to bring together technology, policy and operations to address America's increasingly dynamic energy needs and advance our Nation's energy economy.



Research and Development Division (R&D)

The Research and Development division advances knowledge and technology, in partnership with industry, government, national laboratories, and universities, to meet America's need for a reliable, efficient, and resilient electric power grid. Its work leads to knowledge and technologies that contribute to energy independence, greenhouse gas emissions reduction, and economic growth by improving the reliability, energy efficiency, system efficiency, and security of the Nation's electricity delivery system. It undertakes activities that will: (1) strengthen electricity grid stability and reduce the frequency and duration of operational disturbances; (2) increase efficiency of the electric delivery system through reduced energy losses; (3) reduce peak electricity load at distribution feeders, increase asset utilization, and improve accessibility to a variety of energy sources for generation; and (4) harden the energy infrastructure so it can detect, prevent, and mitigate external disruptions to the energy sector. Refer to pages 15-16 for information regarding R&D's technology successes, as well as pages 9-10 with regard to Smart Grid and the American Recovery and Reinvestment Act (Recovery Act).

Permitting, Siting and Analysis Division (PSA)

PSA provides electricity policy analysis support to Federal officials on a fast turnaround basis. In addition, PSA provides unbiased technical assistance to states and regions that wish to change their policies, laws, regulations, and market mechanisms on any electricity-related topic. Requested topics include most major areas of clean energy resources, including renewable portfolio standards, renewable energy zones, ratepayer-funded energy efficiency, demand response, smart grid, coal with carbon capture, storage, integrated resource planning, portfolio management, transmission siting and planning. PSA implements the grid modernization aspects of the Energy Policy Act of 2005, such as coordination with other Federal agencies of transmission line siting on Federal lands; designation of energy corridors on Federal lands; and a tri-annual study on transmission congestion that is coupled with support to the Secretary for his consideration of any possible designation of geographic areas suitable for Federal "back-stop" siting of transmission. PSA also issues permits for cross-border transmission lines as well as authorizations for electricity exports. Refer also to pages 9-10 for PSA's efforts under the Recovery Act.

Infrastructure Security and Energy Restoration Division (ISER)

ISER's mission leads the Nation's effort to enhance the energy infrastructure's reliability, survivability and resiliency. This division is responsible for assisting Federal agencies, State, Tribal and local governments, and private industry with energy assurance planning, disruption preparation, and response and recovery capabilities; coordinating the Department's response to energy emergencies; and applying DOE's technical expertise to ensure the resiliency of critical energy infrastructure domestically and abroad.

The Division is responsible for enhancing the preparedness and resiliency of critical energy assets and does so by assisting public and private partners with activities in support of Homeland Security Presidential Directives 7 and 8. These directives establish national policies for federal departments to prepare in order to prevent and respond to threatened or actual domestic terrorist attacks, major disasters and other emergencies.

ISER plays an integral role in the larger DOE responsibility for ensuring the reliability of the Nation's energy supply through restoration and recovery actions. Under the National Response Framework, ISER is designated as the lead office for executing the Emergency Support Function #12 – (Energy), facilitating the assessment, reporting, and restoration of damaged energy systems and components. As such, the approach is to leverage a coordinated integration of several DOE capabilities and resources to emergency response situations. This approach enables ISER to provide support for a range of emergency events with a relatively small footprint, while integrating a number of different mission support areas.

Additionally, the Division's energy sector experts and security partners in government and the private sector work together to develop and execute a scalable suite of energy infrastructure support products, designed to enhance U.S. efforts to identify, prioritize, assess and assist key allies in mitigating the risks posed to critical energy sector assets located outside of the U.S. To this end, ISER, in collaboration with the Department of State, has used a collaborative process to work with U.S. agencies, friendly foreign governments and international organizations to enhance security and reliability of foreign energy systems, assets, and products that may affect the global stability of the energy system.

Corporate Business Operations (CBO)

This Division provides the administrative, budgetary, financial, human capital, information technology, logistical, communications and performance tracking support that allows OE to achieve its mission and goals in the most strategic and cost-effective manner. CBO's strength lies in its business practices which will prepare the office for managing current and future challenges, including the Recovery Act. Perhaps the two most important of these business practices are: (1) effective, transparent and responsible use of limited resources; and, (2) embracing a corporate approach closely aligned with DOE. These practices require CBO to build teams and partnerships within DOE, and with other Federal agencies, and the private sector, as well as to oversee alignment of OE's programmatic goals with DOE and OE Mission and strategic goals.

The Office of Electricity Delivery and Energy Reliability (OE) will play a central role in revolutionizing the Nation's energy infrastructure and transforming the way we live, including impacting the economy, national security and the environment.

In recognition of the importance of infrastructure modernization, Energy Secretary Steven Chu stated, "...the future Smart Grid... is very important because it is seen as a major key part of the economic recovery of the United States. This will instantly create many jobs as we rebuild and modernize the grid system and is also laying the foundation of our future prosperity."

To truly solve the energy challenge requires that we effectively generate, transmit and distribute energy. At the core of OE's responsibilities is the development of Smart Grid technology and a modernized transmission system that will enable the transmission and distribution of renewable and other forms of generation. This system will enable a more reliable, efficient, interactive energy delivery system that will transform the way we use energy.

Think of how our interstate highway system transformed the way we travel, commute to work, ship food and other essentials, and receive medical care, thereby improving the quality of life beyond people's imagination. OE envisions an equally transformational leap in the energy infrastructure, energy management, and the electric grid that empowers Americans. Benefits include:

- Involvement of consumers, utilities, grid transmission operators and other power stakeholders in digital, Smart Grid, multi-directional communication and controls that dramatically improve energy usage, including remote monitoring and control of real-time energy pricing and usage in our homes;
- Participation of consumers in energy generation and profits;
- Dramatic expansion in our choices of supply side generation options, including local generation and clean, renewable energy sources that will reduce carbon emissions and the threat of climate change;
- Widespread use of plug-in electric and hybrid electric vehicles that can be recharged at home and potentially supply the grid with electricity; and,
- Job proliferation of the new age green energy workforce.

OE foresees a robust, resilient energy infrastructure in which continuity of business and services is maintained through secure and reliable information sharing, effective risk management programs, coordinated response capabilities, and trusted relationships between public and private security partners at all levels of industry and government.

SYNCHROPHASORS TO ENHANCE GRID RELIABILITY

On August 14, 2003, a cascading power failure left 50 million people in the northeastern United States and eastern Canada in the dark. It was the largest blackout in American history and prompted calls for better ways to monitor the Nation's electric power system.

> "It's like moving from an old black-and-white TV to a wide screen HD TV," said Terry Boston, PJM Interconnection President and CEO
>
> *PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.*

Through the collaborative leadership efforts of the Office of Electricity Delivery and Energy Reliability (OE), the North American Electric Reliability Corporation (NERC) and electric utility companies, deployments of new sensors called phasor measurement units (PMUs) at strategic locations now provide simultaneous measurements of voltage, current and frequency across a wide area of the grid. Phasors provide operators with a faster means to take the pulse of the Nation's electric power grid. Phasors also describe the differences in timing between the crests of the waveforms that characterize electrical power as it travels through the lines. Over the next three years, Smart Grid Investment Grant funds will dramatically increase the number of networked PMUs, providing greatly expanded national coverage.

"If we had phasors in place then, we would have been able to see very clearly at least 30 minutes before that event that we were in trouble," said Stan Johnson, a manager at NERC, which is responsible for situational awareness and security of the electric power infrastructure. NERC sets mandatory reliability standards for how the North American electric grid is managed and enforces grid operator compliance with these standards.

"If we had phasors in place then, we would have been able to see very clearly that we were in trouble. Thirty minutes would have been enough time to take corrective action. We probably would have wound up shutting the lights off in the Cleveland, Ohio, area, but at least [the blackout] would not have steamrolled all the way across the Northeast," Johnson said.

Power once came from sources relatively close to the load. Now, electricity from inexpensive or renewable sources that might be located in remote areas is transmitted over long distances to densely populated regions with high power demands. As a result, bulk power systems are operating much closer to their limits of transmission throughput and capacity.

Voltage phase angles have long been used to assess the health of the grid, but these values were calculated from other measurements. The use of the satellite Global Positioning System (GPS) timing function keeps all the PMU measurements across the grid in precise synchronism, which is the major advance with phasor measurements. Using synchronized measurement devices placed directly on the lines and taking samples numerous times each second, voltage phase angles can now be measured and reported in real time instead of requiring calculations, providing an instantaneous picture of the state of the grid. DOE, NERC and utility industry efforts continue to improve phasor data analysis technology and implement the use of phasor measurements throughout the thousands of miles of electric power lines.

OE: Contributing to Our Nation's Recovery

Overview of the American Recovery and Reinvestment Act of 2009 (Recovery Act)

The American Recovery and Reinvestment Act of 2009 (Recovery Act) – which President Obama signed into law on February 17th, 2009 – is an extraordinary response to a domestic crisis unlike any since the Great Depression, and includes measures to modernize our Nation's energy and communication infrastructure and enhance energy independence.

The Recovery Act includes $4.5 billion for the Office of Electricity Delivery and Energy Reliability. As outlined in the legislation, these funds are an investment in a nationwide plan to modernize the electric grid, enhance security of U.S. energy infrastructure and ensure reliable electricity delivery to meet growing demand.

This represents a significant increase in the Department of Energy's investment in grid modernization and reflects a recognition that a more efficient and integrated Smart Grid is integral to achieving President Obama's goals to significantly increase the use of renewable energy resources and to improve the Nation's economic future.

The funds primarily support implementation of the Smart Grid programs authorized by the Energy Independence and Security Act of 2007. These include the Smart Grid technology research, development and demonstration projects authorized in the Energy Independence and Security Act Title XIII, section 1304, and the Federal matching funds for Smart Grid technologies in section 1306. A significant share of the funds are being used to support these programs through a competitive process.

As President Obama stated,

"The investment we're making today will create a newer, smarter electric grid that will allow for broader use of alternative energy."

February 17, 2009

Activities Created with Recovery Act Funding - $4.5 Billion

1. **SMART GRID INVESTMENT GRANT PROGRAM:** $3.4 billion to create a competitive, merit-based matching grant program that will cover up to fifty percent of investment planned by electric utilities and other entities for deployment of Smart Grid technology, including smart meters, customer-side smart appliances and equipment, demand response measures, distribution and transmission system monitoring and control, and information network systems. Learn More on the Web >
2. **SMART GRID DEMONSTRATION PROJECTS:** $615 million to fund competitively awarded financial assistance projects for: (1) regionally unique Smart Grid demonstration projects, which aim at providing regional solutions and best practices in implementing Smart Grid technologies; and (2) electrical energy storage demonstration and development projects, which aim at rapidly advancing market readiness of utility-scale storage technologies in the United States. Learn More on the Web >
3. **WORKFORCE DEVELOPMENT:** $100 million to address new and different skills required for the American energy/green workplace to lay the foundation for our long-term competitiveness, including retraining of dislocated workers, thereby strengthening urban and rural communities, and rebuilding a strong middle class.
4. **INTEROPERABILITY STANDARDS AND FRAMEWORK:** $10.2 million in cooperation with the National Institute of Standards and Technology (NIST), to support development and implementation of interoperability standards and framework ensure effective and consistent application of Smart Grid technologies.
5. **INTERCONNECTION TRANSMISSION PLANNING AND ANALYSIS:** $80 million to support states and the utility industry and conduct an analysis of future electric demand and transmission requirements. Learn More on the Web >
6. **STATE ASSISTANCE ON ELECTRICITY POLICIES:** $50 million to augment the staff and capabilities of state public utility commissions and thereby enable them to handle the new, large, time-sensitive workload of considering and approving utility expenditures on Smart Grid technologies.
7. **ENHANCING STATE AND LOCAL GOVERNMENT ENERGY ASSURANCE:** $55 million to support a one-time effort to establish the framework and set the momentum for States and local governments to have well-developed energy assurance and resiliency plans they can rely on during emergencies. Learn More on the Web >

DOE'S SECRETARIAL OBJECTIVES, OE'S GOALS AND THE STRATEGIC ACCOUNTABILITY CASCADE

OE's Strategic Accountability Cascade underscores how individual performance plans are tied to DOE's and OE's goals. This reflects how we strive to maintain alignment between each staff member's day-to-day work and the overarching imperatives of the Department. The pyramid shape illustrates how the OE's individual performance plans serve as the foundation for DOE's mission of "Discovering the solutions to power and secure America's future."

Mission

The Office of Electricity Delivery and Energy Reliability leads national efforts to:

- Modernize the electric grid;
- Enhance security and reliability of the energy infrastructure; and
- Mitigate the impact of, and facilitate recovery from, disruptions to the energy supply.

Vision

OE envisions a future in which energy is abundant, accessible, affordable and clean, and one in which the energy infrastructure is adaptable, reliable, and resilient.

Guiding Principles for Accountability

- Embrace OE's Mission and its importance to the Nation.
- Strive to imbue an office-wide and DOE perspective in all that we do.
- Commit to a solution–oriented approach.
- Strive to think beyond conventional approaches to discover truly innovative and extraordinary ways of addressing OE's challenges.
- Systematically leverage time, energy and resources in our pursuit of desired results and outcomes.
- Embrace teams and partnerships as a most effective methodology to achieving success.
- Strive to demonstrate best practices as an example for others.
- Be willing and unafraid to ask the questions "What if?" and "Why not?"

Secretary Chu, in one of his first actions, laid out his three secretarial objectives for the Department.

(1) Maintain U.S. Global Leadership in Science and Engineering;

(2) Build a competitive and sustainable clean energy economy to secure America's energy future; and

(3) Reduce nuclear dangers and environmental risks.

Building upon the first two objectives, the Office of Electricity Delivery and Energy Reliability developed OE's Strategic Goals, Program Level Goals and Objectives.

DOE'S SECRETARIAL GOALS, OBJECTIVES AND STRATEGIC INITIATIVES RELEVANT TO OE

2010 — 2015

DOE Goal 1:

Maintain U.S. Global Leadership in Science and Engineering

Objective A. Advance the Frontier of Modeling & Simulation:

Apply high-fidelity and simulation methodologies developed in the course of stockpile stewardship to accelerate technological innovation and facilitate the transfer to industry of this unique capability to enhance U.S. economic competitiveness.

Strategic Initiatives:

1. Energy Systems Simulation EES

Objective C. Train the Next Generation Workforce:

Cultivate the next generation workforce in science, technology, engineering, mathematics (STEM) imperative for clean energy development and nuclear security.

Strategic Initiatives:

1. Worforce Development
2. Re-Energize
   a) Higher Education
   b) Technical Training and Outreach

DOE Goal 2:

Build a competitive and sustainable clean energy economy to secure America's energy future.

Objective B. Sustain Growth Through Mission-Oriented R&D:

Coordinate energy research and development as mission-oriented, cross-disciplinary, initiatives that span transformational R&D including:

Strategic Initiatives:

2. Energy Innovation Hubs: for Storage and Electric Grid Systems.
5. Regional Innovation Clusters
6. Power Electronics (cross-cut)

Objective D. Scale Energy Efficiency and Conservation:

Develop scalable energy efficiency and conservation programs that help reduce U.S. energy intensity by 2.2% per year for the next 40 years (U.S. baseline of 96 quads, historical rate decrease is 1.8%).

Strategic Initiatives:

2. Efficiency Codes & Standards
7. Energy Literacy

Objective E. Modernize the Electric Grid Within a Decade:

Modernize the electric grid to increase consumer choice, reduce cost, and increase the reliability and flexibility of the energy system.

Strategic Initiatives:

1. Smart Grid Deployment
2. System Reliability and Renewable Integration
3. Security and Resiliancy
4. Energy Storage
5. Transmission

Objective G. Global Energy Security:

Support U.S. and global energy security through sound policy and responsible domestic energy development in areas where the private sector is not investing.

Strategic Initiatives:

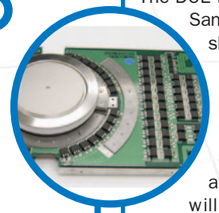
1. Promote International Policy Engagement
3. Engage in Energy Deployment Diplomacy

RECENT OE SUCCESSES

R&D PSA ISER

2009

First High-Temperature Silicon Carbide Power Module Developed



The DOE Energy Storage Program managed by Sandia National Laboratories, in partnership with Arkansas Power Electronics International, Rohm Electronics, and the University of Arkansas, developed the first high-temperature silicon carbide power module. Silicon-carbide-based components such as this one, which has a rated operating temperature of 250 ºC, will allow power electronics system designers to reduce the size and weight of their systems by 90% over systems that use traditional, silicon-based components. System energy losses can be reduced by more than 50%. Smaller, lighter, more efficient power systems made with these new components are less costly and expected to help increase market-penetration of green technologies (e.g.,electric vehicles, renewable generation, and energy storage).
2009 R&D 100 Award Winner

Beacon Power, AEP & DOE Agree to Build First Energy Storage Facility to Provide Frequency Regulation

Beacon Power and American Electric Power (AEP) signed an agreement to build the first energy storage facility to provide frequency regulation services on a commercial basis. AEP will contribute the site and certain integration services, while Beacon will construct the facility. When the 1-megawatt flywheel system is installed and connected, Beacon will begin providing regulation services directly to the mid-Atlantic region system operator and earning commercial revenue from such services. The system is based on the success of two 100kW pioneering units supported jointly by DOE, the California Energy Commission and the New York State Energy Research and Development Authority as well as the design of a 20MW facility funded by DOE. Regulation by fast storage is at least twice as energy efficient as using fossil fuel generation for this purpose. It also reduces the carbon footprint by some 70%. Widespread adoption of flywheel and battery technology for this application can be expected in the near future.

Superconductivity Wire Developed to Overcome Power Losses

A low AC loss superconducting wire platform developed by the Oak Ridge National Laboratory (ORNL) in colaboration with OE, titled "Superconducting Wires by Epitaxial Growth on SSIFFS™." The Structural Single-Crystal Faceted Fibers (SSIFFS™) template developed by ORNL has the potential to overcome a major technical barrier of superconducting wire in practical AC power applications, namely, AC losses.
2009 R&D 100 Award Winner

ieRoadmap Improves DOE's Ability to Plan & Execute Energy Projects

The Department created an online collaborative tool, the interactive energy Roadmap (ieRoadmap), that can be found at www.controlsystemsroadmap.net. The online tool documents cyber security projects in government, academia, and industry, and maps them to specific challenges and priorities identified in the energy roadmap. So far, more than 60 projects have been mapped by 21 organizations, and many are beginning to produce tangible results. The site has also become a hub for news, information sharing, and collaboration within the cyber security community.

Production of New Battery With Increased Cycle Life, Creates Estimated 300-500 Jobs

OE has been working in collaboration with an Australian laboratory to test a new lead-carbon battery. Extensive bench tests at Sandia National Laboratories sponsored by OE show a six fold increase in cycle life compared to quality lead-acid batteries. The resultant batteries are comparable to Lithium-Ion batteries, but at a third the cost. DOE is working with East Penn Manufacturing, one of the biggest U.S. battery companies, to produce the battery in its Pennsylvania plant. Production will begin in mid-2010, creating an estimated 300 to 500 jobs during the next two to three years. The new battery should be applicable to many vehicular and stationary applications. Coordinated mega-watt (MW) scale field tests of the new device are already being planned in the U.S. and Australia.

Free, Open-Source Tool Now Available to Map Energy Utilities

Advanced Network Toolkit for Assessments and Remote Mapping (ANTFARM): Energy utilities now have a free, open-source tool to map and visualize their control systems networks — a critical step in meeting the North American Electric Reliability Corporation's Critical Infrastructure Protection standards. By remotely analyzing multiple sources of network information, ANTFARM uses existing tools to map network connections, outline a security perimeter, and visualize critical cyber assets and vulnerabilities within the perimeter. Released by Sandia National Laboratories in 2008. Enterprise security solution providers are interested in maturing it into a commercially available product.

MELCOT Advancements Lead to Durable, Reliable Power Line Systems

Jointly developed by the Oak Ridge National Laboratory (ORNL), Electric Power Research Institute (EPRI), Tennessee Valley Authority (TVA) and PBS&J, the Methodology for Estimating he Life of Power Line Conductor-Connector Systems Operating at High Temperatures (MELCOT) predicts the service life of conductor-connector systems in electric power transmission systems. Because splices connecting the conductor lines are literally the weak links, this new method of investigating performance and integrity of the power line systems will enable researchers to develop more durable and reliable systems for the electric power grid. This will in turn allow power grid operators to maintain power flow and prevent potential grid failures, and more effectively reroute power distribution during emergency or natural disasters. Funding for this research is provided by DOE-OE, EPRI and ORNL. 2009 R&D 100 Award Winner

New Megawatt Storage Facility Operational at Long Island Bus Depot

The first U.S. customer-side sodium sulfur storage facility was commissioned in 2009 in partnership with the New York State Power Authority. The 1 MW facility is situated at a natural gas refueling depot of the Long Island Bus company. The facility stores off-peak power at night and uses it during peak periods to run gas compressors for 6 hours. The project is expected to save about $46,000 a year in utility bills and an additional $220,000 annual savings in labor costs while reducing peak load for the utility. The facility was funded under a joint New York State Energy Research and Development Authority/OE initiative. DOE will continue monitoring and analysis of the system.

Operational Microgrids Closer to Reality

The Consortium for Electric Reliability Technology Solutions (CERTS) and American Electric Power (AEP) conducted the Microgrid Test Bed Demonstration to demonstrate the ease of integrating small energy sources into a microgrid. A microgrid is a localized grouping of electricity sources that can operate connected or disconnected from the traditional grid. The project accomplished this objective by developing and demonstrating three advanced techniques, collectively referred to as the CERTS Microgrid concept, that significantly reduce the level of custom field engineering needed to operate microgrids consisting of small generating sources.

SCIENCE AND TECHNOLOGY TARGETS

	Current Goals	2011	2012	2013	2014	2015	Long Term Goals
DOE Goal 1 — Object. A.	**Clean Energy Transmission and Reliability** **R&D.** Demonstrate a grid stability prototype alarm tool ** Funding primarily devoted to Goal 2, Objective E*						**R&D.** Deploy over 850 synchrophasors and integrate with new tools and algorithms to enable an automatic, smart, real-time switchable network for transmission system operations to better detect grid disturbances and implement automatic measures to prevent widespread outages (FUNDED UNDER ARRA)
DOE Goal 1 — Object. C.	**Cyber Security for Energy Delivery Systems** **R&D.** Complete development of security audit files for 3 control systems ** Funding primarily devoted to Goal 2, Objective E*						**R&D.** Conduct "virtual" vulnerability assessment of 1 system
DOE Goal 2 — Object. B.	**Energy Storage** **R&D.** Demonstrate MW scale flow battery for renewable firming and load management ** Funding primarily devoted to Goal 2, Objective E*						**R&D.** Demonstrate 4hr storage in grid -scale application at $1,300/kW
DOE Goal 2 — Object. D.	**Smart Grid Development** **R&D.** Smart Grid Information Clearinghouse ** Funding primarily devoted to Goal 2, Objective E*						**R&D.** Demonstrate progressive achievements in distribution automation and demand response(1), with an additional prototypical distribution feeder(2) capable of dynamic optimization of grid operations and resources and 15% peak load reduction
DOE Goal 2 — Object. E.	**Renewable and Distributed Systems Integration** **R&D.** Demonstrate 10% peak load reduction or improvement in asset utilization on two feeder systems						
DOE Goal 2 — Object. E.	**High Temperature Superconductivity** **R&D.** Demonstrate prototype 70,000 A-m critical current-length for second generation wire						
DOE Goal 2 — Object. G.	**Permitting, Siting and Analysis** **PSA.** Support and participate in at least two events (workshops or technical conferences) to facilitate collaborative efforts among groups of States or other stakeholders ** Funding primarily devoted to Goal 2, Objective E*						**PSA.** PSA will assist 30 states each year in designing and implementing state electricity policies, statutes, and regulations that facilitate the development of the electricity infrastructure needed to access clean energy resources. The mixture of states and state assistance will vary from year to year.
DOE Goal 2 — Object. G.	**Infrastructure Security and Energy Restoration** **ISER.** Launch a web-based, industry-wide survey focusing on enhancing the reliability, survivability and resiliency of the oil and gas sector while measuring the reduction of carbon emissions associated with legacy, on-site assessments						**ISER.** Using the interdependency framework from FY 2014, incorporate the findings into a strategic plan for increasing international outreach in order to further enhance the security of international partners' energy infrastructure

Our Nation FACES AN ARRAY of energy challenges to our quality of life...

Our demand for electricity is outpacing the ability of our aging electricity grid to deliver adequate and reliable supplies needed to meet clean energy needs of the future. Bottlenecks and congestion are driving up the cost of electricity, and threatening costly blackouts. Supplies of electricity, oil and gas face the all too frequent specter of disruptions from natural and man-made disasters.

...YET THESE CHALLENGES INVITE

OPPORTUNITIES

Sustainable Living Solutions, Energy Independence, Reliability, Safety & Security, Green Job Proliferation, Global Leadership & Energy Infrastructure Resiliency

The challenges of a reliable energy infrastructure can be met by building on public interest and support, growing partnerships and synergies between the government and private sector, demonstrating leadership, leveraging resources, improving productivity, and effectively developing and using innovative technologies and solutions.

Strategic planning – based on sound analysis of these challenges – is OE's starting point for realizing these opportunities.

"THE INVESTMENT WE'RE MAKING **TODAY**

will create a newer, smarter electric grid that will allow for broader use of alternative energy... This investment will place Smart Meters in homes to make our energy bills lower, make outages less likely, and make it easier to use clean energy... And it's an investment that takes the important first step towards a national transmission superhighway that will connect our cities to the windy plains of the Dakotas and the sunny deserts of the Southwest."

– President Barack Obama, February 17, 2009

Achieving Energy Reliability **Together.**

Learn more about the work of OE and how you can get involved.

RESOURCES:

President Obama's "New Energy For America Plan": Learn More on the Web >

OE's Role in The American Recovery and Reinvestment Act of 2009: Learn More on the Web >

"The Smart Grid: An Introduction": Learn More on the Web >

Grid 2030 - A National Vision for Electricity's Second 100 Years": Download Report >

Energy Resources for Consumers: Learn More on the Web >

TO READ MORE ABOUT THE OFFICE OF ELECTRICITY DELIVERY & ENERGY RELIABILITY'S PROGRAMMATIC DIVISIONS VISIT:

Infrastructure Security & Energy Restoration (ISER): Learn More on the Web >

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