Workforce Training for the Electric Power Sector:
Transforming the Nation's Electric Grid by Training Skilled Workers

The deployment of a smart grid—modernizing the Nation's electric power infrastructure—is currently in the public eye with attention paid predominantly to deployment of advanced equipment, technologies and applications. A less prominent but equally vital factor to the smart grid's success is the need for a highly skilled electric power sector workforce. The current labor force is aging; a considerable number of the most knowledgeable workers are headed toward retirement. Furthermore, even the most experienced workers often lack the updated skills and training needed to successfully support the advanced systems, tools and devices that make up the smart grid.

Critical electric power workforce challenges are highlighted in estimates provided by the U.S. Power and Engineering Collaborative.[1] Approximately 45 percent of power system engineers will be eligible for retirement within five years [of the 2009 report date]. Electric utilities will need to hire over 7,000 new power engineers, and two or three times that number of professional engineers may be needed to satisfy the needs of the entire economy. In addition, about 40 percent of key power engineering faculty at U.S. universities will be eligible for retirement in five years. According to the Collaborative, "Few people doubt that, when they flip the switch, the power will be on. Aging trends in the electrical engineering workforce and in existing infrastructure will make it difficult to meet these reliability expectations unless action is taken today. Engineering workforce shortages are already occurring."

Locations of WFT recipients

To address this need, the U.S. Department of Energy's Office of Electric Delivery and Energy Reliability (OE) is funding 51 organizations to participate in the Workforce Training in the Electric Power Sector Program (WFT). Funding for the WFT is provided by the American Recovery and Reinvestment Act of 2009 (Recovery Act). WFT participant organizations—universities, community colleagues, electric utilities and other workforce institutes—are facilitating development of a trained and skilled electric power workforce capable of implementing a smart grid, providing for the next generation of well-qualified technicians, engineers, and electric power managers.

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[1] The U.S. Power and Engineering Workforce Collaborative. Preparing the U.S. Foundation for Future Electric Energy Systems: A Strong Power and Energy Engineering Workforce. April 2009. < http://www.ieee-pes.org/images/pdf/US_Power_&_Energy_Collaborative_Action_Plan_April_2009_Adobe72.pdf>

Working with a total budget of $185 million, including $99 million in Recovery Act funding, WFT recipients are implementing projects that fall into one of two subject areas: *Developing and Enhancing Workforce Training Programs for the Electric Power Sector* and *Smart Grid Workforce Training*. The WFT Program established these two parallel tracks to meet goals outlined below that support a 21st Century electric power workforce:

- Raise awareness and create interest in careers in electric utilities while addressing employment needs due to electric worker retirements.

- Train professionals at all levels of the utility hierarchy to implement future innovations, including demand response, distributed generation, energy utilization/optimization, and cost simulations based on multiple rate structures.

- Promote excellence in electric power education and research and ignite public interest in smart grid and clean technology systems.

At the heart of the WFT Program are collaborations and partnerships between educational providers and the utility industry to meet the growing demand for workers with the skills necessary to support a digital grid. More than one-third of the selected WFT projects – 19 in total - are partnering with or have also received a Smart Grid Investment Grant (SGIG), and so are leveraging the taxpayer investment of Recovery Act funds to enhance workforce training in the electric power sector. Thus, the taxpayers' investments are being leveraged to enhance both the United States' future electric grid and the electric power sector that will support that grid. Below are examples of projects in which educational providers are partnering with SGIG recipients:

> **Centralia College ($5M WFT) & Avista ($20M SGIG)/Idaho Power ($47M SGIG)**: An exceptional example of synergistic smart grid collaboration is the future Pacific Northwest Center of Excellence for Clean Energy. The entities involved in establishing this institution are Centralia College in Washington State and SGIG recipients Avista Utilities and Idaho Power, along with the Bonneville Power Administration, Pacific Northwest Laboratory, Puget Sound Energy, Seattle City Light, the AFL-CIO, International Brotherhood of Electrical Workers, and the Veterans Conservation Corps. The collaborating partners will design and deliver educational programs to develop future instrument control and relay specialists, line workers, sub-station operators, and meter technicians. Training will be provided in satellite centers throughout the Pacific Northwest, benefitting the region's utilities with a larger pool of highly skilled electric power workers. The collaboration made Centralia a finalist for the 2011 Bellwether Award, which recognizes outstanding and innovative programs and practices that other colleges might find worthy of replicating.

> **Glendale Community College ($750K WFT) & Glendale Water and Power ($20M SGIG)/Burbank Water and Power ($20M SGIG)/Anaheim Public Utilities Department ($5.9M SGIG)**: The Southern California Utilities Initiative is a consortium consisting of WFT and SGIG recipients (as above), three SoCal Workforce Investment Boards, and California State Northridge. The consortium is expanding existing training curricula and programs through regional One-Stop Workforce career centers, which provide training in three curricular areas. Graduates receive Electric Utility certificates, increasing their chances of obtaining high paying

jobs with area utilities. In addition, the career center credits are transferable to local colleges, allowing trainees to further their educations while working. Thus, the project not only helps but also motivates workers to acquire training.

Pennsylvania State University (Penn State) ($5M WFT) and PECO ($200M SGIG)/ PJM ($13.7M): Penn State's GridSTAR Center provides education and training of a workforce needed to design, construct, and operate a smart grid. Operations will begin at University Park and will include two satellite locations at the Philadelphia Navy Yard and the Pittsburgh Green Innovators facility at the former Pittsburgh Public Vocational Technical High School. The GridSTAR Center is coordinating with a team of utility, energy management, manufacturing, and training partners to provide systems-based continuing education and train-the-trainer programs in advanced power systems design, energy economics, cyber security, distributed energy and generation, and building–vehicle–grid systems.

University of Houston ($2.5M WFT) and CenterPoint Energy ($200M SGIG): The Smart Grid Energy Training Coalition is establishing a Power Training Campus in response to workforce needs; establishing processes to determine skill objectives and design training; and providing a clear career progression from getting entry-level hands-on training through developing basic and specialized skills to attaining advanced skills and degrees for higher-level design and management functions. The Coalition will ensure that credits are transferable by executing agreements across training partners.

In some cases, recipients received both WFT and SGIG grants. These recipients are highly motivated to ensure the future U.S. labor force—and their own workers in particular—will be able to implement new SGIG-supported technologies and equipment. These projects are outlined below:

Florida Power & Light (FPL) ($12.5M WFT and $200M SGIG): The Gateway to Power Consortium, led by FPL and Smart Energy Grid Associates, comprises four Florida academic institutions (Florida Atlantic University, Florida International University, Indian River Community College, and Palm Beach Community College) and two out-of-state universities (Massachusetts Institute of Technology and State University of New York–Buffalo). These cross-disciplinary training programs will lead to both certificates and degrees in a number of electric power-related fields. Program graduates will be trained in design, planning, construction, operation, and electric power facility maintenance.

Consolidated Edison Company of New York (Con Edison) ($236K WFT, $136M SGIG): Con Edison is developing a training program to prepare its own workforce to implement advanced system capabilities, such as rapid restoration and grid reconfiguration. The curriculum includes remote operation of reclosers, switches, regulators, sophisticated capacitor band controllers, supervisory control and data acquisition communications systems (SCADA), and sectionalizers, as well as management of these systems. Program requirements include successful completion of North American Electric Reliability Corporation's Critical Infrastructure Protection training. A novel feature of Con Edison's training is the use of simulators in a distribution control center

environment, providing hands-on familiarity with integrated use of SCADA, risk management, contingency analysis, and contingency response.

Potomac Electric Power Company (PEPCO)($4.4M WFT, $168.1M SGIG): As PEPCO implements three separate SGIG projects in Washington, DC, Maryland, and southeast New Jersey, the workforce grant ensures that PEPCO builds and maintains a highly skilled electric power sector workforce by training technicians in four areas: customer engagement; deployment and operation of smart metering, load control, distribution automation and grid optimization; implementation and operation of two-way communications infrastructure; and compliance with interoperability and cybersecurity standards.

Learn More

The Recovery Act provided DOE with $4.5 billion to fund projects that modernize the Nation's energy infrastructure and enhance energy independence. For more information about the status of other Recovery Act projects, visit www.smartgrid.gov. To learn about DOE's Office of Electricity Delivery and Energy Reliability's national efforts to modernize the electric grid, visit www.oe.energy.gov.