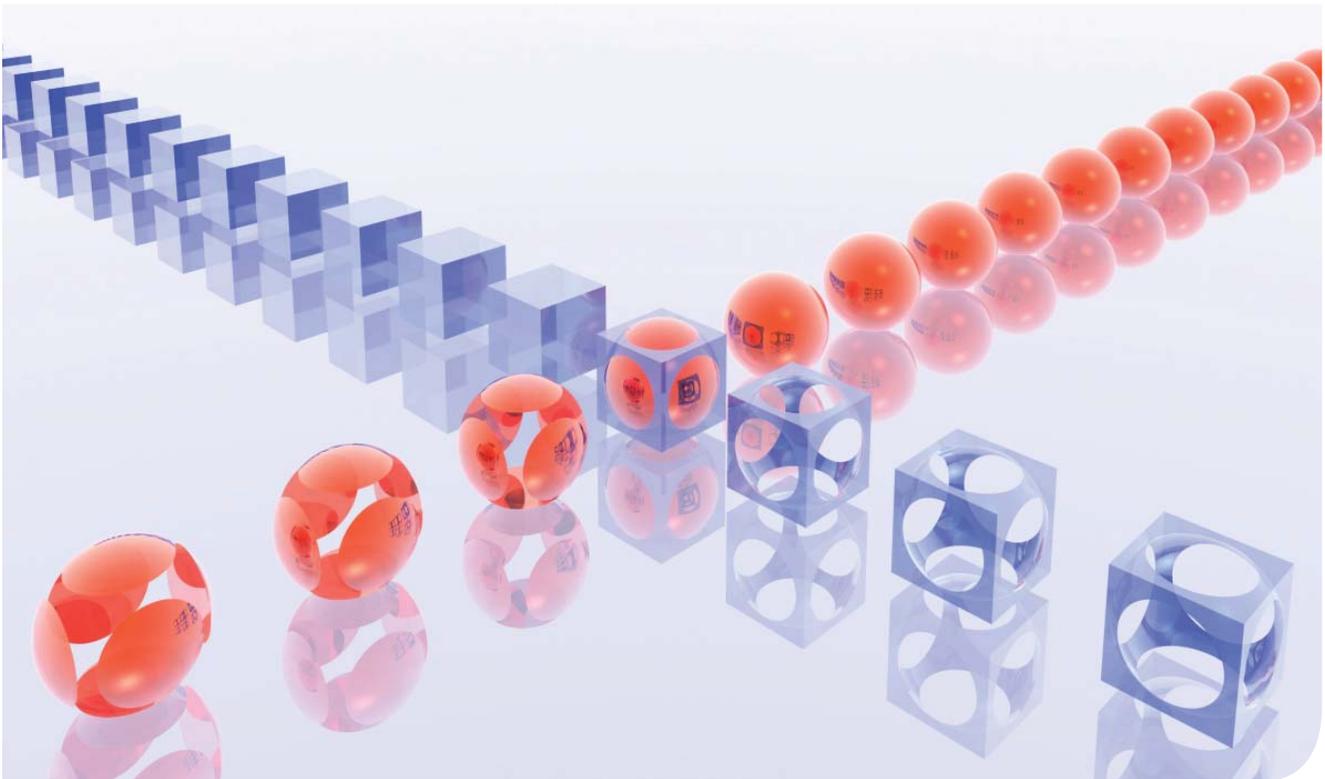


The U.S. Smart Grid Revolution

Smart Grid Workforce Trends 2011



Job creation and development of industry native to the United States is a national priority. Smart grid continues to be a primary example of a technological area that is ripe with opportunity and ready for continued innovation and creativity.

- > Smart grid will expand opportunities in the electric energy industry as a whole, presenting an opportunity for the U.S. to develop a strong native industry around development, deployment, maintenance, and servicing of smart grid infrastructure and technologies
- > Strong investment continues to flow into the smart grid sector, opening new, stronger job opportunities
- > Redefined job requirements are opening opportunities for current employees and for those who will replace them in the future.

Utility Jobs – The evolution of smart grid continues to redefine the electric energy industry. Utilities will begin, and some have already begun, to reorganize and redefine themselves around smart grid technology, processes, procedures, requirements, and products. In the energy industry:

- > Shifting requirements of existing jobs makes retraining efforts of the existing workforce a primary priority, particularly among utilities in the process of deploying smart grid solutions
- > While new jobs are being created, electric energy industry companies are particularly active in retraining efforts to enable current employees within the smart grid workforce to adapt and take on new roles related to smart grid technology and processes.

Smart Grid Sector Jobs – The pace of new market entrants participating in energy delivery is faster now than during any recent period. Utilities, contractors, suppliers, integrators, and manufacturers:

- > Continue to take a very active interest in smart grid
- > Are growing and creating smart grid workforce jobs and a strong demand for new skills
- > Are placing a particular value on skill sets related to communications technology and software development and management. (See Table 2.2 in full report for details.)

Smart Grid Job Potential – Recent survey results suggest that utilities will need to replace 46 percent of skilled technician positions by 2015 due to retirement or attrition. Approximately 50 percent of the engineering workforce will be eligible to retire by 2015:

- > Electric energy industry hiring activity is likely to pickup as the economy continues to stabilize and grow
- > This represents opportunities for the electric energy industry to leverage smart grid with new services and solutions
- > Data on utility workforce retirements and number of replacements through 2015 in the table below emphasize the necessity of new recruiting.

Utilities Workforce Transition 2009-2015

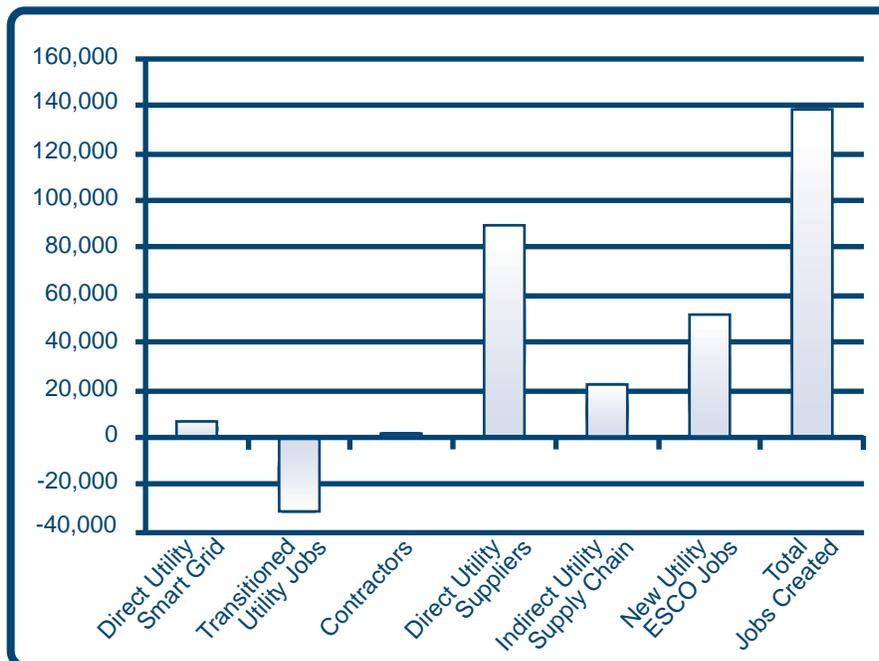
Job Category	Potential Attrition and Retirement %	Estimated Number of Replacements
Technicians	50.7	27,800
Non-Nuclear Plant Operators	49.2	12,300
Pipefitters/Pipelayers	46.1	8,900
Lineworkers	42.1	30,800
Engineers	51.1	16,400

Source: Center for Energy Workforce Development, 2009

Job Forecast – In a 2009 report, KEMA outlined smart grid job projections for six categories, based on a single utility filing for smart grid deployment. In that report, KEMA's projection anticipated that a potential disbursement of \$16 billion in smart grid incentives would:

- > Act as a catalyst to drive associated smart grid projects that are worth \$64 billion
- > Create an estimated 140,000 new direct jobs that would persist beyond the smart grid deployment as permanent, on-going high-value positions
- > There is substantial financial leverage still to come from this investment-leveraging federal dollars will continue to produce thousands of jobs in this sector.

Total Smart Grid Jobs Created and Transitioned: 2009-2018



Source: KEMA, "The U.S. Smart Grid Revolution: KEMA's Perspectives for Job Creation," January 13, 2009

Economic Impact – Retraining of electric energy industry employees displaced by smart grid technology offers significant economic benefit as employees assume a position at a higher classification level within the utility workforce:

- > New jobs within the electric energy industry that require a higher skill level pay significantly more, thereby generating the economic benefit both to the new employee and to the economy at large
- > Electric energy industry companies will need to adjust the number of positions within the higher classification levels to suit individual deployment plans to maintain overall performance efficiency as the legacy electrical network is upgraded.

For an example of the economic impact of smart grid retraining, a large investor owned utility pursuing smart grid initiatives has forecasted a positive local economic benefit through retraining over 200 workers for smart grid-related positions that pay on average between 50-67 percent more than the existing hourly salary.

Enabling Smart Grid Job Creation and Growth

Education and training for the existing and future smart grid workforce is of paramount concern and priority. Successful organizational transition to the smart grid and smart grid job creation and growth include:

- > Designing retraining programs that speak directly to the training gaps of existing electric energy industry workers
- > Designing engineering and technical curricula for future employees that resonate with the needs of the smart grid workforce, such as broad analytical skills, strong engineering fundamentals, and strong business acumen
- > Designing retraining efforts to familiarize workers with smart grid technology and systems
- > Educating current students who will be the smart grid workforce.

To address future smart grid workforce needs, industry, academia, and government must collaborate to create and sustain degree and training programs that meet the broadest possible base of emerging smart grid-related skills.

Considerations for Supporting Smart Grid Job Creation and Growth

Academia	<p>Universities must increase emphasis on cross-disciplinary work. Smart grid jobs will require leaders who can think about several aspects of an electric energy industry company, such as accounting, operations, and technology departments at the same time. The central challenge is to maintain high quality engineering educational programs while augmenting and modifying them to fit this cross-disciplinary need.</p> <p>Community colleges are uniquely positioned to respond directly to local and regional workforce needs and often have direct relationships with individual companies. Community colleges excel at developing training programs and full courses to quickly to respond to particular short-term workforce demands. They also tend to offer comprehensive online courses to accommodate workers who need to retrain while maintaining full-time jobs at renewable energy manufacturers, technology companies, service companies, and utilities.</p> <p>Industry and schools should find exciting ways to promote energy industry work to younger students. Over the last generation, science-technology-engineering-mathematics (STEM) education has weakened and needs to be reemphasized.</p> <p>Private institutions also are providing funding that enables the development of training opportunities. The Bill and Melinda Gates Foundation recently granted \$1.37 million to the Center for Energy Workforce Development to train low-income adults for careers in the energy industry.</p>
Government	<p>Workforce Retraining Programs with effective targeted use of resources for a smart grid-centered industry. These government-funded programs allow students to earn valuable smart grid-related knowledge, which is directly pertinent to the electric energy industry.</p> <p>Before students reach the high-school or college level, they should be exposed to rigorous STEM curricula at the grade-school level. STEM skills are critical to spurring interest in the electric energy industry and to providing a learning base necessary for success in later engineering and technician programs.</p>
Industry	<p>Market forces—in the short term—are acting to fill this smart grid workforce requirement-skill gap. This solution is adequate for the short-term but should not be utilities' and system operators' long-term answer to changing workforce requirements.</p> <p>Utilities must develop roadmaps to fully integrate smart grid as a system, rather than implementing it in an ad-hoc manner. Generating system efficiencies sufficient to justify smart grid investment relies on a comprehensive plan.</p> <p>The electric energy industry must communicate consistently with academic institutions to inform curricula development. The most effective educational programs are driven by market forces, by way of industry activity and input. It is also critical for the electric energy industry to communicate effectively with purveyors of government funding streams that support workforce training.</p>
Change Management	<p>The rapid organizational change and the transition to a smart grid workforce present unique and unprecedented challenges for the electric energy industry. Organizational change creates a new future state that people must populate. Successful change management take a sustained effort over a long period of time before project start to beyond completion.</p>

The full Smart Grid Workforce Trends 2011 report is available at:

http://www.gridwise.org/documents/GWA_2011_SG_Workforce_Trends_Overview.pdf