

*Developing
New Jersey's*

Green Energy Workforce



PSEG

**PUBLIC SERVICE ENTERPRISE GROUP (PSEG):
DEVELOPING NEW JERSEY'S
GREEN ENERGY WORKFORCE**

Executive Summary

Combating climate change is the most important environmental challenge of our time. Meeting this challenge will require that we transform our economy to one that is more energy efficient and less carbon-intensive. This transformation will fuel significant job growth.

While policy changes, such as carbon regulation, are beginning to create the framework for this green economy, initiatives to prepare our workforce are lagging behind. Without adequate workforce planning, we will be unable to meet the greenhouse gas reduction targets that are necessary to prevent the damaging effects of climate change. Moreover, green workforce development is crucial to addressing climate change in a manner that maximizes job creation and long-term economic growth.

PSEG is seeking to become a leader in developing New Jersey's green energy workforce. We will do so by pursuing three critical strategies:

1. Attract and train a greater number of diverse and skilled workers for the green energy industry.
2. Create workforce development partnerships that help the energy industry adapt to the evolving green economy.
3. Facilitate knowledge transfer between our green and traditional workforce.

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Understanding Green Jobs

A green job is defined generally as one that reduces humans' negative impact on the environment. This includes jobs in green industries, such as recycling or forest management, or green jobs within traditional industries, like appliance or automobile manufacturing.

In the electric and gas industry, green jobs include any function that reduces negative environmental impacts from the wellhead or generating station to the end user. This encompasses a wide range of professions. It includes both a Ph.D. scientist who develops solar panel technologies and a solar panel installer trained at a community college. It includes a building analyst with a master's degree who performs complex energy audits on large facilities and a worker with a vocational high school education who retrofits homes with insulation and more efficient equipment. It also includes the range of employees who design, build and run nuclear power plants – by far our nation's largest source of zero-carbon generation.

Green jobs are generally not brand new career paths, but rather modifications of existing careers. To implement energy efficiency upgrades or install and operate renewable energy systems requires heating, ventilating and air conditioning (HVAC) technicians, pipefitters, plumbers, electricians, electrical engineers, carpenters, welders, machinists and a range of other existing professionals who have received additional training in green methods and technologies.

While there remains some debate about the precise definition of a green worker, for New Jersey's energy industry the answer is simple: a green worker is anyone who the energy industry will need to help meet New Jersey's aggressive energy efficiency, renewable energy and carbon reduction goals.

Workforce Challenges in the Energy Industry

The State of New Jersey has set three energy goals to be reached by 2020:

- Reduce demand for electricity and non-electric heat by 20 percent of projected levels.

- Generate 20 percent of electricity from renewable resources.
- Reduce greenhouse gas emissions to their 1990 levels.

One of the characteristics of the renewable energy and energy efficiency industries is that they are labor intensive and promote local job creation. According to the Apollo Alliance, energy efficiency creates 21.5 jobs for every \$1 million invested compared to 11.5 jobs for new natural gas generation, and renewable energy requires four times as many jobs per megawatt of installed capacity as natural gas.¹ The labor intensive nature of these industries means that workforce development is one of the central challenges to growing green industries and meeting the State's goals.

To put in perspective the workforce that will be needed to reach these goals, consider that implementing basic efficiency measures on every single-family home in New Jersey would achieve less than one fifth of the electric demand reduction goal, and only one third of the natural gas demand reduction goal.² The installation of solar energy systems on 100,000 homes would achieve only about 5 percent of the renewable energy goal.³

New Jersey will face competition for this green workforce as other states are also pursuing green energy goals. More than half the states in the nation, including every state in our region, have set renewable energy targets.⁴ At least 14 other states have energy efficiency goals.⁵ And 10 northeast states have agreed to mandatory caps on carbon emissions starting in 2009, with a national carbon regulation system expected to be established within the next few years.

Evidence already suggests that we are not prepared to respond to this rising demand for green workers. Across the country, and in New Jersey, workforce shortages are starting to emerge in green industries, as well as some of the professions from which green industries will have to draw:

- The National Renewable Energy Lab has identified a shortage of skills and training as a leading barrier to growth in the fields of renewable energy and energy efficiency.⁶ Washington State estimates that it will need an additional 25,000 workers to meet its renewable energy goals, and the lack of a green workforce stands as one of its biggest barriers to meeting those goals.⁷
- At a recent meeting convened by the New Jersey Department of Labor and Workforce Development, a wide range of representatives from New Jersey's renewable energy and advanced energy technology industries stated that they are struggling to find enough workers with electrical and mechanical skills at various levels of employment – from laborers and skilled technicians to engineers of all kinds.⁸
- A recent survey by the National Association of Manufacturers revealed that 90 percent of respondents indicated a moderate to severe shortage of qualified, skilled production employees, such as machinists and technicians.⁹

- According to the U.S. Department of Energy (DOE), university programs for power engineering, and the availability of professors to teach those programs, are waning. Without support for these programs, DOE believes a shortage of power engineers will emerge.¹⁰
- According to the Nuclear Energy Institute, 35 percent of the current nuclear workforce will be eligible to retire by 2012.¹¹ Yet, over the last two decades, training programs for nuclear careers have atrophied, with just 30 American colleges offering a course in nuclear engineering – less than half of what was offered in 1980.¹² At the same time, 31 new nuclear units are being considered for construction, which would require roughly 50,000 workers during construction and upward of 20,000 workers to operate.¹³ As demand for nuclear energy increases, the lack of a ready labor force is one of the constraints to growth in this industry.

The electric and gas utility industry also is facing challenges with its traditional workforce. The average age for workers in the energy industry is nearly 50 years old, whereas for all U.S. workers it is just above 40.¹⁴ At least half of electric utilities' technical workforce will be eligible for retirement in the next five to ten years.¹⁵ By 2010, the shortfall in the supply of electric lineworkers nationwide may reach 10,000 – 20 percent of the current lineworker workforce.¹⁶ Therefore, the energy industry will be engaged in a major effort to develop a new generation of workers to fill traditional energy industry jobs at the same time it is trying to develop a green workforce.

Assessing New Jersey's Green Workforce Needs

The natural first step toward establishing effective workforce development policies is to conduct a detailed assessment of New Jersey's green employment needs that identifies skills gaps and barriers to workforce expansion. Based on this analysis, policies can be developed to address these skills gaps and remove barriers to workforce expansion. The State of New Jersey is planning initial steps toward gathering this information. The draft of New Jersey's Energy Master Plan (EMP) – a blueprint for energy policy being prepared by state government – directs relevant state agencies to assess the workforce needs and challenges of New Jersey's existing green businesses.¹⁷

However, given the magnitude of the tasks ahead, and the short time frame in which New Jersey must meet its goals, immediate actions are also required. Without completing a full workforce analysis, we know that achieving dramatic reductions in greenhouse gas emissions will require an infusion of green workers at almost all educational levels. This will include workers to conduct energy audits and implement energy efficiency measures on homes, businesses and industrial facilities. In fact, the draft EMP projects the completion of efficiency upgrades on all of New Jersey's 3.7 million existing buildings by 2020.¹⁸ Achieving the State's goals also will require an increased number of workers who can install, operate and maintain solar, wind and biomass energy generation – all technologies for which the draft EMP sets specific targets for deployment.

Therefore, in addition to conducting a detailed green workforce assessment, New Jersey must begin mapping out strategies for developing a green workforce today if we are to meet the State's energy goals by 2020.

Strategies for Developing New Jersey's Green Workforce

PSEG is starting to make significant investments in energy efficiency and renewable energy and already has major investments in clean central-station power. PSEG is committed to becoming an industry leader in green workforce development. In this effort, we will pursue the following three strategies:

Strategy #1: Attract and train a greater number of diverse and skilled workers for the green energy industry.

The pipeline of green workers coming into New Jersey's energy industry must flow faster if we are to meet the State's energy goals. Increasing the flow of green workers will require a range of actions from government, industry and educational institutions.

For example, federal and state education agencies should take steps to further promote career and technical education. Current standards and regulations place significant value in college admission rates and standardized testing, and relatively less value in apprenticeships, experiential learning and job placement. In response to diminished focus on career and technical education, Florida passed the Florida Career and Professional Training Act, which required each district to have a career and professional academy with a curriculum tailored to meet industry-recognized certifications for high-demand occupations, and streamlined the regulatory approval process for such programs.

The energy industry also should forge stronger working relationships with secondary schools to help attract future workers and better align public education with industry needs. For example, many vocational schools are teaching students to install inefficient and outdated technologies. Energy companies could conduct teacher trainings and donate the latest technologies so that schools are better preparing students for the green economy.

In addition, there are steps the energy industry can take to broaden and strengthen its outreach and recruitment efforts to both mid-career and young professionals. This could range from targeting recruitment efforts at veterans with applicable skills, to utilizing the Internet and social networking applications to attract younger workers.

Preparing a green workforce will also require a focus on re-training New Jersey's existing workforce in green methods and technologies. This will be important to ensure that service professionals, such as HVAC technicians, are installing clean and efficient equipment throughout New Jersey.

PSEG is already taking steps to begin attracting and training more diverse and skilled workers for the green energy industry:

- **Expanding PSEG’s energy utility technology degree program to prepare students for the green energy industry.** PSEG created an energy utility technology degree program as a means to recruit and train our workforce of the future. This program, which is available at four two-year community colleges, combines classroom instruction with technical apprentice-level training at PSEG’s Edison Training and Developmental Center. As part of the program, students complete two internships, and are mentored by PSEG employees on the job and in the classroom. The program has been highly successful, as PSEG has hired 62 students to date – 86 percent of the program’s graduates. A four-year bachelor’s degree in energy utility technology is also available at Thomas Edison State College.

PSEG now is adapting this program to prepare students for the green workforce. In September 2008, a 101-level course called Alternative Energy Sources will be added to the curriculum at Mercer County Community College. This course will help students understand the green economy and expose them to green industries like energy efficiency and the full range of renewable energy technologies. By January 2009, this course will be added at three other community colleges, and PSEG plans to further expand its curriculum with courses to prepare students for specific green jobs.

PSEG plans to make its green curriculum available for use at colleges or high schools nationwide, in an effort to increase student exposure to the green economy.

- **Creating a green energy academy at Essex County Vocational Technical School in Bloomfield.** PSEG is working with the Essex County Vocational Technical School system to create a green energy academy dedicated to preparing students for the green workforce. This academy would combine classroom and experiential learning to equip high school students with the skills necessary to follow one of three paths upon graduation: 1) enter the green workforce as an apprentice or full-time employee, 2) enroll in a community college program, such as the energy utility technology degree program, or 3) enroll in a four-year institution.

A similar model is working in Florida, where Gulf Power Company has partnered with West Florida High School to create a highly successful energy academy, from which Gulf Power has hired 22 graduates in the program’s first three years. Since beginning at West Florida High, this program has been expanded to two additional Florida high schools.¹⁹

- **Working with the State and community development organizations to create a green jobs training facility.** PSEG is partnering with the New Jersey Department of Labor and Workforce Development (DLWD); Isles Inc., a Trenton-based community development corporation; and other organizations to develop plans for a green workforce development training center where industry, educational institutions and government come together to prepare New Jersey’s green workforce for fields such as green building, energy efficiency retrofits, and renewable energy installation. Preliminary plans are for the center to serve as a resource to retrain current energy industry employees, develop new employees, train trainers, and promote urban economic development. The center may also help coordinate statewide industry

certifications for various professions. With the assistance of DLWD funding, the goal is for the center to begin training workers in 2009.

- **Developing additional training capabilities for New Jersey's nuclear workforce.** To help address the looming nuclear workforce shortage, PSEG is implementing a curriculum at Salem County Community College to prepare the next generation of nuclear workers. We anticipate the first course to be in place by September 2008.

In addition, PSEG is partnering with the Stevens Institute of Technology to help build a nuclear power engineering program. PSEG will help develop the curriculum, provide experiential learning opportunities to students and assist with program assessment and review.

- **Promoting urban economic development and job creation.** One of the key roles that utilities will play in the green economy is ensuring universal access to its benefits. This not only means access to renewable energy and improved efficiency, but also access to the jobs and economic growth created by the green economy. To take advantage of these opportunities, the energy industry must work with community development organizations, foundations, and state and local governments to create workforce development programs that allow urban residents to serve their communities by making them greener.

PSEG is a partner in the Trenton Green initiative, which is aimed at creating green jobs and making Trenton more environmentally friendly. PSEG is donating staff resources to help the city evaluate its energy use and create programs to develop a green workforce.

PSEG is also working with a coalition in Newark to create programs to develop the city's green workforce. We hope these will become models for such efforts throughout the state.

- **Paying good wages.** It is critical that green jobs pay good wages. If someone cannot support a family by working a green job, it will not be an attractive career option and we will fall short of developing the workforce we need. PSEG is committed to utilizing our highly skilled unionized workforce to participate fully in the green economy. In addition, publicly funded programs hiring green workers should pay prevailing wages, which are the average local wages paid for similar jobs under collective bargaining agreements.

Strategy #2: Create workforce development partnerships that help the energy industry adapt to the evolving green economy.

Many of the key elements of New Jersey's green economy are already in place. The State has imposed legislative and regulatory mandates that will help drive the development of green industries; policymakers and business leaders have expressed and demonstrated their desire to foster a green economy; and funding opportunities, including federal, state and private investments, are growing rapidly.²⁰

At the same time, much about the green economy remains uncertain. The legal and regulatory landscape is still evolving; green industries are still in periods of rapid initial growth; and green technologies continue to change. These factors make it difficult to predict the kind of green workforce New Jersey will need.

The complexity of this challenge demands thoughtful collaboration among interested parties – government, industry, labor, non-profits and educational institutions – to establish workforce development partnerships that can meet the evolving needs of the green economy. Such partnerships are crucial to ensuring that these groups are sharing information and effectively coordinating their resources to meet New Jersey’s green workforce needs.

Other states have begun to establish models for this type of collaborative workforce development effort. For example, Florida has established an energy workforce consortium of more than 50 members from across the private and public sectors that meets regularly to help the state coordinate resources and map out workforce development strategies.

Some states have created centers for energy workforce development, which pool resources to create a physical home for workforce development. These centers can jumpstart the development of a reliable supply of workers by identifying workforce skill and training needs; coordinating the development of curricula and certification criteria; conducting trainings; helping match workers and employers; and serving as a clearinghouse for model programs and best practices. Such centers have been established in Florida and Washington.²¹

Other states have established green energy research and development institutes at universities. These institutes leverage university resources to attract federal and private research funding; help bridge the gaps between research, commercialization and implementation of green energy technologies; and drive classroom learning toward green industries. In New York, the Syracuse University Center for Environment and Energy fulfills this role. New York is also in the preliminary stages of creating a Wind Energy Research and Testing Center at one of the state’s universities.²²

New Jersey is beginning to develop its own workforce development partnerships to help prepare for the emerging green economy. This has been spurred by the leadership of Governor Corzine and his administration; local leaders, such as Newark Mayor Corey Booker and Trenton Mayor Douglas Palmer; non-profit organizations, such as Green-for-All, the Apollo Alliance and Isles Inc; labor organizations, such as the IBEW; and industry leaders, such as PSEG.

As described above, PSEG is collaborating with high schools, colleges, the State, and broad coalitions in Newark and Trenton to develop and implement green workforce development programs. In addition to these efforts, PSEG is participating in the following partnerships:

- **Participating in New Jersey’s Industry Workforce Advisory Councils (IWAC).** PSEG is a member of two IWACs established by the New Jersey Department of Labor and Workforce Development: the Conservation / Green Collar Jobs IWAC and the Clean Energy / Clean Technology IWAC. These groups seek to identify the green workforce needs of employers, and develop policies to help meet those needs.
- **Serving as Chair of the Center for Energy Workforce Development (CEWD).** PSEG President and CEO Ralph Izzo recently became chairman of CEWD, a non-profit consortium of electric and gas utilities and power companies focused on creating workforce development initiatives to serve the industry. PSEG will use this role, in part, to help improve industry efforts to recruit, train and hire a green workforce.
- **Partnering with nuclear energy trade organizations to address workforce shortages.** PSEG is working with nuclear industry organizations, such as the Nuclear Energy Institute (NEI) and the Institute for Nuclear Plant Operators (INPO), to develop strategies to recruit and train more nuclear workers. Among the strategies being considered is an initiative to better coordinate and standardize pre-employment training programs so that employees are more uniformly prepared once they enter the nuclear industry.
- **Joining with educational institutions to establish Innovation Partnership Institutes (IPI) to develop model green curricula for New Jersey.** IPIs would bring together industry and educational institutions to develop model curricula for New Jersey’s secondary schools and higher education system to prepare students for green careers. PSEG is supporting several educational institutions, including Rutgers University, Essex and Sussex County Community Colleges, and the Stevens Institute of Technology, in their applications for grants from the New Jersey Commission on Higher Education to establish IPIs.

Strategy #3: Facilitate knowledge transfer between our green and traditional workforce.

The increasing public focus on green jobs can at times overshadow the importance of the traditional energy workforce. However, traditional energy functions – central station power, transmission and distribution – will still be important in a green economy. Moreover, PSEG strives to infuse green concepts – clean and efficient processes that minimize negative impact on the environment – into all areas of our business, rather than create two silos of workers: green and non-green.

Conversely, the institutional knowledge and skills of our traditional energy workforce will be crucial to the execution of green jobs. For example, many PSEG employees already enter customers’ homes and perform utility and appliance services, which requires many of the skills necessary to perform home energy audits. And the installation of distributed renewable generation will require connecting to the electric grid that PSEG workers have maintained for over a century.

Therefore, energy companies must ensure that knowledge is transferred between the green and traditional workforce, and between new and more experienced employees. This is particularly important given the wave of retirements expected in the next five to 10 years. PSEG is beginning to do this with the following initiatives:

- **Reinventing retirement.** Rather than the traditional model where employees abruptly depart the workforce, PSEG is developing options for employees to start departing on a more gradual basis, by progressively reducing their workload. Some green jobs, such as conducting home energy audits, could be ideal for a phased retirement as an employee might have the option of working close to home in his or her community.
- **Strengthening mentorship programs.** Formalized mentorship programs are an important way to pass institutional knowledge. PSEG is developing plans to expand and enhance its mentorship programs in anticipation of increased worker retirements.
- **Beginning to re-staff before the wave of retirements to facilitate knowledge transfer.** Energy companies should not wait until they are hit with mass retirements before starting to hire a new generation of workers. PSEG is developing recruitment and hiring strategies to create an overlap between retiring employees and new hires to more effectively facilitate knowledge transfer.

Conclusion

If New Jersey is to meet its goals for combating climate change and transitioning to a green economy, it must begin to develop its green workforce today. PSEG has outlined a strategic framework for developing that workforce, but the real work lies ahead. Meeting this challenge will require careful analysis and planning, and close collaboration among industry, government, labor, non-profits and educational institutions. We are starting to see such efforts in New Jersey and across the nation, and we must build upon these initial successes.

While we are becoming familiar with the litany of consequences of failing to combat climate change, there are equally compelling and positive benefits to be realized if we meet this challenge. Chief among them is economic growth and the creation of well-paying green jobs. PSEG is committed to working with partners across the state to develop our green workforce so that New Jersey can realize the full potential of the green economy.

Questions or comments?
Email PSEG at workforce@pseg.com

¹ “New Energy for America,” The Apollo Alliance, www.apolloalliance.org, January 2004.

² In this example, the basic efficiency measures include laying attic insulation, sealing ducts, installing programmable thermostats, caulking, weather stripping and adding five compact fluorescent light bulbs. Based on PSEG’s analysis, projected savings from these measures is roughly 7% of the average annual residential energy bill. According to the U.S. Census, there are roughly 2.2 million single-family homes in New Jersey.

³ This calculation is based on the installation of 5 KW solar panel systems with a capacity factor of 18%. According to modeling by the State of New Jersey, approximately 16,000 gigawatt hours of renewable energy will be needed to meet the State’s goals; the solar panels in this example would contribute less than 800 gigawatt hours. As an aside, New Jersey also has a specific requirement for solar energy; the installation of 100,000 5 KW systems would achieve roughly one third of this solar requirement.

⁴ U.S. Department of Energy, http://www.eere.energy.gov/states/maps/renewable_portfolio_states.cfm

⁵ “Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy,” Sarah White and Jason Walsh, Center on Wisconsin Strategy/The Workforce Alliance/The Apollo Alliance, March 2008.

⁶ “Nontechnical Barriers to Solar Energy Use: Review of Recent Literature,” R. Margolis and J. Zuboy, National Renewable Energy Laboratory, 2006.

⁷ “Where the Jobs Are: As the renewable-power industry takes off, so does the demand for green-collar workers,” Rebecca Smith, The Wall Street Journal, March 24, 2008.

⁸ Letter from New Jersey Department of Labor and Workforce Development Commissioner David Socolow to member of the Clean Energy / Clean Technology Industry Workforce Advisory Council, February 29, 2008.

⁹ “2005 Skills Gap Report: A National Association of Manufacturers Survey of the American Manufacturing Workforce,” The National Association of Manufacturers, 2005.

¹⁰ “Workforce Trends in the Electric Utility Industry,” U.S. Department of Energy report to Congress, 2006.

¹¹ Carol L. Berrigan, Director, Industry Infrastructure, Nuclear Energy Institute, testimony before the U.S. Senate Committee on Energy and Natural Resources, November 6, 2007.

¹² “Nuclear Help Wanted,” William Underhill, Newsweek Magazine, January 21, 2008.

¹³ Berrigan, op. cit.

¹⁴ “Identifying and Addressing Workforce Challenges in America’s Energy Industry,” U.S. Department of Labor, Employment and Training Administration and U.S. Bureau of Labor Statistics, 2007.

¹⁵ “An Action Plan for Workforce Development,” prepared for the Center for Energy Workforce Development by the John J. Heldrich Center for Workforce Development, 2007.

¹⁶ “Workforce Trends in the Electric Utility Industry,” U.S. Department of Energy, 2006.

¹⁷ Draft New Jersey Energy Master Plan Implementation Strategies, www.nj.gov/emp, April 2008, pg. 56.

¹⁸ Draft New Jersey Energy Master Plan, April 2008, pg. 52-53, and Draft New Jersey Energy Master Plan Implementation Strategies, April 2008, pg 55.

¹⁹ Andra Cornelius, Vice President of Business Outreach for Workforce Florida, Inc, testimony before the U.S. Senate Committee on Energy and Natural Resources, November 6, 2007.

²⁰ At the state level, funding that could be devoted to green workforce development includes the Global Warming Solutions Fund, the Clean Energy Program, and DLWD's Customized Training Grants. At the federal level, the U.S. Department of Labor has funding available for green workforce development initiatives through programs such as the High Growth Job Training Initiative, the Community-Based Job Training Grants program, and the Workforce Innovation in Regional Economic Development (WIRED) initiative. In addition, the 2007 federal energy bill authorized \$125 million in green jobs funding, which has yet to be appropriated. Finally, Democratic presidential candidates Hillary Clinton and Barack Obama have respectively proposed \$5 billion and \$15 billion annually to promote green jobs (Source: "Hillary's Plan to Create a Green Jobs," www.hillaryclinton.com, and "Obama Proposes \$210 Billion for New Jobs," Associated Press, February 13, 2008).

²¹The Employ Florida BANNER Center for Energy is housed at the Lake-Sumter Community College. It develops and delivers energy workforce training and information services. The Center for Excellence for Energy Technology in Washington is located at Centralia College. It coordinates a number of workforce development programs in partnership with the local IBEW, and its stated goal is to "serve as a point-of-contact and resource hub for industry trends, best practices, innovative curriculum, and professional development opportunities" (source: <http://www.centralia.edu/coe/about.html>).

²² NYSERDA press release, February 2008, http://www.nyserda.org/Press_Releases/2008/PressRelease20082502.asp