



Maryland's Energy Industry Workforce Report:

Preparing Today's Workers for Tomorrow's Opportunities



Acknowledgements

This report was produced under the direction of the Governor's Workforce Investment Board (GWIB) Energy Industry Steering Committee, which was composed of stakeholders from utilities, manufacturing, construction, specialty trade contracting, business services, education, unions, and state and local government. The GWIB would like to thank the members of the Energy Industry Steering Committee for their valuable guidance and contributions to this report.

Special appreciation goes to the co-chairs of the Committee, James E. Rzepkowski of Constellation Energy and Peter Lowenthal of the Solar Energy Industry Association Maryland. Their leadership and commitment were essential in the development of this report.

Executive Summary

Creating a sustainable future for Maryland will stimulate economic and workforce development in what numerous policy papers are calling the “green economy.” This report defines Maryland’s green economy and the jobs that currently exist, as well as those that will be needed. The analysis and recommendations are based on the work of the Governor’s Workforce Investment Board (GWIB) Energy Industry Steering Committee (Steering Committee) which was composed of stakeholders from utilities, manufacturing, construction, specialty trade contracting, business services, education, unions, and state and local government. The Steering Committee conducted meetings and focus group sessions between May 2008 and May 2009.

After considerable research and discussion, the Steering Committee determined that Maryland’s green economy is defined as:

The system of production, exchange, distribution and consumption of goods and services produced by any business or entity directly engaged in the research, development, manufacture, sale, distribution, installation, or application of products and/ or services that promote energy generation, efficiency and conservation, renewable and alternative energy production, waste management and/ or organizations that are focused on environmental stewardship.

The definition is designed to be flexible and inclusive of a broad range of traditional industry sectors including construction, manufacturing, utilities, specialty trade contracting, business services and agriculture. Jobs in the green economy are employment opportunities with businesses directly engaged in the research and development, manufacture, sale and distribution, installation, operation and maintenance, and application of products and services related to energy efficiency, renewable or clean energy sources, energy production, and/or environment quality. Through its research, the Steering Committee determined that the majority of green jobs are not new occupations. These jobs include construction workers, cost estimators, financial analysts, computer technicians, accountants, manufacturing workers, truck drivers, salespersons, scientists, engineers, and many other familiar occupations.

The Steering Committee also determined that many of the jobs in the green economy are middle skill jobs, requiring more than high school, but less than a college degree. They require a range of academic competencies that include math and science, and must be built on a foundation of indispensable skills: dependability, attention to detail, good communication skills, and the ability to work well with a broad spectrum of customers and coworkers.

Education and training programs for jobs in the green economy are provided by Maryland’s apprenticeship training programs, community colleges’ continuing education and for-credit programs, and four-year institutions. The Steering Committee acknowledge that the K-12 system is the beginning of the State’s workforce pipeline and recommended that concepts about energy, green building, and clean technology be added to the existing Career and Technology Education (CTE) program and curriculum. Although not all green jobs require certification, the Steering Committee discovered that several certification programs currently exist to ensure workers have a clear understanding of what it means to be green in their respective fields or to help make the transition into a green career.

Key Recommendations

An objective of this report is to provide a summary of strategies and policies that will assist the Governor, Maryland’s workforce system and the industries in the green economy to meet its workforce needs. The Steering Committee developed 15 recommendations. Of these, the following four were selected to be developed over the next 12 months.

Attraction: Create a “buzz” about jobs in Maryland’s green economy by targeting varied audiences: youth, parents, working adults, dislocated workers.

- Work with industry leaders, Maryland State Department of Education (MSDE) and the Maryland Business Roundtable for Education (MBRT) to identify, recruit and train 50 of the industry’s younger workers to serve as speakers to students in grades 7 to 12 by June, 2010.
- Work with GWIB, the DLLR Division of Workforce Development and Adult Learning (DWDAL) and Local Workforce Investment Boards (LWIB) to publish and distribute “Careers in the Green Economy Guidebook” to One-Stop Workforce Centers to help emerging workers, career changers, parents, and career advisors with clear, up-to-date job descriptions with salary data by December 2009.
- Work with DWDAL to develop additional information about energy and other jobs in Maryland’s green economy, including training and workforce development resources (Maryland on-line job matching tools), and provide public access through the GWIB website by June 2010.

Pipeline Development: Increase the number of school systems and schools using the Career and Technology Education (CTE) program, and provide information and materials about energy, green building, clean technology and certifications designed for integration into the construction and development, environmental, agricultural and natural resource systems, and manufacturing, engineering and technology career clusters.

- Work with industry, Center for Energy Workforce Development (CEWD) and MSDE, to present information about the energy industry, careers, training needs and certifications to CTE administrators and teachers at Maryland Career Technical Education conferences or meetings by December, 2010.
- Work with industry, CEWD and MSDE, to present information about the energy industry, careers, training needs and certifications to teachers, students and parents at the Maryland SkillsUSA competitions by May, 2010.
- Work with Maryland’s State Energy Consortia to organize a Maryland Energy and Green Economy Forum for technical school instructors by 2010.

Training: Identify and develop short-term training courses that are aligned with industry needs and will prepare workers for jobs in the green economy.

- Work with CEWD, apprenticeship training programs, and other industry and labor organizations to build competency models for 25 targeted high demand occupations (in green building, energy efficiency, waste/recycling, environmental quality, renewable energy and energy production) that establish common skills sets across all sectors with links to degree options by June, 2010.
- Work with the community colleges’ Construction and Energy Technologies Education Consortium (CETEC) to develop continuing education programs for incumbent workers in the skilled trades (for example, electrician, HVAC, and plumbing) to provide skill updates in green building methods, materials, and energy efficiency standards by June, 2010.
- Work with Maryland’s utilities, CETEC and LWIBs to create and/or adopt existing pre-employment prep and basic training programs to incorporate into the community college curriculum and One-Stop Workforce Centers’ custom training programs by June, 2010.

Data Driven Policy Development: Institute statewide data collection and analysis to help the State focus training resources; to track individuals from pre-apprenticeship to apprenticeship training and from two-year to four-year higher education training; and to assist green business incubators with development and growth of small businesses.

- Work with GWIB to estimate current and future workforce projections through special industry surveys and labor market statistics to better understand the magnitude of green jobs, and electronically distribute this information to industry, One-Stop Workforce Centers and other partners in order to guide workforce development investments and training activities by December 2009.
- Work with MHEC and other state partners to complete a gap analysis to identify training programs, and additional skill training needed by industry, and electronically distribute this information to industry, One-Stop Workforce Centers and other partners by December 2009.

Call for Action

Businesses in Maryland's green economy recognize the challenges to attracting, training and retaining talent. Through the sector strategy initiative, represented by GWIB's Energy Steering Committee, a wide range of recommendations and strategies were developed to address these challenges. In a world of limited resources, it is important to focus on a few, critical, and actionable recommendations.

As a result of the Construction and Energy Workforce Solutions Conference, held July 21, 2009, four key recommendations, and their supporting strategies, were selected for the energy industry action plan. Where possible, GWIB and the Steering Committee made these recommendations specific, measurable, actionable and timely. However, more work needs to be done. Champions are needed to implement any and all of the strategies. GWIB is ready to work with industry, state or local agencies, organizations and businesses to move from planning to doing.

Maryland's Green Economy

Reliable, affordable, and, for many, domestic sources of energy are essential for economic and workforce development. Concerns about demand and supply imbalances¹, volatile energy costs, constraints and potential disruption of energy supplies, and the sustainability of our way of life are changing public attitudes and habits. Maryland and the nation are undergoing a shift in the way they produce, distribute, use, and conserve energy. In 2008, the State passed the EmPOWER Maryland: Energy Efficiency Act. The Act commits the State to a 15 percent reduction in per capita electricity consumption by the end of 2015. To achieve this goal, the State is promoting renewable and alternative energy production, and energy efficiency programs. Maryland is also proposing smart grid improvements which add electronics and "intelligence" to generation, distribution and consumption of electricity..

Harmful greenhouse gas (GHG) emissions are produced from fossil fuels used for transportation and electrical generation.² The Maryland Commission on Climate Change recommended reducing GHG emissions to 1990 levels by the year 2020.³ To achieve this goal, the State legislature established a renewable energy portfolio standard (RPS) for Maryland. The RPS requires that a portion of all retail electricity sales in Maryland come from renewable resources. Such legislation is part of a sustainability strategy to prevent, reduce, or remove environmental pollution, restore damaged natural resources, ensure safe drinking water, maintain oceans and watersheds, and provide healthy aquatic habitats for humans, fish, plant and wildlife.

Businesses, public institutions, communities, and local government are also working to lower GHG and use energy more wisely. They are creating sustainability councils, adopting new, local public policies and practices, and developing community projects that use green/clean materials and technologies. These efforts are being supported with American Recovery and Reinvestment Act (ARRA) investments: \$92 billion in clean technology; nearly \$33 billion in clean energy, and \$27 billion in energy efficiency nationwide.

Creating a sustainable future for Maryland with a combination of policies, regulations and incentives will stimulate economic and workforce development in what numerous policy papers are calling the "green economy." There are many definitions of "green," but all are rooted in energy and/or environmental quality. From this core concept, GWIB's Energy Industry Steering Committee defines Maryland's green economy as:

The system of production, exchange, distribution and consumption of goods and services produced by any business or entity directly engaged in the research, development, manufacture, sale, distribution, installation, or application of products and/ or services that promote energy efficiency, energy conservation, renewable energy production, alternative energy production, or waste management and/ or organizations that are focused on environmental stewardship.

GWIB understands that no green definition is perfect.⁴ For the purposes of this report, the green economy includes those businesses that address Maryland's energy and environmental challenges.

There is a strong demand that Maryland count green businesses and jobs, and provide forecasts to assist State policymakers with qualitative and quantitative analysis of green economic and workforce development efforts.

Smart, Green & Growing

is a State website where Marylanders are coming together to restore the Chesapeake Bay, preserve our land, revitalize our communities, create green jobs, improve transit, conserve energy and address climate change.

<http://www.green.maryland.gov/>



Labor market programs across the country face a similar challenge.⁵ The standard method for counting businesses is to use the North American Industry Classification System (NAICS), which classifies business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. There are no “green industry” NAICS codes.⁶ In fact, green cuts across many traditional industry sectors defined in NAICS: construction, manufacturing, utilities, specialty trade contracting, business services and agriculture.

Using the green definition as a guide, GWIB’s Energy Industry Steering Committee created a green economy model that organizes businesses into three broad categories; Green building; Clean technology; and Energy production, distribution and transmission. Clean technology is further divided into four categories: energy efficiency, waste and recycling, environmental quality, and renewal/alternative energy.

In an effort to provide fact-based data to measure the scope of Maryland’s green economy, GWIB’s Energy Industry Steering Committee, following a methodology suggested by California’s Employment Development Department, has identified NAICS codes that are closely aligned with the proposed green economy model.⁷ (See Appendix A).

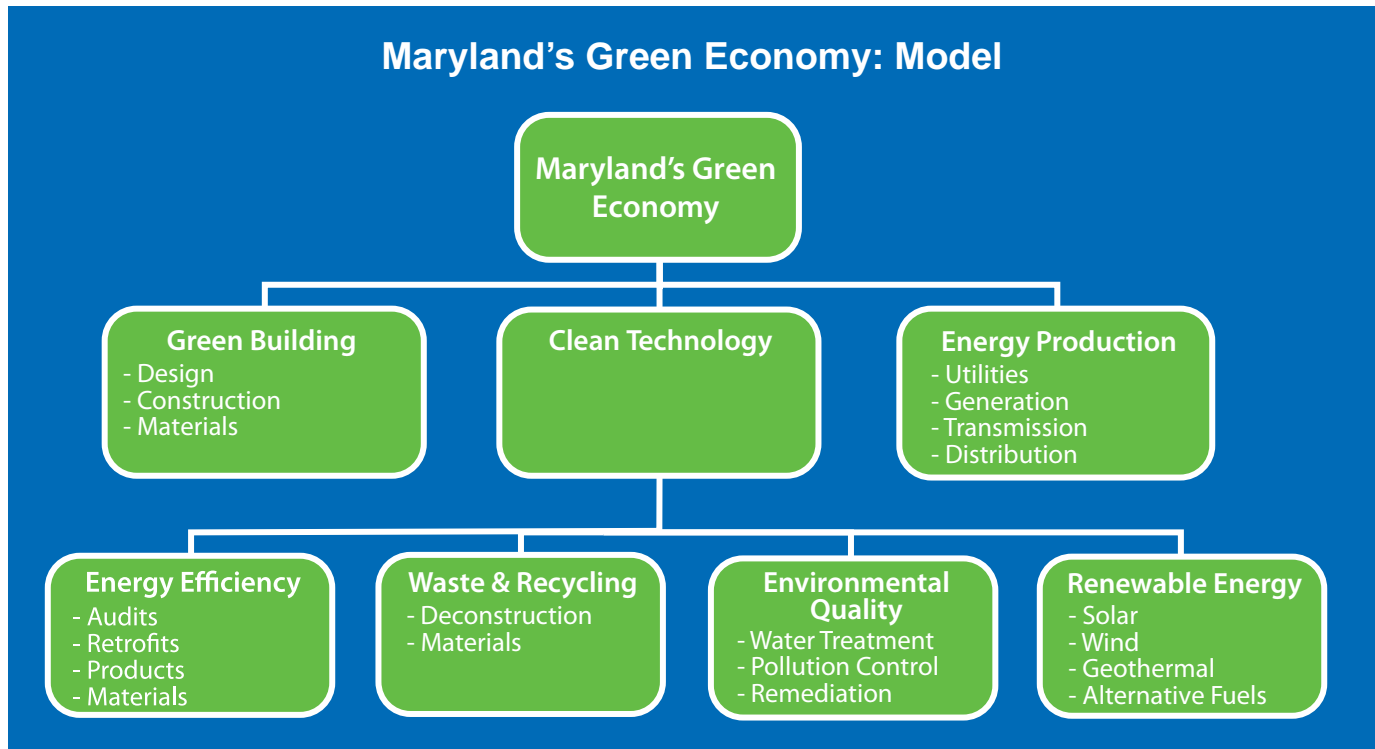
Based on this methodology, and the evaluation of available NAICS data prepared by the Department of Labor, Licensing and Regulations (DLLR), it is estimated that Maryland’s green economy includes 22,000 business units,

Cool Cities

More than 400 mayors representing 61 million Americans have signed the U.S. Mayors Climate Protection Agreement to achieve two important goals: 1). Get cities to take action with smart energy solutions that reduce global warming emissions, and 2) Energize, support and build local volunteer activism and influence, both inside and outside the Sierra Club.

Twelve Maryland cities have signed onto the Cool Cities initiative: Baltimore, Annapolis, Brunswick, Chestertown, Chevy Chase, Edmonston, Kensington, Rockville, Sykesville, Takoma Park, Riverdale Park, and Salisbury.

Maryland Cool Cities: Putting Together a Climate Action Plan. Maryland Chapter of the Sierra Club.



directly employing 249,296 people and generating total wages of \$14.6 billion dollars. Half of Maryland's green economy is related to green building which includes businesses that design, construct and supply materials for residential and commercial constructions. Energy efficiency accounts for 42 percent of the State's green economy. Businesses in energy efficiency weatherize buildings, or provide environmental controls that reduce energy use, or manufacture/sell/install other products that reduce energy use.

It needs to be emphasized that this is just a starting point for defining the size and scope of Maryland's green economy. More research and better data collection must be developed. GWIB's Energy Industry Steering Committee recommends that the State workforce system improve data collection in order to help guide the development of policy, and evaluate workforce initiatives

Jobs in the Green Economy

Green jobs, simply defined, are those employment opportunities in Maryland's green economy. These jobs are directly engaged in the research and development, manufacture, sale and distribution, installation, operation and maintenance, and application of products and services related to energy efficiency, renewable or clean energy sources, energy production, and/or environment quality.⁸

The majority of green jobs will not be new occupations. These jobs will include construction workers, cost estimators, financial analysts, computer technicians, accountants, manufacturing workers, truck drivers, salespersons, scientists, engineers, and many others — as long as those jobs have something to do with energy efficiency and conservation, or increasing the supply of renewable or clean energy sources, or protecting the environment.^{9 10 11}

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There are no "green" O*NET or SOC codes.¹² The O*NET system provides information on key attributes and characteristics of workers and occupations. SOC, the Standard Occupational Classification system, classifies jobs using set occupational definitions. Unlike NAICS, the National Center for O*NET Development is working to develop "definitional boundaries for green employment."¹³ The goal is one, to tag current occupations as "green" and, two, to identify new and emerging "green jobs." The Center has identified 12 green occupational sectors, five of which match Maryland's green economy model.

- Renewable Energy Generation (utilities)
- Green Construction
- Energy Efficiency
- Environmental Protection
- Recycling and Waste Reduction

Occupation and Industry Classification

O*NET and SOC, the Standard Occupational Classification system, classifies over 820 occupations according to their occupational definition. The system uses a numeric code for each occupation.

Potential High Demand Occupations

GWIB's Energy Industry Steering Committee compiled a list of occupations for each category of the green economy model (see Appendix B). In some instances, occupations on the Steering Committee's list match those that the National Center for O*NET Development calls, "increasing in-demand green jobs". Below is a definition of the green economy sectors (Maryland's Green Economy Model) with related high demand occupations.

Green Building: Green Building increases the efficiency with which buildings use resources — energy, water, and materials — while reducing building impacts on human health and the environment during the building's lifecycle, through better site selection, design, construction, operation, maintenance, and removal.

Table 1: Green Building: High Demand Occupations in Maryland

Occupation	Jobs in Maryland	Median Annual Wages
Architectural and civil drafters	1,700	\$45,300
Boilermakers	Data not available	\$51,240
Helpers--carpenters	2,320	\$26,790
Carpenters	18,640	\$40,490
Cement masons and concrete finishers	3,350	\$38,270
Electricians	16,170	\$49,060
Industrial truck and tractor operators	9,770	\$31,680
Helpers--installation, maintenance, and repair workers	4,620	\$25,990
Insulation workers, floor, ceiling, and wall	420	\$33,590
Structural iron and steel workers	950	\$53,830
Laborers and freight, stock, and material movers, hand	39,180	\$24,570
Structural metal fabricators and fitters	1,240	\$33,410
Operating engineers and other construction equipment operators	6,480	\$41,650
Heating, air conditioning, and refrigeration mechanics and installers	5,780	\$45,850
Welders, cutters, solderers, and brazers	3,050	\$36,790

Energy Efficiency: Energy efficiency is achieved with reduction in power consumption resulting from increases in the efficiency of energy use, production, or distribution without affecting the services provided. Based on current State policy and the recent ARRA federal funds, Maryland's green jobs will be concentrated in the energy efficiency sector.¹⁴ Most of the discussion about energy efficiency focuses on retrofitting homes and businesses to use less energy. However, energy efficiency is also achieved through the use of a wide range of products (lighting, internal environment controls, insulation, etc.) and services (from architects to landscaping) applied to the production and use of energy in homes, businesses, and buildings. These products and services must be developed, manufactured, distributed, sold and installed through a complex cluster of industries and businesses. Promoting, attracting or developing such businesses in Maryland can be an important economic development strategy to build a stronger green economy. In addition, energy efficiency can have a positive impact on environmental quality when applied to processes that reduce the energy needed to produce new products. It also includes techniques to reduce waste, reuse or recycle; and techniques to convert used materials into new products.

Table 2: Energy Efficiency: High Demand Occupations in Maryland

Occupation	Jobs in Maryland	Median Annual Wages
Stationary engineers and boiler operators	1,380	\$55,500
Boilermakers	Data not available	\$51,240
Electrical power-line installers and repairers	1,310	\$57,760
Insulation workers, floor, ceiling, and wall	420	\$33,590
Heating, air conditioning, and refrigeration mechanics and installers	5,780	\$45,850

Environmental Quality: Environmental Quality and Remediation includes the prevention and reduction of environmental pollution, as well as restoration of the environment. GWIB’s Energy Industry Steering Committee has included Water Conservation and Treatment in this category as it refers to products, processes and activities that ensure safe drinking water, maintain oceans and watersheds, and provide healthy aquatic habitats for humans, fish, plant and wildlife.

Table 3: Environmental Quality: High Demand Occupations in Maryland

Occupation	Jobs in Maryland	Median Annual Wages
Environmental scientists and specialists, including health	2,760	\$60,390
Fish and game wardens	170	\$71,040
Forest and conservation workers	540	\$22,970
First-line supervisor/manager of farming, fishing, and forestry workers	230	\$44,910
Hydrologists	150	\$73,220
Natural sciences managers	2,210	\$115,090
Forest and conservation technicians	270	\$38,510
Zoologists and wildlife biologists	240	\$89,280

Renewable and Alternative: Renewable energy, sometimes called clean energy, focuses on creating, installing, and maintaining technologies that generate energy from resources that are naturally replenished and generally do not emit the GHG that contribute to global warming. These include solar, wind, geothermal systems and technologies, and the use of wood waste and biogenic/landfill gas.¹⁵

A study conducted for the Maryland Clean Energy Center stated that Maryland has enough renewable energy resources to produce from 30 to 137 percent of all the State’s electricity needs.¹⁶ At present, large scale renewable energy generation in Maryland is small. Wind produced 210 MWh per year and solar power produced 3,300 MWh per year. Together, these two energy sources represented 0.01% of all renewable energy generation. To fulfill Maryland’s 2.0% solar set-aside by 2022 would require the development of 1,500 MWh of additional capacity.¹⁷


In addition to large scale renewable energy generation, Maryland provides incentives to residential customers to install solar photovoltaic and solar thermal systems.

Transforming the energy system with both large and small solar, wind, tidal and geothermal fuel sources will take time. These technologies are also expensive. Maryland has policies and incentives to promote renewable energy, but will need help with scientific breakthroughs from the network of

Maryland Clean Energy Center

Recognizing the need for a coordinated approach to building a strong clean energy economy in Maryland, the State legislature established the Maryland Clean Energy Center in the 2008. The Center’s purpose is to promote clean energy economic development and jobs in the State; encourage deployment of clean energy technologies across Maryland; assist newly developed technologies with pilot projects; collect, analyze and disseminate industry data; and provide outreach and technical support to further the clean energy industry in Maryland.

The Center is structured as a not-for-profit quasi-governmental corporation supported by many state government agencies, including the Office of the Governor and the Maryland Energy Administration. The Center’s Board of Directors was appointed by Governor O’Malley in October 2008.



MARYLAND

CLEAN ENERGY CENTER

Maryland university and federal laboratories.

Fortunately, Maryland is a national leader in green research and advocacy¹⁸. For example, The University of Maryland Energy Research Center (UMERC) is conducting a wide range of research projects that include producing fuels from biomass, fuel cell systems, and small-scale power systems. Research at the University of Maryland is also focusing on alternative fuels, biofuels, to be used in standard or modified internal combustion engines. Maryland researchers are exploring creating fuels from waste-water algae and growing plants like poplar trees, for fuel. Commercial development of Maryland-based energy science and technology research can lead to economic development and job creation. As it happens, Maryland is also a leader in green technology patent registrations. Battery technology accounts for the largest share of patents (35%) registered in the U.S., followed by Fuel Cell technology (31%), and Hybrid Systems (11%).¹⁹

Maryland agriculture and food retailers can also play a role. Maryland's most promising alternative fuel source is bio-diesel. Bio-diesel can be made from animal fats or recycled restaurant cooking oils, agricultural sources or waste food oil for use in diesel engines. Bio-diesel is produced locally in the Mid-Atlantic area with an estimated 7 million gallons per year of capacity. Additional bio-diesel refineries are being planned in Maryland and in surrounding states.

Table 4: Renewable Energy: High Demand Occupations in Maryland

Occupation	Jobs in Maryland	Median Annual Wages
Power distributors and dispatchers	330	\$65,950

Energy Production: Energy production refers to the generation, distribution and transmission of electricity by Maryland's public and private utilities. Coal and nuclear plants generate 88 percent of Maryland's electricity. The State generates a larger portion of its electricity from coal and nuclear fuel than the United States as a whole. The Maryland Public Service Commission (PSC) recently approved a proposed new nuclear energy facility at Calvert Cliffs in Lusby, Maryland. The Mid-Atlantic Power Pathway (MAPP) has proposed a major (500 kV) transmission line linking Virginia to New Jersey via the Delmarva Peninsula, with associated improvements to connecting facilities.

As noted earlier, Maryland is proposing smart grid improvements "...to help utilities coordinate the production of power from large numbers of small power generators, thereby offering an opportunity to reduce power consumption during peak hours. The Smart Grid will use digital technology and advanced sensors to improve the quality and reliability of the power flow. The installation of Smart Meters will help to monitor electricity consumption in real time providing consumers with information to help them change their usage patterns. The meters will also allow the utilities to control devices in homes or businesses during peak hours."²⁰

Several industry associations, most notably the Center for Energy Workforce Development (CEWD), have conducted employer-based surveys on workforce composition and future needs. Based on the CEWD study, the critical occupational areas for electrical utility operations are:

- Lineworkers
- Power Plant Operators
- Technicians (T&D)
- Technicians (Generation)
- Pipefitters & Pipelayers (T&D, and Generation)
- Power Engineers
- All Other Engineers (non-electrical systems, processes, equipment and facilities involved in electric and natural gas energy services. It includes people involved in the planning, research, design, development, construction, installation and operation of equipment, facilities and systems for the safe, reliable and economic generation/ supply, transmission, distribution, consumption and control of electricity and natural gas)

Workforce Demand

Projecting growth trends for high demand occupations in Maryland's green economy is difficult. For established industries and well-documented occupations, projections prepared by the Bureau of Labor Statistics (BLS) are based on historical patterns which can distort current realities.

A case in point is the utilities, who have done little hiring in the past decade due, in part to high retention rates of its incumbent workforce. BLS projections through 2014, which are based on historically low hiring rates, mask what the industry and the U.S. Department of Labor (DOL), acknowledge as the pending shortage of skilled workers. In 2007, the DOL concluded that the energy industry lacked enough skilled craft workers to build the infrastructure, install equipment, operate generating facilities or make repairs.²¹ The CEWD studies confirm that the utility workforce is higher than the average age of the U.S. workforce and that a significant portion of the current energy workforce, potentially 50 percent, are eligible for retirement and will do so in increasing numbers over the next ten years.²² Furthermore, an insufficient number of skilled craft workers are coming through the training and development pipeline to meet replacement and growth needs. According to CEWD, the coal and gas powered utilities nationally will need to replace 95,000 technicians, operators, engineers, pipe fitters and line workers due to retirements. Demographics for Maryland's 9,400 utility workers are consistent with CEWD's national data, and therefore, the State may anticipate replacing 2,000 to 3,000 skilled workers in traditional energy over the next five years.²³

The National Center for O*NET Development is doing its best to anchor "increasing in-demand green jobs" with existing BLS data. This report is relying, in part, on this kind of data. However, most green jobs projections are based on economic input models, each with its own set of assumptions. Nearly all studies reviewed by GWIB's Energy Industry Steering Committee used a "what-if" model to conclude that green job creation will depend on a combination of regulation and incentives to stimulate demand, as well as training investments to create a pipeline of skilled workers.

Most estimates of green job creation are focused on energy efficiency and renewable energy areas, and are national in scope. However, there are three studies that assessed potential energy efficiency and renewable energy job creation in Maryland. According to the American Council for an Energy-Efficient Economy, investments in energy efficiency and renewable energy would create 8,000 new direct and indirect jobs (both trade and professional green jobs) by 2015.²⁴ Covering more of the green economy and with a longer time frame, a 2006 study for the Baltimore Development Corporation stated that State investments in energy efficiency and renewable energy would create 144,000 jobs over the next twenty years.²⁵ A more recent report by the Center for American Progress predicts that Federal investments in building a low carbon economy could benefit Maryland by creating a total of 36,739 jobs.²⁶

Finding Incentives

DSIRE is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency. Established in 1995, DSIRE is an ongoing project of the NC Solar Center and the Interstate Renewable Energy Council funded by the U.S. Department of Energy
<http://www.dsireusa.org/>

Necessary Skills

"Despite the need for some specialized green skills, employers in the focus groups stressed that workers still need the basics. Green skills are an overlay of new skills and knowledge; and learners cannot access the new knowledge without the requisite foundation. Skills in science, technology, engineering and math will be important, and positions with these skills may be most difficult to fill."

Michigan Green Jobs Report, page 5.

Skills for the Green Economy

As noted earlier, many jobs in the green economy will not be new occupations. These jobs will include construction workers, cost estimators, financial analysts, computer technicians, accountants, manufacturing workers, truck drivers, salespersons, scientists, engineers, and many others. GWIB's Energy Industry Steering Committee stressed that both incumbent workers and those applying for these jobs need, what DLLR Secretary Tom Perez called, "the indispensable skills" - dependability, attention to detail, good communication skills, and the ability to work well with a broad spectrum of customers and coworkers. Workers also need to have the flexibility to change as the industry evolves with the desire to constantly learn new skills.

Many of the jobs in the green economy are middle skill jobs, requiring more than high school, but less than a college degree. They require a range of academic competencies that include math and science. The Michigan Green Jobs Report, published by the Michigan Department of Energy, Labor & Economic, found that employers emphasized the need for workers to have a foundation of basics including math and reading, with additional skills to be acquired on the job or in school.²⁷ GWIB's Energy Industry Steering Committee drew similar conclusions.

On the foundation of these indispensable and academic skills, the industry needs to develop competency models for a wide range of occupations. Career One Stop, a career information website sponsored by the DOL, provides an on-line Competency Building Block model designed to provide a consistent definition of the competencies required to work in the industry. CEWD used this tool to develop an Energy/Generation, Transmission and Distribution Competency Model. GWIB's Energy Industry Steering Committee recommends that GWIB work with other industry partners to develop additional occupational competency models to help workers, workforce professionals, students and teachers understand the competencies required to work in the green economy.

Education and Training

Education and training programs for jobs in the green economy are provided by Maryland's apprenticeship training programs, community colleges' continuing education and for-credit programs, and four-year institutions. Industry, including many small businesses, also conducts significant amounts of on-the-job training. Preparing workers for some jobs in the green economy will require a greener curriculum, in other words, existing courses with something added.²⁸

An example of how this might be accomplished can be found in a Green Collar Job Certification program developed by Christy Bozic, Purdue University.²⁹ The program certifies green manufacturing generalists or specialists. The training includes these topics:

- Sustainable Development (reuse, reduce, recycle – materials, energy, water)
- Waste Hierarchy and Waste Stream Management
- Energy Basics (audits, alternative energy sources)
- Environmental Regulations
- Green Tools (ISO, green supply chain, green marketing, audit process, etc.)
- Accreditation and Certification

The Purdue University program is for upper management, mid-level management, lower management, team leaders, general production and maintenance employees. The specialist certification is for managerial and engineering personnel, as well as team leaders from the production floor.

Another example of greening an existing curriculum can be found in the Maryland electrical apprentice and journey electrician training programs. In addition to the regular electrician training materials provided by National Joint Apprenticeship Training Committee (NJATC), there are these "green" NJATC courses:

- Green Building Fundamentals
- Photovoltaic, Wind Turbine Orientation, Fuels Cells
- Building Automation and Programmable Logic Controllers
- Power Quality Analysis

Programs may also explore the standards set by industry or non-profit organizations, for example, the U.S. Green Building Council's (USGBC) Education Provider Program.³⁰ USGBC evaluates professional education programs that "further enrich the knowledge and understanding of green building theory, techniques, and trends for building professionals." This may be as simple as accurately presenting the LEED rating system, but could include material on building design, construction and operation that enables "an environmentally and socially responsible, healthy environment that improves the quality of life." Nonprofit organizations, service providers and universities with continuing education programs may apply to be USGBC recognized education providers.

When responding to a new, acute workforce need, existing curriculum may be imported for use in the State. CETEC, representing Maryland's community colleges, developed a training program for weatherization technicians, energy analysts and auditors based a Department of Energy approved Weatherization Training Center program at the Pennsylvania College of Technology.³¹ Maryland's weatherization training program are comprised of short-term, continuing education courses and are now available in all State Maryland's community colleges.

Secondary Education - Career and Technical Education

The K-12 system is the beginning of the State's workforce pipeline. The State puts great emphasis on preparing the next generation of workers. Maryland's education system ranks highly against many national measures, including graduation rates, and Advanced Placement (AP) participation and scores.

Additionally, enrollments in and completion rates of Maryland's Career and Technology Education (CTE) programs are increasing. This increases the pipeline of technically-skilled workers. CTE is a rigorous program of career and technical study that prepares students for both college and careers in high wage / high-skill occupations. CTE can lead to industry certification and increased articulation opportunities with postsecondary programs.

CTE is focused around 11 career clusters. Three of the clusters, construction, manufacturing and environmental science, are most closely aligned with Maryland's green economy definitional framework. GWIB's Energy Industry Steering Committee recommended that an energy cluster be added to current CTE program, or that concepts about energy, green building, and clean technology be added to the existing clusters.

Green building demands a range of specialized knowledge that most builders don't have -- everything from where to obtain recycled materials to how to orient a building to maximize natural heating and cooling. So, contractors, architects and other pros are rushing to get up to speed, often through their trade groups, which have started offering more training in green techniques. "Green Gap," November 16, 2008. Sari Krieger. *Wall Street Journal*.

Maryland One-Stop Workforce Centers

Maryland maintains a robust workforce system designed to match qualified workers with employers. Maryland's system of One-Stop Workforce Centers, located in every county, have the tools and resources available for training, preparing and placing workers into jobs³². The One-Stop system is designed to serve Maryland's businesses and dislocated workers, unemployed (and underemployed) adults and youth entering the workforce. Nearly \$22-billion of ARRA funding allocated to Maryland for job training will be administered by the LWIBs. The Steering Committee recommended that industry develop partnerships with the State's LWIBs.

Certification Options

Although not all green jobs require certification, several certification programs have been created to ensure workers have a clear understanding of what it means to be green in their respective fields or to help make the transition into a green career. These programs target a variety of professions and require varying degrees of skills and education; all of them focus on building an individual's green knowledge and expertise through education and/or hands-on training. Some of the most recognized certifications and training programs available may be found in Appendix C.

Career Pathways

A career pathway is like a map. It targets an industry or employment sector, and provides connections to and among the State's education and training programs, industry certification, and workforce agencies. The ultimate goal is career pathway that is a seamless system of career exploration, preparation, and skill upgrades linked to academic credits and credentials. The pathway should have multiple entry and exit points spanning middle school, secondary, postsecondary, adult, and workplace education.³³

A career pathway was developed for the Maryland's Weatherization Training Program. The weatherization program, developed by CETEC, Maryland Energy Administration (MEA) and the Maryland Department of Housing and Community Development (DHCD), has four career levels:

- Weatherization Technician;
- Energy Analyst Technician;
- Weatherization Crew Chief; and
- Building Analyst/Auditor.

Maryland's community colleges provide the short-term, continuing education courses. Community organizations and LWIBs, among others, can provide workers to train. Weatherization technician represents an entry-level ramp way for workers seeking basic training in weatherization tactics, safety and lead paint. The other career levels require additional training and experience. All positions provide experience in construction and are pathways to skilled trades in insulation, electrical work, HVAC and carpentry.

Several other pathway examples exist, including an Energy Career Cluster Map developed by CEWD, and a green pathway model discussed in Greener Pathways.³⁴ However, more must be done to help workforce professionals, educators and those seeking careers in Maryland's green economy to understand these careers, the required skills, and the systems for education, training, and certification. GWIB's Energy Industry Steering Committee recommended that GWIB develop career pathway models for targeted high demand occupations in green building, energy efficiency, waste/recycling, environment quality, renewable energy and energy production.

Leadership in Energy and Environmental Design (LEED)

LEED is a rating system for green building. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Workforce Issues and Recommendations

Businesses in Maryland's green economy face many of the same challenges other industries face in trying to increase the pipeline of workers such as an aging workforce, negative image of the trades, and individuals who lack the necessary work readiness or technical skills to gain employment.

GWIB's Energy Industry Steering Committee, composed of stakeholders from utilities, manufacturing, construction, specialty trade contracting, business services, education, unions, and state and local government, met and conducted focus group sessions between May 2008 and May 2009. As result, the Committee defined five broad workforce issues and identified dozens of possible recommendations and strategies. Of these 15 recommendations, four were selected to be developed over the next 12 months (see pages 2-3).

Issue 1. Workforce Attraction and Recruitment

For more than ten years, a stable, mature workforce has limited the need for utilities to hire large numbers of workers. As a result, potential employees are either unaware of the variety of career opportunities available in the industry, or have a fundamentally inaccurate and inadequate perception about working conditions, career choices, advancement, benefits, and compensation. Despite the positive press about jobs in the green economy, few truly understand what these jobs are, how to train for them, or the potential for career growth. High school and college counselors are unaware of the need for skilled and technical workers and are consequently not informing students about these opportunities. Workforce professionals also lack information about high paying and entry level jobs in energy.

On the other hand, industry has overlooked a valuable potential population of workers that includes senior citizens, immigrants, individuals with disabilities, veterans, youth, and ex-offenders. These populations are currently being served by a wide variety of state workforce development programs, but industry has not easily connected with them.

Recommendation 1: Create a "buzz" about jobs in Maryland's green economy targeting varied audiences: youth, parents, working adults, dislocated workers.

Implementation Strategies

- Establish an annual "Maryland Green Innovation Awards" to publicly celebrate and honor Marylanders in STEM fields of importance to the State and who have made a major impact to their field.
- Create an energy ambassador program that brings industry and students together.
- Create hands-on mobile lounge to demonstrate energy and green technologies.
- Create a speakers bureau, sending the industry's younger workers as representatives to speak to students.
- Get youth (all ages) interested and excited about energy careers using current "social networking" systems like Facebook, and YouTube.

Recommendation 2: Develop and disseminate energy career ladders or lattices information.

Implementation Strategies

- Focus on critical pathways and support structures (education, pre-apprenticeship, apprenticeship).
- Develop career pathway models for targeted high demand occupations in green building, energy efficiency, waste/recycling, environment quality, renewable energy and energy production.
- Build competency models for targeted occupations that establish common skills sets across all sectors with links to degree options.
- Define the transferable skills from other industries to those in energy.
- Publish "Careers in the Green Economy Guidebook" to help to emerging workers, career changers, parents,

and career advisors with clear, up-to-date job descriptions with salary data.

Recommendation 3: Develop local industry-One-Stop partnerships.

Implementation Strategies

- Share information and data on who is looking for work between One-Stops and community colleges.
- Use data to help the State focus training resources.
- Create outreach to business including business tours of One-Stops and target marketing campaign aimed at business.
- Create new business services including pre-employment testing, and integrated industry short training programs (boot camps, OJT programs, etc.).
- Build stronger collaborative programs that include community forums throughout the State and sector partnerships of One-Stops and Industry (workforce task force or skill alliances).
- Recruit workers through the local One-Stop Workforce Centers.

Recommendation 4: Partner with programs and agencies currently serving women and other nontraditional populations to promote energy careers.

Implementation Strategies

- Increase Summer Youth Employment Opportunities and Work Experiences by enlisting energy/green business support and participation.
- Link local youth programs with pre- apprenticeship or apprenticeship training, and whenever possible to healthcare, energy, manufacturing, construction or other high growth industry sectors.
- Adopt/adapt other successful job training models: Job Corps, law enforcement recruitment of women.

Issue 2. Education, Training, and Certification

The industry finds potential employees, from high school graduates to non-traditional populations served by Maryland's workforce development system, need stronger job-readiness skills and technical skills. Potential workers are unable to pass pre-employment qualification standards (clean driving records, criminal background checks) and basic math and literacy tests. Further, there are not enough academic programs focusing on renewable energy in order to prepare a trained workforce for the industry.

Recommendation 1: Increase the number of school systems and schools using the CTE program.

Implementation Strategy

- Develop courses related to energy literacy for students in K to 12.
- Develop materials about energy, green building, and clean technology be added to the existing Career and Technology Education (CTE) program and curriculum.

Recommendation 2: Develop partnerships among trade groups, Maryland One-Stops and secondary education to increase the number of students applying for apprenticeship training programs.

Implementation Strategies

- Enhance or create new certificate and apprenticeship programs for targeted energy and clean technology jobs.
- Develop home energy auditor and weatherization technician apprenticeship programs.

Recommendation 3: Identify and develop short-term training courses that are aligned with industry needs and will prepare workers for jobs in the green economy.

Implementation Strategies

- Develop continuing education programs for incumbent workers in the skilled trades (electrician, HVAC, plumbing, and constructions) to provide skill updates in green building methods, materials, and energy efficiency standards.
- Create and/or adopt existing training programs to incorporate into the community college curriculum.
- Train meter readers and other in-house incumbent workers for in-demand positions.
- Promote a green layering strategy for existing curricula.

Recommendation 4: Establish energy industry training centers.

Implementation Strategy

- Establish a weatherization training center in Maryland through CETEC.
- Create partnership with the proposed Maryland Center for Construction Education and Innovation (MCCEI).
- Support the development of a Mid Atlantic regional center for nuclear maintenance education.

Recommendation 5: Expand access to pre-employment programs through Maryland’s community colleges.

Implementation Strategies

- Create State and industry trade association partnerships to align refresher courses and other employment preparation assessments.
- Create internships that extend from high school to college.
- Create pre-apprenticeship programs for emerging youth, and (other target populations).

Recommendation 6: Develop partnerships among industry, national and regional associations, and community colleges in order to help more students obtain education, training, certifications and other credentials.

Implementation Strategies

- Develop a Bachelor in Technical and Professional Studies (BTPS) degree that continues a professional pathway (including apprenticeships, certifications, OJT, certificates, and associate degrees), for a variety of technicians to increase their skills along common skill sets and specific content areas.
- Identify cross-sector (energy, manufacturing, construction, etc.) skill sets to assist in the development of a broad professional pathway for technicians.
- Align Regional Higher Education Centers (RHEC’s) or other facilities with BS/BA and/or BTPS (Bachelor in Technical and Professional Studies) programming with critical community college pathways.
- Create articulation agreements and MOU’s between credentialing organizations and 2-year and 4-year schools to facilitate a BTPS pathway.
- Increase the number of industry experienced instructors at community colleges and other institutions to train workers.

Issue 3. Data Driven Policy Development

There is a strong demand for Maryland to measure the size, scope and trends of green businesses and jobs, and forecast growth. Labor market programs across the country face this challenge. GWIB’s Energy Industry Steering Committee recommends that the State workforce system improve data collection in order to help guide the development of policy, and evaluate workforce initiatives.

Recommendation 1: Develop an inventory of jobs in the green economy.

Implementation Strategies

- Identify those jobs that already exist in Maryland that are “green” or related to clean energy.
- Identify areas where there is potential to grow and Maryland has the resources or existing infrastructure or businesses that allow for capitalization.
- Target emerging energy technologies such as: Fuel-cell, Wind Power, Hydro Power, Biofuels, Solar Power, Nuclear, among others.

Recommendation 2: Gather and promote the sharing of information and best practices about research, and training programs.

Implementation Strategies

- Catalogue all current research in Maryland-based laboratories (government, university, and industry) related to energy: low carbon emission, clean energy or green technologies.
- Work with MHEC to inventory existing training programs.
- Survey Maryland companies and match data with current DLLR statistics.

Issue 4. Public Policy

For the clean energy cluster (solar/wind manufacturing/distribution/installation), State and local regulation, and State and federal policy are the drivers of economic and workforce growth. Maryland needs an energy economic development strategy that maps the State’s economic and workforce assets, targets industry clean energy, and develops, promotes or attracts these industry and/or supply chains to the State.

Federal and State incentives (such as tax credits, rebates or renewable energy certificate trading programs) drive sales mainly for residential, but also some small commercial. Policy/incentive strategies for solar and thermal are not on equal footing with other forms of cheaper energy sources.

Recommendation 1: State and local workforce development systems should vigorously engage in an energy sector strategy (or “industry partnerships”), in collaboration with their institutions of higher education, community colleges, other local agencies and training providers, where appropriate.

Implementation Strategies

- Develop locally-focused economic analysis on green business, and the impact of government investments in partnership with University of Maryland.
- Develop green business incubators to help develop and grow small businesses.
- Create and support local research universities, technology developers, and business incubators in clean technology research.
- Educate businesses about clean technology, how to become greener, and how to train their staff to be greener.

Recommendation 2: The renewable energy and efficiency industry needs incentives to drive and sustain the business.

Implementation Strategies

- Create a simple, stable, long-term and consistent program of credits, grants and other incentives for the installation of alternative energy and energy efficient products (solar panel, geothermal systems, small wind and lighting.)
- Create a program to allow a property owner to receive credit for excess/unused energy by selling it back to the local utility, creating an income stream as collateral against the loan to install solar.
- Create innovative financing proposals to help residential property owners and commercial end-users to buy

- and install energy efficiency and renewable energy upgrades (solar, geothermal).
- Streamline the process and time needed for home owners to apply, get approval and/or reimbursement for grants and other incentives.

Recommendation 3: Develop uniform statewide standards for the procurement, installation and inspection of alternative energy and energy efficient products (solar panel, geothermal systems, small wind, and lighting) for both residential and commercial retrofits and new construction.

Implementation Strategies

- Improve green building codes on statewide basis for new and retrofit construction.
- Create a whole, healthy house program that focuses on energy efficiency, lead, mold, and other health risks in homes.
- Develop energy performance auditing standards for small buildings.
- In an effort to maximize job creation and stimulate the local economy, recommend that the State and its political subdivisions/local governments strictly follow the guidelines set forth in Section IV of the ARRA in using stimulus funding to retrofit government and other public buildings and grant priority to manufacturers, suppliers and contractors located in the State of Maryland in the procurement process

Conclusion

GWIB organized the Energy Industry Steering Committee in May, 2008. More than 90 leaders from business, industry associations, trade groups, labor, education, government and community organizations served on the Steering Committee. Its mission was to analyze and assess the present and future workforce needs of the energy industry in Maryland. A major goal of the Steering Committee was to develop strategies to assist the Governor, Maryland's workforce system and the energy industry to meet its workforce demand.

The Steering Committee convened meetings and focus groups to review reports and gather information. Several outcomes were sought through the process: 1) an accurate profile of the industry and workforce, 2) the identification of critical workforce issues that challenge the industry's ability to attract, hire, and retain talent, and 3) the development of an action plan to strengthen the pipeline of talent.

The GWIB staff assembled the Steering Committee's research and findings into "Energy Industry Initiative Draft Report" which was presented at the Construction and Energy Workforce Solutions Conference on July 21, 2009. Several key recommendations from the report were reviewed in breakout groups. Based on the breakout group discussions, and post-conference review by the Steering Committee, the draft report was revised into this final format.

This report and its recommendations will be presented to the Governor, and the Governor's Workforce Investment Board. The report serves as a blueprint for building the energy workforce. GWIB is committed to supporting the agencies, organizations and businesses willing to implement them. The GWIB will assess the status and progress of the recommendations, providing periodic updates to the Maryland's workforce system and its energy industry partners.

Appendix A: Selected NAICS Codes that Align with the Maryland Green Economy Model

Green Building: Total Employment = 108,314 Jobs

NAICS Code	Industry Title
236220	Commercial building construction
236115	New single-family general contractors
444190	Other building material dealers
238312	Nonresidential drywall contractors
238912	Nonresidential site preparation contractors
541310	Architectural services
238142	Nonresidential masonry contractors
238992	All other nonresidential trade contractors

Energy production: Total Employment = 21,894 Jobs

NAICS Code	Industry Title
221122	Electric power distribution
926130	Utility regulation and administration
423610	Electrical equipment and wiring merchant wholesalers
237130	Power and communication system construction
221112	Fossil fuel electric power generation
237120	Oil and gas pipeline construction

Energy Efficiency: Total Employment = 96,344 Jobs

NAICS Code	Industry Title
541712	Research and Development in the Physical, Engineering, and Life Sciences
238212	Nonresidential electrical contractors
238222	Nonresidential plumbing and HVAC contractors
236118	Residential remodelers
238221	Residential plumbing and HVAC contractors
238211	Residential electrical contractors
238152	Nonresidential glass and glazing contractors
333415	AC, refrigeration, and forced air heating

Waste & Recycling: Total Employment = 9,634 Jobs

NAICS Code	Industry Title
237110	Water and sewer system construction
562111	Solid waste collection
423930	Recyclable material merchant wholesalers

Environmental Quality: Total Employment = 12,818 Jobs

NAICS Code	Industry Title
236220	Commercial building construction
236115	New single-family general contractors
444190	Other building material dealers
238312	Nonresidential drywall contractors
238912	Nonresidential site preparation contractors
541310	Architectural services
238142	Nonresidential masonry contractors
238992	All other nonresidential trade contractors

Appendix B: Examples of Related Green Economy Jobs

Energy Efficiency

- Engineers
- Building Inspectors
- Building Operator/Building Technician
- Energy Analysis and Auditors
- Energy and Indoor Air quality Auditor
- Insulation Workers
- Resource Conservation/Efficiency Manager
- Systems Technician

Environmental Quality

- Remediation Engineer
- Environmental Engineer, Scientist
- Geologist, Hydro geologist
- Civil Engineer
- Environmental Technician, Planner
- Environmental Regulatory Compliance Consultant
- Environmental Program Manager
- Water & Natural Resources Scientist
- Stream Restoration Specialist
- Water Conservation Director
- Water Supply/Utility Manager
- Water Consultant
- Water Operator
- Water Quality Laboratory Technician
- Water Treatment Manager
- Water Production Operator

Waste Management and Recycling

- Hazardous Materials Removal Workers
- Water Recycling Plant Operations Supervisor
- Deconstruction Manager
- Environmental Waste & Water Engineer
- Waste Management Tech (Biomass)
- Chemists
- Engineers

Renewable Energy

- System Designer (Solar, Wind, Ocean)
- Test Technician (Solar, Wind, Biomass, Ocean)
- Plant Maintenance Technician (Solar, Wind, Biomass, Ocean)
- Instrument Tech. (Solar, Wind, Biomass)
- Coastal Hydraulic Engineer (Ocean)
- Marine Engineer (Ocean)
- Solar Cell and Module Manufacturers
- Photovoltaic Equipment Manufacturers
- Solar technician
- Solar Energy Engineer
- Solar Energy System Installer
- Solar Energy Foreman
- Solar Installation Operation
- Wind Turbine machinists
- Wind Turbine electrical engineer
- Wind field technician
- Wind field operations
- Wind generator installer
- Numerous administrative, managerial and support occupations that directly serve renewable energy and energy efficiency organizations

Appendix C: Relevant Certifications

	Certification	Description	Target Audience
	Green Advantage Environmental Certification www.greenadvantage.org	Tests understanding and familiarity with the latest in "green" building practices, technologies and techniques.	Contractors and trades people
Association of Energy Engineers	Certified Energy Auditor www.aeecenter.org/certification	Tests knowledge of the principles and practices of energy auditing and compliance with prescribed standards of performance and conduct.	Facility Managers, HVAC Installers and related alternate energy installers including geothermal
	Certified Energy Manager (CEM) www.aeecenter.org/certification	Tests and recognizes high levels of experience, competency, proficiency in the energy management profession as well as compliance with prescribed standards of performance and conduct.	Facility Managers, HVAC installers and related alternate energy installers including geothermal. Requires engineering degree and years in service OR sufficient years in service.
	Certified Sustainable Development Professional www.aeecenter.org/certification	Tests knowledge and technical competency in energy management and environmental practices and compliance with prescribed standards of professional performance and conduct.	Facility Managers, HVAC installers and related alternate energy installers including geothermal. Requires engineering degree and years in service OR sufficient years in service.
	Certified Green Building Engineer www.aeecenter.org/certification	Tests knowledge of the principles and practices of green building engineering, design and construction and compliance with standards of performance and conduct.	Requires professional Engineering License AND be a Certified Energy Manager.
	Certified Carbon Reduction Manager www.aeecenter.org/certification	Tests knowledge of the principles and practices of carbon reduction and compliance with prescribed standards of professional performance and conduct.	Requires 4-Yr degree or CEM in good standing.
	Certified Lighting Efficiency Professional www.aeecenter.org/certification	Tests knowledge of development and implementation of efficient lighting solutions within commercial, industrial, institutional and governmental buildings.	Facility Managers, Electricians Requires degree in Engineering or Architecture OR sufficient service years.
Building Performance Institute	Certified Building Analyst www.bpi.org/content/contractors/certification-types.html	Written and field exam designed to test an individual's ability to conduct a thorough home performance evaluation, taking into account systems, physical conditions and other energy and non-energy characteristics of the home.	Contractors and tradespeople
Residential Energy Services Network	Home Energy Rater www.natresnet.org/	Tests knowledge and compliance with the Home Energy Rating System (HERS) to inspect and evaluate a home's energy features consistent with RESNET standards. Rater prepares home energy rating report and provides energy improvement recommendations.	Contractors and tradespeople
National Association of Home Builders	Certified Green Professional	Tests the knowledge and ability incorporate green building principles into housing development.	Builders, remodelers and other construction industry professionals
	Green Verifier	Training and certification testing that complies with NAHB green standards.	Builders, remodelers and other construction industry professionals
National Association of Remodeling Industry	Green Certified Remodeling Professional	NARI designation to promote the highest standards of green remodeling through green credentialing of remodeling professionals.	Builders, remodelers and other construction industry professionals

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