The Pennsylvania Green Jobs Report

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The Pennsylvania Green Jobs Report | Executive Summary

1. State and federal policies are driving investment in Pennsylvania’s green sectors. Between 2010 and 2012, $10 billion in public and private investment in the green economy will be a catalyst for generating 115,000 jobs.

2. Pennsylvania is among the states with the highest number of green jobs. Advanced workforce policies and wise investments have made the state a national leader in creating and fostering a green economy.

3. Pennsylvania’s green jobs are located, primarily, in five industry sectors:
   - Energy Efficiency (Sample employers: civil engineering consultants and building construction contractors)
   - Renewable Energy (Sample employers: wind turbine builders and electric utility companies)
   - Clean Transportation (Sample employers: aircraft manufacturers and transportation management companies)
   - Pollution Prevention & Environmental Cleanup (Sample employers: scientific research facilities and water treatment builders)
   - Agriculture & Resource Conservation (Sample employers: corn farms and energy consulting companies)

4. Green jobs fall into three categories:
   - Emerging: including occupations such as energy auditors of buildings and other systems, wind technicians working with wind turbines, geothermal installers, solar panel installers
   - Evolving: including occupations such as construction workers skilled in commercial building, who are mastering new skills, allowing them to become expert conservation retrofitters
   - Traditional: including occupations such as construction laborers working on green building job sites, machinists making parts for wind turbines, refuse & recyclable materials collectors

Pennsylvania defines green jobs as:
Jobs that employ workers in producing or offering products or services that:
- promote energy efficiency;
- contribute to the sustainable use of resources;
- prevent pollution;
- clean up the environment; and
- promote the reduction of harmful emissions.
Pennsylvania identified 81 jobs most closely linked to green services or processes.

- Many of the state’s green occupations are mid-range technical jobs requiring some education beyond high school and/or a technical credential.
- Green occupations generally pay well, are projected to grow and many are already targeted for workforce investments.
- Targeted workforce training in emerging green occupations, such as energy auditors, solar panel installers, water treatment plant operators and weatherization installers & technicians, is a good investment from both a job seeker and employer perspective – a dual focus that Pennsylvania adopted in 2003 with Job Ready Pennsylvania.

Future parts of The Pennsylvania Green Jobs Report will include:

- An inventory of green education and training capacity
- Additional information about careers in Pennsylvania’s green industry sectors
- Job task analyses of emerging and evolving green occupations
Green Jobs, a Stronger Economy and a Cleaner Planet

In 2007, the Pew Charitable Trusts ranked Pennsylvania third among the states with the highest number of clean energy jobs. While a fine achievement, Pennsylvania is just beginning to actualize the state’s green jobs potential.

To this end, Pennsylvania is investing in industries and technologies that will create new jobs and transform old ones. We are improving access to education and training in emerging industries and occupations for our workforce, and we are cultivating partnerships among employers in industries with green potential. By doing so, Pennsylvania is making progress toward accomplishing our three-fold goal of more green jobs, a stronger economy and a healthier planet.

The Pennsylvania Green Jobs Report is part of the process. It looks at how we identify green jobs, how we categorize them and it delivers some projections of where employment in these careers – and the industries of which they’re part – is headed. This report also examines how government – state and federal – is working with the private sector to make good policy and wise investments to help speed economic recovery and position Pennsylvania as the green economic leader it should be.

To start, we must clarify what is meant by the “green economy.” For the purposes of this and future reports, the Department of Labor & Industry, in consultation with environmental experts, defines green jobs as those that promote energy efficiency, contribute to the sustainable use of resources, prevent pollution and reduce harmful emissions or clean up the environment.

Within this broad definition of green jobs, there are three specific types of occupations. Emerging occupations, such as energy auditors, require new skills unique to green industries, and are projected to grow in the near- and long-term future. Evolving occupations, such as electricians and architects, will require workers to learn new skills to master green processes and meet industry demand. And, there are traditional occupations, such as construction laborers working on green building job sites and machinists making parts for wind turbines, that will be affected as green industry grows in Pennsylvania.

To analyze the green economy, the Pennsylvania Department of Labor & Industry’s Center for Workforce Information & Analysis has identified five green industry sectors. They are:

Energy Efficiency:
Includes efforts to reduce energy consumption in existing buildings and in industrial processes. It also includes efforts to improve new buildings’ efficiency, to reduce energy lost in distributing electricity and to cultivate demand management (reducing the “peak demand”), because there’s a higher possibility of pollution when the system is strained.

Sample employers: civil engineering consultants and building construction contractors

Renewable Energy:
Includes the two new industries most commonly thought of as green: wind and solar power. This sector also includes geothermal energy and hydroelectric power.

Sample employers: wind turbine builders and electric utility companies

Clean Transportation:
Includes public transit (rail, subways and others) and vehicle manufacturing (cars, planes and parts), increasing portions of which will use fuels other than fossil fuels, or use them more efficiently.

Sample employers: aircraft manufacturers and transportation management companies

Pollution Prevention & Environmental Cleanup:
Includes efforts to restore polluted land and rivers to health, and clean industrial processes that lower toxins during production. Maintenance of water and sewer infrastructure to reduce pollution and eliminating contaminants from water are also in this category.

Sample employers: scientific research facilities and water treatment plant builders

Agriculture & Resource Conservation:
Includes production of renewable fuels (wood, other crops), effective management of natural resources, and practices such as conservation tillage, sustainable and organic agriculture that maintains or enhances soil quality and minimizes inputs.

Sample employers: corn farms and energy consulting companies
Green industries are located throughout Pennsylvania (Figure 1). Additional maps showing employers by emerging sectors are in Appendix A.

**Figure 1. Potential Green Employers in Pennsylvania**

![Map showing potential green employers in Pennsylvania](source: Center for Workforce Information & Analysis, October 2009)

As shown by Table 1, there are approximately 350,000 jobs across all five of the identified green sectors. The largest (59 percent) is Energy Efficiency (Figure 2), with almost 206,000 jobs and more than 21,800 establishments. Pollution Prevention & Environmental Cleanup is second (18 percent) with more than 63,000 workers and approximately 2,600 establishments. And, while it employs the fewest people, Clean Transportation does have the highest number of workers per establishment, averaging 40 employees at each location.

**Table 1. Number of Establishments and Employment Volume by Sector (2008)**

<table>
<thead>
<tr>
<th>Green Sector</th>
<th>Count of Establishments</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture &amp; Resource Conservation</td>
<td>2,731</td>
<td>26,792</td>
</tr>
<tr>
<td>Clean Transportation</td>
<td>726</td>
<td>29,492</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>21,827</td>
<td>205,557</td>
</tr>
<tr>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
<td>2,587</td>
<td>63,358</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>765</td>
<td>25,303</td>
</tr>
<tr>
<td>Total</td>
<td>28,636</td>
<td>350,502</td>
</tr>
</tbody>
</table>

*Source: Center for Workforce Information & Analysis*
The occupations within each of these emerging sectors vary. Not every job is what most would view as a “green” occupation. Clerical, sales and other administrative positions provide support in these emerging industries, but do not necessarily have job content different than the same occupations in other industries; however, many of the traditional occupations in the emerging green sectors – from lawyers to construction workers – require new skill sets. As the commonwealth prepares to harness the potential of these growing sectors, training and education must be adapted to address the evolving nature of the work.
The Pennsylvania Green Jobs Report | Section 2

Green Policies & Investments

Pennsylvania is a leader in stimulating growth in our emerging green sectors. New investments in alternative energy sources, aggressive energy efficiency strategies, investments in new technologies and replacement of water and sewer infrastructure all work to reduce energy consumption, break our reliance on foreign energy suppliers and create a cleaner environment for future generations. These strategies also create jobs.

This section provides some background on a number of initiatives that are helping make Pennsylvania industry greener and more competitive. Additionally, Table 2 (page 10) shows the estimates for the total amount of public- and private-sector investment over the 2010-2012 period resulting from these state and federal policies.

Pennsylvania’s Alternative Energy Portfolio Standards (AEPS) Act (Act 213) requires electricity suppliers to provide gradually increasing amounts of their energy from alternative energy sources – up to a total of 18 percent by 2020. AEPS also requires that solar energy, specifically, supply 0.5 percent of Pennsylvania’s electricity by 2020. The level of alternative energy required gradually increases according to a 15-year schedule (starting in 2005 through 2020) found in Act 213.

AEPS is moving Pennsylvania’s solar market toward $1 billion per year, and in 2008, investment in wind alone was about $400 million. This level is expected to continue. An additional $170 million per year is expected in private-sector investments in other renewable sectors. Given these assumptions for the various renewable energy sub-clusters, $1.57 billion will be annually invested in renewable energy due to AEPS, or $4.71 billion over three years (as shown in Table 2).

The Alternative Energy Investment Fund, or AEIF, creates a $650 million fund. The fund includes $180 million to stimulate the growth of solar energy, $190 million for other alternative energy projects, $25 million to subsidize energy-efficient green buildings, $40 million for early-stage activities in green business development, $40 million to help low-income customers manage high energy prices, $25 million for pollution-control and technology projects, $50 million in tax credits for alternative-energy production and nearly $100 million for subsidizing energy conservation for homeowners, small businesses and low-income families.²

² Table 2 assumes total investments occur in equal installments over five years, which means $390 million will occur in three years.
Act 129 requires electric utilities with 100,000 or more customers to achieve a 1-percent reduction in electricity consumption by May 31, 2011, a 3-percent reduction in consumption by May 31, 2013 as well as a 4.5-percent reduction in peak demand. Utilities are projected to spend $240 million per year, or $720 million over three years, to reach these efficiency targets. Each dollar of utility investment is projected to leverage approximately three dollars in additional private investment, translating into nearly $1 billion dollars annually as a result of Act 129 implementation.

The American Recovery and Reinvestment Act (ARRA) will provide Pennsylvania with $252.8 million for the Weatherization Assistance Program, which will pay for the weatherization of nearly 30,000 low-income housing units over the next two to three years.

Other ARRA funding will support renewable energy and energy efficiency efforts likely to drive near-term job creation. Those efforts include:

- Pennsylvania State Energy Program – $99.6 million in funding for wind, solar and clean biogas programs;
- Energy Efficiency and Conservation Block Grant – $102.5 million in funding for local governments to increase their energy efficiency;
- Energy Efficiency Appliance Rebate Program – approximately $9 million for the purchase of Energy Star appliances;
- Smart Grid Resiliency Program – $1 million to ensure the resiliency of the country’s electrical grid; and
- Other Grants – provide opportunities for Pennsylvania to compete for grants for renewable energy and energy efficiency projects that could bring approximately $800 million to the commonwealth.

Federal Energy Tax Credits include a 30-percent tax credit for the purchase of solar energy and fuel cells, as well as credits for wind, biomass, energy efficiency and refined coal investments.
Water and Sewer Infrastructure Investment:

- H2O PA: $800 million water and sewer fund for municipalities
- ARRA dollars for water and sewer infrastructure: $220 million total
- PennVest dollars for water and sewer infrastructure — separate from the two previous sources: $300 million annually

Assuming the H2O PA monies will be spent in equal allotments over six years (six years is the maximum length of a multiyear H2O PA grant), $400 million will be spent in the first three years, $220 million in ARRA dollars should all be used by the end of 2012 and $300 million for PennVest annually adds up to $900 million over three years. All three of these sources of water and sewer investment combine for a grand total over three years of $1.52 billion.

The Pennsylvania Community Transportation Initiative will support 80 transportation projects that will create green jobs, relieve traffic congestion and make it easier for students to walk and bike to school.

Biofuels Programs, including the Alternative Fuels Investment Grant program, Pennsylvania Energy Harvest, First Industries Fund and the 2009 biomass-based diesel production incentive program, will invest between $8 million to $13 million annually from 2010 to 2012 to stimulate production of biofuels in the commonwealth’s Agriculture & Resource Conservation sector.
$10 Billion in Green Investments

The combination of new energy policies and investments will lead to $10 billion in public and private investments. Table 2 shows the breakdown of public- and leveraged private-sector investment over three years by policy type. Private-sector investment necessary to meet policy requirements, such as AEPS and Act 129, is included in these estimates.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Energy</td>
<td>$4,710</td>
<td>$240</td>
<td>$11</td>
<td>—</td>
<td>$500</td>
<td>—</td>
<td>—</td>
<td>$5,461</td>
<td></td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td></td>
<td>$135</td>
<td>$2,137</td>
<td>$253</td>
<td>$512</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>$3,037</td>
</tr>
<tr>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
<td>—</td>
<td></td>
<td>$15</td>
<td>—</td>
<td>$1,520</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>$1,535</td>
</tr>
<tr>
<td>Clean Transportation</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
<td></td>
<td></td>
<td>—</td>
<td>$76</td>
<td>$76</td>
</tr>
<tr>
<td>Agriculture &amp; Resource Conservation</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
<td></td>
<td></td>
<td>—</td>
<td>$32</td>
<td>$32</td>
</tr>
<tr>
<td>Total Across All Sectors</td>
<td>$4,710</td>
<td>$390</td>
<td>$2,147</td>
<td>$253</td>
<td>$1,012</td>
<td>$1,520</td>
<td>$76</td>
<td>$32</td>
<td>$10,141</td>
</tr>
</tbody>
</table>

Source: Industry sources and input from the Pennsylvania Department of Environmental Protection

Since this is a report intended to serve as a benchmark for job creation to inform future training and education policy, prior year investments are not counted. In addition, policies and programs on the horizon at the time this report was written have not been captured, but will be included in future reports.
Projected Green Job Growth

Table 3 translates the $10 billion in investments into estimated increases in jobs by year, from 2010 to 2012.

Table 3. Policy-Driven Jobs Resulting from Investment in Green Sectors 2010 to 2012

<table>
<thead>
<tr>
<th>Green Sector</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
<th>Total (2009-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture &amp; Resource Conservation</td>
<td>247</td>
<td>209</td>
<td>152</td>
<td>608</td>
</tr>
<tr>
<td>Clean Transportation</td>
<td>418</td>
<td>418</td>
<td>-</td>
<td>836</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>14,082</td>
<td>16,746</td>
<td>17,763</td>
<td>48,591</td>
</tr>
<tr>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
<td>9,210</td>
<td>9,210</td>
<td>9,210</td>
<td>27,630</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>11,290</td>
<td>12,869</td>
<td>14,065</td>
<td>38,224</td>
</tr>
<tr>
<td>Total</td>
<td>35,247</td>
<td>39,452</td>
<td>41,190</td>
<td>115,889</td>
</tr>
</tbody>
</table>

Sources: Center for Workforce Information & Analysis based on industry and agency input regarding investment estimates each year in the specific green sectors. The IMPLAN model translates investments into employment projections.

The IMPLAN model used to estimate job creation is an input/output model that estimates job creation based on total investment; therefore, job creation includes:

- Direct jobs, which include jobs at companies that produce or supply renewable energy, energy efficiency, clean transportation, and pollution prevention and environmental cleanup services (e.g. wind turbine manufacturer);
- Indirect jobs, which include jobs at companies that supply the green sector with goods and services (e.g. a manufacturer whose product is used in a wind turbine, but has other uses, too); and
- Induced jobs, which include jobs at companies across all sectors that directly benefit from the spending of those employed in direct and indirect jobs (e.g. grocery stores, restaurants, etc.).

Direct jobs account for slightly more than half the total in Table 3 — about 65,000 of the more than 115,000.
The general consensus among local, state and federal researchers is that green jobs fall into three categories:

- **Emerging** – As a point of fact, it isn’t that these jobs didn’t exist at all, but that they are either new enough, or growing in number to such an extent, that current statistical job categories traditionally tracked by labor statisticians don’t include them. Table 4 provides some emerging green occupations Pennsylvania has identified.

- **Evolving** – The majority of green jobs are in manufacturing and construction; however, many of them require new skills specific to the green sector. For example, construction workers skilled in commercial building may need new skills to become expert retrofitters.

- **Traditional** – These are occupations in green industries whose job duties are not changing significantly. Examples of these occupations include refuse & recyclable materials collectors and surveyors.

Table 4 provides examples of emerging, evolving and traditional careers. While they differ by green sector, all of them have an important contribution to make in the increasingly green economy.
### Table 4. Examples of Emerging, Evolving & Traditional Green Occupations in Pennsylvania

<table>
<thead>
<tr>
<th>Emerging Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emerging Occupations</strong></td>
</tr>
<tr>
<td>Energy Auditors <em>Conduct energy audits of buildings, building systems and process systems. May also conduct investment-grade audits of buildings or systems.</em></td>
</tr>
<tr>
<td>Energy Engineers <em>Design, develop, and evaluate energy-related projects and programs to reduce energy costs or improve energy efficiency during the designing, building or remodeling stages of construction. May specialize in electrical systems; heating, ventilation and air-conditioning (HVAC) systems; green buildings; lighting; air quality or energy procurement.</em></td>
</tr>
<tr>
<td>Geothermal Installers <em>Perform technical activities at power plants or individual installations necessary for the generation of power from geothermal energy sources. Monitor and control operating activities at geothermal power generation facilities and perform maintenance and repairs as necessary. Install, test, and maintain residential and commercial geothermal heat pumps.</em></td>
</tr>
<tr>
<td>GIS Specialists <em>Work with related software and programs to create and maintain data and/or maps that can be combined with geographically referenced data. GIS software has the capacity to relate different types of data such as socioeconomic, demographic, administrative or political boundaries, land use, land cover, environmental, infrastructure and transportation networks.</em></td>
</tr>
<tr>
<td>Logistics Analysts <em>Analyze, forecast and report shipping/delivery data. May also assist with the development and optimization of logistic network planning models.</em></td>
</tr>
<tr>
<td>Mechatronics Engineers <em>Apply the latest techniques of interdisciplinary engineering fields— including precision mechanical engineering, controls theory, computer science and electronics— to design process that create more functional and adaptable products.</em></td>
</tr>
<tr>
<td>Mining &amp; Geological Engineering Technicians <em>Inspect, validate, and approve the extraction of coal, metallic ores, nonmetallic minerals, and building materials, such as stone and gravel under the supervision of Mining Engineers. Ensure safety precautions, recommendations and proper techniques are being utilized.</em></td>
</tr>
<tr>
<td>Renewable Energy Technicians <em>Install, inspect, test, maintain or repair green power and renewable energy systems such as wind, solar or biomass systems.</em></td>
</tr>
<tr>
<td>Robotics Engineers <em>Design, test and build robots that are productive and safe to operate as well as economical to purchase and maintain. Engineers use computer-aided design and drafting, and computer-aided manufacturing (CAD/CAM) systems to perform their tasks.</em></td>
</tr>
<tr>
<td>Robotics Technicians <em>Assist engineers in all phases of robotic design, development, production, testing and operations. Technicians may be responsible for the initial installation of the robot as well as in-house maintenance or repair.</em></td>
</tr>
<tr>
<td>Solar Panel Installers <em>Assemble, install or maintain solar photovoltaic (PV) systems on roofs or other structures in compliance with site assessment and schematics. May include measuring, cutting, assembling and bolting structural framing and solar modules. May perform minor electrical work such as current checks.</em></td>
</tr>
<tr>
<td>Transportation Planners <em>Prepare studies for proposed transportation projects. Gather, compile and analyze data. Study the use and operation of transportation systems. Develop transportation models or simulations.</em></td>
</tr>
<tr>
<td>Water Treatment Operators <em>Utilize computers to help monitor equipment, store result samples, make process-control decisions, schedule and record maintenance activities, and produce reports in order to ensure that water is safe for the public to drink.</em></td>
</tr>
<tr>
<td>Weatherization Installers &amp; Technicians <em>Perform a variety of activities to weatherize homes and make them more energy efficient. Duties include repairing windows, insulating ducts, and performing heating, ventilating and air-conditioning (HVAC) work. May perform energy audits and advise clients on energy conservation measures.</em></td>
</tr>
<tr>
<td>Wind Technicians <em>Maintain and repair wind turbines that are used to make energy.</em></td>
</tr>
</tbody>
</table>
## Sample Evolving Occupations

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agricultural &amp; Food Science Technicians</strong></td>
<td>Work with agricultural scientists in food, fiber, and animal research, production, and processing; assist with animal breeding and nutrition work; under supervision, conduct tests and experiments to improve yield and quality of crops or to increase the resistance of plants and animals to disease or insects.</td>
</tr>
<tr>
<td><strong>Architects</strong></td>
<td>Plan and design structures, such as private residences, office buildings, theaters, factories, and other structural property.</td>
</tr>
<tr>
<td><strong>Carpenters</strong></td>
<td>Construct, erect, install, or repair structures and fixtures made of wood, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; wood stairways, window and door frames, and hardwood floors.</td>
</tr>
<tr>
<td><strong>Electricians</strong></td>
<td>Install, maintain, and repair electrical wiring, equipment, and fixtures.</td>
</tr>
<tr>
<td><strong>Environmental Engineering Technicians</strong></td>
<td>Apply theory and principles of environmental engineering to modify, test, and operate equipment and devices used in the prevention, control, and remediation of environmental pollution, including waste treatment and site remediation.</td>
</tr>
<tr>
<td><strong>Heating, Air Conditioning, &amp; Refrigeration Mechanics &amp; Installers</strong></td>
<td>Install or repair heating, central air conditioning, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.</td>
</tr>
<tr>
<td><strong>Industrial Machinery Mechanics</strong></td>
<td>Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.</td>
</tr>
</tbody>
</table>

## Sample Traditional Occupations

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Laborers</strong></td>
<td>Perform tasks involving physical labor at building, highway, and heavy construction projects, tunnel and shaft excavations, and demolition sites.</td>
</tr>
<tr>
<td><strong>Foresters</strong></td>
<td>Manage forested lands for economic, recreational, and conservation purposes.</td>
</tr>
<tr>
<td><strong>Machinists</strong></td>
<td>Set up and operate a variety of machine tools to produce precision parts and instruments.</td>
</tr>
<tr>
<td><strong>Plumbers, Pipefitters, &amp; Steamfitters</strong></td>
<td>Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases.</td>
</tr>
<tr>
<td><strong>Refuse &amp; Recyclable Material Collectors</strong></td>
<td>Collect and dump refuse or recyclable materials from containers into truck.</td>
</tr>
<tr>
<td><strong>Surveyors</strong></td>
<td>Make exact measurements and determine property boundaries. Provide relevant data for engineering, mapmaking, mining, land evaluation, construction, and other purposes.</td>
</tr>
<tr>
<td><strong>Welders, Cutters, Solderers, &amp; Brazers</strong></td>
<td>Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.</td>
</tr>
</tbody>
</table>

*Source: Center for Workforce Information & Analysis*
To determine green occupations, the Pennsylvania Department of Labor & Industry reviewed the more than 800 occupations in the current Standard Occupational Classification, or SOC, structure, applied the state’s definition of green jobs, and identified 81 that are most closely linked to green services or processes (Appendix B). These occupations are found in one or more of the green sectors identified in this report.

Initial research does shed light on some clear characteristics of 81 green occupations:

- Many of the state’s green occupations are mid-range technical jobs requiring some education beyond high school and/or a technical credential;
- Green occupations generally pay well, are projected to grow, and many are already targeted for workforce investments; and
- Targeted workforce training in emerging green occupations, such as energy auditors, solar panel installers, water treatment plant operators and weatherization installers & technicians, is a good investment from both a job seeker and employer perspective – a dual focus that Pennsylvania adopted in 2003 with Job Ready Pennsylvania.

While many of the workers in these 81 green occupations may not be performing green work at this time or may not be performing it full time, many will be able to build on their existing skill sets and transition into the green economy with minimal training.

Figure 3 shows how employment in these 81 green occupations is distributed across all five green sectors, based on broad occupational groupings from the existing classification structure.

- Two out of every five workers are construction-related, primarily carpenters, construction laborers and electricians.
- Farmworkers represent the largest occupation in the Agriculture & Forestry group, which employs 16 percent of green occupational employment.
- Another 16 percent fall in the Engineers & Scientists group, many of which are designing and testing the products and processes that drive the green economy.
To effectively target workforce training investments, Pennsylvania has identified High Priority Occupations, or HPOs, that are in demand by employers and pay a family-sustaining wage. Table 5 highlights green High Priority Occupations. It should be noted that many of the identified 81 green occupations are likely to be added in the future as HPOs. This and future reports are intended to provide estimates of industry demand in these fields.

Table 5. State and Regional **Green** High Priority Occupations: An Initial List

<table>
<thead>
<tr>
<th>SOC Code</th>
<th>SOC Title</th>
<th>2008 Average Annual Wage</th>
<th>Educational Level</th>
<th>Primary Green Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>47-2031</td>
<td>Carpenters</td>
<td>$42,660</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>19-2031</td>
<td>Chemists</td>
<td>$69,980</td>
<td>Bachelor's Degree</td>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
</tr>
<tr>
<td>17-2051</td>
<td>Civil Engineers</td>
<td>$73,310</td>
<td>Bachelor's Degree</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>47-2061</td>
<td>Construction Laborers</td>
<td>$33,260</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>47-2111</td>
<td>Electricians</td>
<td>$54,490</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>SOC Code</td>
<td>SOC Title</td>
<td>2008 Average Annual Wage</td>
<td>Educational Level</td>
<td>Primary Green Sector</td>
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<td>-----------------------------</td>
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<tr>
<td>13-1051</td>
<td>Energy Auditors*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>17-2199</td>
<td>Energy Engineers*</td>
<td>N/A</td>
<td>Bachelor's Degree</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>17-2081</td>
<td>Environmental Engineers</td>
<td>$82,600</td>
<td>Bachelor's Degree</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>49-9021</td>
<td>Geothermal Installers*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>49-9021</td>
<td>Heating, Air Conditioning &amp; Refrigeration Mechanics &amp; Installers</td>
<td>$41,800</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>17-3026</td>
<td>Industrial Engineering Technicians</td>
<td>$51,570</td>
<td>Associate Degree</td>
<td>Clean Transportation</td>
</tr>
<tr>
<td>17-2112</td>
<td>Industrial Engineers</td>
<td>$73,180</td>
<td>Bachelor's Degree</td>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
</tr>
<tr>
<td>49-9041</td>
<td>Industrial Machinery Mechanics</td>
<td>$43,150</td>
<td>On-the-Job Training</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>51-9061</td>
<td>Inspectors, Testers, Sorters, Samplers &amp; Weighers</td>
<td>$35,050</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>51-4041</td>
<td>Machinists</td>
<td>$37,280</td>
<td>On-the-Job Training</td>
<td>Clean Transportation</td>
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<tr>
<td>49-9042</td>
<td>Maintenance &amp; Repair Workers, General</td>
<td>$35,320</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>13-1111</td>
<td>Management Analysts</td>
<td>$85,550</td>
<td>Bachelor's Degree Plus</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>47-2152</td>
<td>Plumbers, Pipefitters &amp; Steamfitters</td>
<td>$53,550</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>53-7081</td>
<td>Refuse &amp; Recyclable Material Collectors</td>
<td>$32,110</td>
<td>On-the-Job Training</td>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
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<tr>
<td>49-9099</td>
<td>Renewable Energy Technicians*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>47-2181</td>
<td>Roofers</td>
<td>$39,790</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
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<tr>
<td>49-9021</td>
<td>Solar Panel Installers*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>47-1011</td>
<td>Supervisors/Managers - Construction &amp; Extraction Workers</td>
<td>$62,650</td>
<td>Work Experience</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>51-1011</td>
<td>Supervisors/Managers - Production Workers</td>
<td>$54,460</td>
<td>Work Experience</td>
<td>Energy Efficiency</td>
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<tr>
<td>51-8031</td>
<td>Water &amp; Liquid Waste Treatment Operators</td>
<td>$41,340</td>
<td>On-the-Job Training</td>
<td>Pollution Prevention &amp; Environmental Cleanup</td>
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<tr>
<td>49-1011</td>
<td>Weatherization Crew Leaders*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>49-9042</td>
<td>Weatherization Installers*</td>
<td>N/A</td>
<td>On-the-Job Training</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>51-4121</td>
<td>Welders, Cutters, Solderers &amp; Brazers</td>
<td>$34,840</td>
<td>Postsecondary Award</td>
<td>Energy Efficiency</td>
</tr>
</tbody>
</table>

High Priority Occupations are those targeted by the commonwealth for workforce investment training monies because they are in-demand by employers, pay a family-sustaining wage and have higher skill requirements. Although the titles listed above are traditional occupations, many of the job duties performed by workers are expected to evolve as a direct result of investments in the five green sectors.

* Educational attainment and selected SOC codes for these occupations are based on research done for this report.

Source: Center for Workforce Information & Analysis
An Opportunity for Growth: Weatherization

The Department of Labor & Industry, in partnership with the Pennsylvania Department of Community and Economic Development, or DCED, collected – from employers and other sources – information about employment and training needs in the weatherization industry. DCED surveyed 43 Pennsylvania weatherization assistance providers to gain a better understanding of their current employee and subcontractor training needs. Using that information, the Department of Labor & Industry and DCED were able to determine how many training providers would be necessary to meet a statewide demand for certified weatherization professionals.

A statewide certification program provides important benefits:

- Employers working to meet Act 129 energy-efficiency requirements will know that prospective hires will have the skill and training they need;
- Certified installers, crew chiefs and auditors will perform at a consistent, high-quality standard everywhere in Pennsylvania;
- The ability to identify where, geographically, there is a need for certified weatherization professionals; and
- The ability to identify where there are people who will benefit from weatherization training.

Six grant recipients will provide weatherization training to students learning to become weatherization installers, crew chiefs and auditors. Additionally, Penn College of Technology – which developed the statewide weatherization training curriculum – will provide technical assistance to the training providers. Other grants will help create an apprenticeship model. All training providers will help Pennsylvania identify, train and certify more than 1,000 workers to complete high-quality energy reduction, conservation and weatherization activities in approximately 30,000 single- and multi-family homes across the state.

In the past, weatherization workers were not required to be certified. Under the Pennsylvania Weatherization Program, workers receive an installer, crew chief or auditor certificate upon the satisfactory completion of a state-certified training course. The Department of Labor & Industry is working with weatherization training providers and industry employers to tie this training to other fields – especially green practices in building and construction.
Career Paths in the Green Economy

Pennsylvania's workforce strategy, based on connecting training to industry needs, has a dual purpose: boosting competitiveness and expanding opportunity. Because so many green occupations are emerging or evolving from traditional occupations, Pennsylvanians may not be aware of the opportunities in the green sectors or the career pathways into these occupations.

Figure 4 illustrates a potential career path in weatherization – an emerging field with an immediate need for workers as a result of recent federal and state investments, and the requirements of electricity providers to lower consumer usage.
Industry Leads the Way

Under Governor Rendell, Pennsylvania has become a nationally recognized leader in industry-led workforce development. Before he took office, Pennsylvania workforce development, like most states, was primarily job matching: career centers making temporary connections between employers and job seekers. Among a host of this approach’s shortcomings: limited training, short-term employment, inadequate wages and an absence of career development opportunities. While immediate employment needs were being met, employers’ long-term workforce needs went unaddressed.

That's changed for good – and for the good of employers, job seekers and the commonwealth of Pennsylvania.

In 2003, Governor Rendell introduced Job Ready Pennsylvania, a collection of innovative workforce development initiatives that improved the connection between employers and the workforce by using industry information about training needs, skill gaps and more to determine and guide workforce policy and investment. By working much more closely with employers to understand their specific needs, and by working much more closely with schools and training providers to deliver targeted instruction and workforce training to job seekers, Pennsylvania is now connecting relevantly skilled workers with employers’ career-focused occupations that pay a family-sustaining wage.

This industry-driven workforce development strategy is ideally suited to respond to emerging green industries’ needs. It uses a three-pronged approach:

- **Targeted Industry Clusters** have been identified by the Pennsylvania Department of Labor & Industry as industries with good jobs and in which the state has a competitive advantage.
- **High Priority Occupations** are those occupations in targeted industry clusters that are in demand by employers, pay family-sustaining wages and offer opportunities for career advancement.
- **Industry Partnerships** are defined as groups of employers, from targeted industry clusters, working together to identify and address their common workforce needs. In addition to the partnerships themselves, local workforce investment boards are all well positioned to help employers extend their reach into green markets.
Pennsylvania already has eight industry partnerships focused on delivering advanced training that meets green employers’ needs (Table 6). Other partnerships – in building and construction, and manufacturing – have the ability to make connections between employers and expanding green industry markets, such as energy-efficient buildings or environmentally responsible products.

**Table 6. Green Training Through PA Industry Partnerships**

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Industry Partnership</th>
<th>Companies</th>
<th>Trainees</th>
<th>Sample Trainings</th>
</tr>
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<tbody>
<tr>
<td>Advanced Manufacturing</td>
<td>Central PA Advanced Manufacturing</td>
<td>34</td>
<td>49</td>
<td>Strategic Energy Planning; Energy Efficient Lighting; Motor Systems Management</td>
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<tr>
<td></td>
<td>Tri-County Manufacturing Consortia</td>
<td>25</td>
<td>35</td>
<td>Building Products for the Green Market; Overview of Evaluating Green in Industry and Manufacturing</td>
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<tr>
<td>Building &amp; Construction</td>
<td>Central PA Building &amp; Construction/Factory Build Housing</td>
<td>34</td>
<td>92</td>
<td>Green Advantage Commercial Construction Certification; Residential Energy Services Network Field Inspector Rater Course; Building Science for Modular Construction</td>
</tr>
<tr>
<td></td>
<td>Northwest PA Building Trades</td>
<td>7</td>
<td>26</td>
<td>Green Advantage Certification; Green Advantage Building Training</td>
</tr>
<tr>
<td>Energy</td>
<td>Smart Energy Initiative</td>
<td>112</td>
<td>143</td>
<td>Basic Grid-Tier Solar Photovoltaic; Advanced Solar Photovoltaic Design/Installation; Green Advantage Certification; RESNET (Residential Energy Services Network); Building Performance Institute</td>
</tr>
<tr>
<td></td>
<td>Three Rivers Clean Energy</td>
<td>33</td>
<td>222</td>
<td>Energy Conservation and Facility Retrocommissioning; Green Awareness; SolidWorks; Radiation Training</td>
</tr>
<tr>
<td></td>
<td>Keystone Utilities</td>
<td>TBD</td>
<td>TBD</td>
<td>Beck Drive Training; Duquesne Light Stimulus Team; IBEW Local 712 Green Training Initiative</td>
</tr>
<tr>
<td>Plastics</td>
<td>Northwest Plastics</td>
<td>4</td>
<td>138</td>
<td>Lean Manufacturing</td>
</tr>
</tbody>
</table>

*Source: Pennsylvania Local Workforce Investment Boards*
Examples of Local Workforce Investment Boards’ Green Activities

The Lancaster County Workforce Investment Board is working on three green-industry projects. They are:

- Development of a Building Energy Technology Program in collaboration with Thaddeus Stevens College of Technology. The curriculum consists of six courses: Green Building Energy Systems; Technical Aspects of Renewable and Alternative Energy; Residential Building Energy and Environmental Systems; Home Performance Energy Evaluations; Commercial, Industrial Building Energy and Environmental Systems; and Building System Maintenance. The first class included 25 participants from 18 companies.

- Staffing of the Lancaster County Center of Excellence in Renewable Energy (www.LancasterCountyRenewableEnergy.com) which is a project of Lancaster Prospers, a local economic development collaborative. The center coordinates all energy training activities taking place in the region. Partners include the Smart Energy Initiative from Chester County, Thaddeus Stevens College and the Lancaster County Career and Technology Center. A December 2008 one-day training event, offered by the center and called “Energy on the Farm,” drew nearly 200 people.

- Advertising green opportunities, in conjunction with other local planning, economic and industry groups, through eye-catching brochures highlighting job duties, skills required, education and certificates needed. Examples of occupations being marketed are:
  - Building Control Systems Technicians
  - Solar PV Installers
  - Geothermal Technicians
  - Energy Regulation Specialists

Several local workforce investment boards in southwestern Pennsylvania are also marketing green occupations through their PA CareerLink® offices. The consortium of local workforce investment boards developed a Clean Tech Resource Manual that profiles more than 90 occupations tied to the energy industry. Included in the profiles are an occupational overview, employment and wage data, educational requirements and related occupations. Examples of occupations included in the manual are:

- Pump Operators
- Electrical Engineering Technicians
- Landscape Architects
- Plumbers, Pipe Fitters and Steam Fitters
Green Pathways Out of Poverty

Pennsylvania is also working with industry partnership employers and private philanthropy to create career paths, accessible to low-income workers, to help them climb out of poverty. Working with organizations such as Pittsburgh’s Heinz Endowments, the Harrisburg-based Foundation for Enhancing Communities and the Berks County Foundation in Reading, green Pathways Out of Poverty projects are already in happening in southwestern, southeastern, south central and northwestern Pennsylvania.

Building Green Pathways Out of Poverty

Southeast Pennsylvania – The Smart Energy Initiative is working with electric utilities in Philadelphia and south central Pennsylvania to encourage energy efficiency companies to design workforce services that meet the industry’s need for additional energy efficiency workers. This basic approach, with utilities encouraging their energy efficiency companies to collaborate with a local industry partnership, makes sense for all seven utilities faced with meeting state electricity conservation mandates.

Southwest Pennsylvania – A new labor-management clearinghouse has been established, with foundation and state support, to create new green pathways out of poverty. The initiative builds on prior industry partnership efforts in three sectors: construction, utilities and energy. An effort is also under way to add weatherization as a career entry point, with promotion possibilities into construction, utilities or the fast-growing private energy efficiency market.
The Pennsylvania Green Jobs Report | Section 5

Next Steps in Research

Pennsylvania is poised to embrace the economic and workforce development potential in the greening of the state’s economy. The Department of Labor & Industry, as the state’s principal workforce policy organization, is uniquely positioned to aid in this effort.

With green jobs now defined, the commonwealth’s workforce system needs to better understand the nature and magnitude of these jobs in the state’s economy. There is a need for a formal system to collect, analyze and disseminate green labor market information, and to develop a labor exchange infrastructure to direct job seekers to careers in green industry sectors such as energy efficiency and renewable energy. Understanding what skills are sought by employers in the green economy, in both entry-level and professional-level workers, is crucial. Through asset-mapping of our existing framework of educational programs, we can better determine if we are producing trained workers with these skills in sufficient quantity; or, if we have sufficient workers, how the workforce system can aid in retooling the existing skill sets of today’s workers for tomorrow’s opportunities. We also need industry to validate industry-recognized certifications that are relevant in the green economy.

On Nov. 18, 2009 Pennsylvania received a $1.25 million competitive Labor Market Information Grant, through the American Recovery and Reinvestment Act, to help develop green labor market information for Pennsylvanians. Considerably aided by this Recovery Act grant, the Pennsylvania Department of Labor & Industry will undertake several activities, in coordination with other state agencies, Local Workforce Investment Boards, Industry Partnerships and employers to enhance its labor market infrastructure and gather information about this emerging economy, including:

1. Economy-wide employer surveys — to estimate current and anticipated green jobs, critical occupations, unique skill needs and potential skill shortages;
2. Employer focus groups and training needs surveys to augment traditional labor-market tools and more precisely define employers’ training needs;
3. Inventory of green education and training capacity drawing on the knowledge of Industry Partnerships and Local Workforce Investment Boards;
4. Job task analyses of emerging and “evolving” green occupations that enable customization of green curricula and assessment tools; and
5. Creation of an automated career tool (with information on wages, career paths and education/certification requirements) to market green jobs to job seekers.
Attention will be given to information gathered from Industry Partnerships and Local Workforce Investment Boards to help determine local training priorities. Part 2 of *The Pennsylvania Green Jobs Report* will analyze the green economy based on the results of a statewide employer survey, and will be targeted to workforce development practitioners and educators to help them prepare businesses and job seekers for green opportunities. It will identify green competencies for green occupational groups and concentrate on potential green career pathways.

Without a doubt, Pennsylvania is at the threshold of an incredible opportunity to capitalize on the trends and investments in the green economy. With the commonwealth’s established workforce development programs, and the potential for growth across the five green sectors, Pennsylvania is positioned to become a national leader in creating and fostering green economy jobs.
The Pennsylvania Green Jobs Report

Appendices

Appendix A: Locations of Employers by Green Sector

Appendix B: Green Occupations

Appendix C: Methodology

Appendix D: NAICS Industries within Pennsylvania’s Five Green Sectors
Appendix A

Locations of Employers by Green Sector

Potential Green Employers in Pennsylvania Agriculture & Resource Conservation

Potential Green Employers in Pennsylvania Clean Transportation

Center for Workforce Information & Analysis, October 2009
Potential Green Employers in Pennsylvania Energy Efficiency

Potential Green Employers in Pennsylvania Pollution Prevention & Environmental Cleanup

Center for Workforce Information & Analysis, October 2009
Potential Green Employers in Pennsylvania Renewable Energy

Center for Workforce Information & Analysis, October 2009
## Green Occupations

<table>
<thead>
<tr>
<th>SOC Code</th>
<th>SOC Title</th>
<th>2006 Estimated Employment</th>
<th>Estimated % Growth 2006-2016</th>
<th>2008 Average Annual Wage</th>
<th>Educational Level</th>
<th>2009 PA HPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-3051</td>
<td>Industrial Production Managers</td>
<td>6,310</td>
<td>-1.27%</td>
<td>$83,230</td>
<td>Bachelor's Degree</td>
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<tr>
<td>11-3071</td>
<td>Transportation, Storage &amp; Distribution Managers</td>
<td>3,330</td>
<td>12.31%</td>
<td>$88,060</td>
<td>Work Experience</td>
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<tr>
<td>11-9011</td>
<td>Farm, Ranch &amp; Other Agricultural Managers</td>
<td>12,770</td>
<td>11.12%</td>
<td>$74,080</td>
<td>Bachelor's Degree +</td>
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<tr>
<td>11-9012</td>
<td>Farmers &amp; Ranchers</td>
<td>33,920</td>
<td>2.33%</td>
<td>N/A</td>
<td>Long-Term OJT</td>
<td></td>
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<tr>
<td>11-9021</td>
<td>Construction Managers</td>
<td>9,720</td>
<td>9.26%</td>
<td>$91,710</td>
<td>Bachelor's Degree</td>
<td></td>
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<tr>
<td>11-9041</td>
<td>Engineering Managers</td>
<td>5,560</td>
<td>2.34%</td>
<td>$112,050</td>
<td>Bachelor's Degree +</td>
<td></td>
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<tr>
<td>11-9121</td>
<td>Natural Sciences Managers</td>
<td>1,320</td>
<td>13.64%</td>
<td>$157,710</td>
<td>Bachelor's Degree +</td>
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<td>13-1111</td>
<td>Management Analysts</td>
<td>24,930</td>
<td>20.18%</td>
<td>$85,550</td>
<td>Bachelor's Degree +</td>
<td>HPO</td>
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<tr>
<td>17-1011</td>
<td>Architects</td>
<td>5,000</td>
<td>-0.20%</td>
<td>$79,190</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-1012</td>
<td>Landscape Architects</td>
<td>730</td>
<td>1.37%</td>
<td>$60,720</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-1021</td>
<td>Cartographers &amp; Photogrammetrists</td>
<td>230</td>
<td>4.35%</td>
<td>$42,900</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-1022</td>
<td>Surveyors</td>
<td>2,130</td>
<td>4.23%</td>
<td>$51,910</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-2021</td>
<td>Agricultural Engineers</td>
<td>90</td>
<td>22.22%</td>
<td>$65,310</td>
<td>Bachelor's Degree</td>
<td></td>
</tr>
<tr>
<td>17-2041</td>
<td>Chemical Engineers</td>
<td>1,100</td>
<td>10.00%</td>
<td>$79,070</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-2051</td>
<td>Civil Engineers</td>
<td>10,870</td>
<td>4.32%</td>
<td>$73,310</td>
<td>Bachelor's Degree</td>
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<td>Electrical Engineers</td>
<td>6,510</td>
<td>-0.61%</td>
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<td></td>
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<td>Electronics Engineers</td>
<td>5,500</td>
<td>10.36%</td>
<td>$84,350</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-2081</td>
<td>Environmental Engineers</td>
<td>2,600</td>
<td>24.62%</td>
<td>$82,600</td>
<td>Bachelor's Degree</td>
<td>HPO</td>
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<tr>
<td>17-2112</td>
<td>Industrial Engineers</td>
<td>9,070</td>
<td>25.69%</td>
<td>$73,180</td>
<td>Bachelor's Degree</td>
<td>HPO</td>
</tr>
<tr>
<td>17-2131</td>
<td>Materials Engineers</td>
<td>1,400</td>
<td>-2.86%</td>
<td>$78,880</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-2141</td>
<td>Mechanical Engineers</td>
<td>9,140</td>
<td>0.00%</td>
<td>$74,640</td>
<td>Bachelor's Degree</td>
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<tr>
<td>17-3022</td>
<td>Civil Engineering Technicians</td>
<td>2,790</td>
<td>-1.43%</td>
<td>$41,050</td>
<td>Associate Degree</td>
<td></td>
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<td>SOC Code</td>
<td>SOC Title</td>
<td>2006 Estimated Employment</td>
<td>Estimated % Growth 2006-2016</td>
<td>2008 Average Annual Wage</td>
<td>Educational Level</td>
<td>2009 PA HPO</td>
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<tr>
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<td>-----------------------------------------------</td>
<td>---------------------------</td>
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<td>--------------------------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>17-3023</td>
<td>Electrical &amp; Electronic Engineering Technicians</td>
<td>7,000</td>
<td>-1.29%</td>
<td>$49,750</td>
<td>Associate Degree</td>
<td></td>
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<tr>
<td>17-3024</td>
<td>Electro-Mechanical Technicians</td>
<td>420</td>
<td>0.00%</td>
<td>$39,910</td>
<td>Associate Degree</td>
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<tr>
<td>17-3025</td>
<td>Environmental Engineering Technicians</td>
<td>1,540</td>
<td>16.23%</td>
<td>$39,750</td>
<td>Associate Degree</td>
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<td>17-3026</td>
<td>Industrial Engineering Technicians</td>
<td>4,150</td>
<td>9.64%</td>
<td>$51,570</td>
<td>Associate Degree</td>
<td>HPO</td>
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<td>17-3027</td>
<td>Mechanical Engineering Technicians</td>
<td>2,080</td>
<td>1.44%</td>
<td>$43,430</td>
<td>Associate Degree</td>
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</tr>
<tr>
<td>17-3031</td>
<td>Surveying &amp; Mapping Technicians</td>
<td>1,710</td>
<td>1.75%</td>
<td>$34,250</td>
<td>Moderate-Term OJT</td>
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<tr>
<td>19-1013</td>
<td>Soil &amp; Plant Scientists</td>
<td>220</td>
<td>4.55%</td>
<td>$62,420</td>
<td>Bachelor's Degree</td>
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</tr>
<tr>
<td>19-1031</td>
<td>Conservation Scientists</td>
<td>710</td>
<td>7.04%</td>
<td>$46,340</td>
<td>Bachelor's Degree</td>
<td></td>
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<tr>
<td>19-1032</td>
<td>Foresters</td>
<td>490</td>
<td>8.16%</td>
<td>$49,340</td>
<td>Bachelor's Degree</td>
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<tr>
<td>19-2031</td>
<td>Chemists</td>
<td>5,030</td>
<td>6.36%</td>
<td>$69,980</td>
<td>Bachelor's Degree</td>
<td>HPO</td>
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<tr>
<td>19-2032</td>
<td>Materials Scientists</td>
<td>620</td>
<td>8.06%</td>
<td>$75,260</td>
<td>Bachelor's Degree</td>
<td></td>
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<tr>
<td>19-2041</td>
<td>Environmental Scientists &amp; Specialists</td>
<td>1,840</td>
<td>16.85%</td>
<td>$66,020</td>
<td>Bachelor's Degree</td>
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<tr>
<td>19-2042</td>
<td>Geoscientists</td>
<td>710</td>
<td>7.04%</td>
<td>$69,870</td>
<td>Bachelor's Degree</td>
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<tr>
<td>19-2043</td>
<td>Hydrologists</td>
<td>130</td>
<td>0.00%</td>
<td>$81,250</td>
<td>Bachelor's Degree</td>
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<tr>
<td>19-3051</td>
<td>Urban &amp; Regional Planners</td>
<td>1,320</td>
<td>6.82%</td>
<td>$46,550</td>
<td>Master's Degree</td>
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<tr>
<td>19-4011</td>
<td>Agricultural &amp; Food Science Technicians</td>
<td>590</td>
<td>0.00%</td>
<td>$34,730</td>
<td>Associate Degree</td>
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<tr>
<td>19-4031</td>
<td>Chemical Technicians</td>
<td>4,550</td>
<td>4.62%</td>
<td>$43,060</td>
<td>Associate Degree</td>
<td></td>
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<tr>
<td>19-4091</td>
<td>Environmental Science &amp; Protection Technicians</td>
<td>1,450</td>
<td>13.10%</td>
<td>$42,930</td>
<td>Associate Degree</td>
<td></td>
</tr>
<tr>
<td>19-4093</td>
<td>Forest &amp; Conservation Technicians</td>
<td>140</td>
<td>0.00%</td>
<td>$36,030</td>
<td>Associate Degree</td>
<td></td>
</tr>
<tr>
<td>25-9021</td>
<td>Farm &amp; Home Management Advisors</td>
<td>1,410</td>
<td>-1.42%</td>
<td>N/A</td>
<td>Bachelor's Degree</td>
<td></td>
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<tr>
<td>27-1021</td>
<td>Commercial &amp; Industrial Designers</td>
<td>1,960</td>
<td>9.18%</td>
<td>$50,720</td>
<td>Bachelor's Degree</td>
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<tr>
<td>27-1025</td>
<td>Interior Designers</td>
<td>1,830</td>
<td>2.19%</td>
<td>$45,290</td>
<td>Bachelor's Degree</td>
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<tr>
<td>37-3011</td>
<td>Landscaping &amp; Groundskeeping Workers</td>
<td>42,170</td>
<td>15.58%</td>
<td>$25,860</td>
<td>Short-Term OJT</td>
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<tr>
<td>SOC Code</td>
<td>SOC Title</td>
<td>2006 Estimated Employment</td>
<td>Estimated % Growth 2006-2016</td>
<td>2008 Average Annual Wage</td>
<td>Educational Level</td>
<td>2009 PA HPO</td>
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<tr>
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<tr>
<td>45-2092</td>
<td>Farmworkers &amp; Laborers, Crop, Nursery &amp; Greenhouse</td>
<td>30,670</td>
<td>7.47%</td>
<td>$23,250</td>
<td>Long-Term OJT</td>
<td></td>
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<tr>
<td>45-4011</td>
<td>Forest &amp; Conservation Workers</td>
<td>500</td>
<td>8.00%</td>
<td>$36,400</td>
<td>Moderate-Term OJT</td>
<td></td>
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<tr>
<td>47-1011</td>
<td>Supervisors/Managers - Construction &amp; Extraction Workers</td>
<td>19,520</td>
<td>2.92%</td>
<td>$62,650</td>
<td>Work Experience</td>
<td>HPO</td>
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<tr>
<td>47-2031</td>
<td>Carpenters</td>
<td>60,420</td>
<td>3.19%</td>
<td>$42,660</td>
<td>Long-Term OJT</td>
<td>HPO</td>
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<tr>
<td>47-2061</td>
<td>Construction Laborers</td>
<td>41,400</td>
<td>3.21%</td>
<td>$33,260</td>
<td>Moderate-Term OJT</td>
<td>HPO</td>
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<tr>
<td>47-2111</td>
<td>Electricians</td>
<td>25,370</td>
<td>1.02%</td>
<td>$54,490</td>
<td>Long-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>47-2121</td>
<td>Glaziers</td>
<td>1,530</td>
<td>0.00%</td>
<td>$36,430</td>
<td>Long-Term OJT</td>
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<tr>
<td>47-2131</td>
<td>Insulation Workers, Floor, Ceiling &amp; Wall</td>
<td>650</td>
<td>1.54%</td>
<td>$41,060</td>
<td>Moderate-Term OJT</td>
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<tr>
<td>47-2132</td>
<td>Insulation Workers, Mechanical</td>
<td>500</td>
<td>0.00%</td>
<td>$60,410</td>
<td>Moderate-Term OJT</td>
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<tr>
<td>47-2152</td>
<td>Plumbers, Pipefitters &amp; Steamfitters</td>
<td>16,200</td>
<td>1.67%</td>
<td>$53,550</td>
<td>Long-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>47-2181</td>
<td>Roofers</td>
<td>5,280</td>
<td>4.36%</td>
<td>$39,790</td>
<td>Moderate-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>47-4011</td>
<td>Construction &amp; Building Inspectors</td>
<td>5,630</td>
<td>7.64%</td>
<td>$45,300</td>
<td>Work Experience</td>
<td></td>
</tr>
<tr>
<td>47-4041</td>
<td>Hazardous Materials Removal Workers</td>
<td>830</td>
<td>13.25%</td>
<td>$41,900</td>
<td>Moderate-Term OJT</td>
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<tr>
<td>49-1011</td>
<td>Supervisors/Managers - Mechanics, Installers &amp; Repairers</td>
<td>15,440</td>
<td>2.07%</td>
<td>$61,140</td>
<td>Work Experience</td>
<td></td>
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<tr>
<td>49-2094</td>
<td>Electrical &amp; Electronics Repairers, Commercial &amp; Industrial Equipment</td>
<td>4,490</td>
<td>3.79%</td>
<td>$46,460</td>
<td>Post-Secondary Vocational</td>
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</tr>
<tr>
<td>49-2095</td>
<td>Electrical &amp; Electronics Repairers, Powerhouse, Substation &amp; Relay</td>
<td>900</td>
<td>-15.56%</td>
<td>$58,450</td>
<td>Post-Secondary Vocational</td>
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<tr>
<td>49-9012</td>
<td>Control &amp; Valve Installers &amp; Repairers</td>
<td>1,030</td>
<td>-6.80%</td>
<td>$44,950</td>
<td>Moderate-Term OJT</td>
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<tr>
<td>49-9021</td>
<td>Heating, Air Conditioning &amp; Refrigeration Mechanics &amp; Installers</td>
<td>14,180</td>
<td>2.47%</td>
<td>$41,800</td>
<td>Long-Term OJT HPO</td>
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<tr>
<td>49-9041</td>
<td>Industrial Machinery Mechanics</td>
<td>16,680</td>
<td>14.57%</td>
<td>$43,150</td>
<td>Long-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>49-9042</td>
<td>Maintenance &amp; Repair Workers, General</td>
<td>66,390</td>
<td>3.84%</td>
<td>$35,320</td>
<td>Long-Term OJT</td>
<td>HPO</td>
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<tr>
<td>49-9051</td>
<td>Electrical Power-Line Installers &amp; Repairers</td>
<td>4,150</td>
<td>1.93%</td>
<td>$59,050</td>
<td>Long-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>SOC Code</td>
<td>SOC Title</td>
<td>2006 Estimated Employment</td>
<td>Estimated % Growth 2006-2016</td>
<td>2008 Average Annual Wage</td>
<td>Educational Level</td>
<td>2009 PA HPO</td>
</tr>
<tr>
<td>---------</td>
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<td>--------------</td>
</tr>
<tr>
<td>51-1011</td>
<td>Supervisors/Managers - Production Workers</td>
<td>30,450</td>
<td>-2.04%</td>
<td>$54,460</td>
<td>Work Experience</td>
<td>HPO</td>
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<tr>
<td>51-2022</td>
<td>Electrical &amp; Electronic Equipment Assemblers</td>
<td>9,430</td>
<td>-22.69%</td>
<td>$29,790</td>
<td>Short-Term OJT</td>
<td>HPO</td>
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<tr>
<td>51-2031</td>
<td>Engine &amp; Other Machine Assemblers</td>
<td>1,030</td>
<td>-5.83%</td>
<td>$35,640</td>
<td>Short-Term OJT</td>
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<tr>
<td>51-4041</td>
<td>Machinists</td>
<td>21,300</td>
<td>9.95%</td>
<td>$37,280</td>
<td>Long-Term OJT</td>
<td>HPO</td>
</tr>
<tr>
<td>51-4121</td>
<td>Welders, Cutters, Solderers &amp; Brazers</td>
<td>18,400</td>
<td>6.20%</td>
<td>$34,840</td>
<td>Post-Secondary Vocational</td>
<td>HPO</td>
</tr>
<tr>
<td>51-4193</td>
<td>Plating &amp; Coating Machine Setters, Operators &amp; Tenders</td>
<td>2,580</td>
<td>4.65%</td>
<td>$31,990</td>
<td>Moderate-Term OJT</td>
<td></td>
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<tr>
<td>51-8012</td>
<td>Power Distributors &amp; Dispatchers</td>
<td>470</td>
<td>-17.02%</td>
<td>$69,500</td>
<td>Long-Term OJT</td>
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<tr>
<td>51-8013</td>
<td>Power Plant Operators</td>
<td>2,070</td>
<td>-8.21%</td>
<td>$55,540</td>
<td>Long-Term OJT</td>
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<tr>
<td>51-8021</td>
<td>Stationary Engineers &amp; Boiler Operators</td>
<td>1,590</td>
<td>1.89%</td>
<td>$46,010</td>
<td>Long-Term OJT</td>
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<tr>
<td>51-8091</td>
<td>Chemical Plant &amp; System Operators</td>
<td>2,000</td>
<td>-0.50%</td>
<td>$50,450</td>
<td>Long-Term OJT</td>
<td></td>
</tr>
<tr>
<td>51-9011</td>
<td>Chemical Equipment Operators &amp; Tenders</td>
<td>4,370</td>
<td>2.75%</td>
<td>$43,680</td>
<td>Moderate-Term OJT</td>
<td></td>
</tr>
<tr>
<td>51-9061</td>
<td>Inspectors, Testers, Sorters, Samplers &amp; Weighers</td>
<td>23,970</td>
<td>-5.09%</td>
<td>$35,050</td>
<td>Moderate-Term OJT</td>
<td>HPO</td>
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<tr>
<td>51-9141</td>
<td>Semiconductor Processors</td>
<td>420</td>
<td>0.00%</td>
<td>$34,170</td>
<td>Associate Degree</td>
<td></td>
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<tr>
<td>53-7072</td>
<td>Pump Operators</td>
<td>340</td>
<td>-5.88%</td>
<td>$35,580</td>
<td>Moderate-Term OJT</td>
<td></td>
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<tr>
<td>53-7081</td>
<td>Refuse &amp; Recyclable Material Collectors</td>
<td>5,550</td>
<td>-3.42%</td>
<td>$32,110</td>
<td>Short-Term OJT</td>
<td>HPO</td>
</tr>
</tbody>
</table>
Defining Five Green Sectors of Economic Activity: In order to estimate the green workforce in Pennsylvania, the Center for Workforce Information & Analysis evaluated numerous reports, including recent reports from Pew Charitable Trusts and Global Insight, and collaborated with other state agencies and experts in the field. To identify green industries, each six-digit North American Industry Classification System (NAICS) code was reviewed to see if the products, services or processes captured in that NAICS code aligned with the following guiding definition for green employment:

*Workers directly involved in the efficient use and conservation of traditional fuels or alternative energy or energy efficient technologies — limited to construction, inspection, research, regulation, distribution, supply and manufacturing processes.*

If so, the specific industry, and corresponding NAICS code, was included. These NAICS codes were further grouped into the five broad sectors described in the body of this report (see Appendix D for more detail).

Defining Green Occupations: Occupations are classified by their own unique coding structure – the Standard Occupational Classification system. As with the NAICS system, the Standard Occupational Classification structure is somewhat dated and designed to group together individuals who perform similar sets of tasks. As such, many of the green jobs of today and tomorrow (and their corresponding labels) do not have their own unique Standard Occupational Classification code at this time. Instead, these workers are grouped with others doing similar work but using traditional processes or products. This limits the availability of occupation-specific data for green jobs.

Given the limitations described in the previous paragraph, a staffing pattern, or occupational employment distribution by Standard Occupational Classification code, was developed for each NAICS code identified as green. Individual industry staffing patterns were then combined to estimate an overall staffing pattern for all green industries. CWIA identified 81 Standard Occupational Classification codes connected prominently to the overall guiding definition for green employment (see Appendix B for the full list).
Defining Investment in the Green Sectors: Pennsylvania’s investment in the five green sectors was based on input from the Department of Environmental Protection, other agencies and industry experts (with the exception of the information presented in Table 3, which, due to state and federal policies, was estimated by the Center for Workforce Information & Analysis).

Estimating Total Output and Job Creation Due to Green Investment: Annualized projections of investment by green sector were converted to estimates of total output and job creation using the IMPLAN model. IMPLAN is an economic analysis system that analyzes inter-industry supply chains and linkages at the national, state and county level using input-output accounting. The system is designed to assess the effects of a real or hypothetical event in a region that increases or reduces economic activity in a region. In this case, the event is the stimulation of demand in green industries. Purchases for final use (final demand) drive the model. Industries produce goods and services for final demand, creating jobs and output. Industries serving final demand markets also purchase goods and services from other producers, leading to indirect job creation at their suppliers, and at the next tier of suppliers, and so on. The income that goes to workers and owners at each point in the supply chain also translates into so-called induced demand. These indirect and induced effects (the effects of household spending) can be mathematically derived. The resulting sets of multipliers describe the change of output for each and every regional industry caused by a $1 change in final demand for any given industry.

To arrive at the Center for Workforce Information & Analysis' green jobs estimates, those IMPLAN industry sectors most closely aligning to the industries contained in each of the Center’s five green sectors were selected and aggregated. This was done for each of the Center’s five green sectors of economic activity. Once aggregated, an economic impact was created by investing $1 million in each IMPLAN green industry sector. Based on the multipliers sets for each converted IMPLAN green industry sector resulting output and job creation estimates were produced. The Agriculture and Resource Conservation Green industry sector produced 19 jobs. The Pollution Prevention & Environmental Cleanup industry sector produced 18 jobs. The Energy Efficiency industry produced 16 jobs. The Clean Transportation industry produced 11 jobs and the Renewable Energy industry sector produced seven jobs.
NAICS Industries within Pennsylvania’s Five Green Sectors

Below is a listing of six-digit North American Industry Classification System (NAICS) codes used by Pennsylvania to define the green economy and its five targeted sectors.

### Agriculture & Resource Conservation

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111000</td>
<td>Crop Production</td>
</tr>
<tr>
<td>113110</td>
<td>Timber Tract Operations</td>
</tr>
<tr>
<td>113210</td>
<td>Forest Nursery/Gathering Forest Products</td>
</tr>
<tr>
<td>113310</td>
<td>Logging</td>
</tr>
<tr>
<td>541320</td>
<td>Landscape Architectural Services</td>
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<tr>
<td>541360</td>
<td>Geophysical Surveying &amp; Mapping Services</td>
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<tr>
<td>541370</td>
<td>Other Surveying &amp; Mapping Services</td>
</tr>
<tr>
<td>541690</td>
<td>Other Technical Consulting Services</td>
</tr>
<tr>
<td>924120</td>
<td>Administration of Conservation Programs</td>
</tr>
<tr>
<td>925120</td>
<td>Urban &amp; Rural Development Admin</td>
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</table>

### Energy Efficiency

<table>
<thead>
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<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>221330</td>
<td>Steam &amp; Air-Conditioning Supply</td>
</tr>
<tr>
<td>236115</td>
<td>New Single-Family Housing Construction</td>
</tr>
<tr>
<td>236116</td>
<td>New Multifamily Housing Construction</td>
</tr>
<tr>
<td>236117</td>
<td>New Housing Operative Builders</td>
</tr>
<tr>
<td>236118</td>
<td>Residential Remodelers</td>
</tr>
<tr>
<td>236210</td>
<td>Industrial Building Construction</td>
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<tr>
<td>236220</td>
<td>Commercial Building Construction</td>
</tr>
<tr>
<td>238151</td>
<td>Residential Glass/Glazing Contractors</td>
</tr>
<tr>
<td>238152</td>
<td>Nonresidential Glass/Glazing Contractors</td>
</tr>
<tr>
<td>238161</td>
<td>Residential Roofing Contractors</td>
</tr>
<tr>
<td>238162</td>
<td>Nonresidential Roofing Contractors</td>
</tr>
<tr>
<td>238211</td>
<td>Residential Electrical Contractors</td>
</tr>
<tr>
<td>238212</td>
<td>Nonresidential Electrical Contractors</td>
</tr>
<tr>
<td>238221</td>
<td>Residential Plumbing/HVAC Contractors</td>
</tr>
<tr>
<td>238222</td>
<td>Nonresidential Plumbing/HVAC Contractors</td>
</tr>
<tr>
<td>333414</td>
<td>Heating Equipment</td>
</tr>
<tr>
<td>333415</td>
<td>AC, Refriger. &amp; Forced Air Heating Mfg</td>
</tr>
<tr>
<td>334512</td>
<td>Automatic Environmental Control Mfg</td>
</tr>
<tr>
<td>334513</td>
<td>Industrial Process Variable Instruments</td>
</tr>
<tr>
<td>334514</td>
<td>Fluid Meters &amp; Counting Devices</td>
</tr>
<tr>
<td>335110</td>
<td>Electric Lamp Bulb &amp; Part Manufacturing</td>
</tr>
<tr>
<td>335221</td>
<td>Household Cooking Appliance Mfg</td>
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<tr>
<td>335222</td>
<td>Household Refrigerators &amp; Freezers</td>
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<tr>
<td>335224</td>
<td>Household Laundry Equipment Mfg</td>
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<tr>
<td>335228</td>
<td>Other Major Household Appliance Mfg</td>
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<tr>
<td>335312</td>
<td>Motor &amp; Generator Manufacturing</td>
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<tr>
<td>541310</td>
<td>Architectural Services</td>
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<tr>
<td>541330</td>
<td>Engineering Services</td>
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<tr>
<td>541350</td>
<td>Building Inspection Services</td>
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<tr>
<td>541410</td>
<td>Interior Design Services</td>
</tr>
<tr>
<td>541420</td>
<td>Industrial Design Services</td>
</tr>
<tr>
<td>926150</td>
<td>Licensing/Regulating Commercial Sectors</td>
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</table>
### Clean Transportation

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<th>Industry Description</th>
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<tr>
<td>324110</td>
<td>Petroleum Refineries</td>
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<tr>
<td>324199</td>
<td>All Other Petroleum &amp; Coal Products</td>
</tr>
<tr>
<td>336111</td>
<td>Automobile Manufacturing</td>
</tr>
<tr>
<td>336112</td>
<td>Light Truck &amp; Utility Vehicle Mfg</td>
</tr>
<tr>
<td>336120</td>
<td>Heavy Duty Truck Manufacturing</td>
</tr>
<tr>
<td>336213</td>
<td>Motor Home Manufacturing</td>
</tr>
<tr>
<td>336312</td>
<td>Gasoline Engines &amp; Engine Parts</td>
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<tr>
<td>336350</td>
<td>Motor Vehicle Power Train Components</td>
</tr>
<tr>
<td>336411</td>
<td>Aircraft Manufacturing</td>
</tr>
<tr>
<td>336412</td>
<td>Aircraft Engine &amp; Engine Parts</td>
</tr>
<tr>
<td>336611</td>
<td>Ship Building &amp; Repairing</td>
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<tr>
<td>336612</td>
<td>Boat Building</td>
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<tr>
<td>336991</td>
<td>Motorcycle, Bicycle &amp; Parts Mfg</td>
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<tr>
<td>541614</td>
<td>Process &amp; Logistics Consulting Services</td>
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<tr>
<td>926120</td>
<td>Transportation Program Administration</td>
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### Pollution Prevention & Environmental Cleanup

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<tr>
<th>NAICS Code</th>
<th>Industry Description</th>
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<tr>
<td>237110</td>
<td>Water &amp; Sewer System Construction</td>
</tr>
<tr>
<td>335911</td>
<td>Storage Battery Manufacturing</td>
</tr>
<tr>
<td>335999</td>
<td>Miscellaneous Electrical Equipment</td>
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<td>541380</td>
<td>Testing Laboratories</td>
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<td>541620</td>
<td>Environmental Consulting Services</td>
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<tr>
<td>541710</td>
<td>Physical/Engineering/Bio Research</td>
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<tr>
<td>562111</td>
<td>Solid Waste Collection</td>
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<td>562119</td>
<td>Other Waste Collection</td>
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<td>562212</td>
<td>Solid Waste Landfill</td>
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<tr>
<td>562213</td>
<td>Solid Waste Combustors &amp; Incinerators</td>
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<td>562219</td>
<td>Other Nonhazardous Waste Disposal</td>
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<td>924110</td>
<td>Air, Water &amp; Waste Program Admin</td>
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### Renewable Energy

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<td>221119</td>
<td>Other Electric Power Generation</td>
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<tr>
<td>221121</td>
<td>Electric Bulk Power Transmission</td>
</tr>
<tr>
<td>221122</td>
<td>Electric Power Distribution</td>
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<tr>
<td>237130</td>
<td>Power/Communication System Construction</td>
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<tr>
<td>237990</td>
<td>Other Heavy Construction</td>
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<tr>
<td>325199</td>
<td>All Other Basic Organic Chemicals</td>
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<tr>
<td>333611</td>
<td>Turbine Generator &amp; Generator Set Units</td>
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<tr>
<td>333911</td>
<td>Pump &amp; Pumping Equipment Mfg</td>
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<tr>
<td>334413</td>
<td>Semiconductor &amp; Related Devices</td>
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<tr>
<td>335311</td>
<td>Electric Power &amp; Specialty Transformers</td>
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<tr>
<td>926130</td>
<td>Utility Regulation &amp; Administration</td>
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</tbody>
</table>
The Pennsylvania Green Jobs Report explores the green economy and green jobs in relation to Pennsylvania’s workforce and economic development efforts.

The Pennsylvania Green Jobs Report – Part I begins by assessing the current status of green jobs in the commonwealth and looking at the projected growth of those jobs as a result of state and federal policies and investments. The report explores green occupations in Pennsylvania, including: new occupations currently in creation, emerging occupations that are projected to grow, evolving occupations that will require new skills and traditional occupations. Finally, the report outlines the framework for Pennsylvania’s green training priorities and identifies the next steps necessary to enhance its labor market infrastructure, identify the needs of employers and gather information on the emerging green economy moving forward.

The Pennsylvania Green Jobs Report – Part 1
January 2010

Commonwealth of Pennsylvania
Edward G. Rendell, Governor
Sandi Vito, Secretary, Department of Labor & Industry
Fred Dedrick, Deputy Secretary for Workforce Development, Department of Labor & Industry
Sue Mukherjee, Director, Center for Workforce Information & Analysis

For more information, call the Center for Workforce Information & Analysis at (717) 787-3266 or visit www.paworkforce.state.pa.us.