

# The Northern Plains & Rocky Mountain Consortium Final Report



The **Northern Plains & Rocky Mountain Consortium**: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming

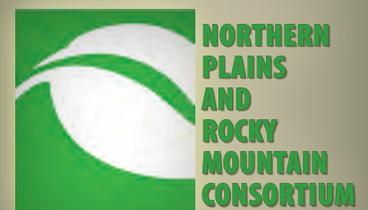
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The **Northern Plains & Rocky Mountain Consortium:** researching the green economy  
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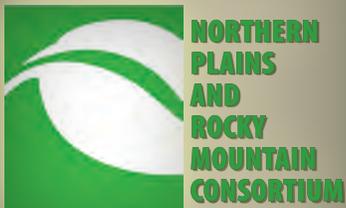
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# Acknowledgements

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- **Montana Department of Labor and Industry**
- **Nebraska Department of Labor**
- **South Dakota Department of Labor and Regulation**
- **Utah Department of Workforce Services**
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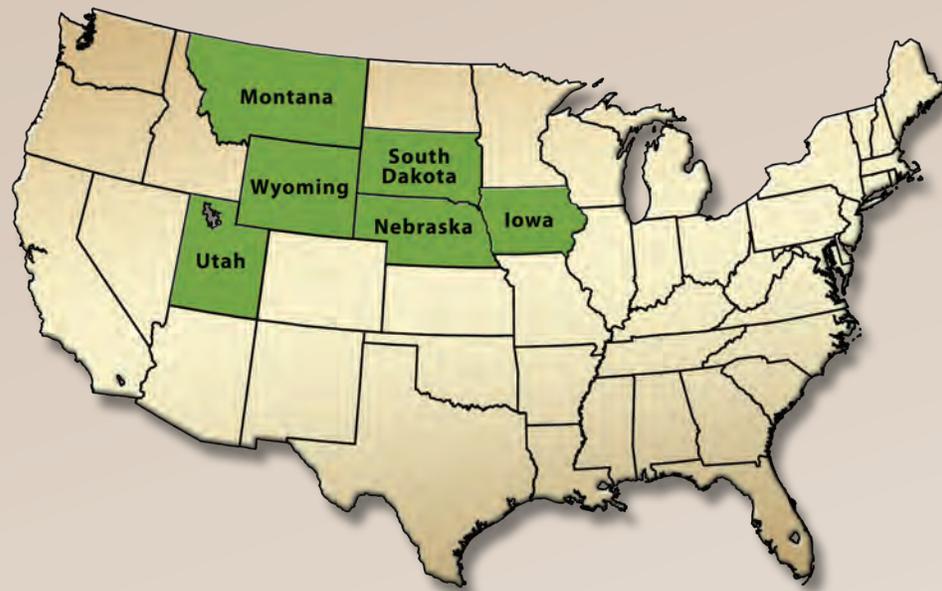
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# Introduction



# Introduction

The concept of green jobs, jobs which are considered as directly or indirectly improving our environment, is not new. However, the idea that green jobs could actually play more than a supporting role in changing the world economy is a fairly new topic of conversation, and one that has been discussed on the national stage. In 2007, the U.S. Congress passed, and President George W. Bush signed into law, a comprehensive energy bill. Title X of that bill (Referred to as the 'Green Jobs Act') amended the Workforce Investment Act's Section 171 by requiring the U.S. Secretary of Labor to establish a competitive Energy Efficiency and Renewable Energy Worker Training Program to help train American workers for jobs in the renewable energy and energy-efficiency industries.



In February of 2009, President Barack Obama signed into law the American Recovery and Reinvestment Act (ARRA) of 2009. Among many things, ARRA provided \$500 million for the Green Jobs Act, including programs such as the National Energy Training Partnership grants, State Energy Training Partnership Program grants, and the Pathways out of Poverty training grants.

However, for complete implementation and effective strategy building, each of these programs would require substantial information on green jobs. Although the Green Jobs Act created a State Labor Market Research, Information, and Labor Exchange Research Program, efforts under this program were neither coordinated nor robust, due to a lack of funding. To jumpstart efforts, and to provide the data training programs would need, ARRA provided \$50 million for Labor Market Information (LMI) Improvement grants. These grants would invest in state and consortium models designed to collect, analyze, and disseminate labor

# Introduction

market information and enhance the labor exchange infrastructure for careers within energy efficiency and renewable energy fields. Subsequently, State Workforce Agencies would be able to use this information as the foundation on which to build and implement effective workforce development strategies.

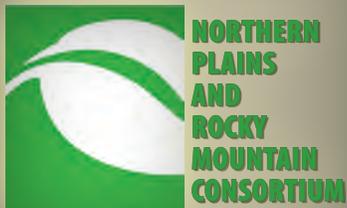
In early summer of 2009, LMI organizations representing six neighboring states developed a strategy and drafted, reviewed, and submitted an LMI Improvement Grant application under the name of the Northern Plains and Rocky Mountain Consortium. The Consortium, comprised of the states of Montana (lead state), Iowa, Nebraska, South Dakota, Utah, and Wyoming, represented a geographic region with similarities and differences in economies, geographies, and workforce characteristics that would provide an excellent case study of green jobs, their impact on the workforce, and their role in today's economy.

The Consortium was awarded nearly \$4 million in December of 2009 to study green jobs. This project ambitiously used a multi-faceted approach to studying green jobs, relying on survey data collection, administrative records research, focus group interaction, subject matter expert reviews of new and emerging technologies, as well as other research methods to collect, analyze, validate, and disseminate workforce and related green jobs information.

At all times, an over-arching focus of the Consortium's efforts was to invest in research that would not only enhance current knowledge and data available on green jobs, but that would also enhance existing state research capabilities. This was a focus on capacity-building in its truest sense. The Consortium benefitted from increased experience in survey design, sampling, and weighting methodology; exposure to and experience with the latest research technologies and software; and improved coordination and communication strategies for interstate research. Although additional funding may still be necessary for true realization of these new and enhanced capabilities, the capacity for improved research has been built, and it is the Consortium's hope that future opportunities for similar research will be made available.



# Executive Summary



# Executive Summary

## Green Jobs Survey

The consortium adopted the definition of green which most closely follows the emphasis on what is produced, as opposed to the environmental impacts of the production process itself. This definition closely mirrored the definition established previously by the Workforce Information Council.

In order to identify the incidence and prevalence of green jobs on a consortium-wide basis, as well as state specific estimates, a survey of business establishments was conducted. A green job was identified as any job, or component thereof, that has activity in any one of six possible areas:

- **Pollution, waste, and greenhouse gas management, prevention and reduction**
- **Energy efficiency and conservation**
- **Environmental cleanup and remediation and waste cleanup mitigation**
- **Renewable energy and alternative fuels**
- **Education, regulation, compliance, training, and energy trading**
- **Sustainable agriculture and natural resource conservation**

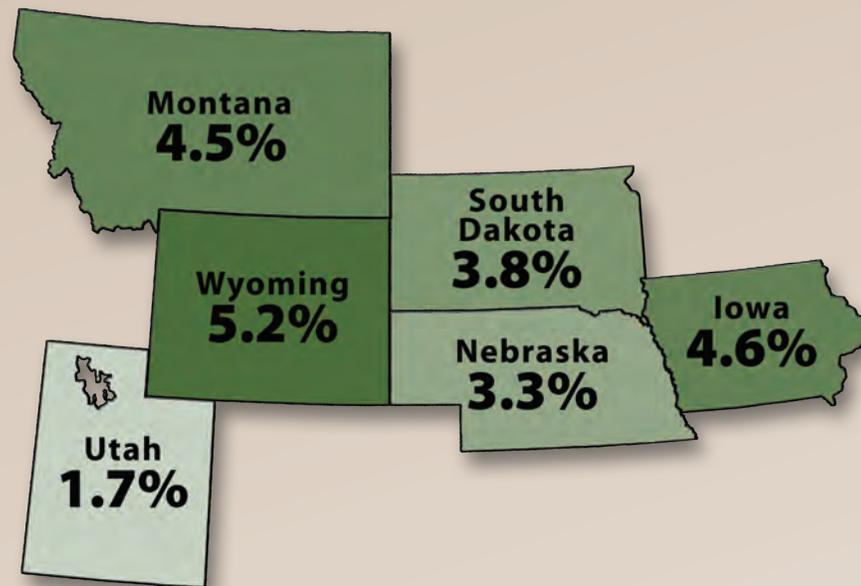
More than 26,000 businesses responded to the Northern Plains and Rocky Mountain Consortium surveys about jobs in the six state economies where green activities result in environmental benefits. Firms were asked about employment levels, “green” economic activities, obstacles to becoming a green employer, and other information about employment, skills, wages and green activities. While not all firms responded to all questions on the survey, the data that is reported is significant at the 95 percent level of confidence.

**Green employment represents under 5 percent of total employment in the six-state consortium.**

Based on the surveys, green employment represents under 5 percent of total employment in the six-state consortium. Consortium states differed in their level of green, with Wyoming reporting the highest percentage at 5.3 percent and Utah reporting the lowest at 1.7 percent. When classified according to the broadest measure of economic activity, two-digit North American Industry Classifica-

# Executive Summary

tion System (NAICS) codes, Construction and Manufacturing account for more than 62,000 green jobs, almost 40 percent of the total economy-wide green employment in the six-state consortium. Although Manufacturing alone accounts for more than 27,000 green jobs, only 6 percent of Manufacturing employment is green. As a percent of each industry's employment, the greener industries are Construction (14.5 percent) and Agriculture, Forestry, Fishing, and Hunting (11.0 percent).



Smaller firms appear to be greener than their larger counterparts. Firms with fewer than 10 employees account for 15 percent of the region's total employment, with 8 percent of these jobs classified as green. Larger firms, those with more than 50 employees, capture 60 percent of the region's total employment, but only 2 percent of those jobs are classified as green. The remaining employment base, firms with 10 to 50 employees, account for a quarter of the region's employment and only 4 percent of their jobs are classified as green.

The top three industries in terms of the estimated percentage of green employment are Construction (14.5 percent); Agriculture, Forestry, Fishing, and Hunting (11 percent); and Professional, Scientific, and Technical Services (7.2 percent).

Based on total employment by major occupational group, Farming, Fishing, and Forestry occupations have the largest percentage of green workers, followed by Life, Physical, and Social Science occupations, and Architecture and Engineer-

# Executive Summary

ing occupations. Over 10 percent of each occupational group has green employment. All other remaining occupational groups have less than 10 percent of their employment involved in green activities.

Most green jobs (58 percent) pay less than \$50,000 per year, excluding fringe benefits. Most workers' wages fall in between \$24,000 per year and \$47,000 per year. For comparison, the average wage for all workers in all industries nationally is \$46,000 in 2009, and \$37,000 for the six state consortium.

Anticipated green job openings in the next year equal 18,099, while anticipated losses equal 2,893, for a net gain of 15,206 green jobs within the next year. The rate of green job creation is approximately 11.2 percent of existing jobs. Although similar data for all jobs does not exist at either the consortium or national level, the rate of payroll job creation in the U.S. was approximately 9.5 percent of existing jobs in the 2nd quarter of 2010, which is not statistically different than the rate of green job creation.

Despite employers reporting a net job increase of roughly 15,000 jobs in the year following the survey, labor economists within the consortium are less optimistic about future green job growth. Consortium projections for green jobs indicate net green job growth of only 1,600 per year, with an additional 2,850 becoming open due to workers retiring or leaving their jobs for other reasons. The total projected openings across the consortium are 4,485 per year.

## **New and Emerging Technologies**

Preparing a workforce for jobs that don't yet exist is always a challenge and it is an even bigger challenge when preparing workers for jobs in green energy. Many energy technologies require large investments of capital and time before becoming a commercially viable energy source. Social and political forces often have a hand in moving technologies forward or stopping them altogether. In order to gather information on the most commercially viable new and emerging technologies the Northern Plains and Rocky Mountain Consortium enlisted the Montana Manufacturing Extension Center (MMEC) at Montana State University to provide assistance to its "Researching the Green Economy" project.

# Executive Summary

A variety of green energy technology sectors were evaluated to identify new and emerging technologies with potential for commercial viability within the next five to ten years and their potential impacts on the workforce. The technology sectors evaluated included:

- Wind energy
- Commercial-scale carbon capture/sequestration
- Biofuels and bio-lubricants (including methane capture)
- Biomass
- Smart grid and transmission
- Solar
- Geothermal
- Other “green” technologies that may be deployed
- Other “traditional” technologies that may offset the use of fossil fuels

## Sustainable Agriculture

The effects that sustainable agriculture can have on an economy can be measured by the extent to which sustainable practices such as organic farming can bring jobs back to the agricultural sector. Organic farming is more labor-intensive than regular conventional farming, and thus potentially could decrease unemployment and help stimulate the economy.

The total number of organic farms certified by the United States Department of Agriculture in Iowa increased dramatically from 4 in 1997 to 677 in 2008. Within the six-state consortium, the number of organic farms that hired labor is greatest in Iowa (219, as of 2007), followed by Nebraska (93), Montana (71), Utah (52), South Dakota (44), and Wyoming (27). Iowa organic farms with hired labor pay an average of \$15,500 per farm (not per worker), while Wyoming leads with \$54,900, Montana \$12,900, Nebraska unknown, South Dakota \$19,000, and Utah \$14,000.

Based on the number of organic farms with hired labor, Iowa has the least number of people per organic farm with 13,911 people, compared to 13,936 in Montana, 18,505 in South Dakota, 19,639 in Nebraska, 20,876 in Wyoming, and 53,152 in Utah. This compares to the number of people per conventional agriculture farm, where Iowa has 33, Montana 34, Nebraska 29, South Dakota 26, Utah 167, and Wyoming 52.

# Defining Green Jobs



# Defining Green Jobs

High energy prices and a growing recognition of the value of services to conserve, maintain, and improve the environment have resulted in businesses and consumers going “green” to minimize environmental damage and reduce energy costs. Businesses have responded to these issues by hiring more workers whose jobs are connected to conservation and environmental protection. Economists, economic developers, and workforce training professionals are now trying to keep up with the greener economy, exploring methods to adequately identify and measure green jobs.

The effort to identify and track green jobs is complicated by an inconsistent definition of the term “green jobs” and by the need to utilize existing data sources for employment statistics. The first hurdle lies within the definition of green, a concept that is still changing, but gradually gaining definition through usage. The second hurdle is to align the definition of green with existing definitions and classifications of industries and occupations so that green jobs can be measured and tracked using existing data sources.

Broadly defined, green jobs are jobs where the work activity aids in environmental protection, renewable energy generation, conservation, or restoration. The green economy refers to the economic impact of these jobs. Other terms to discuss green jobs include “green practices,” which are work methods that minimize environmental damage, such as recycling, and “green knowledge and skills,” which refer to the knowledge and skills required to implement green practices in a green job.<sup>1</sup>

Green jobs are not necessarily new jobs added to the economy, but may be old jobs that have added more environmentally-friendly practices in response to the growing recognition of the importance of the environment and services to conserve, maintain, and improve the environment.

The available studies on green jobs are fairly unified on the general concept of green jobs – green jobs help the environment, including promoting cleaner energy, conservation, and reducing carbon emissions. However, the definition of green jobs remains stubbornly nebulous in the specifics. For example, coal-powered energy promotes U.S. energy security relative to foreign oil, and the coal industry also conducts research on improving the efficiency of coal power and reducing carbon emissions. Yet, coal-powered energy is not considered

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<sup>1</sup>*Corporation for a Skilled Workforce, 1009. “What is a Green Job? Responses and Actions by Other States,” presented by Lindsey Woolsey, Senior Policy Associate, May 12, 2009. Montana State Workforce Investment Board Meeting. Available at [www.skilledwork.org/greenjobsMTSWIBMay12-09.ppt](http://www.skilledwork.org/greenjobsMTSWIBMay12-09.ppt).*

# Defining Green Jobs

green because there are cleaner renewable alternatives. If the definition of green can only be made relative to other alternatives, the rapid development of new energy-efficient technologies may mean that the definition of green will be constantly changing.

Green jobs cut across the boundaries of both industries and occupations. There are some industries that are considered green – such as urban transit and bus systems – that lay fully within the green jobs sphere. Yet, even though the industry may be a green industry, there are payroll clerks, accountants, janitors, and others that do not perform tasks that directly impact the environment. These workers may be considered green to the extent that they work in green industries. Some environmental engineers work in industries that are green, such as renewable energy, but others work in industries that are not green, such as oil and gas. However, all environmental engineers, even those working within the oil and gas industry, may still be considered green because their jobs work to prevent environmental degradation by the oil and gas drilling and by ensuring that their company adheres to environmental regulations.

Measuring the number of jobs in industries that are partially green – such as construction – is particularly difficult because some workers spend only a portion of their time engaging in green activities. For example, residential construction workers are generally not considered green unless they install energy-efficient improvements into a home. A plumber may spend only 10 percent of his time installing energy-efficient toilets, with the rest of the time spent in traditional activities. The question is whether this plumber should be counted as one green job or one-tenth of a green job.

Given all of the difficulties in defining green jobs, the Northern Plains and Rocky Mountain Consortium decided to adopt a definition of green jobs that closely mirrors a definition previously developed by the Workforce Information Council. The Consortium defined a green job as follows:

**A green job is one in which an employee produces a product or service that improves energy efficiency, expands the use of renewable energy, and/or supports environmental sustainability.**

Six distinct areas were defined:

- **Pollution, waste, and greenhouse gas management, prevention and reduction** – activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment,

# Defining Green Jobs

recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gasses, waste water, and other pollutants.

- **Energy efficiency and conservation** – manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, battery development, and storage improvement.
- **Environmental cleanup and restoration, and waste cleanup and mitigation** – environmental remediation including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.
- **Renewable energy and alternative fuels** – manufacturing, production, construction, design, research, delivery, operation, storage, and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane, and waste incineration as a fuel source.
- **Education, regulation, compliance, public awareness, training, and energy trading** – activities to educate the public, business, and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.
- **Sustainable agriculture and natural resource conservation** – products and services to conserve, maintain, and improve natural resources and the environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Includes bioscience-related activities and research.

The Bureau of Labor Statistics (BLS) began an initiative in 2010 to develop and collect new data on green jobs. The goal of the green jobs initiative was three-fold: to determine the number of green jobs over time and their future trend; to determine the industrial, occupational, and geographical location of green jobs; and to determine the wages of workers in green jobs. Two approaches are used to collect data on green jobs. A green job is one that either produces goods or services that benefit the environment or conserve natural resources, or a green job is one in which the process of producing the good or service is environmen-

# Defining Green Jobs

tally friendly or uses fewer natural resources. One definition focuses on the output of the production process, the other focuses on the production process itself.

With respect to measuring green jobs by the output produced, the BLS identified 333 industries that use energy efficiently or from renewable sources, reduce or remove pollution, recycle, conserve natural resources, are environmentally compliant, or have programs to educate, train, or elevate public awareness on environmental issues. Figure 1 provides examples of how industries produce output or provide a service that meets at least one of the green job criteria defined above.

**Figure 1: Green Job Classifications as Defined by the Bureau of Labor Statistics**

|   |   |
|---|---|
| Agriculture, Forestry, Fishing & Hunting      | Certified organic produce, meat, growing trees for reforestation, wood chips for biomass, sustainable certified lumber, organic honey   |
| Mining, Quarrying, Oil & Gas Extraction       | N/A   |
| Utilities                                     | Geothermal steam, water and sewage treatment, hydroelectric and nuclear power generation  |
| Construction                                  | LEED buildings, smart growth developments, construction of water treatment plants, construction of Energy Star buildings  |
| Manufacturing                                 | LEED carpeting, curtains, reclaimed wood, weather-stripping, recycled inputs, soy based inks, electric lawnmowers, Energy Star products, solar cells, emissions testing equipment |
| Wholesale Trade                               | N/A   |
| Retail Trade                                  | Used Energy Star appliances   |
| Transportation & Warehousing                  | Mass transit systems, vanpools, school bus transportation, ferry commuter services  |
| Information                                   | Software to reduce energy or monitor pollution, environmental newspapers, books, manuals, environmental content in broadcasting, environmental compliance websites                |
| Finance & Insurance                           | Emissions allowance trading   |
| Real Estate, Rental & Leasing                 | N/A   |
| Professional, Scientific & Technical Services | Environmental legal services, environmental testing, research on biofuels, environmental photography, public awareness  |
| Management of Companies & Enterprises         | Headquarters for environment-related companies  |
| Administrative and Support & Waste Management | Eco-tourism, energy-efficient landscaping, waste management, recycling, collection of hazardous waste   |
| Educational Services                          | Training/curriculum for green jobs  |
| Health Care & Social Assistance               | N/A   |
| Arts, Entertainment, & Recreation             | Environment and science museums, zoos, botanical gardens, nature preserves  |
| Accommodation & Food                          | N/A   |
| Other Services, exc. Public Administration    | Repair of Energy Star products, environmental research grants, education grants, industry associations  |
| Public Administration                         | Administration of environmental programs, utility regulation, mass transit planning, certification of organic producers, building inspections                                     |

Source: U.S. Bureau of Labor Statistics

# Defining Green Jobs

As evident from the table, not all industries qualify as producing green products or services. According to BLS, the Construction sector and the Professional and Business Services sector account for almost 75 percent of all establishments classified as producing green goods or services.

Green jobs can also come from production processes that reduce the negative impact of production on the environment or natural resources. Examples of environmentally friendly practices include using solar power in a retail establishment, use of high mileage per gallon vehicles, redesigning product packaging, and collecting and recycling waste created during the production process.

The consortium's green job definition closely resembles the BLS definition of green jobs using the output approach, or the production of green goods and services. The focus under this approach emphasizes green jobs that perform duties related to the production of a good or service that has environmental benefits. This approach is not concerned with the environmental impacts of the production process itself. Hence, the consortium's definition of green jobs closely matches those found in Figure 1.

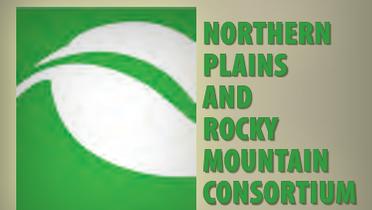
**According to BLS, the Construction sector and the Professional and Business Services sector account for almost 75 percent of all establishments classified as producing green goods or services.**

## Measuring Green Jobs

BLS is collecting data on jobs that produce green goods or provide green services through a mail survey of a sample of business establishments identified as potentially producing green products or services. Distinctions will be made within individual establishments to identify only those jobs that produce green goods or services; those jobs that do not produce green goods or services will not be counted. Since establishments will in all probability have difficulty in separating green from non-green jobs, the BLS will use a share of revenue approach to quantify the number of jobs that are green. This approach uses the revenue share as a proxy for the share of the firm's employment that is associated with the production of a green good or service. Data collection is planned for early 2011, and annually thereafter.

In contrast to the BLS survey, the consortium's mail survey did not narrow the sample based on industry classification. Surveys were mailed to randomly selected businesses across all industry classifications.

# Green Jobs Survey



# Green Jobs Survey

In order to identify the incidence and prevalence of green jobs on a consortium-wide basis, as well as state specific estimates, a survey of business establishments was conducted. A green job was identified as any job, or component thereof, that has activity in any one of the six areas discussed on [page 19](#):

- **Pollution, waste, and greenhouse gas management, prevention and reduction**
- **Energy efficiency and conservation**
- **Environmental cleanup and remediation and waste cleanup mitigation**
- **Renewable energy and alternative fuels**
- **Education, regulation, compliance, training, and energy trading**
- **Sustainable agriculture and natural resource conservation**

Under this broad definition, the consortium collected job information by primary business activity and occupation. To be statistically valid, the consortium used a probability-based stratified random sample of businesses for the fourth quarter of 2009. The sample size for all six states was over 62,000 establishments. The useable sample for statistical analysis was over 40 percent of the 62,000 establishments within the consortium, ranging from a low of 36 percent for Iowa to a high of 49 percent for Montana and Nebraska.

Overall, almost 4 percent of the consortium-wide total employment may be considered green using the definition adopted by the consortium, although estimates range from a low of just under 2 percent for Utah to a high of just over 5 percent for Wyoming. Caution should be used however in interpreting these state-by-state percentages. At the 95 percent level of confidence, lower and upper bounds may be significant for some states, particularly for Iowa and Wyoming. (See Figure 2).

**Figure 2: Proportion of Green Jobs by State**

| State        | Percent of State Jobs that are Green | 95 % Confidence Interval |             |
|--------------|--------------------------------------|--------------------------|-------------|
|              |                                      | Lower Bound              | Upper Bound |
| Iowa         | 4.6                                  | 3.4                      | 5.8         |
| Montana      | 4.5                                  | 4.1                      | 4.9         |
| Nebraska     | 2.7                                  | NA                       | NA          |
| South Dakota | 3.6                                  | 3.0                      | 4.2         |
| Utah         | 1.7                                  | 1.4                      | 2.0         |
| Wyoming      | 5.2                                  | 3.1                      | 7.3         |

*Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium*

# Green Jobs Survey

Note that the state estimates consist of an interval of values that is associated with a 95 percent degree of confidence. Proper interpretation of the confidence intervals means that if the representative sample populations in each state were to be replicated many times, 95 percent of those intervals would actually contain the value of the population mean.

Despite differences in whether private and/or public businesses were included, as well as differences in defining green jobs, other states outside the consortium have also found similar estimates of green jobs as a percent of total state employment.

## Survey Findings

The state surveys yielded new and valuable information on several dimensions of green job activity. Data was collected on green activities by industry and occupational classifications using the North American Industry Classification System (NAICS) and the Standard Occupational Classification (SOC) system. Information was also provided for educational, licensing, certification, and training requirements for green jobs.

## Industry

Establishments were asked to identify the primary green category that most closely corresponded to their business activity, if applicable. Although businesses could easily be involved in more than one activity, only one could be identified. A vast majority of the businesses, (81 percent) indicated that they did not participate in any of the six green categories from which they could choose. A distant second were businesses that identified energy efficiency as their primary green activity (7.5 percent). This category, energy efficiency and conservation, involves the green activities of manufacturing, construction, or installation of energy efficient products; or energy efficiency services, including weatherization, energy efficient production processes, and transportation technology. In an era of rising energy prices, it is surprising that more businesses did not identify with this activity. Each of the other categories of green activities accounted for approximately 2 percent of the businesses indicating involvement in green activities.

# Green Jobs Survey

**Figure 3: Percent of Businesses Involved in Green Activities, by Primary Activity**

| Primary Green Activity             | Estimated Number of Businesses | % of Businesses by Primary Activity | 95% Confidence Interval |             |
|------------------------------------|--------------------------------|-------------------------------------|-------------------------|-------------|
|                                    |                                |                                     | Lower Bound             | Upper Bound |
| Renewable Energy                   | 7,116                          | 2.3                                 | 6,466                   | 7,766       |
| Energy Efficiency                  | 22,788                         | 7.5                                 | 21,626                  | 23,950      |
| Pollution Prevention and Reduction | 6,881                          | 2.3                                 | 6,270                   | 7,491       |
| Environmental Cleanup              | 7,152                          | 2.3                                 | 6,478                   | 7,826       |
| Education and Regulation           | 6,733                          | 2.2                                 | 6,102                   | 7,365       |
| Sustainable Agriculture            | 10,665                         | 3.5                                 | 9,864                   | 11,446      |
| No Green Activity                  | 249,486                        | 81.9                                | 246,695                 | 252,278     |

Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium

**Figure 4:  
Green Jobs by Industry Size**

|  | Total Consortium Employment | Green Employment | Green Percent | 95% Confidence Margin |                | 95% Confidence Margin as Green Percent |             |
|--|-----------------------------|------------------|---------------|-----------------------|----------------|--|-------------|
|  |                             |                  |               | Lower Bound           | Upper Bound    | Lower Bound                            | Upper Bound |
| <b>TOTAL</b>   | <b>4,657,165</b>            | <b>162,117</b>   | <b>3.5%</b>   | <b>150,000</b>        | <b>174,235</b> | <b>3.2%</b>                            | <b>3.7%</b> |
| <b>BY INDUSTRY</b>   |                             |                  |               |                       |                |  |             |
| 11 - Ag, Forestry, Fishing, & Hunting                                  | 42,260                      | 4,666            | 11.0%         | 3,885                 | 5,447          | 9.2%                                   | 12.9%       |
| 21 - Mining  | 45,858                      | 2,591            | 5.7%          | 1,436                 | 3,746          | 3.1%                                   | 8.2%        |
| 22 - Utilities   | 30,996                      | 1,716            | 5.5%          | 1,383                 | 2,049          | 4.5%                                   | 6.6%        |
| 23 - Construction  | 245,217                     | 35,645           | 14.5%         | 31,545                | 39,745         | 12.9%                                  | 16.2%       |
| 31-33 - Manufacturing  | 465,261                     | 27,320           | 5.9%          | 18,937                | 35,702         | 4.1%                                   | 7.7%        |
| 42 - Wholesale Trade   | 195,080                     | 9,655            | 4.9%          | 7,618                 | 11,693         | 3.9%                                   | 6.0%        |
| 44-45 - Retail Trade   | 551,012                     | 11,182           | 2.0%          | 8,605                 | 13,759         | 1.6%                                   | 2.5%        |
| 48-49 - Transportation & Warehousing                                   | 191,899                     | 3,737            | 1.9%          | 2,185                 | 5,288          | 1.1%                                   | 2.8%        |
| 51 - Information   | 95,414                      | 545              | 0.6%          | 212                   | 878            | 0.2%                                   | 0.9%        |
| 52 - Finance and Insurance   | 241,667                     | 1,403            | 0.6%          | 441                   | 2,364          | 0.2%                                   | 1.0%        |
| 53 - Real Estate & Rental & Leasing                                    | 51,949                      | 889              | 1.7%          | 521                   | 1,257          | 1.0%                                   | 2.4%        |
| 54 - Professional, Scientific, & Technical Services                    | 191,201                     | 13,734           | 7.2%          | 11,501                | 15,966         | 6.0%                                   | 8.4%        |
| 55 - Management of Companies & Enterprises                             | 54,908                      | 633              | 1.2%          | 153                   | 1,113          | 0.3%                                   | 2.0%        |
| 56 - Administrative Support, Management, Remediation, & Waste Services | 216,620                     | 9,958            | 4.6%          | 7,495                 | 12,241         | 3.5%                                   | 5.7%        |
| 61 - Education Services  | 354,474                     | 3,567            | 1.0%          | 2,088                 | 5,046          | 0.6%                                   | 1.4%        |
| 62 - Health Care & Social Assistance                                   | 594,070                     | 7,130            | 1.2%          | 4,007                 | 10,253         | 0.7%                                   | 1.7%        |
| 71 - Arts, Entertainment, & Recreation                                 | 86,807                      | 930              | 1.1%          | 558                   | 1,301          | 0.6%                                   | 1.5%        |
| 72 - Accommodations & Food Services                                    | 389,909                     | 4,350            | 1.1%          | 2,646                 | 6,054          | 0.7%                                   | 1.6%        |
| 81 - Other Services, except Public Admin.                              | 137,048                     | 5,374            | 3.9%          | 4,491                 | 6,258          | 3.3%                                   | 4.6%        |
| 92 - Public Administration   | 475,515                     | 17,093           | 3.6%          | 13,057                | 21,128         | 2.7%                                   | 4.4%        |
| <b>BY CLASS SIZE</b>   |                             |                  |               |                       |                |  |             |
| .5 to <10 Employees  | 720,595                     | 54,685           | 7.6%          | 51,122                | 58,248         | 7.1%                                   | 8.1%        |
| 10 to <50 Employees  | 1,114,203                   | 45,864           | 4.1%          | 42,106                | 49,621         | 3.8%                                   | 4.5%        |
| 50 and More Employees  | 2,822,367                   | 61,568           | 2.2%          | 50,613                | 72,524         | 1.8%                                   | 2.6%        |

Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium

# Green Jobs Survey

Total consortium-wide employment is 4.7 million, with only 3.5 percent of this employment classified as green according to one of the six possible green activities businesses could be involved in. The top three industries in terms of the estimated percentage of green employment are: Construction (14.5 percent); Agriculture, Forestry, Fishing, and Hunting (11 percent); and Professional, Scientific, and Technical Services (7.2 percent) (see Figure 4). Smaller businesses, as defined by the number employed, represent the largest category of green employment as a percent of each industry’s total employment. Businesses with fewer than 10 employees, despite having only 15 percent of the consortium’s total employment, have 34 percent of the total green employment within the consortium. Firms with more than 50 employees have over 60 percent of the consortium’s total employment, but only 38 percent of the total employment that is considered green.

Among all workers identified as having green responsibilities at work, six in ten employees engage in green activities on a part time basis. Nearly three in ten workers engage in green job activities on a full-time basis.

**Figure 5: Percent of Workers Having Green Responsibilities, Based on Percent of Time Dedicated to Green Work**

| Percent of Time Dedicated to Green Work | Number of Workers | Percent of Workers | 95% Confidence Interval |             |
|---|-------------------|--------------------|-------------------------|-------------|
|   |                   |                    | Lower Bound             | Upper Bound |
| 1% – 49 %                               | 65,607            | 41                 | 60,633                  | 70,581      |
| 50% - 99%                               | 35,609            | 22                 | 32,589                  | 38,629      |
| 100%                                    | 41,423            | 26                 | 37,041                  | 45,805      |
| Not Reported                            | 19,214            | 12                 | 15,154                  | 23,274      |

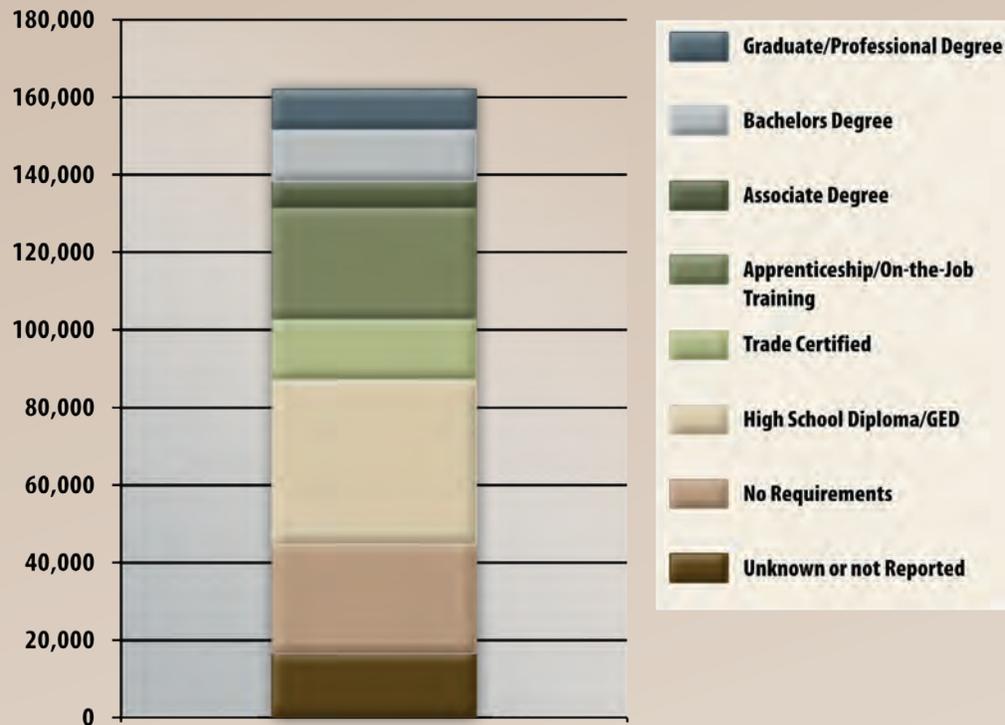
*Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium*

## Education and Other Requirements

Almost half of all jobs that produce a product or service that is considered green require a high school diploma, or lack any special requirements for the green job. On the other end of the education and training spectrum are those green jobs requiring a Bachelor’s degree or graduate or professional degree, 14 percent of all green jobs. For nearly two out of every ten green job employees, apprenticeships or on-the-job training are identified as a minimum education or training requirement by businesses within the consortium. At least at this date in time, education and training do not appear to be significant obstacles for employees engaged in some facet of green activity.

# Green Jobs Survey

**Figure 6: Green Jobs by Minimum Required Education or Training**



Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium

Other requirements for green jobs were commercial driver's licenses, coursework or workshops specific to the job, work experience, and other job-based knowledge or skills. Many different licenses, certificates, or other training were identified for jobs with green activities including Leadership in Energy and Environmental Design (LEED) certification, pesticide application, Occupational Safety and Health Administration (OSHA), Heating, Ventilation, and Air Conditioning (HVAC), hazardous material (HAZMAT), lead, Environmental Protection Agency (EPA), electrical, building codes, etc. In all, over 60 categories of jobs and training were identified.

## Occupations

Job titles were also reported in the Green Jobs Baseline Survey, providing information on corresponding wage rates and the proportion of time spent in green activities. Occupations in the SOC system are classified at four levels of aggregation depending upon the needs of various data users: major group, minor group, broad occupation, and detailed occupation. The 23 major groups are divided into 97 minor groups, 461 broad occupations, and 840 detailed occupations.

# Green Jobs Survey

Figure 7 presents data from the Green Jobs Baseline Survey for ten occupations with the highest proportion of green jobs by major occupational group.

**Figure 7: Estimated Green Jobs by Major Occupational Group**

| Occupational Group                             | Estimated Green Jobs | 95% Confidence Interval |             |
|--|----------------------|-------------------------|-------------|
|  |                      | Lower Bound             | Upper Bound |
| Farming, Fishing, and Forestry                 | 4,943                | 3,758                   | 6,129       |
| Life, Physical, and Social Science             | 8,796                | 7,514                   | 10,078      |
| Architecture and Engineering                   | 10,406               | 8,724                   | 12,088      |
| Construction and Extraction                    | 25,474               | 22,620                  | 28,328      |
| Installation, Maintenance, and Repair          | 18,690               | 16,067                  | 21,313      |
| Production                                     | 27,117               | 22,139                  | 32,095      |
| Management                                     | 10,632               | 7,759                   | 13,506      |
| Building and Grounds Cleaning and Maintenance  | 8,680                | 6,193                   | 11,167      |
| Transportation and Material Moving Worker      | 12,242               | 9,881                   | 14,604      |
| Arts, Design, Entertainment, Sports, and Media | 1,394                | 916                     | 1,871       |

*Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium*

Based on total employment by major occupational group, Farming, Fishing and Forestry occupations have the largest percentage of green workers, followed by Life, Physical, and Social Science occupations, and Architecture and Engineering. Over 10 percent of each occupational group has green employment. All other remaining occupational groups have less than 10 percent of their employment involved in green activities.

Green employment by occupational group may be viewed from another vantage point. As a percentage of total estimated green employment for all occupations in the consortium, only two groups fall out of the top ten: Farming, Fishing, and Forestry occupations and Arts, Design, Entertainment, Sports, and Media occupations. Production occupations capture nearly 17 percent of the region's green employment, followed by Construction and Extraction occupations (16 percent), and Installation, Maintenance, and Repair occupations (12 percent). Together, these three broad occupational groups account for almost half of the region's green employment.

# Green Jobs Survey

Comparable to the results presented by industry classification, occupations where workers engage in green activities full time is rare, with the exception of Production occupations. Half of all green workers in the Production occupational group dedicate all their time to green activities. This is true particularly for First-line Supervisors and Managers of Production and Operating Workers, Stationary Engineers and Boiler Operators, and Chemical Plant and System Operators at the detailed level of occupational classification. Other detailed occupational groups where green workers devote more than half their time to green activities include All Other Life, Physical and Social Science Technicians (61 percent), Medical and Clinical Laboratory Technicians (69 percent), Computer Operators (80 percent), Septic Tank Servicers and Sewer Pipe Cleaners (68 percent), Chemical Plant and System Operators (71 percent), and Refuse and Recyclable Material Collectors (70 percent). Similar to the data reported for industries but now defined by occupation, most green workers devote four hours or less per day to green activities.

**Most green workers devote four hours or less per day to green activities.**

Most green jobs (58 percent) pay less than \$50,000 per year, excluding fringe benefits. Most green workers earn between \$24,000 and \$47,000 per year. For comparison, the average wage nationally is \$46,000, and for the six-state consortium, \$37,000. Occupations with at least 25 percent of their employees engaged in green activity and that pay more than \$47,000 per year include Architecture and Engineering (51 percent), Business and Financial occupations (35 percent), Management (28 percent), and Computer and Mathematical occupations (25 percent). Occupations where at least one-quarter of their employees engaged in green activity and earn less than \$24,000 per year include Food Preparation and Serving-Related occupations (75 percent), Building and Grounds Cleaning and Maintenance (49 percent), Personal Care and Service (33 percent) and Sales and Related occupations (33 percent) (see Figure 8).

# Green Jobs Survey

**Figure 8: Green Job Wage Distribution by Occupational Category**

| Percent of Green Jobs within each Wage Category           |                |                     |                   |                     |                     |                     |
|---|----------------|---------------------|-------------------|---------------------|---------------------|---------------------|
| Occupational Group  | Under \$19,240 | \$19,240 - \$23,919 | \$23,920 - 30,159 | \$30,160 - \$37,959 | \$37,960 - \$47,319 | \$47,320 - \$59,799 |
| Management Occupations                                    | 3%             | 2%                  | 5%                | 5%                  | 11%                 | 9%                  |
| Business and Financial Operations Occupations             | –              | 2%                  | 10%               | 13%                 | 13%                 | 15%                 |
| Computer and Mathematical Occupations                     | –              | –                   | –                 | –                   | 8%                  | 17%                 |
| Architecture and Engineering Occupations                  | 1%             | 1%                  | 3%                | 6%                  | 14%                 | 18%                 |
| Life, Physical, and Social Science Occupations            | 1%             | 5%                  | 10%               | 10%                 | 10%                 | 11%                 |
| Community and Social Services Occupations                 | –              | –                   | –                 | –                   | –                   | –                   |
| Legal Occupations   | –              | –                   | –                 | –                   | –                   | –                   |
| Education, Training, and Library Occupations              | –              | –                   | 21%               | 18%                 | 13%                 | 10%                 |
| Arts, Design, Entertainment, Sports, and Media Occs.      | –              | –                   | 7%                | 11%                 | 13%                 | 10%                 |
| Healthcare Practitioners and Technical Occupations        | –              | –                   | 9%                | 21%                 | 38%                 | 7%                  |
| Healthcare Support Occupations                            | –              | –                   | –                 | –                   | –                   | –                   |
| Protective Service Occupations                            | –              | –                   | –                 | –                   | –                   | –                   |
| Food Preparation and Serving Related Occupations          | 36%            | 36%                 | –                 | –                   | –                   | –                   |
| Building and Grounds Cleaning and Maintenance Occupations | 29%            | 20%                 | 17%               | 9%                  | 3%                  | 1%                  |
| Personal Care and Service Occupations                     | 33%            | –                   | –                 | –                   | –                   | –                   |
| Sales and Related Occupations                             | 20%            | 13%                 | 6%                | 9%                  | 9%                  | 7%                  |
| Office and Administrative Support Occupations             | 15%            | 10%                 | 20%               | 15%                 | 8%                  | 2%                  |
| Farming, Fishing, and Forestry Occupations                | 10%            | 12%                 | 16%               | 12%                 | 13%                 | –                   |
| Construction and Extraction Occupations                   | 2%             | 7%                  | 16%               | 25%                 | 16%                 | 12%                 |
| Installation, Maintenance, and Repair Occupations         | 3%             | 6%                  | 13%               | 21%                 | 28%                 | 9%                  |
| Production Occupations                                    | 6%             | 10%                 | 18%               | 23%                 | 22%                 | 6%                  |
| Transportation and Material Moving Occupations            | 14%            | 12%                 | 17%               | 18%                 | 10%                 | 9%                  |

Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium

## New and Emerging Occupations Projection Methodology

To gain a more complete understanding of the green economy and to evaluate the potential labor market impacts of developments in energy-related technologies in the consortium states, it is important to not only assess the current status of green jobs, but also to project the potential growth of this economic sector. To this end, information from our baseline survey was used in combination with the pre-established techniques of occupational projections set forth by the Employment and Training Administration-supported Projections Managing Partnership to measure potential future impacts of the green economy.

# Green Jobs Survey

The methodology developed in the initial planning stages was based on an expectation that a robust amount of information regarding the level of green saturation within occupations and vacancy rates for those occupations would be collected through the survey. Green job counts and vacancy rates by occupation, as well as information from economic impact estimates of renewable energy projects across the consortium states, would then be used to create both a baseline for green jobs and a projected future demand for green employment. In the case of estimate suppression for baseline levels of individual occupations, data could be imputed for any state using the results of a contiguous consortium state to close the information gap. While current counts would inform the baseline tabulation, vacancy rates, in theory, would aid in formulating dynamic change factors for green occupational concentration over the projection time period.

This plan was based on the assumption that the relative mix of green occupations and green concentration would be consistent across the consortium states. However, once the data were collected from the baseline survey, it became clear that those assumptions would not hold true. First, the percentage of green employment across the consortium states varied significantly, from a high of about 5.2 percent in Wyoming to a low of 1.7 percent in Utah. Additionally, it became clear during survey design discussions that flexibility in data collection and measurement techniques across the states would be necessary in order to address the economic differences that existed within the consortium. Allowing for this variation naturally resulted in some dissimilarity among the data.

It was for these reasons that the methodology for projecting green occupations was adjusted. Instead of multiplying existing occupational projections by the percentage green in each occupation to arrive at the projected number of green jobs, the base percent of total green jobs in a state was used to establish the number of green jobs in any one occupation. From there, the percent of green within an occupation was identified and applied to pre-established projections for the total statewide occupational mix. The advantage of this approach was that the variation in the relative size of any state's green economy was no longer a hurdle in producing green staffing patterns. Additionally, the application of consortium aggregate-based green occupation shares allowed for state-to-state comparisons that would not have otherwise existed due to the slight variations in data collection approaches.

# Green Jobs Survey

Another significant advantage to the aggregation approach was that it allowed for a direct approach to addressing the issue of survey responses to which technicians were unable to assign an occupational code. The consortium aggregate-based occupation share calculations could be used to assign probabilistic occupation codes to the unassigned survey data, thus ensuring that all the collected data could go into the analysis of the green economy in each state.

In generating the projections under this methodology, the following assumptions are taken:

- **A consortium-wide staffing pattern will be the most consistent and least biased source of information to drive the projections by occupation.**
- **Some consortium-wide estimates don't meet statistical and/or confidentiality standards for publication, but are consistent enough to be applied to statewide estimates.**
- **The percentage of green jobs in each occupation remains constant over the projected time period.**
- **The occupational distribution of the survey responses that the technicians couldn't code was the same as the distribution of the occupations that could be coded.**

## **Green Job Projections**

One of the survey questions asked employers whether the green job had been recently created. Employers reported that approximately 11.2 percent of green jobs were created in the past year. They also reported that they planned on creating a similar level of new green jobs positions in the upcoming year. Although the 11 percent is statistically significant, there was a high level of non-response to this question, resulting in a large variance and a high likelihood of estimate bias.

The consortium did not find any jobs that did not fall within the existing taxonomy for coding occupations, or the SOC codes. However, there were some green occupations that were placed in one of the “all other” categories that may require a more specific code in the future.

One such occupation was Sustainability Managers, who analyze business processes and develop new procedures to make their business more green. Responsibilities of this position range from being a team member that ensures fellow co-workers recycle cardboard and empty recycling bins when they are full, to analysts who streamline businesses operations to reduce energy costs, to execu-

# Green Jobs Survey

tives that implement business strategies and marketing to make the business green. Sustainability Managers were coded primarily into 13-1199 Business Operations Specialists, All Other. However, if it was likely that the Sustainability Manager was a high-level executive, such as having the job title of Vice President of Sustainability, the job was coded as 11-9199 Managers, All Other. Alternatively, if a retail salesperson was a Team Sustainability Manager, who provided encouragement and support for their coworkers to recycle, turn off lights, or other energy efficiency measures, they were coded as 41-1011 First-Line Supervisors of Retail Sales Workers.

**Employers reported that approximately 11.2% of green jobs were created in the past year.**

Another common green occupation with potential coding difficulties was Home Energy Efficiency Analysts, or workers who perform tests in residential property to determine where heat is being lost and whether the property needs better insulation, improved windows, or other measures. Many of these workers have backgrounds in construction, suggesting that they should be coded as 47-4011 Construction and Building Inspectors. However, the Occupational Information Network (O\*Net) suggests these workers be coded as 13-1199 Business Operations Specialists, all other (the same code as most Sustainability Managers), while the 2010 SOC Dictionary seems to suggest these workers be coded as 17-2199 Engineers, All Other. Home Energy Efficiency Analysts were a frequently reported occupation in the green jobs survey and were generally coded as Business Operations Specialists.

In general, the green jobs survey had more jobs listed in the All Other occupational categories than expected, based on Occupational Employment Statistics Program (OES) estimates. The additional employment is partially due to survey respondents not providing sufficient information for coding into a more specific category, but may also be because workers tended to emphasize the green portions of their jobs when responding to the green job survey. The green emphasis made them more likely to be placed in the all other category, which currently includes the green occupation. For example, a business analyst responding to an OES survey may have responded that their job duties were to streamline processes and reduce costs, but the same response in a green jobs survey may tend to emphasize that the cost savings come from implementing energy efficiency measures and reducing unnecessary waste. The different job description may result in the job being coded differently.

# Green Jobs Survey

## Projections and Green Worker Shortages

The green jobs survey asked employers for the number of current vacancies they have open for each green job, plus the anticipated job creation and job loss for green jobs within the next year. Employers listed a total of 4,735 vacancies for green jobs (a rate of 2.9 percent of existing jobs). The best comparable data from the Conference Board's Help Wanted OnLine data indicates that the number of vacancies as a percent of total U.S. employment was 2.1 percent in the second quarter of 2010.<sup>1</sup> However, the confidence margin from the green jobs survey includes 2.1 percent, meaning that the two percentages are not statistically different. Further, the two statistics have very different methodologies of data collection.

**Figure 9: Green Jobs Recently Created, Current Openings, and Job Creation and Loss Reported on Green Jobs Survey**

|                           | Estimated Green Jobs | 95% Confidence Interval |             | As a Percent of Existing Green Jobs |
|---------------------------|----------------------|-------------------------|-------------|-------------------------------------|
|                           |                      | Lower Bound             | Upper Bound |                                     |
| Recently Created          | 18,156               | 15,201                  | 21,112      | 11.2%                               |
| Current Vacancies         | 4,735                | 3,472                   | 5,998       | 2.9%                                |
| Job Creation              | 18,099               | 15,402                  | 20,796      | 11.2%                               |
| Job Loss                  | 2,893                | 1,810                   | 3,977       | 1.8%                                |
| Total Existing Green Jobs | 162,117              |                         |             |                                     |

Anticipated green job openings in the next year equal 18,099, while anticipated losses equal 2,893, for a net gain of 15,206 green jobs within the next year. The rate of green job creation is approximately 11.2 percent of existing jobs. Although similar data for all jobs does not exist at either the consortium or national level, the rate of payroll job creation in the U.S. was approximately 9.5 percent of existing jobs in the 2nd quarter of 2010, which is not statistically different than the rate of green job creation.

Despite employers reporting a net job increase of roughly 15,000 jobs in the year following the survey, labor economists within the consortium are less optimistic about future green job growth. Consortium projections for green jobs indicate

<sup>1</sup>2.1% is the ratio of the total vacancies in the Conference Board Help Wanted Online data, 2nd quarter 2010 over total employment from the Current Population Survey, Bureau of Labor Statistics from the same time period.

# Green Jobs Survey

net green job growth of only 1,600 per year, with an additional 2,850 becoming open due to workers retiring or leaving their jobs for other reasons. The total projected openings across the consortium are 4,485 per year.

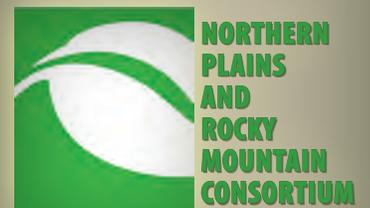
The occupations with the highest number of green job openings, according to consortium projections, are shown in Figure 10. The occupations with the greatest need for new green workers are the Heating, Air Conditioning, and Refrigeration Mechanics and Installers, followed by Electricians.

**Figure 10: Projected Consortium Annual Labor Needs for Green Jobs**

| Occupation  | Annual Job Growth | Annual Replacement Needs | Total Annual Openings |
|---|-------------------|--------------------------|-----------------------|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 181.7             | 89.5                     | 271.2                 |
| Electricians  | 67.5              | 102.1                    | 169.6                 |
| Laborers and Freight, Stock, and Material Movers, Hand                | 14.5              | 132.6                    | 147.1                 |
| Managers, All Other   | 37.1              | 102.3                    | 139.4                 |
| Refuse and Recyclable Material Collectors                             | 51.8              | 78.9                     | 130.7                 |
| Retail Salespersons   | 26.4              | 103.0                    | 129.4                 |
| Water and Liquid Wastewater Treatment Plant and System Operators      | 53.8              | 52.7                     | 106.5                 |
| Maintenance and Repair Workers, General                               | 37.0              | 49.2                     | 86.2                  |
| Landscaping and Groundskeeping Workers                                | 51.5              | 33.8                     | 85.3                  |
| Plumbers, Pipefitters, and Steamfitters                               | 36.0              | 42.8                     | 78.7                  |

It is important to be mindful that projected openings only consider the demand side of the labor market, not the number of workers currently available for each job. A number of the occupations on the top ten list are common within the construction industry. Given the large number of job losses within the construction industry during the 2007 recession, there may be a large pool of available labor to fill the projected openings for several years. For example, there may be several hundred plumbers currently out of work within the consortium states. Even with 79 job openings each year, it will take several years of job growth before demand will exceed the existing pool of available labor.

# New and Emerging Green Technologies



# New and Emerging Green Technologies

Preparing a workforce for jobs that don't yet exist is always a challenge and it is an even bigger challenge when preparing workers for jobs in green energy. Many energy technologies require large investments of capital and time before becoming a commercially viable energy source. Social and political forces often have a hand in moving technologies forward or stopping them altogether. In order to gather information on the most commercially viable new and emerging technologies the Northern Plains and Rocky Mountain Consortium enlisted the Montana Manufacturing Extension Center (MMEC) at Montana State University to provide assistance to its "Researching the Green Economy" project. A variety of green energy technology sectors were evaluated to identify new and emerging technologies with potential for commercial viability within the next five to ten years and their potential impacts on the workforce. The technology sectors evaluated included:

- Wind energy
- Commercial-scale carbon capture/sequestration
- Biofuels and bio-lubricants (includes methane capture)
- Biomass
- Smart grid and transmission
- Solar
- Geothermal
- Other "green" technologies that may be deployed, and
- Other "traditional" technologies that may offset the use of fossil fuels

The technologies selected for review include the following:

## **Wind Energy**

Horizontal axis wind turbines – wind energy is available on both small and large scales, each contributing to the electrical grid. Single, small 100 watt or 10-kilowatt (kW) wind turbines can be found on farms or residences while larger wind farms employ turbines capable of generating between 700 kW to 1.8 Megawatts (MW) of power. Wind farm turbines are typically 160 to 300 feet in length and are tied directly into utility transmission systems.

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In the six-state region wind energy adds 5,725 jobs to the economy. The total number of jobs in each state averages 954 with most jobs due to construction and an average of 37 due to the ongoing operation and maintenance of wind turbines (see Figure 11).

**Figure 11: Wind Energy Development Job Impacts in Consortium States**

| State         | Construction Jobs | Operations/<br>Maintenance Jobs | Total Jobs   |
|---------------|-------------------|---------------------------------|--------------|
| Iowa          | 903               | 33                              | 936          |
| Utah          | 1,007             | 45                              | 1,052        |
| Nebraska      | 919               | 34                              | 953          |
| Montana       | 959               | 45                              | 1,004        |
| South Dakota  | 956               | 35                              | 991          |
| Wyoming       | 759               | 30                              | 789          |
| <b>Totals</b> | <b>5,503</b>      | <b>222</b>                      | <b>5,725</b> |

## Carbon Capture and Storage

Carbon capture and storage (CCS) is a process for capturing CO<sub>2</sub> emissions from existing stationary sources such as power plants using coal, oil, or natural gas, cement kilns, paper plants, refineries, ethanol plants, and other industrial sources. The process has three primary steps: 1) The CO<sub>2</sub> is captured at the source; 2) The CO<sub>2</sub> is transported to a suitable storage location; and 3) The CO<sub>2</sub> is injected into geologic formations deep underground for permanent safe storage.

## Biofuels and Biolubrication

### Algae/Cyanobacterial Production of 2nd and 3rd Generation Biofuels

Ethanol and biofuels can be produced from algae or cyanobacteria from three mechanisms: 1) photoautotrophic – feeding carbon dioxide to algae to promote growth followed by conversion of algae into oils using light as the energy source; 2) chemoheterotrophic – supplying algae with sugars and other nutrients to promote growth followed by conversion of algae into oils; and 3) mixotrophic – supplying algae with CO<sub>2</sub> and organic compounds as sources of carbon to produce oils. Sources of CO<sub>2</sub> for photoautotrophic processes could include coal-fired electricity generation plants, providing reductions in greenhouse gas emissions.

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## **Biochemical Conversion to 2nd and 3rd Generation Biofuels**

The biochemical route for 2nd and 3rd generation biofuel production involves similar unit operations (pretreatment, hydrolysis, fermentation, separation) as the process used to convert corn into the first generation biofuel, ethanol. The feedstock for 2nd and 3rd generation biofuels is lignocellulosic biomass, which can be in the form of crop and forestry residues, components of municipal solid waste, or dedicated biomass sources such as fast growing trees or native grasses.

## **Biodiesel**

Biodiesel is a renewable transportation fuel that can be used by diesel combustion engines without any modification. Biodiesel is typically blended with petroleum-based diesel at 5 percent, 10 percent, or 20 percent by volume. The technology is fully commercialized. The emerging technology for biodiesel is the use of non food-grade oil seed crops. Biodiesel can be made from fats, oils, and grease. The most common feedstock for biodiesel production in the U.S. is soybean oil. Biodiesel is the term that refers to the fuel product from transesterification. Transesterification is a chemical process that converts fatty acids to Ethyl esters.

## **Bio-oils from Lignocellulose**

There are a number of advanced biofuel technologies being developed that may be available in the 2010 to 2025 time frame. The key difference between these and current commercial technologies is the types of biomass feedstocks used for production. Current technologies typically use grain and oil seed crops, while the advanced technologies use lignocellulosic biomass such as wood, switchgrass, and agricultural residues. Although these biomass feedstocks are generally more difficult to convert to biofuels, they are not a human food source and can be much less expensive than grain and seed crops. Lignocellulosic ethanol production is divided into two primary processes: hydrolysis/fermentation and thermochemical/fermentation. Converting lignocellulosic feedstocks to bio-oils begins with pyrolysis as the primary conversion process. Crude bio-oils can be upgraded from there to clean hydrocarbon fuels via hydrotreatment followed by hydrocracking at a petroleum refinery. In the upgrade process the bio-oil is typically mixed with petroleum products during some stage in the refining process, which enables usage of advanced refinery technologies and economies of scale.

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## **Biomass**

### **Co-firing**

Co-firing is the simultaneous combustion of different fuels in the same boiler. Many coal- and oil-fired boilers at power stations have been retrofitted to permit multi-fuel flexibility. Biomass is a well-suited resource for co-firing with coal as an acid rain and greenhouse gas emission control strategy. Co-firing utilizing biomass has been successfully demonstrated in the full range of coal boiler types, including pulverized coal boilers, cyclones, stokers, and bubbling and circulating fluidized beds.

### **Methane Capture/Biogas**

Biogas, a gaseous mixture containing 50 to 95 percent methane (CH<sub>4</sub>) depending on the source, is generated from a variety of sources and can be captured and used for heat and power generation. Methane is commonly produced through anaerobic digestion of organic material. The major sources of organic material that are covered in this document include landfills, wastewater treatment facilities, and livestock production. At many of these sources, biogas can be collected and used on site or transported to a central location, where it can be refined to pipeline-quality gas (comparable to natural gas, which is 95 percent methane) or combusted for electrical generation or heating.

### **Solid Fuel Combustion**

Direct combustion of solid fuel biomass in a boiler to generate steam for process and power use remains the most common way of converting biomass into a usable energy. Stoker grate and fluidized bed boilers combined with steam turbines represent the two most widely used biomass power and cogeneration technologies. They are both well-established mature technologies that continue to evolve and improve.

### **Gasification**

There are numerous biomass gasification-based power generation and Combined Heat and Power (CHP) technology offerings being tendered at varying levels of commercial readiness throughout the world. The report focuses on the new and emerging technologies of biomass-gasification based combined heat and power systems.

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**Figure 12: Summary of Biomass Resource Potential in Consortium States (dry tons/year)**

| State        | Total biomass resource potential (dry tons/year) |                |                  |                       |                  | Total             |
|--------------|--|----------------|------------------|-----------------------|------------------|-------------------|
|              | Crop Residues                                    | Manure         | Forest Biomass   | Primary Mill Residues | Urban Wood Waste |                   |
| IA           | 23,590,059                                       | 141,940        | 359,001          | 129,844               | 29,283           | 24,250,126        |
| MT           | 1,559,984  | 3,628          | 703,938          | 1,937,052             | 13,394           | 4,217,995         |
| NE           | 10,930,551                                       | 102,372        | 72,440           | 57,075                | 13,241           | 11,175,679        |
| SD           | 5,140,289  | 35,694         | 124,999          | 141,856               | 6,518            | 5,449,356         |
| UT           | 88,372   | 9,860          | 30,418           | 102,442               | 18,068           | 249,161           |
| WY           | 106,224  | 2,181          | 57,579           | 254,933               | 3,654            | 424,570           |
| <b>Total</b> | <b>41,415,479</b>                                | <b>295,674</b> | <b>1,348,375</b> | <b>2,623,202</b>      | <b>84,157</b>    | <b>45,766,887</b> |

Source: (Milbrandt, 2005)

## Pellet Fuels

Wood pellet technology is a mature technology as is the production of wood briquettes and fire logs. The production of wood pellets requires the use of dry wood (10 percent moisture content) that has been reduced to fine “saw dust” particles. The wood is either forced through an extruder or a die at pressure of 45,000 psi. The friction and pressure creates 200°F heat which cause the lignin component of the wood to melt and bind the wood particles together without the need for any other binding or adhesive material.

Fuel pellets from herbaceous materials, while technically possible, will not develop due to the ash characteristics of the feedstock. Pellets from biochar/torrefaction have higher energy density than wood pellets and are resistant to water. These are desirable, but the biochar technology is still in the demonstration phase. If biochar/torrefied wood can be produced economically, pellets from these materials will enter the fuel market. Initial deployment will be on a small scale similar to the size of small wood pellet mills, but could grow rapidly if the biochar/torrefication technology is scalable and there is interest in use from utility sized facilities.

## Smart Grid and Transmission

The coming evolution in the delivery of electricity is the smart grid, which is the application of information technology that enables more visibility and control of both the existing grid infrastructure and new grid assets, such as customer demand response and distributed energy resources consisting of small generators and electricity storage devices.

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The smart grid's much higher fidelity control is provided through high-speed, two-way communication, sensing, and real-time coordination of all assets down to the customer meter and the end-use devices. Thus, the smart grid is not characterized by a single technology or a device, but instead is a vision for a distributed, internet-like system that will:

- Provide better control of existing grid infrastructure assets
- Provide additional functionality and benefits from existing assets
- Integrate new (often small, widely distributed) assets into the existing operational paradigm
- Engage these new assets to provide entirely new benefits to the grid

This vision is perhaps best described by a set of essential characteristics, or outcomes. Beyond describing the smart grid as a vision, it is helpful to describe what the smart grid consists of in terms of primary and enabling assets.

## **The primary assets of smart grid include:**

1. Demand response (DR) – communications and controls for end-use devices and systems to reduce (or, in special cases, increase) their demand for electricity at certain times
2. Distributed generation (DG) – small engine or turbine generator sets, wind turbines, and solar electric systems connected at the distribution level
3. Distributed storage (DS) – batteries, flywheels, super-conducting magnetic storage, and other electric and thermal storage technologies connected at the distribution level
4. Distribution/feeder automation (DA/FA) – distribution and feeder automation expand SCADA communications in substations and into the feeders with remotely actuated switches for reconfiguring the network, advanced protective relays with dynamic and zonal control capabilities, dynamic capacitor bank controllers, and condition-based transformer-management systems (to name a few)
5. Transmission wide-area visualization and control – transmission control systems that rapidly sense and respond to disturbances
6. Electric and plug-in hybrid electric vehicles (EVs/PHEVs) – the batteries in EVs represent both a new type of load that must be managed and an opportunity for them to discharge as energy storage resources to support the grid

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## The enabling assets of smart grid include:

1. Wide-area communications networks, servers, gateways, etc.
2. Smart meters—beyond what many consider as basic advanced metering infrastructure (AMI) technology, a more fully smart meter could also support shorter metering intervals approaching 5 minutes or less to support provision of ancillary services and distribution capacity management (rather than the hourly interval generally considered adequate for peak load management at the bulk power systems level).
3. Full two-way communications including to a home-area network to communicate with smart thermostats and appliances
4. Instantaneously read voltage, current, and power factor to support distribution state estimation and optimized system volt-VAR control
5. Offer remote connect/disconnect functionality for reliability and customer service applications
6. Local-area home, commercial building, and industrial energy management and control systems (EMCS) and networks
7. Consumer information interfaces and decision support tools
8. Utility back-office systems, including billing systems

## Solar

### Bulk Heterojunction (BHJ) Solar Cells

The photoactive layer in a bulk heterojunction solar cell is composed of a mixture of a light absorbing polymer, wherein the conducting electrons are generated, and an acceptor molecule to which electrons are passed, under the influence of a molecular-level bias-voltage. Photocells are made of multiple very thin layers of flexible polymer and charge blocking films. It can be formed on a flexible substrate to give an overall flexible, lightweight solar cell. The solar cell can also be formed as a film on glass, to create semitransparent, energy generating windows. The color of the film is determined by the light absorbance of the photo-active polymer.

### Dye-Sensitized Solar Cells (DSSC, Graetzel cells)

Dye-sensitized solar cells are based on very fine powders (nanoparticles) of a high-bandgap semiconductor, most commonly, titanium dioxide (TiO<sub>2</sub>). Powders are soaked with an appropriate dye, which adsorbs to the surface of the

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semiconductor nanoparticles, and absorbs light. Advantages include low materials and processing costs, light weight, flexible structure, and potential for moderate energy conversion efficiencies.

**Figure 13: Solar-Related Industry Comparison Between SD, NE, WY, IA, MT, UT**

| State        | Number of Solar Companies |
|--------------|---------------------------|
| South Dakota | 9                         |
| Nebraska     | 10                        |
| Wyoming      | 10                        |
| Iowa         | 22                        |
| Montana      | 18                        |
| Utah         | 40                        |

## Geothermal

### Thermal Energy Storage

Thermal Energy Storage (TES) is an energy management strategy with various applications. As with batteries for electrical energy storage, thermal energy storage shifts energy capacity from low demand to high demand times. As such, it can be used for daily, weekly, or seasonal energy storage applications. In most energy production or energy use installations, the economics and opportunities depend on both ambient conditions and energy availability.

### Advanced Adiabatic Compressed Air Energy Storage

Compressed air energy storage is a method to meet high peak load electrical power demands and to level power from intermittent renewable energy sources such as solar and wind. The concept is to run high efficiency compressors when electrical energy availability is high (such as when wind is blowing and electrical demand is low) to compress ambient air. The compressed air is then stored in a large cavern or volume until additional power is needed. When additional power is needed, the compressed air is released through a turbine connected to an electrical generator to produce power, much like pneumatic tools connected to a compressed air tank.

### Smart Thermosiphon Arrays

An obvious and virtually fossil-fuel-free method of heating and cooling buildings in most climates is to store summer heat for winter use and winter “cold” for summer cooling. In essence, the idea is to “TiVo” seasonal weather. All build-

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ings sit on a vast volume of geological material – nearly all of it deep enough to store heat (or “cold”) without surface environmental effects. A thermosiphon heat pipe consists of a vertical sealed pipe that is partially filled with a liquid; the top portion of the pipe is filled with the liquid’s vapor. When the bottom portion is hotter than the top, the liquid is vaporized at a rate proportional to the rate of heat transfer from the soil. Due to temperature-gradient-induced pressure gradients, the vapors flow to the cooled end and condense. As the vapor condenses, it releases its energy at a rate proportional to the heat transfer from the pipe. Gravity feeds the condensate back to the bottom evaporator. Thus, a thermosiphon heat pipe effectively operates as a super thermal conductivity heat diode, transferring energy only in the upward direction.

## Other

### Hybrid Nuclear Energy

An emerging hybrid-nuclear technology is a breakthrough energy solution that allows the US to utilize our most abundant resource, coal, while dramatically reducing air pollution as well as greenhouse gas emissions without resorting to problematic CO<sub>2</sub> sequestration. The hybrid is based on the integration of the existing, well-proven technologies of the combustion turbine, combined-cycle power plant and coal gasification as well as the maturing helium gas reactor being developed by the Department of Energy. Figure 14 presents a summary of job impacts from the reviewed technologies.

**Figure 14: Job Impacts from the Reviewed Technologies**

| Technology Sector | Construction/Harvesting/Manufacturing Jobs | Operations and Maintenance Jobs | Total Jobs    |
|-------------------|--|---------------------------------|---------------|
| Wind Energy       | 5,503                                      | 222                             | 5,725         |
| CCS               |  |                                 | 46,529        |
| Biofuels          | 1,120                                      | 191                             | 1,311         |
| Biomass           | 267  | 66                              | 333           |
| Smart Grid        |  |                                 | 500           |
| Solar             |  |                                 | 770           |
| Geothermal        | ---  | ---                             | ---           |
| Hybrid-Nuclear    |  |                                 | 2,500         |
| <b>TOTAL</b>      |  |                                 | <b>57,668</b> |

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## Other Technologies Of Interest But Not Included In Subject Matter Expert Reports

### Instream Hydrokinetic Energy

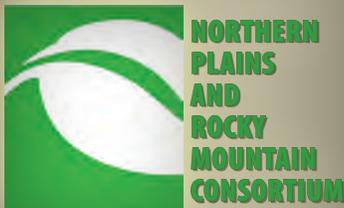
The emerging technology of instream hydrokinetic electricity generation will make the West's water resources even more productive. Instead of damming a river to capture its potential energy, instream hydrokinetic power relies on free-flowing currents that spin underwater turbines. Inland cities and towns along the nation's rivers can benefit from electricity generated from free-flowing waters. For instream hydrokinetic energy projects, turbines are suspended from barges or sit passively on the river bottom.

Instream hydrokinetic generation systems rely mainly on the existing kinetic energy in the water stream. They do not rely upon any artificial water-head, such as impoundments, to be created as the energy source for operation. These systems do not require large civil works, but they can be placed in existing tail-races and channels, utilizing the kinetic energy available. They do not require the diversion of water through manmade channels, riverbeds, or pipes, although they may have applications in such conduits.

Go to [www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com) to read the complete report.



# New Hires Survey



# New Hires Survey

## New Hires Survey

One of the goals of the Northern Plains and Rocky Mountain Consortium was to determine whether the workforce was adequately trained for an ever-changing green economy. To achieve this goal, the Consortium first developed a baseline count of green jobs through the green jobs survey, developed projections for future green job openings, and researched the available labor supply in order to determine whether there were an appropriate number of people to fill future green job openings. The New Hires Survey also took the next step in evaluating the preparedness of the future green job workforce by determining what skills were inadequate among newly-hired workers in green jobs. For the purposes of this research, a new hire was defined as a worker who was employed by an employer and had not been employed by that same employer in the past.

Although the research was designed to identify skill gaps among green workers, the research allowed for more global research about new hire job retention among all jobs. During preliminary research for the green jobs grant, consortium members discovered that less than a third of workers retained employment with an employer for four quarters after hire. The low job duration among newly hired workers has negative consequences for the economy and society. First, there is considerable actual and opportunity costs incurred in the job search process by employers, employees, and society – workers lose valuable time and resources in a job search versus productive employment, employers lose job search costs and productivity from not being adequately staffed, and the public loses output that would have been produced plus any social welfare payments due the worker in the unemployed period. Second, in the long-term, short job duration will cause workers to be inadequately trained for many jobs, but not have the high-level of job-specific skills learned through experience. Third, frequent job changing creates a disincentive for employers to provide worker training and shifts the responsibility of workforce training into the public sphere, where forces other than efficient markets determine what workers are trained, for what types of jobs, and what skills are improved.

In an effort to investigate the causes behind the short job duration, several of the states within the Northern Plains and Rocky Mountain Consortium included a New Hires Survey as part of their research. Research questions sought to identify whether the job was green, the characteristics of green jobs, and the skills required in green jobs. In addition, the survey aimed to understand the causes of and solutions to short job duration. In particular, consortium members wanted to know what skills were associated with long-term employment (and what skill deficiencies led to job separation) in order to inform the curricula of worker

training programs, particularly for green workers. The consortium also wished to develop a statistical model to evaluate various training programs for effectiveness in job retention and wage progression after adjusting for demographic differences in program participants.

To accomplish this goal, each state approached this research by combining an employer survey with administrative data from Unemployment Insurance and other public programs. Differences in the quality and type of administrative data available necessitated differences in data collection methodologies; therefore, consortium-wide results were not possible. Embracing the need for state-specific approaches, each participating state varied survey questions, sampling techniques, and modeling approaches, allowing for post-research evaluation of methodology. The different surveys and methodologies resulted in unique results for each state. The results are summarized in this section and detailed in each state's appendix.

## **Duration of Job Retention:**

Data from Montana and Wyoming indicate that roughly 65% of newly hired workers are still working for the same employer in the quarter following hire. Two quarters after hire, roughly 40% of workers are employed by the business, and about 25% of workers are working for the employer four quarters after first being hired by the employer. This figure includes workers who had a break in employment and returned to work for the same business, such as temporary or seasonal workers. Montana estimates that only 7% of new hires are consecutively employed every quarter for four quarters.

Job retention percentages differ with the quarter of hire and economic conditions, as shown in Figures 15 and 16 (next page). Montana new hires starting employment in the first quarter of the year have a 28% chance of working for that employer a full year later. The likelihood decreases if the new hire starts employment in the fourth quarter due to the high percentage of seasonal hires. Job retention rates increased as the unemployment situation worsened, with the highest retention rates in 2009.

# New Hires Survey

**Figure 15: Retention Rate of New Hires by Quarter, 2006 to 2009**

| Quarter | After One Quarter |         | After Four Quarters |         |
|---------|-------------------|---------|---------------------|---------|
|         | Montana           | Wyoming | Montana             | Wyoming |
| 1       | 0.70              | 0.67    | 0.28                | 0.28    |
| 2       | 0.69              | 0.68    | 0.23                | 0.26    |
| 3       | 0.61              | 0.61    | 0.20                | 0.27    |
| 4       | 0.63              | 0.62    | 0.19                | 0.21    |

**Figure 16: Retention Rate of New Hires by Year, 2006 to 2009**

| Year | After One Quarter |         | After Four Quarters |         |
|------|-------------------|---------|---------------------|---------|
|      | Montana           | Wyoming | Montana             | Wyoming |
| 2006 | 0.66              | 0.63    | 0.24                | 0.26    |
| 2007 | 0.64              | 0.64    | 0.24                | 0.26    |
| 2008 | 0.66              | 0.64    | 0.25                | 0.27    |
| 2009 | 0.68              | 0.67    |                     |         |

## Wyoming's Results

The purpose of Wyoming's survey was to determine the job title, knowledge, skills, and abilities of newly hired employees and secondarily, what percent (if any) of the time "was this job involved in activities and duties related to increasing energy efficiency, utilizing or developing renewable energy resources, or preserving and/or restoring the environment." This is an ongoing survey in Wyoming and will likely yield useful information in terms of the demographic characteristics of these new hired workers as well as statistics related to job tenure and wage progression.

Currently there is little research available about what jobs are most likely to perform energy-efficient activities but the results of this study should help to provide more insight. Because so little research is available on energy-efficient jobs and the types of skills required, this project allows for the comparison of the types of skills needed for jobs that perform energy-efficient activities and those that do not.

# New Hires Survey

**Figure 17: Percent of new Hires Involved in Energy-Efficient Activities for Select Occupations in Wyoming**

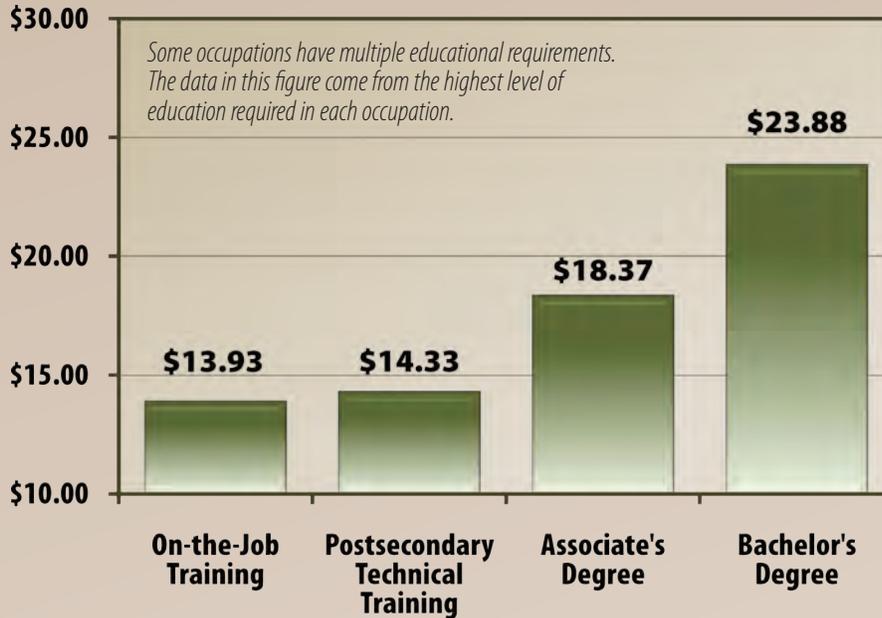
| Occupation  | New Hires     | % in energy-efficient activities |
|---|---------------|----------------------------------|
| Cashiers  | 1,591         | 11.2                             |
| Combined Food Preparation and Serving Workers                 | 1,489         | 10.9                             |
| Retail Salespersons   | 1,479         | 5.8                              |
| Truck Drivers, Heavy and Tractor Trailer                      | 1,336         | 27.1                             |
| Waiters and Waitresses  | 1,164         | 7.7                              |
| Construction Laborers   | 773           | 11.9                             |
| Maids and Housekeeping Cleaners                               | 762           | 16.0                             |
| Janitors and Cleaners, except Maids and Housekeeping Cleaners | 758           | 18.8                             |
| Electricians  | 750           | 17.7                             |
| Cooks, Restaurant   | 653           | 17.2                             |
| Substitute Teachers   | 624           | 5.2                              |
| Secretaries, except Legal, Medical, and Executive             | 601           | 13.3                             |
| Bookkeeping, Accounting, and Auditing Clerks                  | 572           | 15.2                             |
| Carpenters  | 570           | 27.0                             |
| Bartenders  | 552           | 15.3                             |
| <b>Total</b>  | <b>39,902</b> | <b>16.7</b>                      |

Figure 17 shows the percent of new hires involved in energy-efficient activities for select occupations. In total, 16.7 percent of all new hires in Wyoming were involved in some sort of energy-efficient activity with truck drivers, heavy and tractor trailer (27.1%) and carpenters (27.0%) among the highest percentage involved in energy-efficient activities.

Data collected from the new hires survey illustrated that those working in occupations that require a higher level of education earn more than those working in occupations that require on-the-job training (Figure 18). New hires in jobs requiring a bachelor's degree earned a considerably higher hourly average wage (\$23.88) than all other groups. Within the top 90% of all new hires, 77.7% of all occupations required on-the-job training, while only 6.6% of all occupations required a bachelor's degree.

# New Hires Survey

**Figure 18: Average Hourly Wage for New Hires in Wyoming by Educational Requirement, 2009Q4-2010Q1**



Of the 5,331 newly hired positions examined, service orientation was the skill most frequently reported as being important (28.9%). Understandably, more than one skill was considered as important for many of these jobs. The 10 most frequent co-occurrences are shown in Figure 19.

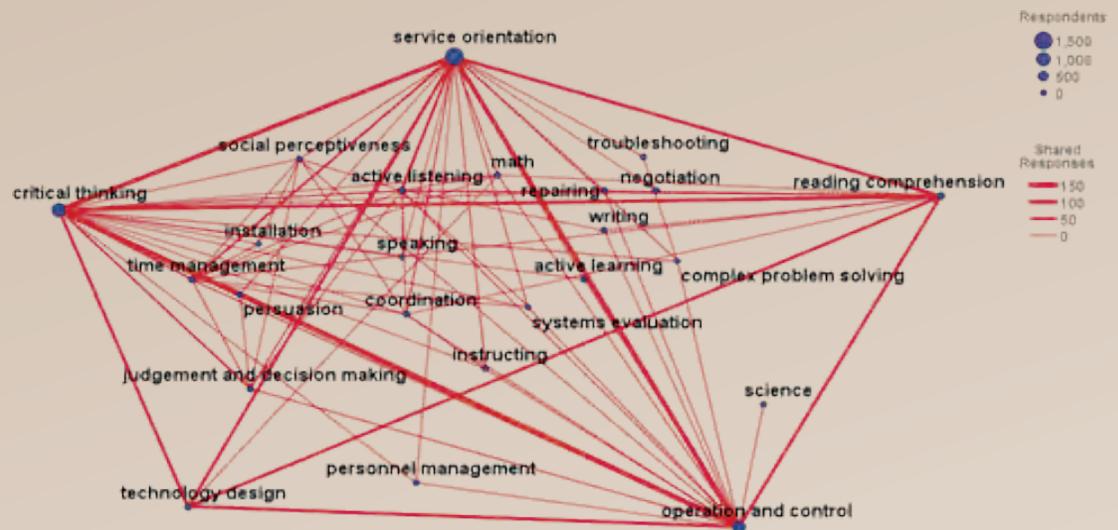
**Figure 19: Number of Co-Occurrences of Skills Reported as Important for the Wyoming New Hires Survey**

| Category 1 (Total Responses) | Category 2 (Total Responses) | Number |
|------------------------------|------------------------------|--------|
| Critical Thinking (1,201)    | Operation & Control (821)    | 146    |
| Service Orientation (1,496)  | Critical Thinking (1,021)    | 119    |
| Reading Comprehension (202)  | Critical Thinking (1,021)    | 81     |
| Operation & Control (821)    | Service Orientation (1,496)  | 70     |
| Critical Thinking (1,021)    | Technology Design (116)      | 69     |
| Reading Comprehension (202)  | Service Orientation (1,496)  | 67     |
| Reading Comprehension (202)  | Operation & Control (821)    | 66     |
| Technology Design (116)      | Operation & Control (821)    | 66     |
| Reading Comprehension (202)  | Technology Design (116)      | 65     |
| Technology Design (116)      | Service Orientation (1,496)  | 65     |

# New Hires Survey

Figure 20 represents a skills concept map. The size of the blue dots represents the number of responses for a given skill. The width of the red lines defines the amount of co-occurrence between a particular set of skills.

**Figure 20: Skills Concept Map**



## South Dakota's Results

For the purposes of the South Dakota new hires survey, “green workers” were operationally defined as those employees who dedicate more than 50 percent of their time to “green activities” related to producing a product or service that improves energy efficiency, expands the use of renewable energy or supports environmental sustainability. (This is different from the Green Jobs survey where green jobs included those dedicating less than 50 percent of their time.) Most green jobs research uses the “output” approach to defining “green jobs,” although the percentage of time dedicated to “green activities” varied. To help further define the level of “greenness,” the new hires survey asked about the reason for the new worker being hired.

The survey requested information about the employee’s current responsibilities. If the worker spent more than 50% of their time dedicated to “green” activities, the employer was asked to indicate the education and training, the basic work skills, and technical work skills required for the position. The survey provided a question about whether the individual had been hired to fill a newly created position because of additional “green” activities. The employer was also asked to rate the availability of job applicants with the right skills for the position. One of the last survey questions dealt with whether or not the position was listed with South Dakota’s public labor exchange.

# New Hires Survey

Since employers have different views on what a green job really is, South Dakota staff tried several different approaches to further define green activities and green jobs. In addition to the survey question about whether or not the worker was hired for a newly created green job, they also used another process to determine the greenness of the worker's position. South Dakota used R.M. Wilson Consulting, Inc.'s Green Job Extractor (GJE) to determine whether or not the newly hired worker's position should be classified as a green job. The GJE uses six levels of "greenness," which are defined in the Figure 21 (below).

**Figure 21: GJE Green Level Descriptions**

| Level        | Description  | Example   |
|--------------|--|---|
| Dark Green   | Jobs that are purely green in focus, activities and skills                 | Environmental Sustainability Planner  |
| Medium Green | Jobs that are primarily green in focus, activities and skills              | Solar Engineer (shares some skills with electrical engineers)   |
| Light Green  | Jobs that are somewhat green in focus, activities and skills               | Bus Driver [has green focus (mass transit) but activities and skills are similar to non-green drivers (ambulances)] |
| Near Green   | Typically non-green jobs working in support of the green economy.          | Maintenance Technician (maintains operation of equipment; improved efficiency may reduce energy use)                |
| Neutral      | Jobs with no significant positive or negative impact on the green economy. | Bank Teller   |
| Anti-Green   | Jobs that can be in conflict with the goals of the green economy           | Military and mining occupations   |

In the case of new hires, the highest level (dark green) was not reached for any of the new hires in the study. The GJE identified approximately 196 (30 percent) of the newly hired workers as being green. Typically the number of green jobs reported through employer surveys is around three percent, but a higher number was expected from this survey as it targeted industries identified to be green.

**Figure 22: 2010 South Dakota New Hires Survey New Hire Workers by Level of Green**

| Green Level   | Number of Workers | Percent of Total |
|---------------|-------------------|------------------|
| Dark Green    | 0                 | 0%               |
| Medium Green  | 7                 | 1%               |
| Light Green   | 111               | 17%              |
| Near Green    | 78                | 12%              |
| Neutral       | 473               | 71%              |
| Anti-Green    | 1                 | 0%               |
| Total Workers | 670               | 100%             |

# New Hires Survey

The following table shows quarterly earnings change by quarter for the workers determined to be “green” by the GJE. Since not all in the sample responded to the survey questionnaire, there is information on 670 out of the 1,380 total new hires. The non-respondents are shown on the first line of the table as N/A under the green code category.

**Figure 23 : Quarterly Earnings Change by Quarter for Green Workers (GJE classification)**

| Count | Green Code | Green Level  | Wages 2009 Q4 | Wages 2010 Q1 | Wages 2010 Q2 |
|-------|------------|--------------|---------------|---------------|---------------|
| 709   | N/A        | N/A          | \$4,515.41    | \$4,315.23    | \$5,755.78    |
| 2     | G0         | Anti-Green   | \$6,258.00    | \$6,919.50    | \$8,969.00    |
| 473   | G1         | Neutral      | \$3,183.44    | \$4,237.75    | \$4,633.19    |
| 78    | G2         | Near Green   | \$3,922.47    | \$4,298.08    | \$5,038.97    |
| 111   | G3         | Light Green  | \$4,433.12    | \$4,484.55    | \$6,418.53    |
| 7     | G4         | Medium Green | \$7,614.57    | \$8,949.57    | \$7,309.86    |

There are many research sources that talk about new green jobs being higher-paying jobs. The preceding table shows that the anti-green level and the medium green level have the highest levels of quarterly earnings. However, the small number of new hires in those categories makes it difficult to make generalized statements about earnings differences.

## Nebraska’s Results

Nebraska conducted a study of individuals who were newly hired within a specific timeframe. The sample was composed of those individuals who were hired in the fourth quarter of 2009 and had no employee-employer relationship present during the previous quarter. Sample selection preference was given to those who had either received Workforce Investment Act training assistance or were registered with the Career Center for Staff Assisted Services. A total of 2,717 surveys were sent out to different businesses.

The survey instrument collected information from the employer on both the employee and the job the employee holds. The survey covered several topics including skills required for the job, desired skills of applicants, pre-identified green skills, education requirements, demographics, compensation, benefits, and satisfaction with employee performance. Results from the survey are tabulated by industry and occupational category.

# New Hires Survey

Detailed information about the Nebraska New Hires Survey can be accessed online in the Publications section of Nebraska's Labor Market Information website at [www.neworks.nebraska.gov/analyzer](http://www.neworks.nebraska.gov/analyzer).

## **Green Jobs Retention and Earnings: The Wyoming Case**

The Wyoming Department of Employment conducted a longitudinal analysis of the retention rates and wage progression of new hires working both green and non-green jobs. Results of the study are presented in depth in Appendix E. A brief summary of the study follows.

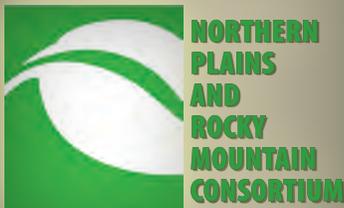
The Wyoming Department of Employment identified new hires from their New Hires database for fourth quarter 2009 and first quarter 2010. Employers were then sent a new hire questionnaire, and when returned, surveys were combined with administrative data to track whether respondents continued to work for the employer as well as the wages received. New hires were tracked for three consecutive quarters following their hire, allowing for longitudinal analysis of wage progression and worker retention.

Respondents were categorized according to whether they used unemployment insurance, employment services, both unemployment insurance and employment services, or neither during the four quarters preceding their employment.

Although a first step in new hires research, the study did find that 17 percent of the new jobs had some component of green activity as part of the job. Six in ten new hires did not use unemployment insurance or employment services prior to their employment. Retention rates were found to vary only modestly by what type of services were used and by whether the job was green or not green. Although new hires in non-green jobs had faster wage progression on a percentage basis than the green job group, new hires in green jobs earned more on average. At the end of three quarters, new hires in green jobs earned about 25 percent more than those working in non-green jobs.



# IMPLAN Projects



# IMPLAN Projects

## Introduction to IMPLAN

The American Recovery and Reinvestment Act of 2009 (ARRA), also known as The Stimulus or Recovery Act, is an economic incentive package designed to create jobs during the recession that started in December of 2007 and ended in June, 2009. Although the Act contained many stimulus incentives, one aspect of the Act contained federal spending for education, health care, and infrastructure, including the energy sector. Using the same model chosen by the U.S. government to track the employment impacts associated with the ARRA, IMPLAN, the consortium states conducted several studies that examined the impact of federal stimulus funds on green projects. These IMPLAN studies are summarized in the next three pages. For a more thorough discussion of each study, the reader is referred to the full report available for each state.

Based on data available at [www.recovery.gov](http://www.recovery.gov), and accessed on March 8, 2011, over \$9.3 billion in ARRA funding was awarded to the consortium states. Approximately 62 percent has been received by the consortium states, resulting in nearly 23,000 jobs. While not all of these jobs are green, specific impact results for green projects are reported for each state in the IMPLAN ARRA Green Project profile boxes.

**Figure 24: American Recovery and Reinvestment Act Funding, by Consortium State (in millions of dollars)**

|                                      | IA        | MT        | NE        | SD        | UT      | WY        |
|--------------------------------------|-----------|-----------|-----------|-----------|---------|-----------|
| <b>Total Funds Awarded</b>           | \$1,518.1 | \$1,414.4 | \$2,153.9 | \$1,342.6 | \$657.3 | \$2,246.7 |
| <b>Total Funds Received</b>          | \$840.4   | \$875.9   | \$1,459.0 | \$732.7   | \$361.7 | \$1,451.2 |
| <b>Reported Jobs</b>                 | 4,512     | 3,240     | 5,190     | 5,657     | 1,001   | 3,388     |
| <b>Jobs per \$1,000,000 Received</b> | 5.4       | 3.6       | 3.6       | 7.7       | 2.8     | 2.3       |

Source: [www.recovery.gov](http://www.recovery.gov)

# IMPLAN Projects

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## IMPLAN Green Project Spotlight: Moab UMTRA Project

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Utah  |
| <b>Project:</b>                | Department of Energy project to dispose of 16 million tons of uranium tailings and to remediate vicinity properties.  |
| <b>Impact Area:</b>            | Utah  |
| <b>Special Considerations:</b> | The ARRA provided \$108 million in additional funding to accelerate the completion of the project by three years.   |
| <b>Project Description:</b>    | The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project is a long-term project carried out by the Department of Energy to dispose of 16 million tons of uranium tailings. The analysis is based on \$47.8 million received locally through 4th quarter 2010. |

### Results per \$1,000,000 Capital Expenditure:

|                     |           |               |             |
|---------------------|-----------|---------------|-------------|
| Total Jobs:         | 12.7      | Total Output: | \$1,848,615 |
| Total Labor Income: | \$586,228 | Average Wage: | \$46,045    |

---

## IMPLAN Green Project Spotlight: Drinking Water Infrastructure Improvements

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Nebraska  |
| <b>Project:</b>                | The economic impact of \$19.5 million spread over 26 projects.  |
| <b>Impact Area:</b>            | Statewide   |
| <b>Special Considerations:</b> | Allocations were made to four IMPLAN sectors based on an analysis of Summary Project data for 26 projects receiving partial or full funding for ARRA projects.                    |
| <b>Project Description:</b>    | The University of Nebraska-Lincoln and the Nebraska Department of Labor modeled the impact of nearly \$20 million in ARRA funding for drinking water infrastructure improvements. |

### Results per \$1,000,000 Capital Expenditure:

|                     |           |               |             |
|---------------------|-----------|---------------|-------------|
| Total Jobs:         | 13.0      | Total Output: | \$1,690,145 |
| Total Labor Income: | \$618,584 | Average Wage: | \$47,677    |

---

## IMPLAN Green Project Spotlight: Transmission Line Construction

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Montana   |
| <b>Project:</b>                | Transmission Line Construction  |
| <b>Impact Area:</b>            | Statewide   |
| <b>Special Considerations:</b> | Short run, construction impacts only  |
| <b>Project Description:</b>    | The Research and Analysis Bureau of the Montana Department of Labor and Industry estimated the economic and workforce impacts of building six major electricity transmission projects that were planned or under construction. Results were presented for both in-state and out-of-state contractors. Because in-state contractors are more likely to use greater proportions of local labor, the economic impact is considerably larger. |

### Results per \$1,000,000 Capital Expenditure:

|              |                         |                     |
|--------------|-------------------------|---------------------|
|              | Out-of-State Contractor | In-State Contractor |
| Direct Jobs: | 1.2                     | 2.5                 |
| Total Jobs:  | 2.0                     | 4.7                 |

---

# IMPLAN Projects

## IMPLAN Green Project Spotlight: Sewage Treatment

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | South Dakota  |
| <b>Project:</b>                | Employment impacts specific to 21 sewage treatment facilities and related processes.  |
| <b>Impact Area:</b>            | Statewide   |
| <b>Special Considerations:</b> | IMPLAN sector: Water, Sewage, and Other Treatment and Delivery Systems used for primary sector of impact.   |
| <b>Project Description:</b>    | The Labor Market Information Center of the South Dakota Department of Labor examined the impact of nearly \$81 million in stimulus funds earmarked for sewage treatment updates or replacement. |

### Results per \$1,000,000 Capital Expenditure:

|                     |             |
|---------------------|-------------|
| Total Jobs:         | 12.0        |
| Total Labor Income: | \$634,819   |
| Total Output:       | \$1,596,976 |
| Average Wage:       | \$53,117    |

## IMPLAN Green Project Spotlight: Clean Diesel Program

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Wyoming   |
| <b>Project:</b>                | Economic impact of converting off-road construction vehicles to reduce diesel emissions was estimated.  |
| <b>Impact Area:</b>            | Six counties  |
| <b>Special Considerations:</b> | Adjustments were made for commuting behavior based on specific employers in the grants, not the industries in which they operate. Wages were allocated to the various counties where those firms' workers reside. |
| <b>Project Description:</b>    | The Research and Planning Section of the Wyoming Department of Employment modeled the impact of nearly \$1.1 million in ARRA grant funding, adjusted for commuting patterns.                                      |

### Results per \$1,000,000 Capital Expenditure:

|                     |           |               |             |
|---------------------|-----------|---------------|-------------|
| Total Jobs:         | 41.5      | Total Output: | \$1,538,402 |
| Total Labor Income: | \$493,148 | Average Wage: | \$47,484    |

## IMPLAN Green Project Spotlight: Unemployment Insurance

|                                |  |
|--------------------------------|--|
| <b>State:</b>                  | Wyoming  |
| <b>Project:</b>                | Impact of ARRA funds to expand unemployment insurance benefits   |
| <b>Impact Area:</b>            | Statewide  |
| <b>Special Considerations:</b> | Modeled net unemployment insurance (UI) benefit payments to Wyoming UI Trust Fund in addition to Wyoming residents receiving UI benefits from other state UI Trust Funds.  |
| <b>Project Description:</b>    | The Wyoming Department of Employment, Research and Planning examined the impact of extending almost \$186 million in unemployment insurance benefits to Wyoming residents. |

### Results per \$1,000,000 Capital Expenditure:

|                     |           |               |           |
|---------------------|-----------|---------------|-----------|
| Total Jobs:         | 5.3       | Total Output: | \$619,087 |
| Total Labor Income: | \$179,391 | Average Wage: | \$33,665  |

# IMPLAN Projects

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## IMPLAN Green Project Spotlight: Economic Impacts of Green ARRA projects in Nebraska

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Nebraska  |
| <b>Project:</b>                | The economic impact of \$144.1 million resulting from 82 ARRA projects through Q1, 2010   |
| <b>Impact Area:</b>            | Regions   |
| <b>Special Considerations:</b> | Although total ARRA funding in Nebraska is \$192.1 million, the study adjusted for wholesale and retail margins for goods and services manufactured out-of-state, resulting in a direct impact of \$144.1 million. The economic results are for gross impacts, in that the future impact of higher taxes on spending and business investment is ignored.  |
| <b>Project Description:</b>    | The University of Nebraska-Lincoln and the Nebraska Department of Labor modeled the impact of nearly \$144.1 million in ARRA funding for 82 projects from approximately 14 different ARRA funding sources. Results are presented for statewide impacts and seven labor market sub-regions. The bulk of the economic impacts were concentrated in two of Nebraska's metropolitan areas, Omaha and Lincoln. |

### Results per \$1,000,000 Capital Expenditure:

|                     |           |               |             |
|---------------------|-----------|---------------|-------------|
| Total Jobs:         | 13.7      | Total Output: | \$1,643,997 |
| Total Labor Income: | \$612,769 | Average Wage: | \$44,728    |

---

## IMPLAN Green Project Spotlight: Forest Restoration

|                                |   |
|--------------------------------|---|
| <b>State:</b>                  | Montana   |
| <b>Project:</b>                | Forest Restoration  |
| <b>Impact Area:</b>            | Statewide   |
| <b>Special Considerations:</b> | Using Q4 data 2009, seven forest restoration projects were identified. The Flathead County Stewardship and Energy Conservation Landscaping Project was used to customize spending and employment for forest restoration projects. Two basic operations were identified: wild-fire fuels hazard reduction/forest restoration and urban and community forestry projects.  |
| <b>Project Description:</b>    | The Research and Analysis Bureau of the Montana Department of Labor and Industry estimated the impact of the seven forest restoration projects on employment, output, and tax revenues using the Flathead County Stewardship/Energy Conservation Landscaping Project as a template. The non-economic benefits attributable to forest health were not quantified in the study, including increased tourism, recreational opportunities, and improvements in wildlife health. |

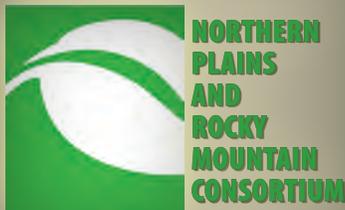
### Results per \$1,000,000 Capital Expenditure:

|                     |             |                    |           |
|---------------------|-------------|--------------------|-----------|
| Total Jobs:         | 19.5        | Total Tax Revenue: | \$167,500 |
| Total Labor Income: | \$575,000   | Average Wage:      | \$29,487  |
| Total Output:       | \$2,330,000 |                    |           |

# Other Consortium Research

Appendix E contains more information on other Consortium research including specific state-level research and products. All of the Northern Plains and Rocky Mountain Consortium research is available at: [www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com).





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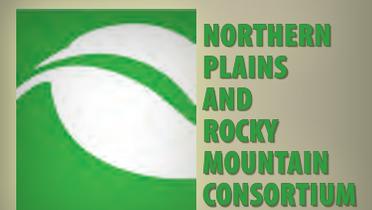
    Nebraska Appendix

    South Dakota Appendix

    Utah Appendix

    Wyoming Appendix

# Appendix A: Methodology



### **Northern Plains and Rocky Mountain Consortium Green Jobs Survey Methodology and Comparisons**

The Northern Plains and Rocky Mountain Consortium conducted a survey of business establishments to identify the incidence and prevalence of green jobs within their respective states and on a consortium-wide geographical basis. Critical to the scope and purpose of the survey was a sound definition of “green.” Consortium consensus was to adopt a version of the definition of green as found in the Workforce Information Council report, “Measurement and Analysis of Employment in the Green Economy.” The Northern Plains and Rocky Mountain Consortium definition of green is as follows:

**A green job is one in which an employee produces a product or service that improves energy efficiency, expands the use of renewable energy, and/or supports environmental sustainability.**

The job involves work in any of these green economic activity categories:

- **Pollution, waste, and greenhouse gas management, prevention and reduction**
- **Energy efficiency and conservation**
- **Environmental cleanup and remediation and waste cleanup mitigation**
- **Renewable energy and alternative fuels**
- **Education, regulation, compliance, training, and energy trading**
- **Sustainable agriculture and natural resource conservation**

Using this definition, the consortium collected green job information by primary business activity and occupation, with the respondent having the option to indicate how much time a worker spends performing green duties. Other information collected included the minimum training requirements for a green occupation, any special requirements to perform the job, the worker’s pay-range and the projected employer demand for the occupation. The survey instrument can be viewed in entirety in Appendix B.

In order to produce reliable green jobs estimates, a probability-based stratified random sampling technique was used to draw the sample. Each state sampled from the fourth quarter of 2009 Quarterly Census of Employment and Wages Enhanced Quarterly Unemployment Insurance (QCEW EQUI) file. Samples

## Appendix A: Methodology

were stratified by employer size and industry sector, with larger states using additional size classes. Private households and establishments with fewer than 0.5 average quarterly employment were removed from the sampling frame. Businesses were surveyed at the establishment level. States sampled under confidence intervals ranging between 90 and 95 percent, with expected green employment levels near 5 percent, error ranges at approximately 1 percent and expected response rates of 40 to 60 percent.

Using the above parameters, states generated the following sample sizes:

- Iowa: 19,099
- Montana: 8,118
- Nebraska: 11,917
- South Dakota: 9,480
- Utah: 12,641
- Wyoming: 1,034

The total consortium sample size amounted to 62,299 establishments.

Data collection took place primarily during the second quarter of 2010, with a few states finishing collection and conducting follow-up during the third quarter of 2010. States initially mailed all units a survey form, with a follow-up mailing sent to nonrespondents. Remaining nonrespondents were solicited over the telephone. Businesses with questionable responses to survey questions received a follow-up phone call for clarification purposes. State response rates varied from 39.4 percent to 49.2 percent, with every state meeting minimum response rate requirements for the production of statistically-valid green jobs estimates.

**Table A1: Survey Response Rates by State**

|                               | WY    | SD    | MT    | UT     | NE     | IA     | Consortium |
|-------------------------------|-------|-------|-------|--------|--------|--------|------------|
| Total Mailed                  | 1,034 | 9,480 | 8,118 | 12,651 | 11,917 | 19,099 | 62,299     |
| Non-Deliverable               | 51    | 605   | 425   | na     | 572    | 401    |            |
| Non-Response                  | 528   | 4,783 | 1,767 | 6,765  | 5,146  | na     |            |
| Refusals                      | 2     | 6     | 1,167 | na     | 169    | na     |            |
| <b>Returned</b>               |       |       |       |        |        |        |            |
| Incomplete or Out-of Business | 46    | 207   | 762   | 455    | 222    | 516    | 2,208      |
| Complete/ Eligible            | 407   | 3,879 | 3,997 | 5,385  | 5,808  | 6,868  | 26,344     |
| Eligible Surveys/Total Mailed | 39.4% | 40.9% | 49.2% | 42.6%  | 48.7%  | 36.0%  | 42.3%      |

Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium

Survey responses were verified using the QCEW EQUI file from the second quarter of 2010 as a part of the data cleaning process. Occupations were coded using the 2010 SOC codes based on the job description provided by the employer, the NAICS code of the employer, and the education, training, and certifications required to perform the position. Jobs that had insufficient information to be coded into an occupation were placed into an Unknown category, or into the appropriate “all other” category (such as Business Operations Specialists, All Other or Production Workers, All Other) if partial information was provided. Occupational employment totals were compared to cross-consortium occupational employment totals from the 2009 OES data to verify the coding of the green employment and ensure survey estimates of green jobs did not exceed total occupational employment.

Estimates were calculated using a post stratification methodology, which minimized variance using employment from the second quarter of 2010. Estimates were suppressed for both confidentiality and statistical significance. Confidentiality suppression occurred if there were fewer than three responses in a category or if a single respondent accounted for more than 80 percent of a cell’s green jobs. These suppression rules are similar to those used for other survey-based labor statistics. Estimates were also suppressed if the estimate was not significant at the 95 percent confidence level (or if the cell’s confidence interval spanned zero).

The consortia-wide green jobs estimate as a percent of total employment was 3.5 percent, with a 0.3 percent relative standard error. Each state’s green job estimates were as follows:

**Table A2: Percentage of Green Jobs by State**

|              | % of State’s Jobs that are Green | 95% Confidence Margin |             |
|--------------|----------------------------------|-----------------------|-------------|
|              |                                  | Lower Bound           | Upper Bound |
| Iowa         | 4.6%                             | 3.4%                  | 5.8%        |
| Montana      | 4.5%                             | 4.1%                  | 4.9%        |
| Nebraska     | 2.7%                             | NA                    | NA          |
| South Dakota | 3.6%                             | 3.0%                  | 4.2%        |
| Utah         | 1.7%                             | 1.4%                  | 2.0%        |
| Wyoming      | 5.2%                             | 3.1%                  | 7.3%        |

*Source: Green Jobs Baseline Survey, Northern Plains and Rocky Mountain Consortium*

## Appendix A: Methodology

Several other states preceded the Northern Plains and Rocky Mountain Consortium with regard to the administration of green jobs surveys. In general, the consortium found similar levels of green jobs as found in other states, with similar occupations and industries reported as having the highest number of green jobs. The consortium differed from other surveys by adopting a different definition of green jobs. The consortium also differed from other surveys by including all industries in the survey and by including both private and public employers in the survey. Other research excluded industries that were viewed as having a negative environmental impact, such as coal production or mining. Further, other surveys excluded the public sector from the survey. Below is a comparative description of the methods and major findings of select states.

### Oregon

#### Green Jobs Definition:

Jobs where the following green activities were essential to the job in 2008:

- Producing energy efficiency
- Producing renewable energy
- Preventing, reducing, or mitigating environmental degradation
- Cleaning up and restoring the natural environment
- Providing education, consulting, policy promotion, accreditation, trading, and offsets or similar services supporting categories 1-4

Reference Period: 2008

#### Sampling

10,436 Oregon firms were randomly sampled on a statewide level, across 15 broad industry groups and with proportion to the size of the firm. Some units that were thought to have green employment were sampled with certainty.

#### Collection

Oregon's green jobs survey was a mail-based survey. Two mail-outs were sent to sampled firms, with telephone followup in industries with low response rates. Oregon achieved a 45 percent green jobs survey response rate.

#### Estimates

It was estimated that 3.0 percent of total Oregon employment was green.

### Washington State

#### Green Jobs Definition:

Jobs where the employee's primary function in the past three months has directly supported environmental protection and clean energy in one of the following four green categories:

- Renewable energy
- Energy efficiency
- Mitigation and cleanup of pollution
- Preventing or reducing pollution

Reference Period: 2009

#### Sampling

19,241 firms were sampled across 14 strata at the two-digit NAICS level, with some industries being identified at the 6-digit level as having high concentrations of green employment via a pre-survey mail-out.

#### Collection

Washington's green jobs survey was a mail-based survey. In addition to the mail survey, Washington performed a nonresponse analysis. Washington achieved a 70 percent green jobs survey response rate.

#### Estimates

It was estimated that 3.3 percent of total Washington employment was green.

### Kansas

#### Green Jobs Definition:

Primary green jobs were defined as jobs which produce a green product or service in one of five core green-related areas including:

- Producing renewable energy
- Increasing energy efficiency
- Agriculture and natural resource conservation
- Pollution prevention and environmental cleanup
- Clean transportation and fuels

Included in Kansas's definition was the distinction between primary green jobs and support green jobs, where support green jobs were those jobs that assisted in the performance of a primary green job.

Reference Period: Fourth quarter of 2008

#### Sampling

Approximately 6,000 Kansas establishments were sampled across five geographic areas and 38 industries at the 3-digit level.

#### Collection

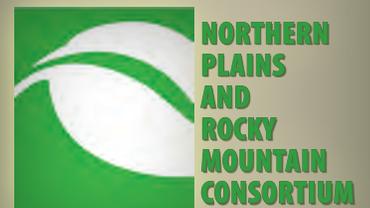
Kansas's green jobs survey was a mail-based survey. Two mailings were sent to sampled establishments and follow-up phone calls were made to nonrespondents. Kansas achieved a 55 percent green jobs survey response rate.

#### Estimates

It was estimated that 1.5 percent of total Kansas employment was primarily green and 1.9 percent of total employment were in supporting green roles.

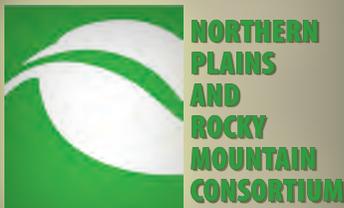
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# Appendix B: Survey Materials





# Iowa Survey Materials



Chester J. Culver, Governor  
Patty Judge, Lt. Governor  
Elisabeth Buck, Director



«NAME1»  
«PHYSICALADDRESS3»  
«CITY3», «ST3» «ZIP3»

**Username: «Username»**  
**Password: «Password»**

Iowa Business Partner:

The purpose of this survey is to help identify and track trends in green jobs and the results will help in program and training development for employees, as well as, assist policymakers to recognize future needs in the labor market.

Please take a moment to complete the survey, even if you do not have any green jobs, to avoid future follow-up correspondence. The survey may be completed by filling out the paper form and returning it in the envelope provided, or by taking the survey on-line by entering the following link into your browser's address bar:

[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)

Once at the website, select the green "Employer's Survey" button located in the lower center of the page. From there, you will be prompted for a **username and password**, which is located in the **upper right hand corner** of this letter, as well as in the green box on Page 1 of the paper survey. If necessary, you may use this login as many times as you like to update the survey prior to submitting it, instead of taking the entire survey at one time.

To assist you in determining jobs that are green, the survey outlines examples of activities that are green-related. When completing the survey, include only those jobs where production of green-related products or services is a function.

The survey should take no longer than 10-15 minutes to complete, The results are confidential and will be reported in aggregate. Please complete this survey by **July 16th, 2010**.

The information you will need to complete the survey includes: job titles; major job duties; training and education requirements; percentage of time devoted to green-related activities; and wage information.

**If you have any questions, or need assistance to complete this survey, please feel free to contact Rob Parker, Labor Market Research Economist, at (515) 281-7524 or [Robert.Parker@iwd.iowa.gov](mailto:Robert.Parker@iwd.iowa.gov).**

Thank you for your participation.





The Northern Plains & Rocky Mountain Consortium: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming



«NAME1»  
«PHYSICALADDRESS3»  
«CITY3», «ST3» «ZIP3»

We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, either on-line ([www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)) or by completing the paper survey form and returning in the envelope provided. **Please respond by July 16, 2010.**

This survey is also available for you to complete online at:

[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)

Username: «Username»  
Password: «Password»

If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.

- Temporarily out of business
- Permanently out of business
- Sold/Merged

If you have any questions about the survey, please contact:  
Rob Parker, Labor Market Research Economist, at (515) 281-7524 or [Robert.Parker@iwd.iowa.gov](mailto:Robert.Parker@iwd.iowa.gov).

## Company Information

1. How many employees does your organization currently have at this location?

(do not include contractors or temporary employees) \_\_\_\_\_

2. Your **company** may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.

**Renewable Energy and Alternative Fuels**

*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*

**Energy Efficiency and Conservation**

*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*

**Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**

*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.*

**Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**

*Environmental restoration including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*

**Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**

*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy related products and processes.*

**Sustainable Agriculture and Natural Resource Conservation**

*Products and services to conserve, maintain and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*

**None of the Above** *This establishment does not participate in any of the above green categories.*

**4. What obstacles or limitations have prevented your organization from having green jobs?**

*(Please select all that apply.)*

- Cost of implementation
- Shortage of workers with the knowledge or skills
- Shortage of available training programs
- Limited green job opportunities in our type of business
- None

## Benefit Information

**5. Which of the following benefits does your organization offer to a majority of its employees?**

*(Please select all of the benefits that you offer.)*

- Child Care
- Dental Insurance
- Disability Insurance
- Life Insurance
- Medical Insurance
- Paid Holiday Leave
- Paid Sick Leave
- Paid Vacation Leave
- Paid Time Off (PTO)
- Retirement Plan with Employer Contribution
- Vision Insurance
- Do Not Offer Benefits

## Advertising Information

**6. Which of the following media does your organization use to advertise vacant positions?**

*(Please select all that apply.)*

- Local Iowa Workforce Development Centers
- Newspapers
- Internet
- Radio
- Television
- Private Employment Agencies
- University/College Career Centers
- Job Fairs
- Trade Publications

**7. If you use internet sites to advertise job openings, please list which sites your organization uses.**

Site 1: \_\_\_\_\_  
 Site 2: \_\_\_\_\_

## Applicant Information

**8. Please rank the following from Strongly Disagree (1) to Strongly Agree (5).**

|  | Strongly Disagree        | 1                        | 2                        | 3                        | 4                        | Strongly Agree           |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Are you having a problem filling job openings due to:  |                          |                          |                          |                          |                          |                          |
| Applicants do not possess the basic skill (reading, writing, mathematics) requirements for vacant positions. | <input type="checkbox"/> |
| Applicants do not possess the "hard" or occupational skill requirements for vacant positions.                | <input type="checkbox"/> |
| Applicants do not possess the "soft" or interpersonal skill requirements for vacant positions.               | <input type="checkbox"/> |

**Once completed, return this survey form in the envelope provided.**

**Contact Information:**

Name: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Email: \_\_\_\_\_

Date Completed \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

**If your organization would like a copy of the findings, how would you like them delivered?**

- Email
- Postal Mail

**Thank you for taking the time to provide us with this valuable information.**



This portion of the survey is intended to capture information on employees directly performing green-related activities as a part of their job duties. Even if you answered “None of the Above” on question 2, you may have employees performing green-related activities. Do not include:

- consultants, contractors or temporary agency employees not on your payroll;
- employees not directly involved in green activities, such as administrative support employees; or
- employees who perform green activities that do not directly contribute to your business’s product or service, like those that carpool or recycle.

**3. Based on these instructions, how many employees at this location perform green-related activities? \_\_\_\_\_**

Please fill out the matrix below by job title for your green employees. If you have no green employees, continue to the next page.

| Job Title & Brief Description<br><br><i>Only list current jobs which produce a product or service that can be considered green. (please do not use acronyms)</i><br><br><i>List job title and briefly describe duties related to green related activities.</i> | Total Employees<br><br><i>Number of employees that have this job duty.</i> | Minimum Education/Training Requirement   |   | Special Requirements<br><br><i>Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position. (please do not use acronyms)</i> | Number of workers having green job responsibilities<br><i>(based on percent of time dedicated to green work)</i> |                   |              |
|--|--|--|---|---|--|-------------------|--------------|
|  |  | 1 = No Requirements<br>2 = HS Diploma/GED<br>3 = Post HS, No Degree<br>4 = Apprenticeship/ On-The-Job Training<br>5 = Trade Certified<br>6 = Vocational Degree<br>7 = Associate Degree<br>8 = Bachelors Degree<br>9 = Graduate/Professional Degree |   |   | Between 1% - 49%   | Between 50% - 99% | 100% or more |
| <i>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</i>   | 7  | 5  | Renewable energy technician certification | 2   | 4  | 1                 |              |
| 1.   |  |  |   |   |  |                   |              |
| 2.   |  |  |   |   |  |                   |              |
| 3.   |  |  |   |   |  |                   |              |
| 4.   |  |  |   |   |  |                   |              |
| 5.   |  |  |   |   |  |                   |              |
| 6.   |  |  |   |   |  |                   |              |
| 7.   |  |  |   |   |  |                   |              |
| 8.   |  |  |   |   |  |                   |              |
| 9.   |  |  |   |   |  |                   |              |
| 10.  |  |  |   |   |  |                   |              |
| 11.  |  |  |   |   |  |                   |              |
| 12.  |  |  |   |   |  |                   |              |
| 13.  |  |  |   |   |  |                   |              |
| 14.  |  |  |   |   |  |                   |              |
| 15.  |  |  |   |   |  |                   |              |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers to fill the position.



# Montana Survey Materials





*Montana*  
**Department of Labor and Industry**

PO Box 1728, Helena MT 59624

May 15, 2010

Dear Montana Employer,

As an employer, you know the importance of having accurate information about the labor market and emerging labor needs. To help us gather such information, your business has been randomly selected to provide information on green jobs within our economy. For the purposes of this research, a green job is defined as one in which an employee produces a product or service that improves energy efficiency, expands the use of renewable energy and/or supports environmental sustainability. The results of this survey will help workforce developers and employers assess how evolving business practices are impacting workforce needs in our state. This survey only applies to your Montana employees.

The information you provide will be kept confidential. It will be combined with data collected from other employers, then analyzed to determine such information as wages of occupations involving green activities, in-demand green occupations by industry, educational requirements that help identify opportunities for worker development and training, and information on the types and prevalence of benefits offered by all Montana employers.

For your convenience, you have three options for participating in this survey:

- Complete it online at [www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com) . In order to access this survey, you will need to use the login and password printed on the survey form. If you have misplaced your survey form call the toll free number below for your login and password information.
- Complete the enclosed form and return it in the postage-paid envelope provided.
- Call our office toll-free at 1-800-541-3904 and provide your responses to us over the phone.

Regardless of which option you choose, the survey should take no longer than 10-15 minutes to complete.

Please respond no later than July 16, 2010.

If you have any questions about the survey, please call us at 1-800-541-3904.

Thank you for your time and cooperation.

Sincerely,

Todd Younkin, Bureau Chief  
Research & Analysis Bureau  
Montana Department of Labor and Industry



Northern Plains Rocky Mountain Consortium  
Montana, South Dakota, Iowa, Nebraska, Utah, Wyoming

4. Does your business engage in any of the following practices that reduce your business's impact on the environment? Please indicate the primary motivations behind implementing each business practice.

|   | I currently engage in this practice | Rationale (Select all that apply)       |                          |   |  |                         |
|---|-------------------------------------|---|--------------------------|---|--|-------------------------|
|   |                                     | Employees requested change in practices | Reduce business costs    | Improve product branding or business's public image | Tax incentives or regulatory requirement | Other (please describe) |
| Recycling   | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |
| Improve building insulation   | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |
| Install energy efficient lights or water fixtures in business's buildings                                 | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |
| Encourage workers to reduce energy use (such as turning off printers when not in use and other measures)  | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |
| Utilize solar, wind, or other sources of renewable energy to partially or fully power business activities | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |
| Other:  | <input type="checkbox"/> Yes        | <input type="checkbox"/>                | <input type="checkbox"/> | <input type="checkbox"/>                            | <input type="checkbox"/>                 |                         |

## Benefit Information

5. Which of the following benefits does your organization offer to a majority of its employees?

*(Please select all of the benefits that you offer)*

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Medical Insurance | <input type="checkbox"/> Disability Insurance | <input type="checkbox"/> Retirement Plan with Employer Contribution |
| <input type="checkbox"/> Dental Insurance  | <input type="checkbox"/> Paid Vacation Leave  | <input type="checkbox"/> Child Care Benefits                        |
| <input type="checkbox"/> Vision Insurance  | <input type="checkbox"/> Paid Sick Leave      |   |
| <input type="checkbox"/> Life Insurance    | <input type="checkbox"/> Paid Holiday Leave   |   |

5b. Do you offer these benefits to:

*(Please select all that apply)*

- |  |   |
|--|---|
| <input type="checkbox"/> All Employees   | <input type="checkbox"/> Full-Time Permanent Employees Only |
| <input type="checkbox"/> Executives Only | <input type="checkbox"/> Only after a Probationary Period   |

6. How much did your organization spend on each of the following components of compensation in 2009?

- Wages and Salaries \_\_\_\_\_
- Insurance (Employer contributions for medical, dental, and vision) \_\_\_\_\_
- Retirement Plans (Employer contributions only) \_\_\_\_\_

**Once completed, return this survey form in the envelope provided.**

**Contact Information:**

Name: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Email: \_\_\_\_\_

Date Completed \_\_\_\_ / \_\_\_\_ / \_\_\_\_

If your organization would like a copy of the findings, how would you like them delivered?

- Email  
 Postal Mail

**Thank you for taking the time to provide us with this valuable information.**



The Northern Plains & Rocky Mountain Consortium: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming

## Montana Department of Labor and Industry

<<name1>> <<name2>>

<<line1>>, <<line2>>

<<city>>, MT <<zip>>

<<note>>

We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, either on-line ([www.researchingthegreeneconomy.com/montana](http://www.researchingthegreeneconomy.com/montana)) or by completing the paper survey form and returning it in the envelope provided. **Please respond by July 16th, 2010.**

This survey is also available for you to complete online at:

[www.researchingthegreeneconomy.com/montana](http://www.researchingthegreeneconomy.com/montana)

Username: <<Username>>

Password: <<Password>>

If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.

Temporarily out of business

Permanently out of business

Sold/Merged

If you have any questions about the survey, please contact:  
Research and Analysis Bureau at (406) 444-2430 or toll free at (800) 541-3904.

## Company Information

1. How many employees does your organization currently have at this location?

(do not include contractors or temporary employees) \_\_\_\_\_

2. Your **company** may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.

**Renewable Energy and Alternative Fuels**

*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*

**Energy Efficiency and Conservation**

*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*

**Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**

*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.*

**Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**

*Environmental restoration including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*

**Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**

*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy-related products and services.*

**Sustainable Agriculture and Natural Resource Conservation**

*Products and services to conserve, maintain, and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*

**None of the Above** This establishment does not participate in any of the above green categories.

This portion of the survey is intended to capture information on employees directly performing green-related activities as a part of your business. Even if you answered "None of the Above" on question 2, you may have employees performing green-related activities. Do not include:

- consultants, contractors or temporary agency employees not on your payroll;
- employees not directly involved in green activities, such as administrative support employees; or
- employees who perform green activities which do not directly contribute to your business's product or service, like those that only perform maintenance on green equipment.

**3. Based on these instructions, how many employees at this location perform green-related activities?**

Please fill out the matrix below by job title for your green employees. If you have no green employees, continue to the next page.

| Job Title & Brief Description<br><br><i>Only list current jobs which produce a product or service that can be considered green.<br/><br/>List job title and briefly describe duties related to green related activities.</i> | Total Employees<br><br><i>Number of employees that have this job duty.</i> | Minimum Education/ Training Requirement   |  | Special Requirements<br><br><i>Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position.</i> | Number of workers having green job responsibilities. (based on percent of time dedicated to green work) |                   |      |
|--|--|---|--|--|---|-------------------|------|
|  |  | Use the following codes:<br>1 = No Requirements<br>2 = HS Diploma/GED<br>3 = Post HS, No Degree<br>4 = Apprenticeship/ On-The-Job Training<br>5 = Trade Certified<br>6 = Vocational Degree<br>7 = Associate Degree<br>8 = Bachelors Degree<br>9 = Graduate/ Professional Degree |  |  | Between 1% - 49%  | Between 50% - 99% | 100% |
| <b>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</b>   | <b>7</b>   | <b>5</b>  | <b>Renewable energy technician certification</b> | <b>2</b>   | <b>4</b>  | <b>1</b>          |      |
| 1.   |  |   |  |  |   |                   |      |
| 2.   |  |   |  |  |   |                   |      |
| 3.   |  |   |  |  |   |                   |      |
| 4.   |  |   |  |  |   |                   |      |
| 5.   |  |   |  |  |   |                   |      |
| 6.   |  |   |  |  |   |                   |      |
| 7.   |  |   |  |  |   |                   |      |
| 8.   |  |   |  |  |   |                   |      |
| 9.   |  |   |  |  |   |                   |      |
| 10.  |  |   |  |  |   |                   |      |
| 11.  |  |   |  |  |   |                   |      |
| 12.  |  |   |  |  |   |                   |      |
| 13.  |  |   |  |  |   |                   |      |
| 14.  |  |   |  |  |   |                   |      |
| 15.  |  |   |  |  |   |                   |      |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers to fill this position.



greenjobs



The **Northern Plains & Rocky Mountain Consortium**: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming



*Judith Gap wind farm photo courtesy of John Ansoategui, Montana Film Office*

## Contact:



Montana Department of Labor and Industry

**Research and Analysis Bureau**  
**Montana Department of Labor and Industry**  
**P. O. Box 1728 | Helena, MT 59624-1728**  
**Phone: 406-444-2430 or 1-800-541-3904**  
**Fax: 406-444-2638**



# Montana Employer Survey

You have been selected to participate in the Montana Employer Survey, brought to you by the Rocky Mountain and Great Plains Consortium. The consortium is formed by Montana and five partner states that are conducting research on how renewable, or “green,” energy is evolving with the workforce. We are also interested in what types of benefits are provided to Montana’s workers.

**All information you provide in the survey is kept strictly confidential.** Any data released will be combined with data collected from other employers and published in aggregate form.



*Camelina photo courtesy of Kent McVay, Montana State University*

**Take the survey online at:**

**[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)**



*Montana*  
**Department of Labor and Industry**





## Pollution, Waste, and Greenhouse Gas (GHS) Management, Prevention and Reduction

Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gases, waste water and other pollutants.

### Examples include:

- Carbon emissions monitoring, biomass or biodiversity preservation
- Recycling center operations
- Mass transit administration
- Wastewater treatment plants

### Examples

#### DO NOT include:

- Workers who telecommute or carpool
- Workplaces using recycled paper
- Cleaning services using "eco-friendly" chemicals



## Energy Efficiency & Conservation



Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.

### Examples include:

- Manufacturing/installation of geothermal components
- Insulation, energy efficient windows and doors
- LEED certified design and construction

### Examples DO NOT include:

- Workers at firms that have become "greener" by replacing light bulbs, reducing office thermostat temperatures, purchasing fuel efficient fleet vehicles, carpooling

# What we mean

For the purposes of the survey, a green job is a product or service that improves energy efficiency, saves energy, and/or supports environmental sustainability.

In this brochure, you will find detailed definitions of green activities, as they are listed in the first section, and whether certain jobs within your organization fall into these examples of specific work activities that do not fall into the category.

If you review these examples and still have questions, please call us at 406-444-2430 or 1-800-541-2430.

## Environmental Cleanup and Remediation

Environmental remediation including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.

### Examples include:

- Operations which recycle plastic, metal and other salvage, and Freon and ethylene glycol
- Hazardous waste handling and disposal
- Wetlands restoration

## Renewable Energy

Manufacturing, production, construction, storage and maintenance of wind, solar, hydro, geothermal, methane and water power.



### Examples include:

- Manufacturing/installation of methane gas capture cells or electrolyzers
- Hydro-electric generation of renewable energy products
- Geothermal drilling
- Production of bio-fuels

# lean by green

is one in which an employee produces efficiency, expands the use of renewable sustainability.

itions of each category of green economic on of the survey. To help you determine on are "green," we have also provided or do not qualify as "green" for each

questions about where your business fits, -3904 for assistance.



## Education, Regulation, Compliance, and Training & Energy Trading

Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

### Examples include:

- Policy analysis, energy auditing, environmental science research
- Carbon credit brokering, certifying environmental practices
- Environmental testing

### Examples DO NOT include:

- Educational administrative staff
- Secretarial services at law firms



## Liability & Waste Clean-up Mitigation

### Examples DO NOT include:

- Volunteers
- Workers that "adopt-a-street"
- Garbage disposal service



## & Alternative Fuels

uction, design, research, delivery, operation, solar, biomass, hydro, alternative transportation waste incineration as a fuel source.

### Examples DO NOT Include:

- Electrical power distribution
- Producing high voltage electric lines

Installation of wind turbines, solar photovoltaic (PV)

operator repair, design of plants

uels, biomass or cellulose

## Sustainable Agriculture & Natural Resource Conservation

Products and services to conserve, maintain and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Includes bioscience related activities and research.

### Examples include:

- Sustainable organic farming, including practices that lessen the admissions of carbon and/or increase removal of carbon from the atmosphere when compared to standard farming practices
- Conservation activities which reduce soil erosion, enhance water supplies and water quality

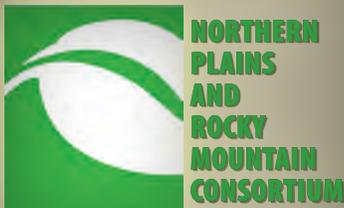
### Examples DO NOT include:

- Workers who garden or buy organic products
- Landscapers





# Nebraska Survey Materials







# Nebraska Green Jobs Survey



The Nebraska Department of Labor is gathering information about jobs in our economy where green activities are a part of employees' work and where employees use specific job-related skills that result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge and **by June 30, 2010**.

## Survey Completion Options:

- Save time and complete the survey online at <<website address>>. **Token:** <<SurveyID>>
- Fax a copy of this survey to (402) 471-9867.
- Call us toll free at (800) 876-1377.
- Return the completed survey in the provided postage-paid envelope.

If your business is not currently in operation or has been sold/merged, please indicate here and return the survey using the included envelope. Thank you for your time.

## Section 1a - Company Information

1. How many employees does your organization currently have at this location? \_\_\_\_\_
2. Your company may be involved in more than one of the green activity categories listed below, but please check the box that most closely corresponds to the majority of green activity within your business.

*\*\*Please refer to the enclosed flyer for categories' definitions and examples.\*\**

- Renewable Energy and Alternative Fuels**  
*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*
- Energy Efficiency and Conservation**  
*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*
- Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**  
*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water and other pollutants.*
- Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**  
*Environmental restoration including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**  
*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy related products and processes.*
- Sustainable Agriculture and Natural Resource Conservation**  
*Products and services to conserve, maintain and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*
- None** *This establishment does not participate in any of the above green categories*

## Section 1b - Green Employee Activities

Even if your primary business may not participate in green activities, you may still have employees performing green-related activities. **These do not include:** consultants, contractors or temporary agency employees not on your payroll; employees not directly involved in green activities, such as administrative support employees; and employees who perform green practices which do not directly contribute to your business's product or service, like those that carpool or recycle.

3. Based on the criteria described above, how many of your employees currently produce a product or service that can be considered green related? \_\_\_\_\_ (please specify "zero" if none)

*If your answer to #3 is more than zero, please continue to Section 2 (page 2).*

*If your answer to #3 is zero, please continue to Section 4 (page 4).*



## Section 2 - Green Jobs

Please fill out the following chart by occupational category regarding only those green jobs you have indicated in question 3, at this location, within your organization. If you have more than 10 green jobs, please photocopy and continue or use the online version.

| Job Title & Brief Description  | Number of Employees   | Minimum Education/Training Requirement  |   | Special Requirements  | Number of workers having green job responsibilities. (Based on percent of time dedicated to green work) |                |      | Starting Wage   |               |
|--|---|---|---|---|---|----------------|------|---|---------------|
|  |   |   |   |   | Between 1-49%   | Between 50-99% | 100% |   |               |
| <p><u>Only list current jobs which produce a product or service that can be considered green.</u></p> <p>List job title and briefly describe duties related to green related activities.</p> | Enter the number of employees with this job title that participate in green activities. | <p><i>Use the following codes:</i></p> <p>1 = No Requirements<br/>           2 = HS Diploma/GED<br/>           3 = Post HS, No Degree<br/>           4 = Apprenticeship/ On-The-Job Training<br/>           5 = Trade Certified<br/>           6 = Vocational Degree<br/>           7 = Associate Degree<br/>           8 = Bachelor's Degree<br/>           9 = Graduate/Professional Degree</p> |   | Please list any required special licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position. | Between 1-49%   | Between 50-99% | 100% | Enter the annual or hourly average starting wage for this position. | Hourly Wage   |
| <p><i>Example: Wind Turbine Technician - Installs &amp; Repairs wind turbines</i></p>  | 7   | 5   | 7 | Renewable energy technician certification   | 2   | 4              | 1    | \$32,000  | Annual Salary |
| 1.   |   |   |   |   |   |                |      |   |               |
| 2.   |   |   |   |   |   |                |      |   |               |
| 3.   |   |   |   |   |   |                |      |   |               |
| 4.   |   |   |   |   |   |                |      |   |               |
| 5.   |   |   |   |   |   |                |      |   |               |
| 6.   |   |   |   |   |   |                |      |   |               |
| 7.   |   |   |   |   |   |                |      |   |               |
| 8.   |   |   |   |   |   |                |      |   |               |
| 9.   |   |   |   |   |   |                |      |   |               |
| 10.  |   |   |   |   |   |                |      |   |               |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking







The Northern Plains & Rocky Mountain Consortium: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming

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**Contact the Nebraska  
Department of Labor**

550 South 16th Street, P.O. Box 94600  
Lincoln, NE 68509-4600

**Phone:** 1-800-876-1377 or 402-471-2600

**Fax:** 402-471-9867

**E-mail:** [LMI\\_NE@nebraska.gov](mailto:LMI_NE@nebraska.gov)

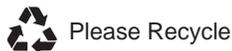
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**The Northern Plains &  
Rocky Mountain Consortium  
Green Jobs Survey**



Equal Opportunity Employment Employer/Program  
TDD: 1.800.833.7352



## Education, Regulation, Compliance, and Training & Energy Trading

Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

### Examples include:

- ✔ Policy analysis, energy auditing, environmental science research
- ✔ Carbon credit brokering, certifying environmental practices
- ✔ Environmental testing

### Examples DO NOT include:

- ✘ Educational administrative staff
- ✘ Secretarial services at law firms



## Sustainable Agriculture & Natural Resource Conservation



Products and services to conserve, maintain and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Includes bioscience related activities and research.

### Examples include:

- ✔ Sustainable organic farming, including practices that lessen the admissions of carbon and/or increase removal of carbon from the atmosphere when compared to standard farming practices
- ✔ Conservation activities which reduce soil erosion, enhance water supplies and water quality

### Examples DO NOT include:

- ✘ Workers who garden or buy organic products
- ✘ Landscapers

## Renewable Energy & Alternative Fuels

Manufacturing, production, construction, design, research, delivery, operation, storage and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.

### Examples include:

- ✔ Manufacturing/installation of wind turbines, methane gas captures, solar photovoltaic (PV) cells or electrolyzes
- ✔ Hydro-electric generator repair, design of renewable energy plants
- ✔ Geothermal drilling
- ✔ Production of bio-fuels, biomass or cellulose

### Examples DO NOT Include:

- ✘ Electrical power distribution
- ✘ Producing high voltage electric lines



## Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention and Reduction

Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gases, waste water and other pollutants.

### Examples include:

- ✔ Carbon emissions monitoring, biomass or biodiversity preservation
- ✔ Recycling center operations
- ✔ Mass transit administration
- ✔ Wastewater treatment plants

### Examples DO NOT include:

- ✘ Workers who telecommute or carpool
- ✘ Cleaning services using “eco-friendly” chemicals
- ✘ Workplaces using recycled paper



## Energy Efficiency & Conservation



Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.

### Examples include:

- ✔ Manufacturing/installation of geothermal components
- ✔ Insulation, energy efficient windows and doors
- ✔ LEED certified design and construction

### Examples DO NOT include:

- ✘ Workers at firms that have become “greener” by replacing light bulbs, reducing office thermostat temperatures, purchasing fuel efficient fleet vehicles, carpooling

## Environmental Cleanup and Remediation & Waste Clean-up Mitigation

Environmental remediation including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.

### Examples include:

- ✔ Operations which recycle plastic, metal and other salvage, and Freon and ethylene glycol
- ✔ Hazardous waste handling and disposal
- ✔ Wetlands restoration

### Examples DO NOT include:

- ✘ Volunteers
- ✘ Workers that “adopt-a-street”
- ✘ Garbage disposal service





## Employee and Position Skills

Employee: <<EmployeeName>>

We are seeking information about how important the following skills are for the job in which the worker was employed during the fourth quarter of 2009. When possible, we request that the individual's direct supervisor complete this part of the survey. **Please use a scale of 5 to 1 where 5 means Very Important and 1 means Very Unimportant. Circle or check the most appropriate response for this job.**

How would you rate the employee's on-the-job adequacy level for these characteristics as a new employee?

| How would you rate the level of importance for the following characteristics for this job? | Very Important  | Important | Neither Important nor Unimportant | Unimportant | Very Unimportant | Do not Know              | Adequate                 | Inadequate               |
|--|---|-----------|-----------------------------------|-------------|------------------|--------------------------|--------------------------|--------------------------|
| <b>Service Orientation</b>   | <i>(Involves actively looking for ways to help people)</i>  |           |                                   |             |                  |                          | <input type="checkbox"/> | <input type="checkbox"/> |
|  | 5   | 4         | 3                                 | 2           | 1                | <input type="checkbox"/> |                          |                          |
| <b>Critical Thinking</b>   | <i>(Involves using logic and reasoning to identify the strengths and weaknesses of alternative solutions or approaches to problems)</i> |           |                                   |             |                  |                          | <input type="checkbox"/> | <input type="checkbox"/> |
|  | 5   | 4         | 3                                 | 2           | 1                | <input type="checkbox"/> |                          |                          |
| <b>Reading Comprehension</b>   | <i>(Involves understanding written sentences and paragraphs in work-related documents)</i>  |           |                                   |             |                  |                          | <input type="checkbox"/> | <input type="checkbox"/> |
|  | 5   | 4         | 3                                 | 2           | 1                | <input type="checkbox"/> |                          |                          |
| <b>Technology Design</b>   | <i>(Involves generating or adapting equipment and technology to serve user needs)</i>   |           |                                   |             |                  |                          | <input type="checkbox"/> | <input type="checkbox"/> |
|  | 5   | 4         | 3                                 | 2           | 1                | <input type="checkbox"/> |                          |                          |
| <b>Operation and Control</b>   | <i>(Involves controlling operations of equipment or systems)</i>  |           |                                   |             |                  |                          | <input type="checkbox"/> | <input type="checkbox"/> |
|  | 5   | 4         | 3                                 | 2           | 1                | <input type="checkbox"/> |                          |                          |

10. How would you rate your overall satisfaction with the employee's work skills?  
*(Example: computer skills, technical competencies, customer service skills, etc.)*

- 5 - Very satisfied
- 4 - Somewhat satisfied
- 3 - Neither satisfied nor dissatisfied
- 2 - Somewhat dissatisfied
- 1 - Very dissatisfied
- Do not know / unfamiliar with employee's work

11. How would you rate your overall satisfaction with the employee's work habits?  
*(Example: appropriate dress, arrives on time, etc.)*

- 5 - Very satisfied
- 4 - Somewhat satisfied
- 3 - Neither satisfied nor dissatisfied
- 2 - Somewhat dissatisfied
- 1 - Very dissatisfied
- Do not know / unfamiliar with employee's work

# Employee and Position Skills (Continued)

Employee: <<EmployeeName>>

12. What are the most important skills **that the employee has**? Please list up to five in order of importance.  
(Example: welding certification, teamwork, computer proficiency, BA in Finance)

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_

13. What are the most important skills **required for this position**? Please list up to five in order of importance.  
(Example: welding certification, teamwork, computer proficiency, BA in Finance)

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_

14. Please note the education or training **that this employee has attained** (check all that apply):

- None
- On-the job training
- Licensure or certification
- Work experience in related occupations
- High school diploma or equivalent
- Post-secondary technical training
- Associate's degree
- Bachelor's degree or greater
- Other (specify) \_\_\_\_\_
- Do not know

15. Please note the educational requirements **for this position** (check all that apply):

- None required
- On-the job training
- Licensure or certification
- Work experience in related occupations
- High school diploma or equivalent
- Post-secondary technical training
- Associate's degree
- Bachelor's degree or greater
- Other (specify) \_\_\_\_\_

16. How would you rate your overall satisfaction with the **available supply of labor for the position** this worker holds?

- 5 - Very satisfied
- 4 - Somewhat satisfied
- 3 - Neither satisfied nor dissatisfied
- 2 - Somewhat dissatisfied
- 1 - Very dissatisfied
- Do not know

17. How would you rate your overall satisfaction with the **skills of the available supply of labor for the position** this worker holds?

- 5 - Very satisfied
- 4 - Somewhat satisfied
- 3 - Neither satisfied nor dissatisfied
- 2 - Somewhat dissatisfied
- 1 - Very dissatisfied
- Do not know

18. How would you rate the extent to which this position is involved in increasing energy efficiency, utilizing or developing renewable energy resources, or preserving and/or restoring the environment?

- All of the time
- Most of the time
- About half of the time
- Some of the time
- None of the time
- Do not know

### Please print your contact information:

Name: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Phone Number (with area code): \_\_\_\_\_  
 E-mail: \_\_\_\_\_

Would you like to receive an e-mail copy of the survey's findings?

- Yes
- No

**Thank you for taking the time to complete the survey.**

**Please return this form either by mail via the enclosed envelope or fax it to 402-471-9867.**



NEBRASKA  
DEPARTMENT OF LABOR

Dear Employer,

You have been selected to take part in the Nebraska Department of Labor's Green Jobs Survey. This survey is designed to identify jobs in the Nebraska workforce associated with green activities so that Nebraska employees can stay competitive in our changing economy.

A survey form will be mailed to you within the next few weeks from the Bureau of Sociological Research at UNL. Please complete the survey and return it by **June 30, 2010**. All information provided will be kept strictly confidential.

Feel free to contact the Nebraska Department of Labor, Office of Labor Market Information at 1-800-867-1377 or 1-402-471-2600 with any questions or concerns about this survey. You may contact us anytime before or after the survey is mailed to you.

Sincerely,



Catherine D. Lang  
Commissioner of Labor

Labor Market Information  
Nebraska Department of Labor  
PO Box 94600  
Lincoln, NE 68509-4600

**ADDRESS SERVICE REQUESTED**

<<Company>>  
<<Address1>>  
<<Address2>>  
<<City>>, <<State>> <<Zip>>



NEBRASKA  
DEPARTMENT OF LABOR

Dear Employer,

Last week, the Bureau of Sociological Research sent you a survey inquiring about green jobs on our behalf. It is designed to identify jobs in the Nebraska workforce associated with green activities so that Nebraska employees can stay competitive in our changing economy.

*Even if you do not consider your business to have green activities or green jobs*, it is still very important that you return the survey with the appropriate boxes checked, indicating that you are not green. Please complete the survey and return it by **June 30, 2010**. Remember, all information obtained will be kept strictly confidential!

You can also complete the survey online. Go to <https://bosrsurvey.unl.edu/survey4/index.php?sid=74735>; your token is [survey ID] .

Feel free to contact the Nebraska Department of Labor, Office of Labor Market Information at 1-800-876-1377 or 1-402-471-2600 with any questions or concerns about this survey.

Sincerely,

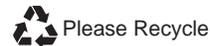
Catherine D. Lang  
Commissioner of Labor

Labor Market Information  
Nebraska Department of Labor  
PO Box 94600  
Lincoln, NE 68509-4600

**ADDRESS SERVICE REQUESTED**

<<Trade Name>>  
<<Legal Name>>  
<<Address1>>  
<<Address2>>  
<<City>>, <<State>> <<Zip>>

<<SampleID>>



# South Dakota Survey Materials



If you indicated in question 3 that your organization currently has no “green” jobs, please answer questions 5 and 6 below.

5. What obstacles or limitations have prevented your organization from having “green” jobs?

(Please select all that apply.)

- Cost of implementation.
- Lack of information.
- Shortage of workers with the knowledge or skills.
- Shortage of available training programs.
- There are no “green” job opportunities in our type of business.
- Other: (Please specify.) \_\_\_\_\_

6. Does your organization plan on creating any “green” jobs in the future?

- Yes
- No

7. Would you like to be added to the mailing list to receive the *South Dakota e-Labor Bulletin*, which provides a monthly update of South Dakota labor economics statistics at no cost?

- Yes (Please make sure to provide your e-mail address in the Contact Information section below.)
- No

**You’re almost done!**

**Please complete the section below, then return this survey form in the envelope provided.**

**Contact Information**

Name: \_\_\_\_\_

Phone Number: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

**Date Completed** \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

If your organization would like a copy of the findings, how would you like it delivered?

- E-mail
- Postal Mail

**Thank you for taking the time to provide us with this valuable information.**

We are conducting an Employers Survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, using one of the options below. **Please respond by June 30, 2010.** If you have any questions about the survey, please contact the Labor Market Information Center at 800.592.1881. Thank you for your time.

Options for completing the Employers Survey :

- Complete online at **www.researchingthegreeneconomy.com**  
Username: <<Username>>  
Password: <<Password>>
- Complete this paper survey and return in the envelope provided.
- Call us at 800.592.1881.

**If your organization is not currently in operation**, please indicate which situation best applies and return the survey form in the envelope provided.

- Temporarily out of business
- Permanently out of business
- Sold/Merged

### Organization Information

1. How many employees does your organization currently have at this location? \_\_\_\_\_  
(Please do not include contractors or temporary agency employees not on your payroll.)
2. Your *organization* may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green activity within your organization. (Please see the enclosed insert for further definitions and examples of the green economic categories.)
  - Renewable Energy and Alternative Fuels**  
*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*
  - Energy Efficiency and Conservation**  
*Manufacturing, construction or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements and transportation technology.*
  - Pollution, Waste and Greenhouse Gas (GHG) Management, Prevention and Reduction**  
*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water and other pollutants.*
  - Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**  
*Environmental restoration including the cleanup and disposal of pollution, waste and hazardous materials, Superfund/Brownfield redevelopment and landfill restoration.*
  - Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**  
*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy related products and processes.*
  - Sustainable Agriculture and Natural Resources Conservation**  
*Products and services to conserve, maintain and improve natural resources and the environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*
  - None of the Above** *This organization does not participate in any of the above green categories.*

This portion of the survey is intended to capture information on employees directly performing green-related activities (question 2, you may have employees performing green-related activities. Please do not include:

- consultants, contractors or temporary agency employees not on your payroll
- employees not directly involved in green activities, such as administrative support employees
- employees who perform green activities that do not directly contribute to your business's product or service, like those who carpool or recycle

3. Based on these instructions, how many employees at this location perform green-related activities? \_\_\_\_\_ If you

4. Please fill out the matrix below by job title for the green employees indicated in question 3.

| A green job is one in which an employee produces a product or service that improves energy  |  |   |  |   |   |                |      |              |                |
|---|--|---|--|---|---|----------------|------|--------------|----------------|
| Job Title & Brief Description   | Number of Employees  | Minimum Education/Training Requirement  |  | Special Requirements  | Number of Workers Who Have Green Job Responsibilities<br>(Based on percent of time dedicated to green work) |                |      | Hourly Wage  | Annual Salary  |
|   |  |   |  |   | Between 1-49%   | Between 50-99% | 100% |              |                |
| <p><u>Only list current jobs which produce a product or service that can be considered green.</u></p> <p>List job title and briefly describe duties related to green-related activities</p> | Enter the number of employees with this job title who participate in green activities. | <p><b>Use the following codes:</b><br/>                     1 = No Requirements<br/>                     2 = HS Diploma/GED<br/>                     3 = Post HS, No Degree<br/>                     4 = Apprenticeship/ On-the-Job Training<br/>                     5 = Trade Certified<br/>                     6 = Vocational Degree<br/>                     7 = Associate Degree<br/>                     8 = Bachelor's Degree<br/>                     9 = Graduate/Professional Degree</p> |  | Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position. | Between 1-49%   | Between 50-99% | 100% | Under \$9.25 | Under \$19,240 |
| <b>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</b>  | 7  | 5   | <b>Renewable energy technician certification</b> |   | 2   | 4              | 1    |              |                |
| 1.  |  |   |  |   |   |                |      |              |                |
| 2.  |  |   |  |   |   |                |      |              |                |
| 3.  |  |   |  |   |   |                |      |              |                |
| 4.  |  |   |  |   |   |                |      |              |                |
| 5.  |  |   |  |   |   |                |      |              |                |
| 6.  |  |   |  |   |   |                |      |              |                |
| 7.  |  |   |  |   |   |                |      |              |                |
| 8.  |  |   |  |   |   |                |      |              |                |
| 9.  |  |   |  |   |   |                |      |              |                |
| 10.   |  |   |  |   |   |                |      |              |                |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers



# Deadline Extended

The deadline has been extended for the Employers Survey about jobs in our economy where green activities result in environmental benefits. We sent you a survey earlier this summer and regrettably did not receive your response. Your response to the survey is important **even if you do not consider your business activities to be green**. Your input is important so we can accurately analyze what impact the green economy is having on our state. **Will you please help us out by responding by Friday, July 16?**

We've made it as simple as possible for you

To take as little of your valuable time as possible, the survey is available to complete online:

**[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)**

**Your username:**

**Your password:**

What are "green activities?"

We hope the enclosure will help you identify any green activities you may have which fit the scope of our research.

Questions?

If you have any questions about the survey, please contact the Labor Market Information Center at 800.592.1881.

**Thankyou!**

We're sorry to say we have not yet received your response to the Employers Survey we sent you. The purpose of the survey is to research jobs in our economy where green activities result in environmental benefits. Please return your completed survey form as soon as possible. If you have misplaced your form, please call our office at 800.592.1881; we'll be happy to send you a replacement or offer other alternatives for participating in the survey.

Thank you!

*Just a friendly reminder*



Labor Market Information Center  
SD Department of Labor  
PO Box 4730  
Aberdeen, SD 57402-4730

PLEASE  
PLACE  
STAMP  
HERE

Mailing Address Line 1  
Mailing Address Line 2  
Mailing Address Line 3  
Mailing Address Line 4  
Mailing Address Line 5



The Northern Plains & Rocky Mountain Consortium  
Iowa, Montana, Nebraska, **South Dakota**, Utah and Wyoming  
Researching the Green Economy



## The Northern Plains & Rocky Mountain Consortium

### Green Jobs Survey

#### Contact the South Dakota Labor Market Information Center

South Dakota Department of Labor

PO Box 4730

Aberdeen, SD 57402-4730

**Phone:** 605.626.2314 or 800.592.1881

**Fax:** 605.626.2322

**E-mail:** [SDDOLLMIC@state.sd.us](mailto:SDDOLLMIC@state.sd.us)



## What We Mean By Green

South Dakota has partnered with five other states to form The Northern Plains & Rocky Mountain Consortium. The Consortium is conducting research to obtain information about green jobs.

You have received this survey as part of our efforts to research the “greening” of our economy and identify green industries and jobs in South Dakota. ***All information you provide in the survey is kept strictly confidential.*** It will be combined with data collected from other employers; any data published or released will be in aggregate form.

As you can see on the survey, a green job is one where an employee produces a product or service that improves energy efficiency, expands the use of renewable energy or supports environmental sustainability.

The inside of this brochure provides a detailed definition of each green economic activity category listed on the first section of the survey. It also provides possible examples that the category may include and examples of what not to include.

If you review these examples and still have questions about where your business fits, please call us at 605.626.2314 or 800.592.1881 for assistance.

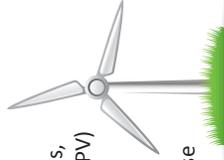


## Renewable Energy & Alternative Fuels

### Examples include:

- ✔ Hydro-electric generator repair, design of renewable energy plant
- ✔ Manufacturing/installation of wind turbines, methane gas captures, solar photovoltaic (PV) cells or electrolyzes
- ✔ Geothermal drilling
- ✔ Production of bio-fuels, biomass or cellulose

Manufacturing, production, construction, design, research, delivery, operation, storage and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.



## Environmental Cleanup and Restoration & Waste Clean-up Mitigation

### Examples include:

- ✔ Operations which recycle plastic, metal and other salvage, and Freon and ethylene glycol
- ✔ Hazardous waste handling and disposal
- ✔ Wetlands restoration

Environmental restoration including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.



### Examples DO NOT include:

- ✘ Volunteers
- ✘ Workers that "adopt-a-street"
- ✘ Garbage disposal services

## Energy Efficiency & Conservation

Manufacturing, construction, installation and production of energy efficient products (such as Energy Star-rated appliances, more efficient lighting); energy efficiency services; weatherization; building retrofitting/efficiency; energy efficient production processes; energy distribution improvements (smart grid); transportation technology; and battery development and storage improvement.



- Examples include:
- ✔ Manufacturing/installation of geothermal components
  - ✔ Insulation, energy efficient windows and doors
  - ✔ LEED certified design and construction

### Examples DO NOT include:

- ✘ Workers at firms that have become "greener" by replacing light bulbs, reducing office thermostat temperatures, purchasing fuel efficient fleet vehicles, carpooling

## Education, Regulation, Compliance, Public Awareness, and Training & Energy Trading

Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy-related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.



### Examples include:

- ✔ Policy analysis, energy auditing, environmental science research
- ✔ Carbon credit brokering, certifying environmental practices
- ✔ Environmental testing

### Examples DO NOT include:

- ✘ Educational administrative staff
- ✘ Secretarial services at law firms

## Pollution, Waste and Greenhouse Gas (GHG) Management, Prevention and Reduction

Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gases, waste water and other pollutants.

### Examples include:

- ✔ Carbon emissions monitoring, biomass or biodiversity preservation
- ✔ Recycling center operations
- ✔ Mass transit administration
- ✔ Wastewater treatment plants

### Examples DO NOT include:

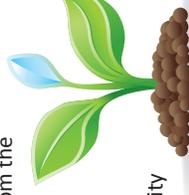
- ✘ Workers who telecommute or carpool
- ✘ Cleaning services using "eco-friendly" chemicals
- ✘ Workplaces using recycled paper



## Sustainable Agriculture & Natural Resources Conservation

### Examples include:

- ✔ Sustainable organic farming, including practices that lessen the admissions of carbon and/or increase removal of carbon from the atmosphere when compared to standard farming practices
- ✔ Conservation activities which reduce soil erosion, enhance water supplies and water quality



Products and services to conserve, maintain and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Includes bioscience related activities and research.

### Examples DO NOT include:

- ✘ Workers who garden or buy organic products
- ✘ Landscapers



# Utah Survey Materials



State of Utah

GARY R. HERBERT  
Governor

GREG BELL  
Lieutenant Governor

Department of  
Workforce Services

KRISTEN COX  
Executive Director

GREGORY B. GARDNER  
Deputy Director

JON S. PIERPONT  
Deputy Director

Dear Employer:

The United States Department of Labor has commissioned Utah to research our state's green economy. Through this research, we hope to study green business activities on a geographic, industrial and occupational basis.

The Utah Department of Workforce Services, along with workforce agencies of other states, is conducting a **Green Jobs Survey**. Your participation in this survey will help identify the existing and emerging needs of employers in Utah's green economy and promote effective workforce training programs.

Even if you don't believe your company has any green activities, please carefully review the criteria and examples in the supplemental 'What We Mean By Green' document. Your business activities may in fact positively impact the environment.

For your convenience, there are many ways to complete the survey. Either return the completed survey in the enclosed self-addressed, postage-paid envelope OR complete the survey online at **[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)**. You can also fax your completed survey to **(801)526-9238**.

If you have any questions or need assistance, please do not hesitate to contact us at **[smckinney@utah.gov](mailto:smckinney@utah.gov)** or **(801)526-9464**.

We look forward to learning more about your company's green activities. Thank you for your valuable time and participation in this survey.

Sincerely,

Kristen Cox  
Executive Director



The **Northern Plains & Rocky Mountain Consortium**: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming



Please see the back of this survey before completing the form.

We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, either on-line ([www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)) or by completing the paper survey form and returning in the envelope provided. **Please respond by June 30, 2010.**

This survey is also available for you to complete online at:

[www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)

If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.

- Temporarily out of business
- Permanently out of business
- Sold/Merged

If you have any questions about the survey, please contact:

Utah Department of Workforce Services at [smckinney@utah.gov](mailto:smckinney@utah.gov) or 801-526-9464

## Company Information

1. How many employees does your organization currently have at this location?

(do not include contractors or temporary employees) \_\_\_\_\_

2. Your **company** may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.

- Renewable Energy and Alternative Fuels**  
*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*
- Energy Efficiency and Conservation**  
*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*
- Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**  
*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.*
- Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**  
*Environmental restoration including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**  
*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy related products and processes.*
- Sustainable Agriculture and Natural Resource Conservation**  
*Products and services to conserve, maintain and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*
- None of the Above** *This establishment does not participate in any of the above green categories.*

# Green Jobs Survey

The Northern Plains & Rocky Mountain Consortium

## What is this survey?

The Northern Plains & Rocky Mountain Consortium is conducting a study about green jobs. The consortium consists of Iowa, Montana, Nebraska, South Dakota, Utah, and Wyoming. Your business has been selected to help the Utah Department of Workforce Services to identify green jobs and environmentally beneficial business activity in Utah.

## What is the purpose of this study?

- + Familiarize statewide career planning with new green jobs
- + Inform the current workforce of existing and future green jobs
- + Identify career-training needs to prepare the green workforce
- + Compare green jobs trends between other states and within Utah
- + Provide employers and job seekers with information about green jobs in Utah

## Where do I go for assistance?

Contact our research analysts:

Sara McKinney  
smckinney@utah.gov  
801-526-9464

Elizabeth Arnold  
earnold@utah.gov  
801-526-9264

**MA4431 A**  
Department of Workforce Services  
Green Jobs  
140 East 300 South Box 45249  
SMDS Box #143001  
PO Box 31431  
Salt Lake City UT 84131-9988

## You can respond quickly by:

- + Completing our paper survey and returning it in the enclosed postage-paid envelope
- + Accessing our website at [www.researchingthegreeneconomy.com](http://www.researchingthegreeneconomy.com)
- + Returning the completed survey via fax at 801-526-9238

\*Your response will be kept confidential and all data will be combined with other responses to form aggregate responses and trends

### Contact Information:

Name: \_\_\_\_\_  
Phone Number: \_\_\_\_\_  
Email: \_\_\_\_\_

Date Completed \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

If your organization would like a copy of the findings, how would you like them delivered?

- Email  
 Postal Mail

Thank you for taking the time to provide us with this valuable information.

This portion of the survey is intended to capture information on employees directly performing green-related activities as a part of their job duties. Even if you answered "None of the Above" on question 2, you may have employees performing green-related activities. Do not include:

- consultants, contractors or temporary agency employees not on your payroll;
- employees not directly involved in green activities, such as administrative support employees; or
- employees who perform green activities which do not directly contribute to your business's product or service, like those that carpool or recycle.

3. Based on these instructions, how many employees at this location perform green-related activities? \_\_\_\_\_

Please fill out the matrix below by job title for your green employees. If you have no green employees, continue to the next page.

| Job Title & Brief Description   | Total Employees  | Minimum Education/Training Requirement   | Special Requirements  | Number of workers having green job responsibilities (based on percent of time dedicated to green work) |                   |          |
|---|--|--|---|--|-------------------|----------|
|   |  |  |   | Between 1% - 49%   | Between 50% - 99% | 100%     |
| <p><i>Only list current jobs which produce a product or service that can be considered green.</i></p> <p><i>List job title and briefly describe duties related to green related activities.</i></p> | <p><i>Number of employees that have this job duty.</i></p> | <p><i>Use the following codes:</i><br/>                     1 = No Requirements<br/>                     2 = HS Diploma/GED<br/>                     3 = Past HS, No Degree<br/>                     4 = Apprenticeship/ On-The-Job Training<br/>                     5 = Trade Certified<br/>                     6 = Vocational Degree<br/>                     7 = Associate Degree<br/>                     8 = Bachelors Degree<br/>                     9 = Graduate/Professional Degree</p> | <p><i>Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position.</i></p> |  |                   |          |
| <b>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</b>  | <b>7</b>   | <b>5</b>   | <b>Renewable energy technician certification</b>  | <b>2</b>   | <b>4</b>          | <b>1</b> |
| 1.  |  |  |   |  |                   |          |
| 2.  |  |  |   |  |                   |          |
| 3.  |  |  |   |  |                   |          |
| 4.  |  |  |   |  |                   |          |
| 5.  |  |  |   |  |                   |          |
| 6.  |  |  |   |  |                   |          |
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| 9.  |  |  |   |  |                   |          |
| 10.   |  |  |   |  |                   |          |
| 11.   |  |  |   |  |                   |          |
| 12.   |  |  |   |  |                   |          |
| 13.   |  |  |   |  |                   |          |
| 14.   |  |  |   |  |                   |          |
| 15.   |  |  |   |  |                   |          |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers to fill



# What We Mean By Green



A green job has essential duties in one of the following six core areas:

| Green Economic Categories | Renewable Energy and Alternative Fuels | Energy Efficiency and Conservation | Pollution, Waste and Greenhouse Gas (GHG) Management, Prevention and Reduction | Environmental Cleanup and Remediation and Waste Cleanup and Mitigation | Education, Regulation, and Compliance, Training and Energy Trading | Sustainable Agriculture and Natural Resource Conservation |
|---------------------------|--|------------------------------------|--|--|--|---|
|---------------------------|--|------------------------------------|--|--|--|---|

| Definition | <p>Manufacturing, production, construction, design, research, delivery, operation, storage and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.</p> | <p>Manufacturing, construction, installation, production of energy-efficient products (such as Energy Star rated appliances, more efficient lighting), energy-efficiency services, weatherization, building retrofitting/efficiency, energy-efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.</p> | <p>Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment. Includes controlling and reducing emissions of CO<sub>2</sub>, other greenhouse gases, wastewater and other pollutants.</p> | <p>Environmental remediation including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.</p> | <p>Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy-related products and processes.</p> | <p>Products and services to conserve, maintain and improve natural resources and environment, including low-carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Include bioscience-related activities and research.</p> |
|------------|---|--|--|--|---|---|
|------------|---|--|--|--|---|---|

| Examples | <p>Manufacturing/installation of wind turbines, methane gas capturers, solar PV (photovoltaic) cells or electrolyzers; hydro-electric generator repair; design of renewable energy plants, geothermal drilling; production of biofuels.</p> | <p>Manufacturing/installation of geothermal components, insulation, energy efficient windows and door. LEED certified design and construction.</p> | <p>Carbon emissions monitoring, biomass or biodiversity preservation, recycling center operations, mass transit administration, wastewater treatment plants.</p> | <p>Operations which recycle plastic, metal and other salvage, as well as freon and ethylene glycol; hazardous waste handling and disposal, wetlands restoration.</p> | <p>Policy analysis, energy auditing, environmental science research, carbon credit brokering, certifying environmental practices; environmental testing; buying and selling of fuels related to energy efficiency and renewable energy as well as cap-and-trade activity.</p> | <p>Sustainable organic farming; conservation activities which reduce soil erosion, enhance water supplies and improve water quality.</p> |
|----------|---|--|--|--|---|--|
|----------|---|--|--|--|---|--|

| DOES NOT include: | <p>Electrical power distribution, producing high-voltage electric lines.</p> | <p>Workers at firms where the firm has become "greener" by replacing light bulbs, reducing office thermostat temperatures.</p> | <p>Workers who telecommute or carpool, cleaning services using "eco-friendly" chemicals.</p> | <p>Volunteers, workers that "adopt a street", garbage disposal services.</p> | <p>Educational administrative staff, secretarial services at law firms, etc.</p> | <p>Workers who garden or buy organic products, landscapers.</p> |
|-------------------|--|--|--|--|--|---|
|-------------------|--|--|--|--|--|---|

# Wyoming Survey Materials



Once completed, return this survey form in the envelope provided  
or cut and fax to (877) 827-9511

**Contact Information:**

|               |  |
|---------------|--|
| Name:         |  |
| Phone Number: |  |
| Email:        |  |

Date Completed 

|  |   |  |   |  |
|--|---|--|---|--|
|  | / |  | / |  |
|--|---|--|---|--|

**If your organization would like a copy of the findings, how would you like them delivered?**

|                                      |
|--------------------------------------|
| <input type="checkbox"/> Email       |
| <input type="checkbox"/> Postal Mail |

Thank you for taking the time to provide us with this valuable information.



The Northern Plains & Rocky Mountain  
Consortium: researching the green economy  
Iowa, Montana, Nebraska, South Dakota, Utah, & Wyoming



We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge by completing the survey form and returning it in the envelope provided, or by faxing it to (877) 827-9511. **Please respond by September 7, 2010.**

**If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.**

- |                          |                             |
|--------------------------|-----------------------------|
| <input type="checkbox"/> | Temporarily out of business |
| <input type="checkbox"/> | Permanently out of business |
| <input type="checkbox"/> | Sold/Merged                 |

**If you have any questions about the survey, please contact:  
Patrick Manning at pmanni@state.wy.us or (866) 579-3873.**

## Company Information

**1. How many employees does your organization currently have at this location?**

*(do not include contractors or temporary employees)* \_\_\_\_\_

**2. Your *company* may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.**

- Renewable Energy and Alternative Fuels**  
*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*
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*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*
- Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**  
*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.*
- Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**  
*Environmental restoration including the cleanup and disposal of pollution, waste, and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**  
*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy related products and processes.*
- Sustainable Agriculture and Natural Resource Conservation**  
*Products and services to conserve, maintain and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*
- None of the Above** *This establishment does not participate in any of the above green categories.*

This portion of the survey is intended to capture information on employees directly performing green-related activities as a part of their job duties. Even if you answered "None of the Above" on question 2, you may have employees performing green-related activities. Do not include:

- consultants, contractors or temporary agency employees not on your payroll;
- employees not directly involved in green activities, such as administrative support employees; or
- employees who perform green activities that do not directly contribute to your business's product or service, like those that carpool or recycle.

**3. Based on these instructions, how many employees at this location perform green-related activities? \_\_\_\_\_**

Please fill out the matrix below by job title for your green employees. If you have no green employees, continue to the next page.

| Job Title & Brief Description<br><br><i>Only list current jobs which produce a product or service that can be considered green. (please do not use acronyms)</i><br><br><i>List job title and briefly describe duties related to green related activities.</i> | Total Employees<br><br><i>Number of employees that have this job duty.</i> | Minimum Education/Training Requirement   |  | Special Requirements<br><br><i>Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position. (please do not use acronyms)</i> | Number of workers having green job responsibilities. (based on percent of time dedicated to green work) |                  |      |
|--|--|--|--|---|---|------------------|------|
|  |  | <i>Use the following codes:<br/>1 = No Requirements<br/>2 = HS Diploma/GED<br/>3 = Post HS, No Degree<br/>4 = Apprenticeship/ On-The-Job Training<br/>5 = Trade Certified<br/>6 = Vocational Degree<br/>7 = Associate Degree<br/>8 = Bachelors Degree<br/>9 = Graduate/Professional Degree</i> |  |   | Between 1% -49%   | Between 50% -99% | 100% |
| <i>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</i>   | <i>7</i>   | <i>5</i>   | <i>Renewable energy technician certification</i> | <i>2</i>  | <i>4</i>  | <i>1</i>         |      |
| 1.   |  |  |  |   |   |                  |      |
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| 3.   |  |  |  |   |   |                  |      |
| 4.   |  |  |  |   |   |                  |      |
| 5.   |  |  |  |   |   |                  |      |
| 6.   |  |  |  |   |   |                  |      |
| 7.   |  |  |  |   |   |                  |      |
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| 13.  |  |  |  |   |   |                  |      |
| 14.  |  |  |  |   |   |                  |      |
| 15.  |  |  |  |   |   |                  |      |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers to fill this

Cut here to fax

Cut here to fax



## Confidentiality

Your individual responses will be kept in confidence and only released in summary statistical reports.

## How to respond



Call (307) 473-3837,  
or toll-free  
(866) 579-3873



Fax your response  
to: (877) 827-9511



Mail your response to:  
LMI Improvement Grant  
Department of  
Employment  
PO Box 2760  
Casper, WY 82601-9957



Wyoming Department of Employment  
Research & Planning  
246 S. Center St.  
Casper, WY 82601  
<http://doe.state.wy.us/LMI>

# Occupational Survey

## Dear Employer

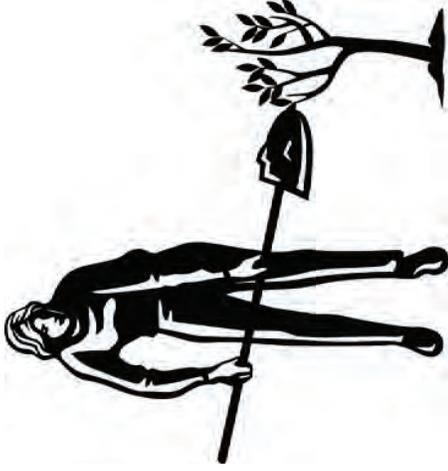
Thank you for taking the time to complete the enclosed survey. Our goal is to collect information about jobs in Wyoming's economy in which employees use specific skills that result in environmental benefits.

Your participation in this survey is crucial. Even if you don't believe your business produces products that are environmentally friendly, your daily activities may very well positively impact the environment.

Your assistance will help us educate potential future workers, training centers, and economic development agencies by sharing your knowledge.

Please assist us in identifying skills needed for both new and existing occupations that require proficiency with developing technologies and materials. Properly trained workers are needed to fill job openings created through public and private investments, such as carbon sequestration, wind energy, and energy efficient construction techniques.

Please return the completed survey by June 30, 2010. Once again, thank you for your time and assistance.



## What types of activities?

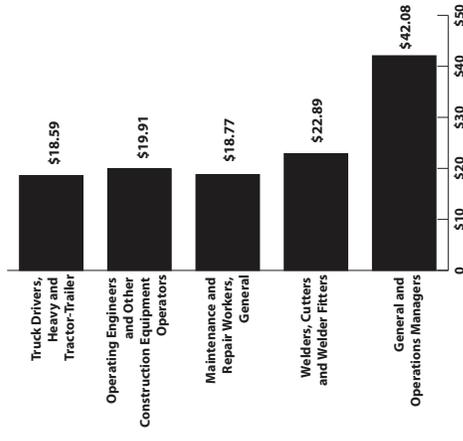
The Bureau of Labor Statistics has defined these types of activities as those “that help protect or restore the environment or natural resources conservation,” and has identified seven broad categories related to these activities:

- Agricultural and natural resources conservation
- Renewable energy
- Energy efficiency
- Greenhouse gas reduction
- Pollution reduction and cleanup
- Recycling and waste reduction
- Education, compliance, public awareness, and training

## Jobs in demand

A recent report released by the U.S. Department of Labor has identified several occupations that will be in demand as more businesses implement environmentally-friendly activities. Research & Planning data suggests demand is likely to increase for the following jobs in Wyoming as a result of the aforementioned activities.

### Mean Wage per Hour



Data from September 2009. For a complete list of occupations and wages, see <http://doe.state.wy.us/lmi/oes.htm>.

## What do we hope to learn?

- We know what these employees make now. How will these new activities affect what you pay your employees in the future?
- How will that impact your ability to recruit and retain employees in these jobs?

THE STATE



OF WYOMING

DAVE FREUDENTHAL  
GOVERNOR

*Department of Employment*

RESEARCH & PLANNING SECTION

P.O. BOX 2760  
CASPER, WY 82602

(307) 473-3807

August 9, 2010

Dear Wyoming Employer:

As an employer, you know the importance of the availability of accurate information about the labor market and emerging labor needs. To help us gather such information, your business has been randomly selected to provide information regarding the prevalence of green jobs within our economy. A green job is one in which an employee produces a product or service that improves energy efficiency, expands the use of renewable energy and supports environmental sustainability. The results of this survey will help employers assess how evolving business activities and practices are changing workforce concerns and needs in this region.

The information you provide will be kept confidential. It will be combined with data collected from other employers, then analyzed to determine such information as wages of occupations involving green activities, in-demand green occupations by industry, and educational requirements that help identify opportunities for worker development and training.

For your convenience, you have three options for participating in this survey:

- Completing the questionnaire and returning it in the stamped self-addressed return envelope.
- Faxing it to us at 1-877-827-9511.
- Calling us toll free at 1-866-579-3873 and providing your responses to us over the phone.

Regardless of which option you choose, the survey should take no longer than 10-15 minutes to complete.

Please respond to the questionnaire no later than September 7, 2010.

Study results will be posted on our website at <http://doe.state.wy.us/LMI>.

All data collected must, by the Wyoming Employment Security Law 27-3-603 and the Workforce Investment Act (Public Law 105-220), be held in the strictest confidence with results published only as summary statistics.

If you have any questions regarding the study or the survey form, please contact Patrick Manning toll free at 1-866-579-3873 or [Pmanni@state.wy.us](mailto:Pmanni@state.wy.us).

Thank you for your time and assistance in completing this survey. If you have already returned the questionnaire, thank you for your response.

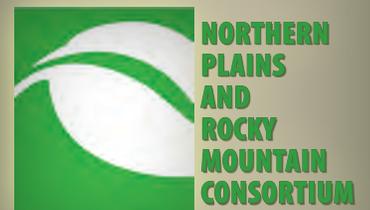
Sincerely,

A handwritten signature in black ink that reads "Tom Gallagher".

Tom Gallagher  
Manager, Research and Planning

Enclosures

# Colorado Survey Materials





We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, either online at [leeds.colorado.edu/greenjobssurvey](http://leeds.colorado.edu/greenjobssurvey) or by completing this paper survey and returning it in the envelope provided. Even if you do not have any green jobs, please complete questions 4 and 5 on page 4. **Please respond by January 28, 2011.**

This survey is also available for you to complete online at:

[leeds.colorado.edu/greenjobssurvey](http://leeds.colorado.edu/greenjobssurvey)

Password:

**If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.**

- Temporarily out of business
- Permanently out of business
- Sold/Merged

**If you have any questions about the survey, please contact:**

Leeds School of Business at 303-492-3307

## COMPANY INFORMATION

**1. How many employees does your organization currently have at this location?** \_\_\_\_\_ employees  
*(do not include contractors)*

**2. Your company may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.**

- Renewable Energy and Alternative Fuels**  
*Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.*
- Energy Efficiency and Conservation**  
*Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.*
- Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction**  
*Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.*
- Environmental Cleanup and Restoration and Waste Clean-up and Mitigation**  
*Environmental restoration including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.*
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading**  
*Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy-related products and services.*
- Sustainable Agriculture and Natural Resource Conservation**  
*Products and services to conserve, maintain, and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.*
- None of the Above** *This establishment does not participate in any of the above green categories.*

4. Regarding the factors listed below, what would most influence you to increase the number of green job workers that you employ, even if you do not have any green job positions now? Please rank each of the factors from 1-5, with 5 being most important.

|  | FACTOR                   |                          |                          |                          |                          | Not Applicable           |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|  | 1<br>Least Important     | 2                        | 3                        | 4                        | 5<br>Most Important      |                          |
| Tax deductions or credits for changing to green business practices/expanding green job employment. | <input type="checkbox"/> |
| Access to capital or financing to start or expand a green enterprise.                              | <input type="checkbox"/> |
| Policies promoting environmental standards in your industry.                                       | <input type="checkbox"/> |
| An increase in customer demand for your company's green services.                                  | <input type="checkbox"/> |
| Public marketing or advertising campaigns promoting green business practices and hiring.           | <input type="checkbox"/> |
| The availability of a trained workforce.   | <input type="checkbox"/> |
| The availability of training programs.   | <input type="checkbox"/> |
| Other: _____   | <input type="checkbox"/> |

5. Regarding the factors listed below, what deters you from creating/hiring or expanding a green workforce? Please rank each of the factors from 1-5, with 5 being most important.

|   | FACTOR                   |                          |                          |                          |                          | Not Applicable           |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|   | 1<br>Least Important     | 2                        | 3                        | 4                        | 5<br>Most Important      |                          |
| The profit margin is not conducive to creating or expanding to green jobs and practices (not profitable). | <input type="checkbox"/> |
| Lack of capital or financing for starting or expanding your green business.                               | <input type="checkbox"/> |
| Lack of time or knowledge to convert workforce or business practices (expertise).                         | <input type="checkbox"/> |
| Not interested or don't care about the green economy.   | <input type="checkbox"/> |
| Lack of qualified workers.  | <input type="checkbox"/> |
| Shortage of available training programs.  | <input type="checkbox"/> |
| Other: _____  | <input type="checkbox"/> |

Once completed, return this survey form in the envelope provided.

**Contact Information:**

Name: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Email: \_\_\_\_\_

Date Completed \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

If your organization would like a copy of the findings, how would you like them delivered?

- Email
- Postal Mail

Thank you for taking the time to provide us with this valuable information.

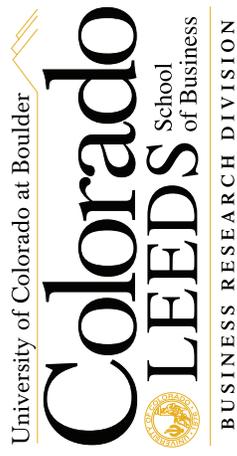
This portion of the survey is intended to capture information on employees directly performing green-related activities as a part of their job duties. Even if you answered “None of the Above” on question 2, you may have employees performing green-related activities.

- Include full-time, part-time, seasonal, and temporary employees.
- Do not include consultants or contractors not on your payroll.
- Do not include employees not directly involved in green activities, such as administrative support employees.
- Do not include employees who perform green activities that do not directly contribute to your business’s product or service, like those who carpool or recycle.

| Job Title & Brief Description   | Total Employees  | Minimum Education/<br>Training Requirement  | Special Requirements  | Number of workers having green job responsibilities (based on percent of time dedicated to green work) |                   |          |
|---|--|---|---|--|-------------------|----------|
|   |  |   |   | Between 1% - 49%   | Between 50% - 99% | 100%     |
| <p><i>Only list current jobs which produce a product or service that can be considered green.</i></p> <p><i>List job title and briefly describe duties related to green related activities.</i></p> | <p><i>Number of employees that have this job duty.</i></p> | <p><b>Use the following codes:</b></p> <p>1 = No Requirements<br/>                     2 = HS Diploma/GED<br/>                     3 = Post HS, No Degree<br/>                     4 = Apprenticeship/ On-The-Job Training<br/>                     5 = Trade Certified<br/>                     6 = Vocational Degree<br/>                     7 = Associate Degree<br/>                     8 = Bachelors Degree<br/>                     9 = Graduate/ Professional Degree</p> | <p><i>Please list any required licenses, certificates or other training above and beyond the normal requirements of this occupation which are necessary due to the green activities of this position.</i></p> |  |                   |          |
| <b>Example: Wind Turbine Technician - Installs &amp; repairs wind turbines</b>  | <b>7</b>   | <b>5</b>  | <b>Renewable energy technician certification</b>  | <b>2</b>   | <b>4</b>          | <b>1</b> |
| 1.  |  |   |   |  |                   |          |
| 2.  |  |   |   |  |                   |          |
| 3.  |  |   |   |  |                   |          |
| 4.  |  |   |   |  |                   |          |
| 5.  |  |   |   |  |                   |          |
| 6.  |  |   |   |  |                   |          |
| 7.  |  |   |   |  |                   |          |
| 8.  |  |   |   |  |                   |          |
| 9.  |  |   |   |  |                   |          |
| 10.   |  |   |   |  |                   |          |
| 11.   |  |   |   |  |                   |          |
| 12.   |  |   |   |  |                   |          |
| 13.   |  |   |   |  |                   |          |
| 14.   |  |   |   |  |                   |          |
| 15.   |  |   |   |  |                   |          |

<sup>1</sup> A vacancy exists if it meets the following criteria: a specific position exists; work could start within 30 days; and you are actively seeking workers to fill this position.





# The Green Jobs Survey



Photo by Glenn Asakawa/University of Colorado

Dear Colorado Employer,

Green jobs are an important part of Colorado's growing and diverse workforce. These environmentally friendly jobs are a growing component of occupations in many industries, ranging from manufacturing to service-providing.

You have been selected to take part in the Colorado Department of Labor and Employment's (CDLE) green jobs survey. This survey, which is being conducted by the Leeds School of Business at the University of Colorado at Boulder on behalf of the CDLE, is designed to identify jobs in the Colorado workforce that are associated with green activities so that Colorado employers can stay competitive in our quickly changing economy.

Start the survey today by visiting [Leeds.Ly/greenjobssurvey](https://Leeds.Ly/greenjobssurvey) and typing in your password, which appears to the right. Or you may fill out the paper survey that you will receive in about a week. Your input is extremely important in obtaining an accurate assessment of Colorado's green jobs and economy. Please be assured that the survey results will remain confidential and will be reported only in aggregated form.

Please visit the green jobs website [Leeds.Ly/greenjobssurvey](https://Leeds.Ly/greenjobssurvey) for more details about the project and contact information.

Thank you for your help.

Sincerely,

Alexandra E. Hall  
Director, Labor Market Information

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DONALD J. MARES  
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Peggy S. Herbertson  
Director, Division of  
Employment and  
Training

ALEXANDRA E. HALL  
Director



## DEPARTMENT OF LABOR AND EMPLOYMENT

### LABOR MARKET INFORMATION

633 17<sup>th</sup> Street, Suite 600  
Denver, Colorado 80202-2107  
MAIN: 303.318.8850  
FACSIMILE: 303.318.8899

<http://lmi.gateway.coworkforce.com/lmi/gateway>



January 7, 2010



Dear Colorado Employer:

As an employer you know the importance of accurate information about the local labor market and emerging labor trends. Colorado is partnering with six other states in the Northern Plains & Rocky Mountain Consortium to study the prevalence of green jobs in the state's economy. To help us gather this information, your business has been scientifically selected to provide information about green jobs within your company. Even if your firm does not have green jobs, your participation is integral to understanding the relative prevalence of green jobs in various industries.



A green job is one in which an employee produces a product or a service that improves energy efficiency, expands the use of renewable energy, or supports environmental sustainability. Your participation in this survey will help identify the existing and emerging needs of employers in Colorado's green economy and promote effective workforce training programs.

Please take a moment to review examples of green jobs in "What We Mean by Green" on the reverse side of this letter.



While the enclosed questionnaire requests detailed employment information, it does not solicit any personal, identifying information about individual employees or employers. The Colorado Department of Labor and Employment is bound by strict rules mandating confidentiality. All published information will be aggregated and protected, as it is for all CDLE labor surveys.



For your convenience, you may complete this survey online by visiting [leeds.colorado.edu/greenjobssurvey](http://leeds.colorado.edu/greenjobssurvey), clicking on "Take Green Jobs Survey," and entering your password (found on the front of the enclosed survey). Please remember that all survey research undertaken by the department is performed and provided in order to help Colorado employers understand their business environment and to better compete in our ever-changing economy. Your participation in this study and accurate responses are critical to the success of this valuable service.



Please submit your completed survey by January 28, 2011.

Thank you for your help.

Alexandra E. Hall  
Director  
Labor Market Information



## Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention and Reduction

Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gases, waste water and other pollutants.

### Examples include:

- ✔ Carbon emissions monitoring, biomass or biodiversity preservation
- ✔ Recycling center operations
- ✔ Mass transit administration
- ✔ Wastewater treatment plants

### Examples DO NOT include:

- ✘ Workers who telecommute or carpool
- ✘ Cleaning services using "eco-friendly" chemicals
- ✘ Workplaces using recycled paper



## Education, Regulation, Compliance, and Training & Energy Trading

Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

### Examples include:

- ✔ Policy analysis, energy auditing, environmental science research
- ✔ Carbon credit brokering, certifying environmental practices
- ✔ Environmental testing

### Examples DO NOT include:

- ✘ Educational administrative staff
- ✘ Secretarial services at law firms



## Energy Efficiency & Conservation

Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.



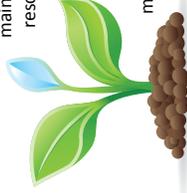
### Examples include:

- ✔ Manufacturing/installation of geothermal components
- ✔ Insulation, energy efficient windows and doors
- ✔ LEED certified design and construction

### Examples DO NOT include:

- ✘ Workers at firms that have become "greener" by replacing light bulbs, reducing office thermostat temperatures, purchasing fuel efficient fleet vehicles, carpooling

Products and services to conserve, maintain and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation.



Includes bioscience related activities and research.

### Examples include:

- ✔ Sustainable organic farming, including practices that lessen the admissions of carbon and/or increase removal of carbon from the atmosphere when compared to standard farming practices
- ✔ Conservation activities which reduce soil erosion, enhance water supplies and water quality

### Examples DO NOT include:

- ✘ Workers who garden or buy organic products
- ✘ Landscapers

## Sustainable Agriculture & Natural Resource Conservation

## Environmental Cleanup and Remediation & Waste Clean-up Mitigation

Environmental remediation including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.

### Examples include:

- ✔ Operations which recycle plastic, metal and other salvage, and Freon and ethylene glycol
- ✔ Hazardous waste handling and disposal
- ✔ Wetlands restoration

### Examples DO NOT include:

- ✘ Volunteers
- ✘ Workers that "adopt-a-street"
- ✘ Garbage disposal service



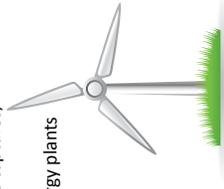
## Renewable Energy & Alternative Fuels

### Examples include:

- ✔ Manufacturing/installation of wind turbines, methane gas captures, solar photovoltaic (PV) cells or electrolyzes
- ✔ Hydro-electric generator repair, design of renewable energy plants
- ✔ Geothermal drilling
- ✔ Production of bio-fuels, biomass or cellulose

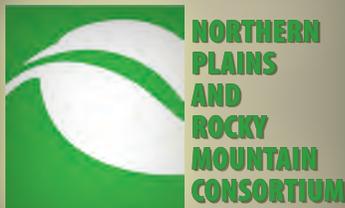
### Examples DO NOT include:

- ✘ Electrical power distribution
- ✘ Producing high voltage electric lines





# Appendix C: Detailed Data Tables



## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation**

| Code   | Title  | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green*** |
|--------|--|-----------------------------|----------------------|-------------------------|-------------|---|------------------|
|        |  |                             |                      | Lower Bound             | Upper Bound |   |                  |
| 000000 | Total  | 6,243                       | 161,855              | 153,451                 | 170,258     |   | 3.5%             |
| 111011 | Chief Executives   | 90                          | 973                  | 730                     | 1,216       | 8,530   | 11.4%            |
| 111021 | General and Operations Managers  | 151                         | 1,914                | 1,470                   | 2,358       | 56,260  | 3.4%             |
| 112021 | Marketing Managers   | 18                          | 111                  | 42                      | 180         | 3,570   | 3.1%             |
| 112022 | Sales Managers   | 10                          | 113                  | 17                      | 209         | 8,090   | 1.4%             |
| 112031 | Public Relations and Fundraising Managers  | 14                          | 110                  | 35                      | 184         | 1,620   | 6.8%             |
| 113011 | Administrative Services Managers   | 16                          | 121                  | 48                      | 194         | 6,450   | 1.9%             |
| 113031 | Financial Managers   | 15                          | 114                  | 38                      | 189         | 13,420  | 0.8%             |
| 113051 | Industrial Production Managers   | 12                          | 80                   | 26                      | 133         | 4,820   | 1.6%             |
| 113071 | Transportation, Storage, and Distribution Managers   | 10                          | 82                   | 17                      | 148         | 3,290   | 2.5%             |
| 119011 | Farm, Ranch, and Other Agricultural Managers   | 40                          | 297                  | 190                     | 404         | *   | *                |
| 119012 | Farmers and Ranchers   | 25                          | 330                  | 164                     | 495         | *   | *                |
| 119021 | Construction Managers  | 63                          | 1,170                | 612                     | 1,728       | 6,640   | 17.6%            |
| 119041 | Architectural and Engineering Managers   | 9                           | 86                   | 24                      | 149         | 3,750   | 2.3%             |
| 119121 | Natural Sciences Managers  | 35                          | 217                  | 123                     | 311         | 1,290   | 16.8%            |
| 119199 | Managers, All Other  | 78                          | 4,512                | 1,757                   | 7,268       | 9,180   | 49.2%            |
| 131022 | Wholesale and Retail Buyers, Except Farm Products  | 5                           | 23                   | 2                       | 44          | 3,550   | 0.6%             |
| 131023 | Purchasing Agents, Except Wholesale, Retail, and Farm Products                               | 10                          | 104                  | 8                       | 200         | 8,590   | 1.2%             |
| 131041 | Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation | 48                          | 528                  | 208                     | 848         | 9,170   | 5.8%             |
| 131081 | Logisticians   | 7                           | 99                   | 14                      | 183         | *   | *                |
| 131199 | Business Operations Specialists, All Other   | 153                         | 1,532                | 1,053                   | 2,010       | 25,800  | 5.9%             |
| 132011 | Accountants and Auditors   | 17                          | 441                  | 115                     | 767         | 34,760  | 1.3%             |
| 132072 | Loan Officers  | 8                           | 139                  | 21                      | 258         | 16,140  | 0.9%             |
| 151131 | Computer Programmers   | 8                           | 147                  | 32                      | 262         | 13,570  | 1.1%             |
| 151099 | Computer Specialists, All Other  | 13                          | 183                  | 14                      | 351         | 4,460   | 4.1%             |

\*The Occupational Employment Statistics (OES) has suppressed employment totals in one or more of the consortium states due to confidentiality concerns or insignificant estimates. Therefore, a consortium employment total is not available for this occupation.

\*\*Occupational employment totals are the sum of the consortium states from the 2009 OES data from the Bureau of Labor Statistics. There are a number of methodological differences between the green employment survey and the OES methodology, one of which is that the OES data shown are 2009 annual figures, while the green employment numbers represent employment in the second quarter of 2009. These employment figures are provided as the best available estimate of the total number of jobs in each occupation in the consortia, but the estimates may not total and are not directly comparable.

\*\*\*Only estimates that were statistically different from zero at the 95% confidence level are shown.

## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation (continued)**

| Code   | Title  | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green** |
|--------|--|-----------------------------|----------------------|-------------------------|-------------|---|-----------------|
|        |  |                             |                      | Lower Bound             | Upper Bound |   |                 |
| 171011 | Architects, Except Landscape and Naval                             | 64                          | 1,840                | 1,266                   | 2,414       | 2,870   | 64.1%           |
| 171012 | Landscape Architects   | 14                          | 306                  | 113                     | 498         | 500   | 61.2%           |
| 171022 | Surveyors  | 10                          | 191                  | 58                      | 325         | 2,580   | 7.4%            |
| 172051 | Civil Engineers  | 83                          | 1,803                | 1,228                   | 2,377       | 8,230   | 21.9%           |
| 172071 | Electrical Engineers   | 21                          | 477                  | 220                     | 734         | 3,840   | 12.4%           |
| 172081 | Environmental Engineers  | 80                          | 1,079                | 750                     | 1,408       | 1,920   | 56.2%           |
| 172141 | Mechanical Engineers   | 23                          | 590                  | 269                     | 912         | 6,950   | 8.5%            |
| 172199 | Engineers, All Other   | 40                          | 1,141                | 70                      | 2,211       | *   | *               |
| 173011 | Architectural and Civil Drafters                                   | 25                          | 382                  | 204                     | 561         | 3,740   | 10.2%           |
| 173012 | Electrical and Electronics Drafters                                | 4                           | 51                   | 0                       | 102         | *   | *               |
| 173019 | Drafters, All Other  | 6                           | 63                   | 5                       | 122         | *   | *               |
| 173022 | Civil Engineering Technicians                                      | 22                          | 385                  | 133                     | 636         | 3,470   | 11.1%           |
| 173023 | Electrical and Electronic Engineering Technicians                  | 9                           | 129                  | 9                       | 248         | 4,220   | 3.1%            |
| 173025 | Environmental Engineering Technicians                              | 31                          | 399                  | 205                     | 592         | *   | *               |
| 173029 | Engineering Technicians, Except Drafters, All Other                | 12                          | 181                  | 32                      | 331         | 1,300   | 13.9%           |
| 173031 | Surveying and Mapping Technicians                                  | 8                           | 114                  | 24                      | 204         | 2,010   | 5.7%            |
| 191013 | Soil and Plant Scientists  | 43                          | 869                  | 518                     | 1,220       | 2,530   | 34.4%           |
| 191023 | Zoologists and Wildlife Biologists                                 | 30                          | 665                  | 357                     | 972         | 1,480   | 44.9%           |
| 191029 | Biological Scientists, All Other                                   | 10                          | 217                  | 19                      | 415         | *   | *               |
| 191031 | Conservation Scientists  | 90                          | 1,109                | 753                     | 1,466       | 1,770   | 62.7%           |
| 191032 | Foresters  | 20                          | 535                  | 192                     | 878         | 600   | 89.2%           |
| 192031 | Chemists   | 10                          | 247                  | 9                       | 485         | 1,990   | 12.4%           |
| 192041 | Environmental Scientists and Specialists, Including Health         | 54                          | 1,195                | 622                     | 1,769       | 2,710   | 44.1%           |
| 192042 | Geoscientists, Except Hydrologists and Geographers                 | 15                          | 139                  | 53                      | 224         | 1,040   | 13.3%           |
| 192043 | Hydrologists   | 43                          | 420                  | 224                     | 616         | *   | *               |
| 193051 | Urban and Regional Planners  | 15                          | 147                  | 17                      | 277         | 1,360   | 10.8%           |
| 194021 | Biological Technicians   | 7                           | 122                  | 10                      | 234         | 4,000   | 3.1%            |
| 194091 | Environmental Science and Protection Technicians, Including Health | 36                          | 485                  | 258                     | 712         | 1,240   | 39.1%           |
| 194093 | Forest and Conservation Technicians                                | 95                          | 1,971                | 1,196                   | 2,746       | *   | *               |
| 194099 | Life, Physical, and Social Science Technicians, All Other          | 19                          | 248                  | 99                      | 397         | 2,080   | 11.9%           |
| 251194 | Vocational Education Teachers, Postsecondary                       | 15                          | 329                  | 13                      | 645         | 5,460   | 6.0%            |
| 253021 | Self-Enrichment Education Teachers                                 | 31                          | 575                  | 146                     | 1,003       | 4,360   | 13.2%           |

## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation (continued)**

| Code   | Title  | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green** |
|--------|--|-----------------------------|----------------------|-------------------------|-------------|---|-----------------|
|        |  |                             |                      | Lower Bound             | Upper Bound |   |                 |
| 253099 | Teachers and Instructors, All Other  | 14                          | 536                  | 133                     | 939         | 22,730  | 2.4%            |
| 271021 | Commercial and Industrial Designers  | 16                          | 410                  | 148                     | 673         | *   | *               |
| 271025 | Interior Designers   | 8                           | 114                  | 4                       | 225         | 1,120   | 10.2%           |
| 273031 | Public Relations Specialists   | 41                          | 461                  | 253                     | 669         | 8,620   | 5.3%            |
| 292012 | Medical and Clinical Laboratory Technicians  | 23                          | 182                  | 72                      | 291         | 5,220   | 3.5%            |
| 299011 | Occupational Health and Safety Specialists   | 13                          | 81                   | 22                      | 140         | 2,050   | 3.9%            |
| 319091 | Dental Assistants  | 9                           | 550                  | 155                     | 945         | 11,300  | 4.9%            |
| 333031 | Fish and Game Wardens  | 9                           | 127                  | 26                      | 228         | *   | *               |
| 353011 | Bartenders   | 5                           | 183                  | 17                      | 348         | 24,590  | 0.7%            |
| 371011 | First-Line Supervisors of Housekeeping and Janitorial Workers                                | 14                          | 131                  | 22                      | 240         | 6,620   | 2.0%            |
| 371012 | First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers              | 31                          | 291                  | 129                     | 454         | 3,180   | 9.2%            |
| 372011 | Janitors and Cleaners, Except Maids and Housekeeping Cleaners                                | 64                          | 3,420                | 1,198                   | 5,642       | 78,180  | 4.4%            |
| 372012 | Maids and Housekeeping Cleaners  | 21                          | 731                  | 341                     | 1,120       | 36,640  | 2.0%            |
| 373011 | Landscaping and Groundskeeping Workers   | 98                          | 3,280                | 2,375                   | 4,185       | 29,200  | 11.2%           |
| 373012 | Pesticide Handlers, Sprayers, and Applicators, Vegetation                                    | 16                          | 607                  | 136                     | 1,078       | 2,580   | 23.5%           |
| 391021 | First-Line Supervisors of Personal Service Workers   | 9                           | 55                   | 10                      | 100         | 4,540   | 1.2%            |
| 411011 | First-Line Supervisors of Retail Sales Workers   | 27                          | 274                  | 143                     | 406         | 42,520  | 0.6%            |
| 412011 | Cashiers   | 6                           | 444                  | 35                      | 853         | 129,310   | 0.3%            |
| 412031 | Retail Salespersons  | 59                          | 3,707                | 2,381                   | 5,032       | 157,820   | 2.3%            |
| 413099 | Sales Representatives, Services, All Other   | 10                          | 211                  | 9                       | 413         | 14,010  | 1.5%            |
| 414011 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products        | 19                          | 239                  | 97                      | 381         | 12,560  | 1.9%            |
| 414012 | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 28                          | 630                  | 315                     | 945         | 52,050  | 1.2%            |
| 419099 | Sales and Related Workers, All Other   | 34                          | 745                  | 429                     | 1,061       | 3,210   | 23.2%           |
| 431011 | First-Line Supervisors of Office and Administrative Support Workers                          | 61                          | 555                  | 378                     | 733         | 38,990  | 1.4%            |
| 433031 | Bookkeeping, Accounting, and Auditing Clerks   | 19                          | 263                  | 83                      | 443         | 77,380  | 0.3%            |
| 434031 | Court, Municipal, and License Clerks   | 11                          | 86                   | 23                      | 148         | 5,220   | 1.6%            |
| 434051 | Customer Service Representatives   | 35                          | 451                  | 222                     | 681         | 86,840  | 0.5%            |
| 434171 | Receptionists and Information Clerks   | 13                          | 217                  | 77                      | 357         | 36,470  | 0.6%            |
| 435071 | Shipping, Receiving, and Traffic Clerks  | 20                          | 461                  | 144                     | 778         | 18,530  | 2.5%            |

## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation (continued)**

| Code   | Title   | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green** |
|--------|---|-----------------------------|----------------------|-------------------------|-------------|---|-----------------|
|        |   |                             |                      | Lower Bound             | Upper Bound |   |                 |
| 435081 | Stock Clerks and Order Fillers  | 17                          | 179                  | 56                      | 302         | 59,940  | 0.3%            |
| 436011 | Executive Secretaries and Administrative Assistants                     | 50                          | 686                  | 368                     | 1,004       | 36,390  | 1.9%            |
| 436014 | Secretaries, Except Legal, Medical, and Executive                       | 29                          | 530                  | 148                     | 911         | 77,720  | 0.7%            |
| 439011 | Computer Operators  | 7                           | 88                   | 18                      | 157         | 3,990   | 2.2%            |
| 439061 | Office Clerks, General  | 38                          | 772                  | 409                     | 1,135       | 84,170  | 0.9%            |
| 452091 | Agricultural Equipment Operators  | 11                          | 150                  | 47                      | 252         | *   | *               |
| 452092 | Farmworkers and Laborers, Crop, Nursery, and Greenhouse                 | 60                          | 1,363                | 772                     | 1,955       | 2,410   | 56.6%           |
| 452093 | Farmworkers, Farm, Ranch, and Aquacultural Animals                      | 67                          | 1,601                | 1,096                   | 2,106       | 3,390   | 47.2%           |
| 452099 | Agricultural Workers, All Other   | 9                           | 150                  | 23                      | 277         | *   | *               |
| 454011 | Forest and Conservation Workers   | 17                          | 580                  | 73                      | 1,087       | *   | *               |
| 471011 | First-Line Supervisors of Construction Trades and Extraction Workers    | 72                          | 1,710                | 932                     | 2,488       | 21,730  | 7.9%            |
| 472031 | Carpenters  | 64                          | 1,796                | 1,222                   | 2,371       | 35,900  | 5.0%            |
| 472051 | Cement Masons and Concrete Finishers                                    | 9                           | 494                  | 107                     | 880         | 12,020  | 4.1%            |
| 472061 | Construction Laborers   | 52                          | 2,493                | 1,525                   | 3,462       | 31,780  | 7.8%            |
| 472071 | Paving, Surfacing, and Tamping Equipment Operators                      | 11                          | 184                  | 11                      | 356         | 2,260   | 8.1%            |
| 472073 | Operating Engineers and Other Construction Equipment Operators          | 38                          | 782                  | 471                     | 1,094       | 22,320  | 3.5%            |
| 472111 | Electricians  | 143                         | 4,769                | 3,483                   | 6,054       | 24,800  | 19.2%           |
| 472121 | Glaziers  | 32                          | 1,385                | 632                     | 2,137       | 1,800   | 76.9%           |
| 472131 | Insulation Workers, Floor, Ceiling, and Wall                            | 48                          | 1,480                | 920                     | 2,039       | *   | *               |
| 472152 | Plumbers, Pipefitters, and Steamfitters                                 | 95                          | 2,484                | 1,740                   | 3,229       | 18,230  | 13.6%           |
| 472181 | Roofers   | 12                          | 602                  | 146                     | 1,059       | 4,430   | 13.6%           |
| 473013 | Helpers--Electricians   | 20                          | 414                  | 194                     | 634         | 2,080   | 19.9%           |
| 474011 | Construction and Building Inspectors                                    | 26                          | 218                  | 53                      | 384         | 2,300   | 9.5%            |
| 474041 | Hazardous Materials Removal Workers                                     | 39                          | 1,392                | 633                     | 2,151       | *   | *               |
| 474071 | Septic Tank Servicers and Sewer Pipe Cleaners                           | 12                          | 280                  | 92                      | 468         | 1,460   | 19.2%           |
| 474099 | Construction and Related Workers, All Other                             | 35                          | 688                  | 421                     | 954         | *   | *               |
| 475013 | Service Unit Operators, Oil, Gas, and Mining                            | 5                           | 117                  | 1                       | 234         | *   | *               |
| 475021 | Earth Drillers, Except Oil and Gas                                      | 12                          | 289                  | 81                      | 497         | 1,370   | 21.1%           |
| 475071 | Roustabouts, Oil and Gas  | 15                          | 633                  | 184                     | 1,083       | *   | *               |
| 491011 | First-Line Supervisors/Managers of Mechanics, Installers, and Repairers | 71                          | 558                  | 388                     | 729         | 15,610  | 3.6%            |

## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation (continued)**

| Code   | Title  | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green** |
|--------|--|-----------------------------|----------------------|-------------------------|-------------|---|-----------------|
|        |  |                             |                      | Lower Bound             | Upper Bound |   |                 |
| 493021 | Automotive Body and Related Repairers  | 12                          | 253                  | 92                      | 415         | 6,110   | 4.1%            |
| 493023 | Automotive Service Technicians and Mechanics                                     | 55                          | 1,821                | 1,087                   | 2,554       | 23,220  | 7.8%            |
| 493041 | Farm Equipment Mechanics   | 20                          | 639                  | 130                     | 1,148       | 5,180   | 12.3%           |
| 499021 | Heating, Air Conditioning, and Refrigeration Mechanics and Installers            | 221                         | 6,722                | 5,610                   | 7,835       | 8,850   | 76.0%           |
| 499031 | Home Appliance Repairers   | 11                          | 298                  | 81                      | 516         | 1,460   | 20.4%           |
| 499041 | Industrial Machinery Mechanics   | 15                          | 206                  | 72                      | 339         | 13,000  | 1.6%            |
| 499042 | Maintenance and Repair Workers, General  | 167                         | 3,895                | 2,868                   | 4,923       | 41,660  | 9.4%            |
| 499043 | Maintenance Workers, Machinery   | 5                           | 72                   | 2                       | 143         | 3,590   | 2.0%            |
| 499051 | Electrical Power-Line Installers and Repairers                                   | 11                          | 246                  | 23                      | 470         | 6,190   | 4.0%            |
| 499099 | Installation, Maintenance, and Repair Workers, All Other                         | 77                          | 2,544                | 789                     | 4,298       | 4,110   | 61.9%           |
| 511011 | First-Line Supervisors/Managers of Production and Operating Workers              | 169                         | 2,413                | 1,557                   | 3,269       | 22,960  | 10.5%           |
| 514011 | Computer-Controlled Machine Tool Operators, Metal and Plastic                    | 6                           | 82                   | 11                      | 153         | 4,200   | 1.9%            |
| 514041 | Machinists   | 12                          | 164                  | 47                      | 281         | 14,950  | 1.1%            |
| 514081 | Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic         | 10                          | 407                  | 93                      | 721         | *   | *               |
| 514121 | Welders, Cutters, Solderers, and Brazers   | 26                          | 1,020                | 458                     | 1,582       | 21,760  | 4.7%            |
| 517041 | Sawing Machine Setters, Operators, and Tenders, Wood                             | 8                           | 147                  | 15                      | 278         | 2,010   | 7.3%            |
| 518013 | Power Plant Operators  | 14                          | 95                   | 30                      | 160         | *   | *               |
| 518021 | Stationary Engineers and Boiler Operators  | 13                          | 140                  | 58                      | 223         | 1,470   | 9.6%            |
| 518031 | Water and Liquid Waste Treatment Plant and System Operators                      | 189                         | 2,774                | 2,123                   | 3,426       | 5,720   | 48.5%           |
| 518091 | Chemical Plant and System Operators  | 17                          | 506                  | 203                     | 809         | *   | *               |
| 518099 | Plant and System Operators, All Other  | 11                          | 211                  | 45                      | 377         | *   | *               |
| 519032 | Cutting and Slicing Machine Setters, Operators, and Tenders                      | 10                          | 88                   | 20                      | 156         | 2,830   | 3.1%            |
| 519041 | Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Ten | 8                           | 169                  | 6                       | 332         | 2,730   | 6.2%            |
| 519061 | Inspectors, Testers, Sorters, Samplers, and Weighers                             | 27                          | 591                  | 250                     | 931         | 14,690  | 4.0%            |
| 519111 | Packaging and Filling Machine Operators and Tenders                              | 9                           | 125                  | 33                      | 216         | 13,250  | 0.9%            |
| 519121 | Coating, Painting, and Spraying Machine Setters, Operators, and Tenders          | 9                           | 212                  | 19                      | 405         | *   | *               |

## Appendix C: Detailed Data Tables

**Table C1: Green Jobs by Detailed Occupation (continued)**

| Code   | Title  | Number of Surveys Reporting | Number of Green Jobs | 95% Confidence Interval |             | Total Employment in Occupation Across Full Consortium** | Percent Green** |
|--------|--|-----------------------------|----------------------|-------------------------|-------------|---|-----------------|
|        |  |                             |                      | Lower Bound             | Upper Bound |   |                 |
| 519122 | Painters, Transportation Equipment   | 7                           | 61                   | 9                       | 113         | 1,190   | 5.1%            |
| 519199 | Production Workers, All Other  | 147                         | 8,064                | 4,807                   | 11,321      | *   | *               |
| 531021 | First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand                     | 20                          | 241                  | 74                      | 408         | 5,800   | 4.2%            |
| 531031 | First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators | 11                          | 87                   | 21                      | 152         | 7,070   | 1.2%            |
| 533031 | Driver/Sales Workers   | 9                           | 457                  | 87                      | 826         | 13,830  | 3.3%            |
| 533032 | Truck Drivers, Heavy and Tractor-Trailer   | 68                          | 2,390                | 1,517                   | 3,263       | 99,160  | 2.4%            |
| 533033 | Truck Drivers, Light or Delivery Services  | 17                          | 392                  | 168                     | 615         | 30,340  | 1.3%            |
| 537032 | Excavating and Loading Machine and Dragline Operators                                      | 6                           | 90                   | 9                       | 171         | 4,250   | 2.1%            |
| 537062 | Laborers and Freight, Stock, and Material Movers, Hand                                     | 95                          | 4,180                | 2,867                   | 5,494       | 70,900  | 5.9%            |
| 537081 | Refuse and Recyclable Material Collectors  | 96                          | 2,808                | 1,337                   | 4,279       | 4,940   | 56.8%           |
| 537121 | Tank Car, Truck, and Ship Loaders  | 5                           | 65                   | 3                       | 126         | *   | *               |

## Appendix C: Detailed Data Tables

**Table C2: Percent of Work Time Spent in Green Activities by Detailed Occupation**

| Code   | Title  | Percent of Time Spent in Green Activities |           |      |              |
|--------|--|---|-----------|------|--------------|
|        |  | 1 to 49%                                  | 50 to 99% | 100% | Not Reported |
| 000000 | Total  | 41%                                       | 22%       | 26%  | 12%          |
| 111011 | Chief Executives   | 40%                                       | 29%       | 25%  |              |
| 111021 | General and Operations Managers  | 42%                                       | 25%       | 25%  | 9%           |
| 112021 | Marketing Managers   | 40%                                       |           |      |              |
| 112031 | Public Relations and Fundraising Managers  | 59%                                       |           |      |              |
| 113011 | Administrative Services Managers   | 53%                                       |           |      |              |
| 113031 | Financial Managers   | 24%                                       |           |      |              |
| 113071 | Transportation, Storage, and Distribution Managers   | 86%                                       |           |      |              |
| 119011 | Farm, Ranch, and Other Agricultural Managers   | 31%                                       | 44%       | 14%  |              |
| 119012 | Farmers and Ranchers   | 36%                                       |           | 36%  |              |
| 119021 | Construction Managers  | 75%                                       | 13%       | 6%   |              |
| 119041 | Architectural and Engineering Managers   | 53%                                       |           |      |              |
| 119121 | Natural Sciences Managers  | 33%                                       |           | 30%  |              |
| 119199 | Managers, All Other  | 25%                                       | 2%        | 3%   | 70%          |
| 131023 | Purchasing Agents, Except Wholesale, Retail, and Farm Products                               | 21%                                       |           |      |              |
| 131041 | Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation | 42%                                       |           | 15%  |              |
| 131081 | Logisticians   | 81%                                       |           |      |              |
| 131199 | Business Operations Specialists, All Other   | 31%                                       | 26%       | 36%  |              |
| 132011 | Accountants and Auditors   |   |           | 15%  |              |
| 171011 | Architects, Except Landscape and Naval   | 37%                                       | 36%       | 23%  |              |
| 171012 | Landscape Architects   | 40%                                       | 33%       |      |              |
| 171022 | Surveyors  | 71%                                       |           |      |              |
| 172051 | Civil Engineers  | 66%                                       | 14%       | 17%  |              |
| 172071 | Electrical Engineers   | 52%                                       | 36%       |      |              |
| 172081 | Environmental Engineers  | 38%                                       | 35%       | 20%  |              |
| 172141 | Mechanical Engineers   | 41%                                       | 53%       |      |              |
| 173011 | Architectural and Civil Drafters   | 62%                                       | 27%       |      |              |
| 173012 | Electrical and Electronics Drafters  | 100%                                      |           |      |              |
| 173022 | Civil Engineering Technicians  | 58%                                       | 38%       |      |              |
| 173025 | Environmental Engineering Technicians  | 36%                                       | 47%       | 17%  |              |
| 191013 | Soil and Plant Scientists  | 35%                                       | 29%       | 35%  |              |
| 191023 | Zoologists and Wildlife Biologists   | 56%                                       | 30%       | 14%  |              |
| 191031 | Conservation Scientists  | 20%                                       | 51%       | 29%  |              |
| 191032 | Foresters  |   | 58%       |      |              |

## Appendix C: Detailed Data Tables

**Table C2: Percent of Work Time Spent in Green Activities by Detailed Occupation (continued)**

| Code   | Title  | Percent of Time Spent in Green Activities |           |      |              |
|--------|--|---|-----------|------|--------------|
|        |  | 1 to 49%                                  | 50 to 99% | 100% | Not Reported |
| 192041 | Environmental Scientists and Specialists, Including Health                                   | 44%                                       | 39%       | 17%  |              |
| 192042 | Geoscientists, Except Hydrologists and Geographers   | 15%                                       |           | 36%  |              |
| 192043 | Hydrologists   | 14%                                       | 62%       | 11%  | 13%          |
| 193051 | Urban and Regional Planners  | 26%                                       |           |      |              |
| 194021 | Biological Technicians   |   | 100%      |      |              |
| 194091 | Environmental Science and Protection Technicians, Including Health                           | 30%                                       | 46%       | 23%  |              |
| 194093 | Forest and Conservation Technicians  | 28%                                       | 47%       | 23%  |              |
| 194099 | Life, Physical, and Social Science Technicians, All Other                                    |   |           | 61%  |              |
| 251194 | Vocational Education Teachers, Postsecondary   | 55%                                       |           |      |              |
| 253021 | Self-Enrichment Education Teachers   | 72%                                       |           |      |              |
| 253099 | Teachers and Instructors, All Other  | 29%                                       |           |      |              |
| 271021 | Commercial and Industrial Designers  | 43%                                       |           |      |              |
| 273031 | Public Relations Specialists   | 16%                                       | 22%       | 29%  | 33%          |
| 292012 | Medical and Clinical Laboratory Technicians  |   | 7%        | 69%  |              |
| 299011 | Occupational Health and Safety Specialists   | 71%                                       |           |      |              |
| 319091 | Dental Assistants  | 100%                                      |           |      |              |
| 333031 | Fish and Game Wardens  | 61%                                       |           |      |              |
| 371011 | First-Line Supervisors of Housekeeping and Janitorial Workers                                | 43%                                       |           |      |              |
| 371012 | First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping                      | 47%                                       | 49%       |      |              |
| 372011 | Janitors and Cleaners, Except Maids and Housekeeping Cleaners                                | 41%                                       |           | 17%  |              |
| 372012 | Maids and Housekeeping Cleaners  | 46%                                       | 32%       |      |              |
| 373011 | Landscaping and Groundskeeping Workers   | 28%                                       | 29%       | 29%  | 14%          |
| 411011 | First-Line Supervisors of Retail Sales Workers   | 80%                                       |           |      |              |
| 412011 | Cashiers   | 92%                                       |           |      |              |
| 412031 | Retail Salespersons  | 31%                                       | 15%       | 34%  | 20%          |
| 414011 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products        | 32%                                       | 47%       | 20%  |              |
| 414012 | Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 45%                                       |           | 47%  |              |
| 419099 | Sales and Related Workers, All Other   | 49%                                       | 32%       | 19%  |              |
| 431011 | First-Line Supervisors of Office and Administrative Support Workers                          | 63%                                       |           | 16%  |              |
| 433031 | Bookkeeping, Accounting, and Auditing Clerks   | 32%                                       |           |      |              |
| 434031 | Court, Municipal, and License Clerks   | 58%                                       |           |      |              |
| 434051 | Customer Service Representatives   | 44%                                       |           | 26%  |              |
| 434171 | Receptionists and Information Clerks   | 30%                                       |           |      |              |

## Appendix C: Detailed Data Tables

**Table C2: Percent of Work Time Spent in Green Activities by Detailed Occupation (continued)**

| Code   | Title   | Percent of Time Spent in Green Activities |           |      |              |
|--------|---|---|-----------|------|--------------|
|        |   | 1 to 49%                                  | 50 to 99% | 100% | Not Reported |
| 435071 | Shipping, Receiving, and Traffic Clerks   | 44%                                       |           |      |              |
| 435081 | Stock Clerks and Order Fillers  | 77%                                       |           | 19%  |              |
| 436011 | Executive Secretaries and Executive Administrative Assistants                   | 57%                                       | 19%       | 19%  |              |
| 436014 | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive |   |           | 27%  |              |
| 439011 | Computer Operators  |   |           | 80%  |              |
| 439061 | Office Clerks, General  | 74%                                       | 16%       |      |              |
| 452091 | Agricultural Equipment Operators  |   |           | 36%  |              |
| 452092 | Farmworkers and Laborers, Crop, Nursery, and Greenhouse                         | 35%                                       | 22%       | 37%  |              |
| 452093 | Farmworkers, Farm, Ranch, and Aquacultural Animals                              | 27%                                       | 19%       | 24%  | 30%          |
| 471011 | First-Line Supervisors of Construction Trades and Extraction Workers            | 53%                                       | 39%       | 7%   |              |
| 472031 | Carpenters  | 63%                                       | 22%       |      |              |
| 472061 | Construction Laborers   | 51%                                       | 32%       |      |              |
| 472073 | Operating Engineers and Other Construction Equipment Operators                  | 27%                                       | 45%       | 27%  |              |
| 472111 | Electricians  | 75%                                       | 14%       | 10%  |              |
| 472121 | Glaziers  | 51%                                       | 20%       | 26%  | 3%           |
| 472131 | Insulation Workers, Floor, Ceiling, and Wall                                    | 40%                                       | 21%       | 34%  |              |
| 472152 | Plumbers, Pipefitters, and Steamfitters   | 68%                                       | 17%       | 14%  |              |
| 473013 | Helpers--Electricians   | 68%                                       |           |      |              |
| 474011 | Construction and Building Inspectors  | 82%                                       |           |      |              |
| 474041 | Hazardous Materials Removal Workers   | 34%                                       |           | 37%  |              |
| 474071 | Septic Tank Servicers and Sewer Pipe Cleaners                                   |   |           | 68%  |              |
| 474099 | Construction and Related Workers, All Other                                     | 64%                                       |           | 26%  |              |
| 475021 | Earth Drillers, Except Oil and Gas  | 32%                                       |           |      |              |
| 475071 | Roustabouts, Oil and Gas  |   | 47%       |      |              |
| 491011 | First-Line Supervisors of Mechanics, Installers, and Repairers                  | 71%                                       | 18%       | 8%   |              |
| 493021 | Automotive Body and Related Repairers   |   | 44%       |      |              |
| 493023 | Automotive Service Technicians and Mechanics                                    | 60%                                       | 26%       |      |              |
| 499021 | Heating, Air Conditioning, and Refrigeration Mechanics and Installers           | 48%                                       | 37%       | 11%  |              |
| 499031 | Home Appliance Repairers  | 63%                                       |           |      |              |
| 499041 | Industrial Machinery Mechanics  | 64%                                       |           |      |              |
| 499071 | Maintenance and Repair Workers, General   | 79%                                       | 8%        | 12%  |              |
| 499099 | Installation, Maintenance, and Repair Workers, All Other                        |   | 15%       | 20%  |              |
| 511011 | First-Line Supervisors of Production and Operating Workers                      | 18%                                       | 22%       | 54%  | 6%           |
| 514121 | Welders, Cutters, Solderers, and Brazers  | 21%                                       | 40%       | 39%  |              |
| 518013 | Power Plant Operators   | 54%                                       |           |      |              |

## Appendix C: Detailed Data Tables

**Table C2: Percent of Work Time Spent in Green Activities by Detailed Occupation (continued)**

| Code   | Title  | Percent of Time Spent in Green Activities |           |      |              |
|--------|--|---|-----------|------|--------------|
|        |  | 1 to 49%                                  | 50 to 99% | 100% | Not Reported |
| 518021 | Stationary Engineers and Boiler Operators  |   |           | 49%  |              |
| 518031 | Water and Liquid Waste Treatment Plant and System Operators                                | 38%                                       | 28%       | 31%  |              |
| 518091 | Chemical Plant and System Operators  |   |           | 71%  |              |
| 519061 | Inspectors, Testers, Sorters, Samplers, and Weighers                                       | 48%                                       |           | 38%  |              |
| 519199 | Production Workers, All Other  | 50%                                       | 9%        | 38%  | 4%           |
| 531021 | First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand                     | 71%                                       |           | 22%  |              |
| 531031 | First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators | 78%                                       |           |      |              |
| 533031 | Driver/Sales Workers   |   | 65%       |      |              |
| 533032 | Truck Drivers, Heavy and Tractor-Trailer   | 33%                                       | 19%       | 37%  | 10%          |
| 533033 | Truck Drivers, Light or Delivery Services  | 30%                                       |           | 42%  |              |
| 537062 | Laborers and Freight, Stock, and Material Movers, Hand                                     | 32%                                       | 35%       | 30%  |              |
| 537081 | Refuse and Recyclable Material Collectors  | 14%                                       | 14%       | 70%  |              |

## Appendix C: Detailed Data Tables

**Table C3: Projected Consortium Annual Labor Needs for Green Jobs**

| Occupation  | Annual Job Growth | Annual Replacement Needs | Total Annual Openings |
|---|-------------------|--------------------------|-----------------------|
| 511011 First-Line Supervisors of Production and Operating Workers                                   | 15.5              | 31.4                     | 46.9                  |
| 452092 Farmworkers and Laborers, Crop, Nursery, and Greenhouse                                      | 2.6               | 38.1                     | 40.7                  |
| 493023 Automotive Service Technicians and Mechanics   | 9.4               | 29.7                     | 39.1                  |
| 514121 Welders, Cutters, Solderers, and Brazers   | 10.6              | 28.5                     | 39.1                  |
| 472121 Glaziers   | 10.2              | 28.1                     | 38.3                  |
| 131199 All Other Business Operations Specialists  | 8.8               | 28.8                     | 37.6                  |
| 472031 Carpenters   | 15.2              | 17.8                     | 33.0                  |
| 191013 Soil and Plant Scientists  | 5.8               | 25.1                     | 31.0                  |
| 111011 Chief Executives   | 2.5               | 24.6                     | 27.0                  |
| 412011 Cashiers   | 1.8               | 24.7                     | 26.4                  |
| 119021 Construction Managers  | 20.1              | 6.2                      | 26.3                  |
| 172081 Environmental Engineers  | 13.6              | 11.4                     | 25.0                  |
| 319091 Dental Assistants  | 15.7              | 8.6                      | 24.3                  |
| 253021 Self-Enrichment Education Teachers   | 15.8              | 8.0                      | 23.8                  |
| 434051 Customer Service Representatives   | 7.6               | 13.0                     | 20.6                  |
| 172199 All Other Engineers  | 8.1               | 12.4                     | 20.5                  |
| 472073 Operating Engineers and Other Construction Equipment Operators                               | 9.3               | 10.9                     | 20.2                  |
| 194091 Environmental Science and Protection Technicians, Including Health                           | 6.4               | 13.0                     | 19.4                  |
| 472051 Cement Masons and Concrete Finishers   | 7.1               | 11.6                     | 18.7                  |
| 172141 Mechanical Engineers   | 4.6               | 13.9                     | 18.5                  |
| 419099 All Other Sales and Related Workers  | 3.9               | 14.6                     | 18.5                  |
| 273031 Public Relations Specialists   | 8.1               | 10.0                     | 18.1                  |
| 414012 Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | 4.6               | 13.0                     | 17.5                  |
| 173025 Environmental Engineering Technicians  | 8.0               | 8.9                      | 16.9                  |
| 473013 Helpers--Electricians  | 8.2               | 8.4                      | 16.6                  |
| 372012 Maids and Housekeeping Cleaners  | 5.0               | 11.3                     | 16.3                  |
| 439061 Office Clerks, General   | 6.8               | 9.4                      | 16.3                  |
| 131041 Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation | 12.3              | 3.8                      | 16.1                  |
| 431011 First-Line Supervisors of Office and Administrative Support Workers                          | 4.7               | 10.6                     | 15.3                  |
| 491011 First-Line Supervisors of Mechanics, Installers, and Repairers                               | 2.8               | 12.3                     | 15.1                  |
| 436011 Executive Secretaries and Executive Administrative Assistants                                | 6.0               | 8.8                      | 14.9                  |
| 191023 Zoologists and Wildlife Biologists   | 2.3               | 12.4                     | 14.7                  |
| 132011 Accountants and Auditors   | 8.4               | 6.2                      | 14.6                  |
| 519061 Inspectors, Testers, Sorters, Samplers, & Weighers   | 4.4               | 9.7                      | 14.2                  |

## Appendix C: Detailed Data Tables

**Table C3: Projected Consortium Annual Labor Needs for Green Jobs (continued)**

| Occupation  | Annual Job Growth | Annual Replacement Needs | Total Annual Openings |
|---|-------------------|--------------------------|-----------------------|
| 172071 Electrical Engineers                                     | 3.8               | 9.5                      | 13.3                  |
| 493041 Farm Equipment Mechanics                                 | 4.0               | 9.2                      | 13.2                  |
| 472181 Roofers  | 4.1               | 8.3                      | 12.4                  |
| 253099 All Other Teachers and Instructors                       | 5.0               | 7.2                      | 12.3                  |
| 194099 All Other Life, Physical, and Social Science Technicians | 1.9               | 10.2                     | 12.1                  |
| 173011 Architectural and Civil Drafters                         | 3.9               | 7.9                      | 11.8                  |
| 435071 Shipping, Receiving, and Traffic Clerks                  | 1.0               | 10.7                     | 11.7                  |
| 192043 Hydrologists   | 3.3               | 8.0                      | 11.3                  |
| 373012 Pesticide Handler, Sprayer, & Applicator, Vegetation     | 6.2               | 4.1                      | 10.3                  |

# Appendix D: Educational Resources, Licenses, Certificates, and Training Programs in the Green Jobs Field

This Appendix identifies the various educational programs and training opportunities available in the six state consortium for those interested in employment in green careers.



# Iowa Green Curriculum



### Green Curriculum

| <u>Green Sector</u>        | <u>Page Number</u> |
|----------------------------|--------------------|
| Solar                      | 158                |
| Wind                       | 160                |
| Biomass                    | 171                |
| Water                      | 177                |
| Water reclamation          | 182                |
| Air pollution              | 184                |
| Recycling, waste, clean up | 185                |
| Retrofitting               | 190                |
| Green design and build     | 196                |
| Sustainable agriculture    | 205                |
| Transportation technology  | 207                |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|--|---|-------------|-------------------------|---|---|
| <b>Solar</b>   |   |             |                         |   |   |
| Solar Energy Applications and Issues                     | This course covers a wide variety of topics providing a substantial overview of solar energy, its use, and the ramifications of this use. It will include a review of history and driving forces for the economic development of solar energy. Both large scale and small scale solar operations will be included, along with location concerns, connections to the power grid and issues of power distribution and transmission.   | Credit      | 2                       | University of Northern Iowa             | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Photovoltaic and Hybrid Electrical Systems               | The Photo-voltaic and Hybrid Electrical systems course will provide students with the opportunity to size, construct, maintain, and analyze residential or commercial sized hybrid systems. Students will gain first hand experience working with electrical energy systems consisting of wind generators, hydrogen fuel cells, photo-voltaic arrays, battery storage systems, back-up generators, inverters and system controllers.  | Credit      | 2                       | Iowa Central Community College          | <a href="http://www.iowacentral.edu/industry_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industry_technology/programs/energy/schedule.asp</a>       |
| M E 540: Solar Energy Systems                            | Prereq: 436. Application of heat transfer, thermodynamics, and photovoltaics to the design and analysis of solar energy collectors and systems.   | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Energy Systems Design                                    | Principles and design of energy conversion systems, including solar, wind, and geothermal power systems; design of thermal-fluid system components, modeling and simulation of systems, optimization techniques; design projects.   | Credit      | 3                       | University of Iowa                      | <a href="http://www.mie.engineering.uiowa.edu">http://www.mie.engineering.uiowa.edu</a>   |
| Renewable Energy Systems Specialist AAS Program          | Renewable Energy Systems Specialists are responsible for installing, maintaining, and troubleshooting photovoltaic systems and wind turbines. People in this position need a strong electro-mechanical background and therefore will receive such training. Renewable Energy System Specialists need to be able to analyze a site, install equipment and have working knowledge of electrical systems, pumps and motors related to renewable energies. A career in renewable energy systems generally requires a minimum of two years college education. Some renewable energy systems programs are longer in length and may culminate in a baccalaureate degree. However, for a technician-level position, a two-year degree is most common. | Credit      | 66                      | Eastern Iowa Community College District | <a href="http://www.eicc.edu/highschool/programs/career/environmental/energy/index.html">http://www.eicc.edu/highschool/programs/career/environmental/energy/index.html</a> |
| Renewable Energy Technology - AAS Degree                 | Renewable Energy Technology is a 21-month (seven-term) program that will give students conceptual as well as hands-on training in technology and practices used in the solar and wind energy field. This program focuses on renewable energy equipment, production, distribution and control with an emphasis on solar and wind power. Geothermal energy transfer will be included. Students meeting all program and graduation requirements receive an Associate of Applied Science degree.  | Credit      | 78                      | Indian Hills Community College          | <a href="http://www.indianhills.edu/courses/tech/renewenergy.html">http://www.indianhills.edu/courses/tech/renewenergy.html</a>   |
| Solar Energy   | We offer a variety of classes in solar energy to help you gain an understanding of these systems.   | Non-Credit  | 32                      | Western Iowa Tech Community College     | <a href="http://www.witcc.com/continuing_ed/mechanical.cfm">http://www.witcc.com/continuing_ed/mechanical.cfm</a>   |
| Green - Fundamentals of Solar Hot Water Heating - Online | This online course concentrates on the basics of installing code compliant solar hot water systems. This course will be useful for people who currently work in or plan to be employed in the solar hot water industry. Student technicians will learn practical design criteria, installation guidelines, safety issues, maintenance, and legal considerations of solar hot water heating systems. This Renewable Energy Technician course is designed to follow the Task Analyses developed by committees of subject matter experts and adopted by the North American Board of Energy Practitioners and in accordance with the Interstate Renewable Energy Council.   | Non-Credit  | 60                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                  | Course Description  | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|--|---|-------------|-------------------------|--------------------------------|---|
| <b>Wind</b>                                  |   |             |                         |                                |   |
| Electric Generators and Co-Generation Energy | The Co-Generation of Energy course will provide students with the opportunity to study ways that industry will improve their use of energy utilization. Students will gain first hand experience working with steam turbine generators, boilers, and internal combustion engines using the engines waste heat.  | Credit      | 2                       | Iowa Central Community College | <a href="http://www.iowa-central.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowa-central.edu/industrial_technology/programs/energy/schedule.asp</a> |
| Wind Energy Workplace Safety                 | Wind Energy Workplace Safety provides a framework for students to develop a thorough understanding of safety requirements in the wind energy workplace, the reason for these requirements, and how to determine if individuals and facilities are meeting those requirements. Emphasis is placed on requirements unique to wind energy worksites.   | Credit      | 2                       | Iowa Western Community College | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |
| Wind Energy Applications in Iowa             | This course develops an understanding of wind energy with respect to environmental, political, economic and technological issues.   | Credit      | 2                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Applications of Alternative Energy           | The Applications of Alternative Energy course will provide students with the opportunity to study the various new and experimental forms of energy production in a hands-on setting. The course is designed to cover aspects of energy production not otherwise taught in their main course of study. Students will gain first hand experience working with hydrogen production, pyrolysis (producing oil and gas from garbage and heat), bio-diesel production, wind turbines, geothermal power, solar power, conventional and fixed-plate methane digesters, bio-mass fuel, sterling engines, "rocket stoves," ethanol distillation, and several other newer and experimental types of energy production. A philosophical overview and discussion of Javon's Paradox will be given as well.               | Credit      | 3                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp</a>   |
| Fundamentals of Wind Turbines                | The goal of this course is to learn how to apply fundamental principles of thermodynamics, fluid mechanics and mechanical systems to wind turbine engineering. Fundamentals of horizontal-axis wind turbines will be emphasized: wind energy conversion to useful work; wind turbine aerodynamics; performance; design of wind turbine components. An overview of wind resource and historical development of wind turbines, and introduction of wind turbine installation and wind farm operation will also be covered. Term project is an integral part of this course: students will form 3-member teams and conduct a term project that applies fundamental principles to wind turbines. The term project could be a computational or design/demonstration project of nature, and of the team's choice. | Credit      | 3                       | University of Iowa             | <a href="http://www.registrar.uiowa.edu/registrar/catalog/">http://www.registrar.uiowa.edu/registrar/catalog/</a>   |
| Wind Turbines                                | The Wind Turbines course will introduce students to the types of wind turbines, their development and their current status will be presented. The evolution of current models/sizes offered by existing companies will be traced from earlier models/sizes. The operating experiences, track record and number of turbines, in operation will be evaluated for the major players in the industry. Students will be expected to carry out research and present reports on selected turbines or wind turbine manufactures.  | Credit      | 3                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp</a>   |
| Energy Research Project                      | This course will provide students the opportunity to research and analyze energy consuming, conversion or producing systems. Students are expected to choose an energy project area construct or utilize a working model to perform laboratory analysis to either analyze and improve the efficiency an energy consumptive system or determine the best utilization of an energy producing system. This is a capstone course and students are expected to prepare a report with a detailed analysis, a presentation with measured graphical representations and live real-time interfaces to perform laboratory analysis of analog physical measurements of energy systems.   | Credit      | 3                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp</a>   |
| Wind Turbine Components                      | The Wind Turbine Components course will explain the function and analyze the operation of the generator, field and armature working relationships to phase and frequency controllers. Feed-forward and feedback controls with axis and yaw and twist counters. Tower alignment, stress points and maintenance procedures will also be studied. Computer control and analysis systems pressure, temperature, direction and velocity sensor inputs along analog, digital, encoder, counter, and proportional inputs will be studied.  | Credit      | 3                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|---|-------------|-------------------------|--|---|
| Introduction to Programmable Logic Controllers  | Introduction to Programmable Logic Controllers gives students experience with programmable devices commonly used in the wind energy industry. Students will study the theory of PLC operation and use their understanding to create and troubleshoot programs.  | Credit      | 3                       | Iowa Western Community College             | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |
| Introduction to Wind Energy   | Introduction to Wind Energy provides students an overview of the wind energy industry. The development, construction, and operation of wind farms will be studied, with emphasis on the operation and maintenance of wind turbines. Students will examine wind turbines in detail and develop a familiarity with standard procedures, tools, and subsystems that comprise the wind turbine.   | Credit      | 3                       | Iowa Western Community College             | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |
| Introduction to Wind Energy   | This course will expose students to the many facets of the wind industry. It will cover the history and development of the wind industry, terminology, turbine application, environmental and economic issues, the future of the wind industry, and other related topics.   | Credit      | 3                       | Western Iowa Tech Community College        | <a href="http://www.witcc.edu/programs/program.cfm?id=197&amp;CFID=12027606&amp;CFTOKEN=98231517">http://www.witcc.edu/programs/program.cfm?id=197&amp;CFID=12027606&amp;CFTOKEN=98231517</a>   |
| Introduction to Wind Energy   | This course will cover the history and development of the wind industry, terminology used in the industry, types and applications of various wind turbines, environmental and economic issues of the wind industry, the future of the wind industry, other topics that are appropriate.   | Credit      | 3                       | Northeast Iowa Community College Calmar    | <a href="http://www.nicc.edu/index.php?option=com_program&amp;task=course_detail&amp;course_id=WTT-103&amp;credit=3.00">http://www.nicc.edu/index.php?option=com_program&amp;task=course_detail&amp;course_id=WTT-103&amp;credit=3.00</a> |
| Introduction to Wind Energy Course  | To provide the student with knowledge of common terminology and general information related to the wind industry. The student will become familiar with the various types of turbines, the technology, sectors, jobs and organizations as well as an outlook on the future of the wind industry.  | Credit      | 3                       | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/pibs/documents/indelmtech.pdf">http://go.dmacc.edu/pibs/documents/indelmtech.pdf</a>   |
| Airfoils and Composite Repair Course  | This course (WTT 223) will enable the student to inspect, repair, and move/transport wind turbine blades. Students will understand common industry terms used in the manufacture and repair of wind turbine blades. This course is offered on the Carroll and Ankeny campuses   | Credit      | 3                       | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/programs/windenergy/Pages/welcome.aspx">http://go.dmacc.edu/programs/windenergy/Pages/welcome.aspx</a>   |
| Wind Power Management   | The course introduces principles of wind power production, design of wind turbines, location and design of wind farms, control of turbines and wind farms, predictive modeling, diagnostics, operations and maintenance, condition monitoring, health monitoring and of turbine components and systems, wind farm performance optimization, and integration of wind power with a grid. The modeling and analysis aspect of the topics discussed in the class will be illustrated with examples and case studies.  | Credit      | 3                       | University of Iowa                         | <a href="http://www.mie.engineering.uiowa.edu">http://www.mie.engineering.uiowa.edu</a>   |
| Energy Systems Design   | Principles and design of energy conversion systems, including solar, wind, and geothermal power systems; design of thermal-fluid system components, modeling and simulation of systems, optimization techniques; design projects.   | Credit      | 3                       | University of Iowa                         | <a href="http://www.mie.engineering.uiowa.edu">http://www.mie.engineering.uiowa.edu</a>   |
| Eng Analysis Alternative Energy Systems   | Engineering and sustainability analyses of conventional and emerging energy technologies; alternative energy sources, including biomass, wind, solar, geothermal; alternative energy carriers (transportation fuels), including varied biofuels, hydrogen, natural gas, ammonia. Prerequisite: 059:009.   | Credit      | 3                       | University of Iowa                         | <a href="http://www.cbe.engineering.uiowa.edu/">http://www.cbe.engineering.uiowa.edu/</a>   |
| Contemporary Topics in Electrical and Computer Engineering: Energy Harvesting, Solar, Wind, and Ocean Energy Conversion Systems | Also called energy scavenging, energy harvesting captures, stores, and uses energy sources by employing interfaces, storage devices, and other units. Unlike conventional electric power generation systems, renewable energy harvesting does not use fossil fuels and the generation units can be decentralized, thereby significantly reducing transmission and distribution losses. But advanced technical methods must be developed to increase the efficiency of devices in harvesting energy from environmentally friendly resources and converting them into electrical energy. Recognizing this need, *Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems* describes various energy harvesting technologies, different topologies, and many types of power electronic interfaces for stand-alone utilization or grid connection of energy harvesting applications. | Credit      | 3                       | University of Iowa                         | <a href="http://www.registrar.uiowa.edu/registrar/catalog/">http://www.registrar.uiowa.edu/registrar/catalog/</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name          | Contact Website   |
|---|--|-------------|-------------------------|-----------------------|---|
| Engineering Analysis of Alternative Energy Systems                  | Engineering and sustainability analyses of conventional and emerging energy technologies; alternative energy sources, including biomass, wind, solar, geothermal; alternative energy carriers (transportation fuels), including varied biofuels, hydrogen, natural gas, ammonia.   | Credit      | 3                       | University of Iowa    | <a href="http://www.cbe.engineering.uiowa.edu/">http://www.cbe.engineering.uiowa.edu/</a> |
| E E 351: Introduction to Energy Systems: An Engineering Perspective | Energy-scientific, engineering and economic foundations. Energy utilization-global and national. Sectoral analysis of energy consumption. Relationship of energy consumption and production to economic growth and environment. Technology for energy production. Economic evaluation of energy utilization and production. Scientific basis for global warming. Environmental impact of energy production and utilization. Renewable energy.  | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 303: Energy Systems and Power Electronics                       | Prereq: Math 267, Phys 222. Credit or registration in 224 and 230. Structure of competitive electric energy systems. System operation and economic optimization. Mutual inductance, transformers. Synchronous generators. Balanced three-phase circuit analysis and power calculations. Network calculations and associated numerical algorithms. Two-port circuits. Voltage regulation. Resonance and power factor correction. DC and induction motors. Power electronic circuit applications to power supplies and motor drives. Electronic loads and power quality. Nonmajor graduate credit. | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 388: Sustainable Engineering and International Development      | Prereq: Junior classification in engineering. Multi-disciplinary approach to sustainable engineering and international development, sustainable development, appropriate design and engineering, feasibility analysis, international aid, business development, philosophy and politics of technology, and ethics in engineering. Engineering-based projects from problem formulation through implementation. Interactions with partner community organizations or international partners such as nongovernment organizations (NGOs). Course readings, final project/design report.              | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 448: Introduction to AC Circuits and Motors                     | Prereq: 303 or 441 or 442. Half-semester course. Magnetic circuits. Power transformers. AC steady state and three-phase circuit analysis. Basic principles of operation and control of induction and single-phase motors. Nonmajor graduate credit.  | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 452: Electrical Machines and Power Electronic Drives            | Prereq: 303; 330 or 332; credit or registration in E E 324. Basic concepts of electromagnetic energy conversion. DC motors and three-phase induction motors. Basic introduction to power electronics. Adjustable speed drives used for control of DC, induction, and AC motors. Experiments with converter topologies, DC motors, AC motors and adjustable speed drives. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 455: Introduction to Energy Distribution Systems                | Prereq: 303, credit or registration in 324. Overhead and underground distribution system descriptions and characteristics, load descriptions and characteristics, overhead line and underground cable models, distribution transformers, power flow and fault analysis, overcurrent protection, power factor correction, system planning and automation, and economics in a deregulated environment. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 456: Power Systems Analysis I                                   | Prereq: 303, credit or registration in 324. Power transmission lines and transformers, synchronous machine modeling, network analysis, power system representation, load flow. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 457: Power Systems Analysis II                                  | Prereq: 303, credit or registration in 324. Power system protection, symmetrical components, faults, stability. Power system operations including the new utility environment. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 554: Power System Dynamics                                      | Prereq: 456, 457, 475. Dynamic performance of power systems with emphasis on stability. Modeling of system components and control equipment. Analysis of the dynamic behavior of the system in response to small and large disturbances.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |
| E E 555: Advanced Energy Distribution Systems                       | Prereq: 455. Transient models of distribution components, automated system planning and distribution automation, surge protection, reliability, power quality, power electronics and intelligent systems applications.   | Credit      | 3                       | Iowa State University | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>                     |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|--|---|-------------|-------------------------|--------------------------------|---|
| EE 556: Power Electronic Systems                                       | Prereq: 452. Converter topologies, AC/DC, DC/DC, DC/AC, AC/AC. Converter applications to do motor drives, power supplies, AC motor drives, power system utility applications (var compensators) and power quality.  | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| EE 551X: Electromechanical Wind Energy Conversion and Grid Integration | Prereq: EE 456 or instructor approval. Industry status and expected growth; power extraction from the air stream; electric machines & power electronics topologies for wind energy conversion; machine-grid power electronic circuits & controller interface, collector (distribution) networks: harmonics, flicker, over/under-voltages, filters, low-voltage rider- through, and reactive compensation; relaying; transmission expansion; grid operation & coordination including intermittency, frequency control and reserves storage technologies & hybrid configurations; interaction with electricity markets; transmission expansion and inclusion of wind in planning. | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| EE 552X: Energy Systems Planning                                       | Prereq: 456, 457 or equivalent background. Characteristics of bulk energy conversion, storage, and transport technologies. Environmental legislation. Modeling of electricity markets. Evaluation of sustainability and resiliency. Types of planning analyses; economic, multi-sector, long-term, national. Planning tools and associated optimization methods.  | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Aer E 381X: Introduction to Wind Energy                                | Prereq: Math 166, Physics 221. Basic introduction to the fundamentals of Wind Energy and Wind Energy conversion systems. Topics include but not limited to various types of wind energy conversion systems and the aerodynamics, blade and tower structural loads, kinematics of the blades and meteorology.  | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Aer E 481X: Advanced Wind Energy: Technology and Design                | Prereq: Aer E 381X or senior classification in engineering or junior in engineering with a course in fluid mechanics. Advanced topics in wind energy, emphasis on current practices. Theoretical foundations for horizontal and vertical axis wind turbine. Design codes for energy conversion systems design, aerodynamic an structural load estimation, wind resource characterization wind farm design, optimization. Nonmajor graduate credit.  | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| EM 570: Wind Engineering   | Prereq: 378, 345. Atmospheric circulations, atmospheric boundary layer wind, bluff-body aerodynamics, aeroelastic phenomena, wind-tunnel and full-scale testing, wind-load code and standards, effect of tornado and thunderstorm winds, design applications.   | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| IE 543X: Wind Energy Manufacturing                                     | Prereq: Undergraduate engineering degree or permission of instructor. Materials, processes and systems required to produce the major components (blades, towers, nacelles) of megawatt scale wind turbines. Transportation, manufacturing siting and procurement decisions as it relates to these large components in an expanding industry.  | Credit      | 3                       | Iowa State University          | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Mechanical Power Transmission  | Mechanical Power Transmission is designed to give students an overview of the terminology, theory of operation, and specific devices involved in the movement of energy. Belts, chains, gears, shafts, hydraulics, and pneumatics will be examined. Emphasis will be on systems used in wind energy.  | Credit      | 4                       | Iowa Western Community College | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |
| Advanced Wind Energy   | WTT 202 Advanced Wind Energy will explore the wind energy field, practices, and policy.   | Credit      | 4                       | Iowa Western Community College | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |
| Sustainable Energy: Wind Energy Tech Certificate                       | "Wind Energy Technology is the wave of the future, and Iowa Western's new certificate program will enable you to get on board with this expanding career field. The Wind Energy Technician certificate program is designed to provide the basic skills and knowledge needed for entry-level jobs in the manufacturing, installation, and maintenance of wind turbines."   | Credit      | 17                      | Iowa Western Community College | <a href="http://www.iwcc.edu/programs/program.asp?id=windenergycer">http://www.iwcc.edu/programs/program.asp?id=windenergycer</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                   | Course Description   | Course Type | Credit or Contact Hours | College Name                        | Contact Website   |
|---|--|-------------|-------------------------|-------------------------------------|---|
| Industrial Plant Technology                   | This program was developed to prepare individuals as plant maintenance technicians. Students will learn basic principles and technical skills in maintaining and troubleshooting common electro-mechanical systems used in industry. Skills are developed in basic electrical and mechanical theory as well as specific skills needed for troubleshooting and repair of today's industrial systems. There is a high demand for industrial maintenance technicians in the Siouxland area. Employers are seeking trained individuals with both mechanical and electrical maintenance aptitude and troubleshooting skills. According to the Bureau of Labor Statistics, employment of industrial machinery mechanics is expected to grow 7 percent from 2006 to 2016. As factories become increasingly automated, these workers will be needed to maintain and repair the automated equipment. (Occupational Outlook Handbook. Bureau of Labor Statistics 2006-2007.) | Credit      | 34                      | Western Iowa Tech Community College | <a href="http://www.witcc.edu/programs/program.cfm?id=129&amp;CFID=12027606&amp;CFTOKEN=98231517">http://www.witcc.edu/programs/program.cfm?id=129&amp;CFID=12027606&amp;CFTOKEN=98231517</a> |
| Wind Turbine Technician Program               | NIACC has created a one year wind turbine technician program. Students will learn about arc flash protection, electric motor drives, PLC's, hydraulic torqueing, fiber optics, hydraulics, preventative maintenance, and the the history of wind energy in the United States.  | Credit      | 35                      | North Iowa Area Community College   | <a href="http://www.niacc.edu/industrial/eltron.html">http://www.niacc.edu/industrial/eltron.html</a>   |
| Welding                                       | The NIACC welding program is a one year program. Students are taught a variety of welding techniques. The newly built lab contains all new welding equipment including Lincoln Electric TIG machines, MIG machines, Lincoln Electric Robotic e-Cell, and a CNC plasma table. The NIACC welding facility is AWS certified and AWS certification is attainable for students.   | Credit      | 38                      | North Iowa Area Community College   | <a href="http://www.niacc.edu/catalog/catalog_08_09/NIACC0809catalog.pdf">http://www.niacc.edu/catalog/catalog_08_09/NIACC0809catalog.pdf</a>   |
| Wind Turbine Maintenance Specialist - Diploma | The number of wind turbines in Iowa and in the United States continues to increase, as does the need for skilled workers who are able to install, maintain, service, and operate them. The Wind Energy Technician program encompasses the skill sets needed as a technician and/or operator, depending on the career path students choose. A number of certificate and diploma options will be available, allowing students to customize their interests and training accordingly. Wind is the fastest growing energy source in the United States. In 2007, wind energy production increased by 21 percent, and a recent report by the U.S. Department of Energy suggests that it could contribute 20 percent of the nation's electricity by 2030. Although BLS does not collect data specifically on wind energy employment, the American Solar Energy Society estimates that in 2006 there were 16,000 jobs in wind turbine construction and maintenance.        | Credit      | 39                      | Western Iowa Tech Community College | <a href="http://www.witcc.edu/programs/program.cfm?id=197&amp;CFID=12027606&amp;CFTOKEN=98231517">http://www.witcc.edu/programs/program.cfm?id=197&amp;CFID=12027606&amp;CFTOKEN=98231517</a> |
| Powerline - Diploma Program                   | Powerline installers construct and maintain electrical overhead and underground powerlines in this challenging out-of-doors career. As a student, you receive training in a 40-acre outdoor laboratory as well as in the classroom. You learn to climb, set, and remove various sized poles; frame structures; install conductors and street lights; install underground cable; trim trees; and operate trucks along with various equipment. In conjunction with the hands-on experience, you learn about electrical concepts and theory, construction techniques, transmission and distribution systems, safety, materials, and hardware. In addition, you learn communication skills and earn a First Aid Certificate. You also have the opportunity to earn a Class A Commercial Driver's License.  | Credit      | 51                      | Northwest Iowa Community College    | <a href="http://www.nwiccc.edu/prospective-students/academics/program-details.aspx?ID=67">http://www.nwiccc.edu/prospective-students/academics/program-details.aspx?ID=67</a>                 |
| Electromechanical Systems Technology          | This AAS degree prepares students for immediate employment as electronic, electrical, and mechanical maintenance personnel in manufacturing settings.  | Credit      | 65                      | North Iowa Area Community College   | <a href="http://www.niacc.edu/industrial/eltron.html">http://www.niacc.edu/industrial/eltron.html</a>   |
| Sustainable Energy: Wind Energy Technology    | Wind Turbine fields are cropping up all over the Midwest, which means that jobs are awaiting those that want to pursue this exciting and growing career field. Students in the Associates of Applied Science degree program will study core aspects of sustainable energy technology and branch into specialized areas such as wind energy, solar power, geo-thermal, and sustainable construction practices.  | Credit      | 65                      | Iowa Western Community College      | <a href="http://www.iwcc.edu/programs/program.asp?id=susenergyaas">http://www.iwcc.edu/programs/program.asp?id=susenergyaas</a>   |

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| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|--|---|-------------|-------------------------|--|---|
| Wind Energy Technician - AAS                                     | The number of wind turbines in Iowa and in the United States continues to increase, as does the need for skilled workers who are able to install, maintain, service, and operate them. The Wind Energy Technician program encompasses the skill sets needed as a technician and/or operator, depending on the career path students choose. A number of certificate and diploma options will be available, allowing students to customize their interests and training accordingly. Wind is the fastest growing energy source in the United States. In 2007, wind energy production increased by 21 percent, and a recent report by the U.S. Department of Energy suggests that it could contribute 20 percent of the nation's electricity by 2030. Although BLS does not collect data specifically on wind energy employment, the American Solar Energy Society estimates that in 2006 there were 16,000 jobs in wind turbine construction and maintenance.   | Credit      | 66                      | Western Iowa Tech Community College        | <a href="http://www.witcc.edu/programs/index.cfm?id=196">http://www.witcc.edu/programs/index.cfm?id=196</a>   |
| Renewable Energy Systems Specialist AAS Program                  | Renewable Energy Systems Specialists are responsible for installing, maintaining, and troubleshooting photovoltaic systems and wind turbines. People in this position need a strong electro-mechanical background and therefore will receive such training. Renewable Energy System Specialists need to be able to analyze a site, install equipment and have working knowledge of electrical systems, pumps and motors related to renewable energies. A career in renewable energy systems generally requires a minimum of two years college education. Some renewable energy systems programs are longer in length and may culminate in a baccalaureate degree. However, for a technician-level position, a two-year degree is most common.   | Credit      | 66                      | Eastern Iowa Community College District    | <a href="http://www.eicc.edu/highschool/programs/career/environmental/energy/index.html">http://www.eicc.edu/highschool/programs/career/environmental/energy/index.html</a>   |
| Wind Turbine Technician AAS Program                              | Register now for Des Moines Area Community College's Industrial Electro-Mechanical Technology program. In just two years, you can earn an Associate of Applied Science (A.A.S.) degree and be ready to take your place in the exciting wind energy industry. With your A.A.S. degree from DMACC, you'll be qualified for a position in wind turbine technology. It's a high-skill, high-pay job with a secure future. You will be able to work in many areas of the country, including right here in Iowa. FPL Group is the largest generator of wind energy in the nation. In the next few years, the Florida-based company will triple its wind energy output to 9,000 megawatts. Part of that expansion will take place in Iowa.   | Credit      | 66                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/programs/windenergy/Pages/welcome.aspx">go.dmacc.edu/programs/windenergy/Pages/welcome.aspx</a>  |
| Wind Turbine Repair Technician - AAS and Diploma                 | The program prepares students to become qualified and gainfully employed in various entities of the Wind Energy Industry. This program curriculum will expose students to the fundamentals of site acquisition, design, construction, turbine service, operation, preventative maintenance and repair. The program focus will provide skill set training in safety, repelling techniques, first aid, communications, Geographic Information System (GIS) theory, maintenance of wind generating equipment, with emphasis on mechanical systems and subsystems (turbine components, gear boxes, gear failure, lubricants and preventive maintenance). Further, students in this course of study will receive training in the compilation of data for determining the accuracy and function of mechanical and electrical equipment for wind turbine generators, hydraulic systems, electrical systems, AC/DC theory, generation/power distribution theory, fastening/tension/torquing, rigging and crane signaling. | Credit      | 72                      | Northeast Iowa Community College Calmar    | <a href="http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=125&amp;almar&amp;Itemid=715">http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=125&amp;almar&amp;Itemid=715</a> |
| Heavy Equipment Operation & Maintenance - Diploma or AAS Program | As a Heavy Equipment Operation and Maintenance student, you learn both the operation of heavy construction equipment and the preventative maintenance and repair of the equipment. You will be able to develop occupational skills using crawler tractors, motor graders, self-propelled scrapers, rubber-tired loaders, compaction equipment, dump trucks, backhoes, and hydraulic excavators. In addition, the program provides tractor-trailer training, which allows you to obtain a Commercial Driver's License. Loading and safe transportation of heavy equipment to the job site is also covered. Training occurs both on campus and at various off-campus sites.   | Credit      | 75                      | Northwest Iowa Community College           | <a href="http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=65">http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=65</a>   |
| General Machinist/ Tool and Die Technology                       | This program provides in-depth study and considerable hands-on skills in the machine processing of a variety of metals. Students become proficient in the operation of mills, lathes, grinders, drills, and saws as they complete increasingly complex projects while holding tight tolerances. Various pieces of precision measuring equipment (optical comparator, coordinate measuring machine, etc...) are used to check quality. Additional work in blueprint reading, heat-treating, and CNC machining is required.   | Credit      | 77                      | North Iowa Area Community College          | <a href="http://www.niacc.edu/industrial/machinist/toolie.html">http://www.niacc.edu/industrial/machinist/toolie.html</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|--|---|-------------|-------------------------|---|---|
| Renewable Energy Technology - AAS Degree   | Renewable Energy Technology is a 21-month (seven- term) program that will give students conceptual as well as hands-on training in technology and practices used the the solar and wind energy field. This program focuses on renewable energy equipment, production, distribution and control with an emphasis on solar and wind power. Geothermal energy transfer will be included. Students meeting all program and graduation requirements receive an Associate of Applied Science degree.  | Credit      | 78                      | Indian Hills Community College          | <a href="http://www.indian-hills.edu/courses/tech/renewenergy.html">http://www.indian-hills.edu/courses/tech/renewenergy.html</a>   |
| Electrical Technology - Adv. Standing AAS Program  | Electrical Technology is a great program for those who wish to combine electrical wiring skills with industrial electronic fundamentals. Building on the Industrial and Commercial Wiring program, students will develop additional skills in industrial controls and will use the latest technologies for electronic motor drives, and plant automation. Further studies include electrical control of temperature, pressure and liquid flow. Upon completion of the Electrical Technology program, graduates are fully prepared to enter today's competitive job market.  | Credit      | 79                      | Northwest Iowa Community College        | <a href="http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=67">http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=67</a>                             |
| Wind Energy & Turbine Technology   | The training focus on construction, maintenance, repair and operation of wind turbines continues through their entire lifespan. Construction of towers, routine maintenance, repair and operation to meet the growing demand for skilled technicians who can install, maintain and service modern wind turbines.  | Credit      | 80                      | Iowa Lakes Community College            | <a href="http://www.iowalakes.edu/programs_study/industrial/wind_energy_turbine/index.htm">http://www.iowalakes.edu/programs_study/industrial/wind_energy_turbine/index.htm</a>                         |
| Industrial Maintenance and HVAC Technology   | The curriculum is designed to introduce students to skills needed for a variety of careers in energy related fields, including wind turbine manufacturing.  | Credit      | 81                      | Kirkwood Community College              | <a href="http://www.kirkwood.edu/site/index.php?d=474">http://www.kirkwood.edu/site/index.php?d=474</a>   |
| Industrial Instrumentation & Control - AAS Program   | Instrumentation and Control technicians solve electrical, electronic, and computer problems using their minds and hands. These technicians install, upgrade, maintain, and repair automated equipment in industries that produce everything from appliances, medical equipment, ethanol and electric power. These principles are applied in the lab settings of the classroom and during the 42-day internship during the fall of the second year. As an Instrumentation and Control student you learn calibration and control of industrial process equipment. You learn about process variables such as motor speed, temperature control, humidity control, pressure, levels, and flow rate. To enter this high-tech program you should have an interest in problem solving. The program has high school options and part-time schedules available. NCC has the only Industrial Instrumentation and Control program in Iowa. Partnerships with several area industries allow greater learning opportunities, and the diversity of the program allows you a wide choice of employment after you graduate. There is a critical shortage of people who are trained in Industrial Instrumentation and Control. Graduates are working in food processing facilities, manufacturing plants, electrical power-generating plants, ethanol plants, and more. | Credit      | 86                      | Northwest Iowa Community College        | <a href="http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=67">http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=67</a>                             |
| Renewable Energy Continuing Education  | The suite of continuing education classes offered at Eastern Iowa Community College contains: Energy Efficiency, Solar PV, Small Wind, MicroHydro, Small Scale Biodiesel, Fuel Cells, and Renewable Energy applications for Disaster Response.  | Non-Credit  | 4                       | Eastern Iowa Community College District | <a href="http://www.eicc.edu/adultlearning/programs/continuing/index.html">http://www.eicc.edu/adultlearning/programs/continuing/index.html</a>   |
| Wind Energy Conference   |   | Non-Credit  | 8                       | Southwestern Community College          | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |
| Current - Self-directed, Internet-based Courses for Power System Operators NERC-Approved Education |   | Non-Credit  | 86                      | Iowa State University                   | <a href="http://www.ede.iastate.edu/Non-Credit/TEG-and-ISU/teg.html">http://www.ede.iastate.edu/Non-Credit/TEG-and-ISU/teg.html</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                     | Contact Website   |
|---|--|-------------|-------------------------|----------------------------------|---|
| Wind Energy Technology                                  | This program is designed for people who seek entry level job in a wind-based electric power generation facilities. Currently there are thousands of wind-based electric generators operating in the United States. Due to environmental reasons as well as a desire to limit reliance on foreign oil, it is expected that wind-based energy is going to be developed at a rapid pace over the next decade. It should also be noted that during the last decade, wind-based energy has dramatically improved its economical competitive position. Some believe that this type of energy is already competitive enough to replace large segments of conventional energy sources. In many other countries this source of energy is being used widely in a successful manner. This indicates that there are no technological impediments stopping wide expansion of this energy sector in the United States. There are very few institutions in the country that provide training for entry-level workers for wind-based electric power plants. Wind-based electric plants (farms) are operated by small groups of highly-trained individuals. | Non-Credit  | 240                     | Southeastern Community College   | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>                                     |
| <b>Biomass</b>  |  |             |                         |                                  |   |
| Biobased Products Seminar - BRT 506 A/B                 | Prereq: Undergraduate training in an engineering or physical or biological discipline or degrees in agriculture or economics. Introduction to the science and engineering of converting biorenewable resources into bioenergy and biobased products. Survey of biorenewable resource base and properties; description of biobased products; methods of biorenewable resource production; processing technologies for fuels, chemicals, materials, and energy; environmental impacts; economics of biobased products and bioenergy.   | Credit      | 0-1                     | Iowa State University            | <a href="http://www.biorenew.iastate.edu/academics/courses.html">http://www.biorenew.iastate.edu/academics/courses.html</a>                     |
| BIO275 - Careers in Biotechnology - Course              | Discussions related to biotechnology careers, organizations, employee skills, and the job market.  | Credit      | 1                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| BIO264 - Fermentation Processes - Course                | Covers principles related to fermentation and basic techniques. Fermentation equipment is utilized to obtain products. Lab included.   | Credit      | 2                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| BIO269 - Basic Cell Culture - Course                    | Covers the basics of animal cell culture. Methods of media preparation, maintenance of cultured cells, monoclonal antibody production, and ELISA assays. Lab included.   | Credit      | 2                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| BIO242 - Issues in Biotechnology - Course               | This course will cover the ethical and moral implications of biotechnology as it applies to plants, animals, human health and forensics.   | Credit      | 3                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| BIO261 - Introduction to Biotechnology - Course         | This course is an overview of Biotechnology which will emphasize applications of DNA/RNA technology, and molecular biology. Topics will include cloning, gene therapy, plant biotechnology, DNA fingerprinting, genetic testing, and various products made through biotechnology. The course is intended for those who have a strong desire to learn about the principles of biotechnology and their applications and/or have an interest in pursuing a career in an industrial, academic, or biomedical research laboratory.  | Credit      | 3                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| SCI110 - Basic Lab Methods for Lab Technicians - Course | The purpose of this course is to cover basic laboratory concepts and techniques. The main emphasis will be on skills and attributes one would need to work effectively in a laboratory setting. The concepts and skills learned in this course are so essential to working in a lab that they are tested again prior to entering the coop experience.  | Credit      | 3                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf">http://www.nwicc.edu/Post/sections/79/Files/biotech.pdf</a>                   |
| Biorenewable Systems                                    | A E 325. Biorenewable Systems. (Cross-listed with Agron, An S, BusAd, Econ, TSM). (3-0) Cr. 3. F.Prereq: Econ 101, Chem 155 or higher, Math 140 or higher. Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, transportation/logistics, and marketing.  | Credit      | 3                       | Iowa State University            | <a href="http://www.public.iastate.edu/~catalog/2009-2011/courses/ae.html">http://www.public.iastate.edu/~catalog/2009-2011/courses/ae.html</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                      | Course Description   | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|--|--|-------------|-------------------------|---|---|
| Production and Use of Biofuels - BRT 545X        | Prereq: BRT 501 or one course in organic chemistry. Basic principles for the production and utilization of biobased fuels with special emphasis on ethanol and biodiesel. Fermentation of carbohydrates to ethanol and transesterification of vegetable oils and animal fats. Process chemistry of ethanol and biodiesel manufacturing. Fuel properties and utilization in internal combustion engines.  | Credit      | 3                       | Iowa State University                   | <a href="http://www.bio-renew.iastate.edu/academics/courses.html">http://www.bio-renew.iastate.edu/academics/courses.html</a>   |
| Thermochemical Processing of Biomass - BRT 535X  | Prereq: Undergraduate course work in thermodynamics and transport phenomena. Introduction to thermal and catalytic processes for the conversion of biomass to biofuels and other biobased products. Topics include gasification, fast pyrolysis, hydrothermal processing, syngas to synfuels, and bio-oil upgrading. Application of thermodynamics, heat transfer, and fluid dynamics to bioenergy and biofuels.   | Credit      | 3                       | Iowa State University                   | <a href="http://www.bio-renew.iastate.edu/academics/courses.html">http://www.bio-renew.iastate.edu/academics/courses.html</a>   |
| Fundamentals of Biorenewable Resources - BRT 501 | Prereq: Undergraduate training in an engineering or physical or biological discipline or degrees in agriculture or economics. Introduction to the science and engineering of converting biorenewable resources into bioenergy and biobased products. Survey of biorenewable resource base and properties; description of biobased products; methods of biorenewable resource production; processing technologies for fuels, chemicals, materials, and energy; environmental impacts; economics of biobased products and bioenergy. | Credit      | 3                       | Iowa State University                   | <a href="http://www.bio-renew.iastate.edu/academics/courses.html">http://www.bio-renew.iastate.edu/academics/courses.html</a>   |
| M E 535: Thermochemical Processing of Biomass    | Prereq: Undergraduate course work in thermodynamics and transport phenomena.. Introduction to thermal and catalytic processes for the conversion of biomass to biofuels and other biobased products. Topics include gasification, fast pyrolysis, hydrothermal processing, syngas to synfuels, and bio-oil upgrading. Application of thermodynamics, heat transfer, and fluid dynamics to bioenergy and biofuels.  | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| A E 325: Biorenewable Systems                    | Prereq: Econ 101, Chem 155 or higher, Math 140 or higher. Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, transportation/logistics, and marketing.   | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| A E 411: Bioprocessing and Bioproducts           | Prereq: A E 216 or equivalent, Math 160 or 165, one of Chem 167 or higher, Biol 173 or 211 or higher or BRT 501, senior or graduate classification. Sustainability, cleaner production. Taxonomy, kinetics, metabolism, aerobic and anaerobic fermentation. Biofuels, bioenergy and coproducts. Mass/energy balances, process integration, pretreatment, separation. Membrane reactors, bioelectrolysis, microbial fuel cells, nanotechnology, genetic engineering, mutagenesis.   | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Biotechnology Applications                       | Highlights applications of biotechnology to improve human life and the environment. Introduction to microbial, animal, and plant biotechnology using a problem-based approach requiring team work. Discussion, 3 periods. (Variable)   | Credit      | 3                       | University of Northern Iowa             | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Introduction to Biotechnology                    | Introduction to Biotechnology provides a general introduction to the field of biotechnology as it relates to science, medicine, and industry. Topics explore trends and methodologies in biotechnology and its global impact. Laboratory work complements each of these areas of study.  | Credit      | 4                       | Iowa Western Community College          | <a href="http://www.iwcc.edu/programs/program.asp?id=prebiotechmbas">http://www.iwcc.edu/programs/program.asp?id=prebiotechmbas</a>   |
| Introduction to Bioscience Technology            | Explores the expanding field of biotechnology and how it impacts science and society. Examines fundamental biological, chemical, and mathematical principles as they apply to biotechnology. Laboratory activities emphasize essential methodologies employed in scientific inquiry and experimentation.   | Credit      | 4                       | Northeast Iowa Community College Calmar | <a href="http://www.nicc.edu/index.php?option=com_program&amp;task=course_detail&amp;course_id=BIO-248&amp;credit=4.00">http://www.nicc.edu/index.php?option=com_program&amp;task=course_detail&amp;course_id=BIO-248&amp;credit=4.00</a> |
| Plant Biotechnology                              | Highlights the theory and applications of plant tissue cultures, genetic engineering (including use of plants for production of antibodies and vaccines), marker-assisted selection, and genomics. Lab component gives students practical experience with the biotechnology applications discussed in lecture. Discussion, 2 periods; lab, 4 periods. (Offered Even Springs)   | Credit      | 4                       | University of Northern Iowa             | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|---|-------------|-------------------------|--|---|
| Bio-Mass to Bio-Fuels   | It is an inductor level biotechnology course emphasizing plant and crop-based resources for the production of biobased products including renewable biofuels. This course is designed to familiarize students with many bioprocessing principles. Topics include biology, microbiology, chemistry, biochemistry. An introductory exploration of agricultural and industrial practices together with the global impact of bioprocessing will be examined. Laboratory work topic of study. 1.) Compare and contrast bioprocesses 2.) Explain dynamics of biofuel process 3.) Investigate concepts of biology chemistry and biochemistry of biomass as it pertains to industrial laboratory 4.) Compare and contrast cell structures and cellular processes, including metabolic pathways, cell growth and product production of bacterial, yeast and plant cells 5.) Analyze the environmental impact of agricultural and bioprocessing industries as it applies to water and soil. | Credit      | 4                       | Iowa Western Community College             | <a href="http://www.iwcc.edu/">http://www.iwcc.edu/</a>   |
| Biorenewable Resources and Technology Graduate Certificate          | Through a series of twelve credit hours of graduate coursework, the Biorenewable Resources and Technology certificate will offer students from a wide variety of science and engineering backgrounds an exposure to advanced study in the use of plant- and crop-based resources for the production of biobased products, including fuels, chemicals, materials, and energy. The program aims to train professionals to serve the emerging bioeconomy, and in so doing to serve state, national, and global needs in moving toward a more sustainable industrial economy.   | Credit      | 12                      | Iowa State University                      | <a href="http://www.ede.iastate.edu/Certificate/Graduate-Certificates-Online/bio.html">http://www.ede.iastate.edu/Certificate/Graduate-Certificates-Online/bio.html</a> |
| Doctor of Philosophy Minor in Biorenewable Resources and Technology | The Ph.D. minor in Biorenewable Resources and Technology requires 15 credits, including 6 credits of core-required courses and 9 credits of core elective courses representing at least 3 of the 4 barrier areas identified by the US DOE.  | Credit      | 15                      | Iowa State University                      | <a href="http://www.biorenew.iastate.edu/academics/degree-requirements-options.html">http://www.biorenew.iastate.edu/academics/degree-requirements-options.html</a>     |
| Biomass Operations Technology Certificate                           | The Biomass Operations Technology certificate is designed to train individuals to become operators in a biomass production facility. At the completion of the program, the students should be able to understand the basic operation of a biomass plant, as well as the chemical flow, instrumentation, environmental and safety issues, lab sampling techniques and other complex plant operations.  | Credit      | 17                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/programs/iemt/pages/biomasscert.aspx">http://go.dmacc.edu/programs/iemt/pages/biomasscert.aspx</a>   |
| Master's of Science in Biorenewable Resources and Technology        | The Master's of Science degree in Biorenewable Resources and Technology requires 30 credits, including 6 credits of core required courses, 9 credits of core elective courses representing at least 3 of the 4 barrier areas identified by the US DOE, at least 9 credits of research, and an additional 6 credits selected from elective courses (including additional research credit).   | Credit      | 30                      | Iowa State University                      | <a href="http://www.biorenew.iastate.edu/academics/degree-requirements-options.html">http://www.biorenew.iastate.edu/academics/degree-requirements-options.html</a>     |
| Intro to Biofuels Chemistry   | This course surveys the relevant chemistry with products and laboratory testing. Introductions to general chemistry, organic chemistry and acid and bases are presented and their relationship to proper processing and testing procedures. Topics will be focused on industry specific interests such as feedstock variations and testing techniques.  | Credit      | 32                      | Western Iowa Tech Community College        | <a href="http://boiler.witcc.edu">http://boiler.witcc.edu</a>   |
| Basic Renewable Fuels   | Learn how to make fuels from renewable sources. Biodiesel and ethanol are fuels that can be blended with traditional petroleum derived fuels for use with current engine technology. Relevant topics include feedstock choices, process dynamics, product refining, fuel use guidelines and process economics. Explore this growing industry and understand its importance to our energy supply.  | Credit      | 32                      | Western Iowa Tech Community College        | <a href="http://boiler.witcc.edu">http://boiler.witcc.edu</a>   |
| Biofuels Program  | The AAS Biofuels Technology degree offers extensive hands-on training for students who desire to work in the manufacture of ethanol and biodiesel fuels. This degree will provide students with the analytical skills necessary to perform quality assurance analyses according to the American Society for Testing and Manufacturing (ASTM) specifications for ethanol and biodiesel as well as learn how to manage the day-to-day operations of a biofuels refining facility.   | Credit      | 63                      | Iowa Central Community College             | <a href="http://www.iowa-central.edu/math-science/science/programs/biofuels/index.asp">http://www.iowa-central.edu/math-science/science/programs/biofuels/index.asp</a> |
| Biotechnology - Renewable Energy Technology (ECC)                   | This program gives an overview of various renewable energy technologies and their current applications including ethanol and biodiesel production, wind and solar and geothermal energy. Students will gain an understanding of the processes involved in ethanol and biodiesel production from biomass. Laboratory exercises will provide hands-on experiences and the vocational skill needed for entry into renewable energy industry employment.  | Credit      | 65                      | Iowa Valley Community College District     | <a href="http://www.iavalley.edu/ecc/about/programs-degrees/RenewableEnergy.html">http://www.iavalley.edu/ecc/about/programs-degrees/RenewableEnergy.html</a>           |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|---|-------------|-------------------------|--|---|
| Biomass Maintenance Technologies AAS Program                  | This program prepares students for career as a maintenance technician in the biomass technologies field. At completion of this program students should be able to troubleshoot and repair industrial equipment ranging from basic mechanical equipment and electrical motor controls to the more complex systems used in biomass environments. Biomass includes ethanol, biodiesel, and cellulose fuel production.  | Credit      | 66                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/programs/iemt/Pages/welcome.aspx">http://go.dmacc.edu/programs/iemt/Pages/welcome.aspx</a>   |
| Biotechnology   | The Biotechnology career program supports lab technicians and lab based manufacturing in terms of biofuels and foods.   | Credit      | 66                      | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/site/index.php?p=18095">http://www.kirkwood.edu/site/index.php?p=18095</a>   |
| Biotechnology Lab Technician - AAS Program                    | What is Biotechnology? A technology based on biology, used in agriculture, food science, medicine, and industry. About the Program NCC's Biotechnology Lab Technician Programs curriculum is designed to meet the increasing demands of businesses and industries seeking skilled lab technicians for employment in laboratory and industrial settings and as quality control/quality assurance technicians. Students who complete the program will have necessary laboratory and communication skills needed for employment. Individuals who like the challenge of working in a laboratory are encouraged to apply. Students will learn how to operate equipment and master techniques commonly used in a lab. This will include maintenance of cell cultures, genetic engineering techniques, protein separation techniques, UV spectrophotometry, High Performance Liquid Chromatography (HPLC), and record keeping to name a few. | Credit      | 71                      | Northwest Iowa Community College           | <a href="http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=38">http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=38</a>                             |
| Doctor of Philosophy in Biorenewable Resources and Technology | The Ph.D. degree in Biorenewable Resources and Technology requires 72 credits, including 6 credits of core required courses, 18 credits of core elective courses representing at least 3 of the 4 barrier areas identified by the US DOE, at least 24 credits of research, and an additional 24 credits selected from elective courses (including additional research credit).  | Credit      | 72                      | Iowa State University                      | <a href="http://www.biorenew.iastate.edu/academics/degree-requirements-options.html">http://www.biorenew.iastate.edu/academics/degree-requirements-options.html</a>                                     |
| Biorenewable Fuel Technology                                  | The Biorenewable Fuel Technology program offers the knowledge and skills applicable to employment in facilities processing corn and/or soybeans into primary products, such as ethanol and biodiesel, and usable co-products.   | Credit      | 77                      | Iowa Lakes Community College               | <a href="http://www.iowalakes.edu/programs_study/agriculture/biorenewable_fuels/index.htm">http://www.iowalakes.edu/programs_study/agriculture/biorenewable_fuels/index.htm</a>                         |
| Agricultural/Biofuels Process Technology - AAS Degree         | Ethanol plants utilize fermentation processes to produce ethanol from nutrients derived from corn. The Agricultural & Biofuels Process Technology program will teach you to apply scientific principles and technical skills in support of ethanol fermentation plant processes. You will receive hands-on training, and study electrical and electronics theory, digital fundamentals, process control, instrumentation, high level equipment maintenance and analysis, and bioprocess laboratory techniques. As a graduate, you will be prepared to work as an ethanol plant technician operating scientific equipment that's used in ethanol fermentation, bio-renewable fuel production, and distillation processes.  | Credit      | 82                      | Indian Hills Community College             | <a href="http://www.indianhills.edu/courses/tech/agbiofuels.html">http://www.indianhills.edu/courses/tech/agbiofuels.html</a>   |
| Bioprocess Laboratory Technology - AS Degree                  | The Bioprocess Laboratory Technology program provides training on large scale fermentation and bioprocessing equipment, and in the application of scientific principles and technical skills in the bio-manufacturing industry. You will also receive instruction in automated process control and instrumentation technologies. The industry involves the production of a wide variety of agricultural, bio-pharmaceutical, and chemical products with jobs available operating computer control systems, monitoring gauges, taking samples, and performing lab tests.   | Credit      | 85                      | Indian Hills Community College             | <a href="http://www.indianhills.edu/courses/tech/biotech.html">http://www.indianhills.edu/courses/tech/biotech.html</a>   |
| Biodiesel Education   | November 17, 2010 6-9 pm Learn more about this clean burning alternative fuel. Offered FREE by Iowa's 15 community colleges in partnership with Iowa Biodiesel Board.   | Non-Credit  | 3                       | Southwestern Community College             | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |
| Biodiesel Workshop  | Learn more about this clean burning alternative fuel.   | Non-Credit  | 3                       | Iowa Western Community College             | <a href="http://www.iwcc.edu/">http://www.iwcc.edu/</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                | Contact Website   |
|--|---|-------------|-------------------------|-----------------------------|---|
| <b>Water</b>                                       |   |             |                         |                             |   |
| Environmental Hydrology                            | Introduction to environmental aspects of watershed hydrology. Surface water hydrologic processes, pollution of surface water resources, surface water - ground water interactions, unsaturated zone hydrologic processes, movement of chemicals in soils, site characterization, and soil remediation techniques. Discussion, 3 periods. (Offered Even Springs)   | Credit      | 3                       | University of Northern Iowa | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Hydrogeology                                       | Principles and applications of hydrogeology including study of runoff, stream flow, soil moisture, and ground water flow. Examination and analysis of ground water flow to wells, regional ground water flow, geology of ground water occurrence, water chemistry of ground water, water quality and ground water contamination, ground water development and management, field methods, and ground water models. Discussion, 3 periods. (Offered Odd Springs)  | Credit      | 3                       | University of Northern Iowa | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| CHE 215: Energy and Water                          | The availability of clean water and energy are critical to our quality of life. This course will deal with the chemistry involved with water, water pollution, and water purification. Students will collect water from various sources including rivers etc near their homes and test them for various contaminants. The advantages and disadvantages of various sources of energy (fossil, nuclear, fuel cell, hydrogen, etc.) will also be discussed. Then students will answer the questions, "which energy source should be used? the cheapest? The one that pollutes the least?" and "what other criteria should be used to decide?" Prerequisites: L.LIB-100, L.LIB-105, L.LIB-110, and L.LIB-112 or above. 4 credits. | Credit      | 4                       | Loras College               | <a href="http://depts.loras.edu/academics/catalog/2008-10bulletin.pdf#page=94">http://depts.loras.edu/academics/catalog/2008-10bulletin.pdf#page=94</a> |
| Leak Detection in Water Mains                      | Students will learn about leak detection and line location with units covering terminology, theory, water audits, plastic lines and eliminating false positives.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Chlorine Chemistry & Dosing                        | In this class students will obtain information on chlorination chemistry, equipment, chemical feed, analysis and dechlorination, as well as state and federal regulations.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Transformers                                       | This course covers theory, power distribution and the need for transformers while learning how to read wiring diagrams for different controls and configurations.   | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Electric Motors                                    | This class introduces the theory and operation of the most common types of motors, including DC, single-phase AC and three-phase AC.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| General Electrical Maintenance & Troubleshooting   | This course covers basic electrical safety practices and procedures, troubleshooting techniques for lighting, switching and power circuits.   | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Operational Math for Water Operators               | This class will help operators learn effective strategies for setting up and solving problems using fractions, decimals, percents, equations, unit conversions and word problems.   | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Advanced Suspended Growth Microbiology - Filaments | In this class filament structure, staining and identification will be covered with hands-on staining and microscopic analysis.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Sampling Concerns for Public Water Systems         | This class addresses proper sampling techniques, transportation and holding time constraints for the sampling parameters required by the Safe Drinking Water Act.   | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Reading Specifications & Drawings                  | This course will help utility personnel how to read and interpret specifications/drawings to better understand and participate in project planning and construction.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Water Microbiology                           | Coliforms, iron bacteria, zebra mussels and water borne pathogens are discussed as they relate to the occurrences, treatment and potential for regrowth within distribution systems.  | Non-Credit  | 5                       | Kirkwood Community College  | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|---|--|-------------|-------------------------|--------------------------------|---|
| Basic Water Treatment - Iron & Manganese Online             | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with iron and manganese levels. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                | Non-Credit  | 5                       | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Water Distribution Systems - Water Quality Online           | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of water quality for distribution systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                | Non-Credit  | 5                       | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Water Distribution Systems - Distribution Facilities Online | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topics of this course involve the issues of water distribution systems and facilities. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links. | Non-Credit  | 5                       | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Water Treatment, Water Distribution, Wastewater Classes     | We periodically offer continuing education classes for water treatment, distribution, and wastewater operators. Contact our office to be added to the list of future offerings.  | Non-Credit  | 5                       | Southwestern Community College | http://www.swc-iowa.edu/index.php?option=com_content&task=view&id=60&Itemid=636 |
| Jar Testing for Water Analysis                              | This class teaches a simple straight forward approach to minimize treatment problems, maximizing cost savings and extending the life of the filter media.  | Non-Credit  | 7                       | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Motor Controls  | This course introduces the single and three-phase power distribution systems, motors and transformers with hands-on troubleshooting of the systems.  | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Electricity   | This course addresses basic electrical theory and safety practices/procedures, the proper use of meters and troubleshooting techniques for lighting, switching and power circuits  | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Pumps - Hands-on  | This hands-on course covers theory of operation, hydraulics, packing, mechanical seals, bearings and coupling alignment. Troubleshooting and hands-on assembly of pumps for water and wastewater plants will be covered.   | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Water Treatment - Sedimentation Online                | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with sedimentation basins. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                     | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Water Treatment - Quality Online                      | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when insuring the quality of the water. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                     | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Water Treatment - Fluoridation Online                 | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with the fluoridation processes. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.               | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Water Treatment - Filtration Online                   | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with the filtration processes. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                 | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |
| Basic Water Treatment - Coagulation and Flocculation Online | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with coagulation and flocculation. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.             | Non-Credit  | 10                      | Kirkwood Community College     | www.kirkwood.edu/etc  |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name               | Contact Website  |
|---|---|-------------|-------------------------|----------------------------|--|
| Water Distribution Systems - Water Mains Online                     | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of water mains for distribution systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Water Distribution Systems - Values, Mains and Meters, O & M Online | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topics of this course are that of proper maintenance and operations of the values, mains, and meters found in water distribution systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links. | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Water Distribution Systems - System Safety Online                   | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of safety issues confronting water distribution systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Water Distribution Systems - System Operations & Maintenance Online | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of the needs for proper operations and maintenance of water distribution systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.                            | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Water Distribution Systems - System Disinfection Online             | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of water disinfection systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Water Distribution Systems - Storage Systems Online                 | Using the Internet students will obtain a working knowledge of potable water distribution systems. The specific topic of this course is that of water storage facilities. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Basic Water Treatment - Disinfection Online                         | Using the Internet students will explore the rudiments of water treatment. The topics of this course include general issues operators face when dealing with a variety of disinfection processes. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 15                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Basic Water Treatment - Water Sources & Treatment Online            | Using the Internet students will explore the rudiments of water treatment. The topics of this course include an overview of water treatment and reservoir management. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 20                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Basic Training Distribution Systems                                 | This basic level course has 20-hrs of classroom training with another 10-hrs of hands-on practice. Topics include - flushing, flowtesting, water quality, tapping and more.   | Non-Credit  | 30                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Basic Training Wastewater Treatment                                 | Entry level course covering the basics of wastewater treatment math, chemistry, operation and maintenance. This course along with six months experience will satisfy the eligibility requirements for the state Wastewater Treatment Plant Operator Grade I exam. This course is a good review for those preparing to take the Wastewater Treatment Plant Operator Grade II exam.                           | Non-Credit  | 30                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |
| Basic Training Water Treatment                                      | Entry level course covering the basics of water treatment math, chemistry, operation and maintenance. This course along with six months experience will satisfy the eligibility requirements for the state Water Treatment Plant Operator Grade I exam. This course is a good review for those preparing to take the Water Treatment Plant Operator Grade II exam.  | Non-Credit  | 30                      | Kirkwood Community College | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|---|--|-------------|-------------------------|--------------------------------|---|
| Basic Water Distribution  | The objective is to provide operators and managers with the knowledge, skills, abilities, and judgment essential to safely operate and maintain their distribution facilities. Description: This entry-level course provides a foundation and builds on knowledge about water sources and characteristics, math, hydraulics, storage, booster stations, distribution system facilities, valves, hydrants, meters, water quality considerations, O&M, disinfection, sampling, laboratory safety, law and regulations. This course, along with six months experience will satisfy the eligibility requirement for the Iowa DNR Distribution Grade I. This course is also a good review for anyone planning to take the Distribution Grade II exam. | Non-Credit  | 30                      | Iowa Western Community College | <a href="http://www.iwcc.edu/ce/classes/trades.asp">http://www.iwcc.edu/ce/classes/trades.asp</a>   |
| <b>Water Reclamation</b>  |  |             |                         |                                |   |
| Operational Math for Wastewater Operators                       | In this class participants will learn skills and techniques to better understand and solve problems involving volumes and calculations required in the wastewater field.   | Non-Credit  | 5                       | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Microbiology                                   | This hands-on class will look at the microbial activity of decomposing wastewater beginning in the collection system and the changes that occur through secondary treatment and digestion.   | Non-Credit  | 5                       | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Water Treatment, Water Distribution, Wastewater Classes         | We periodically offer continuing education classes for water treatment, distribution, and wastewater operators. Contact our office to be added to the list of future offerings.  | Non-Credit  | 5                       | Southwestern Community College | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |
| Basic Wastewater Treatment - Suspended Growth Systems Online    | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding suspended growth systems. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Primary Treatment Online           | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding the steps in primary treatment of wastewater. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Preliminary Treatment Online       | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding the steps in preliminary treatment of wastewater. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.   | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Pond Systems Online                | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding use of wastewater ponds as a treatment method. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.  | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Pollution Control Online           | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding what is meant by the term water pollution, the steps needed to treat it and the math used. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.  | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Fixed Film Process Online          | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues regarding the trickling filter process when treating wastewater. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.  | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Basic Wastewater Treatment - Disinfection & Chlorination Online | Using the Internet students will explore the rudiments of wastewater treatment. The topics of this course include general issues operators face when disinfecting wastewater. Along with reading assignments from the text, the course is enhanced with audio, up-to-date photographs, interactive exercises, and online links.  | Non-Credit  | 10                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                       | Course Description  | Course Type | Credit or Contact Hours | College Name                     | Contact Website   |
|---|---|-------------|-------------------------|----------------------------------|---|
| <b>Air Pollution</b>                              |   |             |                         |                                  |   |
| Air Pollution Control Technology                  | Sources, environmental and health impacts, regulations for power plant design and energy use, modeling of air pollution; processes and alternative strategies for control; global climate considerations.   | Credit      | 3                       | University of Iowa               | <a href="http://www.registrar.uiowa.edu/registrar/catalog/">http://www.registrar.uiowa.edu/registrar/catalog/</a>   |
| Green Chemical and Energy Technologies            | Strategies for pollution prevention for chemical processes studied at the macroscale (industrial sector), the mesoscale (unit operations), and the microscale (molecular level); case studies. Corequisites: 052:105 and 052:187.   | Credit      | 3                       | University of Iowa               | <a href="http://www.cbe.engineering.uiowa.edu/">http://www.cbe.engineering.uiowa.edu/</a>   |
| M E 542: Advanced Combustion                      | Prereq: 332 or Ch E 381. Thermochemistry and transport theory applied to combustion. Gas phase equilibrium. Energy balances. Reaction kinetics. Flame temperatures, speed, ignition, and extinction. Premixed and diffusion flames. Combustion aerodynamics. Mechanisms of air pollution.   | Credit      | 3                       | Iowa State University            | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| M E 444: Elements and Performance of Power Plants | Prereq: 332, credit or enrollment in 335. Basic principles, thermodynamics, engineering analysis of power plant systems. Topics include existing power plant technologies, the advanced energyplex systems of the future, societal impacts of power production, and environmental and regulatory concerns. Nonmajor graduate credit.  | Credit      | 3                       | Iowa State University            | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| M E 446: Power Plant Design                       | Prereq: 332, credit or enrollment in 335. Design of a power plant to meet regulatory, cost, fuel, and output needs. Selection and synthesis of principal components. Oral and written reports required. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University            | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Air Quality                                       | Topics from atmospheric dynamics, atmospheric chemistry, physical meteorology, and micrometeorology; atmospheric transport processes in time and space; local and regional concentrations of pollutants; implications of air pollution control strategies; numerical modeling techniques with application to air quality issues; field studies and remote sensing of atmospheric transport. Discussion, 4 periods. (Offered Even Springs)   | Credit      | 4                       | University of Northern Iowa      | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Air Dispersion Modeling                           | Fundamentals of numerical weather prediction; data assimilation; parameterization techniques; estimating emissions; puff and trajectory models; dispersion of dense gases; statistical models; atmospheric chemical transport models; urban and regional regulatory models. Discussion, 3 periods; lab, 2 periods. (Offered Even Falls)   | Credit      | 4                       | University of Northern Iowa      | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Measurement and Analysis of Air Quality           | Fundamentals of air sampling and monitoring; estimating errors; collection and analysis of gases and particulates; olfactometry; remote sensing with satellites and lidar; indoor air quality. Discussion, 3 periods; lab, 2 periods. (Offered Odd Springs)   | Credit      | 4                       | University of Northern Iowa      | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| <b>Recycling, Waste, Clean-up</b>                 |   |             |                         |                                  |   |
| Lead Safe Renovator Refresher                     | This course is for persons previously trained in "Lead Safe Work Practices". Currently, dates are not set for the refresher; however, please contact our office to be added to the list for future classes.   | Non-Credit  | 4                       | Southwestern Community College   | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |
| Lead Safe Renovator Refresher Course              | This 4-hour course is for persons who have been previously trained in "Lead-Safe Work Practices." It substitutes for the 8-hour course if a renovator has previously taken the IDPH lead safe work practices class and has a training certificate to verify it. It is also used as a three year refresher course for certified renovators to maintain their active certification status. It reviews specific work practices that are lead-safe, and describes prohibited work practices when performing renovations. It also provides renovators a review on proper set up, clean up and on-the-job training for non-certified workers including 2 hours of hands-on exercises. It highlights Federal and State specific regulations that must be followed as a certified renovator, and provides examples of how to maintain and document required reports. Once completed participants will be eligible to apply or reapply for certification with the Iowa Department of Public Health. Audience: Contractors who work in pre-197. | Non-Credit  | 4                       | Northwest Iowa Community College | <a href="http://www.nwicc.edu/continuing-education/search-and-register/default.aspx">http://www.nwicc.edu/continuing-education/search-and-register/default.aspx</a>                                     |

## Appendix D: Education and Training Resources - Iowa

| Course Name                            | Course Description   | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|--|--|-------------|-------------------------|--|---|
| Lead Safety Renovator Refresher Course | This is a 4 hour course for persons who have been previously trained in Lead Safe Work Practices. This course can substitute the 8 hr. course if a renovator has previously had the IDPH lead safe work practices class and has a training certificate to verify it. This class is also used as a three year refresher course for certified renovators to maintain their active certification status. It is a course to prepre renovators for certification or to maintain certification. At the end of the course there will be an exam that requires a score of 80% or better, once completed participants will be eligible to apply or reapply for certification with the IDPH.   | Non-Credit  | 4                       | Des Moines Area Community College - Ankeny | ce.dmacc.edu  |
| Lead Safety Renovator Course           | This is an 8 hour course for persons who have not previously been trained in Lead Safe Work Practices to prepare renovators for certification. This course concentrates on specific work practices that are lead- safe, and describes prohibited work practices when performing renovations. At the end of the course there will be an exam that requires a score of 80% or better, once completed participants will be eligible to apply for certification with the Iowa Department of Public Health. This is NOT a course on lead abatement.   | Non-Credit  | 8                       | Des Moines Area Community College - Ankeny | <a href="http://www.dmacc.edu/conte ddesc/ leadsafety.asp">http://www.dmacc.edu/conte ddesc/ leadsafety.asp</a>   |
| Lead Safe Renovator 8-Hour Initial     | This is an 8-hour course for persons who have not previously been trained in "Lead Safe Work Practices." This course concentrates on specific work practices that are lead-safe, and describes prohibited work practices when performing renovations. It demonstrates lead safe work practices including set up, clean up using hands on activities, and it illustrates proper on-the-job training for non certified workers. It also provides information on Federal and State specific regulations that must be followed as a certified renovator. It provides examples of how to maintain and document required reports. It is a course to prepare renovators for certification. At the end of the course there will be an exam that requires a score of 80% or better, once completed participants will be eligible to apply for certification with the Iowa Department of Public Health. * Note: This is NOT a course on how to do lead abatement.  | Non-Credit  | 8                       | Iowa Valley Community College District     | <a href="http://www.iavalley.edu">www.iavalley.edu</a>  |
| Lead Safe Renovator Certification      | Beginning April 22, 2010, renovators performing work in pre-1978 housing and pre-1978 child-occupied facilities (daycare centers, kindergartens) must be certified. This new law applies to all persons who perform renovation, remodeling, and painting. The Iowa Department of Public Health (IDPH) will carry out these rules in Iowa. Certified people will be called "lead-safe renovators." Renovation and remodeling contractors, rental property owners, maintenance workers, painters, and some plumbers and electricians are required to become certified. Contractors must take an approved 8-hour lead-safe renovator course. If you already took an approved lead-safe work practices course, you must take a 4-hour refresher course. Companies that conduct renovation must be certified.   | Non-Credit  | 8                       | Southeastern Community College             | <a href="http://www.scc.iowa.edu/business/course_solutions/Lead%20Safe%20Renovator%20Information.pdf">http://www.scc.iowa.edu/business/course_solutions/Lead%20Safe%20Renovator%20Information.pdf</a>   |
| Lead Safe Renovator Course             | This course concentrates on specific work practices that are lead-safe, and describes prohibited work practices when performing renovations. It demonstrates lead safe work practices including set up, clean up using hands on activities, and it illustrates proper on-the-job training for non certified workers. It also provides information on Federal and State specific regulations that must be followed as a certified renovator and it provides examples of how to maintain and document required reports. Once completed participants will be eligible to apply for certification with the Iowa Department of Public Health. Audience: Contractors who work in pre-1978 housing and who might disturb painted surfaces (greater than 1.0 square foot) while doing plumbing, electrical, drywall, painting, tile, window replacement, landscaping, repairs, construction, renovation, remodeling, HVAC, demolition, plus many, other jobs. The rule also applies to people who work for rental property owners, schools, etc. | Non-Credit  | 8                       | Northwest Iowa Community College           | <a href="http://www.nwicc.edu/continuing-education/search-and-register/default.aspx">http://www.nwicc.edu/continuing-education/search-and-register/default.aspx</a>                                     |
| Lead Free Renovation                   | Lead-free renovation certification course; 8:00 a.m. to 5:30 p.m. Iowa Lakes Campus Spirit Lake, IA.   | Non-Credit  | 8                       | Iowa Lakes Community College               | <a href="http://www.iowalakes.edu">www.iowalakes.edu</a>  |
| Lead Safe Renovator                    | Classes scheduled on an as needed basis. Please contact our office to be added to the list for future classes.   | Non-Credit  | 8                       | Southwestern Community College             | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                     | Course Description  | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|---|---|-------------|-------------------------|--------------------------------|---|
| Lead Safety Renovator                           | This is an 8 hour course for persons who have not previously been trained in Lead Safe Work Practices to prepare renovators for certification.  | Non-Credit  | 8                       | Iowa Western Community College | <a href="http://www.iwcc.edu/ce/classes/trades.asp">http://www.iwcc.edu/ce/classes/trades.asp</a>           |
| DOT HAZARDOUS MATERIALS TRANSPORTATION - Online | This course is designed to familiarize you with the DOT hazard communication system related safety and security issues. It will help you understand the labels, placards, shipping papers, and markings associated with the transportation of hazardous material. You will learn how to read the Hazardous Material Table and the 2000 Emergency Response Guidebook. The course includes labeling exercises, form completions, and self- tests. Students can access the DOT Regulations and the CFR through online links.   | Non-Credit  | 5                       | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| HAZWOPER REFRESHER - Online                     | This Internet-based course provides eight hours of interactive training online for the annual refresher to the 40-hour Hazardous Wastesite Worker course (29 CFR 1910.120). This course fulfills the requirement for OSHA/EPA.  | Non-Credit  | 8                       | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| HOUSEHOLD HAZARDOUS WASTE WORKERS - Online      | This Internet-assisted class is a 24-hour Moderate Risk course for those in the solid waste field. Eighteen hours of the course are delivered over the Internet and can be taken anytime anywhere. The course includes online text, interactive exercises, web links, self-grading quizzes, final exam, and job specific hands- on training. The six hours of hands-on training has been designed for those employed at landfills, recycling centers, and household hazardous waste facilities.   | Non-Credit  | 24                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| HAZWOPER - MODERATE RISK - Online               | This course is the online portion of the 40-hr class using the nationally recognized curriculum with self- paced, open entry, open exit for waste site workers that meets all the requirements of 29 CFR 1910.120, OSHA's Hazardous Waste Site Worker and Emergency Response Standard. The course consists of an online text, interactive exercises, web links, self- grading quizzes, and final exam. There are two days of face-to-face training to complete the 40 hours for Hazwoper Certification or as a stand-alone course to enhance your skills. Topics include exercises on PPE, Regulations, Site Characterization, Confined Space, Decon, etc.              | Non-Credit  | 24                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| HazWoper 24 Hour Moderate Risk - Online         | This self-paced HazWoper education course on the Internet meets the OSHA/EPA training requirements for workers performing hazardous waste site functions in accord with the provisions of 29 CFR 1910.120. The regulation stipulates that employers at hazardous waste sites, and at many other "sites" as further defined by the regulation, shall ensure that all workers with the potential of chemical exposure will receive a minimum of 24 hours of waste site health and safety training. The course consists of an online text, interactive exercises, web links, self-grading quizzes, and final exam.   | Non-Credit  | 24                      | Southeastern Community College | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a> |
| LANDFILL OPERATIONS - Online                    | Using the Internet those taking this course will gain a vast array of knowledge concerning the many aspects of landfill operations. This course provides eight foundation blocks for the operator with units on waste decomposition, geology & hydrology, engineering, surveying, landfill design, landfill construction, landfill operations, and regulations. This class will meet or exceed most state requirements for the educational components of certification and/or licensing required for solid waste professionals.   | Non-Credit  | 25                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| COMPOSTING OPERATIONS - Online                  | Composting is the controlled process of organic degradation or waste decomposition. This web-based course will provide those taking the class with knowledge in the process of waste decomposition, an array of microorganisms and invertebrates consume the organics and convert them to humus. In the truest sense, solid waste composting is actually microbe farming, and like any type of farming, success has a lot to do with the farmer knowing how to make what he is raising thrive and grow. This class will meet or exceed most state requirements for the educational components of certification and/or licensing required for solid waste professionals. | Non-Credit  | 25                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| HAZWOPER 40-hour Certification - Online         | This nationally recognized curriculum is Internet-based with self-paced, open entry, open exit for waste site workers that meets all the requirements of 29 CFR 1910.120, OSHA's Hazardous Waste Site Worker and Emergency Response Standard. The course consists of an online text, interactive exercises, web links, self- grading quizzes, and final exam. There are two days of face-to-face training to complete the 40 hours for Hazwoper Certification or as a stand-alone course to enhance your skills. Topics include exercises on PPE, Regulations, Site Characterization, Confined Space, Decon, etc.   | Non-Credit  | 40                      | Kirkwood Community College     | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |

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| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|--|-------------|-------------------------|--|---|
| INTEGRATED SOLID WASTE MANAGEMENT - Online              | Using the Internet this course will provide the student with a comprehensive look at solid waste management; combining the aspects of landfill, composting and household hazardous waste operations. This class will meet or exceed most state requirements for the educational components of certification and/or licensing required for solid waste professionals.   | Non-Credit  | 60                      | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/etc">www.kirkwood.edu/etc</a>  |
| Green - Fundamentals of Mold Inspection - Online        | The Fundamentals of Mold Inspection is a course for anyone wanting to learn the core skills needed to evaluate homes and buildings for mold. You will first learn about basic microbiology, causes of mold growth, different categories of mold and their health effects. The course also trains students on how to perform a thorough mold inspection using a 5-step process. You will also learn the when, where, why and how to take mold samples and interpret the results.  | Non-Credit  | 8                       | Northeast Iowa Community College Calmar    | <a href="http://www.the-knowledgebase.org/nicc/csdet.php">http://www.the-knowledgebase.org/nicc/csdet.php</a>             |
| Fundamentals of Mold Inspection                         | The Fundamentals of Mold Inspection is a course for anyone wanting to learn the core skills needed to evaluate homes and buildings for mold. You will first learn about basic microbiology, causes of mold growth, different categories of mold and their health effects. The course also trains students on how to perform a thorough mold inspection using a 5-step process. You will also learn the when, where, why and how to take mold samples and interpret the results.  | Non-Credit  | 8                       | Southeastern Community College             | <a href="http://www.the-knowledgebase.org/secc/csdet.php">http://www.the-knowledgebase.org/secc/csdet.php</a>             |
| <b>Retrofitting</b>                                     |  |             |                         |  |   |
| Energy Star -- How It Saves You Money!                  | Learn how the Energy Star system works before you buy your next appliance, home electronics or a simple light bulb. No matter how small or large, electrical devices are consuming more and more energy everyday in our homes and businesses.  | Non-Credit  | 3                       | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/ce">www.kirkwood.edu/ce</a>  |
| Weatherization and Your Home                            | This course covers home weatherization techniques including proper caulking, weather-stripping, sealing outlets, insulating exposed areas.   | Non-Credit  | 3                       | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/ce">www.kirkwood.edu/ce</a>  |
| Retrofitting Existing Structures to Reduce Energy Costs | This course provides students with effective strategies to better insulate a home or business from fiberglass, cellulose, foam insulation to triple pane, low e, and argon filled windows.   | Non-Credit  | 4                       | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/ce">www.kirkwood.edu/ce</a>  |
| Energy Audit Concepts                                   | This course studies energy efficiencies of major systems of building structures. Thermal properties of materials, air flow, cooling and heating, appliances and lighting, and occupancy safety will be thoroughly discussed.   | Non-Credit  | 6                       | Kirkwood Community College                 | <a href="http://www.kirkwood.edu/ce">www.kirkwood.edu/ce</a>  |
| Green Workplace - Online                                | NEW! Coming Sept. 6, 2010. A greener workplace can provide substantial benefits to your organization's triple bottom line - people, planet and profits. By reducing the energy intensity of their buildings and materials demand and waste, green workplaces can save money and reduce their impact on the environment. Come discover the keys to making green workplaces a success for you and your organization. This course is suitable for those new to green workplaces or already working in a green space and interested in enhancing their knowledge of what makes it a green space. Includes a green workplace toolkit. | Non-Credit  | 16                      | Iowa Valley Community College District     | <a href="http://www.you-gotclass.org/catalog.cfm/lavalley">http://www.you-gotclass.org/catalog.cfm/lavalley</a>           |
| Home Energy Consultant Online Course                    | Receive what you need to start conducting home/residential energy audits. Learn to identify the common energy-wasting areas of a residence and energy conservation techniques in this web based class.   | Non-Credit  | 20                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/ceonline/Pages/greentraining.aspx">http://go.dmacc.edu/ceonline/Pages/greentraining.aspx</a> |
| Green - Home Energy Auditor - Online                    | This program consists of training, certification, and business start-up kit. You will receive everything you need to be able to go out and start conducting home/residential energy audits. You will learn to identify the common energy wasting areas of a residence. You will also learn more in-depth energy conservation techniques to enable you to provide your clients with the maximum in energy savings insight.  | Non-Credit  | 20                      | Northeast Iowa Community College Calmar    | <a href="http://www.the-knowledgebase.org/nicc/csdet.php">http://www.the-knowledgebase.org/nicc/csdet.php</a>             |
| Commercial Energy Consultant Online Course              | Receive what you need to start conducting commercial/retail energy audits. Discover the basics of energy auditing, the economics of energy and how to turn that knowledge into a functioning, profitable business for yourself. This course requires successful completion of the Commercial Energy Certification Exam.  | Non-Credit  | 25                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/ceonline/Pages/greentraining.aspx">http://go.dmacc.edu/ceonline/Pages/greentraining.aspx</a> |
| Green - Commercial Energy Auditor - Online              | The Commercial Energy Auditor Training Program is a comprehensive training program designed to teach you the basics of energy auditing, the economics of energy and how to turn that knowledge into a functioning, profitable business for yourself.   | Non-Credit  | 25                      | Northeast Iowa Community College Calmar    | <a href="http://www.the-knowledgebase.org/nicc/csdet.php">http://www.the-knowledgebase.org/nicc/csdet.php</a>             |

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| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|--|---|-------------|-------------------------|--|---|
| RESNET - Home Energy Auditor Training                |   | Non-Credit  | 40                      | Northeast Iowa Community College Calmar    | <a href="http://www.nicc.edu">www.nicc.edu</a>  |
| Weatherization Training                              | The training will be a 40-60 hr program to learn about weatherization. This program will be offered to contractors looking to upgrade their skills as well as people looking to enter the green job market for the first time.  | Non-Credit  | 40                      | Iowa Western Community College             | <a href="http://www.iwcc.edu/">http://www.iwcc.edu/</a>   |
| Weatherization Energy Auditor Online Course          | This 7 week course is designed for the Dept. of Energy's (DOE) Weatherization Program and similar utility funded programs based on the "core competencies for the Weatherization Assistance Program". Curriculum is designed to train technicians involved in the field of building performance and energy efficiency in this green economy. This course is compliant with the BPI Energy Analyst Standards.  | Non-Credit  | 50                      | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/ceonline/Pages/greentraining.aspx">http://go.dmacc.edu/ceonline/Pages/greentraining.aspx</a>   |
| Green - Weatherization Energy Auditor (BPI) - Online | This course is specifically designed to help a person to prepare for the BPI Envelope Professional Written and Field Examinations. If you are interested in working as a shell technician or installer for helping weatherize homes, use our materials to get the training to help prepare you for working as a shell technician and to prepare for the Envelope Professional Field Exams. Learn how a house and its ducts are tested for leakiness. Learn about energy in the home and where to look for reducing air infiltration and increasing insulation to reduce energy bills. This program also includes a valuable residential basic training package (8 DVD's and a manual) to help you understand how the components in a house work and what they actually look like with over a thousand real life scenes from actual homes. Some additional field work/training is extremely helpful but not required before the BPI certification can be obtained.   | Non-Credit  | 60                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Weatherization Energy Auditor (BPI)                  | This course is specifically designed to help a person to prepare for the BPI Envelope Professional Written and Field Examinations. If you are interested in working as a shell technician or installer for helping weatherize homes, use our materials to get the training to help prepare you for working as a shell technician and to prepare for the Envelope Professional Field Exams. Learn how a house and its ducts are tested for leakiness. Learn about energy in the home and where to look for reducing air infiltration and increasing insulation to reduce energy bills. This program also includes a valuable residential basic training package (8 DVD's and a manual) to help you understand how the components in a house work and what they actually look like with over a thousand real life scenes from actual homes. Some additional field work/training is extremely helpful but not required before the BPI certification can be obtained.   | Non-Credit  | 60                      | Southeastern Community College             | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |
| Green - Home Energy Analyst (HERS) - Online          | RESNET (Residential Energy Services Network) Rater This course is specifically designed to train a person to conduct energy ratings on new homes or audits on existing homes and to help prepare for the RESNET written and field exams or the BPI written and field exams. If you are interested in working as an energy rater or auditor for helping weatherize homes, use our materials to get the training to help prepare you for working as an auditor/rater. Learn how a house is tested for leakiness. Learn about energy in the home and where to look for reducing energy bills. This program also includes a valuable residential basic training package (8 DVD's and a manual) to help you understand how the components in a house work and what they actually look like with over a thousand real life scenes from actual homes. Some additional field work/training is required before the RESNET certification can be obtained. Some additional field work/training is extremely helpful but not required before the BPI certification can be obtained. | Non-Credit  | 60                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Building Analyst (BPI BA Certification)              | The Building Analyst Quick Start Program consists of two online training programs: Principles of Green Buildings and Performing Comprehensive Building Assessments. This program has also been designed to help prepare individuals on the path to various NATE, NARI, BPI, RESNET, and other industry credentials related to green building performance. Instruction aligns with ANSI/ACCA Quality Installation and Maintenance Standards. This program is recognized by North American Technician Excellence (NATE) and Building Performance Institute (BPI) for 28 hours of continuing education (28 CEHs) applicable to NATE and BPI recertification. Must obtain a 75% or higher to obtain CEH recognition.  | Non-Credit  |                         | Southeastern Community College             | <a href="http://www.gatlineducation.com/unbranded/building_analyst_training_overview.html">http://www.gatlineducation.com/unbranded/building_analyst_training_overview.html</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|---|--|-------------|-------------------------|---|---|
| Energy Waste Reduction  | Students gain hands-on experience with energy auditing techniques, building design and update methods, laser & infra red systems for detecting energy loss, super insulation, thermal bridges, heat exchangers, passive solar theory, earth tubes, certifications, and other topics.   | Credit      | 3                       | Iowa Central Community College          | <a href="http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/energy/schedule.asp</a>                               |
| Upgrading Heating & Air Conditioning Systems to Reduce Energy Consumption | This course studies buildings as integrated systems affecting the performance of one another. Equipment selection, energy efficiency, building sustainability, indoor air quality, and health/safety/comfort as they relate to HVAC systems will be discussed.   | Non-Credit  | 10                      | Kirkwood Community College              | <a href="http://www.kirkwood.edu/ce">www.kirkwood.edu/ce</a>  |
| NCI HVAC Performance, Diagnostic, and Balancing Training                  | National Comfort Institute's (NCI) Heating, Ventilation and Air Conditioning (HVAC) certification program. This 2-day intensive workshop will help HVAC contractors to advance their business's service offerings, energy efficiency expertise, and system diagnostic and testing skills. HVAC contractors will receive national certification to test heating and cooling equipment. The class also includes information on how to make the necessary recommendations and repairs to maximize the performance of customers' homes. Day 1: The first day of training will educate contractors on how to determine the actual Effective Efficiency of any functioning HVAC system. The attendee will learn how to and perform static pressure and temperature diagnostics that will improve their ability to identify the unseen causes of poor system efficiency and performance. Using NCI's HeatMaxxT and CoolMaxxT diagnostic reports, contractors will help their customer's to see the benefits of proper system performance. | Non-Credit  | 16                      | Northwest Iowa Community College        | <a href="http://www.nwicc.edu/continuing-education/search-and-register/default.aspx">http://www.nwicc.edu/continuing-education/search-and-register/default.aspx</a>                                     |
| NCI-HVAC Certification  | January 19 & 20, 2011; 9 am-5 pm This 2-day workshop will help HVAC contractors advance their service offerings, energy efficiency expertise, and system diagnostic and testing skills. Attendees will receive national certification to test heating and cooling equipment. The class also includes information on how to make the necessary recommendations and repairs to maximize the performance of customers' home systems.  | Non-Credit  | 16                      | Southwestern Community College          | <a href="http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636">http://www.swcc.iowa.edu/index.php?option=com_content&amp;task=view&amp;id=60&amp;Itemid=636</a> |
| Certified Indoor Air Quality Manager (CIAQM)                              | The Certified Indoor Air Quality Manager (CIAQM) course is comprehensive in its scope, covering concepts in IAQ management, preventative maintenance, microbiology, chemistry, building science, physics, engineering, construction, medicine and law. The course gives you practical steps to establish an IAQ Management Plan for your facility that will help you collect, log and resolve air quality complaints. The course also prepares you for the only accredited certification specifically designed for those that manage indoor air quality problems, sponsored by the American IAQ Council. -----" 28 hours. 3 months access.   | Non-Credit  | 28                      | Southeastern Community College          | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |
| Green - Certified Indoor Air Quality Manager (CIAQM) - Online             | The Certified Indoor Air Quality Manager (CIAQM) course is comprehensive in its scope, covering concepts in IAQ management, preventative maintenance, microbiology, chemistry, building science, physics, engineering, construction, medicine and law. The course gives you practical steps to establish an IAQ Management Plan for your facility that will help you collect, log and resolve air quality complaints. The course also prepares you for the only accredited certification specifically designed for those that manage indoor air quality problems, sponsored by the American IAQ Council.   | Non-Credit  | 28                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Certified Microbial Investigator (CMI) - Online                           | Take your HVAC or mold inspection services to a new level by learning the latest advances in the industry and while you're at it, getting the industry's most recognized microbial certifications, Council-certified Microbial Investigator (CMI) and Council-certified Microbial Consultant (CMC). We'll teach you the core skills needed to perform impressive assessments that will set you apart from the competition. Certification exam through the American Indoor Air Quality Council.   | Non-Credit  | 28                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Certified Microbial Investigator  | Take your HVAC or mold inspection services to a new level by learning the latest advances in the industry and while you're at it, getting the industry's most recognized microbial certifications, Council-certified Microbial Investigator (CMI) and Council-certified Microbial Consultant (CMC). We'll teach you the core skills needed to perform impressive assessments that will set you apart from the competition. Certification exam through the American Indoor Air Quality Council.   | Non-Credit  | 28                      | Southeastern Community College          | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |

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| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|---|--|-------------|-------------------------|---|---|
| Green - Indoor Air Quality - Fundamentals of Standard 62.1 - Online | Properly designed ventilation systems are essential for the well-being of building occupants, to minimize adverse health effects and improve productivity of workers and students. Standard 62.1, Ventilation and Acceptable Indoor Air Quality, is the industry standard for the design and operation of ventilation systems to provide acceptable indoor air quality.  | Non-Credit  | 29                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Green - Certified Indoor Environmentalist (CIE) - Online            | The Certified Indoor Environmentalist Course Online is an in depth program teaching you the core skills needed to perform indoor environmental assessments of all building types. The course not only provides the fundamentals of indoor air quality, it teaches more advanced topics that will educate even seasoned veterans in the field. Certification exam offered through the American Indoor Air Quality Council.  | Non-Credit  | 32                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| M E 442: Heating and Air Conditioning Design                        | Prereq: 441. Design criteria and assessment of building environment and energy requirements. Design of heating, ventilating, and air conditioning systems. System control and economic analysis. Oral and written reports required. Nonmajor graduate credit.  | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| M E 441: Fundamentals of Heating, Ventilating, and Air Conditioning | Prereq: Credit or enrollment in 436. Space conditioning and moist air processes. Application of thermodynamics, heat transfer, and fluid flow principles to the analysis of heating, ventilating, and air conditioning components and systems. Performance and specification of components and systems. Nonmajor graduate credit.  | Credit      | 3                       | Iowa State University                   | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Air Conditioning, Heating, and Refrigeration - Diploma              | The Air Conditioning, Heating, and Refrigeration (HVAC) program includes a study of air conditioning, heating, and refrigeration for residential and light commercial equipment. Students are trained to be HVAC technicians in a real-world, hands-on lab environment. The HVAC facility is equipped with state-of-the-art HVAC systems including geo-thermal and other high-efficiency systems. In addition, students will have ample opportunity to work on conventional HVAC systems. Technicians will be needed to troubleshoot and maintain HVAC systems because of the increasing number of new residential and commercial structures and to respond to the increased demand for energy management, conservation and other "green" technologies. According to the Bureau of Labor Statistics, employment of heating, air-conditioning, and refrigeration mechanics and installers is expected to grow as fast as the average for all occupations through the year 2014. (Occupational Outlook Handbook. Bureau of Labor Statistics).  | Credit      | 44                      | Western Iowa Tech Community College     | <a href="http://www.witcc.edu/programs/program.cfm?id=113&amp;CFID=12027606&amp;CFTOKEN=98231517">http://www.witcc.edu/programs/program.cfm?id=113&amp;CFID=12027606&amp;CFTOKEN=98231517</a>   |
| Heating and Air Conditioning--Diploma                               | Learn the competencies required for successful heating and air conditioning mechanics. Competencies include installation and repair of equipment ranging in size from small residential systems to light commercial systems. You will also have the opportunity to learn how to install, diagnose, and repair electric, gas-fired, and oil-fired furnaces, motors, compressors, and evaporators, as well as following blueprints and design specifications.  | Credit      | 48                      | Northeast Iowa Community College Calmar | <a href="http://www.niccedu/index.php?option=com_program&amp;task=view&amp;programid=78&amp;campus=Peosta&amp;Itemid=99999999">http://www.niccedu/index.php?option=com_program&amp;task=view&amp;programid=78&amp;campus=Peosta&amp;Itemid=99999999</a> |
| HVAC  | When you choose a career in Heating, Ventilation, Air Conditioning and Refrigeration (HVACR), you choose one of the most important jobs in the world. Every man, woman and child on the planet depends on the HVACR industry for comfort, for health -- even for Survival! The Climate Control curriculum provides opportunities to develop the skills necessary for entry into the HVAC industry. The Climate Control curriculum allows students to choose between completing a program in Climate Control mechanics, which leads to a diploma with an emphasis in residential heating and air conditioning or a program in Climate Control Technology, which leads to an Associate in Applied Science Degree with an emphasis in commercial heating and air conditioning. Both the programs are designed around a common group of courses. A diploma will be awarded upon successful completion of the prescribed curriculum with a grade point average of 2.00(C) or better. This recognition is granted to a person who has completed at least thirty (30) semester hours of credit. | Credit      | 65                      | North Iowa Area Community College       | <a href="http://www.niacc.edu/industrial/climate/climate.html">http://www.niacc.edu/industrial/climate/climate.html</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description   | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|--|-------------|-------------------------|--|---|
| <b>Green Design and Construction</b>                          |  |             |                         |  |   |
| Green - LEED Green Associate - Course - Online                | NEW v3 2009 LEED Tier I ----- For professionals who want to demonstrate green building expertise in non- technical fields of practice, GBCI has created the LEED Green Associate credential, which denotes basic knowledge of green design, construction, and operations. The Green Associate credential also serves as the first step for professionals pursuing a LEED AP specialization. New Tier I credential that attests to demonstrated knowledge and skill in understanding and supporting green design, construction, and operations. Exam simulation prep included.  | Non-Credit  | 8                       | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| LEED Green Associate  | NEW v3 2009 LEED Tier I ----- For professionals who want to demonstrate green building expertise in non- technical fields of practice, GBCI has created the LEED Green Associate credential, which denotes basic knowledge of green design, construction, and operations. The Green Associate credential also serves as the first step for professionals pursuing a LEED AP specialization. New Tier I credential that attests to demonstrated knowledge and skill in understanding and supporting green design, construction, and operations. Exam simulation prep included ----- 8 Hours/2 month access ----- Self-paced.  | Non-Credit  | 8                       | Southeastern Community College             | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |
| Green Sustainability - Sustainability 101 - Online            |  | Non-Credit  | 10                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Green Sustainability - Green Purchasing Fundamentals - Online | Organizational purchasing has evolved tremendously over the last decade shifting from an administrative function to a strategic role. The changing dynamics of the global economy altered the skills of procurement professionals amplifying the importance of conditions such as quality, cost, and delivery. Now, the next step in professional evolution is upon us and the functions of on-time delivery and the lowest price are no longer sufficient. Organizational purchasing is in a strategic position to influence the sustainability and carbon footprint of an organization through multiple channels. What are world class purchasing departments doing to help their organizations become more sustainable? Green Purchasing Fundamentals introduces foundational concepts that align with systems, policies, and procedures that support green purchasing practices and organization sustainability. | Non-Credit  | 10                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| LEED Exam Prep Version 3                                      | Evaluate and understand each LEED® pre-requisite and point. Identify critical issues for design and construction of a LEED® building. Demonstrate an understanding of how quality, energy efficiency and first cost effect each LEED® point. Demonstrate an understanding of how planning, scheduling and estimating labor and material costs will be affected by the LEED® process. Analyze and evaluate strategies for designing and construction a LEED® building through case studies of completed LEED® projects. Become better prepared to take and pass the LEED® accreditation exam.   | Non-Credit  | 12                      | Iowa State University                      | " <a href="http://www.ede.iastate.edu/Non-Credit/LEED/leed.html">http://www.ede.iastate.edu/Non-Credit/LEED/leed.html</a> "   |
| Green Building Course   | This course will prepare builders for the construction of energy efficient certified homes. Possible methods include LEED and/or Energy Star. This course will be available beginning winter 2010.   | Non-Credit  | 30                      | Des Moines Area Community College - Ankeny | <a href="http://ce.dmac.edu">ce.dmac.edu</a>  |
| Green Buildings & LEED Rating Systems - Online                | Get the knowledge to excel as a green professional in the new economy. Acquire an introduction to sustainability and how it lays the foundation for a deeper understanding of the green building process. Participants who successfully complete this course are eligible and prepared to sit for the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Associate exam.   | Non-Credit  | 32                      | Iowa Valley Community College District     | <a href="http://www.yougotclass.org/courses.cfm/lavalley/Green-Buildings-and-LEED-Rating-Systems">http://www.yougotclass.org/courses.cfm/lavalley/Green-Buildings-and-LEED-Rating-Systems</a> |
| Green - Commercial Building                                   |  | Non-Credit  | 34                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/">http://www.theknowledgebase.org/nicc/</a>   |
| Green - Residential Building                                  |  | Non-Credit  | 34                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/">http://www.theknowledgebase.org/nicc/</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|---|---|-------------|-------------------------|---|---|
| Green - Fundamentals of Sustainable Buildings and High Performance Systems Design (GREENGUIDE) - Online | A thorough introduction to green design practices, benefits, new green building ideas, and an overview of the architectural decisions and their impact on sustainable and green project goals. Designed for: Recent engineering graduates working in HVACR, Technicians, Architects.  | Non-Credit  | 35                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a> |
| Green Building Sales Professional - Online  | This program is specifically for individual professionals selling or marketing a certified Green residential (Real Estate Professionals), commercial or government project. Our goal is to provide homeowners, developers, builders, investors, realtors and professionals with a resource for clear understanding the in depth concept of green building and how it applies to your projects, purchases, marketing and sales within the marketplace. Topics covered: Intro Green Building, Environmental Quality, Resource Efficiency Advantages, Sustainable Preventative Maintenance and Sales and Marketing Advantage.  | Non-Credit  | 40                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a> |
| Green Building Sales Professional   | This program is specifically for individual professionals selling or marketing a certified Green residential (Real Estate Professionals), commercial or government project. Our goal is to provide homeowners, developers, builders, investors, realtors and professionals with a resource for clear understanding the in depth concept of green building and how it applies to your projects, purchases, marketing and sales within the marketplace. Topics covered: Intro Green Building, Environmental Quality, Resource Efficiency Advantages, Sustainable Preventative Maintenance and Sales and Marketing Advantage.  | Non-Credit  | 40                      | Southeastern Community College          | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a> |
| Green Building Technical Professional - Online  | This course provides you the tools needed to determine a Green Project. Discover what the future may hold for a Green Lifestyle. This track is designed specifically for those individuals who are involved in the nuts and bolts of green building. Engineers, architects, builders, and those that would like to have a more in-depth approach to green building. Topics covered: Intro Green Building, Environmental Quality, Resource Efficiency Advantages, Sustainable Preventative Maintenance and Advanced Green Technologies.  | Non-Credit  | 40                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a> |
| Green Supply Chain Professional (GSCP) - Online   | Our GSCP certification program is designed to give our graduates a comprehensive knowledge of the sustainability areas confronting supply chain and operations professionals. This program will provide the graduate with very unique credentials and experience. Our online sustainability training is a leading edge form of education that enables anyone around the world to learn about sustainability and "green" topics anytime - anywhere 24/7. People like you need information about sustainability to practice green living, remain current in the workplace, or meet the needs of your customers. Companies like yours need information about being sustainable to practice social responsibility, remain competitive, or meet the needs of global markets. Are you a professional seeking to make yourself more competitive or trying to create a new career opportunity for yourself in today's job market? Now you can conveniently get the training you need for yourself, your team, or your entire company--and you don't have to blow your budget or change your schedule. | Non-Credit  | 50                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a> |
| Green - Certified Sustainability Professional Certificate - Online                                      | Our CSP certification program is designed to give our graduates a great balance of core sustainability topics to enable them to stand out individually or to step into a sustainability leadership role with confidence. Our online sustainability training is a leading edge form of education that enables anyone around the world to learn about sustainability and "green" topics anytime - anywhere 24/7. People like you need information about sustainability to practice green living, remain current in the workplace, or meet the needs of your customers. Companies like yours need information about being sustainable to practice social responsibility, remain competitive, or meet the needs of global markets. Are you a professional seeking to make yourself more competitive or trying to create a new career opportunity for yourself in today's job market? Now you can conveniently get the training you need for yourself, your team, or your entire company--and you don't have to blow your budget or change your schedule.  | Non-Credit  | 50                      | Northeast Iowa Community College Calmar | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name   | Course Description  | Course Type | Credit or Contact Hours | College Name                               | Contact Website   |
|---|---|-------------|-------------------------|--|---|
| Energy Efficient Designs for Architects                                   | This course is a US Green Building Council Approved Education Provider Program and provides a firm foundation for LEEDT. Standard 90.1 for Architects is a concise online course to help architects understand, apply and comply with the standard. It provides the information essential to architects, with a brief overview of engineering that avoids the complex details. ANSI/ASHRAE/IESNA Standard 90.1-2004 is the minimum energy efficiency standard for all non-residential buildings, and all residential buildings greater than three stories in height in the USA.   | Non-Credit  | 57                      | Southeastern Community College             | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |
| Certified Green Supply Chain Professional                                 | The supply chain is at the heart of operations for most businesses. Prepare yourself for a challenging and rewarding career in the green supply-chain management field or gain the edge to move forward in your career with this convenient online training program. This professional certification program will help you learn the essentials of green product standards and labeling as well as how to develop sustainability supplier programs, implement sustainable business practices, apply lean and green manufacturing strategies, and integrate these practices across the extended supply chain.  | Non-Credit  | 60                      | Southeastern Community College             | <a href="http://www.gatlineducation.com/unbranded/green_supply_chain.html">http://www.gatlineducation.com/unbranded/green_supply_chain.html</a>                   |
| Green Building for Contractors - Online                                   | To become Green Builder certified, each enrolled user must complete the seven course series. Each study course in this curriculum addresses the fundamental principles of green building relating to energy efficiency, building durability, indoor air quality, resource efficiency, and water efficiency.   | Non-Credit  | 60                      | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Green - Senior Certified Sustainability Professional Certificate - Online | Our SSCP certification program is designed to give our graduates a comprehensive knowledge of sustainability across multiple functional areas along with a balance of internal and external knowledge of sustainability leadership and consultancy. Our online sustainability training is a leading edge form of education that enables anyone around the world to learn about sustainability and "green" topics anytime - anywhere 24/7. People like you need information about sustainability to practice green living, remain current in the workplace, or meet the needs of your customers. Companies like yours need information about being sustainable to practice social responsibility, remain competitive, or meet the needs of global markets. Are you a professional seeking to make yourself more competitive or trying to create a new career opportunity for yourself in today's job market? Now you can conveniently get the training you need for yourself, your team, or your entire company--and you don't have to blow your budget or change your schedule. | Non-Credit  | 100                     | Northeast Iowa Community College Calmar    | <a href="http://www.theknowledgebase.org/nicc/csdet.php">http://www.theknowledgebase.org/nicc/csdet.php</a>   |
| Certified Green Designer  | The Green Designer Certification is a specialized and tailored educational program developed to bring comprehensive and reliable information to you, the Design Professional. You'll learn how to apply sustainable interior design principles and practices to any design project. This program gives you the background and resources you need to evaluate green products, Green Interior Design and finishes with the entire home's or business "environment" in mind, allowing the design professional to make careful selection of healthy and environmentally responsible materials and products. We offer green building education and interior design strategies to improve energy efficiency with optimum utilization of resources.  | Non-Credit  | 100                     | Southeastern Community College             | <a href="http://www.theknowledgebase.org/secc/csdet.php">http://www.theknowledgebase.org/secc/csdet.php</a>   |
| Senior Certified Sustainability Professional                              | Are you prepared for an exciting career as a leader in the green-collar economy? After completing this premier certification program, you'll establish yourself as a sustainable business professional. You'll be ready to take responsibility for coordinating an enterprise's sustainability strategy across multiple functional areas, including sales, marketing, communications, new product development, global supply chain, operations, and corporate social responsibility. You'll start by learning the basics of green purchasing. Next you'll cover corporate social responsibility, and carbon strategies. You'll also explore environmental accounting, green transportation, and sustainability consulting.  | Non-Credit  | 110                     | Southeastern Community College             | <a href="http://www.gatlineducation.com/unbranded/sustainability_professional.html">http://www.gatlineducation.com/unbranded/sustainability_professional.html</a> |
| Green Building Concepts Course  | In this special topics course (CON 949) students will examine green building concepts, concerns and material characteristics as well as selection. Students will also be introduced to current Leadership in Energy and Environmental Design (LEED) Building certification standards and processes. Theory will be provided that will help the students understand the reasoning behind the green concepts and practices. Students will learn the basic concepts of a cost benefit analysis when selecting environmentally friendly or energy saving housing systems.   | Credit      | 1                       | Des Moines Area Community College - Ankeny | <a href="http://go.dmacc.edu/programs/bldgtrades/pages/welcome.aspx">http://go.dmacc.edu/programs/bldgtrades/pages/welcome.aspx</a>                               |

## Appendix D: Education and Training Resources - Iowa

| Course Name                                       | Course Description   | Course Type | Credit or Contact Hours | College Name                   | Contact Website   |
|---|--|-------------|-------------------------|--------------------------------|---|
| Building Science I                                | Students will apply building science methods to determine how insulations, moisture, building pressures, heat flow and durable design apply to today's residential building methods.   | Credit      | 1                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp</a> |
| Building Science II                               | Students will be expanding on Building Science I, utilizing hands on activities to explore the effects of mold, volatile organic compounds, radon, healthy home design, renewable energy, and building failures.   | Credit      | 1                       | Iowa Central Community College | <a href="http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp</a> |
| Building Science I Course                         | Students will apply building science methods to determine how insulation, moisture, building pressures, heat flow and durable design apply to today's residential building methods.  | Credit      | 1                       | Hawkeye Community College      | <a href="http://www.hawkeyecollege.edu/academics/programs/default.aspx">http://www.hawkeyecollege.edu/academics/programs/default.aspx</a>   |
| Sustainability in Construction /LEED              | This course covers building design and techniques that produce minimal environmental impact and long term benefits. It includes Leadership in Energy and Environmental Design (LEED), a green building rating system.  | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Advanced Lean Manufacturing                       | Development of skills and techniques in applying lean manufacturing to service and industrial settings. Topics include lean enterprise, product development, supplies network, JIT tools, Theory of Constraint, and value stream mapping. Prerequisite(s): 330:180 (TECH 4080) or consent of instructor. (Variable)  | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Sustainable/Green Building Construction           | Technologies and processes used in green building construction including low impact site development, material selection, energy efficiency in heating/air conditioning and lighting. Water conservation and reclamation. Prerequisite(s): 330:153 (TECH 4153/TECH 5153). (Variable)   | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Lean Manufacturing                                | Introduction to lean manufacturing systems and concepts - basic philosophy of reducing waste in areas such as production, processing, inventory, transportation, waiting time, and scrap generation - to improve quality, reduce cost and production time. Prerequisite(s): 330:008 (TECH 1008); 330:010 (TECH 1010); 330:023 (TECH 2024); 330:024 (TECH 1024);330:043 (TECH 2043); 330:060 (TECH 2060); 330:072 (TECH 2072); 330:080 (TECH 2080); 800:048 (MATH 1150) or 800:060 (MATH 1420); 860:020 (CHEM 1020) or 860:044 (CHEM 1110); 880:054 (PHYSICS 1511) or 880:130 (PHYSICS 1701); junior standing or consent of instructor. (Offered Spring)  | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Advanced Building Construction topics CE 594L     | This course provides an introduction to the basic principles of LEED® for a New Construction Version 3 (LEED 2009) program as it applies to designing and constructing a LEED® building. Course outcomes: 1. Evaluate and understand each LEED pre-requisite and point; 2. Identify critical issues for design and construction of a LEED building; 3. Demonstrate an understanding of how quality, energy efficiency and first cost effect each LEED® point; 4. Demonstrate an understanding of how planning, scheduling and estimating labor and material costs will be affected by the LEED® process; 5. Analyze and evaluate strategies for designing and construction a LEED® building through case studies of completed LEED® projects; 6. Become better prepared to take and pass the LEED® accreditation exam" | Credit      | 3                       | Iowa State University          | <a href="http://www.ede.iastate.edu/Non-Credit/LEED/leed.html">http://www.ede.iastate.edu/Non-Credit/LEED/leed.html</a>   |
| Construction Resources                            | Examination of the resources commonly utilized in the construction industry--money, materials, methods, processes, personnel--and their management. (Offered Fall and Spring)  | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Undergraduate Research in Construction Management | Senior group research project pertaining to a topic in construction. Includes an oral and written presentation of the findings, conclusions, and recommendations. (Offered Spring)   | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Construction Estimating                           | Construction cost analysis techniques for estimating materials, labor, equipment, and subcontracting costs in commercial building construction. (Offered Spring)   | Credit      | 3                       | University of Northern Iowa    | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description   | Course Type | Credit or Contact Hours | College Name                        | Contact Website   |
|--|--|-------------|-------------------------|-------------------------------------|---|
| Computerized Construction Estimating               | Utilization of contemporary and emerging building estimating software and advanced estimating techniques. (Offered Fall)   | Credit      | 3                       | University of Northern Iowa         | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Sustainable/ Green Building Construction           | Technologies and processes used in green building construction including low impact site development, material selection, energy efficiency in heating/air conditioning and lighting. Water conservation and reclamation. (Variable)   | Credit      | 3                       | University of Northern Iowa         | <a href="http://www.uni.edu/catalog/08-10/index.shtml">http://www.uni.edu/catalog/08-10/index.shtml</a>   |
| Building Construction Systems I and II             | Courses focus on green building methods and an understanding of green construction. The courses can be added to a certificate or a degree.   | Credit      | 5                       | Kirkwood Community College          | <a href="http://www.kirkwood.edu/site/index.php?p=8438">http://www.kirkwood.edu/site/index.php?p=8438</a>   |
| Residential Construction Applications              | Students will apply advanced construction procedures on decks, walls, roofs, stairwells, and related structures. Durable design and application of proven methods will be emphasized. The course relates to sustainable building practices.  | Credit      | 6                       | Iowa Central Community College      | <a href="http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp</a> |
| Framing for Sustainable Design                     | The students will utilize resource efficient framing methods that stress energy efficiency and sustainable design. The "House as a System" method of residential construction will be teamed with Universal Design and Optimum Value Engineering techniques, the "Building America" Program and the LEED (Leadership in Energy efficiency and sustainable design arenas through guest speakers and the opportunity to present at conferences.  | Credit      | 7                       | Iowa Central Community College      | <a href="http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp">http://www.iowacentral.edu/industrial_technology/programs/carpentry/course_schedule.asp</a> |
| Construction: Sustainable Construction Certificate | The Sustainable Construction Technology certificate introduces the students to the principles and techniques utilized in residential construction which will have a positive impact on our environment. This certificate program gives students a chance to gather in-depth information on the growing sustainable construction field and to become work-ready in a short period of time.  | Credit      | 17                      | Iowa Western Community College      | <a href="http://www.iwcc.edu/programs/program.asp?id=consuscer">http://www.iwcc.edu/programs/program.asp?id=consuscer</a>   |
| Construction - Diploma                             | The Construction program provides students with the knowledge and skills needed for employment as a carpenter or concrete specialist. Study includes residential and commercial construction, with all phases explored and applied on a job site or in the lab. Specialized coursework includes drywall installation and finishing, blueprint reading, construction estimating, concrete stamping, and construction materials. Graduates of the program may be employed in general carpentry work, commercial carpentry, or may specialize in one area such as finish carpentry. Career potential includes foreman of a construction company or owning your own construction company. Another advantage of a WITCC Construction education is the accelerated rate of advancement that the graduates experience. Quite often Construction graduates enter into the field slightly above entry-level positions. Because of their educational background graduates quickly advance to crew leaders, foremen, and field supervisors. | Credit      | 35                      | Western Iowa Tech Community College | <a href="http://www.witcc.edu/programs/index.cfm?id=119">http://www.witcc.edu/programs/index.cfm?id=119</a>   |
| Building Trades                                    | Our students develop the skills they need to succeed in construction through a combination of hands-on instruction at NIACC and mentored supervision on North Iowa construction industry jobsites. Daily instruction at NIACC includes trade theory and hands-on practical experience in a state-of-the-art lab, and on our project job-site. Students receive step-by-step instructions and practice developing carpentry skills at their own pace - by constructing full-scale projects in an individualized, competency-based learning process. Building Trades/Carpentry students also work on rewarding community projects, such as helping to build Habitat for Humanity houses and other service-learning projects for community-based non-profit organizations. The NIACC Building Trades program prepares students for successful carpentry careers and active participation in their communities. Our placement rate is 100%!  | Credit      | 38                      | North Iowa Area Community College   | <a href="http://www.niacc.edu/industrial/buildingtrades/">http://www.niacc.edu/industrial/buildingtrades/</a>   |

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| Course Name                        | Course Description   | Course Type | Credit or Contact Hours | College Name                            | Contact Website   |
|------------------------------------|--|-------------|-------------------------|---|---|
| Carpentry - Diploma or AAS Program | As a carpentry student, you will have hands-on experience in the shop and field experience involving framing, roofing, siding, drywall installation, taping and texturing, interior finishing, and cabinet/ countertop installation, along with classroom time. An emphasis is placed on the care and use of hand and power tools, equipment and materials, and common systems of frame construction. You will also learn about drafting, blueprint reading, trade math, estimating and safety. You will also gain fundamental instruction through the frame-to-finish construction of an energy efficient two- or three-bedroom house. Successful students become employed in an industry with increasing needs for skilled carpenters.   | Credit      | 45                      | Northwest Iowa Community College        | <a href="http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=65">http://www.nwicc.edu/prospective-students/academics/program-details.aspx?ID=65</a>   |
| Construction Technology            | The Construction Technology program at Iowa Lakes Community College is unique in combining the related building trades of plumbing, electrical wiring, and drywall with the usual carpentry skills of concrete, framing, finish and cabinet hanging. You study all these areas in the classroom, practice in the lab, then perform a variety of projects both at and away from the college. You do actual construction work from estimating to finish.   | Credit      | 47                      | Iowa Lakes Community College            | <a href="http://www.iowalakes.edu/programs_study/industrial/construction_tech.htm">http://www.iowalakes.edu/programs_study/industrial/construction_tech.htm</a>   |
| Carpentry--Diploma                 | The Carpentry program offers education and practical experience in basic residential carpentry. You will receive competency-based instruction in the use of up-to-date carpentry production equipment such as saws, jointers, sanders, and routers. Practical experience is provided through construction of a residence each year by the carpentry students. As the carpentry trade is one of the most basic trades in our society, employment opportunities for carpenters may be found in communities of all sizes. NICC's Carpentry program is recognized by the Associated General Contractors of America through the National Center for Construction Education and Research.  | Credit      | 48                      | Northeast Iowa Community College Calmar | <a href="http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=15&amp;campus=Peosta&amp;Itemid=715">http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=15&amp;campus=Peosta&amp;Itemid=715</a> |
| Interior Design                    | Interior Design is an exciting and innovative profession for creative, imaginative, and motivated people. It is a growing field in which collaboration with architects, contractors and craftsmen takes place, ensuring that spaces meet regulatory requirements. Interior Designers plan layouts of buildings, design architectural detailing, create green spaces, and direct projects that are Americans with Disabilities (ADA) compliant. Additional activities include the coordination of colors and designs, materials, furnishings, lighting and accessories. A multi-faceted profession, Interior Design is one in which creative and technical processes are applied with the purpose of achieving a planned and aesthetically-pleasing solution. Students will take courses in space planning, residential architecture/construction, hand and computer-aided drafting, presentation methods, and design and color theory. Graduates are prepared for diverse entry-level positions in architectural and engineering design. | Credit      | 64                      | Western Iowa Tech Community College     | <a href="http://www.witcc.edu/programs/program.cfm?id=167&amp;CFID=12027606&amp;CFTOKEN=98231517">http://www.witcc.edu/programs/program.cfm?id=167&amp;CFID=12027606&amp;CFTOKEN=98231517</a>   |
| Construction Technology            | 40 hr or 73 hr training in Build yourself a solid future by enrolling in Iowa Western's Residential Construction Technology program. This two-year program will prepare you for a rewarding career in carpentry and its related skills for application in the field of residential and commercial construction. Each year, students get real-world experience by constructing a home, partnering with Habitat for Humanity. Over the past 10 years, students in the program have completed more than 100,000 hours of community services projects and more than 40,000 college projects services hours. There are many paid internships available, and some lead to students being hired by the companies offering the internship. Sustainability is taught continuously throughout this program.  | Credit      | 73                      | Iowa Western Community College          | <a href="http://www.iwcc.edu/programs/program.asp?id=contechaas">http://www.iwcc.edu/programs/program.asp?id=contechaas</a>   |
| Construction Technology--AAS       | The Construction Technology program prepares you for commercial carpentry, entry-level management, or trainee supervisory positions in the construction and materials supply industry. Courses in hands-on construction experience, communications, business, and mathematics develop the job-site skills necessary to exercise supervision of a construction site after some practical experience.  | Credit      | 81                      | Northeast Iowa Community College Calmar | <a href="http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=15&amp;campus=Peosta&amp;Itemid=715">http://www.nicc.edu/index.php?option=com_program&amp;task=view&amp;programid=15&amp;campus=Peosta&amp;Itemid=715</a> |

## Appendix D: Education and Training Resources - Iowa

| Course Name  | Course Description  | Course Type | Credit or Contact Hours | College Name                           | Contact Website   |
|--|---|-------------|-------------------------|--|---|
| <b>Sustainable Agriculture</b>                                       |   |             |                         |  |   |
| TSM 325: Biorenewable Systems  | Prereq: Econ 101, Chem 155 or higher, Math 140 or higher. Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, transportation/logistics, and marketing.  | Credit      | 3                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| 21st Century Agriculture   | AGRI1100 21st Century Business 3 s.h. Orientation to Agricultural Business including global issues, current industries, educational pathways, and career options. Content includes emphasis on understanding competitive markets and preparation for broad-based (liberal arts) education.  | Credit      | 3                       | Graceland University                   | <a href="http://www.graceland.edu/business/academics/100539/">http://www.graceland.edu/business/academics/100539/</a>   |
| Sustainable Agriculture  | This course examines the social, economic, and scientific concepts relating to adding value to raw and processed agricultural products. The specific topics will include the impact of agriculture on economics, cultures, social structures, technologies, processing, products, nutrition and environmental issues resulting from adding value to agricultural products. Laboratory activities will provide opportunities for examining various technologies, evaluating products, examining nutritional advantages, assessing economic benefits to communities, and determining the environmental impact of various developments.  | Credit      | 3                       | Iowa Central Community College         | <a href="http://www.iowa-central.edu/industrial_technology/programs/agriculture/ag_tech.asp">http://www.iowa-central.edu/industrial_technology/programs/agriculture/ag_tech.asp</a>             |
| TSM 337: Fluid Power Systems Technology                              | Prereq: 210. Fundamental fluid power principles. Fluid properties. Function and performance of components such as pumps, valves, actuators, hydrostatic transmission and continuously variable transmissions. Basic analysis of fluid power systems. Introduction to electrohydraulics.   | Credit      | 3                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| TSM 330: Agricultural Machinery and Power Management                 | Prereq: 210, Math 142 or 160. Selection, sizing, and operational principles of tractors and machinery systems. Cost analysis and computer techniques applied to planning and management of agricultural machine systems. Principles, operation, and application of agricultural machinery.  | Credit      | 3                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| TSM 363: Electric Power and Electronics for Agriculture and Industry | Prereq: 210, Physics 112. Basic electricity. Electrical safety, wiring, 3-phase service, controls, and motors for agricultural and industrial applications. Planning building electrical systems. Electronics to sense, monitor, and control mechanical processes: semiconductors, digital logic circuits; speed, pressure, position, temperature, and moisture sensors. Nonmajor graduate credit.  | Credit      | 4                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| TSM 335: Tractor Power   | Theory and construction of tractor engines, mechanical power trains and hydraulic systems. Introduction to traction, chassis mechanics, and hydraulic power.  | Credit      | 4                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Entrepreneurial and Diversified Agriculture-MCC                      | This program offers the chance to learn sustainable farming techniques and effective small business strategies. It provides practical knowledge in local food production, environmental stewardship, small business planning and hands-on experience with Central Iowa farmers practicing sustainable agriculture, vegetable production, and/or certified organic farming. Students earning the certificate option can receive training in the specific subject area of agriculture.  | Credit      | 64                      | Iowa Valley Community College District | <a href="http://www.iavalley.edu/mcc/about/programs-degrees/Entrepreneurialand-DiversifiedAg.html">http://www.iavalley.edu/mcc/about/programs-degrees/Entrepreneurialand-DiversifiedAg.html</a> |
| Sustainable Agricultural   | Agriculture has become more high-tech over the years, and you can be well prepared for this field by completing Iowa Western's Agriculture Transfer program of study. Students in this program take advantage of the best in computer technology to eventually earn an Associates of Science degree. In this program you will complete the requirements needed for your first two years of a bachelor's degree before transferring on to a four-year institution. In addition, you will learn to use some of the most advanced GIS and GPS technology available while learning more about agronomy, animal science, and farm management principles. With class sizes averaging between 12 and 15 students, this program offers one-on-one interaction with instructors. | Credit      | 64                      | Iowa Western Community College         | <a href="http://www.iwcc.edu/programs/program.asp?id=agtransferas">http://www.iwcc.edu/programs/program.asp?id=agtransferas</a>   |
| Agricultural Technology  | The NIACC Farm Lab consists of 260 no-till acres, 110 acres of pasture, livestock facilities for the swine and beef breeding herds, and provides Ag students with "hands-on" learning experiences in the areas of crop protection and management, precision farming technology, crop and livestock management, show pig and club calf production, and business planning and decision making. All classes required in our curriculum can be transferred to Iowa State University and/or Northwest Missouri State. Graduates can transfer to ISU as a junior and work toward a bachelor's degree in the College of Agriculture. Staff can advise you as to the best academic path for transfer.   | Credit      | 71                      | North Iowa Area Community College      | <a href="http://www.niacc.edu/agtech/index.html">http://www.niacc.edu/agtech/index.html</a>   |

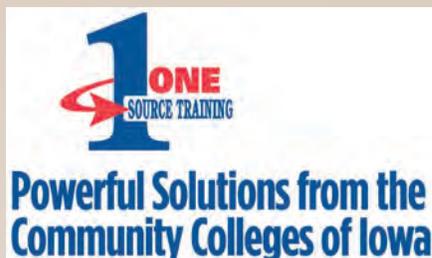
## Appendix D: Education and Training Resources - Iowa

| Course Name                                   | Course Description  | Course Type | Credit or Contact Hours | College Name                           | Contact Website   |
|---|---|-------------|-------------------------|--|---|
| <b>Transportation Technology</b>              |   |             |                         |  |   |
| M E 449: Internal Combustion Engine Design    | Prereq: 335. Basic principles, thermodynamics, combustion, and exhaust emissions of spark-ignition and compression-ignition engines. Laboratory determination of fuel properties and engine performance. Thermodynamic and mechanical design of engine components to meet specified performance, fuel economy, and air pollution requirements. Oral and written reports required. Nonmajor graduate credit.   | Credit      | 3                       | Iowa State University                  | <a href="http://classes.iastate.edu/">http://classes.iastate.edu/</a>   |
| Automotive                                    | Upon the recommendation of the National Automotive Technician Education Foundation (NATEF), a non-profit organization that evaluates automotive training programs according to national standards determined by the automotive industry and educational community, the Automotive Service Technology Program at North Iowa Area Community College has been awarded Automotive Service Excellence (ASE) Master Certification.  | Credit      | 71                      | North Iowa Area Community College      | <a href="http://www.niacc.edu/industrial/automotive.html">http://www.niacc.edu/industrial/automotive.html</a> |
| Hybrid First Responder Safety Training        | This class is designed for first responders, EMT's, firefighters or anyone responding to an emergency situation that need "on-the-scene" training. This is not a technical class but a real world "what do I need to know" session. There are almost 2 million hybrids with high voltage systems in America and that has happened in only ten years. In this new decade you will see 10 times that many. Learn how to be safe when you arrive at the scene of an accident that has a hybrid in the mix. During this course you will learn about: Basic Construction of Hybrids; Location of High Voltage parts; How to "Shut down the HV System" & Keyless Ignition Issues. After class you will be able to: Identify a Hybrid; Safely Shut it Down; Secure the Car; Keep Yourself Safe; & Haz Mat Issues. Instructors Steve Koch is a Certified Hybrid Technician & Craig Van Batenburg is an internally known Certified Hybrid Trainer ( <a href="http://www.fixhybrids.com">www.fixhybrids.com</a> ). Don't miss this chance to learn from the best! | Non-Credit  | 3                       | Iowa Valley Community College District | <a href="http://www.IowaValley.edu">www.IowaValley.edu</a>  |
| Hybrid Towing and Dismantling Safety Training | This class is designed for towers and dismantlers that need "on-the-job" training. This is not a technical class but a real world "what do I need to know" session. There are almost 2 million hybrids with high voltage systems in America and that has happened in only ten years. In this new decade you will see 10 times that many. Learn how to be safe when you tow, remove parts or recycle a damaged hybrid. Class includes basic construction of hybrids, location of high voltage parts, how to "shut down the HV system", & keyless ignition issues. After class you will be able to: identify a hybrid, safely shut it down, tow the car, keep yourself safe, take it part, store HV parts safely, & Haz Mat issues. Craig Van Batenburg is an international certified hybrid trainer ( <a href="http://www.fixhybrid.com">www.fixhybrid.com</a> ). Don't miss this chance to learn from the best!   | Non-Credit  | 3                       | Iowa Valley Community College District | <a href="http://www.IowaValley.edu">www.IowaValley.edu</a>  |
| Introduction to Hybrid Technology             | This 6 hour overview of hybrid technology is for anyone that works on cars today or will be in the future. This class is designed for a working technician with automotive skills that does basic repairs on conventional cars. Some basic skills will be reviewed and you will be tested before and after this class for electrical knowledge and safety procedures. You will be introduced to the 3 types of hybrids sold today. You will learn what a hybrid is and what makes it different. Safety equipment will be shown and used in during high voltage safety discussion. After this class you will be able to do preventive maintenance, a safety shut down, and practice shop safety.   | Non-Credit  | 6                       | Iowa Valley Community College District | <a href="http://www.IowaValley.edu">www.IowaValley.edu</a>  |
| Environmental Training                        | Dealers who incorporate service departments and auto body shops within the dealership will find interest in taking this course as they will be taught the proper disposal techniques for parts washer waste, floor drain sump sludge, used anti-freeze, used oil and filters, refrigerant, batteries, tires, catalytic, converters, waste paint thinner, waste paint, and air emissions.  | Non-Credit  | 6                       | Iowa Western Community College         | <a href="http://www.iwcc.edu/ce/classes/trades.asp">http://www.iwcc.edu/ce/classes/trades.asp</a>             |
| Advanced Hybrid Technology                    | You will learn more about hybrids & have a chance to drive & scan a hybrid in class. This class is designed to advance your skills so that you can continue your career as a technician that can work on all the cars on the road today. Many hybrid tools, parts & equipment have been purchased so this class is real world, hands-on & relevant to the workplace. Topics include: hybrid transmission, regenerative braking & inverter control, A/C & heating systems, preventative maintenance, hybrid battery, starting & charging, intro to Honda IMA, Toyota/Lexus, Ford, GM, Chrysler & Nissan, BMW, Mercedes, Porsche, VW, HEV systems. The previous 57 hours have dedicated to learning about new hybrid technologies on the road today. The last 3 hour of class will be used for review & look at the future of the electrification of the cars that we will be driving in the next few years; the Chevy Volt, Nissan Leaf, Mitsubishi iMiEV and more. A final exam will be given & certificates awarded.                                   | Non-Credit  | 60                      | Iowa Valley Community College District | <a href="http://www.IowaValley.edu">www.IowaValley.edu</a>  |

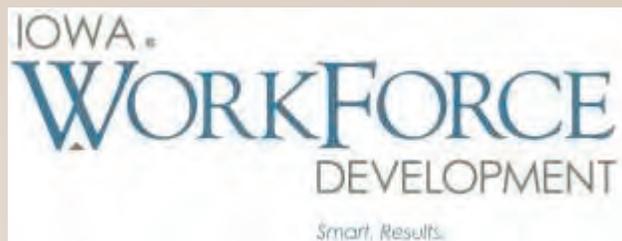
## Appendix D: Education and Training Resources - Iowa



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## Appendix D: Education and Training Resources - Montana

### Montana Green Education Program Inventory

| Montana Training Programs                                   | Provider(s):   |
|---|--|
| <b>Green Technology</b>                                     |  |
| Chemical and Biological Engineering                         | Montana State University                                   |
| Sustainable Food and Bioenergy Systems, Agroecology Option  | Montana State University                                   |
| Automotive and Diesel Technology (Bio-Fuel Technology)      | Montana State University Northern                          |
| Automotive Technology (Alternative Fuel Vehicle Technology) | Montana State University Billings College of Technology    |
| Construction Technology (Energy Star Building Technology)   | Montana State University Billings College of Technology    |
| Energy Technology   | University of Montana College of Technology                |
| Climate Change*   | University of Montana                                      |
| <b>Renewable Energy</b>                                     |  |
| Biofuels Emphasis   | Miles Community College                                    |
| Energy Technology   | Miles Community College                                    |
| Civil Engineering - Bio-Resources Option                    | Montana State University                                   |
| Earth Sciences - Geohydrology                               | Montana State University                                   |
| Earth Sciences - GIS/Planning                               | Montana State University                                   |
| Environmental Engineering                                   | Montana State University                                   |
| Geological Engineering                                      | Montana Tech   |
| Geophysical Engineering                                     | Montana Tech   |
| Hydrogeological Engineering                                 | Montana Tech   |
| Hydrogeology  | Montana Tech   |
| Environmental Studies                                       | University of Montana                                      |
| Geosciences   | University of Montana                                      |
| Wind Energy Technology*                                     | Montana State University Great Falls College of Technology |
| Wind Turbine Technician*                                    | Montana Tech College of Technology                         |
| <b>Restoration and Reclamation</b>                          |  |
| Environmental Science                                       | Flathead Valley Community College                          |
| Natural Resource Management                                 | Flathead Valley Community College                          |
| Land Rehabilitation   | Montana State University                                   |
| Land Resource Sciences                                      | Montana State University                                   |
| Environmental Engineering                                   | Montana Tech   |
| Biological Sciences   | Montana Tech   |
| Resource Conservation                                       | University of Montana                                      |
| Wildland Restoration  | University of Montana                                      |
| Environmental Interpretation                                | University of Montana Western                              |
| Environmental Science Emphasis                              | University of Montana Helena College of Technology         |

\* Upcoming Program

Source: Montana University System

## Appendix D: Education and Training Resources - Nebraska

### Nebraska Green Education Program Inventory

| Nebraska Training Programs                               | Provider(s)                      |
|--|----------------------------------|
| <b>Pre Vocational Programs</b>                           |                                  |
| Safety   | NECC, NSC, AGC, LU464            |
| <b>Renewable Energy Programs</b>                         |                                  |
| Energy Generation Operations                             | SCC                              |
| Renewable Fuels Technology                               | NECC                             |
| Solar Heating and Cooling (SHC)                          | MCC*                             |
| Solar Photovoltaic Systems                               | IBEW, MCC*                       |
| Wind (Urban)   | MCC*                             |
| Wind Energy Technician                                   | IBEW, NECC, WNCC*                |
| <b>Energy Efficiency Programs</b>                        |                                  |
| Building Energy Auditors/Analysts                        | MCC*                             |
| Certified Green Supply Chain Professional                | SCC                              |
| LEED Professional  | AGC, USGBC                       |
| Certified Sustainability/Green Building Professional     | NAHB, SCC                        |
| Insulation   | LU39                             |
| Weatherization   | MCC*                             |
| <b>Supporting Programs</b>                               |                                  |
| Air Conditioning, Refrigeration and Heating Technology   | MCC, NECC, SCC, LU3, LU464, MCAO |
| Architectural Design Technology                          | MPCC, MCC                        |
| Building Maintenance                                     | MCC                              |
| Certified Indoor Air/Environmental Quality Manager       | SCC                              |
| Construction Technology                                  | NECC, MCC, SCC, MPCC             |
| Electrical Apprenticeship                                | IBEW, MCC                        |
| Electrical Plant Maintenance                             | MCC                              |
| Electrical Technology                                    | CCC, SECC, NECC, MCC             |
| Electronics Technology                                   | MCC                              |
| Industrial and Commercial Trades                         | MCC, LU1140                      |
| Plumbing Apprenticeship                                  | MCC, LU464, LU16                 |
| Powerline Construction and Maintenance (PC&M) Technology | WNCC                             |
| Welding Technology                                       | MCC                              |

\* New Program

Source: Montana University System

| Abbreviation Key                                       |
|--|
| MCAO = Mechanical Contractors Association Omaha        |
| IBEW = International Brotherhood of Electrical Workers |
| LU 464 = Steamfitters & Plumbers Union                 |
| AGC = Association of General Contractors               |
| NSC = National Safety Council                          |
| ACT = ACT  |
| LU 16 = Local Plumbers Union                           |
| LU 3 = Local Sheet Metal Union                         |
| LU 1140 = Local Labor Union                            |
| CCC = Central Community College                        |
| MCC = Metro-Community College                          |
| MPCC = Mid-Plains Community College                    |
| NECC = Northeast Community College                     |
| SCC = Southeastern Community College                   |
| WNCC = Western Nebraska Community College              |

### **Advertised Green Postsecondary Education and Training in South Dakota**

As energy efficiency and renewable energy industries emerge, there is a growing need for green programs to train, educate and prepare individuals for this expanding sector. A green program would be a program that prepares and/or trains an individual to “produce a product or service that improves energy efficiency, expands the use of renewable energy or supports environmental sustainability.”

To determine what universities, technical institutions and other training/learning centers in South Dakota are doing to meet educational needs in green areas, information was collected primarily from the websites and the press releases of postsecondary institutions and training centers as well as the South Dakota Department of Labor (DOL). The first section of this report looks at the applicants who were awarded funds as part of the South Dakota State Partnership and Training Grant. The second section focuses on South Dakota’s four technical institutions and their efforts to train individuals in green programs.

---

### **Section 1: South Dakota State Energy Sector Partnerships and Training Grant (American Recovery and Reinvestment Act)**

The DOL received \$2.5 million for the State Energy Partnerships and Training Grant, authorized by the American Recovery and Reinvestment Act (ARRA). The purpose of the grant is to teach workers the skills required in emerging energy efficiency and renewable energy industries. All activities must lead to placement in employment, must teach skills and competencies demanded by the target sector, and support participants’ long-term career growth.

The DOL awarded funds to 11 applicants, based on the following proposals:

#### **Black Hills State University (BHSU), Spearfish**

Energy Management training will educate workers in energy reduction technology by providing hands-on training in energy reduction and building automation control technology. The BHSU Energy Management Technology Certificate program includes three courses: (an introduction to) Smart Buildings, Smart Building Design and Lean Manufacturing Concepts. The university will integrate the management courses into the existing associate of science degree in Advanced Manufacturing, which is offered in Spearfish and Yankton. This program will serve about 60 people.

#### **Killian Community College, Sioux Falls**

The college will add an associate degree in Sustainability and Environmental Sciences, with an emphasis in LEED training and biodiesel. The training will serve about 20 people per year.

#### **Lake Area Technical Institute (LATI), Watertown**

LATI will create energy torque certification training modeled after the national Snap-on certification program. The institute will also offer foundational certification for wind, ethanol, coal and hydropower

## Appendix D: Education and Training Resources - South Dakota

generation construction and maintenance. An associate degree program will serve 50 people and the LATI Corporate Education Center's continuing education program will serve 100.

### **Mitchell Technical Institute (MTI), Mitchell**

MTI will provide training to leading national home energy raters. The school will combine current building construction and Heating, Ventilation and Air Conditioning (HVAC) programs with nationally recognized certifications. MTI will concentrate on remediation and energy efficiency. The program plans to serve 83 people.

### **North Eastern Work and Technical Education Center (NEW TEC), Aberdeen**

NEW TEC will provide a composites training related to wind energy in partnership with Molded Fiberglass Company, resulting in a nationally recognized composites certification. LATI will provide the technical expertise for the program, which plans to serve about 100 people.

### **POET, Sioux Falls, SD**

This program will provide incumbent worker training to upgrade the skills for up to 600 people in the company's ethanol plants. The project will define and utilize national certifications and credentials associated with the ethanol and bio-fuels industry for energy sector training.

### **Regional Technical Education Center (RTEC), Yankton**

RTEC will provide operational support and train five new employees per year in infrastructure efficiency and power utilization effectiveness. The center will also benefit from the funds awarded to BHSU, as part of the Advanced Manufacturing Associate of Science degree BHSU offers in Yankton.

### **Rural Learning Center, Howard**

The Rural Learning Center will focus on entry-level wind turbine technicians. The program, which will serve about 325 people, will integrate specific technology enhancements for renewable energy partners and develop educational technology systems for renewable energy applications.

### **South Dakota State University (SDSU), Brookings (two awards)**

In December 2010, the South Dakota Board of Regents approved SDSU's proposed minor in sustainable energy systems. The DOL funds helped the university adapt, enhance, develop and implement modules in pre-existing courses that will provide expertise to engineers in areas like sustainability, energy efficiency and renewable energy technologies. The grant helped to develop a network of contacts with internships opportunities in areas such as energy engineering, biofuels, wind energy, power generation and energy-related equipment manufacturing. The program will also help them earn *Leadership in Energy and Environmental Design* (LEED) certifications. The program will serve 20 enrolled participants.

Approximately 300 more will benefit from the expanded modules and ability to attain certification. Also, according to a news article on SDSU's website, the university will offer two courses and a workshop for people starting or advancing their careers in the ethanol and bio-energy industries. There is a one-week introduction course centering on the processes used to turn corn and biomass into ethanol and refinery co-products. The second course covers the technical aspects of milling for people currently employed in the ethanol industry. A workshop for high school, undergraduate students and displaced workers interested in bio-energy careers will also be developed.

## Appendix D: Education and Training Resources - South Dakota

### **Southeast Technical Institute (STI), Sioux Falls**

STI will use the funds for tuition assistance for more than 100 people in weatherization, building analyst and green building construction training programs. Each program will lead to certifications.

### **Western Dakota Technical Institute (WDT), Rapid City**

WDT will provide training in green building construction, energy generation and transportation. Current curriculum will be revised to include energy-specific training. Participants can earn a certificate or an associate degree. The program will serve about 90 people over two years.

---

## **Section 2: Energy/Green Programs and Training at South Dakota's Technical Institutes**

*(Information collected from the institutes' websites, as well as educational partners' websites during January and February 2011.)*

### **Lake Area Technical Institute (LATI) – Watertown, SD**

[www.lakeareatech.edu/](http://www.lakeareatech.edu/)

#### **Agriculture**

[www.lakeareatech.edu/academics/programs/ag/index.html](http://www.lakeareatech.edu/academics/programs/ag/index.html)

- Teach the latest, most environmentally friendly soil conservation techniques.
- Work with South Dakota State University (SDSU) on post-harvest cover crop and polyculture studies, for ecologically friendly ways of protecting against soil erosion and increasing soil sustainability.
- Precision Technology option teaches innovative methods of reducing chemical and fertilizer application overlap—resulting in a healthier environment.
- Precision Technology also develops application maps for the purpose of efficient zone application of fertilizer and seed.
- Use reduced-tillage practices, resulting in carbon sequestering and less water and soil run-off.
- Students study environmentally friendly methods of waste management and application—including attending state-sponsored training.

*Within the Agriculture Program:*

#### **Ag-Environmental Technology Option**

[www.lakeareatech.edu/academics/programs/ag/environmental/index.html](http://www.lakeareatech.edu/academics/programs/ag/environmental/index.html)

- Ag-Environmental technicians monitor ag-related chemicals and by-products entering the environment and determine the overall quality of surface and ground water, soil and air.
- The program will dive into agriculture and environmental theory. Students brainstorm ways for agriculture and the environment to exist cohesively. Students also participate in an internship program.

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### Automotive Technology

[www.lakeareatech.edu/academics/programs/auto/index.html](http://www.lakeareatech.edu/academics/programs/auto/index.html)

- Students learn about fuel injection, emissions, catalytic converters, O2 sensors, PCV and EGR systems.
- Students learn about the effects of automotive heating and air-conditioning on greenhouse gasses and ozone depleting gasses. They also take the ASE refrigerant recycling test.
- Instruct in the recycling of coolant.

### Aviation Maintenance Technology

[www.lakeareatech.edu/academics/programs/aviation/index.html](http://www.lakeareatech.edu/academics/programs/aviation/index.html)

- Assist SDSU with a research project to develop ethanol-based fuel for use in piston engine powered aircraft.
- Aviation program includes orientation flights with an energy efficient, environmentally friendly self-launch glider.

### Building Trades Technology

[www.lakeareatech.edu/academics/programs/btt/index.html](http://www.lakeareatech.edu/academics/programs/btt/index.html)

- Use recycled insulation, caulk, sheathing, soffit, and concrete.
- Instruct in the installation of energy efficient lighting, windows and doors.
- Install composite (recycled) decking and siding.
- Whenever possible, install energy efficient in-floor heating.
- Use energy efficient Benchmark® foam LITE-FORMS.
- Use energy efficient Enercept® insulated foam wall panels.

### Diesel Technology

[www.lakeareatech.edu/academics/programs/diesel/index.html](http://www.lakeareatech.edu/academics/programs/diesel/index.html)

- Students attend a bio-diesel fuel seminar each year.
- Assist SDSU with research on the use of bio-diesel fuel in modern diesel engines.
- Teach low emission diesel engines, including diesel particulate filters (DPF), diesel exhaust gas recirculation (EGR) systems, and selective catalytic reduction (SCR) systems. All of these systems are designed to reduce the amount of hydrocarbon (HC) emissions which contribute to the greenhouse effect and the reduction of oxides of nitrogen (NO and NO<sub>2</sub>) emissions that contribute to smog formation.
- Curriculum covers the new method of injecting diesel exhaust fluid (DEF) into the exhaust stream of 2010 truck engines to lower NO<sub>x</sub> emissions.

### Energy Operations

[www.lakeareatech.edu/academics/programs/energyops/index.html](http://www.lakeareatech.edu/academics/programs/energyops/index.html)

- Extensively explore alternative energy including wind, solar, geothermal, and bio-fuels.

## Appendix D: Education and Training Resources - South Dakota

- Use small roof mounted wind turbines and photovoltaic panels to power a number of the lab trainers. These trainers teach not only the concepts of wind and solar power, but also hydrogen production, fuel cells, ethanol and biofuels production, and hydroelectric power.
- Curriculum focuses on lowering emissions from conventional power production facilities. It also includes instruction in how power plant operators must run their facility in an efficient manner to limit the quantities of hazardous emissions that contribute to the greenhouse effect.
- Students study concepts of power production using gas fired turbines which burn syngas, a derivative of the coal gasification process, in order to decrease CO<sub>2</sub> and NO<sub>x</sub> emissions.

### **Energy Technology**

[www.lakeareatech.edu/academics/programs/energytech/index.html](http://www.lakeareatech.edu/academics/programs/energytech/index.html)

- Students in the 20-month Energy Technology program receive both classroom theory and hands-on lab and internship experience. Topics include mechanical maintenance, repair and overhaul, as well as alignment techniques, metallurgy, pneumatics, hydraulics, thermodynamics, combustion, vibration analysis and dynamic balancing.

### **Environmental Technology**

[www.lakeareatech.edu/academics/programs/environmental/index.html](http://www.lakeareatech.edu/academics/programs/environmental/index.html)

- Train students to use the newest testing and monitoring technology available.
- Teach proper sampling and record keeping procedures.
- Along with classroom and field experience, students in this program have the opportunity to participate in an internship, where they receive on-the-job training that will further prepare them for the workforce.
- Technicians' duties include making solutions and reagents, assisting in environmental management and quality assurance, participating in research and development, utilizing various instruments, preparing, collecting and analyzing samples, assessing data, and performing microbiologic and molecular testing.

### **Mitchell Technical Institute (MTI), Mitchell, SD**

[www.mitchelltech.edu/](http://www.mitchelltech.edu/)

#### **Architectural Design and Building Construction (Construction Technologies Division)**

[www.mitchelltech.edu/programs/ViewProgram.aspx?id=9&ContentID=9](http://www.mitchelltech.edu/programs/ViewProgram.aspx?id=9&ContentID=9)

- Focus on energy-efficient building practices.
- Instructors are Certified Green Professionals.
- A 100% Energy Star Builder.
- All MTI's houses are built and rated by the Residential Energy Services Network & Home Energy Rating Standards of Practice (RESNET HERs).

## Appendix D: Education and Training Resources - South Dakota

### Heating & Cooling Technology (Construction Technologies Division)

[www.mitchelltech.edu/programs/ViewProgram.aspx?id=11&ContentID=9](http://www.mitchelltech.edu/programs/ViewProgram.aspx?id=11&ContentID=9)

- The Heating and Cooling Technology program provides students with skills and knowledge in mechanics, electricity and sheet metal. Students also receive extensive training in energy management and environmental controls technology.

### Wind Turbine Technology (Energy Production & Transmission Division\*)

[www.mitchelltech.edu/programs/ViewProgram.aspx?id=24&ContentID=9](http://www.mitchelltech.edu/programs/ViewProgram.aspx?id=24&ContentID=9)

- Students learn the basics of turbines, mechanics, hydraulics, electronics and the computer networks that allow the system to communicate. After the completion of two semesters, a graduate may exit with a diploma or continue in the program for another year. Jobs in turbine construction, maintenance and troubleshooting will be available.
- The optional second year of the program, including an internship, will give graduates experience in areas like PLCs, fiber optics, SCADA, electronics and more. A graduate of the two-year AAS option will find employment opportunities in areas like power distribution, controls and other areas that move the power through the grid.
- Mitchell Technical Institute has been awarded \$1.67 million from the U.S. Economic Development Administration (EDA). The grant will allow MTI to own an operational wind turbine at the Crow Lake site being developed by Basin Electric near White Lake, SD. (Announcement made October 21, 2010).

*\*The Energy Production & Transmission Division programs include several aspects of energy production; however, it seems from the information provided on the website only one emphasizes green aspects – Wind Turbine Technology. Other programs that fall within this division are Power Line Construction & Maintenance, Propane & Natural Gas Technologies, Utilities Technology – Heating & Cooling, and Utilities Technology – Power Line.*

### Corporate Education – Green Energy Training

[www.mitchelltech.edu/corporateEducation/energyauditortraining/](http://www.mitchelltech.edu/corporateEducation/energyauditortraining/)

MTI Corporate Education in partnership with the South Dakota Department of Labor (SDDOL) is providing certification training to become an energy auditor. Energy auditors contribute to environmental sustainability and safety by identifying problems and solutions to home energy efficiency, air quality, safety and durability.

#### Energy Auditor Certification

This certificate training is designed for professionals with moderate experience in residential building contracting. Participants will learn to determine the energy consumption of a home, calculate savings of remediation and suggest energy saving measures to homeowners.

#### Heating and Cooling Remediation

This certificate training is designed for construction or energy professionals who have direct contact with consumers. Participants gain the knowledge needed to educate

## Appendix D: Education and Training Resources - South Dakota

homeowners about energy efficiency. Participants will become knowledgeable about residential HVAC systems, principles of renewable HVAC systems and be able to recommend energy saving measures of retrofit equipment and energy friendly systems to homeowners.

**Outreach – Dual-credit Introduction to Energy Career Training** (outreach to high school students)

[www.mitchelltech.edu/programs/ViewProgram.aspx?id=41&ContentID=9](http://www.mitchelltech.edu/programs/ViewProgram.aspx?id=41&ContentID=9)

MTI offers an Introduction to Energy Career Training program to high school students in four energy-related programs: Power Line Construction & Maintenance, Propane & Natural Gas Technologies, Wind Turbine Technology and Heating & Cooling Technology.

### **Southeast Technical Institute (STI), Sioux Falls, SD**

[www.southeasttech.edu/Pages/default.aspx](http://www.southeasttech.edu/Pages/default.aspx)

#### **Architectural/Construction Engineering Technology, AAS Degree**

[www.southeasttech.edu/Academics/Degrees/Engineering/Pages/ArchitecturalConstructionEngineeringTechnology.aspx](http://www.southeasttech.edu/Academics/Degrees/Engineering/Pages/ArchitecturalConstructionEngineeringTechnology.aspx)

Program includes green building practices such as geothermal heating, active and passive solar technology, envelope home construction and sustainable architecture. A Registered Architect who is pursuing LEED (Leadership in Energy and Environmental Design) Certification teaches the program.

#### **Landscape Design Technology, AAS Degree**

[www.southeasttech.edu/Academics/Degrees/Hort/Pages/LandscapeTechnology.aspx](http://www.southeasttech.edu/Academics/Degrees/Hort/Pages/LandscapeTechnology.aspx)

Landscape Design Technology utilizes skills in design, plant identification and installation, as well as construction techniques. Many green industry areas utilize Landscape Design: retail nurseries, design/build companies, golf courses, sports fields, amusement parks and government agencies.

#### **Business & Industry Training (BIT) Division of Southeast Technical Institute**

[www.trainsiouxfalls.com](http://www.trainsiouxfalls.com)

##### **BPI Building Analyst**

[www.trainsiouxfalls.com/Construction/Pages/BPIBuildingAnalyst.aspx](http://www.trainsiouxfalls.com/Construction/Pages/BPIBuildingAnalyst.aspx)

*Course provided in partnership with CleanEdison ([www.cleandison.com](http://www.cleandison.com)).*

Individuals can become residential energy auditors and weatherization professionals through the Building Analyst Certification. Certified Building Analysts contribute to environmental sustainability and safety by identifying problems and solutions to home energy efficiency, air quality, safety and durability. The course is designed for professionals with minimal experience in residential contracting or home inspection. Participants learn hands-on application of skills in the field while preparing to take the Building Performance Institute's Building Analyst Exam.

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### **BPI Envelope & Shell Professional**

[www.trainsiouxfalls.com/Construction/Pages/BPIEnvelopeShellProfessional.aspx](http://www.trainsiouxfalls.com/Construction/Pages/BPIEnvelopeShellProfessional.aspx)

*Course provided in partnership with CleanEdison (www.cleandison.com).*

The BPI Envelope Professional certification course focuses on building thermal and pressure boundaries and ways to enhance the envelope through insulation and air-sealing techniques. This BPI Building Analyst Training course includes instruction in the classroom and hands-on field training. Course includes both written and field exams participants must pass to become a BPI Envelope Professional. With the proper understanding and the proper equipment, a BPI Envelope professional is qualified to test a home's performance after upgrades and energy efficient retrofits have been completed to ensure the home meets BPI standards.

### **BPI Multi-Family Building Analyst**

[www.trainsiouxfalls.com/Construction/Pages/BPIMulti-FamilyBuildingAnalyst.aspx](http://www.trainsiouxfalls.com/Construction/Pages/BPIMulti-FamilyBuildingAnalyst.aspx)

*Course provided in partnership with CleanEdison (www.cleandison.com).*

This course prepares students to analyze large housing complexes with multiple family units. This course will cover boiler system analysis, whole building envelope analysis, audit software and audit reporting, and energy end use allocation. This program prepares participants to take the exam for the advanced level certification offered by BPI. Using upgraded building science knowledge, participants will not only help building owners to solve heating, cooling and air leakage problems that are driving high energy costs, but will also provide them with a more comfortable, safe and durable building. Using this certification along with the Building Analyst certification allows participants to get their companies accredited and gain access to multiple federal and state incentives.

### **Certified Lead Renovator Training**

[www.trainsiouxfalls.com/Construction/Pages/CertifiedLeadRenovatorTraining.aspx](http://www.trainsiouxfalls.com/Construction/Pages/CertifiedLeadRenovatorTraining.aspx)

*Course provided in partnership with CleanEdison (www.cleandison.com).*

The Environmental Protection Agency (EPA) now requires all contractors who perform renovation, repair and painting projects that may disturb lead paint to be Lead RRP Certified. Work activities including demolition, deconstruction, sanding, or cutting can generate hazardous lead dust and chips by disturbing lead-based paint. The Certified Lead Renovator course instructs trainees to follow specific work practices to prevent lead contamination. Completing this course fulfills EPA requirements and contractors will become Certified Lead Renovators.

### **Green Associate**

[www.trainsiouxfalls.com/Construction/LEEDCertificationTraining/Pages/default.aspx](http://www.trainsiouxfalls.com/Construction/LEEDCertificationTraining/Pages/default.aspx)

*Course provided in partnership with CleanEdison (www.cleandison.com).*

The LEED Green Associate (GA) credential is now an industry standard for Green building professionals. This accreditation is for professionals who want to demonstrate a basic knowledge of green design, construction, and operations, but who do not

## Appendix D: Education and Training Resources - South Dakota

necessarily participate in design and construction work. The LEED GA credential is also the prerequisite for those who wish to obtain their LEED Accredited Professional (AP) accreditation.

**STI BIT also partners with Gatlin Education Services (GES)**, to offer additional online courses/workshops/seminars that focus on green educational programs.

### **Sustainable Energy and Going Green**

[www.gatlineducation.com/bit/green.htm](http://www.gatlineducation.com/bit/green.htm)

- Biofuel Production Operations
- Building Analyst Quick Start
- Certified Green Supply Chain Professional
- Certified Indoor Air Quality Manager
- Certified Indoor Environmentalist
- Natural Gas Plant Operations
- Performing Comprehensive Building Assessments
- Principles of Green Buildings
- Senior Certified Sustainability Professional
- Wind Energy Professional

### **Western Dakota Tech (WDT), Rapid City, SD**

[www.wdt.edu/](http://www.wdt.edu/)

#### **Environmental Engineering Tech**

[www.wdt.edu/Programs/Environmental\\_Engineering\\_Tech/Environmental\\_Engineering\\_Tech.aspx](http://www.wdt.edu/Programs/Environmental_Engineering_Tech/Environmental_Engineering_Tech.aspx)

Program graduates primarily work outdoors in the field, collecting information that is used to assess how increased demand affects the quality and quantity of the nation's natural resources. Graduates work in a broad range of jobs such as collecting and analyzing water and soil samples, measuring stream flow and groundwater levels, and conducting soils testing.

#### **Corporate Education Center (Division of Western Dakota Tech)**

[www.wdt.edu/corped](http://www.wdt.edu/corped)

#### **Green Buildings & Preparing for LEED Green Associate Exam**

[www.westerndakota.augusoft.net/index.cfm?method=ClassListing.ClassListingDisplay&int\\_category\\_id=7&int\\_sub\\_category\\_id=71](http://www.westerndakota.augusoft.net/index.cfm?method=ClassListing.ClassListingDisplay&int_category_id=7&int_sub_category_id=71)

*Course offered in conjunction with UGOT Class.*

Participants learn sustainable fundamental LEED Rating System building concepts. Those who successfully complete the course are eligible and prepared to take the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Associate exam.

## Appendix D: Education and Training Resources - South Dakota

### “WDT is Going Green” website:

[www.wdt.edu/catalog.aspx?id=6690](http://www.wdt.edu/catalog.aspx?id=6690)

There is a Green Campus Committee at WDT. Included in the committee’s vision statement: *We seek to encourage the **study of environmental issues in courses throughout the curriculum** and graduate responsible global citizens prepared to work in the new and evolving sustainable energy market.*

WDT hosted the Rapid City community Earth Day event in April 2010. It featured the following activities/programs/symposiums:

- Exhibitor Booths, Green Automobiles, Speakers, Videos, Food, Children’s Activities
- Rapid City Task Force on Green Cities Symposium
- Presentations/Demonstrations:
  - Building/Construction/LEED
  - South Dakota School of Mines & Technology Center for Advanced Manufacturing & Production (CAMP) Demonstration
  - Rapid City Waste Management
  - Sustainable Business Practices
  - The Conservation Triangle – Application
  - Auto Industry Future
  - Going Green in Cafeteria & Dining Services
  - Sustainable Shopping
  - Grass-Fed Beef & Nutrition
  - The New Pioneers: Rural America, the Internet and the Next Chapter in the American Dream

As of mid-January 2011, WDT had not yet indicated any plans on its website for Earth Day in 2011.

# Utah's Green Job Training Programs

## Energy Management

### Building Operator Certification (BOC)

---

**Energy Sector Curriculum Specialization Group:**  
Energy Management / Auditing

**Job Description:**

Commercial energy auditing including facility electrical, HVAC and lighting systems, indoor air quality, environmental health and safety, and energy conservation

**Skills/Background/Competencies:**

Level I: High school diploma or GED; 2+ yrs working in O&M in commercial or institutional facility; Level II: same plus technical degree; BOC certification and 4 yrs experience

**Link to Training Resources:**

[www.theboc.info/](http://www.theboc.info/)

**Demand from:**

Building managers/owners

**Certification provided as part of training:**

BOC

**Example Curriculum:**

<http://theboc.info/training.html>

**Duration of Training:**

Level I is eight one-day classes; Level II is seven one-day classes

**Training Targets:**

Building and facilities managers (BOMA, UFOMA)

**In Place in Utah:**

No

**Training Cost:**

\$1,375 for each level

**Examples of Training:**

Gwinnett Technical College (GA): <https://aceweb.gwinnetttech.edu/wconnect/CourseStatus.awp?~104SEM1992A>

### Certified Building Analyst (BPI)

---

**Energy Sector Curriculum Specialization Group:**  
Retrofit

**Job Description:**

Conduct comprehensive energy performance analysis on existing home and provide recommendations for energy efficiency improvements

**Skills/Background/Competencies:**

Building and remodeling experience

**Link to Training Resources:**

[www.bpi.org](http://www.bpi.org)

**Demand from:**

Utah Home Performance with ENERGY STAR program, 2009 IECC

**Certification provided as part of training:**

Building Performance Institute

**Example Curriculum:**

Can license from various sources (i.e. NYSERDA), or create own

**Duration of Training:**

3-day to 1 year

**Training Targets:**

General contractors, sub-contractors, and trades people

**In Place in Utah:**

Some

**Training Cost:**

\$850 - \$1,600

**Examples of Training:**

See basecamp documents and contact UCE for more information

**Contact:**

Tiger Adolf (BPI): (518) 951-0666

**NOTES:**

Testing and certification is typically offered directly through AEE. MOU agreements with universities also exist. Eligibility for exam requires previous degree and field experience. AEE provides testing and certification for several titles

## Appendix D: Education and Training Resources - Utah

### Certified Energy Auditor (CEA)

---

**Energy Sector Curriculum Specialization Group:**  
Auditing

**Skills/Background/Competencies:**  
Varies: 4-year engineering/architecture degree or P.E., to 10 years experience as energy auditor, facilities management or related field

**Link to Training Resources:**  
[www.aeecenter.org](http://www.aeecenter.org)

**Demand from:**  
Building managers/owners and individuals wishing to work as independent consultants

**Certification provided as part of training:**  
AEE

**Example Curriculum:**  
Contact AEE

**Duration of Training:**  
3-6 days

**Training Targets:**  
Commercial building facility / energy managers (BOMA, UFOMA)

**In Place in Utah:**  
?

**Training Cost:**  
Training seminar: \$1,450; Application and exam: \$300, \$200 renewal of certification (every 3 years)

**Examples of Training:**  
N/A

**Contact:**  
Bill Kent: 1-770-447-5083 ext. 213

**NOTES:**  
Testing and certification is typically offered directly through AEE. MOU agreements with universities also exist

### Certified Energy Manager (CEM)

---

**Energy Sector Curriculum Specialization Group:**  
Energy Management / Auditing

**Job Description:**  
Recomissioning, energy auditing

**Skills/Background/Competencies:**  
Varies: 4-year engineering degree or 3+ years of experience, to 2-year technical associates degree and 8+ years in energy engineering/management

**Link to Training Resources:**  
[www.aeecenter.org](http://www.aeecenter.org)

**Demand from:**  
Johnson Controls, Siemens, Honeywell, General Motors, General Services Administration, Department of Defense, Sain Engineering Associates, Trane Corporation, Florida Power & Light, Southern California Edison, University of Minnesota

**Certification provided as part of training:**  
AEE

**Example Curriculum:**  
Contact AEE

**Duration of Training:**  
5-day training

**Training Targets:**  
Building and facilities managers

**In Place in Utah:**  
?

**Training Cost:**  
Training seminar: \$1,450; Application and exam: \$300, \$200 renewal of certification (every 3 years)

**Examples of Training:**  
UC Davis (CA); Corporate College, Cuyahoga Community College (OH); Western New England College (MA)

**Contact:**  
Bill Kent: 1-770-447-5083 ext. 213

**NOTES:**  
Testing and certification is typically offered directly through AEE. MOU agreements with universities also exist. Eligibility for exam requires previous degree and field experience. AEE provides testing and certification for several titles

## Appendix D: Education and Training Resources - Utah

### Commercial Energy Inspector, energy code training (ICC)

---

**Energy Sector Curriculum Specialization Group:**  
Inspection

**Job Description:**

Inspect commercial building for compliance with required energy conservation measures in International Energy Conservation Code

**Skills/Background/Competencies:**

Residential and commercial contracting

**Link to Training Resources:**

[www.iccsafe.org](http://www.iccsafe.org), <http://www.pearsonvue.com/icc>

**Demand from:**

Utah Statute, local governments

**Certification provided as part of training:**

DOPL

**Training Targets:**

Contractors, building inspectors and plans reviewers

**In Place in Utah:**

Some

**Contact:**

Dave Nichols, ICC: (888) 422-7233 ext. 7701

**NOTES:**

Testing and certification is typically offered directly through AEE. MOU agreements with universities also exist. Eligibility for exam requires previous degree and field experience. AEE provides testing and certification for several titles

### Commercial Energy Plans Examiner, energy code training (ICC)

---

**Energy Sector Curriculum Specialization Group:**  
Inspection

**Job Description:**

Review commercial building for compliance with required energy conservation measures in International Energy Conservation Code

**Skills/Background/Competencies:**

Residential and commercial contracting

**Link to Training Resources:**

[www.iccsafe.org](http://www.iccsafe.org), <http://www.pearsonvue.com/icc>

**Demand from:**

Utah Statute, local governments

**Certification provided as part of training:**

DOPL

**Training Targets:**

Contractors, building inspectors and plans reviewers

**In Place in Utah:**

Some

**Contact:**

Dave Nichols, ICC: (888) 422-7233 ext. 7701

**NOTES:**

Due to resource constraints, a low percentage of Utah building inspectors/plan reviewers receive energy code training/certification. Testing is currently administered by Pearson VUE.

## Appendix D: Education and Training Resources - Utah

### Energy Management (AAS)

---

**Energy Sector Curriculum Specialization Group:**  
Energy Management / Auditing

**Link to Training Resources:**  
<http://www.slcc.edu/greenacademy/energymanagement-courses.asp>

**Demand from:**  
Energy engineering firms, utility companies

**Certification provided as part of training:**  
SLCC

**Example Curriculum:**  
<http://www.slcc.edu/greenacademy/energymanagement-courses.asp>

**Duration of Training:**  
18 months

**Training Targets:**  
Building managers, facility managers, building auditors, and energy efficiency contractors

**In Place in Utah:**  
Yes

**Contact:**  
Jan Harris (SLCC): (801) 957-5373

**NOTES:**  
Driven in part by successful, comprehensive, long-term utility energy efficiency programs

### HERS Rater

---

**Energy Sector Curriculum Specialization Group:**  
Retrofit

**Job Description:**  
Provide energy audits/analysis primarily to new above-code and also retrofitted residential buildings

**Skills/Background/Competencies:**  
Use of complicated home testing equipment and use of computer modeling software

**Link to Training Resources:**  
[www.natresnet.org](http://www.natresnet.org)

**Demand from:**  
Utah Home Performance with ENERGY STAR program, ENERGY STAR builders, utility new homes incentive programs, 2009 IECC

**Certification provided as part of training:**  
RESNET

**Example Curriculum:**  
Can license from various sources (i.e. NYSERDA)

**Duration of Training:**  
Several days / varies.

**Training Targets:**  
Residential contractors and trades people

**In Place in Utah:**  
Yes

**Training Cost:**  
\$1,200 - \$2,500 plus equipment

**Contact:**  
Cris Peterson (UECC): (801) 765-0034

**NOTES:**  
HERS Raters

## Appendix D: Education and Training Resources - Utah

### Residential Energy Auditor (REA)

---

**Energy Sector Curriculum Specialization Group:**

Auditing

**Skills/Background/Competencies:**

Varies: 2-year technical degree in engineering, building management, energy auditing... or related; CEA or CEM in good standing

**Link to Training Resources:**

[www.aeecenter.org](http://www.aeecenter.org)

**Demand from:**

Utility companies, individuals wishing to work as independent consultants

**Certification provided as part of training:**

AEE

**Example Curriculum:**

Contact AEE

**Duration of Training:**

3-6 days

**Training Targets:**

Residential contractors and independent consultants

**In Place in Utah:**

?

**Training Cost:**

Training seminar: \$1450; Application and exam: \$300, \$200 renewal of certification (every 3 years)

**Examples of Training:**

N/A

**Contact:**

Bill Kent: (770) 447-5083 ext. 213

**NOTES:**

Testing and certification is typically offered directly through AEE. MOU agreements with universities also exist.

### Residential Energy Inspector/Plans Examiner, energy code training (ICC)

---

**Energy Sector Curriculum Specialization Group:**

Inspection

**Job Description:**

Review residential plans and inspect buildings for compliance with required energy conservation measures in International Energy Conservation Code

**Skills/Background/Competencies:**

Residential and commercial contracting

**Link to Training Resources:**

[www.iccsafe.org](http://www.iccsafe.org), <http://www.pearsonvue.com/icc>

**Demand from:**

Utah Statute, local governments

**Certification provided as part of training:**

DOPL

**Training Targets:**

Contractors, building inspectors and plans reviewers

**In Place in Utah:**

Some

**Contact:**

Dave Nichols, ICC: (888) 422-7233 ext. 7701

**NOTES:**

Due to resource constraints, a low percentage of Utah building inspectors/plan reviewers receive energy code training/certification. Testing is currently administered by Pearson VUE.

## Appendix D: Education and Training Resources - Utah

### Residential Weatherization Contractor

---

**Energy Sector Curriculum Specialization Group:**  
Weatherization

**Skills/Background/Competencies:**  
Residential contracting

**Link to Training Resources:**  
<http://trainingportal.ee.doe.gov/nwtp/index.php>

**Demand from:**  
Utah Weatherization Assistance Program, local government and NGO administrators

**Example Curriculum:**  
National Weatherization Training Program: <http://trainingportal.ee.doe.gov/nwtp/index.php>

**In Place in Utah:**  
Yes

### Thermographer

---

**Energy Sector Curriculum Specialization Group:**  
Energy Management / Auditing

**Job Description:**  
Use infrared thermography to locate problems with insulation and air leakage in residential buildings

**Link to Training Resources:**  
<http://www.ecw.org/university/ecuevent.php?ecuid=344>

**Demand from:**  
Utah Home Performance

**Certification provided as part of training:**  
N/A

**Example Curriculum:**  
<http://www.ecw.org/university/ecuevent.php?ecuid=344>

**Duration of Training:**  
Varies

**Training Targets:**  
Construction, remodeling, commercial or residential sub-contracting

**In Place in Utah:**  
No

**Training Cost:**  
\$89

### Renewable Energy and Transmission

#### Licensed Solar PV Installer

---

**Demand from:**

Market/Industry

**Certification provided as part of training:**

NABCEP/DOPL

**Example Curriculum:**

Contact SLCC

**Duration of Training:**

30 - 45 days (SLCC)

**Training Targets:**

Contractors, electricians

**In Place in Utah?**

Yes

**Training Cost:**

\$499 (Basic level), \$999 (Advanced level)

**Contact:**

Judy Fisher: (801) 957-5252

**NOTES:**

Passing the Advanced Solar PV Installation exam and earning the title NABCEP Certified PV Installer is an industry mark of distinction and allows for application for a State of Utah S202 license.

#### Licensed Solar PV Installer

---

**Demand from:**

Market/Industry

**Certification provided as part of training:**

NABCEP/DOPL

**Duration of Training:**

6 weeks (online)

**Training Targets:**

Contractors, electricians

**In Place in Utah?**

?

**Training Cost:**

\$895

**Contact:**

Solar Energy International: (970) 963-8855

**NOTES:**

Need additional information from SEI about how this training relates to applicable licensing requirements

## Appendix D: Education and Training Resources - Utah

### Licensed Solar Thermal Installer

---

**Demand from:**  
Market/Industry

**Certification provided as part of training:**  
NABCEP/DOPL

**Duration of Training:**  
5 days

**Training Targets:**  
Contractors, electricians

**In Place in Utah?**  
?

**Training Cost:**  
\$950

**Contact:**  
Solar Energy International: (970) 963-8855

**NOTES:**  
Need additional information from SEI about how this training relates to applicable licensing requirements

### Wind Technician

---

**Demand from:**  
Market/Industry

**Certification provided as part of training:**  
9 month Certificate or Associate of Applied Science

**Example Curriculum:**  
Available from UCE and Columbia Gorge Community College

**Duration of Training:**  
9 months or 2 years

**Training Targets:**  
Entry level, electricians

**In Place in Utah?**  
No

**Training Cost:**  
\$4,150 or \$7,800

**Contact:**  
Jim Pytel: (541) 506-6000 ex 7157, email: jpytel@cgcc.cc.or.us

**NOTES:**  
One of four colleges in AWEA's 'best practice school' pilot program

### Wind Technician

---

**Demand from:**  
Market/Industry

**Example Curriculum:**  
Available from UCE and on Airstreams website

**Duration of Training:**  
20 day courses

**Training Targets:**  
Entry level, electricians

**In Place in Utah?**  
No

**Training Cost:**  
\$2,500 to \$4,900

**Contact:**  
Jeff Peacon: (661) 882-3963

**NOTES:**  
Company offers very short courses covering energy basics and wind energy.

### Wind Technician

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**Demand from:**  
Market/Industry

**Certification provided as part of training:**  
Associate in Applied Science

**Example Curriculum:**  
Available from UCE and Iowa Lakes Community College

**Duration of Training:**  
2 years (48 and 80 credit programs)

**Training Targets:**  
Entry level, electricians

**In Place in Utah?**  
No

**Training Cost:**  
\$7,300 or \$12,250

**Contact:**  
Angie DeJong: (712) 362-7931, email: adejong@iowalakes.edu; Tracy Rascoe email: tracyr@mesalands.edu

**NOTES:**  
One of four colleges in AWEA's 'best practice school' pilot program

## Appendix D: Education and Training Resources - Utah

### Davis Applied Technology College Energy Technician Program

| Core                                      |                   |                     |                       |                           |
|---|-------------------|---------------------|-----------------------|---------------------------|
| Course                                    | Hours to Complete | Day of Week Offered | Time Offered          | Instructor                |
| Computer Concepts                         | 45                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Rama Rasmussen & Adjuncts |
| Applied Industrial Math                   | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Brenda Gardner & Adjuncts |
|   |                   | Monday & Wednesday  | 4:30 p.m. - 9:00 p.m. |                           |
|   |                   | Tuesday & Thursday  | 4:30 p.m. - 7:30 p.m. |                           |
| OSHA Training                             | 10                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| American Heart Association Heartsaver CPR | 4                 | Scheduled as needed |                       | CPR Staff                 |
| Technical Writing                         | 45                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Kari Phillips             |
| Energy Essentials                         | 60                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Track One: Green Construction             |                   |                     |                       |                           |
| Industrial Safety and Workplace Relations | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Construction Procedures                   | 60                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Blueprint Reading                         | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Steve Berger & Adjuncts   |
|   |                   | Monday - Thursday   | 4:30 p.m. - 9:00 p.m. |                           |
| Sustainable Conservation                  | 90                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Electrical Systems                        | 90                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Electrical Wiring Basics                  | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Photovoltaic Systems                      | 120               | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Track Two: Energy Management              |                   |                     |                       |                           |
| Course                                    | Hours to Complete | Day of Week Offered | Time Offered          | Instructor                |
| Industrial Safety and Workplace Relations | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Construction Procedures                   | 60                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts    |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                           |
| Blueprint Reading                         | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Steve Berger & Adjuncts   |
|   |                   | Monday - Thursday   | 4:30 p.m. - 9:00 p.m. |                           |

## Appendix D: Education and Training Resources - Utah

| Track Two: Energy Management (Continued)                |                   |                     |                       |                                   |
|---|-------------------|---------------------|-----------------------|-----------------------------------|
| Course  | Hours to Complete | Day of Week Offered | Time Offered          | Instructor                        |
| Sustainable Conservation                                | 90                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |
| Energy Efficiency                                       | 90                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |
| Alternative Energy                                      | 120               | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |
| Conducting an Energy Audit                              | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |
| Track Three: Renewable Energy Transmission - Composites |                   |                     |                       |                                   |
| Composites Basics                                       | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Mold Preparation  | 15                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Non-Vacuum and Vacuum Bag Part Fabrication              | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Prepreg Material Laminations                            | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Core Materials  | 45                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Composite Repair  | 15                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Blueprint Reading                                       | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Steve Berger & Adjuncts           |
|   |                   | Monday - Thursday   | 4:30 p.m. - 9:00 p.m. |                                   |
| Blue Print Reading for Composites                       | 15                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Composite Part Testing                                  | 15                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Alternative Composite Processes                         | 30                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Composites Materials Technology Special Project         | 60                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Composites Instructors & Adjuncts |
|   |                   | Monday - Thursday   | 6:00 p.m. - 9:00 p.m. |                                   |
| Alternative Energy                                      | 120               | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |
| Alternative Energy Final Project                        | 15                | Monday - Friday     | 7:30 a.m. - 2:30 p.m. | Stacy Hatch & Adjuncts            |
|   |                   | Monday - Thursday   | 3:00 p.m. - 9:00 p.m. |                                   |

## Appendix D: Education and Training Resources - Utah

### USU-College of Eastern Utah

Energy Academy 2010-11

Technical Foundations and Integrated Skills Courses (Non-Credit)

| Statewide Core  |                                     |       |                  |                |            |           |                   |
|---|-------------------------------------|-------|------------------|----------------|------------|-----------|-------------------|
| Department  | Course                              | Hours | Instructor       | Curriculum     | Start Date | End Date  | Min # of Students |
| Office Support/Skills Classroom   | Computer Skills                     | 45    | P. Espinoza      | Existing       | 1/24/2011  | Variable  | 1                 |
| Office Support/Skills Classroom   | Applied Math                        | 30    | P. Espinoza      | Existing       | 1/24/2011  | Variable  | 1                 |
| Office Support/Skills Classroom   | Technical Writing                   | 45    | P. Espinoza      | Existing       | 1/24/2011  | Variable  |                   |
| Mining & Industrial Safety  | OSHA 10-Hour General Industry       | 10    | TBD              | Existing       | TBD        | TBD       |                   |
| Heath   | CPR                                 | 4     | L. White         | Existing       | 4/19/2011  | 4/21/2011 | 1                 |
| Health  | 1st Aid                             | 2     | L. White         | Existing       | 4/19/2011  | 4/21/2011 |                   |
| Energy  | Energy Essentials*                  | 60    | TBD              | State SESP     | TBD        | TBD       | 10                |
|   | <b>TOTAL CORE HOURS (REQUIRED)</b>  | 196   |                  |                |            |           |                   |
| * Energy Essentials Course includes 16 Hours AC/DC Theory & 8 Hours Technical/Blueprint Reading |                                     |       |                  |                |            |           |                   |
| CNG Sector Specific   |                                     |       |                  |                |            |           |                   |
| Department  | Course                              | Hours | Instructor       | Curriculum     | Start Date | End Date  | Min # of Students |
| Automotive-CNG  | Transportation Fundamentals         | 16    | R. Stevenson     | R. Stevenson   | 5/5/2011   | 5/17/2011 | 6                 |
| Automotive-CNG  | Electrical Systems I - Day (Emery)  | 45    | M. Kava          | Existing       | 1/24/2011  | 5/25/2011 | 6                 |
| Automotive-CNG  | Electrical Systems I - Eve. (Price) | 45    | R. Stevenson     | Existing       | 3/15/2011  | 5/3/2011  | 6                 |
| Automotive-CNG  | Electrical Systems II               | 45    | S. Martineau     | Existing       | 8/2/2011   | 9/15/2011 | 6                 |
| Automotive-CNG  | Engine Performance Basics           | 30    | TBD              | S. Martineau   | 9/20/2011  | 11/4/2011 | 6                 |
| Automotive-CNG  | CNG Conversions (Kit Install)       | 60    | TBD              | Existing (WVU) | 1/1/2012   | 4/1/2012  |                   |
| Automotive-CNG  | Tank Inspection (Price & Vernal)    | 20    | S. Martineau/TBD | Existing (WVU) | 5/1/2011   | 5/1/2011  | 10                |
| Automotive-CNG  | High Pressure Systems Inspection    | 20    | TBD              | Existing (WVU) | TBD        | TBD       |                   |
| Automotive-CNG  | ASE Alternative Fuels Tech          | ?     | TBD              | Existing?      | TBD        | TBD       |                   |
|   | <b>TOTAL CNG SECTOR HOURS</b>       | 281   |                  |                |            |           |                   |

## Appendix D: Education and Training Resources - Utah

### Salt Lake Community College

#### SESP Energy Academy

Curriculum Schedule as of March 08, 2011

| Core Courses                  |                                    |                 |             |           |           |        |              |
|-------------------------------|------------------------------------|-----------------|-------------|-----------|-----------|--------|--------------|
| Track                         | Course                             | Number of Hours | Instructor  | Starting  | Ending    | Days   | Time         |
| Core                          | Applied Math                       | 30              | TBD         |           |           |        |              |
|                               | Computer Literacy                  | 39              | D. Trujillo | 1/24/2011 | 3/9/2011  | M,W    | 1-4pm        |
|                               |                                    | 39              | D. Trujillo | 3/24/2011 | 5/2/2011  | M,W    | 1-4pm        |
|                               | Energy Essentials                  | 24              |             | 3/29/2011 | 4/21/2011 | T, Th  | 6-9pm        |
|                               | OSHA 10 hour                       | 10              |             | 3/5/2011  | 3/12/2011 | S      | 9-2pm        |
|                               |                                    | 10              |             | 3/19/2011 | 3/26/2011 | S      | 9-2pm        |
|                               | CPR/First Aid                      | 4               | R. Malone   | 2/25/2011 | 2/25/2011 | F      | 6-10pm       |
|                               |                                    | 4               | R. Malone   | 3/25/2011 | 3/25/2011 | F      | 6-10pm       |
|                               |                                    | 4               | R. Malone   | 4/29/2011 | 4/29/2011 | F      | 6-10pm       |
|                               |                                    | 4               | R. Malone   | 5/27/2011 | 5/27/2011 | F      | 6-10pm       |
|                               |                                    | 4               | R. Malone   | 6/24/2011 | 6/24/2011 | F      | 6-10pm       |
|                               | Technical Writing                  | 24              | Online      | 3/16/2011 |           | Online | Online       |
|                               |                                    | 24              | Online      | 4/20/2011 |           | Online | Online       |
|                               | Basic Electrical Theory            | 30              | T. Bishop   | 2/22/2011 | 3/24/2011 | T, Th  | 6-9pm        |
|                               |                                    | 30              | T. Bishop   | 5/31/2011 | 6/30/2011 | T, Th  | 6-9 pm       |
| Content Specific Courses      |                                    |                 |             |           |           |        |              |
| Track                         | Course                             | Number of Hours | Instructor  | Starting  | Ending    | Days   | Time         |
| Energy Efficiency             | Intro to Energy Management         | 30              | G. Merrill  | 1/14/2011 | 3/18/2011 | F      | 5:30-8:30 pm |
| Renewable Energy Transmission | Basic PV                           | 30              | T. Bishop   | 1/11/2011 | 2/10/2011 | M, W   | 6-9 pm       |
|                               |                                    | 30              | T. Bishop   | 2/28/2011 | 3/30/2011 | M, W   | 6-9 pm       |
|                               | Advanced PV                        | 30              | T. Bishop   | 4/5/2011  | 5/12/2011 | T,R    | 6-9 pm       |
| Alternative Fuels             | CNG Conversion                     | 42              |             | 3/21/2011 | 4/15/2011 | M,W, F | 6-9:30 pm    |
| Green Construction            | Green Retrofitting                 | 30              | TBD         | TBD       | TBD       | TBD    | TBD          |
|                               | Your Role in The Green Environment | 25              | TBD         | TBD       | TBD       | TBD    | TBD          |

## Appendix D: Education and Training Resources - Utah

### Southwest Applied Technology College

Energy Academy 2010-11

Revised 3-08-2011

#### Technical Foundations and Integrated Skills Course Schedule

| Adult OE/OE Courses               |  |                 |               |                       |           |                                |          |
|-----------------------------------|--|-----------------|---------------|-----------------------|-----------|--------------------------------|----------|
| Department                        | Course   | Number of Hours | Instructor    | Starting              | Ending    | Days                           | Time     |
| Business Technology               |  |                 |               | 1/10/2011*            | 6/24/2011 | M-Th                           | 8am -1pm |
|                                   |  |                 |               |                       |           |                                | 2pm -7pm |
|                                   | *students begin the Monday after they are enrolled |                 |               |                       |           |                                |          |
|                                   | Computer Literacy Accelerated                      | 45              | D Drake       |                       |           |                                |          |
|                                   | Applied Technical Math                             | 30              | D Drake       |                       |           |                                |          |
|                                   | Technical Writing                                  | 45              | D Drake       |                       |           |                                |          |
| Online and Instructor Led Courses |  |                 |               |                       |           |                                |          |
| Safety                            | OSHA 10-Hour General Industry                      | 10              | TBD           | TBD                   |           |                                |          |
| Health Science                    | CPR  | 4.5             | A DeMille     | 2nd Saturday of month |           |                                |          |
|                                   | 1st Aid  | 2               | A DeMille     | 2nd Saturday of month |           |                                |          |
| Energy                            | Energy Essentials                                  | 60              | Mark Florence | 5/6/2011              | 3/16/2010 | M,W,F                          | 9am-noon |
|                                   | Energy Essentials                                  | 60              | Mark Florence | 5/9/2011              | 6/24/2011 | M,W,F                          | 9am-noon |
|                                   | Wind Technician-Basics I                           | 30              | Andy Swapp    | 5/10/2011             | 5/31/2011 | T and Th plus Saturdays<br>TBD | 5pm-8pm  |
|                                   | Wind Technician - Basics II                        | 30              | Andy Swapp    | 6/2/2011              | 6/21/2011 | T and Th plus Saturdays<br>TBD | 5pm-8pm  |
|                                   | Solar Essentials I                                 | 20              | Mark Florence | 5/10/2011             | 5/31/2011 | T and TH                       | 9am-noon |
|                                   | Solar Essentials II                                | 20              | Mark Florence | 6/2/2011              | 6/24/2011 | T and TH                       | 9am-noon |

## Appendix D: Education and Training Resources - Wyoming

### Wyoming Community Colleges and University of Wyoming Environmental Programs of Study Offered

| College or University                       | Contact Information  | Enrollment* | Description  |
|---|--|-------------|--|
| Casper College                              | 125 College Drive<br>Casper, WY 82601<br>800-442-2963<br>307-268-2100<br><a href="http://www.caspercollege.edu/">http://www.caspercollege.edu/</a>                       | 4,478       | Casper College offers certificate and Associate's degree programs in environmental science. Also offered is a program in water quality technology. According to their Continuing Education Courses bulletin, Casper College is offering short-term training in the following areas: accredited geothermal installer; LEED "green associates" training; and LEED "AP building design+construction." It is unclear if these three programs will be permanent program offerings or only for spring 2011. In addition, Casper College is offering a lecture series in green building and hosting a green conference in March 2011. |
| Central Wyoming College                     | 2660 Peck Avenue<br>Riverton, WY 82501<br>307-855-2000<br>800-735-8418<br><a href="http://www.cwc.edu/">http://www.cwc.edu/</a>  | 2,404       | CWC offers two programs of study: environmental science & leadership; and environment, health & safety - environmental technician.   |
| Eastern Wyoming College                     | 3200 West C Street<br>Torrington, WY 82240<br>866-327-8996<br>800-877-9965<br><a href="http://www.ewc.wy.edu/">http://www.ewc.wy.edu/</a>                                | 1,391       | EWC offers a program in weatherization. One certificate is offered for weatherization technician (17 credit hours) and the other is offered for advanced weatherization technician (34 credit hours).  |
| Laramie County Community College            | 1400 East College Drive<br>Cheyenne, WY 82007<br>800-522-2993<br><a href="http://www.lccc.wy.edu/">http://www.lccc.wy.edu/</a>   | 4,905       | LCCC offers a heating, ventilation, and air conditioning/ refrigeration (HVAC/R) program with a focus on energy efficiency. Both an Associate's degree and a certificate are offered in the program. Also offered is an Associate's degree for wind turbine technician.  |
| Northwest College                           | 231 West 6th Street<br>Powell, WY 82435<br>800-560-4692<br><a href="http://www.northwestcollege.edu/">http://www.northwestcollege.edu/</a>                               | 2,099       | None offered.  |
| Northern Wyoming Community College District | 3059 Coffeen Avenue<br>Sheridan, WY 82801<br>800-913-9139<br>307-674-6446<br><a href="http://www.sheridan.edu/site/">http://www.sheridan.edu/site/</a>                   | 3,899       | NWCCD offers a program in natural resources & ranch land management. Among the careers pursued by individuals who achieve an Associate's of Science are "in range management, ranch land management, wildlife management, restoration ecology, and environmental consulting."  |
| Western Wyoming Community College           | 2500 College Drive<br>Rock Springs, WY 82901<br>307-382-1600<br><a href="http://www.wycc.wy.edu/">http://www.wycc.wy.edu/</a>  | 4,079       | None offered.  |
| University of Wyoming                       | UW Admissions<br>Dept. 3435<br>1000 E. University Avenue<br>Laramie, WY 82071<br>800-342-5996<br>307-766-5160<br><a href="http://www.uwyo.edu/">http://www.uwyo.edu/</a> | 12,427      | UW offers a variety of programs in environmental studies. They include environmental engineering; an interdisciplinary program through the School of Environment and Natural Resources; and research through the Institute of Environment and Natural Resources. In addition, the School of Energy Resources offers lectures in renewable energy.  |

\* Enrollment figures are from the National Center for Education Statistics, <http://nces.ed.gov/collegenavigator/?s=WY>  
Compiled by S. Saulcy, Senior Economist, Wyoming Department of Employment, Research & Planning