



## Industry Sector Opportunities: Women Working in Alternative Energy Fact Sheet - Revised

The use of alternative, or renewable, energy has increased tremendously as citizens, governments and organizations have grown concerned about the long-term sustainability and environmental impacts of fossil fuels.<sup>1</sup> New technologies have been developed to harness clean energy sources, and many jobs are being created to meet the demand for alternative energy. According to the Bureau of Labor Statistics, the fastest-growing segment of the electric power industry is renewable energy. While renewable energy sources make up a relatively small piece of the nation's energy mix, both wind and solar energy are expanding rapidly. Companies engaged in production and installation are hiring a significant number of new workers. In the utilities industry, most full-time workers receive substantial benefits in addition to their salaries or hourly wages. Since many of the jobs in alternative energy are non-traditional to women, educators, advocates, and workforce professionals must ensure that women are aware of these opportunities and receive support in seeking training, education, and employment.

### A Closer Look at the Sectors

**Definitions.** According to O\*NET, the Occupational Information Network, alternative energy sectors include “activities related to developing and using energy sources such as solar, wind, geothermal, and biomass.”<sup>2</sup> Below is a brief overview of the major sectors that fall within the umbrella of alternative energy.

- **Biofuels/Biomass:** Plants and other biological materials (such as wood, corn, grasses, algae, and vegetable oils) can be converted into fuels, such as biodiesel and ethanol, that can be used to power vehicles, heating systems, and other technology. Next to hydropower, more electricity is generated from biomass than any other renewable energy resource in the United States.<sup>3</sup>
- **Fuel Cell Battery:** A fuel cell uses hydrogen and oxygen to create electricity, which can be used to power a variety of devices from hearing aids to cars. By using a chemical reaction rather than combustion, the battery's energy does not give off emissions and produces little noise.<sup>4</sup>
- **Geothermal:** This form of energy captures the heat that is created by the earth's core. This heat, found in underground hot water or steam reservoirs, is pumped to the surface for processing and distribution through power plants or smaller systems.
- **Hydroelectric:** Hydro power entails using the movement of water to generate electricity.
- **Solar:** Captured via solar panels, the energy from the sun can be used to power homes, businesses, and other structures, as well as electronic devices.
- **Wind:** Energy from the wind can be gathered through wind turbines. These turbines turn the kinetic energy of the wind into electricity or mechanical motion.

**Market Drivers.** Alternative energy is poised to grow as new investments are made by governments and private companies. As one measure of this growth, the Clean Energy Patent Growth Index shows that there were more U.S. patents granted in the first quarter of 2010 than during any quarter since tracking began in 2002.<sup>5</sup> An increasing number of patents have been granted for fuel cells, hydroelectric, wind, and geothermal technologies, despite the recession.<sup>6</sup> In 2008, renewables made up about ten percent of the total energy production in the U.S.<sup>7</sup> As the push to find alternatives to fossil fuels to meet domestic energy needs continues, this share is likely to increase, perhaps up to as much as 40 percent.<sup>8</sup> In addition, the U.S. alternative energy market may grow as other countries import biomass products, wind turbines, and other resources to support their demands for clean energy.<sup>9</sup>

The American Recovery and Reinvestment Act (ARRA) contributed to additional training, employment, and development in the alternative energy industry. It provided over \$15 billion in grants and tax credits for projects such as improving energy delivery systems (i.e., “smart grids”), developing advanced batteries and hybrid automobiles, supporting state renewable energy programs, and lowering greenhouse gas emissions.<sup>10</sup> States are making additional investments in renewable energy sectors. For example, Michigan is focusing on developing a fuel cell battery niche, and Tennessee is promoting biofuels and responsible energy consumption.



As states and regions explore the economic viability of developing the alternative energy sector in their area, they are gaining a greater understanding of the role that geography, available resources, and a trained workforce play in their efforts. The top states in 2006 for wind energy production were Texas, California, and Iowa.<sup>11</sup> For solar energy production, California leads, followed by New Jersey, Nevada, and Colorado.<sup>12</sup> Biomass is a popular alternative energy source in states with large agricultural economies, such as those in the Midwest and the South. Michigan and Ohio are central states for the fuel cell sector because of their automobile manufacturing histories.

**Labor Needs.** Due to a current lack of a consistent, national means of documenting jobs in the green economy, it is difficult to track workforce changes within alternative energy. However, some have attempted to identify demand in this industry. According to a Pew Charitable Trusts report, in 2007, approximately 85,000 jobs in the U.S. were in the alternative energy industry.<sup>13</sup> Another report, using a more inclusive definition, places the number for 2006 at about 193,500 jobs.<sup>14</sup> The recent recession did not affect the market growth for renewable energy, in fact, there were strong gains for the industry (e.g., large wind capacity, photovoltaic solar capacity, and biofuel production all rose strongly in 2008-2009); employment needs are expected to grow along with the expansion of the industry.<sup>15</sup>

Regionally, demand varies greatly, depending on the established production, transportation, and/or research into alternative energy in an area. In the Missouri Green Jobs Report, for example, survey results from employers showed that clean energy production was 19 percent of the total green employment in the state.<sup>16</sup> This report also found that 25 percent of employers who responded to a survey said that a shortage of workers with knowledge and skills were barriers to growth.<sup>17</sup> To illustrate the point further, according to the American Wind Energy Association, the most wind jobs in 2009 were in Texas, Iowa, and Illinois.<sup>18</sup> So, knowing the nature of the local alternative energy industry is critical to understanding labor needs. As women now comprise about half of the U.S. workforce, and are earning more postsecondary degrees than men, it is important that women consider green jobs, whether in alternative energy or another field.<sup>19</sup> Labor market data available at the state or regional level is most helpful in determining what alternative energy career paths are most in demand.

## Career Options

**Career Pathways.** Careers in alternative energy generally require technical skills and subject matter knowledge in science, technology, engineering, and math (STEM). There are opportunities for advancement in each of the career tracts: research and design, manufacturing, and systems installation and management.

Many careers in alternative energy require a credential, such as a technical certificate, an associate's degree, or a bachelor's degree. Given the diversity of jobs in this sector, there is a corresponding variety of credentials that will lead to gainful employment. For instance, a wind energy engineer might need to have an electrical or mechanical engineering degree, while a solar voltaic systems installer might need to be well versed in construction codes and schematics or trained as an electrician.

A career pathway in the solar industry might begin with basic training and an apprenticeship, followed by electrician journeyman status and managing a field team. In the wind energy industry, many jobs require engineering credentials, but others require less education and transferable skills such as CNC (computer numerically controlled) machining, welding, and maintenance.<sup>20</sup> In biomass, well-paying occupations tend to require at least one to two years of postsecondary education or field experience in welding, machine operation, and business management.<sup>21</sup> Geothermal energy jobs frequently require heating systems knowledge and credentials, but backgrounds in geology and engineering are also valuable.

Business ownership is also a promising career for women who are interested in being part of the green economy. According to the Center for Women's Business Research, in 2008 there were 10.1 million firms in the United States which were at least 50 percent owned by women.<sup>22</sup> This number represents 40 percent of all privately-owned businesses in the country,<sup>23</sup> and women should take advantage of new opportunities as the demand for clean energy technology and products increases.

## Role of Workforce Professionals, Training and Education Providers, and Advocates

Those in workforce development can assist would-be alternative energy workers in the following ways:



- Keep current about changing labor market data, as well as new and emerging green occupations.
- Work closely with employers in the area to understand their hiring needs and their plans for growth.
- Provide a range of green career options for job hunters that are appropriate for their current or enhanced skills and education levels.
- Evaluate the income needs of an individual to develop a career progression that will lead to self-sufficiency and economic security.
- Work with community partners, employers, and women job seekers to address the obstacles that may arise for women before and during employment in a non-traditional career, and to dispel gender myths and stereotypes.
- Link efforts with Small Business Development Centers, women's centers, and other economic development entities to meet the needs of potential alternative energy entrepreneurs or future business owners.

To listen to the teleconference that accompanies this fact sheet, and for further information about "A Woman's Guide to Green Jobs" and other Women's Bureau initiatives supporting green jobs, including Women and Green Jobs Roundtables and green training projects, please visit the USDOL Women's Bureau Web site at: <http://www.dol.gov/wb/>.

## End Notes

- <sup>1</sup> Environmental News Network. "U.S. Renewable Energy Growth Accelerates." Worldwatch Institute (2008). <http://www.enr.com/energy/article/37908>
- <sup>2</sup> O\*NET, "Green Sectors: Renewable Energy Generation." <http://www.onetcenter.org/green.html>
- <sup>3</sup> U.S. Department of Energy, Energy Efficiency & Renewable Energy. "ABC's of Biopower" (2005). [http://www1.eere.energy.gov/biomass/abcs\\_biopower.html](http://www1.eere.energy.gov/biomass/abcs_biopower.html)
- <sup>4</sup> Fuel Cells 2000. "What is a fuel cell?" (2010). <http://www.fuelcells.org/>
- <sup>5</sup> CleanTech Group. "Clean Energy Patent Growth Index 1<sup>st</sup> Quarter 2010." (Heslin Rothenberg Farley & Mesiti P.C., 2010). <http://www.cepgi.typepad.com>
- <sup>6</sup> Alternative Energy News. "Clean Energy Patents Reach New High." (2009). <http://www.alternative-energy-news.info/clean-energy-patents-reach-new-high/>
- <sup>7</sup> U.S. Energy Information Administration. "Primary Energy Production by Source, 1948-2008." *Annual Energy Review*. (2009 June). <http://www.eia.doe.gov/aer/txt/ptb0102.html>
- <sup>8</sup> Bezdek, Roger. *Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century*. Management Information Services for the American Solar Energy Society, November 2007. <http://www.greenforall.org/resources/renewable-energy-and-energy-efficiency-economic>. Cited in Dierdorff, Erich C. et al. *Greening of the World of Work: Implications for O\*NET@-SOC and New and Emerging Occupations*. (The National Center for O\*NET Development, February 12, 2009).
- <sup>9</sup> Steward, Pete. "Wood-based Biomass, Biofuels & Bioenergy," Louisiana: Forest to Market, April 2010.
- <sup>10</sup> "Primary Energy Production by Source, 1948-2008."
- <sup>11</sup> U.S. Energy Information Administration. "Renewable Electric Power Sector Net Generation by Energy Source and State, 2006." *Renewable Energy Annual*, 2007. (2009 April). [http://www.eia.doe.gov/cneaf/solar/renewables/page/rea\\_data/table1\\_15.xls](http://www.eia.doe.gov/cneaf/solar/renewables/page/rea_data/table1_15.xls)
- <sup>12</sup> Interstate renewable Energy Council. "U.S. Solar Market Trends 2008." (2010). [http://www.irecusa.org/fileadmin/user\\_upload/NationalOutreachDocs/SolarTrendsReports/IREC\\_Solar\\_Market\\_Trends\\_Report\\_2008.pdf](http://www.irecusa.org/fileadmin/user_upload/NationalOutreachDocs/SolarTrendsReports/IREC_Solar_Market_Trends_Report_2008.pdf)
- <sup>13</sup> The Pew Charitable Trusts. "The Clean Energy Economy." (2009): 16.
- <sup>14</sup> Bezdek, 25.
- <sup>15</sup> Forsyth, Trudy, Julia Hamm, and Kelly Tiller, Ph.D. "Women Working in Alternative Energy" teleconference, Public Policy Associates, Incorporated and Wider Opportunities for Women for the U.S. Department of Labor, Women's Bureau. August 2010.
- <sup>16</sup> Missouri Economic Research & Information Center. "The Missouri Green Jobs Report." (2009): 12. [http://www.missourieconomy.org/pdfs/mo\\_green\\_jobs\\_report.pdf](http://www.missourieconomy.org/pdfs/mo_green_jobs_report.pdf)
- <sup>17</sup> Missouri Economic Research & Information Center, 13.
- <sup>18</sup> American Wind Energy Association. "Windpower Outlook 2010." [http://www.awea.org/pubs/documents/Outlook\\_2010.pdf](http://www.awea.org/pubs/documents/Outlook_2010.pdf): 3
- <sup>19</sup> Madrid, Jorge. "Women's Role in the Clean Energy Economy," Center for American Progress. (May 25, 2010) [http://www.americanprogress.org/issues/2010/05/women\\_clean\\_economy.html](http://www.americanprogress.org/issues/2010/05/women_clean_economy.html)
- <sup>20</sup> Minnesota Renewable Career Pathways. "Wind." South Central Workforce Council. (2010). Also: Green Energy Jobs, "Wind Energy Jobs," 2010.
- <sup>21</sup> Minnesota Renewable Career Pathways, "Ethanol," South Central Workforce Council. (2008). <http://www.workforcecouncil.org/Ethanol%20Career%20Pathway.pdf>
- <sup>22</sup> Women's Business Research Center. "Key Facts About Women-Owned Businesses." (2010). <http://www.womensbusinessresearchcenter.org/research/keyfacts/>
- <sup>23</sup> "Women's Role in the Clean Energy Economy."



## Additional Resources

The list below provides additional resources. The list is not exhaustive, and inclusion on this list does not represent an endorsement of any institution or program. As Web links can change, further Internet searches may be necessary to find the latest information.

### Green and Non-Traditional Job Training Programs

#### Government Resources

- Green Jobs, Workforce3One Communities. This site compiles an ongoing list of training programs, evaluations, and other green economy information. <http://greenjobs.workforce3one.org/page/resources/1000916955604530872>
- U.S. Department of Energy, Energy Education and Workforce Development. Serves as a clearinghouse of alternative energy information including government programs, K-12 lesson plans, links to post secondary institutions and professional development, internship programs, as well as other information. <http://www1.eere.energy.gov/education/>

#### Non-Government Resources

- The Renewable Energy Valuation and Understanding Project (Rev-Up™). A nonprofit information and educational networking site. Lists alternative energy training programs at colleges across the country as well as internship opportunities. Also serves as an interactive platform to allow users to access and add alternative energy resources. <http://www.rev-up.org/index.php>

### Green Jobs & Labor Market Information

#### Government Resources

- National Center for O\*NET Development. The Center researched green economic sectors, demand occupations, enhanced skills occupations, and new & emerging sectors which have been added to the O\*NET system. <http://www.onetcenter.org/green.html> and <http://online.onetcenter.org/help/bright/>
- Career Information Delivery System (CIDS). State systems for information on employment opportunities. CIDS may be found at community colleges, universities or employment offices.
- CareerOneStop. This site provides an outline of green careers. <http://www.careeronestop.org/GreenCareers/GreenCareers.aspx>
- U.S. Department of Labor, Bureau of Labor Statistics is working with agencies across the Department to produce green jobs data. See: <http://www.bls.gov/green/home.htm>

#### Non-Government Resources

- "Green Collar" Job Creation: A Critical Analysis, Beacon Hill Institute at Suffolk University. This report reviews three studies predicting green jobs growth including reports from the U.N. Environment Programme, the Center for American Progress, and the U.S. Conference of Mayors. <http://www.beaconhill.org/BHISudies/GreenJobs09/BHIGreenCollarJobCritique090625.pdf>
- *The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America*. This 2009 report from the Pew Charitable Trust Center on the States and Collaborative Economics Inc. looks at 16 economic sectors to develop an inventory of existing businesses and jobs in the US. [http://pewcenteronthestates.org/uploadedFiles/Clean\\_Economy\\_Report\\_Web.pdf](http://pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf)

### Industry Information and Educational Materials

#### Government Resources

- National Renewable Energy Laboratory. Federal laboratory dedicated to the development and deployment of alternative energy technologies. Also provides research reports on energy markets, policy, and sustainability. <http://www.nrel.gov/>

#### Non-Government Resources

- Iowa Energy Center. Provides links to renewable energy resources across the country. <http://www.energy.iastate.edu/links/renewable.htm>
- Geothermal Education Office. Offers educational presentations, definitions, and other informative resources for geothermal energy. <http://geothermal.marin.org/>
- Alternative Energy News. A news service dedicated to alternative energy technologies, jobs, and events across the country. <http://www.alternative-energy-news.info/>
- Interstate Renewable Energy Council. The IREC provides up-to-date information on alternative energy education, news, and best practices. They also provide reports on industry trends and procedures. <http://www.irecusa.org/>

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