



# Fact Sheet

## Jobs in Renewable Energy and Energy Efficiency (2014)

December 2014

This factsheet focuses on employment in the renewable energy and energy efficiency sectors in the United States and around the world. The job figures cited below are sourced from the U.S. Department of Energy (DOE) and the Bureau of Labor Statics (BLS), as well as international organizations, national non-profits, think tanks and national trade associations.

### CLEAN ENERGY JOBS IN THE UNITED STATES

A 2013 report from the Bureau of Labor Statistics (BLS) found 3.4 million green jobs in the United States at the end of 2011. This is the latest data available from BLS, due to the elimination of its Green Careers program. On March 1, 2013, the across-the board spending cuts referred to as sequestration, required by the amended *Balanced Budget and Emergency Deficit Control Act*, came into effect. As part of those budget cuts, BLS stopped offering all “measuring green jobs” products.<sup>1</sup>

The BLS Green Jobs Initiative to measure green jobs across the United States was operational beginning in fiscal year 2010.<sup>2</sup> The Initiative sought to provide reliable data to the public on the number of existing green jobs in the country, the changes in job numbers over time, the distribution of green jobs, and the wages workers earn in these jobs.<sup>3</sup> BLS defined “green jobs” as jobs which “produce goods or provide services that benefit the environment or conserve natural resources.”<sup>4</sup> The data BLS provided on green jobs for 2009, 2010 and 2011, has been widely used by government agencies, think tanks, and non-profit organizations. The lack of reliable data updates from BLS is a big loss for green job estimates.

### ENERGY EFFICIENCY & RENEWABLE ENERGY EMPLOYMENT

The following sections include employment assessments for the energy efficiency and renewable energy sectors from government agencies, nonprofits and industry groups. Many of the assessments include direct, indirect, and induced employment. Data collection methodology and specific job categorizations differ between assessments because the information for each sector was collected from different sources.

#### Energy Efficiency

Due to the lack of a standard method of measuring jobs supported by energy efficiency sectors, there are few reliable figures on current estimates of energy efficiency jobs. This year, the American Council for an Energy-Efficient Economy (ACEEE), in cooperation with the Vermont Energy Investment Corporation and the DC Sustainable Energy Utility, is working on developing a new method to estimate the number of jobs supported by energy efficiency practices. The project is expected to be finished in late 2014. The results will be helpful for organizations and government agencies documenting the job creation of energy efficiency practices and their economic impacts.<sup>5</sup>

ACEEE's last report on energy efficiency jobs, published in 2012, estimated that as of 2010, the number of jobs related to energy and resource efficiency in the United States was around 830,000, with an annual increase rate of 3 percent.<sup>6</sup> ACEEE also shows that every \$1 million investment in energy efficiency improvements supports around 20 jobs in the U.S. economy, including direct, indirect and induced jobs. This is larger than the economy-wide average of 17 jobs supported per \$1 million of investment.<sup>7</sup>

In addition, according to the Natural Resources Defense Council (NRDC), the Environmental Protection Agency's (EPA) proposed carbon dioxide (CO<sub>2</sub>) regulation for existing power plants, released June 2, 2014, will increase incentives for investments in energy efficiency, creating more than 274,000 jobs while saving \$37.4 billion on electric bills for American households and business customers.<sup>8</sup>

*The following five sectors of energy efficiency are categorized according to research from Environmental Entrepreneurs (E2).*

**Buildings:** According to a 2011 Brookings-Battelle report, energy efficiency work in the building sector supported 450,000 jobs as of 2010.<sup>9</sup> According to Environmental Entrepreneurs (E2), the building efficiency sector created 12,527 jobs in 2013, and is one of the most active energy efficiency sectors for job creation.<sup>10</sup> In fact, consulting firm McKinsey found that between 2009 and 2020, 600,000 to 900,000 American direct, indirect, and induced jobs could be created by retrofitting buildings for energy efficiency.<sup>11</sup>

**Appliance and Equipment Efficiency Standards:** A 2011 ACEEE report showed that energy efficiency standards for appliances and equipment accounted for about 340,000 jobs in 2010, which was about 0.2 percent of U.S. jobs. This number includes all jobs that are generated by national appliance, equipment, and lighting standards. The report also anticipated the number of such jobs to increase to about 380,000 jobs by 2030.<sup>12</sup>

**Vehicles:** According to E2, the U.S. auto industry is switching to high-mileage, low-emissions vehicles because of a confluence of technology and consumer demand. Because of this changeover, the U.S. auto sector added more than 263,000 jobs related to hybrid and electric vehicles between June 2009 and January 2013.<sup>13</sup>

**Public Mass Transportation:** According to an E2 report, the public transportation sector, which is the other most active sector for job creation in energy efficiency, announced 11,449 new jobs in 2013.<sup>14</sup> E2 estimated that more than 400,000 Americans worked in the \$55 billion mass transportation industry as of 2013.<sup>15</sup>

**Smart Grid and Demand Management:** The E2 report showed that the smart grid sector announced 8,765 new jobs in 2013.<sup>16</sup> According to the U.S. Department of Energy, the *American Recovery and Reinvestment Act of 2009* added at least 47,000 jobs to the smart grid sector.<sup>17</sup> Unfortunately, numbers for this sector's total employment were unavailable.

## Renewable Energy

**Solar:** According to Environmental Entrepreneurs, the solar industry was the top performer in 2013 for generating clean energy jobs.<sup>18</sup> The Solar Foundation estimated there were close to 143,000 solar jobs in the United States in 2013, including 24,000 new jobs announced that year. The rate at which jobs were added in 2013 was more than 20 percent over 2012 levels.<sup>19</sup>

**Wind:** In a 2014 report, the American Wind Energy Association (AWEA) indicated that the wind energy industry directly supported 50,500 full-time-equivalent jobs in 2013.<sup>20</sup> AWEA cited a Navigant Consulting study it commissioned which predicted that if the Federal Production Tax Credit (PTC) were extended for four more years, it would support 54,000 additional jobs over that period, representing a 33 percent growth rate. The study also predicted a 50 percent cut in wind industry jobs in the absence of a PTC.<sup>21</sup>

**Hydropower:** According to a 2014 report from the American Council On Renewable Energy (ACORE), the hydropower industry supports 200,000 to 300,000 jobs in the United States, as well as a supply chain of more than 2,500 companies.<sup>22</sup> A 2010 Navigant Consulting study found the industry could support an additional 230,000 to 700,000 direct and indirect jobs by 2025 and expand its capacity by 23,000-60,000 megawatts (MW) with policies supportive of hydropower development.<sup>23</sup>

**Geothermal:** In a May 2014 report, the International Renewable Energy Agency (IRENA) found that the geothermal industry supported 35,000 direct and indirect American jobs from 2012-2013.<sup>24</sup> The Geothermal Energy Association (GEA) estimated in a 2013 report that the geothermal industry is able to generate about 25,000 more jobs than the natural gas industry at a capacity level of 500 MW.<sup>25</sup>

**Wave & Ocean Power:** The Brookings-Battelle Clean Economy Database found 371 people working in the wave and ocean power sector in 2010.<sup>26</sup> The Ocean Renewable Energy Coalition, in partnership with the U.S. Department of Energy, published a roadmap for wave and ocean power in 2011 which found that if the industry grew to a capacity of 15 gigawatts (GW) by 2030, it would support 36,000 direct and indirect jobs.<sup>27</sup>

**Biomass:** According to IRENA, the biomass industry supported an estimated 152,000 direct and indirect jobs in the United States during the 2012-2013 period, including 15,500 direct jobs.<sup>28</sup> According to the Biomass Power Association (BPA), the power section of the biomass industry employs 18,000 people in the United States, mostly in rural areas.<sup>29</sup> BPA estimates biomass power can generate 10 times as many well-paid jobs as a comparable conventional natural gas facility.<sup>30</sup>

**Waste-to-Energy:** A 2014 report from ACORE on renewable energy in America reported that the waste-to-energy industry, defined as “energy generated from the sustainable management of municipal solid waste,” directly supported 5,350 jobs and indirectly supported 8,600 jobs – a total of close to 14,000 jobs.<sup>31</sup> Government Advisory Associates estimated that each direct waste-to-energy job supports 1.6 additional jobs.<sup>32</sup>

**Fuel Cells:** Fuel Cells 2000 estimated in 2011 that 10,845 jobs were supported by the fuel cell industry, including 3,615 direct and 7,230 indirect jobs.<sup>33</sup> The U.S. Department of Energy estimated that with the rapid increase in the adoption of fuel cells, 180,000 new domestic jobs could be created by 2020, and 685,000 jobs by 2035.<sup>34</sup>

**Biogas:** The American Biogas Council (ABC) estimated in 2014 that there are currently 2,000 operational biogas systems, with a market potential for 12,000 additional systems.<sup>35</sup> In June 2012, ABC Executive Director Patrick Serfass estimated there were more than 2,200 biogas-producing sites operating, including 186 digesters on farms, 1,500 digesters at wastewater treatment plants, and 576 landfill-based energy projects.<sup>36</sup> Although there is no data available for current employment, ABC estimated in 2014 that the biogas industry could support 300,000 construction jobs and 20,000 permanent jobs.<sup>37</sup>

**Renewable Fuels:** According to the Fuels America coalition, the renewable fuels industry – which includes biodiesel, conventional and cellulosic ethanol, as well as advanced biofuels and their suppliers – supported 852,056 jobs in 2014. Among these jobs, 292,166 are direct jobs, 226,098 are induced jobs, and 333,792 are jobs in supplier chains.<sup>38</sup> The following is a job breakdown for the three main sectors of renewable fuels.

**Ethanol:** In a report commissioned by the Renewable Fuels Association, the consulting firm ABF Economics found that in 2013, there were 386,781 jobs in the ethanol industry, including 86,503 direct jobs.<sup>39</sup> Moreover, jobs in the ethanol industry generated more than \$44 billion for the U.S. economy.<sup>40</sup>

**Biodiesel:** In November 2013, LMC International released a study commissioned by the National Biodiesel Board estimating that the U.S. biodiesel industry supported more than 62,000 jobs and \$2.6 billion in wages in 2013. The National Biodiesel Board also predicted the industry would likely produce a record 1.7 billion gallons in 2013. However, in a leaked EPA document on potential Renewable Fuel Standards (RFS) for 2014, EPA proposed limiting the RFS volume for biodiesel to 1.28 billion gallons. If this limit was implemented, the United States would potentially lose 8,000 jobs.<sup>41</sup>

**Advanced Biofuels:** According to E2's *Advanced Biofuel Market Report* of 2013, advanced biofuel companies – companies that focus on cellulosic ethanol, cellulosic butanol, “drop-in” fuels from non-food sources, and biodiesel from non-virgin oil – support about 4,500 direct, full-time jobs (excluding supply chain employment). The number of jobs is expected to increase to 8,000 with 2016 production and expansion plans. The report also said that by 2016, the industry supply chain could reach 12,300 full-time jobs in feedstock production and 33,000 temporary jobs for construction and new facilities related to the advanced biofuel industry.<sup>42</sup>

The International Renewable Energy Agency (IRENA) did a separate estimate of jobs in the renewable energy industry in the United States, finding a total of 625,000 direct and indirect jobs in the solar, biofuel, wind, biomass, hydropower and geothermal industries.<sup>43</sup>

## CLEAN ENERGY JOBS AROUND THE WORLD

There is no official, global definition of green jobs, but one can adopt the definition used by the United Nations Environmental Programme (UNEP) in its 2008 report, *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*. The report defines green jobs as jobs “in agricultural, manufacturing, research and development (R&D), administrative, and services activities that contribute substantially to preserving or restoring environmental quality.”<sup>44</sup> This includes jobs in renewable energy, energy efficiency in buildings, sustainable transportation, sustainable agriculture, and responsible forestry management.

The following two sections gather employment figures for energy efficiency and renewable energy sectors globally and in different countries. The figures are sourced from international organizations, including the United Nations Environmental Programme (UNEP), International Labour Organization (ILO), and International Renewable Energy Agency (IRENA).

### Energy Efficiency

According to UNEP, energy efficiency in buildings and transportation are two major areas that reduce greenhouse gas emissions. However, there is little data on energy efficiency jobs. UNEP's 2008 report, *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, which still provides the most up-to date energy efficiency job data worldwide, estimated that around 4 million direct jobs were supported by energy efficiency in the United States and select European countries in 2006. The report also stated there were over 5 million jobs in railways alone across China, India and the European Union in 2006, with millions more in other forms of public transportation. It also counted 250,000 jobs in vehicle manufacture as “green”: this included manufacturing jobs for fuel-efficient, low-emissions and low-pollution cars.<sup>45</sup>

In 2013, a report on green jobs in the European Union, published by the International Labour Foundation for Sustainable Development (Sustainlabour), estimated that 25,900 full-time jobs can be created for every 1 billion euro investment in energy efficiency in buildings, including 15,000 direct jobs and 10,900 indirect jobs.<sup>46</sup>

## Renewable Energy

The *Annual Review on Renewable Energy and Jobs of 2014* report from the International Renewable Energy Agency (IRENA), showed a total of 6.5 million jobs around the world supported by the renewable energy sectors. Among all the countries, China, Brazil, the United States, India and Germany are the top five largest employers for renewable energy industries. Solar photovoltaic and wind power are the two most dynamic renewable energy sectors, according to IRENA. The solar photovoltaic sector supported 2.3 million jobs; the wind power sector supported 0.8 million jobs.<sup>47</sup>

The following are examples of green jobs in the countries and regions with the largest amount of renewable energy employment.

**China:** According to IRENA, China was the largest employer in the renewable energy sector in 2013, employing 2.64 million people. China's solar photovoltaic sector employed 1.6 million people last year (60 percent of total renewable energy employment), with 1.1 to 1.3 million more jobs than 2011 employment estimates. However, the data also showed that employment has decreased in the sectors of solar heating and cooling. IRENA explained that this is due to different methods of calculation.<sup>48</sup>

**Brazil:** In total, Brazil's renewable energy industries supported 894,000 jobs in 2013. IRENA's annual report estimated that bioenergy was the largest renewable energy sector in Brazil, with 539,000 direct jobs in bioethanol and 82,000 biodiesel jobs. Wind power is also growing quickly and supports about 32,000 jobs.<sup>49</sup>

**European Union (EU):** IRENA estimated that the European Union supported around 1.2 million renewable energy jobs in 2013.<sup>50</sup> Sustainlabor estimated in a report, *Green Jobs and Related Policy Frameworks*, that the major generator of clean jobs in the European Union was solid biomass, which supported 273,000 direct and indirect jobs in 2010. The solar photovoltaic and wind power sectors, which supported an estimated 268,110 and 253,145 jobs respectively in 2010, were also two significant sectors.<sup>51</sup>

**Germany:** According to IRENA, Germany is the largest renewable energy employer in the European Union. Although Germany has seen some job losses, it still supported 371,000 direct and indirect jobs in renewable energy in 2013. The German wind power industry expanded to support a record 138,000 jobs, while the solar photovoltaic industry has lost about 55,000 jobs since 2011, with most of the job losses coming from decreased manufacturing employment.<sup>52</sup>

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*The Environmental and Energy Study Institute (EESI) is a non-profit organization founded in 1984 by a bipartisan Congressional caucus dedicated to finding innovative environmental and energy solutions. EESI works to protect the climate and ensure a healthy, secure, and sustainable future for America through policymaker education, coalition building, and policy development in the areas of energy efficiency, renewable energy, agriculture, forestry, transportation, buildings, and urban planning.*

**This fact sheet is available electronically at [www.eesi.org/papers](http://www.eesi.org/papers).**

## ENDNOTES

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