

CLEAN ENERGY: IT'S WHERE THE JOBS ARE



**U.S. Congress Joint
Economic Committee**
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Minority Staff Report, May 2017



Clean Energy, It's Where the Jobs Are

The global economy is in the midst of a major energy transition: governments, businesses, and consumers around the world are shifting to clean renewable energy generation, such as wind and solar. This transition presents a major opportunity to create jobs and investment in industries of the future – especially in rural areas – and to make the overall economy more innovative, productive, and clean.



Congress now has a critical choice: either embrace this opportunity and continue to invest in America's clean energy economy, creating millions of good jobs in rural areas and billions of dollars in exports of renewable energy goods; or follow the path that the Trump administration has laid out to stall progress towards a lucrative clean energy future.

The Clean Energy Economy is a major part of the U.S. economy

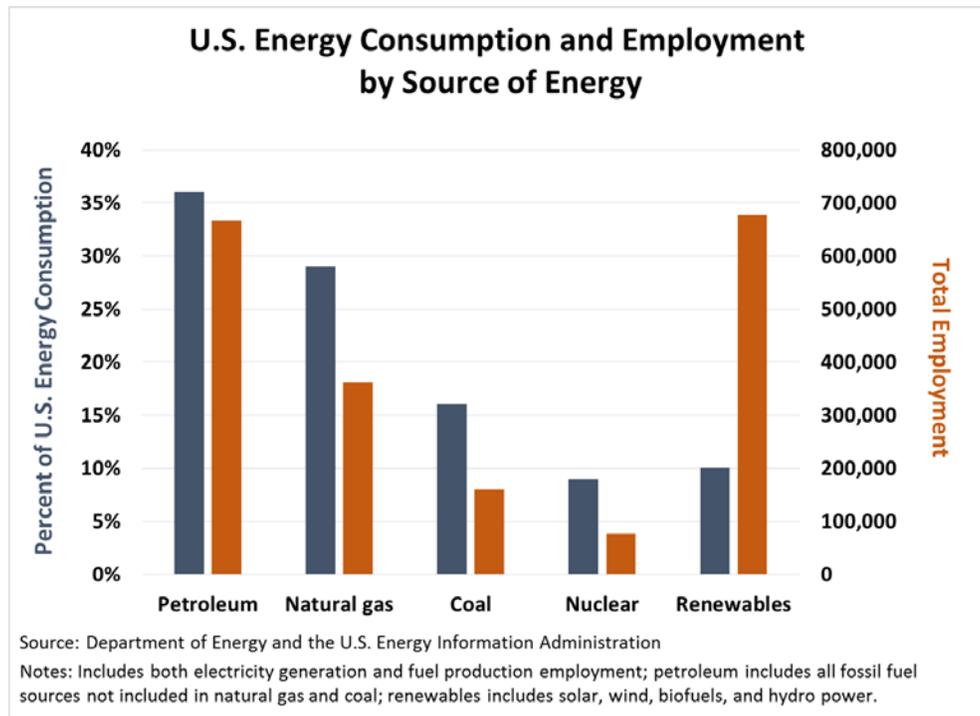
The clean energy economy—encompassing the generation of energy through renewable sources and activities related to improving energy efficiency, building alternative fuel vehicles and constructing and operating the smart grid—is playing an increasingly important role in the American economy.

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Renewable energy is already becoming dominant in terms of job creation in the energy industry, and now employs more than one in three Americans who work in electricity generation and fuel production employment (see figure below). In 2016, more Americans worked in solar electricity generation (374,000) than in fossil fuel electricity generation (150,000).ⁱ Another 100,000 Americans worked in wind generation and 97,000 in other clean energy electricity sources.ⁱⁱ

The clean energy economy isn't limited to generating wind and solar energy, though. More than 2 million Americans work in energy efficiency related positions, producing energy-efficient products or providing services that reduce energy usage. These include manufacturers of energy efficient appliances and construction workers that build energy efficient buildings and retrofit old buildings to improve energy efficiency. These workers are found in sectors across the economy, including manufacturing, construction,

professional and business services, and wholesale trade. Notably, energy efficiency accounts for more than one in five construction jobs.ⁱⁱⁱ



More than 250,000 Americans work in producing and selling cars that use alternative fuel—accounting for more than one in ten workers in the automobile industry.^{iv} Another 90,000 work in renewable storage and 35,000 in smart and micro grids.^v

Altogether, 3.3 million Americans worked in the clean energy economy in 2016—compared with 2.9 million that worked in fossil fuel related jobs.^{vi}

The Clean Energy Economy will continue to grow

Renewable electricity is rapidly expanding across America every day.^{vii} Wind capacity grew by 16 percent in 2016, and solar capacity nearly doubled.^{viii} This resulted in substantial employment growth. Employment in wind electricity increased by 32 percent 2015 to 2016 and employment in solar electricity increased by 18 percent from—compared with an increase in overall employment of 1.6 percent over the same period.^{ix}

This trend will only continue. As technology improves and renewable energy costs continue to fall, the market share for these technologies will grow. In the process, more jobs will be created than disappear. Importantly, many of the jobs created will necessarily be domestic, as wind and solar energy cannot be imported in the same way that fossil fuels can. A recent study estimated that, on net, fully transitioning to renewable energy would create 2 million additional full-time jobs in the United States.^x

The clean energy economy is also growing in areas beyond renewable electricity. Employment in energy efficiency grew by 7 percent in 2016, and employers of energy efficiency workers expect employment to grow by nine percent just in 2017.^{xi} The electric car industry is growing as well—rising from 1,200 cars on the road in 2005 to more than 400,000 in 2015.^{xii}

International competition over renewable jobs is fierce and growing

Many jobs in clean electricity generation will need to be domestic, as wind and sunlight cannot be imported in the same way as oil. But the parts essential to making a wind turbine, the photovoltaic cells that convert sunlight into electricity, and the batteries that store energy can all be produced anywhere on the globe.

Countries around the world recognize this opportunity and are investing billions of dollars into advancing clean energy production, storage, and distribution technologies in the hopes that their countries will become the global leaders producing the technologies and jobs of the future.^{xiii} China recently announced plans to invest \$360 billion in renewable energy by 2020, creating 13 million jobs and reducing pollution emissions along the way.^{xiv} Congress needs to ensure that America is keeping pace and remains a global leader.

Prior to the presidential election, Ernst & Young had rated the United States as the most attractive country in the world for private-sector renewable energy investment.^{xv} President Trump and Congressional Republicans will put this at risk by failing to invest in clean energy research and deployment; instead focusing on propping up declining fossil fuel industries.

Congress must act

There is an emerging global market for clean energy—Congress needs to act now to ensure that American companies and workers are the ones producing and exporting the technology and products that meet this demand. The United States can lead the global community in the clean energy economy by ensuring that the American workforce is properly trained to take up the jobs of tomorrow, investing in clean energy research and development, and leveling the playing field between renewables and fossil fuels by eliminating federal subsidies and addressing negative externalities.

Although the overall transition to clean energy will create more jobs than it displaces, certain communities and workers that rely on fossil fuels will be disproportionately impacted. These workers need to be equipped with the skills that allow them to succeed in the clean energy economy. The development of clean energy infrastructure, and investments in education and training can provide these workers with the jobs that are created in emerging industries.^{xvi} Congress's actions in this space will ensure that all Americans share in the economic growth spurred by this shift to the clean energy economy. The changes in the economy toward clean energy are ongoing and accelerating. It is up to Congress to ensure that American workers and communities benefit from the transition.

Employment in Renewable Energy, Current and in Full Transition, by State

	Employment in 2016				Projected Employment with Full Transition to Clean Energy	
	Solar Electricity Generation	Wind Electricity Generation	Hydro Electricity Generation	Energy Efficiency	Construction	Operations
Alabama	760	1,077	350	30,203	130,925	49,650
Alaska	98	37	469	4,421	14,662	15,099
Arizona	9,774	694	151	40,663	49,200	18,536
Arkansas	339	825	33	14,833	53,887	20,481
California	152,947	4,635	11,890	301,348	315,982	142,153
Colorado	8,027	7,124	1,014	29,756	49,417	21,119
Connecticut	2,927	11	17	33,948	40,487	21,662
Delaware	486	-	118	12,232	8,286	6,458
District of Columbia	1,581	83	35	11,982	n.a.	n.a.
Florida	11,074	3,584	132	108,670	222,082	90,727
Georgia	5,261	483	731	57,443	146,597	73,419
Hawaii	4,883	159	-	5,117	8,239	4,239
Idaho	816	829	151	7,606	16,877	6,707
Illinois	5,325	8,321	617	83,987	132,687	59,709
Indiana	3,866	6,250	17	52,578	119,791	47,951
Iowa	745	3,859	13	18,845	57,914	25,106
Kansas	618	1,981	112	16,339	29,065	13,346
Kentucky	1,722	-	13	23,681	142,163	47,719
Louisiana	3,648	132	32	19,657	174,500	143,400
Maine	770	1,234	163	8,084	17,771	13,381
Maryland	7,279	630	3	67,061	51,557	35,893
Massachusetts	19,635	1,652	1,738	80,373	53,490	37,950
Michigan	5,898	4,559	6,856	87,013	89,250	58,810
Minnesota	3,800	1,966	946	43,808	46,025	29,767
Mississippi	1,266	103	26	15,039	100,778	40,659
Missouri	3,148	1,035	293	37,834	60,791	23,469
Montana	225	43	434	8,049	13,833	5,642
Nebraska	2,096	500	179	12,660	26,533	12,006
Nevada	11,192	1	-	9,559	27,457	9,140
New Hampshire	1,594	1,120	252	10,869	10,402	5,697
New Jersey	9,239	500	71	31,679	86,049	58,606
New Mexico	3,916	1,038	-	4,487	20,885	9,663
New York	12,411	2,855	5,859	110,582	174,775	94,644
North Carolina	9,535	594	526	80,971	99,676	63,199
North Dakota	250	1,740	-	4,763	21,744	8,574
Ohio	8,350	819	70	78,764	151,668	66,117
Oklahoma	1,016	1,798	381	12,294	46,516	20,350
Oregon	6,892	1,190	1,577	41,869	21,564	14,235
Pennsylvania	4,670	2,467	182	62,431	279,540	107,584
Rhode Island	1,584	1,403	84	10,606	7,473	5,775
South Carolina	3,716	1,415	10,504	29,756	58,473	40,345
South Dakota	632	1,482	22	7,202	10,244	4,714
Tennessee	5,085	142	5,274	50,451	148,143	49,950
Texas	11,729	24,374	1,259	146,722	312,979	191,331
Utah	5,894	318	337	31,074	29,857	11,987
Vermont	2,379	328	111	10,918	2,496	1,005
Virginia	4,338	1,260	496	75,552	89,362	57,779
Washington	5,627	3,092	2,460	61,889	38,226	24,927
West Virginia	510	460	132	6,352	53,944	20,295
Wisconsin	4,029	1,462	114	62,289	51,458	33,200
Wyoming	204	75	11	7,200	15,806	7,731

Source: current employment figures from the Department of Energy; projections from Jacobsen et al.

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- ⁱ <https://www.bloomberg.com/news/articles/2016-05-25/clean-energy-jobs-surpass-oil-drilling-for-first-time-in-u-s>
- ⁱⁱ <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 29, table 1
- ⁱⁱⁱ <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 17
- ^{iv} <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 73
- ^v <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 55
- ^{vi} <http://www.eesi.org/papers/view/fact-sheet-jobs-in-renewable-energy-and-energy-efficiency-2017>
- ^{vii} <https://www.greentechmedia.com/articles/read/How-the-US-Wind-Industry-Is-Building-Momentum-Driving-Economic-Benefits>; <https://insideclimatenews.org/news/24052016/solar-energy-27-gigawatts-united-states-one-million-rooftop-panels-climate-change-china-germany>
- ^{viii} http://apps2.eere.energy.gov/wind/windexchange/wind_installed_capacity.asp (82,171 - 74,472) / 74,472
<http://www.seia.org/research-resources/solar-industry-data>
- ^{ix} <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 30, figure 12 – Haver LANAGRA@USECON December 2015 to December 2016
- ^x <http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf>
- ^{xi} <https://energy.gov/downloads/2017-us-energy-and-employment-report> page 61
- ^{xii} <https://www.iea.org/publications/freepublications/publication/global-ev-outlook-2016.html>
- ^{xiii} Need citation
- ^{xiv} Forsythe, Michael. “China Aims to Spend at Least \$360 Billion on Renewable Energy by 2020.” *New York Times*. January 5, 2017. <http://www.nytimes.com/2017/01/05/world/asia/china-renewable-energy-investment.html>
- ^{xv} <http://www.ey.com/gl/en/industries/power---utilities/ey-renewable-energy-country-attractiveness-index-our-index>
- ^{xvi} <http://files.eric.ed.gov/fulltext/ED510507.pdf>