

# CLEAN JOBS PENNSYLVANIA 2017

SEPTEMBER 2017

PRESENTED BY



Environmental Entrepreneurs



KEYSTONE ENERGY EFFICIENCY ALLIANCE

Keystone Energy Efficiency Alliance



# ABOUT

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## ABOUT E2 AND KEEA

**Environmental Entrepreneurs (E2)** is a national, nonpartisan group of business leaders, investors, and professionals from every sector of the economy who advocate for smart policies that are good for the economy and good for the environment. Our members have founded or funded more than 2,500 companies, created more than 600,000 jobs, and manage more than \$100 billion in venture and private equity capital. For more information, see [www.e2.org](http://www.e2.org) or follow us on Twitter at @e2org. E2 is a partner of the Natural Resources Defense Council (NRDC).

The **Keystone Energy Efficiency Alliance (KEEA)** is a non-profit, tax-exempt 501(c)(6) corporation dedicated to promoting the energy efficiency and renewable energy industries in Pennsylvania. In 2006, KEEA was founded in response to the pending expiration of utility rate caps in Pennsylvania and the state's lack of energy efficiency policies. With over 50 business members as well as nonprofit and trade association partners, KEEA advocates on behalf of clean energy on the local, state, and federal levels. By representing the interests of the clean energy industry in Pennsylvania, KEEA is growing the market for energy efficiency and helping the Keystone State secure a prosperous, sustainable tomorrow.

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## ABOUT OUR RESEARCH AND ANALYSIS PARTNERS

**BW Research Partnership** is a full-service, economic and workforce research consulting firm with offices in Carlsbad, California, and Wrentham, Massachusetts. It is the nation's leading provider of accurate, comprehensive clean energy research studies, including the National Solar Census, wind industry analyses for the National Renewable Energy Laboratory and the Natural Resources Defense Council, and state-level clean energy reports for Massachusetts, Illinois, Vermont, Iowa, and Florida, among others.

The **Economic Advancement Research Institute (EARI)** is a nonprofit research organization focused on economic mobility and regional competitiveness. EARI is primarily focused on studying the impact of policies and systems on economic growth and prosperity across all income levels. EARI has conducted numerous labor market analyses that address key economic sectors with high probability to provide opportunities to underrepresented and disadvantaged populations.

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## ACKNOWLEDGEMENTS

E2 would like to thank all the firms that provided information on their clean energy and transportation activities in response to the Clean Jobs Pennsylvania survey. Researchers could not have gathered this data without respondents' willingness to share their valuable time and insights. We also would like to thank Wendy P. Staso of Huckestein Mechanical Services Inc.; Greg Puschnigg of BOSS Controls; and Angela Vincoli of NORESCO for their time and contributions to the company profiles featured in this report.

This report would not have been possible without the work of the following individuals and organizations:

**Philip Jordan**  
BW Research Partnership

**Eric Miller**  
KEEA

**Gail Parson**  
E2

**Ryan Young**  
BW Research Partnership

**Sharon Pillar**  
E2

**Jeff Benzak**  
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**Sarah Lehmann**  
BW Research Partnership

**Bob Keefe**  
E2

**Mark Szybist**  
NRDC

**Matt Elliot**  
KEEA

**Grant Carlisle**  
E2

Design: **Studio 424**

# INTRODUCTION

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## There are nearly 70,000 clean energy jobs in Pennsylvania.

The Clean Jobs Pennsylvania 2017 report is part of E2's and KEEA's ongoing effort to better understand the employment impacts of energy efficiency and renewable energy in the state and identify which policies would support additional job creation.

Our analysis of the size and scope of Pennsylvania's clean energy economy shows **nearly 70,000 Pennsylvanians** work in the state's clean energy sector. That's a nearly **6 percent increase** over the previous year—and it's twice as many jobs as exist in the state's fossil fuel industry.<sup>i</sup>

In fact, clean energy is creating new job opportunities for former coal and gas workers across the Commonwealth. New wind farms are being considered for development near former coal mines in the Scranton area, for instance, and jobs in energy efficiency and other clean energy fields are creating new, promising opportunities for workers across the state.<sup>ii</sup>

Clean energy jobs in Pennsylvania can be categorized either by industry—energy efficiency, renewables, clean vehicles, etc.—or by value chain—i.e., the type of work done within a particular industry to bring a product or service to market.

In terms of industry, most Pennsylvania clean energy workers—about 55,000—work in energy efficiency, a category that encompasses a broad range of jobs including construction workers, electricians, engineers, software developers and marketing professionals.

More than 10,000 Pennsylvanians work in fast-growing renewable energy industries like solar, wind and hydropower, even though renewable energy is in its infancy in the Commonwealth. (Less than 5 percent of the state's electricity is generated from renewable sources, versus more than 15 percent nationwide.)

Another 3,500 Pennsylvanians work in smart grid jobs (which make our electricity system more flexible and renewables-friendly), fuels jobs, and jobs in clean vehicle technologies that help our cars and trucks go further for less money.

As to the clean energy sector's value chain, nearly half of the state's clean energy workforce is involved in the construction industry, while about one in five clean energy workers are in manufacturing. Others are involved in professional services, utilities, the trades and other industries.

The clean energy job growth that Pennsylvania has seen across both traditional and newer industries is part of a broader national shift, as businesses, utilities, power companies and everyday Americans increasingly recognize the economic, health and climate benefits of energy efficiency and renewable energy. Across the United States, more than 3 million people now work in clean energy and clean transportation.<sup>iii</sup>

There's a common misperception in Pennsylvania that clean energy only "works" in certain parts of the state, and only for certain demographics—more affluent Pennsylvanians in urban areas. In fact, there are clean energy jobs—and vast clean energy potential—in every Pennsylvania county.

Because tens of thousands of clean energy jobs are in construction, clean energy offers economic opportunity to both blue-collar and white-collar workers. From rural areas like the Laurel Highlands to big cities like Philadelphia, Pittsburgh and Harrisburg, clean energy workers are a growing and visible part of the state's economy. They build wind farms atop the state's ridges, develop new technologies in labs and retrofit schools, homes and businesses to make them more energy efficient. At a time of growing income inequality across the nation, they're earning family-sustaining wages and salaries.

Clean Jobs Pennsylvania 2017 is the latest evidence that the clean energy sector offers a robust path to grow the state's economy and to unify the state's political differences. There are at least 1,200 clean energy jobs in each of the state's 18 congressional districts. And there are clean energy jobs in each of the state's 50 Senate districts and 203 state House districts.

An update to previous reports released in 2015<sup>iv</sup> and 2016,<sup>v</sup> this year's Clean Jobs Pennsylvania report relies on databases and survey data from Pennsylvania employers. More on the report's methodology can be found at the end of the report.

# MAIN FINDINGS

## OVERALL CLEAN ENERGY JOBS AND GROWTH RATE

### CLEAN ENERGY JOBS

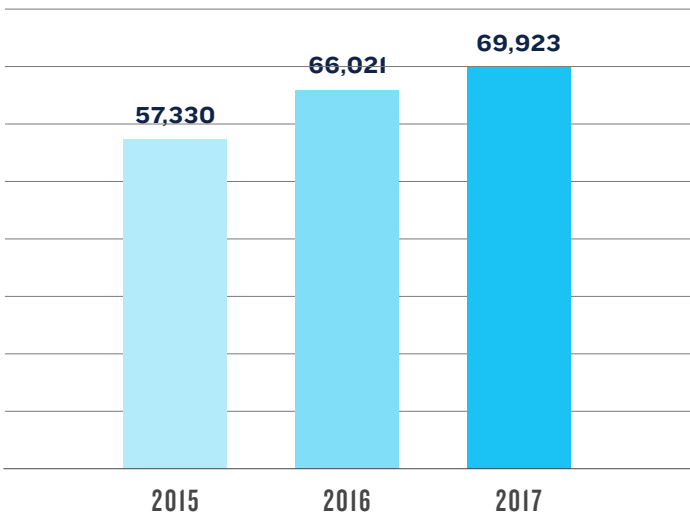
**69,923** +3,902

### GROWTH RATE

**6%**

Pennsylvania has 69,923 clean energy jobs—defined as those positions where at least some portion of time is spent on renewable energy generation, energy efficiency, advanced grid, advanced transportation, or clean fuels. This represents an increase of 3,902 jobs over the previous year's report, for a nearly 6 percent growth rate. By comparison, the 12 months preceding June 2017 saw the state's overall non-farm labor force grow 1.3 percent.<sup>vi</sup>

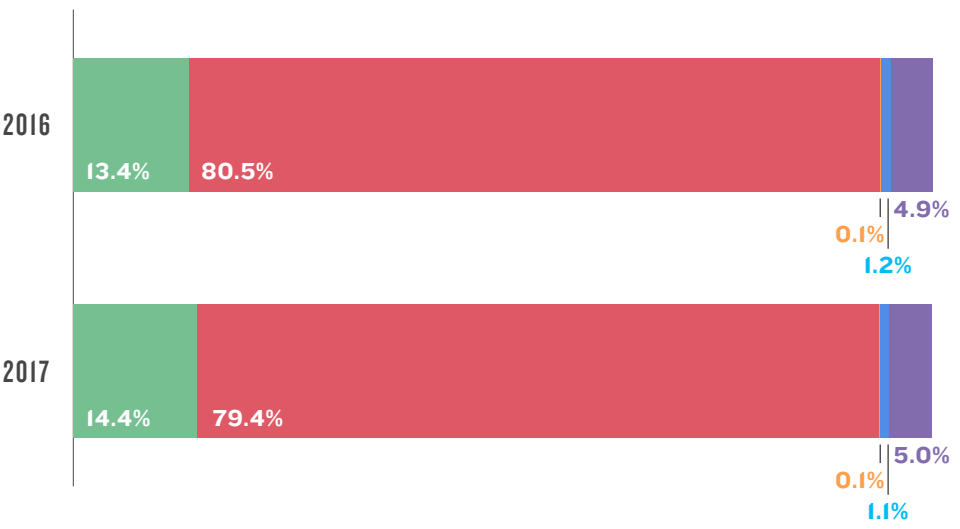
Fig. 1: Clean Energy Jobs in Pennsylvania By Year



As the following chart shows, the percentage of clean energy jobs within each industry remained relatively constant from the 2016 report to the 2017 report, except for a slight increase in the share of renewable jobs and a slight decrease in the share of efficiency jobs.

Fig. 2: Clean Energy Technology Sectors

- KEY
- RENEWABLE ENERGY
  - ENERGY EFFICIENCY
  - ADVANCED GRID
  - ADVANCED TRANSPORTATION
  - CLEAN FUELS



# CLEAN ENERGY INDUSTRIES

## ENERGY EFFICIENCY JOBS

As has been the case for the past two years, energy efficiency provides the bulk of clean energy employment in Pennsylvania, with 55,513 jobs. The industry's largest segment is advanced building materials such as insulation, followed by traditional heating, ventilation and air conditioning (HVAC) goods and services.

Fig. 3: Energy Efficiency Jobs  
Breakdown by Subsector

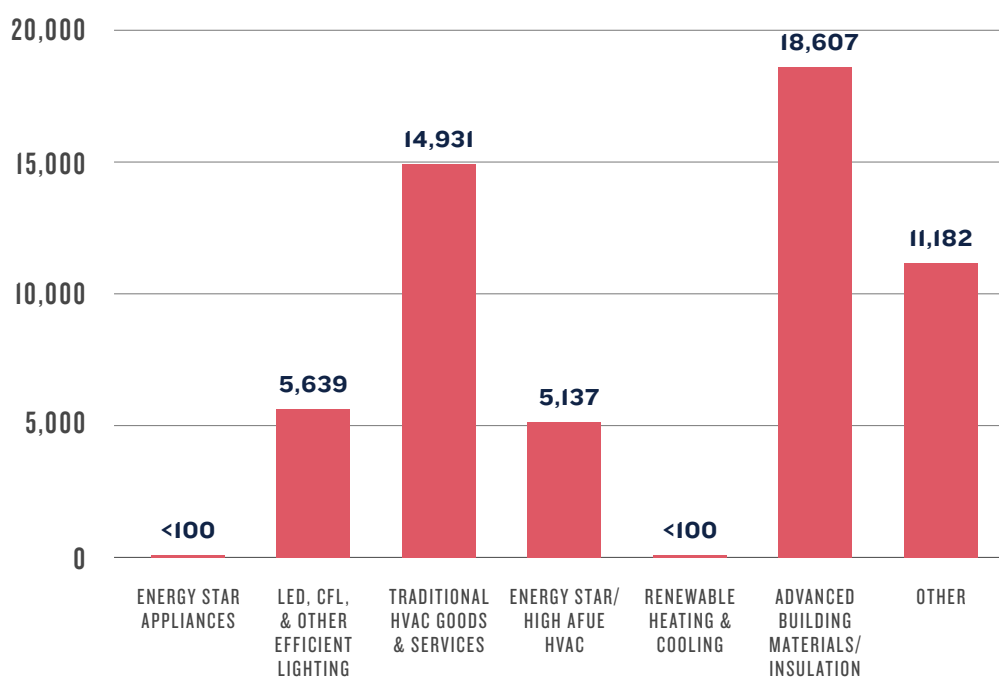
### ACCRONYM KEY

LED: Light-Emitting Diode

CFL: Compact Fluorescent Lamp

AFUE: Annual Fuel  
Utilization Efficiency

HVAC: Heating, Ventilation and  
Air Conditioning



# CASE STUDY

## ENERGY EFFICIENCY COMPANY GRAVITATES TO PITTSBURGH— A HUB FOR TECHNOLOGY AND ENERGY

BOSS Controls is an energy management company located in the Bloomfield neighborhood of Pittsburgh. Founded in 2012, the company employs engineers, technical support staff and sales professionals.

BOSS designs, markets and sells energy efficiency hardware containing Wi-Fi-controlled, cyber-secure software to businesses, universities, school districts and government clients. For example, the company sells a “smart plug” that’s inserted directly into standard wall outlets. Controlled via a mobile device or a computer with an internet connection, BOSS Smart Plugs help monitor, automate and optimize plug-in devices—everything from vending machines in high school hallways to coffee pots and computer printers in office buildings.

BOSS says its products can cut building energy costs by as much as 30 percent, with a return on investment in as little as four months.

“It really puts money back to the building owners and operators which goes directly to their bottom line. The economics of energy efficiency make great business sense,” said founder and CEO Greg Puschnigg, who began his career as an engineering officer in the U.S. Navy.

The company is based in Pittsburgh in part because the city is a nexus of the tech and energy industries. BOSS’ designers, developers, its marketing team and the manufacturer of the company’s products are also all based in Pittsburgh.

One recent client is Chatham University, in Pittsburgh’s Shadyside neighborhood. BOSS installed its Smart Plugs on snack vending machines, water coolers and window air-conditioning units, all of which can now be controlled remotely via computers or smart phones. The university expects its associated energy costs to be halved due to the investment.



BOSS Controls smart plugs. (Photo courtesy of BOSS Controls)



CEO Greg Puschnigg founded BOSS Controls in 2012. Puschnigg began his career as an engineering officer in the U.S. Navy. (Photo screengrab from BOSS Controls YouTube video)

Similar investments have been made by the City of Pittsburgh and Westmoreland Community College in Westmoreland County.

BOSS recently expanded to work with out-of-state clients. For example, BOSS Smart Plugs were installed in two high-profile buildings in the Twin Cities of Minnesota—the Xcel Energy Center (home to the Minnesota Wild National Hockey League franchise) and a convention center in St. Paul. In both buildings, BOSS Smart Plugs now give building managers complete control of plug-in electrical loads coming from devices like energy-wasting televisions, monitors and vending machines.

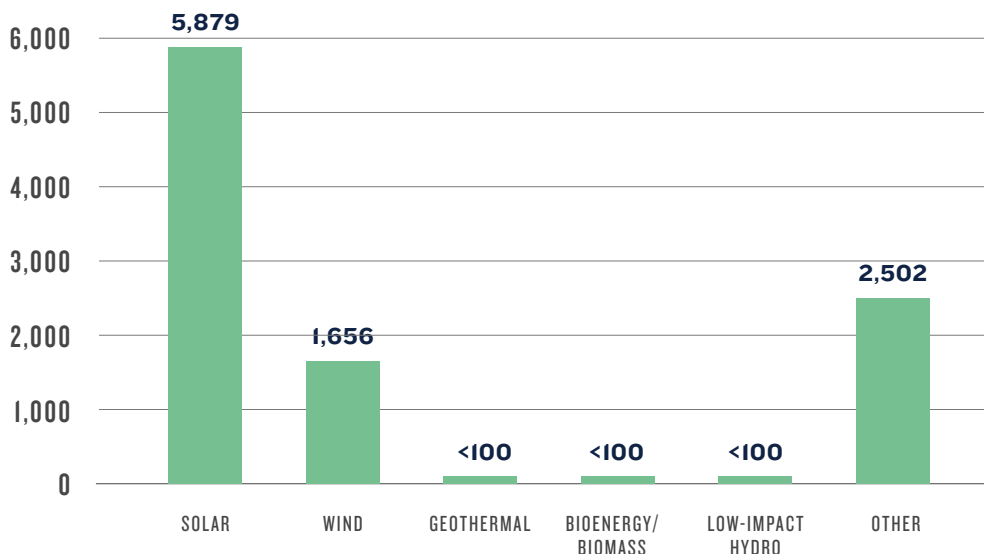
The Xcel Energy Center was the first NHL arena to earn LEED certification for Existing Buildings.

—E2 & BOSS CONTROLS

## RENEWABLE ENERGY JOBS

Fig. 4: Renewable Energy Jobs  
Breakdown by Subsector

The 10,062 renewable energy jobs are predominantly in fast-growing industries like solar and wind.



According to E2's **"Our Energy Renewal,"** an interactive map of utility-scale renewable energy in Pennsylvania (see: [www.e2.org/pamap](http://www.e2.org/pamap)), the state is home to at least 2,500 megawatts of renewable energy capacity, with rural counties like Lancaster, Somerset and Cambria having some of the highest renewable energy concentrations,<sup>vii</sup> and the majority of renewable energy generation in the state coming from wind power.

According to April 2017 data from the U.S. Bureau of Labor Statistics, wind turbine technician is the fast-growing occupation in the country, with a median annual wage of more than **\$52,000**. Solar installer was also cited by the BLS as one of the fastest-growing American jobs, and its median salary is about \$40,000.<sup>viii</sup> Compared to other industries, renewables hire veterans at a higher rate. Nationally, **11.5 percent of wind industry workers and 11.1 percent of solar industry workers are veterans**. The national average is 7 percent, while the fossil fuel electric power generation sector's industries range only from 5.1 to 9.8 percent veterans.<sup>ix</sup>

In addition to the state's Alternative Energy Portfolio Standard (AEPS), federal tax credits such as the Investment Tax Credit (ITC) for residential and commercial solar and the Production Tax Credit (PTC) for wind have boosted job growth in Pennsylvania's clean energy economy. While policies like these have helped renewable energy in the state become more cost-effective, there are broader market forces at work as well. For example, wind and solar power prices have continued to plunge: solar prices were 18 percent lower in June 2016 than June 2015, helping to lower utility bills for consumers nationwide. By January 2016, wind power dropped to a seven-year low of about 2 cents per kilowatt-hour. In some regions, wind and solar power are now the least expensive forms of electricity available, cheaper even than fossil fuels.<sup>x</sup>

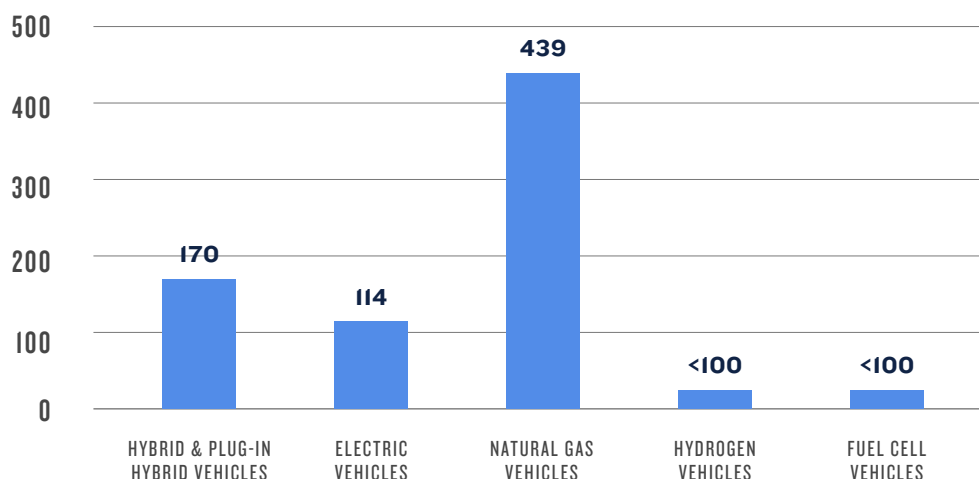
Even though the state already employs more than 10,000 renewable energy generation workers, less than 5 percent of the state's electricity is coming from renewable sources, demonstrating the enormous potential for growth in high-paying jobs as the demand for renewable energy in Pennsylvania increases.



## ADVANCED TRANSPORTATION JOBS

Advanced transportation (including parts and maintenance) employs 782 workers. The largest segments of these are:

Fig. 5: Advanced Transportation Jobs  
Breakdown by Subsector



## FUELS AND SMART GRID JOBS

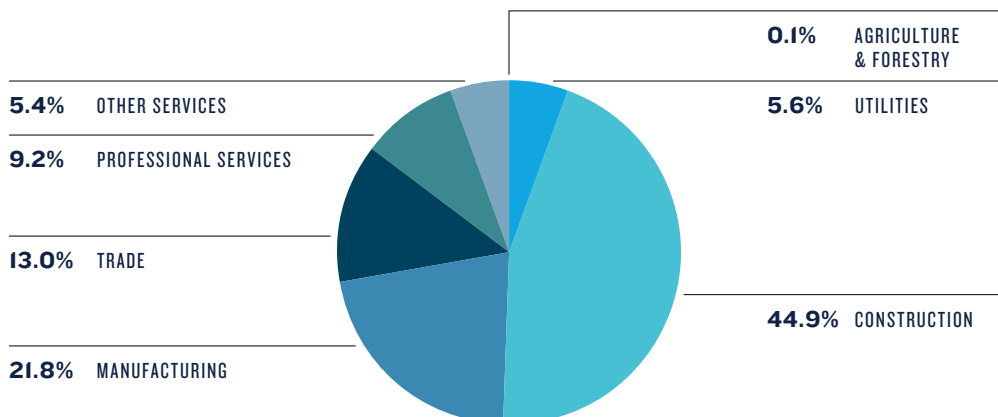
In Pennsylvania 3,519 people work in the fuels sector, with most in woody biomass, an industry whose climate impact must be closely monitored since some biomass industry practices (such as burning whole trees for fuel) emit more carbon than coal.<sup>xi</sup>

About 50 Pennsylvanians work in the highly technical smart grid industry helping to modernize our electric grid and keep it secure.

# CLEAN ENERGY VALUE CHAIN

Clean energy workers are employed in a variety of industries throughout the value chain. Within clean energy, approximately 31,408 workers are employed in construction doing things like making our homes, buildings, offices and schools more energy efficient. This represents about 45 percent of total clean energy employment. About 22 percent work in the manufacturing industry. Manufacturing workers involved in the clean energy industry do things like make components for LED lighting, help build wind turbine blades and assemble ENERGY STAR-rated appliances.

Fig. 6: Clean Energy Value Chain



# CASE STUDY



NORESCO helped re-illuminate the clock tower at Philadelphia's city hall with high-efficiency LED lighting, customized to match the building's historic amber tones. (Photo by Peetlesnumber1, own work, CC BY-SA 4.0, <http://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons)

## PART OF FORTUNE 50 COMPANY GENERATES BIG SAVINGS FROM ENERGY EFFICIENCY

As one of the largest energy service companies in the U.S., NORESKO takes energy efficiency seriously. And success in Pennsylvania is a key to NORESKO's story. The company has been helping customers consume less energy since its inception in 1984 and from offices in Pennsylvania since 1996.

NORESCO uses engineering and construction skills to design, implement, guarantee and maintain energy efficiency measures in buildings. The company also helps integrate sustainable design practices in new construction and existing buildings. NORESKO is a part of UTC Climate, Controls & Security, a unit of Fortune 50 company United Technologies Corp.

State legislation, including the Pennsylvania Guaranteed Energy Savings Act, provides the foundation for much of NORESKO's work in Pennsylvania. For example, through guaranteed energy savings agreements, NORESKO

helps building owners save money on energy and maintenance costs by upgrading existing facilities. These upgrades can be funded through cost savings that the projects generate, without the need for up-front capital expenditures.

NORESCO has implemented 51 guaranteed energy savings agreement projects in Pennsylvania, totaling almost \$350 million of energy efficiency and infrastructure investment.

The City of Philadelphia's work with NORESKO to improve City Hall, the Municipal Services Building, One Parkway and the Criminal Justice Center—known as the Quadplex—demonstrates how historic buildings and energy efficient cityscapes can co-exist. As part of the Quadplex guaranteed energy savings project, the iconic City Hall Clock Tower was re-illuminated with high-efficiency LED lighting, customized to match its historic amber tones. The retrofit reduces energy and maintenance costs while keeping the building's ambience.

Guaranteed energy savings projects help local vendors and subcontractors work within their community and create clean energy jobs. In its role as contractor, NORESKO seeks to use local talent and keep the economic benefits of the project in the local community.

NORESCO serves the Keystone State from offices in Philadelphia, Pittsburgh, Harrisburg and another in nearby Edison, New Jersey. The offices are staffed with energy efficiency professionals including energy analysis engineers and personnel in construction, measurement and verification, operations and maintenance, and customer care with long experience in energy efficiency projects.

Another Pennsylvania project provided \$6.5 million in energy efficiency upgrades across Kutztown University's campus. In addition to saving the university money, the improvements are the heart of a multi-year initiative that trains student leaders to educate others about energy efficiency.

—NORESCO & E2

# CLEAN ENERGY EMPLOYMENT BY COUNTY, METRO AREA AND CONGRESSIONAL/LEGISLATIVE DISTRICT\*

## CLEAN ENERGY JOBS ARE SPREAD ACROSS THE ENTIRE STATE

Data from across the state shows the breadth and depth of clean energy jobs in Pennsylvania. Looking at the state's counties, Allegheny County, which includes Pittsburgh, is top-ranked in the state with 8,100 overall clean energy jobs, while Philadelphia County and its four closest suburban counties—Montgomery, Bucks, Chester and Delaware—all fared well.

In terms of metropolitan areas, **Philadelphia is first with 23,300 jobs, while the Pittsburgh metro area is second with 14,000 jobs.** The Lehigh Valley and Scranton—Wilkes-Barre metro areas ranked third and fourth, respectively, in the number of clean energy jobs. The State College metro area lags behind all of these—but it still has more than 800 clean energy jobs.

While the large metro areas currently have the largest number of jobs, Pennsylvania's rural areas are also home to thousands of clean energy jobs, and there is a tremendous economic development opportunity for the less urban parts of the state. Despite having relatively small populations, Pike, Venango, Wayne, Bedford, Perry, Jefferson and Tioga Counties all registered at least 300 clean energy jobs. And elected officials in rural areas are increasingly attuned to the benefits of the clean energy economy. In Indiana County, for example, county commissioners recently formed a Sustainable Economy Task Force to explore how they can transition their coal- and gas-based economy to one based on clean energy, sustainable agriculture and eco-tourism.

The data also shows that the distribution of clean energy jobs cross all political boundaries. Indeed, there are clean energy jobs in every Pennsylvania congressional and state legislative district.

## EMPLOYMENT BY COUNTY\*\*

Table 1: Top 10 Counties for Clean Energy Employment (With Ties)

RANK	COUNTY	CLEAN ENERGY EMPLOYMENT	RENEWABLE ENERGY GENERATION EMPLOYMENT	ENERGY EFFICIENCY EMPLOYMENT
1	Allegheny	8,100	1,000	6,100
2	Philadelphia	5,900	900	5,000
3	Montgomery	5,800	900	4,900
4	Bucks	4,400	700	3,700
5	Chester	4,100	600	3,400
6	Delaware	3,300	500	2,700
7	Lancaster	3,100	300	2,200
8 (tie)	Lehigh	2,000	1–250	1,500
8 (tie)	Luzerne	2,000	1–250	1,400
8 (tie)	Westmoreland	2,000	1–250	1,400
8 (tie)	York	2,000	1–250	1,400

\* Jobs rounded to nearest 100 (unless fewer than 250 jobs).

\*\* Though not included in these charts, Clean Energy Employment also includes Advanced Grid, Advanced Transportation, and Clean Fuels.

Fig. 7: Heat Map of Clean Energy Employment by County

KEY

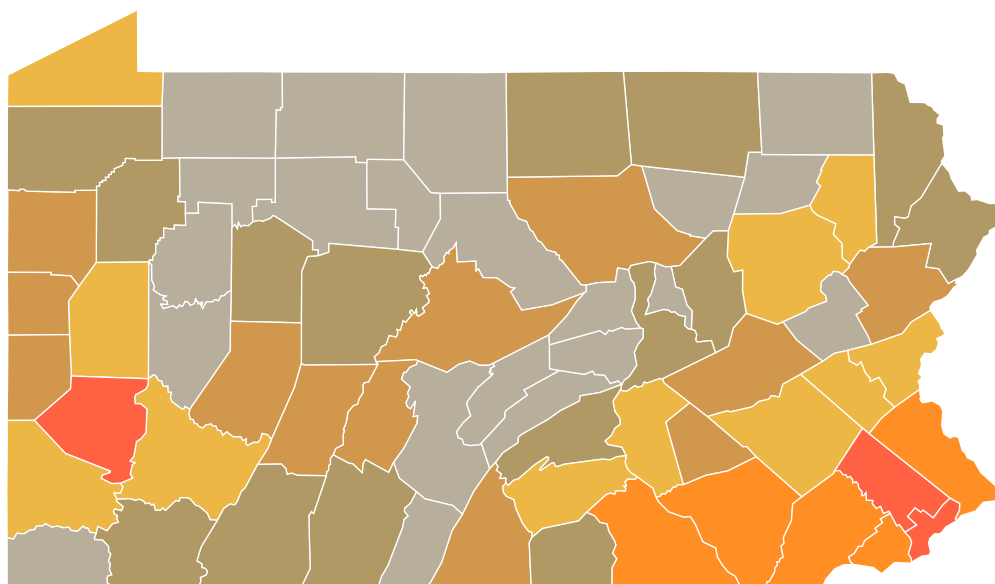
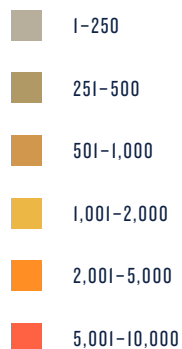


Table 2: Total Clean Energy Employment for All Pennsylvania Counties

COUNTY	CLEAN ENERGY EMPLOYMENT	COUNTY	CLEAN ENERGY EMPLOYMENT	COUNTY	CLEAN ENERGY EMPLOYMENT
Adams	500	Erie	1,400	Northumberland	400
Allegheny	8,100	Fayette	500	Perry	300
Armstrong	1-250	Forest	1-250	Philadelphia	5,900
Beaver	700	Franklin	800	Pike	300
Bedford	300	Fulton	1-250	Potter	1-250
Berks	1,900	Greene	1-250	Schuylkill	700
Blair	700	Huntingdon	1-250	Snyder	1-250
Bradford	400	Indiana	600	Somerset	500
Bucks	4,400	Jefferson	300	Sullivan	1-250
Butler	1,100	Juniata	1-250	Susquehanna	1-250
Cambria	700	Lackawanna	1,400	Tioga	300
Cameron	1-250	Lancaster	3,100	Union	1-250
Carbon	1-250	Lawrence	600	Venango	300
Centre	800	Lebanon	600	Warren	1-250
Chester	4,100	Lehigh	2,000	Washington	1,500
Clarion	1-250	Luzerne	2,000	Wayne	400
Clearfield	500	Lycoming	700	Westmoreland	2,000
Clinton	1-250	McKean	1-250	Wyoming	1-250
Columbia	300	Mercer	600	York	2,000
Crawford	500	Mifflin	1-250		
Cumberland	1,500	Monroe	800		
Dauphin	1,600	Montgomery	5,800		
Delaware	3,300	Montour	1-250		
Elk	1-250	Northampton	1,400		



## EMPLOYMENT BY METRO AREA

Table 3: Top 5 Metro Areas for  
Clean Energy Employment

RANK	METRO AREA (MSA)	CLEAN ENERGY EMPLOYMENT	RENEWABLE ENERGY GENERATION EMPLOYMENT	ENERGY EFFICIENCY EMPLOYMENT
1	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	23,300	3,800	19,300
2	Pittsburgh, PA MSA	14,000	1,800	10,600
3	Allentown-Bethlehem-Easton, PA-NJ MSA	3,700	400	2,700
4	Scranton—Wilkes-Barre, PA MSA	3,500	400	2,600
5	Harrisburg-Carlisle, PA MSA	3,400	400	2,500

Table 4: Total Clean Energy  
Employment for All Pennsylvania  
Metro Areas

METRO AREA (MSA)	CLEAN ENERGY EMPLOYMENT
Allentown-Bethlehem-Easton, PA-NJ MSA	3,700
Altoona, PA MSA	700
Erie, PA MSA	1,400
Harrisburg-Carlisle, PA MSA	3,400
Johnstown, PA MSA	700
Lancaster, PA MSA	3,100
Lebanon, PA MSA	600
PA NONMETROPOLITAN AREA	10,200
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	23,300
Pittsburgh, PA MSA	14,000
Reading, PA MSA	1,900
Scranton-Wilkes-Barre, PA MSA	3,500
State College, PA MSA	800
Williamsport, PA MSA	700
York-Hanover, PA MSA	1,900

## EMPLOYMENT BY DISTRICT

Table 5: Total Clean Energy  
Employment for All Pennsylvania  
Congressional Districts

CONGRESSIONAL DISTRICT	CLEAN ENERGY EMPLOYMENT	CONGRESSIONAL DISTRICT	CLEAN ENERGY EMPLOYMENT
1	4,800	10	4,300
2	3,600	11	3,200
3	4,600	12	4,700
4	4,500	13	1,200
5	3,300	14	5,100
6	7,100	15	3,700
7	4,800	16	2,400
8	5,000	17	2,100
9	4,200	18	2,200

Table 6: Total Clean Energy  
Employment for All Pennsylvania  
State Senate Districts

STATE SENATE DISTRICT	CLEAN ENERGY EMPLOYMENT	STATE SENATE DISTRICT	CLEAN ENERGY EMPLOYMENT
1	4,000	27	900
2	900	28	1,700
3	400	29	900
4	1,400	30	2,100
5	1-250	31	1,300
6	2,900	32	1,400
7	1,300	33	700
8	400	34	1,100
9	3,400	35	1,100
10	1,800	36	800
11	1,800	37	3,600
12	1,000	38	1,700
13	2,400	39	1,500
14	2,000	40	900
15	1,900	41	1,400
16	1,900	42	2,500
17	2,700	43	600
18	1,200	44	400
19	1,400	45	400
20	1,300	46	1,300
21	2,000	47	1,200
22	1,500	48	600
23	1,600	49	1,300
24	900	50	900
25	1,200		
26	700		

Table 7: Total Clean Energy  
Employment for All Pennsylvania State  
House Districts (cont'd on next page)

STATE HOUSE DISTRICT	CLEAN ENERGY EMPLOYMENT	STATE HOUSE DISTRICT	CLEAN ENERGY EMPLOYMENT	STATE HOUSE DISTRICT	CLEAN ENERGY EMPLOYMENT
1	500	43	700	85	1-250
2	500	44	400	86	400
3	1-250	45	1-250	87	900
4	1-250	46	1-250	88	1-250
5	900	47	1,000	89	500
6	400	48	1-250	90	1-250
7	500	49	700	91	600
8	600	50	1-250	92	300
9	500	51	1-250	93	500
10	400	52	1-250	94	1-250
11	300	53	800	95	1-250
12	500	54	900	96	1-250
13	700	55	400	97	1-250
14	500	56	1-250	98	400
15	500	57	1-250	99	1-250
16	300	58	1-250	100	1-250
17	1-250	59	400	101	400
18	600	60	300	102	1-250
19	2,600	61	800	103	900
20	700	62	400	104	400
21	500	63	300	105	1-250
22	600	64	300	106	1-250
23	1-250	65	400	107	600
24	400	66	400	108	1-250
25	700	67	300	109	1-250
26	900	68	600	110	300
27	800	69	300	111	500
28	400	70	800	112	900
29	900	71	300	113	400
30	1-250	72	300	114	1-250
31	900	73	400	115	600
32	400	74	300	116	500
33	1-250	75	400	117	400
34	1-250	76	900	118	600
35	400	77	1-250	119	500
36	1-250	78	400	120	1-250
37	1,700	79	600	121	1-250
38	1-250	80	1-250	122	1-250
39	600	81	1-250	123	500
40	800	82	600	124	1-250
41	500	83	600	125	1-250
42	1-250	84	1-250	126	400

Table 7: Total Clean Energy  
Employment for All Pennsylvania  
State House Districts (cont'd from  
previous page)

STATE HOUSE DISTRICT	CLEAN ENERGY EMPLOYMENT	STATE HOUSE DISTRICT	CLEAN ENERGY EMPLOYMENT
127	1-250	166	1-250
128	300	167	1-250
129	1-250	168	1-250
130	1-250	169	1-250
131	800	170	1-250
132	500	171	1-250
133	600	172	500
134	1-250	173	1-250
135	1-250	174	1-250
136	400	175	1,900
137	300	176	1-250
138	1-250	177	1-250
139	300	178	1-250
140	600	179	1-250
141	1-250	180	1-250
142	600	181	1-250
143	900	182	1,900
144	1-250	183	1-250
145	1-250	184	1-250
146	1-250	185	1-250
147	1-250	186	1-250
148	1,000	187	1-250
149	1,200	188	1-250
150	1-250	189	1-250
151	500	190	1-250
152	400	191	1-250
153	400	192	1-250
154	1-250	193	400
155	400	194	300
156	1,600	195	1-250
157	400	196	1-250
158	1-250	197	1-250
159	500	198	1-250
160	1-250	199	1-250
161	1,000	200	1-250
162	400	201	1-250
163	600	202	1-250
164	1-250	203	1-250
165	400		



# POLICIES MATTER

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Since 2004, state policies like Act I29<sup>xii</sup>, Pennsylvania's energy efficiency standard, and the Alternative Energy Portfolio Standard (AEPS), which requires that 8 percent of electricity come from renewable energy resources by 2021 (with 0.5 percent coming from solar), have helped scale up Pennsylvania's clean energy sector. Act I29's efficiency programs have delivered nearly **\$2.2 billion in savings** to all Pennsylvania electricity consumers and saved 3.37 million megawatt hours of electricity—the amount of electricity consumed by roughly 330,000 Pennsylvania households each year.

According to a report issued by the Pennsylvania Public Utility Commission, for every \$1 invested in energy efficiency over the past three years, Pennsylvania electricity customers have realized \$1.70 in benefits.<sup>xiii</sup> Meanwhile, the AEPS and the \$100 million Sunshine grant program for commercial and residential solar (which ended in 2013) jumpstarted the state's solar industry. There are now **more than 13,000 solar systems** spread across every county in the Commonwealth.

There are a number of steps that lawmakers in Harrisburg and Washington can take, right now, to help create thousands more clean energy jobs in Pennsylvania.

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## STATE POLICY RECOMMENDATIONS\*

- Increase the requirement for renewable energy in the AEPS. While the AEPS was a forward-looking policy when it passed in 2004, most states have since set far more aggressive renewable energy portfolio standards, realizing the tremendous job growth potential.<sup>xiv</sup> New York state has a goal of 50 percent renewables by 2030,<sup>xv</sup> New Jersey is at 20.38 percent renewables by 2020 with 4.1 percent to come from solar and Maryland has a 2.5 percent goal for solar.<sup>xvi</sup> With half the population of Pennsylvania, the state of Massachusetts has close to 20,000 solar jobs, because of its economically focused clean energy policies.<sup>xvii</sup>
- Pass Senate Bill 234, which would permit municipalities, including counties as well as townships, boroughs and cities, to create Commercial Property Assessed Clean Energy (C-PACE) districts. C-PACE is a financing mechanism that helps commercial and industrial facilities invest in energy efficiency upgrades and renewable energy technologies via long-term, low-cost loans from private lenders that are repaid via property tax assessment bills. Upon any sales of C-PACE properties, the clean energy financing mechanism remains intact.
- Pass Senate Bill 404, or the Solar Jobs Bill. This changes the AEPS to allow only Pennsylvania-sited projects to qualify for the AEPS' solar renewable energy credit (SREC) program. Currently, solar systems located in 13 states in the eastern U.S. are eligible to receive Pennsylvania's SRECs. More than 80 percent of systems registered into Pennsylvania are actually projects built in other states that have no SREC programs of their own. This has dis-incentivized Pennsylvania solar projects by devaluing the price of solar credits and provided an unfair advantage to out-of-state businesses and workers.
- Expand Act I29 to drive even more energy efficiency gains—and the jobs that come with them—while rejecting attempts to roll back the policy. For example, Pennsylvania must protect Act I29 from anti-energy efficiency legislation including bills like Senate Bill 805 of 2015-16, which would have allowed large industrial and commercial electricity customers to “opt out” of Act I29. Bills like this would unfairly allow large consumers to benefit from Act I29's programs

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\* Unless otherwise noted, all bill numbers refer to bills introduced in the 2017–18 legislative session.

while not contributing to them. Given the proven benefits of energy efficiency, lawmakers should seek to strengthen the law following the conclusion of a Public Utility Commission investigative proceeding into more approaches to spurring efficiency. KEEA and other groups have submitted multiple comments into an associated docket on ways to improve policies like Act 129.<sup>xviii</sup>

- Adopt policies to support more electric vehicles. As of August 2017, the Pennsylvania Department of Environmental Protection is developing a plan for how to spend around \$118 million from Volkswagen's settlement of emissions violations concerning diesel-fueled vehicles. Maximizing investments in electric vehicles (EVs) and charging infrastructure—under the Volkswagen settlement and under legislation like House Bill 1446, which is designed to jump-start the development of EV charging stations—will both reduce air pollution and grow jobs in Pennsylvania's clean transportation sector.
- Exempt renewable energy equipment from state sales and usage taxes. Equipment for fossil fuels is already exempt. Twenty-four states already have a full or partial exemption for solar systems.<sup>xix</sup>
- Permit community shared solar in Pennsylvania so that people who do not have access to solar on their own property can participate in a solar installation elsewhere and be credited for that solar production directly on their electric bill. The legislature should change the virtual net-metering regulations to permit community solar.
- The Pennsylvania Department of Labor and Industry should start tracking clean energy jobs in the same way that it currently tracks fossil fuel jobs. The omission of a clean energy jobs category not only misrepresents where most of the jobs in Pennsylvania's energy sector are—it also suggests a favoritism toward fossil fuels. Pennsylvania's energy sector has changed significantly since 2004; Labor and Industry's methodology should change accordingly.
- The Pennsylvania Department of Community and Economic Development should work with counties and municipalities to start identifying existing clean energy businesses, as well as industries that have the potential to retool, with the goal of creating clean energy opportunity zones that attract other clean energy companies and build regional clean energy supply pipelines.

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## FEDERAL POLICY RECOMMENDATIONS

- In any tax-reform plan, Congress must maintain the current glide-path for the Production Tax Credit (PTC) for wind and the Investment Tax Credit (ITC) for solar. It should also reinstate credits supporting other renewable technologies, energy efficiency and energy storage.
- Congress should support American innovation by properly funding clean energy research-and-development and making investments in renewable energy and more energy efficient technologies. Specifically, Congress should properly fund the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy, the Advanced Research Projects Agency-Energy (ARPA-E) and the Energy Department's loan guarantee office. As Mayor Bill Peduto wrote in a recent op-ed: "The experience of Pittsburgh in the three decades since the collapse of the steel industry reveals how a commitment to science, research and green technology can transform our cities."<sup>xxx</sup>
- The Trump administration must maintain the current schedule of fuel efficiency standards as put in place by the U.S. Department of Transportation and the U.S. Environmental Protection Agency. Rolling back these standards will damage innovation and hurt American businesses that manufacture advanced vehicle parts.

# CASE STUDY

## NEW CEO HELPS HUCKESTEIN BOUNCE BACK FROM FINANCIAL CRISIS—AND CREATE JOBS IN PITTSBURGH

Huckestein Mechanical Services Inc. employs about 50 people who design and build heating, ventilation and air-conditioning (HVAC) systems using high energy efficiency equipment and an innovative design for air recovery and handling, energy metering and power monitoring for large buildings in Pennsylvania, Ohio and West Virginia.

Headquartered in an old brick warehouse on Pittsburgh's North Side, the company was founded in 1948. It began operations as a sheet metal fabrication and installation company. After expanding its services in the ensuing decades to include everything from refrigeration to plumbing, Huckestein struggled during the financial crises and was put up for sale. The business was purchased in 2010 by Wendy P. Staso, now the company's president and CEO.

Staso is an Indiana University of Pennsylvania graduate who began her career at Westinghouse. She later was a managing partner at a small business holding company. As the leader of Huckestein's five-person executive team, Staso used her previous business experience to restructure and expand Huckestein.

Over the past decade, Huckestein has designed and installed about \$20 million in energy efficiency measures. It's now a thriving small business with steady margins, strong growth in market share—and an expanding workforce.

The company's design, engineering and installation team employs engineers, project managers, a dispatcher, logistics coordinators, a safety coordinator and field technicians. All Huckestein field personnel are members of the Steamfitters Local 449 union; skilled tradespeople at Huckestein have been with the company an average of 25 years.

Some of the company's recent projects include:

- An \$83,000 retrofit completed in 2013 of the Soldiers and Sailors Memorial Hall, a museum and memorial in Pittsburgh originally built to honor Civil War veterans. The tune-up



A Local No. 449 steamfitter fabricates materials for a project in Huckestein Mechanical Services Inc.'s North Side Pittsburgh shop. Huckestein employs about 50 people in the Pittsburgh area. (Photo courtesy of Huckestein Mechanical Services Inc.)

and mechanical renovation to the hall's boiler plant, chiller plant, mechanical room and Honeywell controls system helps save the museum energy and money, makes the building more comfortable for visitors and improves indoor air quality.

- A \$1.07 million project in 2012 to help facilitate the conversion of a hotel from a Radisson to a Doubletree-branded property. The contract with CAM Hospitality Advisors and Management LLC called for replacing 475 outdated air conditioning units with more energy efficient heat pumps. Huckestein also identified and quantified energy consumption reductions and rebate opportunities through Pennsylvania's Act 129.
- A \$1.07 million energy efficiency project in 2015 has helped save the Greater Johnstown

School District money on energy bills.

Partnering with Constellation Energy, now part of the utility Exelon, Huckestein installed efficient fan motors, modified various pipes and a boiler burner, rebuilt classroom HVAC units and upgraded thermostats.

- In 2017, Huckestein installed a combined cooling, heat and power (CCHP) plant at the Energy Innovation Center in Pittsburgh. The plant uses waste heat generated from the facility's HVAC system to generate electricity. While the conventional method of producing heat and power separately has a typical combined efficiency of 45 percent, CHP systems can operate at levels as high as 80 percent. By capturing and using waste heat, these systems normally consume half of the fuel burned by a central power station to provide an equivalent amount of energy.

Huckestein is the only Small Business Administration-certified woman-owned mechanical contractor operating the tri-state area around Pittsburgh. The company has been named one of Pittsburgh's 100 fastest growing companies—for two consecutive years.

In addition to its energy efficiency work, Huckestein also installs renewable energy technologies, including geothermal. All told across the region, Huckestein's workers have been involved in energy retrofits to more than 250 institutional, commercial and government facilities.

—E2 & HUCKESTEIN



Wendy P. Staso, president and CEO of Huckestein Mechanical Services Inc., second from right, meets with her executive team. Over the past decade, Huckestein has installed around \$20 million worth of energy efficiency projects in Pennsylvania and neighboring states. (Photo courtesy of Huckestein Mechanical Services Inc.)

## CONCLUSION

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**Pennsylvania has a proud history of leading the nation in energy innovation, generating power and acting as the keystone of our nation's industrial economy.**

This energy expertise was built over generations through the gritty determination of workers toiling first in underground coal mines and under western Pennsylvania oil derricks, and more recently in nuclear plants and at natural gas deposits like the Marcellus and Utica shale formations. These jobs helped build our nation and provided workers and their families and communities with living wages. Pennsylvania and the nation owe them gratitude for their contributions. They are the veterans of the energy industry, and their communities deserve the investment, training and assistance necessary to rebuild and retool so that they and their children and grandchildren can grow with the new clean energy economy.

With about 70,000 clean energy jobs and massive potential for more energy efficiency and renewable energy generation, Pennsylvania can become a regional and national powerhouse in clean energy, just as it was with coal and natural gas in previous decades. Clean energy workers are now spread across the state. They're in red districts, blue districts, urban areas like Philadelphia and more rural areas like Somerset County.

By adopting stronger clean energy policies now, elected officials in Harrisburg and Washington, D.C., can help create more jobs and ensure a more promising future for all Pennsylvanians.



# APPENDIX

## METHODOLOGY

Data for this year's report is derived from the comprehensive BW Research Energy Employment Index (EEI) administered in 2015 and growth estimates based on sub-technology industry mix and publicly available employer reported growth estimates from the 2017 U.S. Department of Energy (DOE) United States Energy and Employment Report (USEER).

For state-level growth estimates, BW Research utilized six-digit North American Industry Classification System (NAICS) incidence for clean energy sub-technologies. This "industry mix" was developed by analyzing completed survey incidence nationally for all clean energy sub-technologies. For example, the six-digit NAICS industries below cover all firms that reported solar-related employment in 2016:

NAICS	DESCRIPTION
221114	Solar Electric Power Generation
237110	Water and Sewer Line and Related Structures Construction
237130	Power and Communication Line and Related Structures Construction
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
332312	Fabricated Structural Metal Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
334413	Semiconductor and Related Device Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
335121	Residential Electric Lighting Fixture Manufacturing
335312	Motor and Generator Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers
523930	Investment Advice
541110	Offices of Lawyers
541310	Architectural Services
541330	Engineering Services
541370	Surveying and Mapping (except Geophysical) Services
541612	Human Resources Consulting Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541618	Other Management Consulting Services
811211	Consumer Electronics Repair and Maintenance
811219	Other Electronic and Precision Equipment Repair and Maintenance
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

Estimated growth by sub-technology used industry mix U.S. Bureau of Labor Statistics (BLS) publicly reported growth from 2015-2016 averaged with reported national sub-technology growth (from 2017 DOE USEER). The derived growth estimates were applied to 2015 employment numbers and aggregated by technology and total clean energy employment for final 2016 jobs numbers.

Though the BLS Quarterly Census of Employment and Wages (QCEW) datasets track energy employment across traditional production, transmission, and distribution subsectors, the current structure of the NAICS assigns a portion of the nation's energy and energy efficiency work into broad categories of non-energy specific industries, such as construction, wholesale trade, and professional services.

Identifying energy-related employment within broad NAICS industry sectors is particularly important for understanding employment trends across emerging renewable energy and advanced fuel technologies and infrastructures, such as solar, wind, geothermal, biomass, storage, and smart grid. Since rising deployment of efficiency-related technologies has carved out new opportunities for firms in traditional trades to research, manufacture, or install energy efficient products and upgrades, parsing out this employment is especially useful to determine the level of job growth across the nation's energy efficiency subsectors. However, energy efficiency and other clean energy workers are not exactly captured through traditional NAICS alone. For example, a subset of semiconductor manufacturers produces solar panels, while others assemble computer components or medical equipment. Even though the NAICS classifications include a "solar electric generation" subsector, important elements of the solar value chain, such as research, installation, manufacturing, sales, and distribution are embedded within these other broad NAICS categories. While federal labor market data alone presents an incomplete picture of the clean energy workforce, inclusion of these additional manufacturing or construction industries in their entirety would result in exaggerated employment figures, while their exclusion underestimates the clean economy and its workforce.

The 2015 Index was the result of a rigorous survey effort of traditional and clean energy establishments across all 50 states. Final employment figures were extrapolated based on the QCEW.

The 2017 USEER methodology relies on the most recently available data from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW, Quarter I), together with a detailed supplemental survey of business establishments across the United States designed and conducted by BW Research Partnership on behalf of the U.S. Department of Energy. DOE conducted a comprehensive review of the methodology underlying the 2017 USEER and consulted with the BLS for consistency.

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