Welcome to the Webinar!

2019 U.S. Energy Jobs and Employment Report Briefing Webinar

A presentation on regional and national energy & advanced manufacturing jobs and workforce data from the 2019 USEER Report

- All are on mute for the duration of the presentation
- Q&A time permitting; Questions submitted via chat function
- Slides will be posted on netl.doe.gov/rwfi on the Webinar Archive Section
- Subscribe to NETL RWFI E-Note (netl.rwfi@netl.doe.gov)

Disclaimer: The analysis presented and conclusions drawn herein represent solely those views of the author(s), and do not represent the views of the United States Department of Energy

About the Webinar

We hope you will leave the webinar with knowledge about:

- Background on the National Energy Technology Laboratory (NETL) and the NETL Regional Workforce Initiative (NETL RWFI)
- Results from USEER, showing the current number of energy jobs and where they are in the workforce both regionally and nationally
- Future job and workforce growth trends in energy and advanced manufacturing, including employer hiring expectations for the next 12 months
- Hiring difficulty by energy technology and industrial classification
- High demand jobs and workforce skills gaps

Webinar Agenda

NETL RWFI: Energy Jobs Data Report Briefing

I. Introductions and Background on the NETL RWFI
Presenter: Anthony Armaly, Federal Coordinator, NETL RWFI

II. The U.S. Energy and Employment Report; A National Prospective — National Association of State Energy Officials; Energy Futures Initiative
Presenter: David Foster; Distinguished Associate, Energy Futures Initiative

III. The U.S. Energy and Employment Report- A Regional Prospective — BW Research
What is the workforce demand and hiring difficulty for the region?
A discussion of regional trends in current and emerging energy and manufacturing technologies.
Presenter: Phillip Jordan, VP and Principle Researcher, BW Research

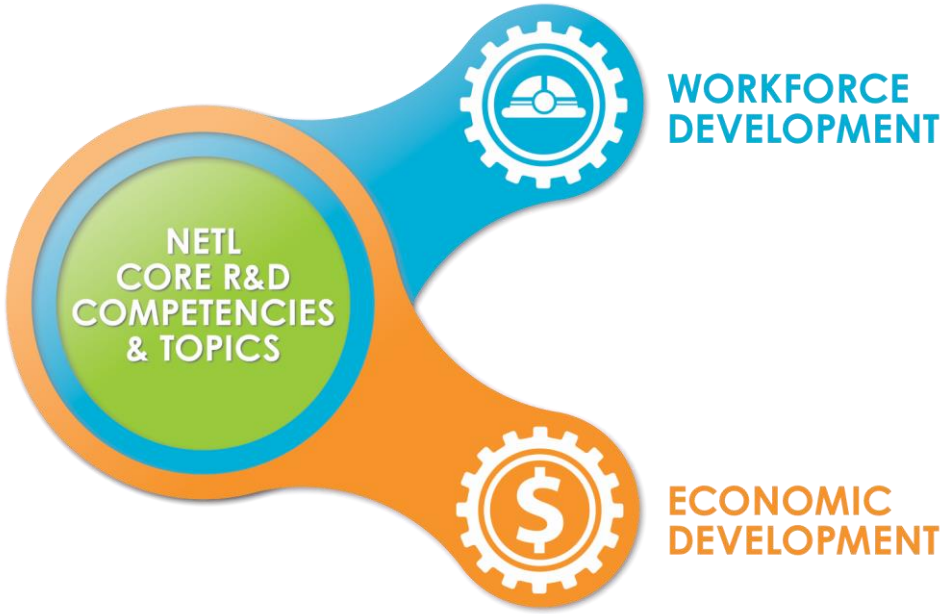
IV. The U.S. Energy and Employment Report, A State Perspective — State of Pennsylvania
A perspective on energy jobs data and what it means for states like Pennsylvania
Presenter: Denise Brinley Executive Director at Pennsylvania Governor's Office of Energy

NETL Regional Workforce Initiative

NETL Regional Workforce Initiative Mission

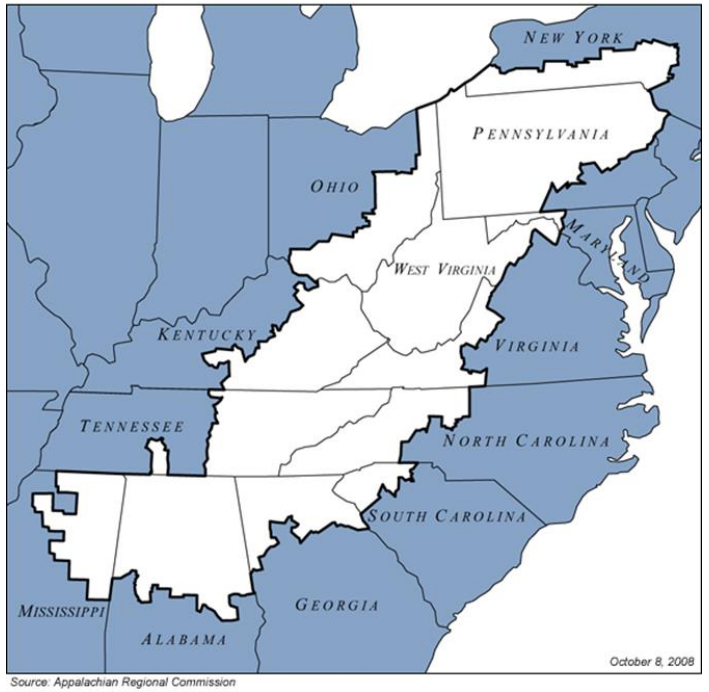
A Platform For:

- Communication and collaboration with regional/national stakeholders and partners, DOE, and other federal agency partners
- Connecting public investment in energy and advanced manufacturing NETL R&D to national and regional economic development, education, and jobs
- Discussing energy and manufacturing regional and national workforce skills gaps generally and specifically related to NETL's core R&D



How We Engage:

- Monthly E-Note Email Bulletin
- On-Campus Engagements
- Webinars and Webcasts
- NETL RWFI Website
- Participation and representation at regional and national energy and manufacturing workforce meetings and groups



Source: Appalachian Regional Commission

Understand, Engage, and Facilitate discussions on the economic and workforce benefit of NETL Research to the Region

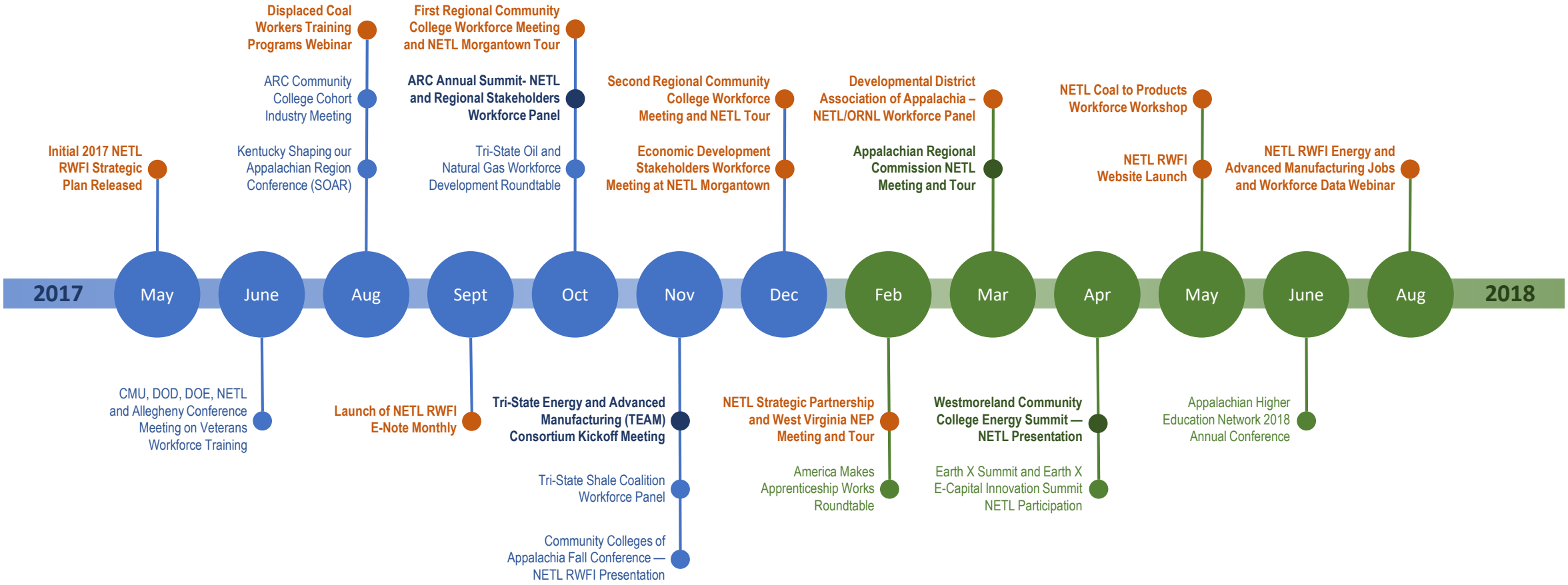
Responsive to Administration Priorities

RWFI aligns to the Administration's efforts to connect R&D investment to economic growth, job growth, and development of a skilled technical workforce.

- OMB Memorandum to Agency Heads on FY 2020 Administration Research Development Budget Priorities
- EO-Establishing the President's Council for the American Worker
- EO-Establishing Apprenticeships in America
- EO-Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure

RWFI Outreach, Meetings, Webinars, and Workshops

Consistent, meaningful, outcome driven, engagement



RWFI Opportunities for FY 2019

- Continued outreach to regional stakeholders, such as the Appalachian Regional Commission (ARC)
- Planning for RWFI webinars on:
  - Briefing on Natural Gas Storage and Regional Energy Infrastructure
  - Energy 101 Series
- Potential on-campus events:
  - The future of work in the national and regional fossil energy sector
  - Energy and advanced manufacturing industry workforce roundtable
  - Innovation and Entrepreneurship in Energy and Advanced Manufacturing

Core Competencies & Technology Thrusts

NATIONAL ENERGY TECHNOLOGY LABORATORY

COAL

Carbon Storage | Carbon Capture | Sensors & Controls | Advanced Materials | Advanced Computing | Advanced Energy Systems | Water Management | Rare Earth Elements

OIL & GAS

Enhanced Resource Production | Environmentally Prudent Development | Methane Hydrates | Offshore | Natural Gas Infrastructure | Unconventional

Support to Other DOE Offices

Energy Efficiency & Renewable Energy (EERE)

Vehicles | Solid State Lighting | Geothermal

Office of Electricity (OE)

Microgrid | Energy Storage

Cybersecurity, Energy Security, and Emergency Response (CESER)

Energy Security & Restoration | Cybersecurity

Contact Information

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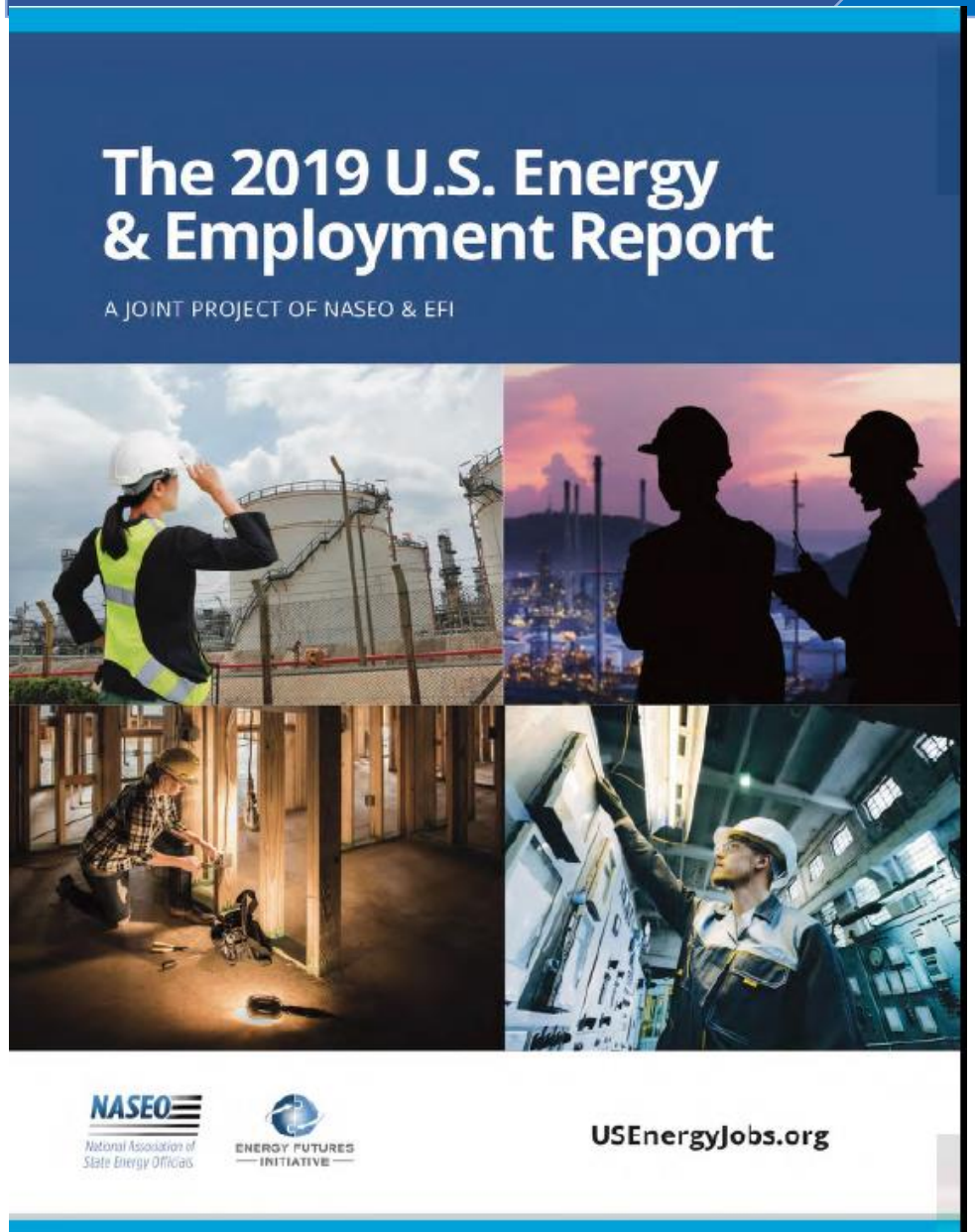
ENERGY FUTURES INITIATIVE

NASEO
National Association of State Energy Officials



2019 U.S. Energy and Employment Report

A Joint Project of the National Association of State Energy Officials and the Energy Futures Initiative

May 30, 2019
NETL Webinar

David Foster, EFI, Distinguished Associate

Overview—2019 USEER

- The USEER is based on an annual supplemental employer survey, integrated with the BLS Quarterly Census on Employment and Wages.
- It studies employment in the following sectors:
  - Fuels
  - Electric Power Generation (EPG)
  - Transmission, Distribution, and Storage (TDS)
  - Energy Efficiency (EE)
  - Motor Vehicles
- Fuels, EPG, and TDS make up the Traditional Energy Sector.

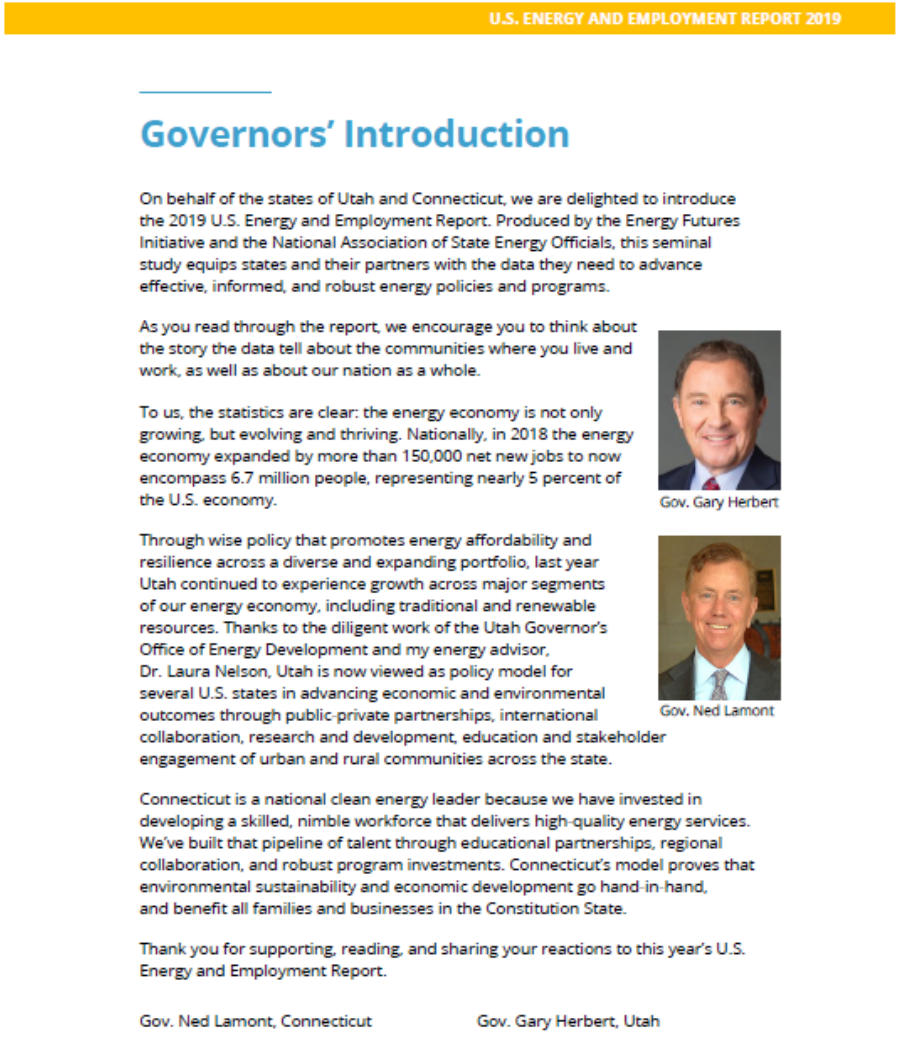
USEER Content

- The survey covers direct employment in 53 different energy, energy efficiency and motor vehicle technologies across 186 NAICS codes located in seven broad industrial classifications.

- The survey determines:
  - Employment numbers
  - Employer hiring expectations for the next 12 months
  - Hiring difficulty by technology and industrial classification
  - High demand jobs and skills gaps
  - Workforce demographics by race, ethnicity, gender, and veteran's status
  - Geographic location by state, county, congressional and legislative districts, and MSA of each technology and industrial classifications

2019 USEER Changes

1. Governor's Introduction.
2. Spotlight on real world experience.
3. More state (9) participation.
4. Two new trade associations.
5. New chart and data formats provide both technology and industrial sector profiles
6. Additional crosscut profiles:
    1. How generation and fuels technologies interact and compare.
    2. Natural gas industry
    3. Nuclear industry
    4. Petroleum industry
    5. Energy storage



U.S. ENERGY AND EMPLOYMENT REPORT 2019

Governors' Introduction

On behalf of the states of Utah and Connecticut, we are delighted to introduce the 2019 U.S. Energy and Employment Report. Produced by the Energy Futures Initiative and the National Association of State Energy Officials, this seminal study equips states and their partners with the data they need to advance effective, informed, and robust energy policies and programs.

As you read through the report, we encourage you to think about the story the data tell about the communities where you live and work, as well as about our nation as a whole.

To us, the statistics are clear: the energy economy is not only growing, but evolving and thriving. Nationally, in 2018 the energy economy expanded by more than 150,000 net new jobs to now encompass 6.7 million people, representing nearly 5 percent of the U.S. economy.

Gov. Gary Herbert

Through wise policy that promotes energy affordability and resilience across a diverse and expanding portfolio, last year Utah continued to experience growth across major segments of our energy economy, including traditional and renewable resources. Thanks to the diligent work of the Utah Governor's Office of Energy Development and my energy advisor, Dr. Laura Nelson, Utah is now viewed as policy model for several U.S. states in advancing economic and environmental outcomes through public-private partnerships, international collaboration, research and development, education and stakeholder engagement of urban and rural communities across the state.

Gov. Ned Lamont

Connecticut is a national clean energy leader because we have invested in developing a skilled, nimble workforce that delivers high-quality energy services. We've built that pipeline of talent through educational partnerships, regional collaboration, and robust program investments. Connecticut's model proves that environmental sustainability and economic development go hand-in-hand, and benefit all families and businesses in the Constitution State.

Thank you for supporting, reading, and sharing your reactions to this year's U.S. Energy and Employment Report.

Gov. Ned Lamont, Connecticut Gov. Gary Herbert, Utah

Key Takeaways—2019 USEER

- Traditional Energy and Energy Efficiency added 152,000 jobs in 2018, out performing the economy for the 4th year in a row by 0.5 percentage point (2.3% to 1.8%).
  - Energy Efficiency again led the way with 76,000 new jobs, almost 275,000 new jobs in 3 years.
- Fuels production added 52,000 new jobs, 33,000 in oil and 17,000 in natural gas, while coal mining held firm.
- Coal generation dropped by 7,000 jobs.
- Solar jobs declined for the second year in a row by 8,000 jobs, but low emissions' natural gas, wind, CHP, and geothermal all grew.
- Energy storage now employs 81,000 with battery storage at 61,000, an 18% increase.
- Motor vehicles added 74,000 jobs, while alternative fuel vehicles bounced back, adding almost 34,000 jobs.
- Hiring difficulty rose sharply to almost 77%, an increase of 10%.
  - In key growth sectors such as EE construction jobs, over 50% of firms now say hiring was very difficult.
- Overall, surveyed employers predicted a 4.6% growth rate for 2019.

Spotlight: "We are in the middle of an historic transition of the energy sector."

Alicia Barton, President and CEO, NYSERDA

The New York State Energy Research and Development Authority's (NYSERDA) mission is to "advance innovative energy solutions in ways that improve New York's economy and environment." Providing significant choices and opportunities for New Yorkers to pursue their own clean energy choices is integral to this mission and advancing the clean energy economy.

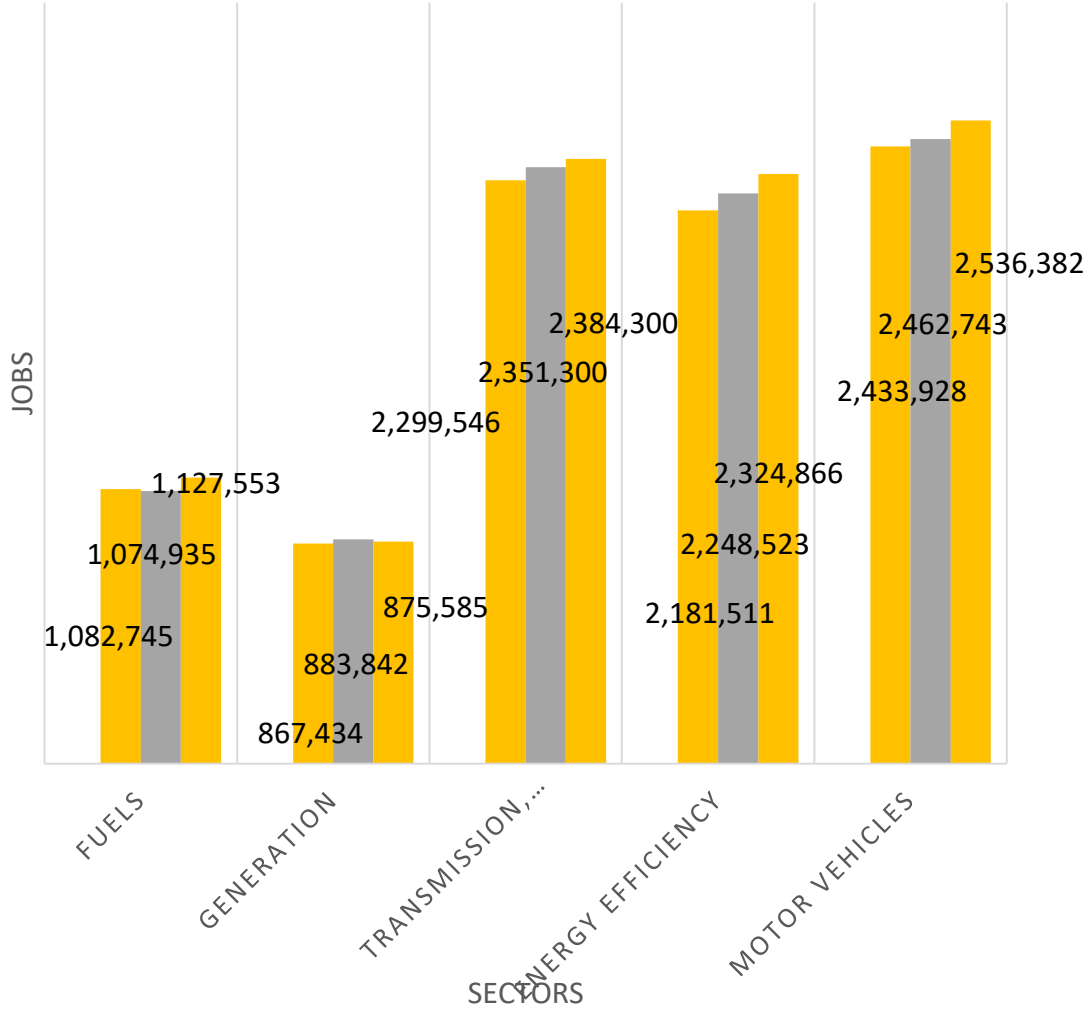
For the last three years NYSERDA has funded the collection of clean energy jobs data to facilitate that mission. This New York data is an important component of the 2019 USEER.

Alicia Barton, President and CEO, NYSERDA, spoke about the importance of jobs data to her organization's business, "We are in the middle of an historic transition of the energy sector. Policy makers in our state rely on jobs data to correlate meaningful progress towards our clean energy goals with sustainable economic growth opportunities for the benefit of all New Yorkers.

Installers from the Radiant Store in Troy, NY get a roof ready for solar thermal. (Photo courtesy: NYSERDA)

2019 U.S. Energy and Employment Report

ANALYZED EMPLOYMENT SECTORS: 4TH Q, 2016-2018



226,000 New Jobs in 2018 in 5 Sectors

- In total, 6.7 million Americans work in Traditional Energy* industries and Energy Efficiency.
  - An increase of 152K (including gas stations).
- Fuels production directly employs almost 1.13 million workers,
  - 52,000 new jobs in Fuels.
- Electric Power Generation employs 875,600.
  - EPG lost almost 8,300 jobs.
- 2.37 million Americans work in Transmission, Distribution, and Storage of all energy products.
  - 33,000 new jobs (excluding gas stations)
- 2.32 million work in Energy Efficiency.
  - A net increase of over 76,000.
- In addition, 2.54 million work in motor vehicles
  - A net increase of 74,000 in 2017.
  - 254,000 work with alternative fuels vehicles, an increase of almost 34,000, after a significant decline in 2017.

*Traditional Energy sectors include Fuels, Electric Power Generation and Transmission, Distribution and Storage.

ENERGY FUTURES INITIATIVE

Executive Summary—Fuels

TRENDS

- **2018 Job Gain.** In 2018, the Fuels sector grew by approximately 52,000 jobs, or nearly 5% for a total of 1,127,553 jobs.
- **Oil and Gas Recovery.** Oil and natural gas employers added the most new jobs, nearly 51,000, employing 603,000 and 271,000 respectively.
- **Coal Growth.** Coal jobs increased by 650 jobs, totaling about 74,800.
- **Biofuels.** Woody biomass added 1,800 jobs, while corn ethanol also increased.
- **2019 Expectations.** Fuels' employers anticipate over 3% job growth in 2019, with most of the increase expected in oil and natural gas.

4.9%

Overall Fuels jobs growth in 2018.

3.0%

Fuels employers predict 3% job growth in 2019.

Executive Summary--Fuels

SNAPSHOT OF EMPLOYMENT

Figure 1.
Fuels Sector – Employment by Industry, 2017-2018

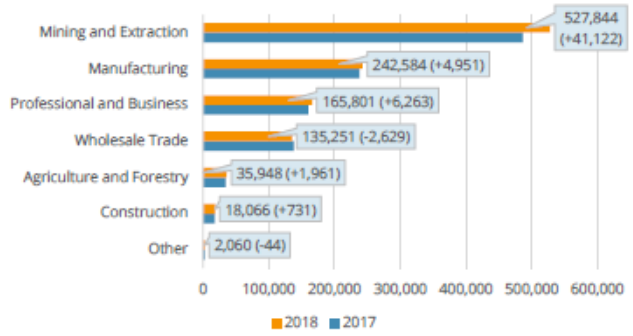
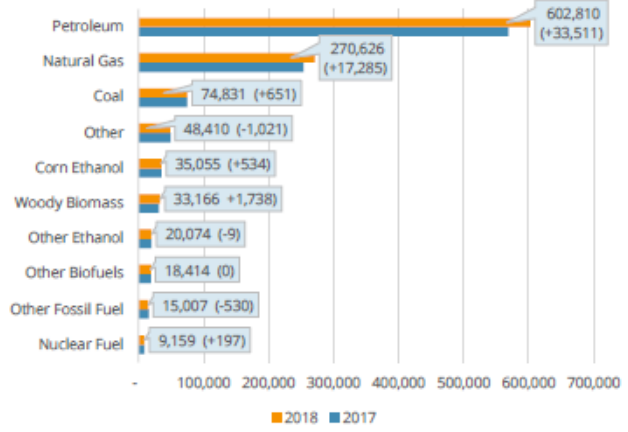


Figure 2.
Fuels Sector – Employment by Detailed Technology Application, 2017-2018



Spotlight: "We are at a critical inflection point in Pennsylvania."

Denise Brinley, Executive Director, Governor's Office of Energy, Pennsylvania

According to USEER data, Pennsylvania has added 6200 jobs in natural gas extraction and electric power generation in the last two years. Currently, almost 17,000 Pennsylvanians are employed in these two sectors.

As **Denise Brinley**, Executive Director of the Governor's Office of Energy in Pennsylvania, observed, "We are at a critical inflection point in Pennsylvania because of the volume of natural gas, the network of pipelines being built, and the importance of climate change. Simultaneously, we have had 14 coal plants with 6,000 MWs of capacity close since 2010. Nuclear power plants produce approximately 40% of the state's baseload electricity, and some are beginning to struggle financially, in part because of the low cost of natural gas. Every form of energy in our state is experiencing a transition.

"Natural gas has provided us with three primary waves of employment. The first was initiated in 2007 with natural gas drilling operations. The second is occurring now and is related to the construction of pipelines. We are now exploring the third, most sustainable future phase — how we can use our natural gas and liquids as a low-cost fuel and feedstock for manufacturers right here in Pennsylvania, which will help spur job creation. We currently export 80% of our natural gas and 100% of our ethane, and we would very much like to change that dynamic.

Executive Summary—Electric Power Generation

TRENDS

- **2018 Job Growth.** In 2018, the Electric Power Generation sector declined by almost 1%, dropping 8,258 jobs for a total of 875,585.
- **Technology Shifts.** Advanced natural gas added the most new jobs, 4,500, while solar contracted, losing 8,000 jobs. Other technologies that grew included wind, combined heat and power, and geothermal while nuclear and coal also declined.
- **2019 Expectations.** Electric Power Generation employers anticipated 7.1% job growth in 2019, with most of the increase expected in renewable construction.

-0.9%

Electric Power Generation job growth in 2018.

7.1%

EPG employers predict 7.1% job growth in 2019.

Executive Summary—EPG

SNAPSHOT OF EMPLOYMENT

Figure 28.
Electric Power Generation Sector – Employment by Industry, 2017-2018

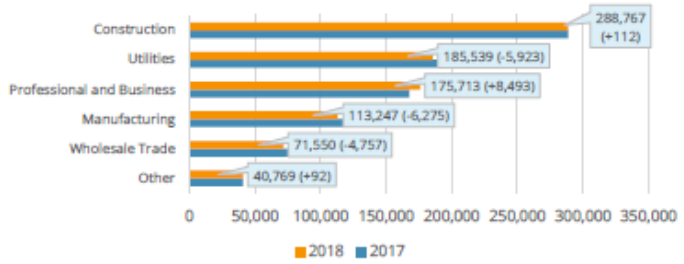
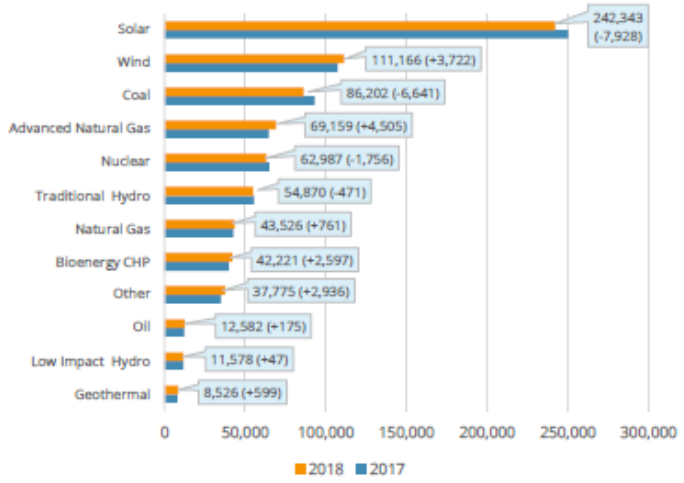


Figure 29.
Electric Power Generation Sector – Employment by Detailed Technology Application, 2017-2018[a]



Spotlight: "For a utility, a cyber-attack doesn't just hurt us; it can turn out the lights for everybody."

Jim Somborovich, Senior Director of Cyber Security, Xcel Energy

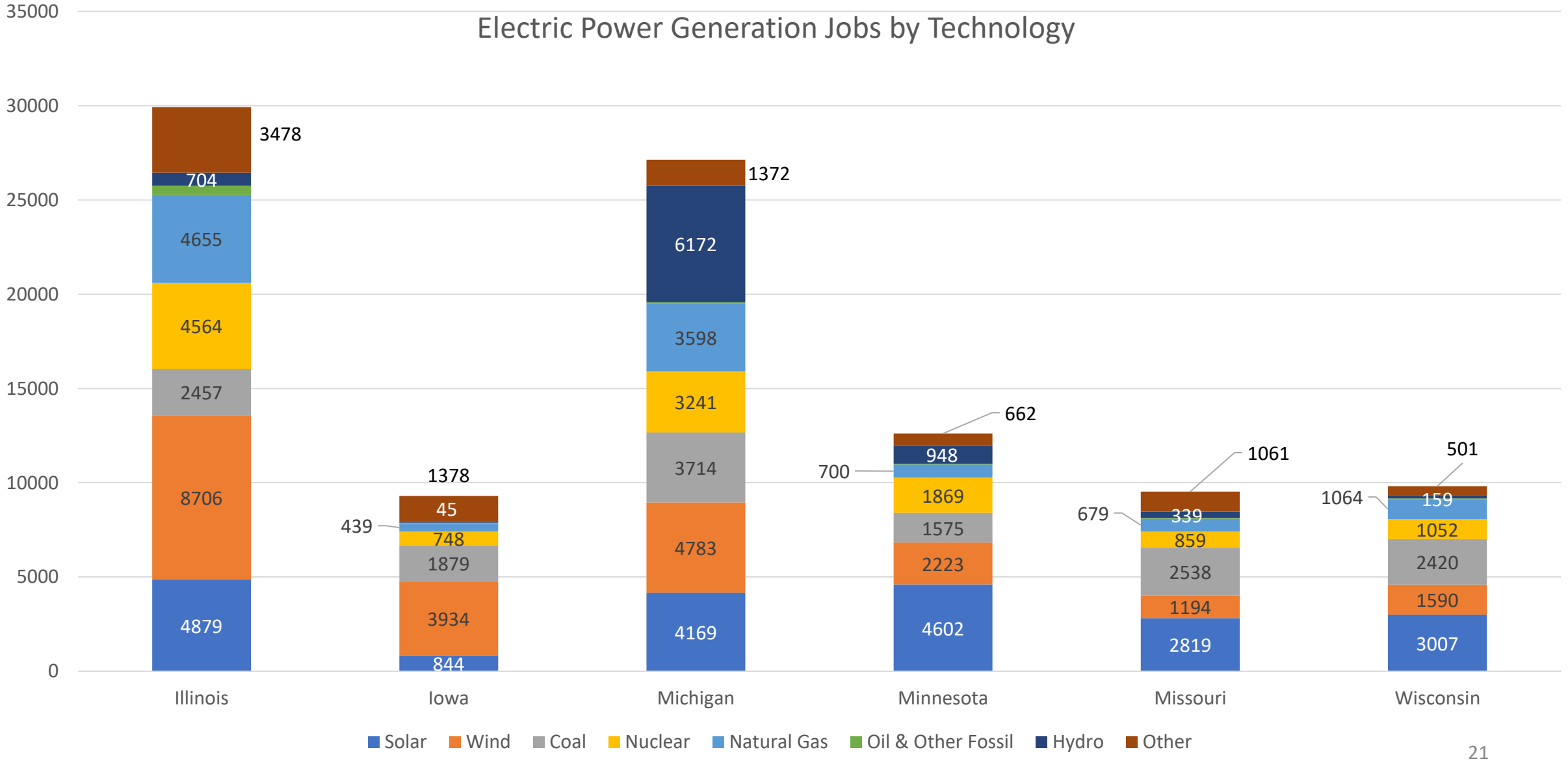
"The reliability of the electricity system underpins virtually every sector of the modern U.S. economy," said the most recent Quadrennial Energy Review from the U.S. Department of Energy.

Xcel Energy serves parts of eight states, providing electricity to 3.6 million customers and natural gas service to 2 million customers. In response to questions on the changing utility workforce, Jim Somborovich, Senior Director of Cyber Security at Xcel, spoke of the rapid growth of cyber employment. "Two years ago, it was me and 25 others. At the end of this year, we will have tripled our cyber workforce."

"Cyber skills are in high demand throughout the economy and we've had to grow in a negative unemployment environment for cyber. Some positions are harder than others to fill, so we have adopted several different strategies.

"We have gone after really junior people with the intent to train them ourselves. For these hires we've developed a 4-to-6-week training program and are preparing a skills assessment tool to help with their eligibility for promotions.

Midwestern States and Generation Jobs



Executive Summary — Transmission, Distribution and Storage

TRENDS

- **2018 TDS Employment:** Excluding retail employees in gas stations and fuel dealers, 1,365,887 workers were employed in Transmission, Distribution, and Storage, adding 33,000 new jobs. Gas stations and fuel dealers contracted by approximately 2,000 employees.
- **2019 Expectations:** TDS employers predict 3.2% job growth in 2019, led by professional and business services employers who anticipate 5.5% growth, followed by wholesale trade, distribution, and transport and other services at 5.4% and 4.9% respectively.
- **Key Industry Sectors:** The construction sector employed 35% of all TDS workers, while the utility industry employed another 31%

2.5%

Job growth, or 33,000 jobs, was reported in TDS in 2018, exclusive of gas stations.

3.2%

Job growth predicted by TDS employers in 2019.

*TD&S includes both electricity and fuels.

Executive Summary—TDS

SNAPSHOT OF EMPLOYMENT

Figure 70.
TDS Sector – Employment by Industry, 2017-2018

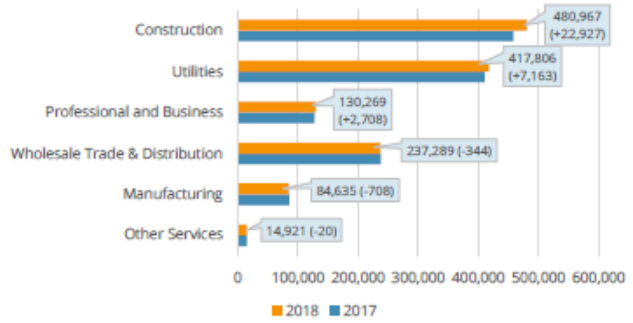
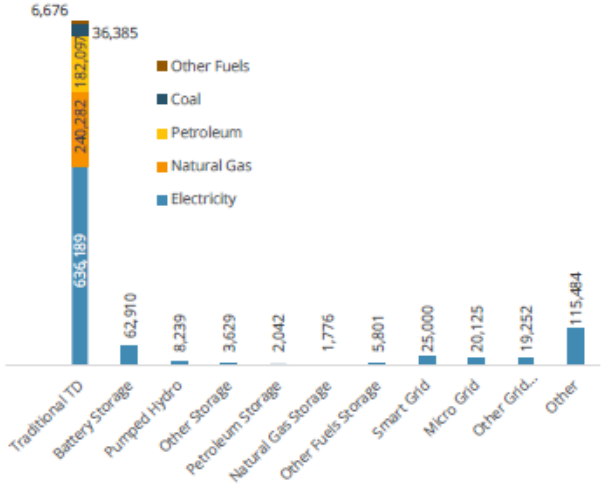


Figure 71.
TDS Sector – Employment by Detailed Technology Application, 2017-2018



Spotlight: "Public agencies have the opportunity to create a pathway forward that is embedded with equity and opportunity."

Madeline Janis, Executive Director, Jobs to Move America

"A moment of transition can be fear-inducing, or it can be a moment of opportunity," states Madeline Janis, co-founder and executive director of Jobs to Move America. "The clean energy transition is creating fear among existing workers in the fossil fuel sector, a fear which can be alleviated by implementing a much more specific framework around good jobs and equity."

Jobs to Move America is a national non-profit organization dedicated to harnessing government procurement to realize equity; to promote environmental sustainability; to further open, democratic government; and to achieve an inclusive, diverse workforce that lifts people into middle-class jobs.

A key leverage point in achieving this mission, notes Janis, is in public purchasing and spending. Jobs to Move America's U.S. Employment Plan offers a multi-point, "all-in" strategy to ensure a just and equitable transition. Recommended strategies include providing training and technology access for transitioning workers; selecting equipment manufacturers that prioritize local communities and equity in their operations and hiring practices; and deploying new technologies in the communities most affected by environmental and economic injustice.

Elisangela "Lisa" Oliveira is a bridge painter for the New York City Department of Transportation.

Photo by Deanne Fitzmaurice

Crosscut—Natural Gas Industry

Natural Gas Industry Employment by Detailed Technology Application and Industry, Q2 2018[64]

	Total	Mining and Extraction	Utilities	Constr-uction	Manufact-uring	Wholesale Trade, Distribution, + Transport (including Pipeline)	Professional and Business Services	Other Services
Fuels	270,626	162,928	--	--	44,444	29,045	34,037	173
Conventional Gas Generation	43,526	--	17,242	10,337	3,582	3,072	8,165	1,128
Advanced Gas	69,159	--	41,780	9,378	2,771	4,824	9,505	900
Fuel Transmission + Distribution	240,282	--	117,145	93,049	--	30,088	--	--
Storage	1,776	--	--	575	301	214	675	12
TOTAL	**625,369**	**162,928**	**176,167**	**113,339**	**51,098**	**67,243**	**52,382**	**2,213**

- Overall, the natural gas industry employs 625,369, growing by 6.2% in 2018.
- The sectors that added the most jobs were:
  - Mining and extraction—16,816
  - Construction—8,373
  - Utilities—7,754
- Natural gas industry wages
  - Average entry level = $18.20
  - Average median level = $26.03
  - Average highest level = $39.92

Crosscut—Petroleum Industry

Petroleum Industry Employment by Detailed Technology Application and Industry, Q2 2018

	Total	Mining and Extraction	Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, + Transport	Professional and Business Services	Other Services
Fuels	602,810	308,681	--	18,066	149,142	58,622	66,947	1,353
Oil & Other Petrol Generation	12,582	--	479	--	5,851	1,922	4,180	149
Fuel Transmission + Distribution	182,097	--	--	71,727	--	110,370	--	--
Storage	2,042	--	--	1,264	274	31	--	471
TOTAL	**799,531**	**308,681**	**479**	**91,057**	**155,267**	**170,945**	**71,127**	**1,973**

- Overall, the petroleum industry employs 799,531, growing by 5.3% in 2018.
- The sectors that added the most jobs were:
  - Mining and extraction—25,471
  - Construction—6,725
  - Professional services—3,963
- Petroleum industry wages
  - Average entry level = $17.75
  - Average median level = $25.99
  - Average highest level = $39.59

Crosscut—Coal Industry

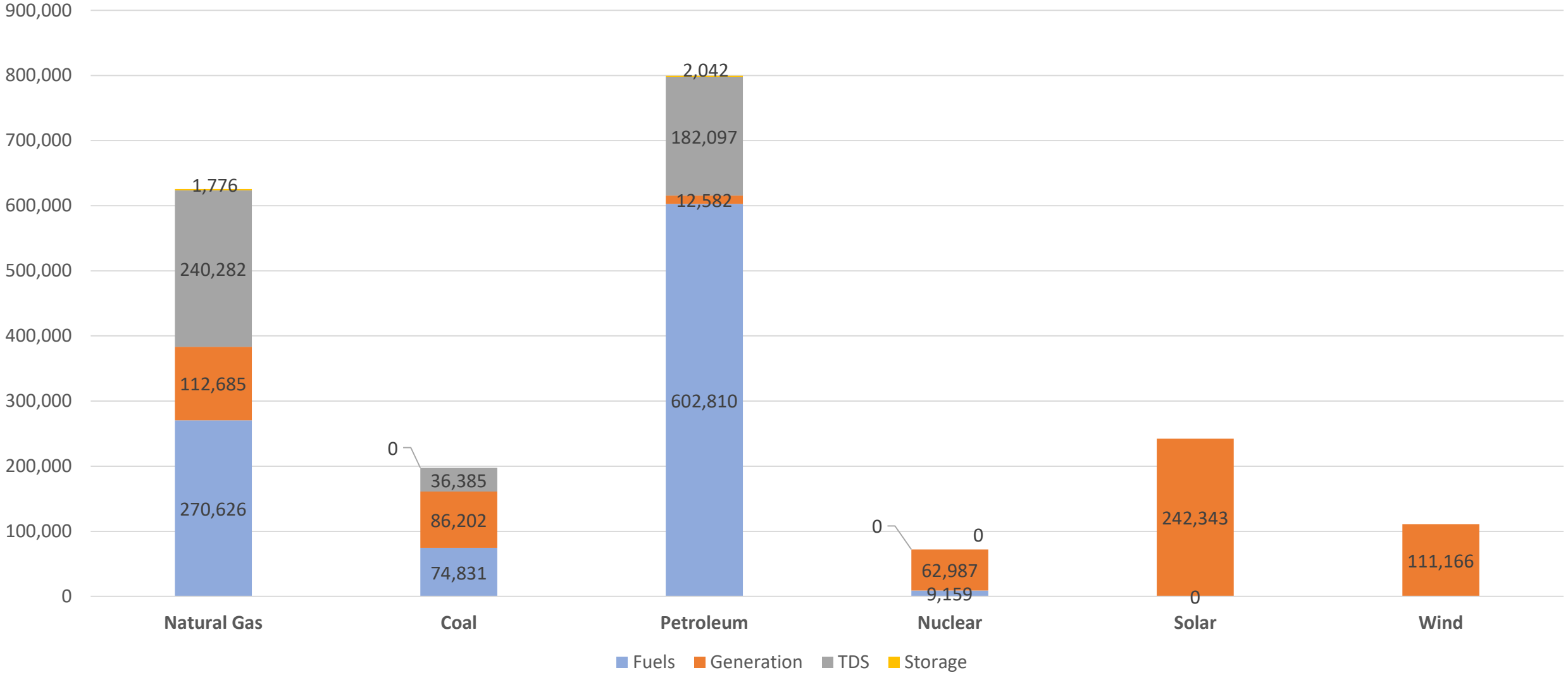
Coal Industry Employment by Detailed Technology Application and Industry, Q2 2018

	Total	Mining and Extraction	Utilities	Constr-uction	Manufact -uring	Wholesale Trade, Distribution, + Transport	Professional and Business Services	Other Services
Fuels	74,831	55,905	--	--	10,194	1,007	7,700	25
Coal Generation	86,202	--	45,795	8,639	1,079	5,935	23,749	1,005
Fuel Transmission + Distribution	36,385	--	--	--	--	36,385	--	--
TOTAL	**197,418**	**55,905**	**45,795**	**8,639**	**11,273**	**43,327**	**31,449**	**1,030**

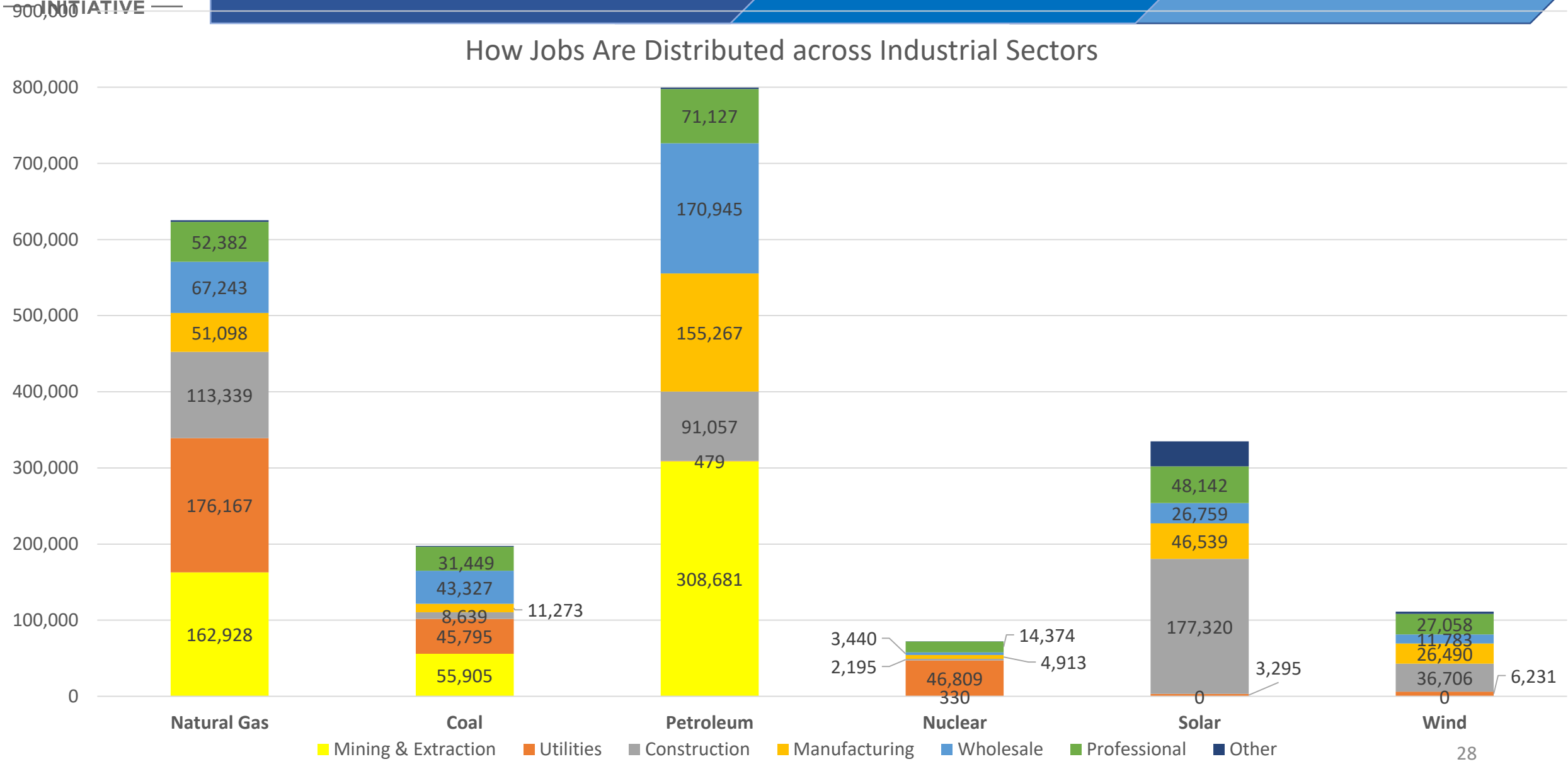
- Overall, the coal industry employs 197,418, declining by 3% in 2018.
- The sectors were impacted unevenly with:
  - Fuels adding 650 jobs
  - Electric power generation losing 6,641 jobs
  - Professional services adding 1,851 jobs
- Coal industry wages
  - Average entry level = $17.53
  - Average median level = $26.25
  - Average highest level = $40.53

Crosscut by Major Technology

How Jobs in Industries Are Distributed Across Different Technologies



Crosscut Analysis by Industry Sector



Executive Summary—Energy Efficiency

TRENDS

•**2018 Job Growth.** In 2018, the Energy Efficiency sector continued to produce the most new jobs of any energy sector — over 76,000 — with 2,324,866 jobs in total. Demand growth for efficient technology and building upgrades has driven expansion across many traditional industries including construction trades which added almost 21,000 jobs and professional services which added 35,000 employees.

•**2019 Expectations.** Energy Efficiency employers report a projected growth rate for employment in 2018 of almost 8%. Construction employers, in particular, report expected Energy Efficiency job growth of 8.8% by the end of 2019.

•**Key Occupations:** The majority, nearly 56%, of Energy Efficiency employees worked at construction firms in 2018, installing or servicing Energy Efficiency goods or performing Energy Efficiency related services.[1] Approximately one in five workers in the Energy Efficiency sector worked in professional and business services.

3.4%

Energy Efficiency job growth in 2018.

7.8%

Employers predict 7.8% Energy Efficiency job growth in 2019.

[1] Building control equipment includes electrical equipment to automate, manage, or otherwise control mechanical and electrical building components such as lighting, ventilation, and power systems equipment.

Executive Summary—Energy Efficiency

Table 44.
Energy Efficiency Sector – Employment by Detailed Technology Application and Industry, Q2 2018

	Total	Construction	Manu-facturing	Wholesale Trade	Professional Services	Other Services
ENERGY STAR Appliances	167,828	86,547	17,350	12,852	46,671	4,408
LED, CFL and Other Efficient Lighting	370,562	184,471	49,408	39,266	93,901	3,517
Traditional HVAC goods, control systems, and services	582,108	322,181	33,023	54,354	156,326	16,224
ENERGY STAR/ High Efficiency heating and cooling equipment	427,503	275,285	74,791	26,362	46,421	4,644
Renewable Heating and Cooling (including Solar Thermal)	128,896	82,513	7,823	7,865	29,909	785
Advanced Building Materials/Insulation	357,765	204,245	74,377	22,462	54,297	2,384
Recycled building materials	82,423	46,921	11,844	2,801	17,849	3,007
Reduced water consumption products and appliances	91,555	58,069	6,109	5,291	20,728	1,358
Other	116,225	35,550	46,856	9,086	18,379	6,354
TOTAL	**2,324,865**	**1,295,782**	**321,581**	**180,339**	**484,481**	**42,681**

Spotlight: "We don't need to choose between good jobs and a clean environment. We can and will have both."

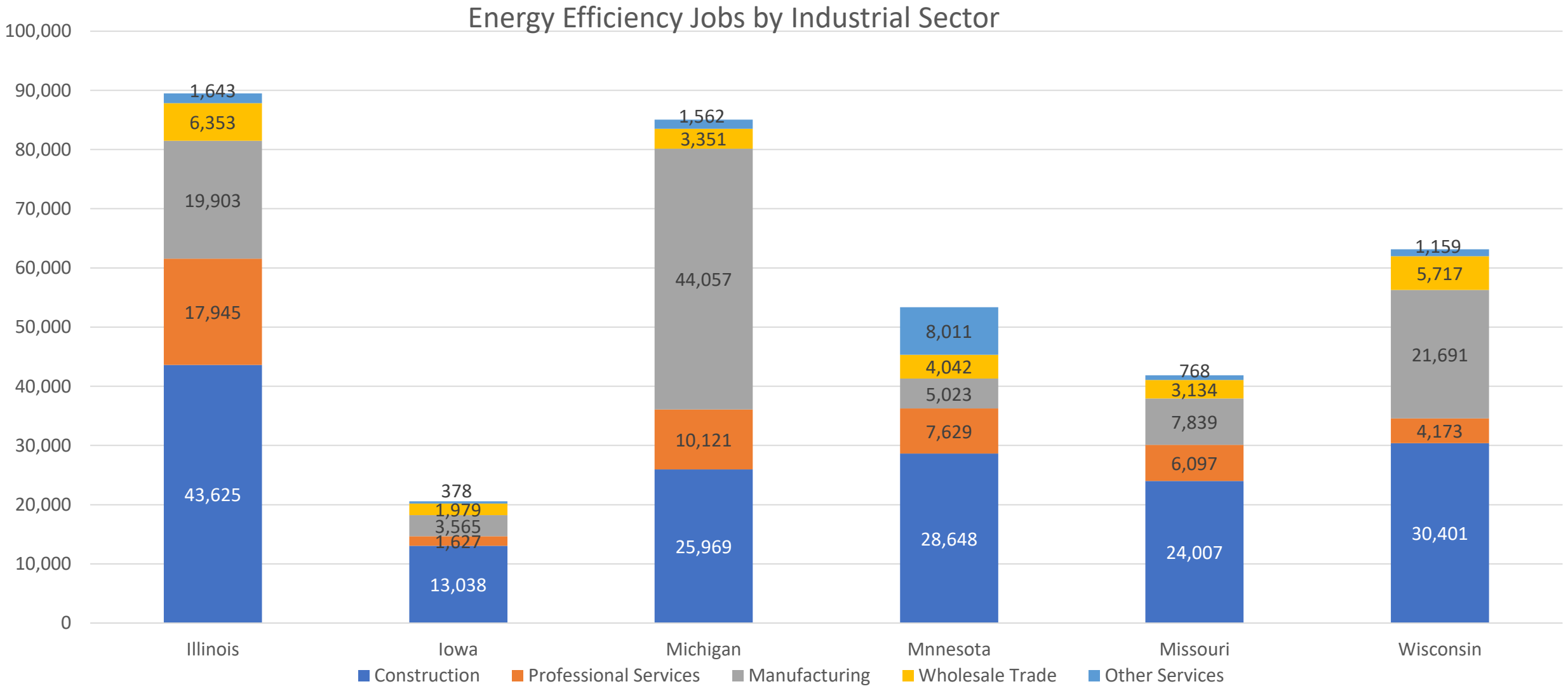
Leo Gerard, International President, United Steelworkers

The United Steelworkers is North America's largest manufacturing union, representing 1.2 million active and retired members in the U.S. and Canada.

Leo Gerard, International President, United Steelworkers observed, "The cheapest way to get carbon out of the atmosphere and create jobs is through energy efficiency. I've been saying this for a long time. If we retrofitted every public school in America, if we retrofitted every government building, and then if we started on all our commercial buildings, we'd create millions of construction jobs.

"And when we start retrofitting our buildings, we create demand for the steel, the aluminum and the cement that puts our Steelworkers back to work. We have hundreds of thousands of miles of old transmission and distribution pipes that are leaking methane and others that are leaking clean water and wasting the energy that operates our filtration plants.

Energy Efficiency Jobs in the Midwest



ENERGY FUTURES INITIATIVE

Energy Efficiency Employment—Top States

State	EE Jobs
CA	318,542
TX	162,816
NY	123,292
FL	118,412
IL	89,469
NC	86,559
MA	86,473
MI	85,061
OH	81,676
VA	78,670
MD	70,530
PA	68,820
WA	63,877
WI	63,141
GA	61,193

State	Efficient Lighting
CA	71,893
TX	59,650
NC	42,893
NY	36,848
FL	32,499
WI	26,054
VA	20,733
OH	16,290
WA	16,222
MI	14,775
MA	14,494
PA	14,286
IL	13,311
MN	12,445
MD	11,748

State	EE Manufacturing
MI	44,057
CA	33,502
WI	21,691
IL	19,903
OH	17,221
TX	15,894
NC	14,391
IN	13,579
PA	13,396
TN	12,239
KY	10,314
GA	8,166
MO	7,839
AL	7,726
MA	7,521

Demographics of EE Workforce

Table 49.
Energy Efficiency Sector – Demographics, Q4 2018

Demographic	Employees	Percent of Sector	National Workforce Averages
Male	1,767,865	76%	53%
Female	557,000	24%	47%
Hispanic or Latino	365,427	16%	17%
Not Hispanic or Latino	1,959,438	84%	83%
American Indian or Alaska Native	32,553	1%	1%
Asian	120,540	5%	6%
Black or African American	175,914	8%	12%
Native Hawaiian or other Pacific Islander	26,716	1%	>1%
White	1,811,682	78%	78%
Two or more races	157,460	7%	2%
Veterans	235,384	10%	6%
55 and over	327,072	14%	23%
Union	251,785	11%	11%

- Key Takeaways, the EE Workforce is
  - 3 to 1 male;
  - Racially diverse, however, A-A's are less represented;
  - Veterans are more represented;
  - Older workers less represented;
  - Almost twice the private sector unionization rate of 6.4% at 11%.

ENERGY FUTURES INITIATIVE

Wage Variation across Energy and Energy Efficiency Industry Sectors

	Construction	Professional Services	Manufacturing	Utilities	Mining and Extraction	Wholesale Trade
Number of EE's	1,867,000	956,000	762,000	603,000	528,000	440,000
Entry level	$14.77	$22.10	$16.75	$25.06	$16.68	$21.83
Median level	$21.82	$33.44	$26.63	$36.61	$26.56	$33.35
Highest level	$34.60	$52.62	$44.38	$55.43	$40.87	$51.64

Key Findings:

- Wage correlation is closest to industry sector as opposed to energy technology.
- Utilities, at all levels, provide the highest median wage.
- Over 50% of energy and energy efficiency sectors have median entry level wages below $17/hr.
- Largest percentage increase from entry level to median are in mining and manufacturing at 59%.

ENERGY FUTURES INITIATIVE

Energy Efficiency Jobs Generally Pay a Premium, but Location and Unions Count.

Description	U.S. Median BLS Hourly Earnings	U.S. Median EE Hourly Earnings	Wage Premium or Discount	Minnesota EE	MN Wage Premium or Discount	North Carolina EE	NC Wage Premium or Discount
Boilermakers	$ 29.93	$ 30.83	$ 0.90	$ 48.64	$ 18.71	$ 25.24	$ (4.69)
Brickmasons and Blockmasons	$ 23.93	$ 24.65	$ 0.72	$ 38.89	$ 14.96	$ 20.18	$ (3.75)
Carpenters	$ 21.71	$ 22.36	$ 0.65	$ 35.28	$ 13.57	$ 18.31	$ (3.40)
Construction Laborers	$ 16.60	$ 17.10	$ 0.50	$ 26.98	$ 10.38	$ 14.00	$ (2.60)
Operating Engineers and Others	$ 22.61	$ 23.29	$ 0.68	$ 36.74	$ 14.13	$ 19.06	$ (3.55)
Electricians	$ 26.01	$ 26.79	$ 0.78	$ 42.27	$ 16.26	$ 21.93	$ (4.08)
Insulation Workers, Floor, Ceiling, and Wall	$ 17.81	$ 18.34	$ 0.53	$ 28.94	$ 11.13	$ 15.02	$ (2.79)
Insulation Workers, Mechanical	$ 21.90	$ 22.56	$ 0.66	$ 35.59	$ 13.69	$ 18.47	$ (3.43)
Plumbers and Pipefitters	$ 25.28	$ 26.04	$ 0.76	$ 41.08	$ 15.80	$ 21.32	$ (3.96)
Roofers	$ 18.74	$ 19.30	$ 0.56	$ 30.46	$ 11.72	$ 15.80	$ (2.94)
Sheet Metal Workers	$ 23.07	$ 23.76	$ 0.69	$ 37.49	$ 14.42	$ 19.45	$ (3.62)
Structural Iron and Steel Workers	$ 25.30	$ 26.06	$ 0.76	$ 41.12	$ 15.82	$ 21.33	$ (3.97)

ENERGY FUTURES INITIATIVE

Executive Summary — Motor Vehicles

TRENDS

- **2017 Job Growth.** The U.S. Motor Vehicles sector employed 2,536,382 Americans in 2018, increasing by 74,000 employees over 2017. This is exclusive of dealerships and retailers, which employed nearly two million additional workers.
- **Alternative fuels vehicles.** Alternative fuels' vehicles employed 253,599 workers in 2018, an increase of nearly 34,000 in 2018, after a significant decline in 2017.
- **Fuel economy.** 43% of employees — over 486,000 — in the auto parts sector work with products that contribute to fuel economy.

- **2019 Expectations.** Motor Vehicles' employers anticipate 2.2% growth in 2019.

3.0%

Motor Vehicle job growth in 2018.

2.2%

Employers predict 2.2% Motor Vehicles job growth in 2019.

ENERGY FUTURES INITIATIVE

SNAPSHOT OF EMPLOYMENT

Figure 93.
Motor Vehicle and Component Parts Sector – Employment by Industry, 2017-2018

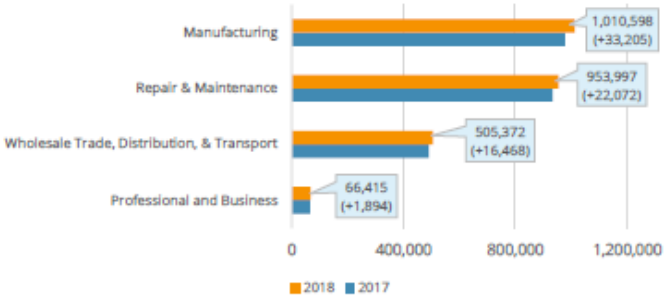
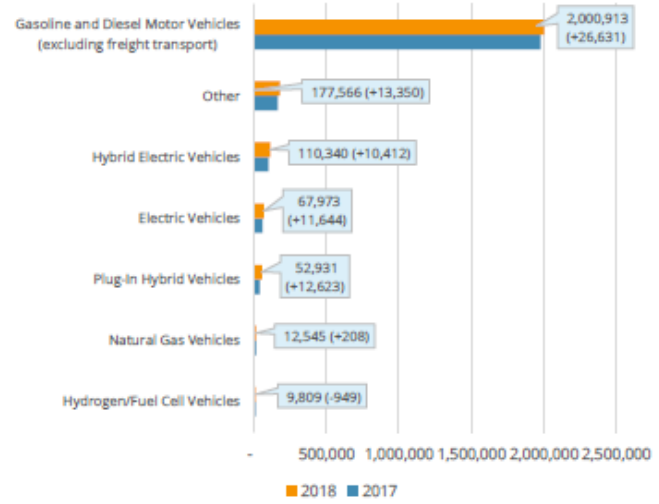


Figure 92.
Motor Vehicles and Component Parts Sector – Employment by Detailed Technology, 2017-2018



Spotlight: "Southwest Michigan is experiencing an extreme shortage of workers."

Melinda Ellsworth, VP of Investor Relations and Corporate Communications, Kaiser Aluminum

Kaiser Aluminum is a leading producer of highly engineered aluminum products for aerospace, general engineering, and automotive applications. Aluminum is inherently sustainable, indefinitely recyclable and one of the most effective materials to achieve fuel efficiency standards.

In 2010, Kaiser opened a state-of-the-art rod and bar extrusion facility in Kalamazoo, Michigan, in the heart of its market with access to a good talent pool and educational resources. The business has continued to grow with the growth in automotive extrusion applications as vehicle light weighting for fuel efficiency drove greater conversion of components from steel to aluminum. The facility produces aluminum extrusions for anti-lock braking systems, control arm assemblies and drive-train applications.

The 2019 USEER reported that 78% of motor vehicles' manufacturers found it was difficult to hire new employees. "Southwest Michigan is experiencing an extreme shortage of workers due to a historically low 3.4% unemployment rate," said Melinda Ellsworth, VP of Investor Relations and Corporate Communications. "We are competing to attract talent with other manufacturers who are also hiring — many well-known and highly regarded employers. Although the shortage of workers poses a challenge, it has been especially challenging with the shortage of skilled trades workers."

Several initiatives to entice applicants include employee referral programs. Other programs include sign-on bonuses for maintenance technicians; partnerships with community colleges/other organizations; expanding the recruiting efforts outside the local areas, offering in certain situations, full relocation; pursuing candidates outside the traditional manufacturing experience pool and continuing to focus on training and development employees.

Executive Summary—Hiring Difficulties

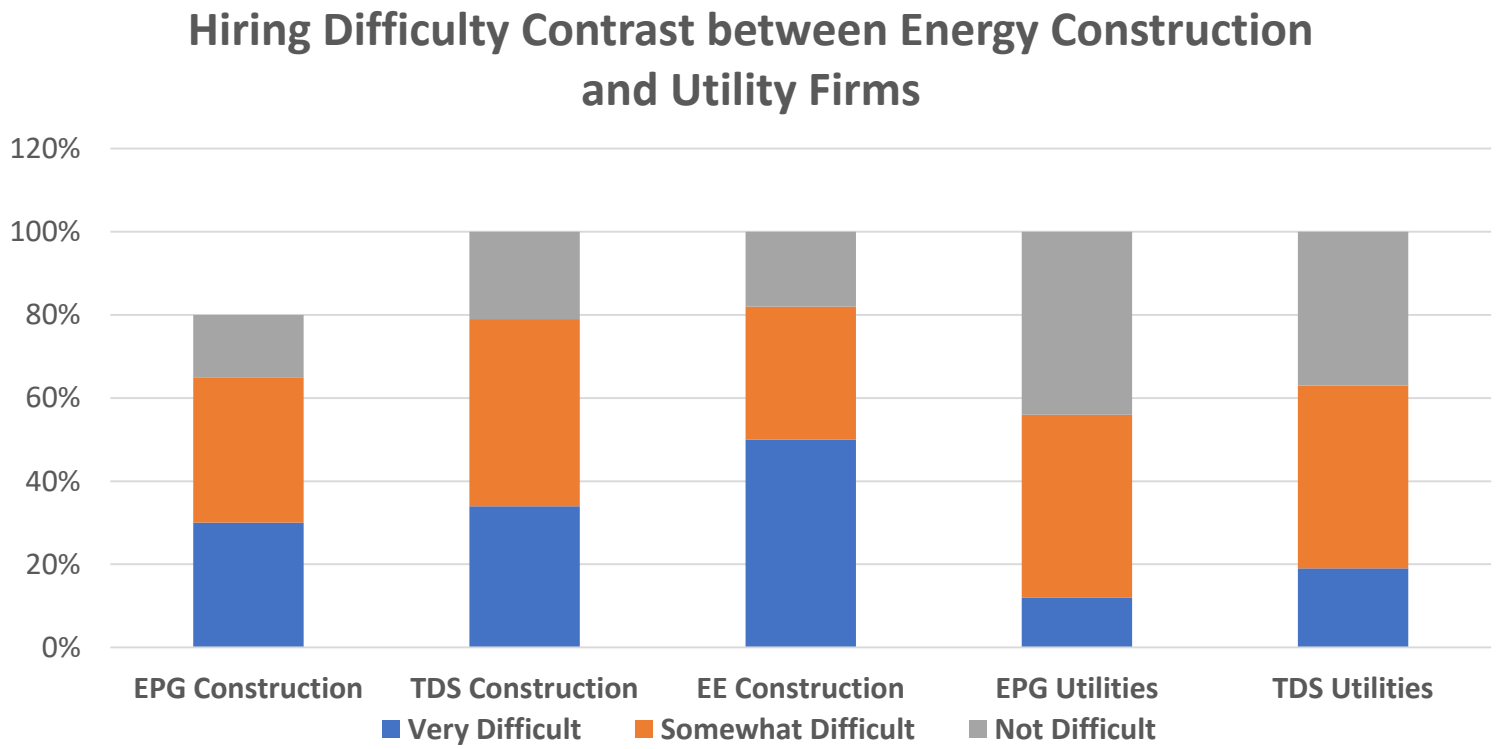
- **76.9% of all surveyed employers reported difficulty hiring qualified workers over the last 12 months; 29% noted it was very difficult.** (In 2017, these numbers were 70% and 26%)
- **Technologies and Occupations with the highest hiring difficulties:**
  - Energy Efficiency construction jobs, 52% very difficult, 84% somewhat difficult.
  - Professional and business services EE jobs, 82% very or somewhat difficult.
  - Battery storage employers, 92% very or somewhat difficult.
- **Highest Demand Occupations in EE Construction:**
  - Technician or mechanical support (42%)
  - Electricians (41%)
  - Installation (27%)

Executive Summary—Projected Hiring Rates

- **Employer projected hiring rates for 2019**:
  - **Energy Efficiency — 7.8% growth or 185,000 jobs** (74,000 in 2018)
  - **Electric Power Generation — 7.1% growth or 62,000 jobs** (-8,000 in 2018)
  - **Transmission, Wholesale Distribution and Storage — 3.2% growth or 44,000 jobs** (33,000 in 2018)
  - **Fuels — 3% growth or 34,000 jobs** projected for 2019 (52,000 job increase in 2018).
  - **Motor Vehicles — 2.2% growth or 56,000 jobs** (74,000 in 2018)

Executive Summary—Hiring Difficulties

- **76.9% of all surveyed employers reported difficulty hiring qualified workers over the last 12 months; 29% noted it was very difficult** (In 2017, these numbers were 70% and 26%).



Executive Summary—Workforce Demographics

- **Many of these sectors are now racially more diverse than the workforce as a whole** (22%).
  - 10–19% Latino or Hispanic compared to 17% overall.
  - 5–9% Black or African-American compared to 12% overall.
  - 7–10% 2 or more races compared to 2% overall.
  - EPG is the most diverse sector with 31% of the workforce people of color.
- **Women make up from 23–32%** of these sectors compared to 47% of the overall workforce.
  - Electric Power Generation employs the highest percentage of women.
- **Veterans comprise about 9–11%** of employees, compared to 6% nationally.
- **Unionization rates are generally higher than the national rate of 6.5% in the private sector, ranging from 3–16%.**

Thank you!

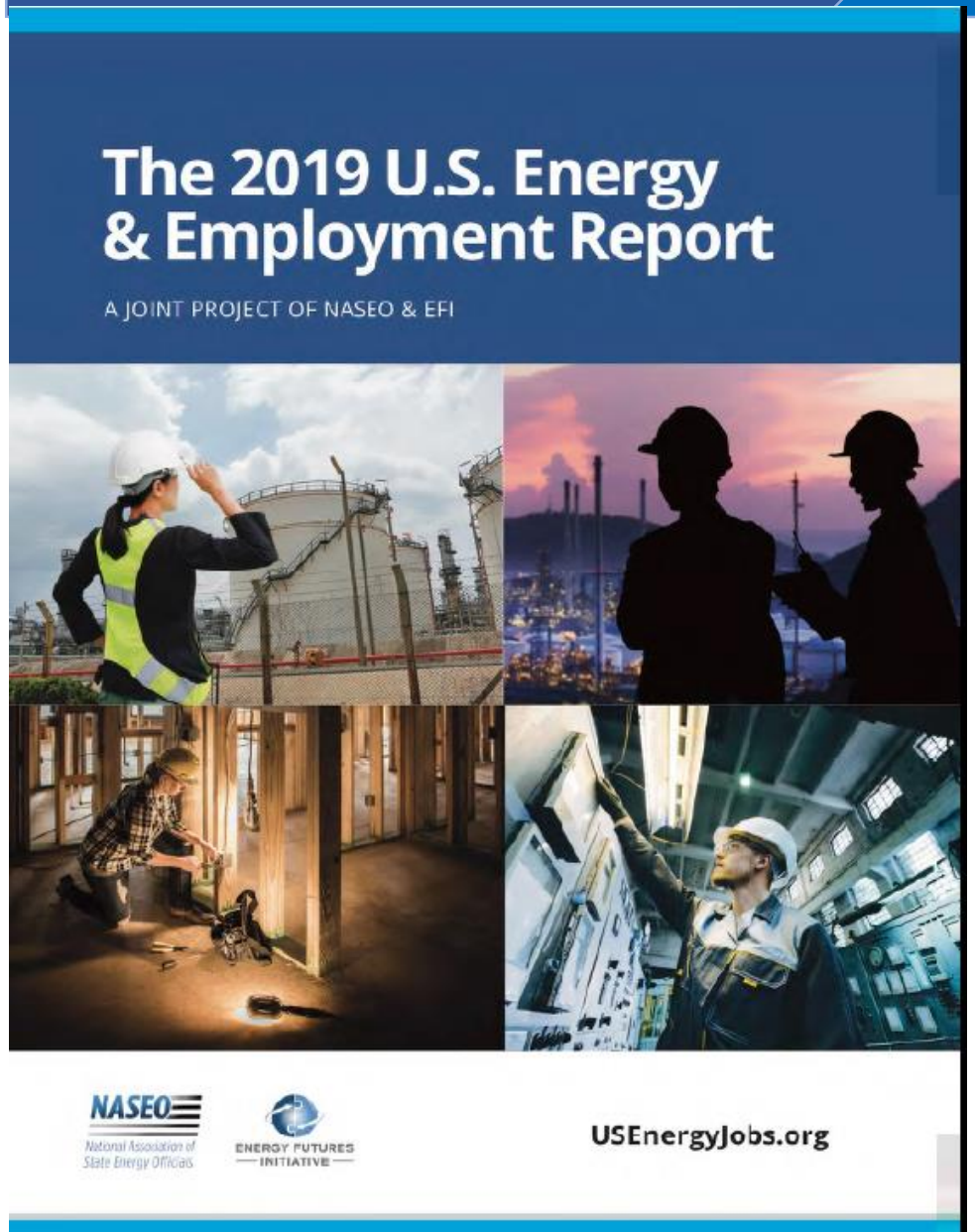
Questions?

For more information, contact:

- David Foster at dafoster@energyfuturesinitiative.org
- Sandy Fazeli at sfazeli@naseo.org

ENERGY FUTURES INITIATIVE

NASEO
National Association of State Energy Officials



2019 U.S. Energy and Employment Report

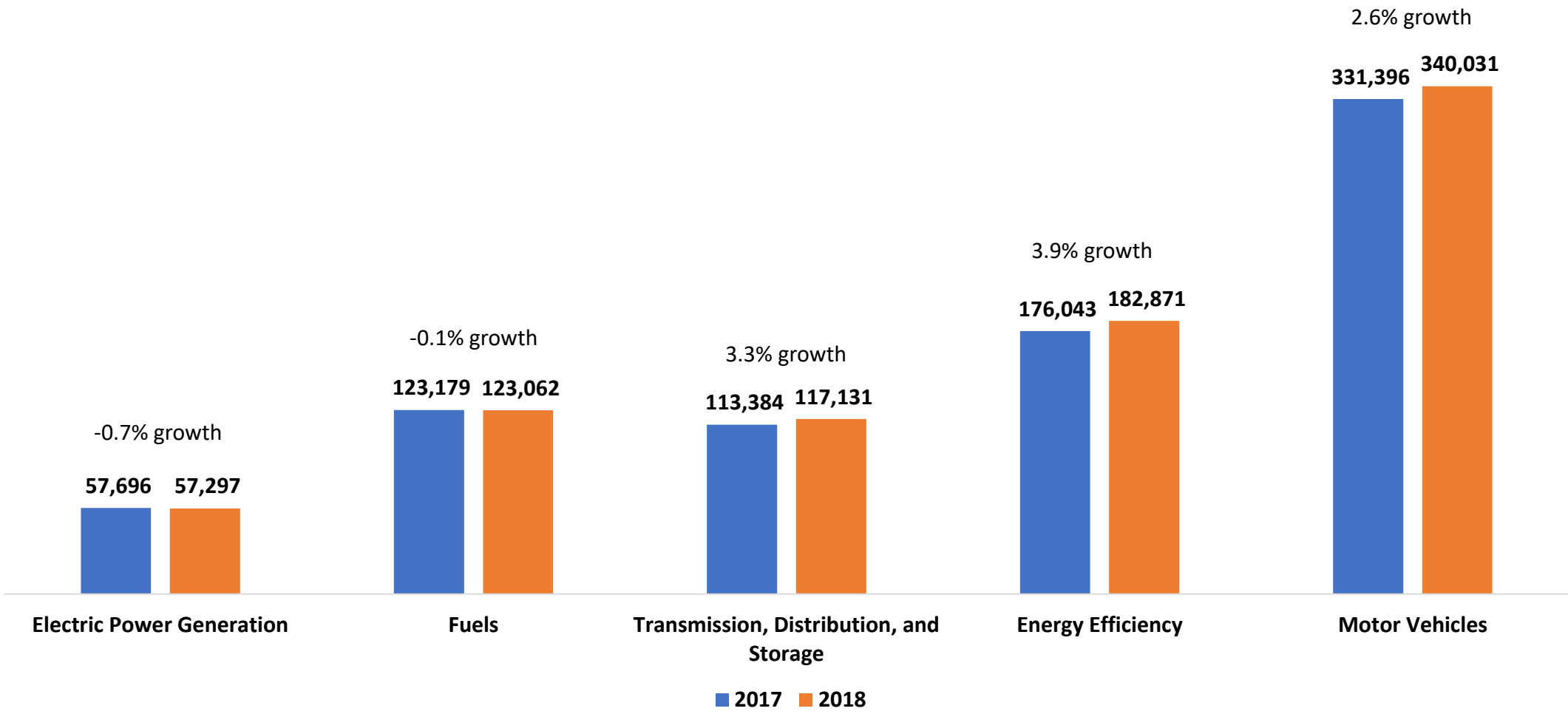
A Regional Look (PA, OH, WV, KY)

May 30, 2019
NETL Webinar

Philip Jordan VP and Principle Researcher
BW Research Partnership

2017-2018 Employment Growth in KY, OH, PA, and WV

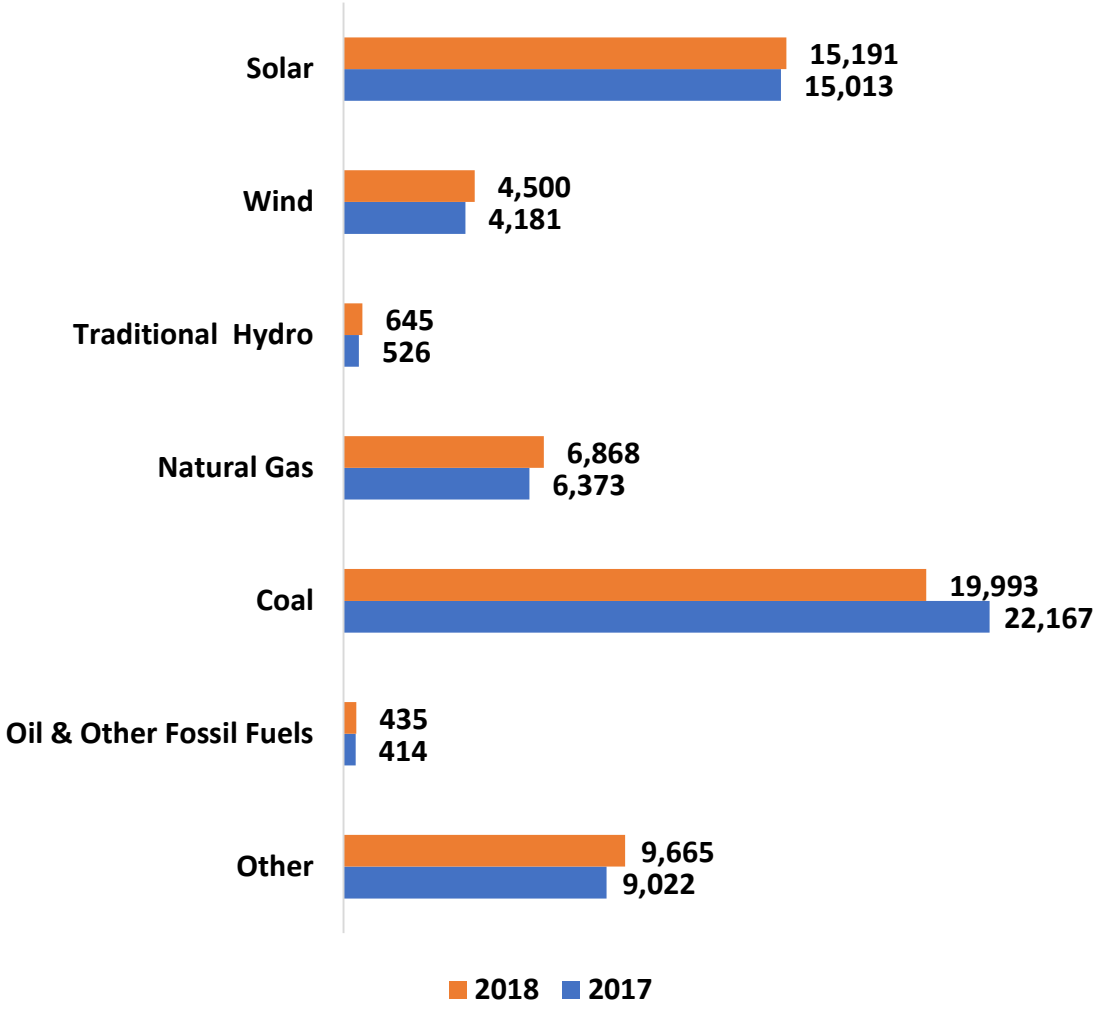
The region added more than 18,600 energy jobs (2.3% growth) between 2017 and 2018



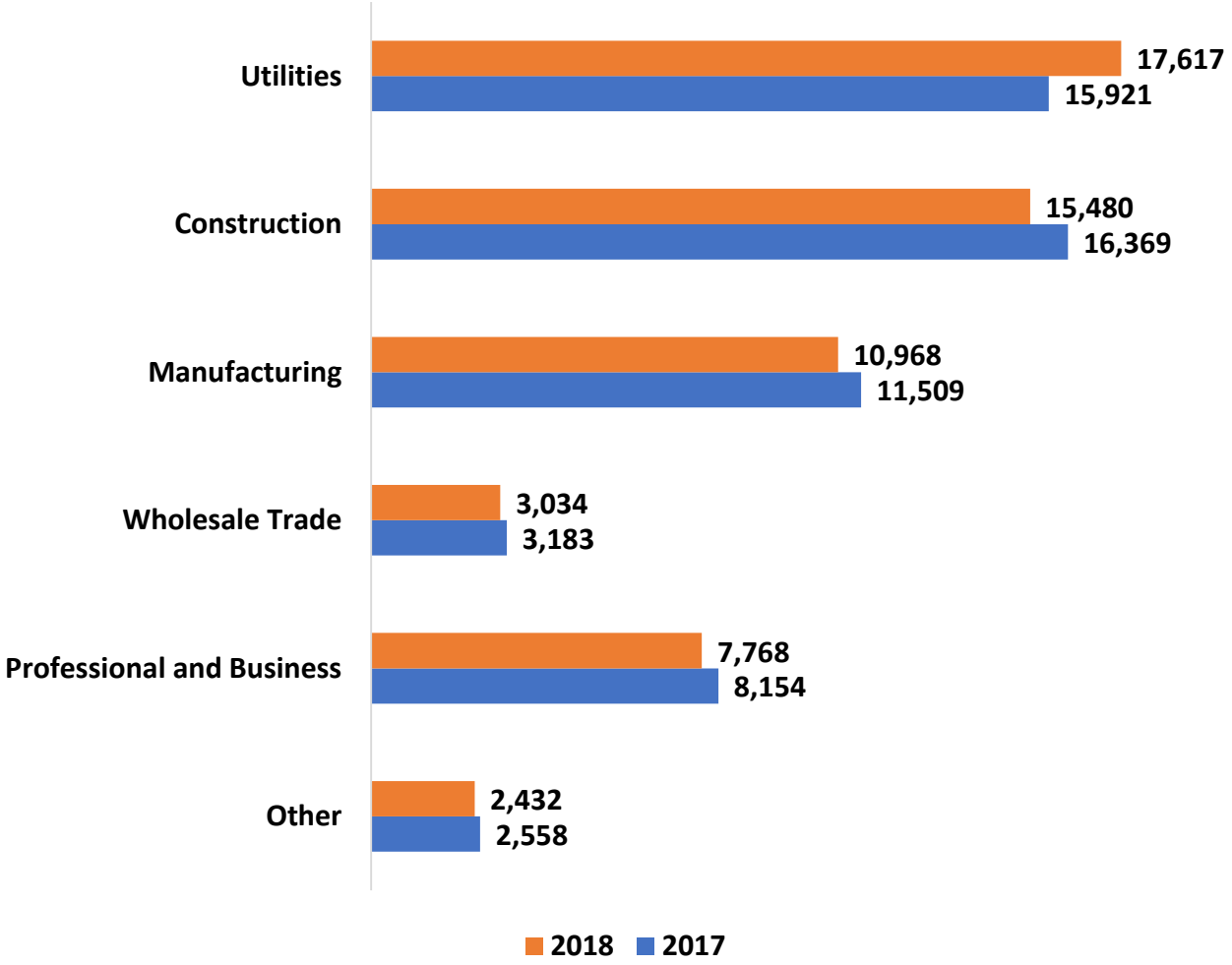
ENERGY FUTURES INITIATIVE

2017-2018 Employment Growth: EPG

Detailed Technology



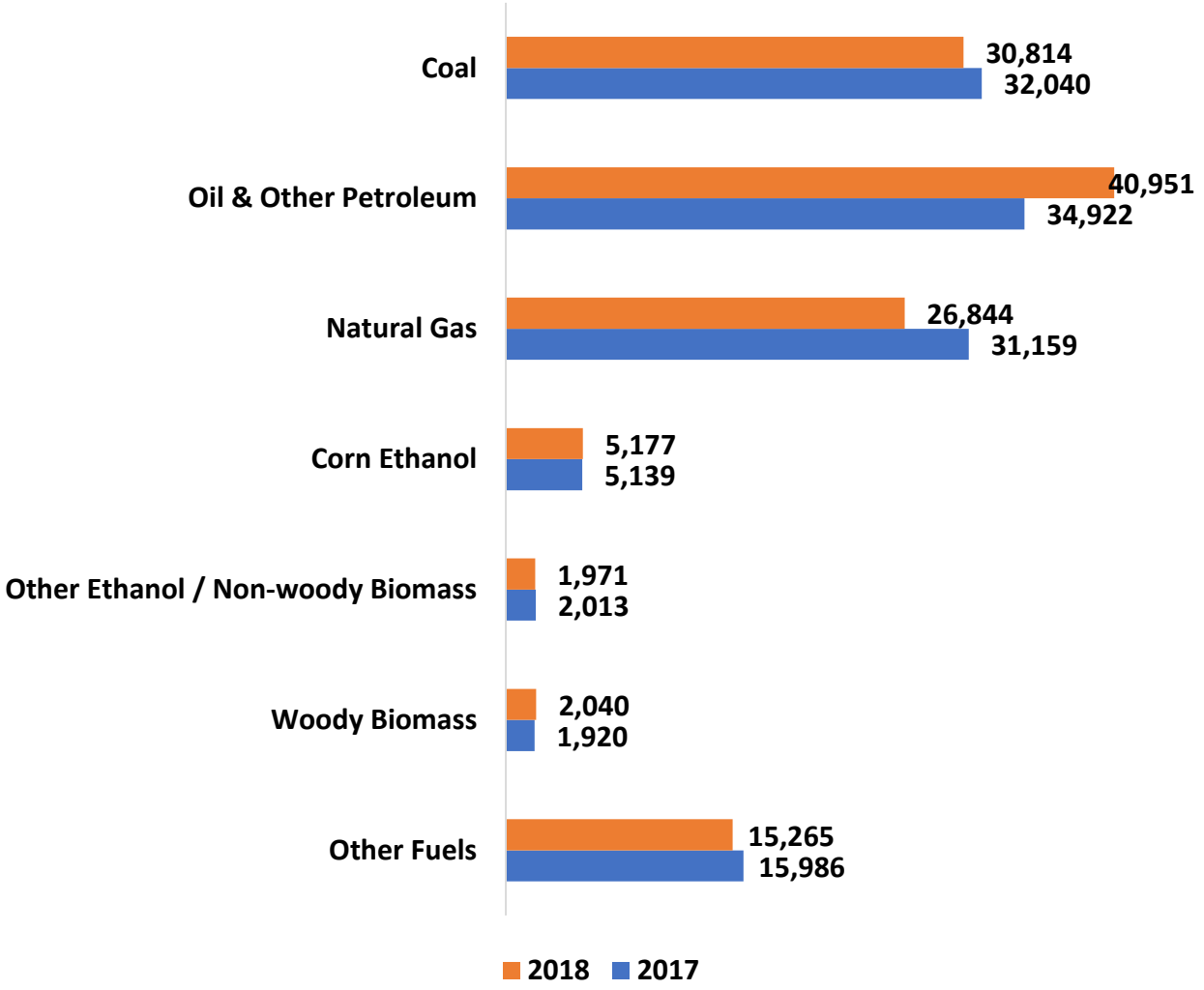
Industry



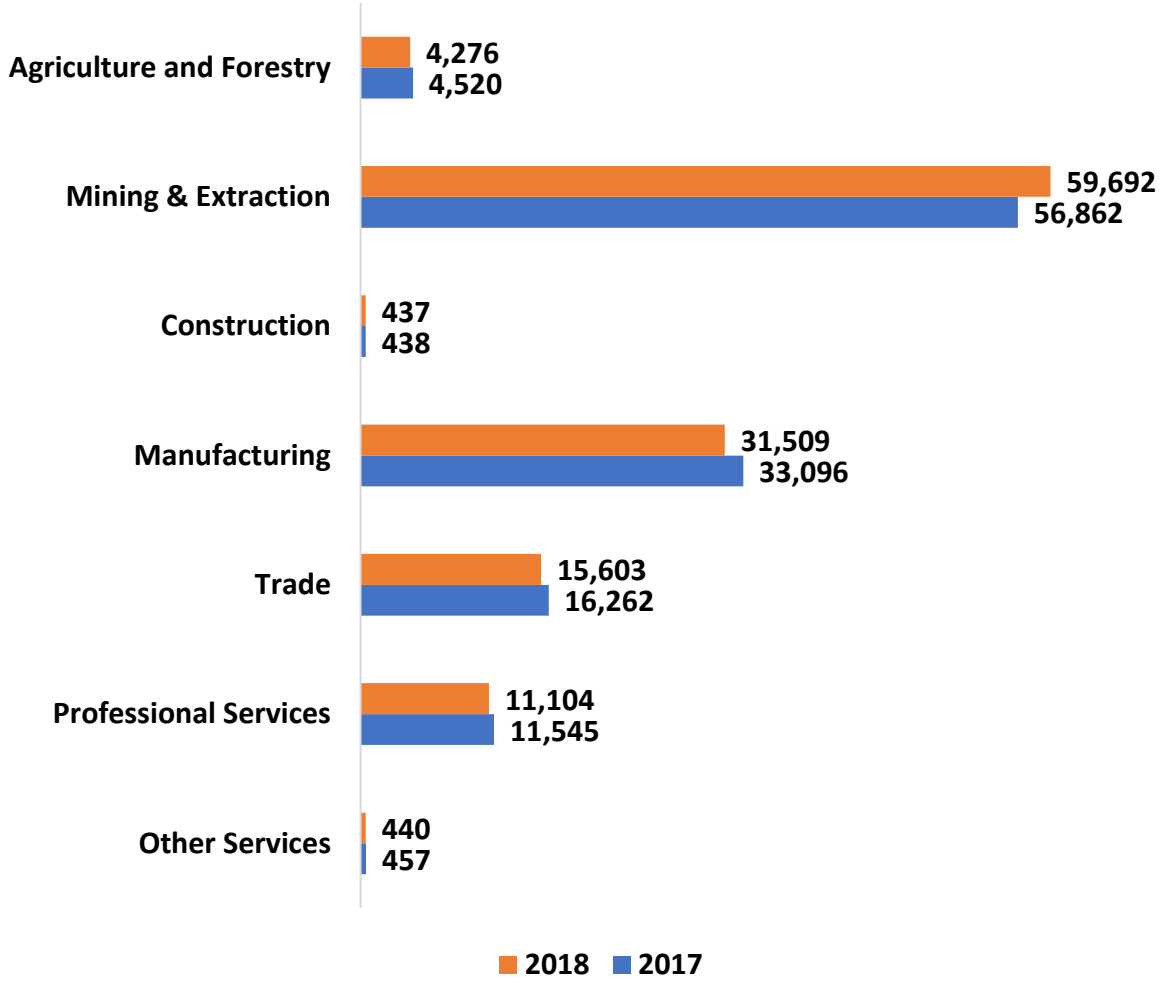
ENERGY FUTURES INITIATIVE

2017-2018 Employment Growth: Fuels

Detailed Technology

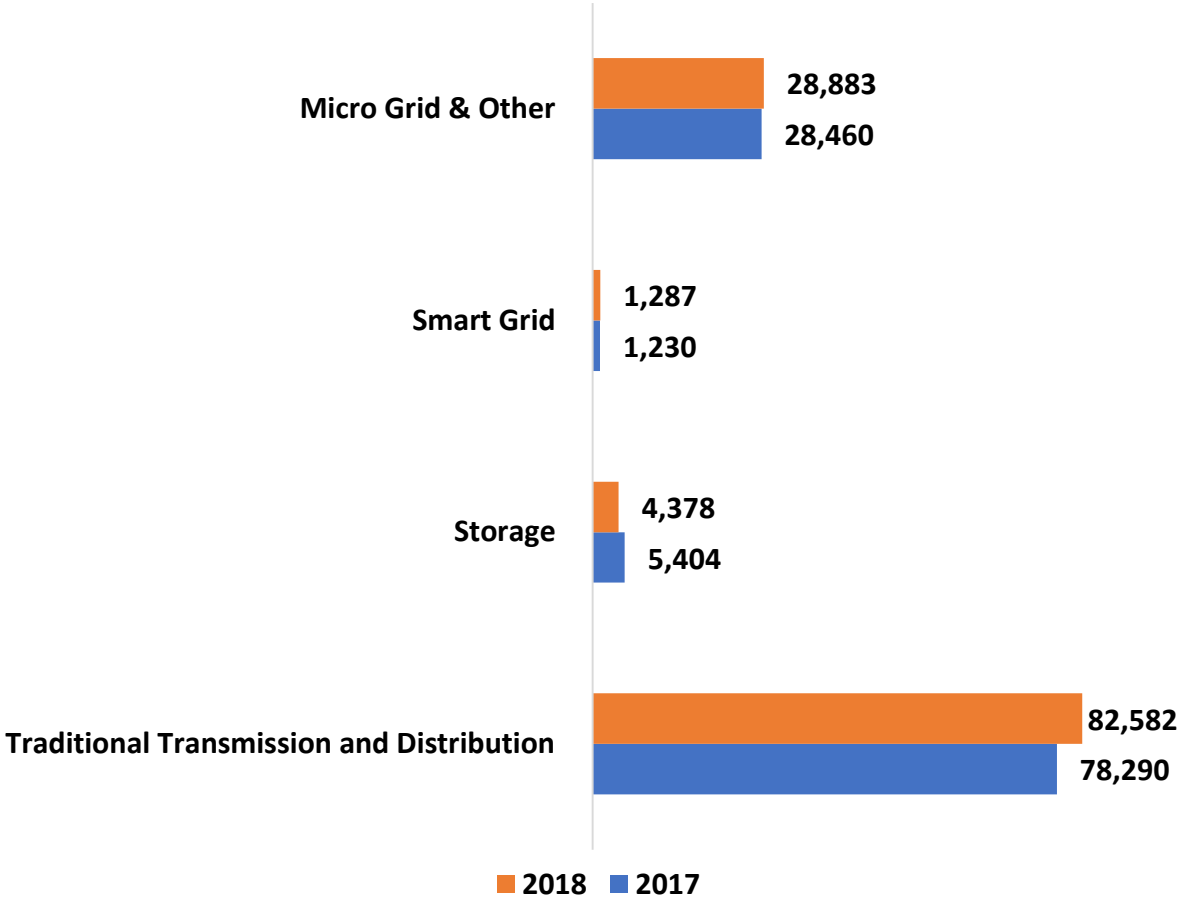


Industry

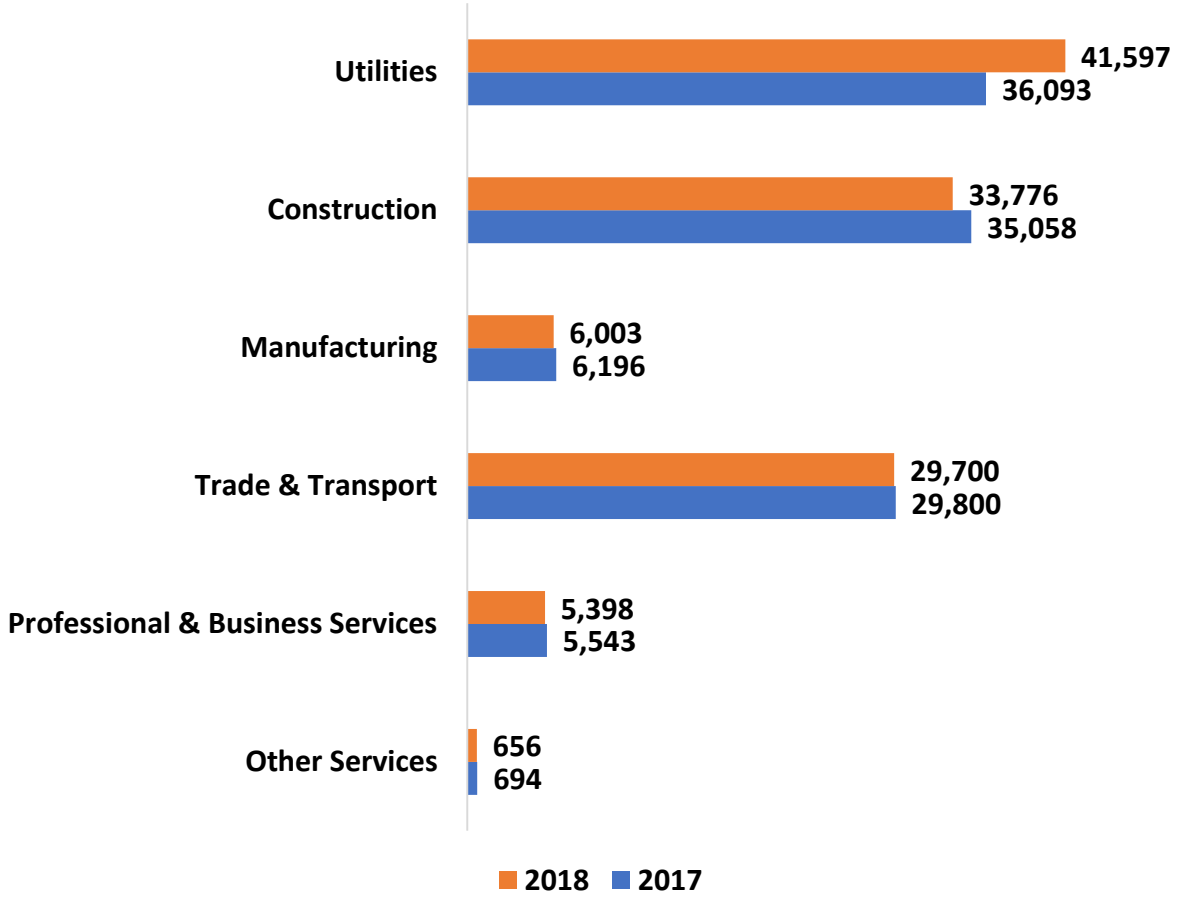


2017-2018 Employment Growth: TDS

Detailed Technology



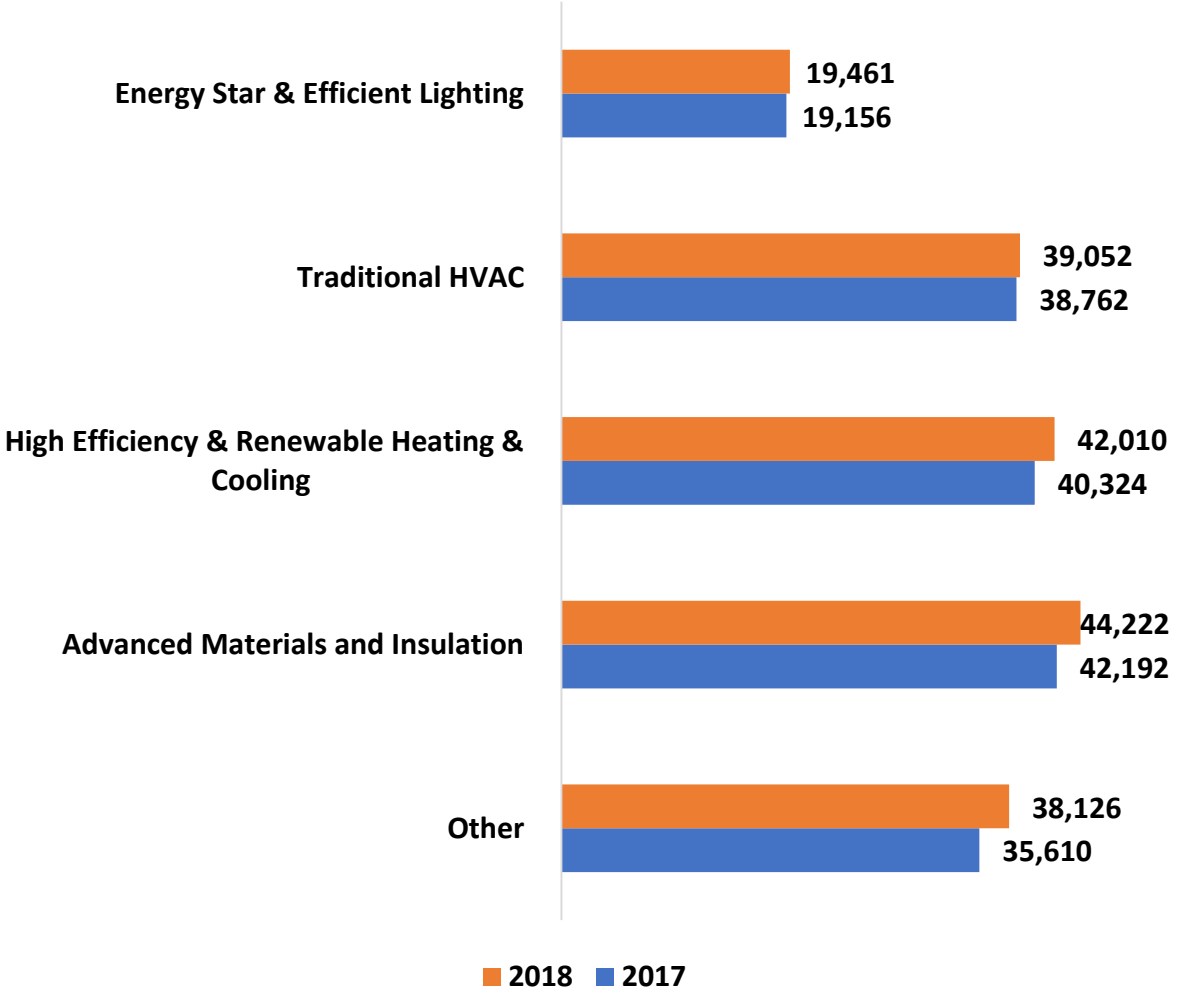
Industry



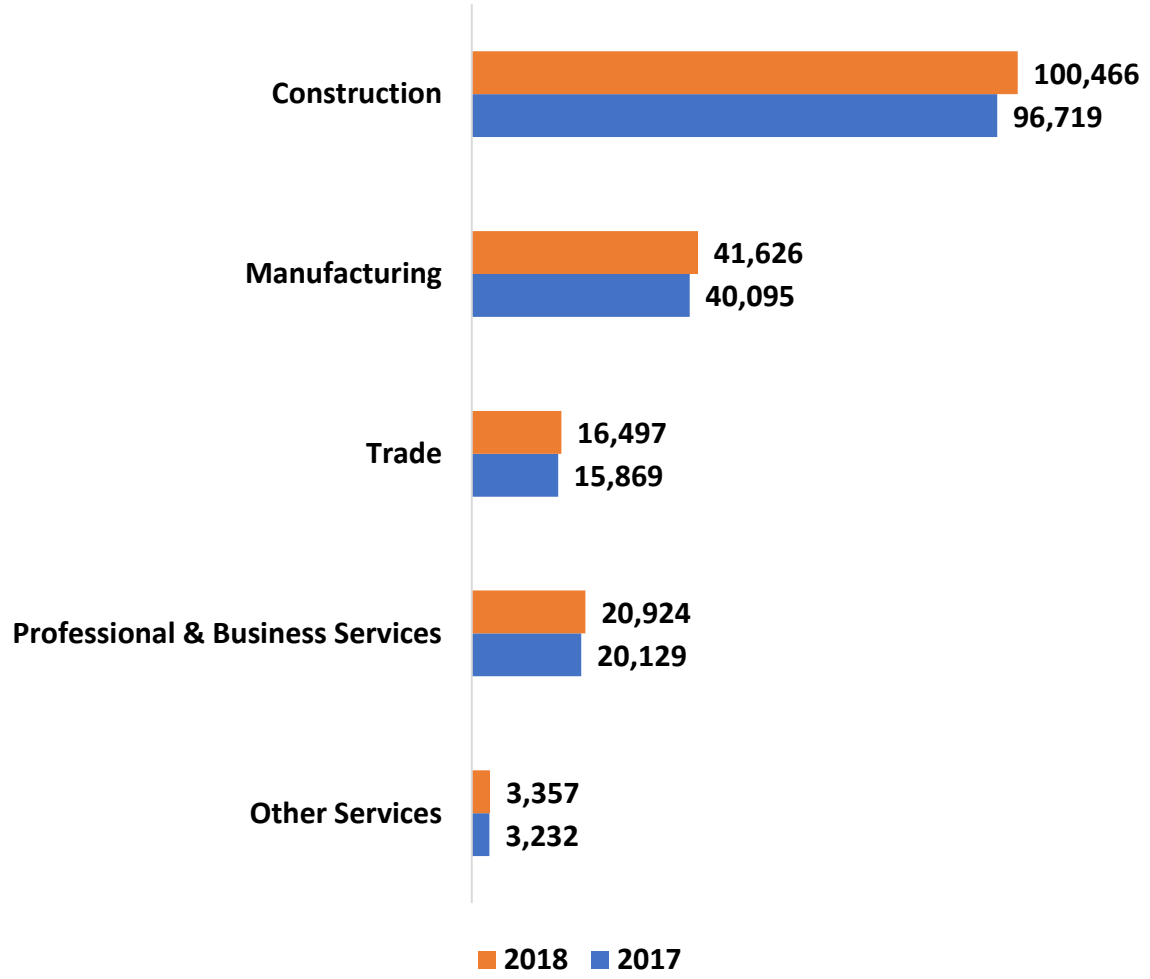
ENERGY FUTURES INITIATIVE

2017-2018 Employment Growth: EE

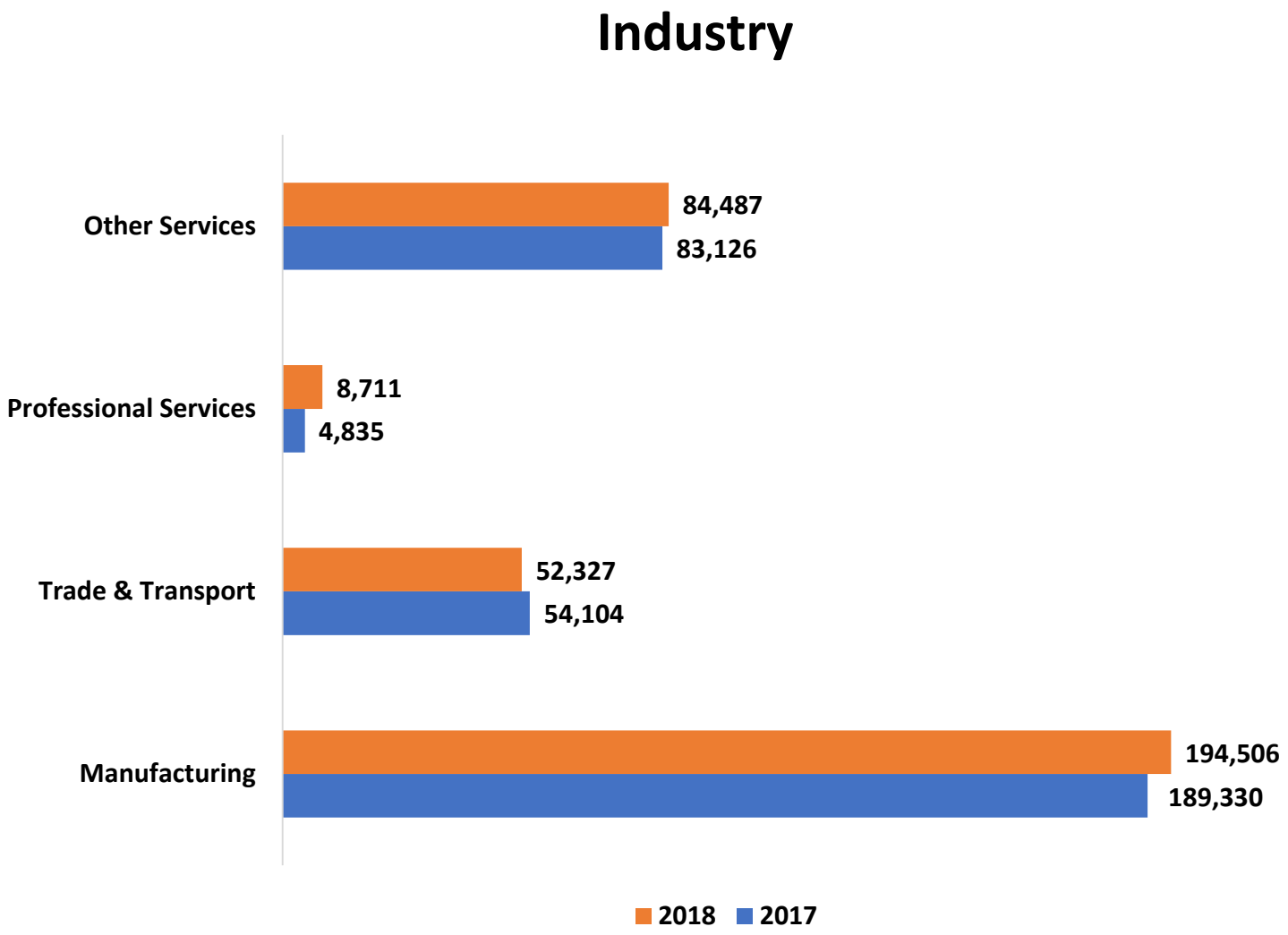
Detailed Technology



Industry



2017-2018 Employment Growth: MV



ENERGY FUTURES INITIATIVE

2019 USEER Supplemental Wage Survey

- 76 Total Occupations
- Measures Regional Differences
- Type of Employment (Permanent, Temporary, Full-Time, Part-Time)
- Entry-level, Average, and Highest Wages by Occupation
- Benefits Offered by Occupation (Health Insurance and Retirement)
- Identifies Feeder Occupations
- Identifies Advancement Occupations

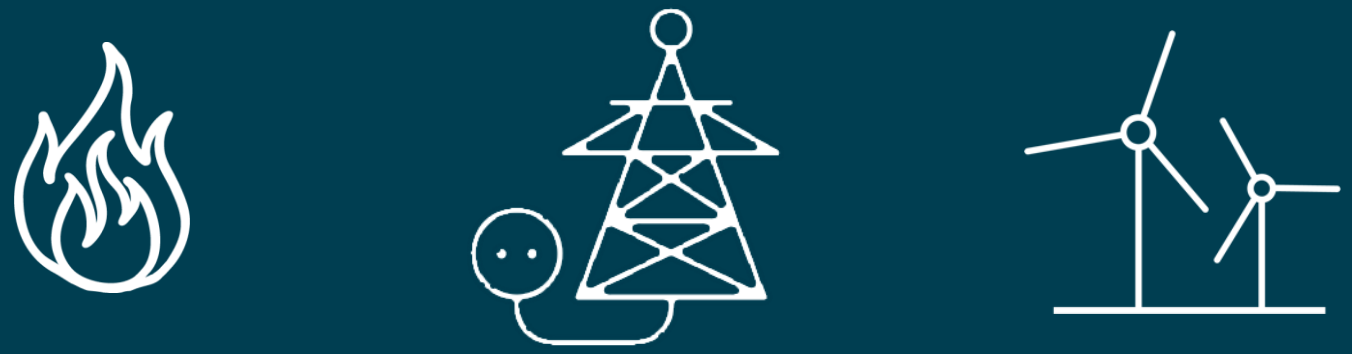
2018 USEER

Thank you!

Questions?

For more information, contact:

Philip Jordan — pjordan@bwresearch.com



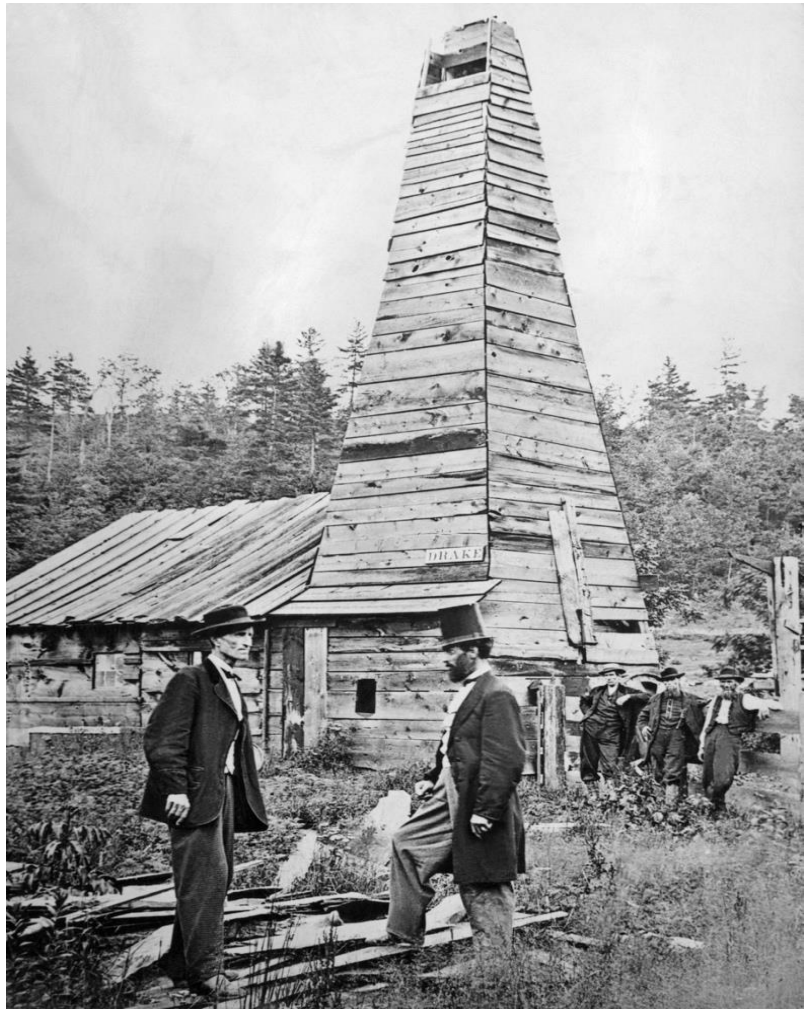
ENERGY IN PA

Diverse Resources Driving Energy Independence

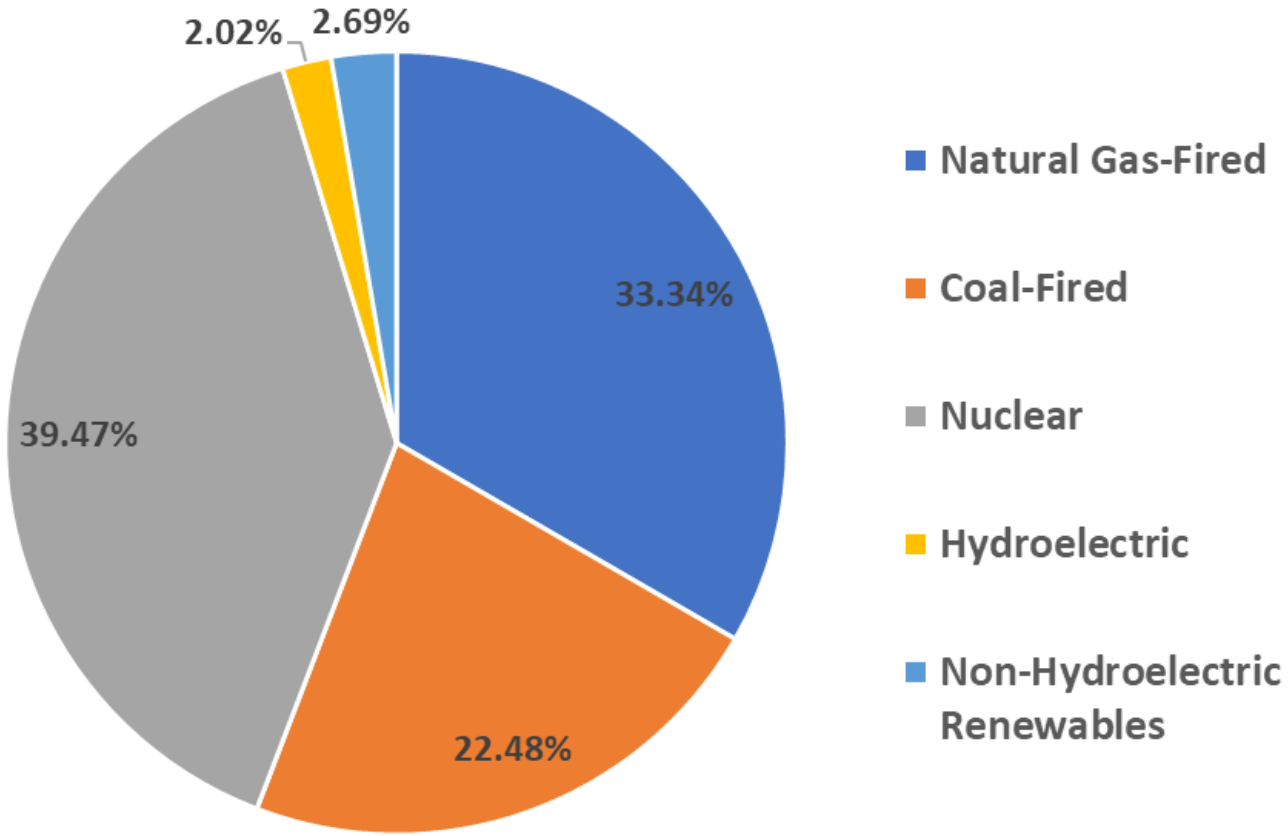
Denise Brinley
Executive Director
Governor's Office of Energy

PENNSYLVANIA ENERGY PRODUCTION

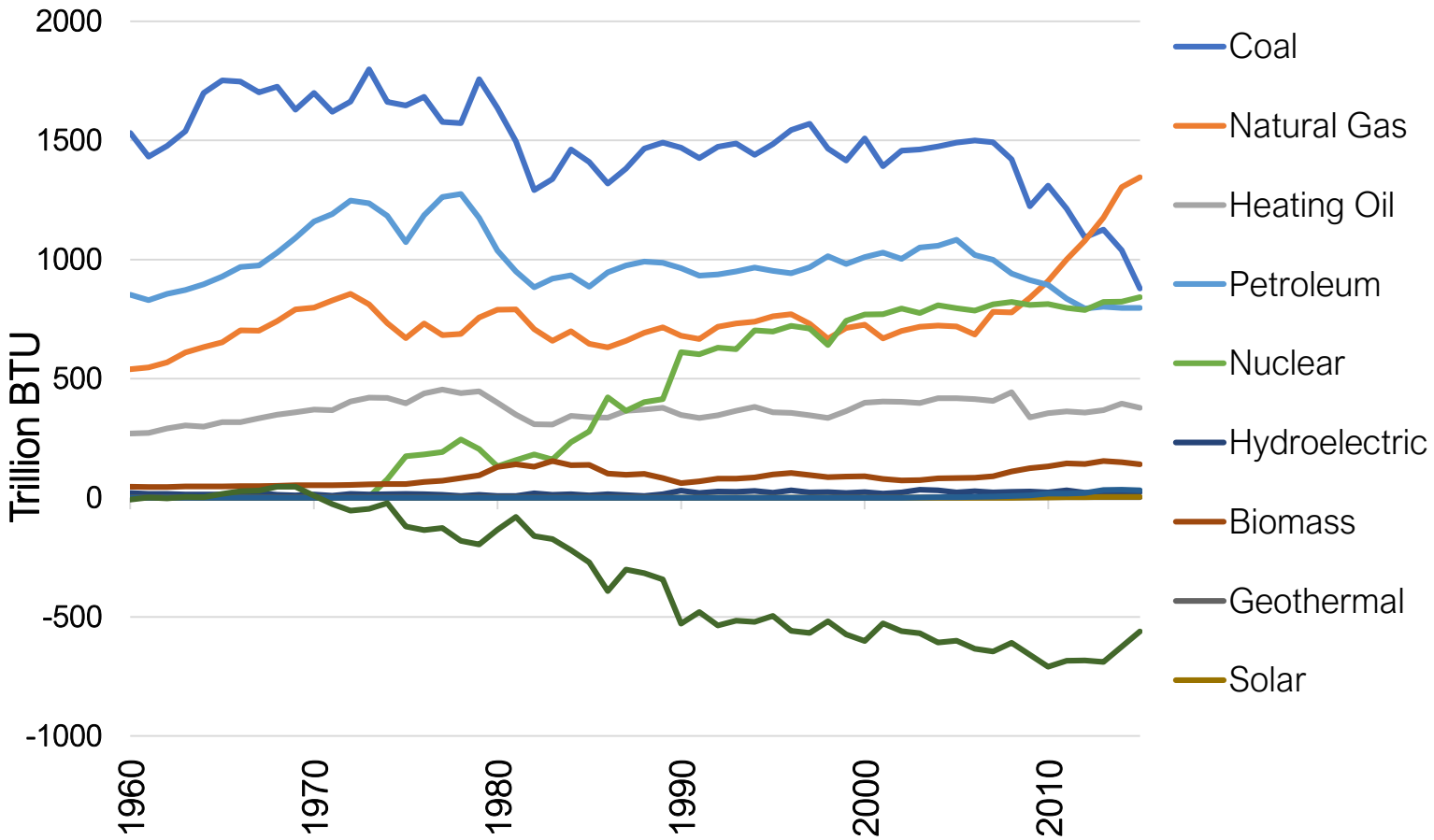
PENNSYLVANIA: PIONEERS IN ENERGY



PENNSYLVANIA'S ELECTRICITY GENERATION: DECEMBER 2018



PENNSYLVANIA'S ENERGY CONSUMPTION: 1960-2015



Source: EIA Total End Use Energy Consumption Estimates for Pennsylvania

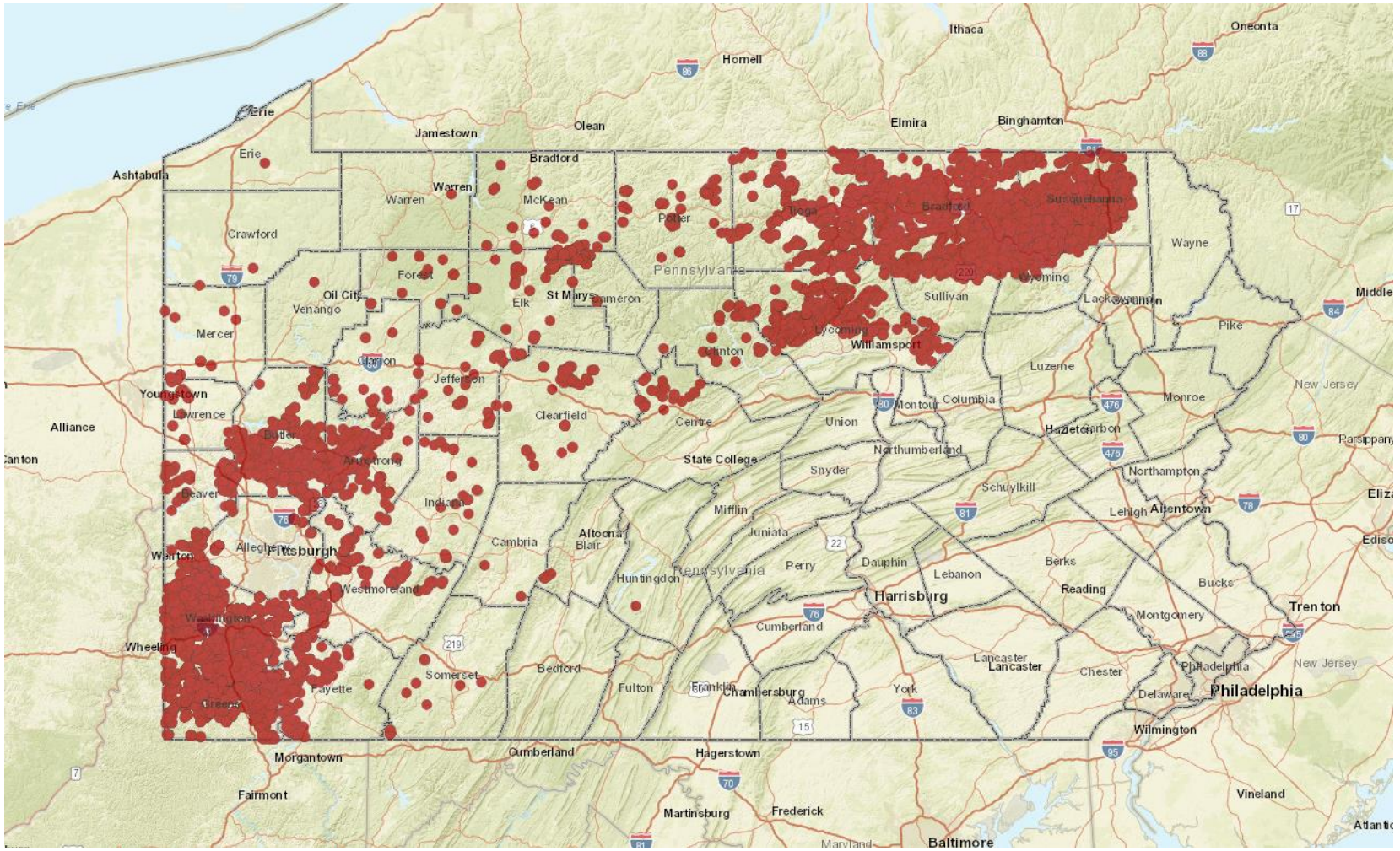
- Coal is decreasing
- Natural gas is increasing
- Nuclear is flat
- Solar is flat

Pennsylvania is a net energy exporter

24% exported in 2018

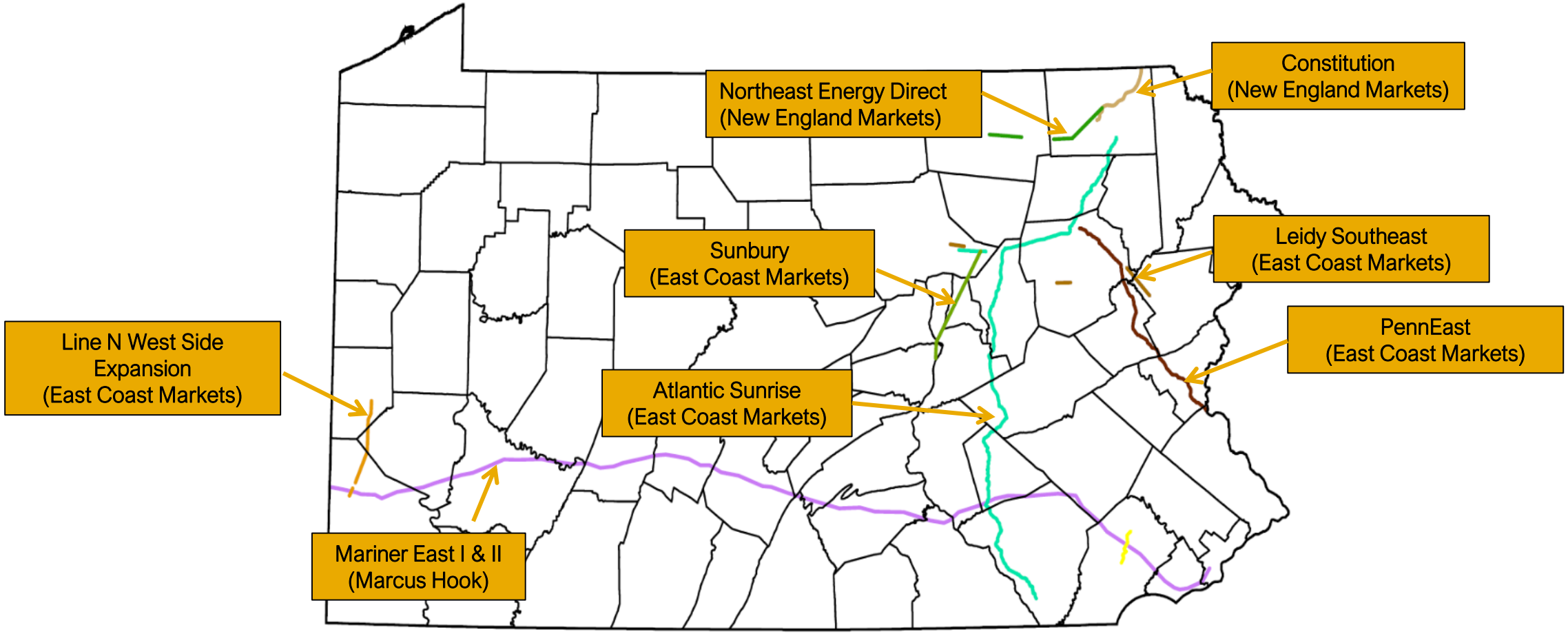
PENNSYLVANIA AND THE SURPRISE OF NATURAL GAS

PENNSYLVANIA NATURAL GAS DRILLING & PRODUCTION: 2008–2018



11,000+ unconventional wells

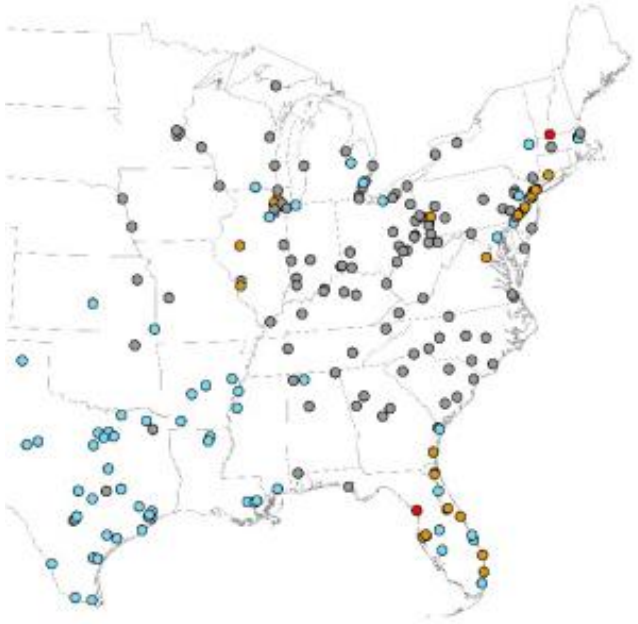
PIPELINE DEVELOPMENT — $10 BILLION



Note: Map is generated from ArcGIS Online and the lines are approximations and generalizations.

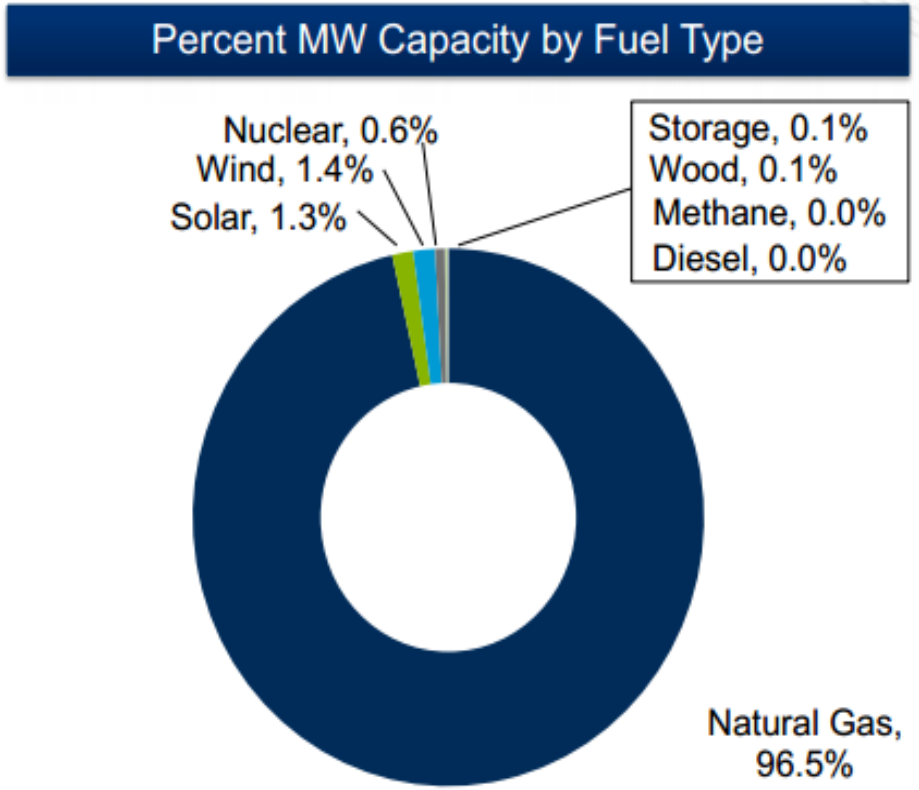
TRANSITIONING FROM COAL TO NATURAL GAS

Power Plant Retirements 2000–2015



Source: Decommissioning U.S. Power Plants — Decisions, Costs, and Key Issues, Resources for the Future, October 2017

Natural gas represents approximately 97 percent of new interconnection requests in Pennsylvania.

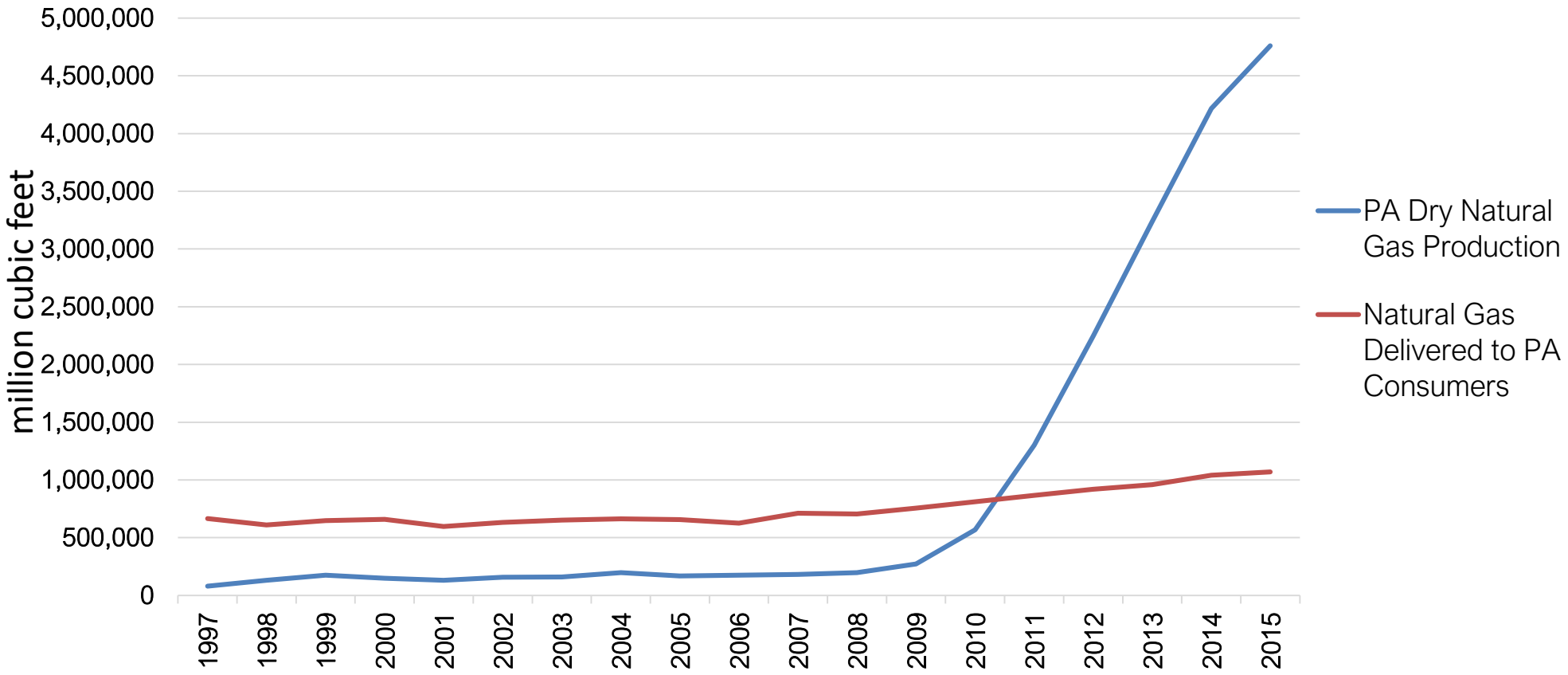


COMBINED CYCLE NATURAL GAS POWER PLANTS

Panda Power Funds Commissions Nation's First Marcellus Shale Gas Power Plant — 829 MW

- First new generating station sited on Marcellus Shale gas formation will power up to 1M homes
- Supports long-term market for PA natural gas royalty owners

PENNSYLVANIA'S NATURAL GAS CONSUMPTION: 1997–2015

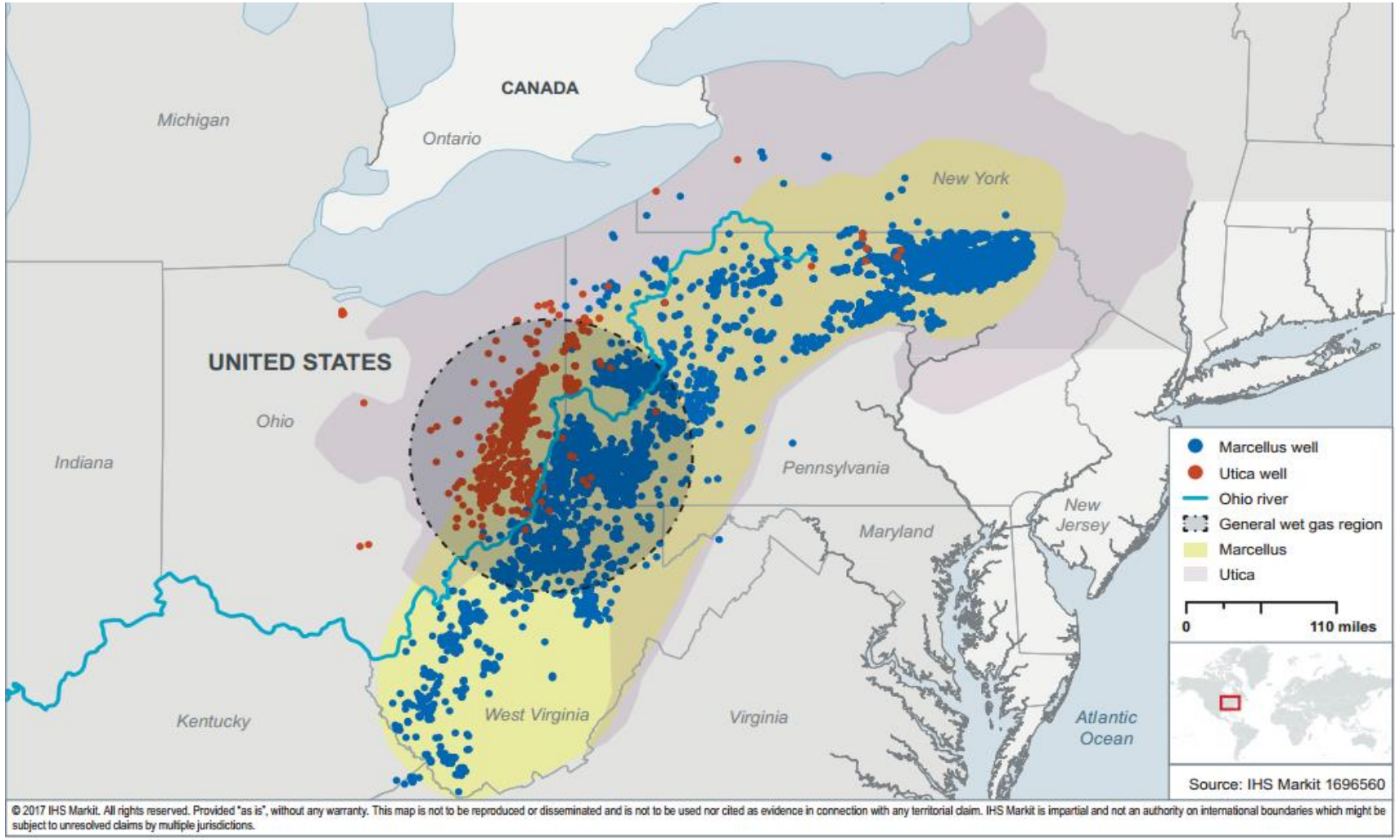


Source: EIA Natural Gas Summary Data for Pennsylvania

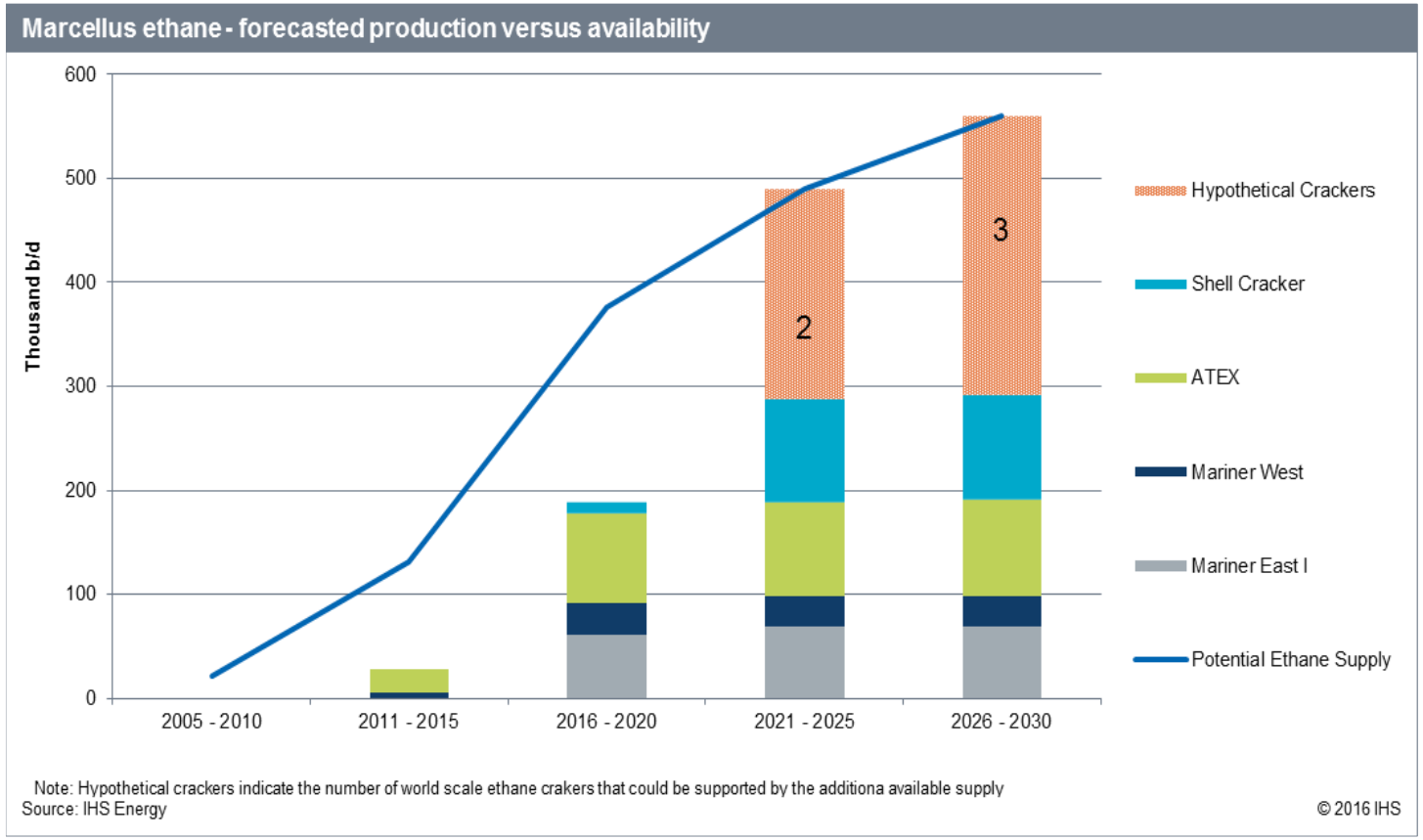
Beginning in 2010, production dramatically outpaces consumption

NATURAL GAS LIQUIDS (NGLS)

ABUNDANT NATURAL GAS LIQUIDS



IHS MARKIT REPORT (March 2017)



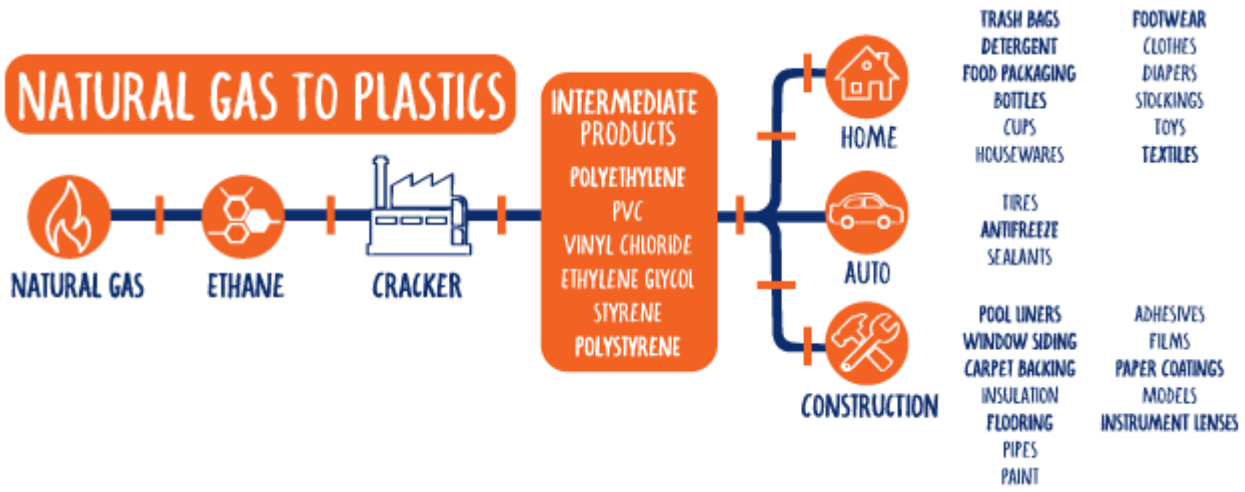
PA's IHS Markit Report estimates enough ethane remaining in the Marcellus to support **three** additional world-scale ethane crackers.

There is enough ethane in the Utica to support **one** additional ethane cracker.

NGLs to PLASTICS

Fully Integrated

Pennsylvania is uniquely positioned as an emerging petrochemical hub with an already-established, strong plastics industry, a combination not found in any other region of the U.S.



- 7th largest in plastics manufacturing in U.S.
- 2nd largest in plastics manufacturing in Appalachian region
- Expected to produce 40% of U.S. natural gas and NGL by 2030
- Globally cost-competitive ethane and propane
- Among top industries for FDI into PA

SHELL PENNSYLANIA CHEMICALS

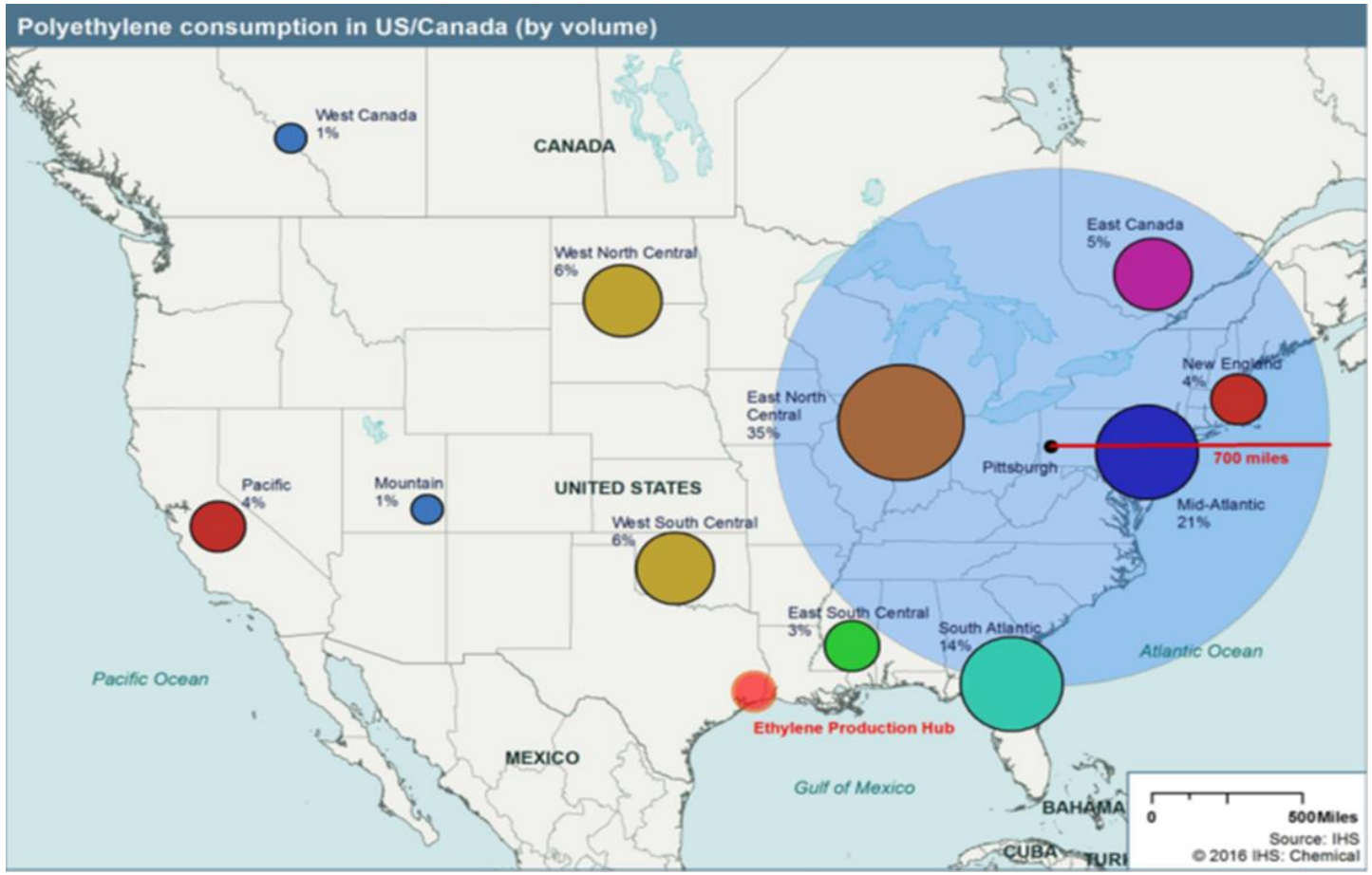
An Ethane Cracker Plant in Southwestern Pennsylvania

SHELL SAID YES TO PA

In 2016, Royal Dutch Shell announced it was building a $6B chemical plant in western Pennsylvania.

This game-changing plant will create thousands of jobs in Pennsylvania while expanding and creating market opportunities for downstream manufacturing and job creation.

WHY DID SHELL CHOOSE PA?



4 Critical Factors:

- Abundant inexpensive ethane
- Proximity to 70% of North American polyethylene customers
- Incentives
- Intensive state, regional, and local collaboration

HOW WILL IT IMPACT PA'S ECONOMY?

- 6,000 construction jobs
- 600 full-time permanent jobs
- Supplies robust, low-cost polyethylene feedstock for downstream market

SHELL OPPORTUNITIES

According to Shell, future jobs at the plant will fall into three main categories:

- Maintenance
- Operations
- Management

PA'S WORKFORCE RESPONDS TO THE TASK

TEAM CONSORTIUM
TRI-STATE ENERGY & ADVANCED MANUFACTURING
OHIO ◆ PENNSYLVANIA ◆ WEST VIRGINIA

University of Pittsburgh Johnstown

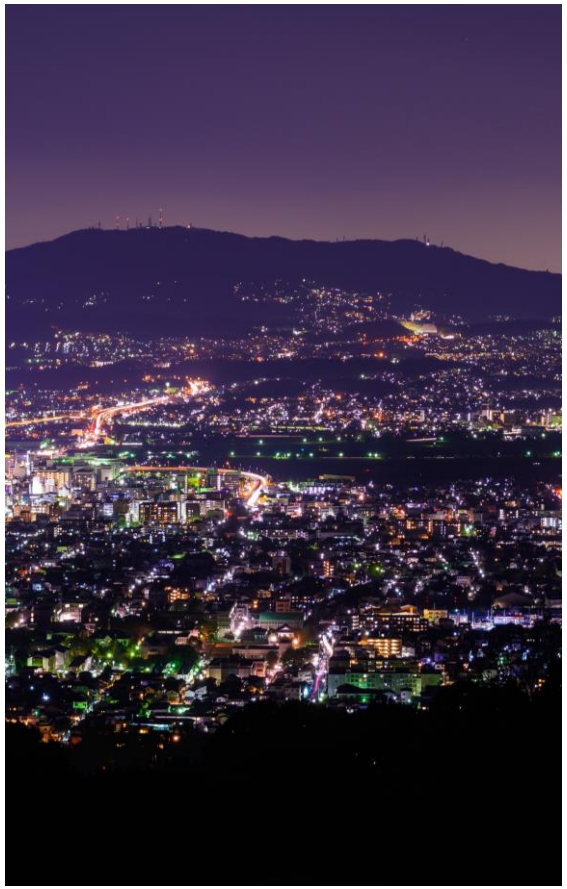
CCBC Community College of Beaver County

CATALYST CONNECTION
Your Strategic Partner for Manufacturing Growth

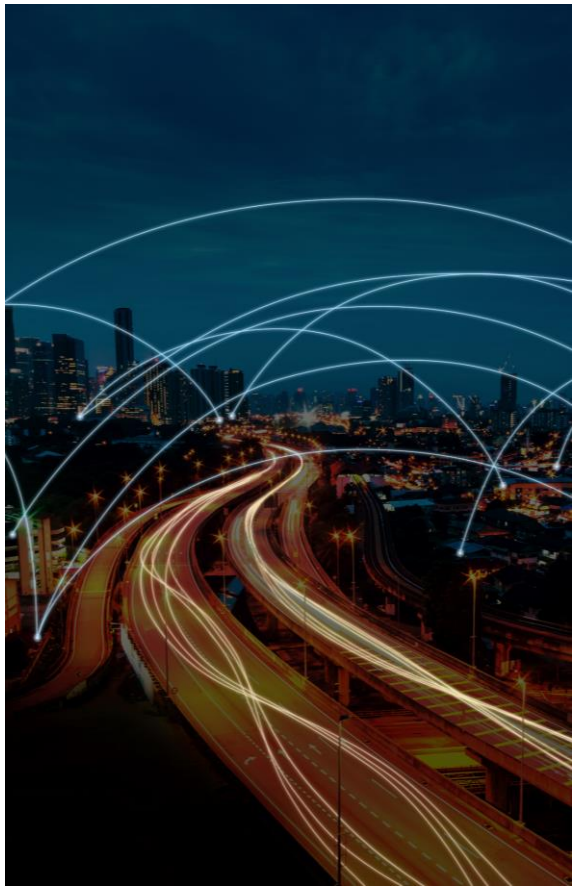
In the interim before the plant reaches full operation, programs like these will help prepare our workers for the unique requirements of the new plant.

THE FUTURE: DISTRIBUTED ENERGY & RENEWABLES

RETHINKING THE ENERGY SYSTEM



Centralized vs.
Distributed Power?

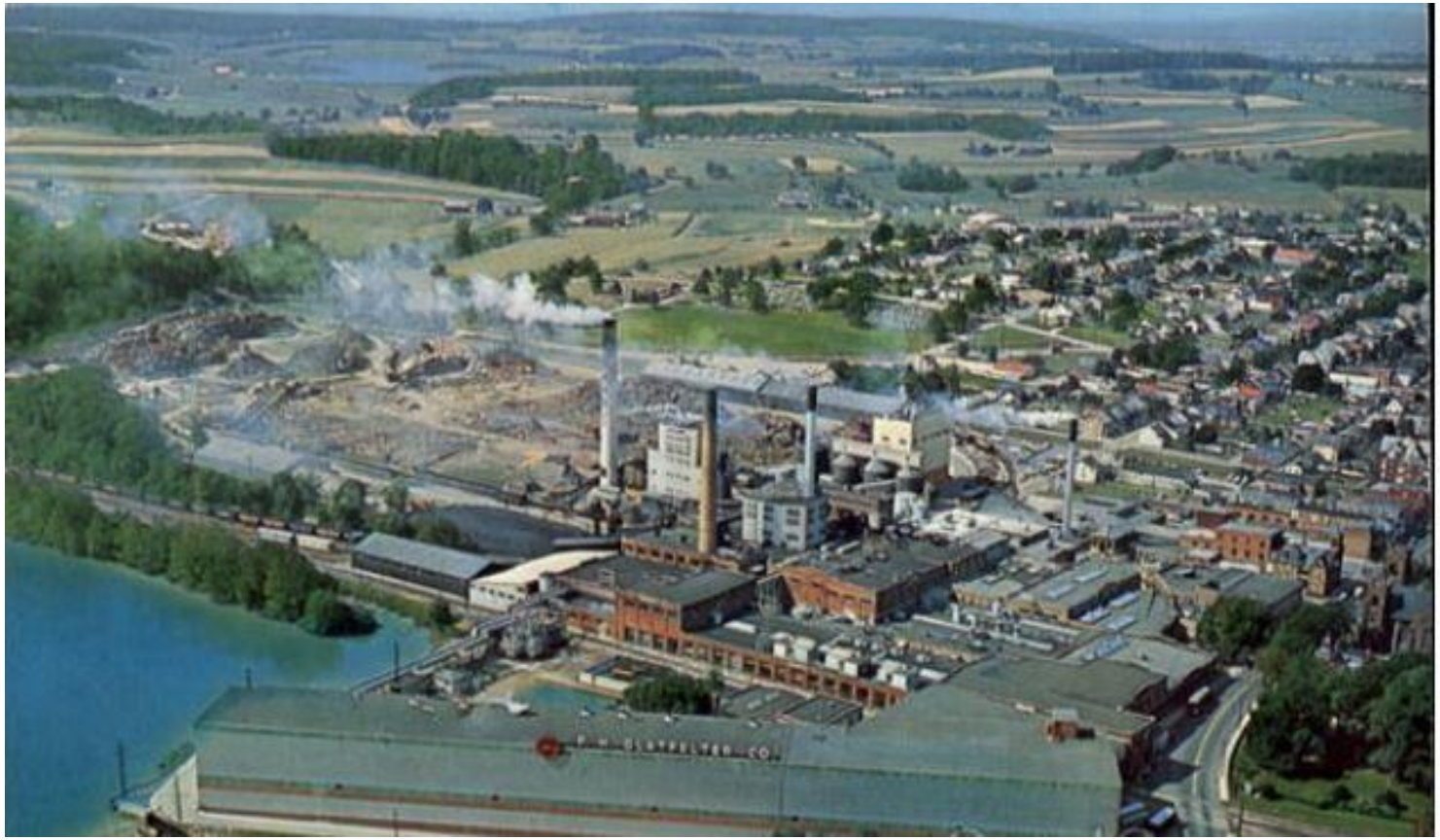


Microgrids?

LOCAL USE — MEHOOPANY, PA

- Proctor & Gamble's largest manufacturing facility in the world
- CHP an effort to save money and reduce CO_2 emissions
- 64 MW of electricity
- Gross savings of $16.5 million per year
- Reduced CO_2 emissions of 850 tons per year

LOCAL USE — YORK, PA



- P.H. Glatfelter completed $63 million in renovations to convert from coal to natural gas
- Global leader in manufacturing of specialty papers
- State assistance played role in conversion ($8 million)

RENEWABLES

Pennsylvania's Solar Future Plan

Promoting 10% in-state generation of solar by 2030

Anticipated 60,000 construction jobs (Installation, O&M)

Manufacturing of panels and electrical parts occurs elsewhere

THANK YOU!

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Pennsylvania
WORK SMART. LIVE HAPPY.

Thank you for your participation

2019 U.S. Energy Jobs and Employment Report Briefing Webinar

A presentation on regional and national energy & advanced manufacturing jobs and workforce data from the 2019 USEER Report

Thursday, May 30th, 2019 1-2 PM ET

Slides will be posted on

netl.doe.gov/rwfi on the Webinar Archive Section

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Disclaimer: The analysis presented and conclusions drawn herein represent solely those views of the author(s), and do not represent the views of the United States Department of Energy

ENERGY FUTURES INITIATIVE

Back Up Slides

- Methodology
- Additions to the 2019 USEER

ENERGY FUTURES INITIATIVE

How Is the USEER Survey Administered?

- A national supplemental survey that tracks existing BLS QCEW data
  - QCEW is compiled from unemployment records collected at the state level and then aggregated into 1,057 industry sectors using the North American Industrial Classification System (NAICS)
- The survey is administered to a representative sample of 30,000 employers by phone and internet. Results are integrated with QCEW data.
- Analyzes four sectors
  1. Electric Power Generation and Fuels Production
  2. Electric Power and Fuels Transmission, Distribution, and Storage
  3. Energy Efficiency
  4. Motor Vehicles

ENERGY FUTURES INITIATIVE

2017 — Some Examples of Undercounting

Electric Power Generation: National

Fuel Source	QCEW-BLS	2017 USEER
Fossil fuels	92,817	187,117
Nuclear	44,753	68,176
Wind	6,050	101,738
Solar	2,708	260,077
CHP	1,649	18,034
Hydro	17,501	65,554
Geothermal	1,117	5,768
Biomass	1,693	26,014

Electric Power Generation: New York

Fuel Source	QCEW-BLS	2017 USEER
Fossil fuels	2,080	5,030
Nuclear	2,991	n/a
Wind	97	2,855
Solar	61	12,411
CHP	n/a	n/a
Hydro	1,045	5,859
Geothermal	n/a	n/a
Biomass	n/a	3,325

What Is the USEER?

- The U.S. Energy and Employment Report (USEER) is produced annually from a supplemental survey of employers with energy sector employment.
  - Based on the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW).
  - Developed at DOE in 2015 with review and approval of BLS and the Energy Information Administration.
  - Issued twice by DOE, in 2016 and 2017, with data collected in the Q4 of the preceding year.
- In Q3, 2017, DOE acknowledged it would not conduct the USEER survey or issue the 2018 USEER.
- In October, 2017, NASEO, and EFI announced an effort to raise private funding, hire BW Research (who held the DOE contract), conduct the Q4 2017 survey and produce the 2018 USEER.

Continuity with Previous Editions of USEER

- The survey instrument in the 2018 USEER and underlying methodology is identical to that used in the primary data collected on behalf of the United States Department of Energy (OMB Control No. 1910-5179) for the 2017 U.S. Energy and Employment Report and secondary data from the United States Department of Labor's Quarterly Census of Employment and Wages for Q2 of 2017.

- Data collection was performed in Q4 2017 to provide accurate year-over-year job comparisons with the 2016 and 2017 USEERs.

USEER Addresses Gaps in Job Numbers

The USEER addresses three gaps in current BLS QCEW energy employment data:

1. Business activities essential to the operation of traditional energy companies, but classified in other industry sectors.
   - Full-time contractor maintenance workers at nuclear plants classified as construction workers.
   - Outside contractors who have displaced utility in-house construction crews.

2. Renewable energy jobs such as wind, solar, geothermal, etc.;
   - Residential PV installers, classified as construction electricians or roofers.
   - Wind development professionals working for non-utility firms.

3. Energy efficiency jobs;
   - No differentiation between employees producing or installing high efficiency, Energy Star, and non-Energy Star products.

USEER Technologies

Electric Power Gen.	Fuels Production	Trans, Dist., Storage	Energy Efficiency	Motor Vehicles
Solar Photovoltaics	Coal	Traditional T&D	Energy Star Appliances	Gasoline and Diesel
Wind	Petroleum	Pumped Hydro	Efficient Lighting	Hybrid Electric
Geothermal	Natural Gas	Battery Storage	Traditional HVAC	Plug-in Hybrid
Bioenergy/Biomass	Other Fossil Fuels	Other Storage	Energy Star HVAC	All Electric
Low Impact Hydro	Corn Ethanol	Smart Grid	Renewable HVAC	Natural Gas
Traditional Hydro	Non-woody Biomass	Micro Grids	Adv. Build. Materials	Hydrogen
Natural Gas	Woody Biomass	Other Modernizing	Recycled Build. Mat.	Fuel Cell
Advanced Gas	Other Biofuels		Reduced H20	
Nuclear	Nuclear Fuels			
Coal				
Petroleum/Oil				
CHP				

USEER NAICS Industry Classifications

- Agriculture — NAICS 11
- Mining, Oil and Gas Extraction — 21
- Utilities — NAICS 22
- Construction — NAICS 23
- Manufacturing — NAICS 31-33
- Wholesale Trade — NAICS 42
- Professional and Technical Services — NAICS 54

What the USEER Is Not

- NOT a substitute for the existing BLS QCEW.
  - The USEER is an additional lens through which to understand energy-related employment numbers, hiring forecasts, hiring difficulty, skills needs, and demographics, etc.
- NOT a measurement of indirect job impacts.
  - The USEER counts and surveys only direct jobs in the identified firms.
- NOT a total jobs impact study of an industry.
  - The USEER does not estimate the “induced jobs” created by the energy industry in other parts of the economy.
- NOT an economic impact analysis of the energy industry.
  - The USEER does not use input-output modelling systems such as Implan or REMI to measure the overall economic impact of an industry based on spending or revenue data nor is it a policy forecasting tool such as NEMS.

ENERGY FUTURES INITIATIVE

Executive Summary — Manufacturing

- **Of the 12.8 million manufacturing jobs in the U.S., over 762,000, about 6%** are directly involved in the production of fuels, generating equipment, and energy efficiency products.
  - **356,000 jobs** are in Electric Power Generation and Fuels
  - **321,000 jobs** are in Energy Efficiency.
  - **85,000 jobs** are in Transmission, Wholesale Distribution, and Storage

- Another **1.01 million jobs** are in Motor Vehicle manufacturing.
  - **57,000** of these jobs are in manufacturing alternative fuels vehicles.
  - **636,000 manufacturing jobs** are in component parts. 43% of all component parts jobs support fuel efficiency technologies.

Executive Summary—Professional Services

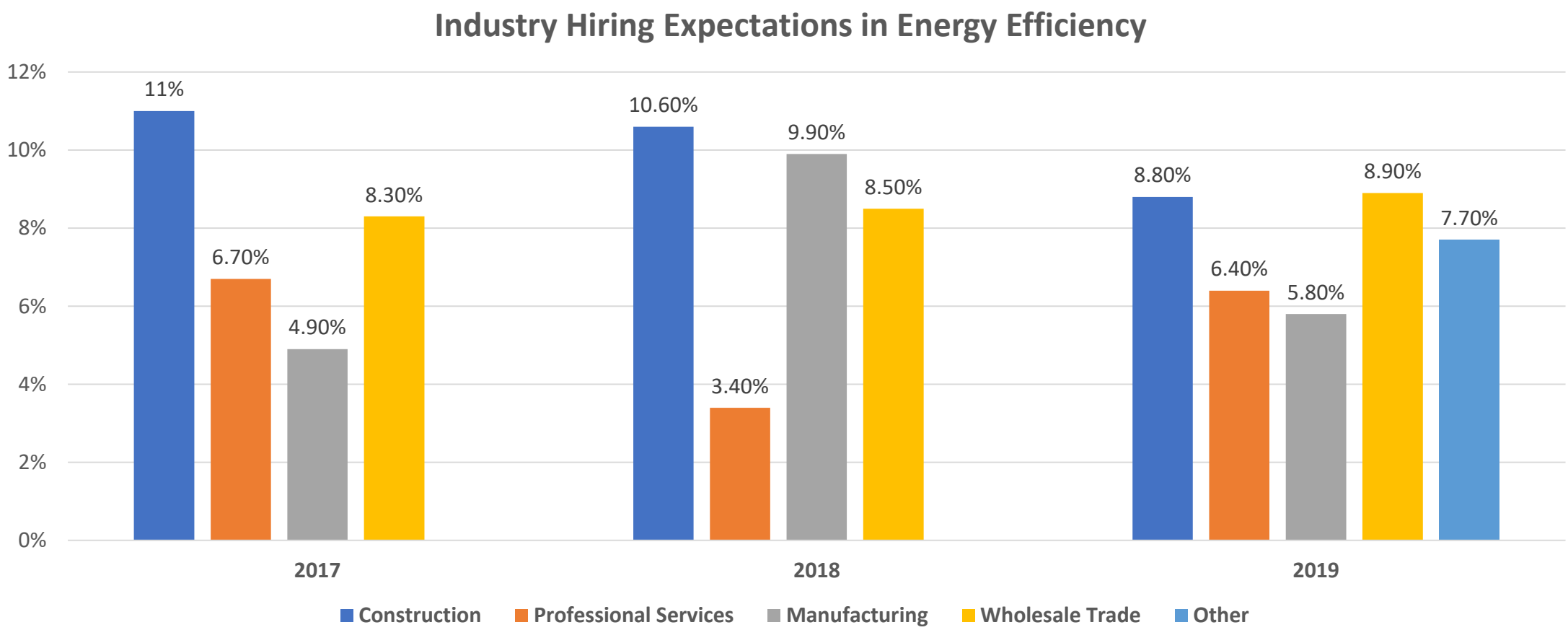
- **Of the 30.1 million professional services jobs in the U.S., 956,000, about 3%** are directly engaged in traditional energy or energy efficiency firms.
  - **166,000 jobs** are in Fuels.
  - **176,000 jobs** are in EPG
  - **130,000 jobs** are in TDS
  - **484,000 jobs** are in EE.
- **2019** projected growth rate is 6.4% or 31,000 new jobs

Conclusions

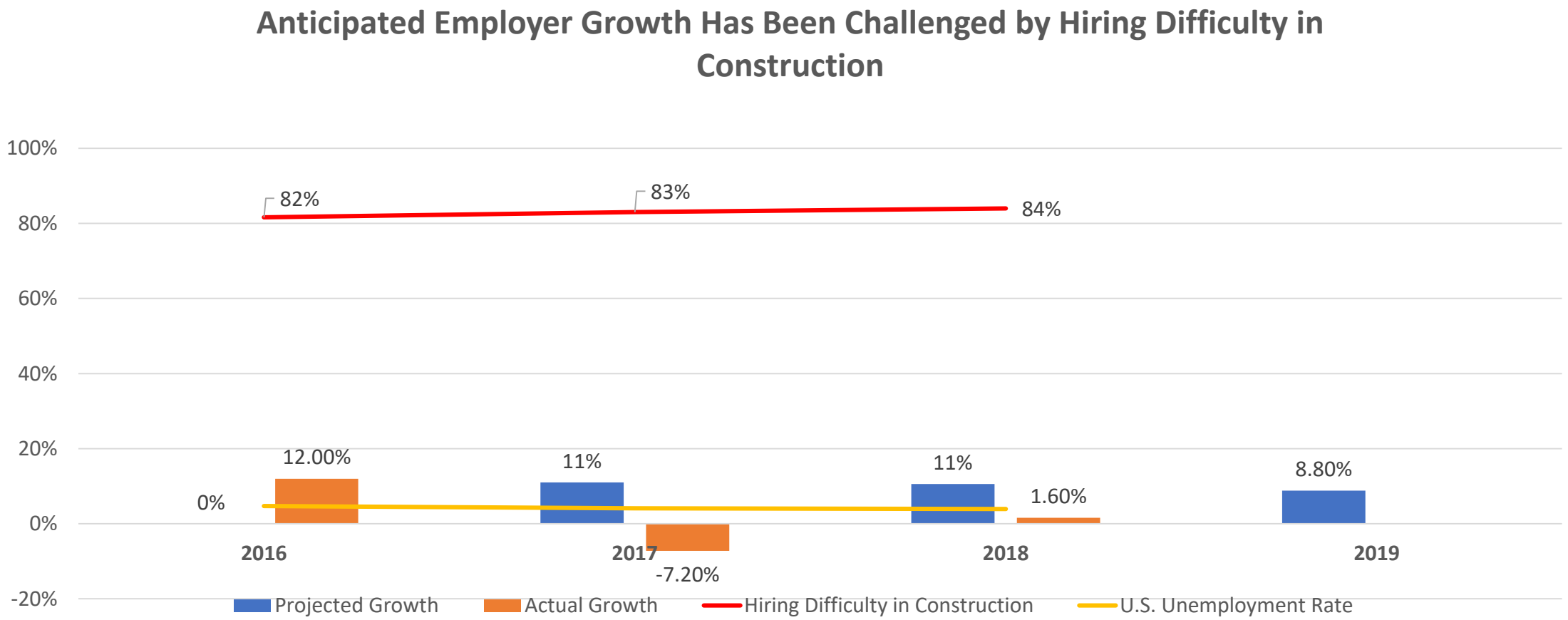
- **Job growth rates in all 5 sectors increased in 2018 to 3.5%, (2.3% in energy and energy efficiency) exceeding the national average of 1.8%.**
- **Fuels**
  - Considerable growth in oil and gas extraction.
- **Electric Power Generation**
  - Overall jobs declined slightly, just under -1%
  - Declines were largest in solar (8,000), coal (7,000), and nuclear (1,700)
  - Natural gas grew the most (5,200)
- **Energy Efficiency**
  - Growth rate increased from 3% in 2017 to 3.4% in 2018, but hiring difficulty also rose.
  - Intensity held steady with 79% of firms spending the majority of their time on EE
  - Employer hiring difficulty over 80% for ¾ of firms; In EE construction firms 52% report “very difficult”, up 3% percentage points.
  - Need concentrated effort to identify in-demand job skills, geographic locations, and relevant training programs.
- **Energy Infrastructure**
  - 65,000 new jobs predicted in Transmission, Wholesale Distribution, and Storage in 2019
  - 16,000 net new jobs in 2017
  - 33,000 new jobs in 2018
  - Energy security, resilience, and efficiency are key opportunities.
- **Motor Vehicles** — industry at all time high in 2016 w/ 17.9M vehicles sold, 17.5M in 2017, 17.1 in 2018
  - Alternative fuel vehicles rose by 34,000 jobs
  - 43% or over 486,000 component parts jobs contribute to fuel efficiency.

ENERGY FUTURES INITIATIVE

2017-19 Energy Efficiency Hiring Expectations by Industry Sector



Projected EE Construction Job Growth vs. Actual



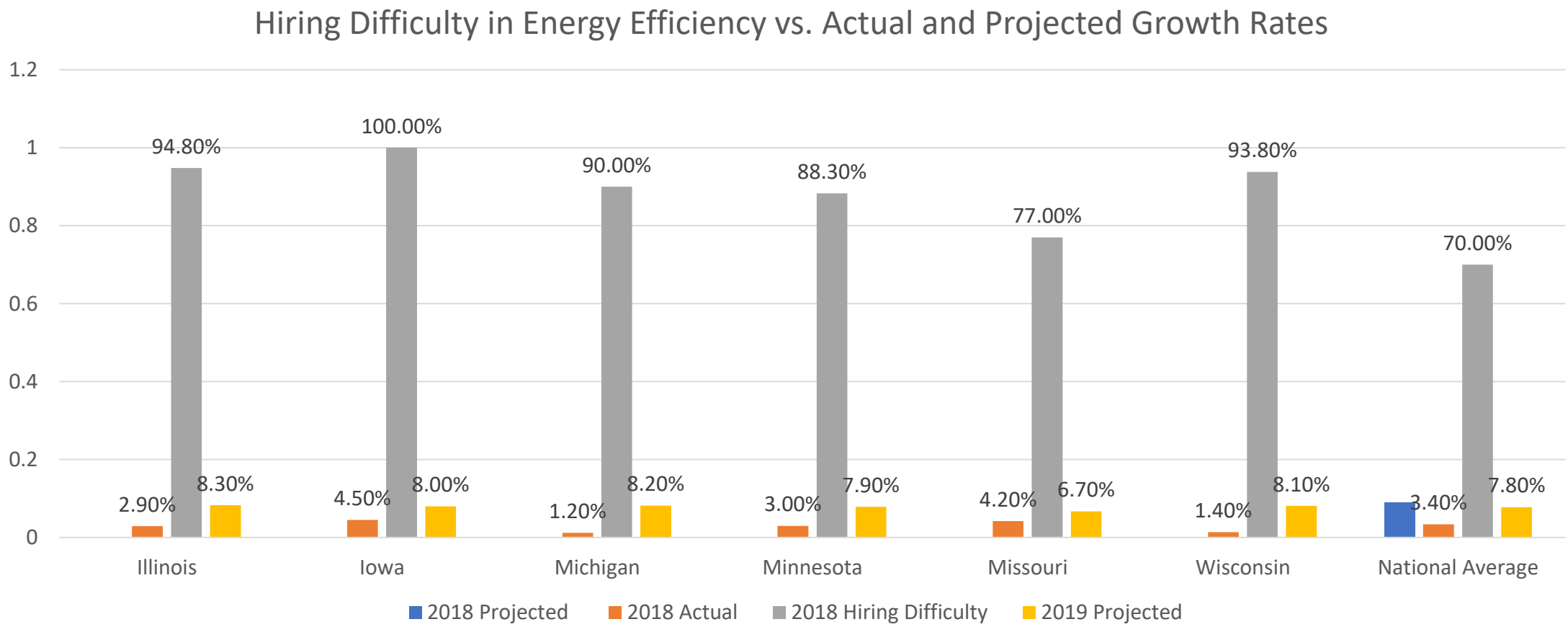
ENERGY FUTURES INITIATIVE

National Hiring Crisis in Clean Energy

In 2018, all surveyed employers reported an increase in hiring difficulty of 7 percentage points from 70% to 77%.

Technology	2017 Projected Hiring	2018 Actual Hiring	2018 Hiring Difficulty	2019 Projected Hiring
Energy Efficiency (overall)	9.0%	3.4	81%	7.8
Energy Efficiency Construction	10.6%	1.6%	84% (52%)	8.8%
Energy Efficiency Professional	3.4%	7.7%	82% (21%)	6.4%
Energy Efficiency Manufacturing	9.9%	1.9%	72%	5.8%
Wind Construction	3.7% (overall)	3.5% (overall)	86% (28%)	6.2%
Solar Construction	5.0% (overall)	(.032)% (overall)	85%	8.6%
Battery Storage	NA	18.1%	92% (23%)	4.4%
Grid Modernization		3.3%	80% (17%)	1.9–2.3%
TDS Construction	5.4%	4.8%	79% (34%)	4.0%
TDS Utilities	(.6)%	1.7%	56% (12%)	1.1

Meeting Demand for Energy Efficiency Jobs



Executive Summary — Low Carbon Emissions Energy

- **800,000 Americans are employed, in whole or part, in low carbon emissions** generation and fuels, virtually unchanged from 2017.
- **In generation**, these include:
  - Solar — 242,000 spending a majority of their time, with another 93,000 spending less than 50%, declines of 3.2% and 4.3%.
  - Wind — 111,000, increase of 3.7%
  - Nuclear — 72,000 (generation and fuels), decrease of 2.7%
  - CHP — 29,000, increase of 7.4%
  - Biomass — 13,000, increase of 8.3%
  - Geothermal — 8,500, increase of 7.6%
  - Hydro — 66,400 (12,000 low impact), a decline of 1%
  - Low emissions natural gas — 69,200, an increase of 7.0%
- **In fuels**, these include:
  - Corn Ethanol — 35,000, an increase of 1.4%
  - Woody Biomass/Cellulosic Biofuels — 33,100, an increase of 5.4%
  - Other Ethanol and Non-woody Biomass, incl. Biodiesel — 20,100, stable
  - Other Biofuels — 18,400, stable

Executive Summary—Construction Industry

- **Of the 7.1 million construction jobs in the U.S., over 1.867 million, about 26%** are directly supported by traditional energy or energy efficiency firms.
  - **1.295 million jobs are in Energy Efficiency**.
  - **481,000 jobs** are in Transmission, Wholesale Distribution, and Storage
  - **307,000 jobs** are in Electric Power Generation and Fuels

- Construction firms in EE report the highest hiring difficulty in the entire survey with 52% indicating it is “very difficult” to hire new employees with 84% reporting some level of difficulty.

ENERGY FUTURES INITIATIVE

Energy Jobs Wage Data Project

- Goal: to create a job quality index for jobs in the energy and energy efficiency sectors during a period of rapid technological change.
- Problem: jobs in different energy technologies rarely require completely unique skills and often build upon existing skill sets, but may require specialized training and qualifications.
- Index components:
  - Wages
  - Benefits
  - Safety performance
  - Career advancement and certification opportunities and premiums
  - Diversity
  - Entry level access
  - Geographic distribution
  - Stability