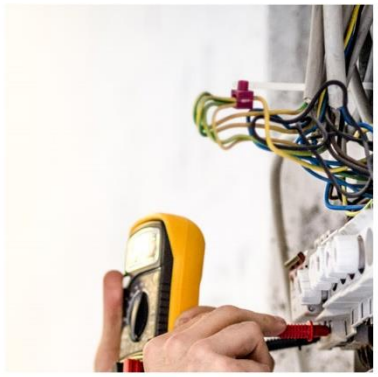


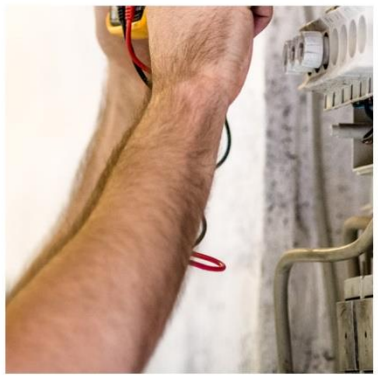


2020

Pennsylvania Energy Employment Report





PRODUCED FOR THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION ENERGY PROGRAMS OFFICE

[bw] RESEARCH PARTNERSHIP

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Introduction

The Pennsylvania Department of Environmental Protection (DEP) works to protect Pennsylvania's air, land and water from pollution; restore these natural resources; and provide for the health and safety of its citizens through a cleaner environment. Advancing this mission, the DEP Energy Programs Office is the primary entity under the Governor's jurisdiction for the implementation of programs that promote knowledge and adoption of energy efficiency and energy conservation technologies and indigenous, clean, diverse, and alternative fuels, including energy production and use technologies. One of its core functions is to work with partners to gather data and develop resources to enable policy makers, planners, and other leaders throughout Pennsylvania to achieve informed and best-outcome decisions related to energy.

The DEP Energy Programs Office commissioned BW Research Partnership to produce the 2020 Pennsylvania Energy Employment Report, providing a comprehensive overview of energy employment statewide from 2017 through 2019 by major technology sector and sub-technologies that comprise energy activities. Energy employment is defined according to the technologies listed in the annual United States Energy and Employment Report (USEER):

1. Electric Power Generation
2. Transmission, Distribution, and Storage
3. Energy Efficiency
4. Fuels
5. Motor Vehicles

Electric power generation, transmission distribution, and storage, and fuels are referred to as the "traditional energy" sector. While transportation is not typically considered a part of the traditional energy economy, it is included due to the energy consumption of production as well as end-use vehicle emissions. Similarly, energy efficiency plays a pivotal role in reducing energy consumption and is thus included. Please refer to the Detailed Energy Sector Employment section, which begins on Page 10, for a more in-depth explanation of each energy sector.

In addition to sector and sub-technology employment figures, this report provides an "industry cross-cut" analysis, which highlights jobs in specific industries—natural gas, petroleum, coal, and nuclear—that are normally disaggregated into fuels, electric power generation, and transmission, distribution, and storage. The aggregation of industry-specific jobs provides for a more comprehensive understanding of employment that spans multiple sectors, such as coal mining and extraction and coal electricity generation.

All data presented are based on the 2020 USEER data collection, a joint project of the National Association of State Energy Officials (NASEO) and the Energy Futures Initiative (EFI).[1] For more information on the

[1] www.USEnergyJobs.org

USEER methodology, please refer to Appendix A. For a detailed list of energy sub-technologies that USEER defines as energy jobs, please refer to Appendix B.

BW Research is a full-service consulting and research firm that specializes in workforce and economic development for public entities, including workforce investment boards, economic development agencies, cities, counties, and educational institutions. BW Research has substantial experience in developing customized research projects and a deep understanding of the clean energy sector and its employers, workforce, and supply chain dynamics. BW Research has designed and conducted over 300 studies for public, private, and not-for-profit agencies throughout the United States and internationally.

Acknowledgments: This material is based upon work supported by the United States Department of Energy, Office of Energy Efficiency and Renewable Energy, under State Energy Program Award Number EE0008293.

Pennsylvania Energy Jobs Overview

Pennsylvania had a total of 269,031 traditional energy, energy efficiency, and motor vehicle jobs across the state in 2019. These jobs accounted for 4.5 percent of the overall statewide workforce as of the last quarter of 2019.[2] Since 2017, traditional energy jobs statewide grew by 7.6 percent, or 8,306 new workers. Between 2018 and 2019 alone, traditional energy employment grew by 5.2 percent, or 5,757 jobs. In fact, energy jobs grew faster than the overall labor market. Total jobs in Pennsylvania grew by only 0.8 percent between 2018 and 2019.[3]

Motor vehicles and energy efficiency were the energy sectors with the highest employment in Pennsylvania, accounting for just over half (56.3 percent) of all energy jobs. Motor vehicle firms alone—which include everything from traditional gasoline and diesel vehicles to hybrid, electric, natural gas, and fuel cell vehicles—accounted for 29.8 percent of energy workers across the state. In total, motor vehicles firms employed 80,130 workers in 2019, a growth of 4.6 percent or 3,558 jobs over two years. Pennsylvania accounted for three percent of all motor vehicle employment in America.

Energy efficiency firms comprised just over a quarter (26.6 percent) of the statewide energy workforce. There are 71,443 energy efficiency jobs in Pennsylvania. The state was home to three percent of all energy efficiency workers nationwide. Since 2017, the sector grew by 9.4 percent, creating 6,155 new jobs across the state related to ENERGY STAR® appliances, efficient lighting, heating, cooling, and building envelope.

Fuels accounted for 19.7 percent of Pennsylvania's energy labor force. As of 2019, there were 53,122 fuels employees across Pennsylvania. Despite declining jobs in natural gas fuels, overall employment in this sector increased by 1.2 percent, or 626 jobs.

Transmission, distribution, and storage firms had experienced continuous job growth since 2017. Altogether, these jobs accounted for 16.4 percent of all energy jobs in Pennsylvania. This sector had the highest relative growth rate of 16 percent over two years, resulting in 6,061 new jobs.

Of the five energy sectors studied, electric power generation represented the smallest energy sector in Pennsylvania. As of the end of 2019, there were 20,308 electric power generation workers, an increase of 8.7 percent, or 1,619 jobs, since 2017. Electric power generation employees represented 7.5 percent of Pennsylvania's total energy labor force, and businesses were optimistic that their workforce would grow by another 5.6 percent in the next 12 months.

Notable sub-sector shifts included job losses in nuclear and coal generation and natural gas fuels, alongside increasing solar, wind, and natural gas electricity generation employment. Nuclear generation shed 243 jobs (-4.5 percent) while coal generation declined by 8.6 percent, or 163 jobs since 2017. These

[2] Total state employment is taken from the Bureau of Labor Statistics, Quarterly Census of Employment and Wages, September 2019. Data was accessed in February 2020. As of September 2019, there were a total of 5.95 million workers in Pennsylvania.
[3] *Id.*

losses came alongside national declines in nuclear and coal generation employment, particularly as the US is shifting away from coal-powered electricity generation toward natural gas and renewables.

Specifically, in Pennsylvania, the closure of Three Mile Island in September 2019 will likely result in continued decline for the nuclear generation workforce. In general, nuclear electric power generation is expected to shed jobs at a rate of 2.7 percent by the end of 2020.[4] Meanwhile, natural gas generation jobs grew by 13.4 percent in Pennsylvania, or 398 workers and wind electric power generation firms added 259 workers for a two-year growth rate of 8.8 percent. The solar industry was growing faster than the nationwide average. Solar electric power generation jobs in Pennsylvania grew by 8.3 percent since 2017, creating an additional 396 jobs across the state. Across the US, solar jobs declined by 1.2 percent between 2017 and 2019.

Petroleum employment continues to grow as the production of crude oil in Pennsylvania and the US increases. Pennsylvania's petroleum industry overall, including fuel extraction, transmission, and generation, grew by 14.9 percent across the state—an increase of 3,077 jobs. Oil generation saw modest growth of 20 jobs (8.4 percent), while petroleum fuels increased employment by 21.8 percent or 3,326 jobs between 2017 and 2019. Despite increases in oil generation and petroleum fuels, refined petroleum product pipeline transport and petroleum commodity flow employment shed under 300 jobs between 2017 and 2019. In spite of these job losses the sector enjoyed an overall net increase of 3,077 workers.

For more information on specific jobs in each sub-technology, please refer to the Detailed Energy Sector Employment section of this report.

Note: It is important to note that the 2020 Pennsylvania Energy Employment Report was commissioned before the global Coronavirus (COVID-19) pandemic, which has significantly altered labor market and employment nationally and statewide. This report is based on data collected in the last quarter of 2019, and therefore the employment figures presented serve as a baseline of energy industry employment pre-pandemic. While the full extent of the economic impact of the pandemic is yet unknown, BW Research estimates that as of April 2020, Pennsylvania has already lost almost 55,000 energy jobs—a 20.4 percent decline—as a result of COVID-19 economic fallout. Further analysis related to the COVID-19 pandemic's economic impacts can be found at http://bwresearch.com/covid19.

[4] Projected employment for NAICS 221113 (nuclear electric power generation) pulled from Emsi. Data accessed March 2020.

FIGURE 1. ENERGY EMPLOYMENT IN PENNSYLVANIA, 2017-2019

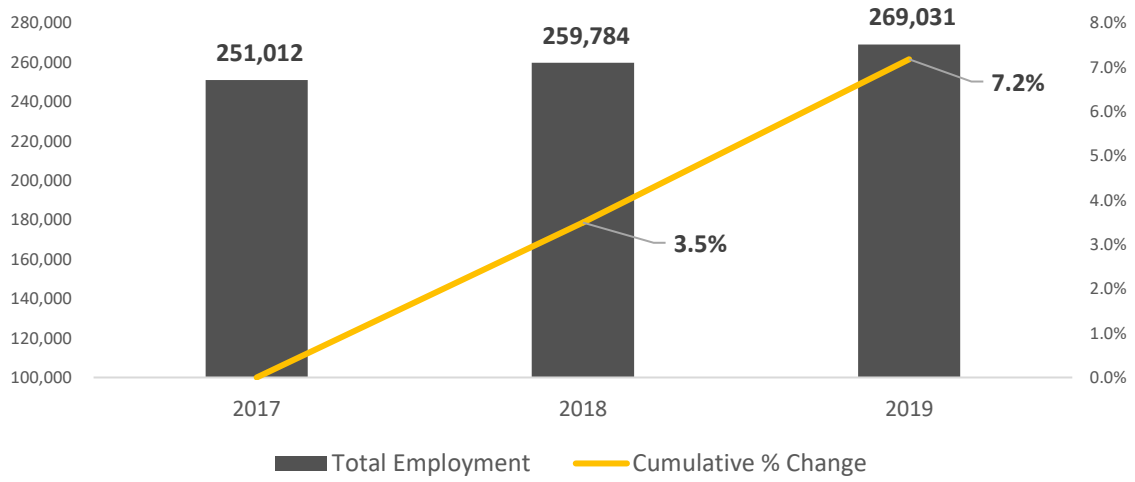
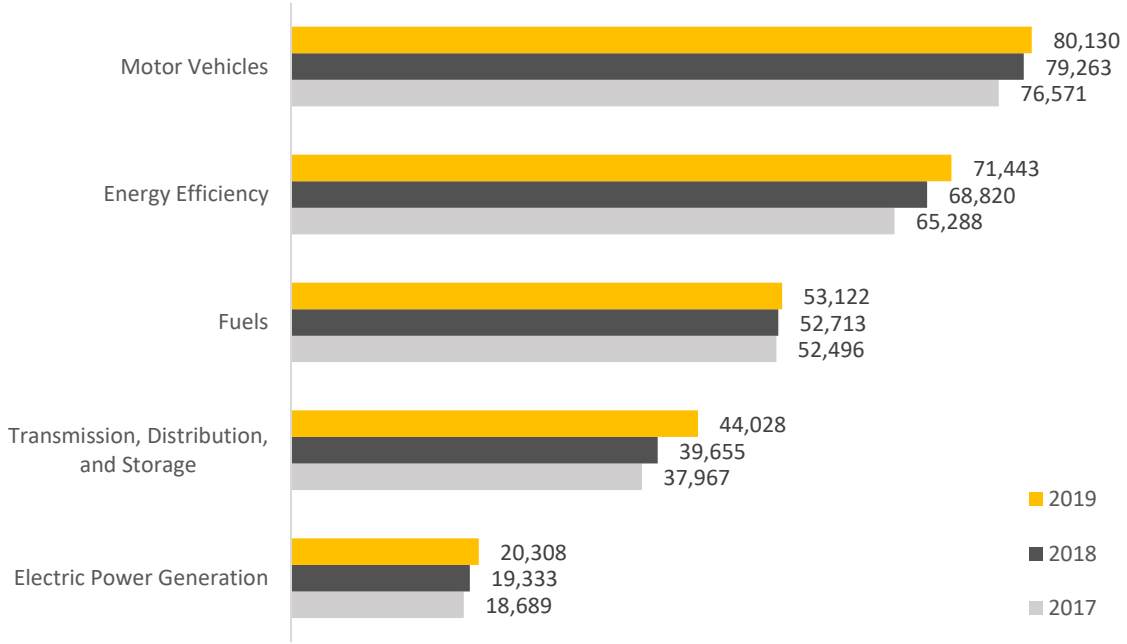


FIGURE 2. ENERGY EMPLOYMENT BY TECHNOLOGY, 2017-2019



Industry Crosscut Employment

The following employment totals are aggregated for each industry across the energy sectors that contain these jobs—fuels; transmission, distribution, and storage; and electric power generation. In general, a comprehensive analysis of Pennsylvania's natural gas, petroleum, coal, and nuclear industries totals to the following employment figures:

Natural Gas Jobs	Petroleum Jobs	Coal Jobs	Nuclear Jobs
23,738	23,690	10,350	5,152

These employment totals include all jobs across fuel extraction and mining, power line transmission and wholesale trade and distribution, fuel storage, and electricity generation from the above sources of energy.

Petroleum

All industries except for petroleum saw job losses between 2017 and 2019. Overall petroleum employment increased, largely the result of growing jobs in the petroleum fuels sector. In total, the petroleum industry increased employment by 14.9 percent between 2017 and 2019, creating 3,077 new jobs in two years. In general, petroleum fuels and oil generation were seeing nationwide job growth of eight and three percent respectively over the last two years, as crude oil production in America and Pennsylvania continues to grow. Between 2014 and 2018, crude oil production in the United States increased by 23.1 percent.[5] In Pennsylvania, there was a slight decline in crude oil production of roughly 5.4 percent over the same time. However, the general trend since 2010 highlights a doubling of field production of crude oil across the state, from 3.2 million barrels in 2010 to 6.5 million barrels in 2018.[6] It is possible that with the closing of the Philadelphia Energy Solution (PES) refinery in 2019, the state could see some declines in petroleum jobs over the next year. The petroleum refineries industry alone is expected to decline by one percent by the end of 2020.[7]

[5] U.S Energy Information Administration. Total Energy, Table 1.2 Primary Energy Production by Source. Monthly Energy Review, February 2020. Data accessed March 2020.
[6] U.S. Energy Information Administration. Pennsylvania Field Production of Crude Oil. Released February 2020. Data accessed March 2020.
[7] Projected employment for NAICS 324110 (petroleum refineries) pulled from Emsi. Data accessed April 2020. This projection is based on existing economic modelling that may not fully account for COVID-19 impacts.

Natural Gas

Overall natural gas employment declined by 7.4 percent, owing to job losses in the natural gas fuels sector. Natural gas electric power generation jobs grew from 2017 to 2019 as the state increased its natural gas electricity generation capacity. Since 2010, the state's share of electricity generation from natural gas has more than doubled, while the share of coal has declined by more than half. In general, natural gas is becoming an increasingly larger share of the energy production mix in the United States.[8] Between 2014 and 2018, natural gas production in America grew by 18.6 percent, and over the last two decades, natural gas production grew by 61.2 percent across the country.[9] Behind Texas, Pennsylvania is the nation's second-largest natural gas producer, accounting for one-fifth of total U.S. gas production in 2018. However, the rapid growth in gross natural gas output from the Marcellus and Utica shales over the last decade has begun to outpace consumption.[10] Overall production and the siting and drilling of new wells is projected to slow down in Pennsylvania over 2020, as the increased supply has driven down prices from $8 per million Btu a decade ago to $2 per million Btu today.[11]

Coal

Coal jobs declined by 3.3 percent since 2017 due to loss of jobs in the coal generation sector—a nationwide phenomenon as the country moves away from coal-fueled electric power generation.[12] In general, coal generation jobs across the United States decreased by 14.1 percent, shedding 13,132 jobs. At the same time, coal production across America declined by 24.3 percent since 2014.[13] Coal production in Pennsylvania between December 2018 and December 2019 alone declined by 21 percent.[14] The overall fossil fuel electric power generation industry in Pennsylvania is projected to decline by 1.8 percent over 2020.[15]

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[8] *See generally*: U.S Energy Information Administration. State Profile and Energy Estimates. Last updated August 2019. Data accessed March 2020; and, US EIA Profile Analysis. https://www.eia.gov/state/analysis.php?sid=PA.

[9] U.S Energy Information Administration. Total Energy, Table 1.2 Primary Energy Production by Source. Monthly Energy Review, February 2020. Data accessed March 2020.

[10] U.S Energy Information Administration. Natural Gas Production in Pennsylvania, Ohio, West Virginia Growing Faster than Demand. 26 January 2018. https://www.eia.gov/todayinenergy/detail.php?id=34692.

[11] *See generally:* Phillips, Susan. Natural Gas Production Headed for a Slow-Down in 2020. State Impact, National Public Radio, December 2019; and, Rick Shrum. Once a Booming Industry, Natural Gas is in the Midst of a Bust. Observer Reporter, December 2019.

[12] U.S Energy Information Administration. Total Energy, Table 1.2 Primary Energy Production by Source. Monthly Energy Review, February 2020. Data accessed March 2020.

[13] *Id.*

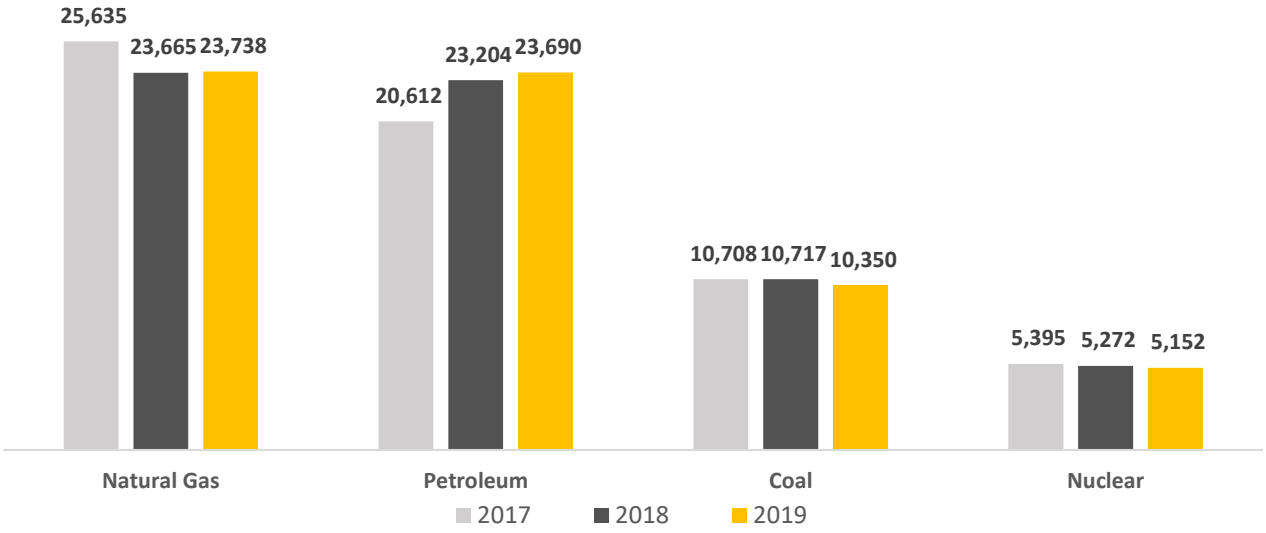
[14] U.S Energy Information Administration. Table 2.8.A, Consumption of Coal for Electricity Generation by State, by Sector. Released February 2020. Data accessed March 2020. https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_2_08_a.

[15] Projected employment, 2019 to 2020, for NAICS 221112 (fossil fuel electric power generation) pulled from Emsi. Data accessed April 2020. This projection is based on existing economic modelling that may not fully account for COVID-19 impacts.

Nuclear

The nuclear industry in Pennsylvania shed jobs at a rate of 4.5 percent over the last two years due to declines in the nuclear generation workforce. Nationally, nuclear generation jobs declined by 5.9 percent as well. While nuclear is a significant component of Pennsylvania's energy generation mix, closure of Three Mile Island in September 2019 will likely contribute to continued job loss in the state's nuclear electric power generation sector. Projected declines for the nuclear electric power generation industry indicate an additional loss of 2.7 percent by the end of 2020.[16]

FIGURE 3. INDUSTRY CROSSCUT EMPLOYMENT, 2017-2019



[16] Projected employment, 2019 to 2020, for NAICS 221113 (nuclear electric power generation) pulled from Emsi. Data accessed March 2020. This projection is based on existing economic modelling that may not fully account for COVID-19 impacts.

Detailed Energy Sector Employment

Motor Vehicles

While motor vehicles are not typically considered part of the "Traditional Energy" industry, motor vehicles and component parts—which include cars, light-duty and heavy-duty trucks, trailers, and component parts—are included in comprehensive energy employment data given the high energy consumption during the manufacture and end-use of these products. Jobs in the motor vehicle industry span manufacturing, repair and maintenance, wholesale trade, and professional and business services. These occupations include mechanics and technicians, wholesale trade or manufacturing sales representatives, production workers, machinists, and team assemblers, as well as managers and supervisors of these workers. Car salesmen and car dealerships are excluded from motor vehicle employment.[17]

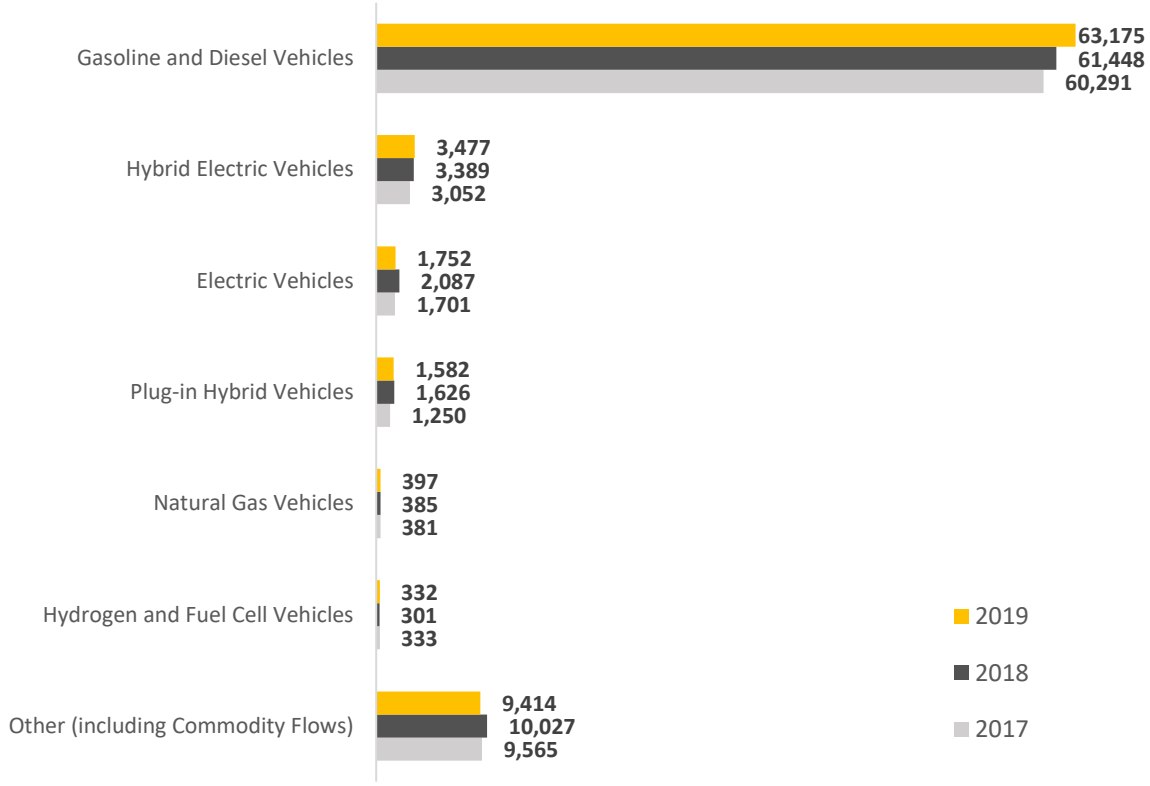
Gasoline and diesel vehicles accounted for most of employment—78.8 percent of 63,175 jobs. This sector grew by 4.8 percent or 2,885 new workers since 2017. Plug-in hybrid vehicles saw significant job growth since 2017; these employers grew their workforce by 26.6 percent, adding 332 new jobs for a total of almost 1,582 workers across the state. Hybrid electric vehicles grew the workforce by 13.9 percent over the same time; these employers created 425 new jobs and accounted for 3,477 total workers, or 4.3 percent of the motor vehicle sector.

Across the United States, plug-in hybrid electric and all-electric vehicle sales had been rising annually over the last decade. However, in absolute numbers, hybrid electric vehicle sales have been significantly higher than plug-in and all-electric vehicles over the last eight years. Between 2011 and 2019, there have been a total of 1.4 million plug-in hybrid and electric vehicles sold in the US compared to 3.5 million hybrid vehicles over the same time.[18] However, with rising plug-in and all-electric vehicle market share and sales in Pennsylvania, it is possible that electric vehicles will match or surpass total hybrid vehicle employment in the coming years.[19]

It is important to note that commodity flow employment—which is folded into the "other" category—includes air, rail, water, and truck transportation of motor vehicles and motor vehicle component parts. Employers also place their workers in the "other" category when they are unable to assign employees to a single specific sub-technology for which they spend most of their labor hours. As such, higher employment in "other" motor vehicles is common, since much of employment is concentrated in repair and maintenance, and motor vehicle repair technicians tend to work across multiple vehicle technologies.

[17] The USEER data collection effort expressly excludes any employment in retail trade, such as motor vehicle dealerships, appliance and hardware stores, and other retail establishments.
[18] U.S. Department of Energy. Alternative Fuels Data Center. Data accessed March 2020.
[19] Pennsylvania Department of Environmental Protection. Pennsylvania Electric Vehicle Roadmap. February 2019.

FIGURE 4. MOTOR VEHICLE EMPLOYMENT BY SUB-TECHNOLOGY, 2017-2019



Energy Efficiency

Much of energy efficiency employment may be found in the construction trades, though jobs also span other industries such as professional and business services, manufacturing, and wholesale trade. This sector details work dedicated to the production and installation of energy-saving products as well as the provision of services that reduce end-use energy consumption. Typical energy efficiency occupations include carpenters, electricians, insulation workers, HVAC workers, sales representatives, engineers, and architects; these are individuals that work with or manufacture ENERGY STAR® products, design buildings to improve natural light and reduce overall consumption, provide insulation, or install, maintain, and repair energy-efficient products or software services.

In general, traditional HVAC[20] was the largest component of the energy efficiency workforce, followed directly by high efficiency HVAC and renewable heating and cooling. Traditional HVAC workers comprised 27.6 percent of the energy efficiency workforce, or 19,700 jobs. This sector grew by 8.9 percent since 2017, creating 1,616 new energy efficiency positions in two years. High efficiency HVAC workers and

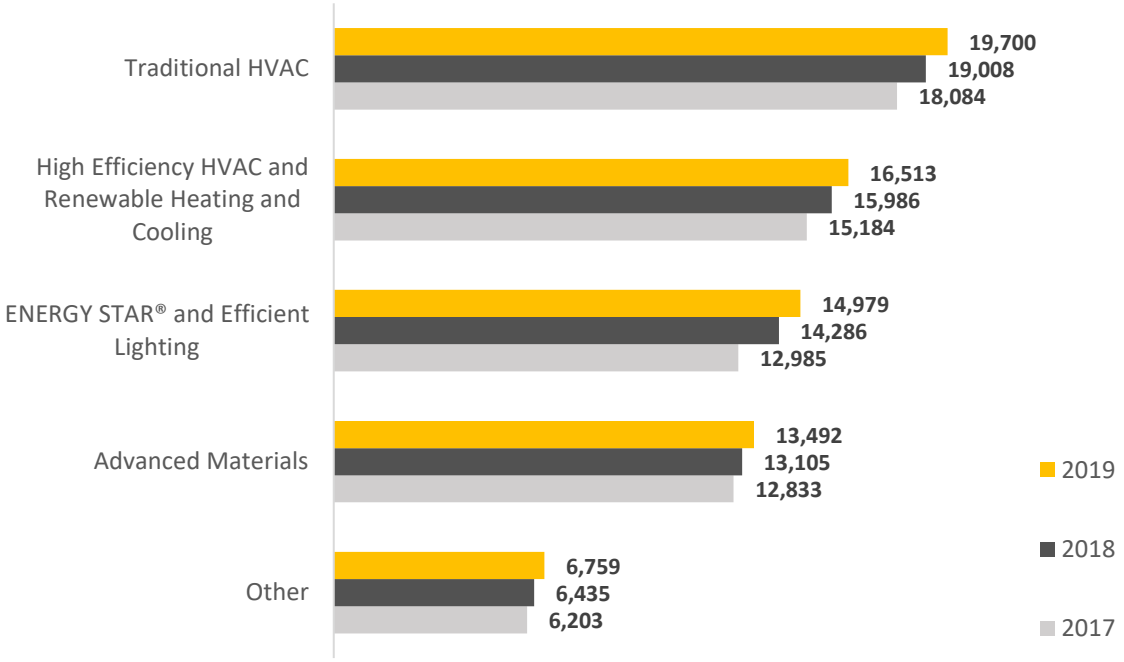
[20] Traditional HVAC workers are those that spend a portion of their time on efficient HVAC goods and services, but do not spend the majority of their labor hours on energy-efficient HVAC technologies.

renewable heating and cooling accounted for just under a quarter (23 percent) of the labor force and grew by 8.8 percent or 1,330 jobs.

ENERGY STAR® and efficient lighting technologies saw the greatest absolute and proportional growth over the last two years. These businesses grew employment by 15.4 percent, or 1,994 workers since 2017. Advanced materials workers were a smaller, but sizeable component of the energy efficiency labor force in Pennsylvania. These jobs accounted for 18.9 percent of the energy efficiency workforce—13,492 jobs. Since 2017, this sector saw jobs grow by 5.1 percent, or 659 workers.

The "other" energy efficiency category includes design, consulting, software, auditing, rating, monitoring, metering, leak detection, and political and non-profit services that are not specific to a detailed technology. This category also includes workers that cannot be classified to a single category where they spend the majority of their labor hours.

FIGURE 5. ENERGY EFFICIENCY EMPLOYMENT BY SUB-TECHNOLOGY, 2017-2019



Fuels

The fuels sector encompasses any work related to fuel extraction, mining, and processing, including petroleum refineries and businesses that support coal mining, oil, and gas field machinery manufacturing. The sector also includes forestry and agriculture workers who support fuel production, such as corn ethanol, biodiesels, and wood fuels. Fuels employment spans several industries including mining and extraction, manufacturing, professional and business services, wholesale trade, agriculture and forestry, and construction. As with motor vehicles, retail trade workers—such as gas pump and convenience store employees—are excluded from the employment estimates.[21] In addition to professional service jobs such as engineering, accounting, and data analysis, fuels jobs also span the construction, maintenance, and materials moving trades as well as extraction workers such as drill operators or mining machine operators.

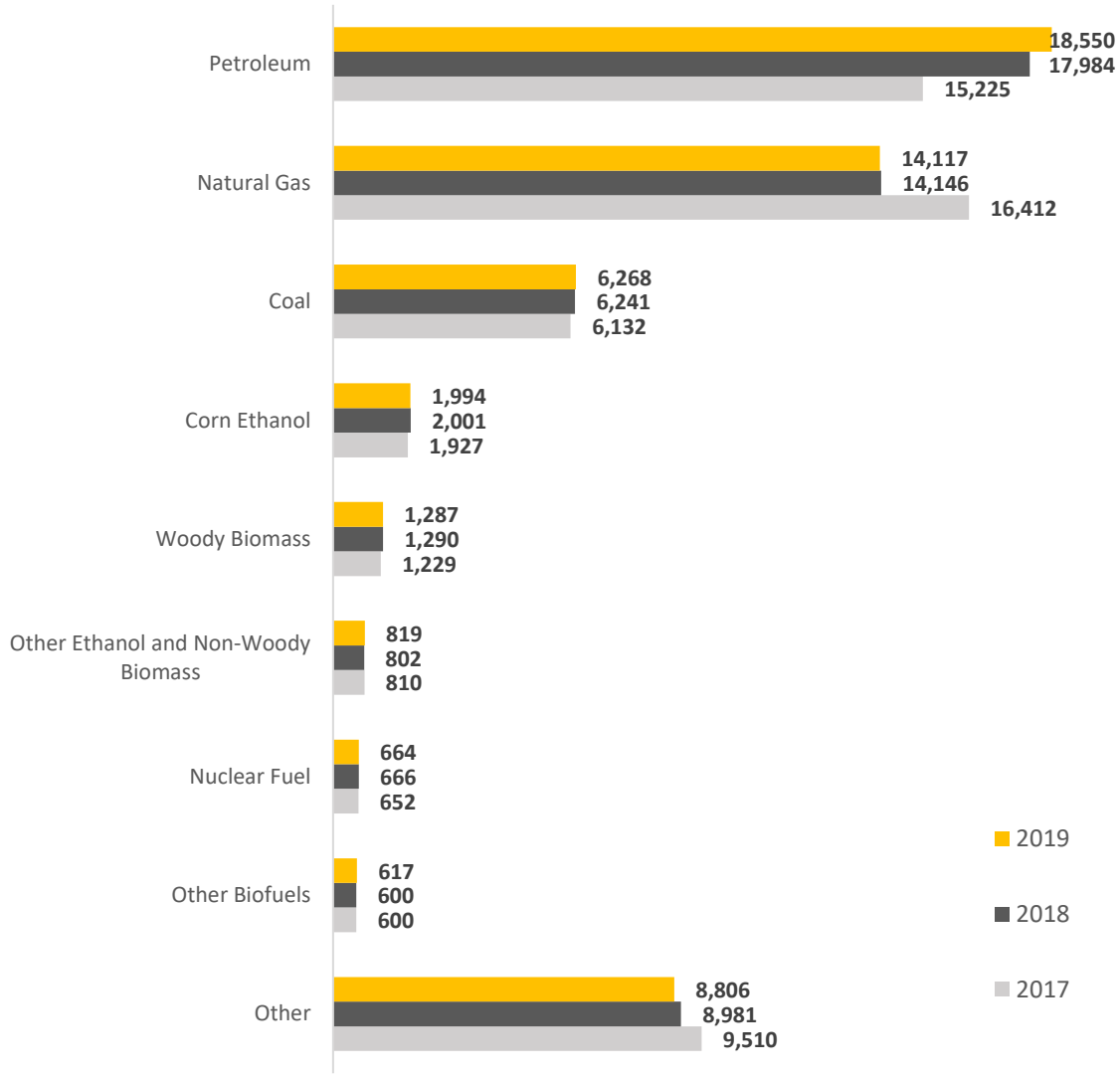
Petroleum was the largest fuels employer in Pennsylvania. These firms employed 34.9 percent of the workforce, consisting of 18,550 jobs. The petroleum sector grew by almost 21.8 percent since 2017, adding another 3,326 jobs. This was followed by natural gas, which accounted for just over a quarter of the fuels workforce, or roughly 14,100 jobs. Natural gas firms shed employment over the last two years at a rate of 14 percent, or 2,295 workers. Coal accounted for 11.8 percent of the fuels workforce and grew by 2.2 percent, or 137 workers, since 2017. The remaining sub-sectors of corn ethanol, woody biomass, non-woody biomass, nuclear fuel, "other" fuels, and other biofuels[22] accounted for just over a quarter (26.7 percent) of all fuels jobs.

The "other" fuels category was comprised mostly of propane (60 percent). The remainder of employment includes individuals working with waste gas (landfill, food, agricultural), hydrogen, or other fuels like alcohol or ammonia. This is not surprising considering biomass generation in Pennsylvania—which accounted for 24 percent of renewable generation in 2018—is largely sourced from municipal solid waste and landfill gas.[23]

For any jobs that could not be assigned to a single category, employers also typically select "other" when their employees work with multiple sub-technologies.

[21] The USEER data collection effort expressly excludes any employment in retail trade, such as motor vehicle dealerships, appliance and hardware stores, and other retail establishments.
[22] Other biofuels include any other fuel that is derived directly from living matter. All other fuels include other fossil fuels as well as employers that are not able to assign their workers to a single detailed technology application.
[23] U.S. Energy Information Administration. Pennsylvania State Profile and Energy Estimates. Last Updated August 2019. Accessed April 2020.

FIGURE 6. FUELS EMPLOYMENT BY SUB-TECHNOLOGY, 2017-2019



Transmission, Distribution, and Storage

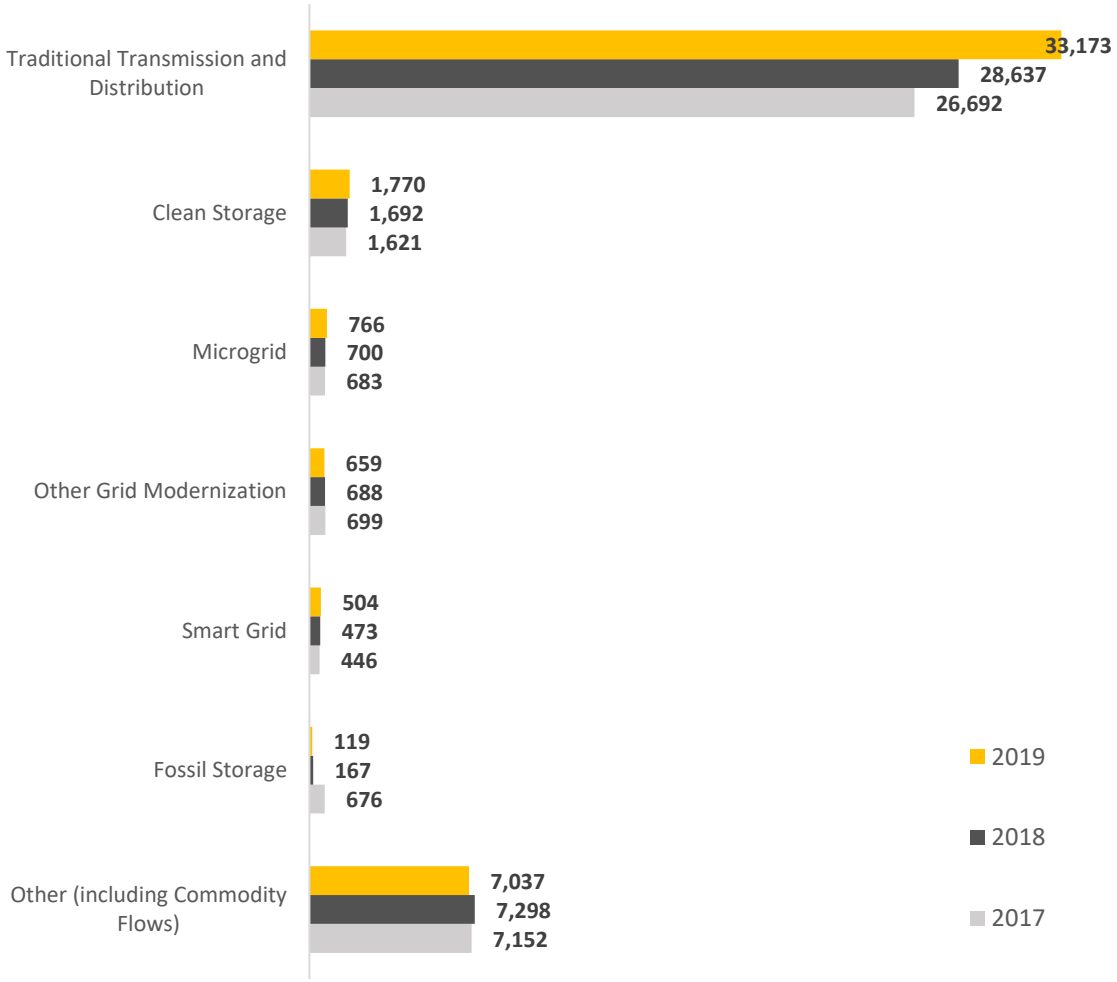
Transmission, distribution, and storage includes all infrastructure for electric power and fuel energy supplies to intermediate and end users. This includes interstate and intrastate pipelines, natural gas storage facilities, ports and railways that handle petroleum products, as well as high-voltage transmission and distribution lines. Employment in this sector is mostly concentrated in construction and utilities, but also includes professional and business services, wholesale trade and distribution, and manufacturing. Such occupations include professional service workers such as engineers, analysts, business operations specialists, and chief executives, as well as sales representatives, accountants, construction workers, technicians, mechanics, and repairmen.

Traditional transmission and distribution was the largest component of the transmission, distribution, and storage sector, accounting for three-quarters of the total workforce. These jobs grew by 24 percent since 2017, adding just under 6,500 jobs to the workforce. After this, smart grid, microgrid, and clean storage[24] saw significant growths of 13 percent, 12 percent, and nine percent, respectively. Together, these three sub-sectors added almost 300 new jobs to the energy workforce. Fossil fuel storage shed 550 jobs over the last two years, a decline of 82 percent since 2017.

The "other" employment sector includes commodity flows, which are defined as the air, rail, water, and truck transportation of energy commodities such as coal, fuel, oil, gas, and petroleum. The category also includes system efficiency, software, site selection, disaster response plans (DRP), incident response plans (IRP), as well as any workers that cannot be classified to a single category where they spend the majority of their labor hours.

[24] "Smart grid" is an electricity supply network that uses digital communications technology to detect and react to local changes in usage. "Microgrids" are a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. "Clean storage" includes pumped hydropower storage, battery storage (including battery storage for solar generation), mechanical storage, thermal storage, biofuels (including ethanol and biodiesel), and nuclear fuels.

FIGURE 7. TRANSMISSION, DISTRIBUTION, AND STORAGE EMPLOYMENT BY SUB-TECHNOLOGY, 2017-2019



Electric Power Generation

Electric power generation jobs cover all utility and non-utility employment for electricity-generating technologies. Included in these employment estimates are any firms engaged in facility construction, turbine and other generation equipment manufacturing, and wholesale parts distribution for all electric generation technologies as well as professional and business services such as consulting, finance, administrative, and legal support.

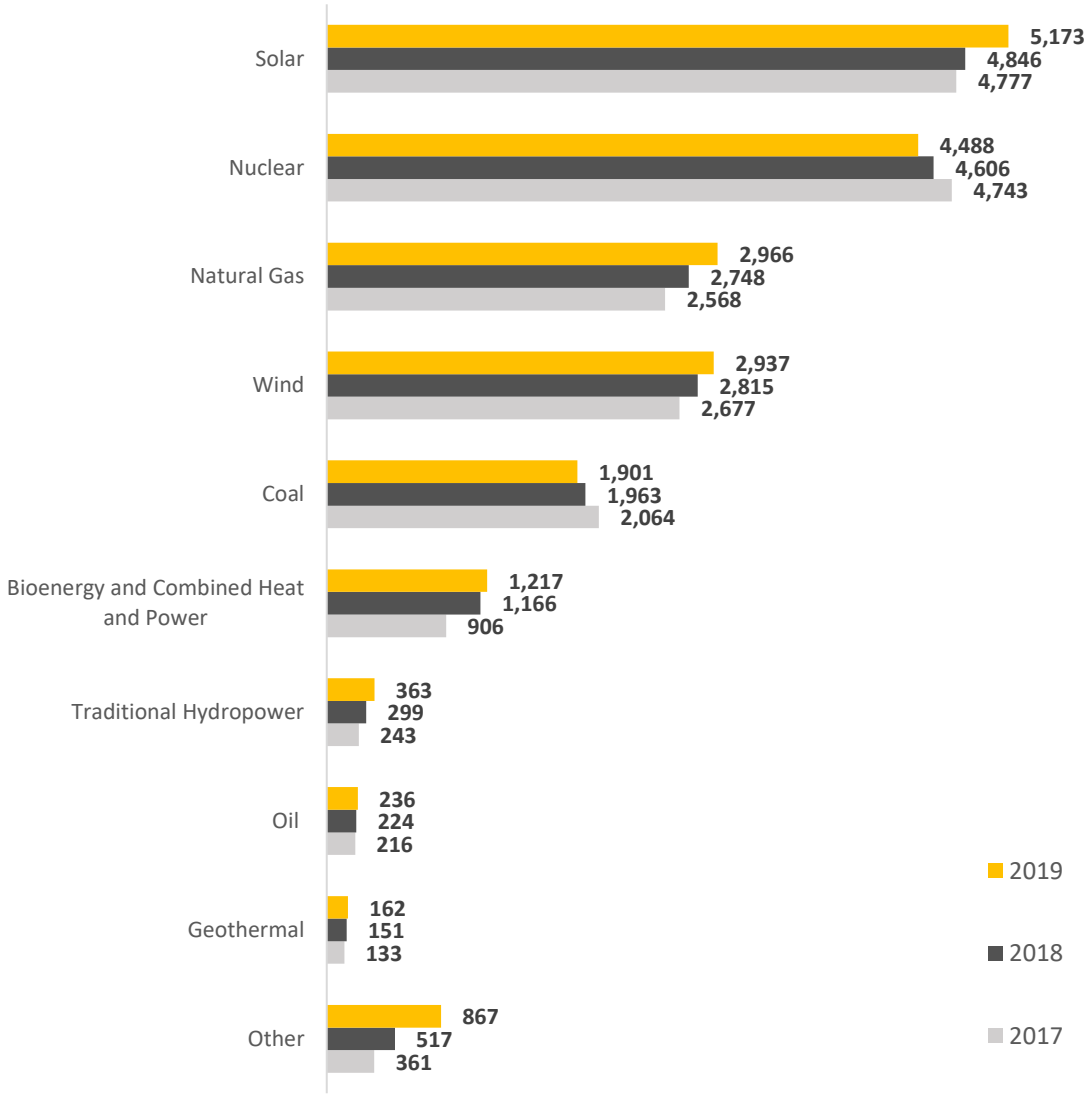
Solar jobs accounted for the largest proportion of energy generation workers in Pennsylvania; these jobs comprised just over a quarter (25.5 percent) of the generation workforce. Solar firms employed a total of 5,173 workers and grew employment by 7.7 percent or 396 jobs since 2017. Nationally, solar generation jobs grew by only 1.3 percent over the same time.

Pennsylvania is also home to a significant nuclear generation workforce; this sector employed 4,488 workers in 2019, but declined by 5.7 percent since 2017, shedding 256 jobs. Job losses in nuclear generation are likely attributable to the closing of Three Mile Island in September 2019.[25] The nuclear electric power generation workforce is projected to continue declining through the end of 2020 by roughly 2.7 percent.[26]

Natural gas and wind firms employed almost 3,000 workers each, totaling 5,903 jobs in 2019. Natural gas generation employment grew by 13.4 percent while wind firms increased their workforce by 8.8 percent over the same time. The remaining sectors of coal, bioenergy and combined heat and power, traditional hydropower, oil, geothermal, and other generation[27] sources accounted for 23.4 percent of the generation workforce.

[25] Brady, Jeff. Three Mile Island Nuclear Plant to Close, Latest Symbol of Struggling Industry. National Public Radio (NPR), May 2019.
[26] Projected employment for NAICS 221113 (nuclear electric power generation) pulled from Emsi. Data accessed March 2020. This projection is based on existing economic modelling that may not fully account for COVID-19 impacts.
[27] Other generation includes generation from incineration of other fuels, such as waste. It also includes workers that cannot be classified into a single category where they spend the majority of their time.

FIGURE 8. ELECTRIC POWER GENERATION EMPLOYMENT BY SUB-TECHNOLOGY, 2017-2019



Conclusions

As the state and nationwide electricity generation mix continues to change, this 2020 baseline analysis of Pennsylvania's energy workforce will provide a foundation upon which to understand energy employment changes in the future. The state's strong motor vehicle and energy efficiency industries can expect to see continued growth, likely supplying both in-state and nationwide demand. Continued declines in coal and nuclear electric power generation across the country portend further job losses in these industry sectors. Looking ahead, future Pennsylvania Energy and Employment Reports will track natural gas, solar, wind, and petroleum fuels jobs, as these industry sectors exhibited strong growth over the last several years. In particular, as the statewide economy recovers from the labor market shocks of the COVID-19 pandemic, this report will be a useful tool to identify which sectors of Pennsylvania's energy industry have recovered most quickly from the pandemic-induced economic recession.

Appendix A: Research Methodology

Data for the 2020 Pennsylvania Energy and Employment Report is taken from the US Energy and Employment Report (USEER). The research methodology for USEER may be found at:

https://www.usenergyjobs.org/

An executive summary and appendices, which include the methodology, can also be found directly at the following links:

https://www.usenergyjobs.org/2020-report

Download USEER Appendix A

Download USEER Appendix B

Appendix B: Energy Technology List

An energy job is defined as any worker that is directly involved with the research, development, production, manufacture, distribution, sales, implementation, installation, or repair of components, goods, or services related to the following sectors of Electric Power Generation; Electric Power Transmission, Distribution, and Storage; Energy Efficiency; Fuels; and Transportation. These jobs also include supporting services such as consulting, finance, tax, and legal services related to energy. Included in these sectors are the following sub-technologies that are currently considered to be energy-related activities.

ELECTRIC POWER GENERATION

- Solar Photovoltaic Electric Generation
- Concentrated Solar Electric Generation
- Wind Generation
- Geothermal Generation
- Bioenergy/Biomass Generation
- Low-Impact Hydroelectric Generation, including wave/kinetic generation
- Traditional Hydroelectric Generation
- Advanced/Low-Emission Natural Gas
- Nuclear Generation
- Coal Generation
- Oil and Other Petroleum Generation
- Natural Gas Generation
- Combined Heat and Power
- Other Generation

ELECTRIC POWER TRANSMISSION, DISTRIBUTION, AND STORAGE

Electric Power Transmission and Distribution

- Traditional Transmission and Distribution
- Smart Grid
- Microgrids
- Other Grid Modernization
- Other Transmission

Storage

- Pumped Hydropower Storage
- Battery Storage, including battery storage for solar generation
    - Lithium Batteries
    - Lead-Based Batteries
    - Other Solid-Electrode Batteries
    - Vanadium Redox Flow Batteries
    - Other Flow Batteries
- Mechanical Storage, including flywheels, compressed air energy storage, etc.
- Thermal Storage
- Liquefied Natural Gas
- Compressed Natural Gas

- Crude Oil
- Refined Petroleum Fuels (liquid)
- Refined Petroleum Fuels (gas)
- Coal Storage (piles, domes, etc.)
- Biofuels, including ethanol and biodiesel
- Nuclear Fuel
- Other Gas Fuel
- Other Liquid Fuel
- Other Storage

ENERGY EFFICIENCY

- ENERGY STAR Certified Appliances, excluding HVAC
- ENERGY STAR Certified Heating Ventilation and Air Conditioning (HVAC), including boilers and furnaces with an AFUE rating of 90 or greater and air and central air conditioning units of 15 SEER or greater
- Traditional HVAC goods, control systems, and services
- ENERGY STAR Certified Electronics (TVs, Telephones, Audio/Video, etc.)
- ENERGY STAR Certified Windows and Doors
- ENERGY STAR Certified Roofing
- ENERGY STAR Certified Seal and Insulation
- ENERGY STAR Certified Commercial Food Service Equipment
- ENERGY STAR Certified Data Center Equipment
- ENERGY STAR Certified LED Lighting
- Other LED, CFL, and Efficient Lighting
- Solar Thermal Water Heating and Cooling
- Other Renewable Heating and Cooling (geothermal, biomass, heat pumps, etc.)
- Advanced Building Materials/Insulation
- Recycled Building Materials
- Reduced Water Consumption Products and Appliances
- Other Energy Efficiency

FUELS

- Coal
- Petroleum
- Natural Gas
- Other Fossil Fuels
- Corn Ethanol
- Other Ethanol/Non-Woody Biomass, including biodiesel
- Woody Biomass/Cellulosic Biofuel
- Other Biofuels
- Nuclear Fuel
- Other Fuels

TRANSPORTATION

- Gasoline and Diesel Motor Vehicles, excluding freight transport
- Hybrid Electric Vehicles
- Plug-In Hybrid Vehicles
- Electric Vehicles

- Natural Gas Vehicles
- Hydrogen Vehicles
- Fuel Cell Vehicles
- Other Vehicles
- Transportation Vehicle Engine and Drive Parts
- Transportation Vehicle Exhaust System Parts
- Transportation Vehicle Body Parts
- Other Transportation Vehicle Parts