



FIVE-YEAR TRENDS

THE USEER: 2016-2020

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The 2020 USEER is the fifth iteration of the annual energy and employment report. This section serves as a summary analysis of the past 5 years of US energy and employment data.

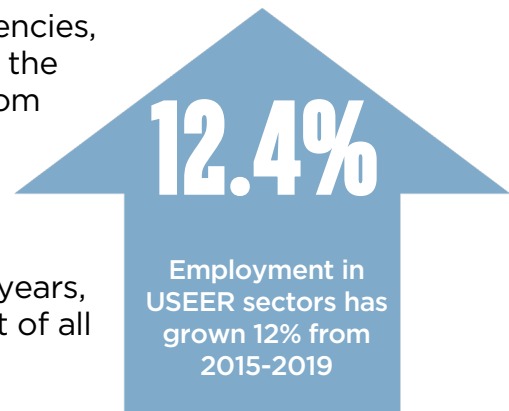
Included are the five major energy, energy efficiency, and motor vehicles technologies, the first three of which comprise the Traditional Energy sector:

- Fuels
- Electric Power Generation (EPG)
- Transmission, Distribution, and Storage (TDS)
- Energy Efficiency (EE)
- Motor Vehicles (MV) including Component Parts

In 2019, U.S. energy, energy efficiency, and motor vehicles firms employed more than 8.27 million Americans, comprising 5.4 percent of the U.S. workforce.

■ The traditional sectors—focused on the production of fuels and electricity and their transmission and distribution to end users—employ 3.3 million Americans. Meanwhile, the downstream sectors of energy efficiency and motor vehicles focused increasingly during the last five years on reducing consumption of the fuels and electricity produced upstream.

■ In spite of these contradictory tendencies, employment in these five sectors of the economy has grown 12.4 percent from 2015-2019, outpacing the general economy’s employment growth rate (6.0 percent).¹ In total, these sectors added nearly 915,000 jobs to the US economy over the past 5 years, representing more than 10.7 percent of all new employment.



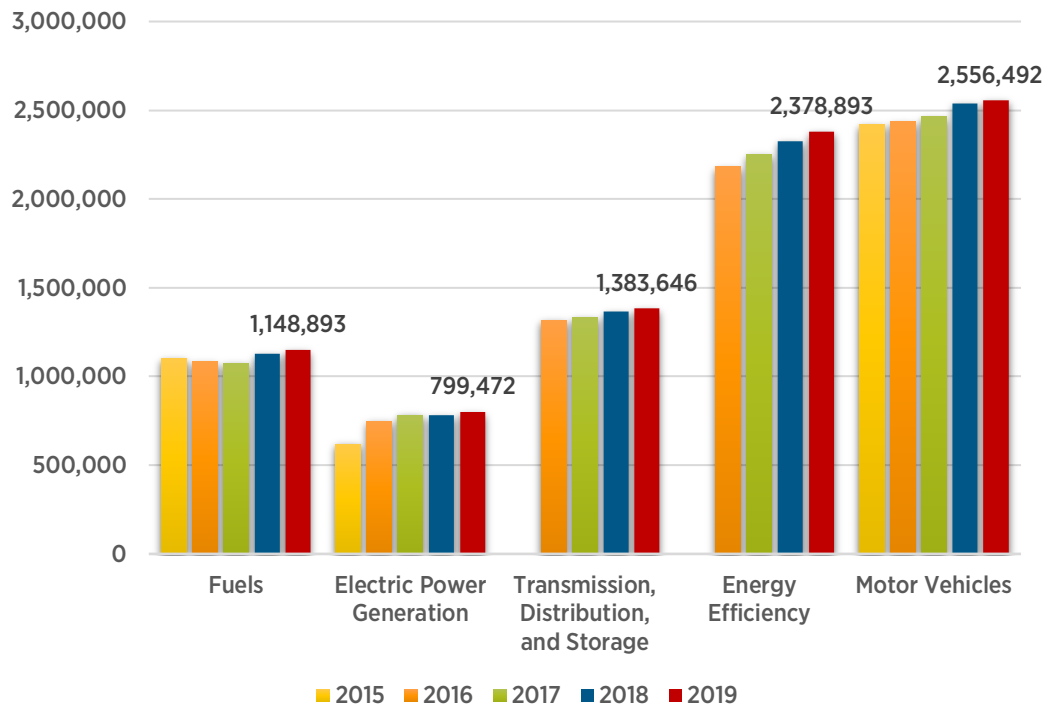
■ The decoupling of energy consumption from job growth is one of the important trends noted in the 2016-2020 USEERs. A second trend is the fact that the deployment of new technologies in all five sectors has driven net job growth,

¹ BLS QCEW Q2 2019.

even while the displacement of old technologies has led to job loss in specific subsectors. The transition from coal-fired generation as the largest source of electricity in the United States in 2015 to natural gas in 2017 is the clearest example of such displacement and will be explored later in this summary.

Finally, the role of energy efficiency, both in the built environment and in transportation, cannot be overstated as a contributor to job growth. While fuel efficiency jobs data in the motor vehicles sector was not collected in 2015, energy efficiency and fuel efficiency contributed to over 400,000 new jobs in the last five years.

Figure 1.
Employment by Major Technology, 2015-2019²



Note: EPG figures do not include less-than-50-percent solar jobs. In 2019, there were 97,359 such jobs.

² 2015 data for EE and TDS have been omitted due to methodological changes between 2015 and 2016, rendering those data incomparable to future data.

Fuels

Fuels sector employment grew more than 4 percent from 2015-2019, adding more than 46,000 new jobs. This growth rate is slightly lower than for the national economy. More than other sectors, fuels employment is affected by global commodity prices which have fluctuated significantly since the introduction of hydraulic fracturing and horizontal drilling. These two technologies are leading the United States to once again become a net energy exporter.³

In its 2020 Annual Energy Outlook, the Energy Information Administration (EIA) projects that U.S. production in these energy sectors will grow significantly, but that U.S. energy consumption will grow moderately, assuming current laws and regulations continue.⁴ Although production in petroleum and natural gas has risen rapidly in the last decade, employment has grown more slowly as productivity has increased, in part as a reaction to sharp global price declines that have forced efficiency initiatives.

Petroleum drives the U.S. fuel economy, employing more than 53 percent of the Fuels sector or more than 615,500 people. However, since petroleum and natural gas fuels are frequently produced jointly, it can sometimes be difficult to differentiate between jobs in these two sectors. In 2017, the Bureau of Labor Statistics redefined the distinction between the mining and extraction jobs in petroleum and natural gas, leading to a relative increase in petroleum jobs and a similar decline in natural gas. However, when petroleum and natural gas fuels jobs are combined to eliminate the effect of this redefinition, the two fuels have gone from 818,000 jobs in 2015 to 891,000 in 2019, a growth rate of 8.9 percent. As mentioned, this growth in production coincided with overall price declines.

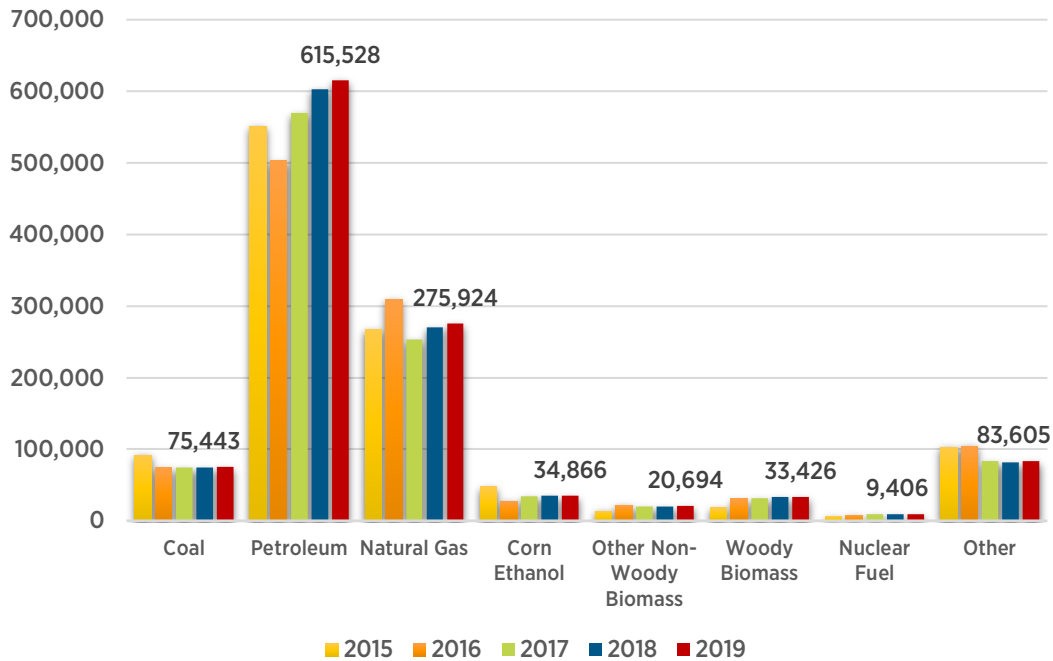
Not surprisingly, coal fuels have seen a sharp 18 percent decline over the same time period, shedding 17,000 jobs. Much of this decline was driven by the closures of coal-fired generation, discussed elsewhere in the 2020 USEER report, and its replacement by natural gas and renewable generation. Together, fossil fuels (coal, petroleum, natural gas) employed 84 percent of Fuels workers, or nearly 967,000 employees in 2019. As reported in the USEER state profiles, 535,000 of these employees are engaged in mining and extraction and 88 percent of those live in just 10 states, underscoring the long-term difficulty in responding to changing energy production.

³ Department of Energy, Energy Information Administration [EIA], *Annual Energy Outlook 2020 With Projections to 2050* [AEO2020] (Washington, DC: EIA, 2020), 11.

⁴ EIA, AEO2020, 10

While alternative fuel technologies do not maintain similar market share, some categories have undergone relatively rapid growth since 2015 while others have declined. Biomass fuels, (non-woody and woody combined) employed 54,100 workers in 2019 and grew 65 percent since 2015. However, corn ethanol employment declined by over 12,000 jobs, or 26 percent.

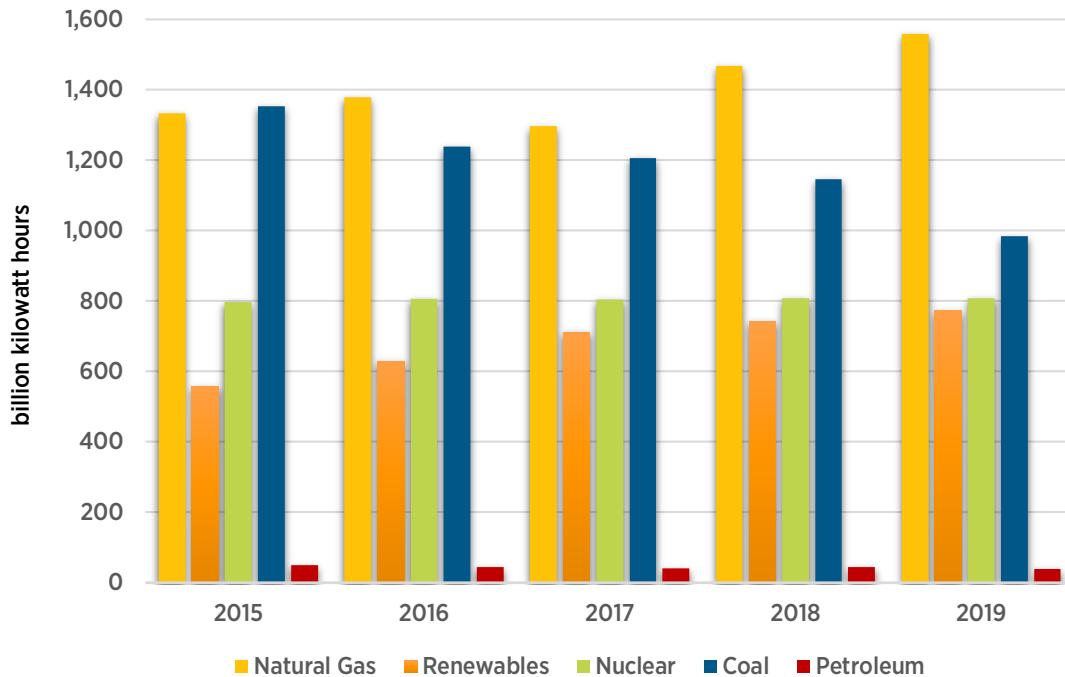
Figure 2.
Fuels Employment by Detailed Technology, 2015-2019



Electric Power Generation

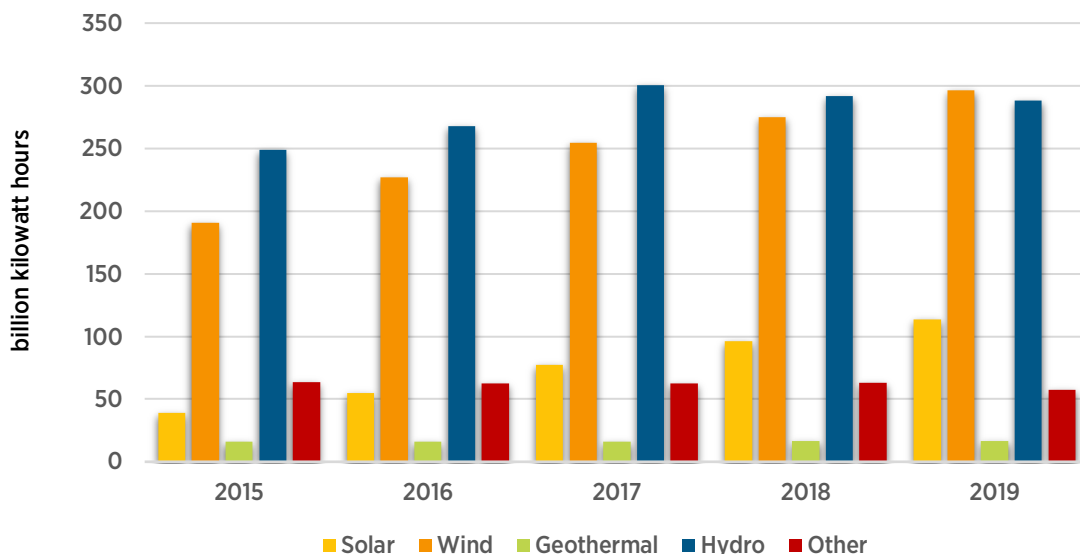
During the last five years, Electric Power Generation has experienced a significant shift in generation sources. In 2015, coal and natural gas each generated 33 percent of the electricity produced in the United States. Five years later, natural gas had increased to 39 percent while coal had fallen to 24 percent. In addition, the share of electricity generated from renewable sources had risen from 14 percent to 19 percent. Within the renewables sector, half of that growth came from wind, with the remaining half split between solar and hydro. Wind and hydro each produce slightly more than 7 percent of the nation’s electricity, while solar produces slightly less than 3 percent.⁵

Figure 3.
Electric Power Generation by Fuel Type, 2015-2019



⁵ EFI calculation from data at EIA, AEO2020, 62.

Figure 4.
Renewable Electric Power Generation, 2015-2019



This transition in generation sources has been reflected in the employment shifts in the sector. USEER employment data for 2015 is incomplete and thus, cannot provide a reliable baseline for all sectors.⁶ However, in 2015, the EPG sector employed 622,000 Americans. Over the next five years, the sector added over 177,000 jobs with the increases in employment centered, at first, in solar and then in natural gas, wind, CHP, and other low carbon technologies. Today, the sector employs 799,000 Americans.

Solar jobs, which had grown rapidly in the preceding six years, were relatively stagnant from 2016-2019, losing jobs in 2017 and 2018 and bouncing back in 2019. Currently, solar employs 248,000, down from its high point of 260,000 in 2016.

Job loss was most pronounced in coal-fired generation, which lost more than 13,000 jobs in 2018 and 2019, declining from 92,000 in 2016 to 79,000 in 2019. Natural gas, now the largest fuel source for electricity generation, added 33,600 jobs in the last four years and employs 122,000. Advanced, low-emissions natural gas actually added almost 40,000 new jobs, but traditional natural gas technologies declined.

Wind, which surpassed hydro as the largest producer of renewable electricity in 2019, added 16,000 new jobs in the last four years and now employs 115,000 while traditional and low-impact hydro employ 68,000 combined. Other low-emission technologies, including biofuels generation, geothermal, and CHP, all experienced growth.

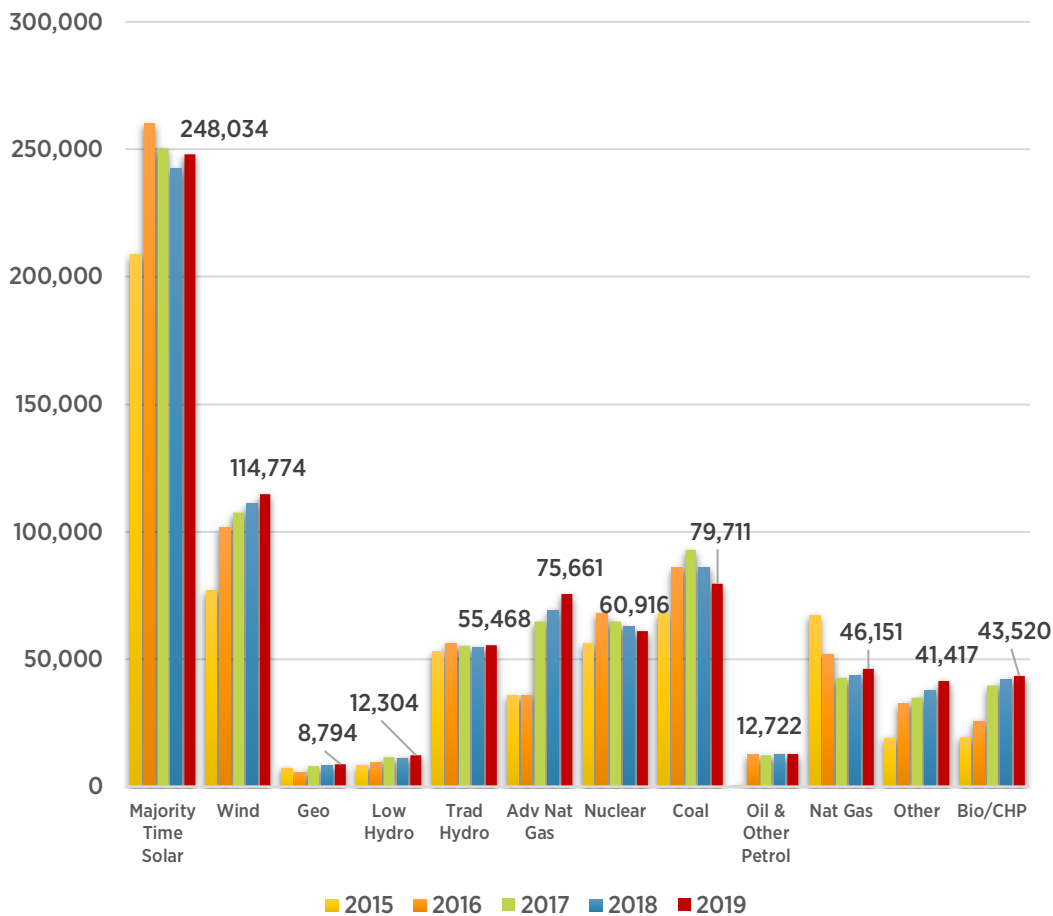
⁶ The 2016 USEER did not distinguish between different fossil fuel generation. It also combined majority time and less than majority time solar jobs. Subsequent editions of the USEER differentiated between these two. The 2020 USEER uses majority time solar jobs only for overall generation employment comparisons.

Nuclear generation shares with renewables the most zero-emission electricity production at 19 percent. Nuclear generation employment has continued to decline slowly over the last four years, losing 7,200 jobs.

At the state level these shifts in technology employment were experienced unevenly in different parts of the country, underscoring the economic and community difficulties associated with an energy transition.

In 2019, for instance, a majority of solar employment was found in just five states—California, Massachusetts, New York, Florida, and Texas. Meanwhile, 83 percent of the job losses in coal-fired generation were concentrated in 15 states. One state, Ohio, lost almost 25 percent of those jobs.

Figure 5.
EPG Employment by Detailed Technology, 2015-2019



Transmission, Distribution, and Storage

Employment growth in the Transmission, Distribution and Storage (TDS) sector has been driven by several key factors, including the expansion of domestic oil and gas production, the deployment of new renewable resources, grid modernization, the introduction of smart technologies, and a rising demand for energy storage. Unlike the EPG sector, where new technologies are displacing the old, in TDS, the new technologies represent the expansion of — or augmentation to — existing infrastructure. As a result, there has been steady employment growth over the last five years with little resulting dislocation.

As with EPG, improvements in the USEER survey in 2016 prevent exact comparisons between 2015 and 2019, since that survey expanded the number of manufacturing jobs included in the results by over 80,000. Nonetheless, TDS added the second most jobs from 2015 to 2019, with more than 156,000 new jobs, or nearly 13 percent growth. Currently, 1.38 million Americans work in this sector. (As described elsewhere in this report, this number does not include retail jobs such as gasoline stations.)

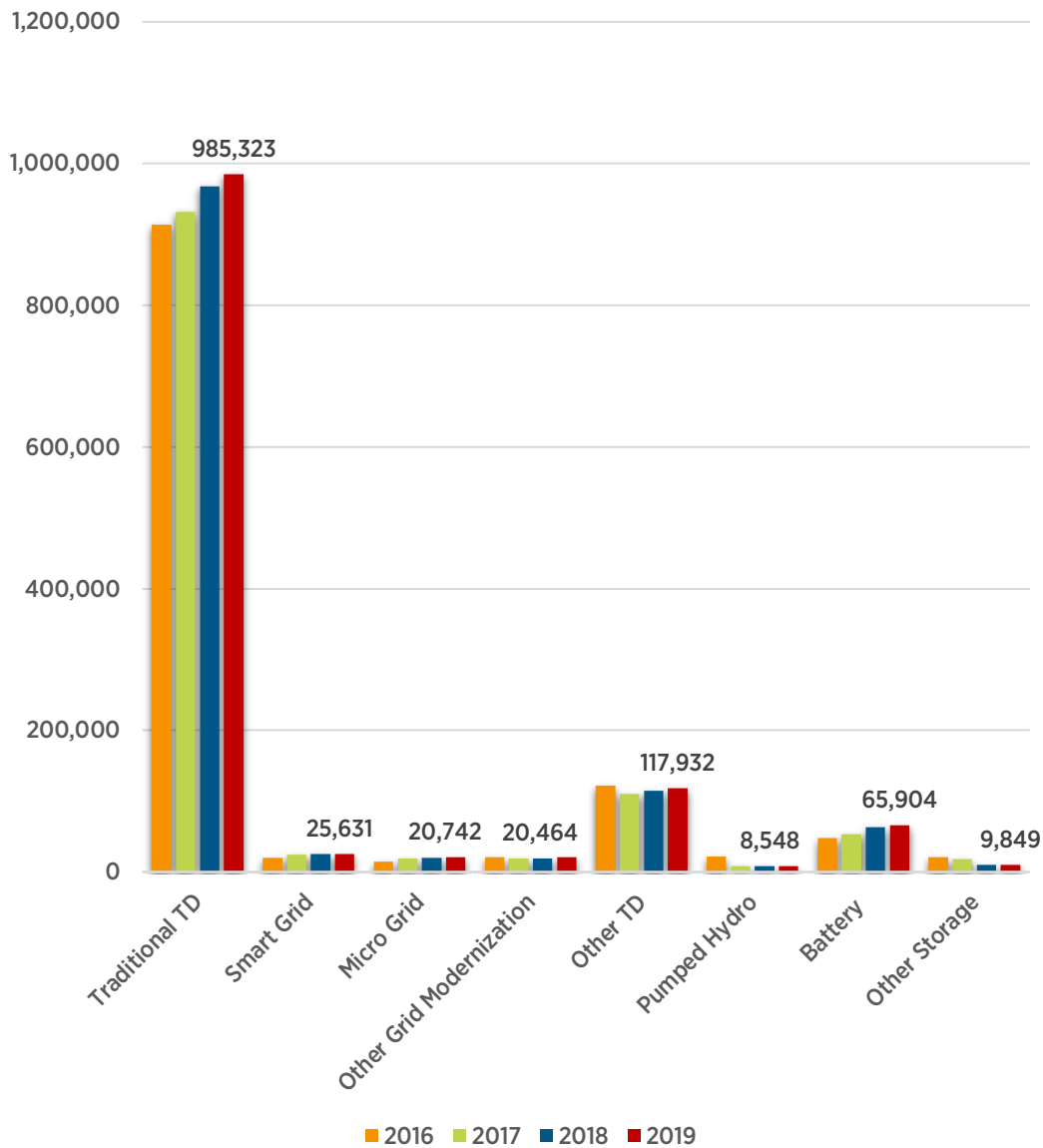
TDS employees are more heavily concentrated in the construction and utilities industries (at 40 and 33 percent, respectively) than EPG workers (at 37 and 22 percent). This, of course, reflects that 79 percent, or more than 985,300 TDS employees, build or maintain electrical transmission and distribution lines or oil and gas pipeline systems. Traditional TDS has grown 8 percent since 2016,⁷ adding 71,900 workers to the TDS workforce.

In 2018 and 2019, 48 and 42 percent of construction firms respectively reported that a majority of their revenues came from grid modernization or other utility-funded projects, reflecting the close reliance of these industry and workforce sectors on each other. A majority of the new jobs created in TDS from 2016 to 2019, 74,200, were in construction.

Smart grid and micro grid technologies have also experienced rapid employment growth since 2016, growing 30 and 39 percent respectively. Smart grid and micro grid technologies added a combined 11,700 jobs to the TDS sector. Battery storage has also experienced strong growth since 2016, adding 18,300 new jobs, or 38 percent growth, for a total of 65,900 workers in 2019.

⁷ Methodological changes to the USEER survey instrument in 2016 allowed for disaggregation of several detailed technologies. For this reason, comparison of detailed technologies in TDS are limited to 2016-2019.

Figure 6.
TDS Employment by Detailed Technology, 2016-2019



Note: Does not include commodity flow employment that works to transport fuels by rail, truck, air, or water (129,252 employees in 2019).

Energy Efficiency

Energy Efficiency employment grew the most significantly of the five surveyed sectors over the past 5 years, adding just over 400,000 jobs.

Its growth rate of 20 percent was over three times that of the overall economy. Today, the EE sector employs nearly 2.38 million Americans.

Many factors have contributed to the continued growth of energy efficiency jobs over the last five years. First, are the high number of states—30—that have active energy efficiency standards or voluntary programs. Seven of these were enacted or renewed in the last five years.⁸ Second, 75 percent of utilities now administer energy efficiency programs at the local level, encouraging the deployment of new appliances, lighting systems, insulation, and HVAC equipment.

At the federal level, over 50 new energy efficiency standards were adopted by the Department of Energy, while the EPA expanded its ENERGY STAR® residential and commercial building certification programs. Today, 231,000 construction workers work on ENERGY STAR certified residential home construction, while 255,000 construction employees work on ENERGY STAR certified commercial and industrial projects.

Another important trend is the increasing number of employees that construction firms report spending the majority of their time working with energy efficiency technologies. As of 2019, 56 percent of EE workers were employed in the construction industry. In 2015, the number of these employees working the majority of their time with energy efficiency technologies was 64.8 percent. By 2019, the number had risen to 78 percent. The largest jump occurred in 2016, when the number of employees doing energy efficiency work for traditional HVAC companies dropped sharply and rose significantly for those working with ENERGY STAR appliances, including HVAC systems.

Employment across detailed technologies in the EE sector has been relatively stable across the last four years with most technologies showing growth. In reviewing residential building energy consumption, the EIA projects a 17 percent residential energy decrease from 2019 to 2050 in its *Annual Energy Outlook 2020*, explaining, "The main factors contributing to this decline include gains in appliance efficiency, onsite electricity generation (e.g., solar photovoltaic), utility energy efficiency rebates, rising residential natural gas prices, lower space heating demand, and a continued population shift to warmer regions."⁹ EIA expects similar

⁸ [https://www.eia.gov/todayinenergy/detail.php?id=32332'](https://www.eia.gov/todayinenergy/detail.php?id=32332)

⁹ EIA, AEO2020, 118.

declines over the next decade in commercial energy intensity with the largest impact coming from the deployment of efficient lighting systems.

ENERGY STAR Appliances (including HVAC) and Traditional HVAC employed 26 and 25 percent of total EE workers in 2019 and added 56,300 and 77,800 jobs respectively between 2016 and 2019. Efficient Lighting technologies added 52,500 jobs during that same four-year period. One of the most important industry sectors of growth between 2016 and 2019 has been the Professional and Business Services sector which added 113,000 jobs.

Figure 7.
EE Employment by Detailed Technology, 2016-2019

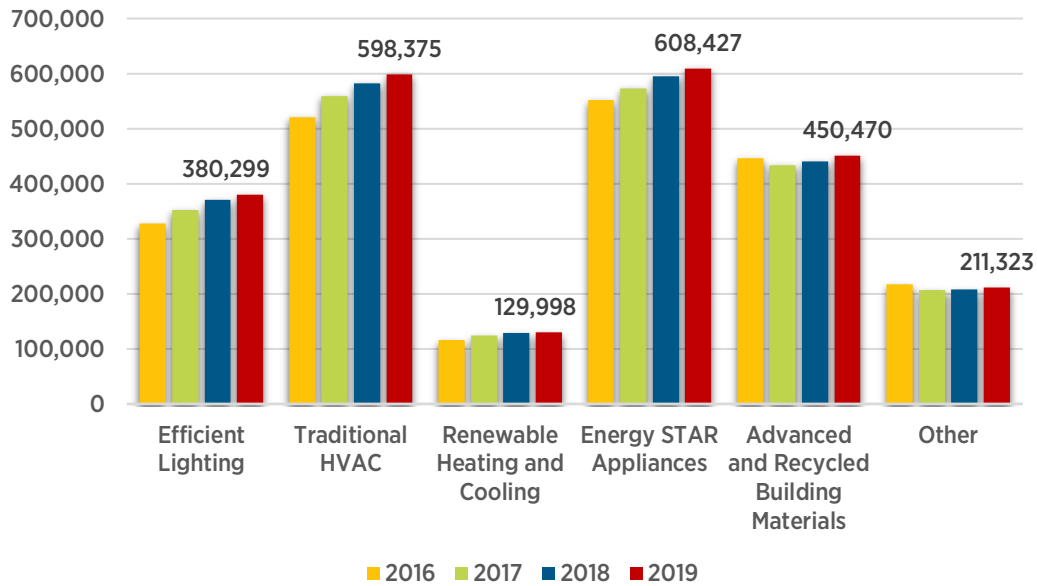
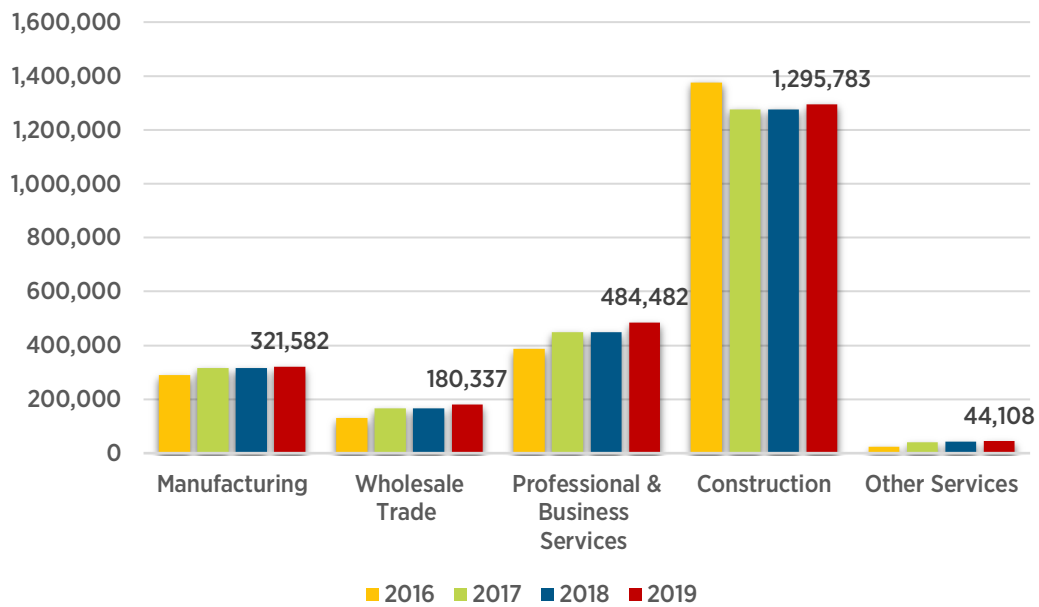


Figure 8.
EE Employment by Industry, 2016-2019



Motor Vehicles and Component Parts

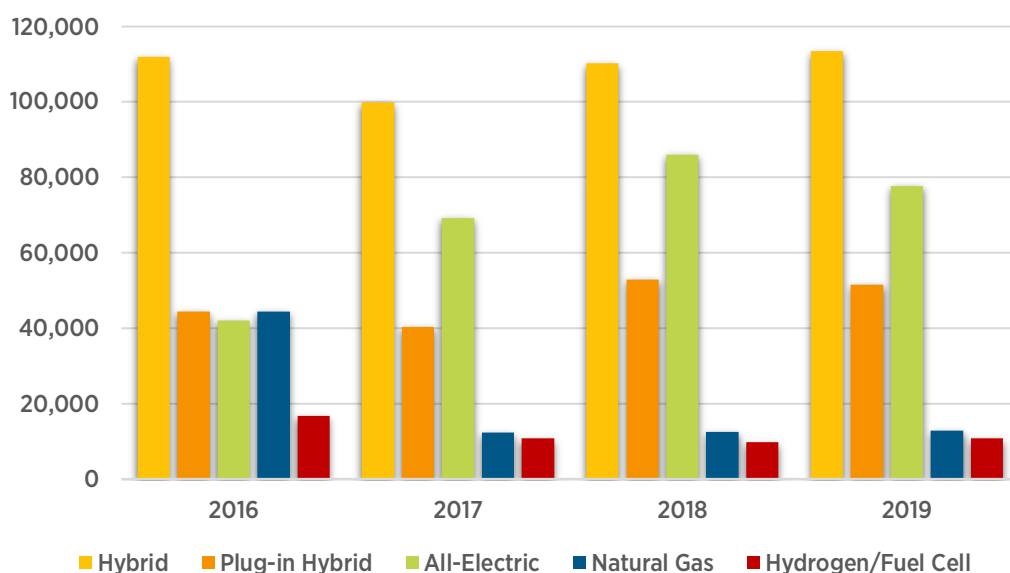
Motor Vehicles, the largest surveyed sector, employed 2.56 million Americans in 2019. Since 2015, the sector added 134,300 jobs representing just over 5.5 percent growth.

The preceding decade has been one of the most dynamic in the global motor vehicles industry since its inception with record production coinciding with dramatic technology shifts. In 2012, the United States adopted the most aggressive fuel economy standards in the world, while in 2019 multiple global automotive companies—Toyota, Ford, GM, Volvo, VW, and Tesla, among others—made announcements about vehicle electrification timelines and/or multiple new EV model introductions and production expansions.

One of the goals of the USEER was to track how the introduction of fuel economy measures including new technologies, light-weighting, materials substitution, and the growth of EVs, hybrids, plug-ins, and other alternative fuels vehicles would affect jobs in the overall industry.

Between 2015 and 2019, the Motor Vehicles industry added 76,000 alternative fuels vehicles jobs, rising from 190,300 to 266,400. During the last four years, the USEER tracked the shifts in domestic production of five specific vehicle types—all electric vehicles, plug-in hybrids, hybrids, natural gas, and hydrogen/fuel cells. Of those categories, the all-electric vehicles showed the most job growth, adding 36,000 jobs.

Figure 9.
Alternative Fuels Vehicles Jobs, 2015-2019



In 2016, the USEER also started tracking the number of jobs in the Component Parts sector that contributed to achieving the 2012 fuel economy standards. In 2016 that number was 489,000, or 44 percent of all jobs in component parts. That number has fluctuated up and down, annually, by 3 percent and now stands at 494,000.

One clear conclusion to draw from the changes in Motor Vehicles employment over the last decade, since the end of the Great Recession, is that fuel efficiency and electrification technologies have helped rejuvenate job growth in the sector. Motor Vehicle manufacturing has added approximately 220,000 jobs since 2010 with 86,000 of those coming during the last five years, well after the introduction of the new fuel efficiency standards.

Repair and Maintenance is the other major sector of the Motor Vehicles industry, comprising 39 percent of the jobs. It has also experienced significant growth, adding over 61,500 jobs.

Figure 10.
MV Employment by Industry, 2015-2019

