



Transmission, Distribution & Storage

Transmission, Distribution and Storage

Transmission, Distribution, and Storage (TDS) infrastructure for electric power and fuel links energy supplies to intermediate and end users. It includes the following:

- 2.6 million miles of interstate and intrastate pipelines
- 414 natural gas storage facilities
- 330 ports handling crude petroleum and refined petroleum products
- 140,000 miles of railways that handle crude petroleum, refined petroleum products, liquefied natural gas (LNG), and coal
- 642,000 miles of high-voltage transmission lines
- 6.3 million miles of distribution lines⁵²

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.
- **2019 Expectations:** TDS employers predict 3.2 percent job growth in 2019, led by professional and business services employers who anticipate 5.5 percent growth, followed by wholesale trade, distribution, and transport and other services at 5.4 percent and 4.9 percent respectively.
- **Key Industry Sectors:** The construction sector employed 35 percent of all TDS workers, while the utility industry employed another 31 percent.

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

⁵² DOE, Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure, 1-2.

SNAPSHOT OF EMPLOYMENT

Figure 70.

TDS Sector - Employment by Industry, 2017-2018

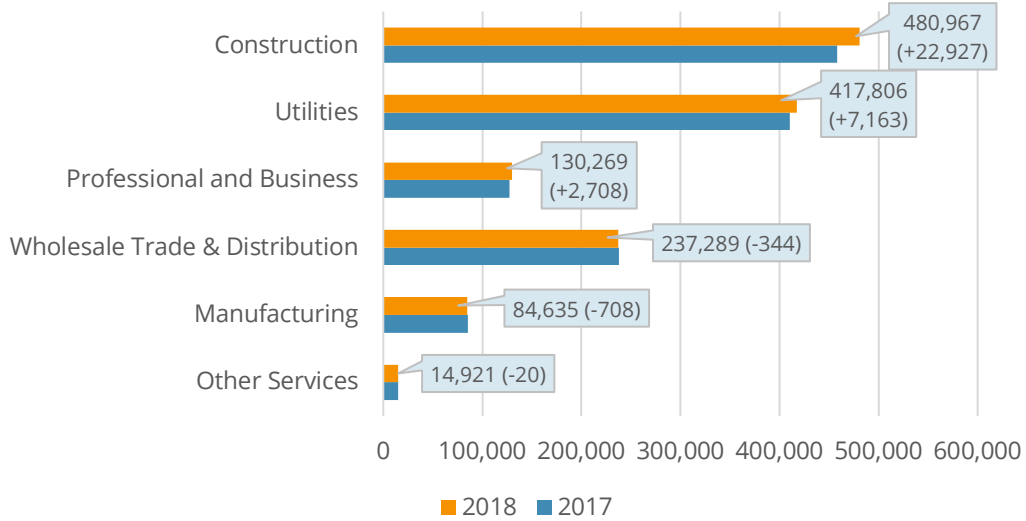
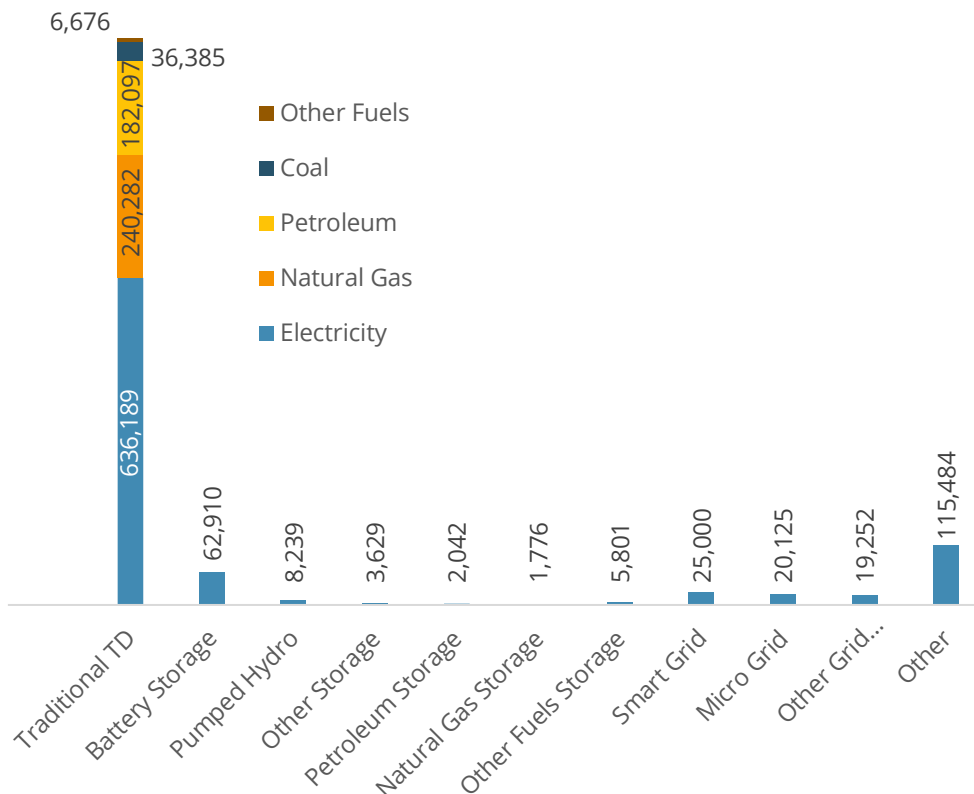


Figure 71.

TDS Sector - Employment by Detailed Technology Application, 2017-2018



KEY TAKEAWAYS

- **Construction firms employed 480,967 Americans** in TDS, a 5 percent increase from 2017. Utilities employed 417,806 workers across the United States in 2018, up 2 percent from 2017 and just over half of energy utility employment nationwide. While TDS manufacturing employment declined by 1 percent in 2018, manufacturers predicted that number would grow by 2.3 percent in 2019. Wholesale trade, which declined by 2 percent in 2018, includes nearly 138,000 employees involved in the transport of commodity energy products by rail, truck, air, and water.
- **Utility investments.** Overall, 48 percent of respondent employers working in Transmission, Distribution, and Storage reported that a majority of their revenues come from grid modernization or other utility-funded modernization projects (an increase from the 37.8 percent proportion reported in 2017).
- **Fuels employment.** The transmission, distribution, and storage of fuels employed 468,383 workers in the sector in 2018. Of these, 242,058 work with natural gas, 184,139 work with petroleum, and 36,385 work with coal fuels.

Table 34.
TDS Sector – TDS Employment by Detailed Technology Application and Industry, Q2 2018⁵³

	Total	Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, + Transport ⁵⁴	Professional Services	Pipeline Transport	Other Services
Traditional Transmission + Distribution Electricity	636,189	300,661	167,489	44,456	35,841	75,795	--	11,898
Traditional Transmission + Distribution Petroleum	182,097	--	71,727	--	90,792	--	19,578	--
Traditional Transmission + Distribution Natural Gas	240,282	117,145	93,049	--	--	--	30,088	--
Traditional Transmission + Distribution Coal	36,385	--	--	--	36,385	--	--	--
Traditional Transmission + Distribution Other Fuels	6,676	--	--	--	6,676	--	--	--
Pumped Hydro	8,239	--	3,322	2,508	272	1,386	667	85
Battery Storage	62,910	--	30,188	12,645	7,654	11,316	--	1,108
Other Storage	4,031	--	1,488	1,599	50	806	--	88
Petroleum Storage	2,042	--	1,264	274	31	--	--	471
Natural Gas Storage	1,776	--	575	301	214	675	--	12
Other Fuels Storage	1,983	--	1,322	--	<10	601	--	59
Smart Grid	25,000	--	11,738	1,735	1,505	9,840	--	183
Micro Grid	20,125	--	11,454	3,629	1,619	2,906	--	517
Other Grid Modernization	19,252	--	14,439	1,842	266	2,463	--	242
Other	115,082	--	72,912	15,646	1,784	24,481	--	258
TOTAL	1,362,069	417,806	480,967	84,635	183,089	130,269	50,333	14,921

⁵³ Employers in the “other” category typically work across multiple technology applications and workers are unable to be assigned to a single technology.

⁵⁴ Traditional transmission and distribution of petroleum, natural gas, and coal only includes commodity flow employment.

HIRING DIFFICULTY

- **79 percent of TDS construction employers** reported that it was somewhat difficult or very difficult to hire new employees in 2018 (with 34 percent reporting that hiring was very difficult).
- **74 percent of professional and business services** employers reported that it was either somewhat difficult or very difficult to hire new employees.
- **By comparison, among utilities, a smaller percentage—56 percent—**reported that it was somewhat difficult or very difficult to hire new employees (with only 12 percent of utilities reporting that hiring was very difficult).

HIGHEST-DEMAND OCCUPATIONS IN TDS

More than half the construction employers that hired workers in 2018 reported that electricians and construction laborers were the most difficult to hire.

Table 35.
TDS Sector – Reported Occupations with Hiring Difficulty by Industry, Q4 2018

Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, and Transport	Professional and Business Services	Other
Electrician/ construction laborers (36%)	Electrician/ construction laborers (56%)	Engineers/ scientists (45%)	Technician or mechanical support (38%)	Sales, marketing, or customer service representatives (31%)	Sales, marketing, or customer service representatives (40%)
Technician or mechanical support (25%)	Technician or mechanical support (36%)	Technician or mechanical support (35%)	Sales, marketing, or customer service representatives (38%)	Engineers/ scientists (31%)	Management (directors, supervisors, vice presidents) (40%)
Management (directors, supervisors, vice presidents) (21%)	Drivers/ dispatchers (10%)	Sales, marketing, or customer service representatives (30%)	Electrician/ construction workers (24%)	Management (directors, supervisors, vice presidents) (21%)	Operations or business development (20%)

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

“Public agencies have the opportunity to create a pathway forward that is embedded with equity and opportunity, at minimal cost, if any.”

The Los Angeles County Metropolitan Transportation Authority, the second-largest transit agency in the country, applied Jobs to Move America’s principles in voting to transition its fleet of over 2,200 buses to zero emission electric buses by 2030. The roll-out of the electric buses will be prioritized in environmental justice communities.

INTRODUCTION

For purposes of the USEER, Transmission, Distribution, and Storage encompasses the employment associated with constructing, operating, and maintaining this energy infrastructure. It includes workers associated with the entire network of power lines that transmit electricity from generating stations to customers, as well as activities that support power and pipeline construction, fuel distribution and transport, and the manufacture of electrical transmission equipment.

Several NAICS codes actively track employment across utility transmission, including natural gas distribution, electrical transmission line construction, and fossil fuel pipeline transportation. This year, for the first time in a USEER report, traditional transmission and distribution technologies were split between electricity and fuels. Also included this year is employment for the storage of fuels. The TDS sector's remaining employment is found within energy-related industry subsectors in construction, manufacturing, wholesale trade, professional and business services, and other services.

In the broadest possible sense, Transmission, Distribution, and Storage could also encompass the final retail sale of gasoline and other liquid fuels to consumers. Retail sales of gasoline and liquid fuels dealers employ a significant number of workers—in 2018, there were 1,014,007 such employees (down 2,000 since 2017), comprising workers in gasoline stations with convenience stores (838,746 employees), other gasoline stations (103,976 employees), and fuel dealers (71,285 employees).⁵⁵ These employees are part of the larger universe of 15,775,096 employees in retail trade in the United States in 2018.⁵⁶ For purposes of the 2019 USEER, though, this retail trade employment is not included in the scope of this chapter on Transmission, Distribution, and Storage (or in the associated state fact sheets on energy employment that accompany this report). Workers associated with the wholesale trade and distribution of energy commodities, though, are within the scope of this chapter.

⁵⁵ BLS, QCEW, 2018 Second Quarter, U.S. Total June Employment for NAICS 44711, NAICS 44719, and NAICS 45431.

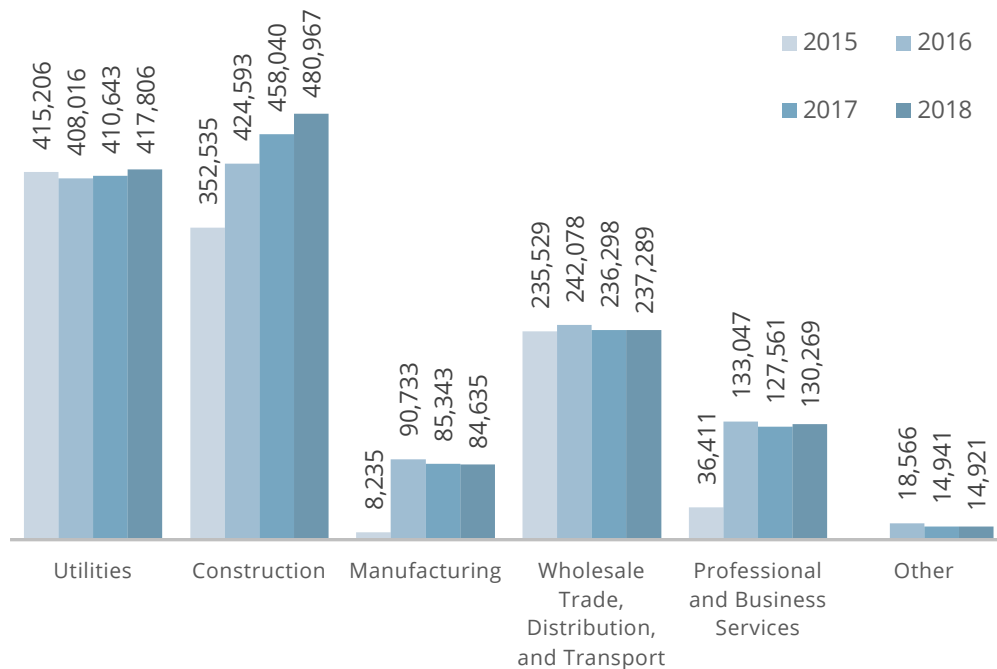
⁵⁶ BLS, QCEW, 2018 Second Quarter, U.S. Total June Employment for NAICS 44-45.

SUMMARY

Transmission, Distribution, and Storage, plus the retail workers discussed above, employed just under 2.38 million Americans in 2018. Excluding these retail employees, 1,365,887 workers were employed in the TDS sector. As shown in Figure 72,⁵⁷ about 66 percent of this employment was across utilities and construction firms,⁵⁸ including 35 percent in construction companies that construct pipeline and other infrastructure that support the Transmission, Distribution, and Storage, including both fuels and electricity.⁵⁹ Overall, 48 percent of respondent employers working in the TDS sector reported that a majority of their revenues come from grid modernization or other utility-funded modernization projects (an increase from the 37.8 percent proportion reported in 2017). Employers project to increase their hiring of workers by just over 3 percent in 2019.

Figure 72.

TDS Sector – Employment by Industry Sectors, Q2 2015 - Q2 2018



⁵⁷ It should be noted that any changes in the manufacturing industry are not directly comparable to employment totals for 2015 in the 2016 USEER. The 2017 USEER, 2018 USEER, and 2019 USEER significantly improved the methodology and scope used, to capture more manufacturing jobs. As a result, changes in the methodology account for most of the apparent and observed growth in 2016, compared to 2015 data.

⁵⁸ Hydrogen and fuel cell technologies are split among motor vehicles, storage, and other generation, depending on application—however, the numbers were too small to report separately within the latter two categories.

⁵⁹ This includes transportation employment, which is calculated using commodity flow data and employment data on rail, truck, air, and sea transportation.

TRANSMISSION, DISTRIBUTION, AND STORAGE EMPLOYMENT BY DETAILED TECHNOLOGY APPLICATION

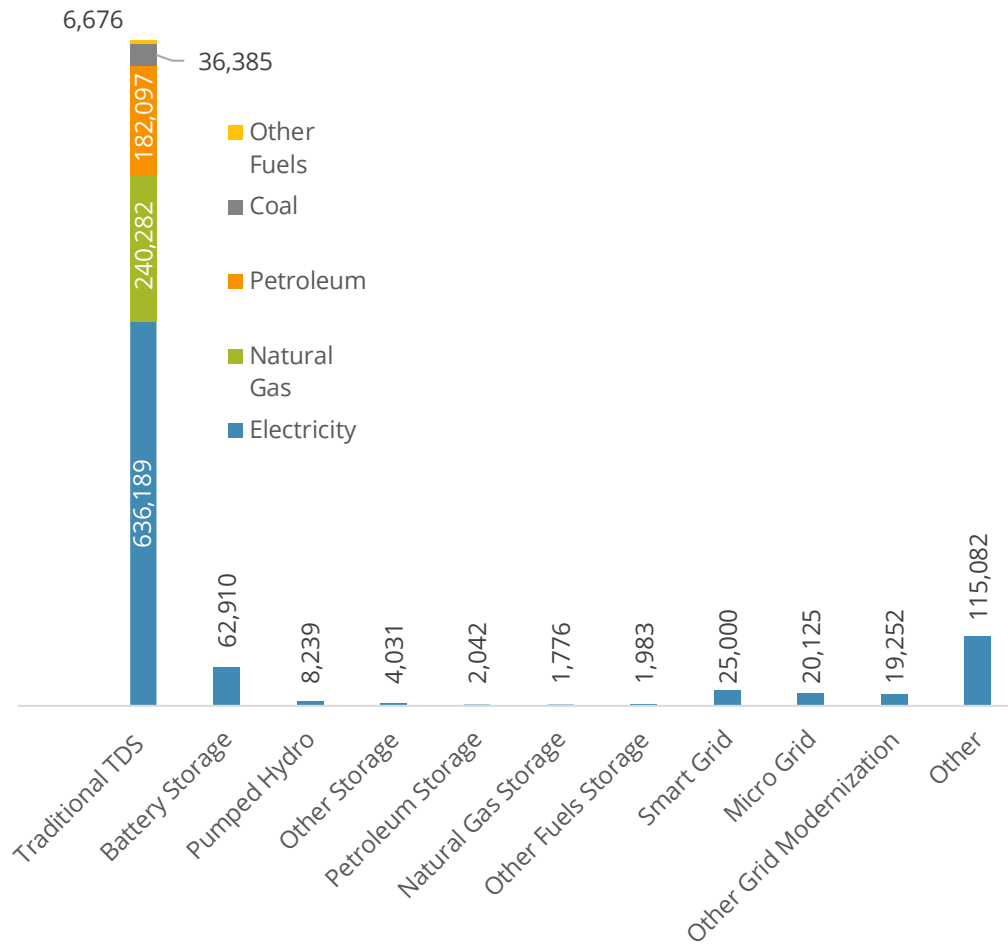
In 2018, 71 percent of Transmission, Distribution, and Storage employees worked to manufacture, construct, repair, and operate traditional electrical and natural gas transmission and distribution. This includes natural gas pipeline and power line construction. Approximately 81,000 workers were employed with storage technologies (including pumped hydro-storage)⁶⁰ in 2018, while 64,400 worked with smart grid,⁶¹ micro grid, or other grid technologies. About 137,200 employees were involved with the transport of fuel via rail, air, water, or truck, and an additional 115,100 worked on other detailed technology applications within Transmission, Distribution, and Storage.⁶²

⁶⁰ Hydro-storage is included in this section when it is separate from hydropower generation, which is included in the generation and fuels chapter.

⁶¹ Defined as employees that work on an electricity supply network that uses digital communications technology to detect and react to local changes in usage

⁶² Fossil fuel commodity flows via air, rail, water, and truck transportation are included using the Quadrennial Energy Review methodology – these employment figures are relative to the percentage of fuels being transported. These include jobs supported by oil and coal train and truck transportation, for instance. The employment generated from commodity flow data is grouped into the “other” category as these employers were not directly surveyed. Total “other” employment is 252,633.

Figure 73.
TDS Sector – Employment by Detailed Technology, 2018



Professional and business services firms within Transmission, Distribution, and Storage reported expected growth of 5.6 percent by the end of 2019, as shown in Figure 74.⁶³

⁶³ The data in Figure 74 does not include commodity flow employers, as they were not surveyed for 2019 USEER.

Figure 74.
TDS Sector – Expected Employment Growth by Industry (Q4 2018 – Q4 2019)

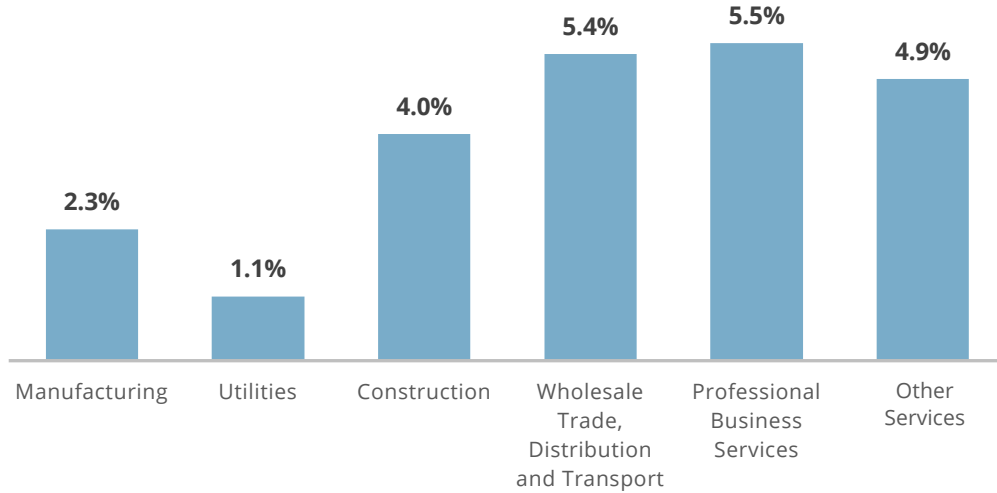
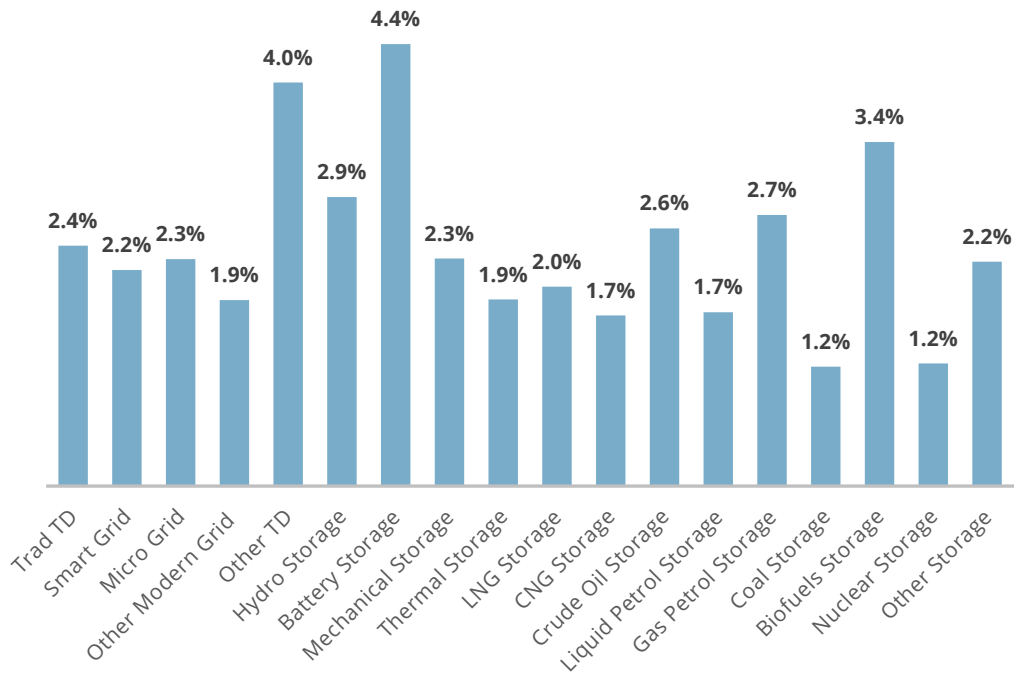


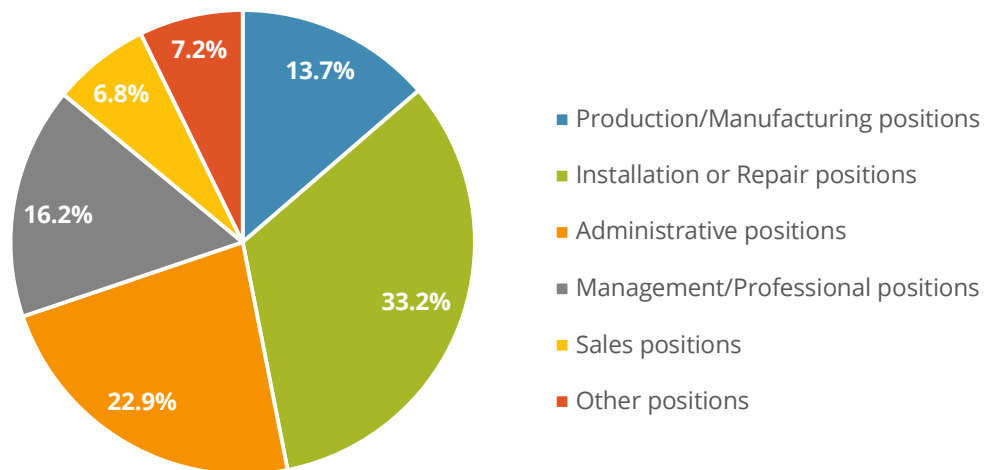
Figure 75.
TDS Sector – Expected Employment Growth by Detailed Technology (2018-2019)



TRANSMISSION, DISTRIBUTION, AND STORAGE – WORKFORCE CHARACTERISTICS

One-third (33 percent) of Transmission, Distribution, and Storage workers were employed in installation or repair positions in 2018. Twenty-three percent of workers were employed in administrative positions.

Figure 76.
TDS Sector – Occupational Distribution, Q4 2018



Manufacturing firms in TDS reported the highest overall hiring difficulty in 2018, followed by construction, and professional and business services. Construction, which makes up the largest percentage of TDS employment (35 percent), reported the largest number of employers stating that it was very difficult to hire new employees in 2018 (34 percent). However, this was down by 13 percentage points from 2017. Utilities, with 31 percent of TDS employees, continued to experience the least difficulty in hiring.

Figure 78.
TDS Sector – Hiring Difficulty by Industry

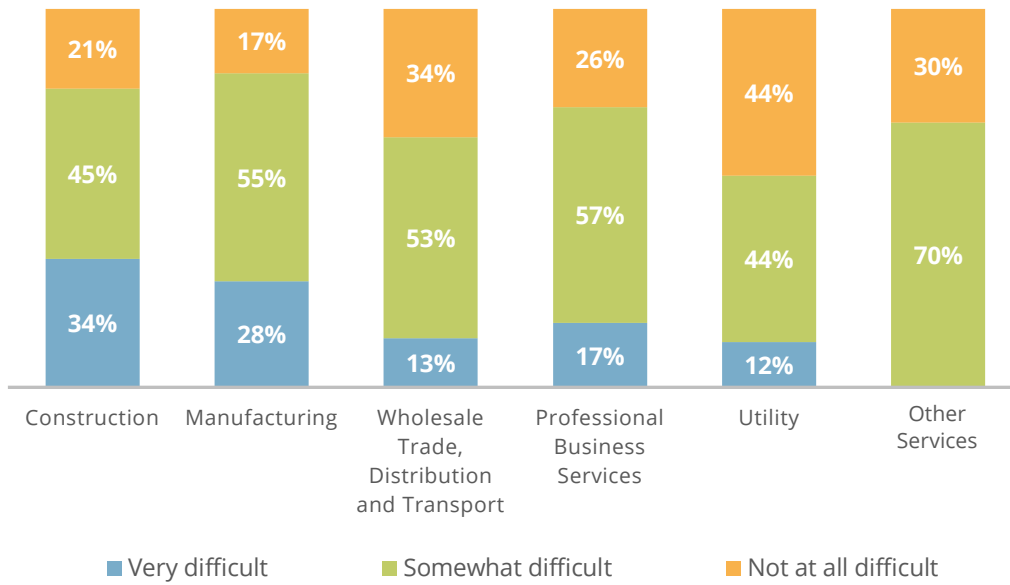
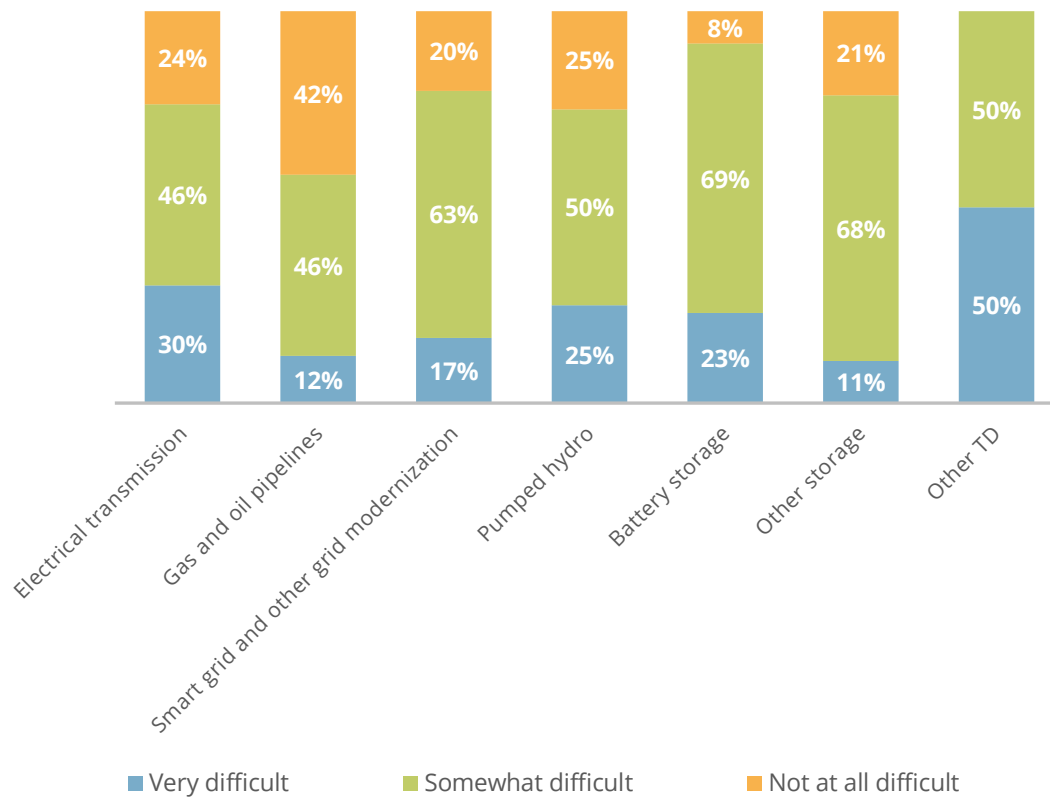


Figure 77.
TDS Sector – Hiring Difficulty by Technology, Q4 2018



Transmission, Distribution, and Storage industry sectors reported lack of experience, training, or technical skills as the number one reason for reported hiring difficulty.

Table 36.
TDS Sector – Reasons for Hiring Difficulty by Industry, Q4 2018

Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, and Transport	Professional and Business Services	Other
Lack of experience, training, or technical skills (36%)	Lack of experience, training, or technical skills (53%)	Lack of experience, training, or technical skills (36%)	Lack of experience, training, or technical skills (53%)	Lack of experience, training, or technical skills (53%)	Lack of experience, training, or technical skills (50%)
Location (28%)	Insufficient non-technical skills (26%)	Insufficient non-technical skills (32%)	Insufficient qualifications, certifications, education (21%)	Insufficient qualifications, certifications, education (33%)	Competition/ small applicant pool (33%)
Insufficient qualifications, certifications, education (21%)	Insufficient qualifications, certifications, education (24%)	Location (23%)	Insufficient non-technical skills (16%)	Insufficient non-technical skills (13%)	Difficulty finding industry-specific knowledge, skills, and interest (33%)

Utilities and construction firms that had hiring difficulty in 2018 cited electricians and/or construction laborers as the most difficult occupational category to hire for.

Table 37.
TDS Sector – Reported Occupations with Hiring Difficulty by Industry, Q4 2018

Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, and Transport	Professional and Business Services	Other
Electrician/ construction laborers (36%)	Electrician/ construction laborers (56%)	Engineers/ scientists (45%)	Technician or mechanical support (38%)	Sales, marketing, or customer service representatives (31%)	Sales, marketing, or customer service representatives (40%)
Technician or mechanical support (25%)	Technician or mechanical support (36%)	Technician or mechanical support (35%)	Sales, marketing, or customer service representatives (38%)	Engineers/ scientists (31%)	Management (directors, supervisors, vice presidents) (40%)
Management (directors, supervisors, vice presidents) (21%)	Drivers/ dispatchers (10%)	Sales, marketing, or customer service representatives (30%)	Electrician/ construction workers (24%)	Management (directors, supervisors, vice presidents) (21%)	Operations or business development (20%)

Just under a quarter of Transmission, Distribution, and Storage employees across the nation in 2018 were women. Eighteen percent of employees were Hispanic or Latino, slightly higher than the national workforce average. While African American employment was below the national average, overall racial diversity was 8 percentage points above the national workforce average. Unionization rates in TDS are almost 50 percent higher than the national workforce average. As noted earlier in connection with Figure 74, commodity flow employment is not included in this section as commodity flow employers were not directly surveyed for the 2019 USEER.

Table 38.
TDS Sector – Demographics, Q4 2018

Demographic	Employees	Percent of Sector	National Workforce Averages
Male	927,292	76%	53%
Female	300,874	24%	47%
Hispanic or Latino	216,276	18%	17%
Not Hispanic or Latino	1,011,890	82%	83%
American Indian or Alaska Native	25,929	2%	1%
Asian	101,854	8%	6%
Black or African American	101,993	8%	12%
Native Hawaiian or other Islander	9,483	1%	>1%
White	864,198	70%	78%
Two or more races	124,709	10%	2%
Veterans	100,031	8%	6%
55 and over	242,032	20%	23%
Union	194,552	16%	11%

NATURAL GAS INDUSTRY CROSSCUT

The natural gas industry has employment in three of the 2019 USEER chapters— Fuels, Electric Power Generation, and Transmission, Distribution, and Storage. For detailed information on hiring trends and demographic makeup, see the sections in these chapters beginning on pages 33, 80, and 106.

In total, the 2019 USEER finds that the natural gas industry employs 625,369 Americans, spread through the industrial sectors in Table 39 below. Overall, natural gas industry employment grew by 6.2 percent in 2018.

The largest industry sectors in the natural gas industry were the following:

- Utilities—176,167 jobs
- Mining and Extraction—162,928 jobs
- Construction—113,339 jobs

The fastest growing industry sectors for natural gas were the following:

- Mining and Extraction – 11.5 percent growth
- Construction – 8.0 percent growth
- Professional and Business Services – 6.7 percent growth

The industry sectors that added the most jobs in natural gas were the following:

- Mining and Extraction – 16,816 jobs
- Construction – 8,373 jobs
- Utilities – 7,754 jobs

Table 39.
Natural Gas Industry Employment by Detailed Technology Application
and Industry, Q2 2018⁶⁴

	Total	Mining and Extraction	Utilities	Constr- uction	Manufac- turing	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

⁶⁴ Text, charts, and tables in the 2019 report include revised 2017 employment totals for advanced and traditional natural gas generation based on additional available data from the Energy Information Administration.

SNAPSHOT OF THE NATURAL GAS INDUSTRY

- Contribution to GDP in 2018: \$199.13 billion.⁶⁵
- Overall employment: 625,369
- 1,362,996 GWh of natural gas generation through November 2018⁶⁶
- End-use consumption of natural gas through November 2018: 5.9 percent by lease and plant fuel, 2.7 percent by pipeline and distribution use, 14.9 percent residential, 10.9 percent deliveries to commercial consumers, 27.9 percent industrial, 0.1 percent vehicle fuel, 37.6 percent deliveries to electric power consumers
- 1,197,155,000 metric tons of carbon dioxide emissions through September 2018⁶⁷

WORKFORCE TRENDS

Overall difficulty hiring

- 75.7 percent of natural gas firms have had difficulty in hiring in 2018; 32.1 percent have reported hiring was very difficult.

Most difficult industries

- Construction (81.4 percent) and “other” (81.8 percent) industries have had the most difficulty hiring for natural gas in 2018.
 - 50.7 percent of construction firms reported that hiring has been very difficult.

Most difficult occupations

- Technical/mechanical support was the most difficult occupation to hire for in 2018, cited twice as much (40.7 percent) as the next most cited occupation.
 - Other occupations that were noted as being difficult to hire for include electricians/construction laborers (21.1 percent), management (16.7 percent), and engineers/scientists (15.3 percent).

⁶⁵ Source: GDP estimates are developed by BW Research Partnership using Bureau of Economic Analysis (BEA) RIMS II data and data collected in the employer survey.

⁶⁶ Source: U.S. Energy Information Association, Monthly Energy Review, Table 1.1. Net Generation by Energy Source: Total (All Sectors), January 2018-November 2018

⁶⁷ Source: U.S. Energy Information Association, Monthly Energy Review, Table 12.1. Carbon Dioxide Emissions from Energy Consumption by Source, January 2018-September 2018

Reasons for difficulty

- The most frequently cited reasons for hiring difficulty among firms dealing with natural gas were lack of experience, training, or technical skills (46.3 percent), insufficient non-technical skills (22.2 percent), insufficient qualifications (certifications or education) (16.7 percent), and competition/small applicant pool (15.7 percent).

Wage distribution⁶⁸

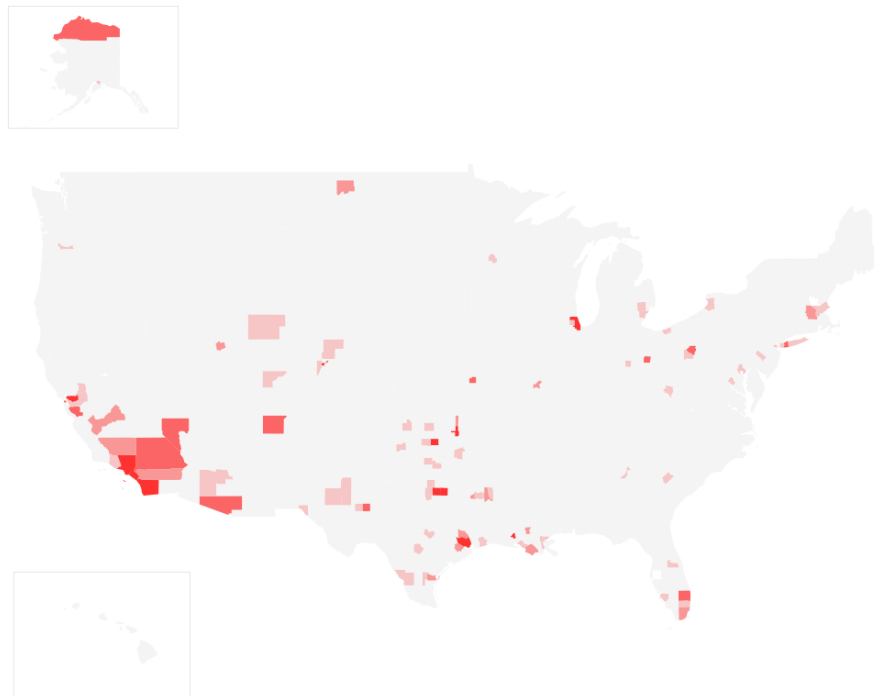
- The average reported median full-time hourly wage for all entry level workers in the natural gas industry is \$18.20/hour.
- The average reported median full-time hourly wage for all mid-wage workers is \$26.03/hour.
- The average reported median full-time hourly wage for the highest earners in the industry is \$39.92/hour.

Top wage jobs in industry

- Top wage earners in the natural gas industry include executive management (averaging \$64.62/hour), general or operations specialties managers (averaging \$52.78/hour), engineers (averaging \$49.21/hour), accountants/auditors (averaging \$46.88/hour), and boilermakers (averaging \$36.81/hour).

Figure 79.

National Heat Map Showing Distribution of Natural Gas Jobs



⁶⁸ Source: Employer reported Q4 2018 wages and May 2017 BLS OES wages.

COAL INDUSTRY CROSSCUT

The coal industry has employment in three of the 2019 USEER chapters—Fuels, Electric Power Generation, and Transmission, Distribution, and Storage. For detailed information on hiring trends and demographic makeup see the sections in these chapters beginning on pages 30, 77, and 106.

In total, the 2019 USEER finds that the coal industry employs 197,418 Americans, spread through the industrial sectors in Table 40 below. Overall, coal industry employment declined by 3 percent in 2018.

The largest industry sectors in coal industry were the following:

- Mining and extraction employed 55,905.
- Utilities employed 45,795.
- Wholesale trade employed 43,327.

The fastest growing industry sectors for coal were the following:

- Professional and Business Services – 6.3 percent growth
- Other Services – 4.2 percent growth
- Construction – 3.4 percent growth

The industry sectors that added the most jobs in coal were the following:

- Professional and Business Services – 1,851 jobs
- Construction – 288 jobs
- Manufacturing – 212 jobs

Table 40.

Coal 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	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

SNAPSHOT OF THE COAL INDUSTRY

- Contribution to GDP in 2018: \$66.08 billion.⁶⁹
- Overall employment: 197,418
- 1,049,299 GWh of coal generation through November 2018⁷⁰
- End-use consumption for coal through October 2018: 74.5 percent by electric utilities, 25.0 percent independent power, 0.01 percent commercial, and 0.4 percent for industrial
- 953,461,000 metric tons of carbon dioxide emissions through September 2018⁷¹

WORKFORCE TRENDS

Overall difficulty hiring

- 74.2 percent of coal firms have had difficulty in hiring in 2018; 31.5 percent have noted that hiring was very difficult.

Most difficult industries

- Construction (87.5 percent) and wholesale trade (75.0 percent) industries have had the most difficulty with hiring in 2018.
 - 54.2 percent of construction firms have reported that hiring has been very difficult.

Most difficult occupations

- Technician/mechanical support (34.8 percent), electrician/construction laborers (21.3 percent), engineers/scientists (19.1 percent), and management (16.9 percent) were cited as the most difficult occupations to hire for among coal firms in 2018.

⁶⁹ Source: GDP estimates are developed by BW Research Partnership using Bureau of Economic Analysis (BEA) RIMS II data and data collected in the employer survey.

⁷⁰ Source: U.S. Energy Information Association, Table 1.1. Net Generation by Energy Source: Total (All Sectors), 2008-November 2018

⁷¹ Source: U.S. Energy Information Association, Monthly Energy Review, Table 12.1. Carbon Dioxide Emissions from Energy Consumption by Source, January 2018-September 2018

Reasons for difficulty

- Most (44.0 percent) of coal firms cited lack of experience, training, or technical skills as a reason for hiring difficulty.
 - Other reasons that were frequently cited are insufficient qualifications (certifications or education) (23.1 percent), insufficient non-technical skills (19.8 percent), and difficulty finding industry-specific knowledge, skills, and interest (16.5 percent).

Wage distribution⁷²

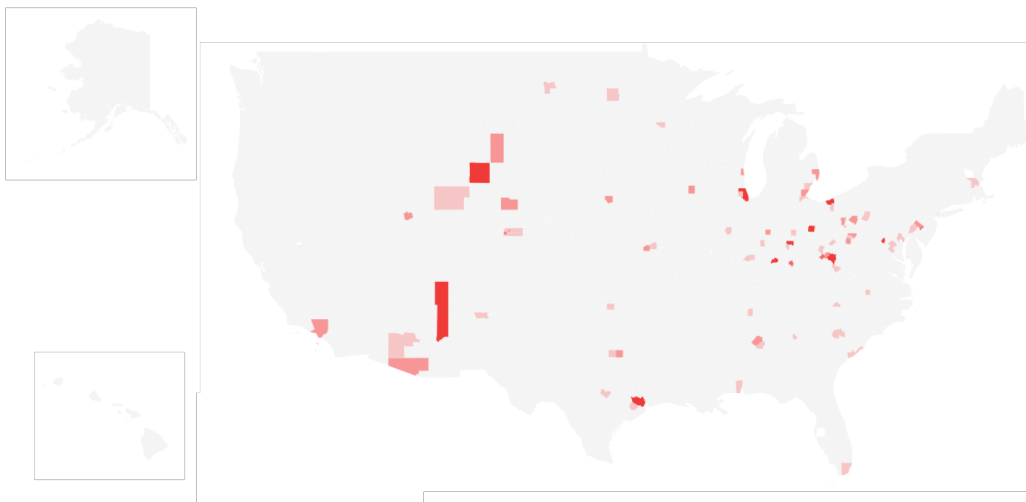
- The average reported median full-time hourly wage for all entry level workers in the coal industry is \$17.53/hour.
- The average reported median full-time hourly wage for all mid-wage workers is \$26.25/hour.
- The average reported median full-time hourly wage for the highest earners in the industry is \$40.53/hour.
- The average coal worker receives a higher median wage than both natural gas and petroleum workers at all three pay levels.

Top wage jobs in industry

- Top wage earners in the coal industry include executive management (averaging \$58.73/hour), operations specialties managers (averaging \$50.78/hour), construction managers (averaging \$44.43/hour), boilermakers (averaging \$36.81/hour) and power plant operators (averaging \$36.26/hour).

Figure 80.

National Heat Map Showing Distribution of Coal Jobs



⁷² Source: Employer reported Q4 2018 wages and May 2017 BLS OES wages.

PETROLEUM INDUSTRY CROSSCUT

The petroleum industry has employment in three of the 2019 USEER chapters—Fuels, Electric Power Generation, and Transmission, Distribution, and Storage. For detailed information on hiring trends and demographic makeup see the sections in these chapters beginning on pages 27, 86, and 106.

In total, the 2019 USEER finds that the petroleum industry employs 799,531 Americans, spread through the industrial sectors in Table 41 below. Overall, the industry employment grew by 5.3 percent in 2018.

The largest industry sectors in the petroleum industry were the following:

- Mining and Extraction—308,681 jobs
- Wholesale Trade, Distribution, and Transport—170,945 jobs
- Manufacturing—155,267 jobs

The fastest growing industry sectors for petroleum were the following:

- Other Services – 28.7 percent growth
- Mining and Extraction – 9.0 percent growth
- Construction – 8.1 percent growth

The industry sectors that added the most jobs in petroleum were the following:

- Mining and Extraction – 25,471 jobs
- Construction – 6,725 jobs
- Professional and Business Services – 3,963 jobs

Table 41.

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

	Total	Mining and Extraction	Utilitie s	Constr- uction	Manufac- uring	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

SNAPSHOT OF THE PETROLEUM INDUSTRY

- Contribution to GDP in 2018: \$372.29 billion.⁷³
- Overall employment: 799,531
- 22,793 GWh of petroleum generation through November 2018⁷⁴
- End-use consumption for petroleum through September 2018: 25.2 percent industrial, 2.7 percent residential, 2.3 percent commercial, 69.2 percent transportation, 0.6 percent electric power
- 1,780,798,000 metric tons of carbon dioxide emissions through Sept. 2018⁷⁵

WORKFORCE TRENDS

Overall Difficulty Hiring

- 77.2 percent of petroleum firms have had difficulty in hiring in 2018; 32.4 percent note that hiring was very difficult.

Most difficult industries

- Construction (85.3 percent) and wholesale trade (81.9 percent) industries have seen the most difficulty hiring
 - 58.3 percent of construction firms have noted that hiring has been very difficult.

Most difficult occupations

- The most difficult occupation to hire for is technician/mechanical support (62.0 percent), cited over twice as much as the next most cited occupation.
 - Other occupations that are noted as being difficult to hire for are sales, marketing, or customer service (23.2 percent), management (13.2 percent), and electrician/construction laborers (11.7 percent).

Reasons for difficulty

The most frequently cited reasons for the hiring difficulty were lack of experience (49.2 percent), insufficient non-technical skills (25.2 percent), competition/small applicant pool (16.3 percent), and insufficient qualifications (certifications or education) (16.1 percent).

⁷³ Source: GDP estimates are developed by BW Research Partnership using Bureau of Economic Analysis (BEA) RIMS II data and data collected in the employer survey.

⁷⁴ Source: U.S. Energy Information Association, Table 1.1. Net Generation by Energy Source: Total (All Sectors), 2008-November 2018, petroleum liquids and coke

⁷⁵ Source: U.S. Energy Information Association, Monthly Energy Review, Table 12.1. Carbon Dioxide Emissions from Energy Consumption by Source, January 2018-September 2018

Wage distribution⁷⁶

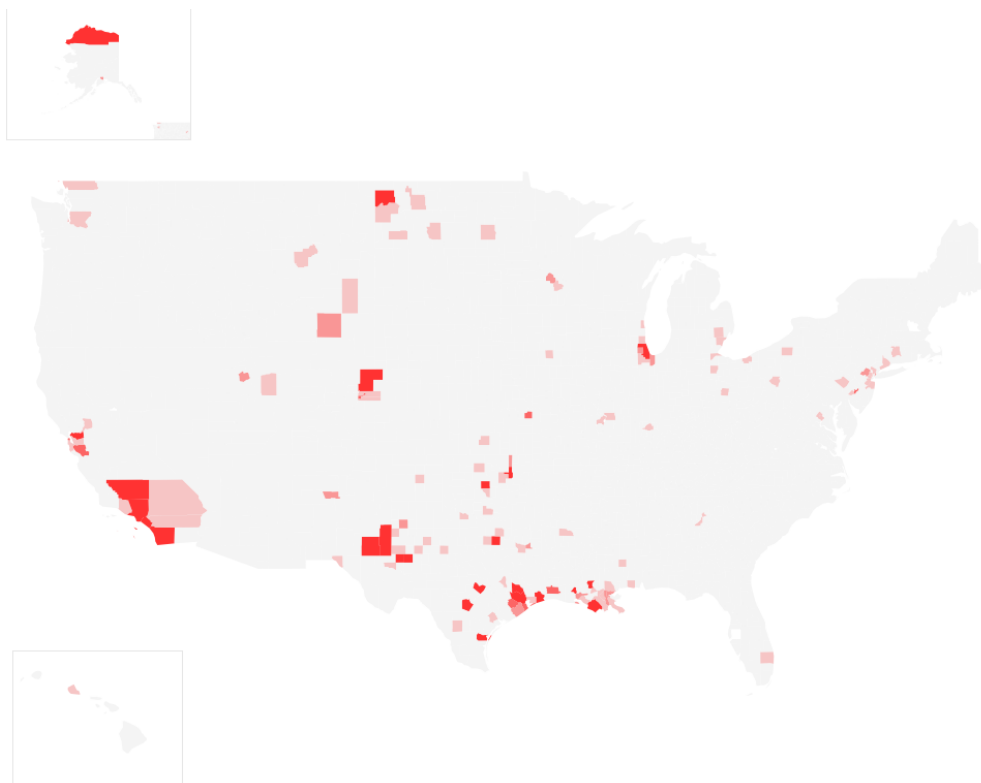
- The average reported median full-time hourly wage for all entry level workers in the petroleum industry is \$17.75/hour.
- The average reported median full-time hourly wage for all mid-wage workers is \$25.99/hour.
- The average reported median full-time hourly wage for the highest earners in the industry is \$39.59/hour.

Top wage jobs in industry

- Top wage earners in the petroleum industry include executive management (averaging \$56.15/hour), operations specialties managers (averaging \$49.74/hour), engineers (averaging \$46.92/hour), boilermakers (averaging \$36.81/hour), and first-line supervisors of mechanics, installers, and repairers (averaging \$32.77/hour).

Figure 81.

National Heat Map Showing Distribution of Petroleum Jobs



⁷⁶ Source: Employer reported Q4 2018 wages and May 2017 BLS OES wages.

NUCLEAR INDUSTRY CROSSCUT

The nuclear industry has employment in two of the 2019 USEER chapters—Fuels and Electric Power Generation. For detailed information on hiring trends and demographic makeup see the sections in these chapters beginning on pages 36 and 83.

In total, the 2019 USEER finds that the nuclear industry employs 72,146 Americans, spread through the industrial sectors in Table 42 below. Overall, nuclear industry employment declined by 2.1 percent in 2018.

The largest industry sectors in the nuclear industry were the following:

- Utilities employ 46,809.
- Professional services employ 14,374.
- Manufacturing employ 4,913.

The fastest growing industry sectors for nuclear were the following:

- Other Services – 13.2 percent growth
- Manufacturing – 3.6 percent growth
- Wholesale Trade, Distribution, and Transport – 1.5 percent growth

The industry sectors that added the most jobs in nuclear were the following:

- Manufacturing – 172 jobs
- Wholesale Trade, Distribution, and Transport – 50 jobs
- Professional and Business Services – 39 jobs

Table 42.
Nuclear Industry Employment by Detailed Technology Application and Industry, Q2 2018

	Total	Mining and Extraction	Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, + Transport	Professional Services	Other
Fuels	9,159	330	--	--	3,038	909	4,883	--
Nuclear Generation	62,987	--	46,809	2,195	1,875	2,531	9,491	86
TOTAL	72,146	330	46,809	2,195	4,913	3,440	14,374	86

SNAPSHOT OF THE NUCLEAR INDUSTRY

- Contribution to GDP in 2018: \$33.46 billion.⁷⁷
- Overall employment: 72,146 jobs
- 735,420 GWh of nuclear generation through November 2018⁷⁸

Wage Distribution⁷⁹

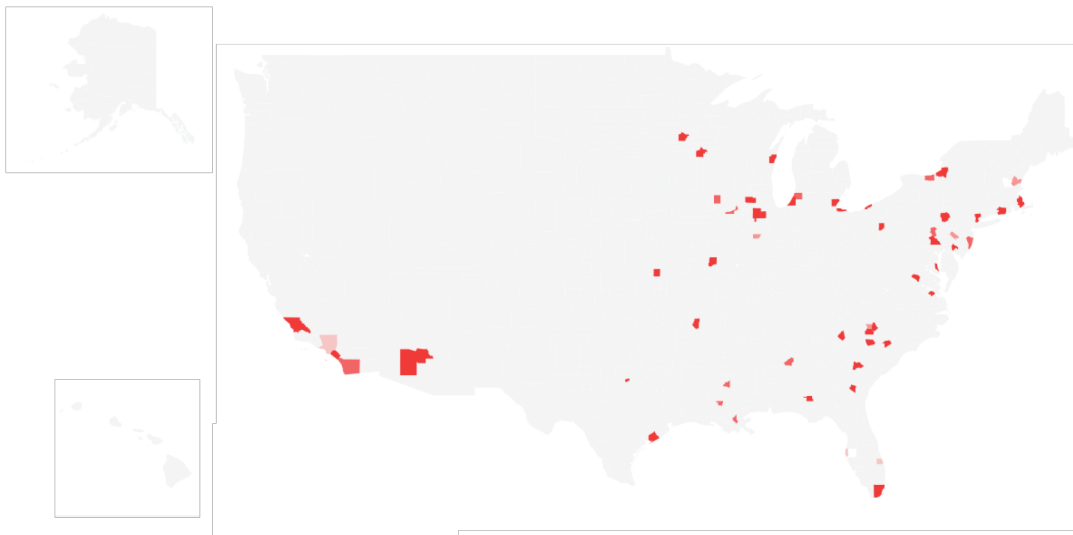
- The average reported median full-time hourly wage for all entry level workers in the nuclear industry is \$22.09/hour.
- The average reported median full-time hourly wage for all mid-wage workers is \$35.47/hour.
- The average reported median full-time hourly wage for the highest earners in the industry is \$55.40/hour.

Top wage jobs in industry

- Top wage earners in the nuclear industry include executive management (averaging \$88.11/hour), computer and information systems managers (averaging \$52.78/hour), physicists (averaging \$57.13/hour), and nuclear engineers (averaging \$50.87/hour).

Figure 82.

National Heat Map Showing Distribution of Nuclear Jobs



⁷⁷ Source: GDP estimates are developed by BW Research Partnership using Bureau of Economic Analysis (BEA) RIMS II data and data collected in the employer survey.

⁷⁸ Source: U.S. Energy Information Association, Table 1.1. Net Generation by Energy Source: Total (All Sectors), 2008-November 2018

⁷⁹ Bureau of Labor Statistics Occupational Employment Statistics; Economic Modeling Specialists, Inc.

STORAGE INDUSTRY

The storage industry has employment in one of the 2019 USEER chapters, Transmission, Distribution, and Storage. For detailed information on hiring trends and demographic makeup see the section beginning on page 106.

In total, the 2019 USEER finds that the storage industry employs 80,982 Americans, spread through the construction, manufacturing, wholesale trade, distribution, and transport, professional and business services, and other services in Table 43 below. Battery storage increased by 17.9 percent in 2018, driven by manufacturing employment.

SNAPSHOT OF THE STORAGE INDUSTRY

- Overall employment: 80,982 jobs

Table 43.
Storage Industry Employment by Detailed Technology Application and Industry, Q2 2018

	Total	Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, + Transport ⁸⁰	Professional Services	Pipeline Transport	Other Services
Pumped Hydro	8,239	--	3,322	2,508	272	1,386	667	85
Battery Storage	62,910	--	30,188	12,645	7,654	11,316	--	1,108
Other Storage	4,031	--	1,488	1,599	50	806	--	88
Petroleum Storage	2,042		1,264	274	31	--	--	471
Natural Gas Storage	1,776		575	301	214	675	--	12
Other Fuels Storage	1,983	--	1,322	--	<10	601	--	59
TOTAL	80,981	0	38,159	17,327	8,221	14,784	667	1,823

⁸⁰ Traditional transmission and distribution of petroleum, natural gas, and coal only includes commodity flow employment.

Figure 83.
National Heat Map Showing Distribution of Storage Jobs

