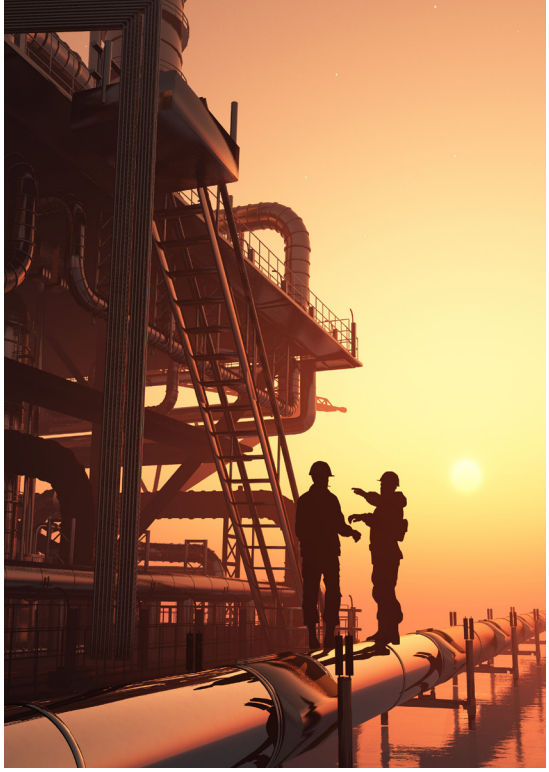
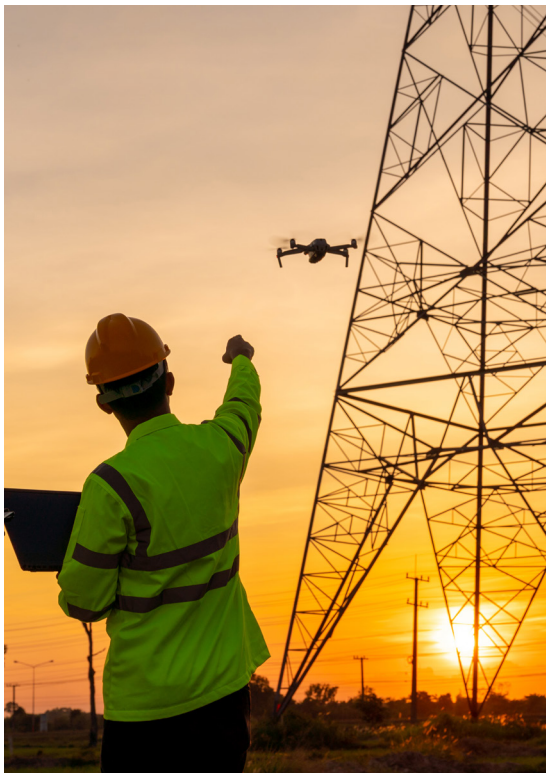




UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

U.S. DEPARTMENT OF ENERGY

ENERGY.GOV/USEER


DEPARTMENT OF ENERGY
Secretary Jennifer M. Granholm

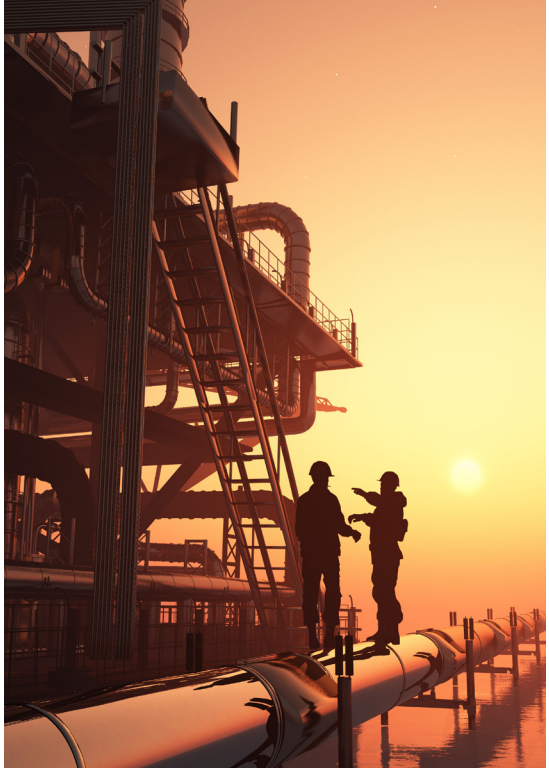
DEPARTMENT OF ENERGY
OFFICE OF ENERGY JOBS

Authorship and Acknowledgments

This report was prepared by the U.S. Department of Energy's (DOE) Office of Energy Jobs, with significant contributions from the following individuals: David Keyser, Marie Fiori, Betony Jones, Hugh Ho, Shrayas Jatkar, Kate Gordon, Gina Copland-Newfield, Carla Frisch, and Christy Veeder.

The interagency Energy Jobs Council provided valuable direction and recommendations. The Energy Jobs Council is comprised from the Department of Commerce, U.S. Census Bureau, Bureau of Labor Statistics, Energy Information Administration, Department of Energy State Energy Advisory Board, and Department of Transportation.

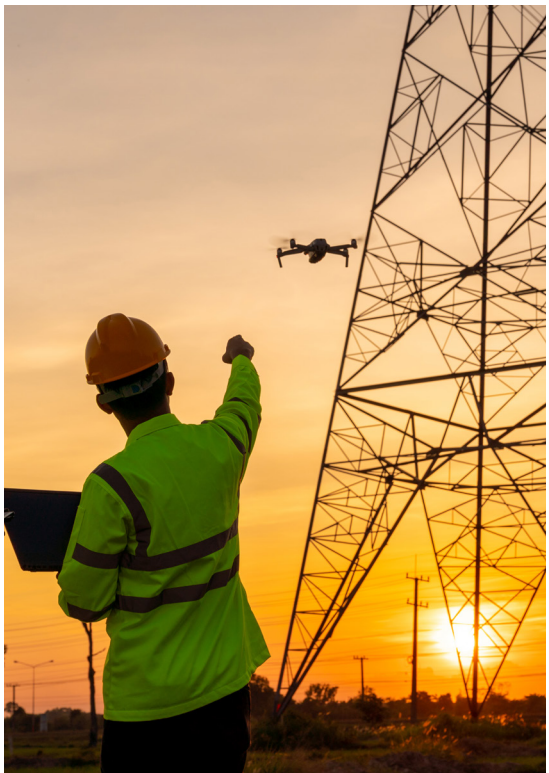
This underlying survey and data collection was provided by BW Research, funded by DOE under Award Number 89303021COP000001.


UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

KEY FINDINGS

ENERGY.GOV/USEER


EXECUTIVE SUMMARY

The number of U.S. energy sector jobs grew 3.8% from 2021 to 2022, and clean energy jobs grew 3.9%, outpacing overall U.S. employment, which increased 3.1% in the same time period.[1]

The energy sector added nearly 300,000 jobs, increasing from 7.8 million total energy jobs in 2021 to more than 8.1 million in 2022. Though women are underrepresented in the U.S. energy sector, they made up more than half of the new workers in 2022.

Prior to the COVID-19 pandemic, the energy sector was one of the nation's fastest-growing job markets. From 2015 to 2019, the annual growth rate for energy employment in the U.S. was 3.0% — double the 1.5% job growth in the U.S. economy as a whole. COVID-19 and its associated economic fallout deeply impacted energy employment, with the sector losing jobs at a higher rate than the economy as a whole.[2]

As of 2022, the energy sector has recovered 71% of the jobs lost in 2020.[3] The energy sector has added back 596,000 of the 840,000 jobs lost during the first year of the pandemic, but the distribution of these jobs has shifted across technologies. For example, the number of jobs in battery storage was 11% higher than the 2019 level, while the number of jobs in advanced and recycled building materials was at 92% of its 2019 level. Employment increased across all major technology areas from 2021 to 2022.

KEY STATISTICS

- Clean energy jobs increased in every state and grew 3.9% nationally from 2021 to 2022.
- The number of jobs in battery electric vehicles increased by 28,366 (+27%) from 2021 to 2022, which was the fastest growth of any energy technology. The growth in battery electric vehicles was almost 17 times faster than the increase in gasoline and diesel vehicle employment.
- Clean vehicles accounted for 59% of all net new jobs in motor vehicles.
- Other technologies with double-digit growth include offshore wind (20%), other grid modernization (12%), coal fuel (22%), natural gas fuel (24%), petroleum (13%), hydrogen fuel cell vehicles (25%), natural gas vehicles (14%), and plug-in hybrid vehicles (10%).
- Clean energy electricity technologies, such as solar and wind, accounted for

nearly 87% of net new electric power generation jobs, adding 22,279 jobs (+3.6%).

- Employers across all technologies report they expect growth from 2022 to 2023, ranging from 1.6% in fuels to 6.4% in energy efficiency.
- The number of women working in energy increased by 149,732 (+7.8%), meaning that over half of the net jobs added in 2022 were held by women.
- Veterans made up 9% of the U.S. energy workforce, higher than their representation in the overall U.S. economy (5%).
- Union employers were more than twice as likely than non-union employers (46% and 22%, respectively), to offer or require a diversity and/or inclusion training program aimed at advocating workplace diversity and inclusion as well as more likely to report specific strategies, policies, or programs to increase the number of women, ethnic and racial minorities, and LGBTQ+ hires.[4]
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in the energy workforce (11%) was over 1.5 times the private sector average (7%).
- Union employers[5] reported lower difficulty finding workers than non-union employers in 2022; 48% of non-union firms reported that it was "very difficult" to find workers, while only 29% of unionized firms reported this difficulty.

INTERPRETING USEER DATA

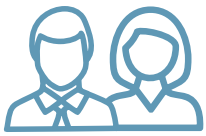
This report includes data from a snapshot in time, and current events can affect reported results. In 2022, the conflict in Ukraine had a notable impact on fuels industries, resulting in increased U.S. exports of petroleum and wet gas.[6] In addition, the number of active crude oil and natural gas rotary rigs increased by 35% between December 2021 and December 2022,[7] and establishments engaged in the fuels value chain added nearly 124,000 jobs between 2021 and 2022, a growth rate of 13.6%.

JOBS ADDED IN 2022

+300,000

IN THE ENERGY SECTOR, WHICH NOW EMPLOYS

8.1 MILLION
AMERICANS



+150,000

INCREASE IN WOMEN WORKING IN ENERGY **(+7.8% IN 2022)**

3.9%

INCREASE IN **CLEAN ENERGY JOBS**, OUTPACING GROWTH IN ENERGY JOBS OVERALL

CLEAN ENERGY JOBS

The United States has a goal to reach net-zero greenhouse gas emissions by 2050. "Net-zero emissions" refers to achieving an overall balance between greenhouse gas emissions produced, avoided, and removed from the atmosphere.[8]

In this report, "clean energy jobs" are reported at the national and state levels with slightly different definitions due to data availability. Nationally, clean energy jobs include jobs in the technologies that align with this "net-zero" future, including those related to renewable energy; grid technologies and storage; traditional electricity transmission and distribution for electricity; nuclear energy; a subset of energy efficiency that does not involve fossil fuel burning equipment; biofuels; and plug-in hybrid, battery electric, and hydrogen fuel cell vehicles and components.

In 2022, there were 3.1 million clean energy jobs meeting the net-zero aligned definition. This represents an increase of more than 114,000 since 2021, or growth of 3.9%. These jobs made up more than 40% of total energy jobs in 2022.

At the state level, USEER does not have the level of granularity to limit clean energy jobs to only those aligned with a net-zero economy, so state-level clean energy jobs include all energy efficiency jobs. In Appendix A, state-level clean energy jobs are reported including and excluding transmission and distribution jobs. Nationally, 54% of energy efficiency jobs and 69% of traditional transmission and distribution jobs were net-zero aligned, but these percentages may vary by state. If the state-level definition of clean energy jobs was applied nationally, the total number of clean energy jobs would be 9% higher (3.3 million) excluding transmission and distribution, and 40% higher (4.3 million) including transmission and distribution.

Many individual workers split time between traditional and clean energy tasks. The USEER survey classifies jobs as "clean" where workers spend more than half of their time working in clean energy technology areas.

Please note that many clean energy investments from the Infrastructure Investment and Jobs Act (the Bipartisan Infrastructure Law), Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act, and Inflation Reduction Act are initially supporting work that was likely not covered in the USEER survey. USEER data depends on employer responses to survey questions. Jobs related to the construction of supply chain facilities such as battery or clean energy component manufacturing or materials processing plants, for example, would not be reported unless the construction employers indicated that their work was primarily in an energy technology sector. Since factory construction work is not particularly specific to the technology that will eventually be produced there, it's unlikely that factory construction jobs are reflected in this year's USEER. Future USEER surveys will seek to capture and report the construction employment associated with building the facilities for clean energy supply chains.

EMPLOYMENT BY TECHNOLOGY

Every technology category in the energy sector showed growth in 2022.

		Job growth since 2020
MOTOR VEHICLES	2.6 MILLION JOBS AT THE END OF 2022	+13% SINCE 2020
ENERGY EFFICIENCY	2.2 MILLION JOBS AT THE END OF 2022	+7.4% SINCE 2020
FUELS	1.0 MILLION JOBS AT THE END OF 2022	+11% SINCE 2020
TRANSMISSION, DISTRIBUTION & STORAGE	1.4 MILLION JOBS AT THE END OF 2022	+3.8% SINCE 2020
ELECTRIC POWER GENERATION	883,300 JOBS AT THE END OF 2022	+6.1% SINCE 2020

ELECTRIC POWER GENERATION

The Electric Power Generation (EPG) sector employed

883,300

a gain of

25,700 JOBS

+3.0%

WOMEN LED EPG EMPLOYMENT GROWTH, ACCOUNTING FOR 65% OF NET JOB GAINS IN 2022

Clean energy technologies accounted for more than 84% of net new electric power generation jobs, adding 21,664 jobs. The clean energy electric power generation workforce grew by 3.6%, which was 16% faster than overall domestic economic growth.

Both solar and wind, the two largest employment sectors of electric power generation technologies, increased from 2021 to 2022, following increases from 2020 to 2021. Solar had the largest number of jobs gained, adding 12,256 workers (+3.7%). Land-based wind added 5,238 workers, for a growth rate of 4.4%. Offshore wind, although small relative to other renewable energy technologies, had the highest growth rate from 2021 to 2022 (+20.3%, or +178 jobs).

Employment in other renewable energy electric power generation technologies also grew in 2022, including traditional and low-impact hydropower employers, which added 1,758 jobs (+2.7%), bioenergy employers, which added 462 jobs (+3.7%), and geothermal employers, which added 413 jobs (+5.0%). Though the absolute number of jobs gained for some emerging renewable energy technologies, such as offshore wind and geothermal, was small, they exhibit above average rates of growth.

Nuclear electric power generation employment increased by 1,358 jobs in 2022, up 2.4% from 2021, whereas it had decreased the previous year. Employment increased and decreased across different categories of fossil energy for electric power generation. Coal electric power generation jobs decreased by 6,780 from 2021 to 2022, down 9.6%, while natural gas electric power generation[9] jobs increased by 7,311, a growth rate of 6.6%. Oil electric power generation employment increased by 2.4%, adding 279 jobs in 2022.

TRANSMISSION, DISTRIBUTION AND STORAGE

Transmission, Distribution, and Storage (TDS) employed

1.4 MILLION

a gain of

29,900 JOBS

+2.2%

TRADITIONAL TDS ADDED THE MOST JOBS (17,700) AND GREW 1.9% IN 2022

Other grid modernization[10] outpaced virtually all other transmission, distribution, and storage technologies in growth rate, increasing 11.6% (2,157 jobs). Batteries, for both grid storage and electric vehicles, added 3,225 jobs (+4.6%).

In 2022, battery manufacturing represented 16% of all storage jobs (11,667 jobs), up from 14% in 2021.

Battery storage manufacturers in transmission, distribution, and storage produce batteries for multiple applications; consumer devices, vehicles or other transportation (including electric vehicles), behind-the-meter (buildings or industrial facilities), and front-of-meter (electric grid).

ENERGY EFFICIENCY

The Energy Efficiency sector employed

2.2 MILLION

a gain of

50,500 JOBS

+2.3%

FIRMS UNDERWENT POSITIVE JOB GROWTH IN ALL EFFICIENCY TECHNOLOGIES

Energy efficiency was hit especially hard by the COVID-19 pandemic in 2020, resulting in across-the-board declines amounting to a loss of 271,719 jobs. Since 2020, energy efficiency employers have added 163,461 workers, recovering 60.2% of the total lost during the pandemic. Energy efficiency grew more slowly in 2022 than the energy sector as a whole (2.3% versus 3.8%). The energy efficiency sector remained one of the largest energy technology sectors, with over 2.2 million workers.[11]

TRADITIONAL HVAC

Traditional HVAC firms added the highest number of jobs:

+2.8%

a gain of

15,118 JOBS

FUELS

The Fuels sector employed

1.0 MILLION

a gain of

123,400 JOBS

+13.6%

FUELS EMPLOYERS ADDED THE MOST JOBS IN 2022 AMONG ALL ENERGY CATEGORIES

PETROLEUM & NATURAL GAS

Petroleum fuels saw the largest increase in employment in this sector, followed by natural gas fuels

PETROLEUM JOBS

+12.5%

a gain of

58,100 JOBS

NATURAL GAS JOBS

+24.1%

a gain of

51,100 JOBS

Most of growth was within the mining and extraction industry, which added 107,029 jobs over the year.

Biofuels employment, including corn ethanol, renewable diesel fuels, biodiesel fuels, and waste fuels, grew by 1.7%, adding 1,878 jobs.

Fuels employment remained 117,094 jobs below the total reported in 2019.

MOTOR VEHICLES AND COMPONENT PARTS

Motor Vehicles (including component parts) employed

2.6 MILLION

+2.7%

a gain of nearly

65,000 JOBS

MOTOR VEHICLES AND COMPONENT PARTS IS THE LARGEST ENERGY TECHNOLOGY AREA

CLEAN ENERGY VEHICLES

Jobs in clean energy vehicles increased 38,232 from 2021 to 2022 (182,526 to 220,759).

+20.9%

+38,200 JOBS

BATTERY ELECTRIC VEHICLES

Jobs in battery electric vehicles (BEV) grew by 28,366 (+27%). The growth in BEVs was almost 17% faster than the increase in gasoline and diesel vehicle employment.

+26.8%

+28,400 JOBS

HYBRID ELECTRIC VEHICLES

Employment in the **hybrid EV** workforce grew by 6.6 percent (9,500 jobs).

+6.6%

+9,500 JOBS

Hydrogen/fuel cell vehicles employers added a smaller number of jobs from 2021 to 2022 (+3,573) but grew by more than a quarter (+25%).

Motor vehicles recovered the jobs lost from 2019 to 2020 and in 2022 had approximately 61,700 more workers than in 2019.

THE INVEST IN AMERICA ENERGY INVESTMENTS

In November 2021, the Infrastructure Investment and Jobs Act (the Bipartisan Infrastructure Law) (Pub. L. 117-58) was signed into law. The $1.2 trillion infrastructure law allocates more than $75 billion to clean energy, including $7.5 billion for EV charging infrastructure and $62 billion for the DOE to revitalize domestic supply chains and strengthen America's manufacturing leadership; expand access to energy efficiency and clean energy for families, communities, and businesses; deliver reliable, clean, and affordable power to more Americans; and build the technologies of tomorrow through clean energy demonstrations.

In August 2022, the Inflation Reduction Act (IRA) (Pub. L. 117-169) was enacted, investing approximately $370 billion in clean energy and climate over 10 years. In addition to a broad portfolio of tax credits that will incentivize the creation and deployment of thousands of new clean energy projects across the country, IRA funding includes $2.0 billion for the domestic production of advanced vehicles, $5.8 billion to reduce industrial emissions, $9.0 billion for states to provide home retrofit and energy efficiency consumer rebates, $27 billion to the Greenhouse Gas Reduction Fund, and $40 billion in new loan authority to guarantee loans for innovative clean energy projects.

Also in 2022, the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act (Pub. L. 117-167) was signed into law, authorizing historic levels of funding to support the production of semiconductors and other strategic technologies, including $67 billion to the DOE to enable cutting-edge research and development in clean energy, improve infrastructure at the National Labs, and support investments in innovation and technology hubs across the country.

Together, these Invest in America laws provide the funding needed to modernize America's electrical grid, revitalize our manufacturing capabilities, strengthen pathways for STEM careers, and expand access to clean energy, all while addressing legacy pollution, creating quality jobs, and building healthier communities.

Many projects funded under these laws are still in the design and planning phases, and the full job creation of these investments will likely show up in future surveys.

INDUSTRY DATA

Within each technology sector, this report accounts for employment across different industries (see **Figure 2** below). The changes in energy jobs in each technology sector is reported by industry in **Table 1**. Mining and extraction firms added the most jobs among industry categories, due to job growth in mining and extraction of fuels. Construction industry jobs grew the second most among industry categories, with the majority of new workers employed within energy efficiency. All the technology sectors added jobs in the manufacturing; wholesale trade, distribution, and transport; professional and business services; and "other services" industries.

Figure 2. Energy Employment by Technology Category and Industry, 2022

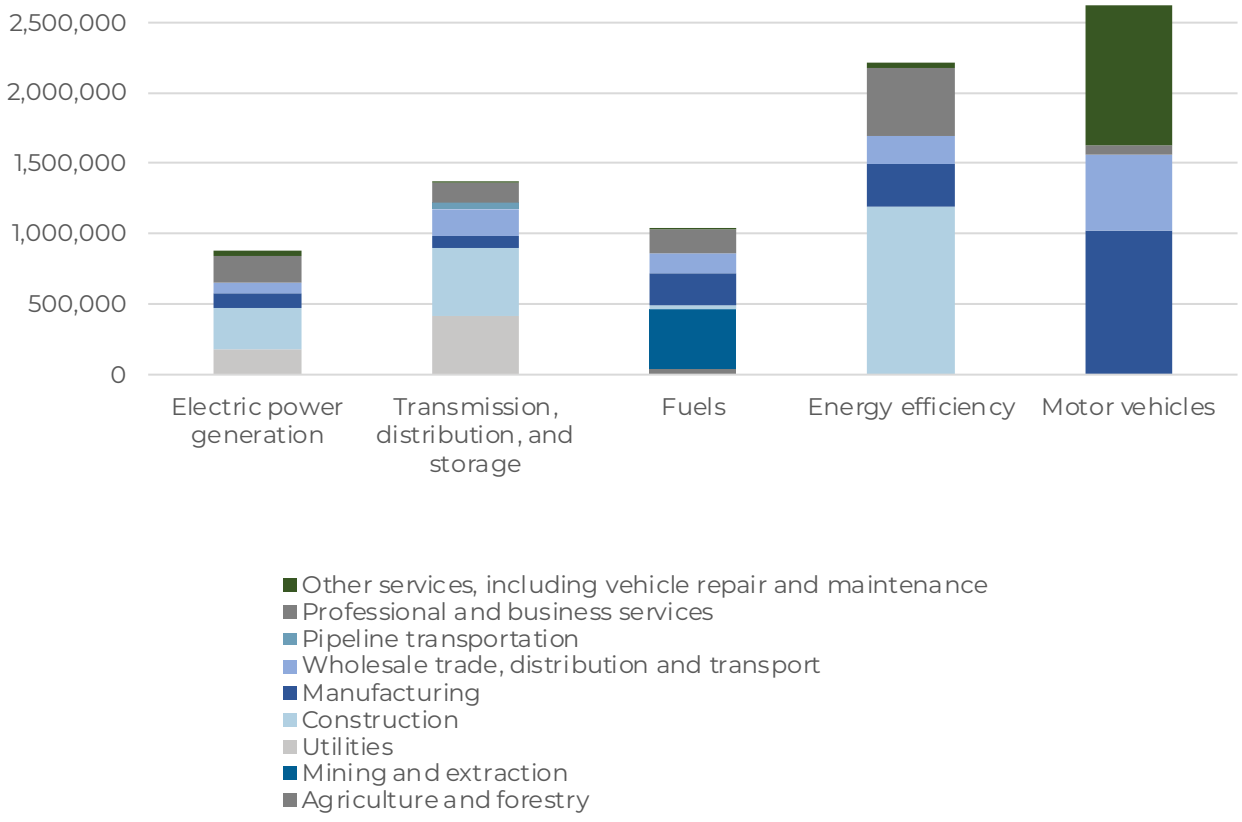


TABLE 1. Change in Energy Jobs by Industry, 2021-22

	Electric Power Generation	Transmission, Distribution, and Storage	Fuels	Energy Efficiency	Motor Vehicles	Industry Total
Agriculture and Forestry	0	0	82	0	0	82
Mining and Extraction	0	0	107,029	0	0	107,029
Utilities	5,142	5,866	0	0	0	11,008
Construction	6,660	13,989	885	23,729	0	45,263
Manufacturing	2,193	2,862	4,266	6,022	16,354	31,697
Wholesale Trade, Distribution, and Transport	2,276	2,069	3,362	8,213	19,489	35,409
Pipeline Transportation[12]	0	-181	0	0	0	-181
Professional and Business Services	8,015	5,047	7,689	11,504	1,092	33,347
Other Services	1,397	284	64	1,049	27,938	30,732
Total change from 2021	**25,683**	**29,936**	**123,377**	**50,517**	**64,873**	**294,386**

2022 DEMOGRAPHIC INFORMATION AND DIVERSITY

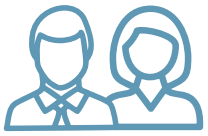
As with other data in this report and in previous USEER reports, demographic information and diversity data was collected from surveys with employers and augmented by data from BLS, QCEW, and EIA. Depending on the employer's source of data, the demographic data (particularly for the race and ethnicity or workers) reported by employers could vary from the race and ethnicity individuals would report for themselves. A summary of the demographics of the U.S. energy workforce is in **Table 2**.

- The energy workforce was 73% dominated by men, making it less balanced in terms of gender than the U.S. workforce average, which was 53% male. Women made up 26% of the energy workforce, much less than the U.S. average, which was 47%.[13] Gender nonbinary workers made up <1% of the energy workforce, but there are insufficient data to compare this to the U.S. workforce overall.

- Women remained underrepresented in the energy workforce (26% compared to 47% in overall workforce), but their participation in the workforce has grown. The number of women in energy increased by 151,000 (+7.8%), meaning that over half of the jobs added in 2022 were held by women. The representation of

women was highest in electric power generation across the different technologies sectors, where they made up 32% of the workforce.

- American Indian or Alaska Native workers made up 2% of the energy workforce, which was more than twice as high as the U.S. workforce average, which was less than 1%.
- There was a slightly higher percentage of non-white workers in energy, 24% compared to 23% of the entire U.S. workforce. However, the energy workforce had a lower-than-average percentage of Black or African American workers. In no technology were Black or African American workers represented proportionally to their representation in the overall U.S. workforce. Transmission, distribution, and storage had the highest representation of Black or African American workers, at 11% compared to the national average of 13%.[14]



WOMEN COMPRISED

26%

OF THE ENERGY WORKFORCE

(COMPARED TO 47% OF OVERALL WORKFORCE)

50.3%

OF THE NET NEW ENERGY JOBS IN 2022 WERE HELD BY WOMEN

- The proportion of Hispanic or Latino workers in energy (18%) was just below the national average of 19%.
- The percentage of Asian workers in energy was the same as the national workforce average, at 7%.
- The percentage of non-white workers in transmission, distribution, and storage was higher than the energy workforce average (30% compared to 25%). This was attributable to Asian workers (9% compared to 7%), Black or African American workers (11% compared to 9%), and American Indian or Alaska Native workers (3% compared to 2%) being more represented in transmission, distribution, and storage than in the overall energy workforce.
- Union employers were more than twice as likely than non-union employers (46% and 22%, respectively), to offer or require a diversity and/or inclusion training program aimed at advocating workplace diversity and inclusion as well as more likely to report specific strategies, policies, or programs to increase the number of women, ethnic and racial minorities, and LGBTQ+ hires.
- Individuals requesting accommodations for disabilities were underrepresented in the energy workforce (2% compared to 4% in the overall U.S. economy). Individuals requesting accommodations for disabilities worked in transmission, distribution, and storage at a higher rate (3%) than

TABLE 2. United States Energy Workforce Demographics and Characteristics[15]

	Number of Workers	Energy Workforce Average	National Workforce Average
Male	5,757,198	73%	53%
Female	2,065,291	26%	47%
Gender Nonbinary	42,810	<1%	insufficient data
Hispanic or Latino	1,410,187	18%	19%
Not Hispanic or Latino	6,455,112	82%	82%
American Indian or Alaska Native	169,238	2%	<1%
Asian	531,464	7%	7%
Black or African American	721,120	9%	13%
Native Hawaiian or Other Pacific Islander	81,827	1%	<1%
White	5,889,528	75%	77%
Two or More Races	395,173	5%	3%
Unknown Race	76,949	<1%	insufficient data
Veterans	709,961	9%	5%
18 to 29	2,334,990	30%	22%
30 to 54	4,172,277	53%	54%
55 and Over	1,358,033	17%	24%
Disability	180,538	2%	4%
Formerly Incarcerated	96,950	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	849,959	11%[16]	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

the energy workforce average.

- While 2% of the workforce was formerly incarcerated, these individuals made up only 1% of the energy workforce.
- Veterans made up 9% of the U.S. energy workforce, higher than their representation in the overall U.S. economy (5%). Veterans made up 10% of the motor vehicles and fuels sectors. The energy workforce was younger than the U.S. workforce as a whole. Eighty-three percent of the energy workforce was younger than 55 compared to the national workforce average of 76% (Table 2). Both coal fuels and corn ethanol fuels employed workers aged 55 and older at close to the national workforce average (23% versus 24%). Just over one-fifth (21%) of motor vehicles and component parts workers were aged 55 and older.

UNION MEMBERSHIP

The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in the energy workforce (11%) was over 50% higher than the private sector average (7%), although there was considerable geographic variability. The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in transmission, distribution, and storage (18%) was considerably higher than the overall energy workforce average (11%). Across all energy technologies covered in this report, nuclear electric power generation had the highest unionization rate in 2022, at 19%.

Union shops were more likely than non-union shops to have policies about recruiting from communities of color or women:

UNION SHOPS WERE

50%

more likely to have a policy to recruit women

2x

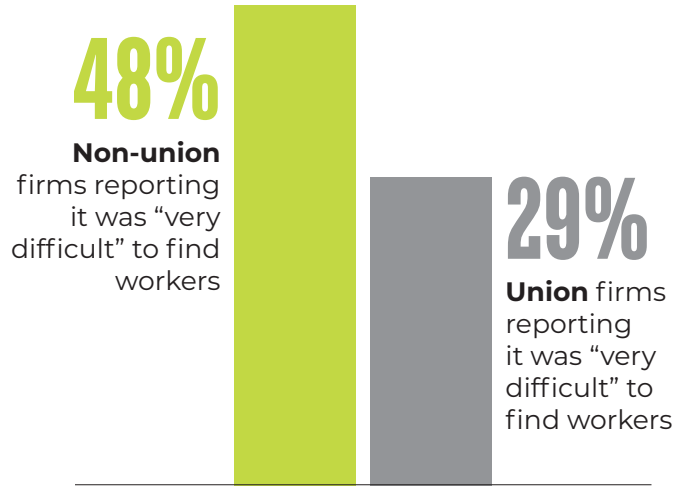
more likely to have a policy to recruit persons of color

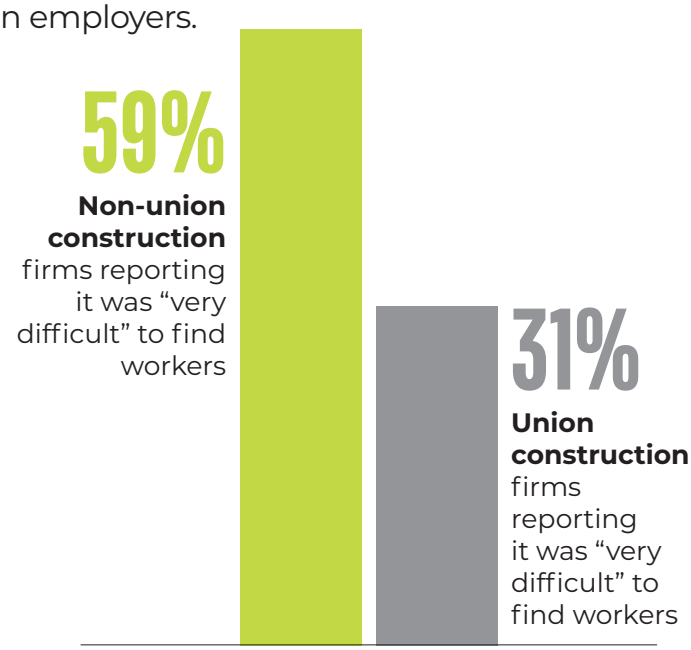
2.5x

more likely to have a policy to recruit LGBTQ+

UNIONIZATION & ENERGY JOBS

Union employers reported lower difficulty finding workers than non-union employers in 2022, with 29% of union and 48% of non-union firms reporting that it was "very difficult" to find workers. This difference was especially pronounced in the construction industry, where 31% of union construction employers reported that it was "very difficult" to find workers, compared to almost double the percentage (59%) of non-union employers.

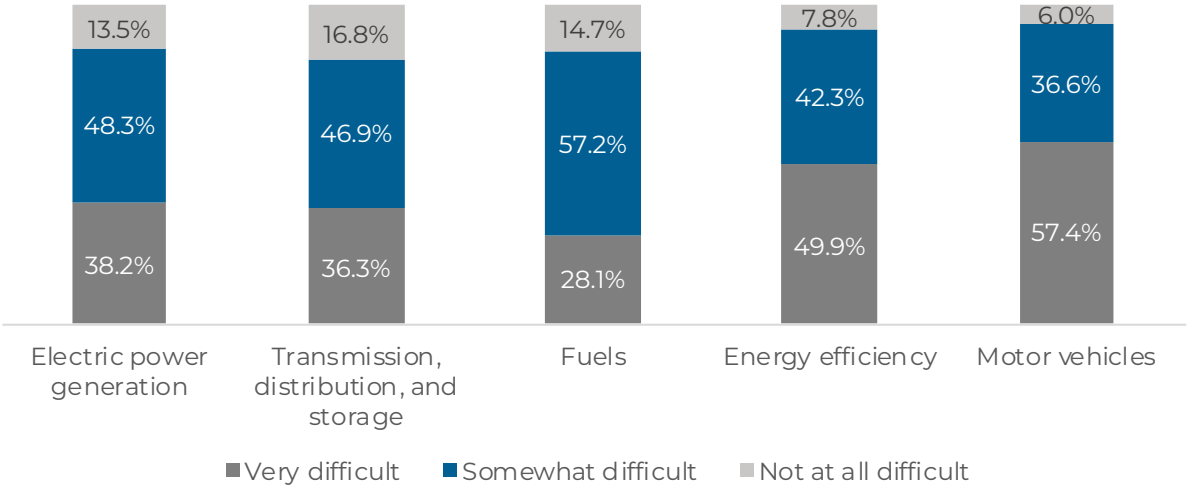




EMPLOYER PERSPECTIVE ON WORKFORCE ISSUES

When asked about their experience "finding qualified workers," more than four out of five employers across energy technologies reported at least "some difficulty." Motor vehicles (94.0%) and energy efficiency (92.2%) employers reported the highest overall difficulty among all technologies. More than half (57.4%) of all motor vehicles employers indicated that finding qualified workers was "very difficult" in 2022 **(See Figure 3)**

Figure 3. Hiring Difficulty by Technology



Union employers[17] reported lower difficulty finding workers than non-union employers in 2022, with 29% of union and 48% of non-union firms reporting that it was "very difficult" to find workers. This difference was especially pronounced in the construction industry, where 31% of union construction employers reported that it was "very difficult" to find workers, compared to almost double the percentage (59%) of non-union employers.

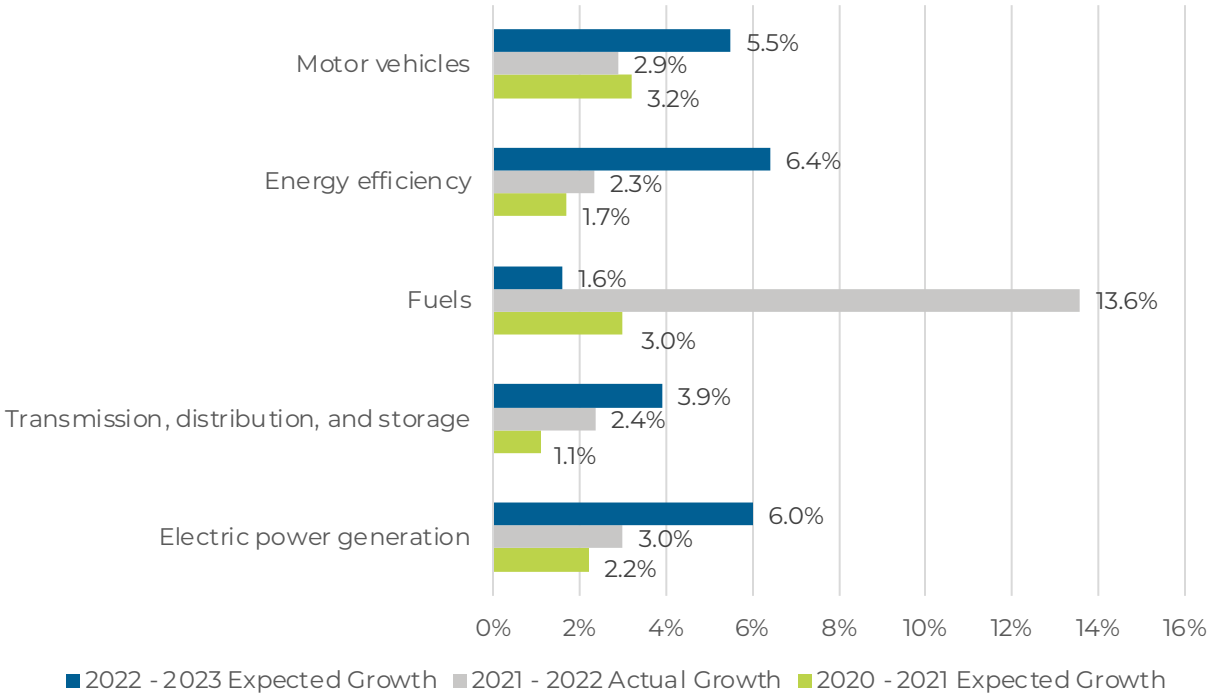
One explanation for union employers' relative ease of hiring is that unionized workforces often partner with and support registered apprenticeship programs. Registered apprenticeship programs and other labor-management training programs can provide employers with a reliable source of well-trained workers.

Publication Number: DOE/OP-0020

Surveyed companies in all energy technologies reported that they expect job growth from 2022 to 2023 (Figure 4). This was led by energy efficiency (+6.4% growth expected by employers), followed by electric power generation (+6.0%), motor vehicles (+5.5%), transmission, distribution, and storage (+3.9%), and fuels (+1.6%). Except for motor vehicles and fuels, estimated energy sector employment growth was significantly higher in 2022 than in 2021.

.

Figure 4. Anticipated and Actual Change in Employment by Technology



Past surveys show that employers' expectations are unreliable indicators of the magnitude and direction of such changes. Figure 4 illustrates the actual employment change by technology from 2021 to 2022 compared to employer expectations from the 2021 USEER. Employment in most technology areas grew more than expected. Fuels employers expected to increase employment by 3.0% while actual growth was nearly 14%, mostly owing to the expansion of employment in the fuels mining and extraction industry.

KEY STATE TAKEAWAYS

In addition to this national report, USEER data are collected at the state level in a companion report, which includes a brief energy and employment profile for each state and the District of Columbia. The state report includes a high-level snapshot of employment in electric power generation, transmission, distribution, and storage, fuels, energy efficiency, and motor vehicles and component parts, as well as breakdowns by technology application and industry. Highlights are provided below. For more information, view the state-level report at energy.gov/useer.

- Energy jobs grew in all 50 states and Washington, D.C., with the largest growth in Texas, California, and Pennsylvania.
- Clean energy jobs grew across all 50 states and D.C. Excluding traditional transmission and distribution, California added 13,116 jobs (+3.6%), followed by Texas, which added 5,198 (+5.5%), and New York, which added 5,054 (+3.0%). When including transmission and distribution jobs, California added 13,293 (+3.2%), followed by West Virginia, which added 6,975 (+19%), and Texas, which added 5,136 (+3.5%).
- The top four states with the highest percentage growth in energy efficiency included Nevada (+6.7%, 769 jobs), New Mexico (+6.1%, 347 jobs), Oklahoma (+5.4%, 727 jobs), and New Jersey (+5.1%, 1,748 jobs).
- Although every state and Washington, D.C. increased overall energy jobs from 2021 to 2022, several states lost a significant amount of employment in different technology areas, including Indiana (-0.8% in motor vehicles and component parts, -1,520 jobs), Wisconsin (-0.9% in energy efficiency, -505 jobs), and Ohio (-1.1% in electric power generation, -291 jobs).
- The highest percentage growth in transmission, distribution, and storage jobs occurred in West Virginia (+20%, 6,579 jobs), Oklahoma (+9.9%, 3,043 jobs), and Pennsylvania (+9.8%, 4,606 jobs).

STATES ADDING MOST JOBS

50,200
TEXAS

21,200
CALIFORNIA

15,200
PENNSYLVANIA

- Employment in electric power generation grew fastest in Delaware (+14%, 184 jobs), followed by Idaho (+12%, 303 jobs), the District of Columbia (+11%, 291 jobs), and Montana (+9.6%, 139 jobs).
- The top four states with the highest percentage growth in fuels jobs were North Dakota (+31%, 7,786 jobs), West Virginia (+28%, 5,933 jobs), New Mexico (+26%, 6,078 jobs), and Wyoming (+21%, 3,855 jobs).
- Growth in motor vehicles and component parts jobs was spread across many states, led by Florida (+6.5%, 6,430 jobs), Hawaii (+6.0%, 217 jobs), Arizona (+5.8%, 2,086 jobs), and California (+5.3%, 11,435 jobs).

CONCLUSION

Energy employment in the United States continued to outpace economy-wide employment, growing by 3.8% compared to 3.1% between 2021 and 2022. Clean energy employment outpaced the energy sector average, growing 3.9%. The energy sector has recouped 71% of the number of jobs lost in 2020 during the COVID-19 pandemic. The percentage of women in the energy workforce increased by 149,732 workers representing a 7.8% increase in 2022, and increasing female participation from 25% to 26% of the energy workforce. Unionized employers report less difficulty in having skilled workers and are much more likely to have formal diversity, equity, inclusion, and access programs.

The fuels sector saw the largest percent increase from 2021 to 2022, with the fastest growth seen in onshore natural gas. The second largest percent increase was in electric power generation jobs. Among states, Texas added the most energy jobs (50,197) from 2021 to 2022, followed by California (21,198), and Pennsylvania (15,162). Clean energy jobs increased in all 50 states plus Washington, DC.

[1] Bureau of Labor Statistics (BLS) Current Employment Statistics (CES) December 2021 to December 2022 total employment, not seasonally adjusted

[2] This may be explained by a decrease in energy use during the pandemic, although this report does not ask employers reasons for changes in employment. For more information about energy use during the pandemic see Pandemic drives down U.S. energy use in 2020 | Lawrence Livermore National Laboratory (llnl.gov).

[3] The economy as a whole surpassed 2019 employment levels in 2022.

[4] Question was asked for each demographic group. Union employers were between 43%-150% more likely to have such programs or policies versus non-union employers.

[5] For this analysis, a union employer is defined as one with at least 20% of its workforce as a member of a labor union or covered by either a project labor agreement or a collective bargaining agreement.

[6] U.S. Energy Information Administration, U.S. Exports of Crude Oil and Petroleum Products, high of 10.2 million barrels exported in December 2022

[7] U.S. Energy Information Administration, U.S. Crude Oil and Natural Gas Rotary Rigs in Operation, 579 in December 2021 and 780 in December 2022.

[8] https://www.sustainability.gov/pdfs/net-zero-declaration.pdf

[9] Includes traditional natural gas generation and advanced natural gas generation (combined cycle, etc.)

[10] Defined as other modernization of the nation's electricity transmission and distribution system (that is not part of any other technology category in transmission, distribution, and storage) to maintain a reliable and secure electricity infrastructure that can meet future demand growth.

[11] Within EE, construction of new energy efficient buildings would only count as energy jobs if they contained ENERGY STAR components.

[12] This does not include pipeline construction. Pipeline construction falls under the NAICS 23712 code, which is construction.

[13] Percentages do not sum to 100% due to rounding.

[14] The 2023 USEER combines last year's report categories of "Black or African American" and "Black, Indigenous" back into the single category of "Black or African American." The 2023 USEER also includes an updated methodology for capturing "Two or More Races" and includes the new category of "Unknown Race."

[15] For more information about the definition of different demographics categories and how the questions are framed see Appendix B.

[16] Unionization rates vary by state.

[17] For this analysis, a union employer is defined as one with at least 20% of its workforce as a member of a labor union or covered by either a project labor agreement or a collective bargaining agreement.

OVERVIEW

The U.S. energy system is rapidly transforming, driven by policies that expand production, foster innovation, support domestic manufacturing, and create high wage jobs across America, while substantially reducing emissions. Landmark investments from the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) provide critical funding to drive more rapid adoption of zero emissions products, incentivize expanded domestic manufacturing capacity, and facilitate the development of next-generation technologies through programs that emphasize equity and a just transition.

The pace of change in the energy sector makes tracking energy employment more important than ever, but it also increases its complexity. The diversity and breadth of energy industries across the United States create significant challenges for economic modeling and traditional labor market data collection. While many of its segments, such as utility-scale power generation, fossil fuel extraction, and electric and gas transmission and distribution, are inarguably part of the energy sector, other activities (such as storage technologies and energy efficiency products and services) are difficult to define and isolate from other sectors of the economy. Given the complex relationship between energy and the overall economy, the 2023 U.S. Energy Employment Report (USEER) investigates, with a special supplemental survey, Traditional Energy sectors — Electric Power Generation, Fuels, and Transmission, Distribution, and Storage — followed by individual analyses of employment in two important energy end-use sectors — Energy Efficiency and Motor Vehicles.

Employment data collected by the BLS provide information on many, but not all, energy-related job categories. Most notably, BLS does not collect data on employment levels by energy technology across business segments. For instance, residential solar installation establishments are typically labeled as electrical contractors (together with all other traditional electrical businesses) without being identified specifically as solar companies. Petroleum-engineering firms are included in engineering services, with civil, mechanical, and other engineers, while electric vehicle manufacturers are combined with gasoline and diesel-fueled vehicle manufacturing. As a result, BLS employment data does not capture the full scope of energy employment trends.

The spread of business activities within each of the analyzed sectors presents additional taxonomic challenges, as early-stage research and development, repair and maintenance, or professional and technical services vary across energy, energy efficiency, and manufacturing. Natural gas business activities, for instance, differ from business activities relating to advanced building materials and solar photovoltaic (PV) materials..

The 2023 USEER relies on a comprehensive survey of approximately 34,000 business representatives across the United States, conducted by BW Research Partnership on behalf of the Department of Energy. The survey data are used to filter and analyze the concentration, intensity, and distribution of various energy technologies and activities throughout traditional industry sectors, using third-quarter 2022 employment data from the BLS QCEW and the BLS Unemployment Situation Table B-1 monthly reports through December 2022. USEER data also provides an additional layer of information to track sector-specific growth potential, obstacles, and opportunities. The data presented in the USEER are not intended to remove, replace, or replicate existing data from the BLS QCEW, but instead to reorganize categories and provide insight for policymakers and the public regarding trends in energy employment, energy production, and energy consumption across the United States.

For the USEER survey, a Qualifying Firm is—

An organization with employees in the United States that is directly involved with researching, developing, producing, manufacturing, distributing, selling, implementing, installing, or repairing components, goods or services related to Electric Power Generation; Electric Power Transmission, Distribution, and Storage; Energy Efficiency, including Heating, Cooling and Building Envelope; Fuels, including Extraction, Processing, Production, and Distribution; and Transportation, including Motor Vehicles. This also includes supporting services such as consulting, finance, tax, and legal services related to energy, fuels, energy efficiency, or motor vehicles.

Qualifying Workers are—

Employees of a qualifying firm that spend some portion of their time supporting the qualifying energy, energy-efficiency, or motor vehicle portion of the business.[1]

This report provides detail into levels of employment activity that include both "a portion of their time" and "a majority of their time" when referencing qualifying workers. This is especially true within the Energy Efficiency sector where the employing construction or repair firms are frequently engaged in both traditional energy-related construction or installation as well as in high-efficiency activities that qualify for ENERGY STAR designation.

HOW TO USE THIS REPORT

The 2023 USEER relies on a survey of 34,200 business representatives to analyze existing data from the BLS with technology and value-chain definitions that reflect the activities of the DOE. The survey is conducted using a stratified sampling method (which relies on survey quotas based on specific characteristics of companies, to ensure representation). BW Research uses three characteristics in this sampling plan: (1) NAICS industry, (2) state location, and (3) company size.

Using the NAICS framework and building the sample frame using establishment totals from the QCEW allows for more accurate and efficient data collection and analysis. Further, it accommodates changes in business models. If a utility, for example, outsources a portion of its activities to a construction firm, USEER's methodology allows for those jobs to continue to be counted and tracked.

At the same time, employment is allocated based on NAICS industries only. In the utility-outsourcing example used above, the USEER would still count the jobs as energy employment, but would allocate those jobs to construction rather than utilities. Because the supplemental survey captures employment across a wide range of activities and industries, the report includes more than a million jobs that would not otherwise be identified as part of the Traditional Energy sectors.

The USEER relies primarily on data from public sources as well as the comprehensive employer survey. As a result, it includes some data limitations, including statistical margin of error. The overall margin of error for identifying Qualifying Firms is +/- 0.53% at a 95% confidence interval. The margin of error for the number of Qualifying Workers sector wide is +/- 1.15% at a 95% confidence interval.[2] Data included in this report represent an estimate with a range based on the specific margin of error. For more detail, please see Appendix B, Methodology.

The 2023 USEER is organized into six chapters. The first three chapters — representing Electric Power Generation, Transmission, Distribution, and Storage, and Fuels — describe Traditional Energy jobs, from fuel extraction to processing, generation, transmission, and distribution. These chapters include fossil, nuclear, and renewable energy sources and their value chains. The report also includes two sectors selected for their importance to energy demand: Energy Efficiency and Motor Vehicles. Finally, the report includes a chapter that addresses technologies that cut across multiple chapters, such as natural gas, which has employment in Electric Power Generation, Transmission, Distribution, and Storage, and Fuels.

Within each chapter of this report, data are reported across three distinct lenses, by technology, industry, and occupation. The first lens, technology, can be used to understand changes of specific products and services over time. Viewing employment through this lens can therefore illustrate relative changes in employment among different generation technologies, such as solar, wind, coal, natural gas, etc. These changes in employment can then be analyzed in the context of changes in the energy mix over the same period.

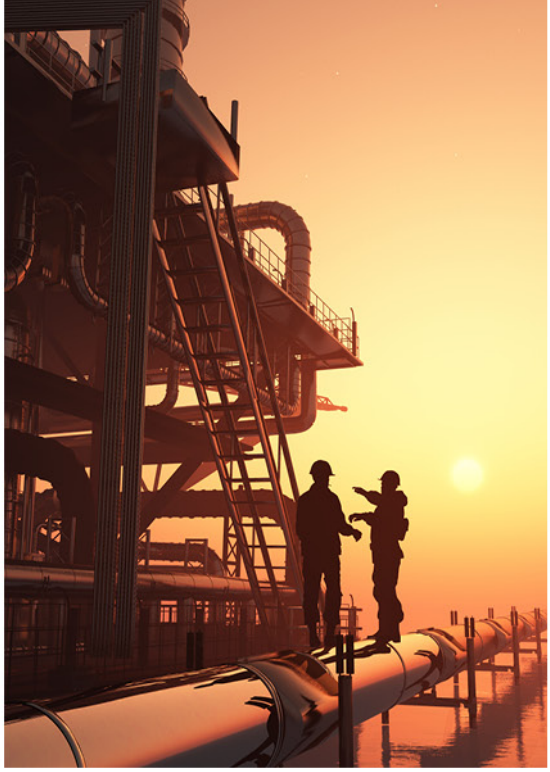
Viewing data through the second lens, industry, allows for deeper understanding of changes within the energy value chain and can be useful for developing industrial and economic policy for the sector. Viewing data through this lens depicts changes in economic sectors, such as construction, manufacturing, professional services, etc. These changes can be further analyzed and understood in the context of broad, macroeconomic trends over the same period.

Finally, viewing the data through the third lens, occupation, allows for a deeper exploration of workforce availability and needs. Organizing data by occupation provides key detail on the types of opportunities that are growing and declining and can provide a framework for empirically driven workforce development. By filtering the same data through each lens, this report provides critical detail to a wide range of stakeholders.

[1] Data presented in this report exclude retail employees. Qualifying Workers in energy will be referenced as energy-related jobs. Where "portion of their time" includes employees whose activities are less than 50 percent of their time, specific reference will be made of that fact.

[2] For a number of detailed NAICS, data on establishments and employment are directly included in the total. Therefore, these margins represent an overstatement of potential error. It is also important to note that the margin of error increases for each subgroup of participants that participated in the survey. For example, the margin of error for questions answered by all firms that identified as "solar photovoltaic" is +/- 3.49% at a 95% confidence interval.

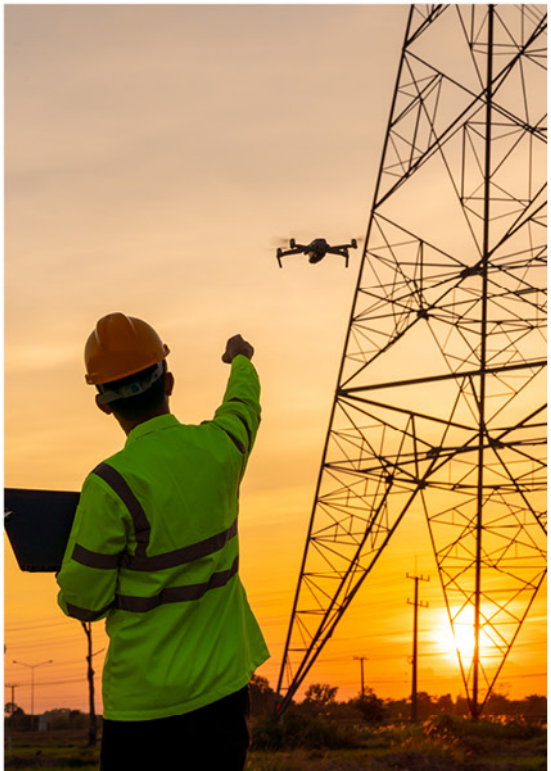
TABLE OF CONTENTS


UNITED STATES ENERGY
& EMPLOYMENT REPORT 2023

ELECTRIC POWER GENERATION

ENERGY.GOV/USEER


Electric Power Generation

The electricity sector accounts for 25% of U.S. greenhouse gas emissions.[1] While zero carbon technologies have grown substantially over the last decade, even faster adoption will be necessary to decarbonize the electricity sector and meet the nation's climate goals. The Inflation Reduction Act includes a comprehensive set of solutions to advance zero carbon technology deployment, including increased tax credits for individuals and developers, new project financing mechanisms, support for American manufacturers, and direct purchases for federal properties and tribal lands.

Electric power generation (EPG) includes a wide variety of industries, activities, and technologies related to generating electricity, including the construction, maintenance, operation, and decommissioning of power plants and renewable energy projects. EPG has changed dramatically over the past several decades, with marked declines in coal-fired generation and significant new capacity additions of combined cycle natural gas and renewable energy systems. The decarbonization of electricity generation is projected to continue through 2050,[2] suggesting that the employment changes evident in EPG (e.g., decreases in coal generation employment and increases in renewable energy employment) are likely to continue for the foreseeable future.

In addition to construction, operation, and maintenance of utility and non-utility generation facilities and projects, EPG includes key manufacturers and other suppliers, as well as vendors providing professional and technical services. For example, the data in this chapter include information on employment not only with energy developers, but also at U.S.-based original equipment manufacturers, component suppliers (largely Tier 1-4), and consultants and technical advisers.

Trends and Key Takeaways

- Employment in EPG grew by 25,683 jobs or 3.0% in 2022 — roughly the same as the overall economy at 3.1% and about the same as in 2021.
- Clean energy[3] technologies accounted for more than 84% of net new EPG jobs, adding 21,664 jobs or growing by 3.6%, which was 16% faster than rate of economy-wide employment growth in the U.S. from 2021 to 2022.
- Solar EPG added the most jobs of all EPG technologies (12,256, 3.7% growth), exceeding pre-pandemic employment totals by 26,470 by the end of 2022.
- Coal EPG was the only EPG technology in which employment declined, shedding 6,780 jobs or -9.6%.

[1] Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, available at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
[2] U.S. Energy Information Administration, Annual Energy Outlook 2023, Figure 2, available at https://www.eia.gov/outlooks/aeo/narrative/index.php#TheElectricityMixinth.
[3] Net-zero aligned. Net-zero emissions refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions prevented or taken out of the atmosphere.

- The largest employment gains in EPG were in the professional and business services industry,[4] with 8,015 new jobs. Industries that had more moderate job gains were construction (+6,660 jobs), utilities (+5,142), manufacturing (+2,193), wholesale trade (+2,276), and other industries (+1,397).
- Employment of female workers in EPG grew by 65% (+16,667) in 2022. This can likely be attributed to a variety of factors, including an increased labor force participation rate among women[5] and a decline in coal generation, which is more male dominated. EPG also experienced increases in industries that employ higher rates of female workers, including professional and business services and utilities. With these gains, female workers still represented less than one-third of all EPG employment, driven by lower participation in construction.
- The percentage of non-white workers in EPG was higher than the national average (28% compared to 23% in the overall U.S. workforce). This is attributable to Asian workers (10% compared to 7% nationally) and workers of two or more races (5% compared to 3% nationally). The demographic data were largely unchanged from 2021.[6]
- Employment of veterans in EPG grew by more than 4,000 jobs in 2022, and veteran employment in EPG continued to outpace the overall economy on a percentage basis (8% in EPG and 5% economy-wide).
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in EPG (12%) was unchanged since 2021 and remained higher than the energy sector average (11%) and significantly higher than the national private sector average (7%).[7]
- The percentage of formerly incarcerated workers in EPG was slightly lower (1%) than the national workforce average (2%).

[4] The professional and business services supersector is part of the service-providing industries group of supersectors. It includes professional, scientific, and technical services (NAICS 54), management of companies and enterprises (NAICS 55), and administrative and support and waste management and remediation services (NAICS 56).

[5] Federal Reserve Bank of St. Louis, Labor Force Participation Rate — Women, available at https://fred.stlouisfed.org/series/LNS11300002.

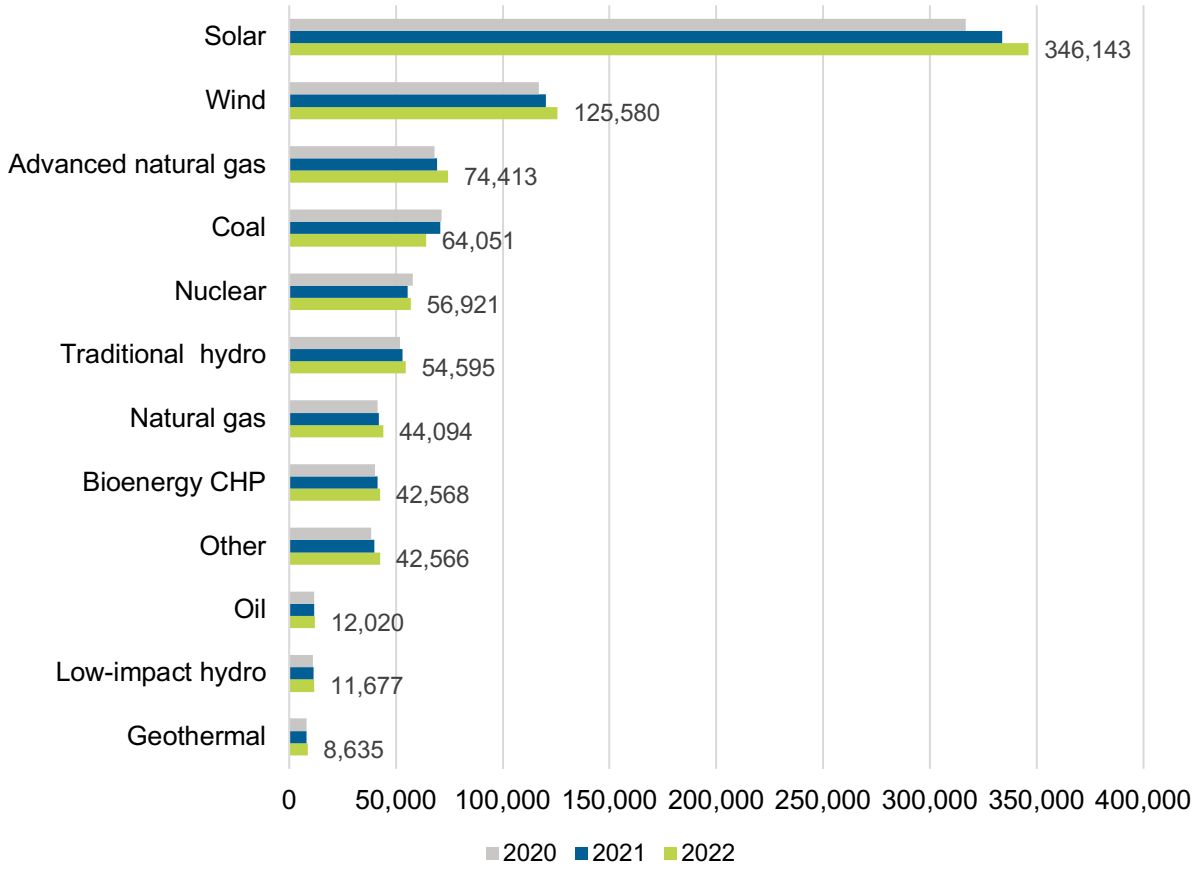
[6] Employer-reported demographic data, particularly related to race and ethnicity, are likely to contain some level of respondent error. BW Research estimates employment demographics based on survey responses at the energy technology, detailed technology, and industry levels. These estimates are anchored by publicly available Bureau of Labor Statistics demographic data at the industry level (NAICS) and data from the U.S. Census Bureau.

[7] https://www.bls.gov/news.release/pdf/union2.pdf

Employment by Technology, Industry, and Occupation

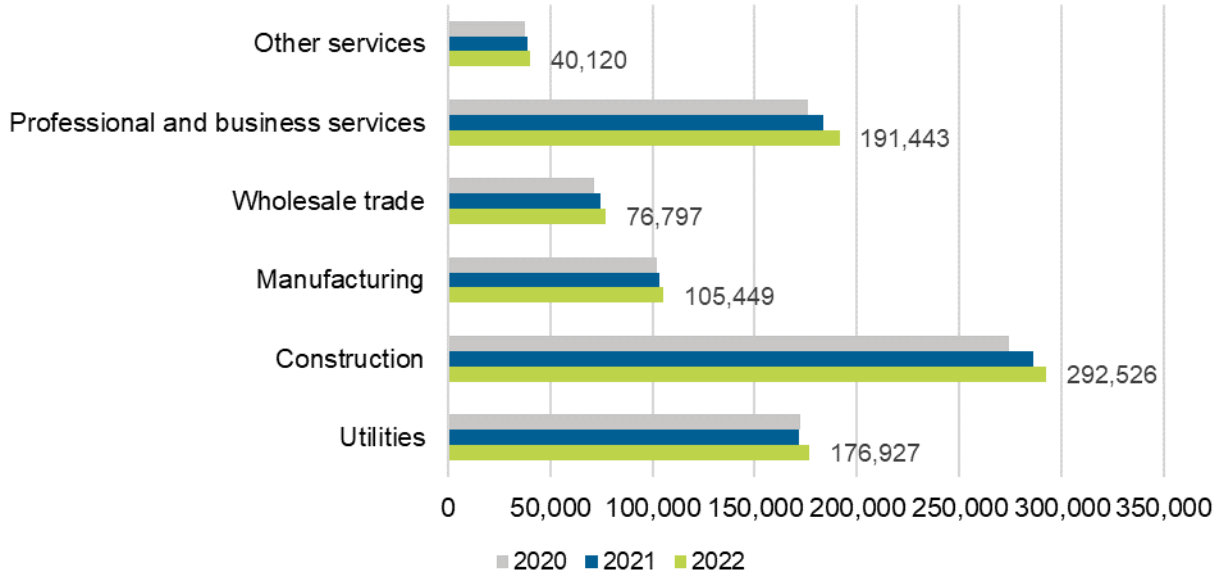
In 2022, 883,262 workers were employed in EPG, representing a change of 3.0% from 2021 (Figure 1). Solar primarily drove these changes, increasing by 12,256 workers. Coal was the only technology with a decrease in employment, declining by 6,780 workers or -9.6%. Advanced natural gas experienced the greatest percentage growth at 7.7% (5,300 new jobs).

Figure 1. Electric Power Generation Employment by Technology



The construction industry[8] employed the greatest number of EPG workers, at 292,526.[9] EPG construction grew 2.3% from 2021 to 2022 (Figure 2), though it remained slightly below pre-pandemic levels. The professional and business services industry experienced both the largest job growth — 8,015 — and the greatest percentage growth rate at 4.4%.

Figure 2. Electric Power Generation Employment by Industry



[8] The construction industry is different from construction occupations. For example, solar installation may fall into the construction industry, even if the majority of workers are in non-construction occupations (administrative, management, etc.).
[9] As with data in the Quarterly Census of Employment and Wages from the Bureau of Labor Statistics, industry employment does not include unincorporated sole proprietors or workers whose wages are not reported to state and federal agencies (e.g., under-the-table or informal economy work).

Technologies that have fewer operations and maintenance activities[10] had a higher concentration of workers in construction, while those with more operations and maintenance had a higher concentration of workers in utilities. Of all EPG technologies, geothermal had the highest concentration of jobs in construction, with 56% of all workers, followed by solar with 51% (Table 1), where the physical installation of solar arrays is considered construction activity. Nuclear EPG and advanced natural gas had the highest concentration of jobs in utilities, with 71% and 62%, respectively.

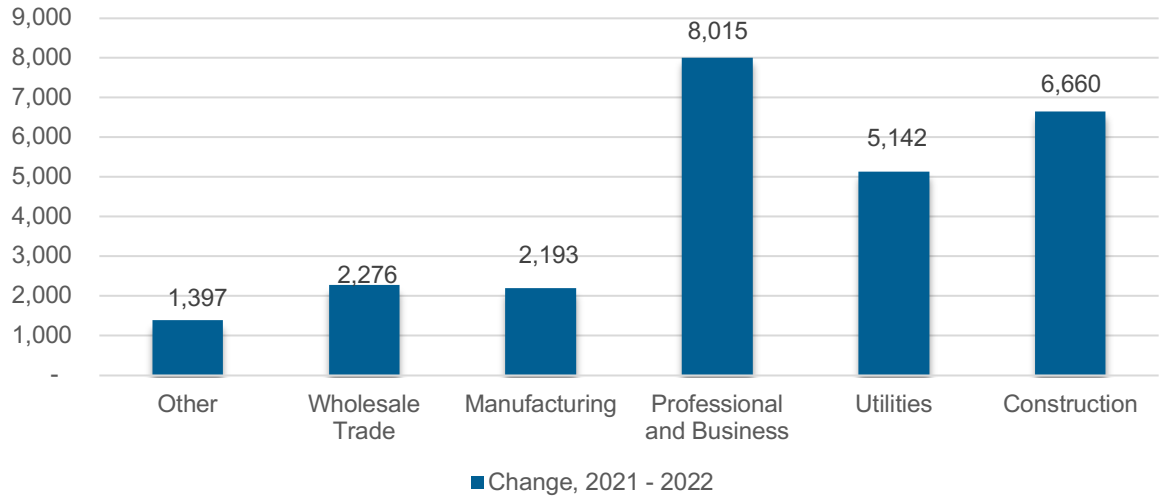
Table 1. Concentration of Electric Power Generation Employment by Technology and Industry

	Utilities	Construction	Manufacturing	Wholesale Trade	Professional and Business Services	Other Services
Solar	3%	**51%**	13%	8%	16%	10%
Land-based Wind	7%	**36%**	19%	10%	26%	2%
Offshore Wind	0%	32%	16%	1%	**48%**	3%
Geothermal	14%	**56%**	3%	4%	22%	0%
Bioenergy	16%	**43%**	9%	4%	25%	3%
Low-impact Hydro	0%	15%	27%	21%	**36%**	1%
Traditional Hydro	**34%**	15%	24%	11%	16%	0%
Advanced Natural Gas	**62%**	13%	4%	7%	14%	1%
Nuclear	**71%**	4%	3%	5%	17%	0%
Coal	**41%**	11%	2%	9%	36%	1%
Oil	3%	0%	**44%**	17%	35%	1%
Natural Gas	**40%**	23%	8%	7%	19%	2%
Combined Heat and Power (CHP)	5%	14%	7%	13%	**60%**	1%

[10] Operations and maintenance activities are spread across industries, but are most often located in utility generation, as part of developer activity in professional and business services, and in repair and maintenance embedded in other services.

Professional and business services[11] firms added the most EPG jobs from 2021 to 2022, creating 8,015 positions (Figure 3). This was followed by construction, which added 6,660. There were no job declines in any industry.

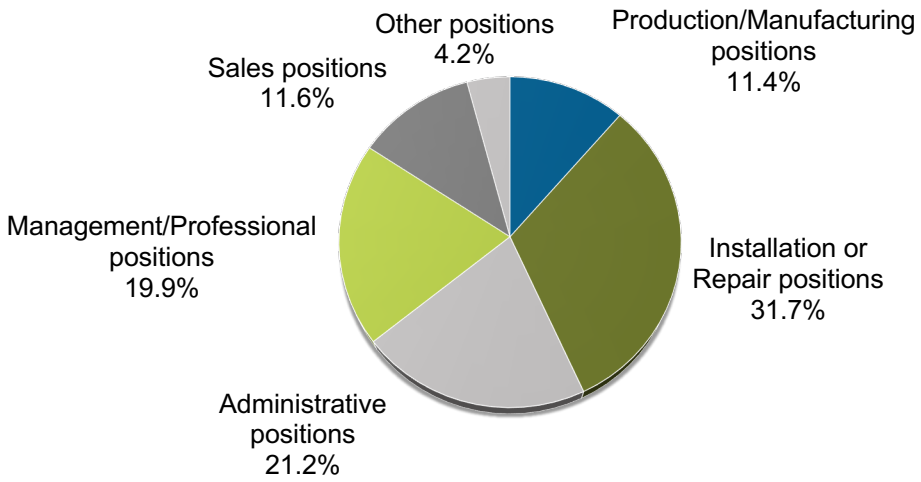
Figure 3. Electric Power Generation Employment Changes by Industry, 2021-2022



Employment by Technology and Occupation

Workers with occupations in the utilities aspect can work in different industries. For example, the construction industry will include many installation or repair occupations, and utilities and other industries will also employ people in these occupations. For this reason, different trends show up if parsing the data by industry or occupation. It can be useful to show energy employment data and trends by both. In terms of distribution of jobs by occupation across all industries, the largest occupational category of workers within EPG was installation or repair positions, with 32% of the total (Figure 4). This was followed by administrative positions (21%), and management and professional positions (20%).

Figure 4. Worker Occupations in Electric Power Generation



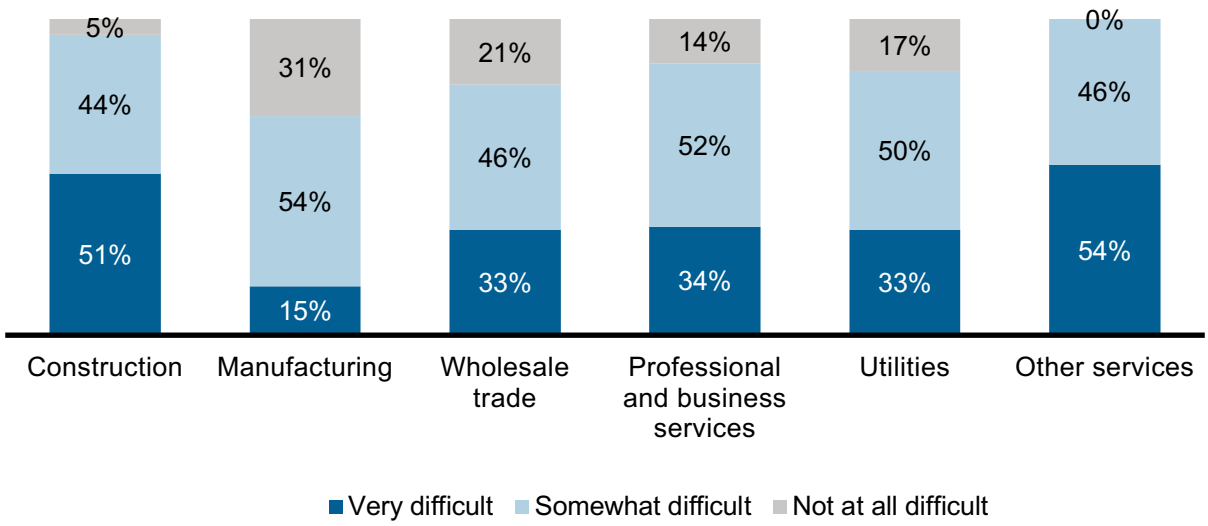
[11] Examples of job titles include computer software engineers, researchers, accountants, and lawyers.

Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within EPG industries, construction was the industry with the greatest difficulty hiring workers (Figure 5). About 95% of EPG construction employers reported finding qualified workers as “very difficult” or “somewhat difficult,” with 51% claiming it was “very difficult.” EPG manufacturing firms reported the least difficulty hiring, with 31% stating that it was “not at all difficult.”

Figure 5. Electric Power Generation Hiring Difficulty by Industry



Employers cited competition/small applicant pool as the most common reason for reported hiring difficulties in the utilities; construction; wholesale trade and other services (Table 2).[12] For professional and business services and manufacturing, lack of experience, training, or technical skills topped the list of reasons for hiring difficulty. Employers were not asked about the compensation offered to attract talent or the effect of compensation on hiring difficulty.

Table 2. Electric Power Generation Employer Reasons for Hiring Difficulty

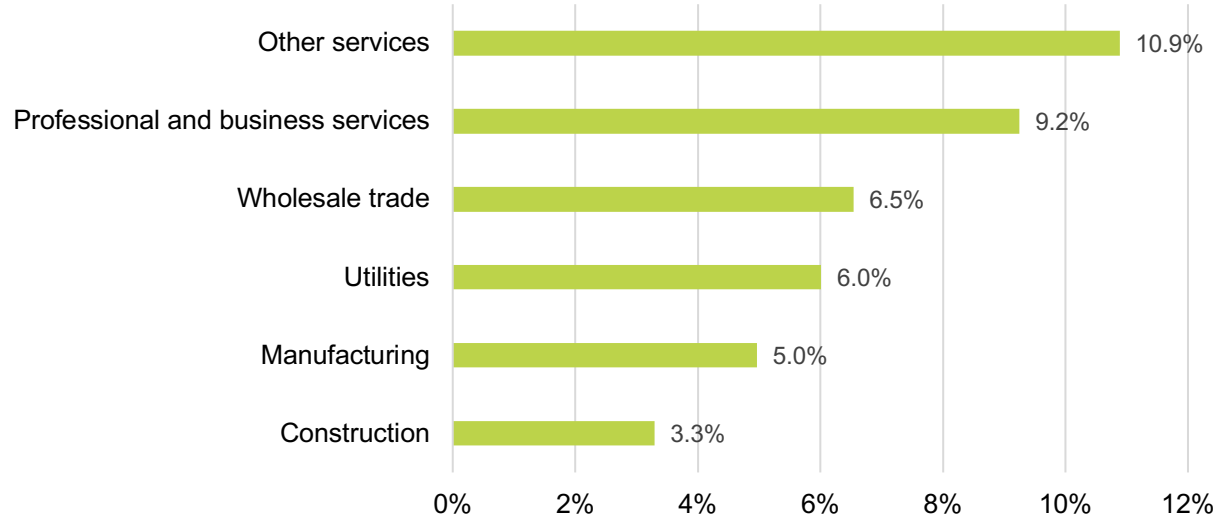
Industry	Most Common Reason	Second Most Common Reason	Third Most Common Reason
Utilities	Competition/small applicant pool (70%)	Lack of experience, training, or technical skills (20%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (20%)
Construction	Competition/small applicant pool (42%)	Lack of experience, training, or technical skills (41%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (26%)
Manufacturing	Lack of experience, training, or technical skills (47%)	Competition/small applicant pool (24%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (24%)
Wholesale Trade	Competition/small applicant pool (35%)	Lack of experience, training, or technical skills (29%)	Difficulty finding industry-specific knowledge, skills, and interest (29%)
Professional and Business Services	Lack of experience, training, or technical skills (38%)	Competition/small applicant pool (34%)	Insufficient qualifications (certifications or education) (30%)
Other Services	Competition/small applicant pool (67%)	Lack of experience, training, or technical skills (25%)	Location (25%)

[12] Reasons for hiring difficulty can only be reported for EPG as a whole and not for individual sub-technologies due to data limitations.

Employment Change by Industry

The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology and industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Employers in all six industries within EPG anticipate growth in 2023, ranging from 3.3% in construction to 10.9% in "other services" (Figure 6).[13]

Figure 6. Electric Power Generation Anticipated Employment Changes, 2022-2023

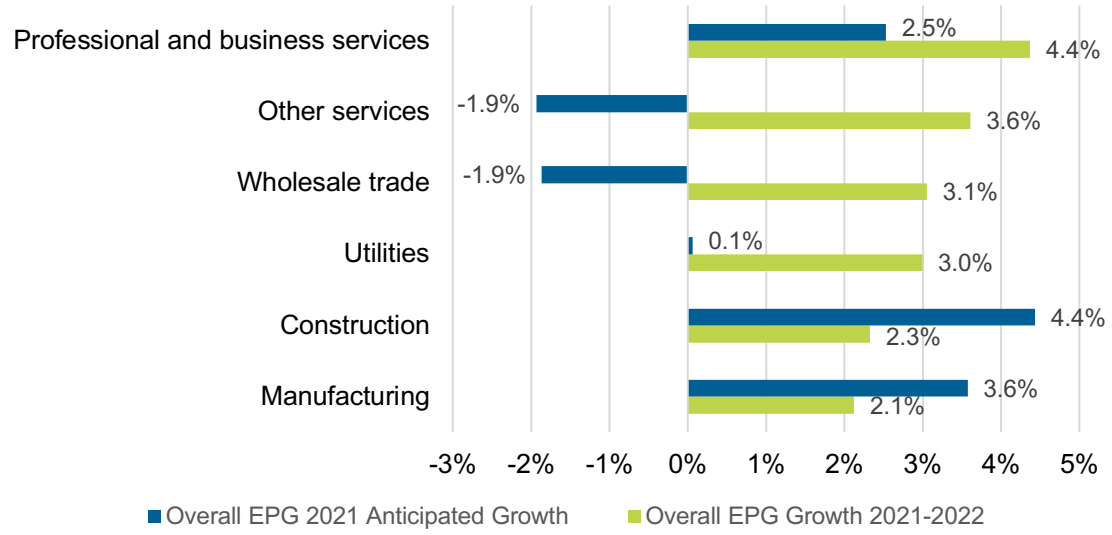


When asked in last year's USEER, employers in wholesale trade and those in "other services" expected a decline in jobs from 2021 to 2022 (-2%), while the remaining industries expected to grow. Overall, industries within EPG all registered growth, ranging from 2% in manufacturing to 4.4% in professional business services (Figure 7).

Figure 7 includes anticipated growth from last year's USEER (blue bars) as well as the actual employment change as published in the 2023 USEER (green bars). The chart illustrates the accuracy of employment change anticipated by employers.

[13] "Other services" encompasses relevant industries within NAICS 81.

Figure 7. Electric Power Generation Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Electric Power Generation Demographics

Demographics for the TDS workforce are displayed in Table 3 below. Female workers made up a higher proportion of the workforce in EPG (32%) than in the overall energy workforce (26%) but lower than the overall workforce average in the U.S. (47%). Male workers made up 67% of the EPG workforce, less than the 73% energy workforce average, and higher than the national workforce average (53%). EPG employers reported fewer than 1% of their employees as gender nonbinary.[14]

The proportion of non-white workers in EPG was 28%, higher than the national workforce average of 23% and overall energy workforce of 25%.

At 1%, the proportion of formerly incarcerated EPG workers was lower than the national average (2%) but on par with the overall energy workforce (1%). The proportion of EPG workers requesting accommodations for disabilities was lower than the national average (2% compared to 4% nationally) and similar to the overall energy workforce (2%). The proportion of EPG workers aged 55 or older was lower than the national average (15% compared to 24%). Workers aged 18 to 29 (29% compared to 22%) and 30 to 54 (56% compared to 54%) were more concentrated in EPG than in the national workforce. The concentration of veterans in EPG was higher than the national average (8% compared to 5% nationally) and slightly lower than the overall energy workforce average (9%).

The percentage of EPG workers represented by a union or covered under a project labor or collective bargaining agreement (12%) was similar to the overall energy workforce average (11%) and nearly double the national private sector average of 7%.

[14] As with all demographic data in this report, there is a potential for reporting errors and biases. For gender specifically, it is important to note that the U.S. Census only collects data on biological "sex" and not "gender;" reporting on gender nonbinary employment should be interpreted with caution.

Table 3. Electric Power Generation Demographics and Characteristics

	Number of Workers	Electric Power Generation Average	Energy Workforce Average	National Workforce Average
Male	594,388	67%	73%	53%
Female	284,488	32%	26%	47%
Gender Nonbinary	4,386	<1%	<1%	n/a
Hispanic or Latino	173,517	20%	18%	19%
Not Hispanic or Latino	709,745	80%	82%	82%
American Indian or Alaska Native	12,949	1%	2%	1%
Asian	85,541	10%	7%	7%
Black or African American	83,490	9%	9%	13%
Native Hawaiian or Other Pacific Islander	10,797	1%	1%	<1%
White	635,004	72%	75%	77%
Two or More Races	47,882	5%	5%	3%
Unknown Race	7,601	1%	<1%	n/a
Veterans	72,579	8%	9%	5%
18 to 29	253,982	29%	30%	22%
30 to 54	497,834	56%	53%	54%
55 and Over	131,446	15%	17%	24%
Disability	19,039	2%	2%	4%
Formerly Incarcerated	12,296	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	109,764	12%[15]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[15] Unionization rates vary by state.

Solar EPG

Solar EPG companies, which include the value chain of activities from research and development through installation, operations, and maintenance for both photovoltaics and concentrating solar power, employed 346,143 workers in a part- or full-time capacity in 2022, up 12,256 (3.7%) from those employed in 2021.[16]

Trends and Key Takeaways

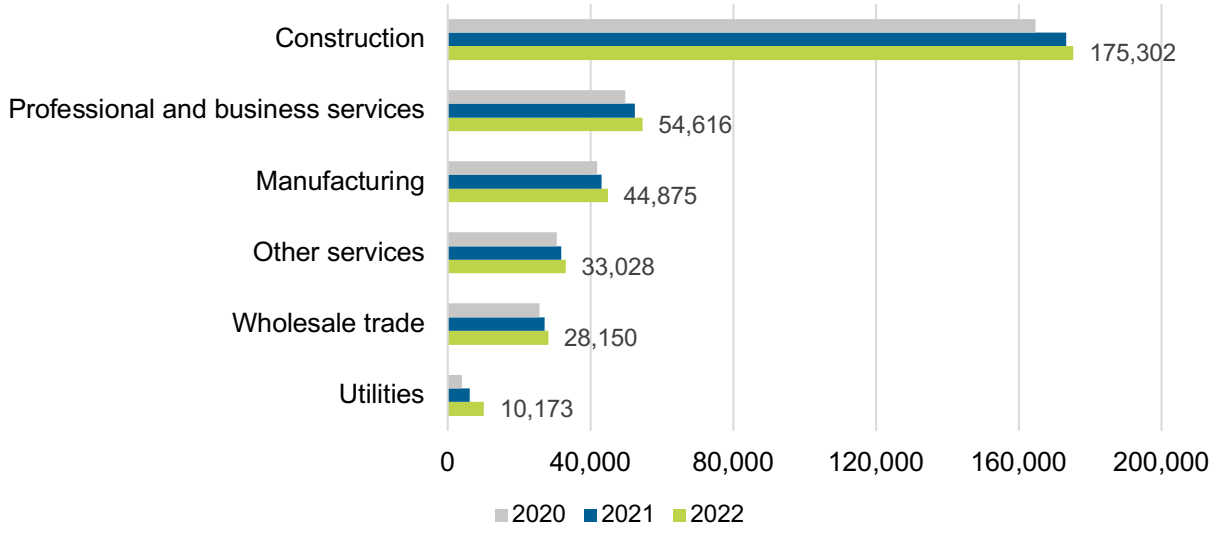
- Solar EPG's largest job gains were in the utilities industry, with 4,041 new jobs (+65.9%). Construction (+2,019 jobs, or +1.2%), professional and business services (+2,150, or +4.1%), manufacturing (+1,784, 0r +4.1%), other (+1,279, or +4%), and wholesale trade (+984, or +3.6%) had more moderate gains.
- Solar EPG employers in all six industries expect employment growth in 2023.
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in solar energy (11%) was similar to the overall energy workforce (11%) but was higher than the national private sector average (7%).[17]
- Female workers were more represented in the solar workforce (31%) than the energy workforce average (26%) but were much less represented when compared to the national workforce average (47%).
- Hispanic or Latino workers were more concentrated in solar energy than the national workforce average and the overall energy workforce (21% compared to 19% and 18%, respectively).
- The solar EPG workforce was more racially diverse than national averages. The percentage of non-white workers was higher than the national average (26% compared to 23%) and just slightly higher than the energy workforce overall (25%).
- Black or African American workers were less represented in solar than in the workforce overall (8% compared to 13%) and slightly less represented when compared to the overall energy workforce (9%).
- Veterans were less represented in solar EPG jobs (8%) when compared to the energy workforce average (9%) but were more represented when compared to the national workforce average (5%).
- Workers requesting accommodations for disabilities were less represented in solar EPG jobs than in the national workforce (3% compared to 4% nationally). The percentage of formerly incarcerated workers in solar EPG was also lower than the in national workforce (1% compared to 2%).

[16] In 2022, 261,776 solar workers spent 50% or more of their time on solar, a growth rate of 3.4% since 2021.
[17] Unionization rates vary by state.

Employment by Industry

The largest number of solar EPG workers were employed in the construction industry, with 175,302 workers (Figure 8). Utilities reported the largest number of new jobs, with 4,041 or 65.9% growth.

Figure 8. Solar EPG Employment by Industry

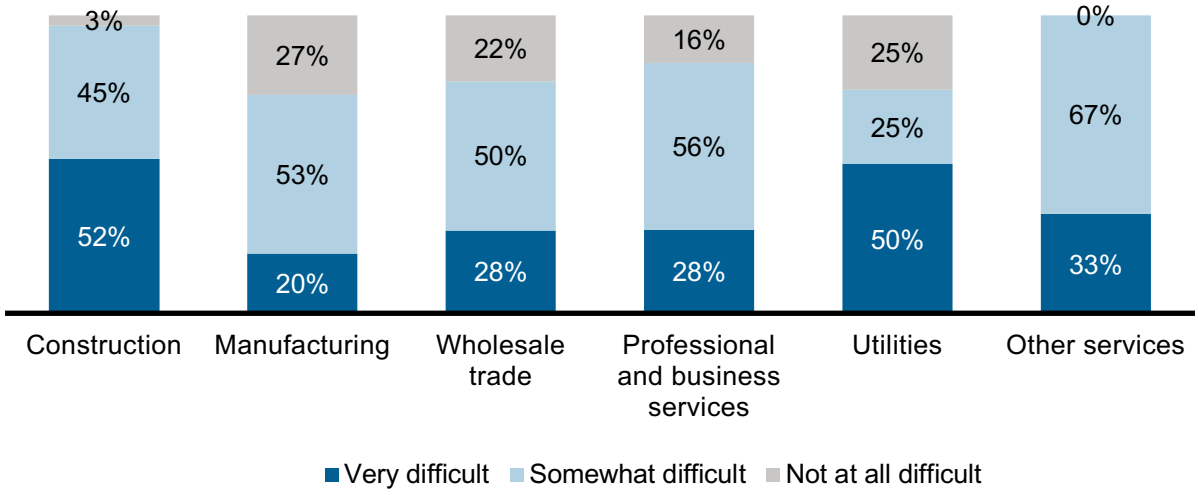


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Among respondents employing solar energy workers, construction companies reported the greatest difficulty hiring workers (Figure 9). Ninety-seven percent of construction employers reported difficulty finding qualified solar workers, with 52% claiming it was “very difficult,” the highest among industries. Manufacturing firms reported the least difficulty hiring, with 27% stating that it was “not at all difficult.”

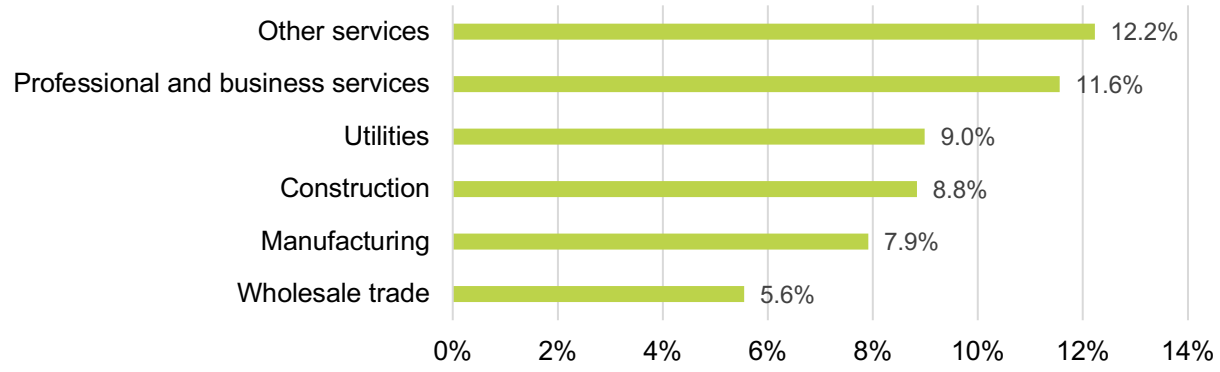
Figure 9. Solar EPG Hiring Difficulty by Industry



Employment Change by Industry

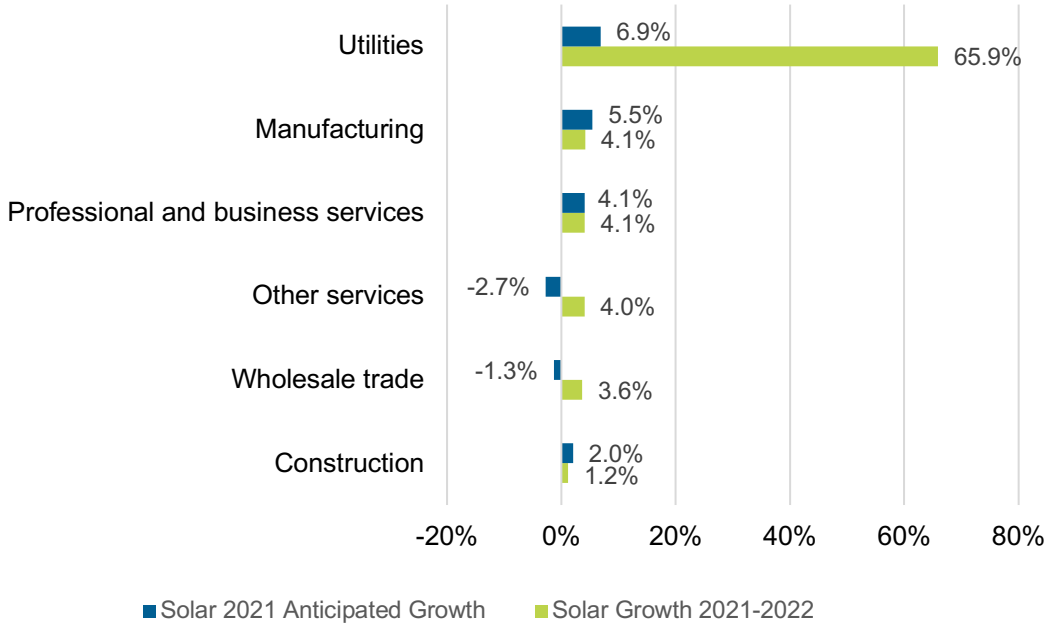
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021.As shown in Figure 10, all industries expect growth in solar EPG employment in 2023: other services (+12.2%), professional and business services (+11.6%), utilities (+9.0%), construction (+8.8%), manufacturing (+7.9%), and wholesale trade (+5.6%).

Figure 10. Anticipated 2023 Changes in Solar EPG Employment



Although the wholesale trade industry (-1.3%) and other services (-2.7%) had expected a decline in solar jobs from 2021 to 2022, all six industries reported growth in solar EPG employment, ranging from 1.2% in construction to 66% in utilities (Figure 11).

Figure 11. Solar EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Solar EPG Demographics

Demographics for the solar EPG workforce are displayed in Table 4 below. The solar EPG workforce was more diverse than the rest of the energy workforce. Male workers made up 69% of the solar EPG workforce, less than the 73% energy workforce average. The solar EPG workforce has higher representation of male workers than the overall economy (53%), however.

The proportion of Hispanic or Latino workers working in solar EPG companies was higher than the energy workforce average and the national workforce overall (21% compared to 18% and 19%, respectively). The proportion of non-white workers in solar EPG jobs was also higher than the energy workforce average and national workforce average (26% compared to 25% and 23%, respectively), which can partially be attributed to a higher representation of Asian workers in solar EPG than in both the national and energy workforce average (9% compared to 7%).

The concentration of veterans in solar EPG was lower than the energy workforce average (8% compared to 9%) but higher than the overall U.S. workforce average (5%). Workers aged 55 or older had lower representation than both the overall energy workforce (17%) and the national workforce (24%). Workers under age 30 were more represented in solar EPG (31%) than in the overall energy workforce (30%) and the national workforce overall (22%). This was also the case for workers between the ages of 30 and 54 when compared to the overall energy workforce and overall U.S. workforce (56% compared to 53% and 54%, respectively).

The proportion of formerly incarcerated workers was the same as the energy workforce average (1%) but lower than the national workforce average. The proportion of workers represented by a union or covered under a project labor or collective bargaining agreement was the same as the overall energy workforce (11%) and higher than the national private sector average (7%).

Table 4. Solar EPG Workforce Demographics and Characteristics

	Number of Workers	Solar EPG Average	Energy Workforce Average	National Workforce Average
Male	238,472	69%	73%	53%
Female	106,037	31%	26%	47%
Gender Nonbinary	1,634	<1%	<1%	n/a
Hispanic or Latino	73,029	21%	18%	19%
Not Hispanic or Latino	273,115	79%	82%	82%
American Indian or Alaska Native	4,248	1%	2%	1%
Asian	31,552	9%	7%	7%
Black or African American	29,134	8%	9%	13%
Native Hawaiian or Other Pacific Islander	4,505	1%	1%	<1%
White	255,307	74%	75%	77%
Two or More Races	18,555	5%	5%	3%
Unknown Race	2,843	<1%	<1%	n/a
Veterans	28,451	8%	9%	5%
18 to 29	107,981	31%	30%	22%
30 to 54	193,607	56%	53%	54%
55 and Over	44,555	13%	17%	24%
Disability	6,055	3%	2%	4%
Formerly Incarcerated	1,526	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	36,542	11%[18]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[18] Unionization rates vary by state.

Wind EPG

Wind EPG companies employed 125,580 workers in 2022, an increase of 5,416 positions (+4.5%). Most wind workers in the U.S. — 124,524 — were in land-based wind EPG, and the remaining 1,056 were in offshore wind EPG.

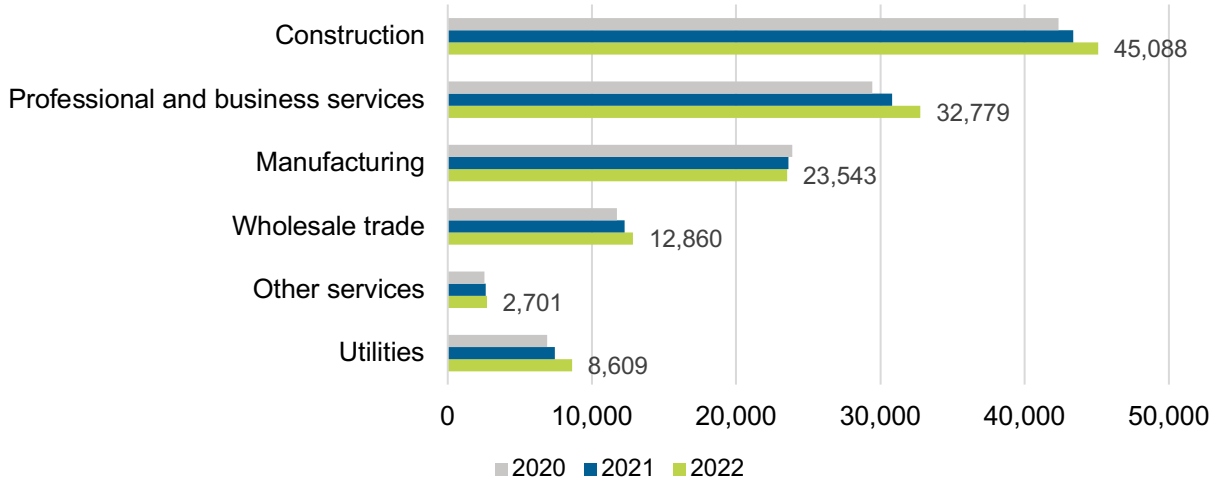
Trends and Key Takeaways

- Wind EPG employment continued its growth trend, creating 5,416 new jobs in 2022.
- The largest job gains in wind EPG from 2021 to 2022 were in the professional and business services industry, with 1,955 new jobs (+6.3%). Professional and business services was followed by construction, (+1,717), utilities (+1,180), wholesale trade (+582), and other services (+83). Manufacturing experienced a decline of 101 jobs.
- Wind EPG employers in three out of six industries anticipate employment growth greater than 7% in 2023.
- Wind EPG's male workforce was lower than the energy workforce average, at 67% compared to 73% but higher than the national workforce average of 53%.
- Wind EPG was more non-white than the energy and economy-wide workforce averages (28% compared to 25% and 23%, respectively). This is attributable to Asian workers (10% compared to 7% for both national and energy workforce averages), and workers of two or more races (6% compared to 4% for national workforce average and 5% for energy workforce average) being more concentrated in wind EPG.
- The percentage of American Indian and Alaska Native workers was lower than the energy workforce average (1% compared to 2%) but slightly higher than the national workforce average (<1%)
- The proportion of Black or African American workers in wind EPG was the same as the energy workforce average (9%) and lower than the economy-wide average (13%).
- The percentage of veterans in wind EPG was equivalent to the energy workforce average (9%) and somewhat higher than the U.S. workforce average (5%).
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in wind EPG (12%) was higher than both the energy (11%) and national private sector workforce averages (7%).
- Workers requesting accommodations for disabilities were more represented in wind EPG, at 3%, than in the rest of the energy workforce (2%) but lower than the overall national workforce (4%). The percentage of formerly incarcerated workers was higher than the energy workforce average (2% versus 1%) but in line with the national workforce average (2%).

Employment by Industry

The largest number of wind EPG employees was in the construction industry, with 45,088 workers — up 1,717 from 2021 (Figure 12). Professional and business services reported the largest number of new jobs, at 1,955, translating to 6.3% growth from 2021 to 2022.

Figure 12. Wind EPG Employment

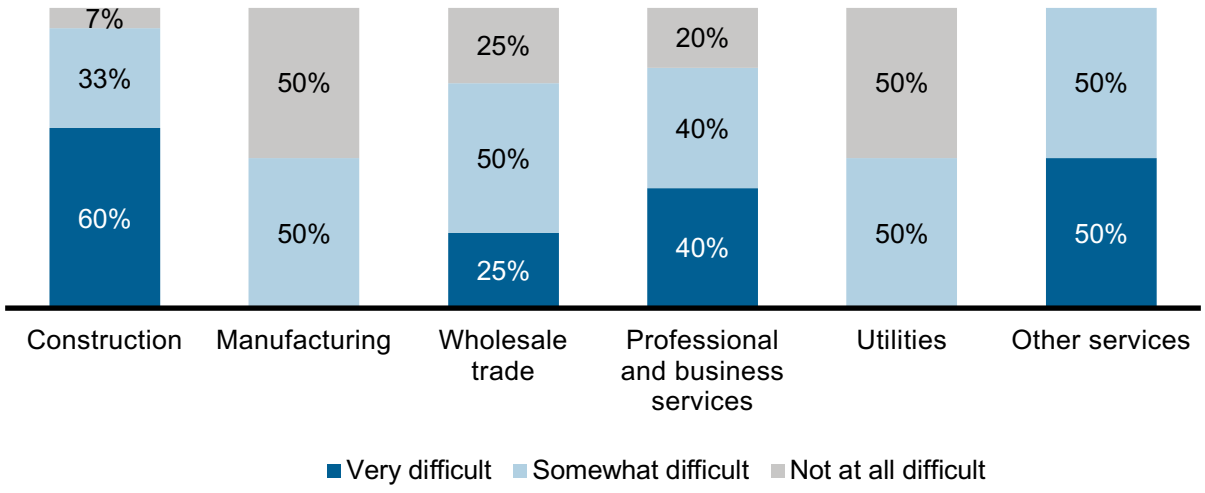


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within wind EPG, construction industry employers reported significant difficulty hiring workers (Figure 13). Ninety-three percent of construction employers reported at least some difficulty finding qualified workers, with 60% claiming it was “very difficult.” Manufacturing and utilities had the lowest difficulty, with 50% of companies reporting hiring to be “not at all difficult.”

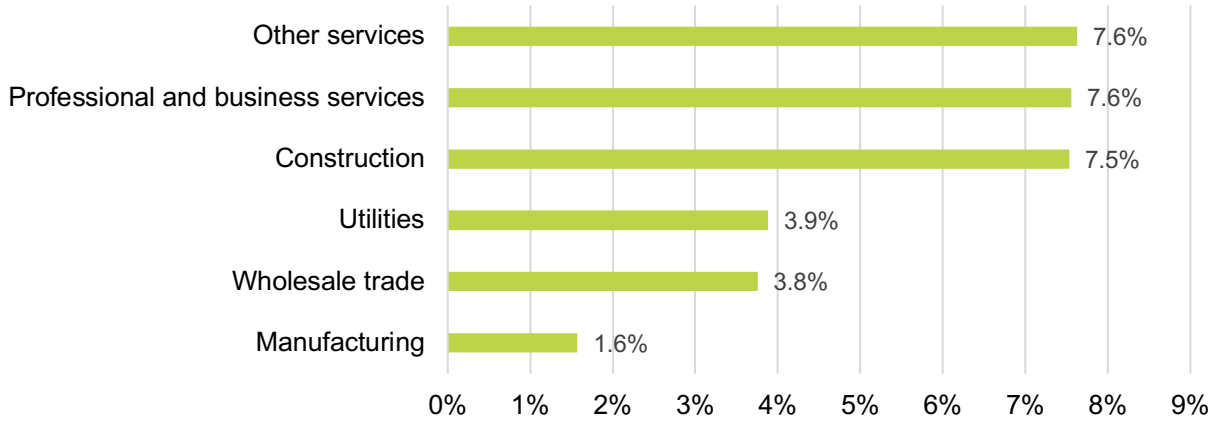
Figure 13. Wind EPG Hiring Difficulty by Industry



Employment Change by Industry

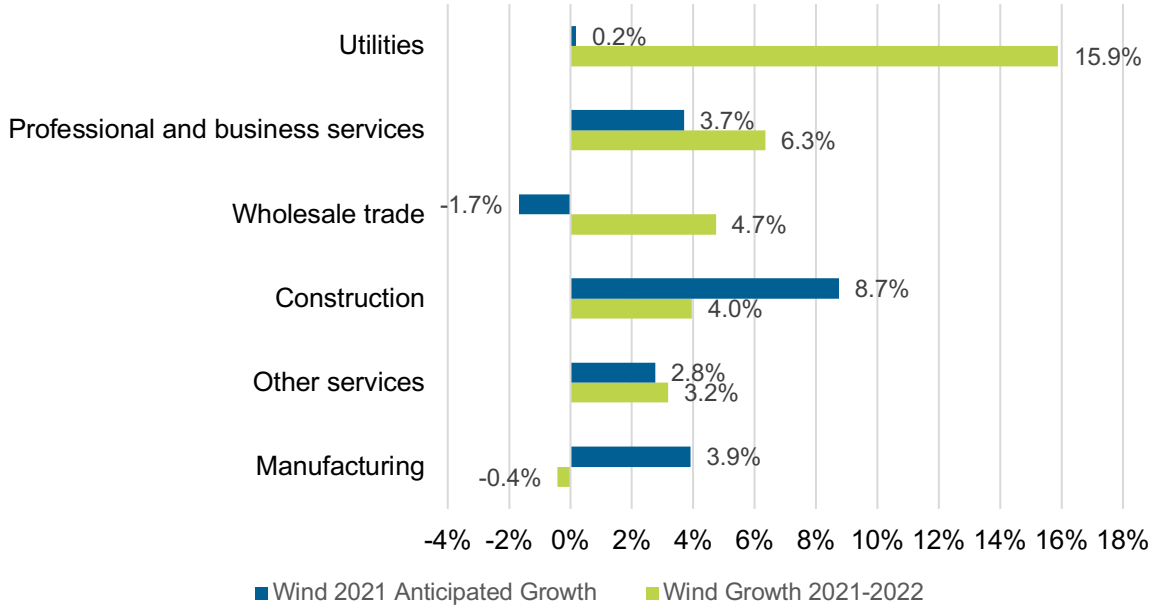
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry within wind EPG as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As shown in Figure 14, employers from all industries in wind EPG expect growth in 2023: professional and business services (+7.6%), other (+7.6%), construction (+7.5%), utilities (+3.9%), wholesale trade, distribution, and transport (+3.8%), and manufacturing (+1.6%).

Figure 14. Anticipated 2023 Changes in Wind EPG Employment



Wholesale trade, distribution, and transport had expected a decline in jobs in the previous year (-1.7%), while other industries within wind had expected growth (Figure 15). However, five of six industries within wind registered growth in the past year, ranging from 4% in construction to 16% in utilities. Manufacturing declined by 0.4% from 2021 to 2022 (-101 jobs).

Figure 15. Wind EPG Actual Employment Change 2021-2022 vs. Anticipated Change 2021



Wind EPG Demographics

The wind EPG workforce was more diverse in terms of gender than the rest of the energy workforce. Male workers (67%) accounted for a lower proportion of the wind EPG workforce than the energy workforce average (73%), while female workers in wind EPG (32%) accounted for a higher proportion than the energy workforce average (26%) (Table 5). Female workers are still less represented in wind EPG when compared to the overall national workforce average (47%).

The proportion of the workforce made up of Hispanic or Latino workers was slightly higher than the energy workforce and national workforce averages (22% compared to 18% and 19%, respectively).

The proportion of non-white workers in wind EPG jobs was 28%, higher than the energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of workers of two or more races (6% compared to the energy workforce average of 5%), and Asian workers (10% compared to the energy workforce average of 7%). Native Hawaiian or other Pacific Islander (1%) and American Indian or Alaska Native workers were the lower than the energy workforce average (2%).

The proportion of veterans in wind EPG jobs was the same as the energy workforce average (9%) and higher than the overall U.S. workforce (5%). The proportion of formerly incarcerated workers was higher than the energy workforce average (2% compared to 1%) but similar to the national workforce average (2%). Workers requesting accommodations for disabilities in wind EPG was higher than the energy workforce overall (3% compared to 2%) but lower than the national workforce average (4%). The proportion of workers under the age of 30 was the same as the energy workforce average (30%) but higher than the overall U.S workforce average of 22%. Workers between the ages of 30 and 54 were more represented in wind EPG than in the overall energy workforce and the national workforce (55% compared to 53% and 54%, respectively). The proportion of workers aged 55 or older (15%) was lower than both the energy workforce average (17%) and the national workforce average (24%).

The proportion of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce and overall national private sector average (12% compared to 11% and 7%, respectively).

Table 5. Wind EPG Workforce Demographics and Characteristics

	Number of Workers	Wind EPG Average	Energy Workforce Average	National Workforce Average
Male	84,241	67%	73%	53%
Female	40,369	32%	26%	47%
Gender Nonbinary	970	<1%	<1%	n/a
Hispanic or Latino	27,130	22%	18%	19%
Not Hispanic or Latino	98,450	78%	82%	82%
American Indian or Alaska Native	1,684	1%	2%	1%
Asian	12,363	10%	7%	7%
Black or African American	10,726	9%	9%	13%
Native Hawaiian or Other Pacific Islander	1,503	1%	1%	<1%
White	90,019	72%	75%	77%
Two or More Races	7,982	6%	5%	3%
Unknown Race	1,303	1%	<1%	n/a
Veterans	10,921	9%	9%	5%
18 to 29	37,366	30%	30%	22%
30 to 54	69,501	55%	53%	54%
55 and Over	18,713	15%	17%	24%
Disability	3,370	3%	2%	4%
Formerly Incarcerated	2,511	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	14,483	12%[19]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[19] Unionization rates vary by state.

Coal EPG

Coal EPG[20] employed 64,051 workers in 2022, down 6,780 from the 70,831 employed in 2021 (-9.6%).

Trends and Key Takeaways

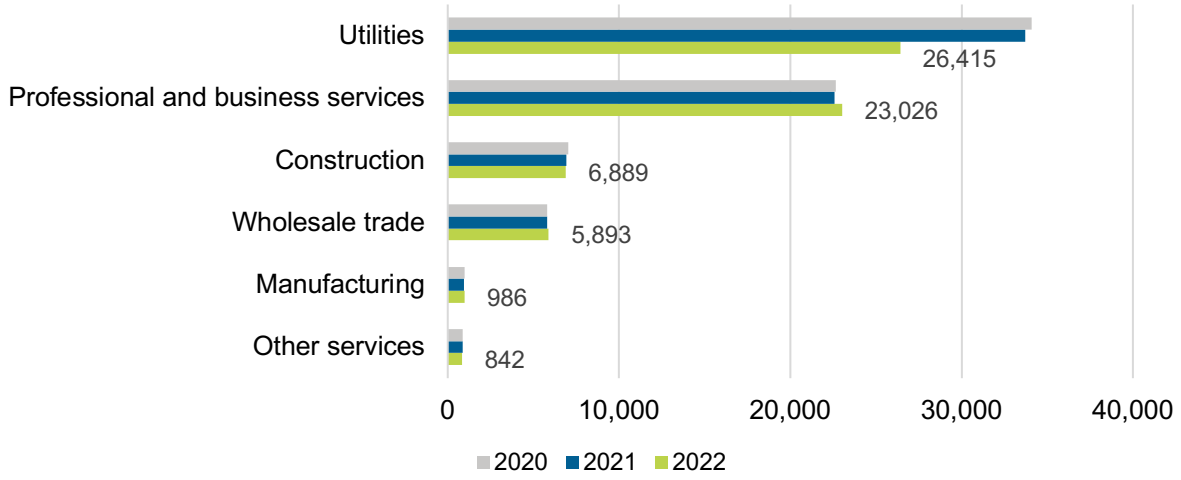
- The largest job declines were in the utilities industry, with 7,306 fewer jobs in 2022 than in 2021 (-21.7%). Other (-2.5%) and construction (-0.5%) also saw a decline in jobs in the past year.
- Jobs increased slightly in the manufacturing; wholesale trade; and professional services industries, by 583 workers altogether.
- Professional and business services firms anticipate high growth in 2023 (+7.7%).
- Coal EPG's workforce was more gender diverse than the rest of the energy workforce, with 67% male workers compared to the 73% energy workforce average. Coal EPG is less gender diverse than the economy as a whole, which is 53% male.
- Hispanic or Latino workers were less represented in coal EPG than in the energy and national workforce averages (16% compared to 18% and 19%, respectively).
- Coal EPG had a higher percentage of non-white workers (29%) than the energy workforce average (25%) and the national workforce average (23%). This is partially attributable to Asian workers (10% compared to 7%) being more concentrated in coal EPG. The percentage of American Indian or Alaska Native workers was the same as the energy workforce average (2%).
- Black or African American workers were more represented in the coal EPG workforce than they were in the rest of the energy workforce, making up 11% of the coal EPG workforce compared to 9% of the overall energy workforce. The proportion of Black or African American workers in coal is lower than the national workforce average of 13%.
- The percentage of workers in coal EPG represented by a union or covered under a project labor or collective bargaining agreement (17%) was higher than the energy workforce and overall national private sector workforce averages (11% and 7%, respectively).
- Formerly incarcerated workers were more represented in coal EPG than in the overall energy workforce, at 2% compared to 1%, but were on par with national workforce averages (2%). The proportion of workers requesting accommodations for disabilities was the same as the overall energy workforce average (2%) and lower than the national workforce average (4%).

[20] This is solely coal electricity generation. Coal extraction is included in the Fuels and Multi-Sectors sections of this report.

Employment by Industry

The largest number of coal EPG employees were in the utilities industry, with 26,415 workers (Figure 16). Utilities also reported the largest decrease in jobs from 2021 to 2022, which shrank by 7,306 positions (-21.7%).

Figure 16. Coal EPG Employment by Industry

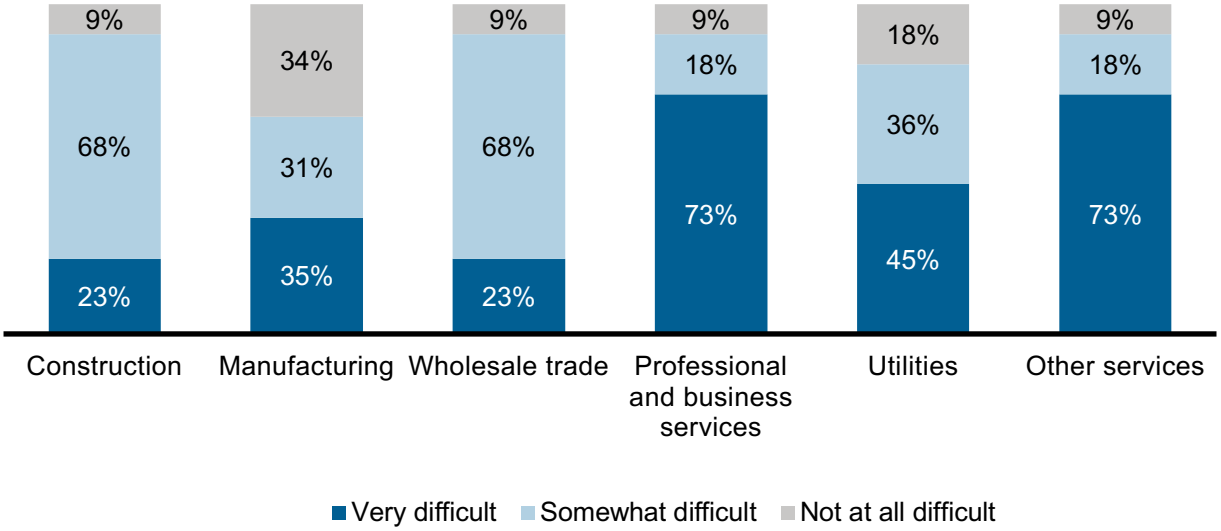


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within coal EPG industries, construction; wholesale trade; other services; and professional services reported the highest hiring difficulty (Figure 17). Ninety-one percent of these employers reported finding qualified workers as “very difficult” or “somewhat difficult.” Manufacturing reported the least difficulty, with 34% reporting hiring was “not at all difficult.”

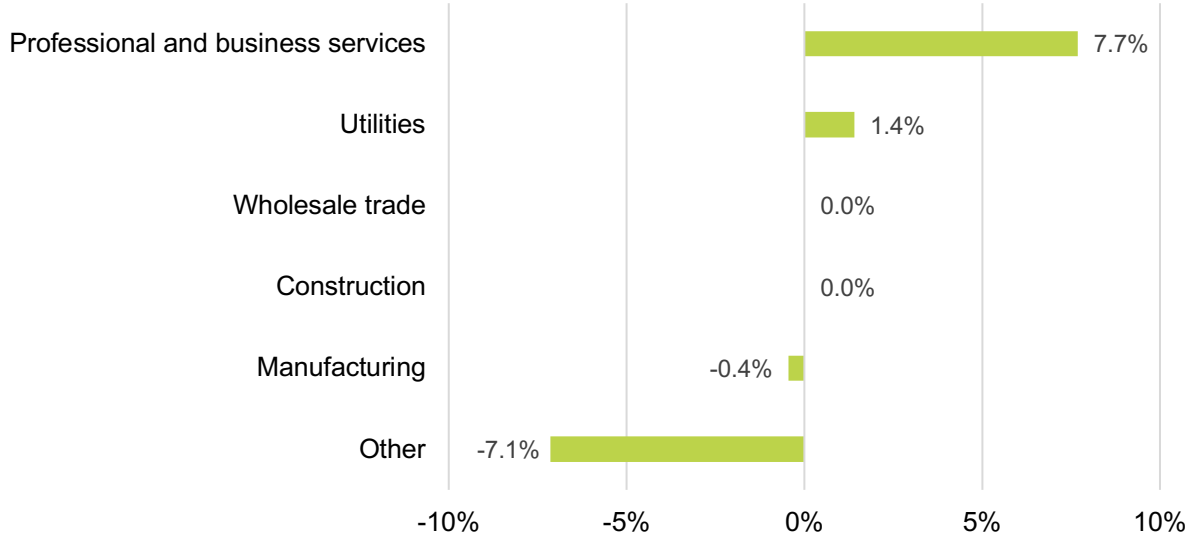
Figure 17. Coal EPG Hiring Difficulty by Industry



Employment Change by Industry

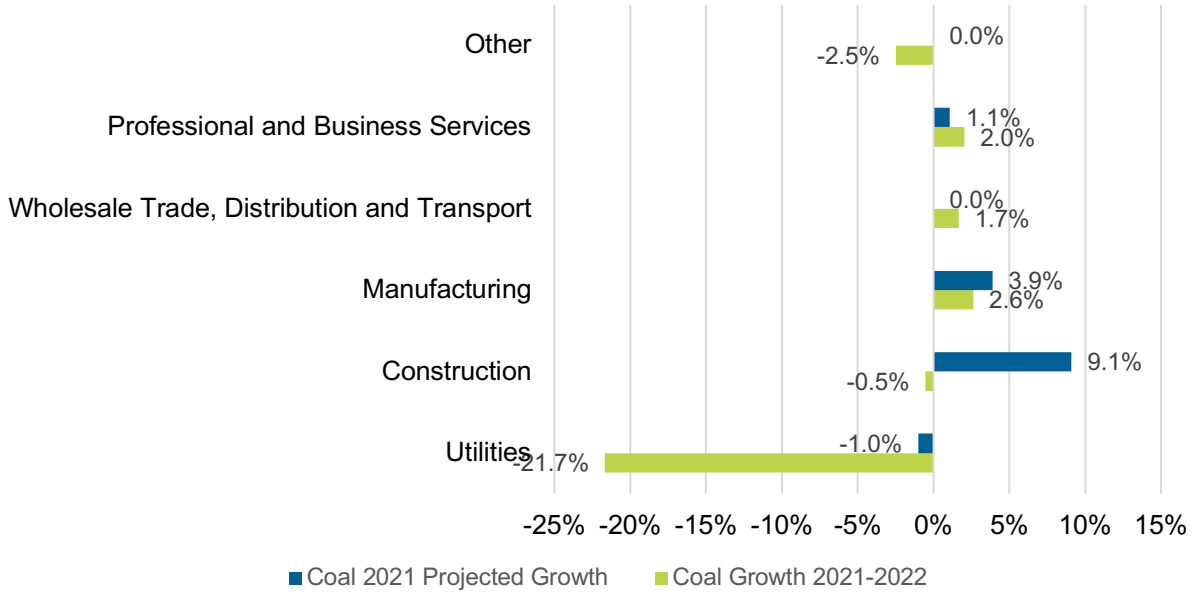
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021.As illustrated in Figure 18, two out of the six industries in coal EPG expect growth in 2023: professional and business services (+7.7%), and utilities (+1.4%). Other services (-7.1%) and manufacturing (-0.4%) expect a decline in coal EPG jobs. The construction and wholesale trade industries do not expect changes.

Figure 18. Anticipated 2023 Changes in Coal Electric Power Generation Employment



Utilities experienced a much deeper employment decline in 2022 than its employers had anticipated, while professional and business services and wholesale trade growth exceeded employer-reported expectations over the period (Figure 19).

Figure 19. Coal EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Coal EPG Demographics

Coal EPG was more gender diverse than the rest of the energy workforce but less diverse than the national economy as a whole. Male workers made up a smaller proportion of the coal workforce than the overall energy workforce (67% compared to 73%) but represent a higher proportion when compared to the national workforce average of 53%. Female workers make up a larger proportion of the coal workforce than the overall energy workforce (33% compared to 26%) (Table 6).

The proportion of non-white workers in coal EPG was 29%, higher than the energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of Asian workers in coal than in the overall energy workforce (10% compared to 7%). The concentration of Black or African American workers in coal was higher than the energy workforce average (11% compared to 9%) but lower than the national workforce average (13%).

The concentration of veterans was lower than the energy workforce average (7% compared to 9%) but higher than the overall U.S. workforce average of 5%. The proportion of formerly incarcerated workers was higher than the energy workforce average (2% compared to 1%) and the same as the national workforce average (2%). The proportion of the coal EPG workforce requesting accommodations for disabilities was the same as the energy workforce average (2%) but lower than the national workforce average (4%). The percentage of workers under the age of 30 was lower in coal than in the overall energy workforce (25% compared to 30%), while the percentage of workers

between the ages of 30 and 54 was higher than the energy workforce average (56% compared to 53%), which was also the case for workers aged 55 or older (19% compared to 17%).

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average and the national private sector average (17% compared to 11% and 7%, respectively).

The proportion of the workforce made up of Hispanic or Latino workers was lower than the energy and national workforce averages (16% compared to 18% and 19% respectively).

Table 6. Coal EPG Workforce Demographics and Characteristics

	Number of Workers	Coal EPG Average	Energy Workforce Average	National Workforce Average
Male	42,643	67%	73%	53%
Female	21,168	33%	26%	47%
Gender Nonbinary	239	<1%	<1%	n/a
Hispanic or Latino	10,371	16%	18%	19%
Not Hispanic or Latino	53,680	84%	82%	82%
American Indian or Alaska Native	1,036	2%	2%	1%
Asian	6,438	10%	7%	7%
Black or African American	7,041	11%	9%	13%
Native Hawaiian or Other Pacific Islander	1,053	2%	1%	<1%
White	45,739	71%	75%	77%
Two or More Races	2,075	3%	5%	3%
Unknown Race	669	1%	<1%	n/a
Veterans	4,407	7%	9%	5%
18 to 29	15,944	25%	30%	22%
30 to 54	35,700	56%	53%	54%
55 and Over	12,407	19%	17%	24%
Disability	1,323	2%	2%	4%
Formerly Incarcerated	1,311	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	10,979	17%[21]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[21] Unionization rates vary by state.

Natural Gas EPG

Natural gas EPG,[22] which includes conventional as well as advanced natural gas,[23] employed 118,506 workers in 2022, up 7,310 from the 111,196 employed in 2021 (+6.6%). Of these, 74,413 were in advanced natural gas with the remaining 44,094 in conventional natural gas.

Trends and Key Takeaways

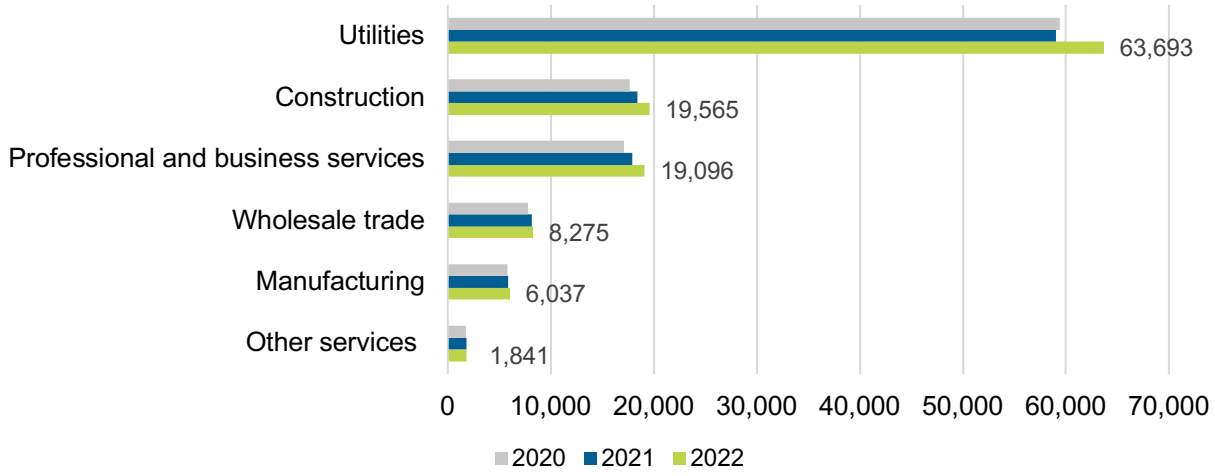
- The largest job gains were in the utilities industry, with 4,680 new jobs (+7.9%), followed by construction (+1,132 jobs), professional and business services (+1,172), manufacturing (+161), wholesale trade (+138), and other services (+28).
- Natural gas EPG industries that anticipate relatively high growth in 2023 include other (+10.5%), professional and business services (+9.1%), and utilities (+6.7%).
- The natural gas EPG workforce was more gender diverse than the rest of the energy workforce, with 63% male workers compared to 73% in the overall energy workforce but was still higher than the national workforce average of 53%. Natural gas was the most gender-diverse workforce of EPG technologies, just ahead of nuclear EPG (64% male workers).
- The percentage of non-white workers was higher in natural gas than the energy and economy-wide workforce averages (31% compared to 25% and 23%, respectively). This is partially attributable to Asian workers (10% compared to 7% economy-wide) and workers of two or more races (7% compared to 3% economy-wide).
- Black or African American workers were employed at a higher rate in natural gas EPG (11%) than the overall energy workforce (9%) but lower than the economy-wide workforce (13%).
- Veterans were less represented in natural gas EPG, at 8%, than in the overall energy workforce (9%) but are more represented when compared to the overall national workforce (5%).
- The percentage of workers in natural gas EPG represented by a union or covered under a project labor or collective bargaining agreement (17%) was higher than the energy workforce average (11%) and significantly higher than the national private sector average (7%).
- Workers requesting accommodations for disabilities were equally represented in natural gas EPG as they were in the overall energy workforce (2%) but are less represented than workers requesting accommodations for disabilities in the national workforce (4%). The percentage of formerly incarcerated workers was slightly higher than the overall energy workforce (2% versus 1%) but was the same as the national workforce average (2%).

[22] The employment numbers in this section do not include fuels (such as extraction). These are included in the Fuels and Multi-Sector sections of this report.
[23] Advanced natural gas includes combined cycle natural gas generation.

Employment by Industry

The largest number of natural gas EPG employees was in the utilities industry, with 63,693 workers (Figure 20). The utilities industry also reported the largest number of new jobs within natural gas (+4,680 jobs), translating to 7.9% growth. Professional services experienced the second greatest percentage growth in jobs (+6.5%), followed by construction (+6.1%).

Figure 20. Natural Gas EPG Employment by Industry

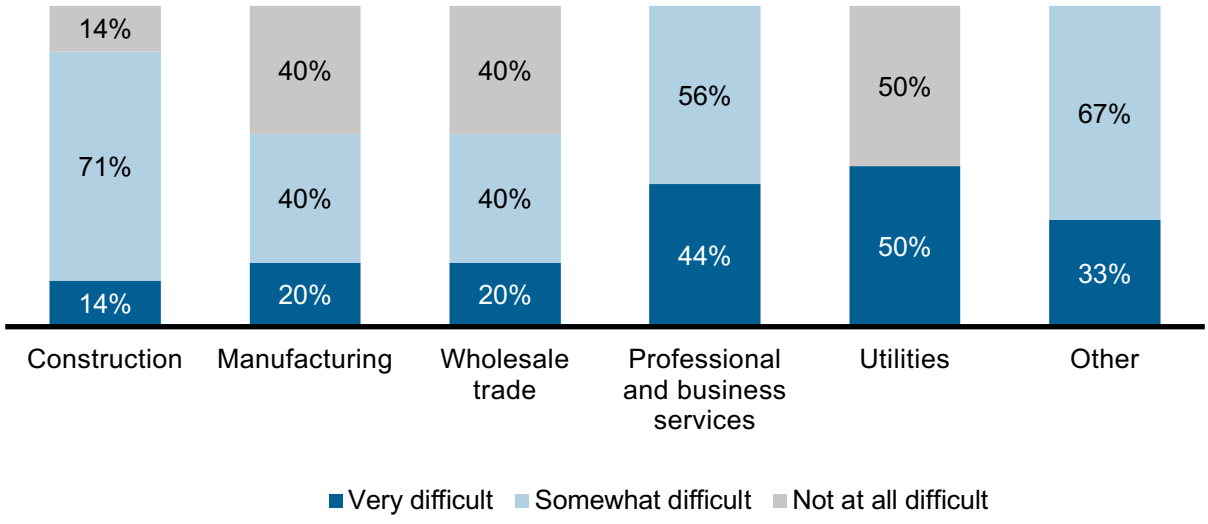


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within natural gas EPG industries, professional and business services reported the greatest difficulty hiring, with 100% indicating at least some difficulty (Figure 21). Manufacturing; wholesale trade; and utilities had the lowest reported difficulty, with 40%, 40% and 50%, respectively, reporting that hiring was “not at all difficult.”

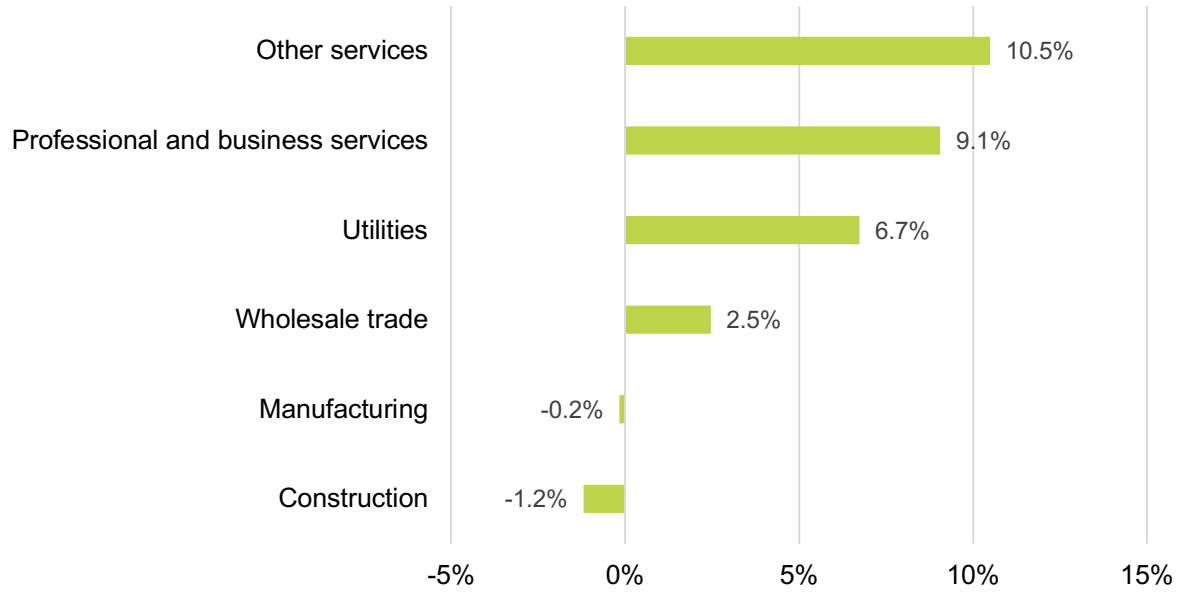
Figure 21. Natural Gas EPG Hiring Difficulty by Industry



Employment Change by Industry

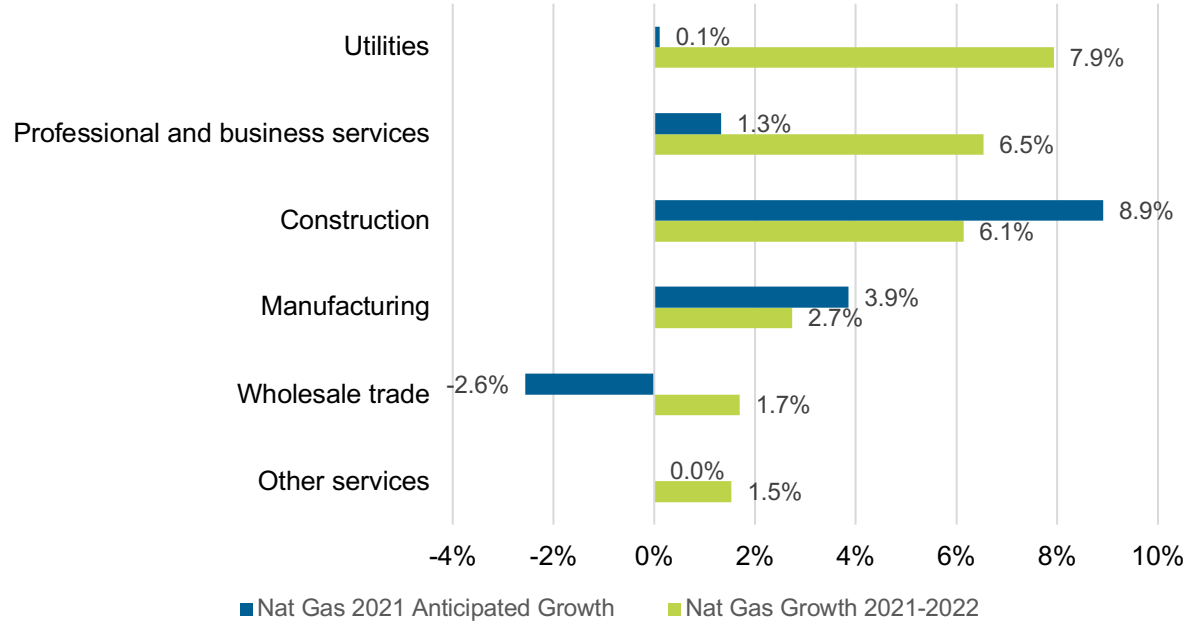
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by natural gas EPG industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021.As shown in Figure 22, employers in four out of six industries in natural gas EPG anticipate growth in 2023: Other services (+10.5%), professional and business services (+9.1%), utilities (+6.7%), and wholesale trade (+2.5%). Construction (-1.2%) and manufacturing (-0.2%) employers anticipate a decline in jobs in 2023.

Figure 22. Anticipated 2023 Changes in Natural Gas EPG Employment



Only wholesale trade, distribution, and transport employers had expected a decline in jobs from 2021 to 2022, while employers in the remaining industries within natural gas EPG had expected growth (Figure 23). All six industries within natural gas EPG registered growth between 2021 and 2022, ranging from 1.5% in other to 8% in utilities.

Figure 23. Natural Gas EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Natural Gas EPG Demographics

Natural gas EPG was more gender diverse than the overall energy workforce, with male workers (63% compared to 73%) making up a smaller share of the natural gas workforce and female workers (37% compared to 26%) more represented in the natural gas workforce than in the overall energy workforce (Table 7). Natural gas EPG was still less gender diverse than national workforce averages, with a 53% share of male workers compared to 47% female workers.

The proportion of the workforce made up of Hispanic or Latino workers was slightly higher than the overall energy workforce (19% compared to 18%) and similar to the U.S. workforce average (19%).

The proportion of non-white workers in natural gas EPG was 31%, higher than the 25% energy workforce average and the 23% national workforce average. This was attributable to higher-than-average proportions of workers of two or more races (7% compared to 5% in the overall energy workforce) and Asian workers (10% compared to 7% in the overall energy workforce). The proportion of Native Hawaiian or other Pacific Islander workers was the same as the overall energy workforce (1%), while American Indian or Alaska Native workers were less represented in the natural gas EPG workforce than in the overall energy workforce (1% compared to 2%).

Formerly incarcerated individuals were more represented in the natural gas EPG workforce than in the overall energy workforce (2% compared to 1%) but were represented at the same rate in the overall U.S. workforce (2%). The proportion of veterans in natural gas EPG was lower than in the overall energy workforce (8% compared to 9%) but higher than the national workforce average of 5%. The proportion of workers requesting accommodations for disabilities was the same as the energy workforce average (2%) and half of the national workforce proportion (4%). There are fewer workers under the age of 30 (26% compared to 30%) and aged 55 or older (15% compared to 17%) in the natural gas industry than in the overall energy workforce. The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average and the national private sector average (17% compared to 11% and 7%, respectively).

Table 7. Natural Gas EPG Workforce Demographics and Characteristics

	Number of Workers	Natural Gas EPG Average	Energy Workforce Average	National Workforce Average
Male	75,049	63%	73%	53%
Female	43,266	37%	26%	47%
Gender Nonbinary	191	<1%	<1%	n/a
Hispanic or Latino	22,409	19%	18%	19%
Not Hispanic or Latino	96,097	81%	82%	82%
American Indian or Alaska Native	1,655	1%	2%	1%
Asian	12,231	10%	7%	7%
Black or African American	13,367	11%	9%	13%
Native Hawaiian or Other Pacific Islander	1,255	1%	1%	<1%
White	81,372	69%	75%	77%
Two or More Races	8,103	7%	5%	3%
Unknown Race	522	<1%	<1%	n/a
Veterans	9,586	8%	9%	5%
18 to 29	31,201	26%	30%	22%
30 to 54	69,540	59%	53%	54%
55 and Over	17,766	15%	17%	24%
Disability	2,961	2%	2%	4%
Formerly Incarcerated	1,976	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	19,939	17%[24]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[24] Unionization rates vary by state.

Nuclear EPG

Nuclear EPG companies[25] employed 56,921 workers in 2022, up 1,359 from 2021 (2.4%) but 1,081 fewer than in 2020, when employment was 58,002.

Trends and Key Takeaways

- Jobs increased in five industries. Utilities had the largest number of new jobs, at 790 (+2.0%), and was the largest industry in nuclear EPG (40,605 workers), followed by professional and business services (9,740), wholesale trade (2,652), construction (2,120), manufacturing (1,725), and other services (78).
- Nuclear EPG employers in the wholesale trade (+1.8%), other services (+0.7%), and manufacturing (+0.4%) industries anticipate growth in 2023.
- Nuclear EPG's workforce was more gender diverse than the overall energy workforce, with a smaller share of male workers (64% compared to 73% across all energy employment) and a larger share of female workers (36% compared to 26%). Nuclear EPG was less gender diverse than the national workforce overall (53% male and 47% female).
- The nuclear EPG workforce trends younger than the energy workforce average. The percentage of workers aged 18 to 29 in nuclear EPG (23%) is higher than the energy workforce average (22%) and close to the national workforce average (22%). The percentage of workers aged 30 to 54 is higher in nuclear EPG when compared to overall energy and national workforce averages (62% versus 53% and 54%, respectively).
- Nuclear EPG included a higher percentage of non-white workers than energy workforce and national workforce averages. The percentage of non-white workers was 33% compared to 25% and 23%, respectively. This is attributable to Asian workers (10% compared to 7%) and American Indian or other Alaska Native workers (3% compared to 2%) being more represented in nuclear EPG than in the overall energy workforce.
- Hispanic or Latino workers were less represented in nuclear EPG (15%) than in the overall energy workforce (18%) and the U.S. workforce (19%).
- Black or African American workers were more represented in nuclear EPG than in the overall energy workforce (12% compared to 9%) but slightly less than in the national workforce overall (13%).
- Veterans were less represented in nuclear EPG than in the overall energy workforce (7% compared to 9%) but were more represented when compared to the national workforce overall (5%).
- At 19%, nuclear EPG was the most unionized (represented by a labor union or covered under a collective bargaining agreement or a project labor agreement) energy technology,

[25] These job numbers do not include extraction, which is covered in the Fuels and Multi-Sector sections of this report.

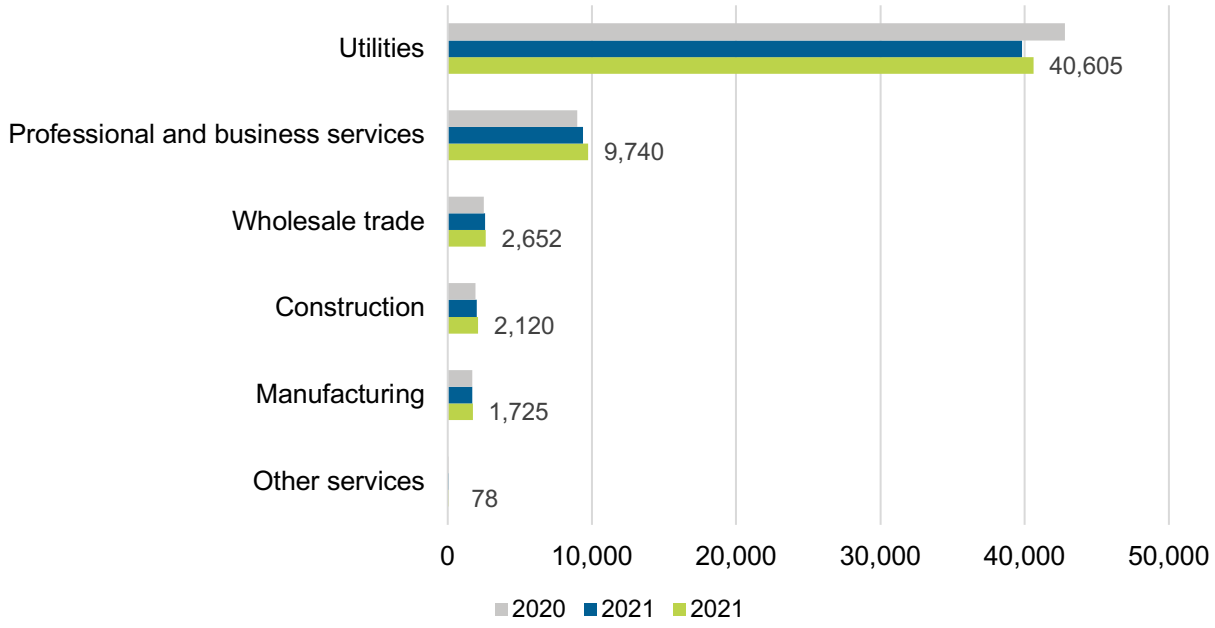
higher than the overall energy average of 11% and the national private sector average of 7%.

- Formerly incarcerated workers were more represented in nuclear EPG than in the overall energy workforce (2% compared to 1%) but at the same rate as in the national workforce (2%). Workers requesting accommodations for disabilities were less represented in nuclear (1%) than in the energy workforce (2%) and national workforce (4%).

Employment by Industry

The largest number of nuclear EPG employees were in utilities, with 40,605 workers (Figure 24). Utilities employment increased by 790 workers (+2.0%). Professional and business services employment grew by 377 new positions (+4.0%) followed by construction, with 109 new jobs (+5.4%).

Figure 24. Nuclear EPG Employment by Industry

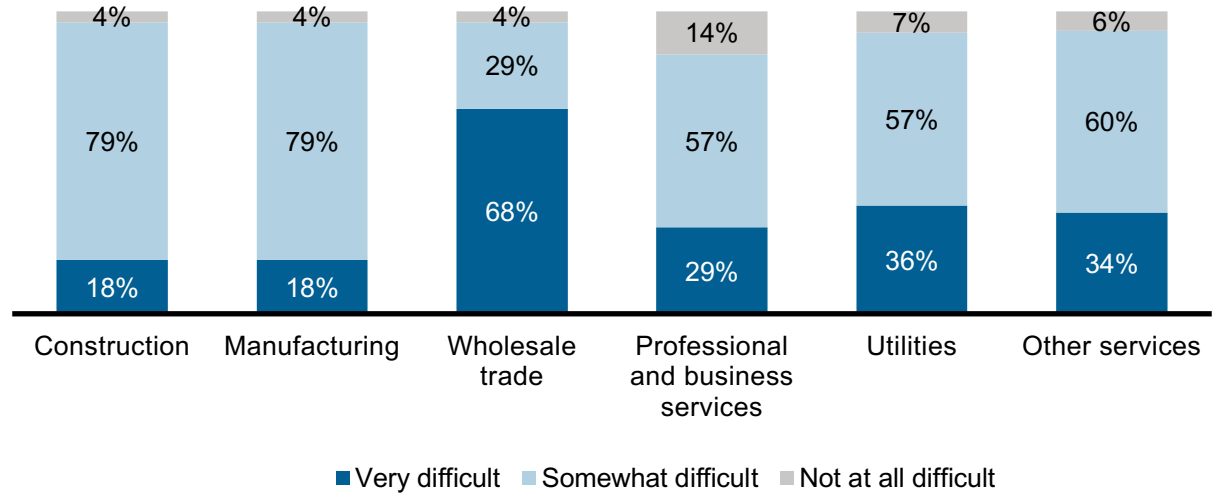


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within nuclear EPG industries, wholesale trade employers reported the greatest difficulty hiring workers (Figure 25), with approximately 96% reporting at least some difficulty finding qualified workers and 68% claiming it was "very difficult" — the highest percentage for "very difficult" among industries. Professional and business services reported the lowest level of difficulty hiring, yet nearly 86% of this industry still reported at least some hiring difficulty, highlighting the employment challenges in this category.

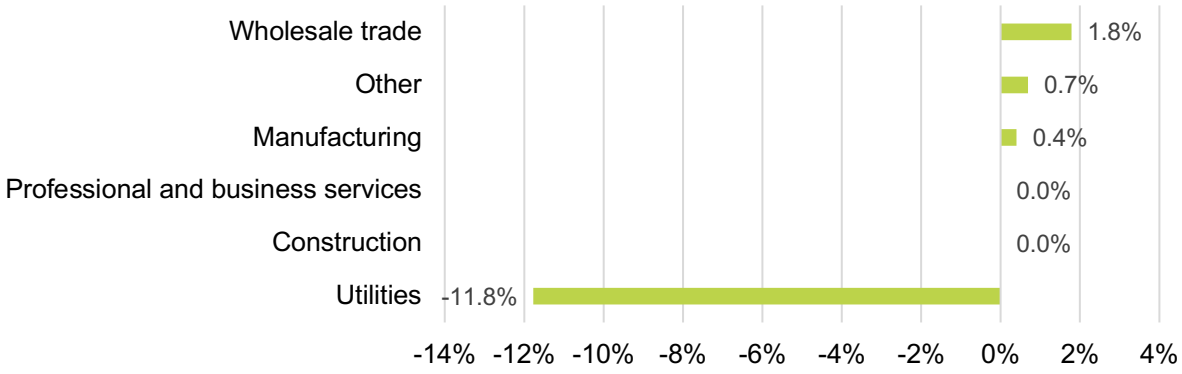
Figure 25. Nuclear EPG Hiring Difficulty by Industry



Employment Change by Industry

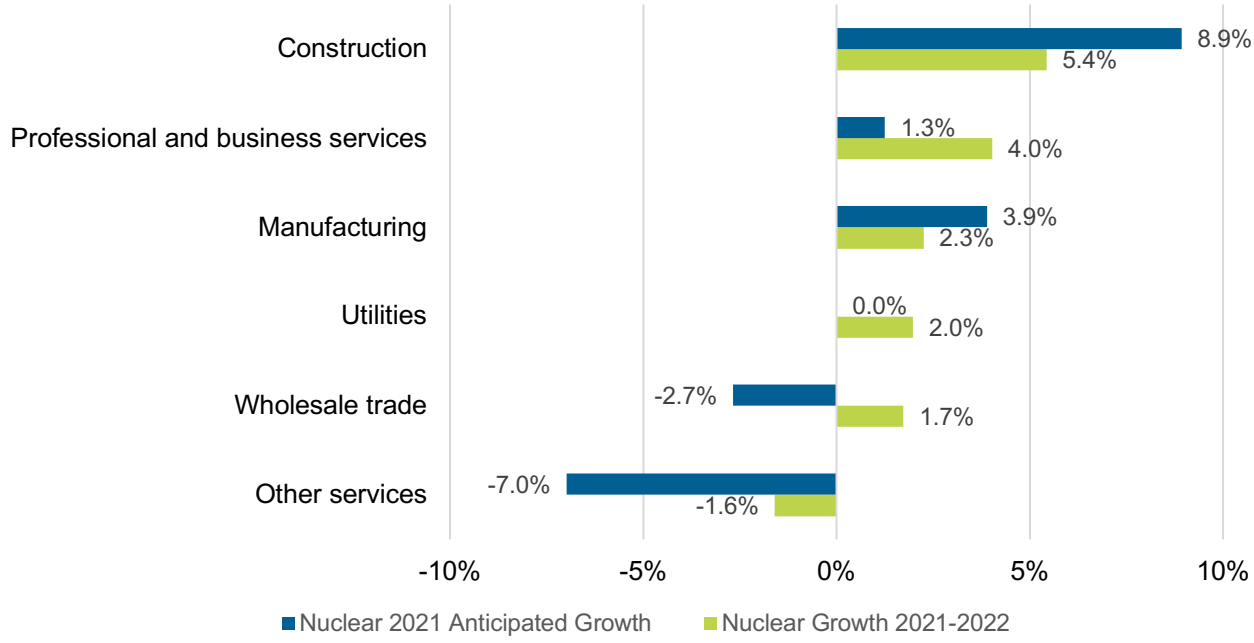
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Manufacturing (+0.4%), other (+0.7%), and wholesale trade (+1.8%) employers expect slow growth over 2023, while employers in utilities expect a decline in employment (-11.8%) (Figure 26).

Figure 26. Anticipated 2023 Changes in Nuclear EPG Employment



Wholesale trade employers experienced actual growth from 2021 to 2022 despite expecting declines, and construction employers underperformed their 2022 growth expectations (Figure 27).

Figure 27. Nuclear EPG Actual Employment Change 2021–2022 vs. Anticipated Employment Change 2021



Nuclear EPG Demographics

Nuclear EPG was more gender diverse than the overall energy workforce, with a larger share of female workers (36% compared to 26% energy workforce average) and a smaller share of male workers (64% compared to 73%) (Table 8). Nuclear EPG was less diverse than the national workforce overall (53% male and 47% female). The proportion of non-white workers in nuclear EPG was 33%, higher than the overall energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of Asian workers (10% compared to 7%) and American Indian or Alaska Native workers (3% compared to 2%) than in the overall energy workforce.

The concentration of Hispanic or Latino workers was 15%, compared to the energy workforce average of 18% and the U.S. workforce average of 19%. Black or African American workers were more represented in the nuclear EPG workforce than in the overall energy workforce (12% compared to 9%) but less so when compared to the national workforce overall (13%).

Formerly incarcerated individuals were more represented in the nuclear EPG workforce than in the overall energy workforce (2% compared to 1%) but had similar representation as the overall national workforce (2%). Veterans were less represented in the nuclear EPG workforce than in the overall energy workforce (7% compared to 9%) but were more represented when compared to the national workforce average (5%). Workers requesting accommodations for disabilities were less represented

in nuclear EPG than in the overall energy and national workforce (1% compared to 2% and 4%, respectively).

The nuclear EPG workforce had a higher proportion of workers between 30 and 54 years old than the rest of the energy workforce (62% compared to 53%). It also had fewer workers both under the age of 30 (23% compared to 30%) and aged 55 or older (16% compared to 17%) than the overall energy workforce.

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average and the national private sector average (19% compared to 11% and 7%, respectively).

Table 8. Nuclear EPG Workforce Demographics and Characteristics

	Number of Workers	Nuclear EPG Average	Energy Workforce Average	National Workforce Average
Male	36,202	64%	73%	53%
Female	20,334	36%	26%	47%
Gender Nonbinary	385	<1%	<1%	n/a
Hispanic or Latino	8,611	15%	18%	19%
Not Hispanic or Latino	48,310	85%	82%	82%
American Indian or Alaska Native	1,935	3%	2%	1%
Asian	5,449	10%	7%	7%
Black or African American	6,878	12%	9%	13%
Native Hawaiian or Other Pacific Islander	617	1%	1%	<1%
White	38,272	67%	75%	77%
Two or More Races	3,005	5%	5%	3%
Unknown Race	765	1%	<1%	n/a
Veterans	3,733	7%	9%	5%
18 to 29	13,075	23%	30%	22%
30 to 54	35,017	62%	53%	54%
55 and Over	8,828	16%	17%	24%
Disability	840	1%	2%	4%
Formerly Incarcerated	1,142	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	10,965	19%[26]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[26] Unionization rates vary by state.

Water Power EPG

Water power EPG includes traditional facilities, such as dams, as well as smaller, low-impact hydropower facilities and marine and hydrokinetic power. In 2022, water power companies employed 66,272 workers, up 1,758 (+2.7%) from the 64,514 employed in 2021 and up 3,141 from the 63,131 employed in 2020. Most water power EPG employment (54,595 jobs) was in traditional hydropower. The remaining 11,677 were in low-impact hydropower.[27]

Trends and Key Takeaways

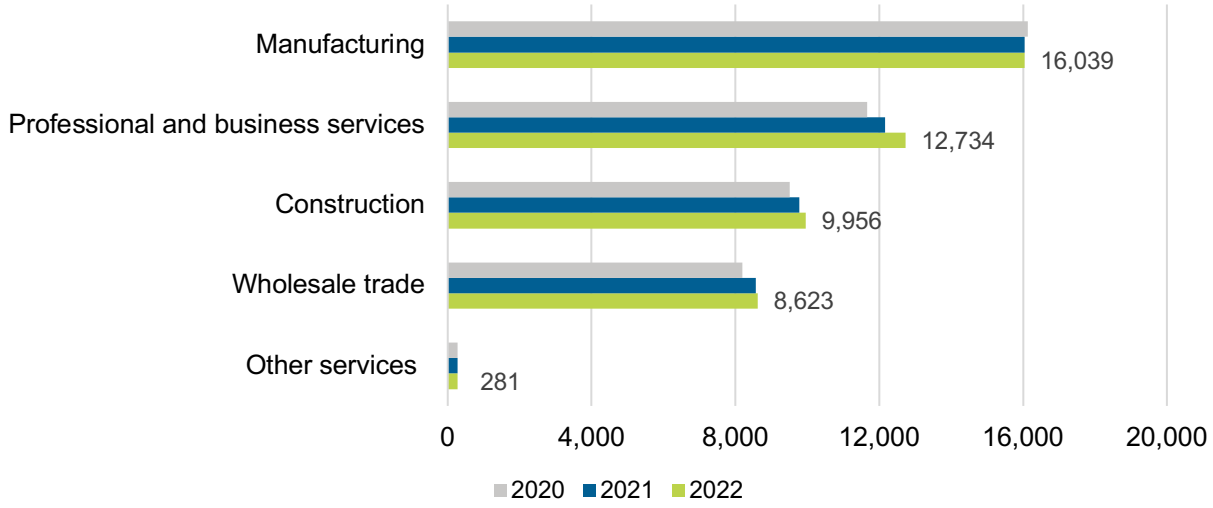
- The largest job gains were in the utilities industry, with 956 new jobs (+5.4%), followed by professional and business services (+563 jobs), construction (+179), wholesale trade (+59), and other services (+5).
- Water power EPG employers in every industry anticipate growth in 2023, led by manufacturing (+13.2%).
- The percentage of workers in water power EPG represented by a union or covered under a project labor or collective bargaining agreement (12%) was higher than the energy workforce average (11%) and the national private sector average (7%).
- The water power EPG workforce was more gender diverse than the overall energy workforce, with a smaller share of male workers (69% compared to 73%) and a larger share of female workers (30% compared to 26%).
- Water power EPG companies employed non-white workers at a higher rate than overall energy workforce and national workforce averages (30% compared to 25% and 23%, respectively). This is largely attributable to Asian workers being more represented in water power EPG than in the overall energy workforce (11% compared to 7%).
- Hispanic or Latino workers were as represented in water power EPG as they were in the overall energy workforce (18%) but were slightly less represented when compared to the U.S. economy-wide average.
- Black or African American workers were more represented in water power EPG than in the overall energy workforce, making up 11% of the water power workforce compared to 9% of the overall energy workforce. Black or African American workers were less represented in water power when compared to the national workforce average of 13%.
- The proportion of veterans working in water power EPG was the same as the energy workforce average (9%) and higher than the national workforce average (5%).
- The proportion of workers requesting accommodations for disabilities in water power EPG was the same as in the overall energy workforce (2%) and lower than the U.S. workforce average of 4%. The percentage of formerly incarcerated workers was higher than the energy workforce and national workforce averages (3% compared to 1% and 2%, respectively).

[27] This report includes marine and hydrokinetics in low-impact hydropower. This is due to low employment numbers in marine and hydrokinetics that cannot be reported due to statistical significance.

Employment by Industry

The utilities industry had the largest number of water power EPG employees, with 18,639 workers (Figure 28). Utilities showed both the largest number of new jobs, at 956, and the highest growth rate (+5.4%). Manufacturing employment was essentially flat (0%) from 2021 to 2022.

Figure 28. Water Power EPG Employment by Industry

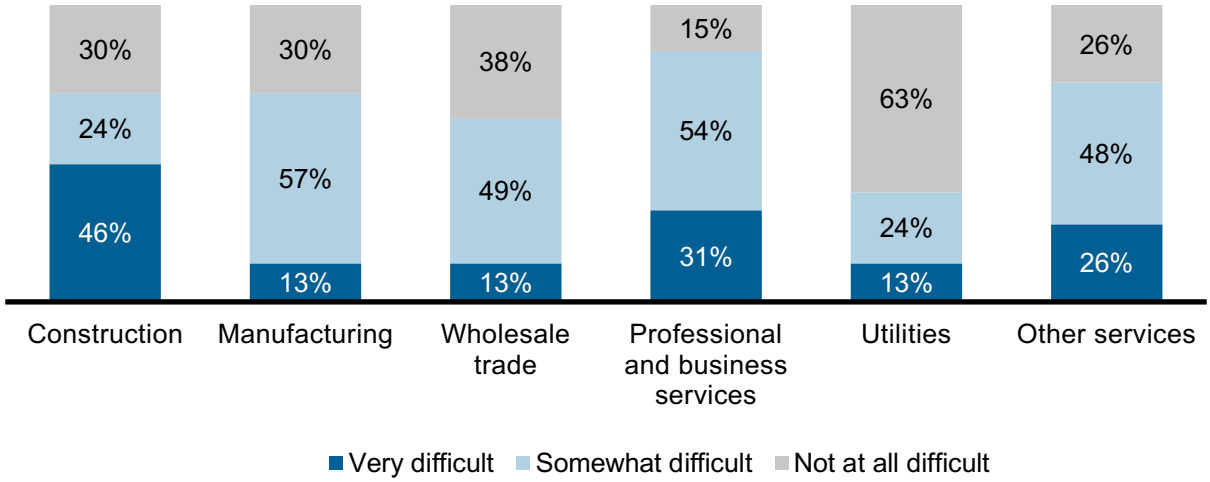


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Professional and business services employers reported the greatest difficulty hiring workers (Figure 29). Approximately 85% of that industry's employers reported at least some difficulty finding qualified workers, with 31% claiming it was "very difficult." Construction employers had the highest percentage for reporting that hiring was "very difficult" among industries, with 46% of employers reporting that level of difficulty. Utilities reported the least difficulty hiring, with 63% stating that it was "not at all difficult," although 37% still reported hiring difficulty.

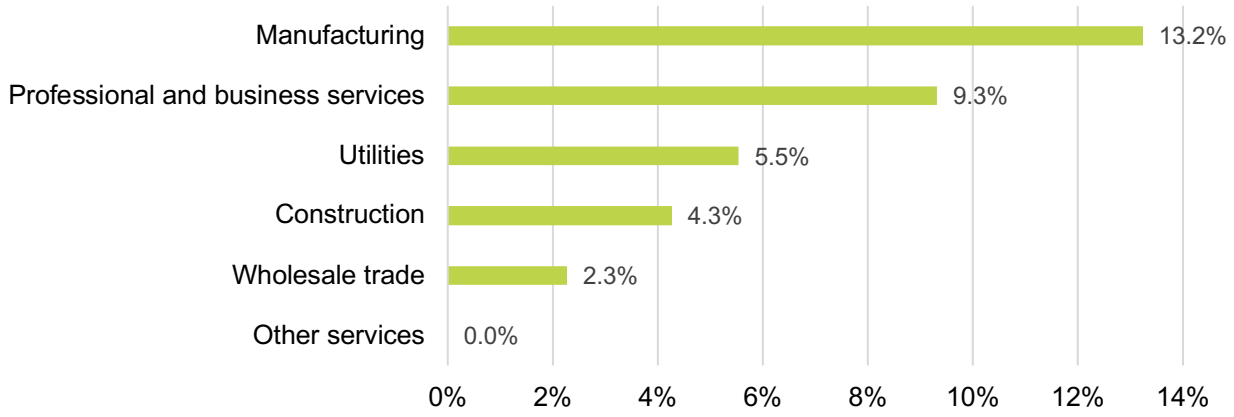
Figure 29. Water Power EPG Hiring Difficulty by Industry



Employment Change by Industry

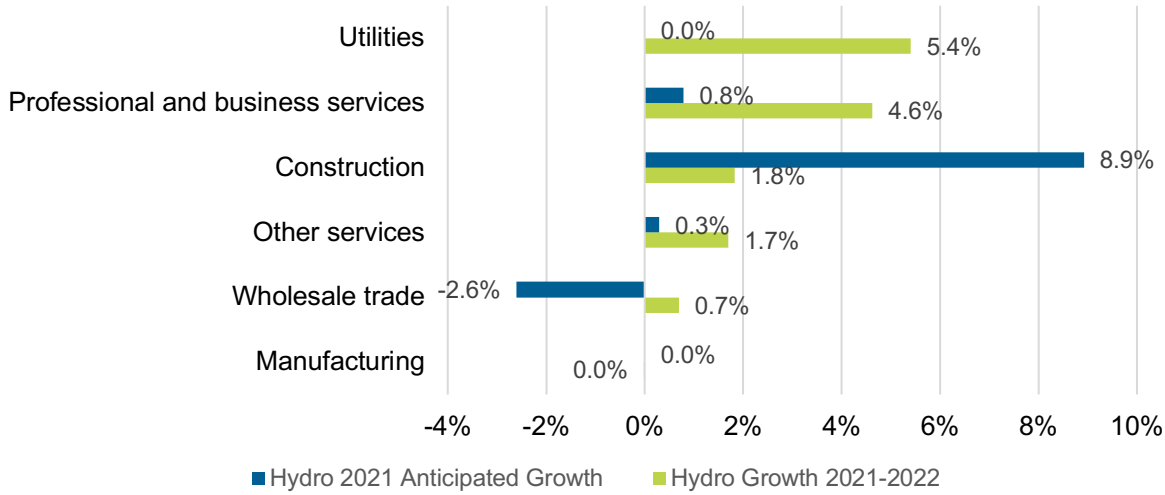
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Manufacturing establishments anticipate strong growth in 2023 (+13.2%), as do firms engaged in professional and business services (+9.3%) (Figure 30). Utilities (+5.5%) and construction (+4.3%) companies also expect above average growth[28] in 2023.

Figure 30. Anticipated 2023 Changes in Water Power EPG Employment



From 2021 to 2022, wholesale trade companies did not decline as they had expected, and professional and business services firms grew much more than they had expected. By contrast, construction companies did not meet their growth expectations (Figure 31).

Figure 31. Water Power EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



[28] Above average refers to anticipated growth higher than past growth for the technology (3.7% for solar from 2021 to 2022)

Water Power EPG Demographics

The water power EPG workforce was more gender diverse than the overall energy workforce, with a larger representation of female workers (30% compared to 26%), and a smaller share of male workers (69% compared to 73%) (Table 9). As with many other technologies in EPG, water power EPG remains less gender diverse than the national workforce overall (53% male and 47% female).

The percentage of non-white workers in water power EPG was 30%, higher than the energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportion of Asian workers in water power EPG (11% compared to 7% in the overall energy workforce) and Black or African American workers (11% compared to 9% in the overall energy workforce). Workers of American Indian or Alaska Native descent and Native Hawaiian or other Pacific Islanders were equally represented in the water power EPG and overall energy workforce (2% and 1%, respectively). Individuals of two or more races were represented less in water power EPG than in the overall energy workforce (4% compared to 5%).

The percentage of Hispanic or Latino workers in water power EPG was the same as the energy workforce average (18%) and slightly lower than the U.S. workforce average.

The proportion of veteran workers in water power EPG was the same as the energy workforce average (9%) and nearly double the national workforce average of 5%. Formerly incarcerated individuals were more represented in water power EPG than in the overall energy and national workforce (3% compared to 1% and 2%, respectively). The proportion of workers requesting accommodations for disabilities was the same as the energy workforce average (2%) but lower than the national workforce average of 4%. The water power EPG workforce tended to be more middle-aged than the overall energy workforce, with 56% of workers aged between 30 and 54 years old compared with the 53% energy workforce average. The water power EPG workforce had fewer workers under the age of 30 than the overall energy workforce (26% compared to 30%), and more workers aged 55 or older (18% compared to 17%).

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average and the national private sector average (12% compared to 11% and 7%, respectively).

Table 9. Water Power EPG Workforce Demographics and Characteristics

	Number of Workers	Water Power EPG Average	Energy Workforce Average	National Workforce Average
Male	45,678	69%	73%	53%
Female	20,199	30%	26%	47%
Gender Nonbinary	395	1%	<1%	n/a
Hispanic or Latino	11,641	18%	18%	19%
Not Hispanic or Latino	54,630	82%	82%	82%
American Indian or Alaska Native	1,116	2%	2%	1%
Asian	7,143	11%	7%	7%
Black or African American	7,563	11%	9%	13%
Native Hawaiian or Other Pacific Islander	758	1%	1%	<1%
White	46,476	70%	75%	77%
Two or More Races	2,754	4%	5%	3%
Unknown Race	461	<1%	<1%	n/a
Veterans	5,806	9%	9%	5%
18 to 29	17,509	26%	30%	22%
30 to 54	36,841	56%	53%	54%
55 and Over	11,922	18%	17%	24%
Disability	1,547	2%	2%	4%
Formerly Incarcerated	1,871	3%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	8,047	12%[29]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[29] Unionization rates vary by state.

Combined Heat and Power EPG

Combined heat and power (CHP) EPG employed 29,718 workers in 2022, up 615 (+2.1%) from the 29,103 employed in 2021 and up 1,611 (+5.7%) from the 28,107 employed in 2020.

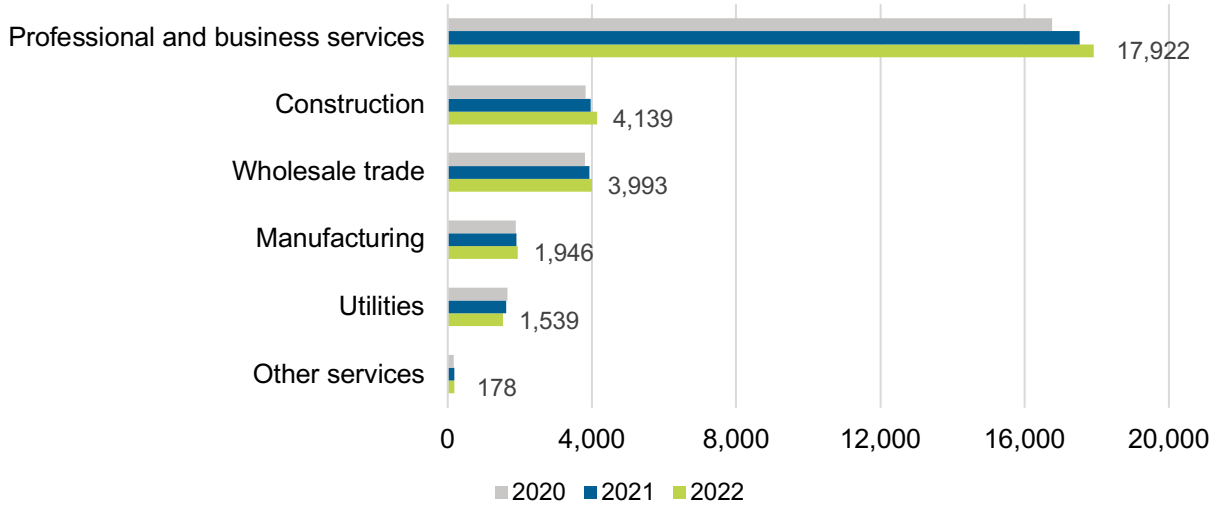
Trends and Key Takeaways

- The largest job gains were in the professional and business services industry, with 402 new jobs (+2.3%). Construction employers expanded by the greatest percentage, adding 179 jobs and increasing 4.5%. Companies had more modest job gains in the wholesale trade (+65 jobs), manufacturing (+45), and other services (+3) industries, while utilities underwent a decline of 80 jobs (-4.9%).
- CHP EPG employers in four out of six industries anticipate growth in 2023, with expectations ranging from below average to average job growth.
- The percentage of workers in CHP EPG represented by a union or covered under a project labor or collective bargaining agreement (12%) was higher than the overall energy average (11%) and the national private sector average (7%).
- The CHP EPG workforce was more gender diverse than the overall energy workforce, with a larger share of female workers in CHP than in overall energy (32% compared to 26%) and a smaller share of male workers in CHP than in overall energy (67% compared to 73%). CHP EPG was less gender diverse than the national workforce overall (53% male and 47% female)
- The percentage of non-white workers was higher in CHP EPG than the energy workforce and national workforce average (26% compared to 25% and 23%, respectively). This is attributable to Asian workers (9% compared to 7%) and workers of two or more races (6% compared to 5%) being more concentrated in CHP EPG than in the overall energy workforce. The percentage of Native Hawaiian or other Pacific Islanders in CHP and the overall energy workforce was the same (1%).
- Black or African American workers were underrepresented in CHP EPG, making up 8% of the workforce compared to 9% of the overall energy workforce and 13% of the U.S. workforce overall.
- CHP EPG establishments employed Hispanic or Latino workers at a higher rate than the energy workforce and national workforce averages (20% compared to 18%and 19%, respectively).
- Veterans were more represented in CHP EPG (11%) than the energy workforce (9%) and national workforce overall (5%).
- The proportion of workers requesting accommodations for disabilities was the same as the energy workforce average (2%) and lower than the U.S. economy-wide average (4%).
- Formerly incarcerated workers were more represented in CHP EPG than in the overall energy workforce (2% compared to 1%) but were similar to the national workforce (2%).

Employment by Industry

The professional services industry had the largest number of CHP EPG employees, with 17,922 workers (Figure 32). This industry also gained the largest number of new jobs in 2022 (+402 jobs or +2.3%). Construction experienced the greatest growth rate (+4.5%). Every industry had more employees in 2022 than in 2020, except for utilities, which dropped from 1,664 employees in 2020 to 1,539 in 2022.

Figure 32. CHP EPG Employment by Industry

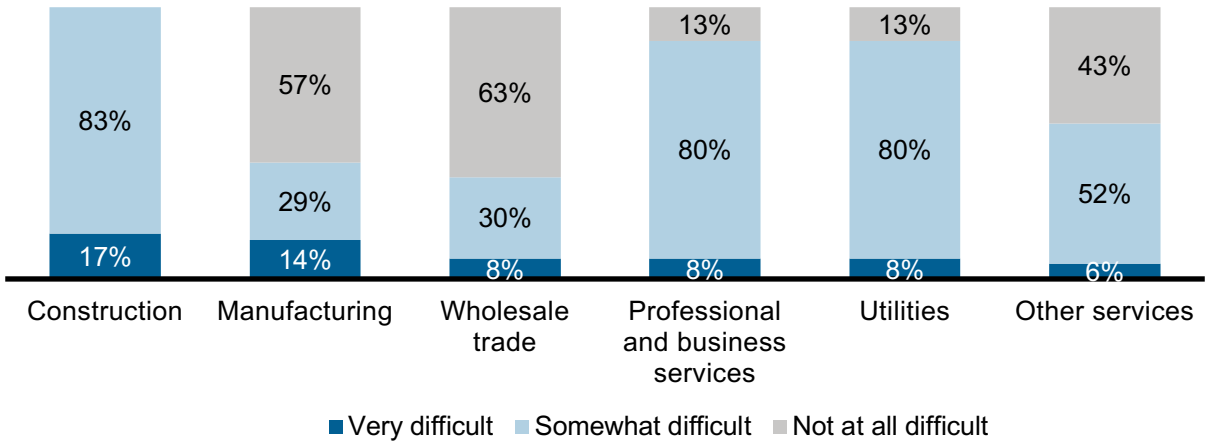


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within CHP EPG, the construction industry reported the greatest difficulty hiring workers (Figure 33), with 100% indicating that it was “very difficult” or “somewhat difficult” to find employees. Construction firms also reported the highest percentage of it being “very difficult” to find workers (17%). Wholesale trade, distribution, and transport reported the least difficulty hiring, with 63% of employers indicating it was “not at all difficult” hiring workers.

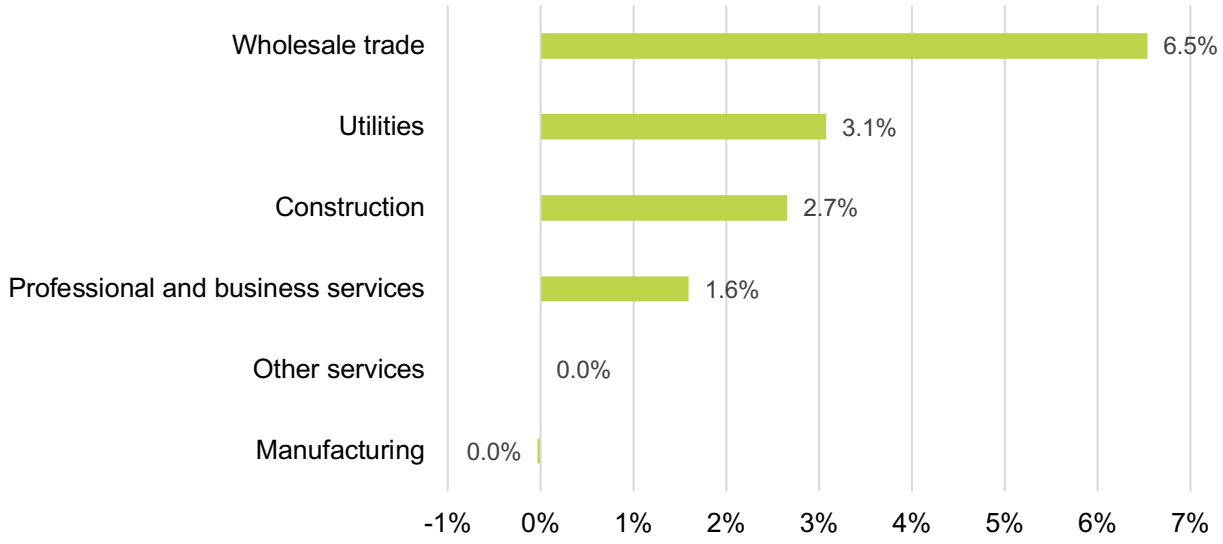
Figure 33. CHP EPG Hiring Difficulty



Employment Change by Industry

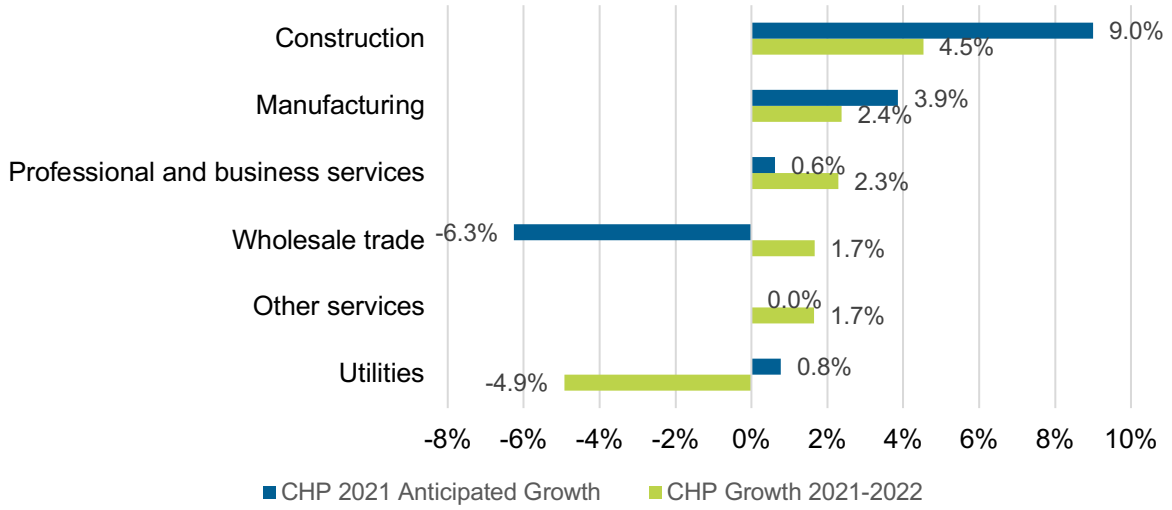
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Employers in the wholesale trade industry expect above average job growth (+6.5%) in 2023, while firms in utilities (+3.1%), construction (+2.7%), and professional and business services (+1.6%) expect below average job growth (Figure 34).

Figure 34. Anticipated 2023 Changes in CHP EPG Employment



Half of all industries experienced slower growth in 2022 than their expectations, except for professional and business services, wholesale trade, and other services (Figure 35). Employers in the utilities industry had expected limited growth in 2022, but actual growth was negative.

Figure 35. CHP EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



CHP EPG Demographics

Demographics for the CHP EPG workforce are displayed in Table 10 below. The CHP EPG workforce was more gender diverse than the rest of the energy workforce, with a smaller share of male workers (67% compared to 73%) and a larger share of female workers (32% compared to 26%) than overall energy workforce averages. However, the CHP EPG workforce was less diverse when compared to the national workforce overall (53% male and 47% female)

The percentage of non-white workers employed in CHP EPG was 26%, higher than the national energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of workers of two or more races (6% compared to 5%) and Asian workers (9% compared to 7%) in CHP compared to the overall energy workforce. American Indian or Alaska Native workers are less represented in CHP EPG than in the overall energy workforce (1% compared to 2%). The proportion of the workforce made up of Hispanic or Latino workers was also higher than the energy workforce and national workforce averages (20% compared to 18% and 19%, respectively), while Black or African American workers in CHP EPG (8%) were less represented than in the overall energy workforce (9%) and the U.S. workforce overall (13%).

The proportion of veteran workers in CHP EPG (11%) was higher than in the overall energy workforce (9%) and the national workforce average (5%). The share of formerly incarcerated workers in CHP EPG is on par with the national workforce average (2%) and higher than the energy workforce overall (1%). The proportion of workers requesting accommodations for disabilities was the same as the energy workforce average (2%) but lower than the overall U.S. workforce average (4%).

The CHP EPG workforce was older than the overall energy workforce, with 21% of workers aged 55 and over compared to 17% for the overall energy workforce. The share of workers under the age of 30 (28% compared to 30%) and between the ages of 30 and 54 (51% compared to 53%) was lower than energy workforce averages.

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average and the national private sector average (12% compared to 11% and 7%, respectively).

Table 10. Combined Heat and Power EPG Workforce Demographics and Characteristics

	Number of Workers	CHP EPG Average	Energy Workforce Average	National Workforce Average
Male	20,034	67%	73%	53%
Female	9,581	32%	26%	47%
Gender Nonbinary	102	<1%	<1%	n/a
Hispanic or Latino	5,946	20%	18%	19%
Not Hispanic or Latino	23,772	80%	82%	82%
American Indian or Alaska Native	303	1%	2%	1%
Asian	2,597	9%	7%	7%
Black or African American	2,331	8%	9%	13%
Native Hawaiian or Other Pacific Islander	216	1%	1%	<1%
White	22,093	74%	75%	77%
Two or More Races	1,658	6%	5%	3%
Unknown Race	521	2%	<1%	n/a
Veterans	3,190	11%	9%	5%
18 to 29	8,255	28%	30%	22%
30 to 54	15,123	51%	53%	54%
55 and Over	6,340	21%	17%	24%
Disability	742	2%	2%	4%
Formerly Incarcerated	635	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	3,537	12%[30]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[30] Unionization rates vary by state.

Oil EPG

Oil EPG,[31] primarily related to peaking plants,[32] employed 12,020 workers in 2022, up 279 (+2.4%) from 2021.

Trends and Key Takeaways

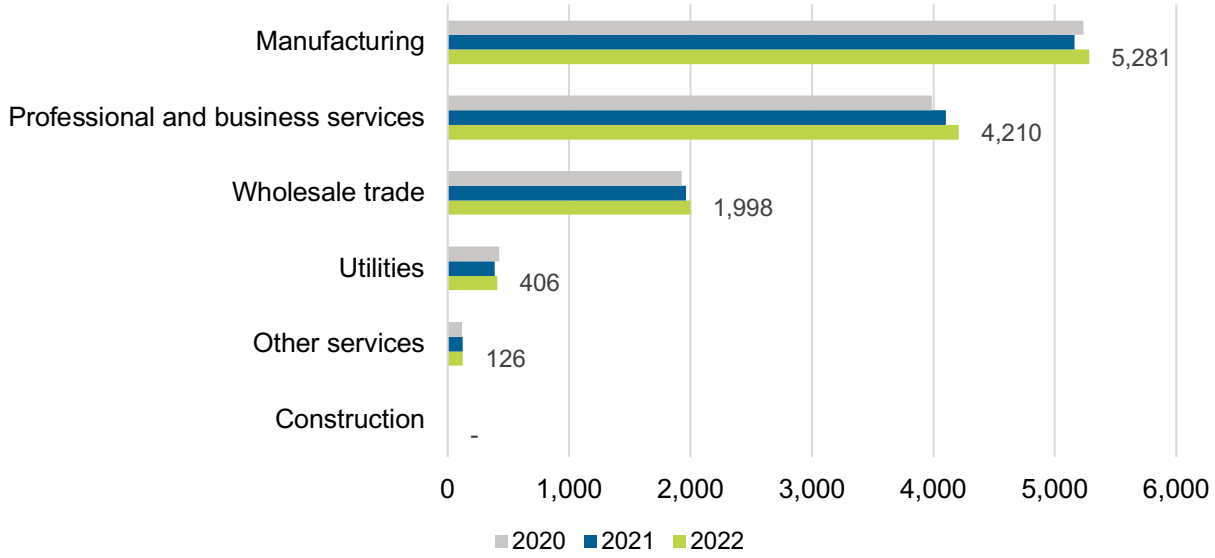
- The largest job gains were in the manufacturing industry, with 117 new jobs (+2.3%), followed by professional and business services (+107 jobs), wholesale trade (+33), utilities (+18), and other (+5).
- Other (+18.6%), professional and business services (+10.4%), wholesale trade (+6.5%), and utilities (+1.2%) all anticipated growth in 2023.
- The percentage of workers in oil EPG represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce average (9% compared to 11%) but higher than the overall national private sector average (7%).
- Oil EPG workers were predominantly male, similar to the overall energy workforce (71% compared to 73%) and significantly higher than the U.S. workforce average (53%).
- Oil EPG employees were slightly more racially diverse than the overall energy average and the national workforce average. The proportion of non-white workers in oil EPG was higher than both the energy workforce and national workforce averages (27% compared to 25% and 23%, respectively). This is attributable to Asian workers being more concentrated in oil EPG than in the energy workforce overall (10% compared to 7%).
- The proportion of workers with two or more races and of Native Hawaiian or Pacific Islander workers were the same as energy workforce averages (5% and 1%, respectively). American Indian or Alaska Native workers were less represented in the oil EPG workforce than in the overall energy workforce (1% compared to 2%).
- Oil EPG firms employed Black or African American workers at a slightly higher rate (10%) than the overall energy workforce (9%), though still below the economy-wide average (13%).
- Fewer veterans worked in oil EPG than in the overall energy workforce (8% compared to 9%) but the proportion of veterans in oil EPG was higher than the national workforce average (5%).
- Workers requesting accommodations for disabilities were employed at a higher rate in oil EPG compared to the overall energy workforce (3% versus 2%) but lower than the national workforce rate (4%).
- The percentage of formerly incarcerated individuals was higher in oil EPG than in the overall energy workforce (2% compared to 1%) but on par with the U.S. workforce (2%).

[31] These job numbers do not include extraction, which is covered in the Fuels and Multi-Sector sections of this report.
[32] Also known as “peaker plants.”

Employment by Industry

The largest number of oil EPG employees was in the manufacturing industry, with 5,281 workers (Figure 36). The manufacturing industry also had the largest job gains, with 117 new jobs (+2.3%) from 2021 to 2022.

Figure 36. Oil EPG Employment by Industry

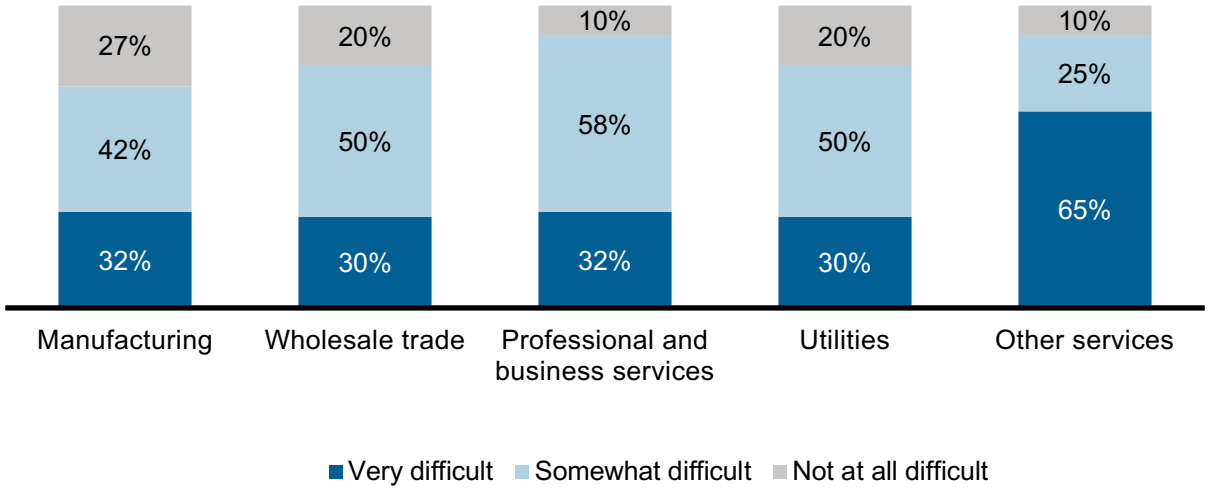


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Professional and business services and other services industries reported the highest hiring difficulty, with 90% of respondents indicating it was “very difficult” or “somewhat difficult” to find employees (Figure 37). Manufacturing had the lowest hiring difficulty, with 27% of employers reporting that it was “not at all difficult” to find workers.

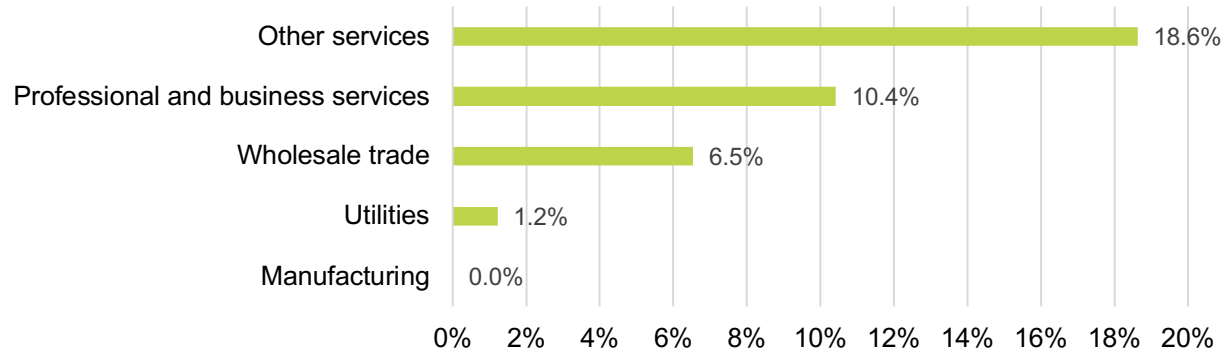
Figure 37. Oil EPG Hiring Difficulty by Industry



Employment Change by Industry

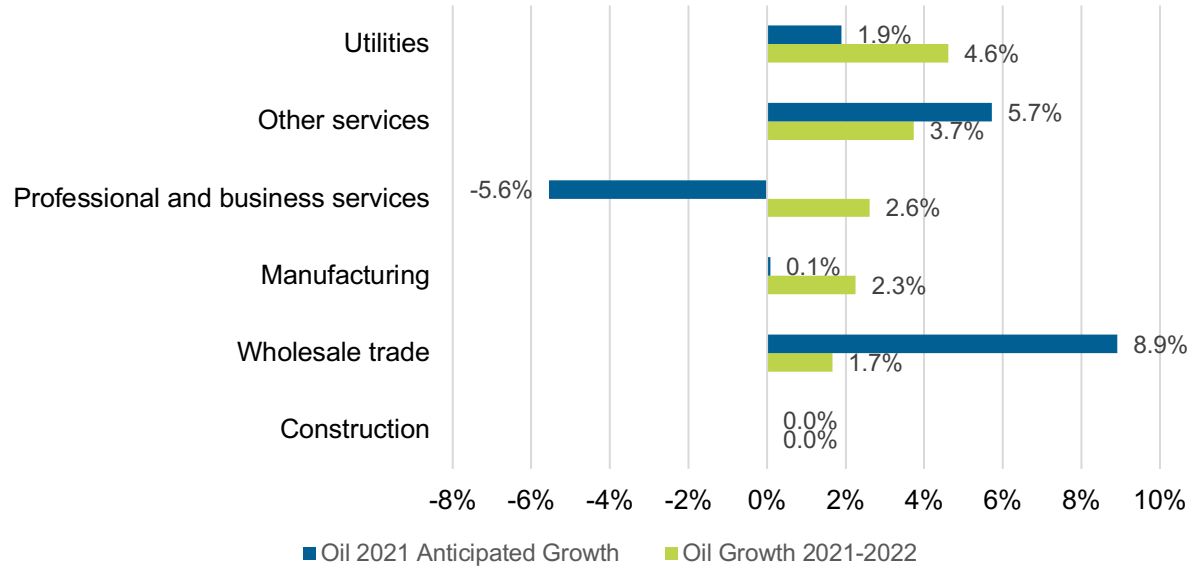
The previous section highlighted employers' current hiring difficulty across industry in oil EPG, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As shown in Figure 38, employers across all industries expect to grow over 2023, except for manufacturing firms, which anticipate flat employment. Other services (+18.6%), professional and business services (+10.4%), and wholesale trade (+6.5%) employers expect above average growth[33], while utilities (+1.2%) expect lower than average growth in the next year.

Figure 38. Anticipated 2023 Changes in Oil EPG Employment



Professional and business services, manufacturing, and utilities employers exceeded their growth expectations, while wholesale trade firms did not grow as they had anticipated (Figure 39).

Figure 39. Oil EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



[33] Above average refers to anticipated growth higher than past growth for the technology (2.4% for oil EPG from 2021 to 2022)

Oil EPG Demographics

The oil EPG workforce was slightly more gender diverse than the overall energy workforce, but less so when compared to the overall U.S. workforce. Male workers made up 71% of the workforce compared to 73% of the overall energy workforce and 53% of the national workforce overall (Table 11).

The proportion of non-white workers in oil EPG was 27%, higher than the energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of Asian workers in oil EPG than in the overall energy workforce (10% compared to 7%). The proportion of workers of two or more races and of Native Hawaiian or other Pacific Islander workers was the same in oil EPG as overall energy workforce averages (5% and 1%, respectively). American Indian or Alaska Native workers were less represented in the oil workforce than in the overall energy workforce (1% compared to 2%).

The proportion of the oil EPG workforce made up of Hispanic or Latino workers was the same as the overall energy workforce average, at 18%, but lower than the overall U.S. workforce (19%).

The concentration of veterans in oil EPG was lower than the energy workforce average (8% compared to 9%) and higher than the national workforce average of 5%. The oil workforce age distribution was comparable to that of the overall energy workforce, albeit slightly higher in workers aged between 30 and 54 years old (54% compared to 53%) and slightly lower in workers aged 55 or older (16% compared to 17%).

The concentration of oil EPG workers represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce average (9% compared to 11%) but higher than the national private sector average (7%).

Table 11. Oil EPG Workforce Demographics and Characteristics

	Number of Workers	Oil EPG Average	Energy Workforce Average	National Workforce Average
Male	8,575	71%	73%	53%
Female	3,430	29%	26%	47%
Gender Nonbinary	15	<1%	<1%	n/a
Hispanic or Latino	2,218	18%	18%	19%
Not Hispanic or Latino	9,802	82%	82%	82%
American Indian or Alaska Native	165	1%	2%	1%
Asian	1,215	10%	7%	7%
Black or African American	1,142	10%	9%	13%
Native Hawaiian or Other Pacific Islander	143	1%	1%	<1%
White	8,726	73%	75%	77%
Two or More Races	602	5%	5%	3%
Unknown Race	27	<1%	<1%	n/a
Veterans	988	8%	9%	5%
18 to 29	3,574	30%	30%	22%
30 to 54	6,495	54%	53%	54%
55 and Over	1,951	16%	17%	24%
Disability	354	3%	2%	4%
Formerly Incarcerated	220	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	1,094	9%[34]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[34] Unionization rates vary by state.

Bioenergy

Bioenergy EPG employed 12,850 workers in 2022, up 463 (+3.7%) from 2021.

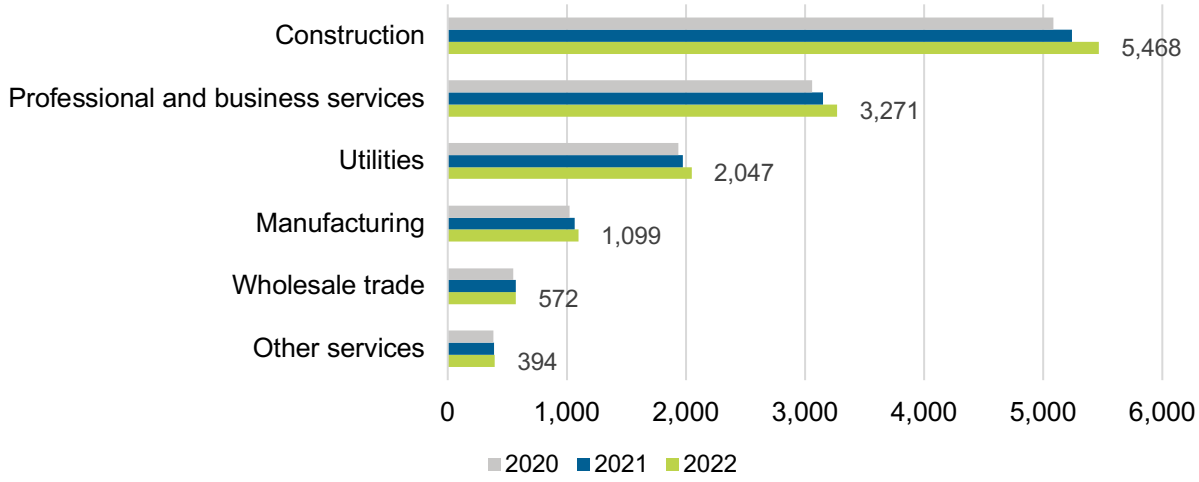
Trends and Key Takeaways

- The largest job gains were in the construction industry, with 227 new jobs (+4.3%), followed by professional and business services (+120 jobs), utilities (+74), manufacturing (+35), other services (+5), and wholesale trade (+3).
- Construction (+5.5%) and professional and business services (+5.1%) firms in bioenergy EPG expect to see above average job growth through 2023.
- The percentage of workers in bioenergy EPG represented by a union or covered under a project labor or collective bargaining agreement was the same as the overall energy workforce (11%) and higher than the national private sector average of 7%.
- Bioenergy EPG companies employed a higher percentage of women (33%) than the average for all energy firms (26%) but still lower than the economy-wide average of 47%.
- The percentage of non-white workers in bioenergy EPG was higher than the energy workforce and national workforce averages (27% compared to 25% and 23%, respectively). This is partially attributable to Asian workers being more concentrated in bioenergy EPG than in the overall energy workforce (9% compared to 7%).
- The percentage of American Indian or Alaska Native workers in bioenergy EPG was less than the overall energy workforce average (1% compared to 2%).
- Bioenergy EPG companies employed Black or African American workers at a higher rate than energy employers overall (11% compared to 9%) but lower when comparted to the national workforce (13%).
- Hispanic or Latino workers were slightly more represented in bioenergy EPG than in the overall energy workforce (19% compared to 18%).
- Veterans were more likely to work in bioenergy EPG (11%) than in the energy workforce overall (9%) and the national workforce overall (5%).
- Workers requesting accommodations for disabilities were more represented in bioenergy EPG than in the overall energy workforce (3% compared to 2%) but were less represented when compared to the overall U.S. workforce average of 4%.
- The percentage of formerly incarcerated workers was the same as the overall energy workforce average (1%) and lower than the national workforce average as a whole (2%).

Employment by Industry

The construction industry had the largest number of bioenergy EPG employees, with 5,468 workers (Figure 40). Construction also added the largest number of new jobs (227 jobs or a 4.3% growth rate).

Figure 40. Bioenergy EPG Employment by Industry

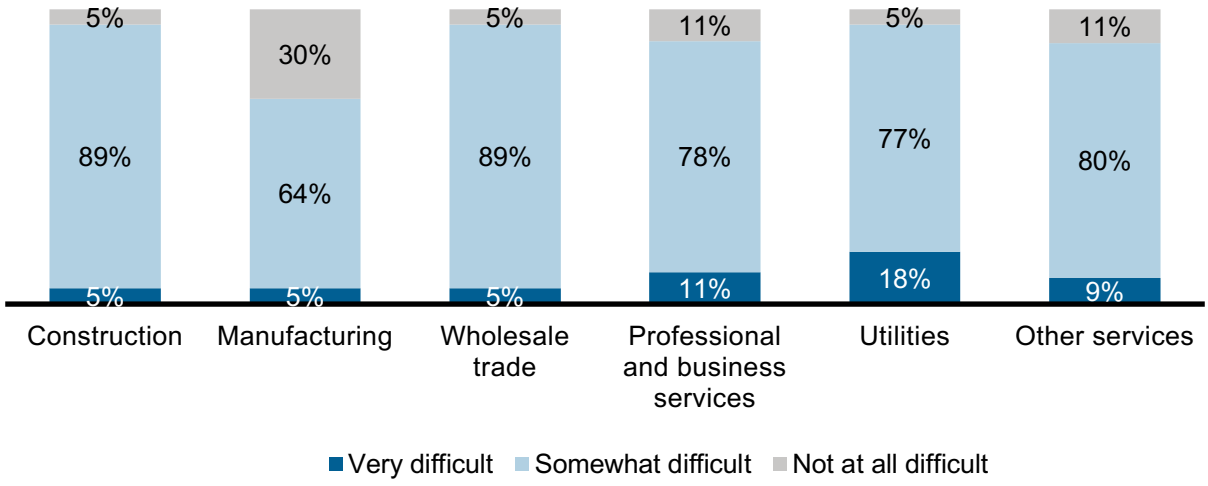


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within bioenergy EPG, construction; wholesale trade; and utilities employers reported the greatest difficulty hiring workers (Figure 41), with about 94% of these employers reporting at least some difficulty finding qualified workers. Manufacturing firms reported the lowest difficulty, with 30% reporting hiring was “not at all difficult.”

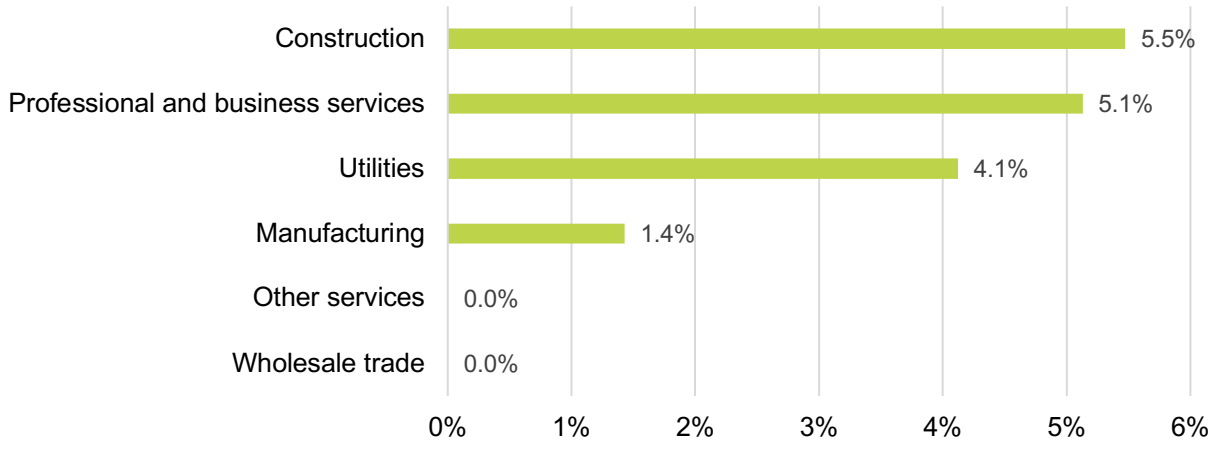
Figure 41. Bioenergy EPG Hiring Difficulty



Employment Change by Industry

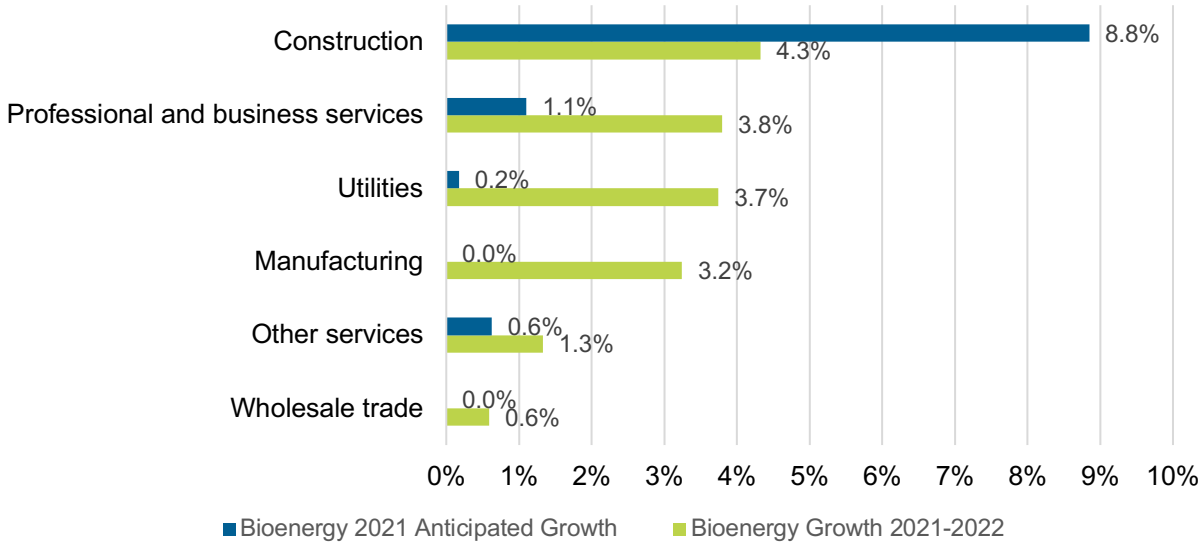
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As illustrated in Figure 42, four out of the six industries in bioenergy EPG expect growth in 2023: construction (+5.5%), professional and business services (+5.1%), utilities (+4.1%), and manufacturing (+1.4%). Other and wholesale trade, distribution, and transport firms do not expect changes in employment in 2023.

Figure 42. Anticipated 2023 Changes in Bioenergy EPG Employment



Actual growth in 2022 exceeded expectations in all industries, except for construction, which did not add as many workers as its employers had anticipated (Figure 43).

Figure 43. Bioenergy EPG Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Bioenergy EPG Demographics

Bioenergy EPG employers employed female workers at a higher rate (33%) than the energy sector overall (26%) but lower when compared to the national workforce average (47%) (Table 12).

The proportion of the workforce made up of Hispanic or Latino workers was slightly higher than the energy workforce average (19% compared to 18%) and similar to the U.S. workforce average of 19%.

Bioenergy EPG companies employed non-white workers at a higher rate (27%) than the energy workforce average of 25% and the national workforce average of 23%. This is attributable to higher-than-average proportions of Asian workers in bioenergy than in the overall energy workforce (9% compared to 7%). American Indian or Alaska Native workers were less represented in the bioenergy EPG workforce than the overall energy workforce (1% compared to 2%).

The proportion of veterans working in bioenergy EPG was higher than both the energy workforce average and the national workforce average (11% compared to 9% and 5%, respectively). Individuals requesting accommodations for disabilities were employed in bioenergy EPG at a higher rate (3%) when compared to the overall energy workforce average (2%) and at lower rate when compared to the economy-wide average (4%). The share of formerly incarcerated individuals working in bioenergy was the same as in the overall energy workforce (1%) and lower in comparison to the national workforce average (2%). Workers represented by a union or covered under a project labor or collective bargaining agreement in bioenergy EPG was similar to the energy workforce average overall (11%) and higher than the national private sector average (7%).

Workers under the age of 30 were less represented in the bioenergy workforce than the overall energy workforce (27% compared to 30%), while workers aged 50 or older were more represented (21% compared to 17%).

Table 12. Bioenergy EPG Workforce Demographics and Characteristics

	Number of Workers	Bioenergy EPG Average	Energy Workforce Average	National Workforce Average
Male	8,463	66%	73%	53%
Female	4,251	33%	26%	47%
Gender Nonbinary	136	1%	<1%	n/a
Hispanic or Latino	2,461	19%	18%	19%
Not Hispanic or Latino	10,389	81%	82%	82%
American Indian or Alaska Native	180	1%	2%	1%
Asian	1,180	9%	7%	7%
Black or African American	1,393	11%	9%	13%
Native Hawaiian or Other Pacific Islander	159	1%	1%	<1%
White	9,323	73%	75%	77%
Two or More Races	435	3%	5%	3%
Unknown Race	180	1%	<1%	n/a
Veterans	1,438	11%	9%	5%
18 to 29	3,466	27%	30%	22%
30 to 54	6,701	52%	53%	54%
55 and Over	2,683	21%	17%	24%
Disability	372	3%	2%	4%
Formerly Incarcerated	160	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	1,470	11%[35]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[35] Unionization rates vary by state.

Other EPG

"Other EPG" technologies, which include geothermal generation, generation from incineration of "other fuels" (waste, etc.), and employment that cannot be classified into other EPG categories, employed 51,201 workers in 2022, up 3,006 from the 48,195 employed in 2021 (+6.2%).

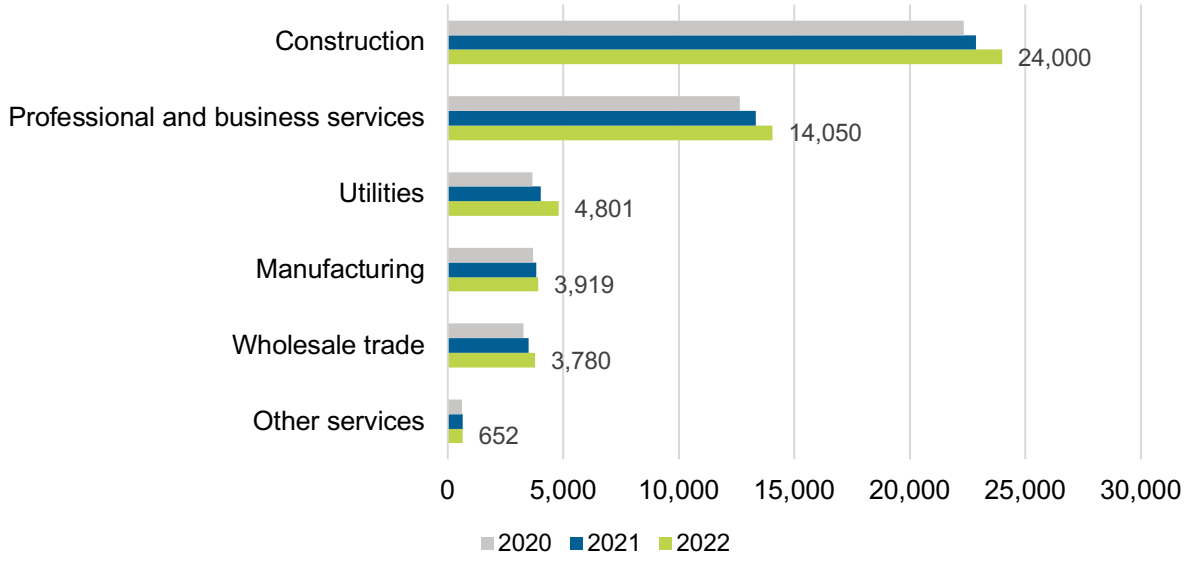
Trends and Key Takeaways

- The largest absolute job gains were in the construction industry, with 1,135 new jobs (+5.0%), followed by utilities (+788 jobs), professional and business services (+709), wholesale trade (+269), manufacturing (+93), and other services (+13).
- Construction firms expect the highest growth in 2023 (+12.8%).
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in "other EPG" was lower than the energy workforce average (5% versus 11%) and lower than the national private sector average of 7%.
- The workforce in "other EPG" tended to be more gender diverse than the overall energy workforce, with higher female employee representation (31% compared to 26%) and lower male employee representation (68% compared to 73%).
- The proportion of Hispanic or Latino workers in other EPG was slightly higher than the overall energy workforce average (19% compared to 18%) but similar to the national workforce overall (19%).
- Firms engaged in the mix of technologies that makes up other EPG were more diverse than national averages. The percentage of non-white workers was slightly higher than the energy workforce average and the U.S. overall workforce average (26% compared to 25% and 23%, respectively).
- The share of American Indian or Alaska Native workers was lower than the energy workforce average (1% compared to 2%).
- Veterans were less represented in "other EPG," at 8% compared to the 9% energy workforce average but were more represented when compared to the national workforce average (5%).
- Those requesting accommodations for disabilities were more represented in "other EPG" at 3% compared to the 2% energy workforce average.
- The percentage of formerly incarcerated workers was higher in "other EPG" than the energy workforce average (2% compared to 1%) but similar to the national workforce average (2%).

Employment by Industry

The largest number of "other EPG" employees were in the construction industry, with 24,000 workers (Figure 44). Construction firms added the largest number of new jobs from 2021 to 2022 (1,135 jobs or +5.0%), while utilities grew at the highest rate, expanding 19.6% (+788 jobs).

Figure 44. "Other EPG" Employment by Industry



Employer Perspective on Workforce Issues

Current Hiring Difficulty

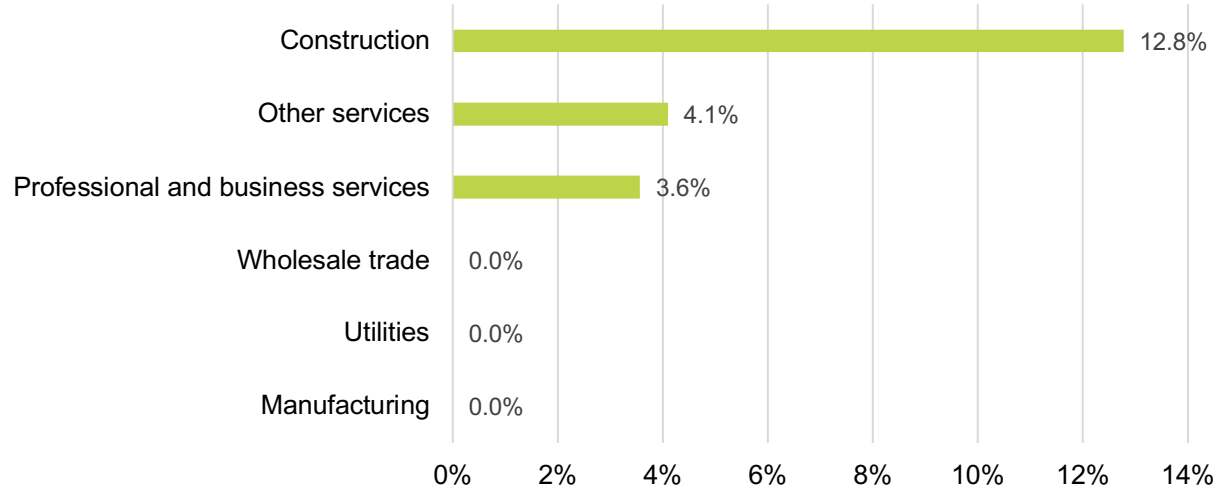
Within "other EPG" industries, construction, and wholesale trade employers reported the greatest difficulty hiring workers (Figure 45). About 86% of employers in those two industries reported hiring was "very difficult."

Figure 45. "Other EPG" Hiring Difficulty

Employment Change by Industry

As shown in Figure 46, three out of six industries in "other EPG" expect growth through 2023: construction (+12.8%), other services (+4.1%), and professional and business services (+3.6%). All other industries do not anticipate changes in 2023.

Figure 46. Anticipated 2023 Changes in "Other EPG" Employment



"Other EPG" Demographics

"Other EPG" employers were more gender diverse than the overall energy sector, with a greater representation of female workers (31% compared to 26%) and a lower representation of male workers (68% compared to 73%) than in the overall energy workforce (Table 13). This is not the case when compared to national workforce averages (53% male and 47% female).

The proportion of the workforce made up of Hispanic or Latino workers was slightly higher than the overall energy workforce (19% compared to 18%) and on par with the U.S. workforce overall (19%).

The share of non-white workers in "other EPG" was 26%, higher than the energy workforce average of 25% and the national workforce average of 23%.

Veterans working in "other EPG" were less represented than in the overall energy workforce (8% compared to 9%) but more represented when compared to national workforce averages (5%). Workers represented by a union or covered under a project labor or collective bargaining agreement were less represented in "other EPG" when compared to the energy workforce as a whole and national private sector averages (5% compared to 11% and 7%, respectively).

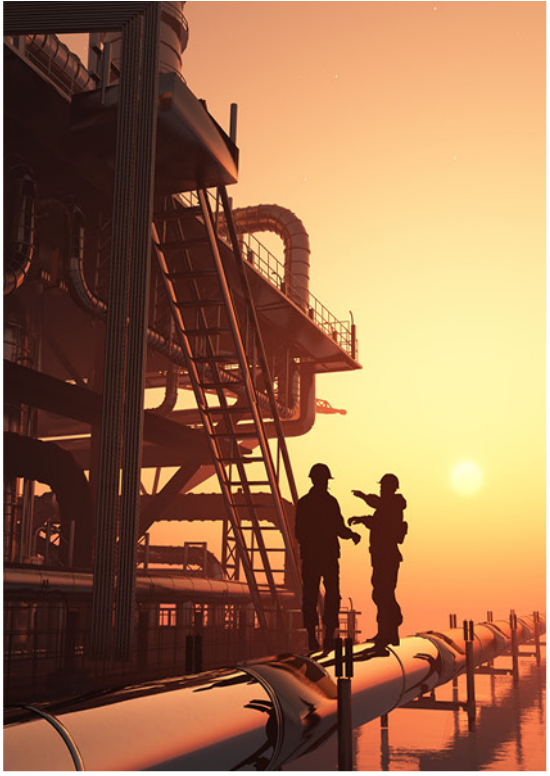
The proportion of workers under the age of 30 in "other EPG" was the same as in the overall energy workforce (30%), while workers between the ages of 30 and 54 were more represented (57% compared to 53%) and workers aged 55 or older were less represented (12% compared to 17%) in "other EPG" than in the overall energy workforce.

Table 13. "Other EPG" Workforce Demographics and Characteristics

	Number of Workers	"Other EPG" Average	Energy Workforce Average	National Workforce Average
Male	35,030	68%	73%	53%
Female	15,852	31%	26%	47%
Gender Nonbinary	319	<1%	<1%	n/a
Hispanic or Latino	9,700	19%	18%	19%
Not Hispanic or Latino	41,501	81%	82%	82%
American Indian or Alaska Native	627	1%	2%	1%
Asian	5,373	10%	7%	7%
Black or African American	3,913	8%	9%	13%
Native Hawaiian or Other Pacific Islander	587	1%	1%	<1%
White	37,677	74%	75%	77%
Two or More Races	2,713	5%	5%	3%
Unknown Race	310	<1%	<1%	n/a
Veterans	4,058	8%	9%	5%
18 to 29	15,611	30%	30%	22%
30 to 54	29,309	57%	53%	54%
55 and Over	6,281	12%	17%	24%
Disability	1,476	3%	2%	4%
Formerly Incarcerated	944	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	2,707	5%[36]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

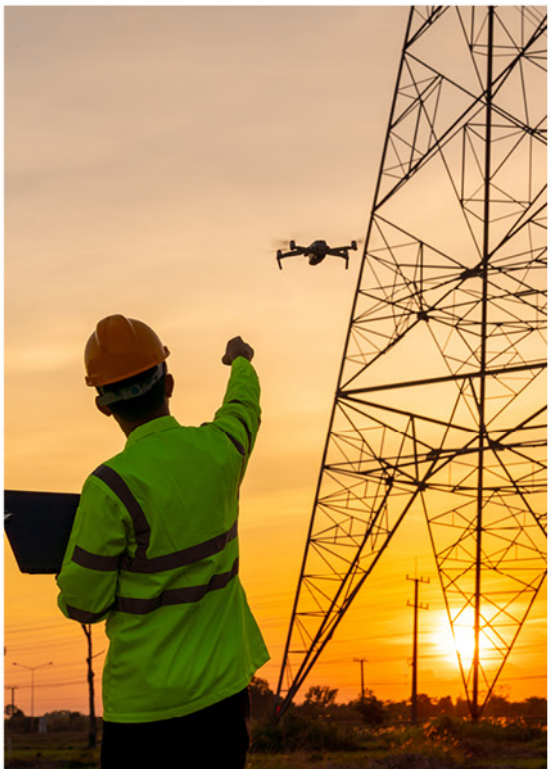
[36] Unionization rates vary by state.


UNITED STATES ENERGY
& EMPLOYMENT REPORT 2023

TRANSMISSION, DISTRIBUTION, AND STORAGE

ENERGY.GOV/USEER


Transmission, Distribution, and Storage

Transmission, distribution, and storage (TDS) includes a wide variety of industries, activities, and technologies related to constructing, operating, and maintaining energy transportation and storage infrastructure. Traditional transmission and distribution technologies are split between transmission and distribution of electricity and transportation of fuels. Transportation of fuels is captured in pipeline transportation and commodity flows which include truck, rail, air, and water transport. Employment pertaining to the storage of electricity and fuels is also included. This includes employment associated with electric power transmission lines, pipeline construction, fuel distribution, and transport and the manufacture of equipment used for electrical transmission. Also included in this technology sector is employment related to storage technologies such as batteries, pumped storage, compressed air, and other utility-scale storage methods. The TDS sector includes both legacy power lines and newer technologies such as microgrids and smart grids.

TDS technology sector employment also encompasses jobs in energy-related sub-sectors in utilities, construction, manufacturing, wholesale trade, professional and business services, and other services.

Trends and Key Takeaways

- TDS employment grew by 29,937 jobs or 2.2% in 2022, below the growth rate of the overall economy at 3.1%.
- Traditional transmission and distribution including electric bulk power transmission and control, electric power distribution, and natural gas distribution added the most jobs of any TDS technology, at 17,708 (+1.9%). This was followed by electric vehicle (EV) charging and other electric power transmission and distribution[37], with 3,547 added jobs (+3.2%); other grid modernization, with 2,157 added jobs (+11.6%); smart grid, with 691 added jobs (+2.9%); and microgrid, with 468 added jobs (+2.4%).
- Battery storage jobs (which include 13,600 jobs in battery manufacturing) made up 81% of all storage technology jobs and added 3,225 jobs (+4.6%) in 2022.
- By industry, the largest employment gains in TDS were in construction, with 13,989 added jobs (+3.0%). This was followed by utilities, with 5,866 added jobs (+1.4%); professional and business services, with 5,047 added jobs (+3.8%); and manufacturing, with 2,862 added jobs (+3.6%).
- Renewable energy and efficiency enabling TDS jobs increased by 5,100, or 4.0%, growing at a faster rate than TDS as a whole (+2.2%). Growth for these TDS jobs was faster than growth for clean energy electric power generation jobs (+3.6%) and energy efficiency for buildings as a whole (+2.3%).

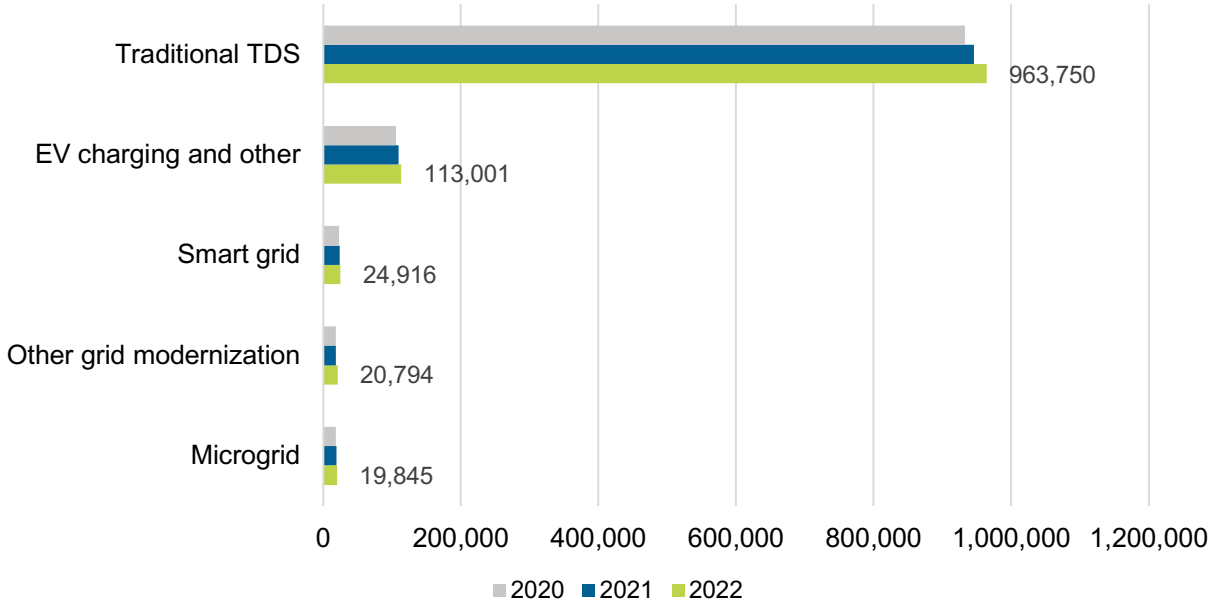
[37] Electric power transmission and distribution employment that cannot be placed in one of traditional transmission and distribution, smart grid, microgrid, other grid modernization, or electric vehicle charging based on employer response.

- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in TDS (18%) was considerably higher than the overall energy workforce average (11%) and the overall U.S. private sector average (7%).
- Five of the six TDS industries anticipate growth in 2023. Other services is the only TDS industry that does not expect to grow in 2023 and instead expects its employment to stay unchanged in the upcoming year.
- The TDS workforce was disproportionately male, consistent with the overall energy workforce, at 73% but considerably higher than the national workforce overall (53%)
- The percentage of non-white workers in TDS was higher than the energy workforce average (30% compared to 25%) and also higher than the national workforce average (23%). This is attributable to Asian workers (9% compared to 7%), Black or African American workers (11% compared to 9%), and American Indian or Alaska Native workers (3% compared to 2%) being more represented in TDS than in the overall energy workforce.
- The proportion of Hispanic or Latino workers in TDS was the same as the overall energy workforce average (18%) and slightly lower than the U.S. economy average (19%).
- Veterans were less represented in TDS than in the overall energy workforce, at 7% compared to 9% but remain higher than the national workforce estimate (5%).
- Individuals requesting accommodations for disabilities were more represented in TDS, at a higher rate (3%), than the energy workforce average (2%) but lower than the national workforce overall (4%).
- The percentage of formerly incarcerated workers in TDS was the same as the energy workforce average (1%) and lower than the national workforce average (2%).

Employment by Technology, Industry, and Occupation

In 2022, TDS employed nearly 1.4 million workers, representing a 2.2% increase from 2021. As shown in Figure 47, traditional transmission and distribution drove this change, increasing from 946,042 to 963,750 (+1.9%).[38][39]

Figure 47. Transmission and Distribution Employment by Technology

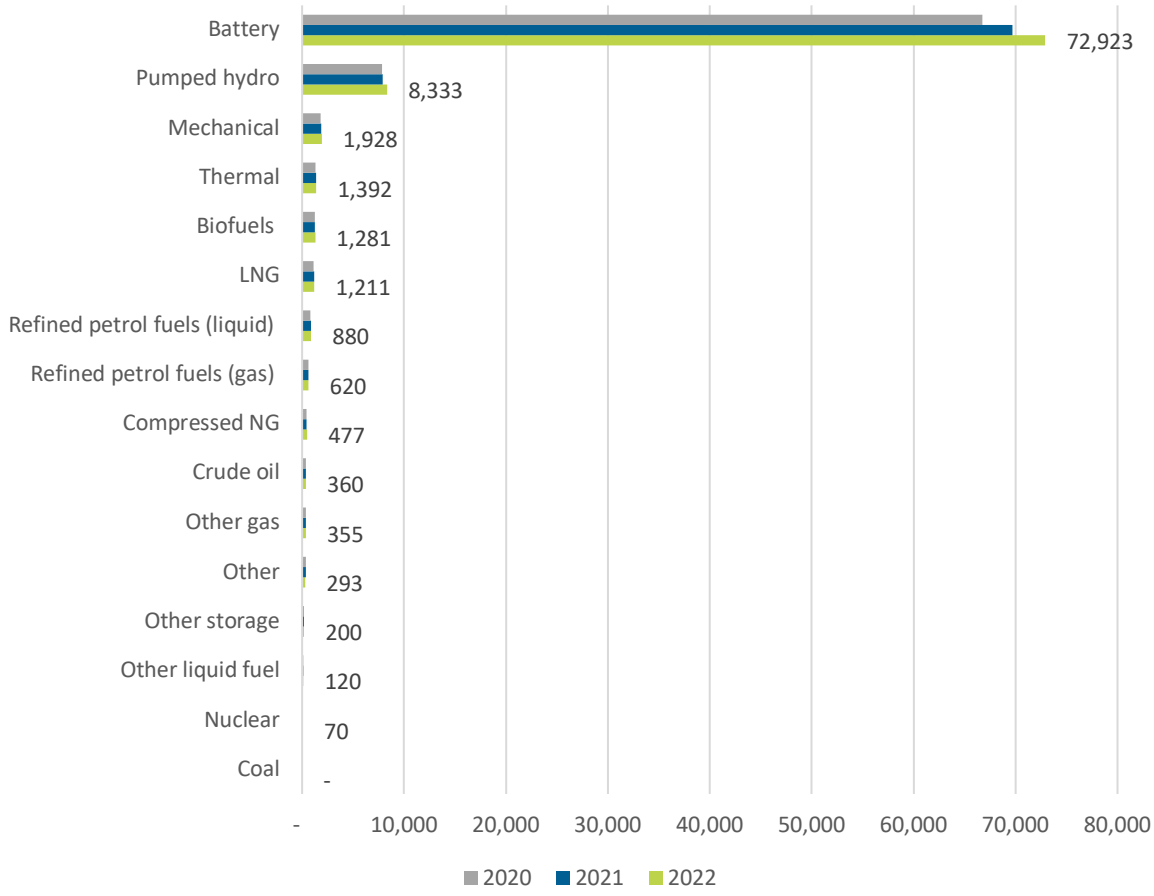


EV charging and "other", charging accounted for 2,229 jobs and "other" accounted for the remaining 110,772 in the EV charging and "other" category.[40] Jobs in "other" increased 3,419 (+3.2%) from 2021 while electric vehicle charging increased by 128 (+6.1%).

[38] Figure 1 does not include commodity flows (air, water, truck, and rail transportation of fuels), which are associated with transmission and distribution yet not assignable to any one specific technology. This accounted for 140,835 jobs in 2022.
[39] Appendix B contains definitions of each technology.
[40] EV charging was combined with "other" transmission and distribution in USEER data prior to 2021 so EV charging jobs cannot be isolated prior to this.

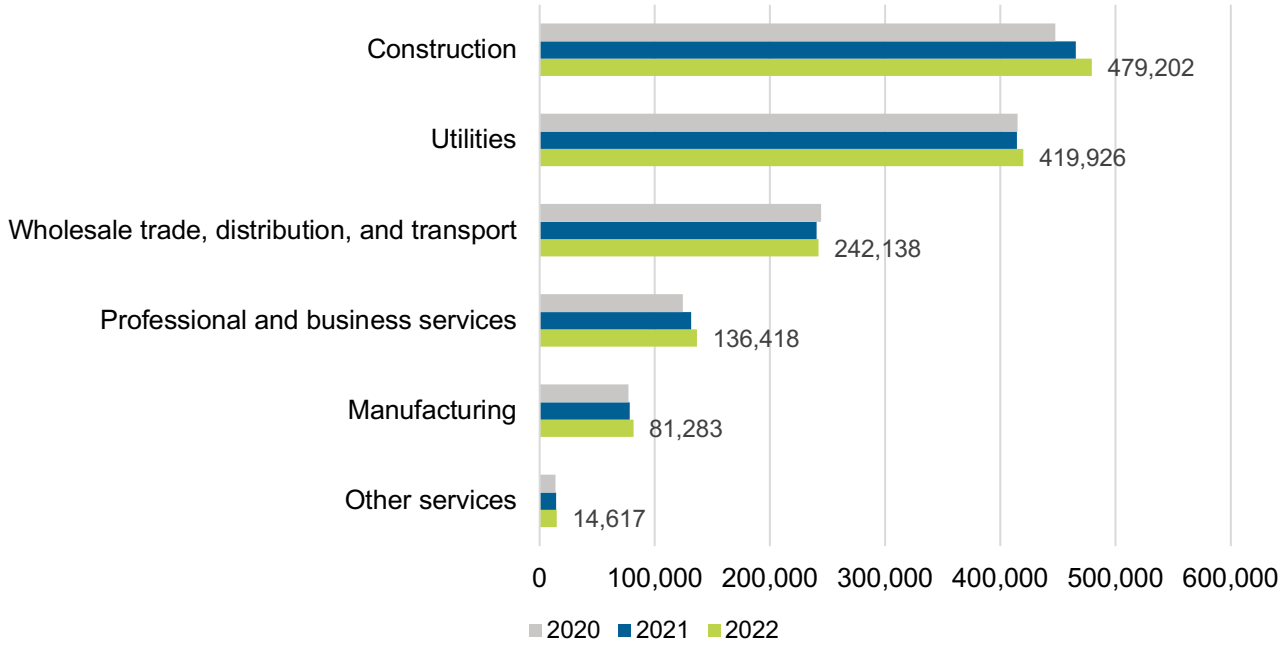
Within storage, battery storage had the most jobs, employing 72,923 workers (Figure 48). Just under one-fifth (13,600 or 18.6%) of battery storage jobs are in manufacturing. This was nearly nine times the 8,333 employed in pumped storage hydropower, the next largest storage sector in terms of jobs. Employment in other technologies (excluding coal, which did not employ anyone) ranged from 70 in nuclear storage to 1,928 in mechanical storage.

Figure 48. Storage Employment by Technology



In terms of distribution by industry, the largest number of TDS employees was in the construction industry, with 479,202 workers **(Figure 49).** Construction also showed the largest number of new jobs from 2021 to 2022 — with 13,989 added jobs. Professional and business services grew by the greatest percentage, at 3.8%, adding 5,047 jobs.

Figure 49. Transmission, Distribution, and Storage Employment by Industry



Of the TDS technologies, “other grid modernization” had the highest concentration of workers in construction, with 76% of all workers, followed by “other fuels” storage, with 65% (Table 14). Higher percentages of jobs in construction generally represent growth and expansion of the particular technology, although they could also represent decommissioning activity. While some construction industry firms remain engaged in TDS operations through maintenance and repair contracts, the more significant numbers of construction jobs occur during the build out phase. Only traditional transmission and distribution technologies for both electricity and natural gas had employment in utilities.

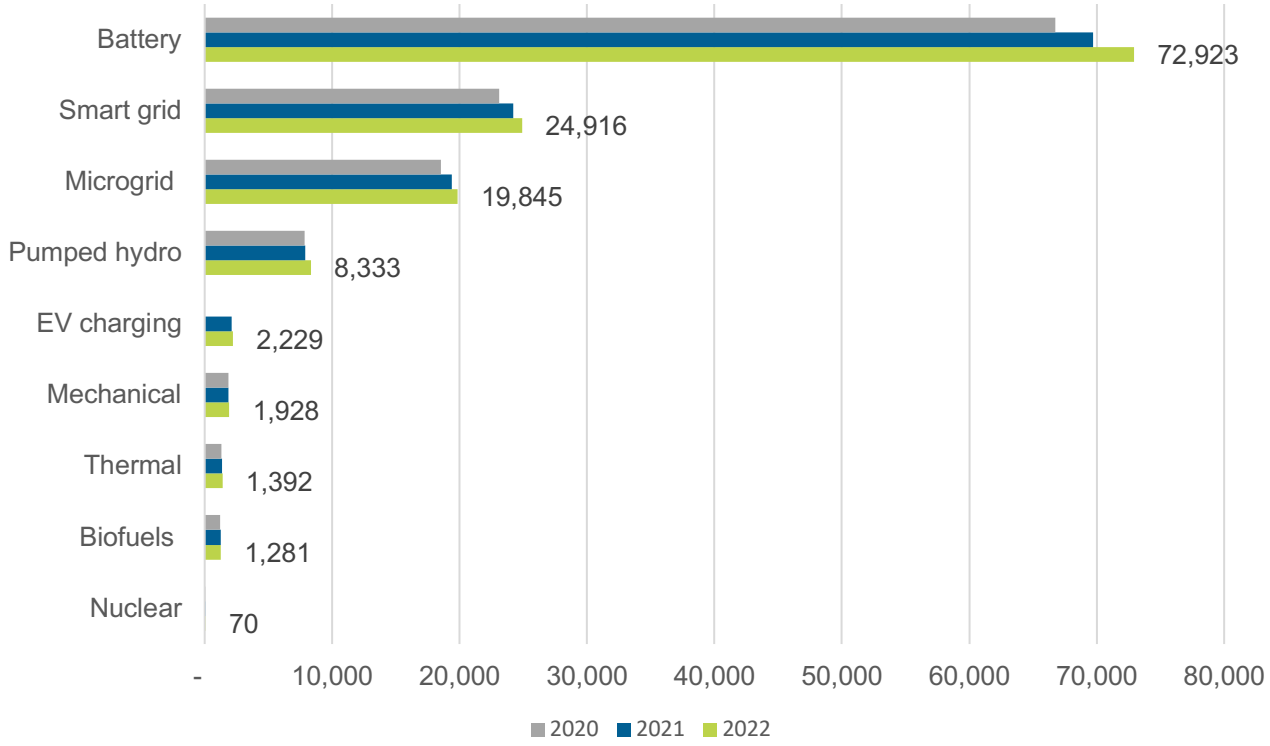
Table 14. Concentration of Transmission, Distribution, and Storage Employment by Technology and Industry

	Utilities	Construction	Manufacturing	Wholesale Trade, Distribution, & Transport	Professional & Business Services	Pipeline	Other Services
Traditional Transmission & Distribution, Electricity	**46%**	29%	6%	5%	12%	0%	2%
Traditional Transmission & Distribution, Petroleum	0%	45%	0%	**46%**	0%	9%	0%
Traditional Transmission & Distribution, Natural Gas	**60%**	23%	0%	0%	0%	16%	0%
Traditional Transmission & Distribution, Coal	0%	0%	0%	**100%**	0%	0%	0%

Traditional Transmission & Distribution, "Other Fuels"	0%	0%	0%	**100%**	0%	0%	0%
Pumped Hydro	0%	**37%**	29%	3%	18%	12%	1%
Battery Storage	0%	**52%**	19%	11%	17%	0%	1%
"Other Storage"	0%	34%	**42%**	1%	21%	0%	2%
Petroleum Storage	0%	**61%**	14%	2%	0%	0%	23%
Natural Gas Storage	0%	31%	16%	13%	**40%**	0%	1%
"Other Fuels" Storage	0%	**65%**	0%	0%	32%	0%	3%
Smart Grid	0%	**45%**	7%	6%	41%	0%	1%
Microgrid	0%	**57%**	18%	8%	15%	0%	2%
"Other Grid Modernization"	0%	**76%**	9%	1%	12%	0%	1%
EV Charging	0%	**33%**	8%	25%	27%	0%	7%
Other	0%	**63%**	13%	1%	23%	0%	0%

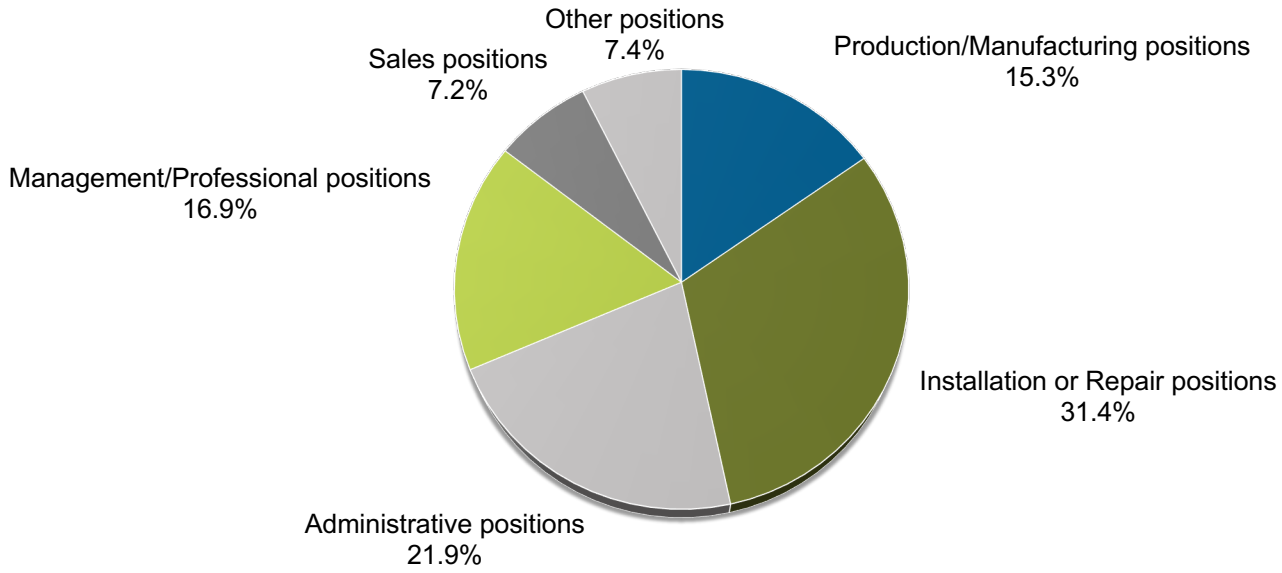
Clean energy TDS technologies, which include electricity storage, advanced grid technologies, clean fuels storage, and electric vehicle charging, grew from 127,817 jobs in 2021 to 132,917 jobs in 2022, (Figure 50), an increase of 5,100 jobs (+4.0%).

Figure 50. Clean Energy Transmission, Distribution, and Storage Jobs



Workers with the same occupation can work in different industries. For example, the construction industry will include many installation or repair occupations, but utilities and other industries will also employ people in these occupations. For this reason, different trends show up if parsing the data by industry or occupation. It can be useful to show energy employment data and trends by both. In terms of distribution of jobs by occupation across all industries, the largest occupational category of workers within TDS was installation or repair positions, accounting for 31.4% (Figure 51). This was followed by administrative positions (21.9%) and management and professional positions (16.9%).

Figure 51. Worker Occupations in Transmission, Distribution, and Storage

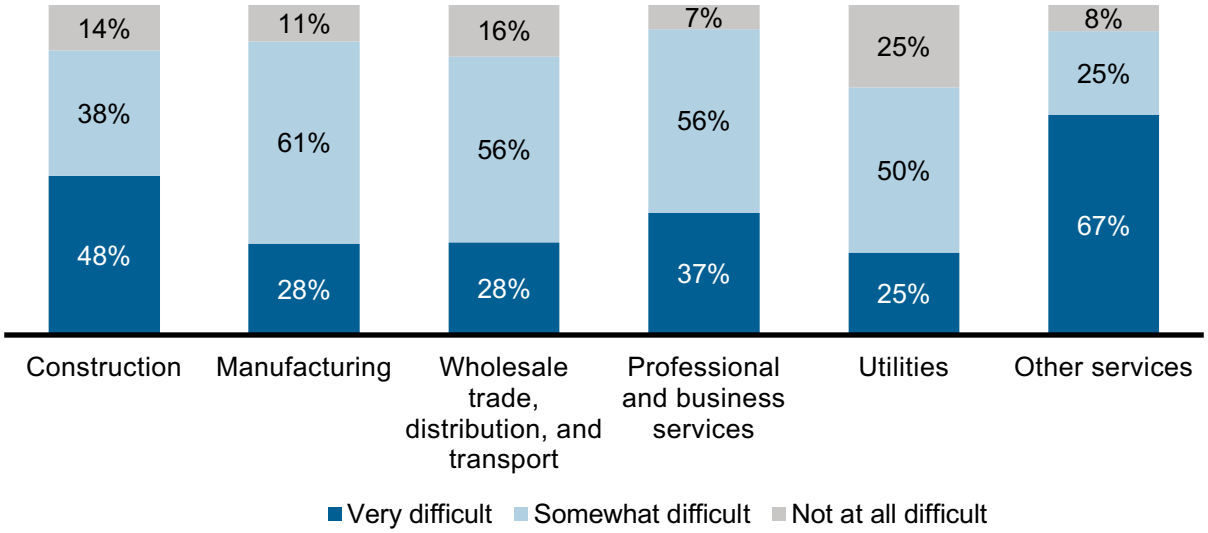


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within TDS industries, professional and business services firms reporting the greatest difficulty hiring workers (Figure 52). About 93% of these employers reported at least some difficulty finding qualified workers, with 37% claiming it was "very difficult." About 48% of construction and 67% of "other services" reported it was "very difficult" to hire. Utilities reported the least difficulty hiring, with 25% stating that it was "not at all difficult."

Figure 52. TDS Hiring Difficulty by Industry



As shown in Table 15, employers in all TDS industries except manufacturing cited competition/small applicant pool as the most common reason for hiring difficulty. Four of six industries cited lack of experience, training, or technical skill as a top reason for hiring difficulty, and this was most pronounced in manufacturing. Manufacturing firms also noted their inability to pay competitive wages, which was not one of the top three issues for other industries. Three of the six industries reporting insufficient non-technical skills (work ethic, dependability, critical thinking) as a top reason for hiring difficulty.

Reported hiring difficulty varied greatly among unionized[41] and non-unionized TDS employers. While 39% of non-union TDS employers reported that it was "very difficult" to find workers, only 17% of union shops reported the same.

Table 15. TDS Employer Reasons for Hiring Difficulty

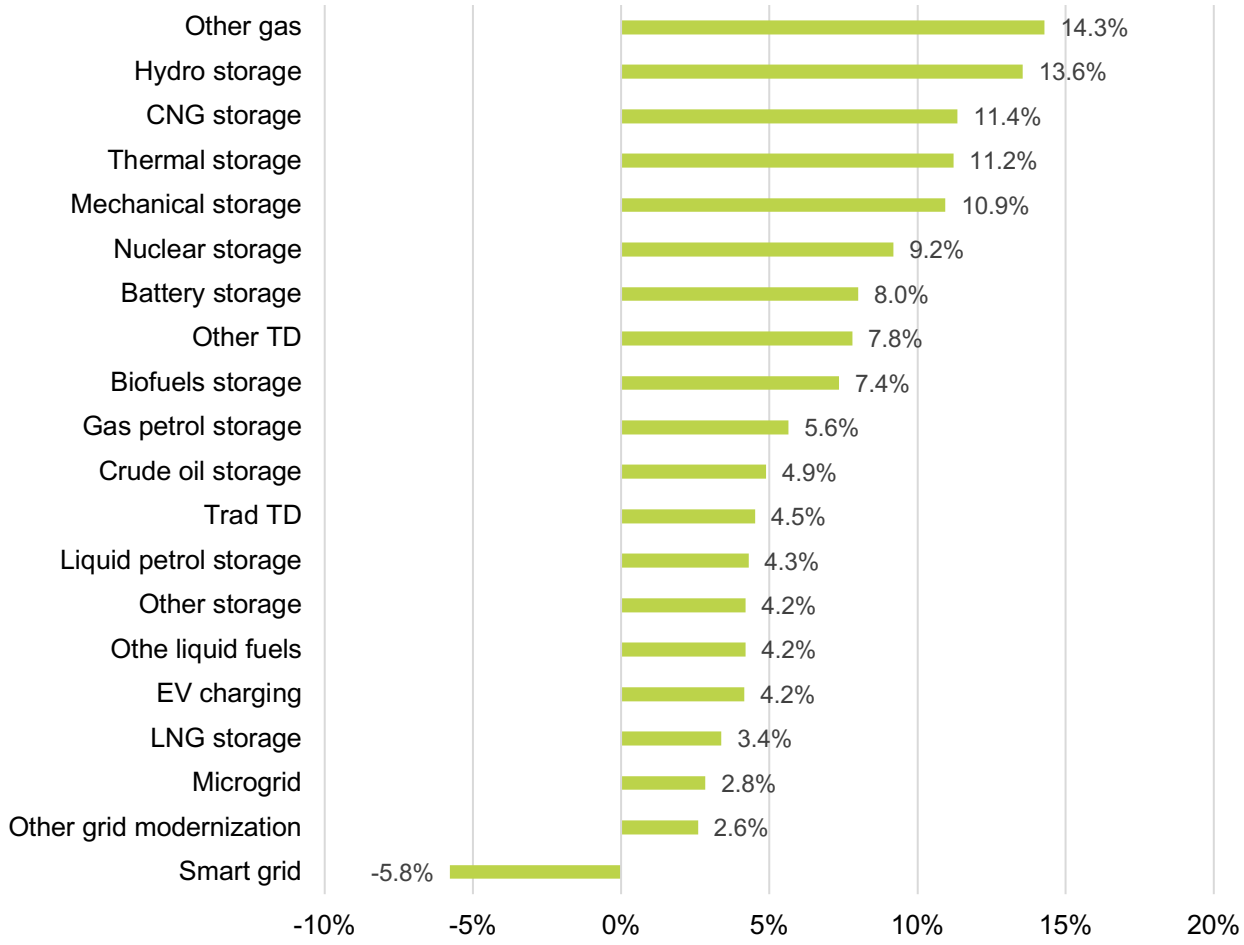
Industry	Most Common Reason	Second Most Common Reason	Third Most Common Reason
Utilities	Competition/small applicant pool (42%)	Insufficient qualifications (certifications or education) (39%)	Lack of experience, training, or technical skills (25%)
Construction	Competition/small applicant pool (44%)	Lack of experience, training, or technical skills (32%)	Insufficient qualifications (certifications or education) (28%)
Manufacturing	Lack of experience, training. or technical skills (50%)	Insufficient qualifications (certifications or education) (25%)	Cannot provide competitive wages (19%)
Wholesale Trade, Distribution, and Transport	Competition/small applicant pool (42%)	Insufficient qualifications (certifications or education) (31%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (31%)
Professional and Business Services	Competition/small applicant pool (36%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (32%)	Lack of experience, training, or technical skills (32%)
Other Services	Competition/small applicant pool (44%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (38%)	Location (32%)

[41] Defined as having 20% or more of staff represented by a union or covered under a project labor or collective bargaining agreement.

Employment Change by Technology and Industry

The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology and industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Of all TDS technologies, "other gas" firms anticipate the highest growth rate for 2023, at 14.3% (Figure 53). The only technology that anticipates a decline is smart grid, expecting about 6% fewer jobs from 2022 to 2023.

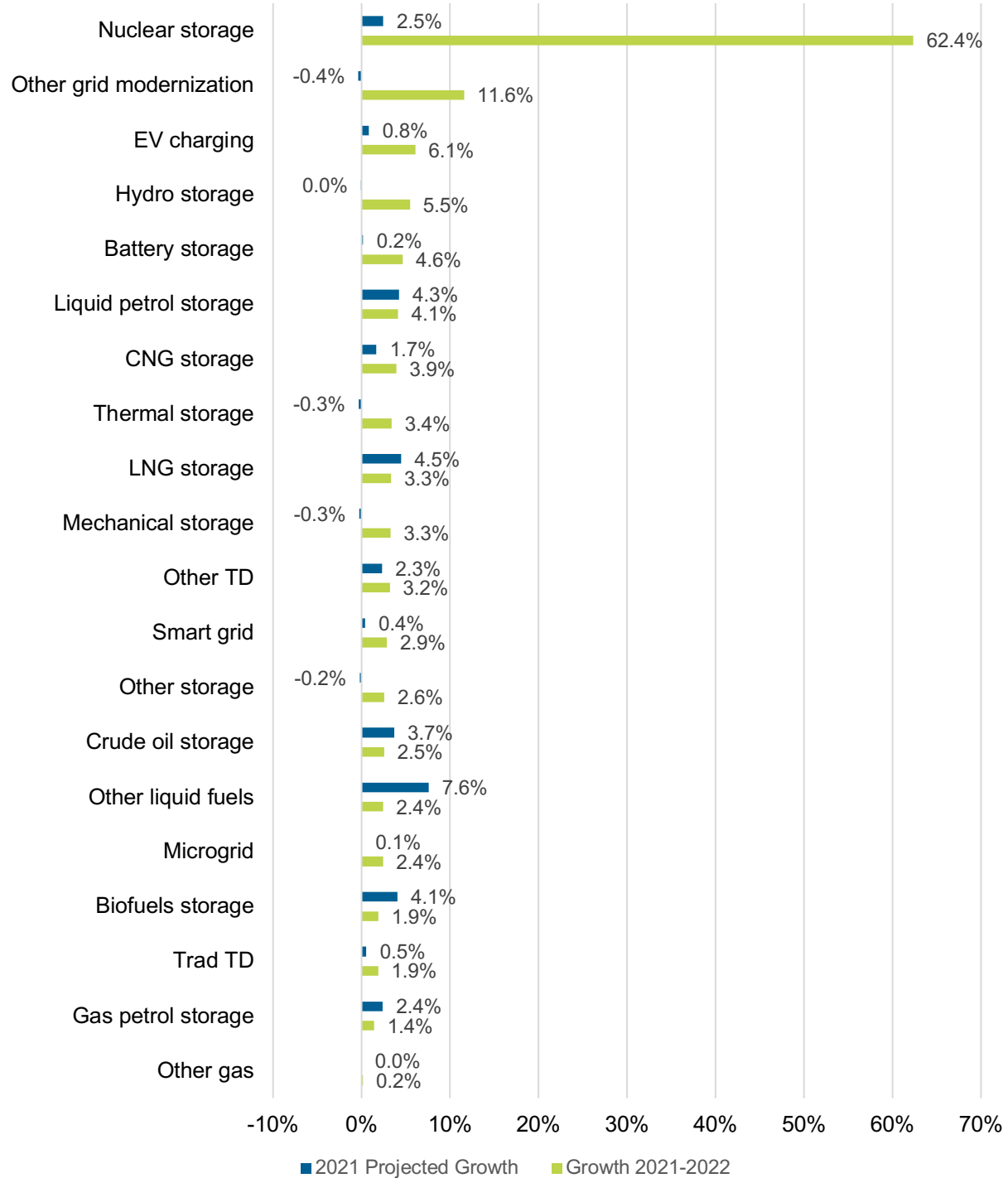
Figure 53. TDS Anticipated Changes in Employment by Technology, 2022-2023[42]



[42] For definitions of technologies, refer to Appendix K: Energy Technology Definitions

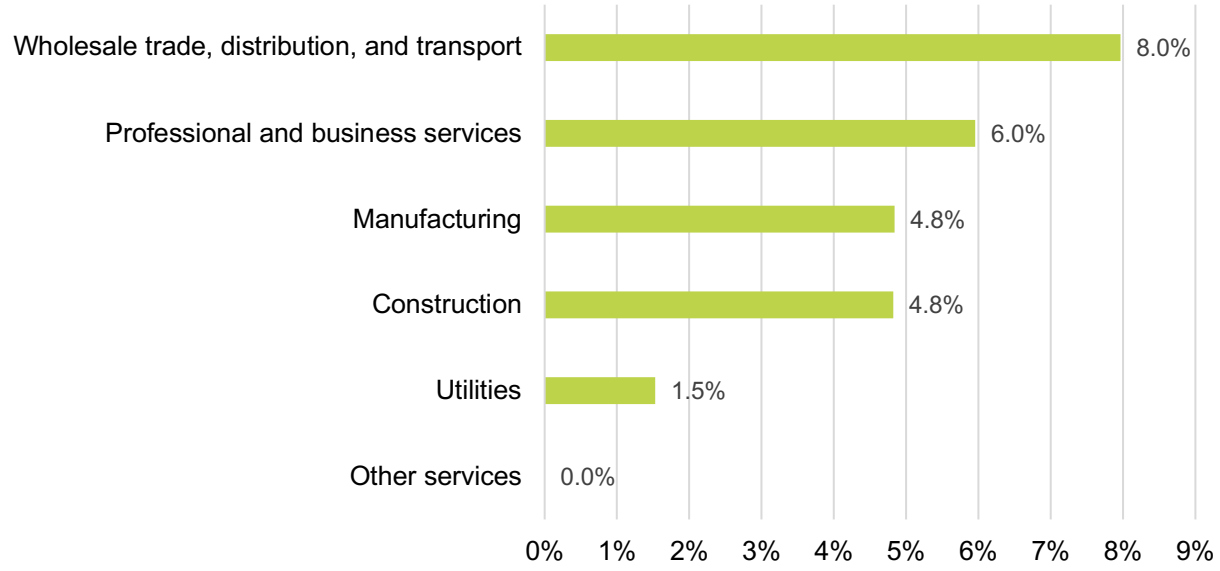
TDS employers had expected to grow last year across many of the technologies (Figure 54). Most firms in TDS technologies registered more growth than expected, ranging from 0.2% in "other gas" to 62.4% in nuclear storage.

Figure 54. TDS Actual Employment Change by Technology 2021-2022 vs. Anticipated Employment by Technology 2021



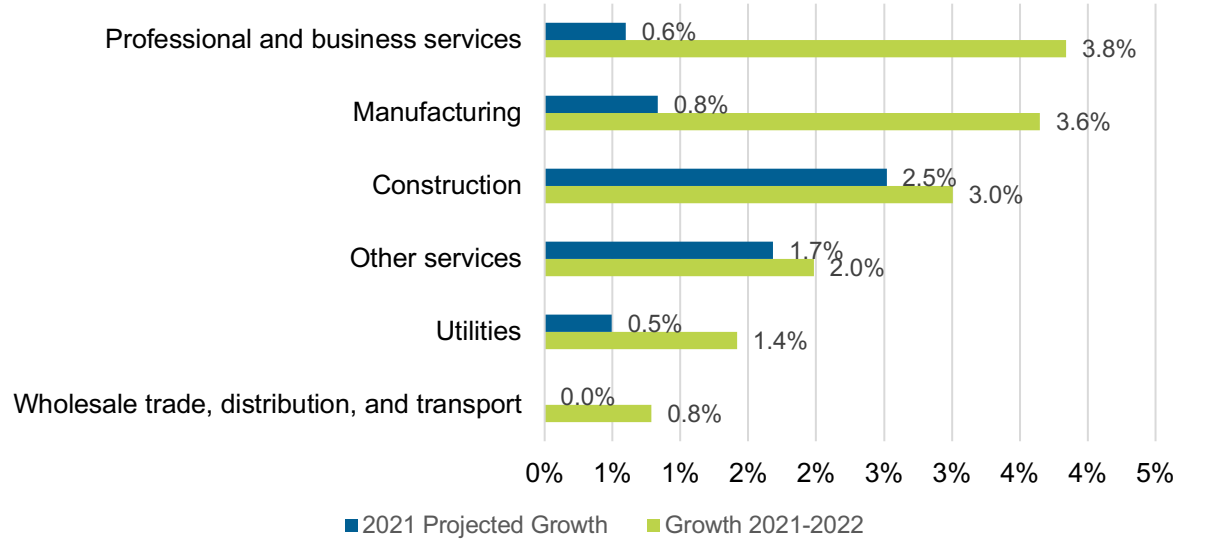
No industries in TDS anticipate a decline in employment in 2023 (Figure 55). Anticipated employment growth rates range from 1.5% in utilities to 8.0% in wholesale trade, distribution, and transport.

Figure 55. TDS Anticipated Employment Changes by Industry, 2022-2023



Looking at the same data by technology rather than industry, five of the six industries within TDS had expected growth last year, ranging from 0.5% in utilities to 2.5% in construction, but all six industries grew more than expected (Figure 56). Professional and business services; wholesale trade, distribution, and transport; and manufacturing grew much more than expected.

Figure 56. TDS Actual Employment Change by Industry 2021-2022 vs. Anticipated Employment Change by Industry 2021



Transmission, Distribution, and Storage Demographics

Demographics for the TDS workforce are displayed in Table 16 below. Demographic estimates are only available for TDS technologies and industries not including commodity flows (truck, rail, water, and air transport of fuels)[43]. In 2022, the TDS workforce was disproportionately male, consistent with the overall energy workforce average, at 73%, and higher than the national economy as a whole (53%).

The proportion of the TDS workforce made up of Hispanic or Latino workers was the same as the energy workforce average (18%), and slightly lower than the national economy average (19%). TDS trails both motor vehicles and component parts (20%) and electric power generation (20%) in Hispanic or Latino representation.

The portion of non-white workers in TDS was 30%, higher than the energy workforce average of 25% and the national economy average of 23%. This is attributable to Asian workers (9% compared to 7%), Black or African American workers (11% compared to 9%), and American Indian and Alaska Native workers (3% compared to 2%) being represented at higher rates in TDS than in the overall energy workforce.

Veteran workers were less represented in TDS than in the overall energy workforce (7% compared to 9%), but veteran representation was higher when compared to the national economy overall (5%). The proportion of formerly incarcerated individuals was the same as the energy workforce average (1%) and lower than the national workforce average (2%). The proportion of individuals requesting accommodations for disabilities was greater than the energy workforce average (3% compared to 2%) but lower than the 4% estimated in the U.S. economy overall.

The TDS workforce was mainly composed of middle-aged workers, with a 57% share of workers between ages 30 and 54 compared to the energy workforce average of 53% and the national economy average of 54%. Workers under the age of 30 are underrepresented in TDS, with 26% compared to the 30% energy workforce average, but their share was higher in TDS when compared to the national workforce as a whole (22%).

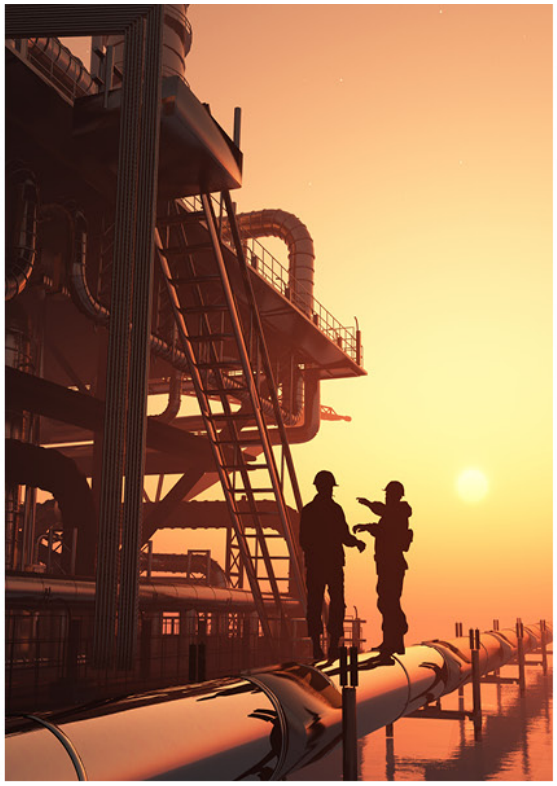
The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was greater than the energy workforce average and the national workforce average (18% compared to 11%).

[43] Commodity flows include workers that transport fuels via truck (NAICS 484), rail (NAICS 482), water (NAICS 483), and air (NAICS 481), These NAICS codes are not surveyed and the proportion of employment was calculated by dividing the value of commodity shipments (in millions of dollars) for coal, fuel oil, gas, motor vehicles, petroleum and other coal and petroleum products by total commodity value at the state level by truck, rail, air and water transport. See Appendix B.

Table 16. TDS Workforce Demographics and Characteristics

	Number of Workers	Transmission, Distribution, and Storage Average	Energy Workforce Average	National Workforce Average
Male	898,850	73%	73%	53%
Female	319,546	26%	26%	47%
Gender Nonbinary	14,354	1%	<1%	insufficient data
Hispanic or Latino	218,428	18%	18%	19%
Not Hispanic or Latino	1,014,322	82%	82%	82%
American Indian or Alaska Native	34,262	3%	2%	<1%
Asian	113,830	9%	7%	7%
Black or African American	130,161	11%	9%	13%
Native Hawaiian or Other Pacific Islander	11,889	<1%	1%	<1%
White	866,142	70%	75%	77%
Two or More Races	63,502	5%	5%	3%
Veterans	83,016	7%	9%	5%
18 to 29	324,738	26%	30%	22%
30 to 54	702,115	57%	53%	54%
55 and Over	205,896	17%	17%	24%
Disability	30,992	3%	2%	4%
Formerly Incarcerated	14,342	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	225,701	18%	11%	7%

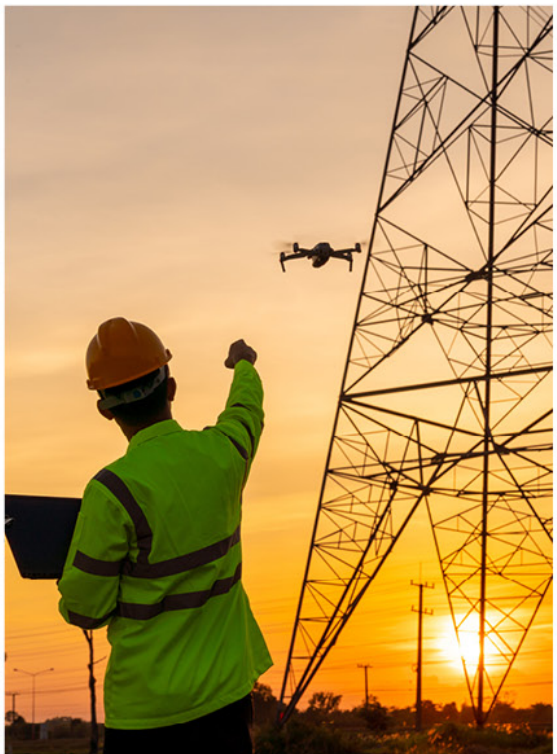
National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)


UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

FUELS

ENERGY.GOV/USEER


Fuels

Fuels are combusted or otherwise spent in the generation of electricity or heat. Employment in fuels includes any work related to fuel extraction, mining, and processing. This includes firms that manufacture machinery that supports oil and gas extraction as well as coal mining. Agriculture and forestry workers who support fuel production with biodiesels, corn ethanol, and fuel wood are also included in the employment data for fuels. This category also includes the production of nuclear fuels for power plants. Jobs in electricity fuel to power vehicles and buildings are reflected in the Electric Power Generation section.[44]

In 2022, the fuels sector employed 1,031,799 workers, up 123,377 from 908,422 in 2021 (+13.6%). Several fuels technologies saw a significant increase in jobs in the mining and extraction industry. For example, there were 579 U.S. crude oil and natural gas rotary rigs in operation in December 2021, which increased to 780 in December 2022, a 34.7% increase year-over-year.[45]

Trends and Key Takeaways

- Employment in fuels grew by 123,377 jobs to a total of 1,031,799, or 13.6% growth from 2021 to 2022, outpacing growth in all other energy categories — EPG (+3.0%), TDS (+2.2%), energy efficiency (+2.3%), and motor vehicles and component parts (+2.5%).
- Firms working with clean energy fuels such as corn ethanol, woody biomass/cellulosic biofuel, and “other biofuels” added 1,962 jobs, growing 1.7% from 2021 and 2022.
- Onshore and offshore petroleum added the most jobs of all fuels technologies, increasing by 58,085 jobs (+12.5%). Onshore and offshore natural gas added 51,113 jobs (+24.1%), followed by coal, with 11,545 added jobs (+21.7%).
- The mining and extraction industry had the largest employment gains, with 107,029 added jobs (+33%). This was followed by professional and business services, with 7,689 added jobs (+5%); manufacturing, with 4,266 added jobs (+2%); wholesale trade, with 3,362 added jobs (+2%); construction, with 885 added jobs (+5%); agriculture and forestry, with 82 added jobs (+0.2%); and other services, with 64 added jobs (+3%).
- Six out of seven industries within fuels expect growth through 2023, ranging from 0.2% in wholesale trade to 6.8% in construction. Agriculture expects a decline in employment close to 7%.
- The percentage of workers in fuels represented by a union or covered under a project labor or collective bargaining agreement (7%) was lower than the overall energy workforce average (11%), but in line with the national private sector average (7%).
- The fuels workforce was disproportionately male, with an average the same as the overall energy workforce average (73%) and higher than the national workforce average (53%).

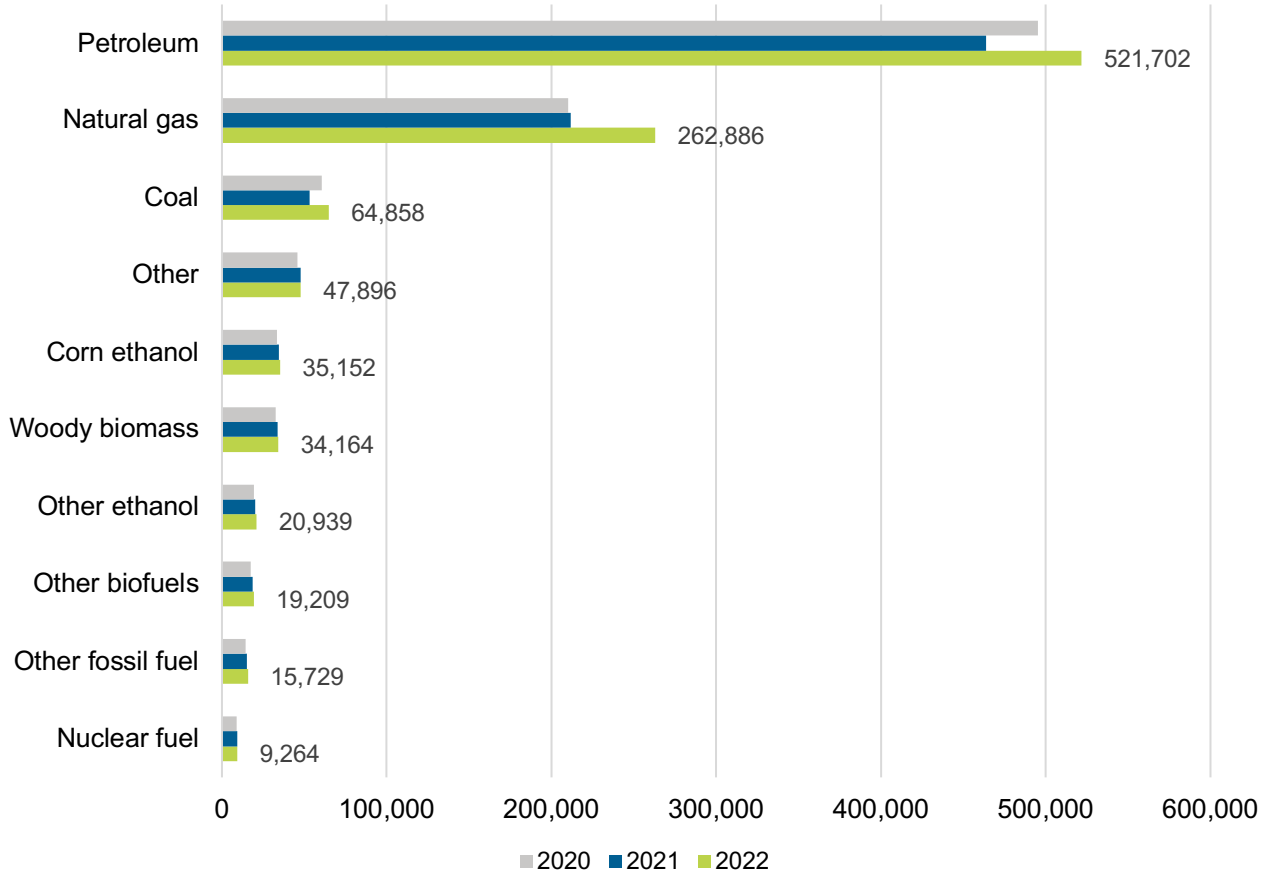
[44] Appendix J contains definitions of each technology.
[45] Energy Information Administration (EIA)

- The proportion of non-white workers in fuels was lower than both the overall energy workforce average and the overall national workforce average (22% compared to 25% and 23%, respectively). This is partially attributable to Asian (6% compared to 7%) and Native Hawaiian or other Pacific Islander (<1% compared to 1%) workers, who are underrepresented in the fuels workforce. The proportion of Black or African American workers in fuels was the same as the energy workforce average (9%), which was also the case for American Indian or Alaska Native workers (2%).
- Hispanic or Latino workers were less represented in fuels (14%) than both the overall energy workforce (18%) and the U.S. workforce overall (19%).
- Veterans were more represented in fuels, at 10%, than in the overall energy workforce (9%) and the national workforce overall (5%).
- The proportion of formerly incarcerated individuals working in fuels was the same as the overall energy workforce average (1%) and lower than the national workforce average (2%).
- Workers requesting accommodation for a disability in fuels was also the same as the energy average, 2%, and lower than the U.S. workforce as a whole.

Employment by Technology, Industry, and Occupation

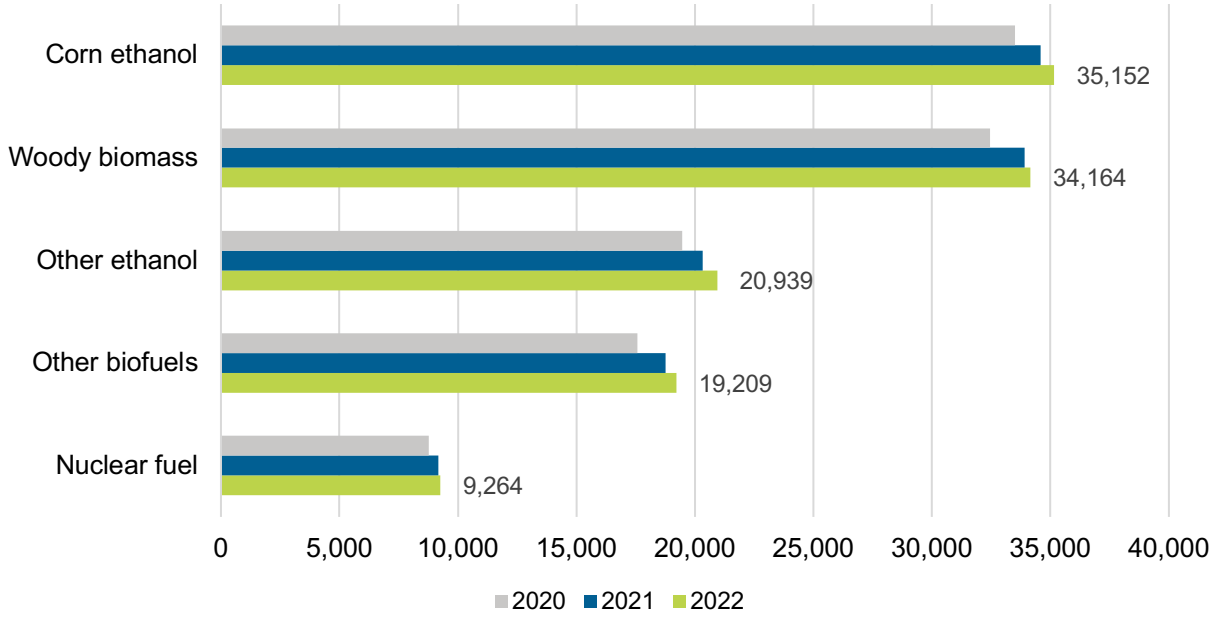
In 2022, fuels employed 1,031,799 workers, representing an increase of 13.6% from 2021 (Figure 57). Petroleum and natural gas employers primarily drove this growth, with petroleum increasing by 58,085 workers (+12.5%) and natural gas increasing by 51,113 workers (+24.2%).

Figure 57. Fuels Employment by Technology, 2020-2022



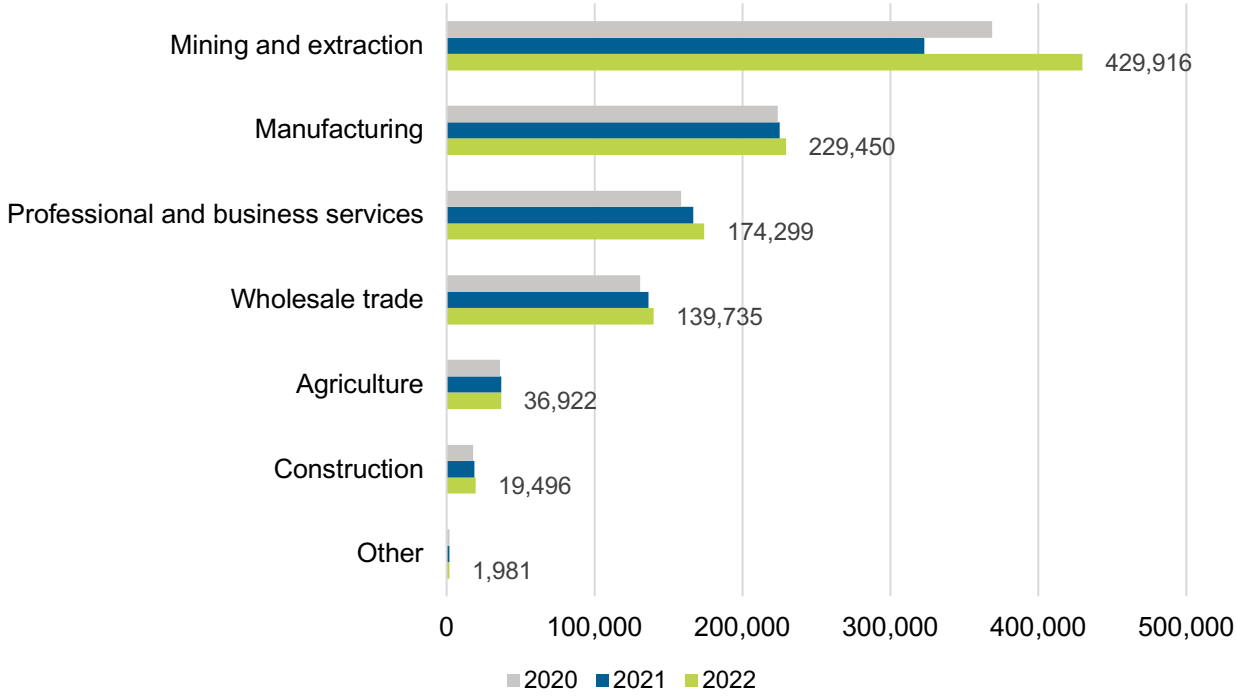
Clean energy fuels — nuclear and those from bio stock — grew from 116,767 in 2021 to 118,729 in 2022, an increase of 1.7% (Figure 58). All clean energy fuels underwent job growth between 2021 and 2022.

Figure 58. Clean Energy Fuel Technologies, 2020-2022



The largest number of fuels employees were in the mining and extraction industry,[46] with 429,916 workers (Figure 59). Mining and extraction experienced the largest increase in employment from 2021 to 2022, adding 107,029 jobs (+33.1%). Construction had the second largest percentage of growth in fuels employment levels, at 4.8%, adding 885 jobs. All industries exceeded their 2020 employment levels in 2022.

Figure 59. Fuels Employment by Industry, 2020-2022



Fuels employees were concentrated across numerous industries within different fuel technology areas. The mining and extraction industry had the largest share of employment. Several technologies, including renewable diesel fuels, offshore natural gas, and nuclear fuels, had the highest concentration of their workers in the professional and business services industry (Table 17).

Table 17. Concentration of Fuels Employment by Technology and Industry[47]

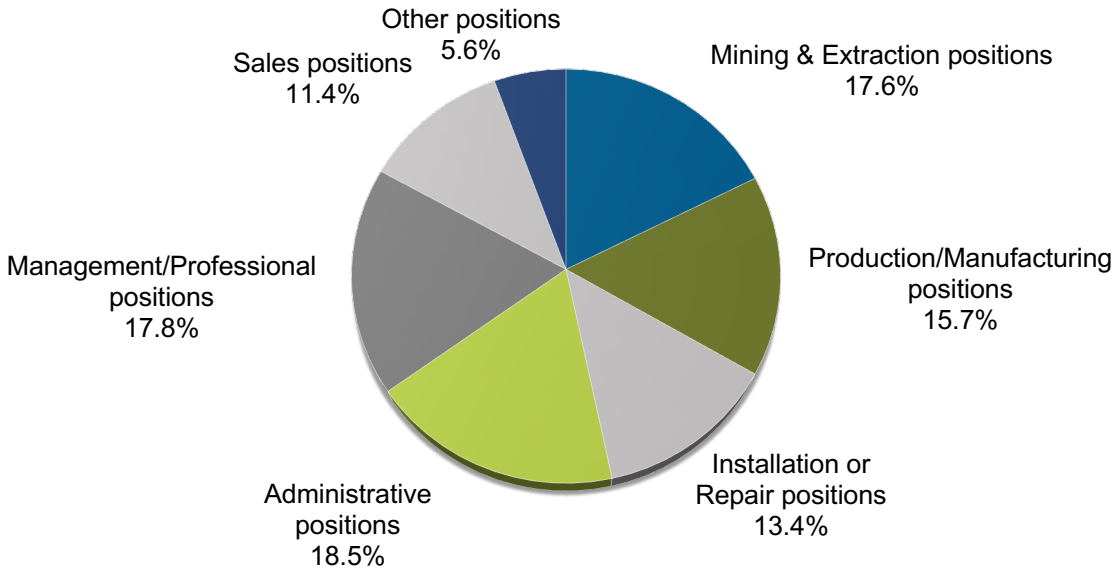
	Agriculture	Mining and Extraction	Construction	Manufacturing	Wholesale Trade	Professional and Business Services	"Other Services"
Coal	0%	**71%**	0%	15%	2%	12%	0%
Onshore Petroleum	0%	**44%**	4%	23%	14%	14%	0%

[46] Includes mining and extraction of petroleum, natural gas, and coal as well as support activities for mining and extraction (NAICS 21).
[47] Highlighted values indicated the industry for which the largest share of technology (row) employment lies.

Offshore Petroleum	0%	40%	0%	**46%**	2%	12%	1%
Onshore Natural Gas	0%	**63%**	0%	15%	12%	10%	0%
Offshore Natural Gas	0%	15%	0%	24%	1%	**59%**	0%
“Other Fossil Fuel”	0%	0%	0%	18%	**48%**	34%	1%
Corn Ethanol	**45%**	0%	0%	27%	19%	8%	0%
“Other Ethanol/Non-Woody Biomass”	12%	0%	0%	13%	27%	**47%**	0%
Woody Biomass/Cellulosic Biofuel	**54%**	0%	0%	13%	3%	30%	0%
Renewable Diesel Fuels	0%	0%	0%	7%	3%	**90%**	0%
Biodiesel Fuels	0%	0%	0%	9%	7%	**84%**	0%
Waste Fuels	0%	0%	0%	3%	2%	**95%**	0%
“Other Biofuels”	0%	0%	0%	3%	22%	**74%**	0%
Nuclear Fuel	0%	5%	0%	31%	10%	**55%**	0%
“Other Fuels”	0%	0%	0%	28%	**52%**	19%	0%

Workers with the same occupation can work in different industries. For example, the manufacturing industry will include many production/manufacturing occupations, but wholesale trade and other industries will also employ people in these occupations. For this reason, different trends show up if parsing the data by industry or occupation. It can be useful to show energy employment data and trends by both. In terms of distribution of jobs by occupation across all industries, the largest occupational category of workers within fuels was administrative positions, at 18.5% (Figure 60). This was followed by management and professional occupations (17.8%) and mining and extraction positions (17.6%).

Figure 60. Fuels Employment by Occupation

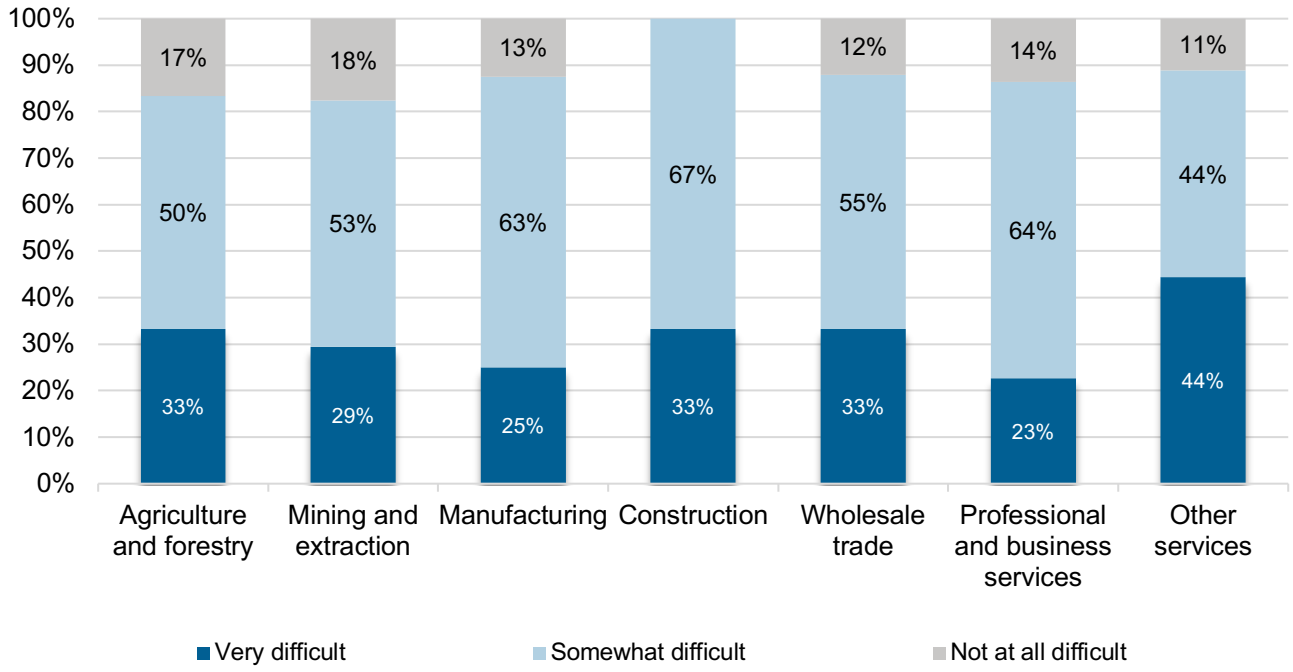


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Among industries within fuels, 100% of construction employers reported at least some difficulty hiring workers (Figure 61). More than two in five firms in other services (44.4%) that had hired workers from 2021 to 2022 reported that finding qualified workers was “very difficult.” Mining and extraction firms reported the least problems with hiring; 18% of respondents indicated that it was “not at all difficult” to hire qualified workers.

Figure 61. Fuels Hiring Difficulty by Industry



As illustrated in Table 18, lack of experience, training, or technical skills was the most cited reason for hiring difficulty by employers in mining and extraction, manufacturing, and professional and business services. [48] For construction and other services, competition/small applicant pool topped the list of reasons for hiring difficulty.

Table 18. Fuels Reasons for Hiring Difficulty

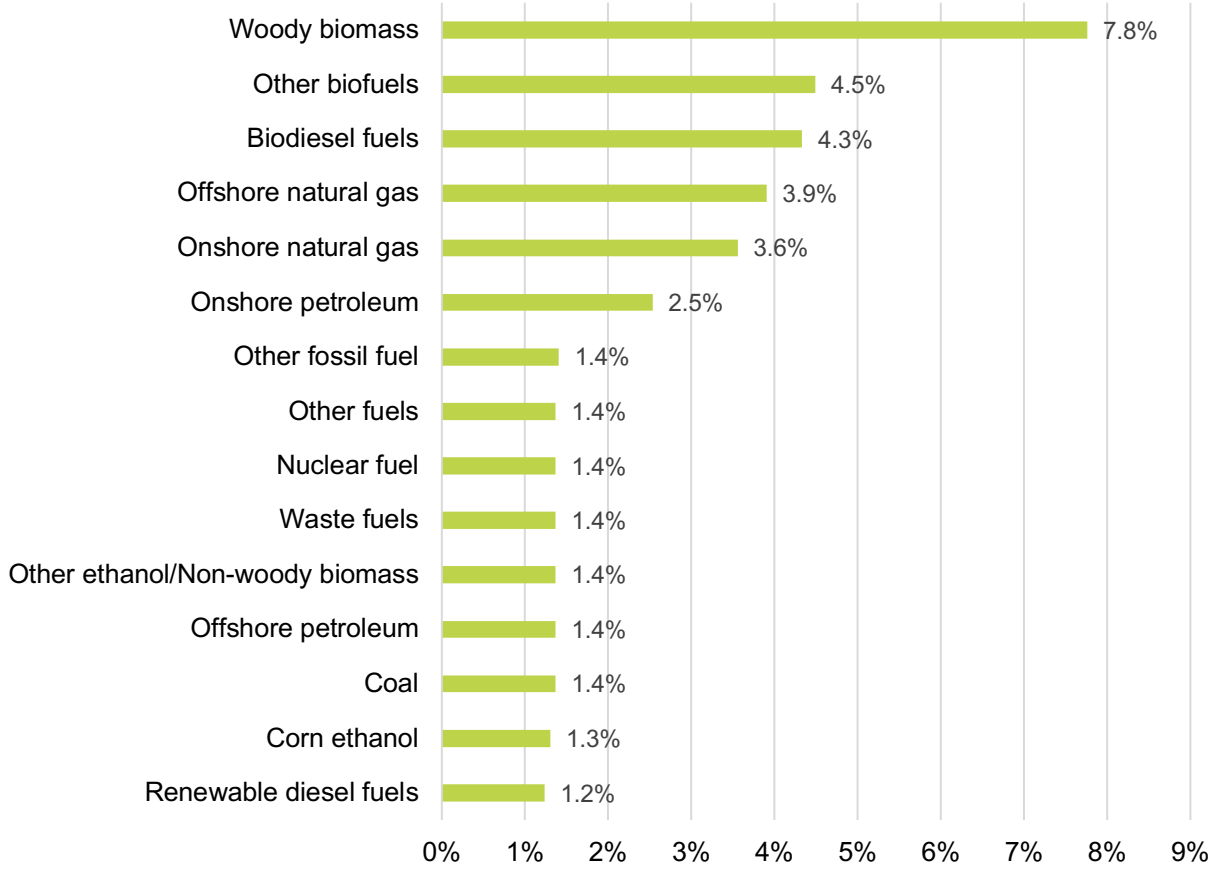
Industry	Most Common Reason	Second Most Common Reason	Third Most Common Reason
Agriculture & Forestry	Insufficient qualifications (certifications or education) (40%)	Lack of experience, training, or technical skills (46%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (40%)
Mining & Extraction	Lack of experience, training, or technical skills (40%)	Competition/small applicant pool (46%)	Economy/structural problem (31%)
Manufacturing	Lack of experience, training, or technical skills (33%)	Competition/small applicant pool (33%)	Cannot provide competitive wages (33%)
Construction	Competition/small applicant pool (67%)	Lack of experience, training, or technical skills (17%)	Cannot provide competitive wages (17%)
Wholesale Trade, Distribution, and Transport	Insufficient qualifications (certifications or education) (45%)	Competition/small applicant pool (41%)	Cannot provide competitive wages (31%)
Professional and Business Services	Lack of experience, training, or technical skills (61%)	Competition/small applicant pool (33%)	Cannot provide competitive wages (28%)
Other	Competition/small applicant pool (50%)	Cannot provide competitive wages (38%)	Insufficient qualifications (certifications or education) (38%)

[48] Reasons for hiring difficulty can only be reported for fuels as a whole and not for individual sub-technologies due to data limitations.

Employment Change by Technology and Industry

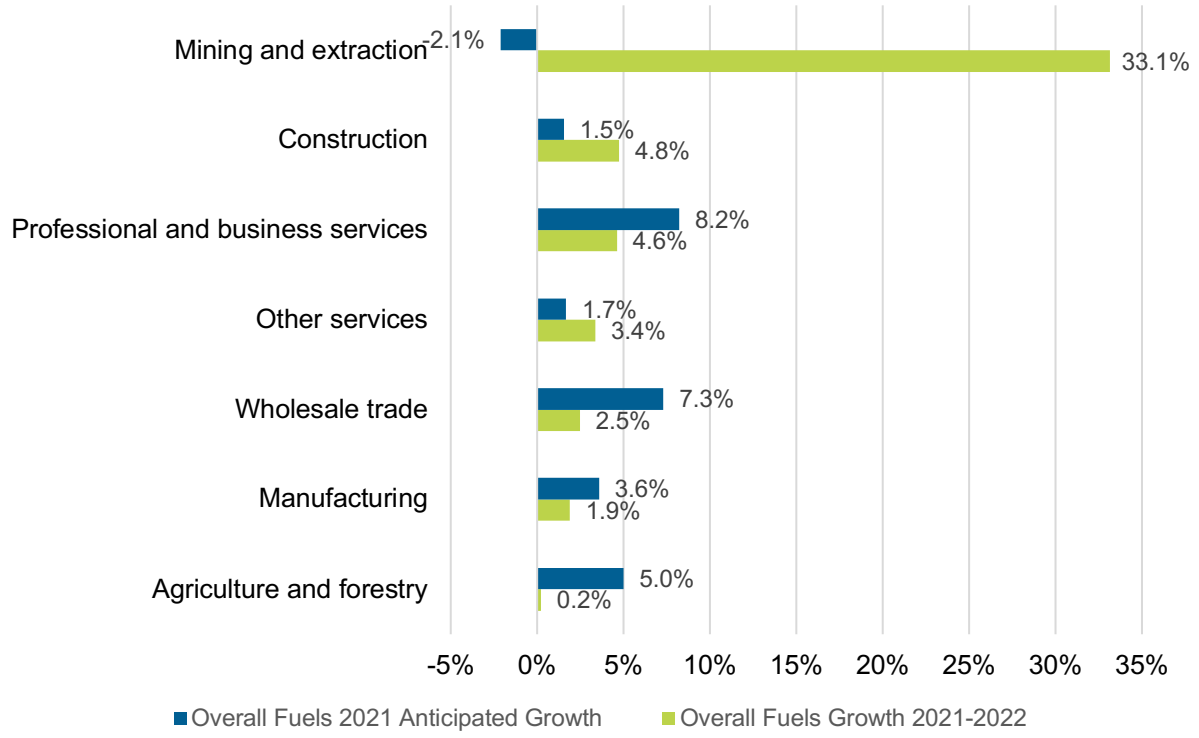
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology and industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. All fuels technologies anticipate growth through 2023 (Figure 62), ranging from 1.2% in renewable diesel to 7.8% in woody biomass.

Figure 62. Fuels Anticipated Employment Changes by Technology, 2022-2023



Six out of the seven industries within fuels had expected growth from 2021 to 2022 (Figure 63). Mining and extraction employers did not anticipate the significant growth that occurred from 2021 to 2022. Firms in mining and extraction had anticipated a 2.1% decline in employment, but actual growth was much higher, at 33.1%. Agriculture and forestry, professional and business services, wholesale trade, and manufacturing experienced less growth than anticipated.

Figure 63. Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Fuels Demographics

The workforce participation of female workers was slightly higher in fuels (27%) than in the overall energy workforce (26%) but was lower when compared to the national workforce average (47%). Male workers made up 73% of the workforce, matching the 73% energy workforce average and far exceeding the share of male workers in the overall U.S. workforce (53%). Employers reported fewer than 1% of their employees as gender nonbinary[49] (Table 19).

The proportion of Hispanic or Latino workers in the fuels workforce was below both the national workforce average and the energy workforce average (14% compared to 19% and 18%, respectively).

The proportion of non-white workers in fuels was 22%, lower than the energy workforce average of 25% and the national workforce average of 23%. The proportion of Black or African American workers in fuels was the same as the energy workforce average (9%), but lower than the proportion of Black or African American workers employed economy-wide (13%).

Veterans had higher representation in fuels than in the overall energy and national workforce (10% compared to 9% and 5%, respectively). The proportion of formerly incarcerated individuals was the same as the energy workforce average (1%), but lower than the U.S. workforce average of 2%. Individuals requesting accommodations for disabilities are employed in fuels at a similar rate when compared to the energy workforce as a whole (2%), but lower than the overall national workforce average (4%).

The fuels workforce was composed of more workers under the age of 30 than the overall energy workforce (31% compared to 30%), which was also the case for workers aged 55 or older (19% compared to 17%).

Workers represented by a union or covered under a project labor or collective bargaining agreement were similarly represented in fuels (7%) compared to the national private sector workforce average (7%) and lower than the overall energy workforce average (11%).

[49] As with all demographic data in this report, there is a potential for reporting errors and biases. For gender specifically, the U.S. Census only collects data on "sex" and not "gender;" so reporting on gender nonbinary employment should be interpreted with caution.

Table 19. Fuels Workforce Demographics and Characteristics

	Number of Workers	Fuels Average	Energy Workforce Average	National Workforce Average
Male	755,529	73%	73%	53%
Female	273,748	27%	26%	47%
Gender Nonbinary	2,521	<1%	<1%	n/a[50]
Hispanic or Latino	147,142	14%	18%	19%
Not Hispanic or Latino	884,657	86%	82%	82%
American Indian or Alaska Native	16,461	2%	2%	<1%
Asian	59,727	6%	7%	7%
Black or African American	90,588	9%	9%	13%
Native Hawaiian or Other Pacific Islander	9,539	<1%	1%	<1%
White	799,756	78%	75%	77%
Two or More Races	46,568	5%	5%	3%
Unknown Race	9,159	<1%	<1%	n/a
Veterans	99,209	10%	9%	5%
18 to 29	319,349	31%	30%	22%
30 to 54	511,776	50%	53%	54%
55 and Over	200,674	19%	17%	24%
Disability	18,578	2%	2%	4%
Formerly Incarcerated	14,091	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	75,758	7%[51]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[50] While the USEER asks male, female and nonbinary, no data from the Bureau of Labor Statistics or U.S. Census exist for the number of nonbinary workers within the national workforce.

[51] Unionization rates vary by state.

Petroleum Fuels

Petroleum fuels companies employed 521,702 workers in 2022, up 58,085 from the 463,617 employed in 2021 (+12.5%). The majority of petroleum fuels workers in the United States — 435,654 — worked in onshore petroleum fuel, while the remaining 86,048 worked in offshore petroleum fuel.

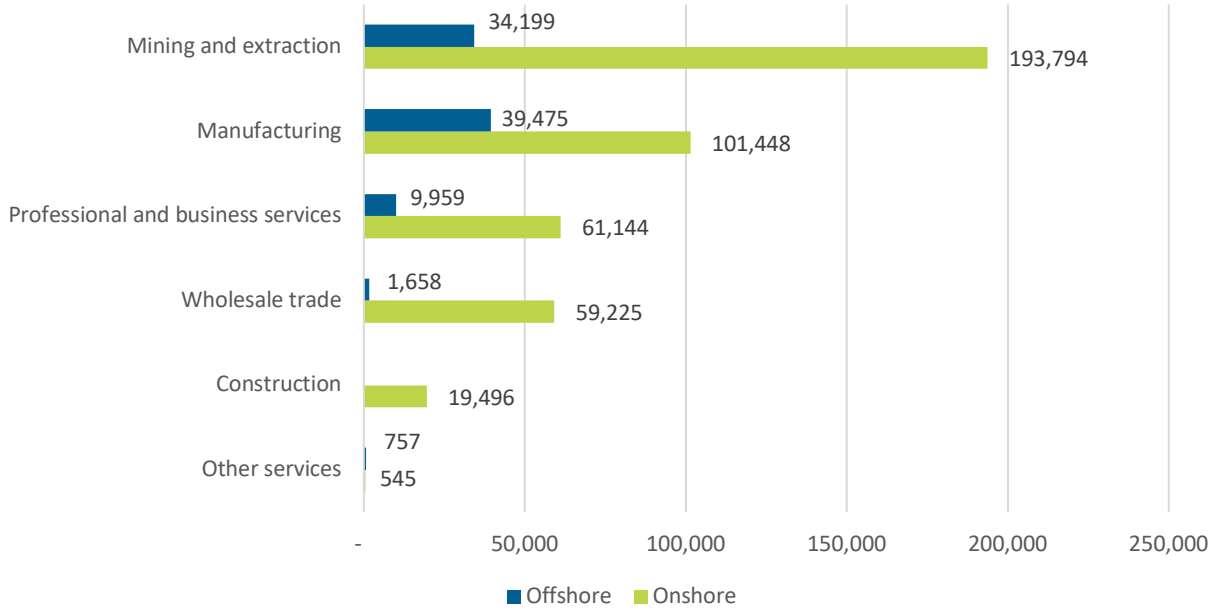
Trends and Key Takeaways

- The largest job gains in petroleum fuels were in the mining and extraction industry, with 48,735 added jobs (+27.2%) from 2021 to 2022. This was followed by professional and business services, with 4,151 added jobs (+6.2%); manufacturing, with 2,695 added jobs (+1.9%); wholesale trade, with 1,566 added jobs (+2.6%); construction, with 884 added jobs (+4.8%); and other services, with 54 added jobs (+4.4%).
- All industries within onshore petroleum anticipate growth in 2023, except for mining and extraction employers, which expect a 0.4% decline in employment. All six industries in offshore petroleum anticipate growth in the next year, ranging from 2.2% in manufacturing to 11.5% in mining and extraction.
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in petroleum fuels (7%) was lower than the energy workforce average (11%) but in line with the national private sector average (7%).
- Female workers were less represented in petroleum fuels (25%) than both the energy workforce average (26%) and the national workforce average (47%).
- Hispanic or Latino workers were less represented in petroleum fuels than in both the overall energy workforce and the national workforce overall (15% compared to 18% and 19%, respectively).
- Petroleum fuels firms were less racially diverse than the energy workforce as a whole. The percentage of non-white workers was lower than the energy workforce average (24% versus 25%) but higher than the economy-wide average of 23%.
- Black or African American workers were more represented in petroleum fuels than in the overall energy workforce (10% compared to 9%) but less represented when compared to the national workforce average (13%).
- The proportion of veterans in petroleum fuels was the same as the overall energy workforce average (9%) and higher than the national workforce average (5%).
- Individuals requesting accommodations were less represented in petroleum fuels than in the overall energy and overall national workforce (1% compared to 2% and 4%, respectively).
- The proportion of formerly incarcerated individuals working in petroleum fuels was the same as the energy workforce average (1%) and lower than the national workforce average (2%).

Employment by Industry

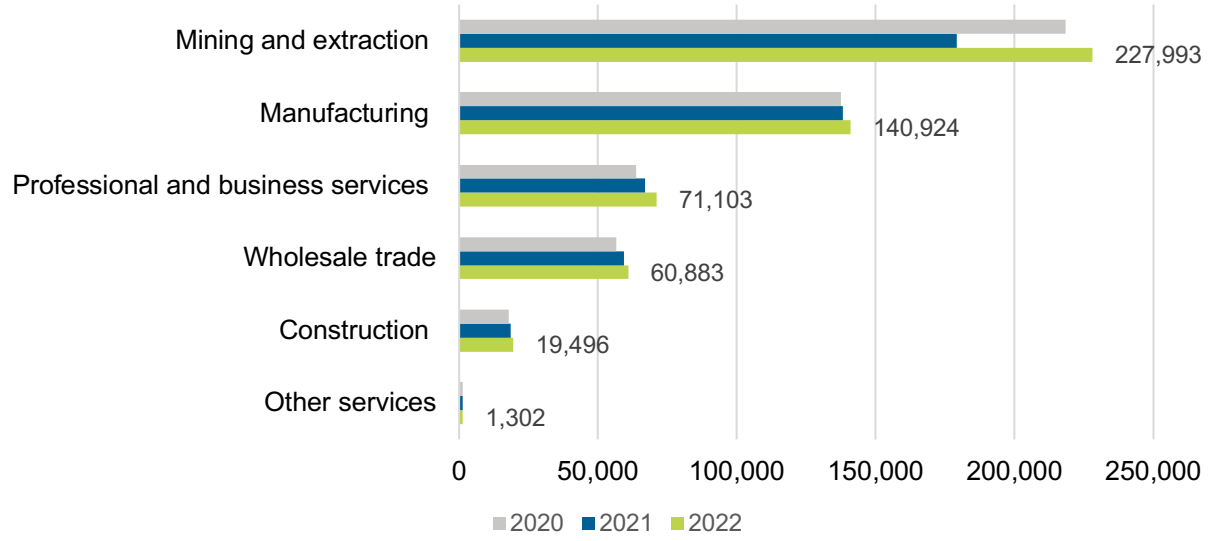
Figure 64 shows employment for onshore and offshore petroleum by industry in 2022. Onshore petroleum firms employed 435,654 workers, while offshore firms employed 86,048 workers. Onshore petroleum represented 83.5% of all petroleum fuels employment.

Figure 64. Onshore and Offshore Petroleum Fuels Employment by Industry



The largest number of petroleum fuels employees was in the extraction industry, with 227,993 workers (Figure 65). Firms in the extraction industry added the most jobs between 2021 and 2022, increasing by 48,735 workers or 27.2%.

Figure 65. Petroleum Fuels Employment by Industry, 2020-2022



Employer Perspective on Workforce Issues

Current Hiring Difficulty

Among respondents employing onshore petroleum fuels workers, construction businesses reported the greatest difficulty finding qualified employees (Figure 66). Firms representing each industry within offshore petroleum fuels that hired workers from 2021 to 2022 reported at least some hiring difficulty, with more than half (58%) of manufacturing businesses identifying hiring as "very difficult" (Figure 67).

Figure 66. Onshore Petroleum Fuels Hiring Difficulty

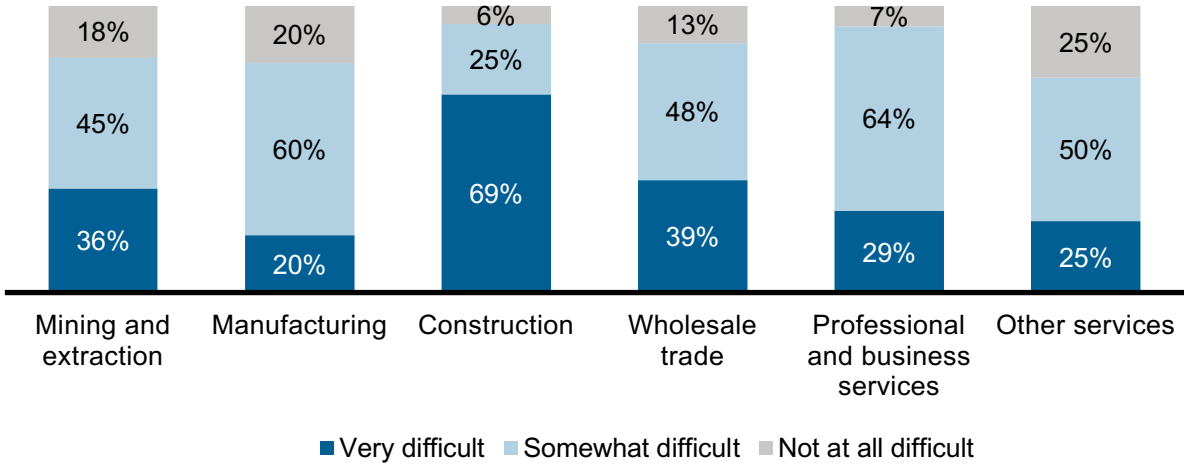
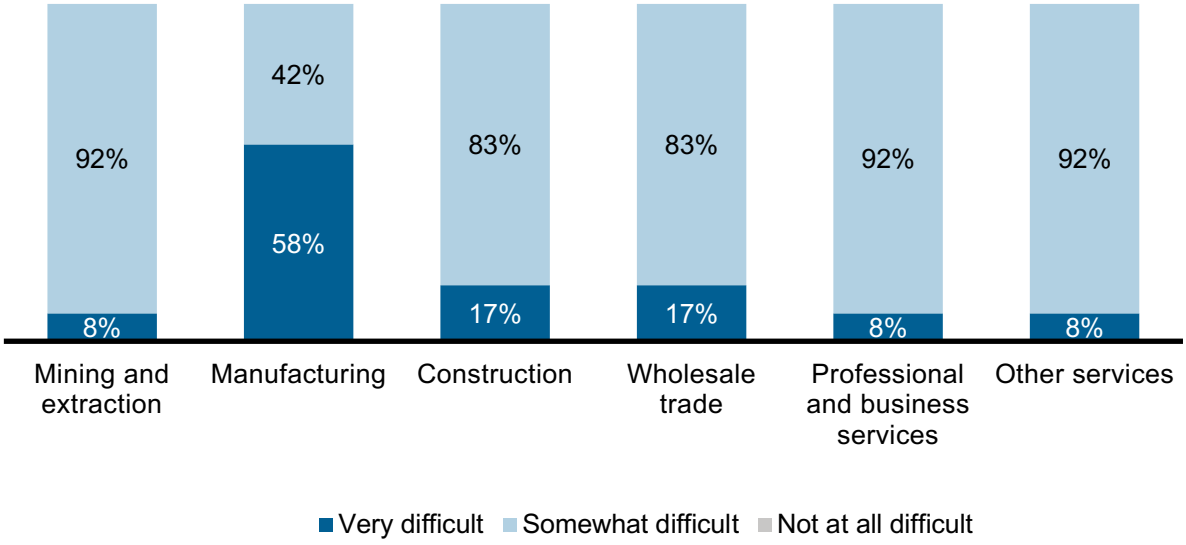


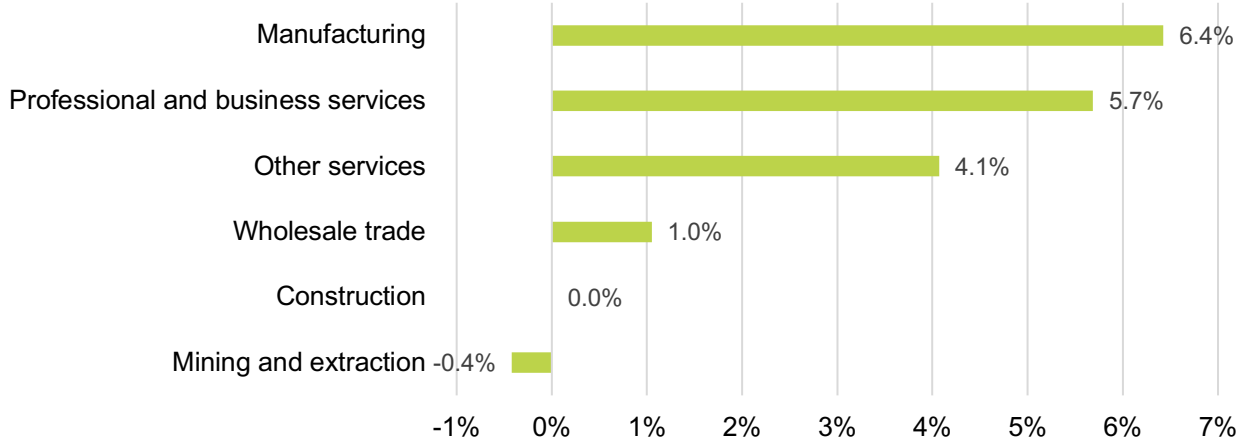
Figure 67. Offshore Petroleum Fuels Hiring Difficulty



Employment Change by Industry

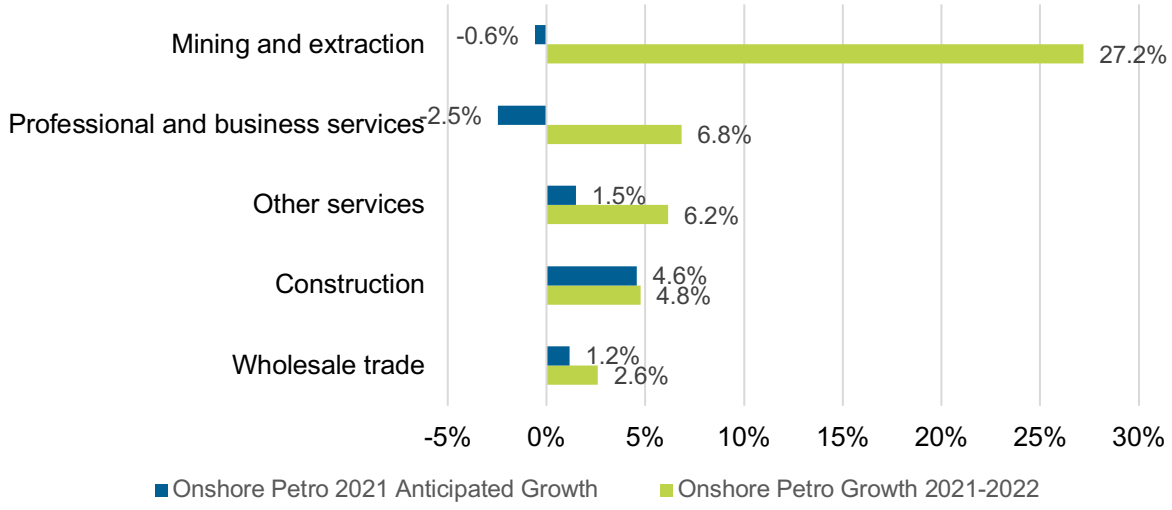
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Onshore and offshore petroleum firms reported differing expectations for growth through 2023. Among onshore petroleum fuels employers, the majority of industries anticipate positive growth (Figure 68).

Figure 68. Onshore Petroleum Fuels Anticipated Employment Change by Industry, 2022-2023



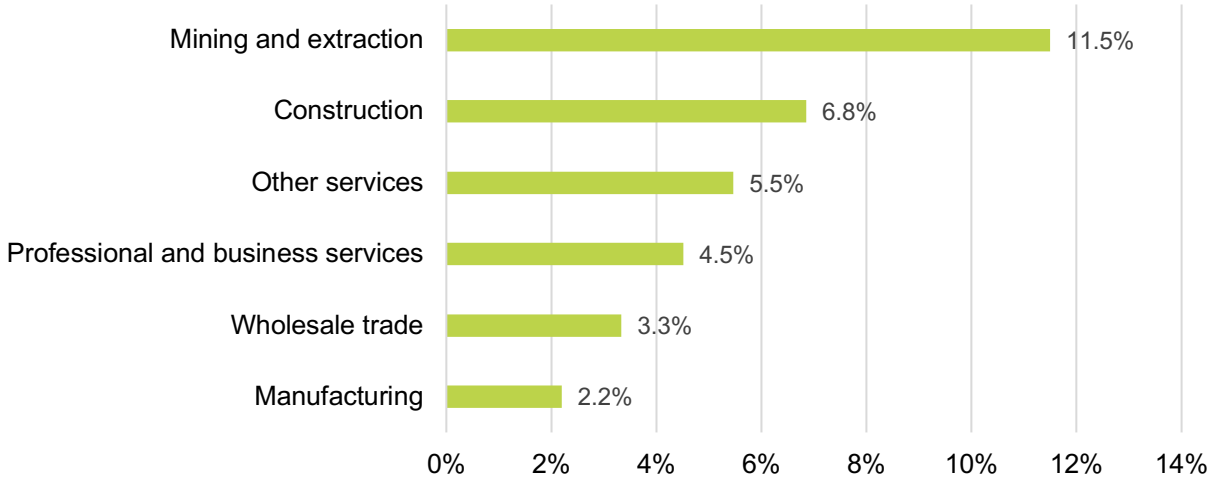
Professional and business services and mining and extraction firms were the only two industries within onshore petroleum fuels that had anticipated a decline in employment from 2021 to 2022. In fact, all industries registered growth from 2021 to 2022, ranging from 2.1% in manufacturing to 27.2% in mining and extraction (Figure 69).

Figure 69. Onshore Petroleum Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



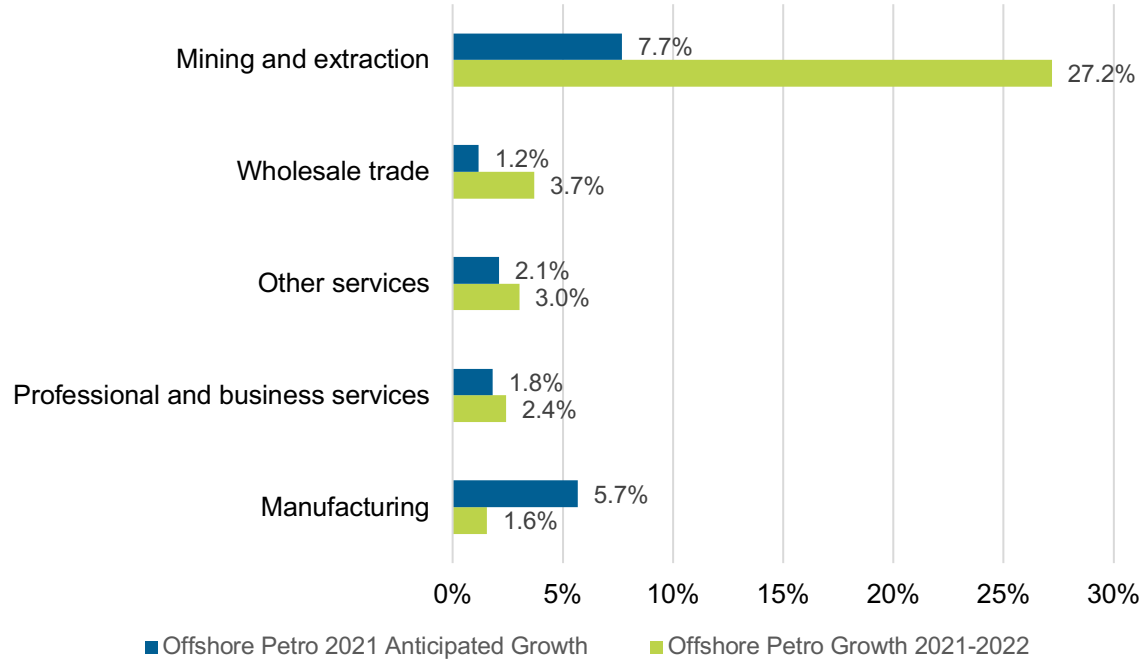
Offshore petroleum fuels employers across all industries expect growth in 2023, with mining and extraction firms the most optimistic, anticipating 11.5% growth (Figure 70).

Figure 70. Offshore Petroleum Fuels Anticipated Employment Changes by Industry, 2022-2023



Firms from all industries involved with offshore petroleum fuels, had anticipated growth from 2021 to 2022 and each registered greater growth than expected, except for manufacturing (Figure 71).

Figure 71. Offshore Petroleum Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Petroleum Fuels Demographics

Petroleum fuels was less gender diverse than the overall energy workforce and the national workforce average, with males making up 75% of the petroleum fuels workforce compared to the 73% energy workforce average and 53% national workforce average (Table 20).

The proportion of Hispanic or Latino workers in the petroleum fuels sector was lower than both the energy workforce average and the national workforce average (15% compared to 18%, respectively). The proportion of non-white workers in petroleum fuels was lower than the energy workforce average (24% compared to 25%) but higher than the overall U.S. workforce average (23%). Demographic proportions in petroleum fuels were also lower compared to the energy workforce average for Asian workers (6% compared to 7%), Native Hawaiian or other Pacific Islander workers (<1% compared to 1%), and workers of two or more races (4% compared to 5%).

Black or African American workers were more represented in petroleum fuels than in the overall energy workforce (10% compared to 9%) but less represented when compared to the economy-wide average (13%). The proportion of American Indian or Alaska Native workers was the same as the energy workforce average (2%).

The proportion of veteran workers in petroleum fuels was the same as the energy workforce average (9%) and nearly double the share of veterans in the U.S. workforce as a whole (5%).

The proportion of workers aged 55 or older was higher than the energy workforce average (18% compared to 17%). Workers under the age of 30 were slightly more represented in petroleum fuels than in the overall energy workforce (31% compared to 30%).

The proportion of formerly incarcerated workers was the same as the energy workforce average (1%) and lower than the national workforce average (2%). The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce average (7% compared to 11%) but on par with the national private sector average (7%).

Table 20. Petroleum Fuels Workforce Demographics and Characteristics

	Number of Workers	Petroleum Fuels Average	Energy Workforce Average	National Workforce Average
Male	389,378	75%	73%	53%
Female	131,826	25%	26%	47%
Gender Nonbinary	498	<1%	<1%	n/a
Hispanic or Latino	80,004	15%	18%	19%
Not Hispanic or Latino	441,698	85%	82%	82%
American Indian or Alaska Native	9,027	2%	2%	<1%
Asian	31,774	6%	7%	7%
Black or African American	51,722	10%	9%	13%
Native Hawaiian or Other Pacific Islander	5,110	<1%	1%	<1%
White	397,720	76%	75%	77%
Two or More Races	22,395	4%	5%	3%
Unknown Race	3,954	<1%	<1%	n/a
Veterans	47,091	9%	9%	5%
18 to 29	164,003	31%	30%	22%
30 to 54	261,603	50%	53%	54%
55 and Over	96,096	18%	17%	24%
Disability	6,040	1%	2%	4%
Formerly Incarcerated	7,152	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	35,366	7%[52]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[52] Unionization rates vary by state.

Natural Gas

Natural gas fuels employed 262,886 workers in 2022, up 51,114 from the 211,772 employed in 2021 (+24.1%). The majority of natural gas workers in the United States — 241,755 — worked in onshore natural gas, while the remaining 21,131 worked in offshore natural gas.

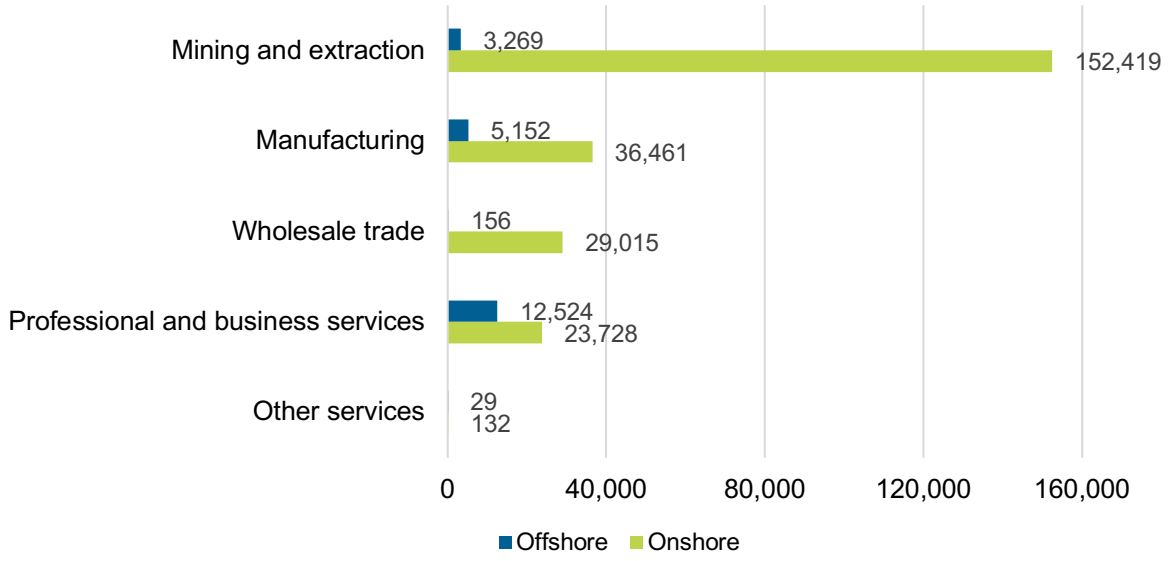
Trends and Key Takeaways

- The largest natural gas fuels job gains were in the mining and extraction industry, with 47,404 new jobs (+43.8%), followed by professional and business services, with 1,996 added jobs (+5.8%), wholesale trade, with 974 added jobs (+3.5%), and manufacturing, with 740 added jobs (+1.8%).
- In natural gas fuels, the male workforce share was the same as the energy workforce average of 73% and much higher when compared to the national workforce average of 53%.
- Hispanic or Latino workers were less represented in natural gas fuels than in both the overall energy workforce and the overall national workforce (14% compared to 18% and 19%, respectively).
- Natural gas fuels employers had a lower percentage of non-white workers than the energy workforce average (24% compared to 25%) but higher when compared to the U.S. workforce average (23%). This is largely attributable to a lower proportion of Asian (5% compared to 7%), American Indian or Alaska Native (1% compared to 2%), and Native Hawaiian or other Pacific Islander (<1% compared to 1%) workers than energy workforce averages.
- The proportion of Black or African American workers in natural gas fuels was the same as the energy workforce average (9%) but lower than the national workforce average of 13%. Workers of two or more races were more represented in natural gas than in the overall energy workforce (7% compared to 5%).
- The proportion of veteran workers in natural gas fuels was equivalent to the energy workforce average, at 9%, and nearly double the national workforce average of 5%.
- The percentage of workers in natural gas fuels represented by a union or covered under a project labor or collective bargaining agreement (7%) was lower than the energy workforce average (11%) and similar to the national private sector average (7%).
- The proportion of individuals requesting accommodations for disabilities was the same as the energy workforce average (2%) and half when compared to the national workforce average (4%).
- The percentage of formerly incarcerated workers was higher than the energy workforce average (2% compared to 1%) and the same when compared to the U.S. workforce as a whole (2%).

Employment by Industry

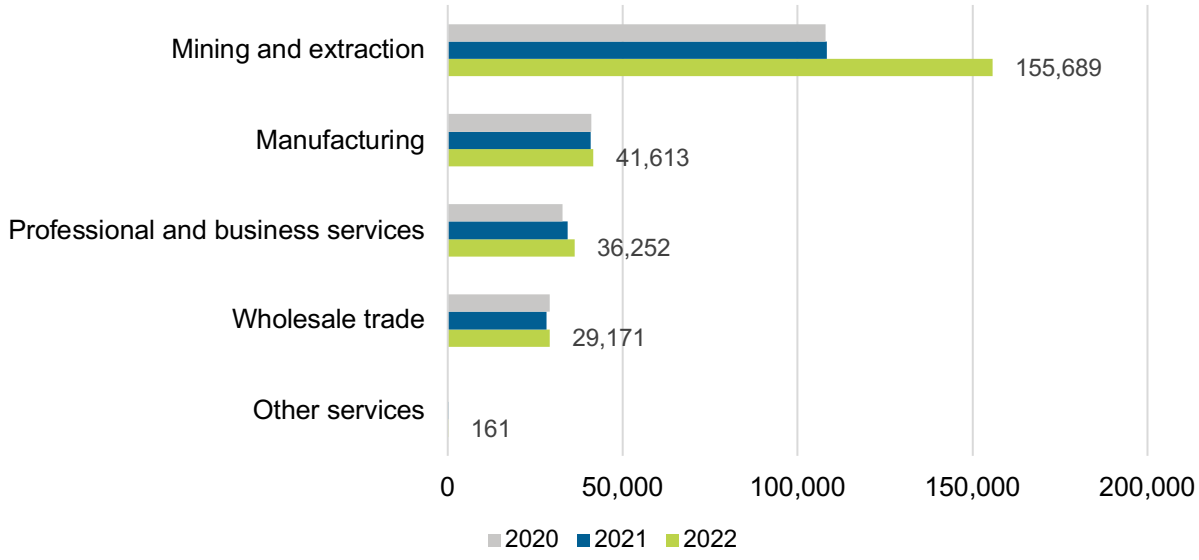
The 2023 USEER splits natural gas fuels into onshore and offshore categories. Figure 72 displays employment between the two categories by industry. Onshore natural gas fuels firms employed a total of 241,755 workers in 2022, while offshore firms had 21,131 workers. Onshore natural gas fuels represented 91.9% of all natural gas fuels employment.

Figure 72. Onshore and Offshore Natural Gas Fuels Employment by Industry



The largest number of natural gas fuels workers were in the extraction industry, which had 155,689 workers, representing 59.2% of the total technology (Figure 73). This was up 43.8%, or 47,404 additional jobs, from 2021.

Figure 73. Natural Gas Fuels Employment by Industry, 2020-2022

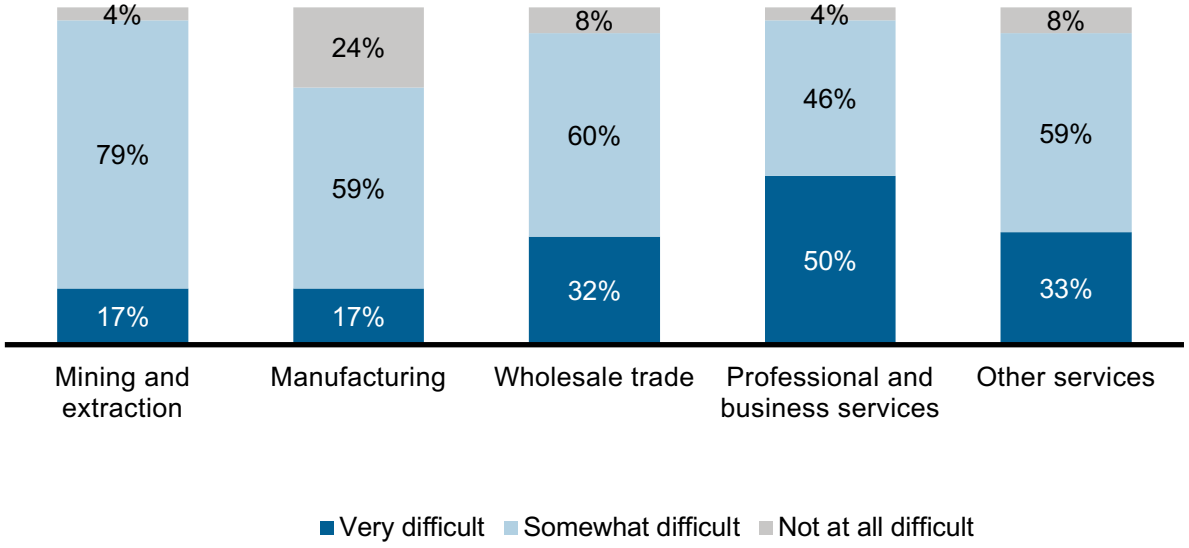


Employer Perspective on Workforce Issues

Current Hiring Difficulty

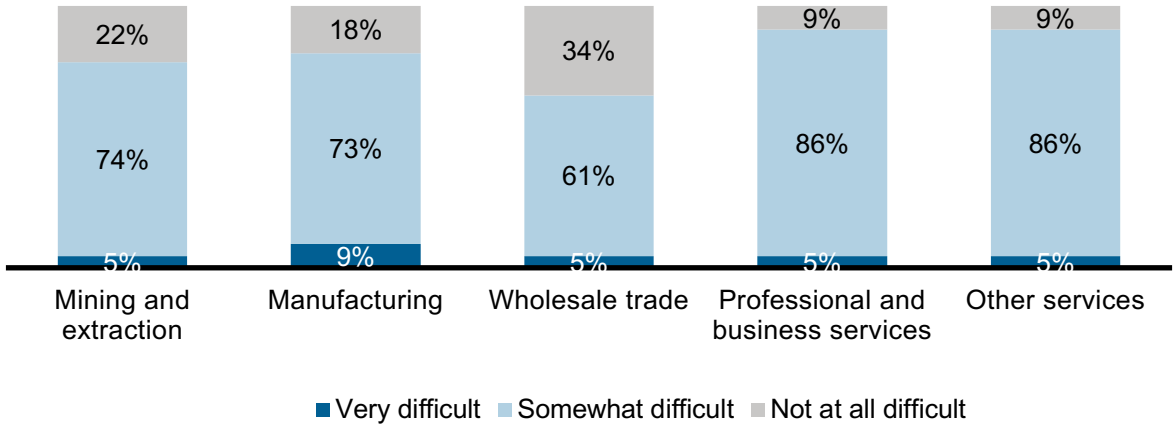
In onshore natural gas fuels, professional and business services and mining and extraction employers reported the highest hiring difficulty, with 96% of respondents for each indicating at least some difficulty (Figure 74). Professional and business services had the highest percentage of employers indicating that it was “very difficult” to hire for onshore natural gas fuels (50%).

Figure 74. Onshore Natural Gas Fuels Hiring Difficulty



In offshore natural gas fuels, professional and business services, and other services employers had the highest reported hiring difficulty, with 91% of respondents indicating at least some difficulty (Figure 75). Manufacturing had the highest proportion of employers indicating that it was “very difficult” to hire for offshore natural gas fuels (9%).

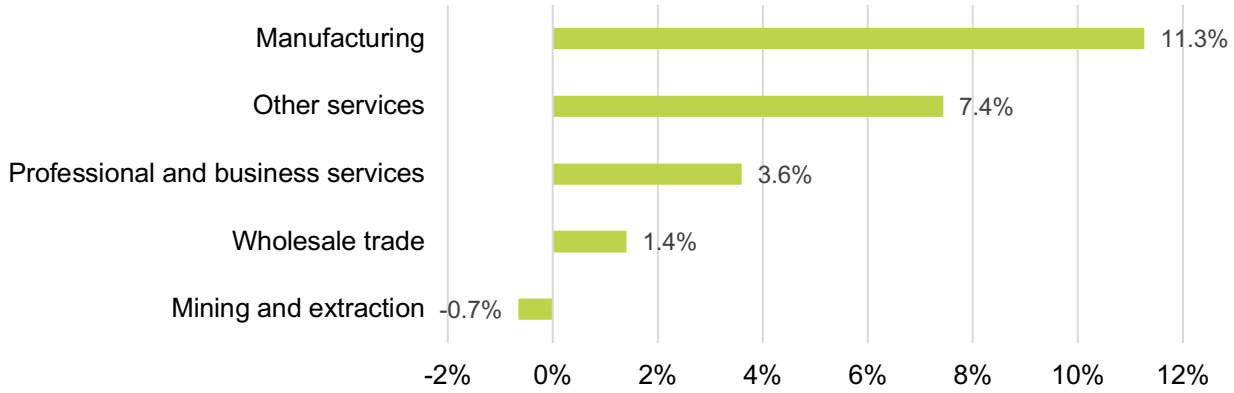
Figure 75. Offshore Natural Gas Fuels Hiring Difficulty



Employment Change by Industry

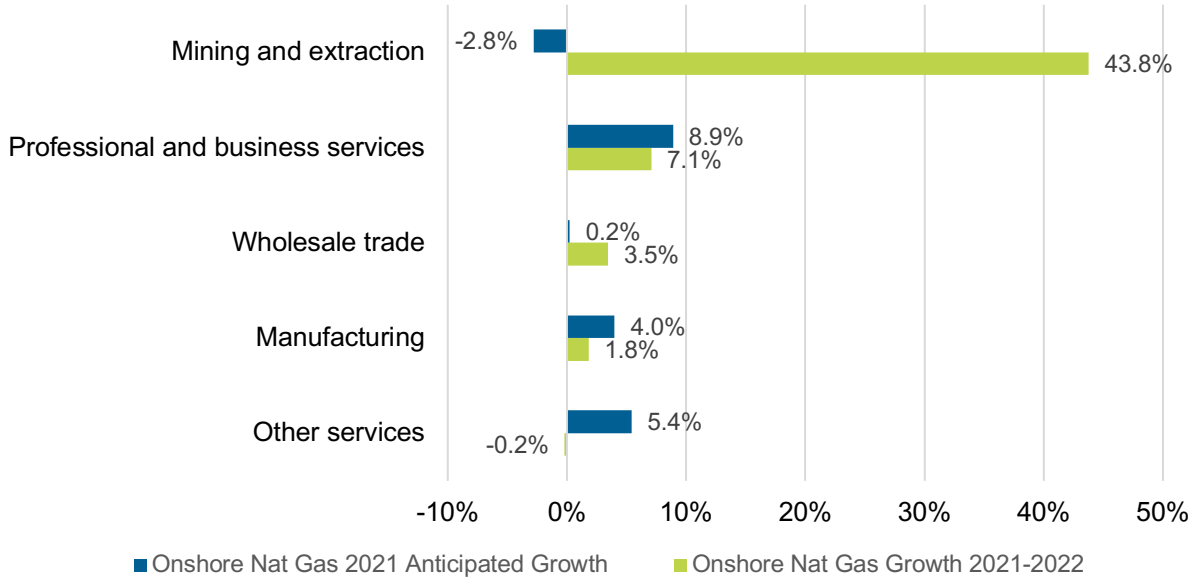
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Onshore natural gas growth expectations through 2023 range from 1.4% for wholesale trade, distribution, and transport employers to 11.3% for manufacturing firms. Mining and extraction firms in onshore natural gas fuels anticipate a decline in employment over the next year of just under 1% (Figure 76).

Figure 76. Onshore Natural Gas Fuels Anticipated Employment Change, 2022-2023



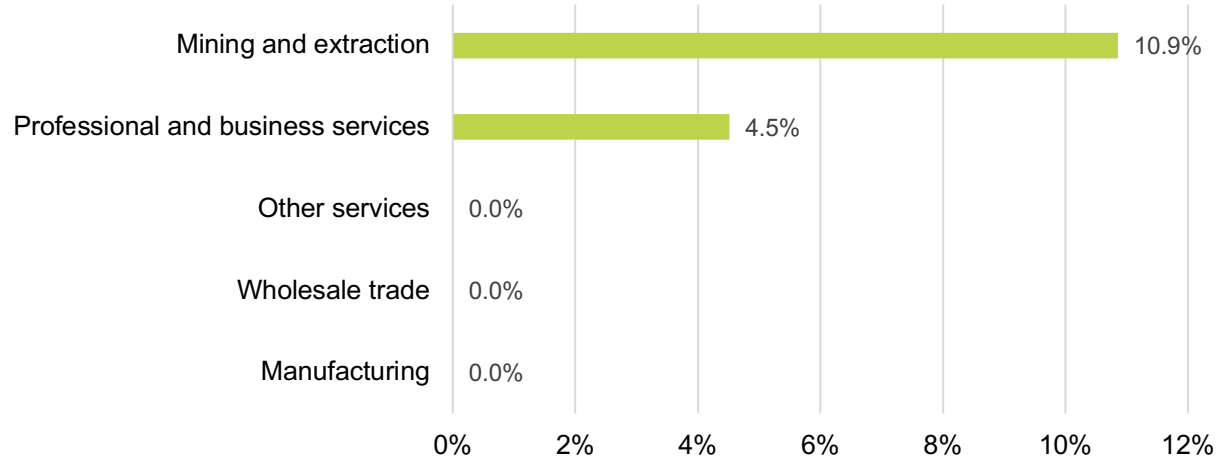
Mining and extraction employers were the only industry within onshore natural gas to anticipate a decline in employment from 2021 to 2022. Professional and business services (+7.1%), wholesale trade, (+3.5%), manufacturing (+1.8%), and mining and extraction (+43.8%) underwent growth, while other services remained flat (-0.2%) year-over-year (Figure 77).

Figure 77. Onshore Natural Gas Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



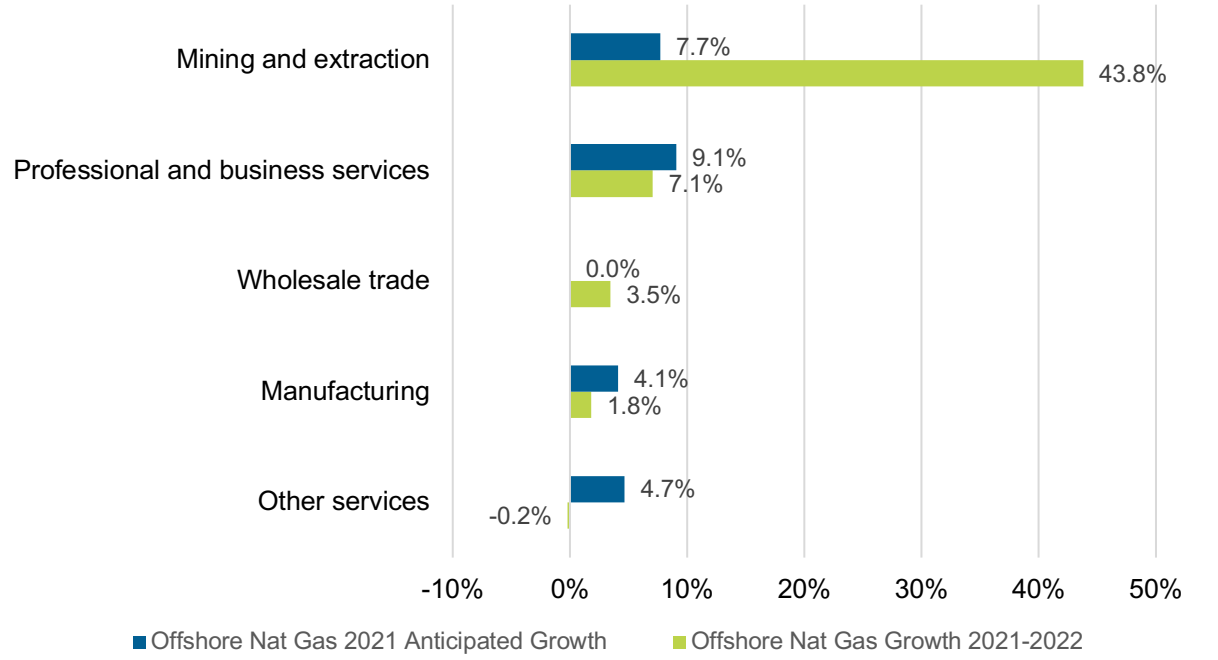
Offshore natural gas fuels employers anticipate growth ranging from 4.5% in professional and business services to 10.9% in mining and extraction through 2023. Employers in manufacturing, wholesale trade, and other services do not anticipate changes in employment in 2023 (Figure 78).

Figure 78. Offshore Natural Gas Fuels Anticipated Employment Changes, 2022-2023



Firms in four out of five industries within offshore natural gas fuels had anticipated growth from 2021 to 2022, according to last year's USEER, while wholesale trade firms did not expect a change in employment. Other services within offshore natural gas fuels was the only industry to not add jobs from 2021 to 2022 (Figure 79).

Figure 79. Offshore Natural Gas Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Natural Gas Fuels Demographics

Natural gas fuels was slightly more gender diverse than the energy workforce, with women making up 27% of employment compared to 26% overall (Table 21). This was much lower when compared to the overall national workforce average of 43%.

The proportion of the workforce made up of Hispanic or Latino workers was lower (14%) than both the energy workforce average of 18% and the U.S. economy-wide average of 19%. The share of non-white workers in natural gas fuels was slightly lower than the energy workforce average (24% compared to 25%) but higher when compared to the national workforce average of 23%.

The concentration of veterans was the same as the energy workforce average (9%) and nearly double the U.S. workforce average of 5%. The share of formerly incarcerated individuals (2%) was higher than the energy workforce average (1%) but similar to the national workforce overall (2%). The proportion of workers requesting accommodations for disabilities (2%) was the same as the energy workforce average and half the proportion of workers requesting accommodations for disabilities in the national workforce overall (4%).

The percentage of workers under the age of 30 was larger in natural gas fuels than across energy as a whole (32% compared to 30%). Workers between the ages of 30 and 54 were less represented in natural gas fuels than the energy workforce average (48% compared to 53%). The percentage of workers aged 55 or older was larger than the energy workforce average (20% compared to 17%).

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce as a whole (7% compared to 11%) but in line with the national private sector average (7%).

Table 21. Natural Gas Fuels Workforce Demographics and Characteristics

	Number of Workers	Petroleum Fuels Average	Energy Workforce Average	National Workforce Average
Male	192,154	73%	73%	53%
Female	70,479	27%	26%	47%
Gender Nonbinary	254	<1%	<1%	n/a
Hispanic or Latino	37,485	14%	18%	19%
Not Hispanic or Latino	225,402	86%	82%	82%
American Indian or Alaska Native	3,811	1%	2%	<1%
Asian	14,048	5%	7%	7%
Black or African American	24,070	9%	9%	13%
Native Hawaiian or Other Pacific Islander	1,308	<1%	1%	<1%
White	199,879	76%	75%	77%
Two or More Races	17,891	7%	5%	3%
Unknown Race	1,880	<1%	<1%	n/a
Veterans	22,699	9%	9%	5%
18 to 29	82,851	32%	30%	22%
30 to 54	126,992	48%	53%	54%
55 and Over	53,044	20%	17%	24%
Disability	5,861	2%	2%	4%
Formerly Incarcerated	3,966	2%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	18,481	7%[53]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[53] Unionization rates vary by state.

Coal Fuels

Coal fuels employed 64,858 workers in 2022, up 11,546 from the 53,312 employed in 2021 (+21.7%).

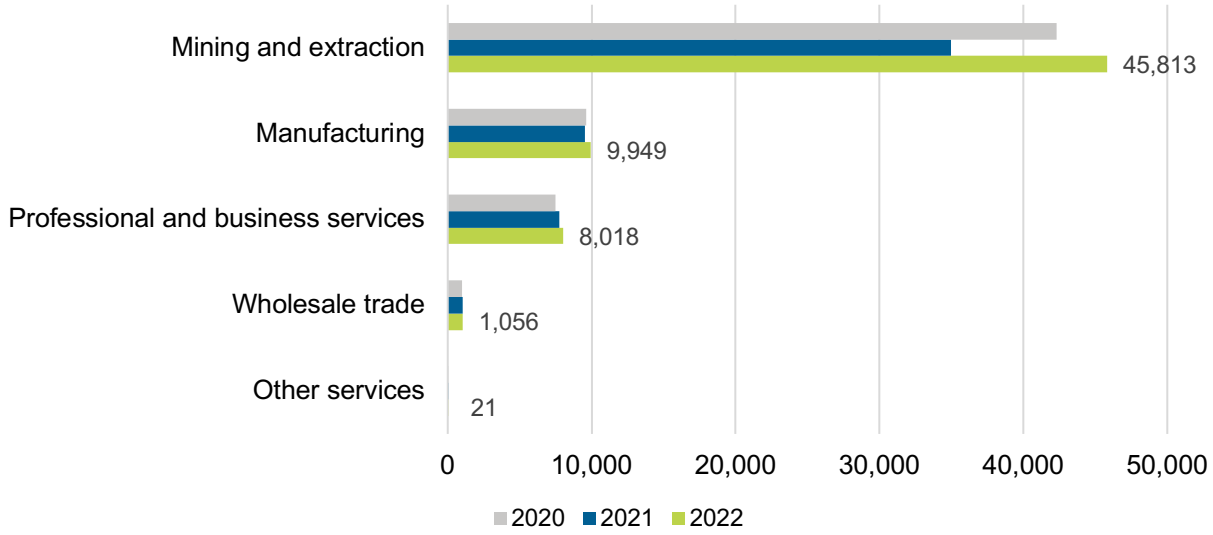
Trends and Key Takeaways

- The largest job gains in coal fuels were in the extraction industry, with 10,843 added jobs (+31%), followed by manufacturing, with 413 added jobs (+4.3%), professional and business services, with 260 added jobs (+3.4%), and wholesale trade, with 31 added jobs (3.1%). Other services jobs declined slightly.
- Firms within all five industries that make up coal fuels anticipate growth through 2023. Employer estimates range from 0.2% growth in wholesale trade to 7.7% growth in manufacturing.
- The coal fuels workforce was disproportionately male, with greater male representation than the overall energy workforce (74% compared to 73%) and national workforce overall (53%).
- Hispanic or Latino workers were less represented in coal fuels than in both the overall energy workforce and U.S. workforce overall (14% compared to 18% and 19%, respectively).
- The share of non-white workers in coal fuels was lower compared to both the overall energy workforce and national workforce averages (17% compared to 25% and 23%, respectively). This is attributable to lower-than-average proportions of Asian workers (5% compared to 7%) and workers of two or more races (3% compared to 5%) in coal fuels than in the energy workforce overall.
- Black or African American workers were underrepresented in coal fuels, making up 5% of the workforce compared to 9% of the overall energy workforce and 13% economy-wide.
- The proportion of veteran workers in coal fuels was the same as the energy workforce average, at 9%, and nearly double when compared to the national workforce average (5%).
- The percentage of workers in coal fuels represented by a union or covered under a project labor or collective bargaining agreement (12%) was higher than both the energy workforce average (11%) and the national private sector average (7%).
- The proportion of individuals requesting accommodations was the same as the energy workforce average (2%) and lower when compared to the national workforce a whole (4%).
- The percentage of formerly incarcerated individuals was the same as the energy workforce average (1%) and lower than the national workforce average of 2%.

Employment by Industry

The largest number of coal fuels employees worked at firms in the extraction industry (45,813 workers) (Figure 80). Extraction firms also accounted for the most job gains, increasing by 10,843 workers from 2021 to 2022.

Figure 80. Coal Fuels Employment by Industry, 2020-2022

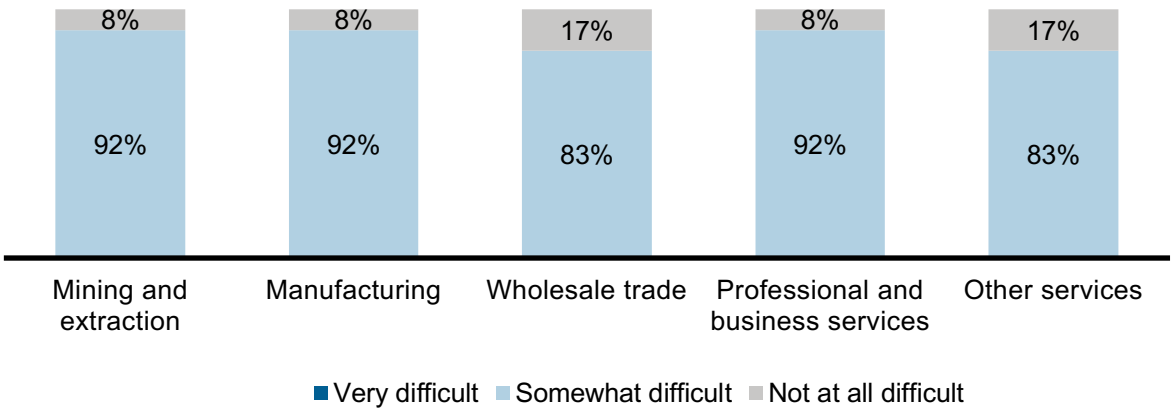


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within coal fuels industries, mining and extraction, manufacturing, and professional and business services employers had the greatest difficulty hiring workers (Figure 81). Approximately 92% of employers in each of these three industries reported finding qualified workers as "somewhat difficult." Other services and wholesale trade firms in coal fuels reported the least difficulty hiring, with 17% stating that it was "not at all difficult" to find qualified workers. No firms indicated that hiring was "very difficult."

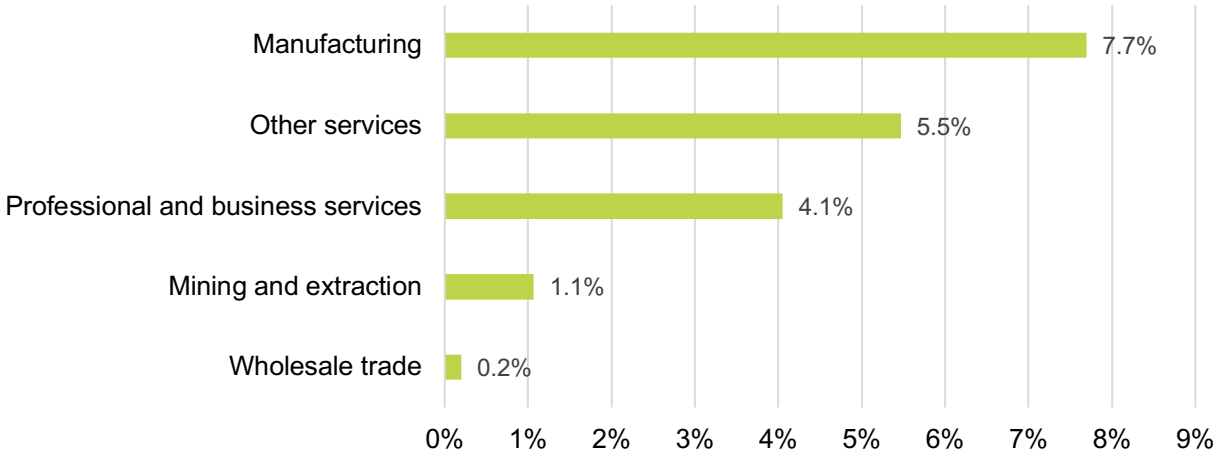
Figure 81. Coal Fuels Hiring Difficulty



Employment Change by Industry

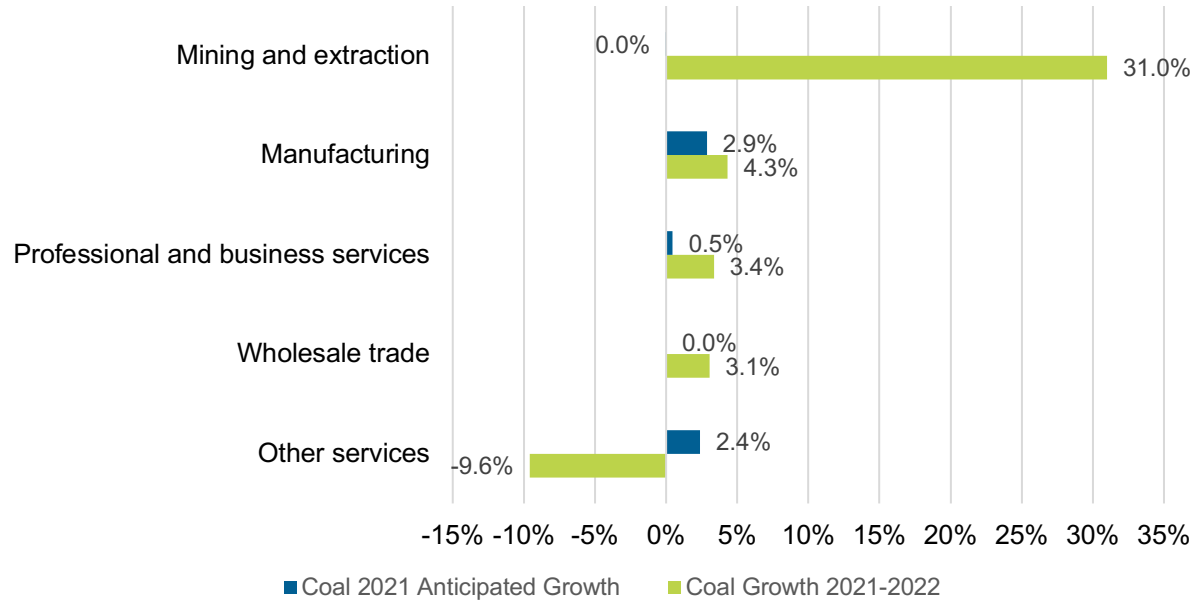
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As illustrated in Figure 82, employers across all industries in coal fuels anticipate positive growth through 2023. Growth estimates range from 0.2% in wholesale trade, distribution, and transport to 7.7% in manufacturing.

Figure 82. Coal Fuels Anticipated Employment Change, 2022-2023



Mining and extraction firms in coal fuels had anticipated no growth from 2021 to 2022; however, the industry increased employment by 31% over the period (Figure 83).

Figure 83. Coal Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Coal Fuels Demographics

Coal fuels were slightly less diverse than the rest of the energy workforce in terms of gender; males made up 74% of the workforce, more than the 73% energy workforce average (Table 22). Coal fuels was much less diverse than the national workforce as a whole (53% male and 47% female). The proportion of the workforce made up of Hispanic or Latino workers was lower than the energy workforce average and the national workforce average (14% compared to 18% and 19%, respectively).

Non-white workers in coal fuels (17%) were less represented compared to the energy workforce average (25%) and national workforce average (23%). The proportion of Black or African American workers in coal fuels was lower than the both the energy workforce average and the economy-wide average (5% compared to 9% and 13%, respectively).

The concentration of veterans (9%) was the same as the energy workforce average and nearly double when compared to the U.S. workforce average (5%). The proportion of formerly incarcerated individuals was the same as the energy workforce average (1%) but lower than the national workforce overall (2%). Individuals requesting accommodations for disabilities were less represented in coal fuels (2%) when compared to the U.S. workforce as a whole (4%).

The coal fuels workforce had more workers under the age of 30 than the overall energy workforce (31% compared to 30%), which was also the case for workers aged 55 or older (23% compared to 17%).

The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average (12% compared to 11%) and the national private sector average of 7%.

Table 22. Coal Fuels Workforce Demographics and Characteristics

	Number of Workers	Coal Fuels Average	Energy Workforce Average	National Workforce Average
Male	48,156	74%	73%	53%
Female	16,478	25%	26%	47%
Gender Nonbinary	224	<1%	<1%	insufficient data
Hispanic or Latino	9,109	14%	18%	19%
Not Hispanic or Latino	55,749	86%	82%	82%
American Indian or Alaska Native	1,387	2%	2%	<1%
Asian	3,395	5%	7%	7%
Black or African American	3,470	5%	9%	13%
Native Hawaiian or Other Pacific Islander	854	1%	1%	<1%
White	53,653	83%	75%	77%
Two or More Races	1,665	3%	5%	3%
Unknown Race	433	<1%	<1%	n/a
Veterans	5,558	9%	9%	5%
18 to 29	20,182	31%	30%	22%
30 to 54	29,445	45%	53%	24%
55 and Over	15,231	23%	17%	24%
Disability	1,388	2%	2%	4%
Formerly Incarcerated	967	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	7,825	12%[54]	11%	11%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[54] Unionization rates vary by state.

Corn Ethanol Fuels

Corn ethanol fuels firms in the United States employed 35,152 workers in 2022, up 561 from the 34,592 employed in 2021 (+1.6%).

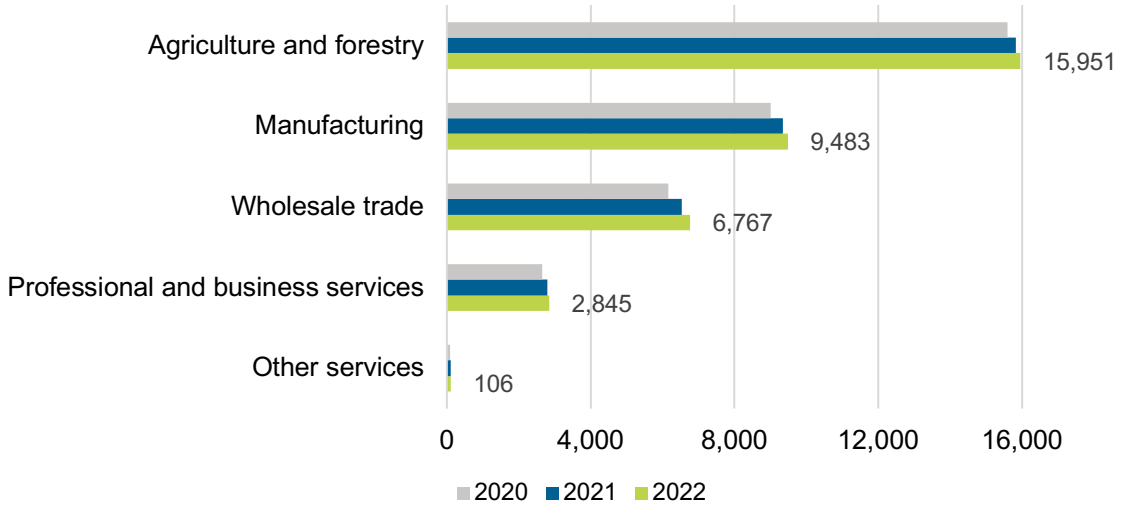
Trends and Key Takeaways

- The largest corn ethanol fuels job gains were in the wholesale trade industry, with 240 new jobs (+3.7%), followed by manufacturing, with 140 added jobs (+1.5%), agriculture, with 33 added jobs (+0.8%), and professional and business services, with 45 added jobs (+1.6%).
- Corn ethanol fuels employers in manufacturing, wholesale trade and professional and business services anticipate growth in 2023, with expectations ranging from 1.3% to 2.6%. Agriculture and forestry firms and other services firms anticipate no growth.
- Corn ethanol fuels was a more gender diverse workforce than the overall energy workforce, with 31% female workers compared to 26% in the energy workforce overall, but still lower than the 47% female worker share in the overall national workforce.
- Hispanic or Latino workers were less represented in corn ethanol fuels than in the overall energy workforce and the national workforce (11% compared to 18% and 19%, respectively).
- The proportion of non-white workers in corn ethanol fuels (20%) was lower than the energy workforce average (25%) and the overall U.S. workforce average (23%). This is attributable to a lower-than-average proportion of Asian workers (6% compared to 7%), American Indian or Alaska Native workers (1% compared to 2%), Black or African American workers (7% compared to 9%), and workers of two or more races (3% compared to 5%) in corn ethanol fuels than in the overall energy workforce.
- Veterans made up 15% of the corn ethanol fuels workforce, a higher concentration than the 9% energy workforce average and triple the share in the national workforce overall (5%).
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in corn ethanol fuels (7%) was lower than the energy workforce average (11%) but on par with the national private sector average of 7%.
- Individuals requesting accommodations for disabilities were twice as represented in corn ethanol fuels as they were in the overall energy workforce (4% compared to 2%).
- The percentage of formerly incarcerated individuals was lower than the energy workforce average (<1% compared to 1%).

Employment by Industry

The largest number of corn ethanol fuels jobs were in the agriculture industry, with 15,951 workers (Figure 84). This was up 133 from 2021 (+0.8%) and 361 from 2020. Wholesale trade firms contributed the largest number of new corn ethanol fuels jobs from 2021 to 2022, increasing by 240 or 3.7%.

Figure 84. Corn Ethanol Fuels Employment by Industry, 2020-2022

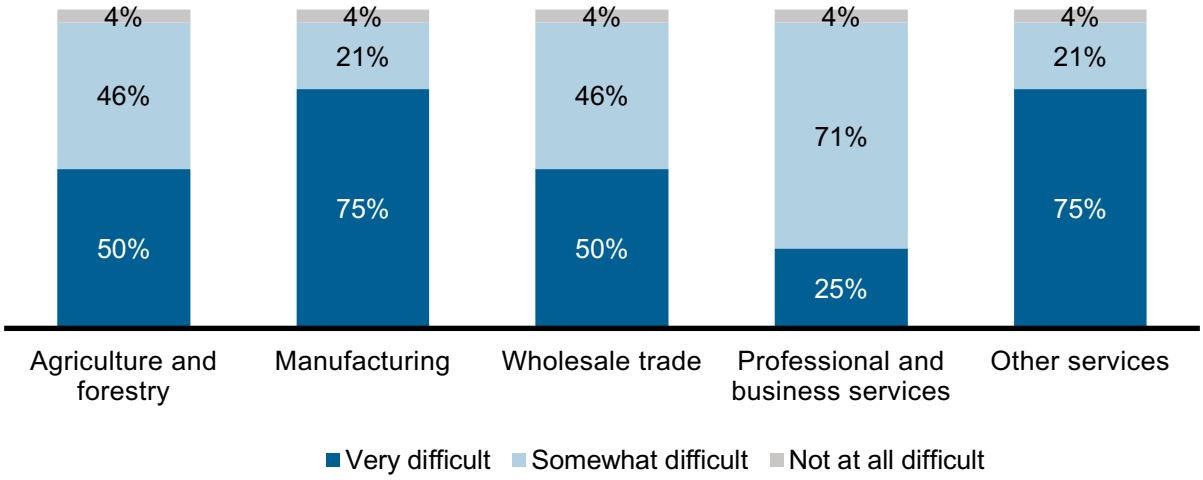


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within corn ethanol fuels industries, employers in across all industries had similar overall difficulty hiring workers (Figure 85). Three-quarters of manufacturing and "other services" firms within corn ethanol fuels reported that finding qualified candidates was "very difficult."

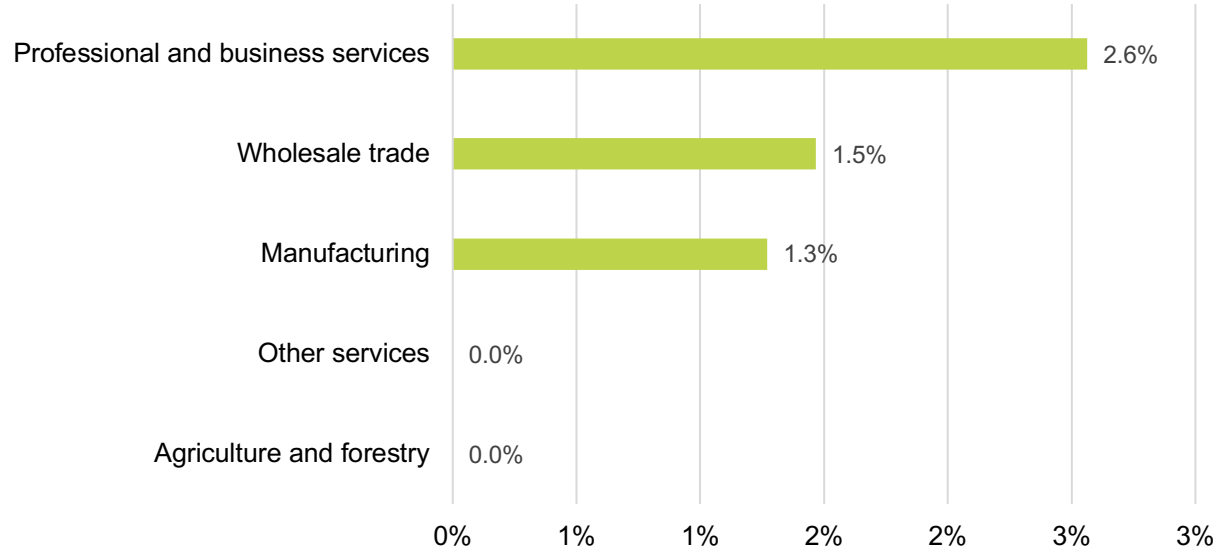
Figure 85. Corn Ethanol Fuels Hiring Difficulty



Employment Change by Industry

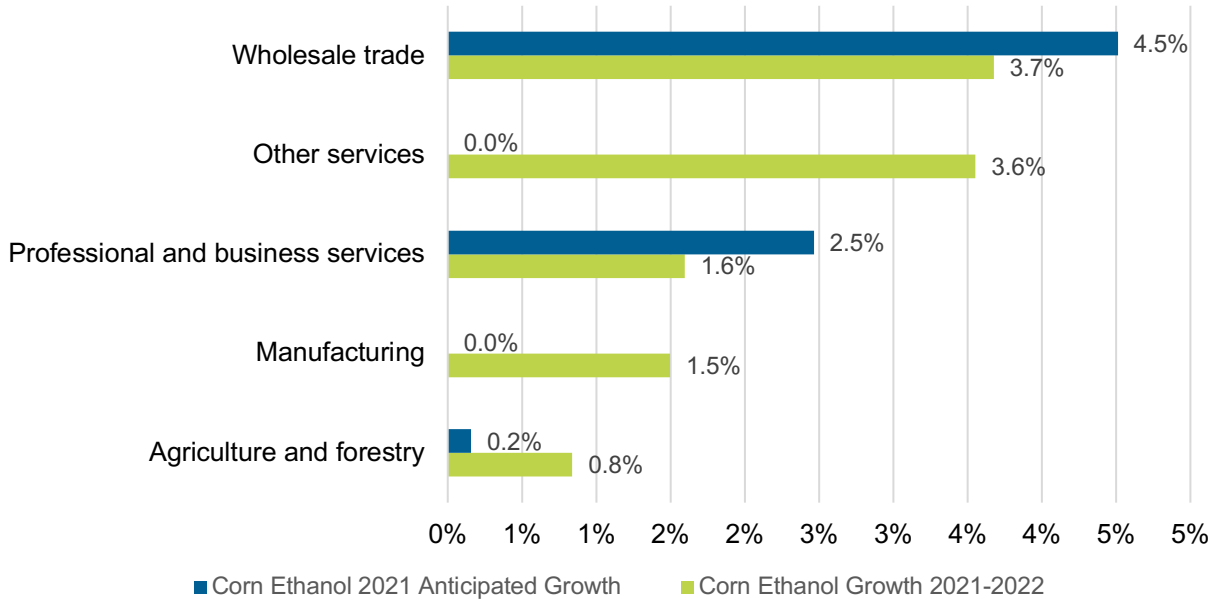
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As displayed in Figure 86, firms from three industries in corn ethanol fuels anticipated growth from 2022 to 2023: professional and business services (+2.6%), wholesale trade (+1.5%), and manufacturing (+1.3%). Other services and agriculture and forestry firms do not anticipate a change through 2023.

Figure 86. Corn Ethanol Fuels Anticipated Employment Change, 2022-2023



Wholesale trade (+4.5%), professional and business services (+2.5%), and agriculture and forestry (+0.2%) had anticipated growth from 2021 to 2022. Firms within each industry category in corn ethanol fuels underwent growth from 2022 to 2023 (Figure 87).

Figure 87. Corn Ethanol Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Corn Ethanol Fuels Demographics

Corn ethanol fuels was more gender diverse than the rest of the energy workforce; female employees made up 31% of the workforce, higher than the 26% energy workforce average (Table 23). However, corn ethanol fuels was less diverse when compared to the U.S. workforce as a whole (47% female workers).

The proportion of the workforce made up of Hispanic or Latino workers was lower than both the energy workforce and national workforce averages (11% compared to 18% and 19%, respectively). The proportion of non-white workers (20%) was lower than the energy workforce average (25%) and the overall national workforce average (23%). This is attributable to lower-than-average proportions of Asian workers (6% compared to 7%), American Indian or Alaska Native workers (1% compared to 2%), Black or African American workers (7% compared to 9%), and workers of two or more races (3% compared to 5%) within corn ethanol fuels.

The representation of veterans was higher than both the energy workforce average and the U.S. workforce average (15% compared to 9% and 5%, respectively). Workers requesting accommodations for disabilities were more represented in corn ethanol fuels when compared to the overall energy workforce (4% compared to 2%). Formerly incarcerated individuals were less represented in the corn ethanol fuels workforce (<1%) than the energy workforce average (1%) and the national workforce average (2%).

The share of workers aged 55 or older was higher in corn ethanol fuels than in the energy workforce overall (23% compared to 17%), while the share of workers under the age of 30 was lower than the overall energy workforce (28% compared to 30%).

The proportion of workers represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce average (7% compared to 11%) but similar to the national private sector average (7%).

Table 23. Corn Ethanol Fuels Workforce Demographics and Characteristics

	Number of Workers	Corn Ethanol Average	Energy Workforce Average	National Workforce Average
Male	23,957	68%	73%	53%
Female	10,958	31%	26%	47%
Gender Nonbinary	238	<1%	<1%	insufficient data
Hispanic or Latino	4,030	11%	18%	19%
Not Hispanic or Latino	31,123	89%	82%	82%
American Indian or Alaska Native	408	1%	2%	<1%
Asian	2,243	6%	7%	7%
Black or African American, Not Indigenous	2,335	7%	9%	13%
Native Hawaiian or Other Pacific Islander	634	2%	1%	<1%
White	28,235	80%	75%	77%
Two or More Races	885	3%	5%	3%
Veterans	5,400	15%	9%	5%
18 to 29	9,961	28%	30%	22%
30 to 54	17,091	49%	53%	54%
55 and Over	8,100	23%	17%	24%
Disability	1,413	4%	2%	4%
Formerly Incarcerated	124	<1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	2,463	7%[55]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[55] Unionization rates vary by state.

Other Biofuels

"Other biofuels" industries include any fuel made from biomatter that is not classified elsewhere in the USEER, such as non-woody biomass, renewable diesel fuels, biodiesel fuels, waste fuels, and ethanol not produced from corn. Firms in "other biofuels" employed 40,148 workers in 2022, an increase of 1,052 from the 39,096 employed in 2021 (+2.7%).

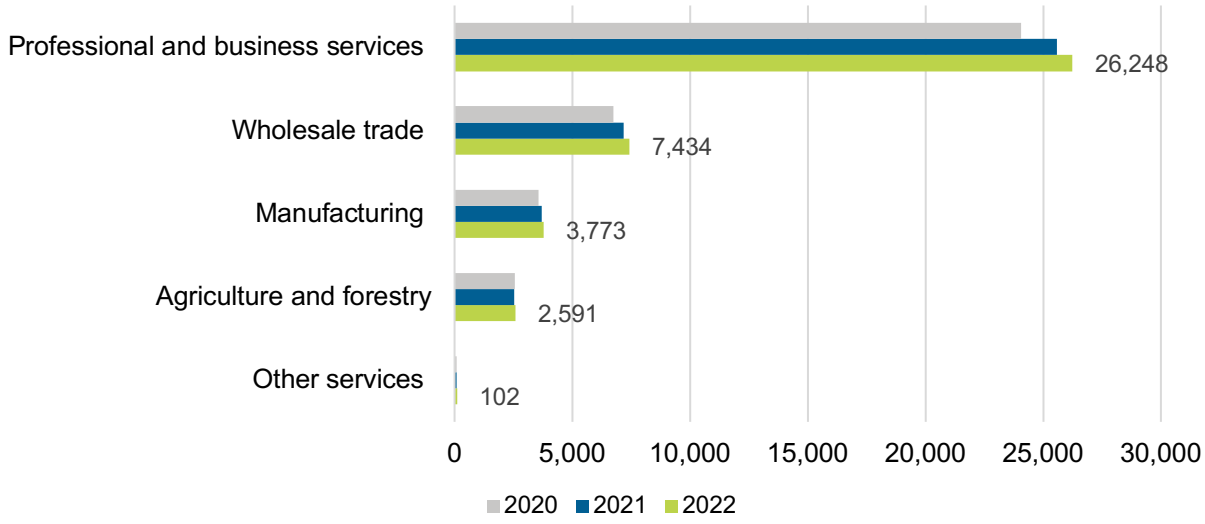
Trends and Key Takeaways

- The largest job gains were in the professional and business services industry, with 670 new jobs (+2.6%), followed by wholesale trade, with 255 added jobs (+3.6%), manufacturing, with 63 added jobs (+1.7%), and agriculture and forestry, with 59 added jobs (+2.3%).
- The majority of firms within "other biofuels" expect growth in 2023, ranging from 2.2% in manufacturing to 6.1% in professional and business services.
- The percentage of workers in "other biofuels" represented by a union or covered under a project labor or collective bargaining agreement (5%) was lower than the energy workforce average (11%) and the national private sector average (7%).
- "Other biofuels" was more gender diverse than the overall energy workforce, with a third of workers identified as female (33%) compared to 26% in the energy workforce overall. "Other biofuels" was less gender diverse than the national workforce as a whole (47% female workers).
- The share of non-white workers was the same as the energy workforce average (25%) and higher than the national workforce average (23%).
- Black or African American workers were more represented in "other biofuels" than in the overall energy workforce, making up 10% of the workforce compared to 9% of the overall energy workforce but they were underrepresented compared to the U.S. workforce as a whole (13%).
- Veterans were less represented in "other biofuels," at 8%, compared to the 9% energy workforce average.
- Individuals with requesting accommodations for disabilities were twice as represented in "other biofuels" as in the overall energy workforce (4% compared to 2%), which was only true for two other technologies within fuels: corn ethanol and woody biomass.

Employment by Industry

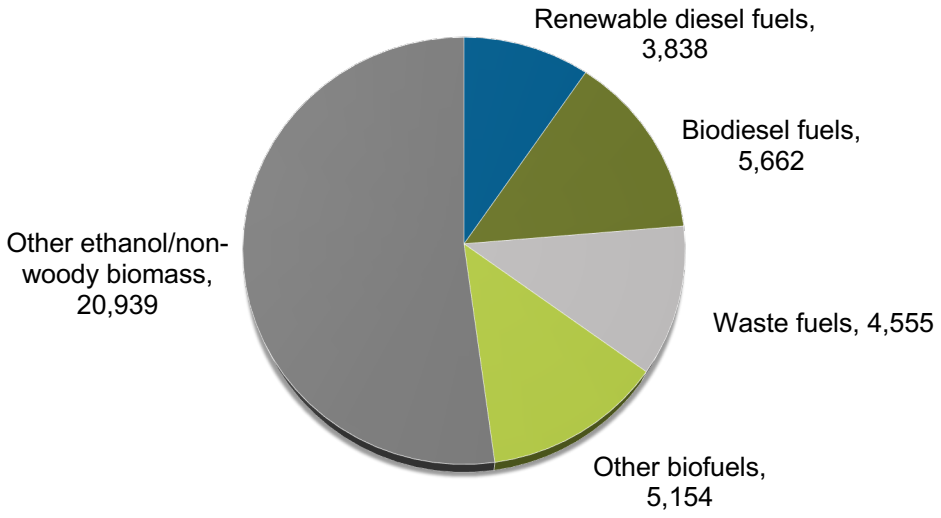
The largest number of "other biofuels" employees was in the professional and business services industry, with 26,248 workers (Figure 88). Professional and business services firms added the most jobs from 2021 to 2022 (+670 jobs, or +2.6%), followed by wholesale trade firms (+255 jobs, or +3.6%).

Figure 88. "Other Biofuels" Employment by Industry, 2020-2022



The 2023 USEER splits "other biofuels" into several components: other ethanol/non-woody biomass, renewable diesel fuels, biodiesel fuels, waste fuels, and other biofuels. Figure 89 illustrates how employment in these technologies was distributed. The largest component was other ethanol/non-woody biomass, with 20,939 workers, followed by biodiesel fuels, with 5,662 workers.

Figure 89. "Other Biofuels" by Component Fuels Technology

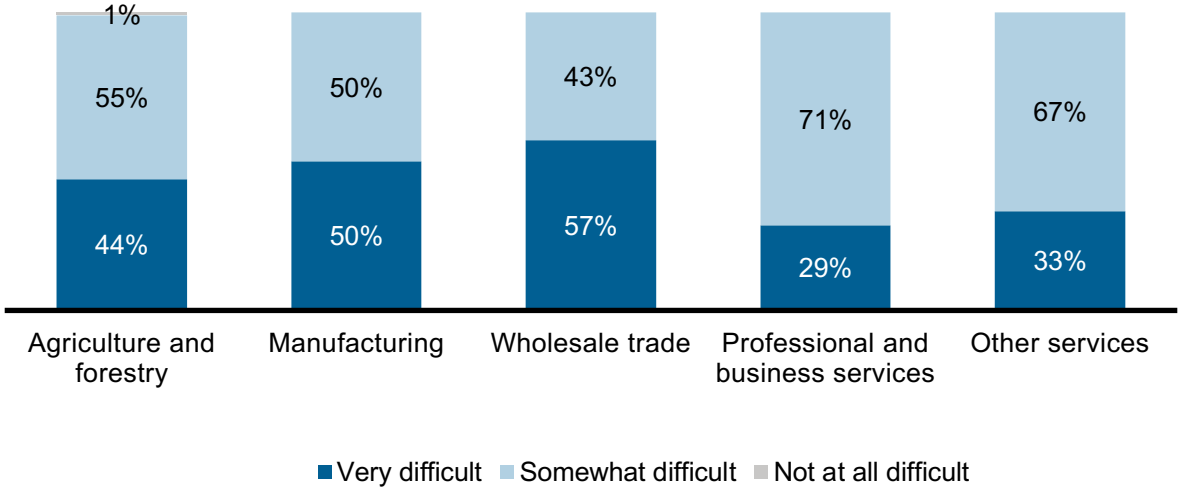


Employers Perspective on Workforce Issues

Current Hiring Difficulty

Firms within all "other biofuels" industries had difficulty finding qualified workers, with nearly all employers reporting it was at least "somewhat difficult" to hire (Figure 90).

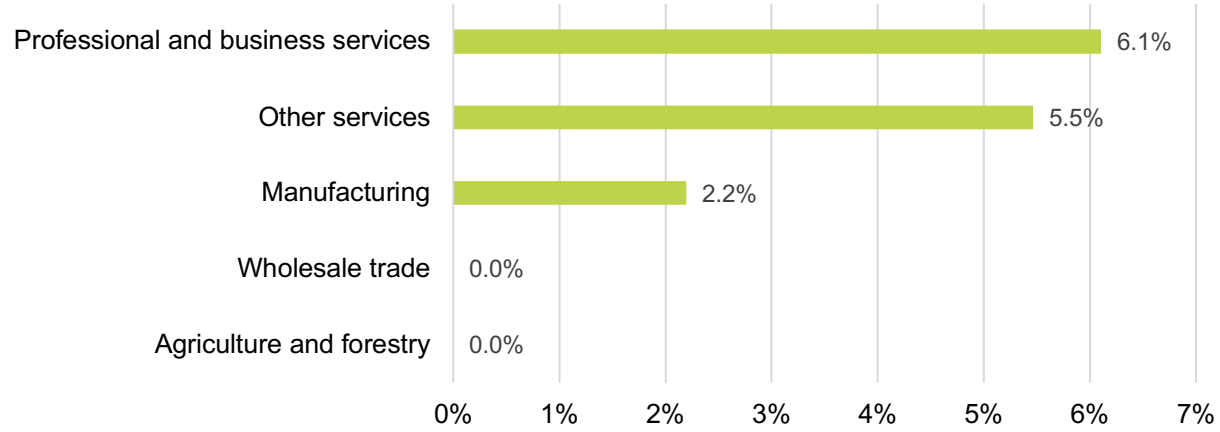
Figure 90. "Other Biofuels" Hiring Difficulty



Employment Change by Industry

The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Three industries within "other biofuels" expect growth through 2023, ranging from 2.2% in manufacturing to 6.1% in professional and business services (Figure 91). Firms in wholesale trade, distribution, and transport and agriculture and forestry anticipate no change in employment.

Figure 91. "Other Biofuels" Anticipated Employment Change, 2022-2023



"Other biofuels" was more diverse than the overall energy workforce in terms of gender; female employees made up 33% of the workforce, higher than the 26% energy workforce average (Table 24). Although a third of workers in "other biofuels" are female, it was still considerably less gender diverse than the U.S. workforce overall (47% female).

The proportion of the "other biofuels" workforce made up of Hispanic or Latino workers was lower than the energy workforce and overall national workforce averages (12% compared to 18% and 19%, respectively).

The proportion of non-white workers in "other biofuels" was the same as the energy workforce average (25%) and higher when compared to the national workforce overall.

The concentration of veterans was lower than the energy workforce average (8% compared to 9%) but still higher than the national workforce average (5%). The proportion of formerly incarcerated workers was the same as the energy workforce average (1%) but lower than the proportion economy-wide (2%). The proportion of workers requesting accommodations for disabilities was twice as high as the energy workforce average (4% compared to 2%) and in line with the national workforce average (4%).

The "other biofuels" workforce was younger than the overall energy workforce, with more workers under the age of 30 (31% compared to 30%) and between 30 and 54 years old (55% compared to 53%). Workers aged 55 and older were less represented in "other biofuels" than in the overall energy workforce (13% compared to 17%).

The share of workers represented by a union or covered under a project labor or collective bargaining agreement was lower than both the energy workforce average and the national private sector average (5% compared to 11% and 7%, respectively).

Table 24. "Other Biofuels" Workforce Demographics and Characteristics

	Number of Workers	"Other Biofuels" Average	Energy Workforce Average	National Workforce Average
Male	26,254	65%	73%	53%
Female	13,405	33%	26%	47%
Gender Nonbinary	489	1%	<1%	insufficient data
Hispanic or Latino	4,984	12%	18%	19%
Not Hispanic or Latino	35,165	88%	82%	82%
American Indian or Alaska Native	727	2%	2%	<1%
Asian	2,889	7%	7%	7%
Black or African American	3,873	10%	9%	13%
Native Hawaiian or Other Pacific Islander	783	2%	1%	<1%
White	30,270	75%	75%	77%
Two or More Races	1,047	3%	5%	3%
Veterans	3,275	8%	9%	5%
18 to 29	12,517	31%	30%	22%
30 to 54	22,219	55%	53%	54%
55 and Over	5,412	13%	17%	24%
Disability	1,759	4%	2%	4%
Formerly Incarcerated	569	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	1,962	5%[56]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[56] Unionization rates vary by state.

Woody Biomass and Cellulosic Biofuels

Woody biomass and cellulosic biofuels employed 34,164 workers in 2022, an increase of 266 from the 33,898 employed in 2021 (+0.8%).

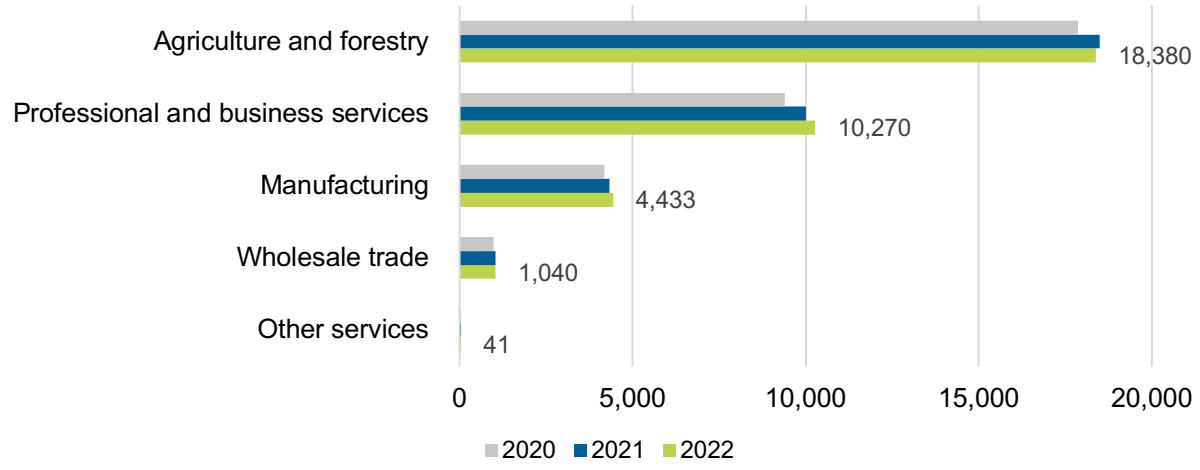
Trends and Key Takeaways

- The largest job gains in woody biomass and cellulosic biofuels were in the professional and business services industry, with 270 new jobs (+2.7%), followed by manufacturing, with 100 added jobs (+2.3%). Agriculture and forestry saw a decline of 110 jobs (-0.6%).
- Most employers within woody biomass and cellulosic biofuels expect growth through 2023, ranging from 0.2% in wholesale trade to 8.6% in manufacturing. Agriculture and forestry firms expected a 7% decline between 2022 and 2023.
- The percentage of workers in woody biomass and cellulosic biofuels represented by a union or covered under a project labor or collective bargaining agreement (8%) was lower than the overall energy workforce (11%) and slightly higher than the national private sector average (7%).
- The woody biomass and cellulosic biofuels workforce tended to be more gender diverse than the overall energy workforce, with a contingent of 30% female workers compared to 26% in the overall energy workforce, but still lower than the 47% female worker share in the national workforce overall.
- The proportion of non-white workers was lower than both the energy workforce average and the national workforce average (17% compared to 25% and 23%, respectively). This is attributable to lower-than-average representation of most minority races.
- Hispanic or Latino workers were less represented in woody biomass and cellulosic biofuels than in the overall energy workforce and overall national workforce (11% compared to 18% and 19%, respectively), which was also the case for Black and African American workers, at 5% compared to the 9% energy workforce average and 13% for the national workforce average.
- The woody biomass and cellulosic biofuels workforce had the highest proportion of veterans of energy technology: 16%. Corn ethanol and “other fuels” are closest in terms of veteran share, with 15% and 14%, respectively, among all other technologies in USEER. This was higher than the 9% energy workforce average and the 7% national private sector average.
- Woody biomass and cellulosic biofuels was one of only three technologies in which individuals requesting accommodations for disabilities were represented at a higher rate than the energy workforce (4% compared to 2%). Corn ethanol and “other biofuels” were the others with the same representation.

Employment by Industry

The largest number of woody biomass and cellulosic biofuels employees was in the agriculture and forestry industry, with 18,380 workers (Figure 92). The agriculture and forestry industry experienced a decline of 110 jobs from 2021 to 2022 (-0.6%). The industry sector with the largest gains was professional and business services, with 270 added jobs (+2.7%), followed by manufacturing, with 100 added jobs (+2.3%).

Figure 92. Woody Biomass and Cellulosic Biofuels Employment by Industry, 2020-2022

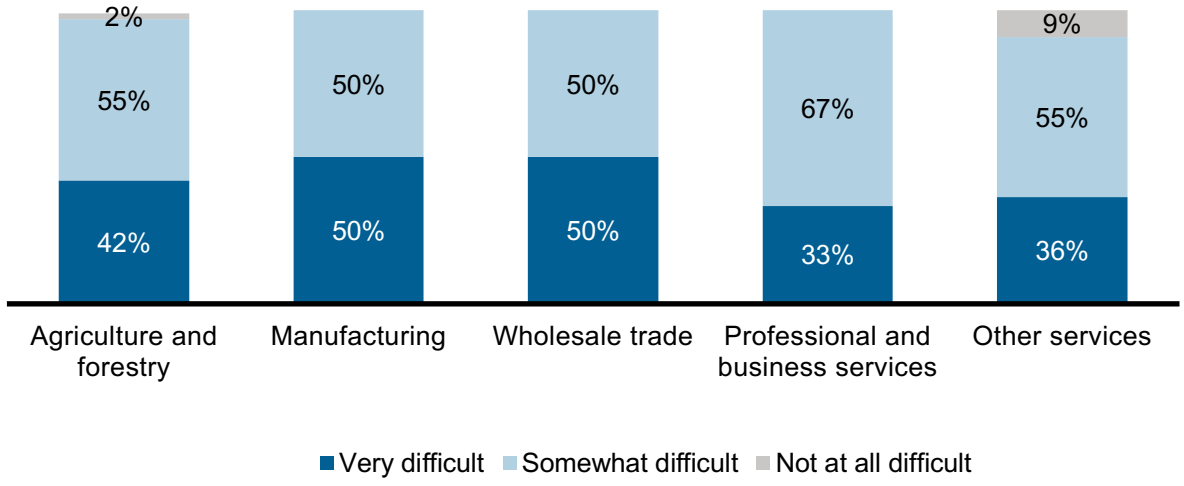


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within woody biomass and cellulosic biofuels, the manufacturing, wholesale trade, distribution, and transport and professional and business services industries had the greatest difficulty hiring workers, with 100% of employers claiming some level of difficulty (Figure 93). Nearly 98% of agriculture and forestry employers indicated difficulty finding qualified workers.

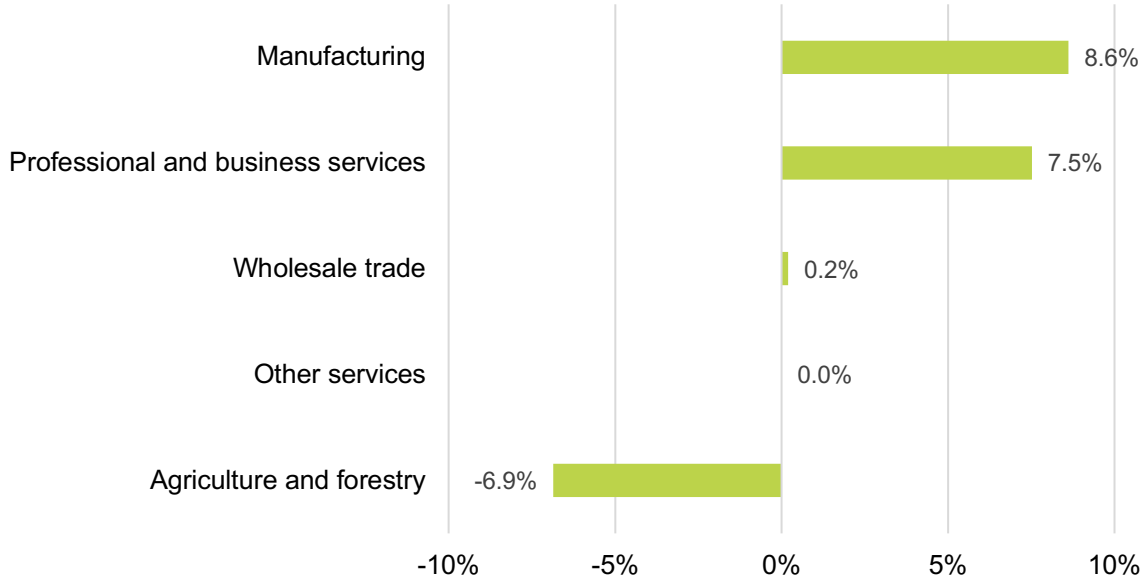
Figure 93. Woody Biomass and Cellulosic Biofuels Hiring Difficulty



Employment Change by Industry

The previous section highlighted employers' current hiring difficulty across industry in woody biomass and cellulosic biofuels, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As displayed in Figure 94, employers in manufacturing (+8.6%), professional and business services (+7.5%), and wholesale trade (+0.2%) expect growth through 2023. Firms in agriculture and forestry anticipate a decline from 2022 to 2023 (-6.9%).

Figure 94. Woody Biomass and Cellulosic Biofuels Anticipated Changes in Employment, 2022-2023



Woody Biomass and Cellulosic Biofuels Demographics

Woody biomass and cellulosic biofuels was more diverse than the rest of the energy workforce in terms of gender; female employees made up 30% of the workforce, higher than the 26% energy workforce average (Table 25). The proportion of female workers in woody biomass and cellulosic biofuels was lower than the proportion of female workers in the U.S. workforce overall (47%).

The proportion of Hispanic or Latino workers in woody biomass and cellulosic biofuels was 11% compared to 18% in the overall energy workforce and 19% in the national workforce overall.

The proportion of non-white workers was lower than both the energy workforce average and the national workforce average (17% compared to 25% and 23%, respectively), which is attributable to lower-than-average representation of all minority races in woody biomass and cellulosic biofuels.

The representation of veterans (16% compared to 9%) was higher than the energy workforce average and more than triple the representation in the U.S. workforce overall. Individuals requesting accommodations for disabilities were represented at twice the rate in woody biomass and cellulosic biofuels when compared to the energy workforce overall (4% versus 2%).

The share of those represented by a union or covered under a project labor or collective bargaining agreement (8% compared to 11%) was lower than the energy workforce average and slightly higher than the national private sector average (7%). The proportion of formerly incarcerated workers was greater than the overall energy workforce average and the national workforce average (3% compared to 1% and 2%, respectively). Although the proportion of workers under the age of 30 was similar to the energy workforce average (30%), woody biomass and cellulosic biofuels had an aging workforce, with workers aged 55 or older more represented than in the overall energy workforce (21% compared to 17%).

Table 25. Woody Biomass and Cellulosic Biofuels Workforce Demographics and Characteristics

	Number of Workers	Woody Biomass Average	Energy Workforce Average	National Workforce Average
Male	23,661	69%	73%	53%
Female	10,225	30%	26%	47%
Gender Nonbinary	278	<1%	<1%	insufficient data
Hispanic or Latino	3,612	11%	18%	19%
Not Hispanic or Latino	30,552	89%	82%	82%
American Indian or Alaska Native	400	1%	2%	<1%
Asian	1,807	5%	7%	7%
Black or African American	1,623	5%	9%	13%
Native Hawaiian or Other Pacific Islander	295	<1%	1%	<1%
White	28,486	83%	75%	77%
Two or More Races	1,055	3%	5%	3%
Veterans	5,401	16%	9%	5%
18 to 29	10,251	30%	30%	22%
30 to 54	16,707	49%	53%	54%
55 and Over	7,206	21%	17%	24%
Disability	1,219	4%	2%	4%
Formerly Incarcerated	937	3%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	2,677	8%[57]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[57] Unionization rates vary by state.

Nuclear Fuels

Nuclear fuels employed 9,264 workers in 2022, up slightly from the 9,181 employed in 2021; this represented just under a 1% growth rate.

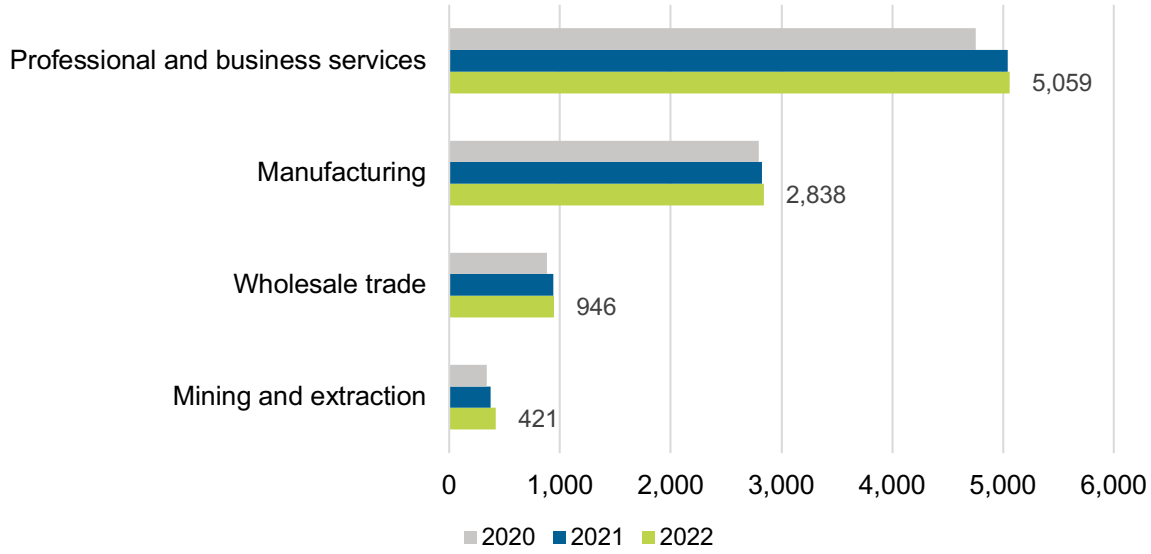
Trends and Key Takeaways

- The mining and extraction industry experienced the greatest job gains, with 48 new jobs (a 12.9% growth rate), followed by manufacturing, with 17 added jobs (+0.6%), professional and business services, with 15 added jobs (+0.3%), and wholesale trade, which remained flat.
- Employers in each industry within nuclear fuels anticipate growth in 2023, ranging from 0.2% in wholesale trade, distribution, and transport to 4.5% in professional and business services.
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in nuclear fuels (8%) was lower than the energy workforce average (11%) but higher than the national private sector average of 7%.
- The proportion of female workers in nuclear fuels (32%) was higher than the energy workforce average (26%) but lower than the U.S. workforce proportion (47%).
- Hispanic and Latino workers were less concentrated in nuclear fuels compared to the energy workforce average and the overall national workforce average (15% versus 18% and 19%, respectively).
- The percent of non-white workers in nuclear fuels was 29%, higher than the 25% energy workforce average and the 23% national workforce average.

Employment by Industry

The largest number of nuclear fuels employees was in the professional services industry (5,059 workers). The mining and extraction industry in nuclear fuels underwent the greatest increase in jobs in 2022, growing by 48 workers or an increase of 12.9% (Figure 95).

Figure 95. Nuclear Fuels Employment by Industry, 2020-2022

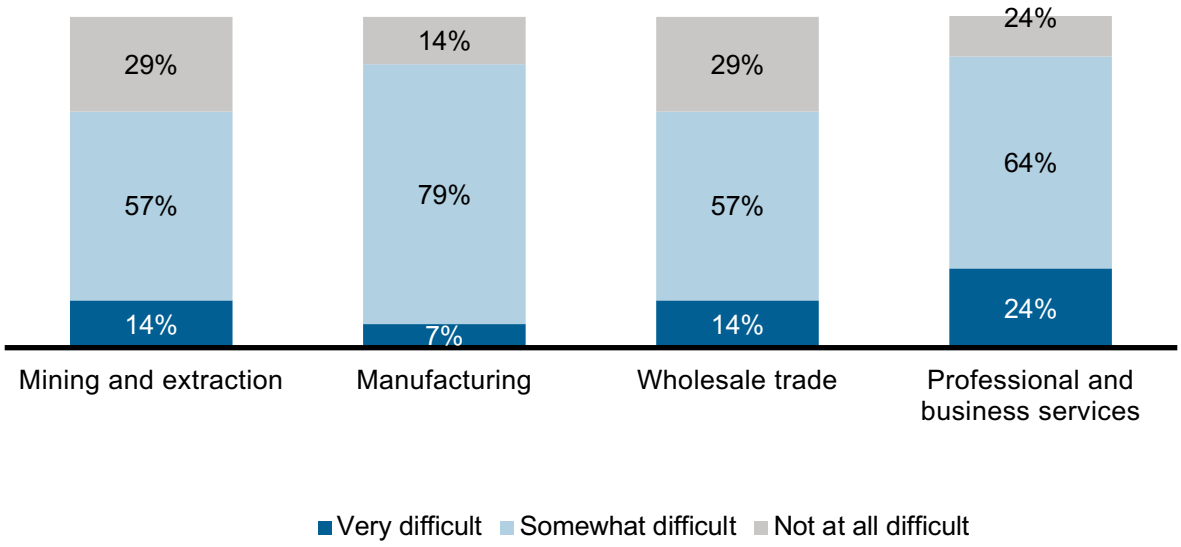


Employer Perspective on Workforce Issues

Current Hiring Difficulty

Within nuclear fuels, firms in manufacturing had the greatest difficulty hiring workers. Eighty-six percent of these employers reported at least some difficulty finding qualified workers (Figure 96).

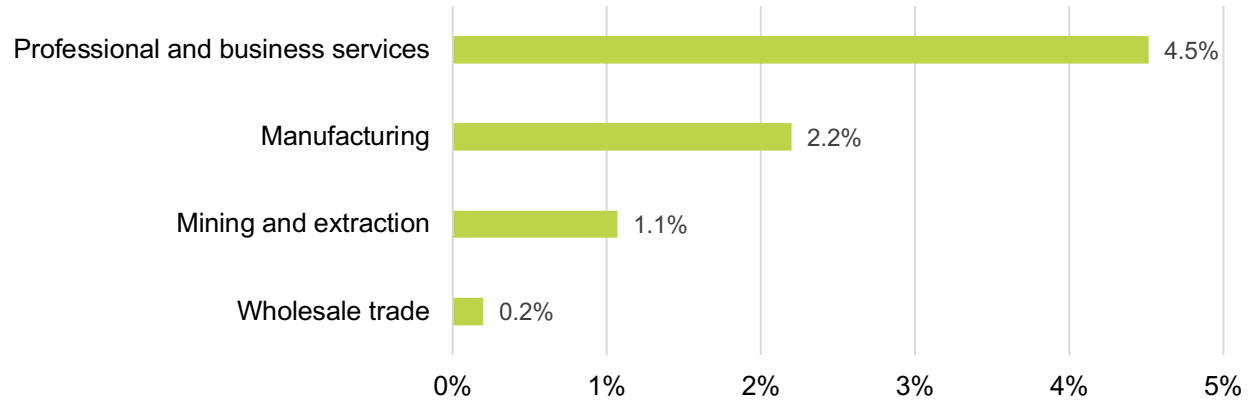
Figure 96. Nuclear Fuels Hiring Difficulty



Employment Change by Industry

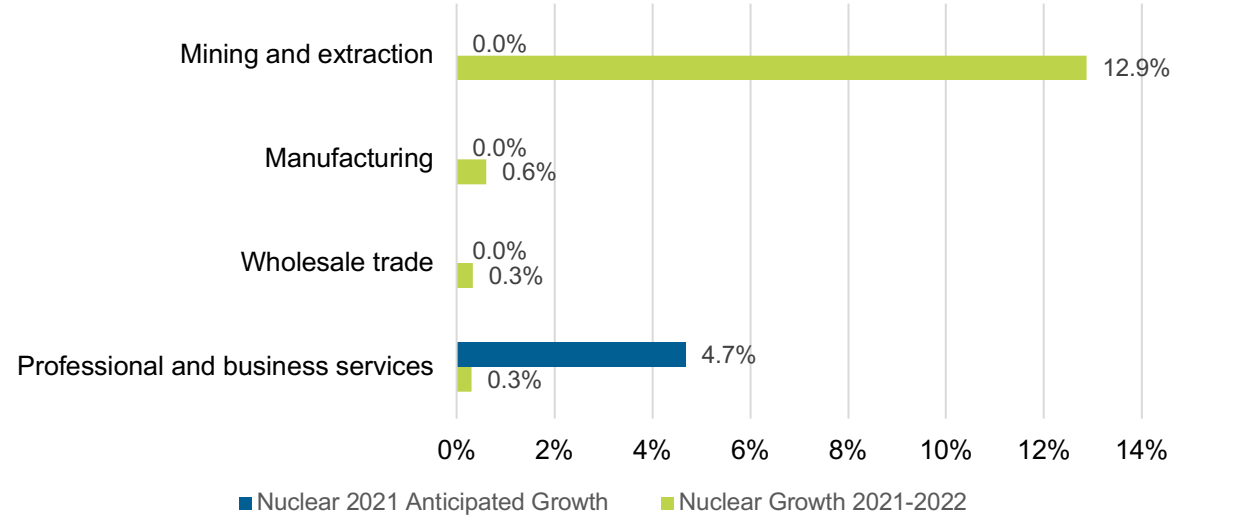
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Each of the four industries within nuclear fuels anticipates growth through 2023, ranging from 0.2% in wholesale trade to 4.5% in professional and business services (Figure 97).

Figure 97. Nuclear Fuels Anticipated Employment Change, 2022-2023



No industry had anticipated employment change from 2020 to 2021, except for professional and business services, which expected 4.7% growth. Nonetheless, firms from each industry within nuclear fuels experienced growth between 2021 and 2022, ranging from 0.3% in professional and business services and wholesale trade, to 12.9% in mining and extraction (Figure 98).

Figure 98. Nuclear Fuels Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Nuclear Fuels Demographics

The share of male workers in nuclear fuels was lower compared to the energy workforce average (68% versus 73%) but higher when compared to the national workforce overall (53%). (Table 26).

The proportion of non-white workers in nuclear fuels (29%) was higher than the 25% energy workforce average and the U.S. workforce average (23%). This is attributable to higher-than-average proportions of workers of two or more races (9% compared to 5%) and Asian workers (9% compared to 7%) in nuclear fuels compared to the energy workforce average. The proportion of American Indian or Alaska Native workers was the same as the overall energy workforce average (2%).

The proportion of the workforce made up of Hispanic or Latino workers in nuclear fuels was lower than the energy workforce average and the overall national workforce average, 15% compared to 18% and 19%, respectively.

The concentration of those represented by a union or covered under a project labor or collective bargaining agreement was lower than the energy workforce average (8% compared to 11%) but higher than the national private sector average (7%).

The proportion of formerly incarcerated workers was the same as the energy workforce average (1%) but lower than the proportion in the national workforce (2%). There were slightly more workers requesting accommodations for disabilities in nuclear fuels compared to the energy workforce average (3% versus 2%). The proportion of workers aged 18 to 29 (31%) and those aged 30 to 54 (54%) were slightly higher than energy workforce averages (30% and 53%, respectively). The percentage of workers aged 55 or older was slightly lower than the energy workforce average (16% compared to 17%).

Table 26. Nuclear Fuels Workforce Demographics and Characteristics

	Number of Workers	Nuclear Fuels Average	Energy Workforce Average	National Workforce Average
Male	6,294	68%	73%	53%
Female	2,939	32%	26%	47%
Gender Nonbinary	32	<1%	<1%	insufficient data
Hispanic or Latino	1,361	15%	18%	19%
Not Hispanic or Latino	7,903	85%	82%	82%
American Indian or Alaska Native	161	2%	2%	<1%
Asian	820	9%	7%	7%
Black or African American	702	8%	9%	13%
Native Hawaiian or Other Pacific Islander	126	1%	1%	<1%
White	6,581	71%	75%	77%
Two or More Races	817	9%	5%	3%
Veterans	866	9%	9%	5%
18 to 29	2,857	31%	30%	22%
30 to 54	4,957	54%	53%	54%
55 and Over	1,451	16%	17%	24%
Disability	253	3%	2%	4%
Formerly Incarcerated	97	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	775	8%[58]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[58] Unionization rates vary by state.

Other Fuels

"Other fuels" firms employed 63,624 workers in 2022, up 672 from the 62,953 employed in 2021 (+1.1%).

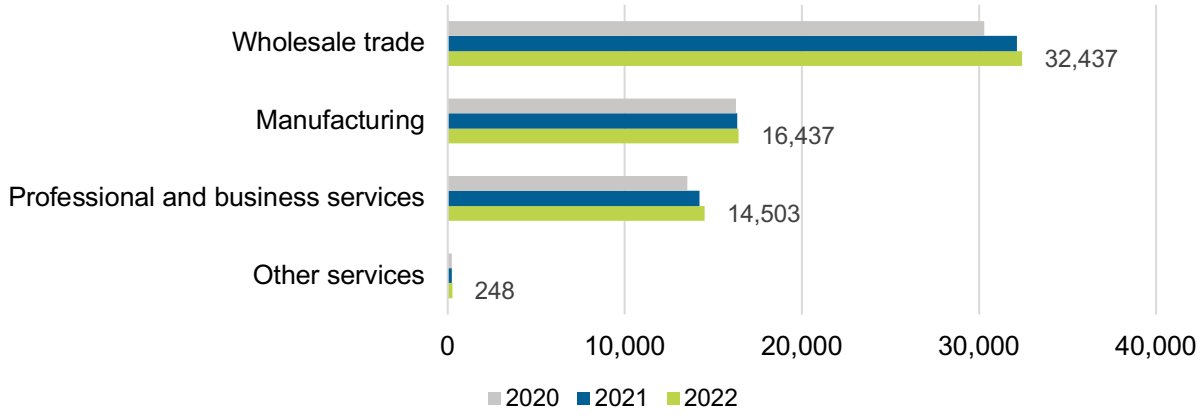
Trends and Key Takeaways

- The largest job gains were in the wholesale trade industry, with 288 new jobs (+0.9%), followed by professional and business services, with 281 added jobs (+2%), and manufacturing, with 98 added jobs (+0.6%).
- Employers in professional and business services and "other services" industries expect growth over 5% through 2023.
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in "other fuels" (10%) was slightly lower than the energy workforce average (11%) but higher than the national private sector average.
- Male workers made up 72% of the "other fuels" workforce, slightly lower than the 73% energy workforce average.
- Hispanic or Latino workers were less concentrated in "other fuels" than in the energy workforce and national workforce as a whole (10% compared to 18% and 19%, respectively).
- The proportion of non-white workers in "other fuels" (14%) was significantly lower than the energy workforce average (25%) and the national workforce average (23%).
- Black or African American workers were underrepresented, making up 4% of the "other fuels" workforce compared to 9% of the overall energy workforce and 13% in the U.S. workforce overall.
- Veterans were more represented in "other fuels," at 14% compared to 9% in the overall energy workforce and 5% in the national workforce.

Employment by Industry

The largest number of “other fuels” workers were in the wholesale trade industry, with 32,437 workers (Figure 99). The wholesale trade industry also experienced the largest job growth (288 added jobs or a 0.9% growth rate).

Figure 99. “Other Fuels” Employment by Industry, 2020-2022

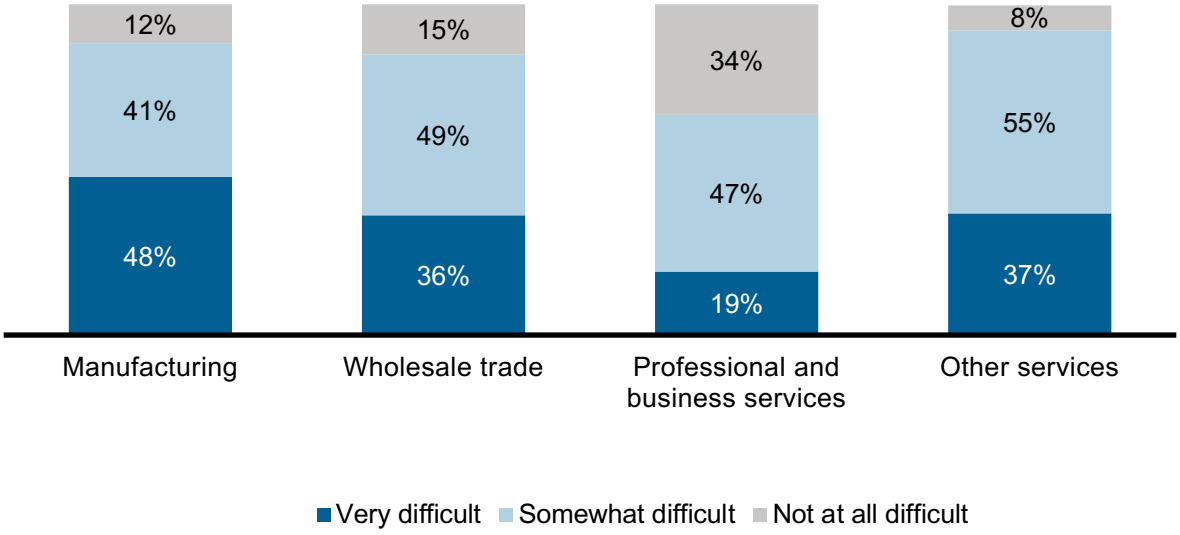


Employer Perspective on Workforce Issues

Current Hiring Difficulty

The other services industry within “other fuels” had the greatest difficulty hiring workers from 2021 to 2022 (Figure 100). Ninety-two percent of employers in other services reported at least some difficulty finding qualified workers, with 37% claiming it was “very difficult.”

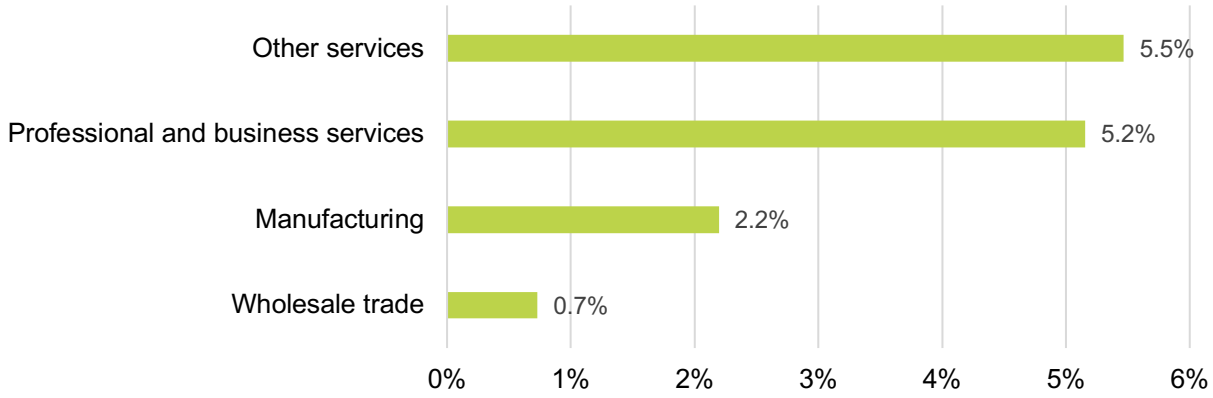
Figure 100. “Other Fuels” Hiring Difficulty



Employment Change by Industry

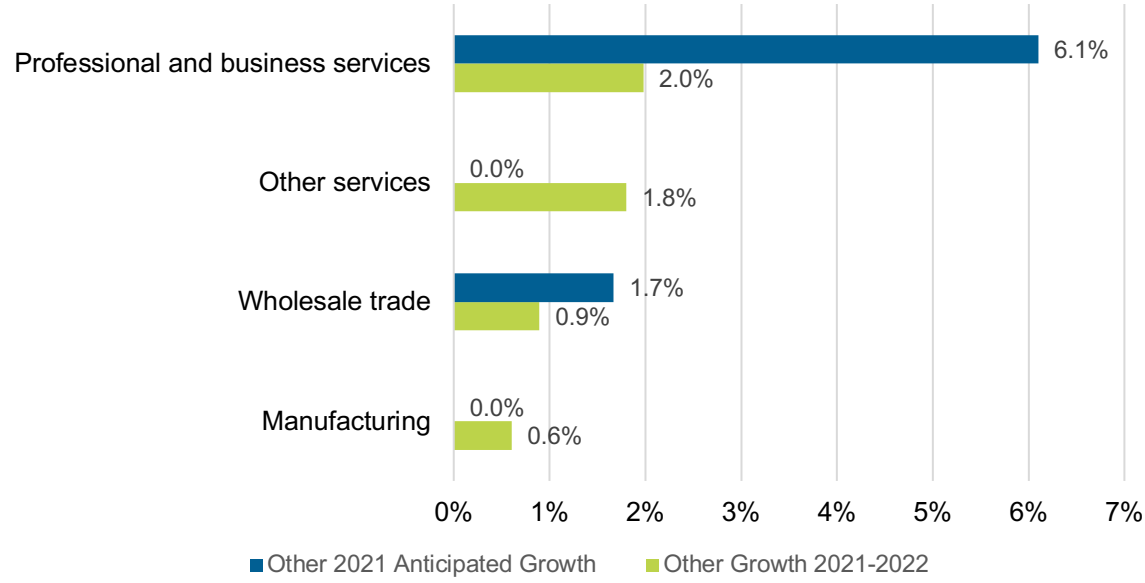
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. As illustrated in Figure 101, all industries within "other fuels" are expecting growth in 2023, ranging from 0.7% in wholesale trade, distribution, and transport to 5.5% in "other services."

Figure 101. "Other Fuels" Anticipated Change in Employment, 2022-2023



Professional and business services and wholesale trade, distribution, and transport were the industries within "other fuels" that had anticipated growth from 2021 to 2022 (Figure 102). However, firms across all industries registered growth between 2021 and 2022, ranging from 0.6% in manufacturing to 2.0% in professional and business services and in "other services."

Figure 102. "Other Fuels" Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



"Other Fuels" Demographics

The proportion of male workers in "other fuels" was slightly lower than the energy workforce average (72% compared to 73%) and much higher than the national workforce average (53%) (Table 27).

The proportion of the workforce in "other fuels" that was made up of Hispanic or Latino workers was lower than both the energy workforce average and the U.S. workforce average (10% versus 18% and 19%, respectively).

The share of non-white workers in "other fuels" was 14%, which was lower than the energy workforce average of 25% and the national workforce average of 23%.

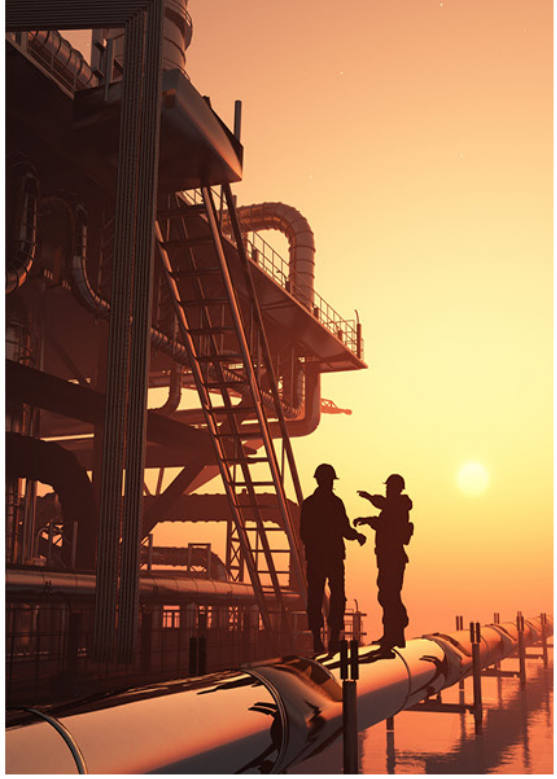
The concentration of veterans in "other fuels" was higher than the overall energy workforce (14% compared to 9%) and nearly triple the share of veterans in the national workforce overall (5%). The share of workers aged 55 or older was higher than the energy workforce average (22% compared with 17%), while the shares of workers aged 18 to 29 (26%) and aged 30 to 54 (51%) were lower than energy workforce averages (30% and 53%, respectively). Workers represented by a union or covered under a project labor or collective bargaining agreement, at 10%, was slightly lower than the energy workforce average of 11% but higher than the national private sector average (7%).

Table 27. "Other Fuels" Workforce Demographics and Characteristics

	Number of Workers	"Other Fuels" Average	Energy Workforce Average	National Workforce Average
Male	45,677	72%	73%	53%
Female	17,439	27%	26%	47%
Gender Nonbinary	509	<1%	<1%	insufficient data
Hispanic or Latino	6,558	10%	18%	19%
Not Hispanic or Latino	57,067	90%	82%	82%
American Indian or Alaska Native	541	<1%	2%	<1%
Asian	2,752	4%	7%	7%
Black or African American	2,795	4%	9%	13%
Native Hawaiian or Other Pacific Islander	428	<1%	1%	<1%
White	54,933	86%	75%	77%
Two or More Races	813	1%	5%	3%
Veterans	8,920	14%	9%	5%

18 to 29	16,727	26%	30%	22%
30 to 54	32,761	51%	53%	54%
55 and Over	14,136	22%	17%	24%
Disability	646	1%	2%	4%
Formerly Incarcerated	279	<1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	6,209	10%	11%	7%

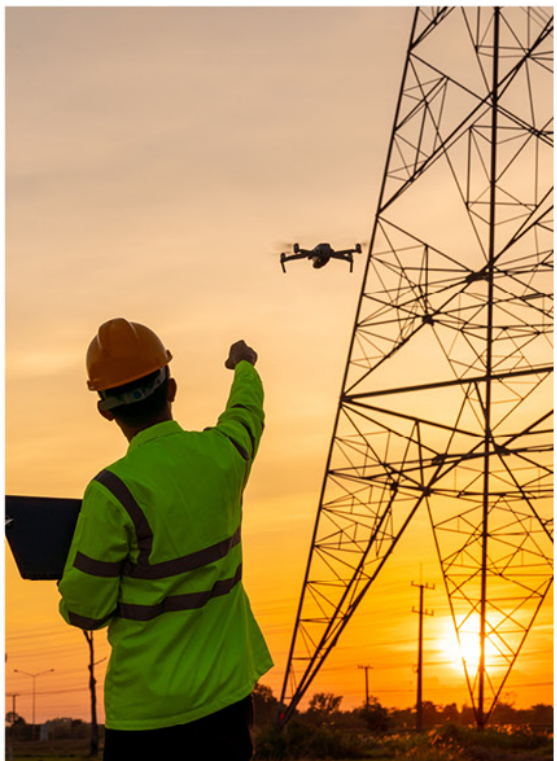
National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)


UNITED STATES ENERGY
& EMPLOYMENT REPORT 2023

MULTI-SECTOR TECHNOLOGIES

ENERGY.GOV/USEER


Multi-Sector Technologies

Four sectors — natural gas, coal, oil/petroleum, and nuclear — are present in three sections of this report: Electric Power Generation; Transmission, Distribution, and Storage; and Fuels.[59] These sectors both use fuels for electric power generation (EPG) and are responsible for transmission, such as pipelines that transport natural gas or railroads that move coal. These sectors are also responsible for storing fuel, making storage a cross-cutting technology. This section presents full employment results for each of these four sectors and for storage technologies from across those three report sections.

Natural Gas

In 2022, the natural gas sector employed 581,135 workers across all technologies, with the largest concentration (262,886) in fuels,[60] up more than 50,000 from 2021. Fuel transmission and distribution had the second-largest number of natural gas workers, at just under 200,000 (Table 28). Together, these two energy categories made up 79% of all natural gas jobs.

Table 28. Natural Gas Employment by Technology and Industry

	Fuels	Conventional Gas Electric Power Generation	Advanced Gas Electric Power Generation	Fuel Transmission and Distribution	Storage	Total
Mining and Extraction	155,689	-	-	-	-	155,689
Utilities	-	17,707	45,986	119,375	-	183,067
Construction	-	10,160	9,405	46,295	519	66,379
Manufacturing	41,613	3,418	2,619	-	270	47,920
Wholesale Trade, Distribution, and Transport (Including Pipeline)	29,171	3,213	5,063	32,385	221	70,052

[59] Previous USEERs referred to this section as “crosscuts.”

[60] Fuels are combusted or otherwise spent in the generation of electricity or heat. Employment in fuels includes any work related to fuel extraction, mining, and processing. This includes firms that manufacture machinery that supports oil and gas extraction as well as coal mining. Agriculture and forestry workers who support fuel production with biodiesels, corn ethanol, and fuel wood are also included in the employment data for fuels. This category also includes the production of nuclear fuels for power plants.

Professional and Business Services	36,252	8,574	10,521	-	667	56,015
"Other Services"	161	1,022	819	-	11	2,013
Total	**262,886**	**44,094**	**74,413**	**198,055**	**1,688**	**581,135**

The largest proportion of natural gas jobs were in the utilities industry, concentrated in natural gas EPG and natural gas transmission and distribution. The largest concentration of natural gas workers in any technology or industry sector was in mining and extraction within fuels, which totaled 155,689 jobs, or approximately 27% of total natural gas jobs.

Coal

In 2022, the coal sector employed 161,388 workers across all technologies, with the largest concentration — 64,858 — in fuels. Coal EPG totaled 64,051 jobs, and another 32,480 jobs were in fuel transmission and distribution via rail, truck, and water transport[61] (Table 29).

Table 29. Coal Employment by Technology and Industry

	Fuels	Electric Power Generation	Fuel Transmission and Distribution	Total
Mining and Extraction	45,813	-	-	45,813
Utilities	-	26,415	-	26,415
Construction	-	6,889	-	6,889
Manufacturing	9,949	986	-	10,936
Wholesale Trade, Distribution, and Transport (Including Pipeline)	1,056	5,893	32,480	39,429
Professional and Business Services	8,018	23,026	-	31,044
“Other Services”	21	842	-	862
Total	**64,858**	**64,051**	**32,480**	**161,388**

Coal sector employment was most concentrated in three industries: mining and extraction for fuels; utilities for EPG; and wholesale trade, distribution, and transport for transportation, distribution, and storage (TDS). One hundred percent of fuel transmission and distribution transport was in the wholesale trade, distribution, and transport industry as commodity flows, 71% of fuels jobs were in the mining and extraction industry, and 41% of coal EPG jobs were in the utilities industry.

[61] Commodity flows as determined by the Quadrennial Energy Review

Petroleum

In 2022, the petroleum sector employed 740,681 workers across all technologies, an increase of more than 70,000 over 2021. Petroleum employment was most concentrated in fuels, which accounted for 70% of petroleum jobs (Table 30).

Table 30. Petroleum Employment by Technology and Industry

	Fuels	Electric Power Generation	Fuel Transmission and Distribution	Storage	Total
Mining and Extraction	227,993	-	-	-	227,993
Utilities	-	406	-	-	406
Construction	19,496	-	91,755	1,136	112,387
Manufacturing	140,924	5,281	-	267	146,472
Wholesale Trade, Distribution, and Transport (Including Pipeline)	60,883	1,998	113,345	31	176,257
Professional and Business Services	71,103	4,210	-	1	75,314
“Other Services”	1,302	126	-	424	1,852
Total	**521,702**	**12,020**	**205,100**	**1,860**	**740,681**

The majority of fuels jobs were in the mining and extraction industry, at 44%. The second-largest number of fuels jobs was in the manufacturing sector (i.e., refining and petroleum products). Nearly one-third (31%) of all petroleum jobs (across all technologies) were in mining and extraction.

Nuclear

In 2022, the nuclear sector employed 66,185 workers across fuels and EPG. Most nuclear jobs (86%) were in EPG, with just 14% in fuels (Table 31).

Table 31. Nuclear Employment by Technology and Industry

	Fuels	Electric Power Generation	Total
Mining and Extraction	421	-	421
Utilities	-	40,605	40,605
Construction	-	2,120	2,120
Manufacturing	2,838	1,725	4,563
Wholesale Trade, Distribution, and Transport	946	2,652	3,598
Professional and Business Services	5,059	9,740	14,800
“Other Services”	-	78	78
Total	**9,264**	**56,921**	**66,185**

Seventy-one percent of nuclear EPG jobs were in the utilities industry, and EPG jobs in the utilities industry accounted for 61% of all nuclear jobs (across all technologies). Fuels jobs were distributed primarily between manufacturing and professional and business services. Fuels and EPG jobs in the professional and business services industry accounted for 22% of all nuclear jobs.

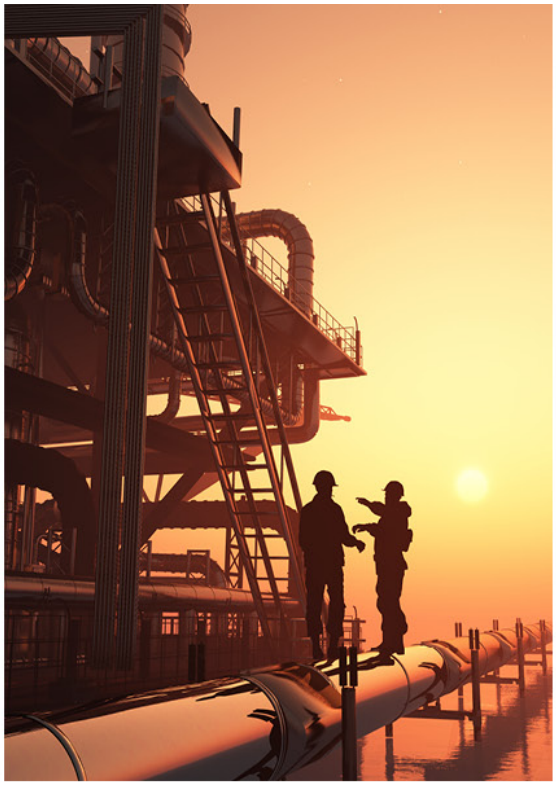
Storage

Storage technologies fall under the TDS category and employed 90,444 workers in 2022 (Table 32). Of these, 81% were in battery storage and 9% were in pumped hydro storage, the second-largest number of jobs in storage.

Table 32. Storage Employment by Technology and Industry

	Pumped Hydro	Battery	Other	Petroleum	Natural Gas	Other Fuels	Total
Mining and Extraction	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-
Construction	3,096	37,761	1,281	1,136	519	1,182	44,976
Manufacturing	2,445	13,600	1,588	267	270	-	18,170
Wholesale Trade, Distribution, and Transport (Including Pipeline)	1,231	8,097	48	31	221	-	9,628
Professional and Business Services	1,483	12,384	811	1	667	592	15,938
“Other Services”	77	1,081	86	424	11	52	1,732
Total	**8,333**	**72,923**	**3,814**	**1,860**	**1,688**	**1,827**	**90,444**

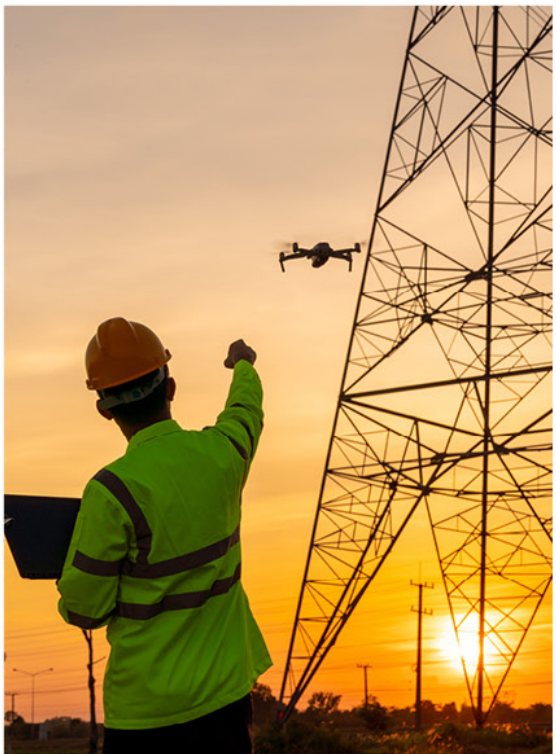
The construction industry employed the most workers in the storage technologies, representing 50% of all jobs. Manufacturing of storage components was the second-largest industry, employing 18,170 or one-fifth (20%) of all storage jobs. Battery manufacturing made up 15% of all storage jobs, up from 14% in 2021.


UNITED STATES ENERGY
& EMPLOYMENT REPORT 2023

ENERGY EFFICIENCY

ENERGY.GOV/USEER


Energy Efficiency

Reducing the energy usage of buildings is an important component of the nation's decarbonization strategy. The Inflation Reduction Act created and expanded programs aimed at decarbonizing buildings, including providing a number of direct incentives to consumers to install more efficient and less polluting technologies such as the Energy Efficiency Home Improvement Credit and the High-Efficiency Electric Home Rebate Act. In addition, the Bipartisan Infrastructure Law (2021), supports federal investments in research and development, demonstration, and deployment programs to help to achieve carbon-free electricity in the U.S. by 2035 and a net-zero economy by 2050.

For the purposes of this report, energy efficiency (EE) includes the production, wholesale trade, installation, and repair and maintenance of products that increase EE and the provision of services that reduce energy consumption related to buildings by the end user. EE also includes design and contracting services that improve buildings' efficiency, such as insulation and lighting upgrades (including improvement in natural lighting), or that otherwise reduce overall energy consumption across homes and businesses. Energy efficiency sector employment categories include EE technology employment; ENERGY STAR appliances, products, and services; advanced and recycled building materials; LED, CFL, and other efficient lighting; renewable heating and cooling; and other EE activities.

Within EE, the ENERGY STAR program is an important component of the USEER survey. ENERGY STAR establishes definitions in efficiency for residential and commercial products. The USEER survey identifies employment involved in the production, construction, installation, and maintenance component of these products. Jobs in this chapter include contractors who install, maintain, and repair ENERGY STAR products, as well as other upstream activities such as wholesale trade and distribution.[62]

Companies performing EE activities do not have dedicated industry classifications (NAICS codes), so data on the size and scope of EE employment are limited. Employment at EE firms is therefore embedded within other industry data (e.g., electrical contractors; heating, ventilation, and cooling [HVAC] and plumbing contractors; appliance manufacturers). Furthermore, firms may not be wholly engaged in EE work, and therefore workers may spend only a portion of their time supporting EE activities. Direct reporting from employers is therefore necessary to ensure accurate and useful data on the sector.

Utility Energy Efficiency Programs

Many energy utilities and third parties in the U.S. sponsor or manage EE programs for residential, commercial, and industrial properties. However, the USEER EE employment numbers do not include direct employees of the utilities that administer these programs. These employees are included in the numbers for "utilities" employees in either the electric power generation or transmission, distribution, and storage sections of this report. Though the Energy Efficiency section does not

[62] For the purposes of this report, EE does not include activities related to efficient manufacturing and industrial processes, increasing fuel economy of vehicles (efficient vehicles and components that increase fuel economy are included in the Motor Vehicles chapter of this report), or programs embedded with utilities, including combined heat and power (employment at utilities are included in the EPG and TDS chapters of this report. CHP is included in the EPG chapter of this report).

capture these employees, the programs include many different incentives and tools that reduce energy consumption and improve EE in meaningful ways.[63]

In 2022, EE employed 2,215,432 workers, an increase of 50,517 jobs or 2.3% from the 2,164,914 employed in 2020. This was 163,461 fewer workers than the 2,378,893 workers employed in 2019, prior to the pandemic.

Trends and Key Takeaways

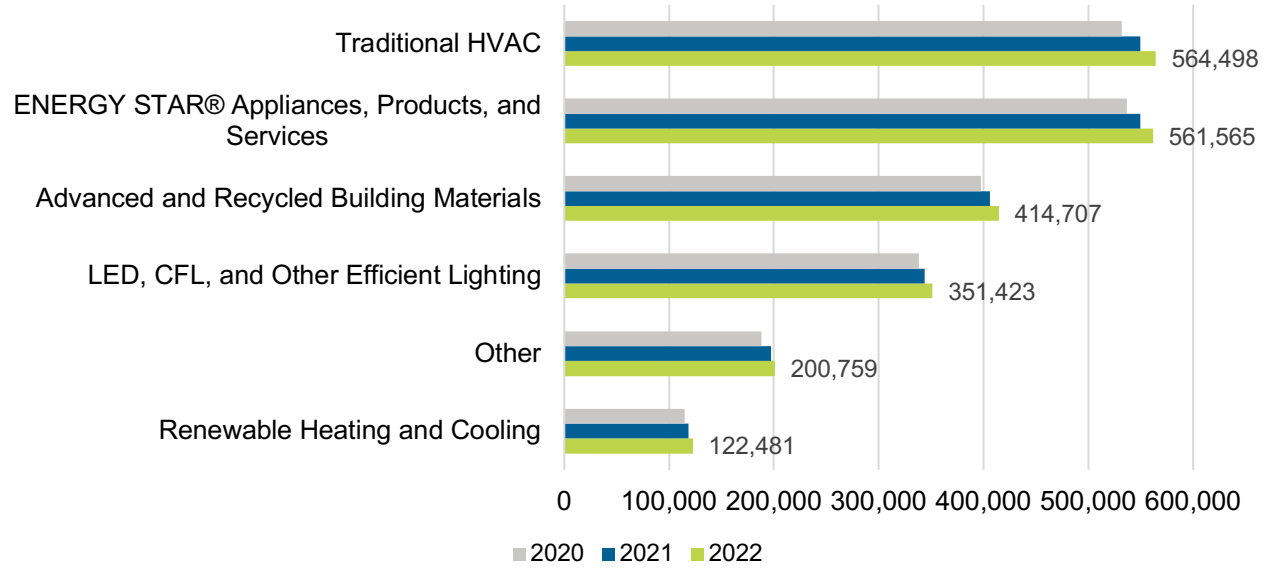
- EE employment from 2021 to 2022 grew by 50,517 jobs or 2.3%. All technologies related to EE grew from 2021 to 2022.
- Traditional HVAC[64], the largest EE technology employment category, added the most jobs, at 15,118 (+2.8%), followed by ENERGY STAR appliances, products, and services (+12,022 jobs); advanced and recycled building materials (+8,663); LED, CFL, and other efficient lighting (+7,401); renewable heating and cooling (+3,796); and "other" (+3,516).
- The largest gains were in the construction industry, with 23,729 added jobs (+2.0%), followed by professional and business services (+11,504 jobs, +2.4%), wholesale trade (+8,213 jobs, +4.4%), manufacturing (+6,022 jobs, +2.0%), and other services (1,049 jobs, +2.7%).
- Employers in all five EE industries anticipate growth in 2023, with construction and other services expecting the most growth.
- The percentage of workers in EE represented by a union or covered under a project labor or collective bargaining agreement (12%) was higher than the energy workforce average (11%).
- EE's workforce tended to be disproportionately male, with an average the same as the overall energy workforce average, at 73%. This compares with 53% economy-wide.
- EE firms employed a slightly lower percentage of Hispanic or Latino workers than the overall energy average (17% compared to 18%).
- The percent of non-white workers in EE was lower than the energy workforce average, 24% compared to 25%. This is attributable the fact that Asian workers (6% compared to 7%) and workers of two or more races (4% compared to 5%) are less represented in the EE workforce than in the overall energy workforce.
- The proportion of Black or African American workers in EE in 2022 was the same as the overall energy workforce, at 9%.
- The proportion of veterans working in EE was also the same as the energy workforce average, at 9%.
- There were slightly more workers requesting accommodations for a disability in EE, 3%, than in the overall energy workforce, at 2%.
- The percentage of formerly incarcerated workers was the same as the overall energy workforce average (1%).

[63] For examples see Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology | Electricity Markets and Policy Group (lbl.gov).
[64] For definitions of technologies, refer to Appendix J: Energy Technology Definitions.

Employment by Technology, Industry, and Occupation

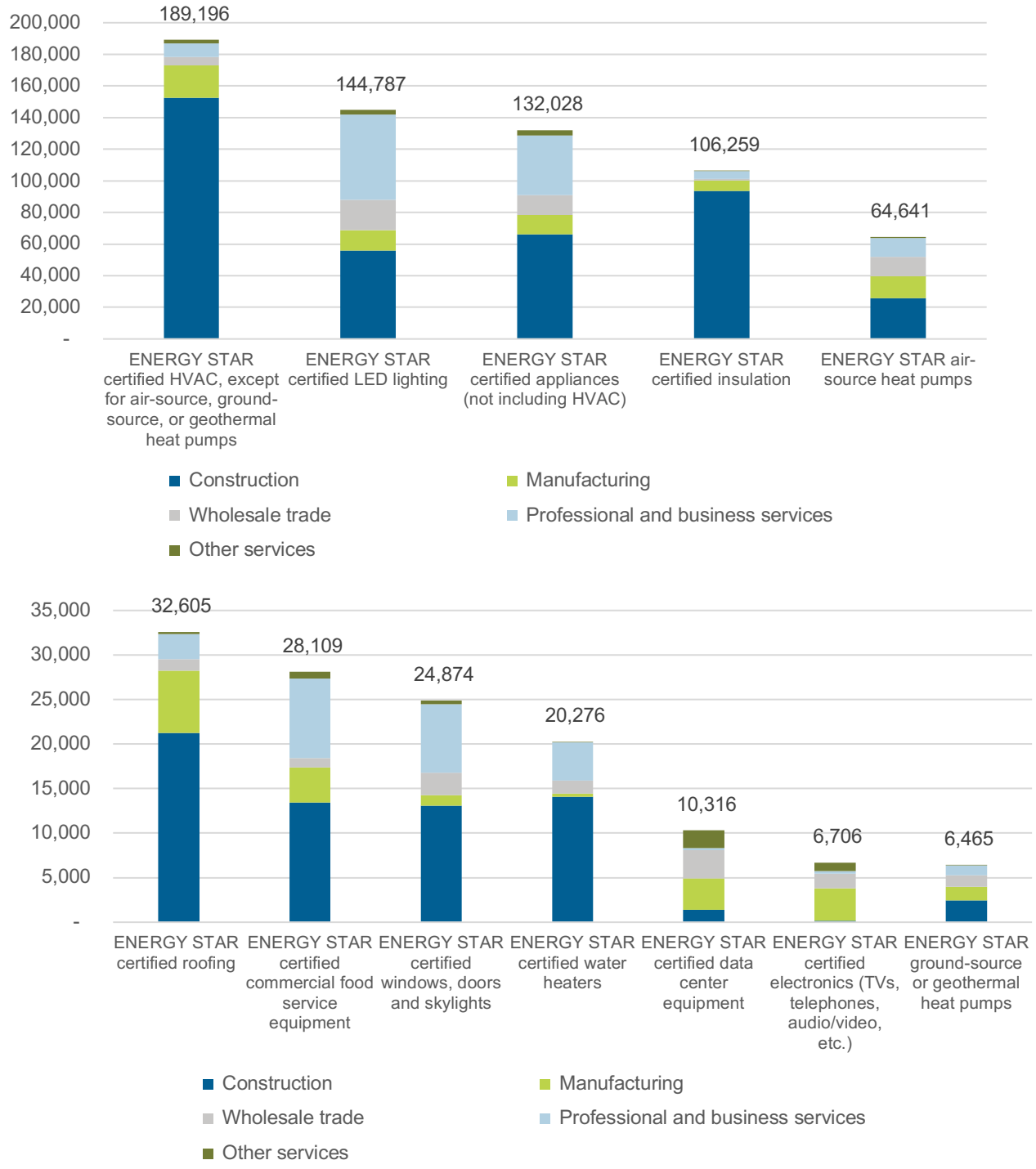
Firms that manufacture, sell, install, or otherwise work with traditional HVAC products and services employed the most workers of all EE technologies in 2022, with 564,498 workers (Figure 103). This was up 15,118 from 2021, or 2.8%.

Figure 103. Energy Efficiency Employment by Technology Group, 2020-2022



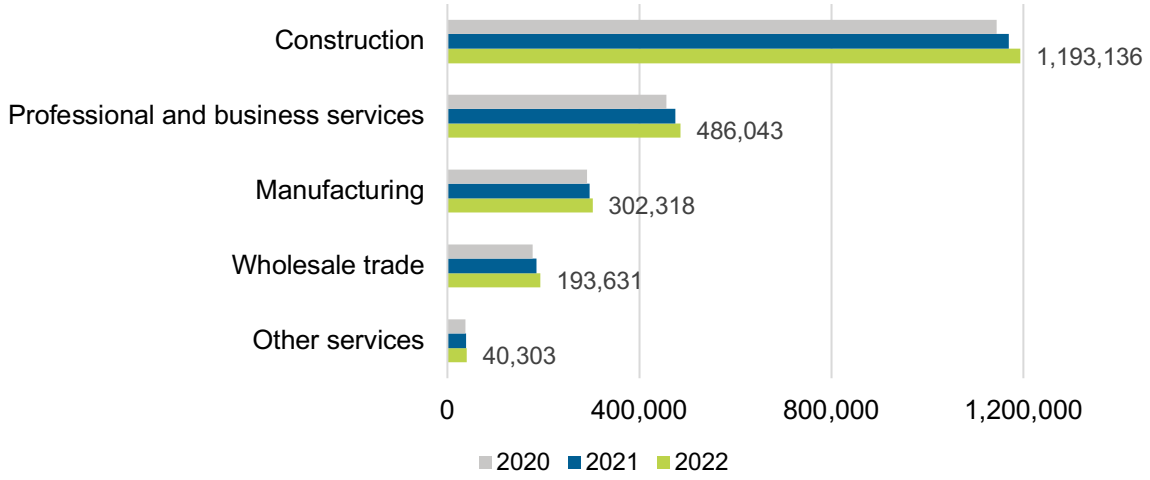
There are 12 ENERGY STAR detailed technologies identified in EE. ENERGY STAR certified HVAC firms employed 189,196 workers, the most of any technology area (Figure 104). ENERGY STAR certified LED lighting followed, with 144,787 employees. ENERGY STAR technologies not identified in EE fall into the "other EE" category.

Figure 104. Energy Efficiency Employment in ENERGY STAR Technologies, 2022



Workers in the construction industry made up the largest segment of EE jobs, with 1,193,136 positions, which was up 23,729 from 2021 (Figure 105). Wholesale trade firms grew by the largest percentage in 2022 at 4.4% (+8,213 jobs).

Figure 105. Energy Efficiency Employment by Industry, 2020-2022



The construction industry was also the largest employer for the majority of the EE technologies, except for the four technologies for which manufacturing employment was largest; ENERGY STAR certified electronics (TVs, telephones, audio/video, etc.); ENERGY STAR certified data center equipment; advanced building materials/insulation; and "other" energy efficiency technologies (Table 33).

Table 33. Energy Efficiency Employment by Technology and Industry, 2022[65]

Detailed Technology	Construction	Manufac-turing	Wholesale Trade	Professional and Business Services	Other Services
ENERGY STAR certified appliances (not including heating, ventilation, and cooling [HVAC])	**50%**	9%	9%	29%	3%
ENERGY STAR certified HVAC, except for air-source, ground-source, or geothermal heat pumps	**81%**	11%	3%	5%	1%

[65] Highlighted cells indicated the industry will the largest share of employment for each technology (row).

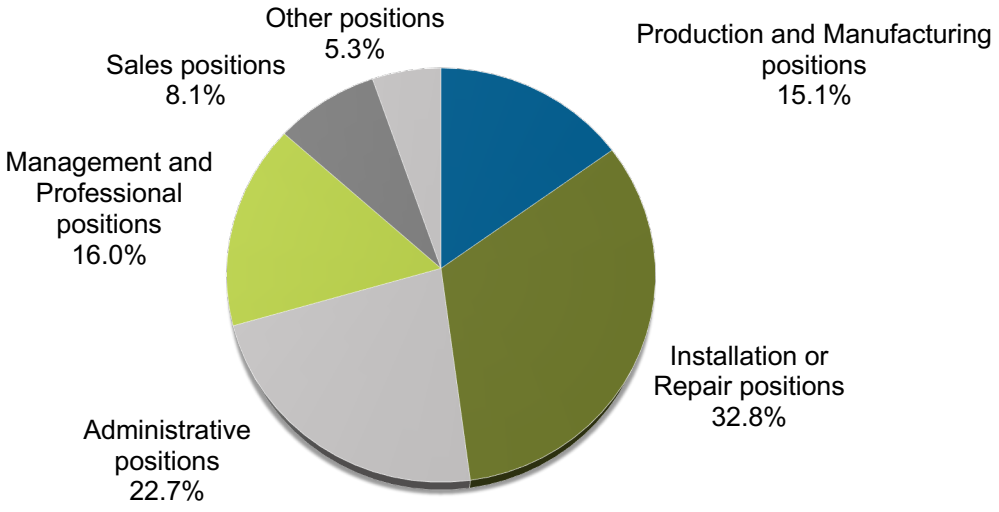
ENERGY STAR air-source heat pumps	**40%**	21%	19%	19%	1%
ENERGY STAR ground-source or geothermal heat pumps	**38%**	23%	20%	18%	1%
Other high-efficiency HVAC that are out of scope for ENERGY STAR certification (e.g., indirect evaporative coolers, air-to-water heat pumps, energy recovery systems)	**51%**	24%	6%	18%	1%
Traditional HVAC goods, control systems and services	**53%**	5%	10%	28%	3%
ENERGY STAR certified water heaters	**70%**	2%	7%	21%	0%
ENERGY STAR certified electronics (TVs, telephones, audio/video, etc.)	2%	**56%**	23%	4%	15%
ENERGY STAR certified windows, doors, and skylights	**53%**	5%	10%	31%	1%
ENERGY STAR certified roofing	**65%**	21%	4%	9%	1%
ENERGY STAR certified insulation	**88%**	6%	1%	4%	0%
Air sealing	**52%**	3%	26%	18%	0%
ENERGY STAR certified commercial food service equipment	**48%**	15%	3%	31%	2%
ENERGY STAR certified data center equipment	13%	**35%**	31%	2%	19%

ENERGY STAR certified LED lighting	**39%**	9%	13%	37%	2%
Other LED, CFL and efficient lighting	**54%**	16%	11%	19%	0%
Other renewable heating and cooling (geothermal, bioenergy, solar heating, etc.)	**62%**	7%	7%	24%	1%
Advanced building materials/insulation	24%	**50%**	1%	24%	1%
Recycled building materials	**55%**	15%	4%	23%	4%
Reduced water consumption products and appliances	**62%**	7%	6%	24%	1%
Energy auditing services	**48%**	0%	0%	46%	5%
Other	33%	**41%**	5%	18%	3%
TOTAL	**54%**	14%	9%	22%	2%

Workers with the same occupation can work in different industries. For example, the construction industry will include many installation or repair occupations, but wholesale trade and other industries will also employ people in these occupations. For this reason, different trends show up if parsing the data by industry or occupation. It can be useful to show energy employment data and trends by both.

The largest occupation group within EE was installation or repair positions, which accounted for 32.8% of all EE jobs (Figure 106). This was followed by administrative positions (22.7%), management and professional positions (16%), and production and manufacturing positions (15.1%).

Figure 106. Energy Efficiency Employment by Occupation

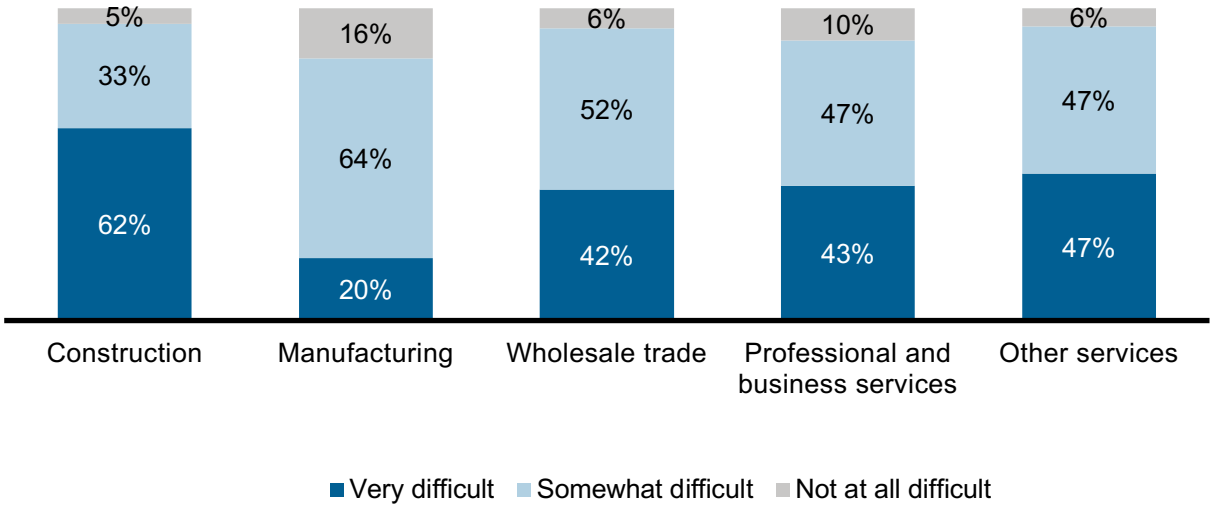


Employer Perspective on Workforce Issues

Current Hiring Difficulty

EE firms reported hiring challenges, with 84% to 95% reporting at least some difficulty finding workers in 2022 (Figure 107). Construction firms reported the highest hiring difficulty, with 95% reporting that it was "very difficult" or "somewhat difficult" to hire qualified workers. Construction also had the highest percentage of employers indicating that it was "very difficult" to hire, at 62%. Union construction firms[66] reported lower hiring difficulty than construction overall, with only 37% reporting that it was "very difficult" to hire.

Figure 107. Energy Efficiency Hiring Difficulty



[66] Defined as firms with at least 20% of their employees belonging to a union or covered by a project labor or collective bargaining agreement.

All industries reported competition/small applicant pool as the primary reason that it was difficult to hire, except for other services, which indicated a lack of experience, training, or technical skills as the primary reason (Table 34). All industries reported problems due to insufficient skill, qualifications, or training as contributing factors to their difficulty hiring workers.

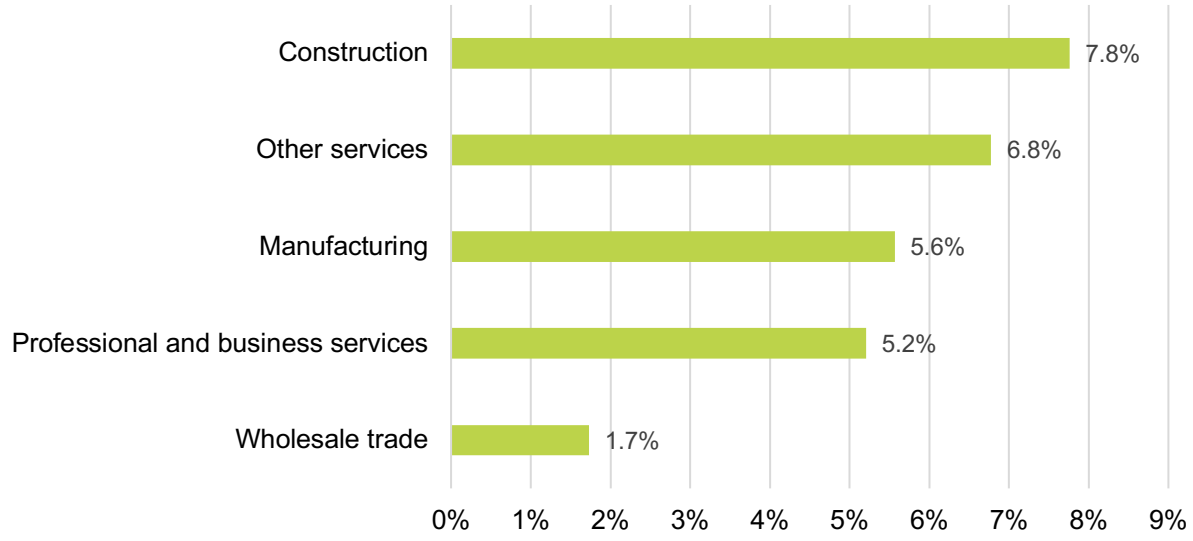
Table 34. Energy Efficiency Hiring Difficulty Reasons

Industry	Most Common Reason	Second Most Common Reason	Third Most Common Reason
Construction	Competition/small applicant Pool (44%)	Lack of experience, training, or technical skills (36%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (26%)
Manufacturing	Competition/small applicant pool (57%)	Lack of experience, training, or technical skills (29%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (19%)
Wholesale Trade	Competition/small applicant pool (56%)	Insufficient qualifications (certifications or education) (14%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (30%)
Professional and Business Services	Competition/small applicant pool (45%)	Lack of experience, training, or technical skills (29%)	Cannot provide competitive wages (24%)
Other Services	Lack of experience, training, or technical skills (47%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (47%)	Insufficient qualifications (certifications or education) (27%)

Employment Change by Industry

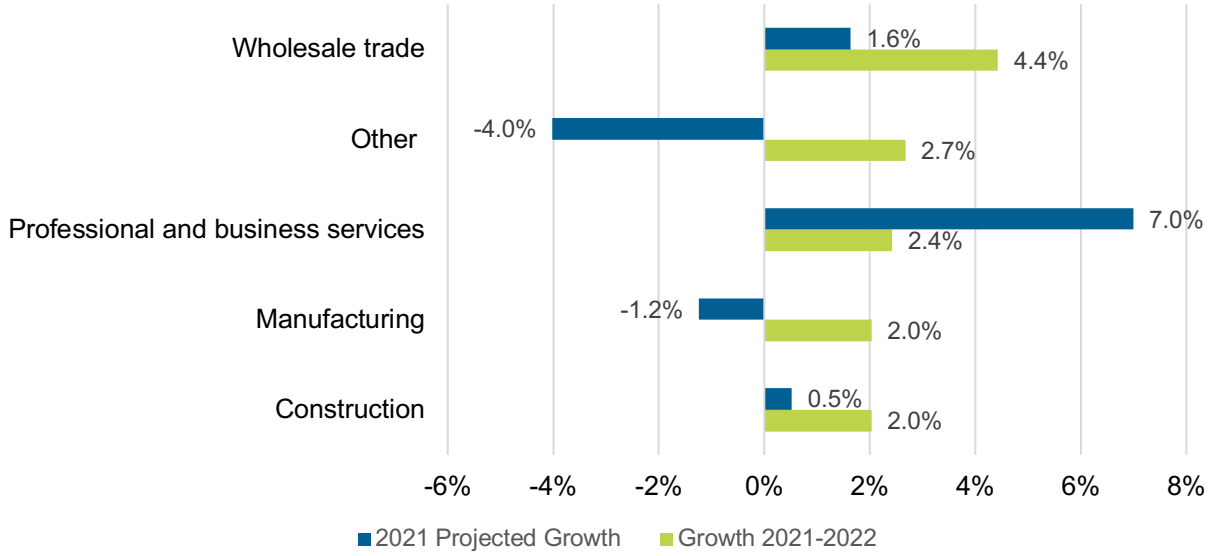
The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology and industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Employers in all of the five EE industries anticipate growth in 2023, ranging from 1.7% in wholesale trade to 7.8% in construction (Figure 108).

Figure 108. Energy Efficiency Anticipated Employment Changes, 2022-2023



Wholesale trade, manufacturing, and construction all grew faster than anticipated in 2022 (Figure 109).

Figure 109. Energy Efficiency Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Energy Efficiency Demographics

Demographics for the EE workforce are displayed in Table 35 below. The EE workforce was disproportionately male, consistent with the overall energy workforce (73%), but significantly higher than the U.S. workforce average (53%).

The proportion of Hispanic or Latino workers in EE was slightly lower than the overall energy workforce, at 17% compared to 18%. Hispanic or Latino workers are also less represented in EE when compared to the national economy average (19%).

EE establishments employed a smaller percentage of non-white workers than the overall energy sector (24% compared to 25%), but the proportion is higher than the national workforce average (23%). This is attributable to lower-than-average proportions of workers of two or more races (4% in EE compared to 5% in the energy workforce) and Asian workers (6% compared to 7%). The proportion of Black or African American (9%) and Native Hawaiian or Pacific Islander (1%) workers in EE was the same as in the overall energy workforce. American Indian or Alaska Native workers were more represented in EE than in the overall energy workforce (3% compared to 2%).

The percentage of veterans in the EE workforce was the same as the energy workforce average (9%), but somewhat higher than the national workforce average (5%). Formerly incarcerated workers are employed in EE at the same rate as they are in the overall energy industry as a whole (1%), but lower when compared to the U.S. workforce average (2%). Workers requesting accommodations for disabilities were employed at a higher rate in EE than in the overall energy workforce (3% compared to 2%) but lower than the national workforce average (4%).

The EE workforce was mostly composed of young and middle-aged workers, with workers under the age of 30 (31% compared to 30%) and between the ages of 30 and 54 (56% compared to 53%) more represented in EE than in the overall energy workforce. Workers under the age of 30 are more represented in EE than the national workforce overall (31% versus 22%). Workers aged 55 or older were less represented, with 13% in the EE workforce compared to 17% in the energy workforce and 24% in the national workforce overall.

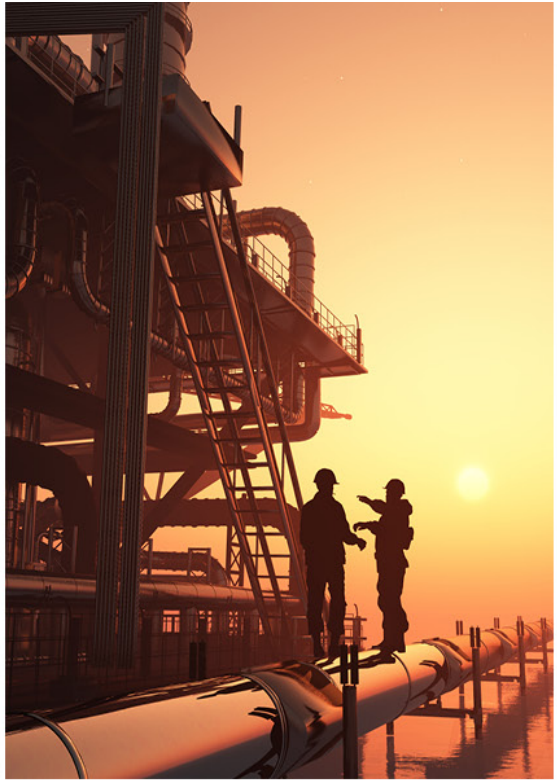
The concentration of workers represented by a union or covered under a project labor or collective bargaining agreement was higher than the energy workforce average (12% compared to 11%) and the national private sector average (7%).

Table 35. Energy Efficiency Workforce Demographics and Characteristics

	Number of Energy Efficiency Workers	Energy Efficiency Average	Energy Workforce Average	National Workforce Average
Male	1,614,454	73%	73%	53%
Female	590,206	27%	26%	47%
Gender Nonbinary	10,772	<1%	<1%	insufficient data
Hispanic or Latino	376,079	17%	18%	19%
Not Hispanic or Latino	1,839,353	83%	82%	82%
American Indian or Alaska Native	60,484	3%	2%	<1%
Asian	141,424	6%	7%	7%
Black or African American	200,254	9%	9%	13%
Native Hawaiian or Other Pacific Islander	26,484	1%	1%	<1%
White	1,677,678	76%	75%	77%
Two or More Races	79,572	4%	5%	3%
Veterans	203,602	9%	9%	5%
18 to 29	687,950	31%	30%	22%
30 to 54	1,239,536	56%	53%	54%
55 and over	287,946	13%	17%	24%
Disability	70,872	3%	2%	4%
Formerly Incarcerated	30,486	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	263,417	12%[67]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

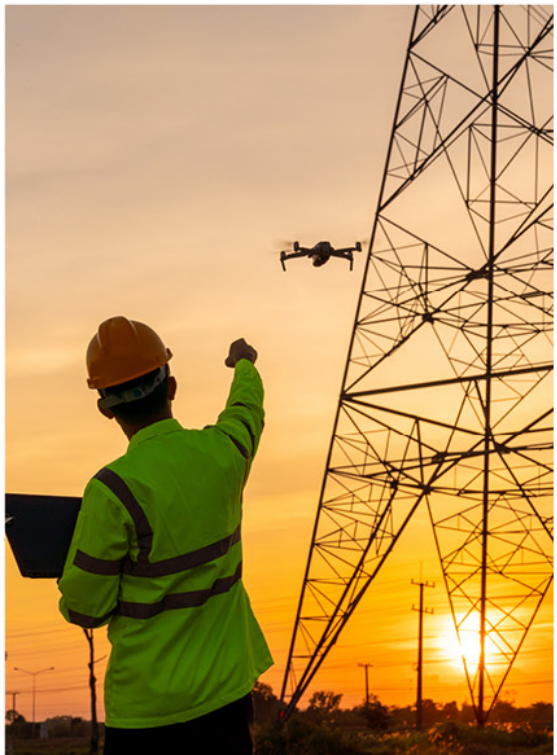
[67] Unionization rates vary by state.


UNITED STATES ENERGY
& EMPLOYMENT REPORT 2023

MOTOR VEHICLES AND COMPONENT PARTS

ENERGY.GOV/USEER


Motor Vehicles and Component Parts

Transportation is the leading source of greenhouse gas emissions in the United States,[68] and motor vehicles are a major driver of those emissions.[69] Increasing the efficiency of motor vehicles and developing zero-emissions vehicles are major components of recent federal and state policies, including the Inflation Reduction Act.[70]

The motor vehicles (MV) and component parts (CP) category includes companies that manufacture and ship new vehicles and parts, design vehicles and parts, and repair motor vehicles. In this section, "MV & CP jobs" and "MV & CP employment" are used to refer to jobs or employment in both motor vehicles *and* component parts.

In 2022, MV & CP companies employed 2,618,241 workers, a 64,873 (+2.5%) increase from the 2,553,368 employed in 2021.[71] Of these 64,873 new positions, CP contributed 25,670, an increase of 2.4%.

Trends and Key Takeaways

- MV & CP jobs grew by 64,873 jobs, or 2.5%.
- Gasoline and diesel vehicle employment, the largest MV & CP technology, added the most jobs of any category, at 31,017 (+1.6%), although battery electric vehicle (BEV) jobs grew the fastest by percentage, increasing 26.8% (+28,366 new jobs). In addition, hydrogen or fuel cell vehicle jobs increased 25.2% (+3,573 jobs), plug-in hybrid vehicle jobs increased 10% (+6,293), and hybrid electric vehicle jobs increased 6.6% (+9,528 jobs).
- Overall, jobs in clean vehicles (BEV, plug-in hybrid, hybrid electric, and hydrogen/fuel cell) increased by 47,760, or 14.7%.
- Almost a third (31.5%) of battery storage firms classified in transmission, distribution, and storage (TDS) identified vehicles or other transportation as the application of their battery technology.
- The largest job gains were in the repair and maintenance industry, with 27,938 new jobs (+2.9%).
- The wholesale trade, distribution, and transport industry increased employment by the greatest percentage (+4.9% or +19,605 jobs).
- Wholesale trade, distribution, and transport; repair and maintenance; and manufacturing had the highest percentage of companies reporting hiring difficulty, with more than nine out of 10

[68] Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks, available at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.
[69] Environmental Protection Agency, Fast Facts on Transportation Greenhouse Gas Emissions, available at https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.
[70] *See generally*, https://afdc.energy.gov/laws/electric-vehicles-for-tax-credit.
[71] There are 2,502,057 MV workers employed in identifiable technologies such as those in Figure 110 and Figure 111. The difference between this and the 2,618,241 total is due to the flow of commodities that are technology agnostic.

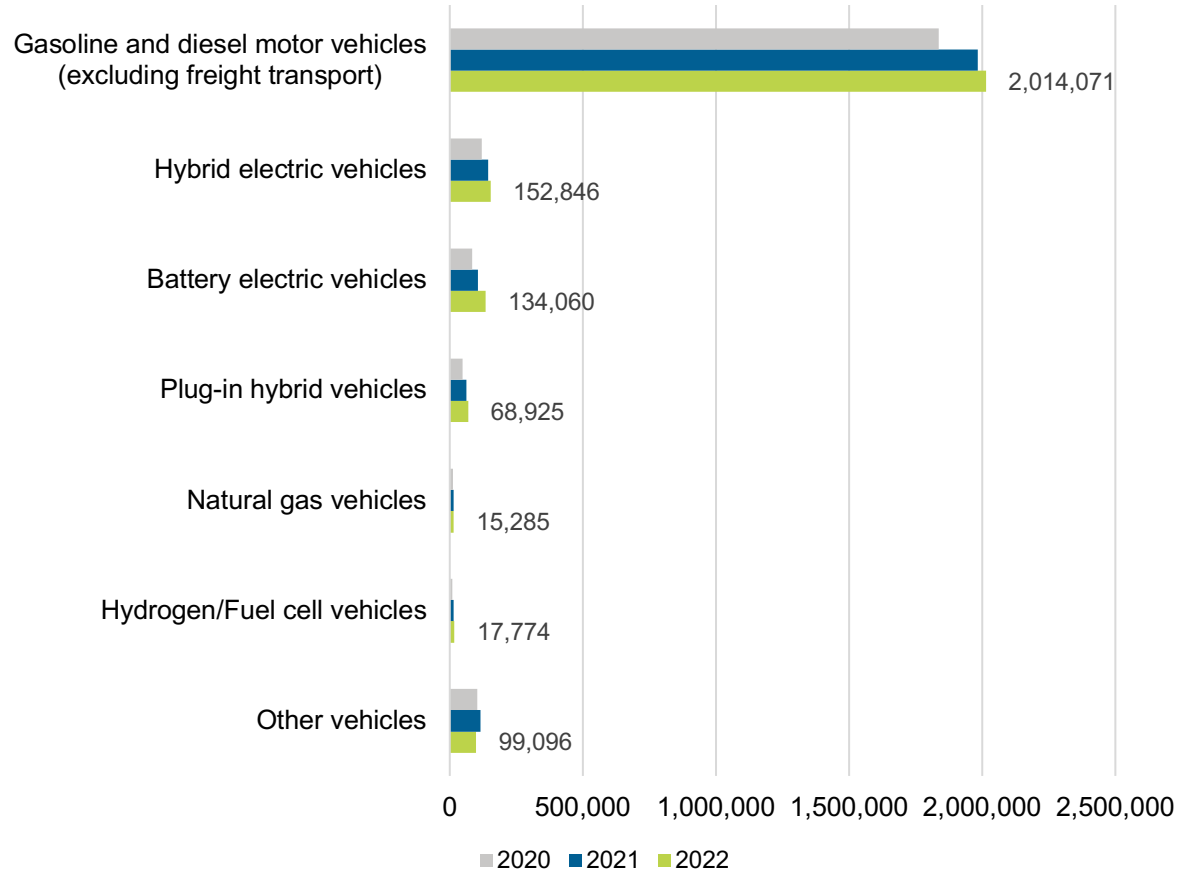
respondents within each of those industries indicating it was “very difficult” or “somewhat difficult” to find employees.

- Employers in all MV & CP industries anticipate growth through 2023.
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in MV & CP (6%) was slightly lower than the private sector national average (7%) and lower than the overall energy workforce average (11%).
- The MV & CP workforce was disproportionately made up of male employees, with 76% of workers being male compared to 73% for the overall energy workforce.
- The percent of non-white workers was higher than the national workforce average, 24% compared to 23%, but lower than the overall energy workforce (25%).
- Hispanic or Latino workers were more concentrated in MV & CP than the national workforce average and the energy workforce average (20% compared to 19% and 18%, respectively).
- Black or African American workers were underrepresented compared to the national workforce average (9% versus 13%) but represented at the same percentage as the energy workforce average (9%).
- Veterans were more represented in MV & CP, at 10%, than in the national workforce (5%) and the overall energy workforce (9%).
- Those requesting accommodations for disabilities were less represented in MV & CP than the national workforce average (2% compared to 4%) but were the same as the energy workforce average (2%).
- The percentage of formerly incarcerated workers (1%) was slightly lower than the national workforce (2%) and on par with the overall energy workforce (1%).

Employment by Technology, Industry, and Occupation

Gasoline and diesel vehicles remained the largest MV & CP technology by employment, adding 31,017 jobs (+1.6%), although BEV employment grew almost 17 times faster (+26.8%, or 28,366 jobs) (Figure 110). All clean vehicle jobs, which include jobs in hybrid electric, BEV, plug-in hybrid, and hydrogen/fuel cell vehicles, exceeded 2019 employment levels in 2022. Employment in "other vehicles" declined by 15,626 workers, or -13.6%.

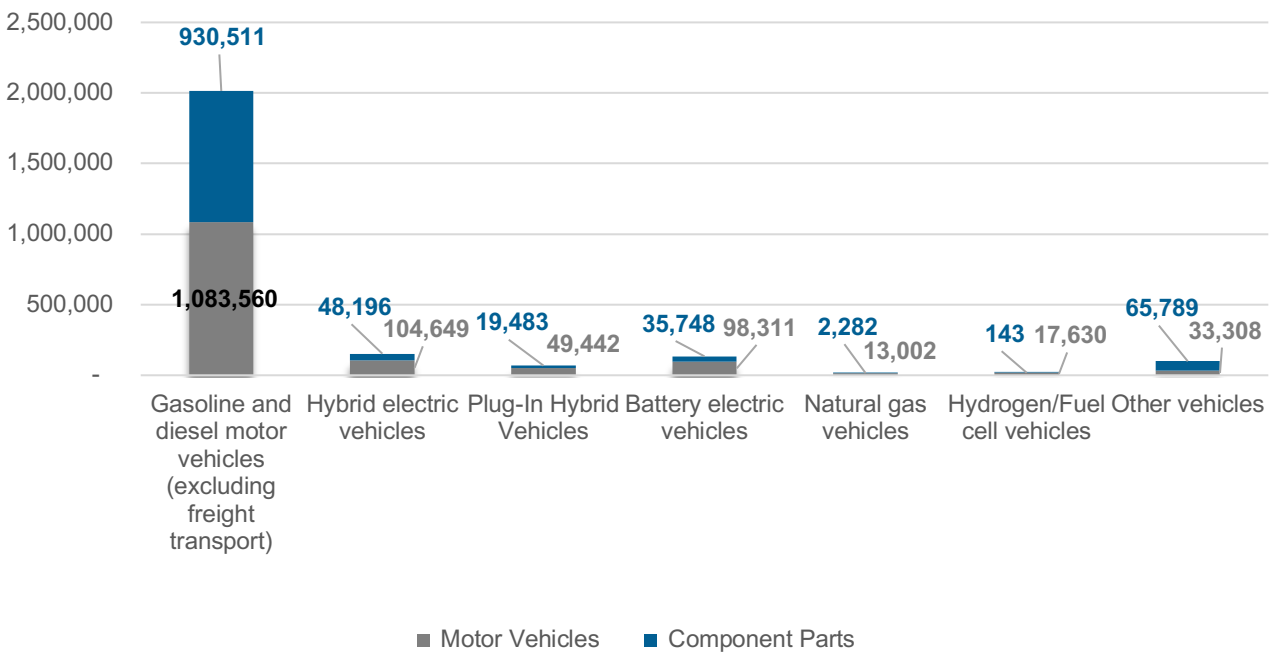
Figure 110. Motor Vehicles and Component Parts Employment by Technology, 2020-2022



Employment in alternative technology vehicles grew a collective 14.7%, led by 28,366 new jobs in BEVs (+26.8% growth) and 9,528 jobs in hybrid electric vehicles (+6.6% growth). Plug-in hybrid vehicle jobs grew by 6,293 (+10%). Hydrogen and fuel cell vehicles employment, though still quite low, grew by the second-highest percentage, expanding by 25.2% or by 3,573 jobs.

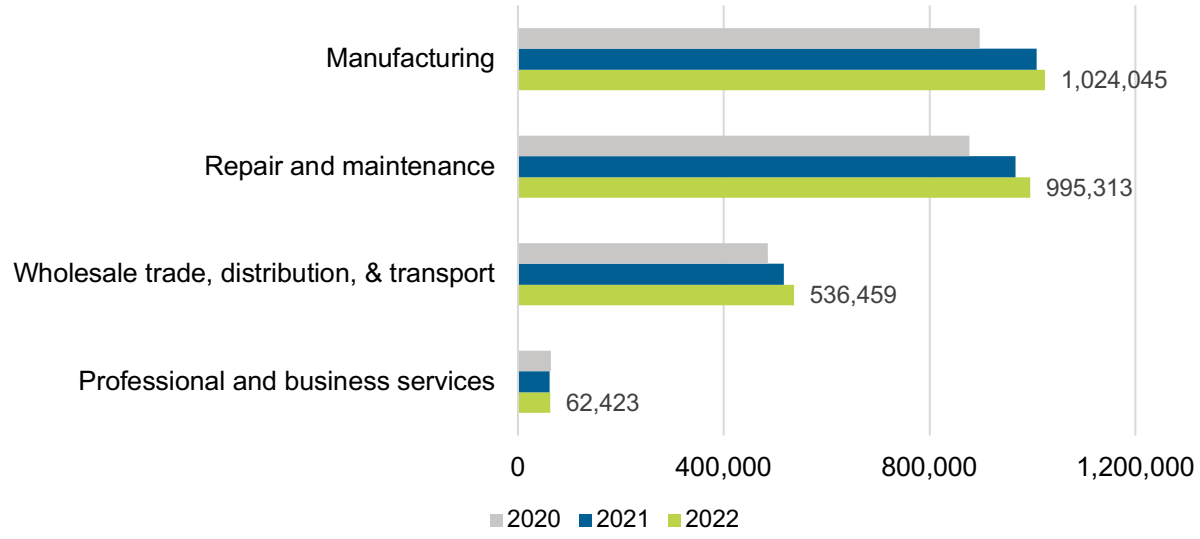
The majority of employment across vehicle technology types was in the MV category, with 1,399,904 workers (Figure 111). Workers focused on the CP value chain totaled 1,102,153 in 2022. Close to half of the jobs in gasoline and diesel motor vehicles were in component parts, while for alternative fuel vehicles, component parts make up a much smaller percentage of the total jobs.

Figure 111. Motor Vehicles and Component Parts Employment by Activity



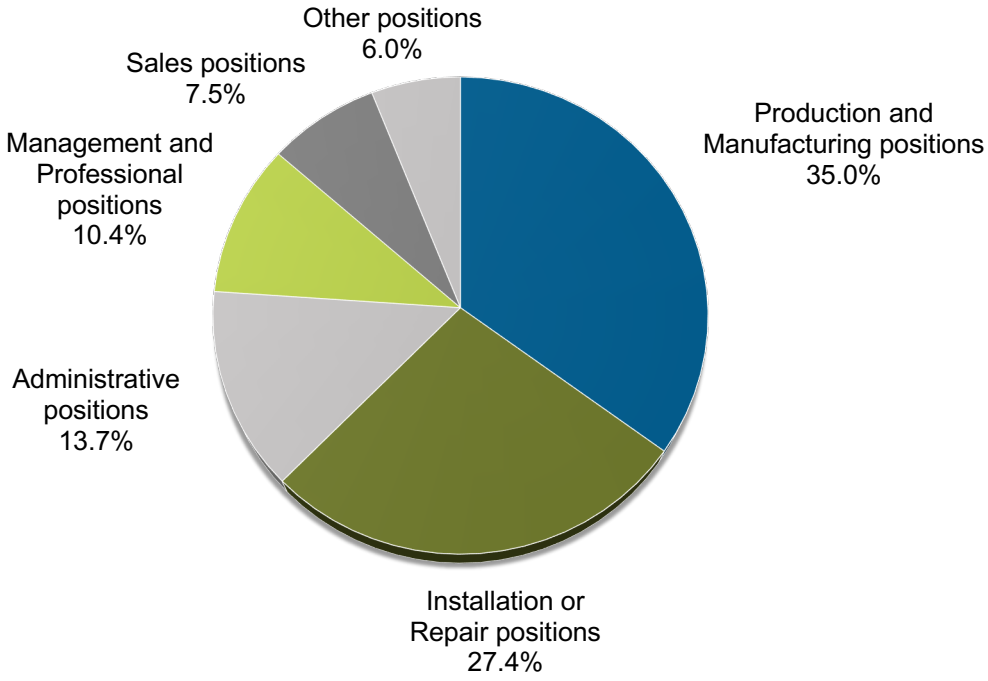
In terms of distribution by industry, MV & CP employment was largely concentrated in the manufacturing industry, with 1,024,045 workers in 2022, up 16,354 jobs from 2021, or 1.6% (Figure 112). The wholesale trade, distribution, and transport industry had the fastest rate of employment growth by percentage, increasing by 4.9% over 2022 (+19,605). Repair and maintenance firms added the most employees—nearly 28,000 (+2.9%) from 2021 to 2022.

Figure 112. Motor Vehicles Employment by Industry, 2020-2022



Workers with the same occupation can work in different industries. For example, the manufacturing industry will include many production and manufacturing positions, but repair and maintenance and other industries will also employ people in these occupations. The largest occupation group within MV & CP was production and manufacturing positions, which accounted for 35% of jobs (Figure 113). This was followed by installation or repair positions (27.4%) and administrative positions (13.7%).

Figure 113. Motor Vehicles and Component Parts Employment by Occupation

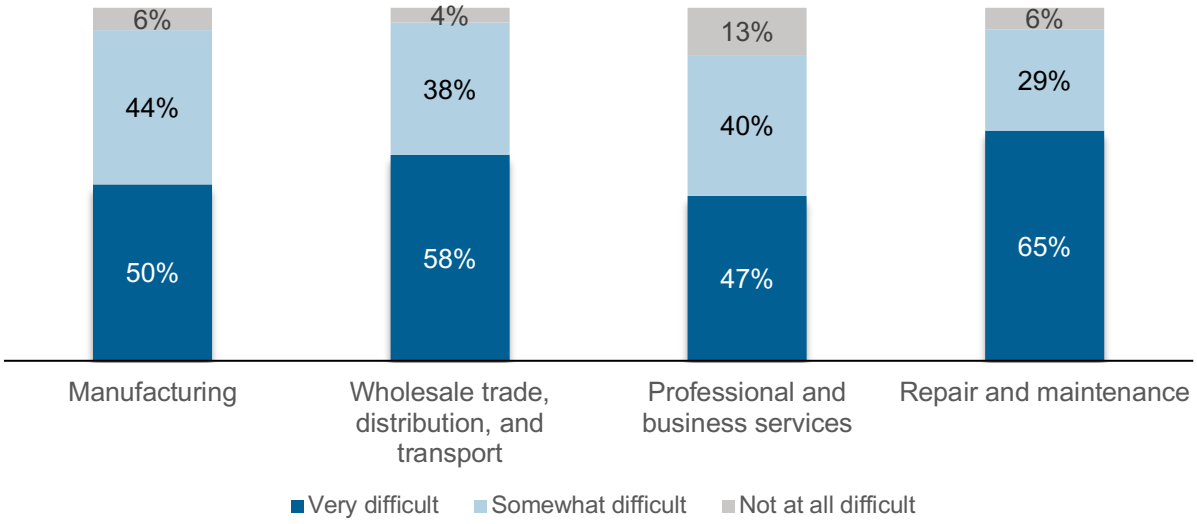


Employer Perspective on Workforce Issues

Current Hiring Difficulty

More than 90% of employers across manufacturing; wholesale trade, distribution, and transport; and other services in MV & CP reported at least some difficulty hiring workers (Figure 114). Repair and maintenance had the highest percentage of employers reporting that hiring was “very difficult” (65%), followed by wholesale trade, distribution, and transport, at 58%.

Figure 114. Motor Vehicles and Component Parts Hiring Difficulty



Competition/small applicant pool was the primary driver of hiring difficulty, according to employers (**Table 36**). Lack of experience, training, or technical skills and insufficient non-technical skills (work ethic, dependability, critical thinking) were cited by employers in three out of four industries within MV & CP.

Table 36. Motor Vehicles and Component Parts Hiring Difficulty Reasons

Industry	Most Common Reason	Second Most Common Reason	Third Most Common Reason
Manufacturing	Insufficient non-technical skills (work ethic, dependability, critical thinking) (40%)	Competition/small applicant pool (33%)	Lack of experience, training, or technical skills (33%)
Wholesale Trade, Distribution, and Transport	Insufficient qualifications (certifications or education) (48%)	Competition/small applicant pool (43%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (17%)
Professional and Business Services	Competition/small applicant pool (46%)	Lack of experience, training, or technical skills (46%)	Cannot provide competitive wages (46%)
Repair and Maintenance	Competition/small applicant pool (44%)	Lack of experience, training, or technical skills (35%)	Insufficient non-technical skills (work ethic, dependability, critical thinking) (33%)

Employment Change by Industry

The previous section highlighted employers' current hiring difficulty across industry, whereas this section focuses on anticipated employment change by technology and industry as well as offering comparisons between actual employment change over the last year versus anticipated employment change in 2021. Employers across all MV & CP industries anticipate growth in 2023 (Figure 115). Expected growth across specific industries within MV & CP ranges from 1.7% in other services (repair and maintenance) to 13.9% in manufacturing. Manufacturers were similarly bullish in 2022, but their actual growth fell short of expectations (Figure 116).

Figure 115. Motor Vehicles and Component Parts Anticipated Change in Employment, 2022-2023

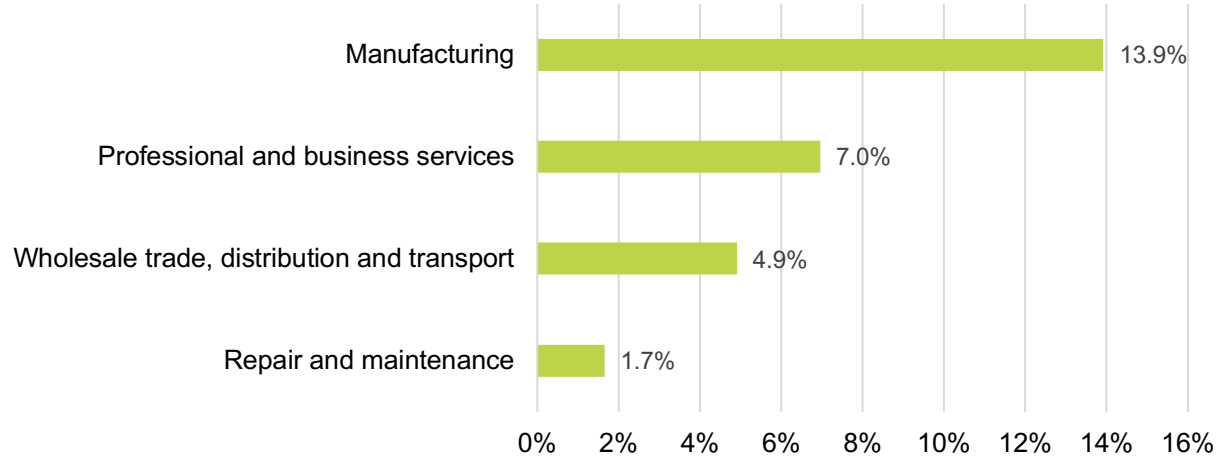
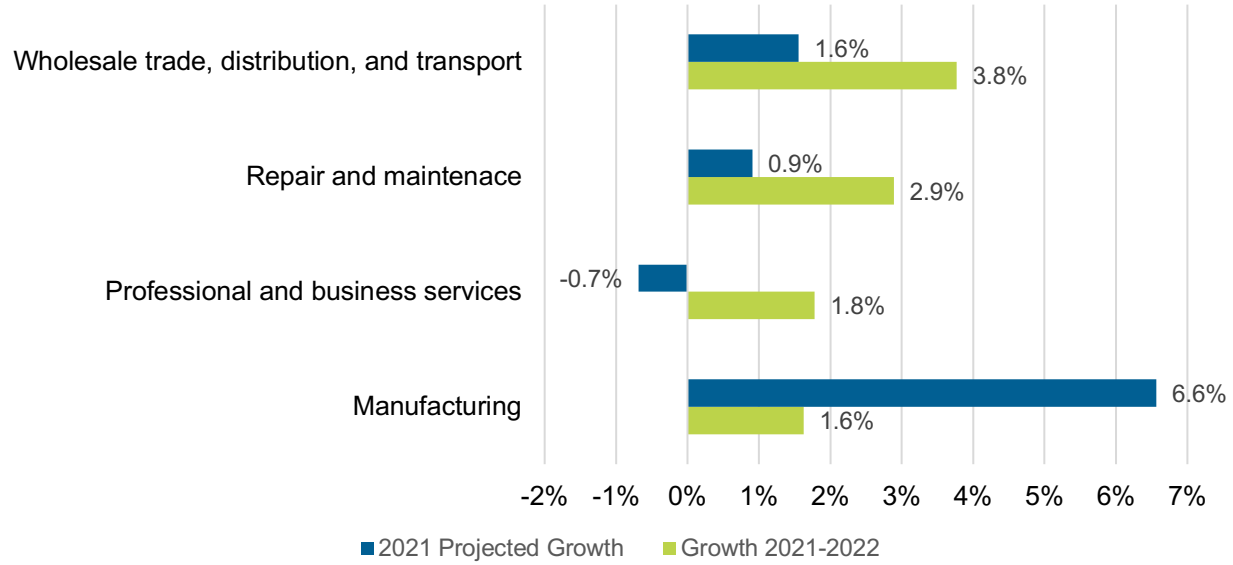


Figure 116. Motor Vehicles and Component Parts Actual Employment Change 2021-2022 vs. Anticipated Employment Change 2021



Motor Vehicles and Component Parts Demographics

The MV & CP workforce was less diverse than the rest of the economy and slightly less diverse than the overall energy workforce in terms of gender; male workers made up 76% of the workforce, more than the 53% national workforce average and the 73% energy workforce average (Table 37). Female workers were 24% of the MV & CP workforce which was lower than both the energy workforce average (26%) and the national workforce average (47%).

The proportion of non-white workers in vehicles was 24%, higher than the 23% national average but lower than the 25% energy workforce average. The percentage of workers that were Black or African American was equal to the energy workforce average of 9% but lower than the national workforce average (12%). Compared to the national workforce average, the proportion of workers of two or more races in MV & CP was approximately double (6% versus 3%).

The proportion of the workforce made up of Hispanic or Latino workers was higher than the national average and the energy workforce average, 20% compared to 19% and 18%, respectively.

The proportion of veterans (10%) was double the national workforce average (5%) and slightly higher than the energy workforce average (9%). The concentration of formerly incarcerated workers was lower than the national average (1% compared to 2%) but in line with the energy workforce average (1%). Workers requesting accommodations for disabilities were half as concentrated in MV & CP (2%) compared to the national workforce average (4%) but once again equal to the energy workforce average (2%). The proportion of workers aged 18 to 29 was higher in MV & CP compared to the national workforce average (30% versus 22%).

Workers represented by a union or covered under a project labor or collective bargaining agreement (6%) was lower than the national private industry workforce average (7%) and lower than both the national workforce (including public sector workforce) and overall energy workforce averages (11%).

Table 37. Motor Vehicles and Component Parts Workforce Demographics and Characteristics

	Number of Workers	Motor Vehicles Average	Energy Workforce Average	National Workforce Average
Male	1,893,977	76%	73%	53%
Female	597,304	24%	26%	47%
Gender Nonbinary	10,776	<1%	<1%	insufficient data
Hispanic or Latino	495,022	20%	18%	19%
Not Hispanic or Latino	2,007,035	80%	82%	82%
American Indian or Alaska Native	45,082	2%	2%	<1%
Asian	130,942	5%	7%	7%
Black or African American	216,626	9%	9%	13%
Native Hawaiian or Other Pacific Islander	23,118	<1%	1%	<1%
White	1,910,948	76%	75%	77%
Two or More Races	157,649	6%	5%	3%
Veterans	251,554	10%	9%	5%
18 to 29	748,971	30%	30%	22%
30 to 54	1,221,016	49%	53%	54%
55 and Over	532,070	21%	17%	24%
Disability	41,057	2%	2%	4%
Formerly Incarcerated	25,734	1%	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	160,320	6%[72]	11%	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

[72] Unionization rates vary by state.

Appendix A:
State Level Clean Energy Jobs

Due to data limitations, the state-level definition of clean energy jobs differs from the national definition. At the state level, fossil and non-fossil jobs cannot be split at the for energy efficiency and traditional transmission and distribution due to the statistical significance of data at these more detailed geographies. At the national level in 2022, 54% of energy efficiency jobs were considered clean under the formal definition and 69% of traditional transmission and distribution jobs – those involving electricity - were considered clean under the same definition.[1]

State-level clean energy jobs refer to a more expansive set of jobs than the national clean job definition. If the state-level definitions were applied nationally, national clean job estimates would total 4,320,739 (including electrical and non-electrical traditional transmission and distribution) and 3,352,450 (including only the efficiency jobs without traditional transmission and distribution. This means that the new-zero aligned definition which totals 3,075,857 jobs, is 71% of the fully expansive state-level definition (with T&D) and 92% of the state-level definition including all energy efficiency.

Since states have very distributions of energy efficiency and transmission and distribution jobs, we caution against applying an across-the-board discount to clean energy jobs to approximate those aligned with a net-zero future. To facilitate independent state-level clean energy jobs figures, the definition used in this report includes:

- All renewable electric power generation technologies, including traditional hydropower
- Nuclear electric power generation and fuel
- Microgrids and grid modernization
- Non-fossil storage
- All biofuels, including corn ethanol
- Plug in hybrid vehicles, battery electric vehicles, and hydrogen fuel cell vehicles
- All energy efficiency*
- Traditional transmission and distribution (including that associated with fossil fuels)*

**Note difference with national clean energy jobs definition, which includes only a subset of this category*

Because nationally, 31% of traditional transmission and distribution jobs are associated with fossil fuels, **Table 1** presents state-level clean energy job numbers with and without traditional transmission and distribution. While both energy efficiency and traditional transmission and distribution are only partially included at the national level, all energy efficiency jobs are involved in reducing energy use and included in the state-level clean energy jobs data in the tables below.

[1] Other forms of transmission and distribution are petroleum, natural gas, coal, and other fuels.

Without including traditional transmission and distribution, California had the highest number of clean energy jobs with 527,696, followed by Texas (248,891) and New York (171,377). Including traditional transmission and distribution, the top three states were still California, Texas, and New York.

Table 1. State Level Clean Energy Jobs

State	Clean Energy Jobs Without Traditional Transmission and Distribution	Clean Energy Jobs With Traditional Transmission and Distribution	Percent Increase in Clean Energy Jobs from Including Traditional T&D
Alabama	44,063	61,374	39%
Alaska	5,518	9,535	73%
Arizona	63,092	76,526	21%
Arkansas	21,948	32,576	48%
California	527,696	623,972	18%
Colorado	66,388	85,222	28%
Connecticut	42,896	51,393	20%
Delaware	12,453	15,136	22%
District of Columbia	15,125	17,068	13%
Florida	164,037	202,556	23%
Georgia	80,710	108,089	34%
Hawaii	13,924	16,468	18%
Idaho	14,375	18,872	31%
Illinois	126,806	156,919	24%
Indiana	81,249	96,565	19%
Iowa	34,756	43,768	26%
Kansas	26,430	39,855	51%
Kentucky	34,008	46,463	37%
Louisiana	31,141	60,091	93%
Maine	13,560	15,395	14%
Maryland	81,383	92,139	13%
Massachusetts	121,939	133,897	10%

Michigan	119,623	137,479	15%
Minnesota	62,619	79,798	27%
Mississippi	21,503	30,705	43%
Missouri	56,279	77,649	38%
Montana	10,535	15,696	49%
Nebraska	21,918	31,406	43%
Nevada	32,891	41,804	27%
New Hampshire	16,860	19,497	16%
New Jersey	56,932	71,877	26%
New Mexico	12,619	25,852	105%
New York	171,377	230,119	34%
North Carolina	105,151	123,369	17%
North Dakota	9,255	16,260	76%
Ohio	108,006	139,370	29%
Oklahoma	22,625	51,525	128%
Oregon	58,231	65,763	13%
Pennsylvania	99,956	139,142	39%
Rhode Island	14,536	16,530	14%
South Carolina	56,478	65,711	16%
South Dakota	13,148	15,773	20%
Tennessee	81,054	100,346	24%
Texas	248,891	396,071	59%
Utah	43,904	48,839	11%
Vermont	16,162	17,572	9%
Virginia	97,156	113,565	17%
Washington	81,257	101,611	25%
West Virginia	9,743	43,331	345%
Wisconsin	71,870	84,747	18%
Wyoming	8,374	15,455	85%

From 2021 to 2022, clean jobs grew in all states and the District of Columbia regardless of whether traditional transmission and distribution was included. As shown in Table 2, excluding traditional transmission and distribution, New Mexico had the fastest clean energy job growth, increasing 6.3% (749 jobs), followed by Kentucky (+6.1%; 1,956) and Oklahoma (+6.1%; 1,298). If traditional transmission and distribution is included, West Virginia grew the fastest, expanding 19.3% (6,975) and followed by New Mexico (+9.1%; 2,130) and Oklahoma (+9.1%; 4,190).

Table 2. Change in Clean Energy Jobs, 2021 – 2022

State	Clean Energy Jobs Growth (Without Traditional Transmission and Distribution) 2021 - 2022	Growth Rate, 2021 – 2022	Clean Energy Jobs Growth (With Traditional Transmission and Distribution) 2021 - 2022	Growth Rate, 2021 – 2022
Alabama	2,205	5.3%	2,363	4.0%
Alaska	149	2.8%	131	1.5%
Arizona	2,441	4.0%	2,538	3.5%
Arkansas	946	4.5%	956	3.1%
California	13,116	3.6%	13,293	3.2%
Colorado	2,584	4.0%	2,681	3.4%
Connecticut	1,081	2.6%	978	2.0%
Delaware	197	1.6%	418	2.9%
District of Columbia	736	5.1%	753	4.7%
Florida	2,722	4.8%	2,698	3.9%
Georgia	3,866	5.0%	3,984	3.9%
Hawaii	227	1.7%	483	3.2%
Idaho	721	5.3%	719	4.2%
Illinois	3,773	3.1%	3,740	2.5%
Indiana	2,868	3.7%	2,953	3.3%
Iowa	957	2.8%	946	2.3%
Kansas	1,068	4.2%	816	2.2%
Kentucky	1,956	6.1%	1,989	4.6%
Louisiana	1,573	5.3%	1,192	2.1%
Maine	536	4.1%	585	4.1%
Maryland	1,356	1.7%	1,454	1.7%

Massachusetts	4,556	3.9%	4,739	3.9%
Michigan	4,370	3.8%	4,673	3.6%
Minnesota	2,003	3.3%	1,934	2.6%
Mississippi	1,080	5.3%	1,175	4.1%
Missouri	2,207	4.1%	2,009	2.7%
Montana	337	3.3%	408	2.8%
Nebraska	784	3.7%	621	2.1%
Nevada	1,025	3.2%	908	3.4%
New Hampshire	390	2.4%	385	2.1%
New Jersey	3,065	5.7%	3,113	4.6%
New Mexico	749	6.3%	2,130	9.1%
New York	5,054	3.0%	4,313	2.0%
North Carolina	1,965	1.9%	2,561	2.2%
North Dakota	295	3.3%	390	2.6%
Ohio	4,504	4.4%	4,399	3.3%
Oklahoma	1,298	6.1%	4,190	9.0%
Oregon	1,581	2.8%	1,631	2.7%
Pennsylvania	4,042	4.2%	4,042	6.4%
Rhode Island	255	1.8%	462	2.9%
South Carolina	1,549	2.8%	1,668	2.7%
South Dakota	445	3.5%	481	3.3%
Tennessee	4,021	5.2%	4,139	4.4%
Texas	5,198	5.5%	5,136	3.5%
Utah	1,366	3.2%	1,538	3.3%
Vermont	71	0.4%	81	0.6%
Virginia	3,388	3.6%	4,334	4.0%
Washington	1,984	2.5%	1,853	2.0%
West Virginia	341	3.6%	6,975	19.3%
Wisconsin	405	0.6%	472	0.6%
Wyoming	30	0.4%	537	3.7%

Appendix B: Discussion of USEER Methodology

I. Survey Overview

The 2023 USEER methodology relies on the most recently available data from the BLS QCEW (QCEW, third quarter 2022), the BLS Unemployment Situation Table B-1 monthly reports, together with a detailed supplemental survey of business establishments across the U.S. designed and conducted by BW Research Partnership in partnership with the DOE. During a time of rapid change in energy technology and business employment structure, supplemental surveys are an important tool to capture developing trends. Taken together, the BLS and survey data provide the most comprehensive calculation of energy-related employment available. The methodology has been used for local, state, and federal energy-related data collection and analysis for a decade, including the Interstate Renewable Energy Council's *National Solar Jobs Census* series, traditional and clean energy reports for state agencies in the Commonwealths of Massachusetts, and Pennsylvania, New York State, and the States of California, Connecticut, Maryland, Minnesota, New Hampshire, Rhode Island, and Vermont, and numerous nonprofit agencies across the U.S.

The 2023 USEER survey uses a stratified sampling plan that is representative by industry code (NAICS or ANAICS),[2] establishment size and geography to determine the proportion of establishments that work with specific energy-related technologies, as well as the proportion of workers in such establishments that use the same. These data are then analyzed and applied to existing public data published by the BLS, effectively constraining the potential universe of energy establishments and employment. For more detail, see Section III, USEER Sampling Plan.

The 2023 USEER survey was administered by telephone (more than 274,000 outbound calls) and by web, with more than 327,700 emails sent to participants throughout the U.S. The phone survey was conducted by ReconMR. The web instrument was programmed internally, and each respondent was required to use a unique ID to prevent duplication.

The sample was split into two categories, referred to as the known and unknown universes. The known universe includes establishments that have previously been identified as energy related, either in prior research or in some other manner, such as membership in an industry association or participation in government programs. These establishments were surveyed census-style, and their associated establishment and employment totals were removed from the unknown universe for both sampling and for resulting employment calculations and estimates.

The unknown universe included tens of thousands of businesses in potentially energy-related NAICS codes, across agriculture, mining and extraction, utilities, construction, manufacturing, wholesale trade, distribution (including pipeline

2 ANAICS is a term used by BLS, which means Allocation NAICS, and refers to the industries included in the aggregation of industries likely to participate in said activities (https://www.bls.gov/ggs/ggs_technote_extended.pdf)

distribution), professional services, and repair and maintenance. Each of these segments and their total reported establishments (within the BLS QCEW) were carefully analyzed by size (employment) and state to develop representative clusters for sampling. In total, approximately 34,200 business establishments participated in the survey effort, with approximately 7,200 providing full responses to the survey. These responses were used to develop incidence rates among industries (by state) as well as to apportion employment across various industry categories in ways currently not provided by state and federal labor market information agencies. The margin of error for incidence in the USEER is ±0.53% at a 95% confidence interval. The margin of error for all energy firms that answered questions related to energy employment in the survey is ±1.15% at a 95% confidence interval. The margin of error increases for each subgroup of respondents that participated in the survey. For example, the margin of error for questions answered by all firms that identified as solar photovoltaic (PV) is ±3.49% at a 95% confidence interval.

For several industries, particularly transportation of goods, the USEER uses the methodology developed by DOE, BW Research, the National Renewable Energy Laboratory, and the National Energy Technology Laboratory for the first installment of the USEER. The proportion of employment, referred to as "commodity flows," was calculated by dividing the value of commodity shipments (in millions of dollars) for coal, fuel oil, gas, motor vehicles, petroleum and other coal and petroleum products by total commodity value at the state level by truck, rail, air and water transport. This proportion was applied to NAICS employment for truck transportation (NAICS 484), water transportation (NAICS 483), air transportation (NAICS 481) and Railroad Retirement Board employment for rail transportation at the state level. With this analysis, truck transportation represents the majority of energy-related transportation employment (69%), followed by rail (22%), water (8%) and air (1%).

Of important note, the USEER expressly excludes any employment in retail trade NAICS codes except for Fuel Dealers (NAICS 454310). This excludes motor vehicle dealerships, gas stations,[3] appliance and hardware stores and other retail establishments.

All data in the USEER rely on the BLS QCEW data for the end of the third quarter of 2022, and the BLS Unemployment Situation Table B-1 monthly reports through December 2022. Employment extrapolations are based off BLS QCEW and survey data, resulting in totals that carry precise decimal values. As a result, some employment totals for tables in the report will sum differently due to rounding. The USEER survey was administered between January 31, 2023, and March 30, 2023, and averaged 17 minutes in length.

II. Methodology Discussion

Employment data collected by the BLS provide information on many, but not all, energy-related job categories. Most notably, BLS does not collect data on employment levels by energy technology across business segments. For instance, residential solar installation establishments are typically labeled as electrical contractors (together with all other traditional electrical businesses) without being

3 Gas station employment had been reported in previous years up to the 2021 USEER. The 2023 USEER excludes mention of employment in this industry.

identified specifically as solar companies. Petroleum engineering firms are included in engineering services, with civil, mechanical, and other engineers, while electric vehicle prototype manufacturers are combined with gasoline- and diesel-fueled vehicle manufacturing. As a result, BLS employment data do not capture the full scope of energy employment trends.

Given the complex relationship between energy and the overall economy, the 2023 USEER investigates, with a special supplemental survey, the three traditional energy sectors — electric power generation, fuels, and transmission, distribution, and storage — followed by individual analyses of employment in two important energy end-use sectors — energy efficiency and motor vehicles. The spread of business activities in each of the five analyzed sectors presents additional taxonomic challenges, as early-stage research and development, repair, and maintenance or professional and technical services vary across energy, energy efficiency, and manufacturing. Natural gas business activities, for instance, differ from business activities relating to advanced building materials and solar photovoltaic materials.

Historically, the BLS has conducted supplemental surveys to acquire more complete information on new industries, specific demographic profiles within the workforce or new labor force trends such as the role of contingent workers. In this way, significant modification to the current BLS structure of industry and occupational classifications is avoided by capturing the required energy employment data using a supplemental survey tool based on existing BLS data and classifications.

The 2023 USEER relies on such a comprehensive survey of 34,200 business representatives across the U.S., conducted by BW Research. The survey data were used to filter and analyze the concentration, intensity and distribution of various energy technologies and activities throughout traditional industry sectors, using third quarter 2022 employment data from the BLS QCEW and the BLS Unemployment Situation Table B-1 monthly reports through December 2022. USEER data also provide an additional layer of information to track sector-specific growth potential, obstacles, and opportunities. The data presented in the USEER are not intended to remove, replace, or replicate existing data from the BLS QCEW, but instead to reorganize categories and provide insight for policymakers and the public regarding trends in energy employment, energy production and energy consumption across the U.S.

The USEER provides data for direct employment only and does not attempt to estimate indirect employment or induced employment related to the analyzed sectors. Many employment studies generate employment estimates that rely on input/output modeling. These studies typically define an activity based on reported expenditures or expenditures and associated levels of employment reported by a defined industry or activity, such as U.S. solar PV installation. In this example, solar PV installation firm employment would be the “direct” jobs. Most studies go at least one step further, identifying “indirect” employment, which includes the supply chain or other support services to the industry. In the solar example, these would include U.S. manufacturing jobs related to producing PV equipment used in domestic installations (and their suppliers and vendors) as well as consulting, tax, legal, and other professional services to support domestic PV installation companies. Another typical calculation is “induced” jobs, which includes jobs created or supported by wages paid and other benefits provided by employers of direct and indirect employees.

In the USEER, by comparison, the direct job category of interest is defined as the solar industry generally, including utility-scale solar, residential, and commercial installations, as well as the manufacturing, professional services, and wholesale trade that make up the sector. However, the indirect jobs that support this industry are **not** included, such as polysilicon production (the raw material used in solar panels), aluminum production and extrusion activities for frame manufacturing or

A Note on Sources for Figures and Tables in the Report

All reported employment numbers and actual employment growth percentages for figures and tables in USEER rely on a combination of NAICS employment reported by BLS QCEW Q3 (for each year) with growth through Q4 estimated from the BLS Unemployment Situation Table B-1 monthly reports through December combined with employment extrapolations the USEER survey itself.

Any mention of employer hiring difficulty, reasons for hiring difficulty, and anticipated growth is taken directly from USEER survey data and is presented at the energy technology or industry level.

other aspects of the solar energy value chain. Induced jobs — those created economy-wide as a result of the spending of wages by the employees whose income derives, in whole or part, from this industry — are also not included.

Employment numbers in the text, charts, and tables of the USEER are reported at all place values to follow QCEW reporting. In other words, the number of significant digits given for each number in this report matches that given in QCEW reporting for the same type of numbers. For information on margin of error, refer to the first paragraph on page A-2 of the methodology.

For this survey, a qualifying firm is

An organization with employees in the United States that is directly involved with researching, developing, producing, manufacturing, distributing, selling, implementing, installing, or repairing components, goods or services related to Electric Power Generation; Electric Power Transmission, Distribution, and Storage; Energy Efficiency, including Heating, Cooling and Building Envelope; Fuels, including Extraction, Processing, Production, and Distribution; and Transportation, including Motor Vehicles. This also includes supporting services such as consulting, finance, tax, and legal services related to energy, fuels, energy efficiency, or motor vehicles.

Qualifying workers are

Employees of a qualifying firm that spend some portion of their time supporting the qualifying energy, energy-efficiency, or motor vehicle portion of the business.[4]

This report provides detail into levels of employment activity that include both “a portion of their time” and “a majority of their time” when referencing qualifying workers. This is especially true in the energy efficiency sector where the employing

[4] Data presented in this report exclude retail employees. Qualifying workers in energy will be referenced as energy-related jobs. Where “portion of their time” includes employees whose relevant activities are less than 50% of their time, specific reference is made of that fact.

construction or repair firms frequently are engaged in both traditional energy-related construction or installation as well as high-efficiency activities that qualify for ENERGY STAR designation.

Primary energy consumption[5] in the U.S. is divided among four sectors: electric power sector (37.6%), residential and commercial buildings (12%), industrial (23.1%) and transportation (27.4%). This distribution of energy consumption by sector is based on total 2022 estimates published by the EIA.[6]

End-use electricity consumption, in turn, is divided with 74.1% consumed by residential and commercial buildings, 25.8% by industrial and 0.1% by transportation.[7] Thus, residential and commercial buildings consumed 39.8% of all energy (an amount consisting of their direct energy end use, their electricity end use and the electrical system energy losses allocated to the sector by EIA).[8]

As with the 2022 report, the 2023 USEER identifies jobs that manufacture ENERGY STAR appliances and other ENERGY STAR labeled products, as well as employment in building design and contracting services that provide insulation, improve natural lighting, and reduce overall energy consumption across homes and businesses.[9] As with the 2022 report, the 2023 USEER includes a section that disaggregates ENERGY STAR technologies more thoroughly, further highlighting the employment impacts of the program.

Motor vehicles are included in this report primarily because of their intensive use of energy and contribution to carbon emissions.[10] This report delineates employment between traditional gas and diesel motor vehicles, hybrid and plug-in hybrid, all-electric, natural gas, hydrogen, and fuel cell technologies, as well as motor vehicle component parts for such vehicles. USEER does not, however, cover all sectors of transportation, such as aviation and maritime transportation. According to the EIA, the transportation sector accounted for 27.4% of U.S. primary energy consumption in 2022;[11] 67.2% of overall U.S. petroleum consumption was attributable to the transportation sector.[12]

Motor vehicles employment reported at the state level includes overall value chain (manufacturing, wholesale trade, commodity flows or freight transport of motor vehicles, professional and business services and repair and maintenance) and employment by detailed technology (gas and diesel, hybrid, plug-in hybrid, electric, hydrogen and fuel cell, natural gas and other). Employment at the state level is not reported by value chain within detailed technology.

---

[5] Primary energy consumption is the direct consumption of energy at its first point of use. Importantly, this does not include consumption of electricity, so that primary energy consumption in the residential and commercial building sector includes direct use of fuels like natural gas for heating, but not electricity used for lighting and cooling.
[6] EIA, *Monthly Energy Review*, Table 2.1 and Table 2.6. Percentages are based on primary energy consumption in 2022 and do not add up to 100.0% due to rounding.
[7] EIA, *Monthly Energy Review*, Table 7.6. Percentages of retail electricity sales in 2022.
[8] EIA, *Monthly Energy Review*, Table 2.1. Percentage based on total energy consumption in 2022.
[9] Estimates do not include retail employment.
[10] The USEER covers motor vehicle employment across vehicle parts manufacturing, automotive repair and maintenance, as well as vehicle, parts and supplies wholesalers, including air, rail, water, and truck transportation of motor vehicle parts and supplies. It does not capture jobs associated with the final assembly of some transportation equipment such as forklifts and golf carts.
[11] EIA, Monthly Energy Review, Table 2.1.
[12] EIA, *Monthly Energy Review*, Table 3.7c. Percentage calculated using the sum of sector totals in Tables 3.7a through 3.7c.

BW Research, an independent research organization, collected and analyzed the data. The data set includes technology, value chain, and energy employment data in all 50 U.S. states and the District of Columbia. In a time of rapid change in energy technologies across the board, continued refinement of supplemental surveys will remain an important tool in analyzing existing BLS data sets.

Another benefit of using the QCEW framework and a supplemental survey is the ability to understand and report the concentration of energy-related activities in traditional industries, such as construction, manufacturing, and utilities. This helps illustrate the significant impact that energy and energy-related activities have on the overall economy. The impacts to the various selected industries are illustrated briefly below.[13]

Demographic Data Collection Update

The 2023 USEER includes updated demographic estimates for "Black or African Americans" and "two or more races," and an additional category ("unknown race") for employers to place workers if they are unable to identify race. "Black or African American" is a combined category that was split between "Black or African American, Not Indigenous" and "Black, Indigenous" for the 2022 USEER. The "two or more races" category was not included in the questionnaire due to employers incorrectly categorizing workers of unknown race into "two or more races." The "two or more races" category was extrapolated in 2023 from multiple response overage to the USEER race question in this year's survey. This methodology was instituted with the help of the U.S. Census Bureau. Finally, "unknown race" was included in this year's questionnaire for employers to place workers they were unable to categorize. This addition also limited incorrect placement of workers in the "two or more races" category as a default response.

III. USEER Sampling Plan

1a. Universe

Geographic coverage included the 50 states, the District of Columbia, and the U.S. territories. Private establishments and government units were included, but units with average employment of zero over the last 12 months were excluded. Data were collected for establishments in 266 detailed industries identified to be of specific interest for the USEER survey. The industries were defined using the six-digit detail of the NAICS (which includes 1,099 six-digit industries).

The sampling frame is a representative sample of employers drawn from establishment totals from the QCEW Longitudinal Database (LDB) maintained by the BLS, stratified by employment size categories developed by the Census Bureau County Business Patterns data set. The actual contact information and business names were drawn from a private data set, Data Axle USA, because the QCEW is confidential. About 2.9 million establishments with employment of 26 million were in the 266 in-scope industries.

[13] Because the USEER uses modeling to estimate fuel-stock employment in agriculture and forestry, and because these industry codes are not effectively captured by QCEW, no estimate is made as to the percent of the total industry captured by the USEER.

For the purposes of USEER sample allocation, we aggregated 266 detailed industries into seven groups or "allocation" NAICS (ANAICS). For most in-scope industries, the ANAICS is the two-digit NAICS and includes all in-scope NAICS-defined industries in the two-digit code. In some two-digit industries, ANAICS splits out specific five- and six-digit NAICS industries that have historically had a higher incidence of energy activity. ANAICS two- and three-digit coding is the same as for NAICS, though restricted to USEER-eligible industries.

Industry sectors are also defined for use in allocation. Industry sectors are two-digit ANAICS with two exceptions. The manufacturing sector combines three two-digit codes. The trade sector combines retail trade and wholesale trade.

About 16,500 in-scope known universe establishments with 1 million employees were pre-identified as having energy activity. A database of known universe establishments was developed internally by BW Research by collecting industry association databases, approved utility contractor lists, and other public and private sources, as well as prior indication in a USEER survey collection. By comparing the information obtained through these sources and comparing the NAICS codes of these establishments in the QCEW, Known Universe establishments were matched to the QCEW/Data Axle USA data set and a "known" indicator was used to assist in oversampling known establishments.

1b. Sample

BW Research contacts between 30,000 and 35,000 establishments per year. The total survey completion targets were based on a sample selected using the QCEW/Data Axle USA frame for the second quarter of 2022. Quotas were established for each NAICS or ANAICS code by size and state.

The USEER is stratified by six-digit NAICS and size class (1-9, 10-19, 20-49, 50-99 and 100+ employees) and systematic samples selected in the noncertainty strata. Known establishments can be of any ownership, are processed separately and are excluded from the other portions of the frame. Federal and state government stratification are both at the state level by industry sector. Local government stratification is at the state level by industry sector for these sectors: utilities; transportation and warehousing; professional, scientific, and technical services; remediation services; educational services; arts, entertainment, and recreation; and public administration, with all other sectors combined to a residual category. For private establishments (excluding the known universe), three levels of stratification are examined during sample allocation: (1) at the state level by industry sector, (2) national ANAICS, and (3) national six-digit NAICS. Further stratification by establishment size did not prove to be practical for similar studies.

2. Sample Design

USEER panels have a probability-based sample aimed at satisfying data needs at both the state by industry sector level and the national ANAICS level. The basic sampling unit is an establishment. Response quotas are set based on the representation of total establishments by six-digit NAICS, times the proportion of establishments in each size category as identified in the most recent available data from the Census Bureau County Business Patterns.

Restricted to in-scope industries, establishments on the QCEW frame are separated into five mutually exclusive parts that are separately sampled. Approximate sample counts refer to a sample selected from the QCEW frame for the second quarter of 2022.

- Known universe; census, with up to six attempts; stratification industry by size class (can have any ownership code)

- Federal government; sample size of 50; stratification at the state level by industry sector

- State government; sample size of 50; stratification at the state level by industry sector

- Private; sample size of 29,900; complex stratification using state and industry

Known sampling: All establishments in the known universe will be contacted up to six times. The responses will be treated separately, and the overall employment from the known universe sample will be de-duplicated from the appropriate panel of ANAICS, based on the known universe respondent NAICS code.

The allocation for private establishments and government (excluding known universe) has four basic steps:

1. Determine establishments by state — relying on the most recent data available from QCEW, the proportion of establishments in each selected NAICS is determined as a percentage of the total establishments in all selected NAICS.
2. Determine NAICS establishments by size — relying on the most recent data available in the Census Bureau County Business Patterns, the proportion of establishments within each size category in each six-digit NAICS is determined. The total NAICS quota is allocated by the size proportions to develop the percentage of total state-level sample.
3. De-duplicate known universe establishments from the sampling universe — verifying by name, NAICS, contact name, address, phone, and other identifying information, known universe establishments are removed from the private, state and federal government sampling universes.
4. Establish quotas — state-level quotas are established by multiplying the total number of proposed survey completions per state by the percentage determined in Steps 1 and 2.

Appendix C:
USEER 2023 Employer Survey

OMB No. 1910-5179 Expiration 2024

Introduction:

Hello, my name is _____ and I am calling on behalf of the United States Department of Energy. We are conducting a national survey about the energy, energy-related, and advanced manufacturing industries. May I please speak to the person most knowledgeable about staffing at [organization]?

Is now a convenient time?

This survey uses specific terms to describe various technologies and activities. If you require any definitions for clarification, please ask me at any time.

The survey is **voluntary** and can take up to 45 minutes of your time.

(If needed): This important survey addresses businesses that research, develop, manufacture, install or work with products that generate, distribute or save energy.

(If needed): This includes organizations involved in fossil and renewable energy production, energy efficiency products and services, motor vehicles, solar, wind, fossil and other energy sources, and other energy related products and services.

(If needed): Your individual responses will **not** be published; only aggregated information will be used in reporting the survey results.

(If needed): Your participation will help determine how investments of time and money should be made to support the industry and prepare the present and future labor pool.

(If needed):: If you have any questions about DOE's involvement in this survey, please contact David Keyser at [insert phone]

Paperwork Reduction Act Burden Disclosure Statement

This data is being collected to allow energy-related employment to be assigned by primary value chain activity, including: research and development; manufacturing; sales and distribution; installation, repair and maintenance; and professional services. It will also provide insight on workforce demographics and employers' ability to recruit qualified workers.

The data you supply will be used by industry, training organizations, community colleges, job seekers, federal agencies and other stakeholders, to better inform the workforce development system by highlighting changes in the industry that are driving demand for workers. The data will also inform energy economic development planning activities at the local, state and regional levels by providing a more detailed assessment of energy jobs, as well as the changing energy landscape and how such changes influence labor markets.

Public reporting burden for this collection of information is estimated to up to 45 minutes, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of the Chief Information Officer, Enterprise Policy Development & Implementation Office, IM-22, Paperwork Reduction Project OMB Control Number 1910-5179, U.S. Department of Energy, 1000 Independence Ave SW, Washington, DC, 20585-1290; and to the Office of Management and Budget (OMB), OIRA, Paperwork Reduction Project OMB Control Number 1910-5179, Washington, DC 20503.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB control number.

Submission of this data is voluntary.

A. Does your organization have at least one location with employees in the United States, including territories? (Please count yourself as an employee if you are an owner-operated business or sole proprietor).

1 Yes [CONTINUE]
2 No [TERMINATE]

For this survey, please only answer for your current business location. If your organization has other U.S. locations, please do not include their data. What is the zip code of your current location? [SHOW ADDRESS FROM SAMPLE FILE]

_____ (Accept all five-digit responses)

(DON'T READ) Have check box for Refused (Terminate if Refused)

B. Is your organization involved, in whole or part, with an activity related to energy? (PAUSE, IF UNSURE OR NO READ REMAINDER OF QUESTION, IF YES GO TO SC) We define this as being directly involved with researching, developing, producing, manufacturing, distributing, selling, implementing, installing, or repairing components, goods or services related to Electric Power Generation; Electric Power Transmission, Distribution, and Storage; Energy Efficiency, Including Heating, Cooling and Building Envelope; Fuels, including Extraction, Processing, Production, and Distribution; and Transportation, including Motor Vehicles. This also includes supporting services such as consulting, finance, tax, and legal services related to energy.

1 Yes [CONTINUE]

2 No [TERMINATE]

3 Not sure [TERMINATE]

C. What is your role in your organization?
1. Human resources
2. Owner, manager, or proprietor
3. Other [Specify]

D. Which of the following industries describes your organization's work?

[ALLOW MULTIPLE RESPONSES] [IF NEEDED: If your organization is involved in energy research or professional services for the industry, please select the options that are most relevant to your organization.]

1. Electric Power Generation
2. Electric Power Transmission and Distribution, including electric vehicle charging stations
3. Storage, including electric vehicle batteries
4. Energy Efficiency, Including Heating, Cooling and Building Envelope (IF NEEDED THIS INCLUDES THERMAL OR HOT WATER SOLAR)
5. Fuels
6. Transportation Vehicles, including Motor Vehicles (IF NEEDED: Including industrial and agricultural vehicles, such as forklifts, tractors, and recreational vehicles, such as golf carts) e
7. Component Parts for Transportation Vehicles
8. Carbon Capture and Storage
9. Other (Specify _____) TERMINATE
10. DK/NA TERMINATE

[ASK SCREENER D IF SC COUNT>1]]

F. Which do you consider your organization's **primary** industry, based on the majority of labor hours performed at your location? [PIPE IN SC CATEGORIES, ACCEPT ONE]

1. Electric Power Generation
2. Electric Power Transmission and Distribution, including electric vehicle charging stations
3. Storage, including electric vehicle batteries
4. Energy Efficiency, Including Heating, Cooling and Building Envelope (IF NEEDED THIS INCLUDES THERMAL OR HOT WATER SOLAR)
5. Fuels
6. Transportation, including Motor Vehicles (IF NEEDED: Including industrial and agricultural vehicles, such as forklifts, tractors, and recreational vehicles, such as golf carts)
7. Component Parts for Transportation Vehicles
8. Carbon Capture and Storage

CREATE **SDPRIME** FROM SC IF SC COUNT=1, OR SD IF SC COUNT>1

G. [ASK FOR EACH SC] Which of the following [INSERT SC RESPONSE] technologies is your organization directly engaged with? [READ LIST, ALLOW MULTIPLE RESPONSES]

A. Electric Power Generation (IF SC=1) [RANDOMIZE]
1. Solar Electric Generation [SET SOLAR=1]
2. Land-based Wind Generation
3. Offshore Wind Generation
4. Geothermal Generation
5. Bioenergy/Biomass Generation
6. Low-Impact Hydroelectric Generation such as run of river
7. Traditional Hydroelectric Generation
8. Marine and Hydrokinetic Generation
9. Advanced/Low Emission Natural Gas
10. Nuclear Generation
11. Coal Generation
12. Oil and other Petroleum Generation
13. Natural Gas Generation
14. Combined Heat and Power
15. Other Generation (Specify)

B. Electric Power Transmission and Distribution (IF SC=2) [RANDOMIZE]
1. Traditional Transmission and Distribution
2. Electric Vehicle Charging Stations
3. Smart Grid
4. Micro Grids
5. Other Grid Modernization
6. Other (Specify)

C. Storage (IF SC=3) [RANDOMIZE] [IF SEA=1, "(including battery storage for solar generation)"

1. Pumped hydro-power storage
2. Battery storage, including electric vehicle batteries [IF SEA=1, "(including battery storage for solar generation)"
3. Mechanical storage (flywheels, compressed air energy storage, etc.)
4. Thermal storage
5. Liquefied natural gas
6. Compressed natural gas
7. Crude oil
8. Refined petroleum fuels (liquid)
9. Refined petroleum fuels (gas)
10. Coal storage (piles, domes, etc.)
11. Biofuels, including ethanol and biodiesel
12. Nuclear fuel
13. Other gas fuel (Specify)
14. Other liquid fuel (Specify)
15. Other Storage
16. Other (Specify)

IF SEC=2, ASK C_2 AND C_3

C_2. What type of Battery Storage do you work with? [READ LIST, ALLOW MULTIPLE RESPONSES] [RANDOMIZE]

1. Lithium batteries
2. Lead-based batteries
3. Other solid-electrode batteries (Specify)
4. Vanadium redox flow batteries
5. Other flow batteries (Specify)

C_3. What is the application of your battery storage work? [READ LIST, ALLOW MULTIPLE RESPONSES] [RANDOMIZE]

1. Consumer devices
2. Vehicles or other transportation (including electric vehicles)
3. Behind-the-meter (buildings or industrial facilities)
4. Front-of-meter (electric grid)
5. Other (Specify)

D. Energy Efficiency, Including Heating, Cooling and Building Envelope (IF SC=4) [RANDOMIZE]

1. ENERGY STAR® Certified Appliances (not including HVAC)
2. ENERGY STAR Certified Heating, Ventilation, and Cooling (HVAC), except air-source and ground-source heat pumps
3. ENERGY STAR Air-Source Heat Pumps
4. ENERGY STAR Ground-source or geothermal heat pumps
5. Other high efficiency HVAC that are out of scope for ENERGY STAR certification (e.g. indirect evaporative coolers, air to water heat pumps, energy recovery systems, etc.)
6. Traditional HVAC goods, control systems, and services
7. ENERGY STAR certified water heaters
8. ENERGY STAR Certified Electronics (TVs, Telephones, Audio/Video, etc.)
9. ENERGY STAR Certified Windows, Doors and Skylights
10. ENERGY STAR Certified Roofing
11. ENERGY STAR Certified Insulation
12. Air sealing
13. ENERGY STAR Certified Commercial Food Service Equipment
14. ENERGY STAR Certified Data Center Equipment
15. ENERGY STAR Certified LED lighting
16. Other LED, CFL, and efficient lighting
17. Solar thermal water heating and cooling [SET SOLAR=1]
18. Other renewable heating and cooling (biomass, etc.)
19. Advanced building materials/insulation
20. Recycled building materials
21. Reduced water consumption products and appliances
22. Energy auditing services
23. Other (Specify)

E. Fuels (IF SC=5) [RANDOMIZE]

1. Coal
2. Onshore petroleum, including gasoline and diesel
3. Offshore petroleum, including gasoline and diesel
4. Onshore natural gas
5. Offshore natural gas
6. Other Fossil Fuel
7. Corn Ethanol
8. Renewable Diesel
9. Biodiesel
10. Other Ethanol/Non-Woody Biomass
11. Woody Biomass/Cellulosic Biofuel
12. Waste Fuels
13. Other Biofuels
14. Nuclear Fuel
15. Other (Specify)

ASK EA IF SEE = 2 & 3

EA. Do you primarily work with onshore or offshore petroleum?

1. Onshore petroleum
2. Offshore petroleum
3. Don't know/ Refused

ASK EB IF SEE = 4 & 5

EB. Do you primarily work with onshore or offshore natural gas?

1. Onshore natural gas
2. Offshore natural gas
3. Don't know/ Refused

F. Transportation Vehicles, Including Motor Vehicles (IF SC=6) [RANDOMIZE]

1. Gasoline and Diesel Motor Vehicles (excluding freight transport)
2. Hybrid Electric Vehicles
3. Plug-In Hybrid Vehicles
4. Electric Vehicles
5. Natural Gas Vehicles
6. Hydrogen Vehicles
7. Fuel Cell Vehicles
8. Other (Specify _____)

G. Component Parts for Transportation Vehicles (IF SC=7) [RANDOMIZE]

1. Transportation Vehicle Engine & Drive Parts
2. Transportation Vehicle Exhaust System Parts
3. Transportation Vehicle Body Parts
4. Other Transportation Vehicle Parts (Specify _____)

SET SOLAR=1 IF SEA=1 OR 2, OR TSF=1, AND SED=5

IF SE TOTAL>1, ASK SEPRIME, IF NOT, SKIP

SEPRIME. Which of the following technologies is your organization *PRIMARILY* engaged with?

[PIPE-IN RESPONSES FROM SEA-SEG]

[IF RESPONDENT ONLY IDENTIFIES WITH ONE INDUSTRY AT SCREENER E (QC), USE THAT INDUSTRY FOR THE REMAINDER OF THE SURVEY IN PLACE OF "ENERGY" / IF MORE THAN ONE, CONTINUE TO USE "ENERGY." EXCEPTION - IF THE ONLY SELECTION AT SCREENER C IS "OTHER" OR "DK/NA," USE "ENERGY"]

H. Which of the following industry descriptions describe your organization's focus as it relates to the [energy/ SC] industry? [ALLOW MULTIPLE RESPONSES]

1. An organization involved in agricultural goods and services
2. An organization involved in mining and extraction
3. An organization that manufactures and/or assembles [energy/ SC] goods or produces components that go into energy products
4. An organization that conducts research and development and related services for [energy/ SC]
5. An organization involved in the wholesale trade and distribution of [energy/ SC] products and services
6. An organization that installs [energy/ SC] systems or provides services for installation of [energy/ SC] systems
7. A public or private utility
8. An organization that provides consulting, engineering, finance, legal, or other professional services related to energy
9. An organization that conducts operations and maintenance (O&M) for [energy/ SC] systems
10. An organization primarily involved in education and training
11. Other support services (Specify: _____)
12. Other (Specify: _____)
13. (DON'T READ) Not sure

[ASK SCREENER G IF MORE THAN ONE SELECTED AT SCREENER F]

G. Which do you consider your organization's **primary** focus as it relates to the [energy/ SC] industry, based on the labor hours performed at your location

1. An organization involved in agricultural goods and services
2. An organization involved in mining and extraction
3. An organization that manufactures and/or assembles [energy/ SC] goods or produces components that go into energy products
4. An organization that conducts research and development and related services for [energy/ SC]
5. An organization involved in the wholesale trade and distribution of [energy/ SC] products and services
6. An organization that installs [energy/ SC] systems or provides services for installation of [energy/ SC] systems
7. A public or private utility
8. An organization that provides consulting, engineering, finance, legal, or other professional services related to energy
9. An organization that conducts operations and maintenance (O&M) for [energy/ SC] systems
10. An organization primarily involved in education and training
11. Other support services (Specify: _____)
12. Other (Specify: _____)
13. (DON'T READ) Not sure

SET SGPRIME BASED ON SCREENER G RESPONSE OR SCREENER F RESPONSE IF SCREENER F COUNT=1

ASK SFA IF SEA=14 **OR** SEB=6 **OR** SEC = 13, 14, 15, OR 16 **OR** SEE = 15, **AND** SF = 4, 8, OR 10

SFA. Does your organization work with hydrogen fuel in any capacity?

1. Yes (Please specify)_____
2. No
3. Don't know/ Refused

ASK SGA IF SC=4, OR IF SF = 4, 6, 8, OR 9

SGA. Is your organization considered an Energy Service Company (ESCO)?

1. Yes
2. No
3. Don't know/ Refused

IF SGPRIME=6, ASK SCREENER H, OTHERWISE SKIP

H. Does your organization work on ENERGY STAR certified new home construction?
   1. Yes
   2. No
   3. DK/NA

I. Does your organization work on ENERGY STAR certified buildings and plants (commercial and industrial)?
   a. Yes
   b. No
   c. DK/NA

J. Does your organization have an energy manager or director responsible for energy management at one or more facilities?
   a. Yes
   b. No
   c. DK/NA

IF SGPRIME=7, ASK SCREENER K

K. Does your organization employ workers that are in charge of administering, managing, evaluating, or otherwise working on utility-led energy efficiency programs, rebates, and other activities?
   a. Yes
   b. No
   c. DK/NA

For this survey, we will just be asking about the employees that work from or directly report to your current location.

1. Including all full-time and part-time employees, how many **permanent** employees work at or from your current location?

   Record # of employees _____

   (DON'T READ) Have check box for Refused

2. Based on [Take Q1 #] full-time and part-time permanent employees at your location, how many employees do you expect to have at your location 12 months from now?

   1 More [record #_____]

   2 Fewer [record #_____]

   3 (DON'T READ) Same number

   4 (DON'T READ) Refused

[If amount differs by 10% or more in either direction, ask:]

Just to confirm, you currently have ____ permanent employees at your current location and you expect to have _____ (more/fewer) employees, for a total of ____ permanent employees 12 months from now.

3. Of the [Take Q1 #] full time and part-time permanent employees at your current location, how many of these workers support the [energy/ SC] portion of your business? Please note that your response should include administrative staff supporting the energy portion of your business.

   Record # of employees _____

   (DON'T READ) Have check box for Refused

[IF NEEDED: SUPPORT WORKERS ARE DEFINED AS THOSE INDIVIDUALS THAT SPEND ANY AMOUNT OF TIME, DIRECTLY WORKING ON ENERGY RELATED PROJECTS INCLUDING ADMINSTRATIVE SUPPORT WORKERS]

[Q3 SHOULD BE LESS THAN OR EQUAL TO Q1 - BUILD IN CHECK]

4. Of your [Take Q3 #] energy staff at your location (office staff and in the field), please classify them into the area where they spent most of their time over the last 12 months. Please count each employee only once.

a. In-state within your region/metropolitan area [Record #]_____
b. In-state outside your region/metropolitan area [Record #]_____
c. Out-of-state [Record #]_____

5. How many full-time and part-time **permanent** employees did you have working at your current location 12 months ago that supported the [energy/ SC] portion of your business?

   Record # of employees _____

   (DON'T READ) Have check box for Refused

6. Based on [Take Q3 #] full-time and part-time permanent employees at your location that support the [energy/SC] portion of your business, how many employees do you expect to have at your location 12 months from now?

   1 More [record #_____]

   2 Fewer [record #_____]

   3 (DON'T READ) Same number

   4 (DON'T READ) Refused

Just to confirm, you currently have ____ permanent employees supporting the energy portion of your business and you expect that number to be _____ (more/fewer) 12 months from now, for a total of ____

7. Thinking of your [INSERT Q3] energy employees, how many spend at least 50% of their time supporting the energy portion of your business?

8. Thinking of your [Q3 ANSWER] energy employees, how many spend all of their time supporting the energy portion of your business?

SECTION 2 – Workforce Profile Questions

If SC COUNT > 1 response, ASK Q9

9. Thinking of your [Take Q3] [energy/ SC] workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the area where they spend the most time.

PIPE IN SCREENER C RESPONSES

If SC COUNT > 1 response and Q7>0, ASK Q10

10. Thinking of your [Take Q7] [energy/ SC] workers that spend at least 50% of their time supporting the energy portion of your business, please classify them in the following categories. Please count each employee only once and categorize them in the area where they spend the most time.

PIPE IN SCREENER C RESPONSES AND EMPLOYMENT FROM Q8

Record # of employees _____

BUILD CHECK SO TOTAL MUST = Q7

IF SC = 1 and Screener E.A > 1 response, ASK Q11 OTHERWISE SKIP

USE Q3 IN PLACE OF Q9 IF SELECTED COUNT AT SCREENER C WAS ONE (ONE CHOICE)

11. Thinking of your [PIPE IN Q9/Q3 GENERATION ANSWER] energy generation workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.A RESPONSES

Record # of employees _____

IF SC = 2 and Screener E.B > 1 response, ASK Q12 OTHERWISE SKIP

12. Thinking of your [PIPE IN Q8/Q3 ELECTRIC POWER TRANSMISSION AND DISTRIBUTION ANSWER] energy transmission, distribution, and storage workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.B RESPONSES

Record # of employees _____

IF SC = 3 and Screener E.C > 1 response, ASK Q12 OTHERWISE SKIP

13. Thinking of your [PIPE IN Q9/Q3 STORAGE ANSWER] storage workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.C RESPONSES

Record # of employees _____

IF Q13_2(BATTERY STORAGE)>0, ASK Q14

14. Thinking of your [PIPE IN Q13_2 #] battery storage workers at your location, please classify in them in the following categories. Please count each employee only once and categorize them in the battery storage application category where they spend the most time.
    1. Consumer devices [Record # of employees]
    2. Vehicles or other transportation [Record # of employees]
    3. Buildings or industrial facilities [Record # of employees]
    4. Electric Grid [Record # of employees]
    5. Other (Specify) [Record # of employees]

IF SC = 4 and Screener E.D > 1 response, ASK Q15 OTHERWISE SKIP

15. Thinking of your [PIPE IN Q9/Q3 ENERGY EFFICIENCY, INCLUDING HEATING, COOLING AND BUILDING ENVELOPE ANSWER] energy efficiency, including heating, cooling and building envelope, workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.D RESPONSES

Record # of employees _____

IF SC = 5 and Screener E.E > 1 response, ASK Q16 OTHERWISE SKIP

16. Thinking of your [PIPE IN Q9/Q3 FUELS ANSWER] fuels-related workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.E RESPONSES

Record # of employees _____

IF SC = 6 and Screener E.F > 1 response, ASK Q17 OTHERWISE SKIP

17. Thinking of your [PIPE IN Q9/Q3 TRANSPORTATION VEHICLES ANSWER] motor-vehicle related workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.F RESPONSES

Record # of employees _____

IF SC = 5 and Screener E.G > 1 response, ASK Q18 OTHERWISE SKIP

18. Thinking of your [PIPE IN Q9/Q3 COMPONENT PARTS ANSWER] energy generation workers at your location, please classify them in the following categories. Please count each employee only once and categorize them in the technology area where they spend the most time.

PIPE IN SCREENER E.G RESPONSES

Record # of employees _____

Demographic questions

19. Thinking of your [Take Q3] [energy/ SC] employees, how many are:
    a) Male: Record # employees _____
    b) Female: Record # of employees _____
    c) Gender non-binary: Record # of employees _____
    d) (DON'T READ) Refused

Q19 a+b must = Q3

20. Thinking of your [Take Q3] [energy/ SC] employees, please indicate the ethnicity:

(a) Hispanic or Latino

(b) Not Hispanic or Latino

(c) (DON'T READ) Refused

Q20 a+b must = Q3

21. Thinking of your [Take Q3][energy/SC] employees, please indicate the race and choose all that apply, including employees of two or more races:
    a) American Indian or Alaskan Native: Record # of employees _____
    b) Asian: Record # of employees _____
    c) Black or African American: Record # of employees _____

d) Native Hawaiian or other Pacific Islander: Record # of employees ____

e) White: Record # of employees _____

f) Don't know: Record # of employees _____

g) (DON'T READ) Refused

22. Thinking of your [Take Q3] [energy/ SC] employees, how many:

    a) Are Veterans of the U.S. Armed Forces Record # of employees _____
    b) Are 55 and over Record # of employees _____
    c) Are between 30 and 54 Record # of employees _____
    d) Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements Record # of employees _____
    e) Have a disability that requires accommodation
    f) Were formerly incarcerated
    g) (DON'T READ) Refused

23. Thinking of the current [Take Q3] [energy/ SC] employees at your location, how many are in the following occupational categories?

(Please only assign one category to each employee that supports the [energy/ SC] portion of your business. If they fall into more than one category, please assign them to the category in which they devote more of their time.)

a. Mining and Extraction Field positions (includes oil field workers, miners, etc.)
b. Production/Manufacturing positions (includes workers in refineries and assembly workers and those involved in the design, quality control and manufacturing process)

Record # of employees _____

(DON'T READ) Have check box for Refused

c. Installation or repair positions (includes technicians, building trades people, and supervisors that are working at project site)

Record # of employees _____

(DON'T READ) Have check box for Refused

d. Administrative positions (includes customer service representatives, clerks, office and operations support)

Record # of employees _____

(DON'T READ) Have check box for Refused

e. Management/Professional positions (***does not include*** those supervisors that spend a majority of their time at project sites or sales managers)

Record # of employees _____

(DON'T READ) Have check box for Refused

f. Sales positions (includes cost estimators, sales representatives and sales managers)

Record # of employees _____

(DON'T READ) Have check box for Refused

g. Other (Specify: _____)

Record # of employees _____

(DON'T READ) Have check box for Refused

(CREATE INTERNAL CONTROL SO Q23 A+B+C+D+E+F+G EQUALS Q3]

SECTION 3 – Workforce Development & Training Needs

24. How many energy workers have you hired over the last 12 months, either for new positions or to replace former workers?

    Record _____

IF Q24>0, ask Q25-28 otherwise SKIP

25. Thinking of the [Insert Q24] energy workers that you have hired at your location over the last 12 months, please indicate your level of difficulty finding qualified applicants to fill the positions.
    1. Very difficult
    2. Somewhat difficult
    3. Not at all difficult
    4. DK/NA

IF Q25 = 1 or 2 ask Q26 and Q27, otherwise SKIP

26. What are the two most significant reasons for the reported difficulty?

27. Please provide the two most difficult positions for your organization to fill at your location.

28. You reported [insert Q24] additional workers at your organization over the last 12 months. Of these [insert Q24] positions, how many:

a. Were newly created positions?

    Record # of employees _____

b. Were existing employees that added energy responsibilities?

    Record # of employees _____

c. Were hired to replace workers due to turnover or retirement?

    Record # of employees _____

d. Were positions that required previous work experience related to the position?

    Record # of employees _____

e. Required a bachelors degree or beyond: _____

    Record # of employees _____

f. Required an associate degree or academic certificate from an accredited college, but not a bachelors degree: _____

    Record # of employees _____

g. Required a vocational or technical postsecondary certificate or credential: _____

Record # of employees _____

h. Are represented by a union, collective bargaining agreement, or a project labor agreement: _____

Record # of employees _____

29. Does your firm have a formal or informal mentorship/sponsorship program?
    1. Yes
    2. No
    3. DK/NA

30. Briefly describe the mentorship/sponsorship program?

31. Has your firm adopted any specific strategies, policies, or programs to increase the number of female hires?
    1. Yes
    2. No
    3. DK/NA

IF Q31 = 1, ASK Q32

32. Briefly describe the strategies, policies, or programs to increase female hires?

33. Has your firm adopted any specific strategies, policies, or programs to increase the number of ethnic or racial minority hires?
    1. Yes
    2. No
    3. DK/NA

IF Q33 = 1, ASK Q34

34. Briefly describe the strategies, policies, or programs to increase minority hires?

35. Has your firm adopted any specific strategies, policies, or programs to increase the number of LGBTQ+ hires?
    1. Yes
    2. No
    3. DK/NA

IF Q35 = 1, ASK Q36

36. Briefly describe the strategies, policies, or programs to increase LGBTQ+ hires?

37. Does your firm offer or require a diversity and/or inclusion training program aimed at advocating workplace diversity and inclusion?

    1. Yes
    2. No
    3. DK/NA

SECTION 4 – Business Questions

38. The following is a list of factors that may contribute to difficulty growing a profitable business. Please rate the significance of each factor. [READ ITEM, THEN SAY] is it very significant, somewhat significant, or not at all significant. [RANDOMIZE]
    a. Lack of capital
    b. Lack of qualified talent
    c. Poor demand
    d. Cost or supply of materials
    e. Permitting delays
    f. Interconnection delays
    g. Policy challenges

39. Thinking about your organization's energy related suppliers and vendors, what percent of your supply chain purchases (in dollars/value), are:

    a. In-state (Enter %)_____
    b. Out of state but in the United States (Enter %)_____
    c. Outside of the United States (Enter %)_____ (WEB ONLY SPECIFY COUNTRIES_____)
    d. DK/NA

40. Thinking about your organization's energy related customers, what percent are located:

    1. In-State (Enter %)_____
    2. In a bordering state but out of state (Enter %)_____
    3. In the United States, but outside of a bordering state (Enter %)_____
    4. Outside of the United States (Enter %)_____ (WEB ONLY SPECIFY COUNTRIES ____)
    5. DK/NA

SECTION 5 – Revenue Questions

Ask Q41 if SGPRIME = 5 or 6

41. Can you name any specific rebates or incentives that can reduce the cost of selling, distributing or installing energy for your customers? [Record up to 3]

    Record: ___

42. Approximately how much of your organization's work at your current location, in terms of total gross revenue, is related to energy?

Record $:_____

ASK Q43 if SE has multiple responses, otherwise SKIP

43. Approximately how much of your organization's work at your current location, in terms of total gross revenue, is related to each of the following products or services? (Use numbers to indicate percentages, for instance 20=20%)
    1. INSERT SE RESPONSE 1 ____%
    2. INSERT SE RESPONSE 2 ____%
    3. INSERT SE RESPONSE 3 ____%
    4. …
    5. All other revenue not related to energy ____%

Q43 total must equal 100%

SECTION 6 – Motor Vehicles & Component Parts

ASK Q44 if SC = 6, otherwise SKIP

44. With which of the following types of transportation vehicles does your firm primarily design, manufacture, sell, repair, or otherwise work with? [SELECT ONE]
    1. Automobiles
    2. Light- or Medium- Duty Vehicles
    3. Heavy Duty Vehicles
    4. Industrial Vehicles, such as forklifts
    5. Recreational Vehicles, such as golf carts
    6. Rail
    7. Other (specify _____)

ASK Q45-Q47 if SC = 7, otherwise SKIP

45. Does your firm manufacture, design, sell, and/or distribute parts solely used for alternative vehicles, or vehicles with a fuel source other than gasoline or diesel?
    1. Yes, electric vehicles
    2. Yes, hydrogen fuel cell vehicles
    3. Yes, other (Specify)____
    4. No
    5. Don't know/ Refused

ASK Q46 IF Q45=1, otherwise SKIP

46. How much of your firm's work, as a percentage of your total revenue, is attributed to parts solely used for alternative vehicles, or vehicles with a fuel source other than gasoline or diesel?
    1. All of it (100%)
    2. Half to most of it (50% to 99%)
    3. A quarter to almost half of it (25% to 49%)
    4. Less than a quarter (1% to 24%)
    5. (DON'T READ) DK/NA

47. Thinking of the type of fuel used, does your organization offer parts or products for any of the following types of transportation vehicles? [ALLOW MULTIPLE]
    1. Gasoline and Diesel Motor Vehicles (excluding freight transport)
    2. Hybrid Electric Vehicles
    3. Plug-In Hybrid Vehicles
    4. Electric Vehicles
    5. Natural Gas Vehicles
    6. Hydrogen Vehicles
    7. Fuel Cell Vehicles
    8. Other (Specify _____)

[If Q47 = 2,3, or 4, ask Q48, otherwise SKIP]

48. Which systems for electric and hybrid vehicles does your firm primarily work with?

    a. Body design or structure
    b. Batteries
    c. Charging components
    d. Electric propulsion (i.e. converter, controller, transmission, etc.)
    e. Auxiliaries (i.e. brakes, steering, climate control, etc.)
    f. Other (Specify_____)

SECTION 7 – Energy Efficiency

IF SCREENER H=1, ASK Q49

49. How many of your [Take Q3#] energy employees work on ENERGY STAR certified new home construction?

Record # of employees: _____

IF SCREENER I=1, ASK Q50

50. How many of your [Take Q3#] energy employees work on ENERGY STAR certified buildings and plants (commercial and industrial)?

Record # of employees: _____

IF SCREENER K=1, ASK Q51

51. How many of your [Take Q3#] energy employees work on administering, managing, evaluating, or otherwise working on utility-led energy efficiency programs, rebates, and other activities?

Record # of employees: _____

Thank you for completing the survey. Since it sometimes becomes necessary for the project manager to confirm responses to certain questions, please verify your contact information.

da. First and Last Name (Interview note enter 99 for REF)
1. First Name
2. Last name
db. Position (Interview note enter 99 for REF)
dc. Phone (Interviewer Note 9999999999 for REF)
dd. Email (Interview note enter 99 for REF)
de. Organization Name (Interview note enter 99 for REF)
df. Organization Street Address (Interview note enter 99 for REF)
dg. Organization City (Interview note enter 99 for REF)
dh. Organization State (Interview note enter 99 for REF)
di. Organization Zip (Interviewer Note 99999 for REF)

Thank you very much for your time.

HOW DID THE CALL END?

1 COMPLETED INTERVIEW

2 SURVEY SAID THEY DID NOT QUALIFY

3 CALLBACK NEEDED, PARTIAL

4 REFUSAL

5 SOMETHING ELSE

PLEASE DISPOSITION CALL CORRECTLY.

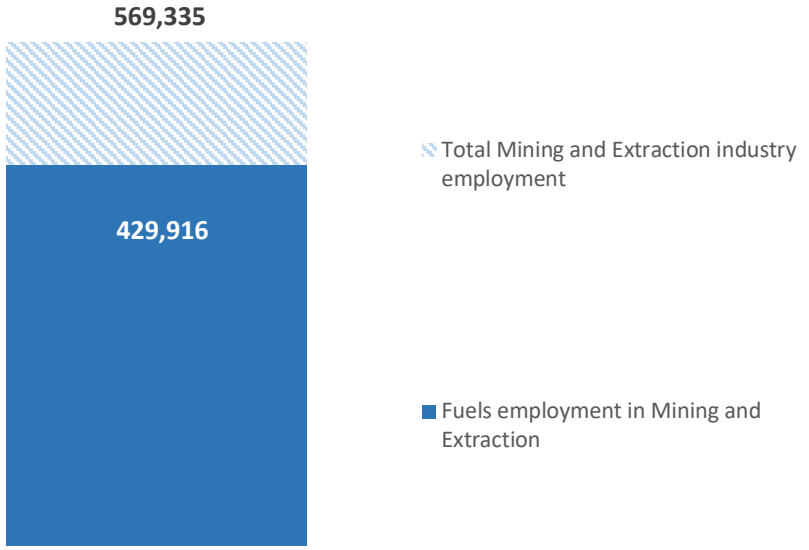
Thank you for your time!

Appendix D: Summary of Energy-Related Employment in Existing Industries by NAICS Code

NAICS 21: Mining, Quarrying and Oil and Gas Extraction (Mining and Extraction)

The 2023 USEER survey found that 429,916 workers (100% in fuels) were associated with the mining and extraction of oil, gas, coal, and nuclear fuel stock in 2022. This represents 76% of the total mining and extraction jobs (569,335) in the U.S. in that year, including support activities for mining (NAICS 213) (Figure 1).

Figure 1. Energy-Related Employment in NAICS 21



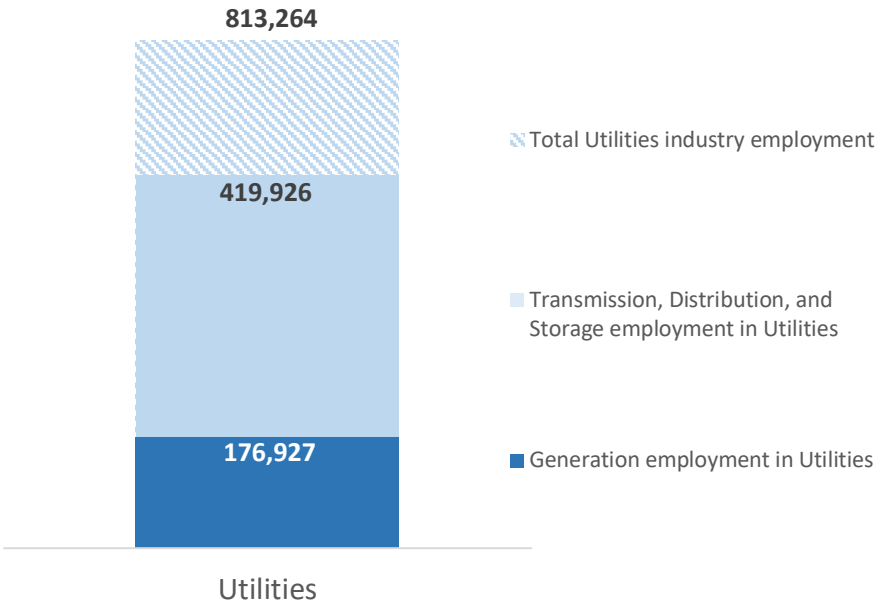
NAICS 22: Utilities

According to the standard industry definitions used by the Census Bureau, the utilities sector comprises establishments engaged in the provision of the following utility services: electric power, natural gas, steam supply, water supply and sewage removal. In this sector, the specific activities associated with the utility services provided vary by utility — electric power includes generation, transmission and distribution; natural gas includes distribution; steam supply includes provision and/or distribution (natural gas transmission lines, however, are included under NAICS 486, Pipeline Transportation); water supply includes treatment and distribution; and sewage removal includes collection, treatment and disposal of waste through sewer systems and sewage treatment facilities.[14] This includes generating plants, but excludes waste management services.

[14] "Sector 22 — Utilities: The Sector as a Whole," 2017 NAICS Definition, North American Industry Classification System, U.S. Census Bureau, U.S. Department of Commerce.

Across the U.S., utilities employed 813,264 workers in 2022, with nearly three-quarters working in energy generation, transmission, or distribution (Figure 2).

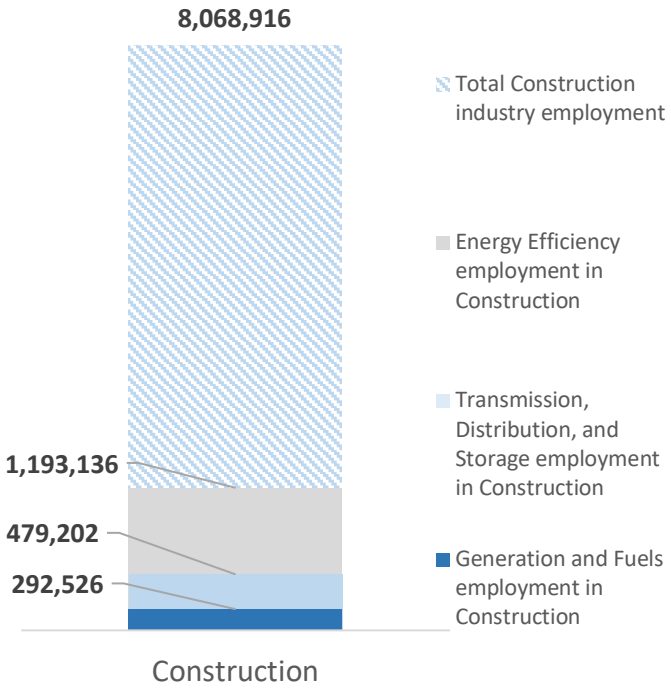
Figure 2. Energy-Related Employment in NAICS 22



NAICS 23: Construction

Energy-related activities account for a significant amount of employment in the construction industry. In 2022, electric power generation and fuels, and transmission, distribution and storage represented nearly 10% of total construction employment in the U.S., while energy efficiency activities accounted for an additional 15% of the construction workforce (Figure 3).

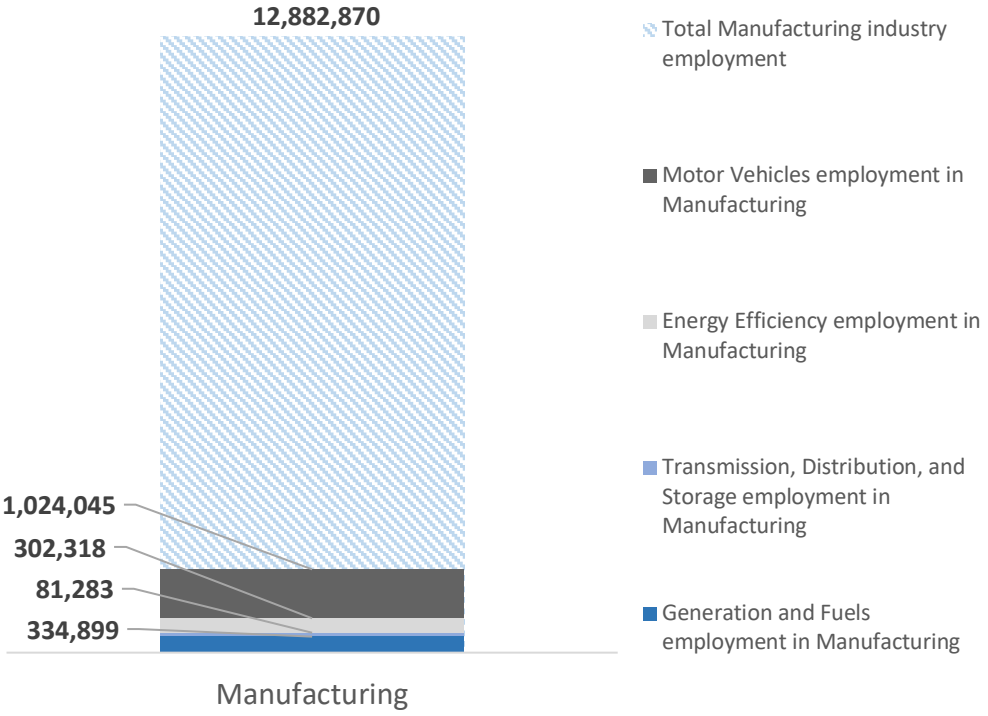
Figure 3. Energy-Related Employment in NAICS 23


8,068,916
1,193,136
479,202
292,526
Total Construction industry employment
Energy Efficiency employment in Construction
Transmission, Distribution, and Storage employment in Construction
Generation and Fuels employment in Construction
Construction

NAICS 31-33: Manufacturing

Manufacturing is an important component of the energy economy, and includes petroleum refining, nuclear enrichment and component and finished product assembly of solar panels, wind and gas turbines and mining equipment. In addition to the totals reported in USEER, many manufacturing jobs are affected by energy efficiency in their processes but are not tracked herein. Traditional energy sectors (electric power generation and fuels and transmission, distribution, and storage) accounted for about 3.2% of all manufacturing jobs in the U.S. in 2022. Energy efficiency product manufacturing (composed of ENERGY STAR products and energy-related building materials, such as insulation, windows, and doors) added 2.3% and motor vehicle and parts manufacturers added a further 7.9% (Figure 4).

Figure 4. Energy-Related Employment in NAICS 31-33



NAICS 42, 486, and Commodity Flow Data: Wholesale Trade, Distribution and Transport (Wholesale Trade)

Wholesale trade, distribution and transport includes wholesale equipment and supplies merchant wholesalers of goods that are linked to the energy industry (including motor vehicles and motor vehicle parts and building materials). Also included in this NAICS category is all employment related to the pipeline transportation of fuels and the transport (via truck, rail, air, and water) of energy commodities such as coal, fuel oil, gas, motor vehicles and petroleum.

NAICS 51, 52, 53, 54, 55 and 56: Information (Software, etc.), Finance, Insurance, Professional and Business Services (Professional and Business Services)

Professional and business services provide support for energy-related activity in the U.S. Firms from this sector are primarily involved in software development and other

information services; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management of companies and enterprises and administrative support; and waste management and remediation services.

NAICS 81: Other Services (Repair and Maintenance/Other)

Other services are important to the energy economy, including repair and maintenance and nonprofit activity. Motor vehicles accounted for over one-fifth (22.4%) of the workforce in the larger industry in 2022, driven by employment in automotive repair and maintenance. Generation and fuels combined for 1% of the overall workforce in other services.

Appendix E: Electric Power Generation and Fuels Employment by Industry

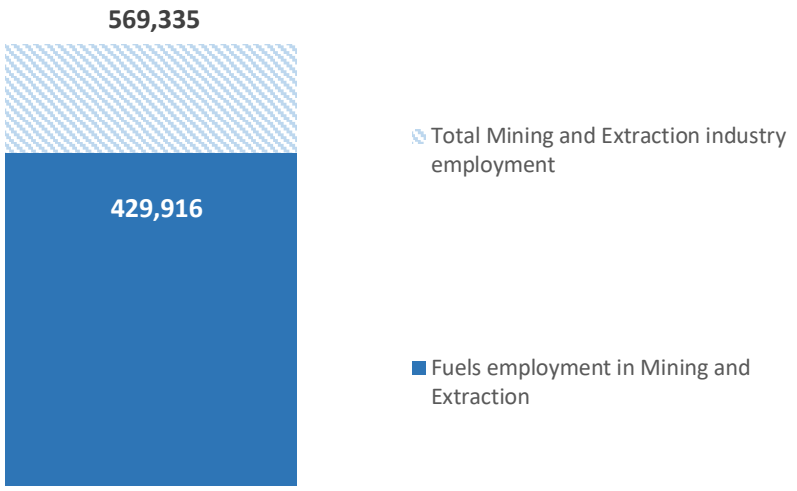
Agriculture and Forestry

The QCEW does not capture a significant portion of agricultural labor. The BLS estimates that its methodologies exclude the majority of agricultural workers (52%) due to the nature of the industry. In addition, forestry and logging employment is highly seasonal and relies heavily on unreported subcontractors. The 2023 USEER estimates employment in these segments using a customized model based on inputs on fuel stocks generated by the U.S. Department of Agriculture Economic Research Service (ERS).[15] Based on these inputs, an estimated 36,922 agriculture and forestry employees worked in 2022 to support fuel production.[16]

Mining, Extraction and Utility Generation

About 76% of all mining and extraction employment in the U.S. in 2022 was for fuels used in energy production; this translates to nearly 430,000 workers in 2022. These workers support the fuels industry through crude petroleum[17] and natural gas extraction, as well as surface and underground coal mining (Figure 5).[18]

Figure 5. Mining and Extraction Employment



Electric utility generation (in which the generating equipment is operated by the utility) employed a total of 176,927 workers across hydroelectric, fossil fuel, nuclear,

[15] These data can be found in "U.S. Bioenergy Statistics," Economic Research Service, U.S. Department of Agriculture, https://www.ers.usda.gov/data-products/us-bioenergy-statistics/

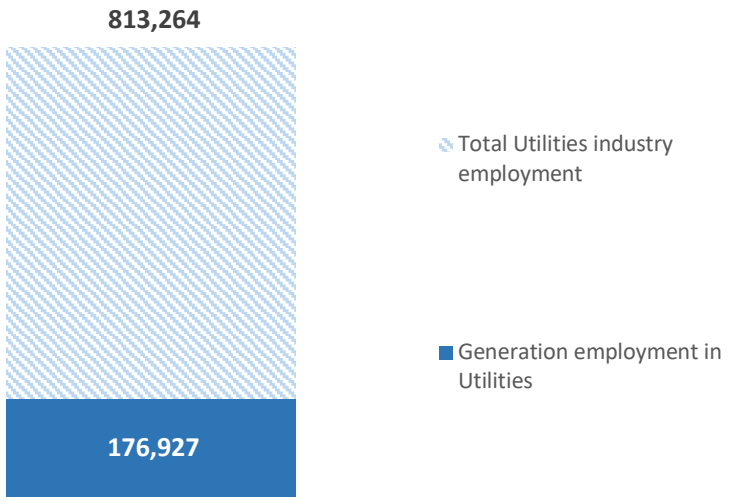
[16] Energy- and fuel-related agricultural employment was derived using three different calculations for fuelwood, corn ethanol and biodiesel. The BLS QCEW cover exclusions were used to develop a factor for agricultural worker exclusions and this factor was applied to employment for the NAICS codes specific to each of the three fuel types. Additionally, a technology-specific percentage was derived from ERS estimates for the percentage of total wood, corn and biodiesel produced that is used for fuel. This percentage was applied together with the exclusion factor to the second quarter of 2020 QCEW employment data for fuelwood NAICS (113110, 113310, 115310), corn ethanol (11115) and biodiesel (11111) to determine the number of workers supporting agricultural fuel production.

[17] Petroleum is a liquid mixture of hydrocarbons that is present in certain rock strata and can be extracted and refined to produce fuels including gasoline, kerosene and diesel oil.

[18] These support workers are specific to fuel mining and extraction, and do not include support for other mining and extraction activities.

solar, wind, geothermal, biomass, steam, and air-conditioning supply (including CHP) and other electric power generation. It is important to note that utility generation employment excludes any utilities that support water supply and irrigation systems or sewage treatment. It also excludes non-utility-owned or -operated generation from wind, solar, CHP, biomass, nuclear or fossil fuels (Figure 6).

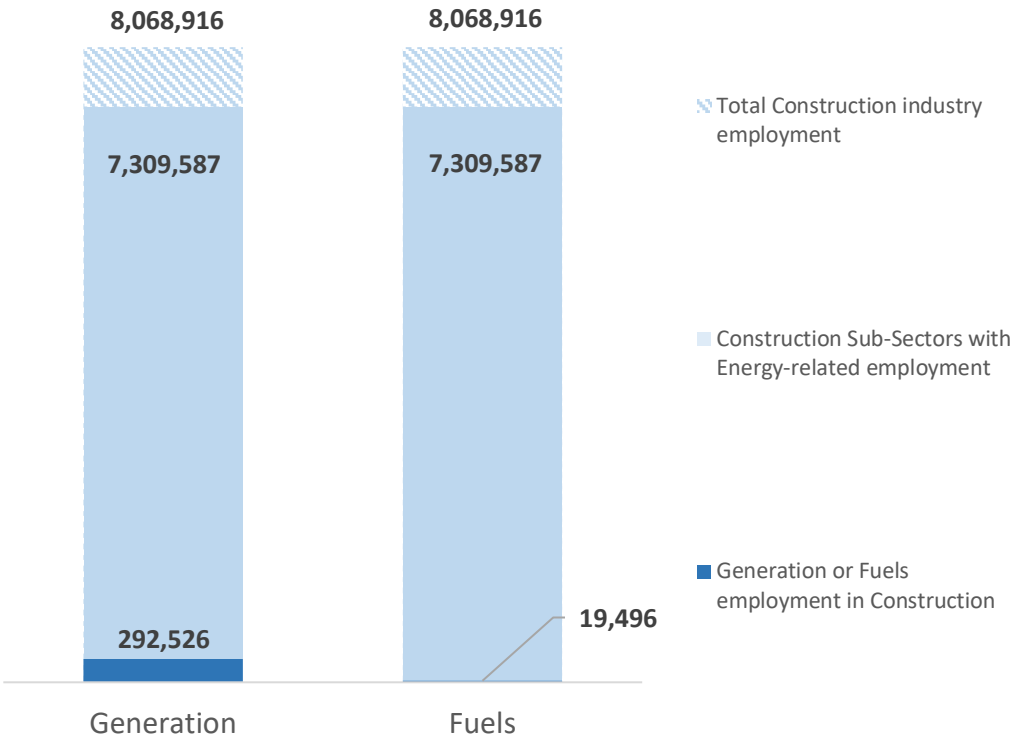
Figure 6. Utilities Employment



Construction

For the 8.1 million construction workers in the U.S., roughly 91% of employment in 2022 was in construction subsectors with workers that support energy generation technologies. In these subsectors, 312,022 construction workers supported both electric generation and fuels production technologies. Ninety-four percent of these employees were engaged in the construction and installation of new electric generation technologies (Figure 7).

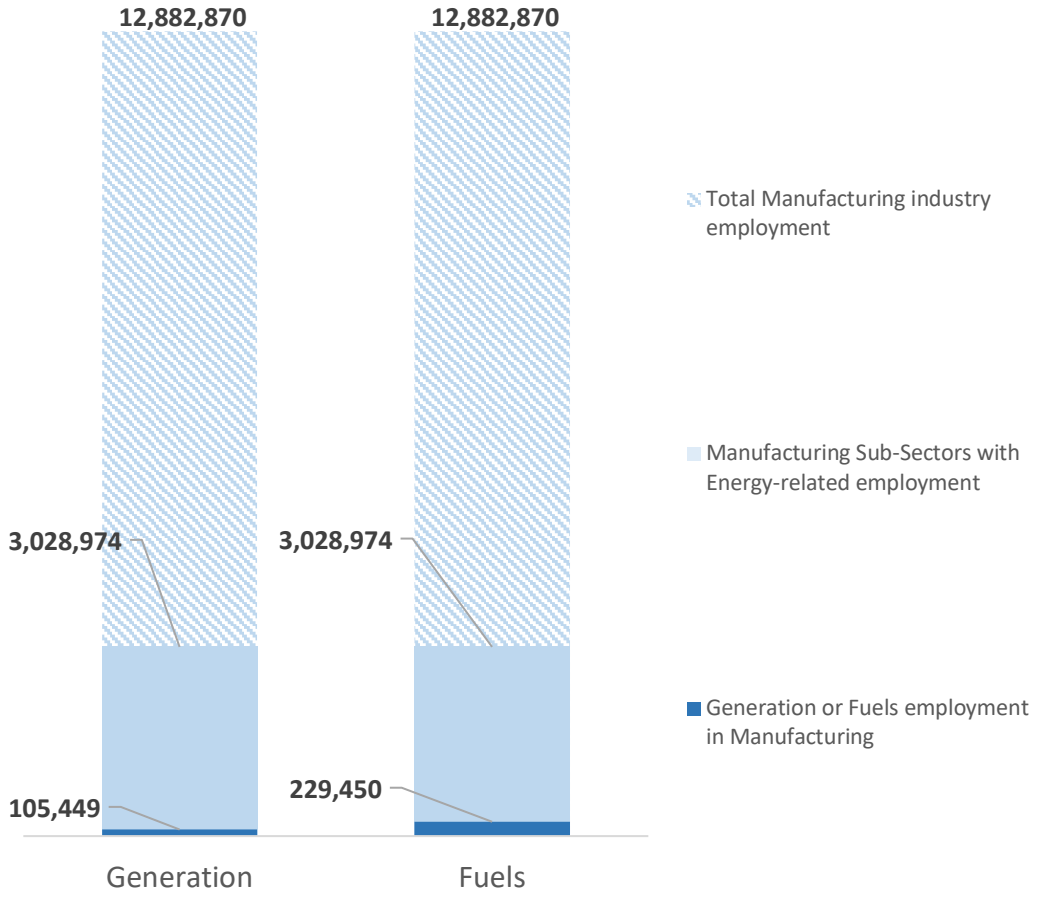
Figure 7. Construction Employment



Manufacturing

The national manufacturing industry employed more than 12.8 million workers in 2022. About 23.5% of that overall manufacturing employment comprised subsectors that could support electric power generation and fuels technologies, including petrochemical, turbine, and generator manufacturing. These detailed industries accounted for nearly 3,029,000 workers in 2022, more than 7% of which supported fuels. Electric power generation and fuels manufacturers include those firms working on PV arrays, turbine generators, oil and gas field machinery and other motor or generator manufacturing (Figure 8).

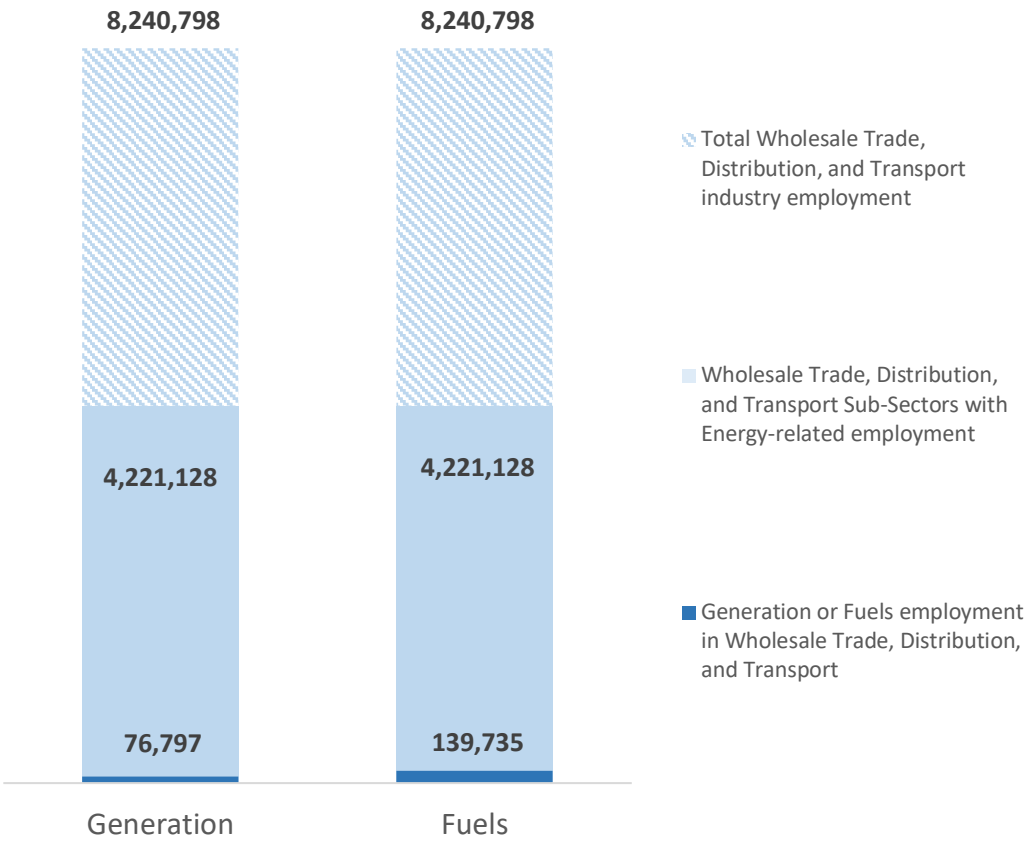
Figure 8. Manufacturing Employment



Wholesale Trade

Of the more than 8.2 million wholesale trade, distribution, and transport workers in the U.S., about 51% were working in detailed industries that could support electric power generation and fuel activities, including electric equipment, chemical and petroleum merchant wholesalers. In these wholesale trade, distribution, and transport industries, about 76,797 and 139,735 workers spent some amount of their time in 2022 supporting electric power generation and fuels applications, respectively.[19]

Figure 9. Wholesale Trade, Distribution, and Transport Employment

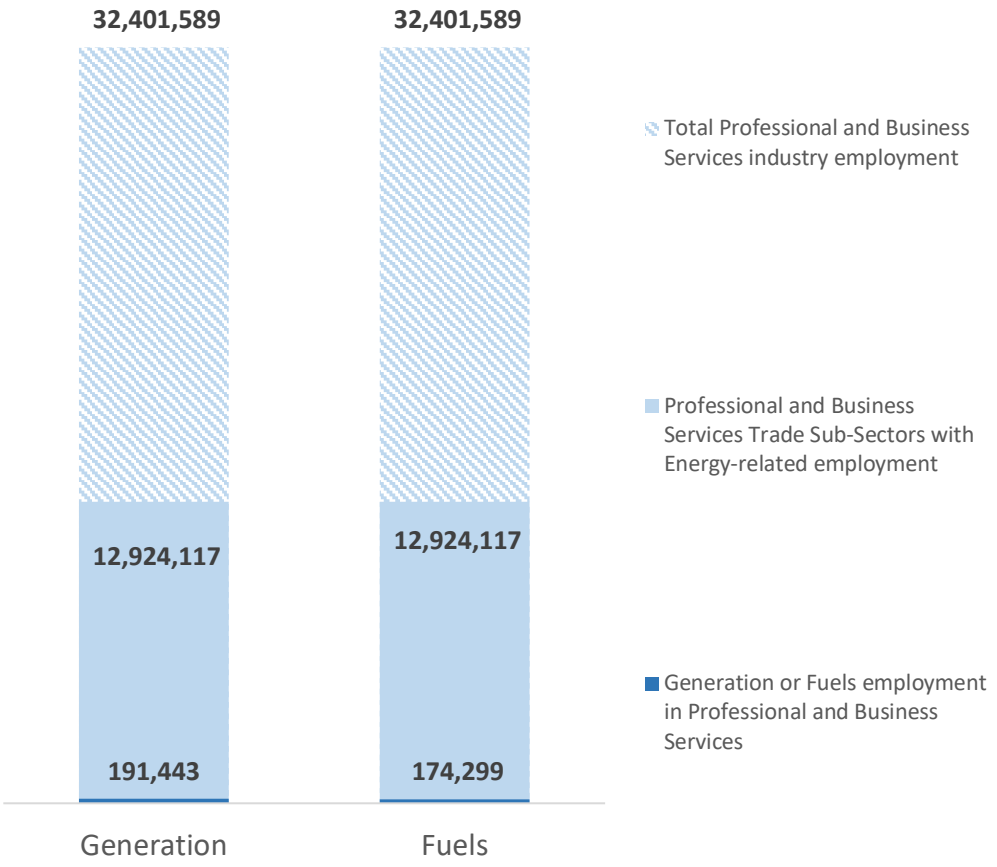


[19] Transmission and trade of fuels are included in the Transmission, Distribution, and Storage chapter of the report.

Professional and Business Services

The professional and business services industry in the U.S. employed more than 32 million workers in 2022. In this aggregate industry, several detailed industries supported generation and fuel operations with software, legal services, biotechnology research, architecture, and engineering. Of the nearly 13 million jobs in these energy-related professional service industries in 2022, about 191,000 and 174,000 respectively supported electric power generation and fuels technologies (Figure 10).

Figure 10. Professional and Business Services Employment



Appendix F: Transmission, Distribution and Storage Employment by Industry

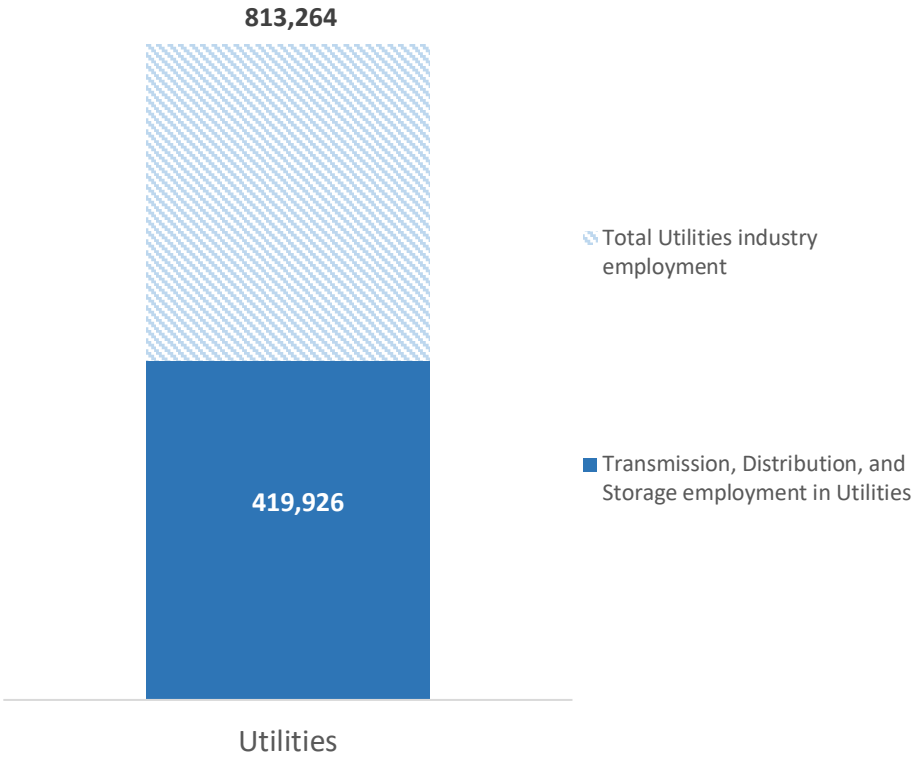
As noted in the report, transmission, distribution and storage employed 1,373,585 workers in 2022.

Using survey data, the following sections illustrate a breakdown of sector-wide employment in five broad high-level industry classifications, including construction and manufacturing.

Utilities

Utility companies[20] that employ transmission and distribution workers are captured entirely by their respective detailed NAICS classifications by BLS. Electric power transmission, control and distribution and natural gas distribution employed 419,926 transmission, distribution, and storage workers across U.S. utility firms in 2022, a slight increase from 2021. This number represents just over half of energy utility employment nationwide (Figure 11).

Figure 11. Utilities Employment

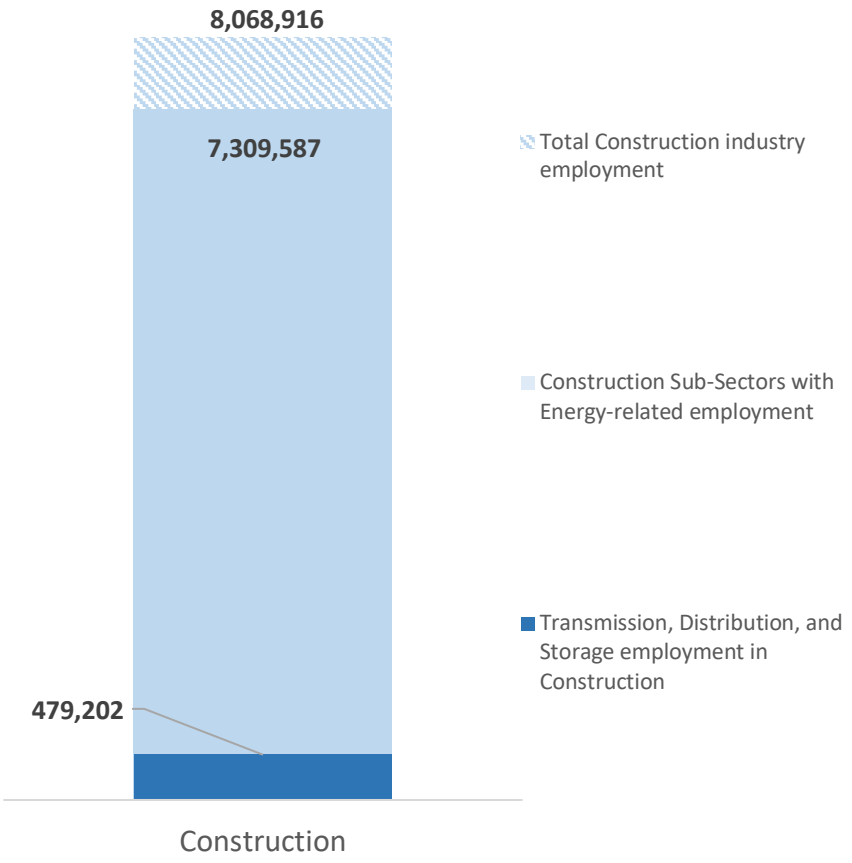


[20] As with all other industries in this report, this section relies on NAICS definitions. Utility-scale power generators, for example, are classified as utilities regardless of ownership or regulation.

Construction

Construction firms contributed the most employment to transmission, distribution, and storage activities in 2022, with 479,202 jobs. This work included pipeline and electric transmission and distribution activity, as well as the development of smart grids and microgrids (Figure 12).

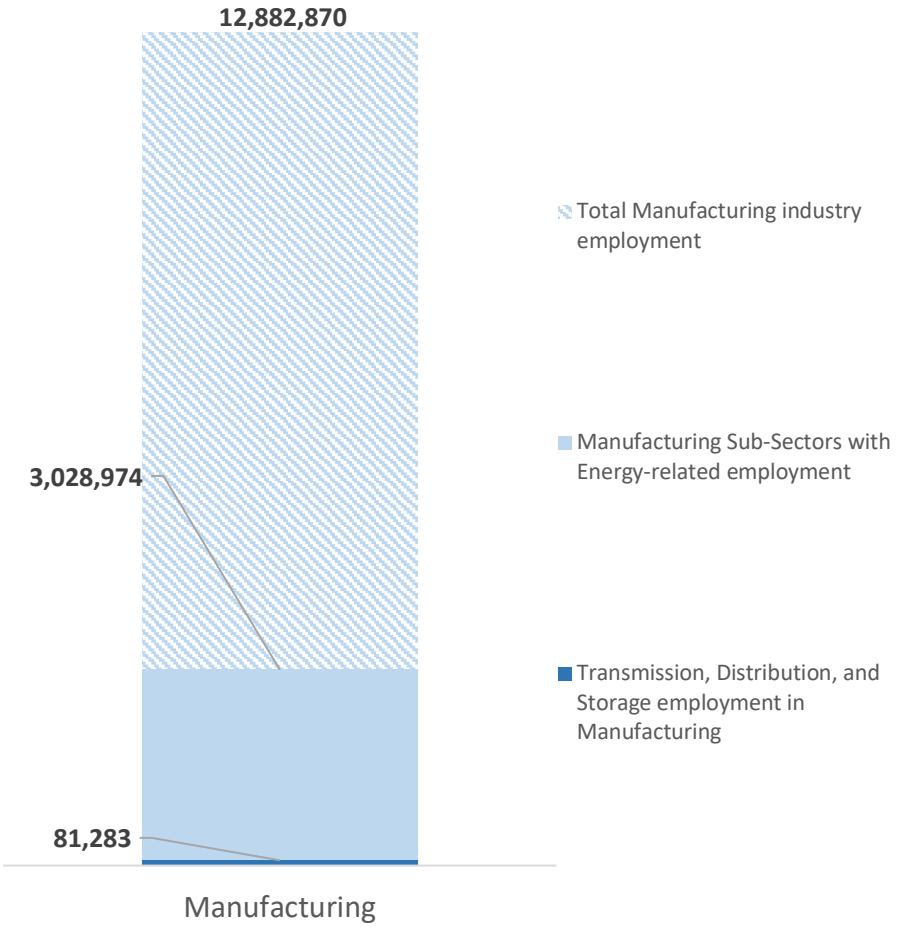
Figure 12. Construction Employment



Manufacturing

The manufacturing jobs in transmission, distribution and storage are found in several energy-related detailed manufacturing industries. These include bulk manufacturing firms that assemble storage batteries, current-carrying wiring devices, air and gas compressors, sheet metal and other electrical and nonelectrical equipment or components. Of the nation's nearly 12.9 million total manufacturing jobs in 2022, almost 24% or more than 3 million were in energy-related industries that may support transmission-related infrastructure, and 2.7% of those, or approximately 81,283 workers, produced products for transmission, distribution, and storage in 2022 (Figure 13).

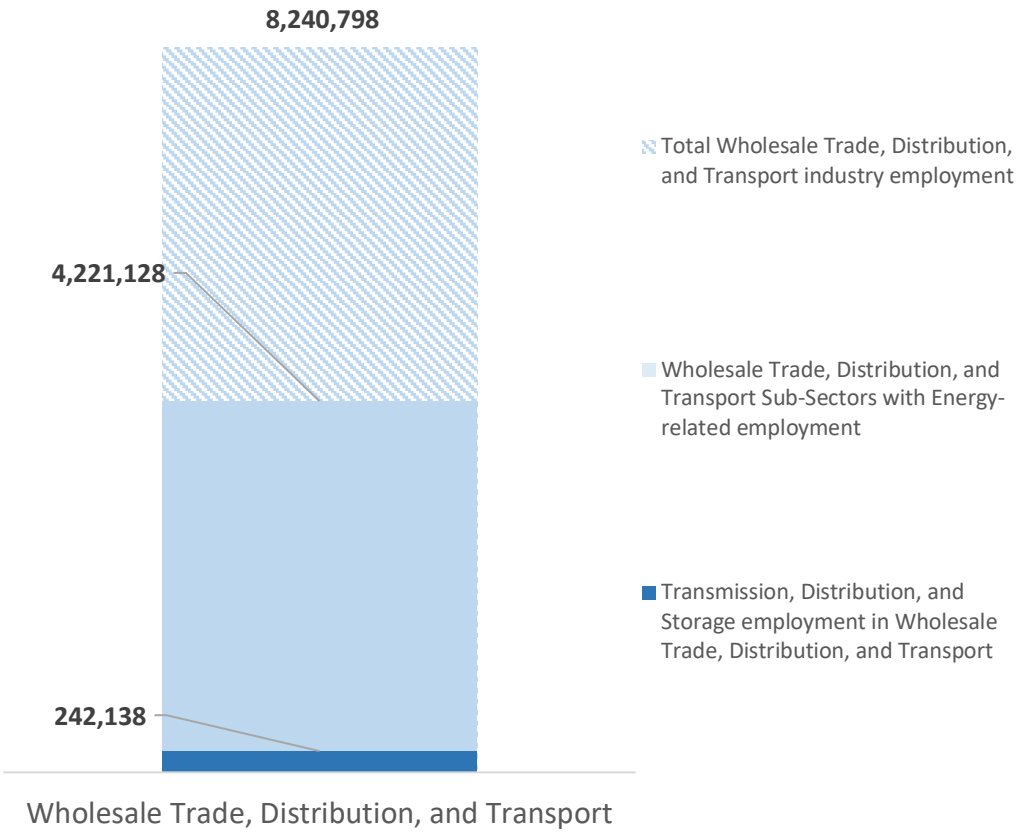
Figure 13. Manufacturing Employment



Wholesale Trade

Several industry codes used by BLS capture employment entirely dedicated to the transport of crude oil, natural gas and other refined petroleum products. About 140,800 jobs were included for 2022 by identifying proportional employment from energy-related commodity data for truck, rail, air and water transport using the methodology from the first USEER.[21];[22] An additional 49,843 jobs identified by the survey are in detailed wholesale industries such as electrical equipment, wiring, appliance and electronics merchant wholesalers. Together, fossil fuels transport and electrical equipment wholesalers employed more than 242,000 transmission, distribution and storage workers in 2022 (Figure 14).[23]

Figure 14. Wholesale Trade

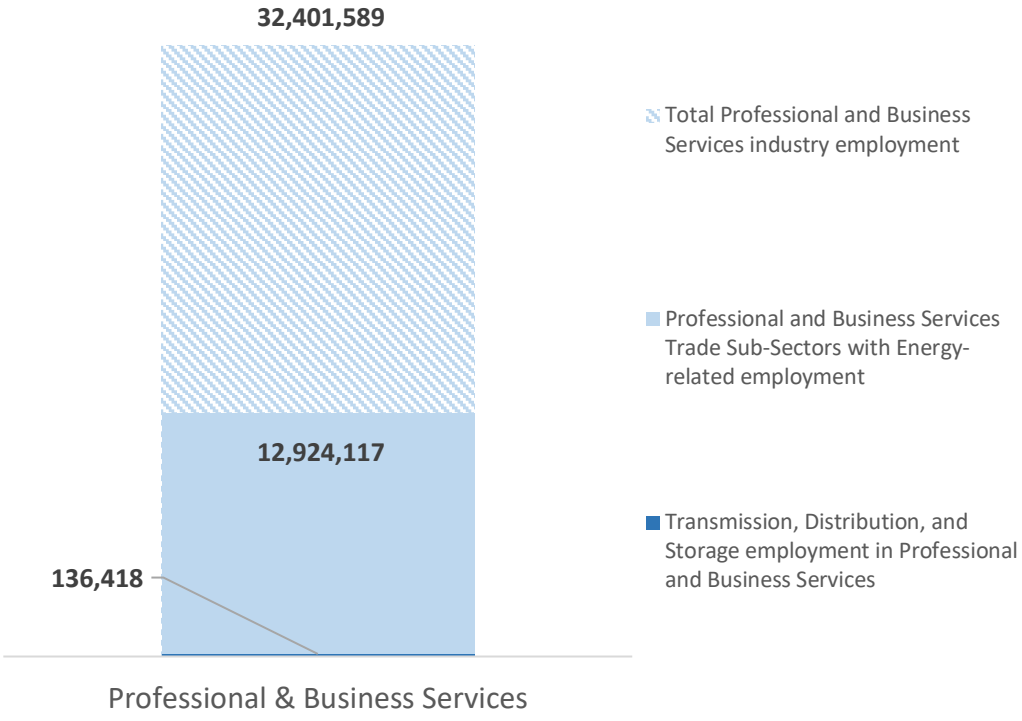


[21] For the methodology, see this report's Appendix B: Discussion of USEER Methodology.
[22] See U.S. Energy and Employment Report 2016 | Department of Energy.
[23] This employment figure excludes raw material and component manufacturers; the limitations of a survey-based approach prevent accurate data collection for suppliers that are significantly upstream.

Professional and Business Services

A very small proportion (1.1%) of energy-related professional and business services support transmission, distribution and storage infrastructure and technology. Of the 32.4 million workers in these detailed industry codes, the USEER identified about 136,418 who spent some of their time supporting these technologies in 2022 (Figure 25).

Figure 15. Professional and Business Services Employment

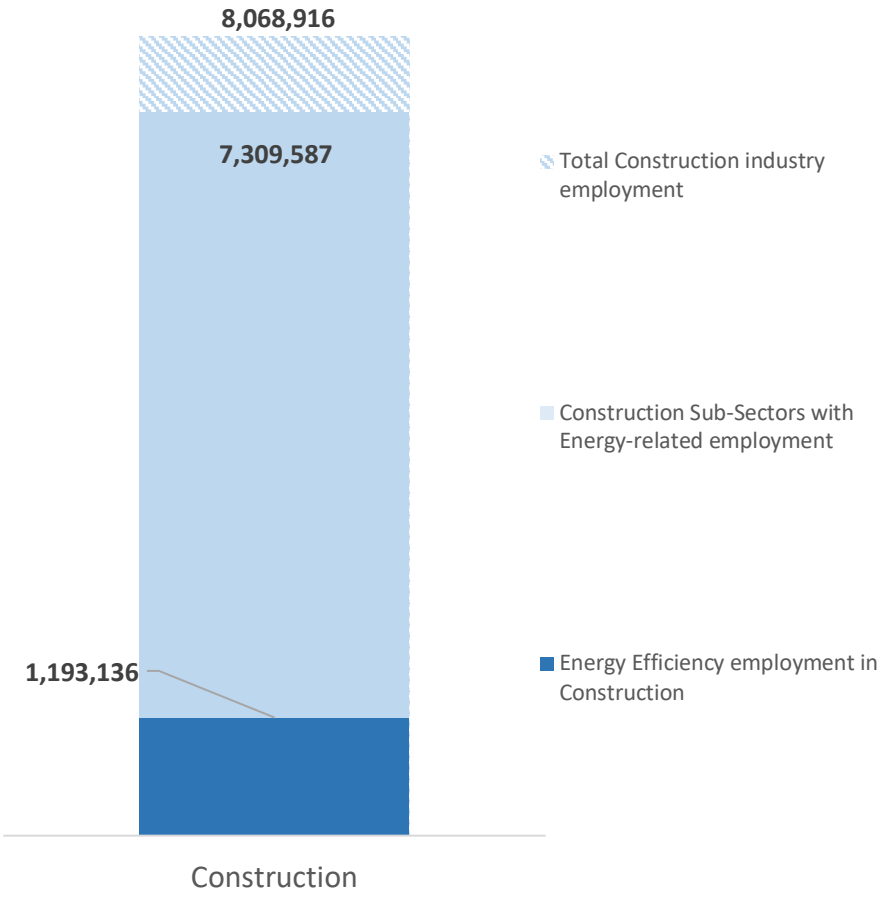


Appendix G: Energy Efficiency Employment by Industry

Construction

The majority of energy efficiency employment (53.9%) identified with USEER data was in construction firms (1.193 million). Of the 8.01 million construction workers in the U.S., about 14.8% worked in 2022 to support the construction or installation of energy-efficient technologies (Figure 16).

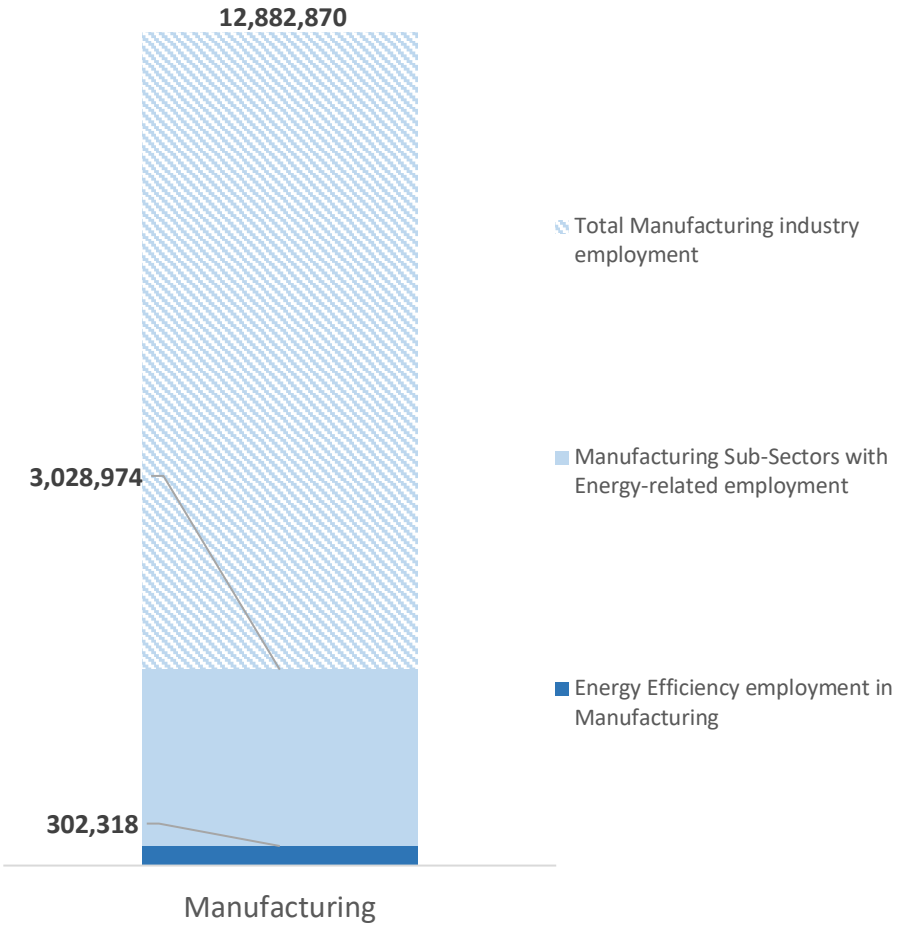
Figure 16. Construction Employment



Manufacturing

Manufacturing activity is a sizable portion of the U.S. energy efficiency sector (Figure 17). The jobs included in this section refer only to the manufacture of ENERGY STAR rated appliances or other products such as energy-efficient building and lighting services. They do not include process efficiency (e.g., manufacturers that produce goods using energy-efficient equipment, machinery or processes). Of the 3,028,974 jobs found in relevant energy manufacturing subsectors in 2022 — such as lighting, household appliances or HVAC equipment manufacturing — about 302,318 workers manufactured energy-efficient products as defined in these appendices.

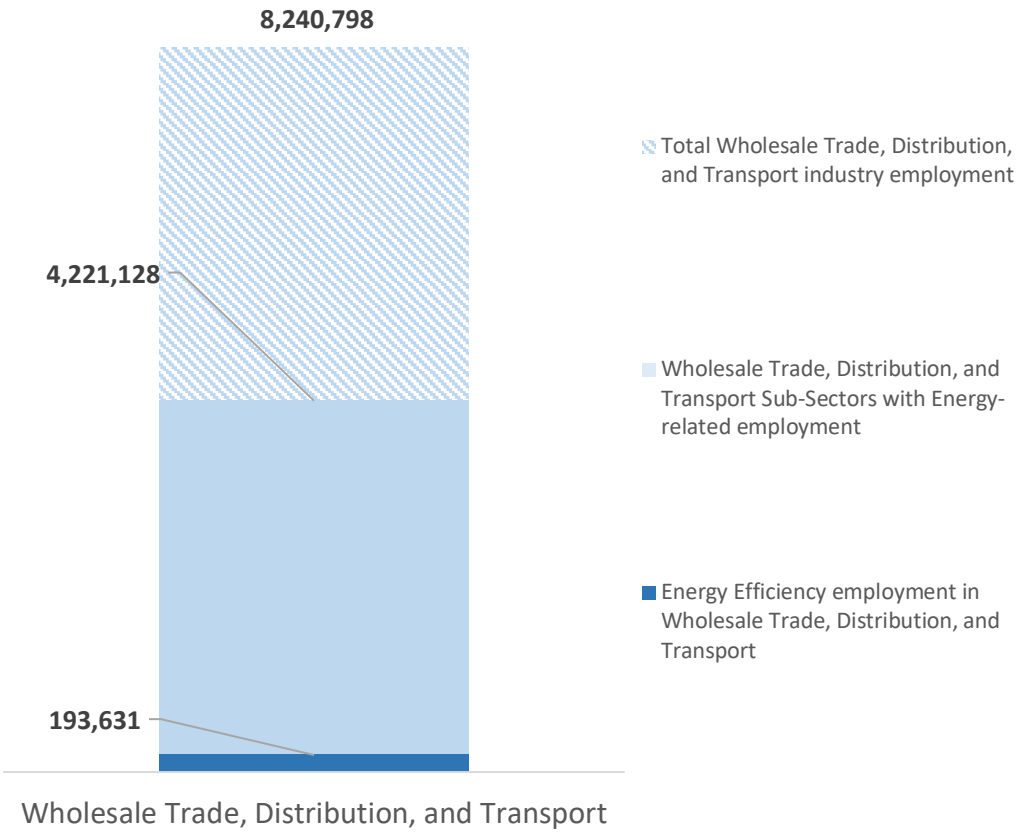
Figure 17. Manufacturing Employment



Wholesale Trade

Approximately 51% of the more than 8.2 million wholesale trade, distribution and transport jobs across the nation were in trade subsectors that support energy-related employment. Of these 4.22 million jobs, USEER survey data identified that about 4.6% of workers were engaged in efficiency-related work in 2022 (Figure 18).

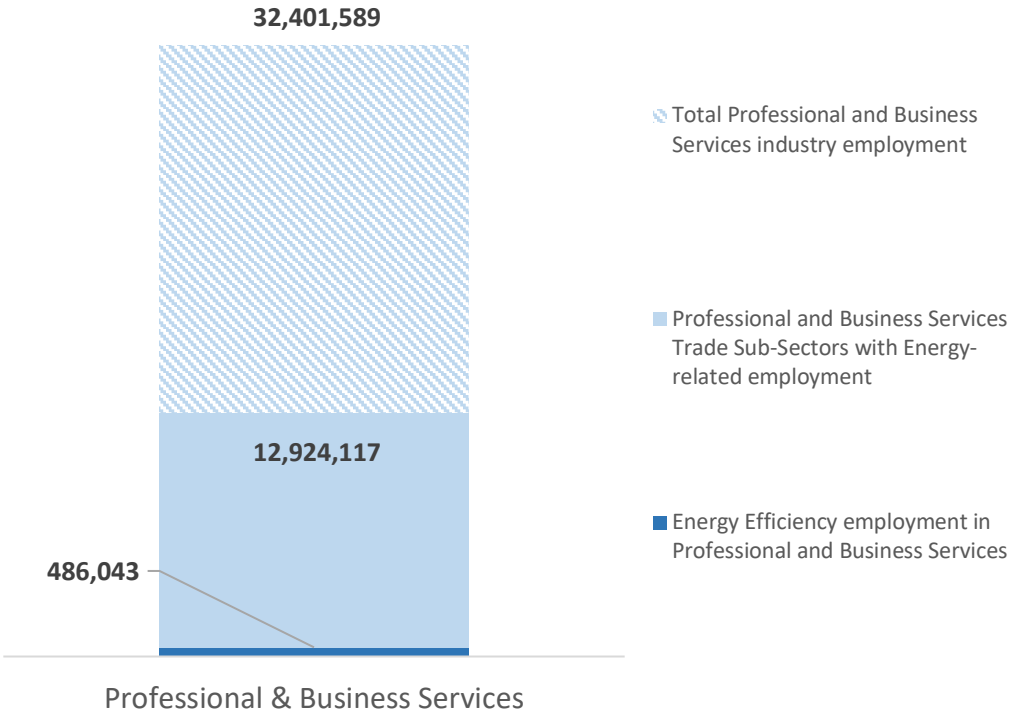
Figure 18. Wholesale Trade Employment



Professional and Business Services

Forty percent of professional and business services jobs may support the energy industry through activities including software development, finance, management and legal services. Of these detailed subsectors, USEER survey data identified 3.8% of employees, or 486,043, who worked to support energy-efficient products and services in 2022 (Figure 19).

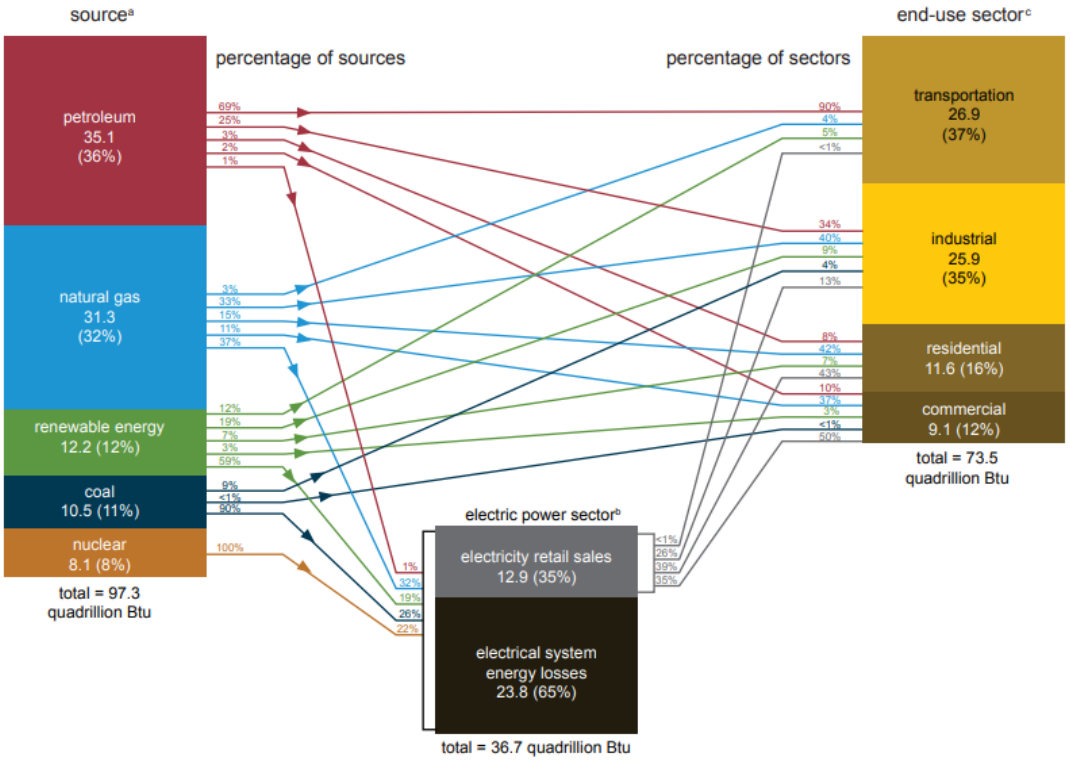
Figure 19. Professional and Business Services Employment



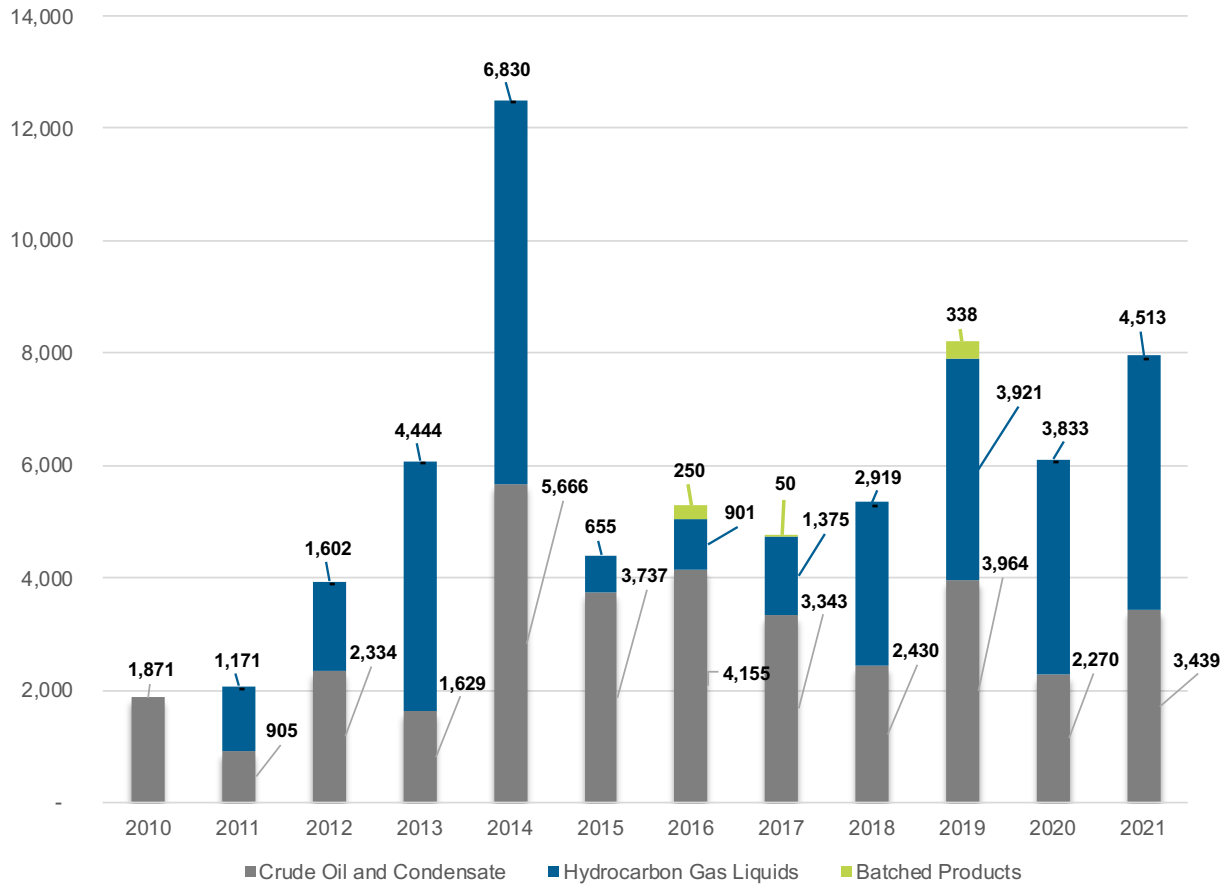
Appendix H: Primary Energy Consumption by Source and Sector, 2021 (Quadrillion Btu)

U.S. energy consumption by source and sector, 2021

quadrillion British thermal units (Btu)



Appendix I: Completed Liquid Fuel Pipeline Capacity, 2010-2022 (Quadrillion Btu)[24]



[24] Source: https://www.eia.gov/petroleum/xls/EIA_LiqPipProject.xlsx

Appendix J: ENERGY STAR Unit Shipment and Market Penetration Report Calendar Year 2021 Summary

ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2021 Summary

This is the 20th year in which EPA has collected unit shipment data for the ENERGY STAR Program from program partners and/or their representative associations and used it to project the market penetration of ENERGY STAR certified products.

Data:

For 2021, data was collected for the following ENERGY STAR certified products:

- Audio/Video Products
- Boilers
- Ceiling Fans
- Central Air Conditioners and Air-Source Heat Pumps
- Clothes Dryers
- Clothes Washers
- Commercial Boilers
- Commercial Coffee Brewers
- Commercial Dishwashers
- Commercial Fryers
- Commercial Griddles
- Commercial Hot Food Holding Cabinets
- Commercial Ice Makers
- Commercial Ovens
- Commercial Refrigerators and Freezers
- Commercial Steam Cookers
- Commercial Water Heaters
- Computers
- Connected Thermostats
- Data Center Storage
- Decorative Light Strings
- Dehumidifiers
- Dishwashers
- Displays
- Electric Vehicle Supply Equipment
- Enterprise Servers
- Freezers
- Furnaces
- Geothermal Heat Pumps
- Imaging Equipment
- Laboratory Grade Refrigerators and Freezers
- Lamps
- Light Commercial HVAC
- Luminaires
- Pool Pumps
- Refrigerators
- Room Air Cleaners
- Room Air Conditioners
- Storm Windows
- Telephony
- Televisions
- Uninterruptible Power Supplies
- Vending Machines
- Ventilating Fans
- Water Coolers
- Water Heaters

For more details:

https://www.energystar.gov/sites/default/files/asset/document/2021%20Unit%20Shipment%20Data%20Summary%20Report_0.pdf

Appendix K: Energy Technology Definitions

Pursuant to OMB Control Number 1910-5179, the United States Department of Energy is conducting a national Energy and Jobs Survey about the energy, energy-related, and advanced manufacturing industries. This important survey addresses businesses that research, develop, manufacture, install or work with products that generate, distribute, or save energy. This includes organizations involved in fossil and renewable energy production, energy efficiency products and services, motor vehicles, solar, wind, fossil and other energy sources, and other energy related products and services.

SC & SD - Which of the following industries best describes your organization's work? [ALLOW MULTIPLE RESPONSES] [IF NEEDED: If your organization is involved in energy research or professional services for the industry, please select the options that are most relevant to your organization.]

1. Electric Power Generation - the process of generating electric power from other sources of primary energy whether connected to a distribution grid or not
2. Electric Power Transmission, Distribution, and Storage – stores electricity or carries electricity from suppliers to demand sites
3. Energy Efficiency, Including Heating, Cooling and Building Envelope (IF NEEDED THIS INCLUDES THERMAL OR HOT WATER SOLAR) - Goods and services that reduce electricity demand pursuant to EPA's Energy Star Standards or Department of Energy Efficiency Standards or refers to establishments that are involved with heating, ventilation and air conditioning (HVAC) from Renewable Energy sources or work that increases the Energy Efficiency of HVAC systems
4. Fuel Production, including Fossil, Nuclear, and Renewable - substances that produces useful energy when they undergo a chemical or nuclear reaction
5. Transportation Vehicles, including Motor Vehicles - includes fossil and non-fossil fuel related rail, aircraft, vessels, and vehicles
6. Component Parts for Transportation Vehicles – parts for fossil and non-fossil fuel related rail, aircraft, vessels, and vehicles
7. Carbon Capture and Storage - the process of trapping carbon dioxide from industrial sources and storing it in such a way that it is unable to affect the atmosphere
8. Other (Specify _____) TERMINATE
9. DK/NA TERMINATE

SE - [ASK FOR EACH SCREENER C RESPONSE, EXCEPT SCREENER C = 7] Which of the following [INSERT SCREENER C RESPONSE] technologies is your organization directly engaged with?? [READ LIST, ALLOW MULTIPLE RESPONSES]

A. Electric Power Generation

1. Solar Photovoltaic Electric Generation - generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect.
2. Concentrated Solar Electric Generation - generating solar power by using mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area.
3. Wind Generation - converting the wind's kinetic energy into electrical power
4. Geothermal Generation - using steam produced from reservoirs of hot water found a few miles or more below the Earth's surface to produce electricity.
5. Bioenergy/Biomass Generation - generating electricity from materials derived from biological sources or any organic material which has stored sunlight in the form of chemical energy.
6. Low-Impact Hydroelectric Generation including Wave/Kinetic Generation – similar to traditional, but certification criteria are aimed at ensuring that the certified dam adequately protects or mitigates its impacts in eight key resource areas: river flows, water quality, fish passage and protection, watersheds, threatened and endangered species, cultural resources, and public access and recreation opportunities. The eighth criterion requires that the dam not have been recommended for removal (LIHI – Low Impact Hydropower Institute).
7. Traditional Hydroelectric Generation - electricity generated by hydropower; the production of electrical power through the use of the gravitational force of falling or flowing water.
8. Marine and Hydrokinetic Generation - harnessing power from the natural movement of water, including waves, tides, and river and ocean currents
9. Advanced/Low Emission Natural Gas – efficient, low emission, leak free natural gas, including systems that use any of the following technologies High Efficiency Compressor, Advanced Low NOx Combustion Technology, First Application of Closed Loop Steam Cooling in an Industrial Gas Turbine, Advanced Turbine Blade and Vane Materials, High Temperature TBC and Abradable Coatings, Advanced Row 4 Turbine Blades, 3-D Aero Technology, Advanced Brush Seal.
10. Nuclear Generation - converting atomic energy into usable power.
11. Coal Generation – the burning of thermal coal to create electricity.
12. Oil and other Petroleum Generation - the burning of oil or other petroleum to create electricity.
13. Natural Gas Generation, other than Advanced Natural Gas Generation - the burning of natural gas to create electricity.
14. Combined Heat and Power - generating electricity and useful thermal energy in a single, integrated system. Heat that is normally wasted in conventional power generation is recovered as useful energy
15. Other Generation (specify) – any generation that is not captured in the categories listed previously or a category that is used when unable to split employment into a single category where employees spend “more of their time.”

B. Electric Power Transmission, Distribution, and Storage

1. Traditional Transmission and Distribution - allow electricity to move across the country through infrastructure commonly referred to as “poles and wires.”
2. Electric Vehicle Charging Stations - Stations that charge vehicles which use one or more electric motors for propulsion with no onboard generator or non-electric motor.
3. Pumped Hydro Storage - hydroelectric energy storage used by electric power systems for load balancing. The method stores energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation.
4. Battery Storage – using a cell or connected group of cells to convert chemical energy into electrical energy by reversible chemical reactions and that may be recharged by passing a current through it in the direction opposite to that of its discharge
5. Mechanical storage (flywheels, compressed air energy storage, etc.) - storing inputted energy through kinetic or gravitational forces.
6. Thermal storage - heating or cooling a medium to store thermal energy.
7. Liquefied natural gas storage - storing liquified natural gas in tanks.
8. Compressed natural gas storage - storing compressed natural gas.
9. Crude oil storage - storing crude oil in tanks.
10. Refined petroleum fuels (liquid) - storing refined petroleum fuels in liquid form.
11. Refined petroleum fuels (liquid) - storing refined petroleum fuels in gas form.
12. Coal storage (piles, domes, etc.) - storing coal awaiting use or transportation.
13. Biofuels - storing biofuels including ethanol and biodiesel.
14. Nuclear fuel - storing spent nuclear fuel.
16. Other Storage - any storage that is not captured in the categories listed previously or a category that is used when unable to split employment into a single category where employees spend “more of their time.”
17. Other gas fuel (Specify) - any gas fuel storage that is not captured in the categories listed previously or a category that is used when unable to split employment into a single gas fuel storage category where employees spend “more of their time.”
18. Other liquid fuel (Specify) - any liquid fuel storage that is not captured in the categories listed previously or a category that is used when unable to split employment into a single liquid fuel storage category where employees spend “more of their time.”
15. Smart Grid - an electricity supply network that uses digital communications technology to detect and react to local changes in usage.
16. Micro Grids - 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.
17. Other Grid Modernization – other modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth.
18. Other (Specify)- any transmission, distribution, and storage that is not captured in the categories listed previously or a category that is used when unable to split employment into a single transmission, distribution, and storage category where employees spend “more of their time.”

C. Energy Efficiency, Including Heating, Cooling and Building Envelope

1. Energy Star Appliances – appliances that meet the international Energy Star standard for energy efficient consumer products originated in the United States.
2. LED, CFL and Other Efficient Lighting – energy efficient lighting sources.
3. Traditional HVAC goods, control systems, and services - heating, ventilation, and air conditioning systems (HVAC), including building retro-commissioning and retrofits connected to heating and cooling.
4. Energy Star/ High AFUE HVAC - HVAC that meets the international Energy Star standard for energy efficient consumer products originated in the United States or has high Average Fuel Utilization Efficiency (AFUE) rating of 90 or greater or 15 SEER or greater.
5. ENERGY STAR Air-Source Heat Pumps - air-source heat pumps that meet the international Energy Star standard for energy efficient consumer products originated in the United States.
6. ENERGY STAR Ground-source or geothermal heat pumps - heat pumps that use the earth's natural heat to provide heating and cooling, and meet the international Energy Star standard for energy efficient consumer products originated in the United States.
7. Other high efficiency HVAC that are out of scope for ENERGY STAR certification (e.g. indirect evaporative coolers, air to water heat pumps, energy recovery systems, etc.)
8. Traditional HVAC goods, control systems, and services - include wall units, furnaces
9. ENERGY STAR certified water heaters - water heaters, which can come with gas, solar, or electric heat pump technology, that meet the international Energy Star standard for energy efficient consumer products originated in the United States.
10. ENERGY STAR Certified Electronics - electronic appliances such as TVs, Telephones, and Audio/Video devices that meet the international Energy Star standard for energy efficient consumer products originated in the United States.
11. ENERGY STAR Certified Windows, Doors and Skylights - windows, doors, and skylights which meet the international Energy Star standard for energy efficient consumer products originated in the United States.
12. ENERGY STAR Certified Roofing - Energy Star certified roof products which reflect more of the sun’s rays and decrease the amount of heat transferred into a building.
13. ENERGY STAR Certified Insulation - insulation products, including blankets, foam boards, and loose fill, which meet the international Energy Star standard for energy efficient consumer products originated in the United States.
14. Air sealing - products that reduce the amount of air that leaks in and out of a building by sealing cracks and openings
15. ENERGY STAR Certified Commercial Food Service Equipment - Commercial kitchen equipment, including refrigerators, dishwashers, and ovens, which meet the international Energy Star standard for energy efficient consumer products originated in the United States.
16. ENERGY STAR Certified Data Center Equipment - IT equipment, such as servers, uninterruptible power supplies, data storage, and network

equipment, which meets the international Energy Star standard for energy efficient consumer products originated in the United States.
17. ENERGY STAR Certified LED lighting - LED light bulbs which meet the international Energy Star standard for energy efficient consumer products originated in the United States.
18. Other LED, CFL, and efficient lighting
19. Renewable Heating and Cooling (including Solar Thermal) - refers to establishments that are involved with heating, ventilation and air conditioning (HVAC) from Renewable Energy sources or work that increases the Energy Efficiency of HVAC systems (solar thermal - uses the sun's energy to generate thermal energy).
20. Advanced Building Materials/Insulation - all materials that represent advances in efficiency over the traditional materials.
21. Recycled building materials
22. Reduced water consumption products and appliances high efficiency (HE) washing machines, faucet aerators, low flow shower heads, etc.
23. Energy auditing services
24. Other (Specify) - any energy efficiency that is not captured in the categories listed previously or a category that is used when unable to split employment into a single energy efficiency category where employees spend "more of their time."

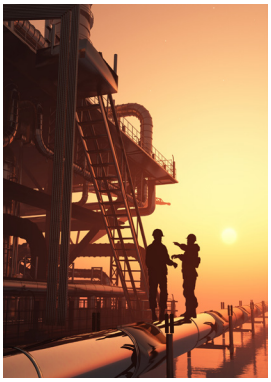
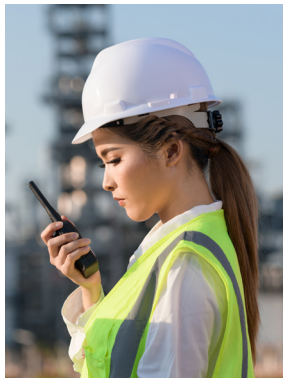
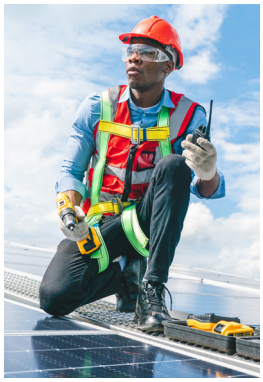
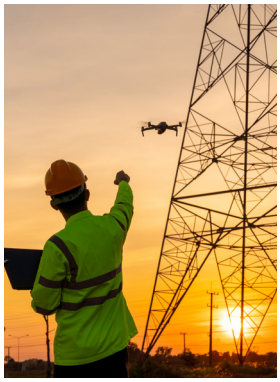
D. Fuels

1. Coal - a combustible black or dark brown rock consisting mainly of carbonized plant matter, found mainly in underground deposits and widely used as fuel.
2. Petroleum - a liquid mixture of hydrocarbons that is present in certain rock strata and can be extracted and refined to produce fuels including gasoline, kerosene, and diesel oil; oil.
3. Natural Gas - flammable gas, consisting largely of methane and other hydrocarbons, occurring naturally underground (often in association with petroleum) and used as fuel.
4. Other Fossil Fuel - a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.
5. Corn Ethanol - ethanol produced from corn that is used as a biomass.
6. Renewable diesel - a fuel made from fats and oils, such as soybean oil or canola oil, that is processed to be chemically the same as petroleum diesel.
7. Biodiesel - a renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in diesel vehicles or any equipment that operates on diesel fuel.
8. Other Ethanol/Non-Woody Biomass Fuel, including Biodiesel – fuel made from other materials such as straw, manure, vegetable oil, animal fats, etc.
9. Woody Biomass/Cellulosic Biofuel – fuel developed from the by-product of management, restoration, and hazardous fuel reduction treatments, as well as the product of natural disasters, including trees and woody plants (limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or rangeland environment)

10. Other Biofuels – other fuel derived directly from living matter.
11. Nuclear Fuel - a substance that will sustain a fission chain reaction so that it can be used as a source of nuclear energy.
12. Other (Specify) - any fuel that is not captured in the categories listed previously or a category that is used when unable to split employment into a single fuel category where employees spend “more of their time.”

E. Transportation Vehicles, Including Motor Vehicles

1. Gasoline and Diesel Motor Vehicles (excluding freight transport) – vehicles that run on gasoline and diesel internal combustion engines.
2. Hybrid Electric Vehicles - use two or more distinct types of power, such as internal combustion engine + electric motor.
3. Plug-In Hybrid Vehicles - a hybrid electric vehicle that uses two or more distinct types of power, such as internal combustion engine and an electric motor that is powered by rechargeable batteries, or another energy storage device, that can be recharged by plugging it in to an external source of electric power.
4. Electric Vehicles - a vehicle which uses one or more electric motors for propulsion with no onboard generator or non-electric motor.
5. Natural Gas Vehicles - an alternative fuel vehicle that uses compressed natural gas (CNG) or liquefied natural gas (LNG) as a cleaner alternative to other fossil fuels.
6. Hydrogen Vehicles - uses hydrogen as its onboard fuel for motive power.
7. Fuel Cell Vehicles - a type of hybrid vehicle which uses a fuel cell, instead of an engine, in combination with a storage device, such as a battery, to power its on-board electric motor.
8. Other - any motor vehicle technology that is not captured in the categories listed previously or a category that is used when unable to split employment into a single motor vehicle category where employees spend “more of their time.”


UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

U.S. DEPARTMENT OF ENERGY

For more information,
visit energy.gov/useer

DOE/OP-0020 • June 2023