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 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 2023, 54% of energy efficiency jobs were considered clean under the formal definition and 68% 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 4,595,923 (including electrical and non-electrical traditional transmission and distribution) and 3,579,658 (including only the efficiency jobs without traditional transmission and distribution). This means that the new-zero aligned definition which totals 3,209,638 jobs, is 70% of the fully expansive state-level definition (with T&D) and 90% of the state-level definition including all energy efficiency.

Since states have very different 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

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

Because nationally, 33% 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.

Without including traditional transmission and distribution, California had the highest number of clean energy jobs with 545,207, followed by Texas (261,934) and New York (177,202). Including traditional transmission and distribution, the top three states were still California, Texas, and New York.

Table 1. State Level Clean Energy Jobs, 2023

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	45,889	67,137	46%
Alaska	5,654	9,614	70%
Arizona	65,524	83,049	27%
Arkansas	22,779	34,002	49%
California	545,207	640,449	17%
Colorado	68,814	89,419	30%
Connecticut	44,138	52,505	19%
Delaware	12,667	15,388	21%
District of Columbia	15,494	17,442	13%
Florida	172,115	210,308	22%
Georgia	83,350	113,980	37%
Hawaii	14,191	16,714	18%
Idaho	15,439	19,863	29%
Illinois	130,473	160,263	23%
Indiana	82,395	99,189	20%
Iowa	35,659	44,546	25%
Kansas	27,380	40,495	48%
Kentucky	35,630	49,797	40%
Louisiana	32,423	61,115	88%
Maine	13,961	16,662	19%
Maryland	82,926	93,661	13%

Massachusetts	126,417	139,898	11%
Michigan	122,092	143,723	18%
Minnesota	64,699	81,666	26%
Mississippi	22,155	34,758	57%
Missouri	58,065	79,041	36%
Montana	10,962	16,800	53%
Nebraska	22,654	31,951	41%
Nevada	34,480	42,838	24%
New Hampshire	17,345	19,967	15%
New Jersey	59,668	74,548	25%
New Mexico	13,255	27,177	105%
New York	177,202	234,825	33%
North Carolina	108,521	135,495	25%
North Dakota	9,505	16,533	74%
Ohio	111,499	142,429	28%
Oklahoma	23,657	53,290	125%
Oregon	59,237	67,246	14%
Pennsylvania	103,412	145,153	40%
Rhode Island	14,933	16,950	14%
South Carolina	57,539	70,147	22%
South Dakota	13,567	17,014	25%
Tennessee	84,126	106,203	26%
Texas	261,934	409,973	57%
Utah	45,893	52,987	15%
Vermont	16,251	18,051	11%
Virginia	100,200	119,551	19%
Washington	83,279	103,241	24%
West Virginia	10,089	41,929	316%
Wisconsin	73,398	87,929	20%
Wyoming	8,559	16,052	88%

Table 2. State Level Clean Energy Jobs, 2022 Revised

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	61,373	39%
Alaska	5,528	9,534	72%
Arizona	63,160	76,515	21%
Arkansas	21,962	32,568	48%
California	528,247	623,584	18%
Colorado	66,479	85,212	28%
Connecticut	42,905	51,385	20%
Delaware	12,456	15,135	22%
District of Columbia	15,130	17,068	13%
Florida	164,132	202,530	23%
Georgia	80,787	108,064	34%
Hawaii	13,944	16,467	18%
Idaho	14,421	18,869	31%
Illinois	126,887	156,869	24%
Indiana	81,140	96,350	19%
Iowa	34,785	43,755	26%
Kansas	26,454	39,846	51%
Kentucky	33,997	46,416	37%
Louisiana	31,184	60,087	93%
Maine	13,576	15,393	13%
Maryland	81,426	92,133	13%
Massachusetts	122,187	133,877	10%
Michigan	118,866	136,583	15%
Minnesota	62,714	79,787	27%
Mississippi	21,512	30,691	43%
Missouri	56,296	77,620	38%
Montana	10,546	15,694	49%
Nebraska	21,923	31,399	43%
Nevada	33,361	41,800	25%
New Hampshire	16,864	19,495	16%
New Jersey	56,965	71,865	26%

New Mexico	12,639	25,850	105%
New York	171,465	230,090	34%
North Carolina	105,209	123,339	17%
North Dakota	9,270	16,257	75%
Ohio	107,986	139,268	29%
Oklahoma	22,668	51,518	127%
Oregon	58,297	65,753	13%
Pennsylvania	100,034	139,115	39%
Rhode Island	14,543	16,529	14%
South Carolina	56,497	65,681	16%
South Dakota	13,160	15,769	20%
Tennessee	81,027	100,270	24%
Texas	249,248	395,995	59%
Utah	43,926	48,830	11%
Vermont	16,183	17,570	9%
Virginia	97,195	113,542	17%
Washington	81,382	101,600	25%
West Virginia	9,764	43,327	344%
Wisconsin	71,919	84,725	18%
Wyoming	8,388	15,454	84%

From 2022 to 2023, clean jobs grew in all states and the District of Columbia except for in West Virginia, which lost jobs in traditional transmission and distribution. As shown in Table 2, excluding traditional transmission and distribution, Idaho had the fastest clean energy job growth, increasing 7.7% (1,105 jobs), followed by Texas (+6%; 14,829 jobs), and New Mexico (+5.9%; 740 jobs). If traditional transmission and distribution is included, Mississippi grew the fastest, expanding 13.8% (4,221 jobs) followed by North Carolina (+10.6%; 13,007 jobs) and Alabama (+10.1%; 6,167 jobs).

Table 3. Change in Clean Energy Jobs, 2022 – 2023

State	Clean Energy Jobs Growth (Without Traditional Transmission and Distribution) 2022 - 2023	Growth Rate, 2022 – 2023	Clean Energy Jobs Growth (With Traditional Transmission and Distribution) 2022 - 2023	Growth Rate, 2022 – 2023
Alabama	1,826	4.1%	5,764	9.4%
Alaska	126	2.3%	80	0.8%
Arizona	2,364	3.7%	6,534	8.5%
Arkansas	818	3.7%	1,434	4.4%
California	16,960	3.2%	16,865	2.7%
Colorado	2,335	3.5%	4,207	4.9%
Connecticut	1,233	2.9%	1,119	2.2%
Delaware	211	1.7%	252	1.7%
District of Columbia	364	2.4%	374	2.2%
Florida	7,983	4.9%	7,778	3.8%
Georgia	2,563	3.2%	5,916	5.5%
Hawaii	247	1.8%	247	1.5%
Idaho	1,018	7.1%	995	5.3%
Illinois	3,586	2.8%	3,394	2.2%
Indiana	1,254	1.5%	2,838	2.9%
Iowa	875	2.5%	792	1.8%
Kansas	926	3.5%	649	1.6%
Kentucky	1,633	4.8%	3,381	7.3%
Louisiana	1,239	4.0%	1,028	1.7%
Maine	385	2.8%	1,269	8.2%
Maryland	1,500	1.8%	1,528	1.7%
Massachusetts	4,230	3.5%	6,021	4.5%
Michigan	3,226	2.7%	7,140	5.2%
Minnesota	1,985	3.2%	1,880	2.4%
Mississippi	643	3.0%	4,067	13.3%
Missouri	1,769	3.1%	1,421	1.8%
Montana	417	4.0%	1,105	7.0%
Nebraska	731	3.3%	553	1.8%
Nevada	1,120	3.4%	1,038	2.5%
New Hampshire	480	2.8%	473	2.4%
New Jersey	2,703	4.7%	2,684	3.7%

New Mexico	616	4.9%	1,327	5.1%
New York	5,737	3.3%	4,736	2.1%
North Carolina	3,312	3.1%	12,156	9.9%
North Dakota	235	2.5%	276	1.7%
Ohio	3,512	3.3%	3,160	2.3%
Oklahoma	989	4.4%	1,772	3.4%
Oregon	940	1.6%	1,493	2.3%
Pennsylvania	3,378	3.4%	6,038	4.3%
Rhode Island	390	2.7%	422	2.6%
South Carolina	1,042	1.8%	4,466	6.8%
South Dakota	407	3.1%	1,244	7.9%
Tennessee	3,099	3.8%	5,933	5.9%
Texas	12,686	5.1%	13,979	3.5%
Utah	1,968	4.5%	4,157	8.5%
Vermont	67	0.4%	481	2.7%
Virginia	3,005	3.1%	6,008	5.3%
Washington	1,897	2.3%	1,641	1.6%
West Virginia	325	3.3%	(1,398)	-3.2%
Wisconsin	1,479	2.1%	3,204	3.8%
Wyoming	171	2.0%	598	3.9%

Appendix B: Discussion of USEER Methodology

I. Survey Overview

The 2024 USEER methodology relies on the most recently available data from the BLS QCEW (QCEW, third quarter 2023), 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 2024 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 2024 USEER survey was administered by telephone (more than 1,047,000 outbound dials) and by web, with more than 275,000 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 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 42,100 business establishments participated in the survey effort, with approximately 10,200 providing full responses to the survey. These responses were used

[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)

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 ±0.47% at a 95% confidence interval. The margin of error for all energy firms that answered questions related to energy employment in the survey is ±0.97% 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 ±2.67% at a 95% confidence interval.

For several industries, particularly transportation of goods, the USEER uses the methodology developed by the DOE and the National Renewable Energy Laboratory for the first installment of the QER. 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. 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 (75%), followed by rail (16%), 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 2023, and the BLS Unemployment Situation Table B-1 monthly reports through December 2023, except for motor vehicle employment. Due to anomalies in BLS QCEW 2023 Q4 motor vehicle and motor vehicle component parts manufacturing employment caused by the September 2023 United Auto Workers (UAW) strike, revised 2023 Q3 and 2022 Q3 data is used. The 2024 USEER includes revised 2022 employment numbers (from the 2023 USEER) for motor vehicle and motor vehicle component parts and any other employment number that relies on an aggregation that includes motor vehicle and motor vehicle component parts employment, including total energy at the national and state level. 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 December 21, 2023, and March 28, 2024, and averaged 18 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 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.[4]

[3] Gas station employment had been reported in previous years up to the 2021 USEER. The 2024 USEER excludes mention of employment in this industry.
[4] DOE, Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure, 8-7.

Given the complex relationship between energy and the overall economy, the 2024 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 2024 USEER relies on such a comprehensive survey of 42,100 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 2023 employment data from the BLS QCEW and the BLS Unemployment Situation Table B-1 monthly reports through December 2023, except for motor vehicle employment. Due to anomalies in BLS QCEW 2023 Q4 motor vehicle and motor vehicle component parts manufacturing employment caused by the September 2023 United Auto Workers (UAW) strike, revised 2023 Q3 and 2022 Q3 data is used. 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, such as those included in chapter 8 of the first installment of the QER, 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 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.[5]

Energy Infrastructure addition for the 2024 USEER

The 2024 USEER also includes employment data on construction firms that have been active over the previous 12 months building out energy infrastructure projects that include manufacturing and warehouse facilities, ports for offshore wind and other energy projects such as liquified natural gas (LNG) terminals, and other energy infrastructure. This data has not been included in USEER previously and required a supplemental survey effort.

For the USEER energy infrastructure construction survey, a Qualifying Firm is —

> A construction firm that does not meet the conditions to be classified as an "Energy" firm using the standard USEER qualification, but is involved in the building, construction, or retrofitting of energy manufacturing, assembling, or processing facilities; the building, construction, or retrofitting of warehouses and related logistical facilities related to energy; the building, construction, or retrofitting of public facilities for infrastructure, energy, or transportation; and/or the building, construction, or retrofitting of ports and port related facilities with and end use related to energy.

[5] 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.

Qualifying Workers for energy infrastructure are —

> Employees of a qualifying firm that spend some portion of their time supporting the qualifying building, construction, and/or retrofitting of energy infrastructure projects.

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 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[6] in the U.S. is divided among four sectors: electric power sector (34.3%), residential and commercial buildings (11.7%), industrial (24.1%) and transportation (29.8%). This distribution of energy consumption by sector is based on total 2022 estimates published by the EIA.[7]

End-use electricity consumption, in turn, is divided with 73.3% consumed by residential and commercial buildings, 26.5% by industrial and 0.2% by transportation.[8] Thus, residential and commercial buildings consumed 36.9% 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).[9]

The 2024 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.[10] The 2024 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.[11] 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 29.8% of U.S. primary energy consumption in 2023;[12] 67.8% of overall U.S. petroleum consumption was attributable to the transportation sector.[13]

---

[6] 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.
[7] EIA, *Monthly Energy Review*, Table 2.1 and Table 2.6. Percentages are based on primary energy consumption in 2023 and do not add up to 100.0% due to rounding.
[8] EIA, *Monthly Energy Review*, Table 7.6. Percentages of retail electricity sales in 2023.
[9] EIA, *Monthly Energy Review*, Table 2.1. Percentage based on total energy consumption in 2023.
[10] Estimates do not include retail employment.
[11] 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.
[12] EIA, *Monthly Energy Review*, Table 2.1.
[13] EIA, *Monthly Energy Review*, Table 3.7c. Percentage calculated using the sum of sector totals in Tables 3.7a through 3.7c.

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.

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.[14]

Demographic Data Collection Update

As with the 2023 USEER, the 2024 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 2024 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

[14] 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.

3 million establishments with employment of 29.3 million were in the 266 in-scope industries.

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 42,000 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 2023. 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 2023.

- 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 2024 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]]

E. 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

F. [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"]

G. 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?

   Record: _____

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

Record # of employees _____

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.

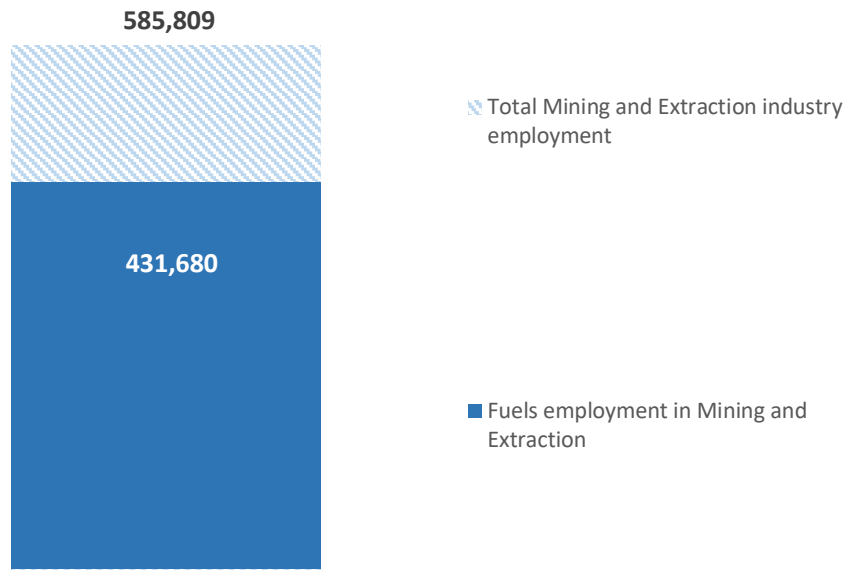
Thank you for your time!

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 2024 USEER survey found that 431,680 workers (100% in fuels) were associated with the mining and extraction of oil, gas, coal, and nuclear fuel stock in 2023. This represents 74% of the total mining and extraction jobs (585,809) in the U.S. in that year, including support activities for mining (NAICS 213) (Figure 1).

Figure 1. Energy-Related Employment in NAICS 21

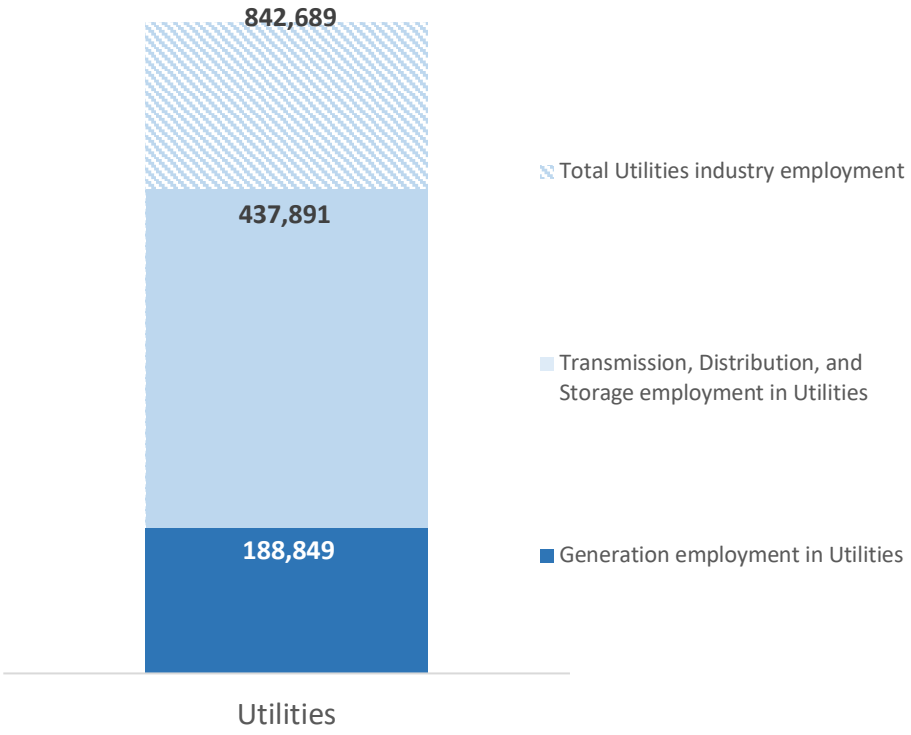


NAICS 22: Utilities

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.[15] This includes generating plants, but excludes waste management services.

Across the U.S., utilities employed 842,689 workers in 2023, with nearly three-quarters working in energy generation, transmission, or distribution (Figure 2).

Figure 2. Energy-Related Employment in NAICS 22

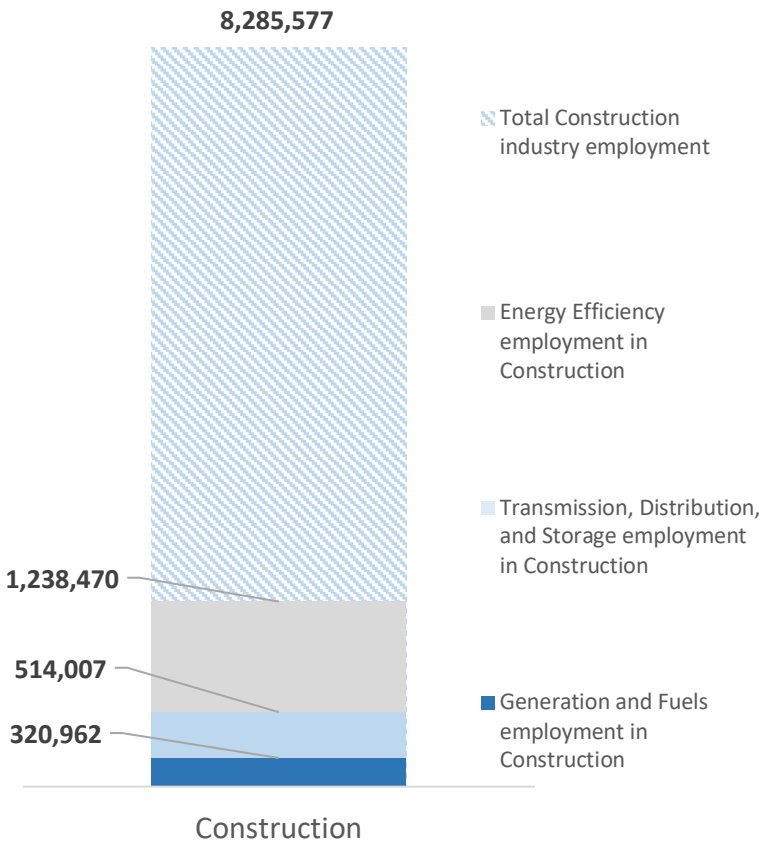


[15] "Sector 22 — Utilities: The Sector as a Whole," 2022 NAICS Definition, North American Industry Classification System, U.S. Census Bureau, U.S. Department of Commerce.

NAICS 23: Construction

Energy-related activities account for a significant amount of employment in the construction industry. In 2023, electric power generation and fuels, and transmission, distribution and storage represented 10% of total construction employment in the U.S., while energy efficiency activities accounted for an additional 15% of the construction workforce (Figure 3).

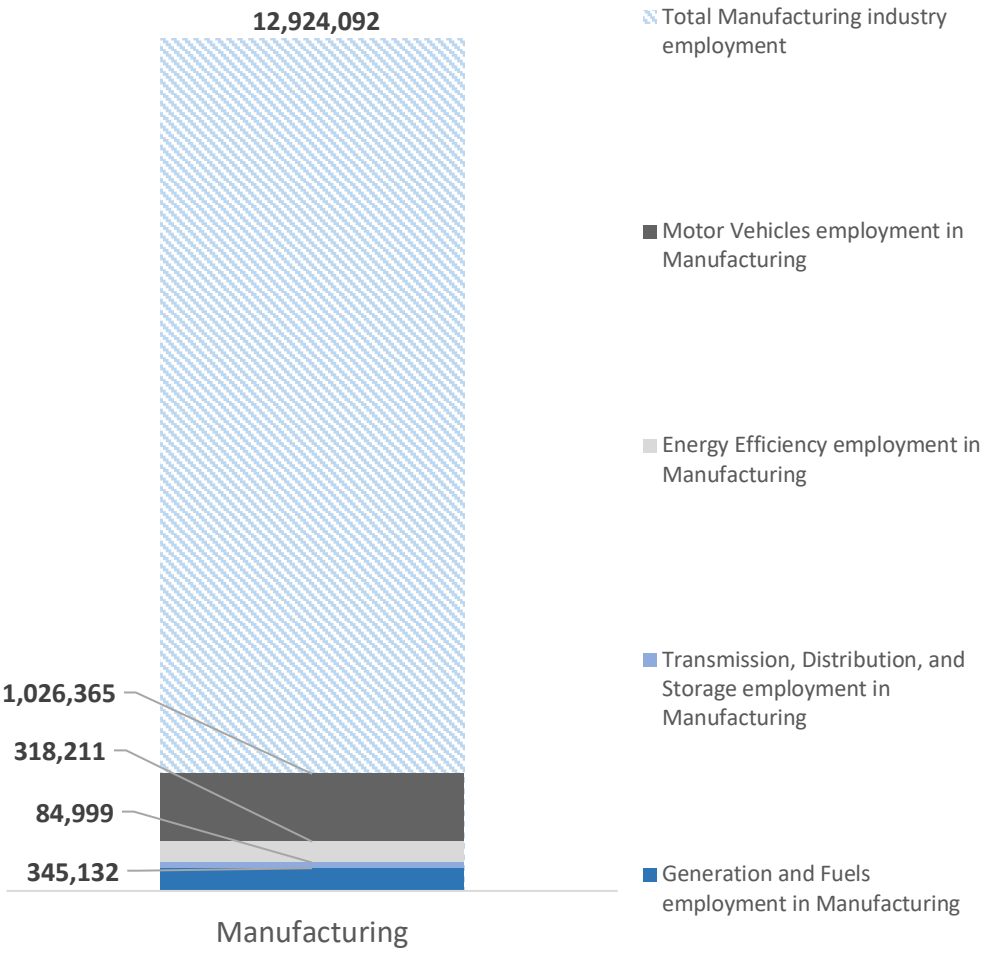
Figure 3. Energy-Related Employment in NAICS 23



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 3.3% of all manufacturing jobs in the U.S. in 2023. Energy efficiency product manufacturing (composed of ENERGY STAR products and energy-related building materials, such as insulation, windows, and doors) added 2.5% 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 (22.7%) of the workforce in the larger industry in 2023, 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

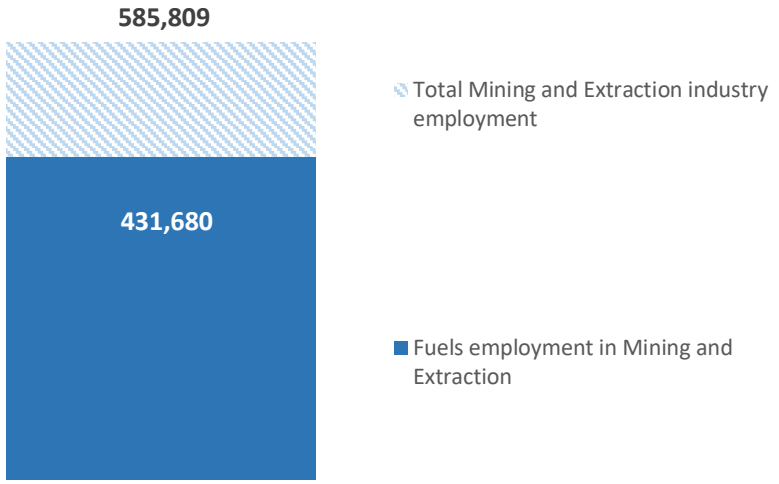
Agriculture and Forestry

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 2024 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).[16] Based on these inputs, an estimated 37,370 agriculture and forestry employees worked in 2023 to support fuel production.[17]

Mining, Extraction and Utility Generation

About 74% of all mining and extraction employment in the U.S. in 2022 was for fuels used in energy production; this translates to more than 431,000 workers in 2023. These workers support the fuels industry through crude petroleum[18] and natural gas extraction, as well as surface and underground coal mining (Figure 5).[19]

Figure 5. Mining and Extraction Employment



[16] 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/

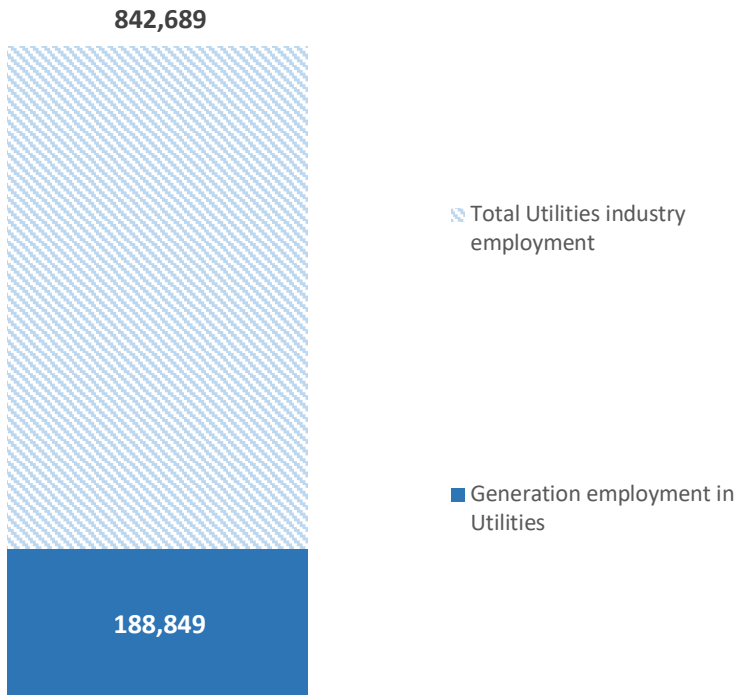
[17] Energy- and fuel-related agricultural employment was derived using three different calculations for fuelwood, corn ethanol and biodiesel. The BLS QCEW cover exclusions were used to develop a factor for agricultural worker exclusions and this factor was applied to employment for the NAICS codes specific 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.

[18] 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.

[19] These support workers are specific to fuel mining and extraction, and do not include support for other mining and extraction activities.

Electric utility generation (in which the generating equipment is operated by the utility) employed a total of 188,849 workers across hydroelectric, fossil fuel, nuclear, 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).

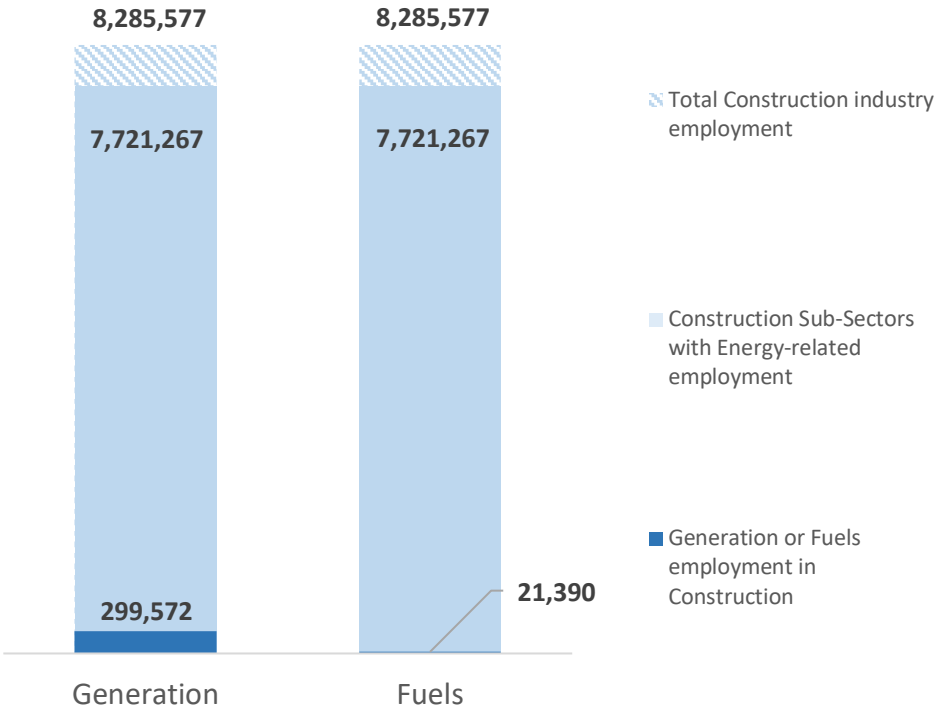
Figure 6. Utilities Employment



Construction

For the nearly 8.3 million construction workers in the U.S., roughly 93% of employment in 2023 was in construction subsectors with workers that support energy generation technologies. In these subsectors, 320,962 construction workers supported both electric generation and fuels production technologies. Ninety-three percent of these employees were engaged in the construction and installation of new electric generation technologies (Figure 7).

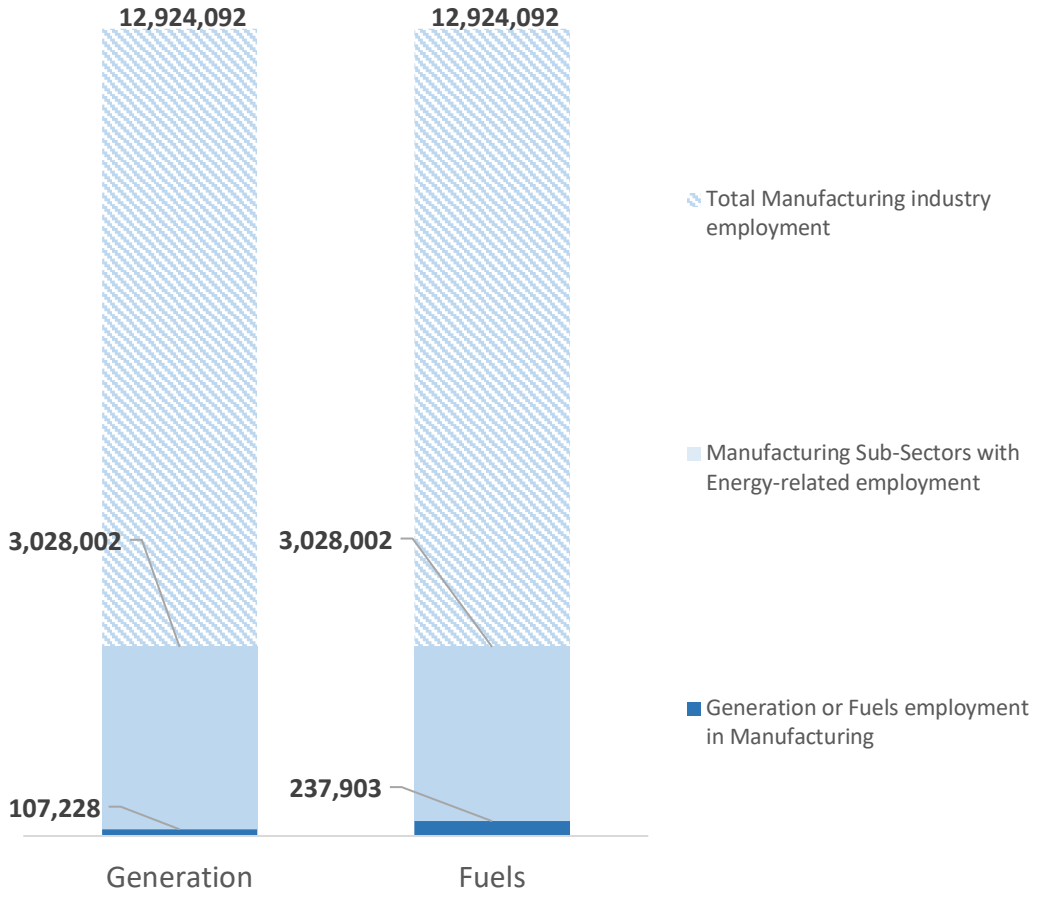
Figure 7. Construction Employment



Manufacturing

The national manufacturing industry employed more than 12.9 million workers in 2023. About 23.4% 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 more than 3,028,000 workers in 2023, nearly 8% 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).

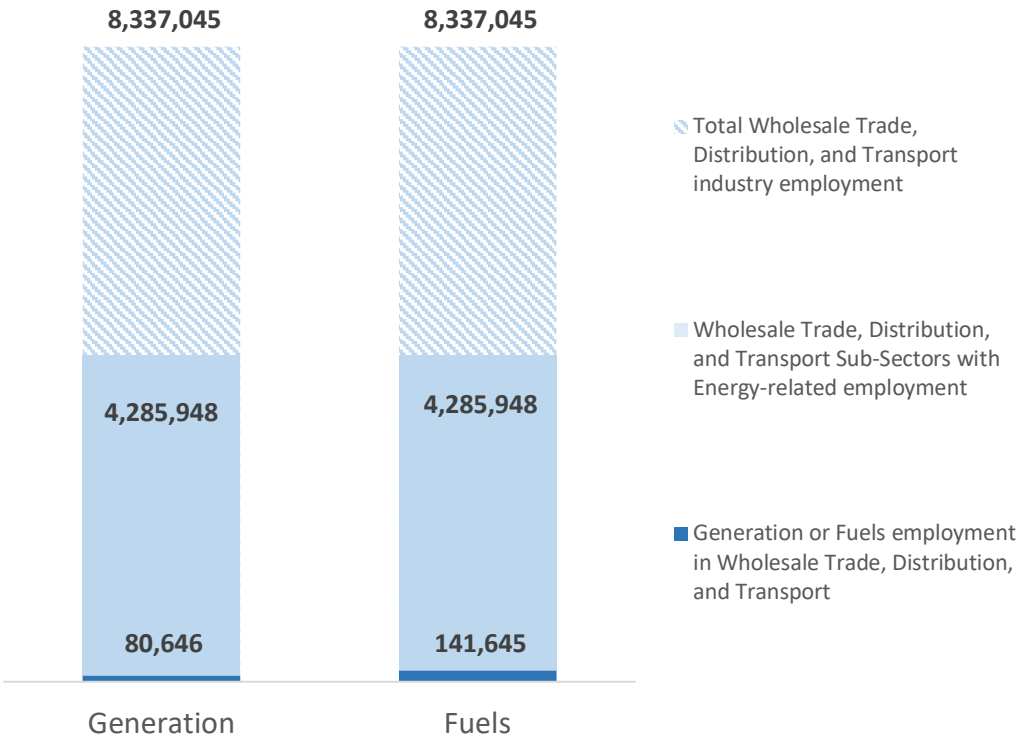
Figure 8. Manufacturing Employment



Wholesale Trade

Of the more than 8.3 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 80,646 and 141,645 workers spent some amount of their time in 2023 supporting electric power generation and fuels applications, respectively.[20]

Figure 9. Wholesale Trade, Distribution, and Transport Employment

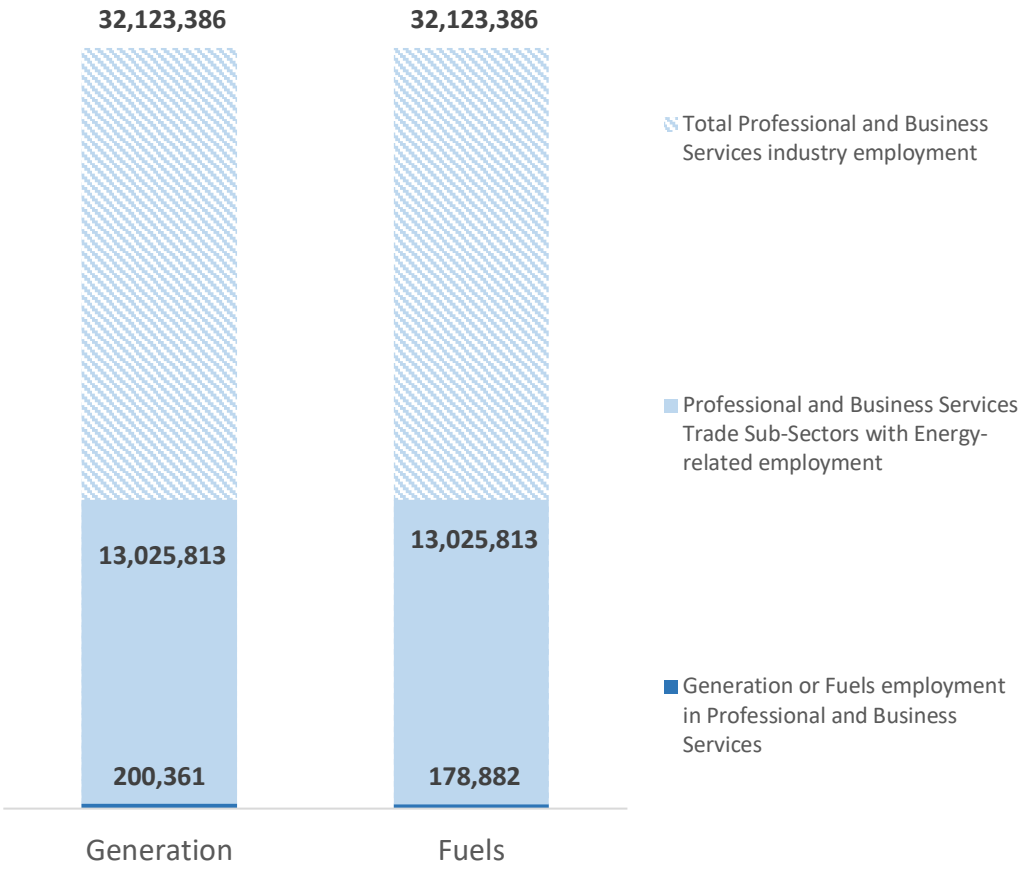


[20] Transmission and trade of fuels are included in the Transmission, Distribution, and Storage chapter of the report.

Professional and Business Services

The professional and business services industry in the U.S. employed more than 32 million workers in 2023. In this aggregate industry, several detailed industries supported generation and fuel operations with software, legal services, biotechnology research, architecture, and engineering. Of the more than 13 million jobs in these energy-related professional service industries in 2023, about 200,000 and 179,000 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

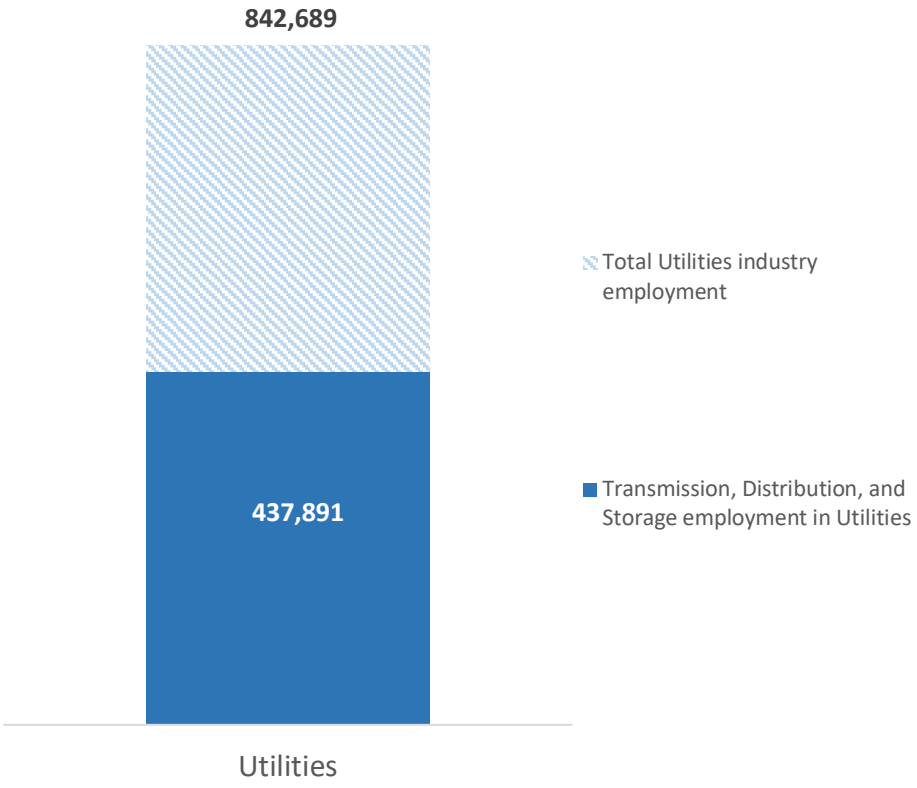
As noted in the report, transmission, distribution and storage employed 1,425,602 workers in 2023.

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[21] 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 437,891 transmission, distribution, and storage workers across U.S. utility firms in 2023, an increase from 2022. This number represents just over half of energy utility employment nationwide (Figure 11).

Figure 11. Utilities Employment

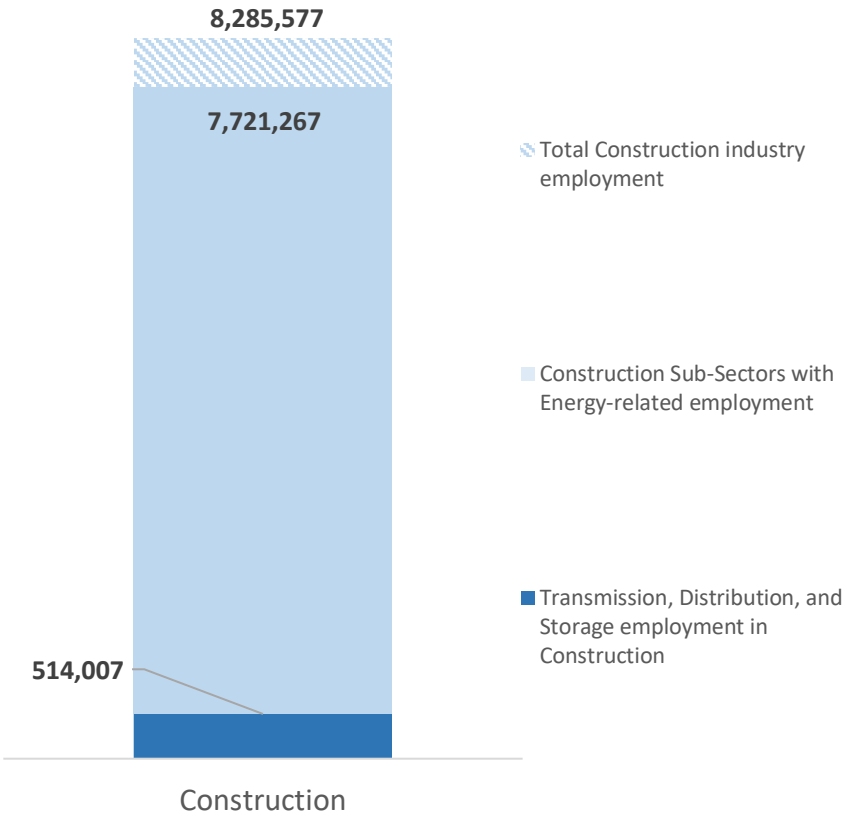


[21] As with all other industries in this report, this section relies on NAICS definitions. Utility-scale power generators, for example, are classified as utilities regardless of ownership or regulation.

Construction

Construction firms contributed the most employment to transmission, distribution, and storage activities in 2023, with 514,007 jobs. This work included pipeline and electric transmission and distribution activity, as well as the development of smart grids and microgrids (Figure 12).

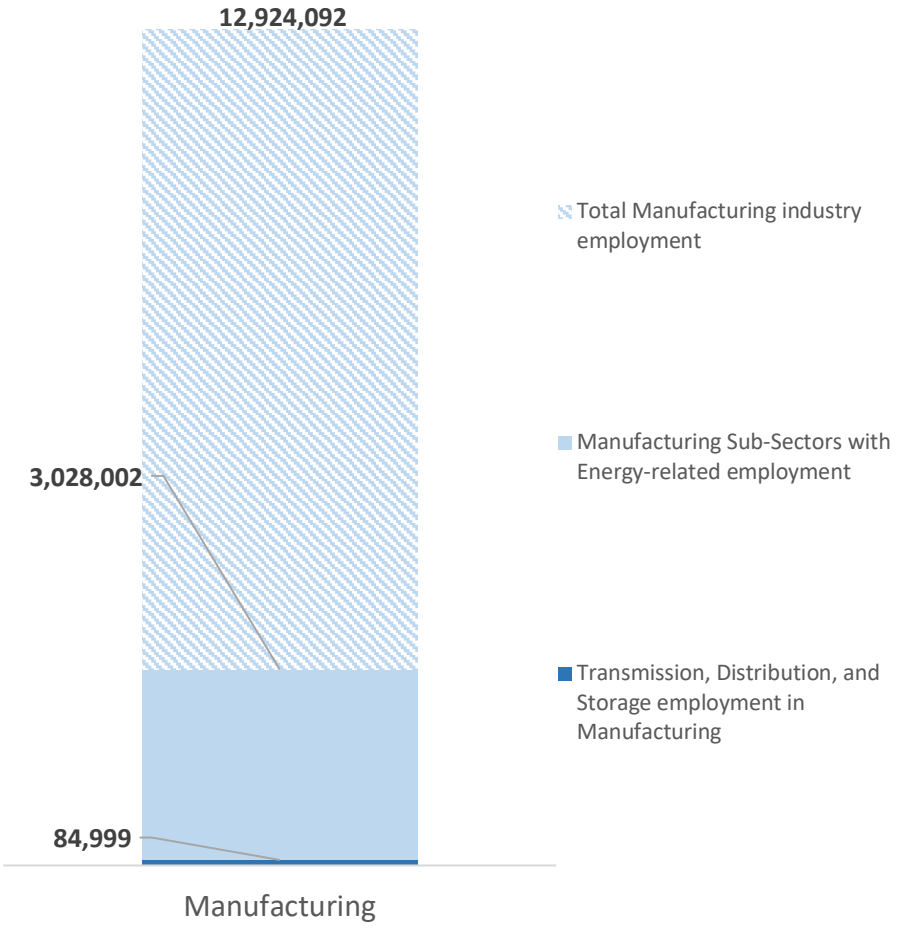
Figure 12. Construction Employment



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 more than 12.9 million total manufacturing jobs in 2023, more than 23% or more than 3 million were in energy-related industries that may support transmission-related infrastructure, and 2.8% of those, or approximately 84,999 workers, produced products for transmission, distribution, and storage in 2023 (Figure 13).

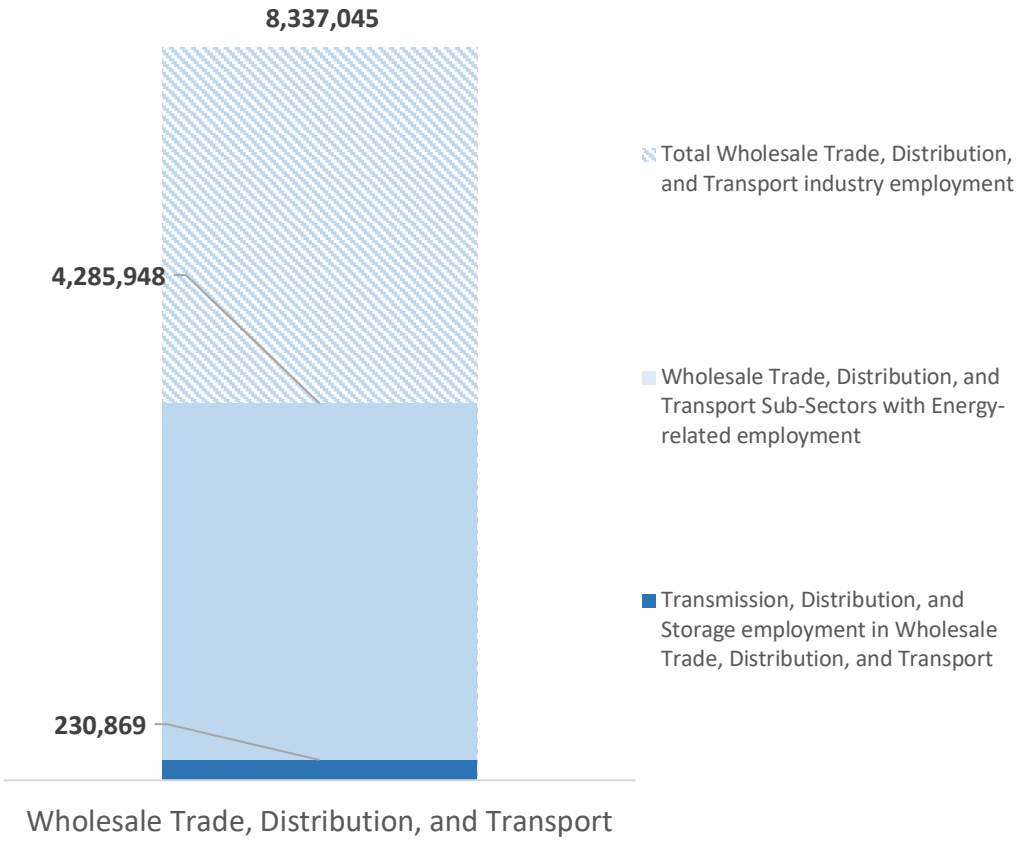
Figure 13. Manufacturing Employment



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 124,500 jobs were included for 2023 by identifying proportional employment from energy-related commodity data for truck, rail, air and water transport using the methodology from the first installment of the QER.[22] An additional 51,930 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 nearly 231,000 transmission, distribution and storage workers in 2023 (Figure 14).[23]

Figure 14. Wholesale Trade

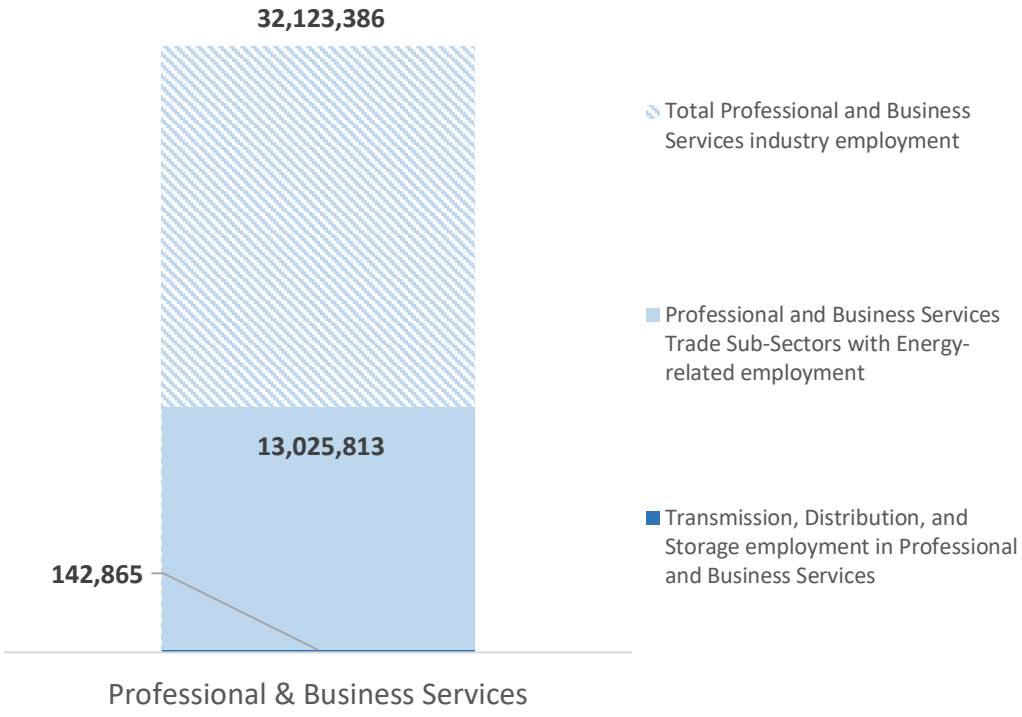


[22] For the methodology, see this report's Appendix A: Discussion of USEER Methodology.
[23] This employment figure excludes raw material and component manufacturers; the limitations of a survey-based approach prevent accurate data collection for suppliers that are significantly upstream.

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 32.1 million workers in these detailed industry codes, the USEER identified about 142,865 who spent some of their time supporting these technologies in 2023 (Figure 15).

Figure 15. Professional and Business Services Employment

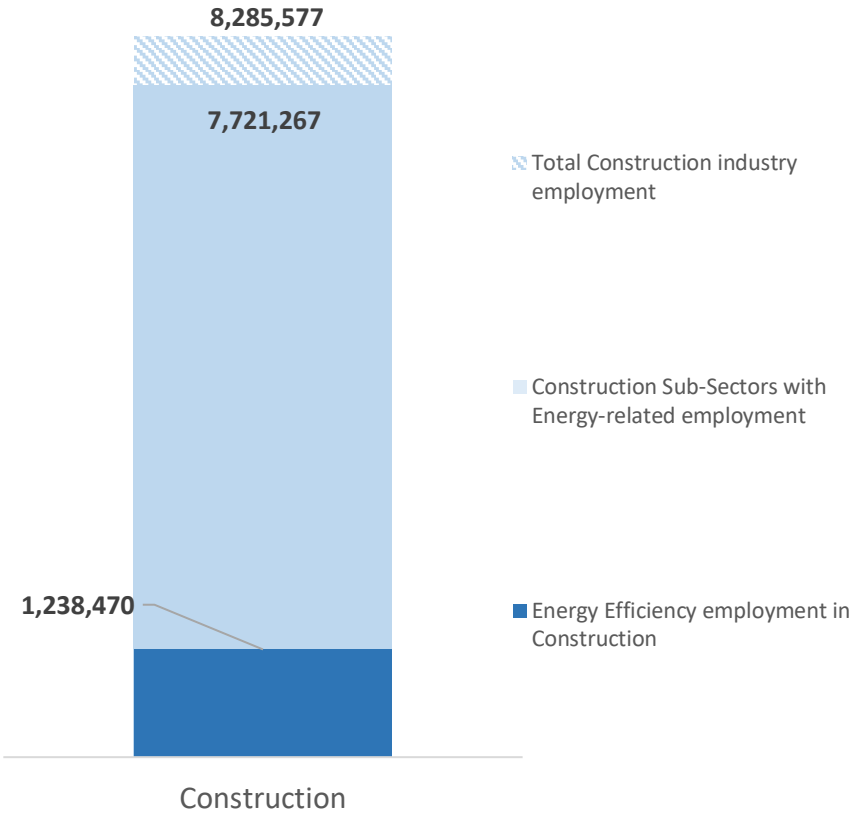


Appendix G: Energy Efficiency Employment by Industry

Construction

The majority of energy efficiency employment (54.1%) identified with USEER data was in construction firms (1.238 million). Of the 8.29 million construction workers in the U.S., about 14.9% worked in 2023 to support the construction or installation of energy-efficient technologies (Figure 16).

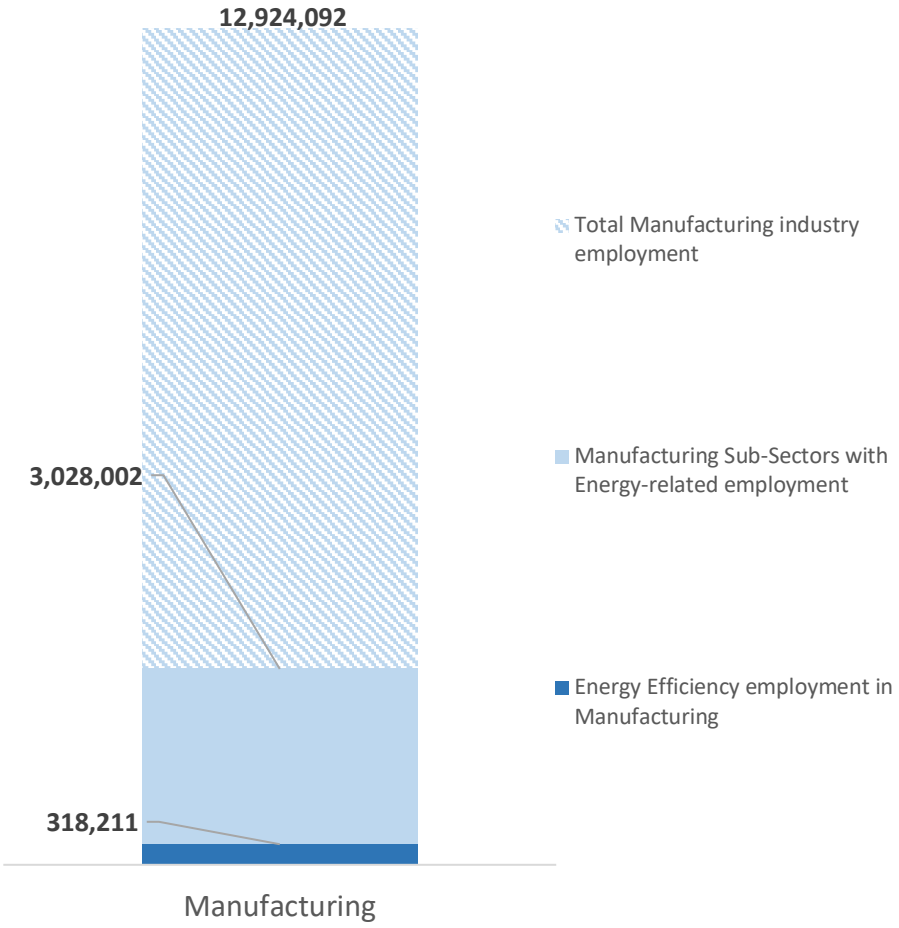
Figure 16. Construction Employment



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 3,028,002 jobs found in relevant energy manufacturing subsectors in 2023 — such as lighting, household appliances or HVAC equipment manufacturing — about 318,211 workers manufactured energy-efficient products as defined in these appendices.

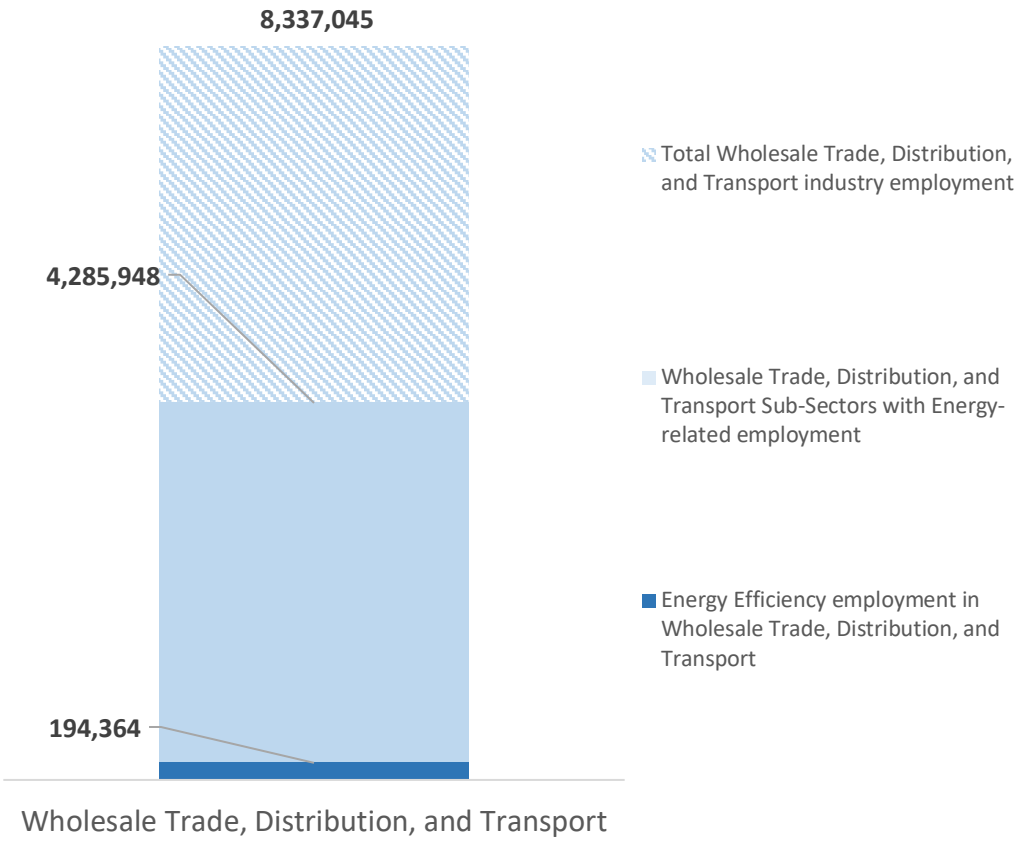
Figure 17. Manufacturing Employment



Wholesale Trade

Approximately 51% of the more than 8.3 million wholesale trade, distribution and transport jobs across the nation were in trade subsectors that support energy-related employment. Of these 4.29 million jobs, USEER survey data identified that about 4.5% of workers were engaged in efficiency-related work in 2023 (Figure 18).

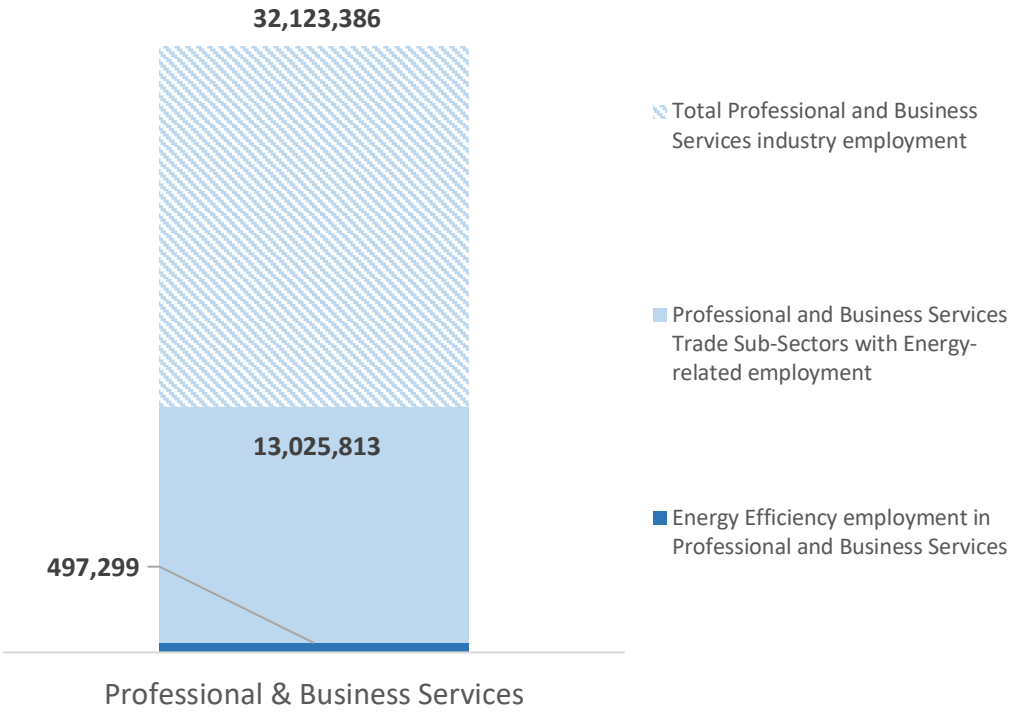
Figure 18. Wholesale Trade Employment



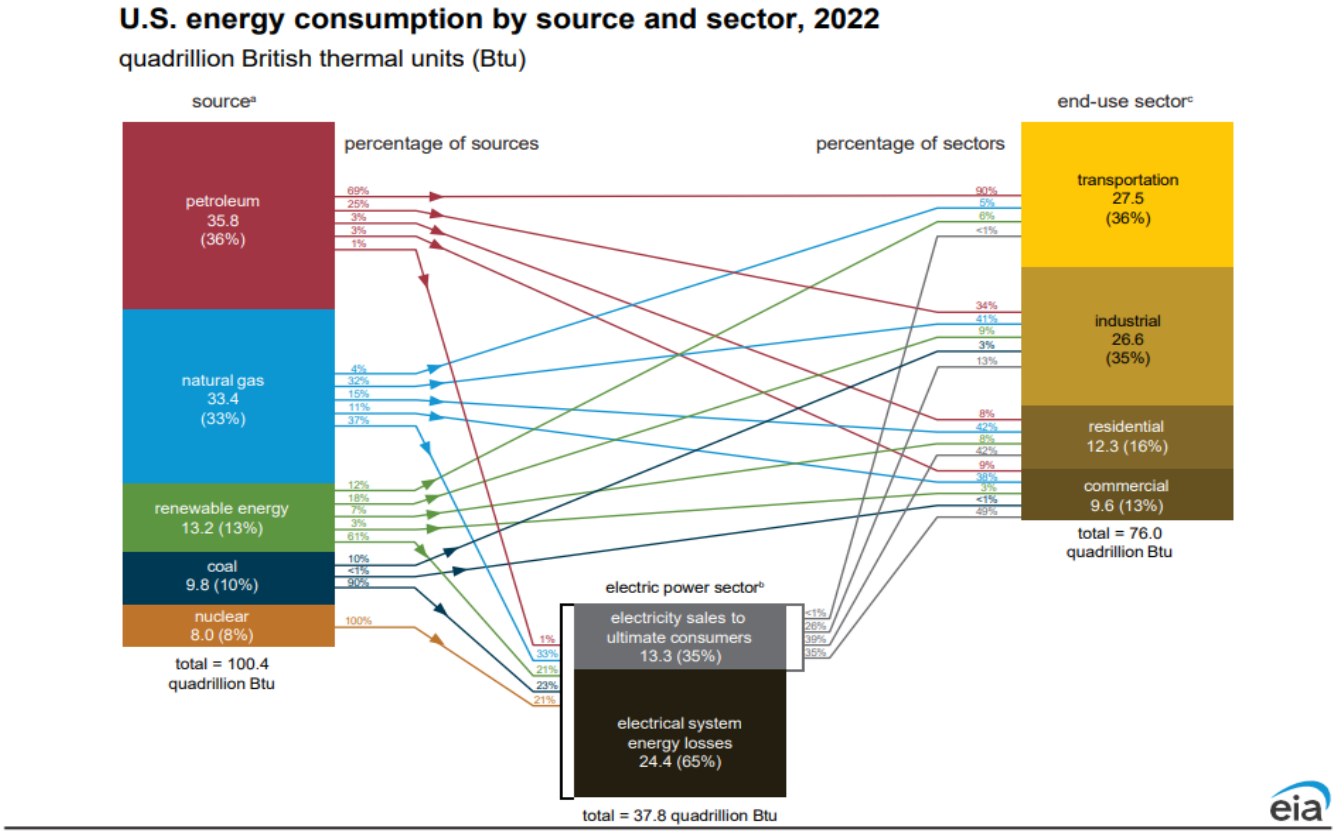
Professional and Business Services

Forty-one percent of professional and business services jobs may have the capacity to 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 497,299, who worked to support energy-efficient products and services in 2023 (Figure 19).

Figure 19. Professional and Business Services Employment



Appendix H: Primary Energy Consumption by Source and Sector, 2021 (Quadrillion Btu)



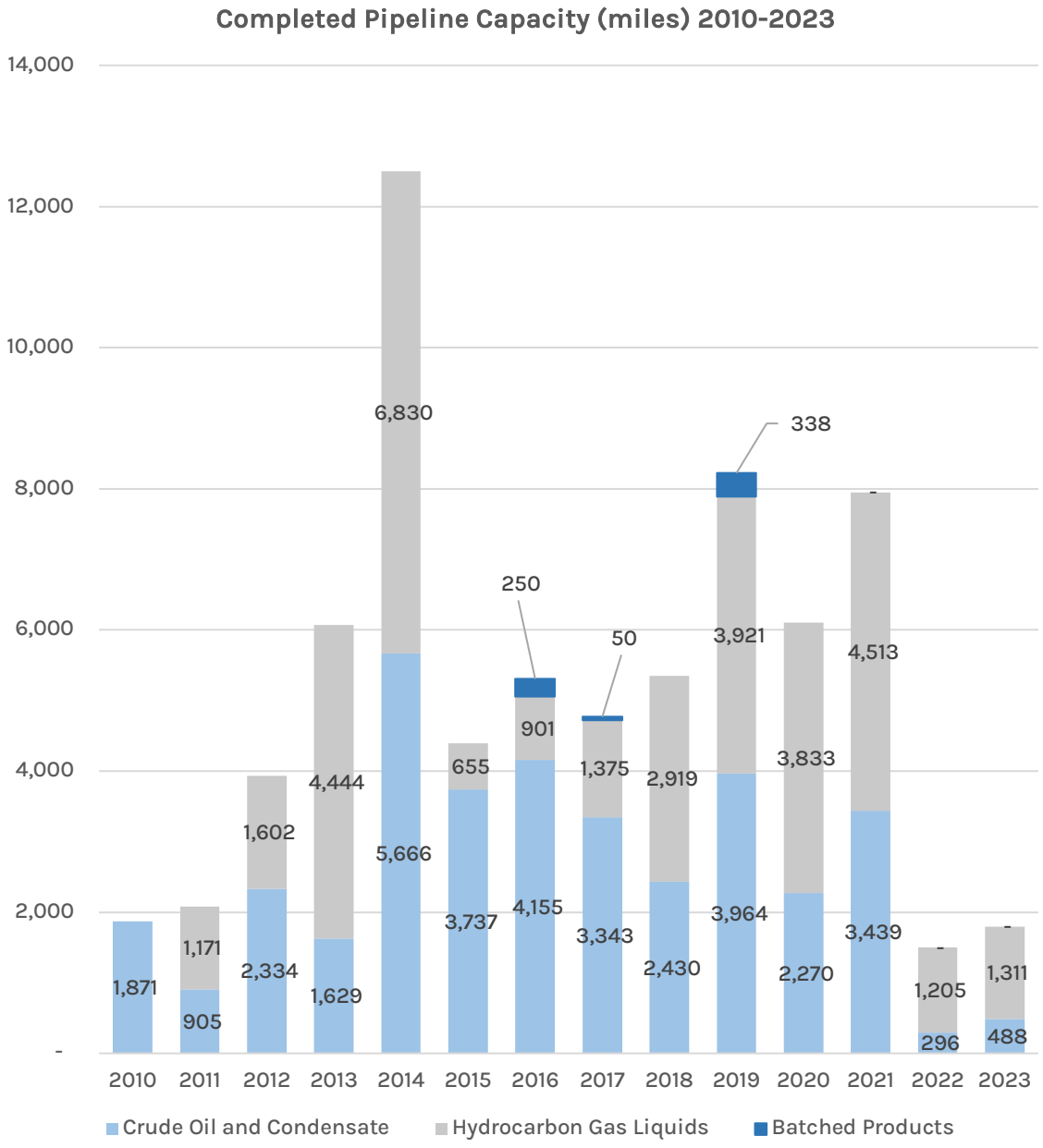
Sources: U.S. Energy Information Administration (EIA), *Monthly Energy Review* (April 2023), Tables 1.3. 1.4c, and 2.1a-2.6.
Note: Sum of components may not equal total due to independent rounding. All source and end-use sector consumption data include other energy losses from energy use, transformation, and distribution not separately identified. See "Extended Chart Notes" on next page.

[a] Primary energy consumption. Each energy source is measured in different physical units and converted to common British thermal units (Btu). See EIA's *Monthly Energy Review* (MER), Appendix A. Generation from noncombustible renewable energy sources are converted to Btu using the "Fossil Fuel Equivalency Approach." See MER Appendix E.

[b] The electric power sector includes electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. Energy consumed by these plants reflects the approximate heat rates for electricity in MER Appendix A. The total includes the heat content of are electricity net imports, not shown separately. Electrical system energy losses are calculated as primary energy consumed by the electric power sector minus the heat content of electricity sales to ultimate consumers. See Note 1, "Electrical System Energy Losses," at the end of MER Section 2.

[c] End-use sector consumption of primary energy and electricity sales to ultimate consumers, excluding electrical system energy losses. Industrial and commercial sectors consumption includes primary energy consumption by CHP and electricity-only plants contained within the sector.

Appendix I: Completed Liquid Fuel Pipeline Miles, 2010-2023 [24]



[24] Source: https://www.eia.gov/petroleum/xls/EIA_LiqPipProject.xlsx

Appendix J: ENERGY STAR Unit Shipment and Market Penetration Report Calendar Year 2022 Summary

ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2022 Summary

This is the 21st 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 2022, 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
- Coolers
- 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 - Fissionable material that has been enriched to a composition that will support a self-sustaining fission chain reaction when used to fuel a nuclear reactor, thereby producing energy (usually in the form of heat or useful radiation) for use in other processes.
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.”