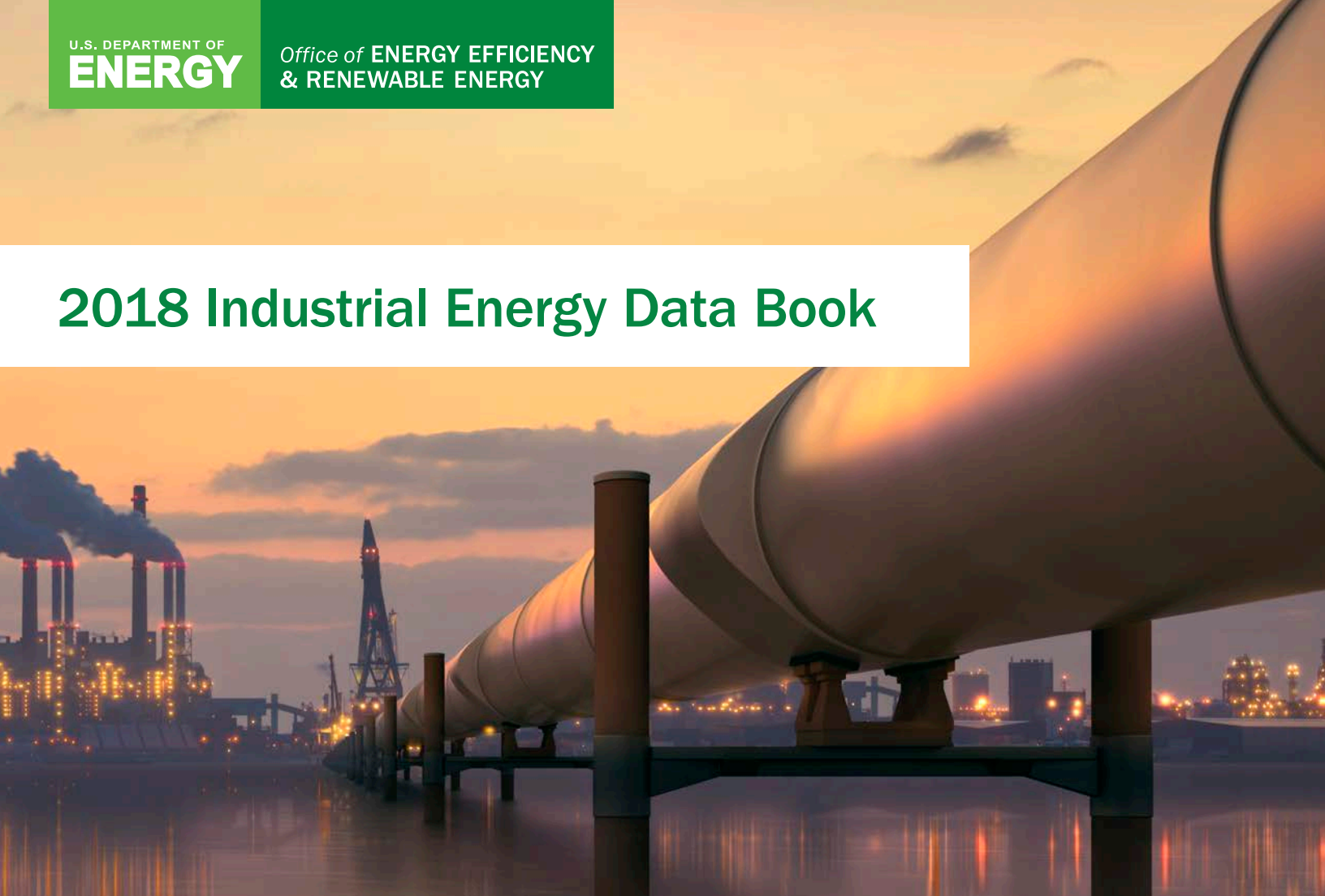
U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

2018 Industrial Energy Data Book



Acknowledgments

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Overview

- The *2018 Industry Energy Data Book* summarizes the status of, and it identifies the key trends in energy use and its underlying economic drivers across the four industrial subsectors in the United States: agriculture, construction, manufacturing, and mining.
- Due to the reporting schedules of underlying data sources, data are reported for years 2016-2018.
- This inaugural edition of the data book provides an overview of largest, yet least extensively quantified energy end-use sector.
- Given the relationships between energy and water use, industry water withdrawals are also discussed in the data book.
- In addition to compiling data from existing public sources, the data book reports estimated combustion energy use for the largest industrial facilities and estimated total energy use at the county level for all industrial establishments. These estimates are the most extensive and detailed energy data that are publicly available.
- The data sets for large facility[1] energy use and at the county level are available for download from the NREL Data Catalog, an open-data platform, to facilitate their use (https://dx.doi.org/10.7799/1575074).

[1] Large facilities are defined as those with annual greenhouse gas emissions exceeding 25,000 metric tons CO_2e who are required to report under U.S. EPA's Mandatory GHG Reporting Rule (40 CFR Part 98).

Key Findings: Industrial Energy Use

- In 2018, total industrial energy use reached nearly 33 quadrillion British thermal units (Btus, or also quads). Energy use for the sector has gradually increased since the 2007-2009 recession, and **industry continues to be the largest energy end-use sector in the United States**.

- About 6 quads of industrial energy use—equivalent to nearly **6% of U.S. total energy use—were used for non-fuel purposes as feedstocks** to produce plastics, lubricants, waxes, and other products.

- **Three energy carriers account for nearly 90% of total industry energy use**: natural gas (32%), electricity (29%), and petroleum products (27%).

- **Renewable energy carriers make up about 8% of total industry energy use**; in 2018, non-biomass renewable sources (e.g., wind, solar, hydro) accounted for less than 0.2%. The largest sources of biomass energy are wood and biomass losses and coproducts.

- NREL estimates of industrial fuel energy use (i.e., not including non-fuel use) by subsector in 2016 show that **manufacturing accounted for 70% of industrial sector energy use, followed by mining (20%), construction (5%), and agriculture (5%)**.

Key Findings: Large Energy Uses and County Energy Use

- In 2016, combustion energy use of the largest energy-using industrial facilities in the United States—approximately 2,960 out of 1,038,100, or about **0.3% of industrial facilities–accounted for an estimated 8.863 quads, which is equivalent to about 28% of total industry energy use**. The median combustion energy use of these facilities was 869,900 MMBtu and the average combustion energy use was 3,011,300 MMBtu.

- **Texas, Louisiana, and California are home to the largest portion of large energy using facilities** due in part to the prevalence of petroleum refining and petrochemicals industries. Together they account for about 41% of large facility combustion energy use and about 37% of total industry energy use.

Key Findings: Industrial Energy Prices

- Industry energy expenditures increased to nearly $78 billion in 2017, but they remain below expenditures for 2010–2014 in both real and nominal terms. **Petroleum accounts for the largest expenditures, at $34 billion**. Petroleum (44%), electricity (34%), and natural gas (18%) comprised about 96% of energy expenditures in 2017. Coal and biomass comprised the remaining portion of expenditures.

- In 2017, **large changes in industrial energy prices occurred with No. 2 fuel oil and residual fuel oil**, which increased by 36% and 17% from 2016, respectively. In 2017, prices at the state level for residual fuel oil (nominal) ranged from $7.51/MMBtu in Delaware to $10.95/MMBtu in Texas.

- **Natural gas prices (nominal) changed little from 2016 to 2017**, and state prices ranged from $2.96 per MMBtu in West Virginia to $20.12 per MMBtu in Hawaii.

- Retail electricity prices (nominal) also saw little change from 2016 to 2017. Retail prices (nominal) ranged from **$13.49/MMBtu (4.6¢/kWh) in Washington to $67.17/MMBtu (23¢/kWh) in Hawaii**.

Key Findings: Industrial Economic Activity

- Like industry total energy use, industry real gross domestic product (GDP) has gradually increased since 2010, and it reached $3.425 trillion (adjusted for inflation) in 2018. **In 2018, however, industry's share of total real GDP did not change and was equivalent to about 18%**.

- Of industry's four subsectors–agriculture, construction, manufacturing, and mining—manufacturing remains the largest contributor to GDP. Since 2013, transportation equipment **manufacturing has emerged as the largest manufacturing industry in terms of GDP**. Since 2011, the GDP contribution of the construction industry continues to recover; mining industry GDP continues to fall; and agriculture has increased.

Key Findings: Industrial Water Use

- Water withdrawals by the industrial sector continue to be dominated by agriculture, which is the second-largest source of water withdrawals, behind thermoelectric power generation. **In 2015, agriculture was responsible for about 40% of total U.S. water withdrawals**.

- **The 10 counties with the largest water withdrawals account for about 12% of industrial withdrawals**. Agriculture constitutes more than 90% of withdrawals for all but one county: in Lake County, Indiana manufacturing withdrawals make up nearly 100% of industrial withdrawals.

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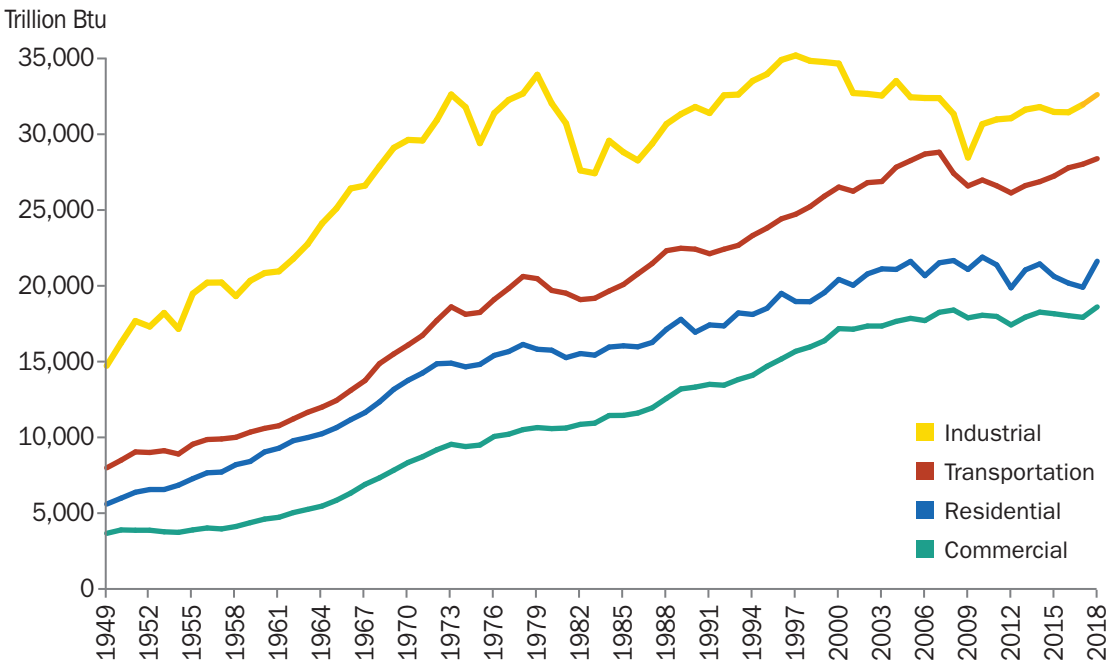
I. Industrial Energy Use

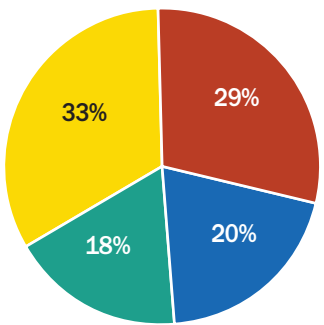
National Level: Energy Use by Sector

The industrial sector was the largest energy user of all the end-use sectors in the United States in 2018, accounting for 32.6 quads, or one-third of total energy demand.

U.S. Energy Use by End-Use Sector (1949–2018)



U.S. Energy Use by Sector (2018)

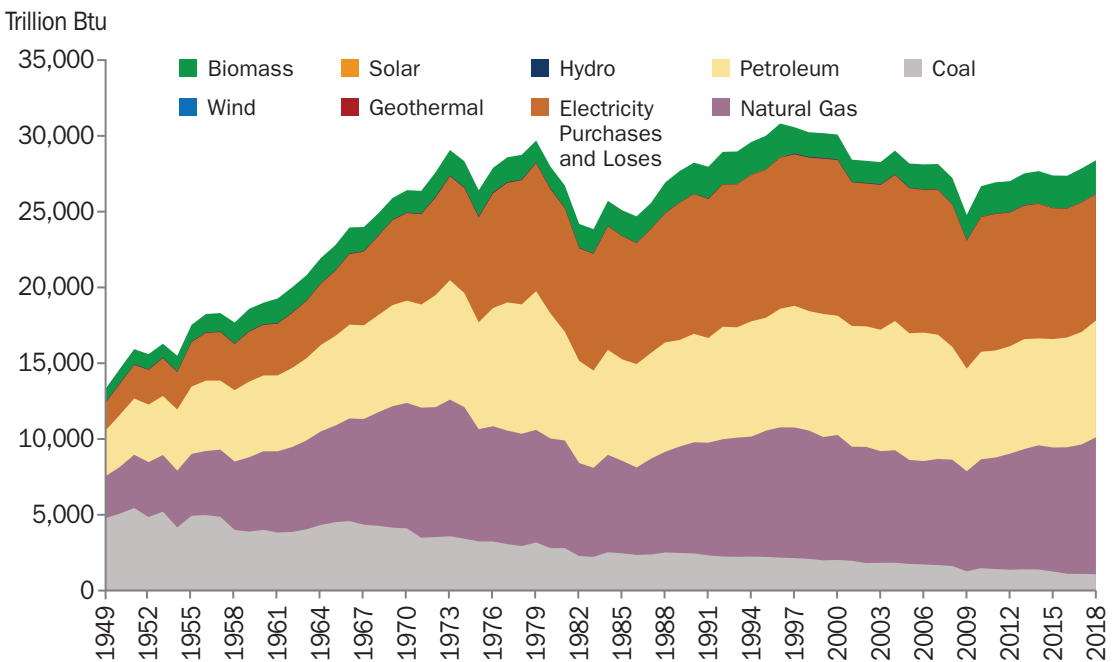


Source: EIA Monthly Energy Review (MER)
Notes: Btu = British thermal units
Includes electricity losses

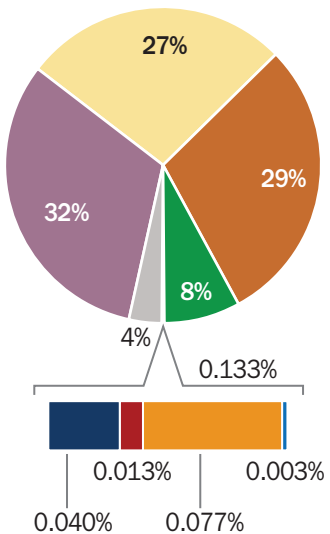
National Level: Industrial Energy Use by Fuel

Fossil fuels—including natural gas, petroleum, and coal—represented approximately 88% of the energy sources used by the industrial sector in 2018. Non-biomass renewable energy accounted for less than 0.15% of industrial energy use.

U.S. Industrial Energy Use by Fuel (1949–2018)



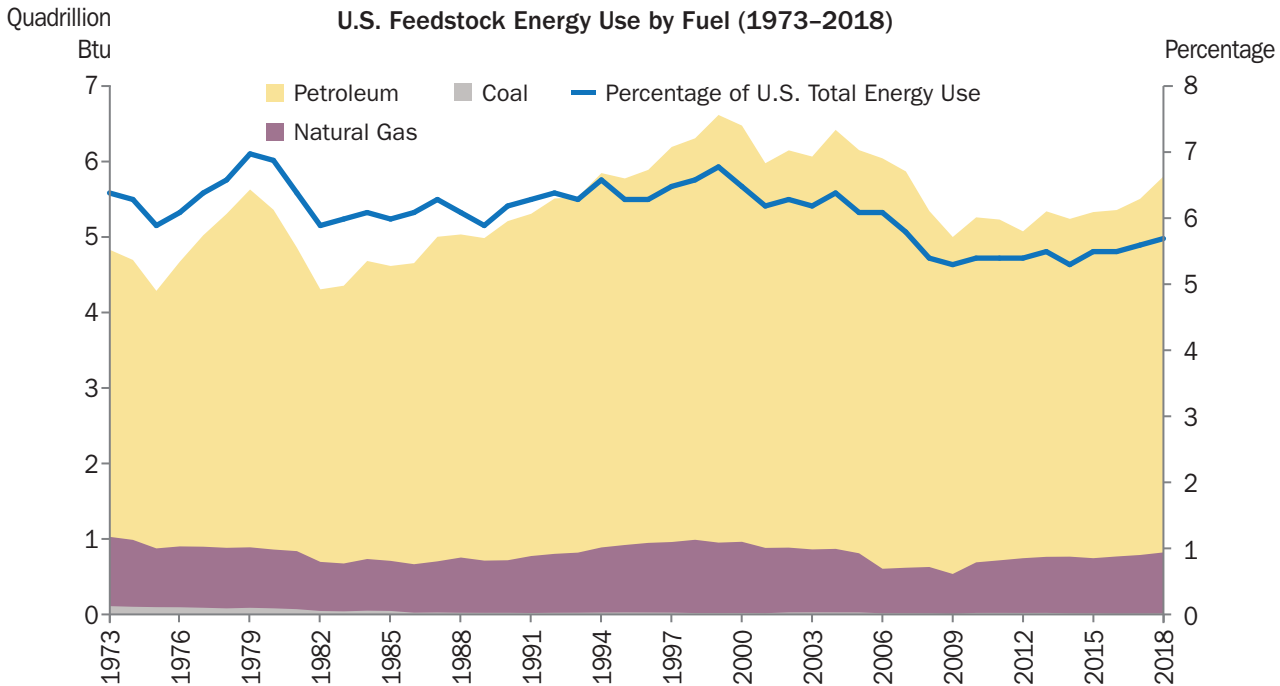
U.S. Industrial Energy Use by Fuel (2018)



Source: EIA Monthly Energy Review (MER)

National Level: Heat Content of Non-Combustion Use of Fossil Fuels

Unlike the other end-use sectors, which use fuels only as sources of energy, industry uses fuels to produce materials. The energy content of this use of fuels, which is also included in national energy statistics, accounted for nearly six quads in 2018.

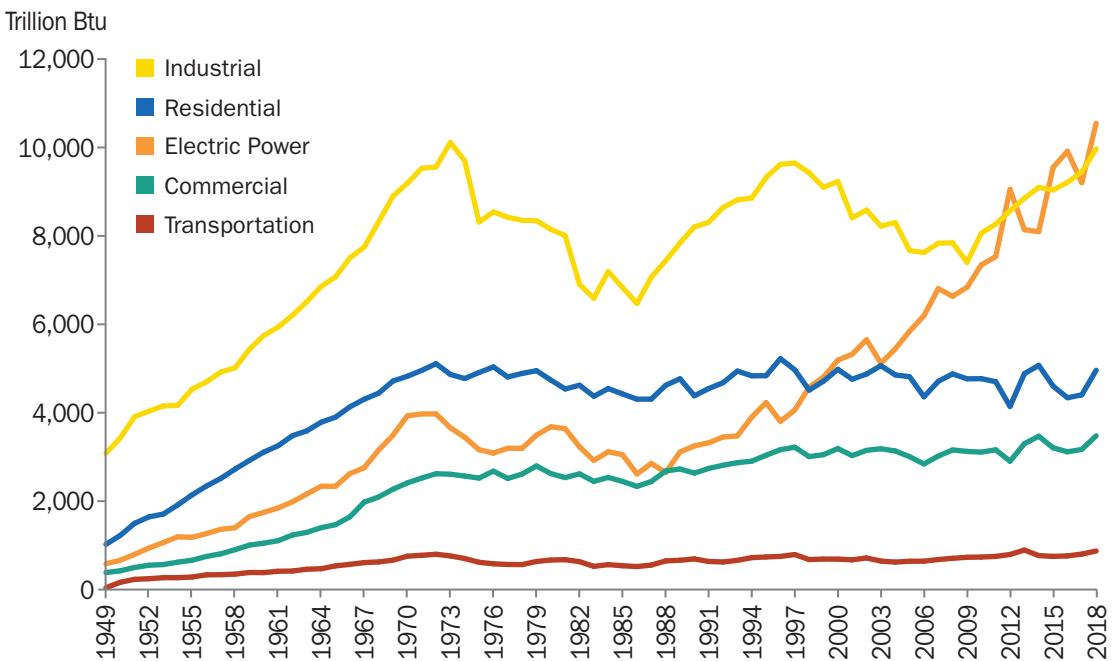


Source: EIA Monthly Energy Review (MER)

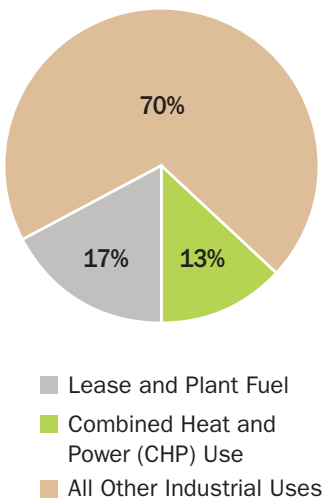
National Level: Natural Gas Consumption

In 2018, industry was the second-largest consumer of natural gas, behind electric power generation. Most natural gas used in the industrial sector was used for combustion in process heating and conventional boilers.

U.S. Natural Gas Consumption by Sector (1949–2018)



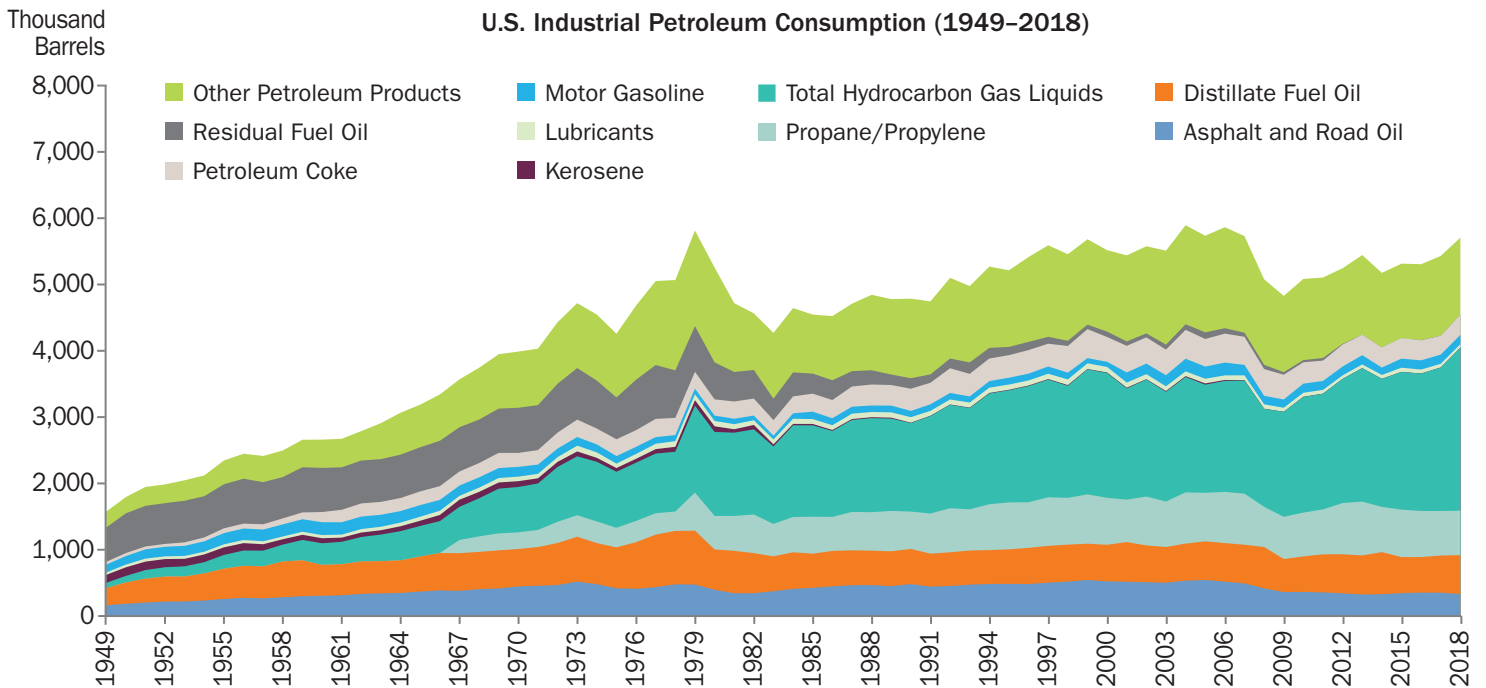
U.S. Industrial Natural Gas Consumption (2018)



Source: EIA Monthly Energy Review (MER)

National Level: Industrial Petroleum Consumption

The industrial sector's increasing consumption of petroleum in the past five decades was mainly driven by the growing use of hydrocarbon gas liquids and propane/propylene. The oil crises in 1973 and 1979 as well as the 2007-2009 recession lead to decreases in industrial petroleum use.

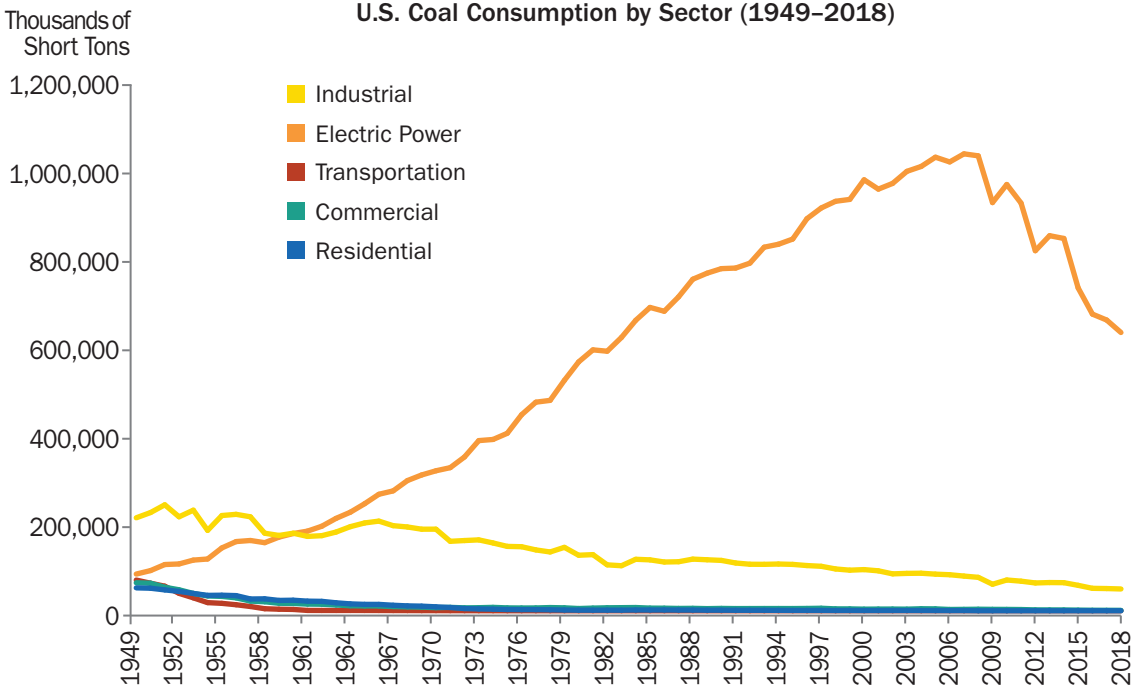


Source: EIA Monthly Energy Review (MER)

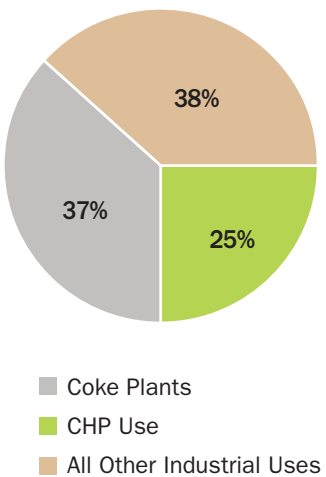
National Level: Coal Consumption

In 2018, the industrial sector was the second-largest coal consumer, after only the electric power sector. In the last decade, coal consumption has decreased in all sectors. The two largest end-uses of coal in industry are combustion in conventional boilers and process heating, and in coke plants.

U.S. Coal Consumption by Sector (1949–2018)



U.S. Industrial Coal Consumption (2018)

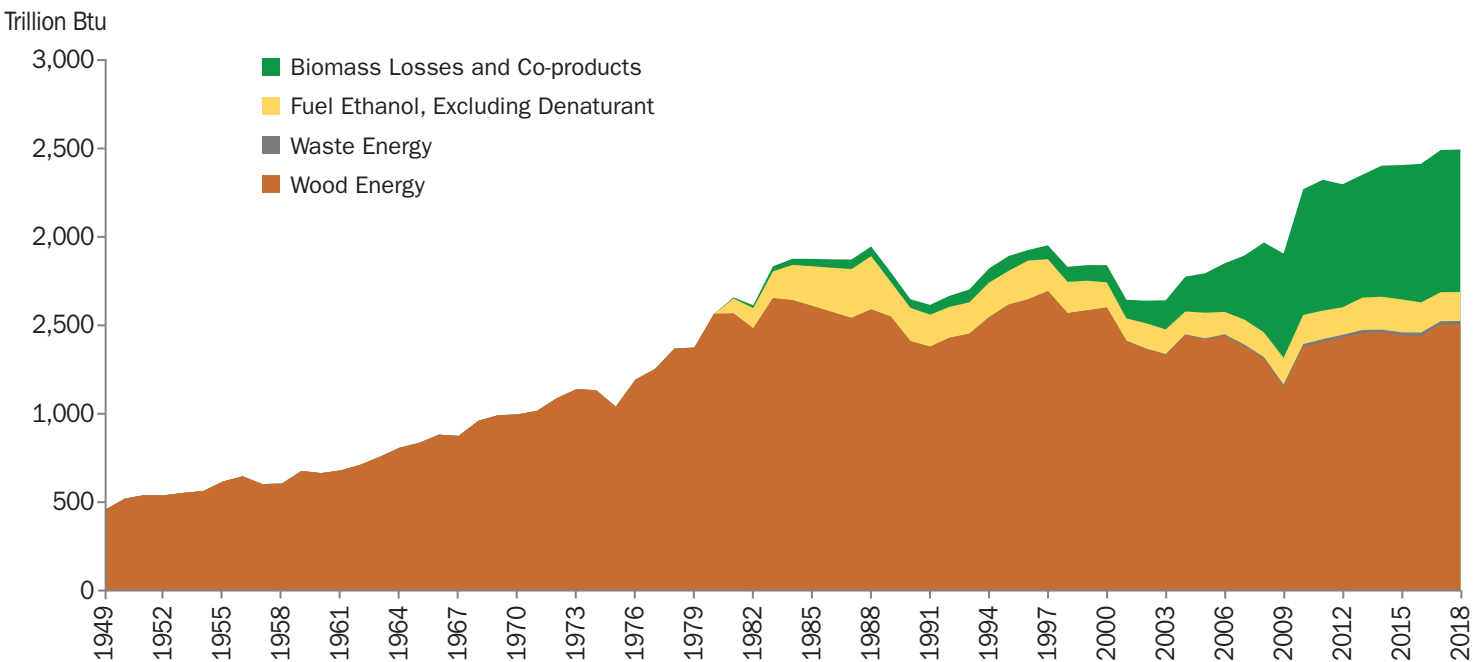


Source: EIA Monthly Energy Review (MER)

National Level: Industrial Biomass Energy Consumption

Most renewable energy used by the U.S. industrial sector is in the form of biomass. As ethanol and biodiesel production have increased, the losses and co-products from their production have become the second-largest source of biomass energy for industry.

U.S. Industrial Biomass Energy Consumption (1949–2018)

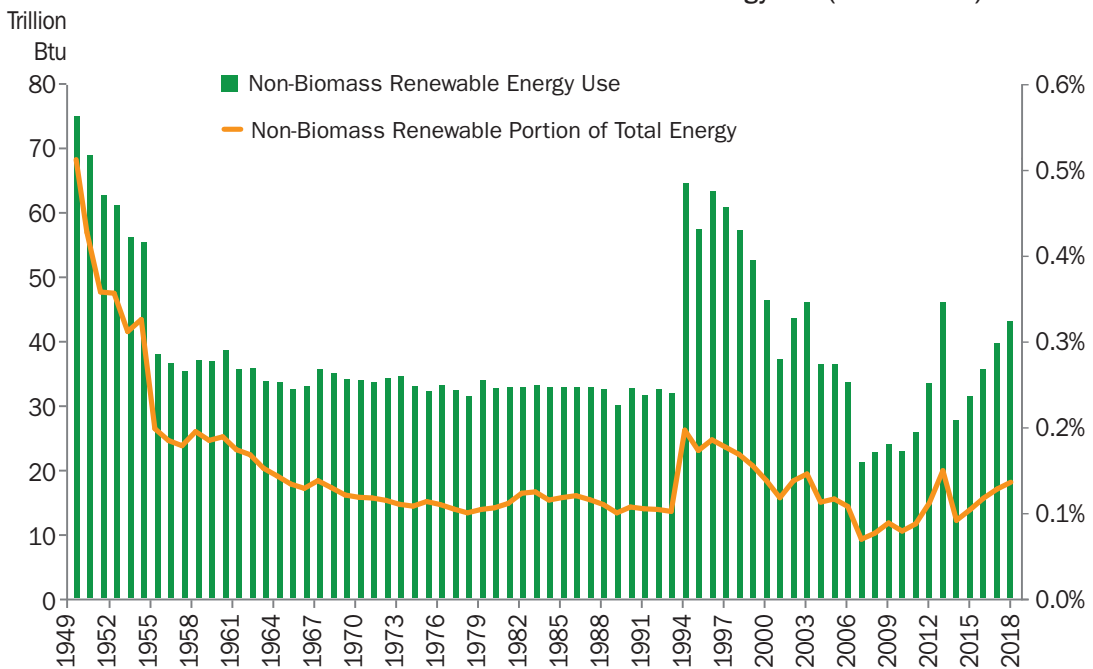


Source: EIA Monthly Energy Review (MER)

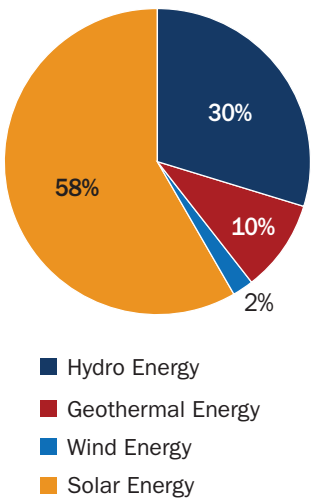
National Level: Industrial Non-Biomass Renewable Energy Use

Solar energy is the primary non-biomass renewable used directly in the industrial sector. Although use of non-biomass renewables increased rapidly in the past decade in the industrial sector, they account for about 0.13% of the total industrial energy use.

U.S. Industrial Non-Biomass Renewable Energy Use (1949–2018)



U.S. Industrial Non-Biomass Renewable Energy Use (2018)

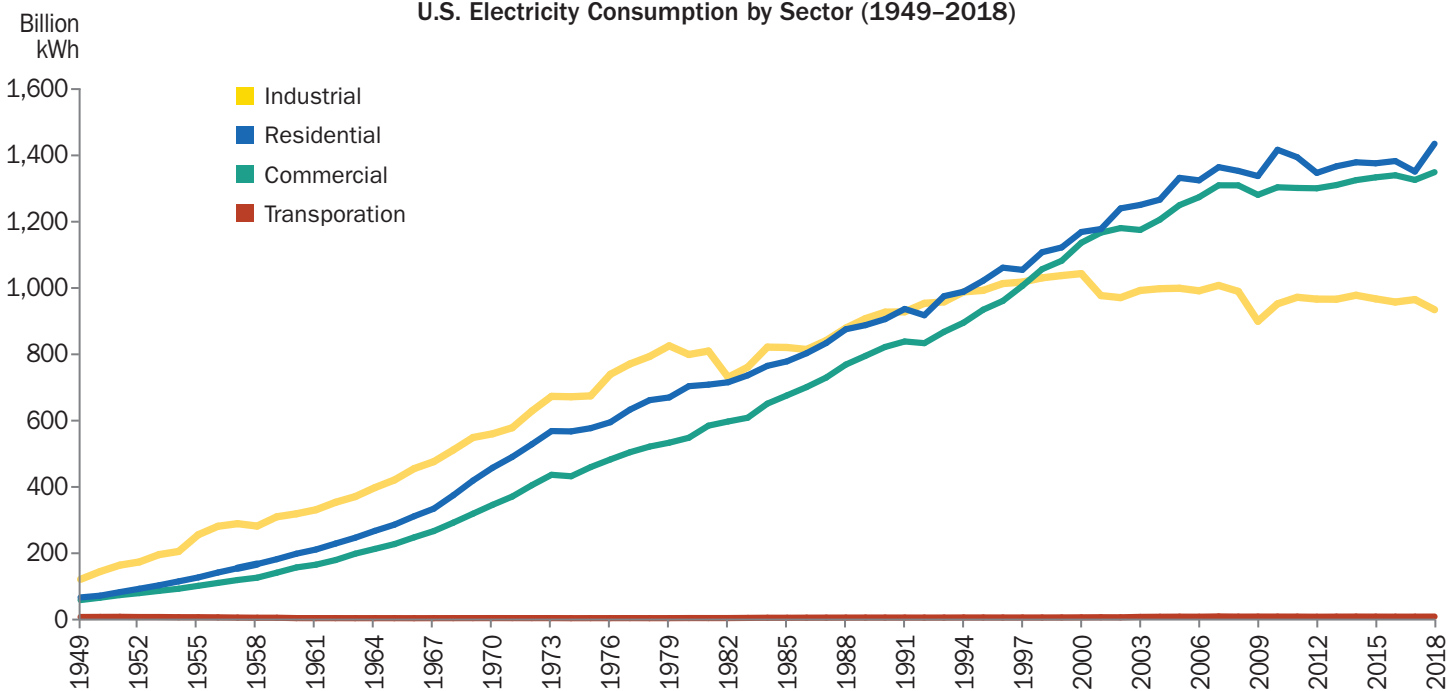


Source: EIA Monthly Energy Review (MER)

National Level: Electricity Consumption by Sector

In 2018, the industrial sector consumed less electricity than both the residential and commercial sectors. Industrial electricity consumption has gradually decreased since its peak in 2000.

U.S. Electricity Consumption by Sector (1949–2018)

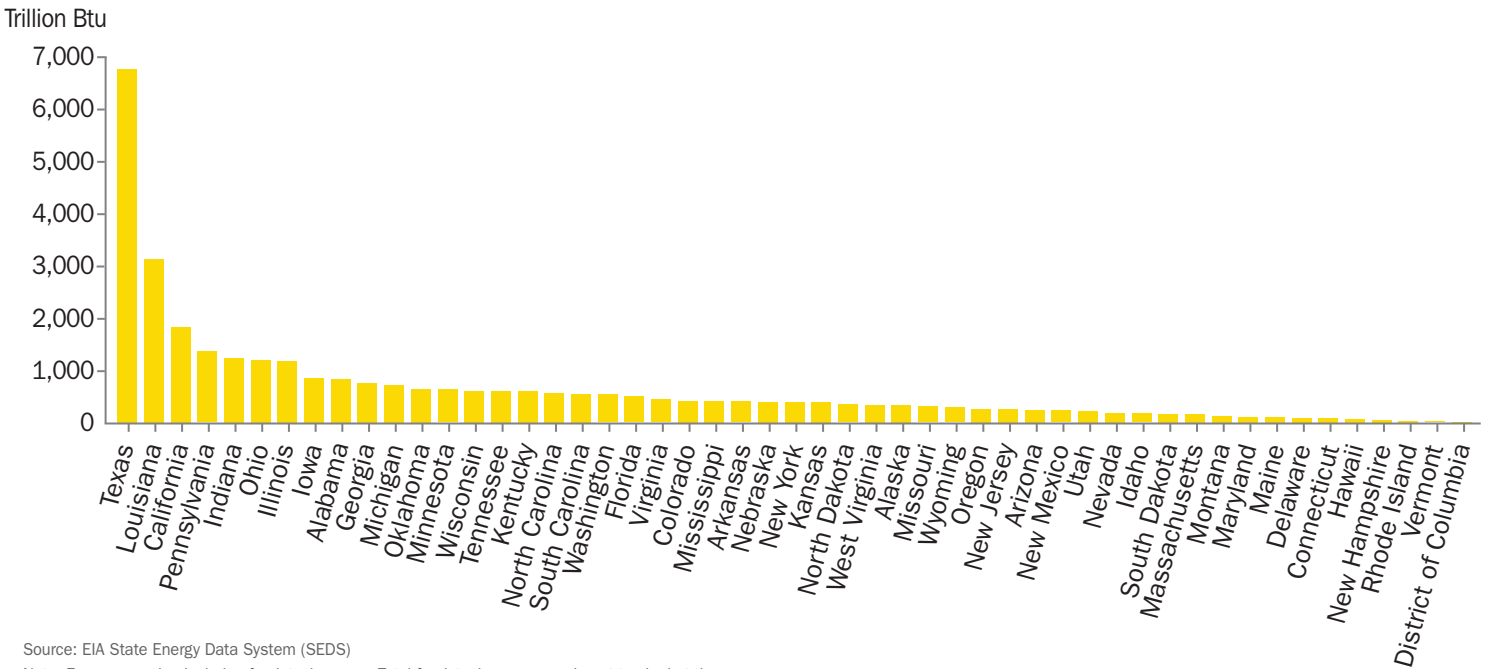


Source: EIA Monthly Energy Review (MER)
Notes: kWh = kilowatt-hours

State Level: Industrial Energy Use by State

The three states that used the most energy in the industrial sector in 2017 were Texas, Louisiana, and California. These three states have a significant portion of large energy-using facilities, as discussed in the next section.

Industrial Energy Use (Total) by State (2017)



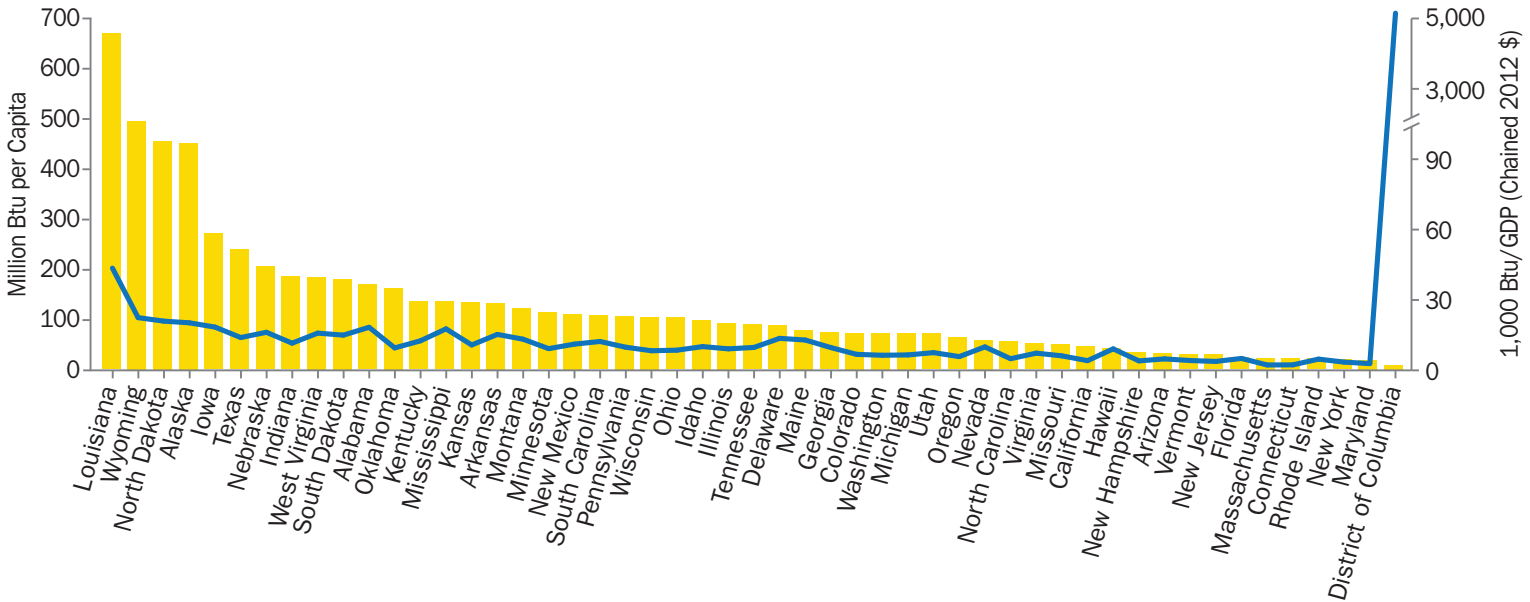
Source: EIA State Energy Data System (SEDS)

Note: Energy use also includes feedstock energy. Total feedstock energy use is not tracked at the state level. However, states with large refining and chemical manufacturing sectors (e.g., Texas and Louisiana) can be expected to have higher-than-average use of fuels for feedstocks.

State Level: Industrial Energy Use by State

The three states with the highest per capita energy use in the industrial sector in 2017 were Louisiana, Wyoming, and North Dakota. These states also have high energy use per GDP. Washington, D.C. is an outlier due to its very small industry GDP.

Industrial Energy Use (Per Capita and Per GDP) by State (2017)

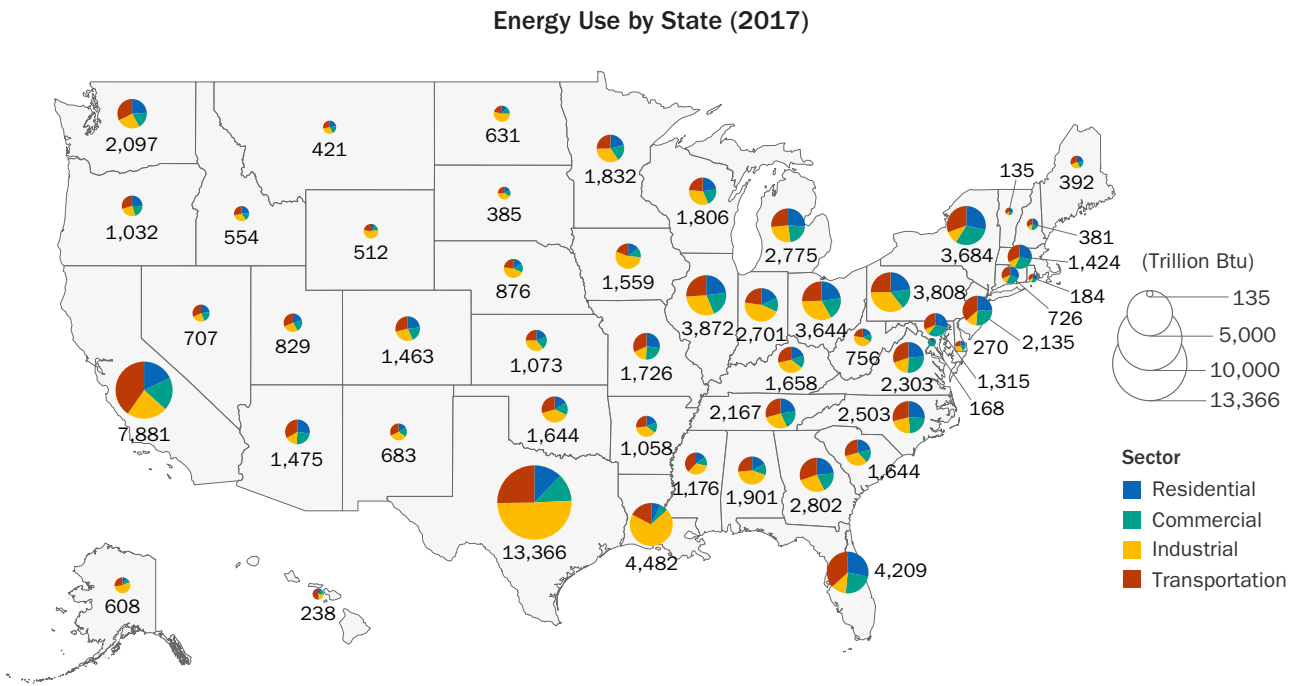


Sources: EIA State Energy Data System (SEDS) and BEA

Note: Energy use also includes feedstock energy. Total feedstock energy use is not tracked at the state level. However, states with large refining and chemical manufacturing sectors (e.g., Texas and Louisiana) can be expected to have higher-than-average use of fuels for feedstocks.

State Level: Energy Use by Sector

Many of the states that use the largest amount of energy also have a large portion of industrial energy use, most notably Texas, Louisiana, and Pennsylvania.



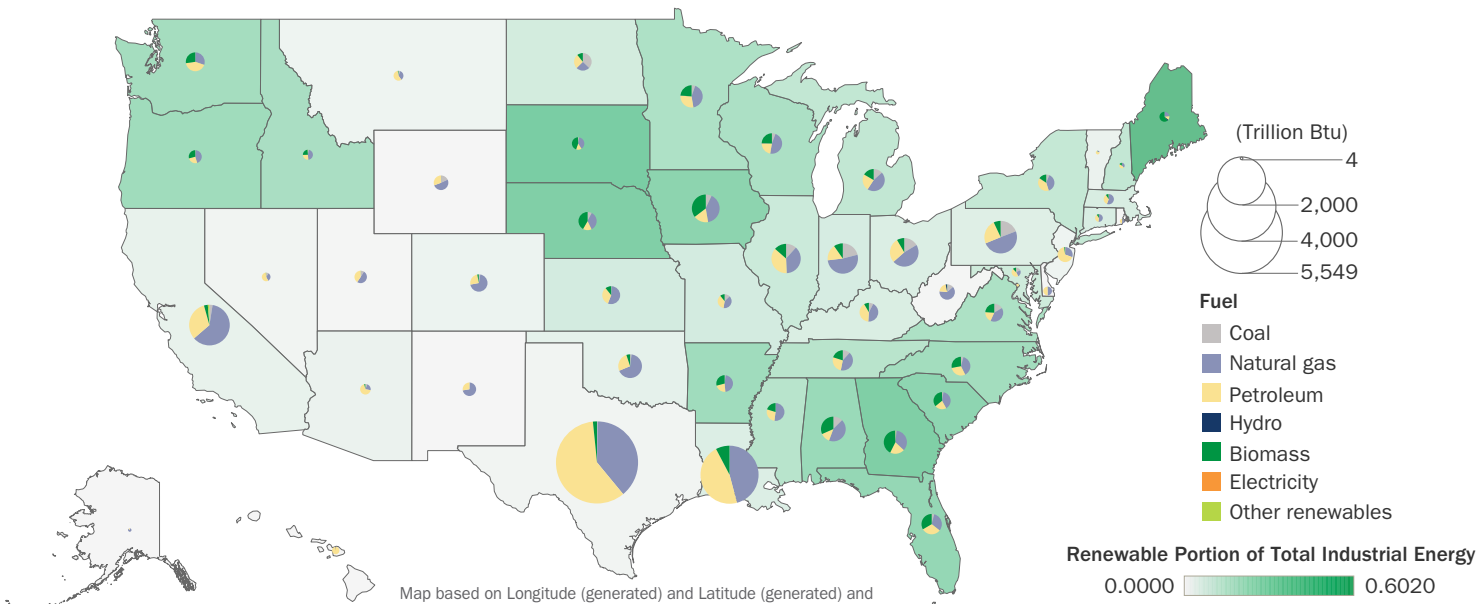
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated) (2): Color shows details about Sector. Size shows sum of Energy use (trillion Btu).

State Level: Industrial Energy Use by Fuel

Natural gas and petroleum are widely used in industry across most states. The three states that had the highest penetration of renewable energy in the industrial sector in 2017 were Maine, Georgia, and South Dakota.

Industrial Energy Use by State (2017)



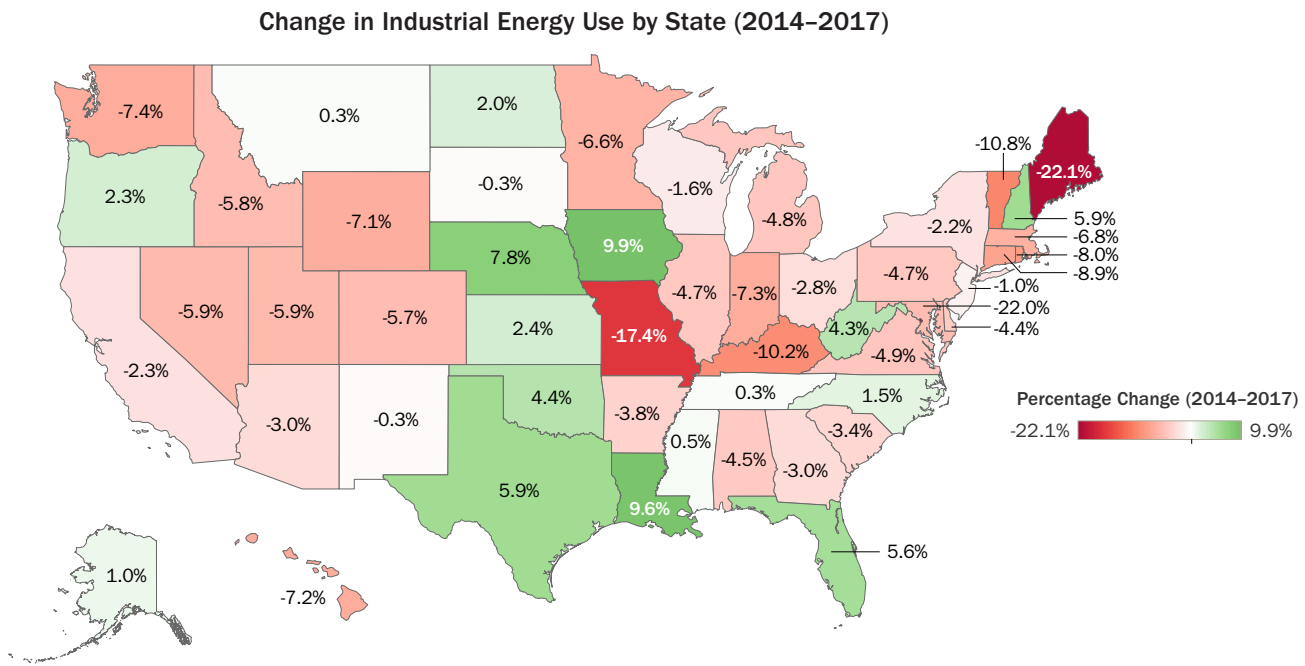
Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of Renewable penetration rate. For pane Latitude (generated) (2): Color shows details about Fuel. Size shows sum of Energy use (Trillion Btu).

Renewable penetration rate is defined as the renewable energy faction of total industrial energy use by state

Source: EIA State Energy Data System (SEDS)

State Level: Industrial Energy Use Percentage Change by State

Most states experienced a decrease in industrial energy use, most notably Maine and Missouri. The largest increase over the period—about 10%—occurred in Iowa and Louisiana.



Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Industrial energy use growth rate (2014–2017). The marks are labeled by sum of Industrial energy use growth rate (2014–2017). Details are shown for State.

II. Estimates of Large Energy Users and County Energy Use

Introduction

- Publicly available sources of industrial energy data are aggregated in ways that limit the ability to conduct analysis of specific industries at local levels.
- Building on previous work (McMillan and Narwade 2018; McMillan, et al. 2016), newly updated estimates of county-level industrial energy use and combustion energy use of the largest energy-using industries have been developed for 2010–2016.
- In addition to increasing the geographic resolution, these estimate also provide a greater operational resolution in terms of North American Industry Classification System (NAICS) codes. About 400 NAICS codes are reported across agriculture, construction, manufacturing, and mining industries.
- Each group of estimates is based on publicly available reporting of combustion emissions and energy of individual industrial facilities. The county-level data also include additional estimates from publicly available sources of energy expenditures and energy prices. Neither group of estimates includes non-combustion fuel used for feedstocks.
- Data are available to download from the NREL Data Catalog (https://dx.doi.org/10.7799/1575074), and the estimation calculations are documented and available for use (https://github.com/NREL/Industry-energy-data-book).

- Aggregated to the national level, county-level estimates of industrial energy use from 2010 to 2016 follow the general trend in data reported by the U.S. Energy Information Administration (EIA). Estimated energy use in 2016 was about 20.7 quads, up nearly 15% from the 2010 estimate of about 18.1 quads.

- The five largest energy-using industries in 2016 are petroleum refining (2,844 trillion Btu [TBtu]), crude petroleum and natural gas extraction (2,404 TBtu), paper mills (982 TBtu), iron and steel production (892 TBtu), and paperboard mills (802 TBtu). Together these industries accounted for 39% of industrial fuel energy use in 2016. The largest 10 industries accounted for 53% of industrial fuel use in 2016.

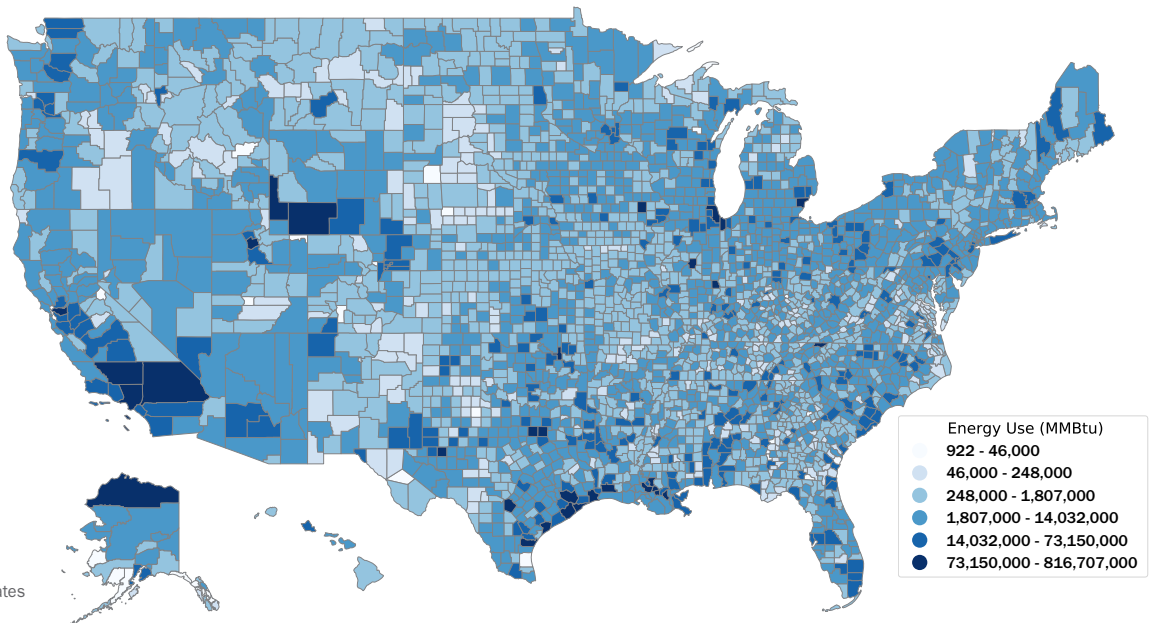
- Most industrial energy use occurs in counties with a large footprint of petroleum refining or crude petroleum and natural gas extraction industries. The largest energy-using counties tend to be in the Gulf Coast region, specifically in Texas or Louisiana. In 2016, of the 3,146 counties, the 10 largest energy-using counites—seven of which are in Texas or Louisiana—accounted for 14% of industrial fuel energy use.

- The largest energy-using industries tend to be associated with the largest energy-using facilities. These facilities have a median combustion fuel demand of about 1 TBtu and are concentrated in Texas, Louisiana, and California.

Industrial Energy Use by County

Industrial energy use at the county level is even more unevenly distributed than it is at the state level. The counties with the largest industrial energy use tend to be along the Gulf Coast. Harris County, Texas, had the largest industrial energy use in 2016.

Industrial Energy Use by County (2016)



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

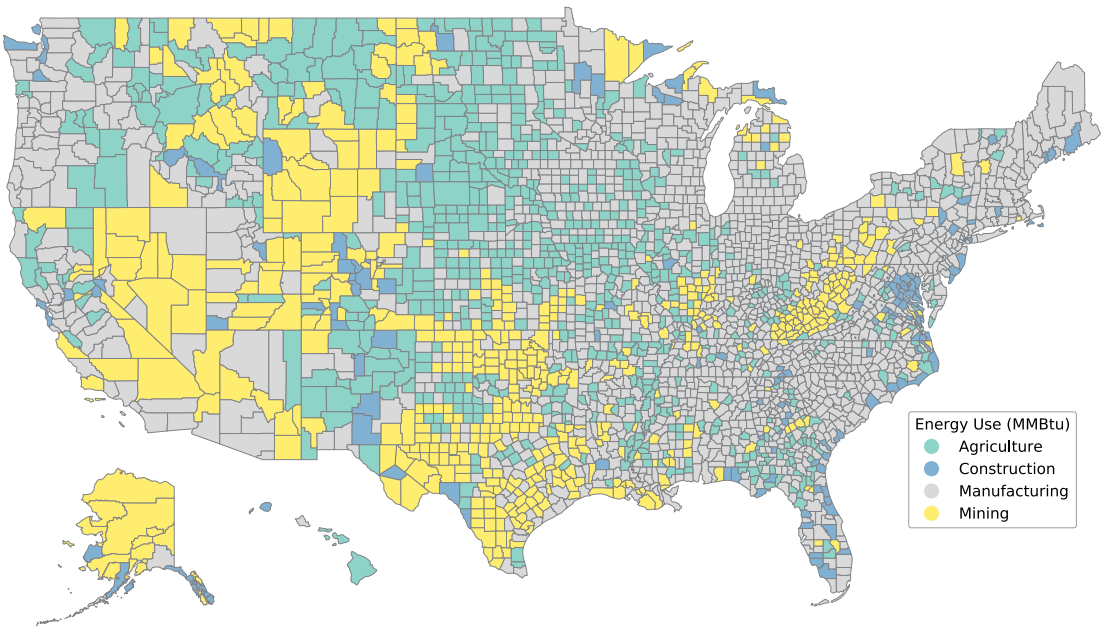
Note: Data does not include feedstock energy use.

Map based on Longitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of 2016MMBtu.

Industrial Subsector Consuming the Most Energy in Each County

Although manufacturing is the largest of the industrial subsectors, not all counties have large manufacturing footprints. Counties with mining or agriculture as their largest industrial sector tend to be located in the country's interior. Construction is the predominant industry in only a few counties.

Industry Subsector Energy Use by County (2016)



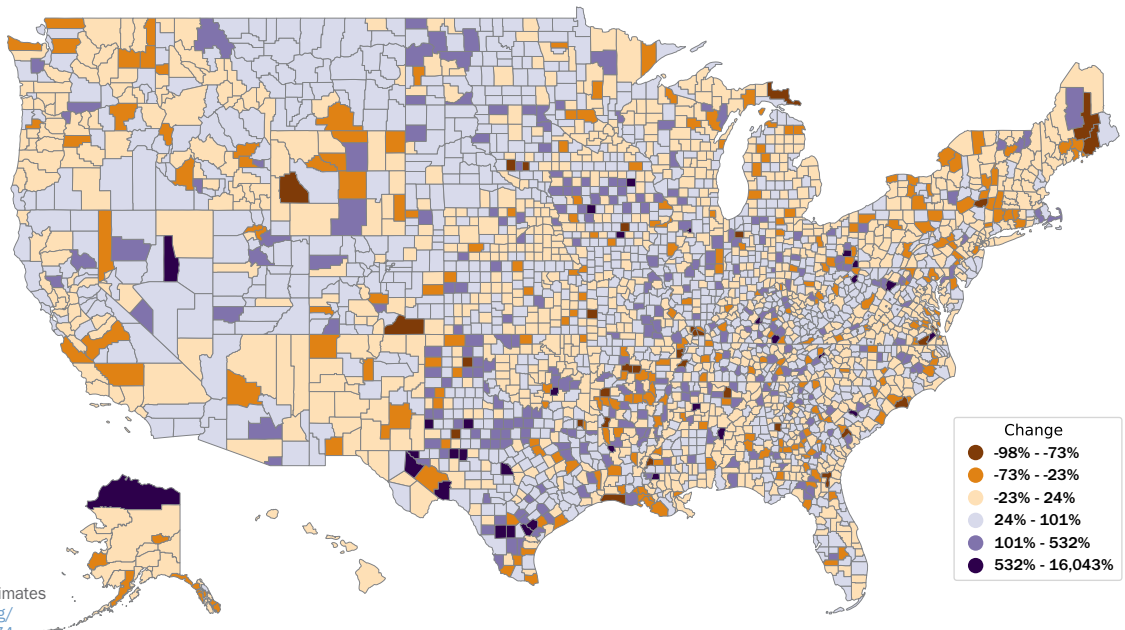
Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Note: Data does not include feedstock energy use.

Change in Industrial Energy Use by County

Industrial energy use in most counties was flat or decreased from 2010 to 2016. Notable exceptions include North Slope Borough, Alaska and several counties in Texas, which are linked to the oil and gas extraction industries.

Change in Industrial Energy Use by County (2010–2016)



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

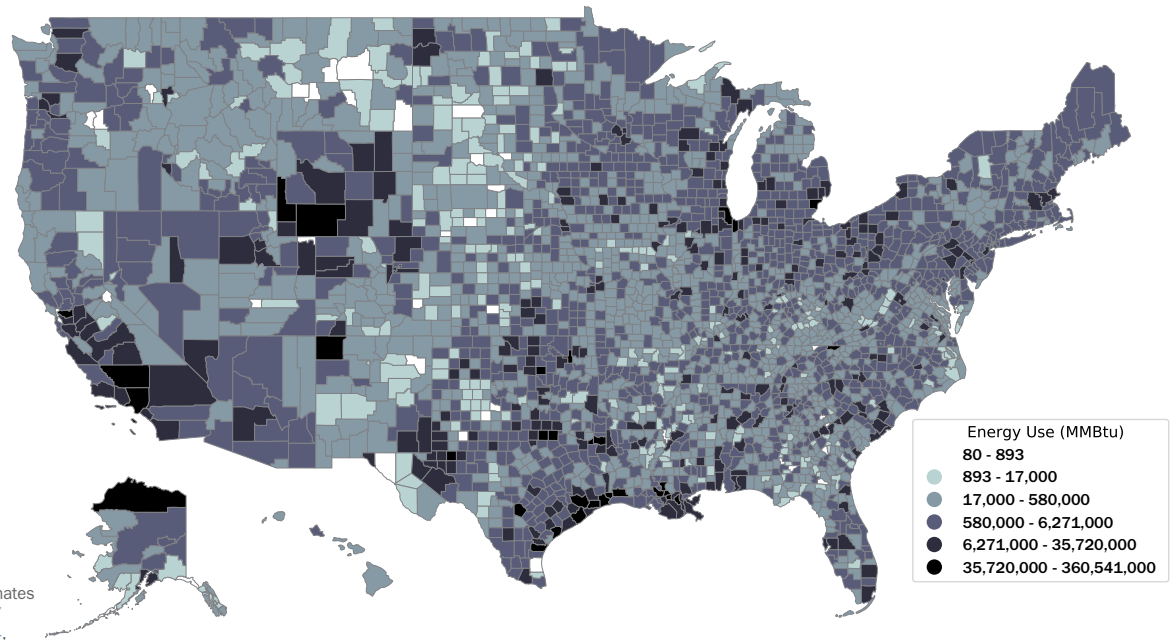
Note: Data does not include feedstock energy use.

Map based on Longitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows percent change in total MMBtu from 2010 to 2016.

Industrial Natural Gas Use by County

Counties that use the most natural gas are located along the Gulf Coast. Other significant use occurs in North Slope Borough, Alaska, and in California, and Wyoming.

Industrial Natural Gas Use by County



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Note: Data does not include feedstock energy use.

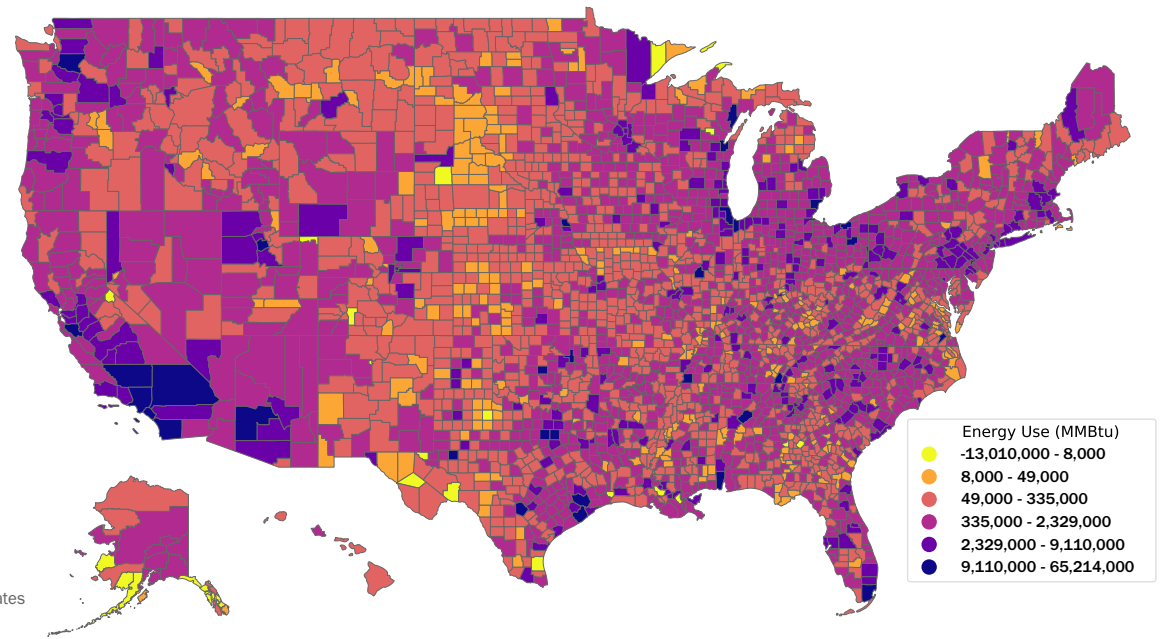
Map based on Longitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of Natural gas MMBtu.

Does not include coal used to produce coke by coke plants

Industrial Net Electricity Use by County

Industrial net electricity use is more evenly distributed across counties than natural gas use. Negative values indicate that sales and other transfers from facilities that generate their own electricity are larger than facility use.

Industrial Net Electricity Use by County (2016)

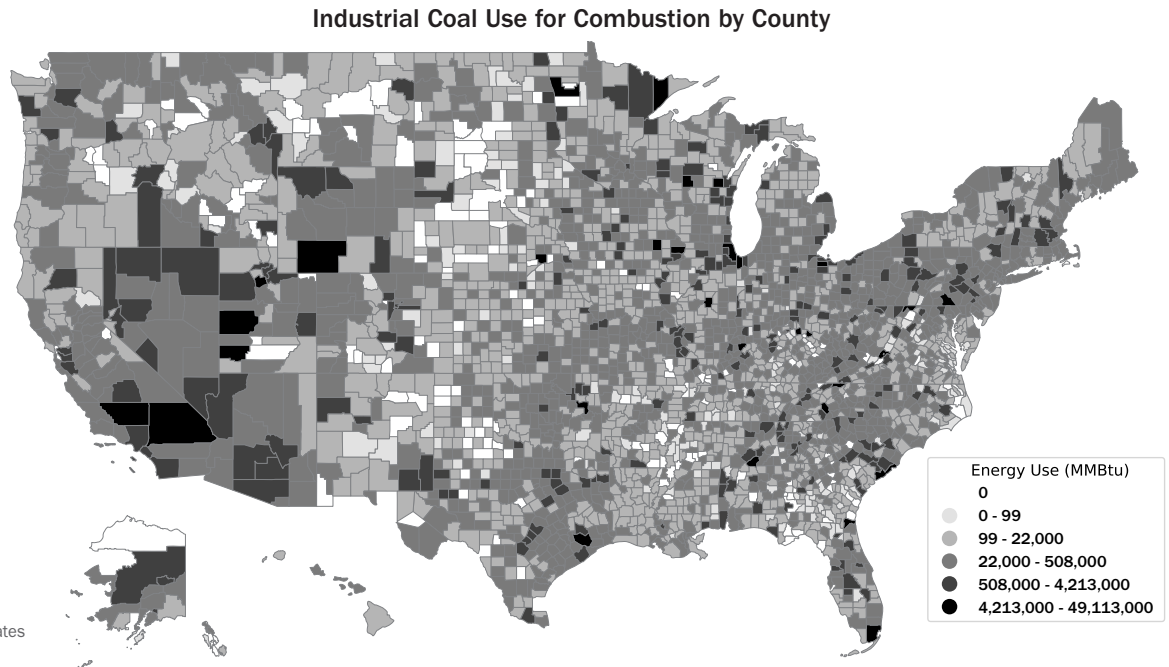


Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of Net electricity MMBtu.

Industrial Coal Use by County

Coal is not widely used as an industrial fuel. The counties with the largest use are in Wyoming, Illinois, California, and Iowa.



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

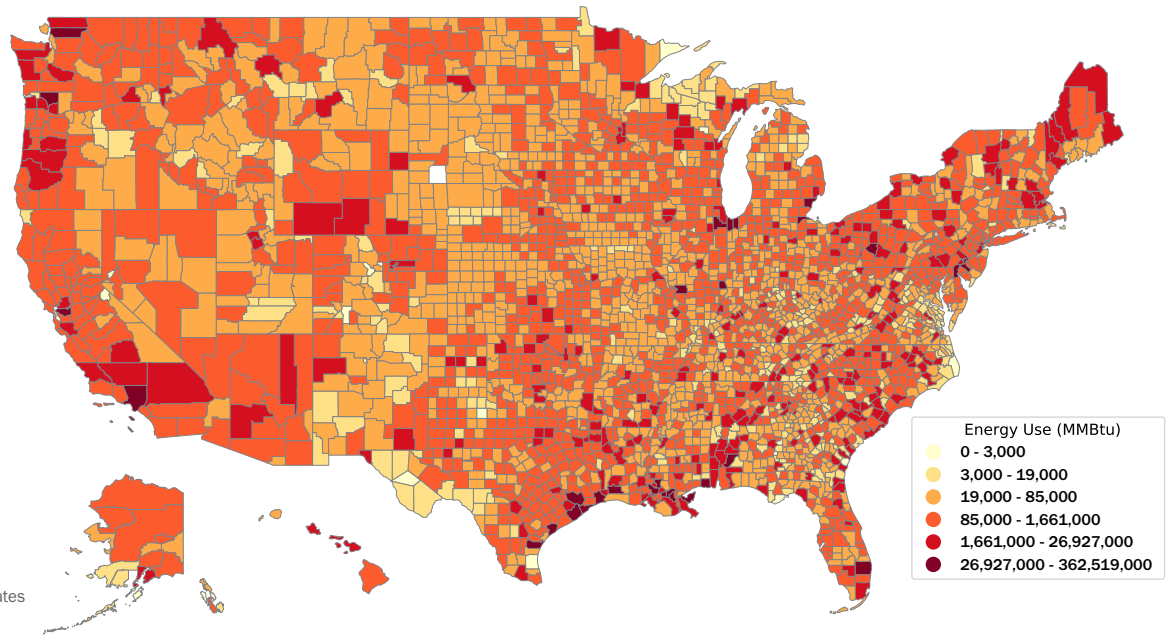
Map based on Longitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of Coal MMBtu.

Industrial Use of Other Fuels by County

Other fuels—which include gasoline and diesel, as well as byproducts like fuel gas, blast furnace gas, and wood residuals—are widely used. The most intensive use occurs in counties with a large presence of petroleum refining, pulp and paper, iron and steel, or ethyl alcohol manufacturing.

II

Industrial Use of Other Fuels by County

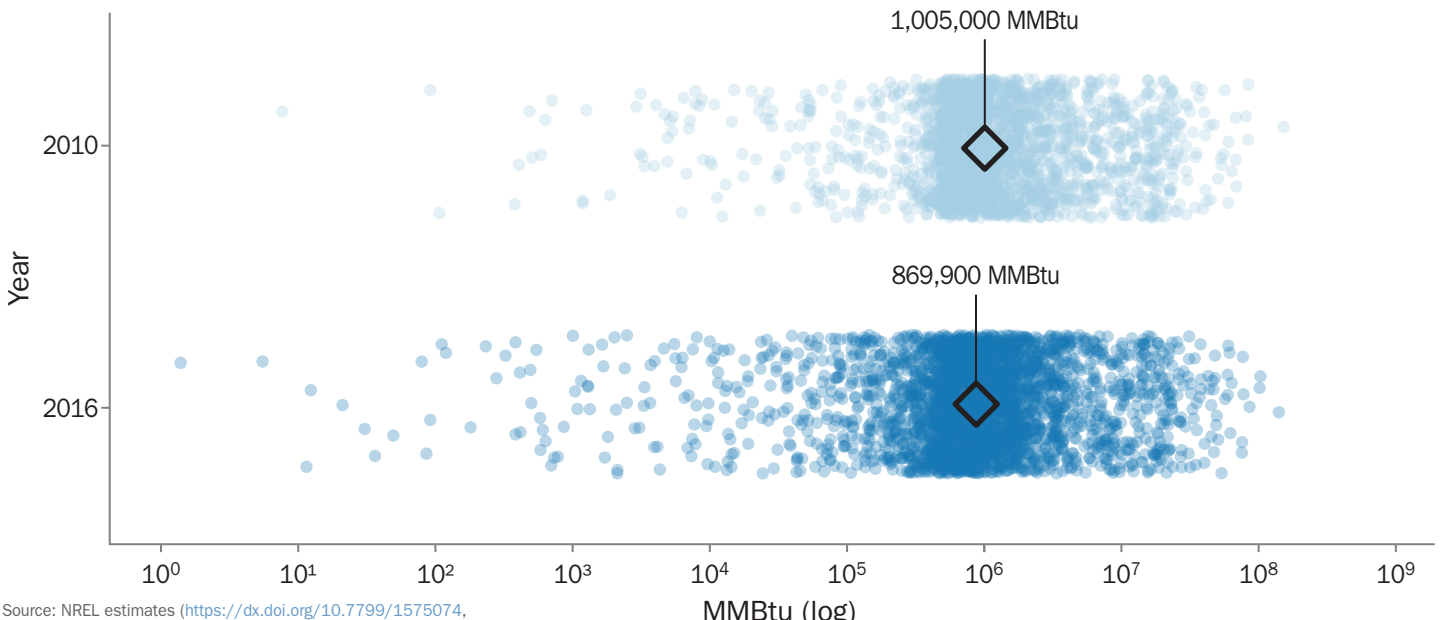


Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Map based on Longitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated): Color shows sum of Coal MMBtu.

Distribution and Median of Estimated Combustion Energy Use of Large Facilities

Most of the large facilities have annual combustion energy use of about 1,000,000 MMBtu. This is equivalent to the annual space heating demand of about 28,300 households.*



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Notes: Data does not include electricity use.

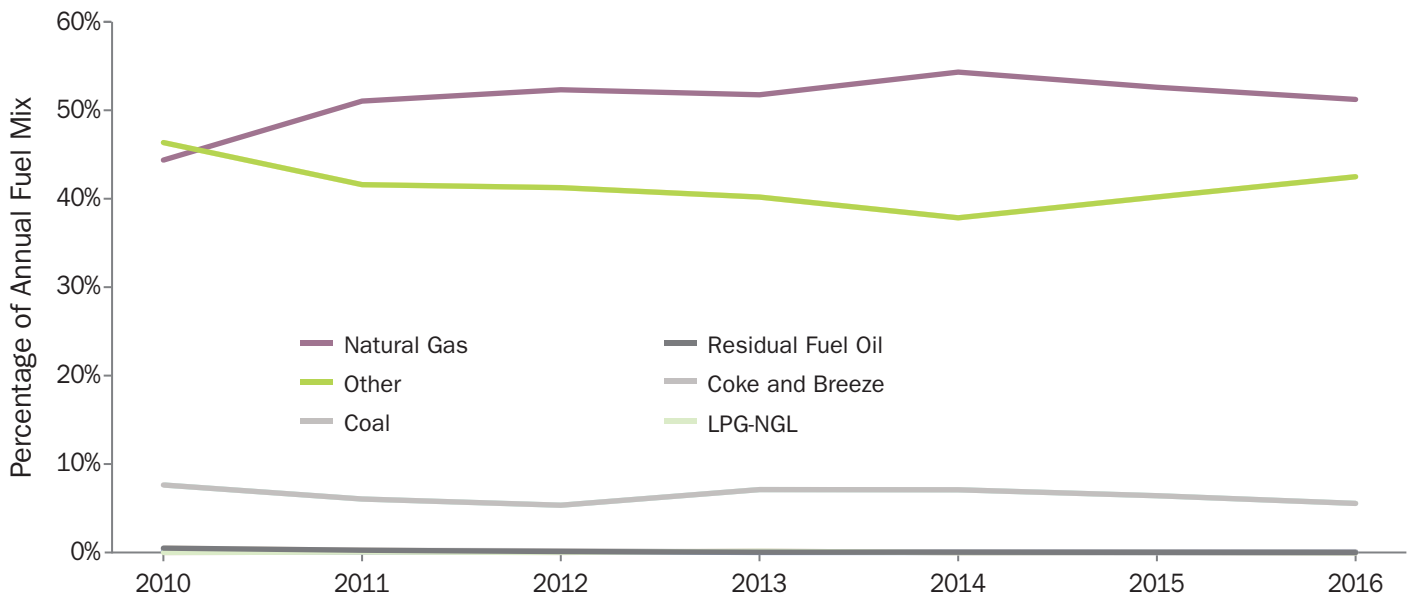
*Assumes an annual demand of 35.3 MMBtu/household (https://www.eia.gov/consumption/residential/data/2015/)

Combustion Fuel Mix of Large Energy Users

The share of natural gas in the fuel mix of large energy uses has increased since 2010. Since 2011, it has comprised over half of all fuels.

II

Combustion Fuel Mix of Large Energy Users (2010–2016)



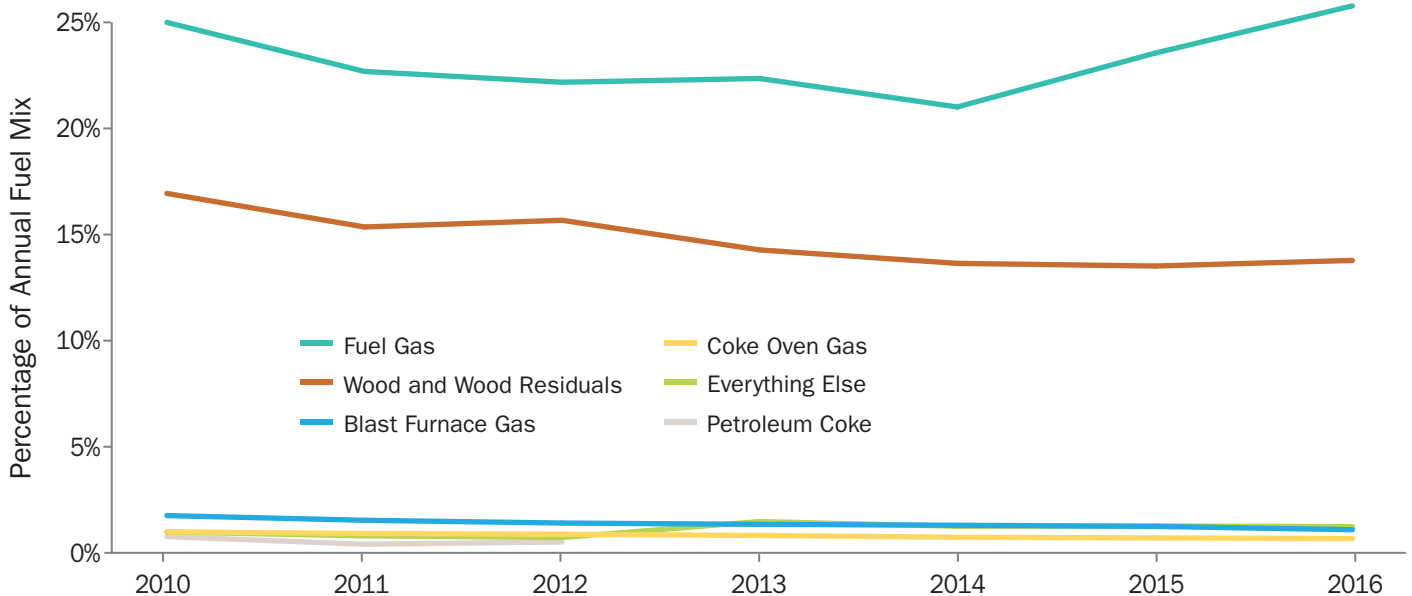
Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Note: Data does not include electricity use.

Other Combustion Fuel Mix of Large Energy Users

Most of the "other" fuels used by large energy users can be considered byproducts of industrial processes. Fuel gas is produced during petroleum refining and constitutes about 25% of total combustion fuel. Wood and wood residuals, which include wood pulping byproducts, constitute about 15% of total combustion fuel.

Other Combustion Fuel Mix of Large Energy Users (2010–2016)

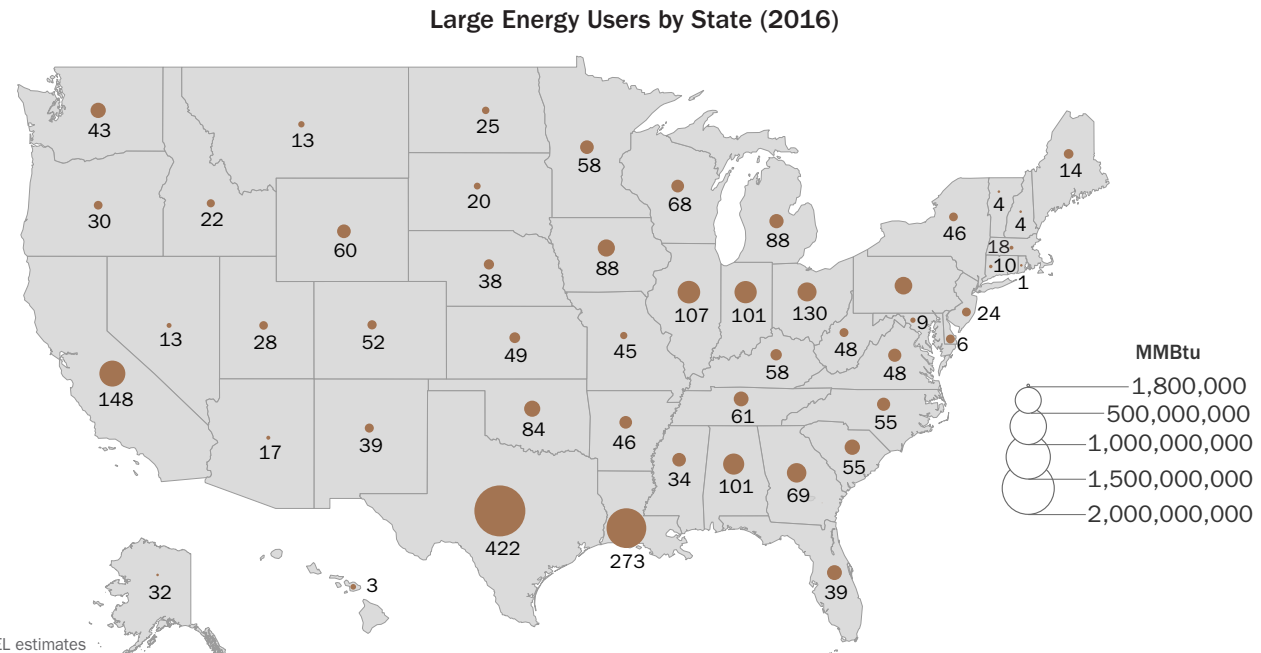


Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Note: Data does not include electricity use.

Energy Use and Count of Large Energy Users by State

In addition to using the most industrial energy, Texas, Louisiana, and California also have many of the facilities that are the largest energy users.



Source: NREL estimates (https://dx.doi.org/10.7799/1575074, https://github.com/NREL/Industry-energy-data-book)

Note: Data does not include feedstock energy use.

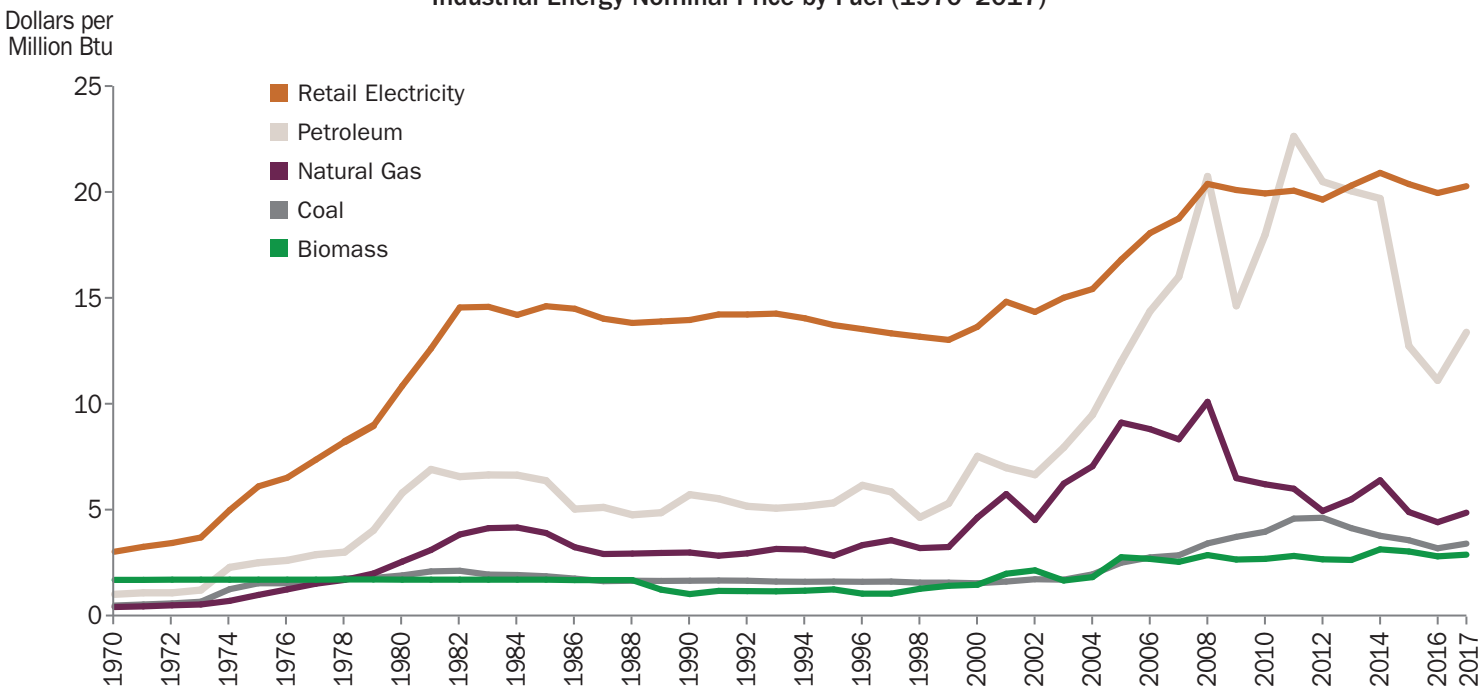
Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). Details are shown for State Name. For pane Latitude (generated) (2): Size shows sum of MMBtu TOTAL. Numeric values represent the count of large energy users by state.

III. Industrial Energy Price

National Level: Industrial Energy Nominal Price by Fuel

In the industrial sector, nominal energy prices dropped after 2014, especially petroleum prices.

Industrial Energy Nominal Price by Fuel (1970–2017)

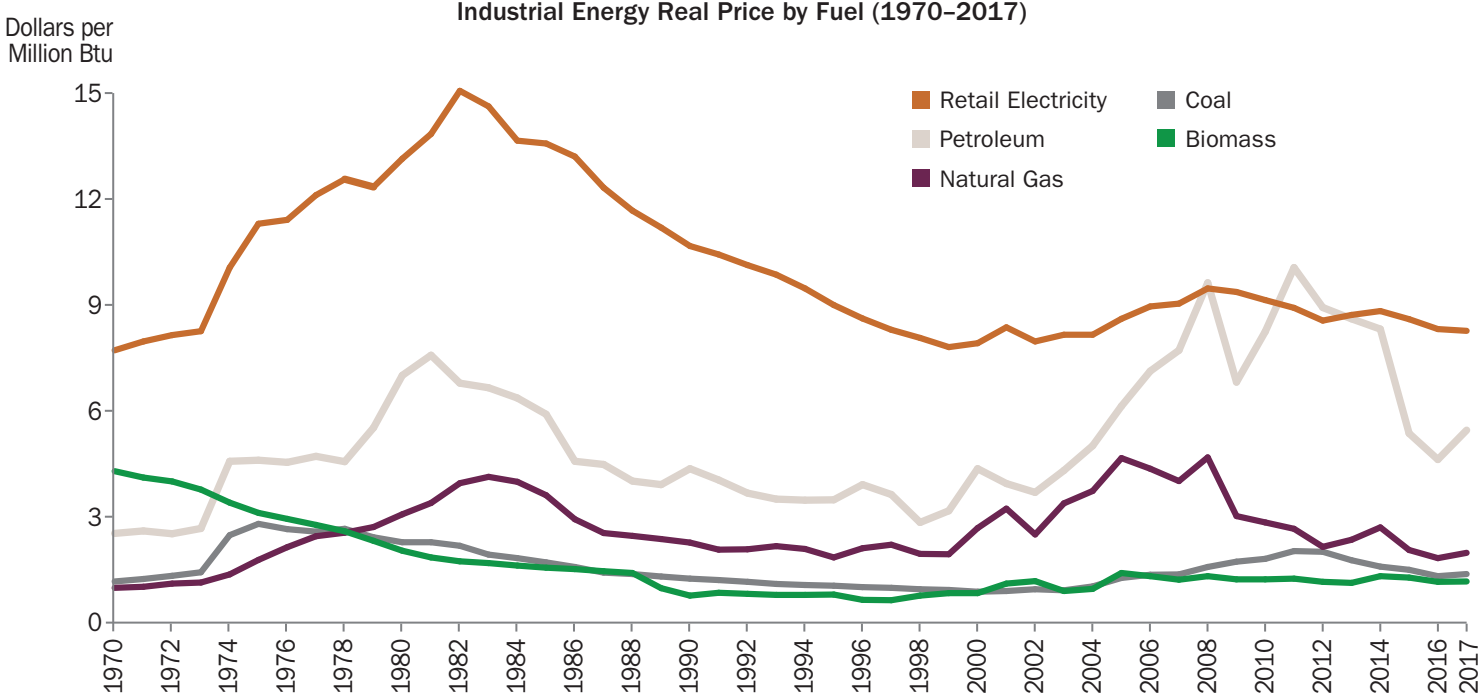


Source: EIA State Energy Data System (SEDS)

National Level: Industrial Energy Real Price by Fuel

Adjusting for inflation, real energy prices in the industrial sector generally decreased during the 1980s and 1990s. After increasing in the 2000s, petroleum and natural gas have since fallen, a result of unconventional production methods.

Industrial Energy Real Price by Fuel (1970–2017)



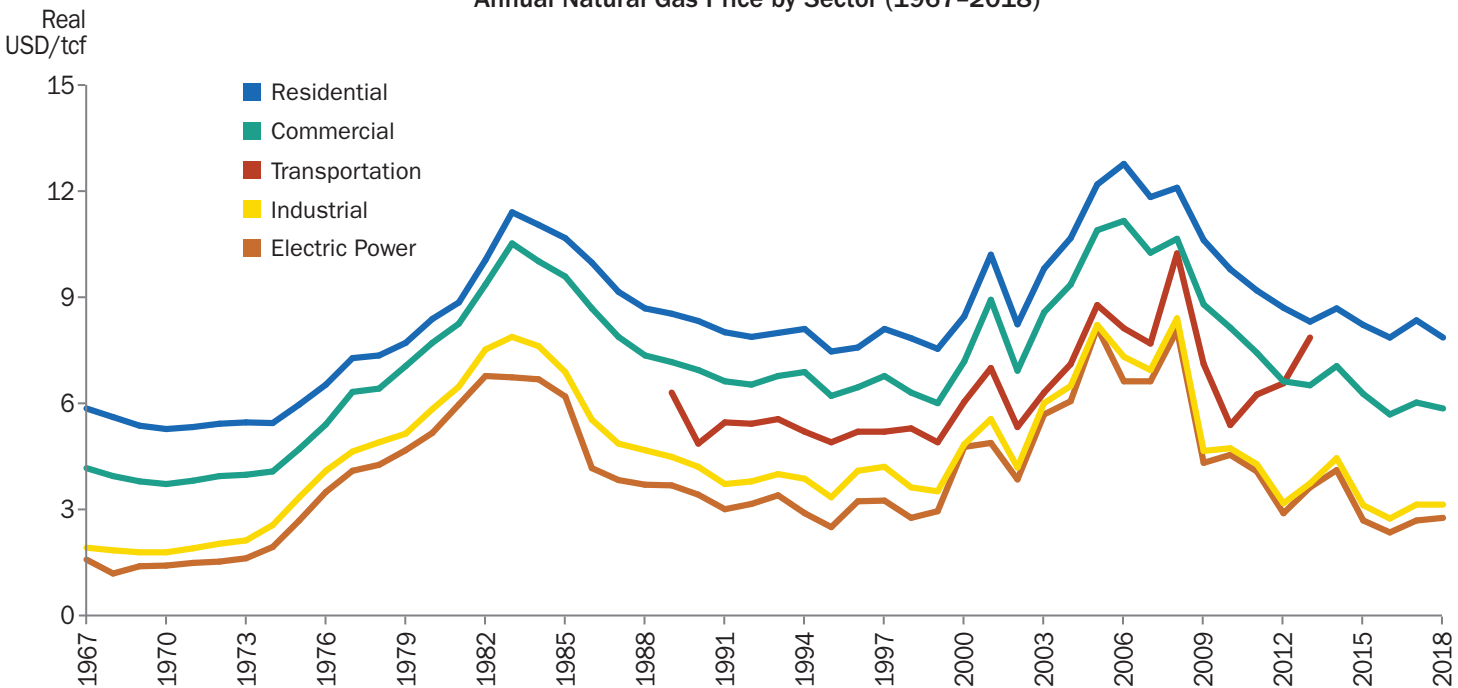
Source: EIA State Energy Data System (SEDS)

[a] Deflated using Consumer Price Index (1982-84=100)

National Level: Natural Gas Real Price by Sector (Annual)

In real terms, natural gas prices in the industrial sector remain at 40-year lows.

Annual Natural Gas Price by Sector (1967–2018)



Source: EIA Monthly Energy Review (MER)

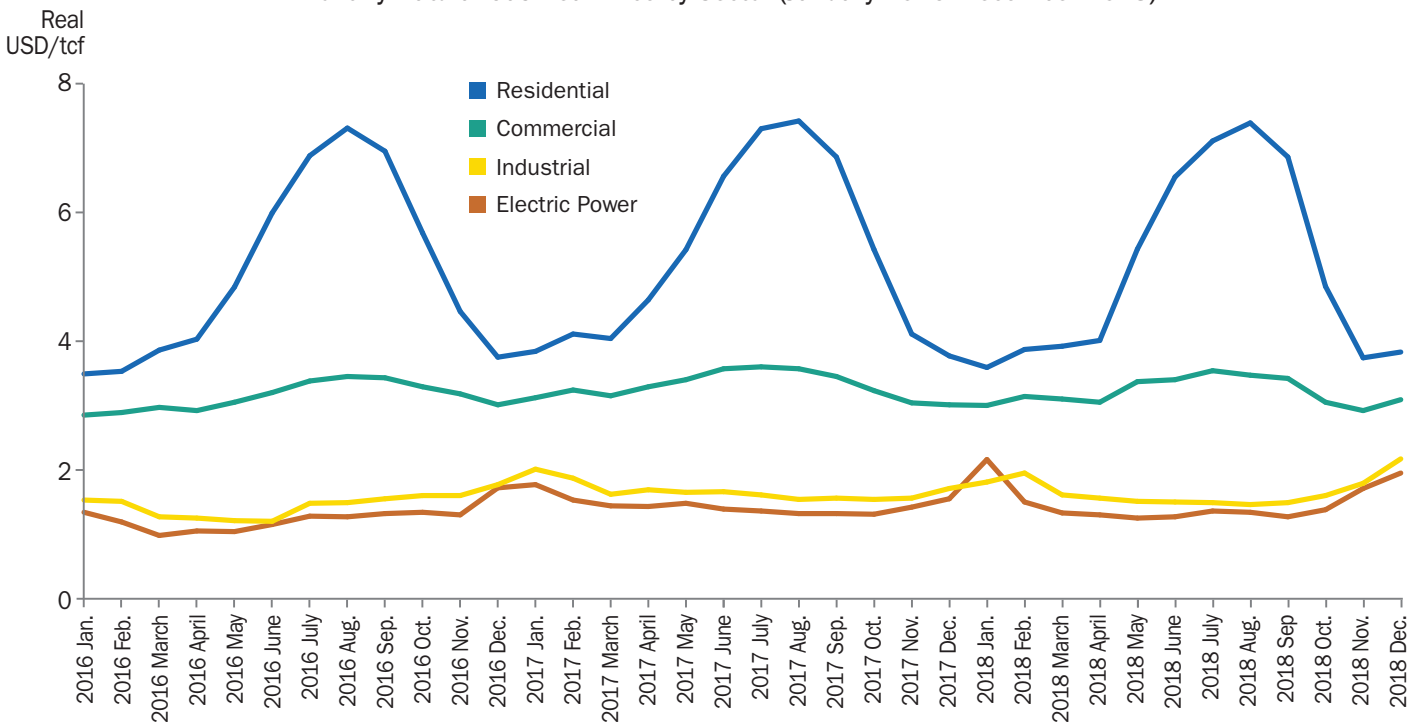
Note: tcf = thousand cubic feet. Prices are not available for the transportation sector after 2013.

[a] Deflated using Consumer Price Index (1982-84=100)

National Level: Natural Gas Real Price by Sector (Monthly)

Industrial natural gas prices (real) do not show the same seasonal trends as residential and commercial prices.

Monthly Natural Gas Real Price by Sector (January 2016–December 2018)



Source: EIA Monthly Energy Review (MER)

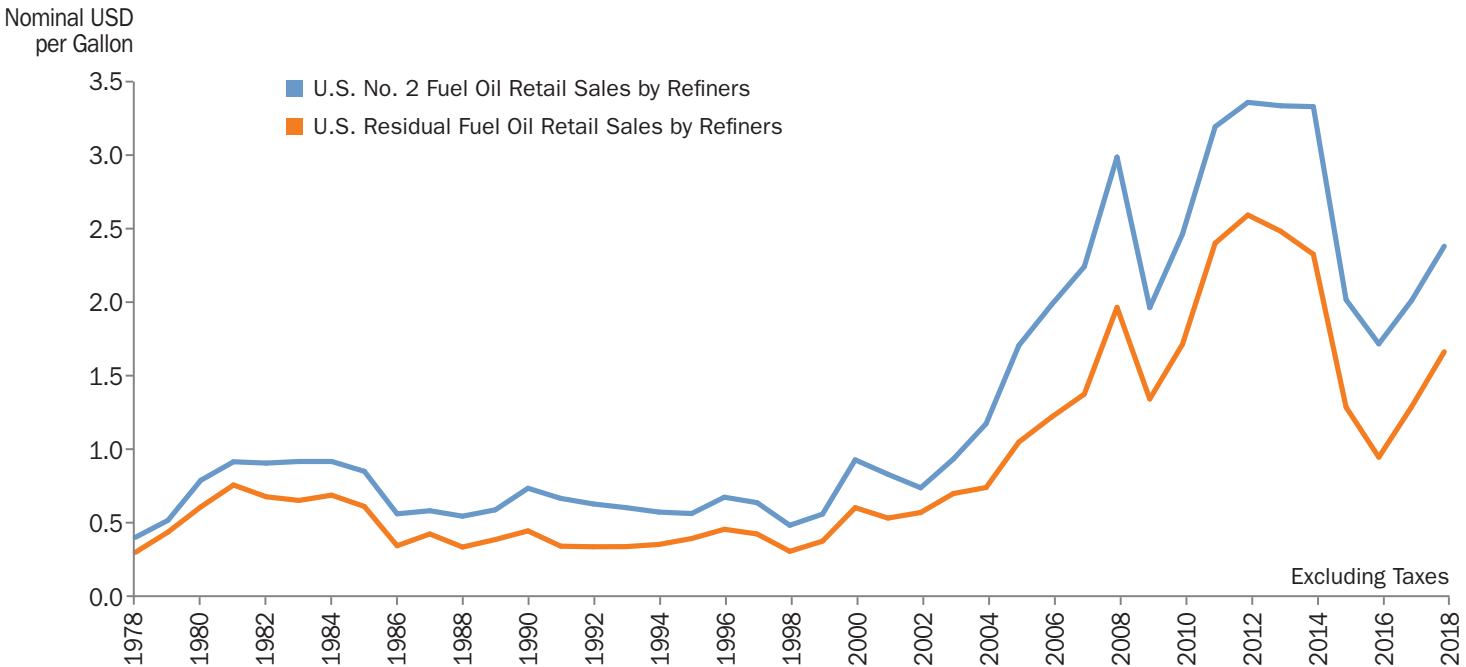
Note: tcf = thousand cubic feet

[a] Deflated using Consumer Price Index (1982-84=100)

National Level: Nominal Retail Prices of No. 2 and Residual Fuel Oil

The retail prices (nominal) of No. 2 fuel oil and residual fuel oil dropped significantly in 2015.

Nominal Retail Prices of No. 2 and Residual Fuel Oil (1978–2018)

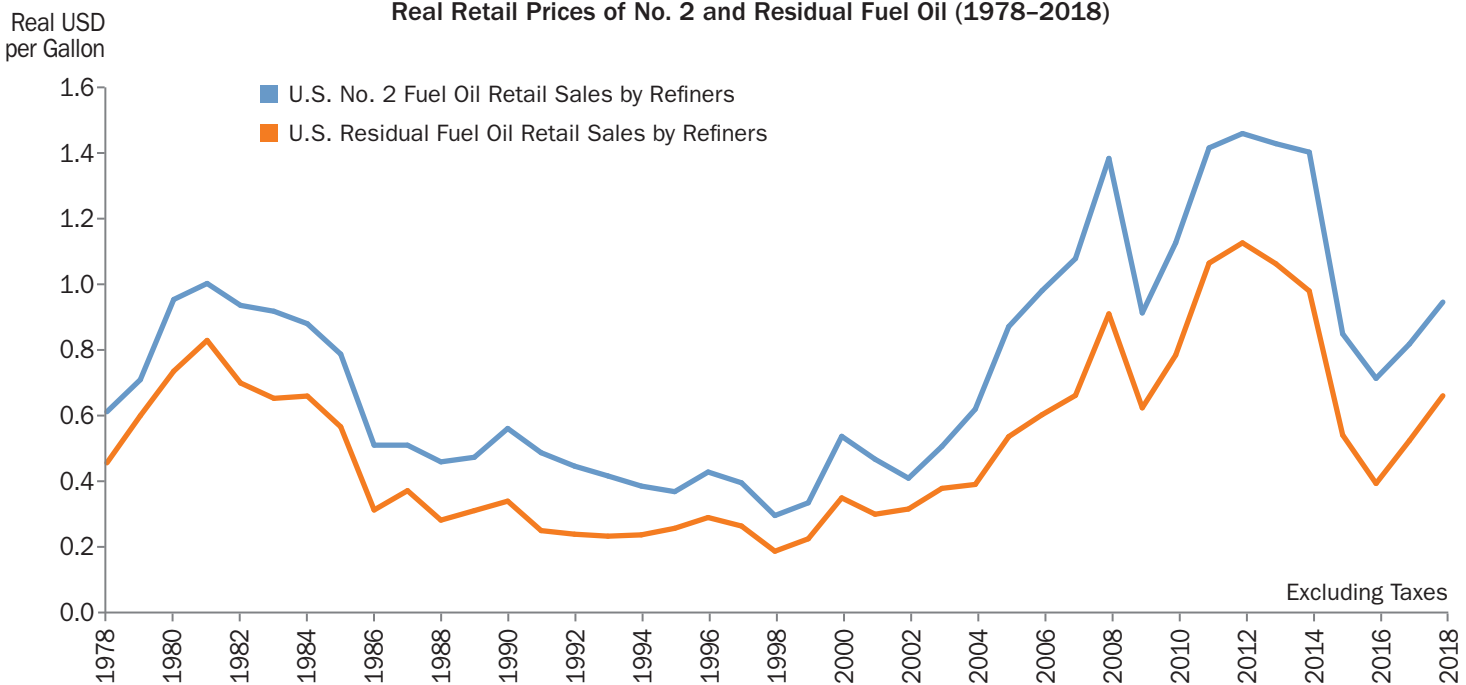


Source: EIA Refiner Petroleum Product Prices by Sales Type

National Level: Real Retail Prices of No.2 and Residual Fuel Oil

The real prices of No. 2 fuel oil and residual fuel oil also dropped significantly in 2015, but they remain higher than prices in the mid-1980s and 1990s.

Real Retail Prices of No. 2 and Residual Fuel Oil (1978–2018)



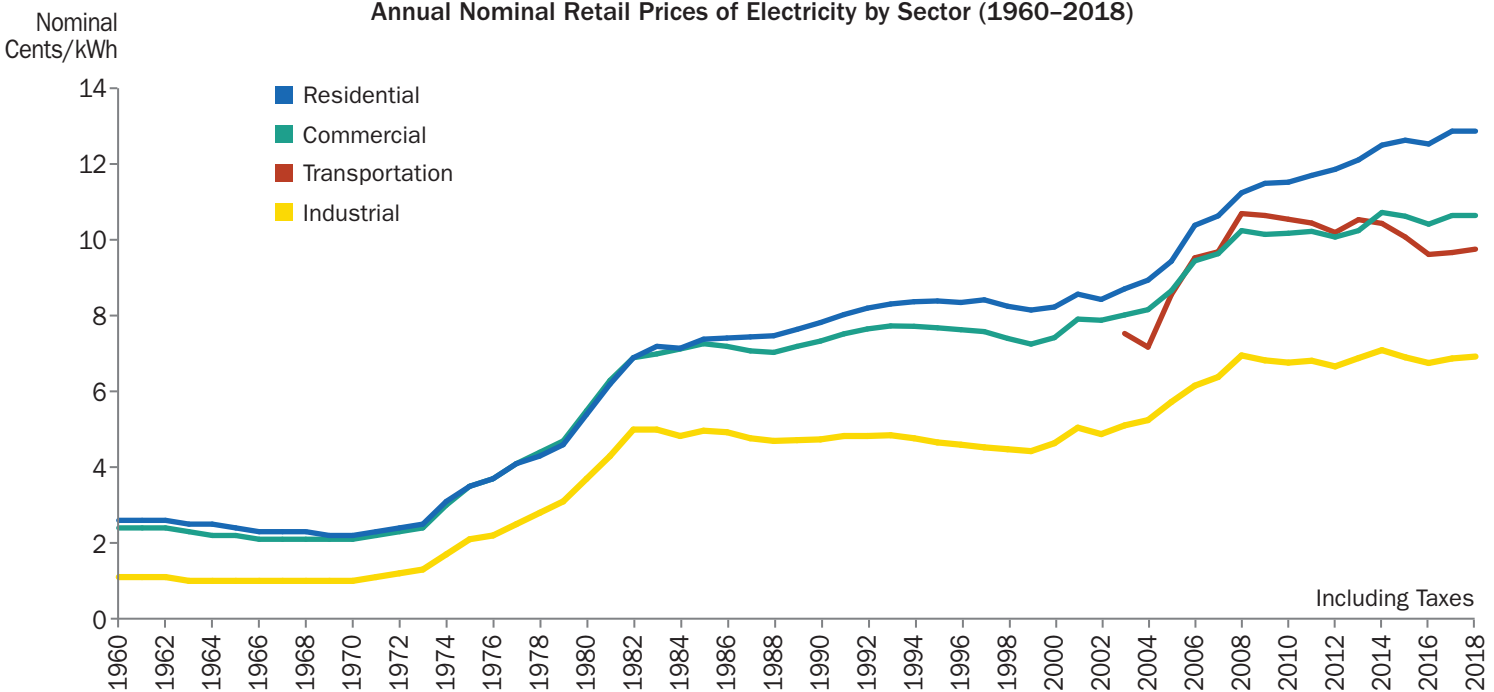
Source: EIA Refiner Petroleum Product Prices by Sales Type

[a] Deflated using Consumer Price Index (1982-84=100)

National Level: Nominal Prices of Electricity by Sector

The industrial sector has had the lowest average retail prices (nominal) of electricity of all end-use sectors.

Annual Nominal Retail Prices of Electricity by Sector (1960–2018)



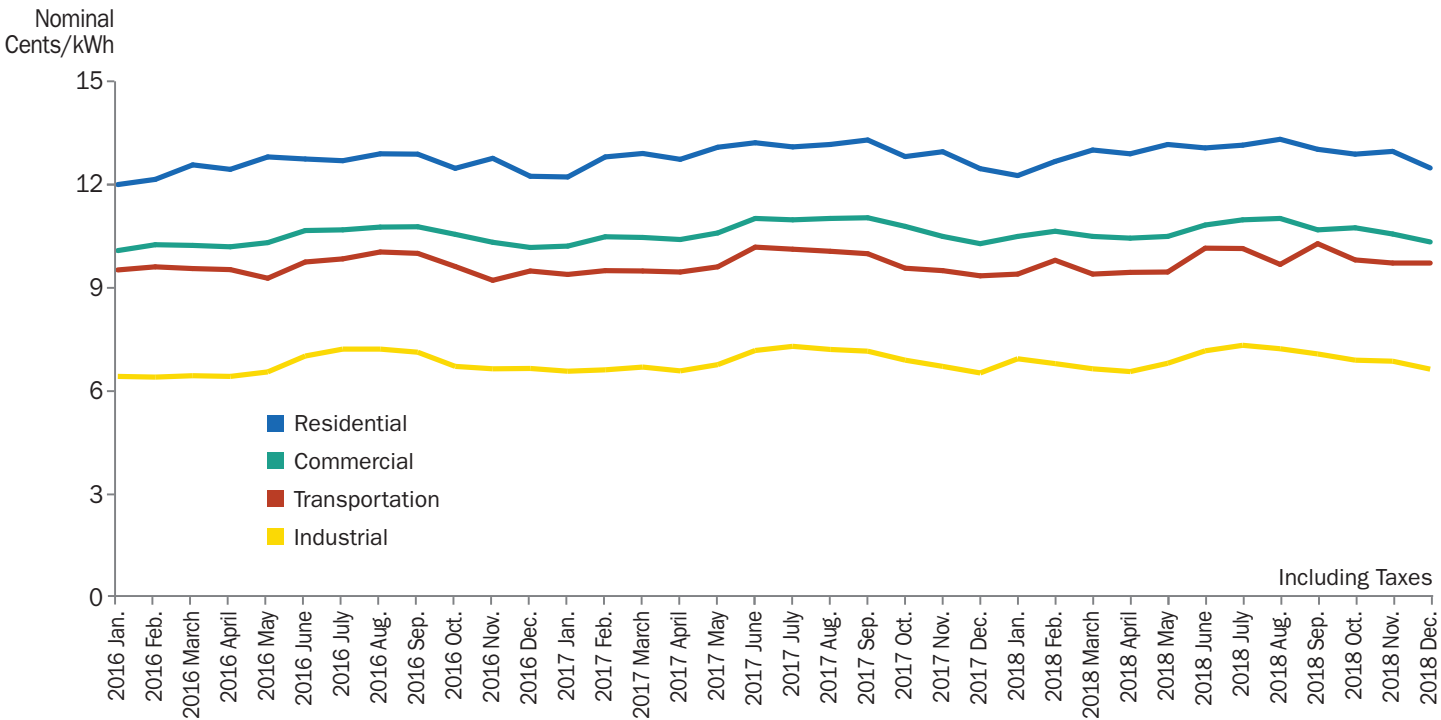
Source: EIA Monthly Energy Review (MER)

Transportation prices were not tracked prior to 2003.

National Level: Industrial Nominal Prices of Electricity by Sector

The industrial sector has had the lowest average retail prices (nominal) of electricity of all end-use sectors.

Monthly Nominal Retail Prices of Electricity by Sector (January 2016–December 2018)

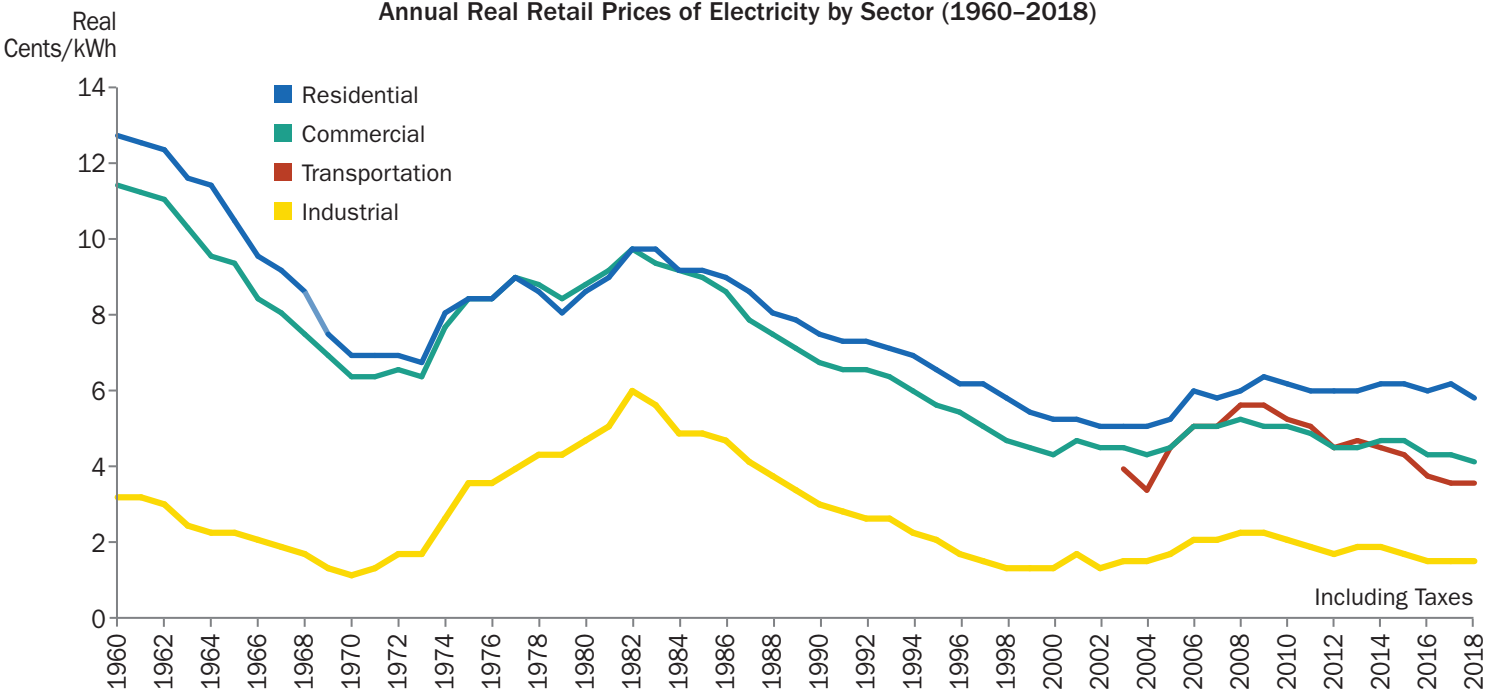


Source: EIA Monthly Energy Review (MER)

National Level: Industrial Retail Prices of Electricity by Sector

The industrial sector has had the lowest average retail prices (real) of electricity of all end-use sectors. However, industrial prices have not declined as much in absolute terms as the other end-use sectors.

Annual Real Retail Prices of Electricity by Sector (1960–2018)



Source: EIA Monthly Energy Review (MER)

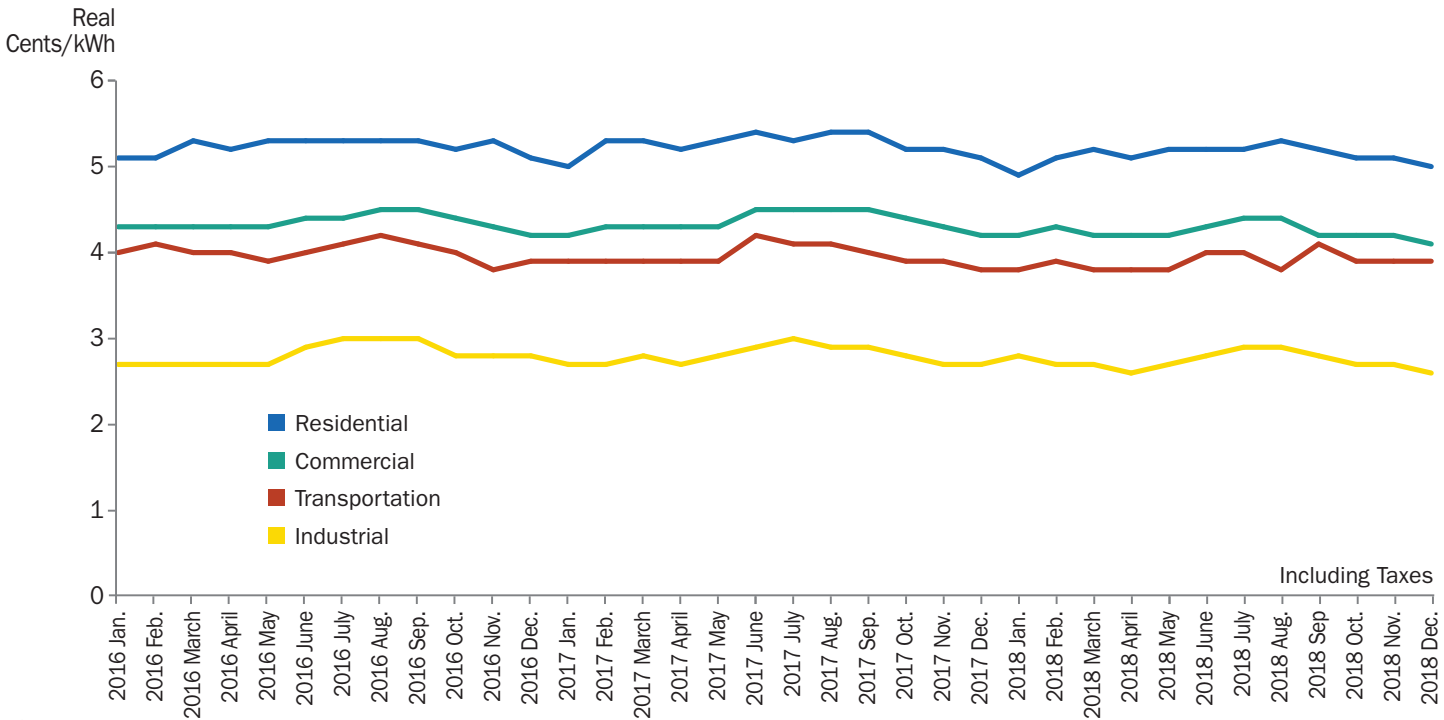
[a] Deflated using Consumer Price Index (1982-84=100)

Transportation prices were not tracked prior to 2003

National Level: Monthly Real Retail Prices of Electricity by Sector

The industrial sector has had the lowest average retail prices (real) of electricity of all end-use sectors.

Monthly Real Retail Prices of Electricity by Sector (January 2016–December 2018)



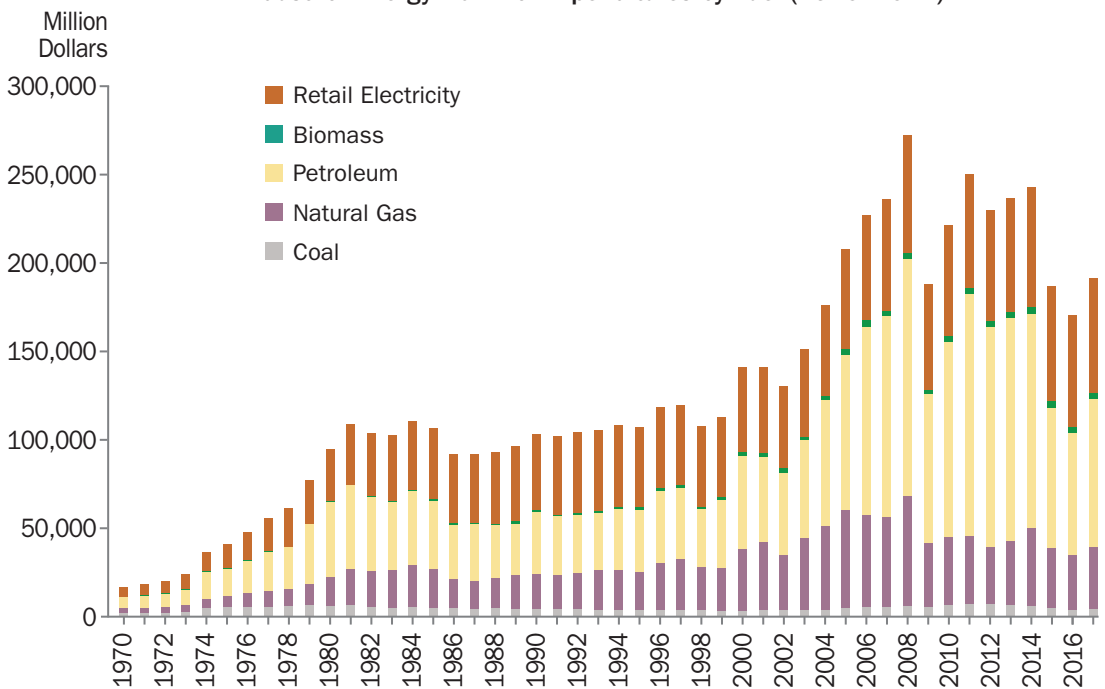
Source: EIA Monthly Energy Review (MER)

[a] Deflated using Consumer Price Index (1982-84=100)

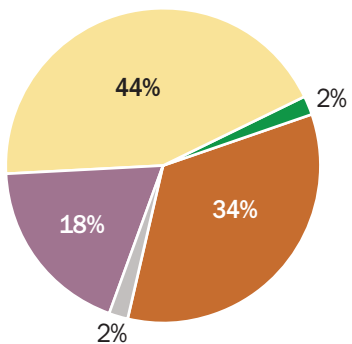
National Level: Industrial Energy Expenditures by Fuel

In 2017, petroleum, retail electricity, and natural gas accounted for about 96% of the total industrial energy expenditures (nominal).

Industrial Energy Nominal Expenditures by Fuel (1970–2017)



Industrial Energy Nominal Expenditure by Fuel (2017)

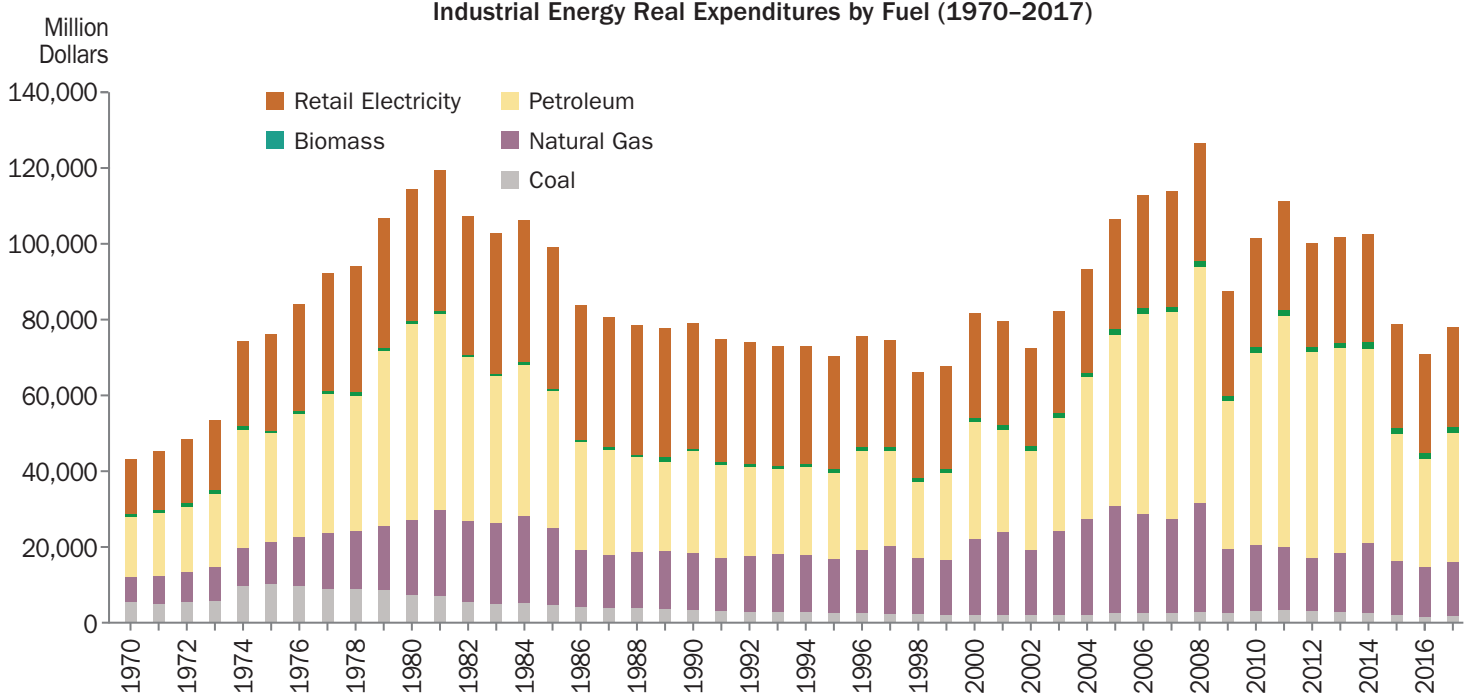


Source: EIA State Energy Data System (SEDS)

National Level: Industrial Energy Real Expenditures by Fuel

Industrial fuel expenditures decreased dramatically in 2015 due to the drop in prices of petroleum-derived fuels. However, petroleum remains a large portion of total energy expenditures for industry.

Industrial Energy Real Expenditures by Fuel (1970–2017)



Source: EIA State Energy Data System (SEDS)

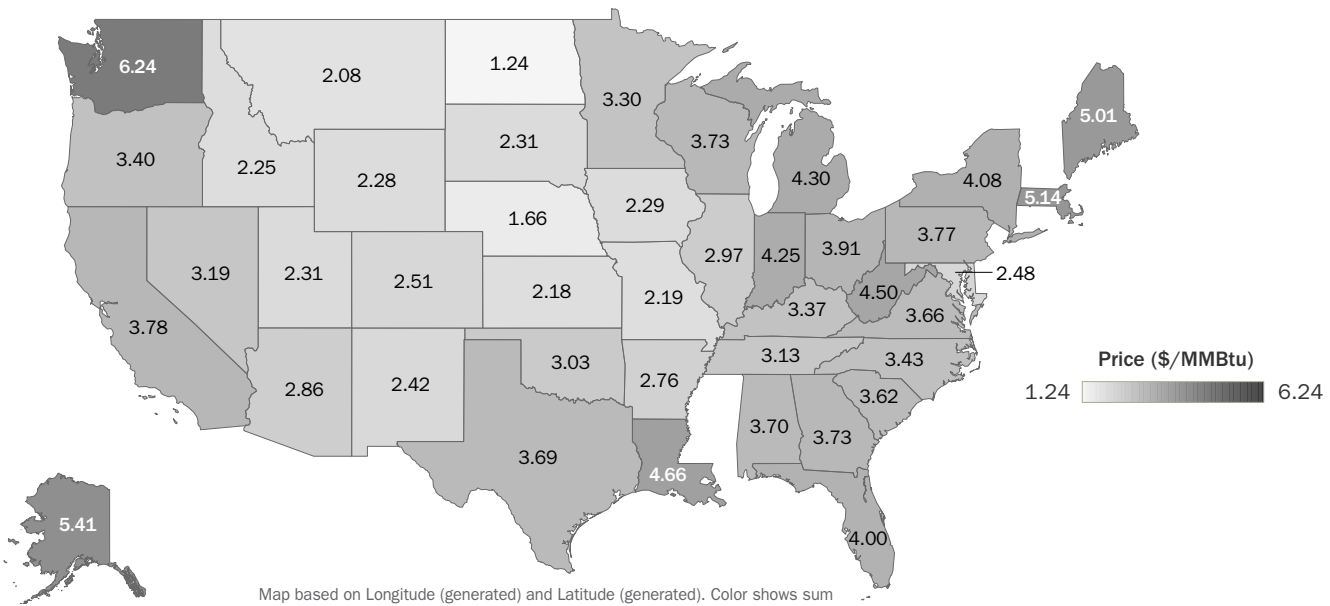
[a] Deflated using Consumer Price Index (1982-84=100)

State Level: Industrial Coal Price

In 2017, the three states with the most-expensive coal (per million Btu) were Washington ($6.24), Alaska ($5.41), and Massachusetts ($5.14). In 2017, the three states with the least-expensive coal (per million Btu) were North Dakota ($1.24), Nebraska ($1.66), and Montana ($2.08).

III

Industrial Coal Price by State (2017)



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

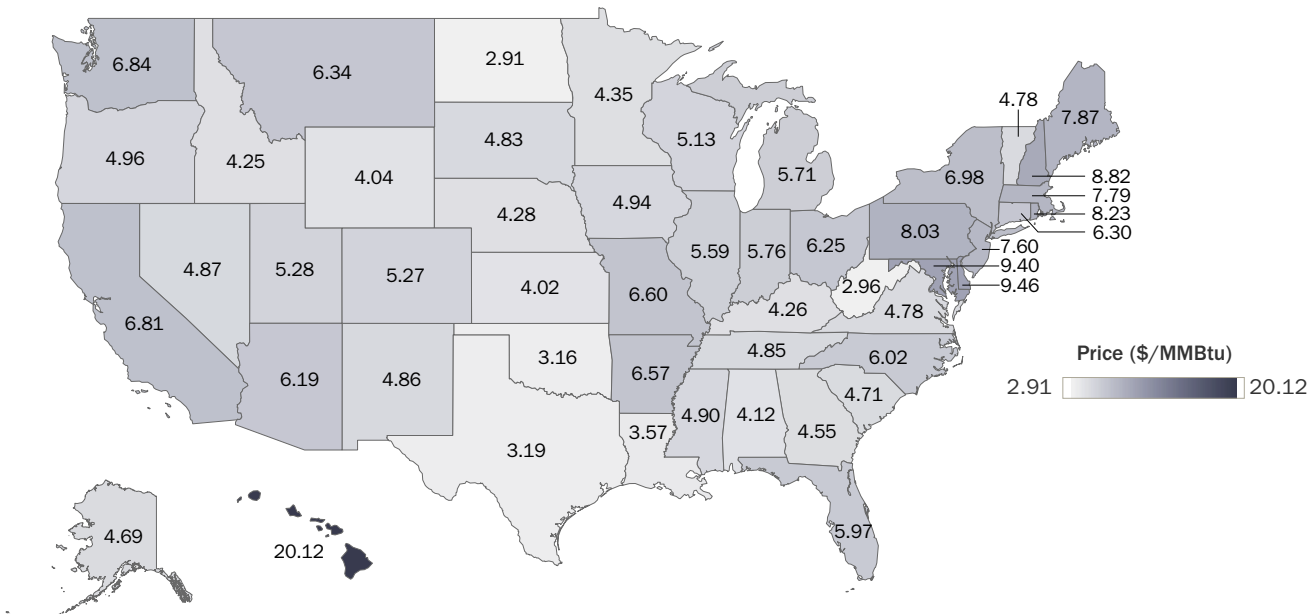
States without reported prices are not shown.

Source: EIA State Energy Data System (SEDS)

State Level: Industrial Natural Gas Price

In 2017, the three states with the most-expensive natural gas (per million Btu) were Hawaii ($20.12), Delaware ($9.46), and Rhode Island ($8.23). In 2017, the three states with the least-expensive natural gas (per million Btu) were North Dakota ($2.91), West Virginia ($2.96), and Oklahoma ($3.16).

Industrial Natural Gas Price by State (2017)



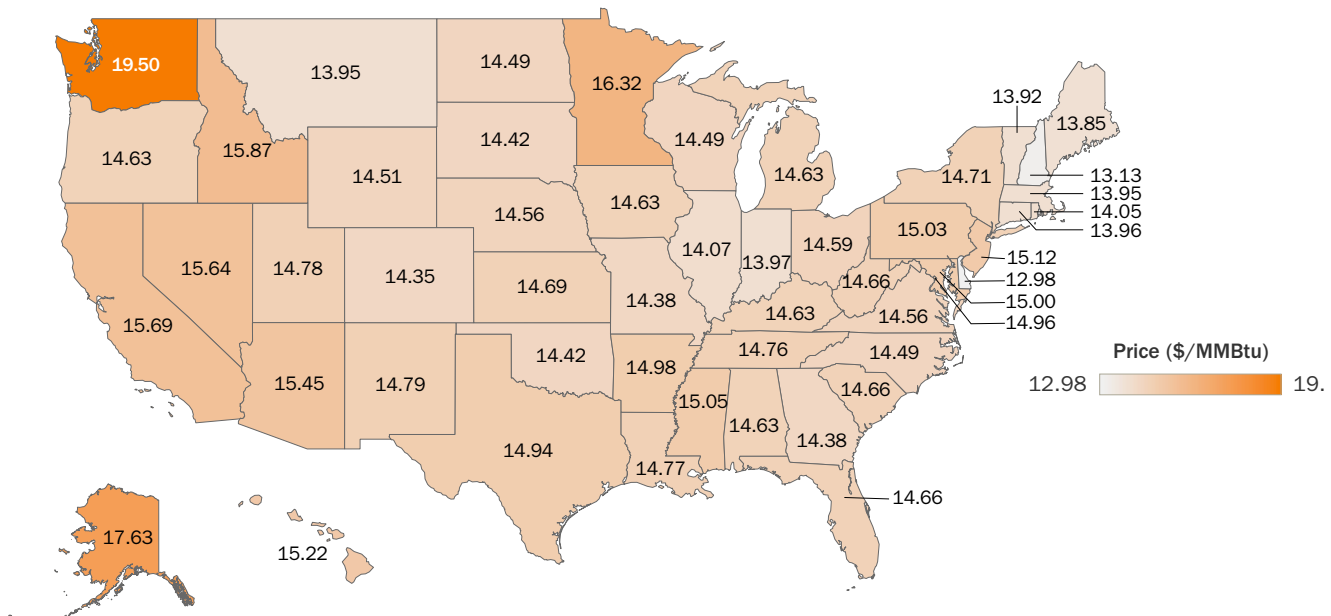
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Petroleum (Distillate Fuel Oil) Price

In 2017, the three states with the most-expensive distillate fuel oil (per million Btu) were Washington ($19.50), Alaska ($17.63), and Minnesota ($16.32). In 2017, the three states with the least-expensive distillate fuel oil (per million Btu) were Delaware ($12.98), New Hampshire ($13.13), and Maine ($13.85).

Industrial Petroleum (Distillate Fuel Oil) Price by State (2017)



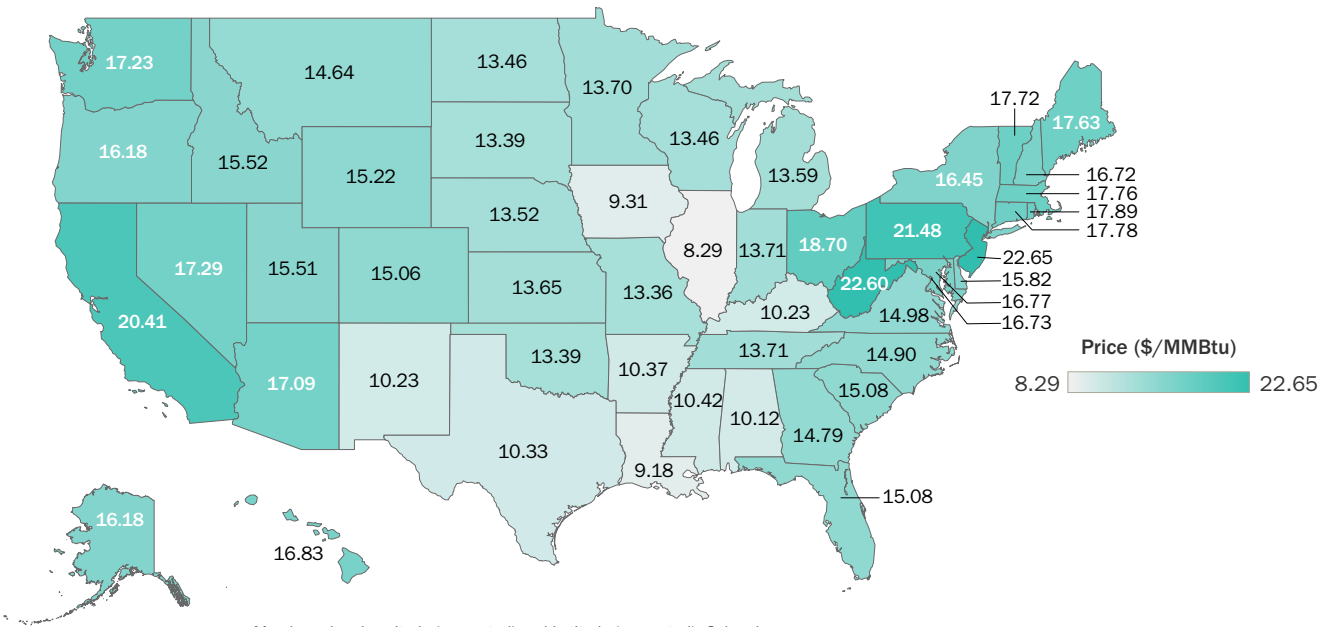
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Petroleum (HGL) Price

In 2017, the three states with the most-expensive HGL (per million Btu) were New Jersey ($22.65), West Virginia ($22.60), and Pennsylvania ($21.48). In 2017, the three states with the least-expensive HGL (per million Btu) were Illinois ($8.29), Louisiana ($9.18), and Iowa ($9.31).

Industrial Petroleum (HGL) Price by State (2017)



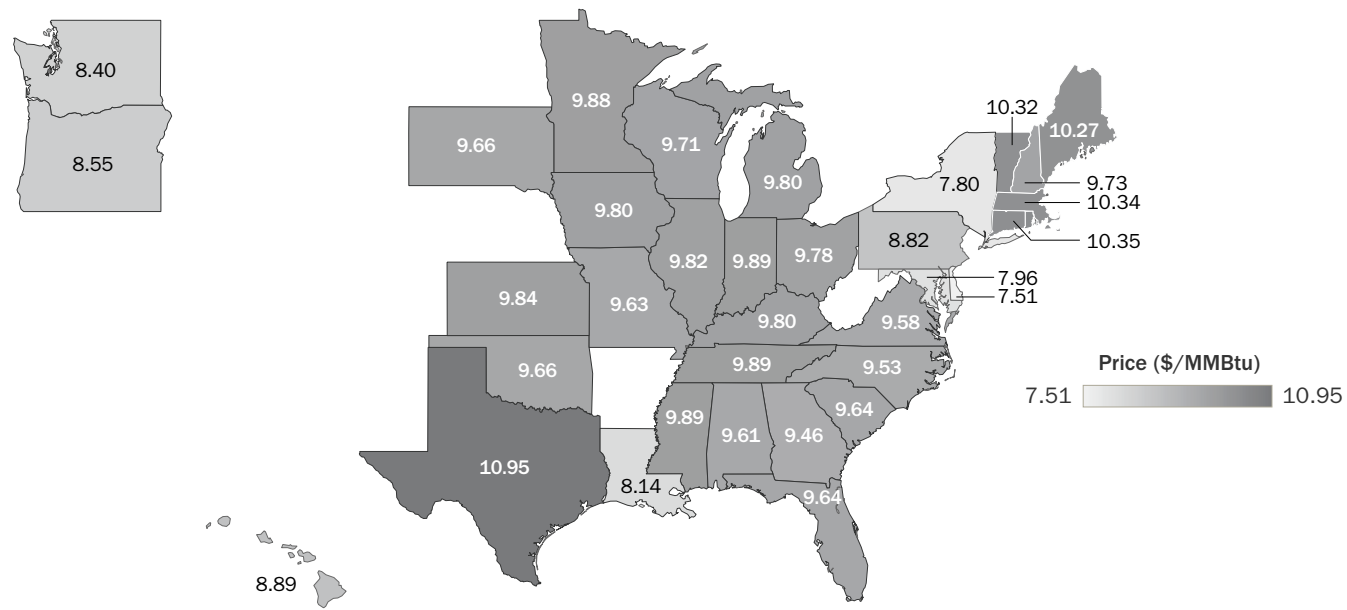
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Petroleum (Residual Fuel Oil) Price

In 2017, the three states with the most-expensive residual fuel oil (per million Btu) were Texas ($10.95), Rhode Island ($10.41), and Connecticut ($10.35). In 2017, the three states with the least-expensive residual fuel oil (per million Btu) were Delaware ($7.51), New York ($7.80), and Maryland ($7.96).

Industrial Petroleum (Residual) Price by State (2017)



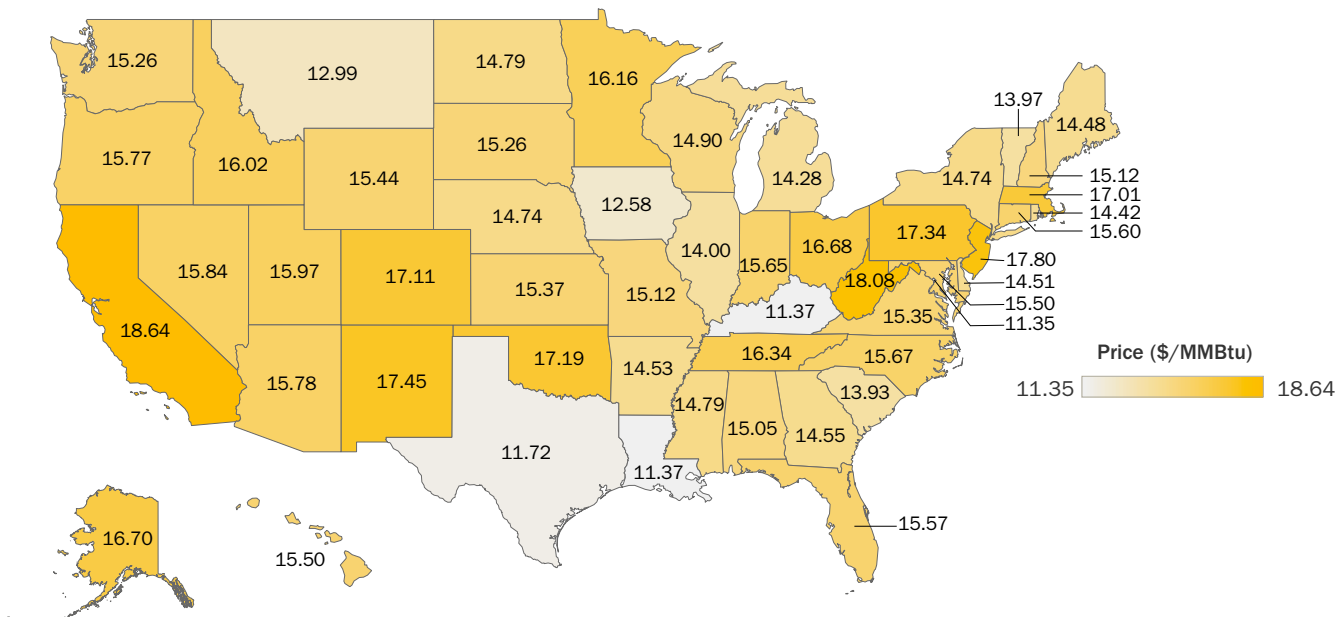
Source: EIA State Energy Data System (SEDS)
© 2019 Mapbox © OpenStreetMap TBD
States without reported prices are not shown.

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Petroleum (Total) Price

In 2017, the three states with the most-expensive petroleum (per million Btu) were California ($18.64), West Virginia ($18.08), and New Jersey ($17.80). In 2017, the three states with the least-expensive petroleum (per million Btu) were Louisiana ($11.37), Kentucky ($11.37), and Texas ($11.72).

Industrial Petroleum (Total) Price by State (2017)



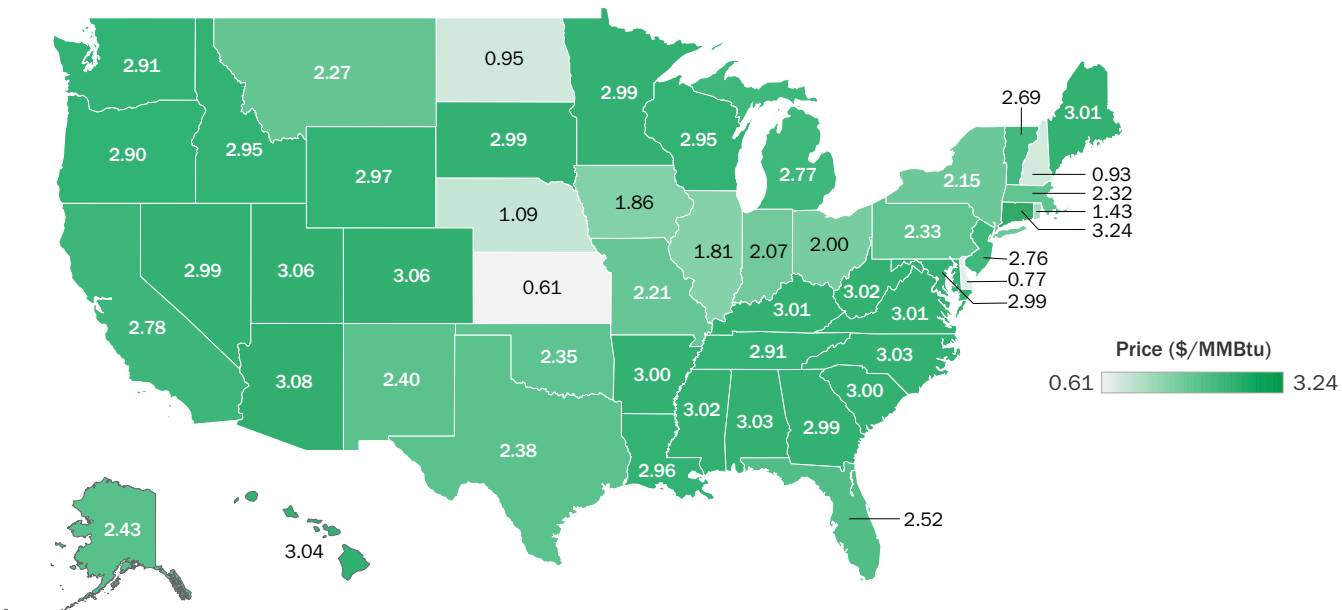
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Biomass Energy Price

In 2016, the three states with the most-expensive biomass energy (per million Btu) were Connecticut ($3.24), Arizona ($3.08), and Colorado ($3.06). In 2017, the three states with the least-expensive biomass energy (per million Btu) were Kansas ($0.61), Delaware ($0.77), and New Hampshire ($0.93).

Industrial Biomass Price by State (2017)



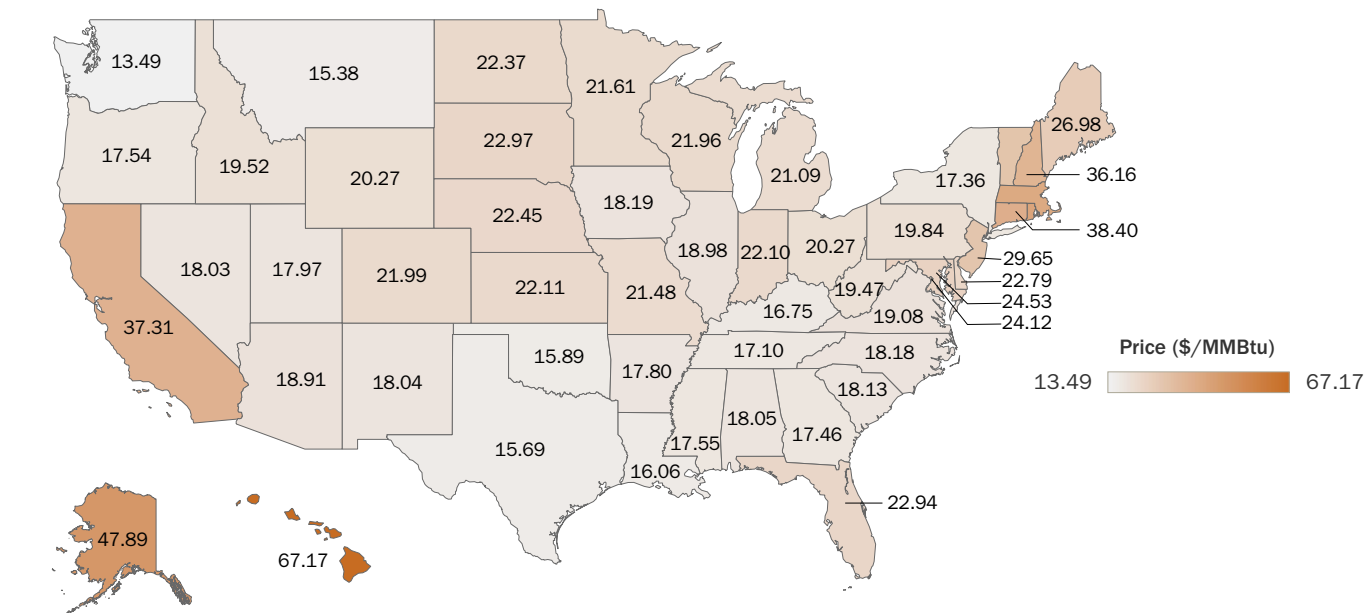
Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Retail Electricity Price

In 2017, the three states with the most-expensive retail electricity (per million Btu) were Hawaii ($67.17), Alaska ($47.89), and Rhode Island ($42.69). In 2017, the three states with the least-expensive retail electricity (per million Btu) were Washington ($13.49), Montana ($15.38), and Texas ($15.69).

Industrial Retail Electricity Price by State (2017)

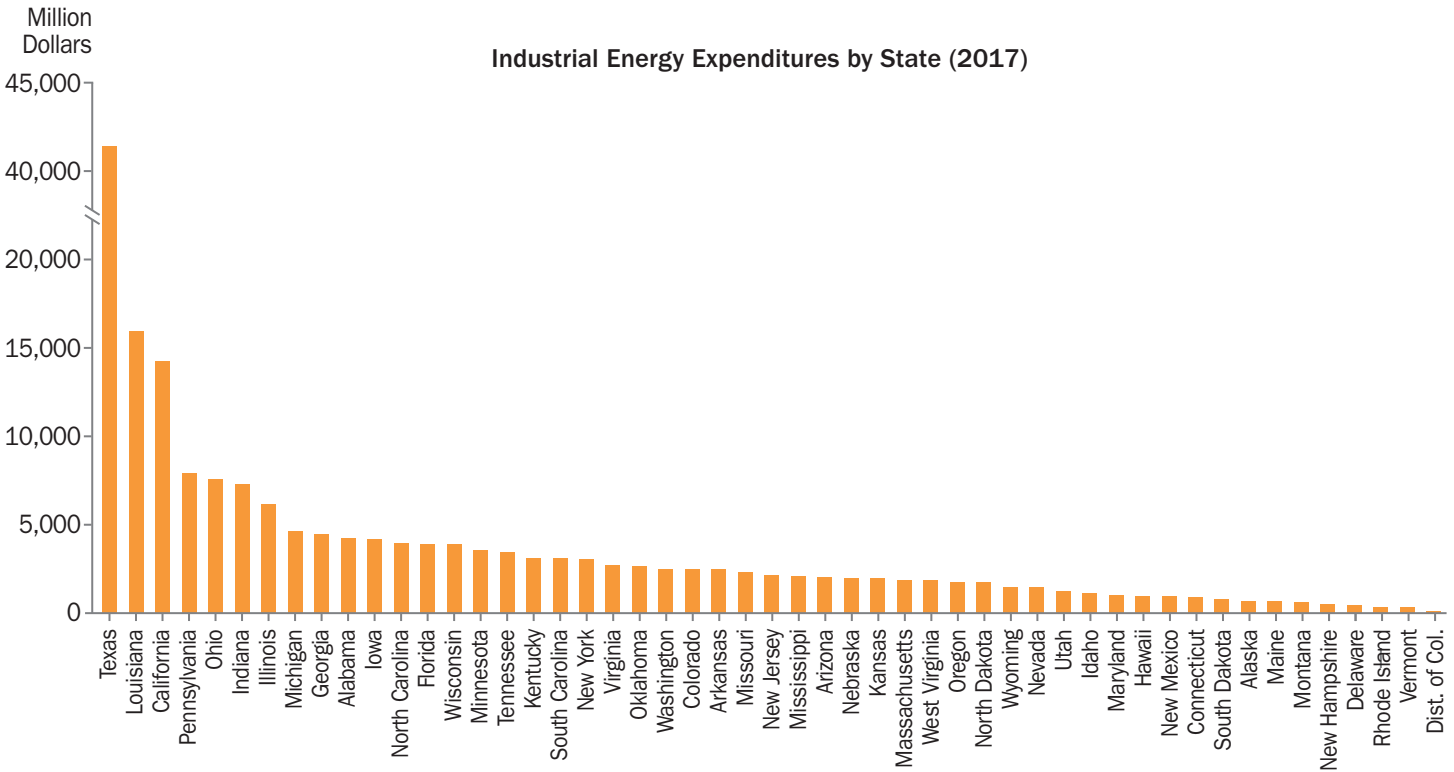


Source: EIA State Energy Data System (SEDS)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Price ($/million btu). The marks are labeled by sum of Price ($/million btu). Details are shown for State.

State Level: Industrial Energy Expenditure

In 2017, the three states with the highest industrial energy expenditures were Texas, Louisiana, and California. These three states account for 37% of all industrial energy expenditures.

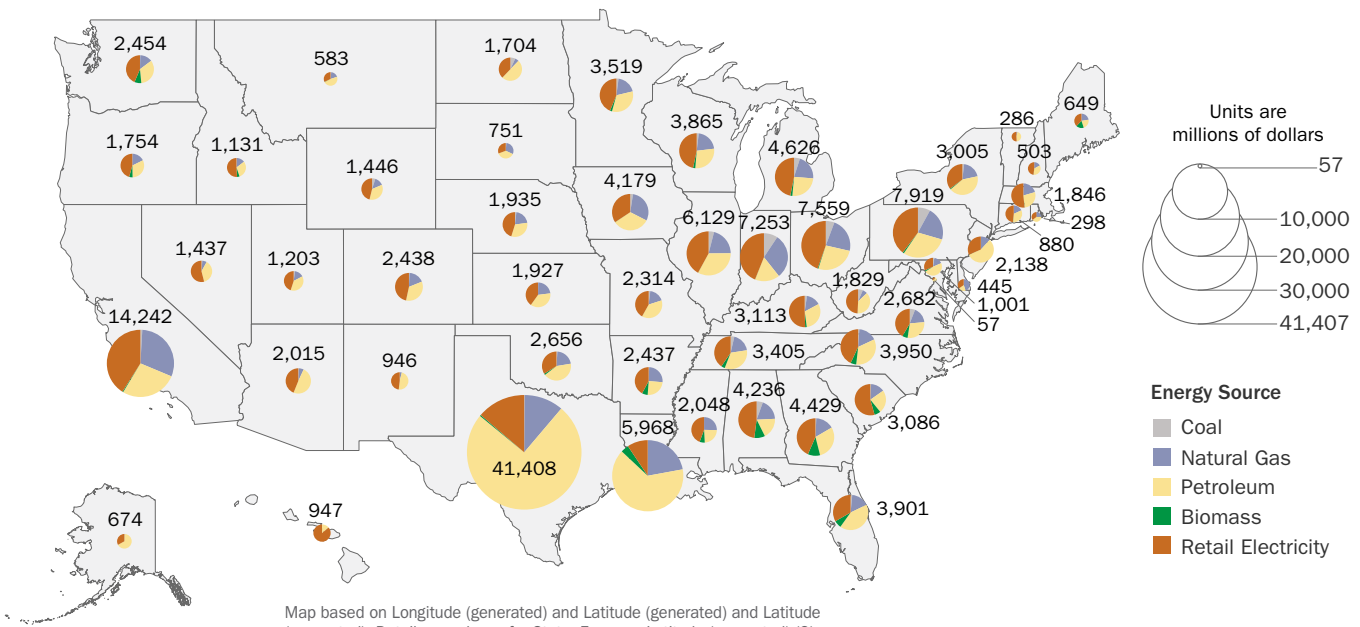


Source: EIA State Energy Data System (SEDS)

Industrial Energy Expenditure by State and Source

In addition to being the largest industrial energy user, Texas also purchases a higher portion of petroleum fuels. Petroleum accounted for 75% of Texas expenditures in 2017, compared to the national average of 44%.

Industrial Energy Expenditures by State and Source (2017)



Source: EIA State Energy Data System (SEDS)

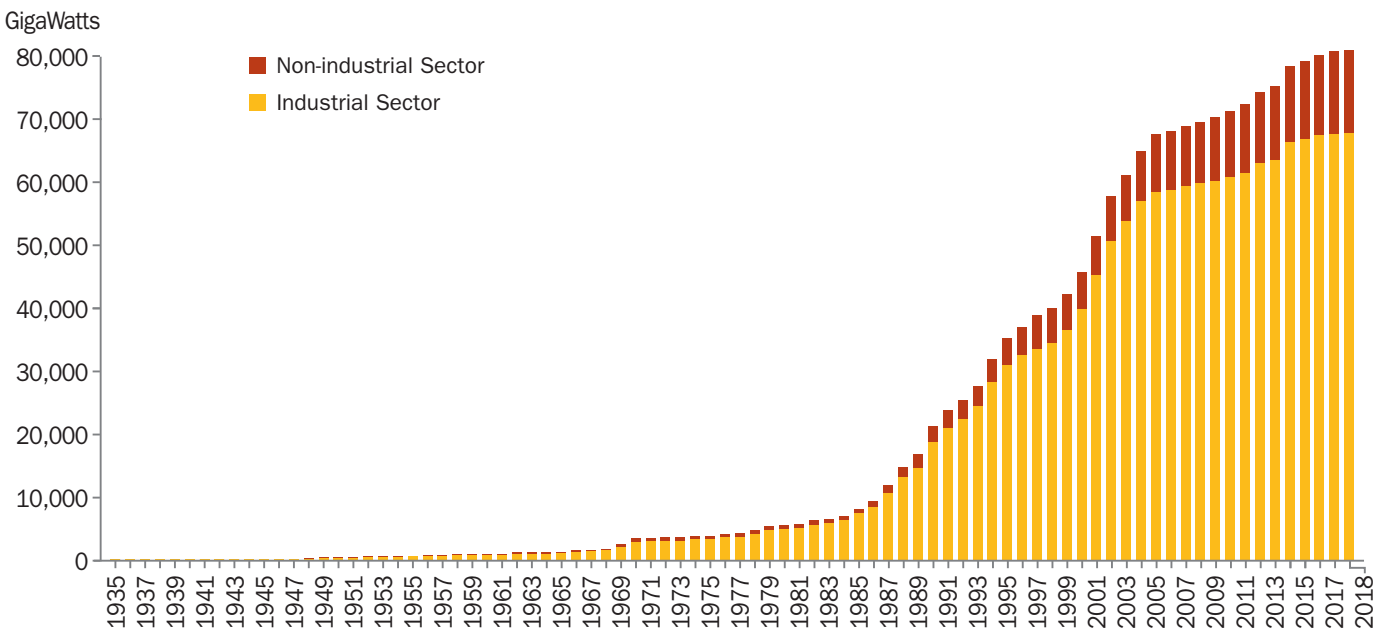
Map based on Longitude (generated) and Latitude (generated) and Latitude (generated). Details are shown for State. For pane Latitude (generated) (2): Color shows details about Energy Source. Size shows sum of Expenditure (million dollars).

IV. Industrial Combined Heat and Power

Combined Heat and Power: Cumulative Capacity

In 2018, the industrial sector represented over 83% of the total combined heat and power (CHP) cumulative capacity in the United States.

Combined Heat and Power (CHP) Cumulative Capacity (1935–2018)

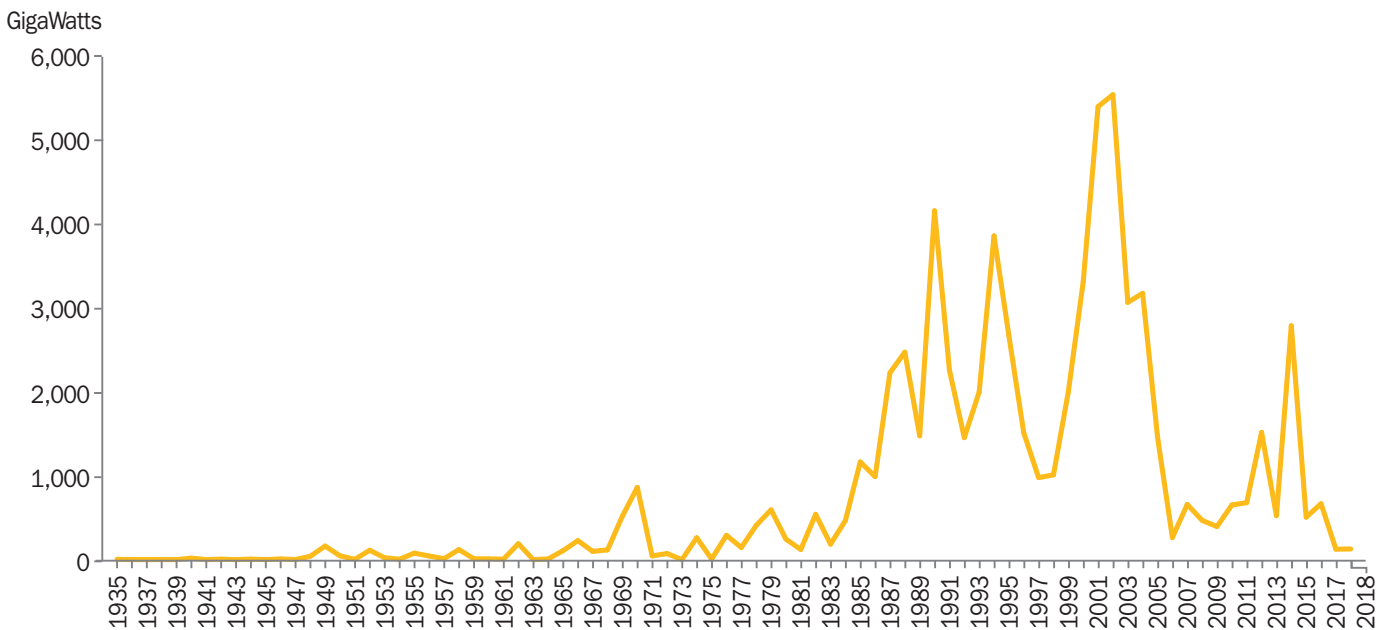


Source: DOE CHP Installation Database
Note: GW = gigawatts

Combined Heat and Power: Annual Capacity Addition

CHP capacity expanded significantly between 1985 and 2005 and peaked in 2002.

Industrial CHP Annual Capacity Addition (1935–2018)

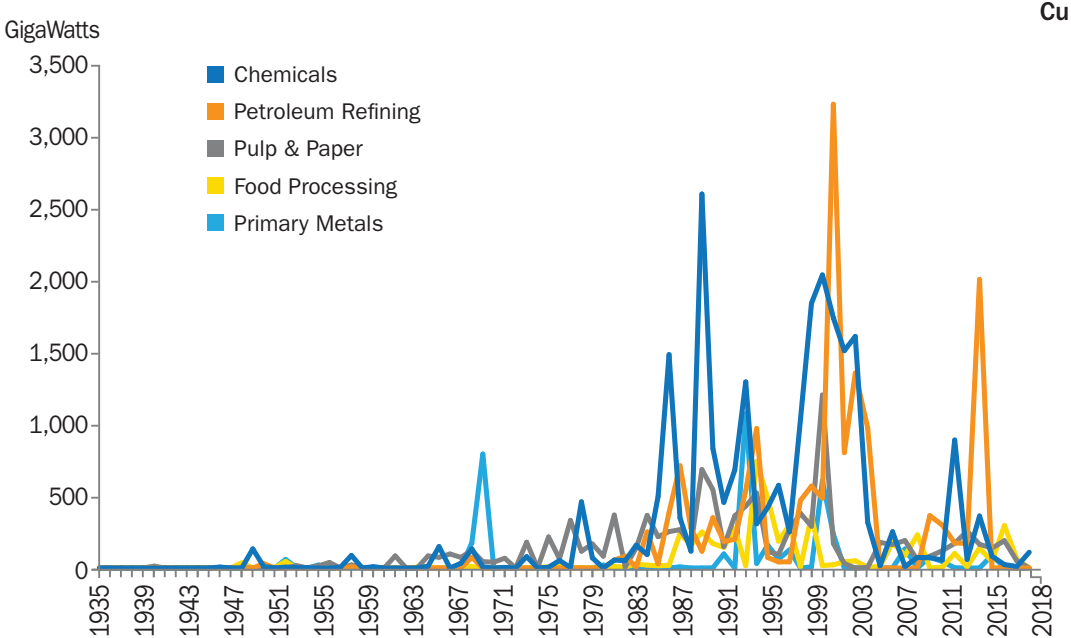


Source: DOE CHP Installation Database

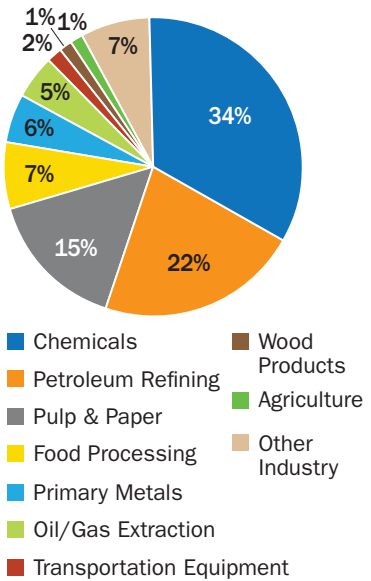
Combined Heat and Power: Capacity Addition

The five industrial subsectors with the highest CHP cumulative capacity in 2018 were chemicals, petroleum refining, pulp and paper, food processing, and primary metals. Together these subsectors accounted for 84% of cumulative capacity.

Industrial CHP Annual Capacity Addition by Subsector (1935–2018)



Industrial CHP Cumulative Capacity by Subsector (2018)



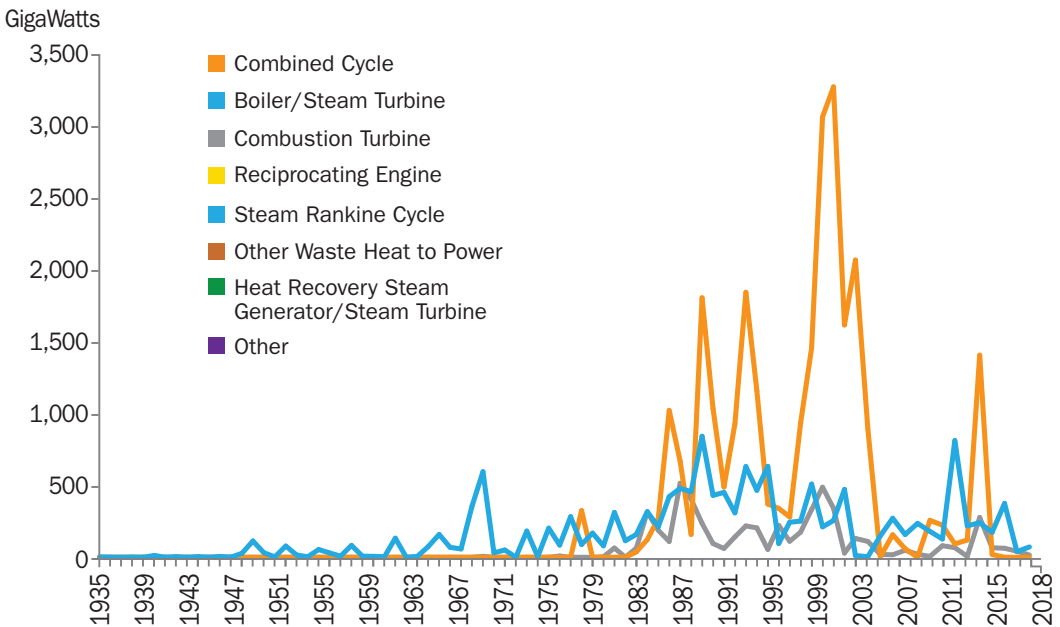
IV

Source: DOE CHP Installation Database

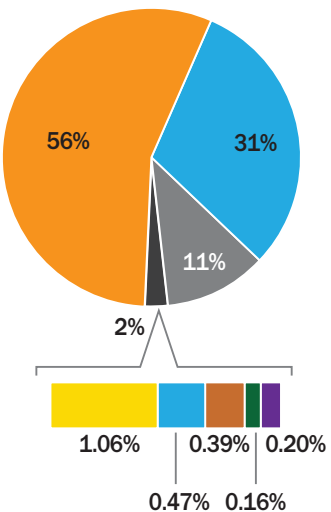
Combined Heat and Power: Capacity Addition

The top three technologies that had the highest industrial CHP cumulative capacity in 2018 were combined cycle, boiler/steam turbine, and combustion turbine. Together they accounted for nearly 98% of cumulative capacity.

Industrial CHP Annual Capacity Addition by Technology (1935–2018)



Industrial CHP Cumulative Capacity by Technology (2018)



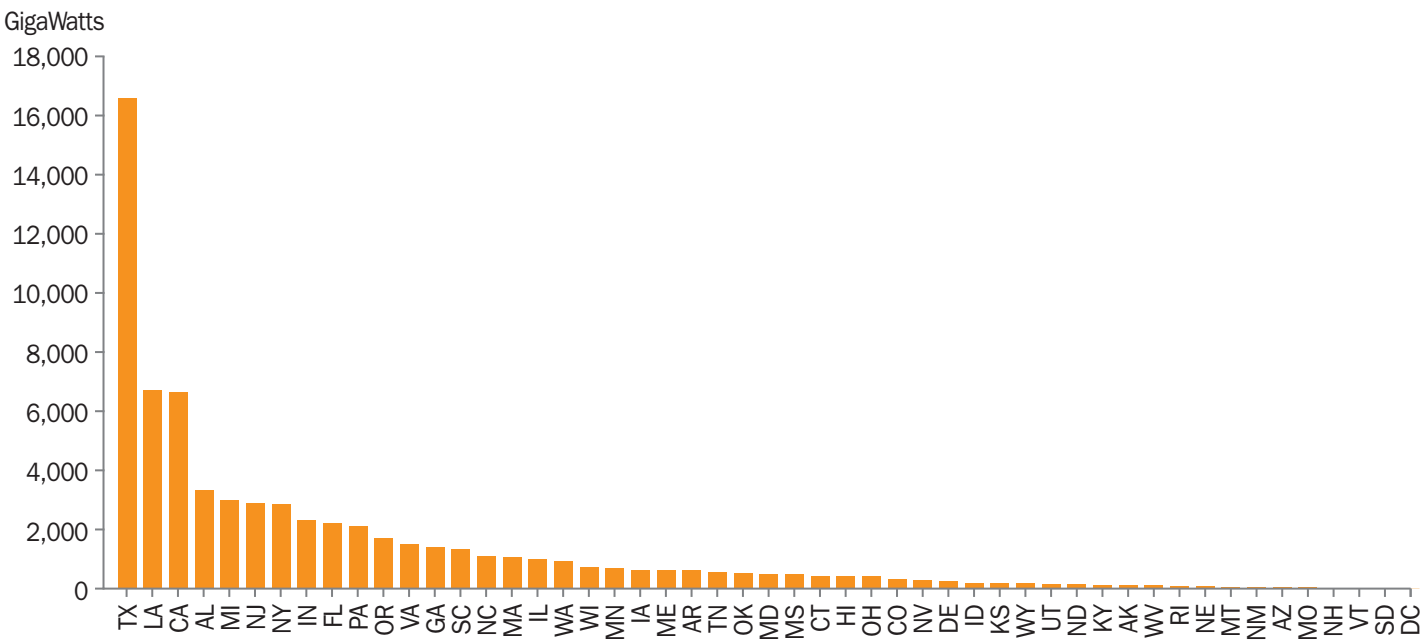
IV

Source: DOE CHP Installation Database

Combined Heat and Power: Cumulative Capacity by State

The five states with the highest industrial CHP cumulative capacity in 2018 were Texas, Louisiana, California, Alaska, and Michigan.

Industrial CHP Cumulative Capacity by State (2018)



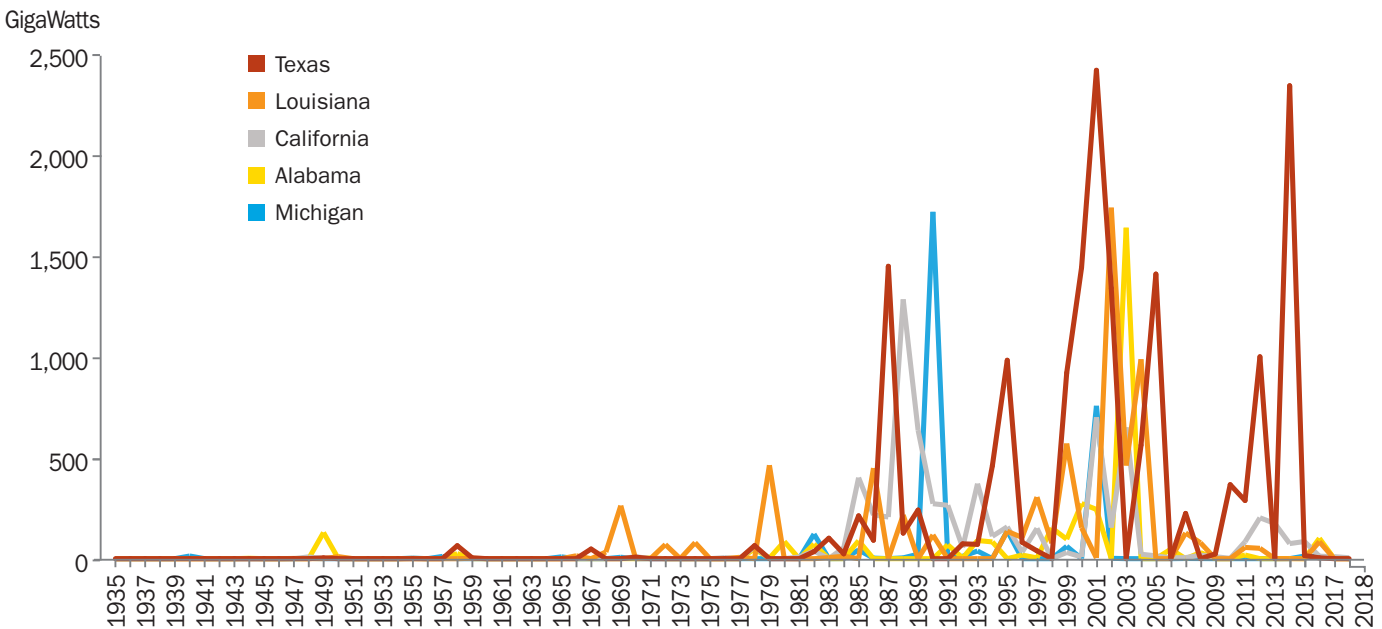
IV

Source: DOE CHP Installation Database

Combined Heat and Power: Annual Capacity Addition

The significant expansion of CHP capacity between 1985 and 2005 was led by Texas. Large additions also occurred in Michigan and California during the beginning of this period, while large additions in Louisiana and Alabama occurred at the end.

Industrial CHP Annual Capacity Addition (Top Five States) (1935–2018)



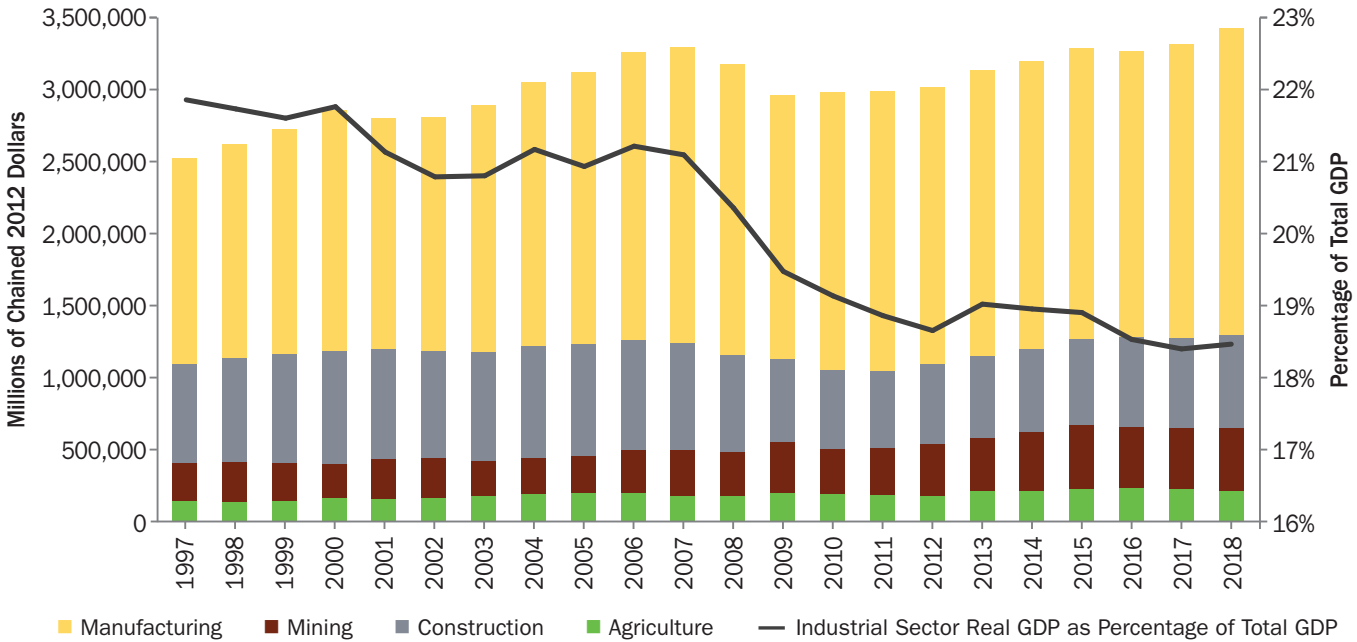
Source: DOE CHP Installation Database

V. Industrial Economic Activity

Overview: Industrial Sector Real GDP

In addition to being the largest energy-using industrial subsector, manufacturing is the largest contributor to GDP. However, the contribution of industry to GDP continues to its overall decline since 1997, reaching about 18% in 2018.

Industrial Sector Real Gross Domestic Product, or GDP (1997–2018)

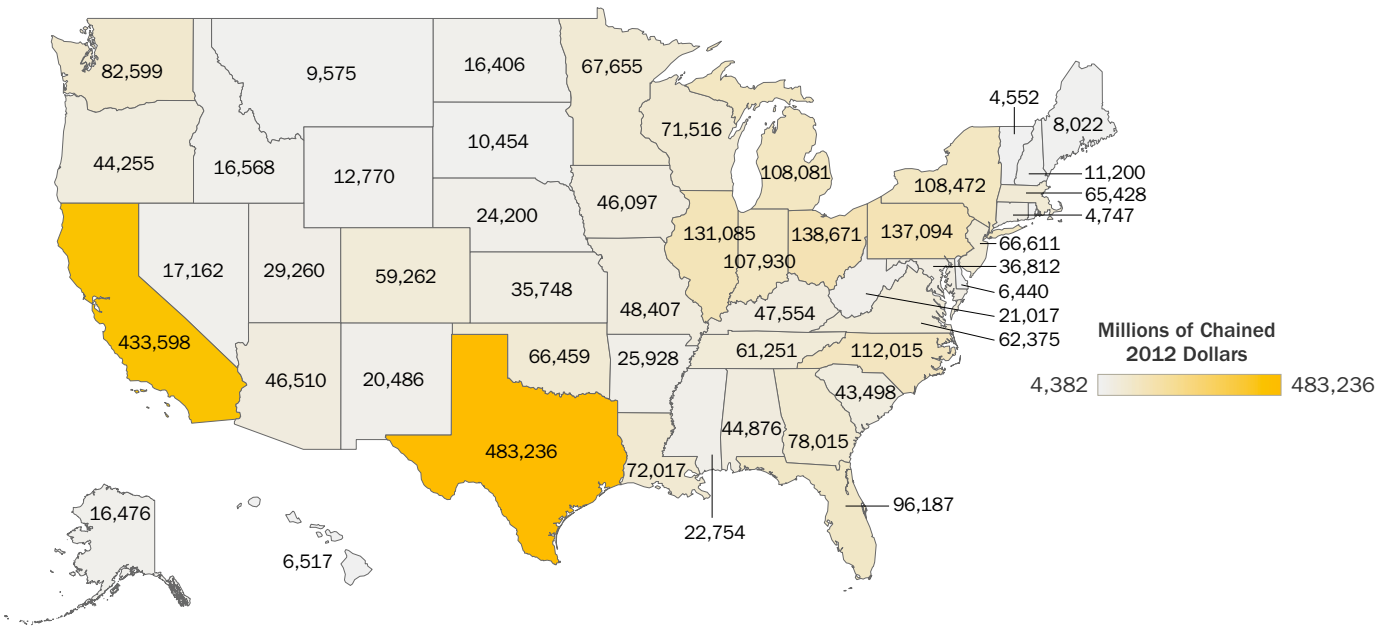


Source: BEA

Overview: Industrial Sector Real GDP by State

The three states with the highest industrial sector real GDP in 2018 were Texas, California, and Ohio. Together these states account for nearly one-third of total industrial GDP.

Industrial Sector Real GDP by State (2018)



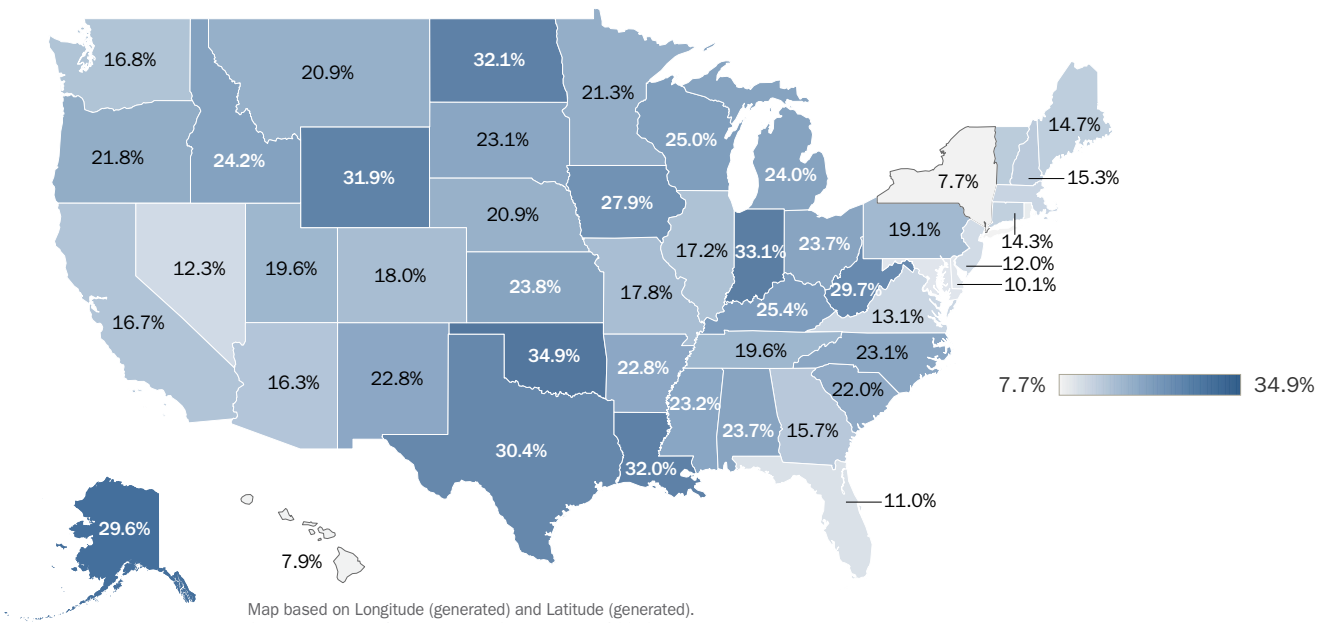
Map based on Longitude (generated) and Latitude (generated). Color shows sum of industrial sector real GDP. The marks are labeled by sum of industrial sector real GDP. The marks are labeled by sum of Industrial sector real GDP as % of total GDP. Details are shown for State.

Source: BEA

Overview: Industrial Sector Real GDP

In 2018 the three states with the highest industrial portion of total GDP were Oklahoma, Indiana, and North Dakota. The industrial sector accounted for about one-third of the total GDP for each state. This compares to a national average of about 18%.

Industrial Sector Real GDP as Percentage of Total GDP by State (2018)



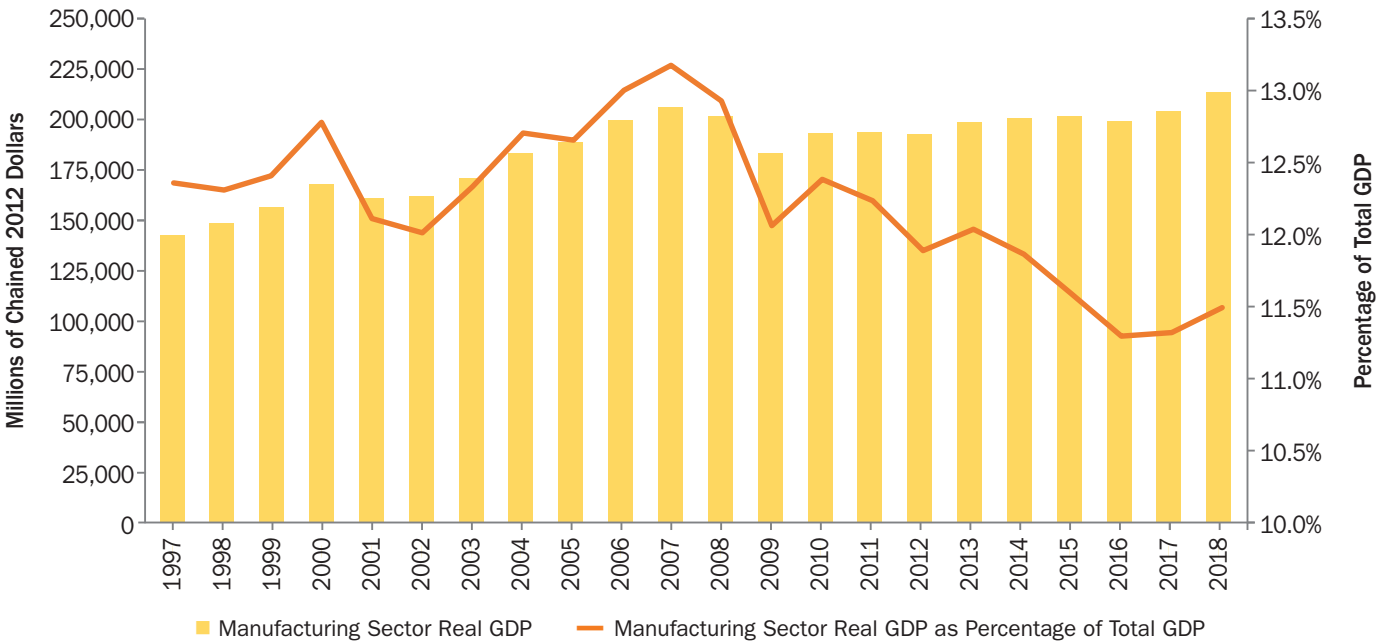
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Industrial real GDP (millions of 2012 chained dollars). The marks are labeled by sum of Industrial real GDP (millions of 2012 chained dollars). Details are shown for State.

Source: BEA

Manufacturing: Real GDP

Manufacturing GDP has increased gradually since 2009. By 2018, GDP grew larger than its pre-recession level in 2007. The sector's size relative to total GDP also increased in 2017 and 2018.

Manufacturing Sector Real GDP (1997–2018)

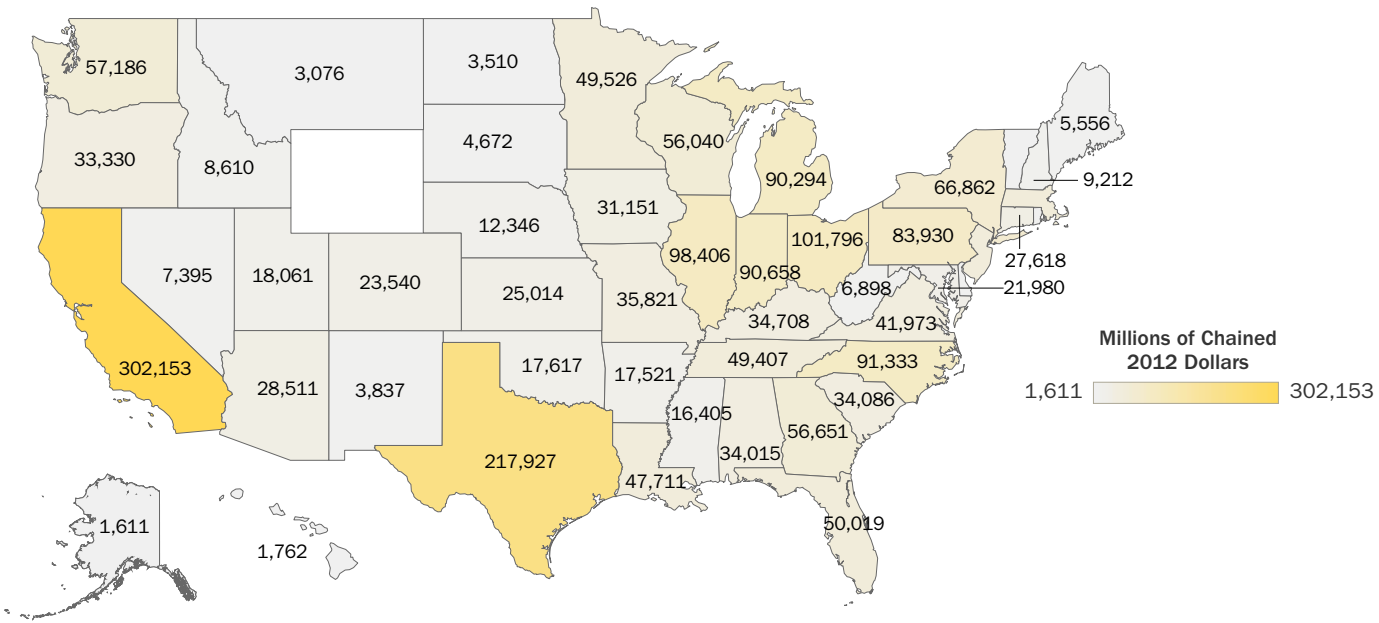


Source: BEA

Manufacturing: Real GDP by State

The three states with highest industrial sector real GDP in 2018–Texas, California, and Ohio—were also the three states with the highest manufacturing GDP. Together these states account for 30% of total manufacturing GDP.

Manufacturing Sector Real GDP by State (2017)



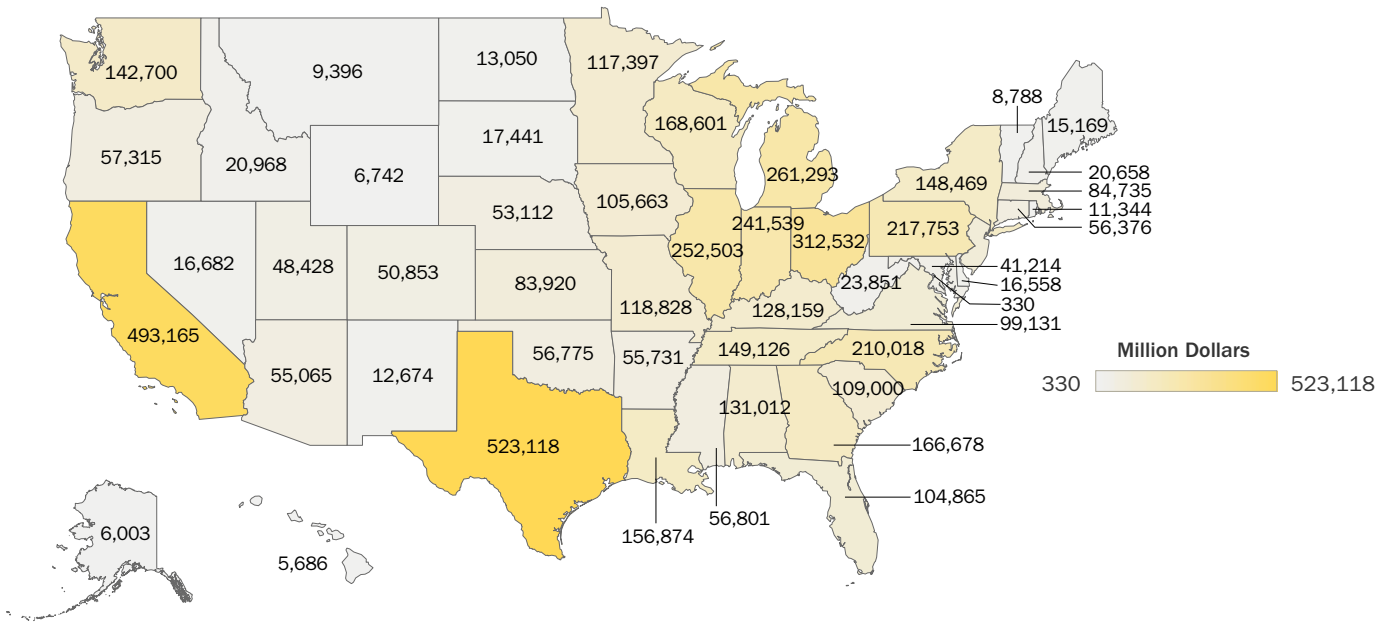
Source: BEA

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Millions Of Chained 2012 Dollars. The marks are labeled by sum of Millions Of Chained 2012 Dollars. Details are shown for State.

Manufacturing: Total Values of Shipments and Receipts for Service by State

The three states with the highest total values of shipments and receipts for services in 2016 were Texas, California, and Ohio.

Manufacturing Total Value of Shipments and Receipts for Services by State (2016)



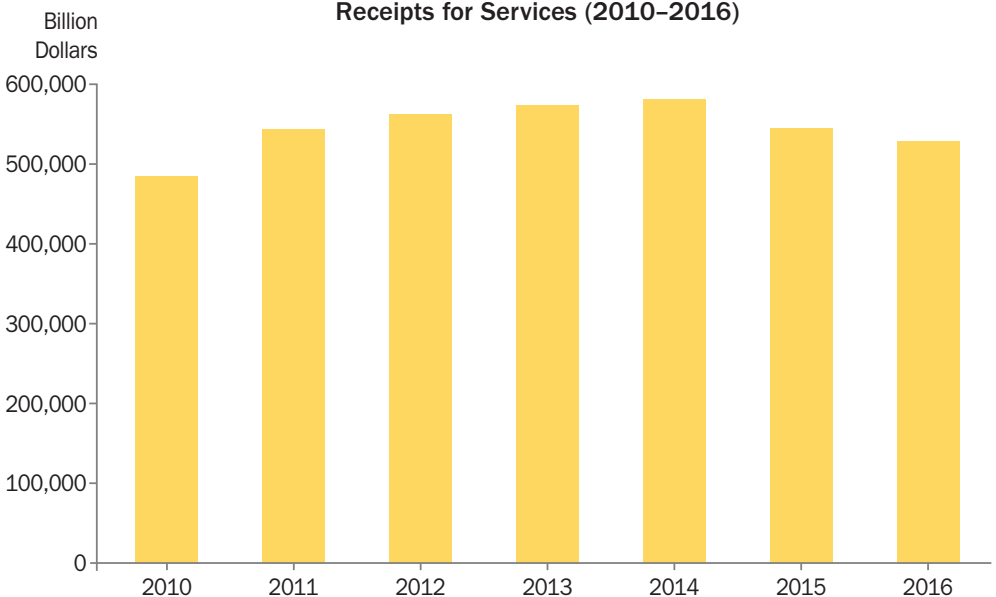
Source: U.S. Census Bureau Annual Survey of Manufacturers (ASM)

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Millions Of Chained 2012 Dollars. The marks are labeled by sum of Millions Of Chained 2012 Dollars. Details are shown for State.

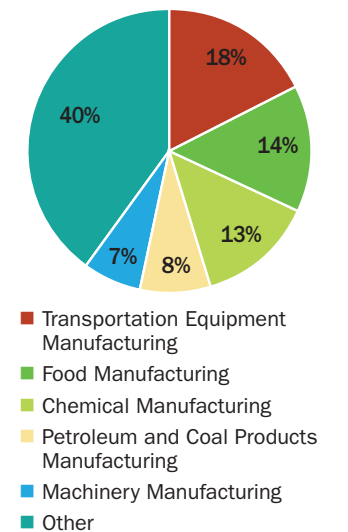
Manufacturing: Total Value of Shipments and Receipts for Services (Nominal)

The total value of shipments and receipts for services has declined since 2014, driven by the drop in petroleum prices for the petroleum and coal products manufacturing sector.

Manufacturing Total Value of Shipments and Receipts for Services (2010–2016)



Manufacturing Value of Shipments and Receipts for Services by Subsector (2016)



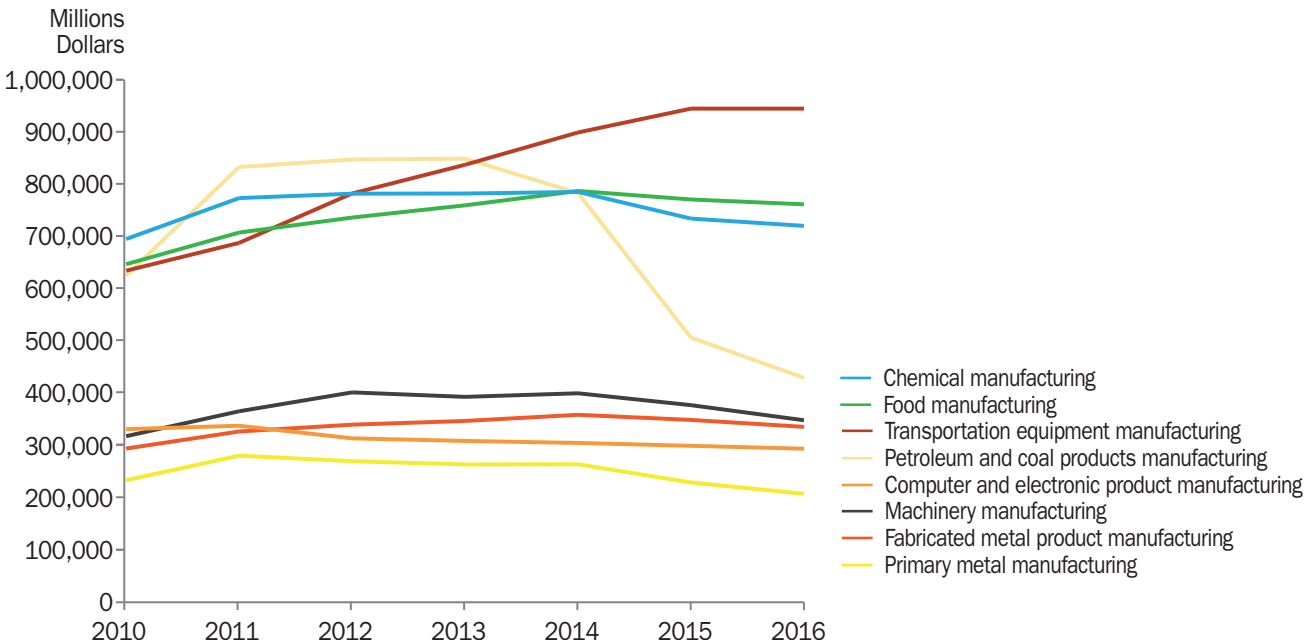
V

Source: U.S. Census Bureau: Annual Survey of Manufactures (ASM)

Manufacturing: Value of Shipments of Receipts for Services by Subsector

In 2016, three industries—transportation equipment manufacturing, food manufacturing, and chemical manufacturing—comprised 45% of all manufacturing value of shipments and receipts for services.

Manufacturing Value of Shipments of Receipts for Services by Subsector (2016)

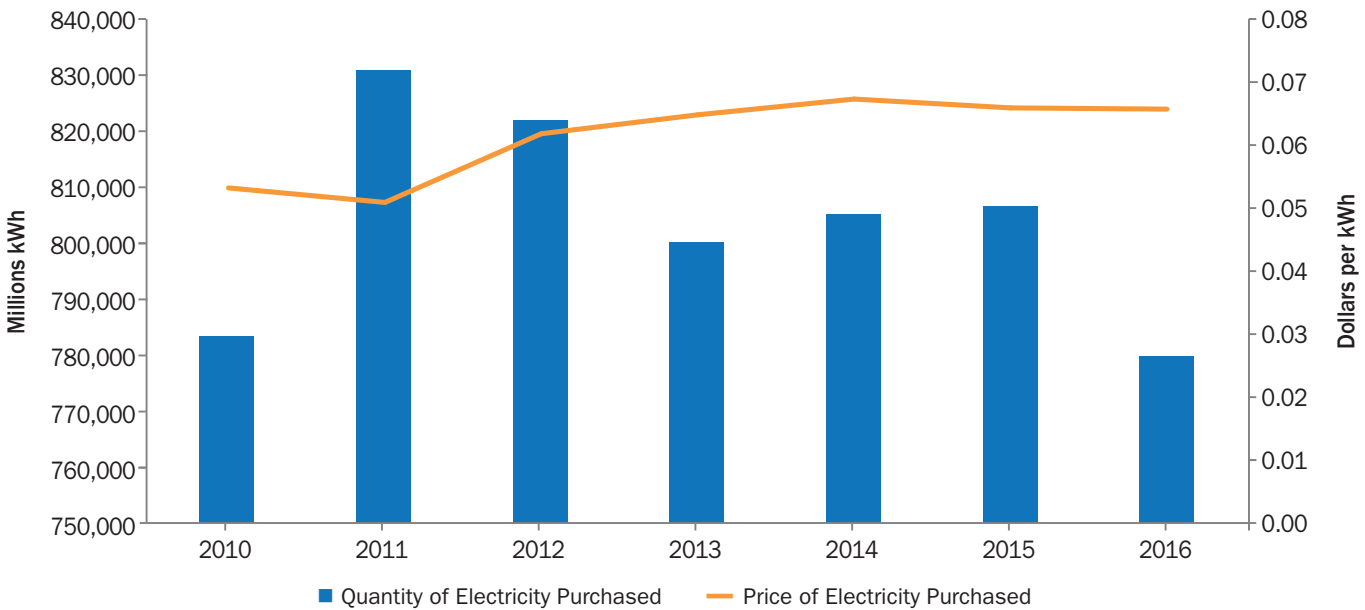


Source: U.S. Census Bureau: Annual Survey of Manufactures (ASM)

Manufacturing: Sector Quantity and Price of Purchased Electricity

In 2016, the quantity of electricity purchased by manufacturers decreased, dropping below the quantity in 2010.

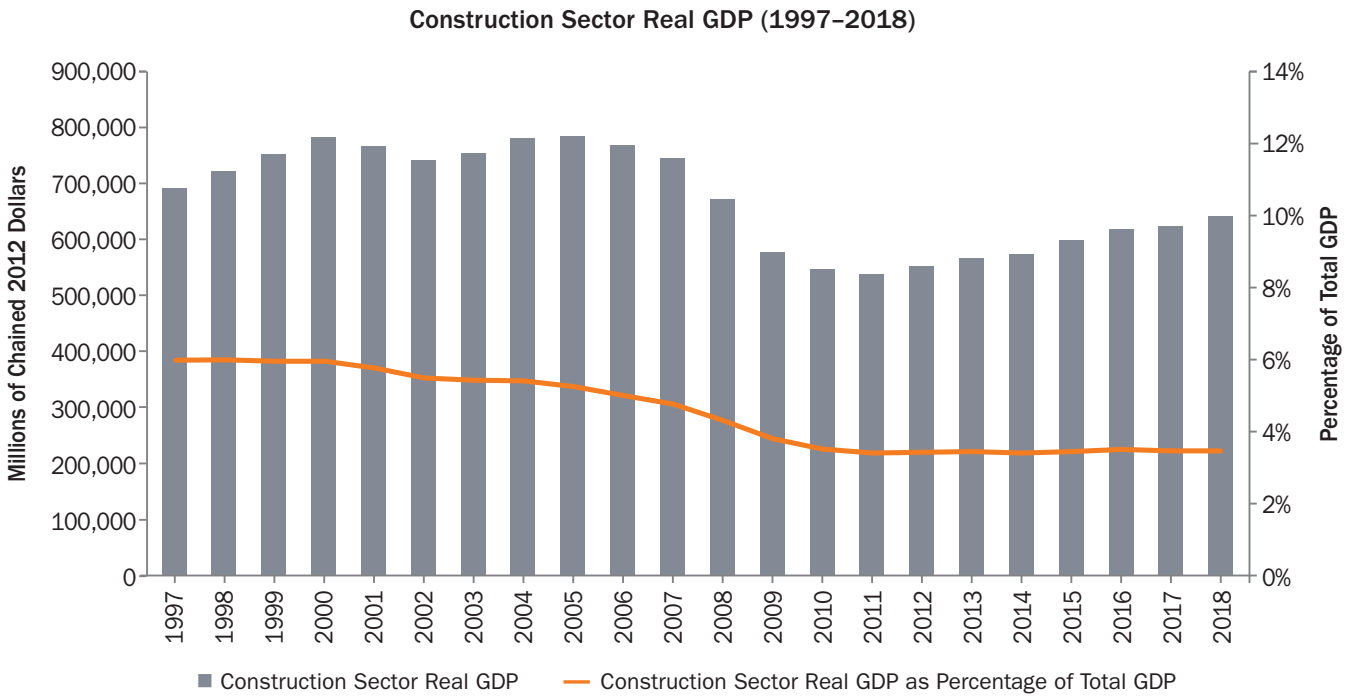
Manufacturing Sector Quantity and Price of Purchased Electricity (2010–2016)



Source: U.S. Census Bureau: Annual Survey of Manufactures (ASM)

Construction: Real GDP

Construction sector real GDP continues to rebound from the 2007-2009 recession, but its portion of total GDP has remained relatively constant since 2010.

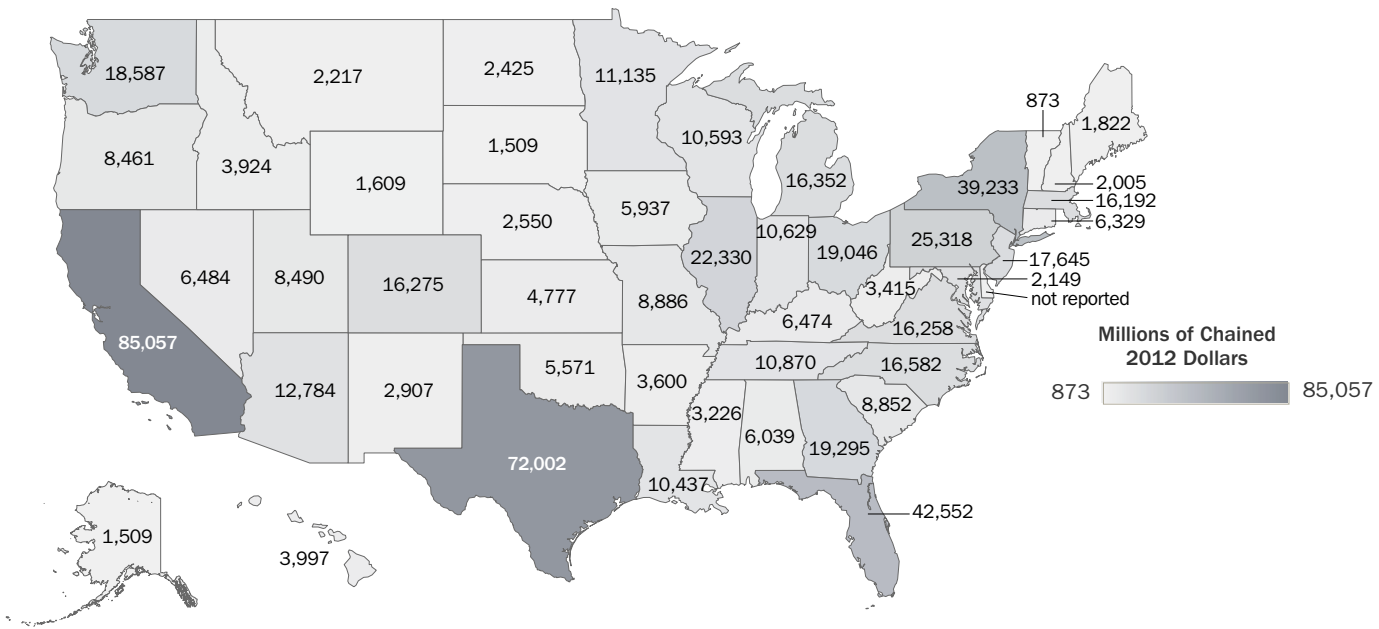


Source: BEA

Construction: Real GDP by State

The three states with the highest construction sector real GDP in 2018 were California, Texas, and Florida.

Construction Sector Real GDP by State (2018)



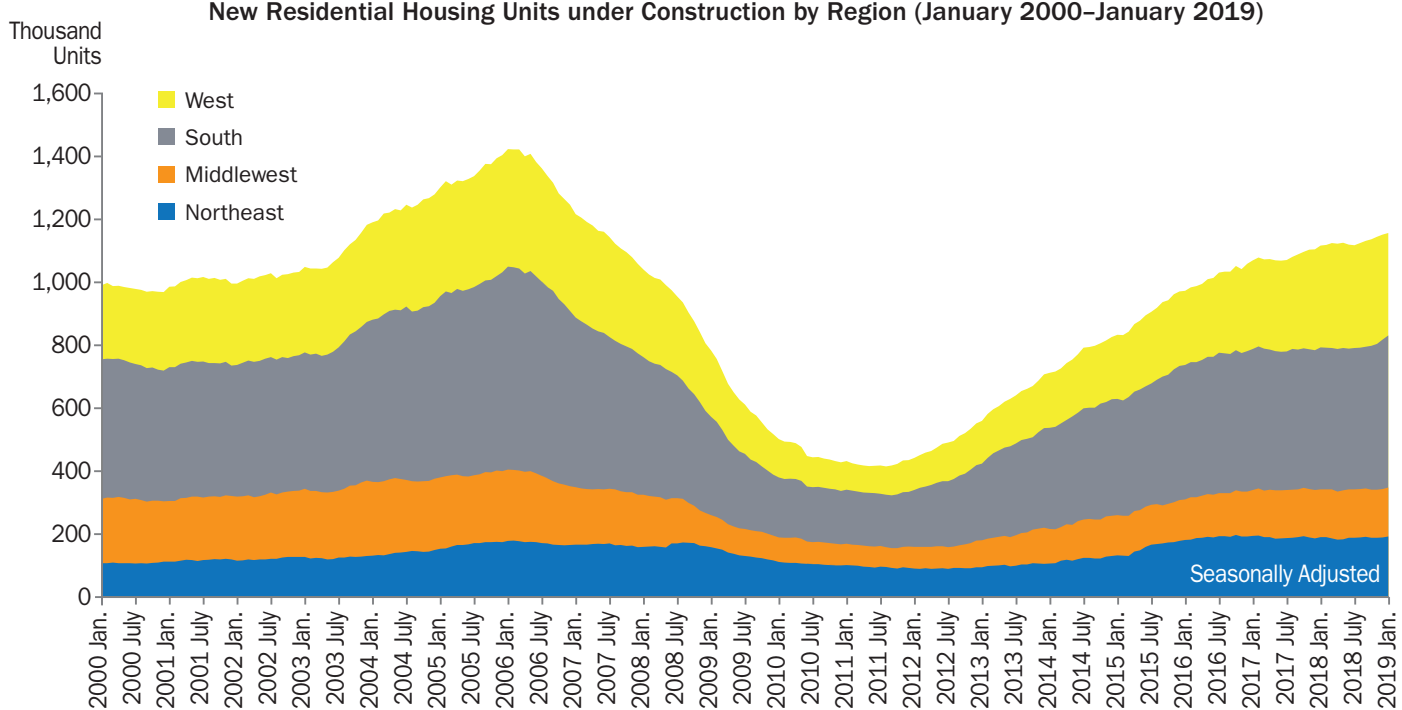
Source: BEA

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Millions Of Chained 2012 Dollars. The marks are labeled by sum of Millions Of Chained 2012 Dollars. Details are shown for State.

Construction: New Residential Housing Units under Construction by Region

Like construction GDP, new residential housing units under construction dropped significantly during the 2007-2009 recession. New housing units have increased to pre-crisis levels in the Northeast and West but not in the South or Midwest.

New Residential Housing Units under Construction by Region (January 2000–January 2019)



Source: U.S. Census Bureau New Residential Construction

Construction: Spending by Sector

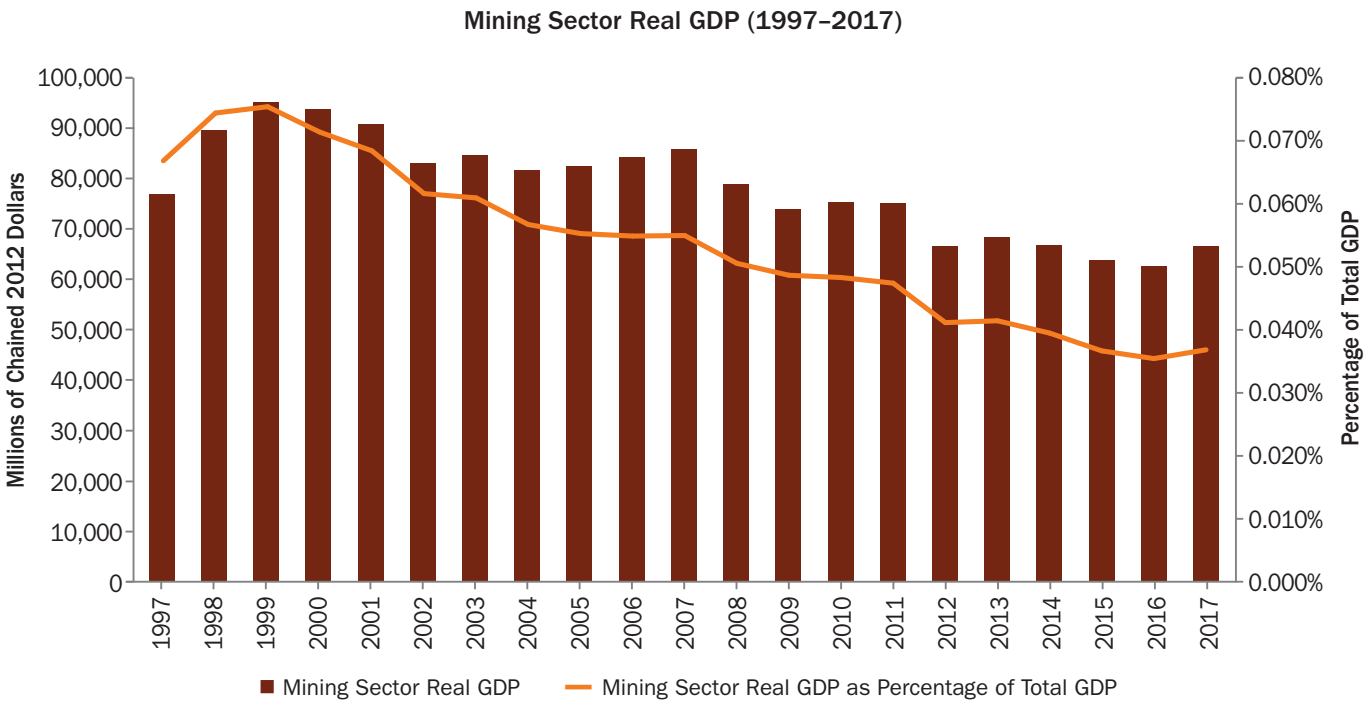
Both residential and non-residential construction spending continue to increase since 2011.

Construction Spending by Sector (2009– 2018)

Source: U.S. Census Bureau Construction Spending

Mining: Real GDP

In 2017 mining sector real GDP increased in absolute terms and as a portion of total GDP, although both have been in overall decline since 1999

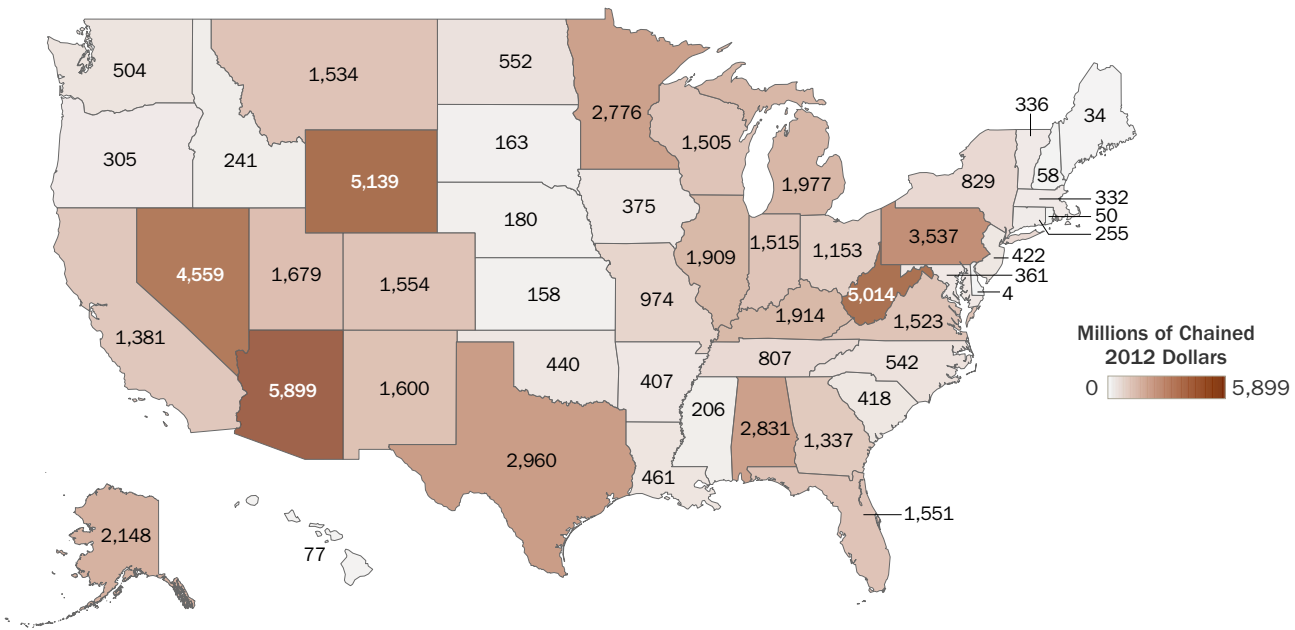


Source: BEA

Mining: Real GDP by State

The three states with the highest mining sector real GDP in 2017 were Arizona, Wyoming, and West Virginia. These three states accounted for 25% of total mining GDP.

Mining Sector Real GDP by State (2017)



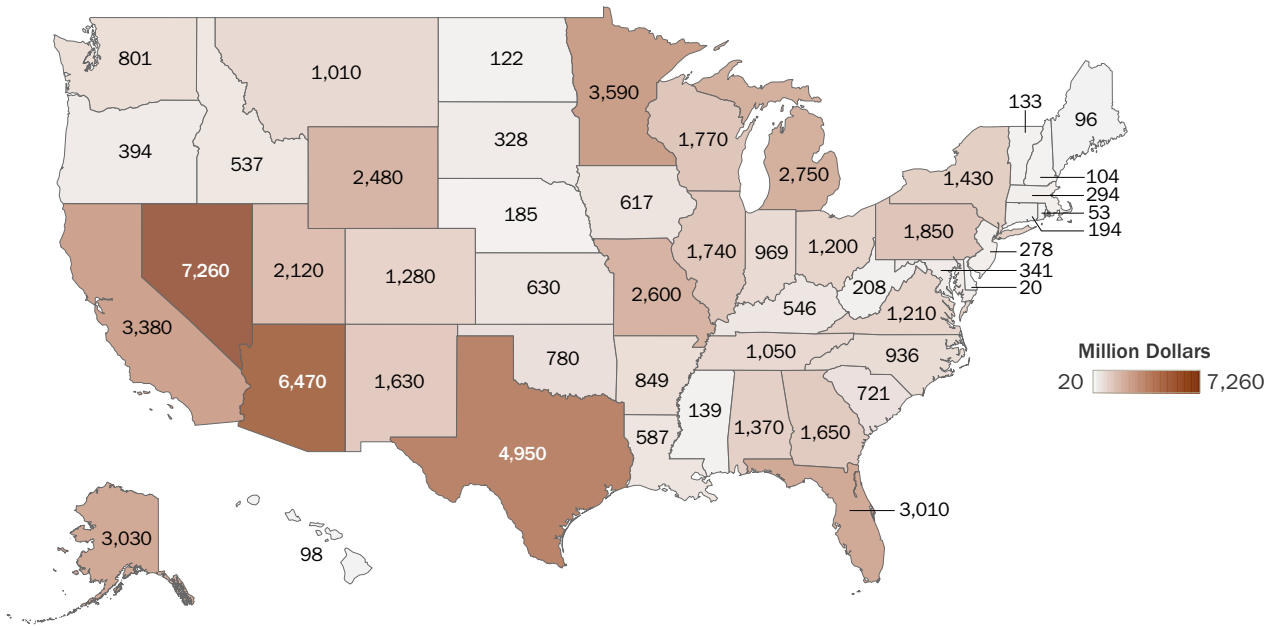
Source: BEA
© 2019 Mapbox © OpenStreetMap TBD

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Millions Of Chained 2012 Dollars. The marks are labeled by sum of Millions Of Chained 2012 Dollars. Details are shown for State.

Mining: Nonfuel Mineral Production Value by State

The three states with the highest nonfuel mineral production value in 2015 were Nevada, Arizona, and Texas.

Nonfuel Mineral Production Value by State (2015)

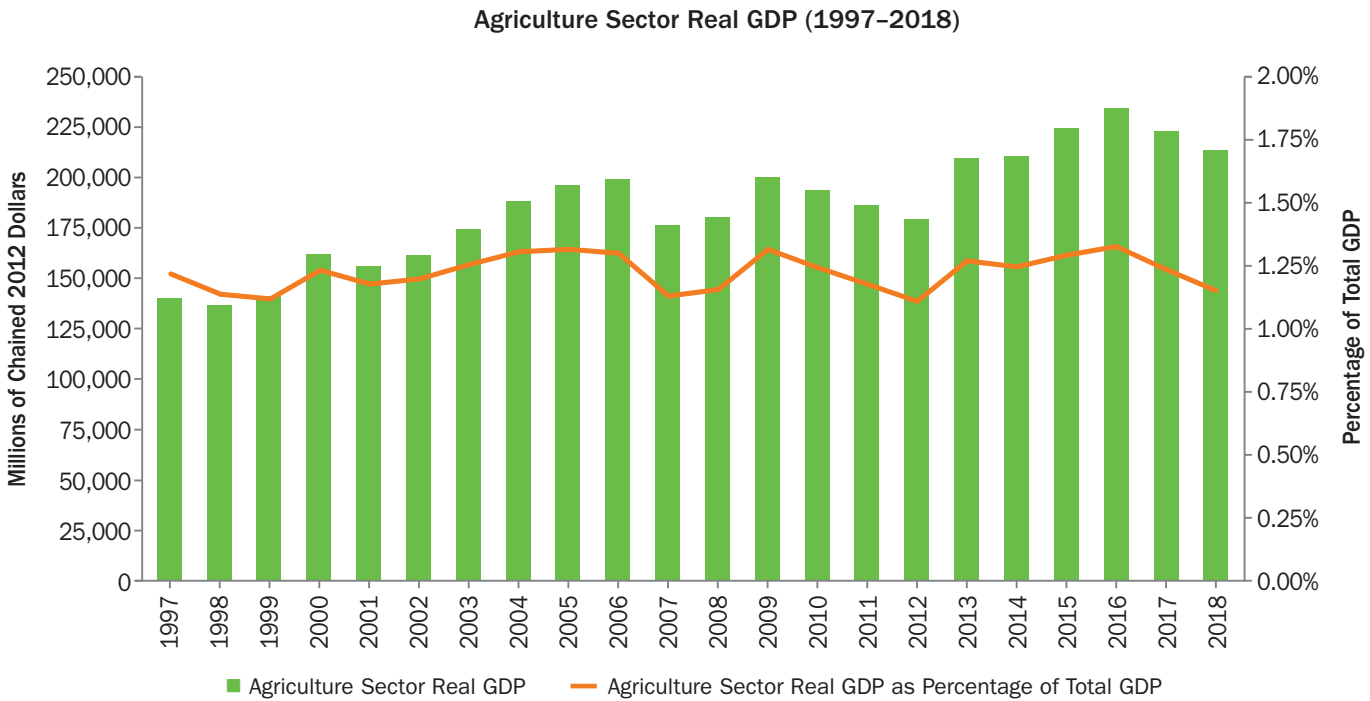


Source: USGS Minerals Yearbook 2015

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Million dollars. The marks are labeled by sum of Million dollars. Details are shown for State.

Agriculture: Real GDP

In 2018, agriculture GDP continued to decrease from 2016 in absolute terms and as a portion of total GDP.

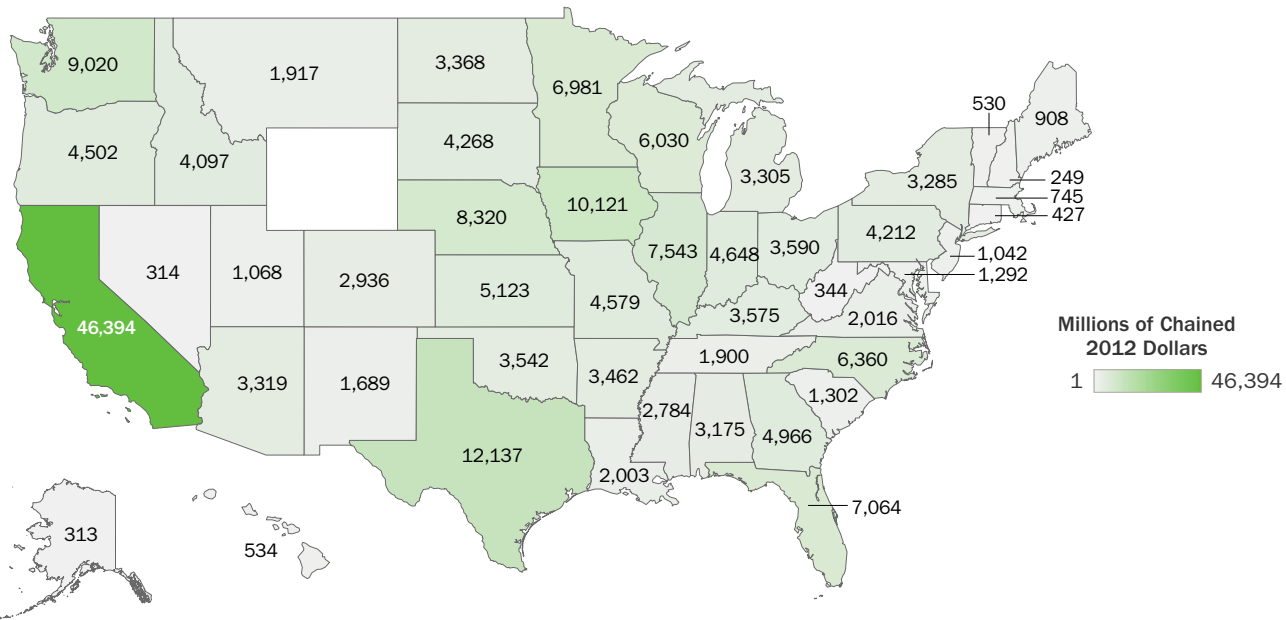


Source: BEA

Agriculture: Real GDP by State

The three states with the highest agricultural sector real GDP in 2018 were California, Texas, and Iowa. These three states together accounted for nearly one-third of agriculture GDP.

Agricultural Sector Real GDP by State (2018)



Source: BEA

Note: Data for Wyoming, Rhode Island, and Delaware withheld to avoid disclosure of confidential information.

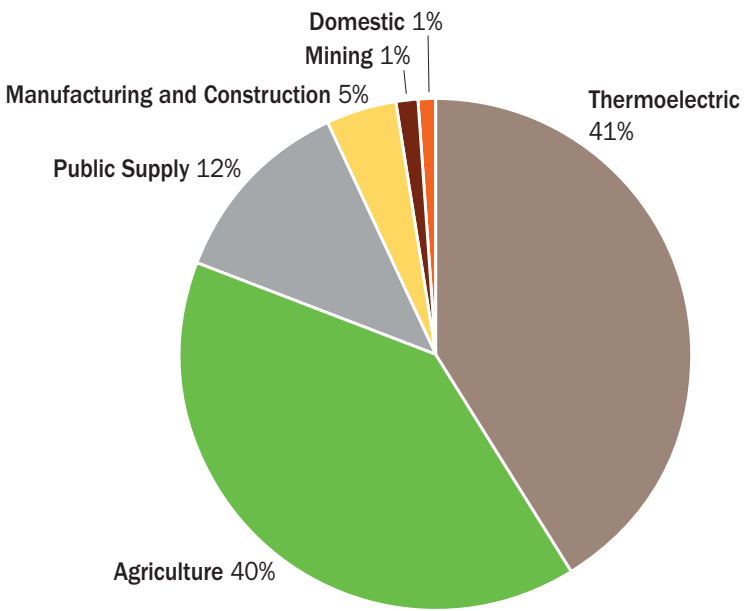
Map based on Longitude (generated) and Latitude (generated). Color shows sum of Millions Of Chained 2012 Dollars. The marks are labeled by sum of Millions Of Chained 2012 Dollars. Details are shown for State.

VI. Industrial Water Uses

National Level: Water Withdrawals by Sector

Water used to produce steam by thermoelectric generators accounts for the largest use of water withdrawals as defined by USGS. However, the industrial sector—defined in terms of agricultural, construction, manufacturing subsectors—represents a larger source and accounts for nearly 46% of withdrawals.

U.S. Water Withdrawals by Sector (2015)

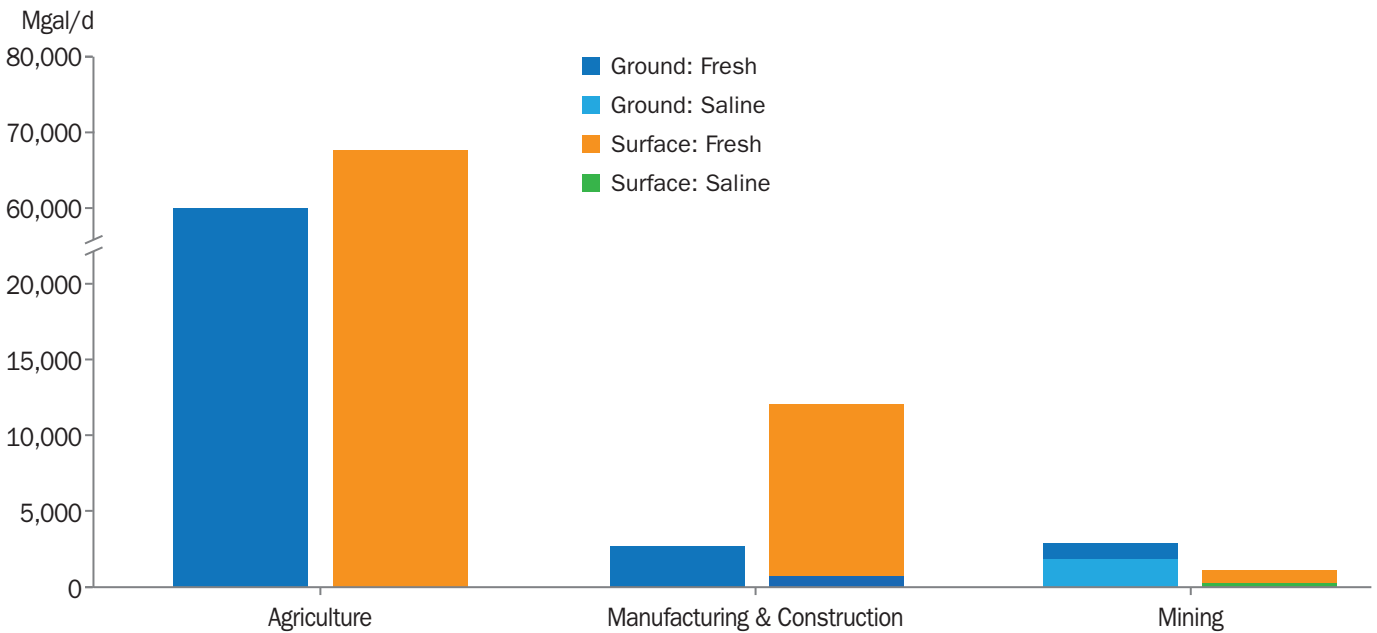


Source: USGS Estimated Use of Water in the United States in 2015

National Level: Water Withdrawals by Subsector and Source

Surface water sources constitute a much larger portion of manufacturing and construction withdrawals than the other industrial subsectors.

U.S. Industrial Water Withdrawals by Subsector and Source (2015)

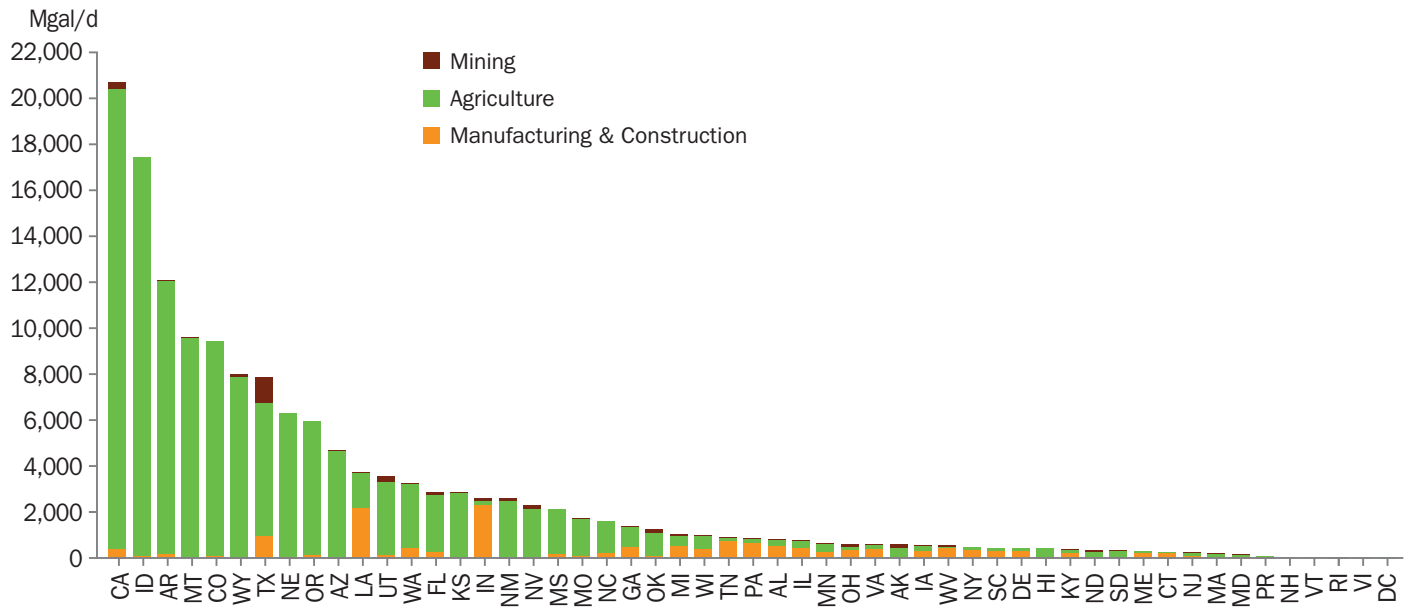


Source: "USGS Estimated Use of Water in the United States in 2015
Note: Mgal-day = Millions of Gallons per Day

State Level: Industrial Water Withdrawals by State and Subsector

California withdraws the most water for agriculture and in total; Indiana withdraws the most water for manufacturing; and Texas withdraws the most water for mining.

Industrial Water Withdrawals by State and Subsector (2015)



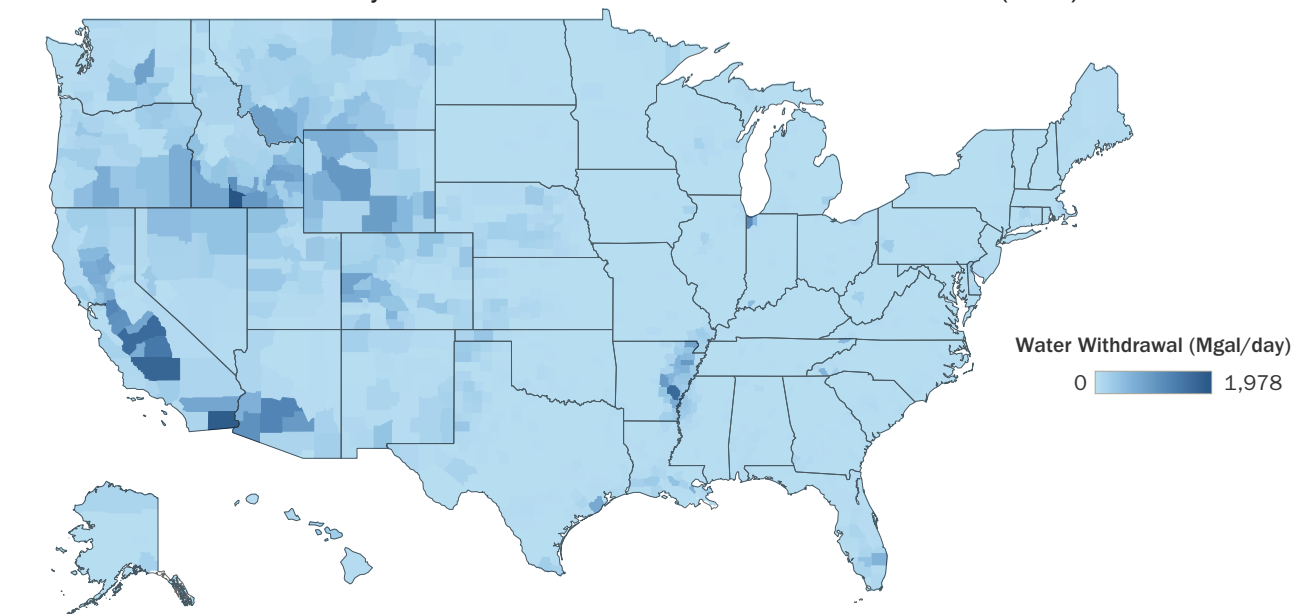
Source: USGS Estimated Use of Water in the United States in 2015

County-Level: Total Water Withdrawal in the Industrial Sector

Top 10 counties with the most industrial water withdrawals in 2015 (Mgal/day) were:

1. Twin Falls County, Idaho (1,978)
2. Imperial County, California (1,878)
3. Kern County, California (1,754)
4. Arkansas County, Arkansas (1,676)
5. Fresno County, California (1,657)
6. Tulare County, California (1,455)
7. Maricopa County, Arizona (1,252)
8. San Joaquin County, California (1,236)
9. Lake County, Indiana (1,186)
10. Gooding County, Idaho (1,096)

County-Level Total Water Withdrawal in the Industrial Sector (2015)



Source: USGS Estimated Use of Water in the United States in 2015

Map based on Longitude (generated) and Latitude (generated). Color shows sum of Industrial water withdrawal (Mgal/day). Details are shown for State and County.

Note: Incudes all industrial fresh and saline withdrawals from ground and surface sources.

VII. Glossary

Glossary

All definitions unless otherwise noted come from the EIA glossary (https://www.eia.gov/tools/glossary/index.php)

Agriculture

An energy-consuming subsector of the industrial sector that consists of all facilities and equipment engaged in growing crops and raising animals (EIA)

Biomass Losses and Coproducts

The remainder of biomass feedstocks that are not converted into deliverable fuels, but are used as combustion fuels

Combined Heat and Power (CHP)

A plant designed to produce both heat and electricity from a single heat source (EIA)

Consumptive Water Use

The portion of water withdrawn that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise not available for immediate use. Water returned to a different watershed than the point of withdrawal (interbasin transfer) is not considered a consumptive use ("Water-Use Terminology," USGS, https://www.usgs.gov/mission-areas/water-resources/science/water-use-terminology?qt-science_center_objects=0#qt-science_center_objects)

Energy Carrier

Either a substance or a phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes (https://www.iso.org/obp/ui/#iso:std:iso:13600:ed-1:v1:en)

Feedstock Energy

The energy content of fuels used to produce construction materials, chemical feedstocks, lubricants, solvents, waxes, and other products

Fuel Gas

A mixture of gases (e.g., hydrogen, methane, ethane, butane, and propane) produced during petroleum refining

Gross Domestic Product (GDP)

The market value of goods and services produced by labor and property in the United States, regardless of nationality (https://www.bea.gov/help/glossary)

Hydrocarbon Gas Liquids (HGLs)

A group of hydrocarbons including ethane, propane, normal butane, isobutane, and natural gasoline, and their associated olefins, including ethylene, propylene, butylene, and isobutylene. As marketed products, HGL represents all natural gas liquids (NGL) and olefins. EIA reports production of HGL from refineries (liquefied refinery gas, or LRG) and natural gas plants (natural gas plant liquids, or NGPL). Excludes liquefied natural gas (LNG) (EIA)

Industry

A group of businesses that produce a product or provide a service (https://www.census.gov/glossary/). In terms of energy accounting and this data book, industry is defined as agriculture, construction, and manufacturing businesses

Lease and Plant Fuel

Natural gas used in well, field, and lease operations and used as fuel in natural gas processing plants

Manufacturing

An energy-consuming subsector of the industrial sector that consists of all facilities and equipment engaged in the mechanical, physical, chemical, or electronic transformation of materials, substances, or components into new products. Assembly of component parts of products is included, except for that which is included in construction (EIA)

Mining

An energy-consuming subsector of the industrial sector that consists of all facilities and equipment used to extract energy and mineral resources (EIA)

Net Electricity Use

Consumption of electricity computed as self-generation, plus imports, minus exports, minus transmission and distribution losses

No. 2 Fuel Oil

A distillate fuel oil that has a distillation temperatures of 400 degrees Fahrenheit at the 10-percent recovery point and 640 degrees Fahrenheit at the 90-percent recovery point and meets the specifications defined in ASTM Specification D 396. It is used in atomizing type burners for domestic heating or for moderate capacity commercial/industrial burner units

North American Industrial Classification System (NAICS)

A standardized, hierarchical classification of business operations

Primary Energy

Energy in the form that it is first accounted for in a statistical energy balance, before any transformation to secondary or tertiary forms of energy. For example, coal can be converted to synthetic gas, which can be converted to electricity (EIA)

Residual Fuel Oil

A general classification for the heavier oils, known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations (EIA)

Total Value of Shipments and Receipts for Services

Includes the received or receivable net selling values, "Free on Board" (FOB) plant (exclusive of freight and taxes), of all products shipped, both primary and secondary, as well as all miscellaneous receipts, such as receipts for contract work performed for others, installation and repair, sales of scrap, and sales of products bought and sold without further processing (https://www.census.gov/glossary/)

Water Withdrawal

Water removed from the ground or diverted from a surface-water source for use (https://www.usgs.gov/mission-areas/water-resources/science/water-use-terminology?qt-science_center_objects=0#qt-science_center_objects)

Wood and Wood Residuals

a category of fuel comprised of wood and wood waste, including chemical wood pulping byproducts (e.g., black liquor)

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energy.gov/eere

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