



2018 Commercial Buildings Energy Consumption Survey Consumption and Expenditures Highlights



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What is the *Commercial Buildings Energy Consumption Survey* (CBECS)?

CBECS is:

- The only independent, statistically representative source of national-level data on the characteristics and energy use of commercial buildings
- A snapshot of the commercial buildings stock and energy use for the reference year—in this case, 2018
- A sample survey where every commercial building has a known chance of being selected

EIA collects data for commercial buildings in two parts:

- We collect building characteristics through an in-person or web survey. Respondents, such as building owners and managers, completed the survey for 6,436 buildings for the 2018 CBECS, representing 5.9 million buildings in the United States.
- We collect energy usage data from suppliers of electricity, natural gas, fuel oil, and district heat.

We have conducted the CBECS periodically since 1979, as required by Congress.

- The 2018 CBECS is the 11th iteration.





Key takeaways from 2018 CBECS consumption and expenditures results

- Despite no significant changes in energy consumption, commercial buildings overall consumed 12% less energy per square foot of floorspace in 2018 than in 2012.
- Buildings used primarily for inpatient health care, outpatient health care, offices, and education had statistically significant decreases in energy intensity.
- Electricity and natural gas continued to be the main energy sources for commercial buildings. Electricity accounted for 60% of energy consumed and natural gas for 34%.
- Electricity accounted for the most energy consumed in every census region, and its share of energy consumption was highest in the South.
- Large buildings (over 100,000 square feet) were 2% of buildings but consumed over one-third of total energy in commercial buildings.
- Food service, food sales, and inpatient health care buildings were the most energy intensive; vacant, warehouse and storage, and religious worship buildings were the least energy intensive.
- Energy expenditures per British thermal unit of energy consumed were lowest for natural gas.
- Space heating made up at least two-thirds of end-use consumption for natural gas, district heat, and fuel oil. Electricity was consumed most for cooling, ventilation, lighting, and other end uses.
- Space heating was the most energy-intensive end use, especially in colder climates. Office equipment and computing were the least intensive end uses.

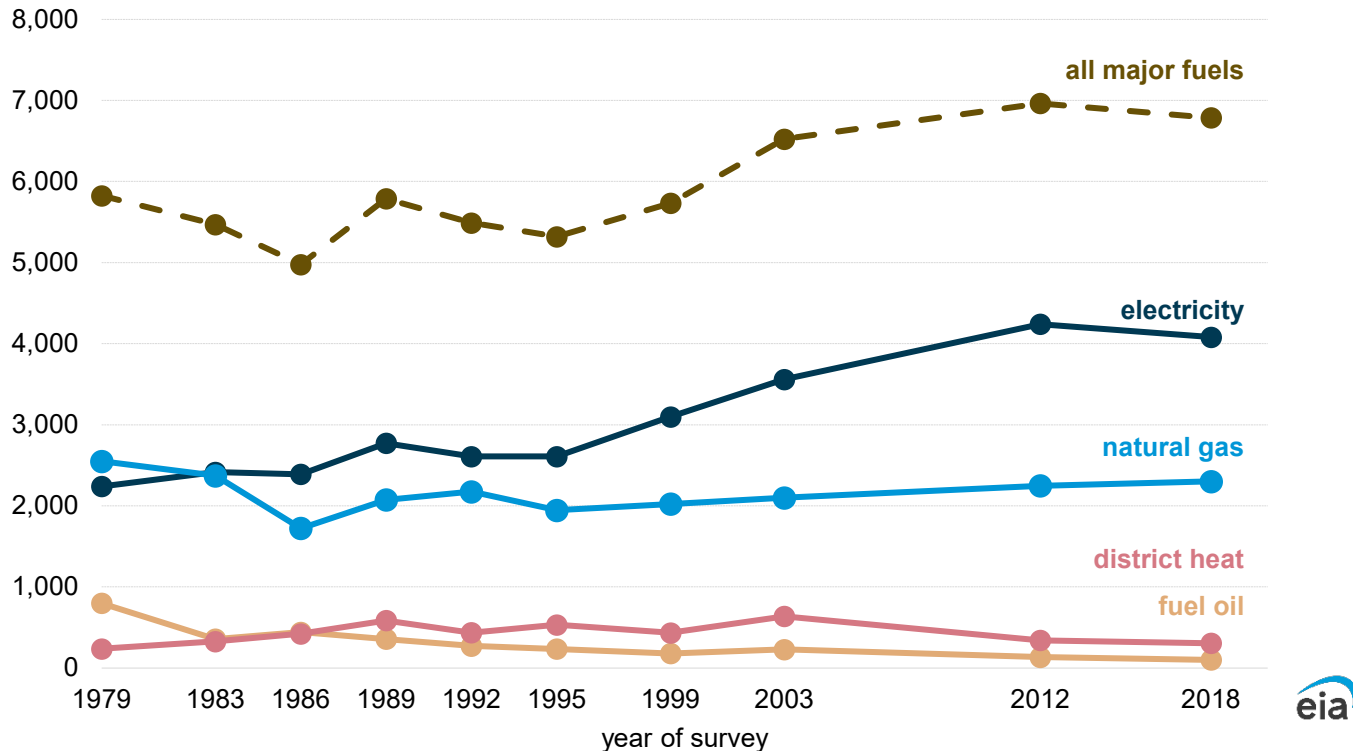
Notes: These data are for reference year 2018 and do not reflect the impact of the COVID-19 pandemic. All data referenced in this document are available in the [CBECS consumption and expenditures tables](#). Unless otherwise noted, all differences are statistically significant at the 10% significance level or lower. A lower significance level indicates a lower likelihood of incorrectly concluding a difference exists between two values when no difference actually exists.

Trends: Commercial Building Energy Consumption Over CBECS Survey Years

No significant changes in energy consumption of any source occurred from 2012 to 2018

Energy consumption by major fuel, 1979–2018

trillion British thermal units



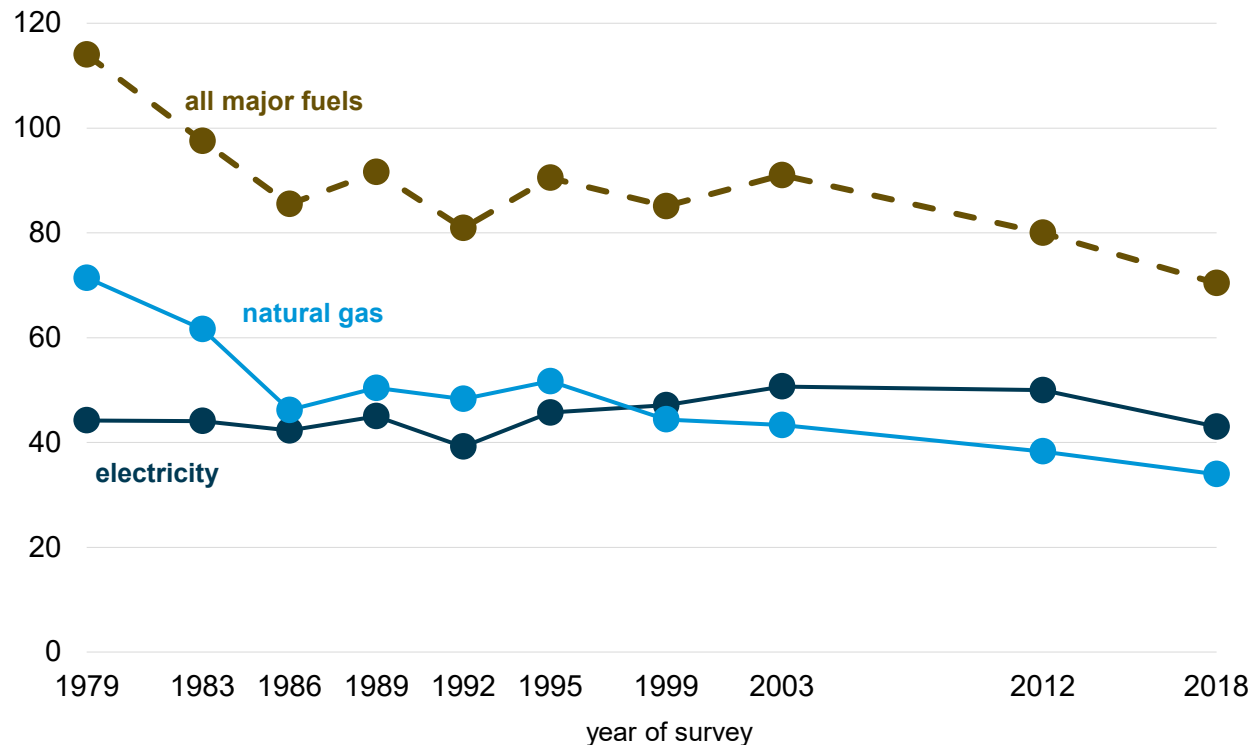
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

- U.S. commercial buildings used 6,787 trillion British thermal units (TBtu) of all major fuels: 4,081 TBtu of electricity, 2,300 TBtu of natural gas, 305 TBtu of district heat, and 101 TBtu of fuel oil.
- None of the changes in energy consumption between 2012 and 2018 were statistically significant.
- Since the first CBECS in 1979, consumption of all major fuels increased by 17%, electricity increased by 82%, and fuel oil decreased by 87%. Neither natural gas nor district heat showed statistically significant changes.



Energy intensity continued to decrease in commercial buildings

Energy intensity by select fuels, 1979–2018
thousand British thermal units per square foot



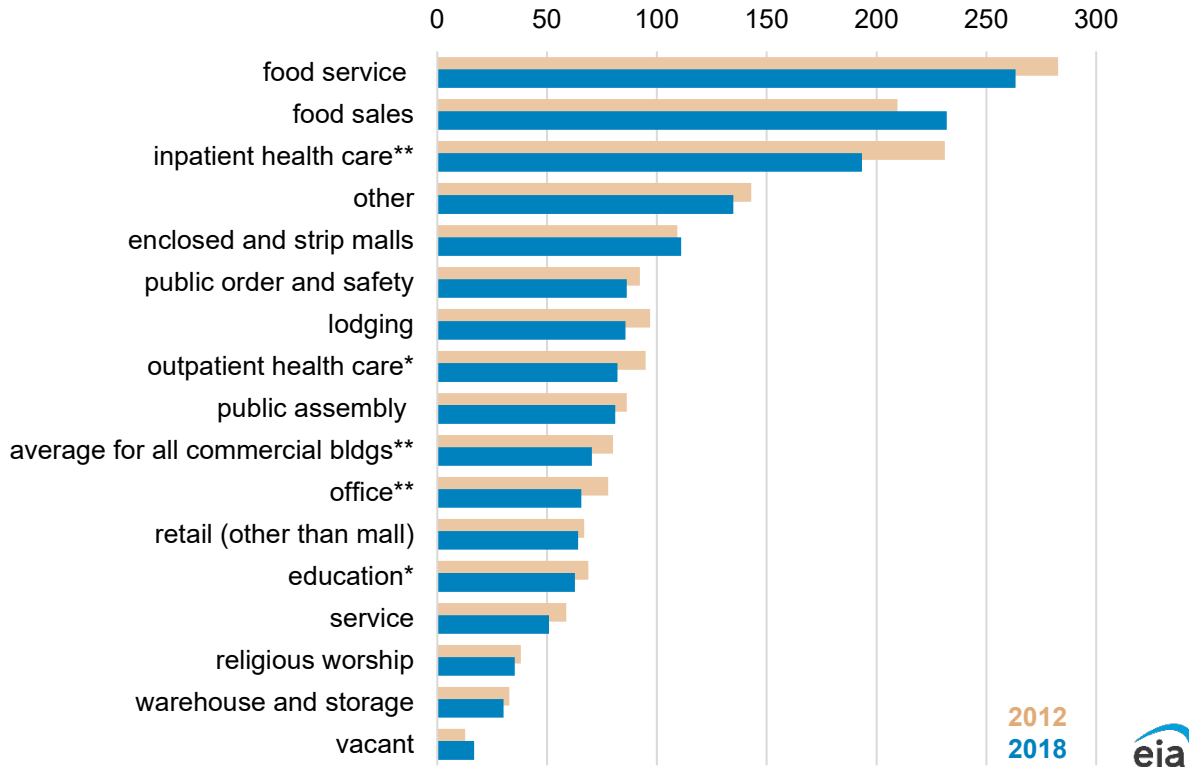
- Total floorspace in commercial buildings increased but energy consumption did not, meaning intensity (consumption per square foot) decreased.
- The major fuels energy intensity in commercial buildings decreased by 12% from the 2012 CBECS, from 80.0 thousand British thermal units per square foot (MBtu/sf) to 70.4 MBtu/sf.
- Electricity intensity decreased by 14%, and natural gas intensity decreased by 11% from 2012 to 2018.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



Energy intensity decreased in several building types from 2012 to 2018

Major fuels intensity by principal building activity, 2012–2018
thousand British thermal units per square foot



- Inpatient health care, outpatient health care, office, and education buildings showed statistically significant decreases in the energy use per square foot of major fuels (electricity, natural gas, fuel oil, and district heat).
- Energy intensity in inpatient health care buildings decreased by 16% from 2012 to 2018, the largest intensity decrease of all the building types.
- There were no statistically significant increases in energy intensity for any of the building types.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

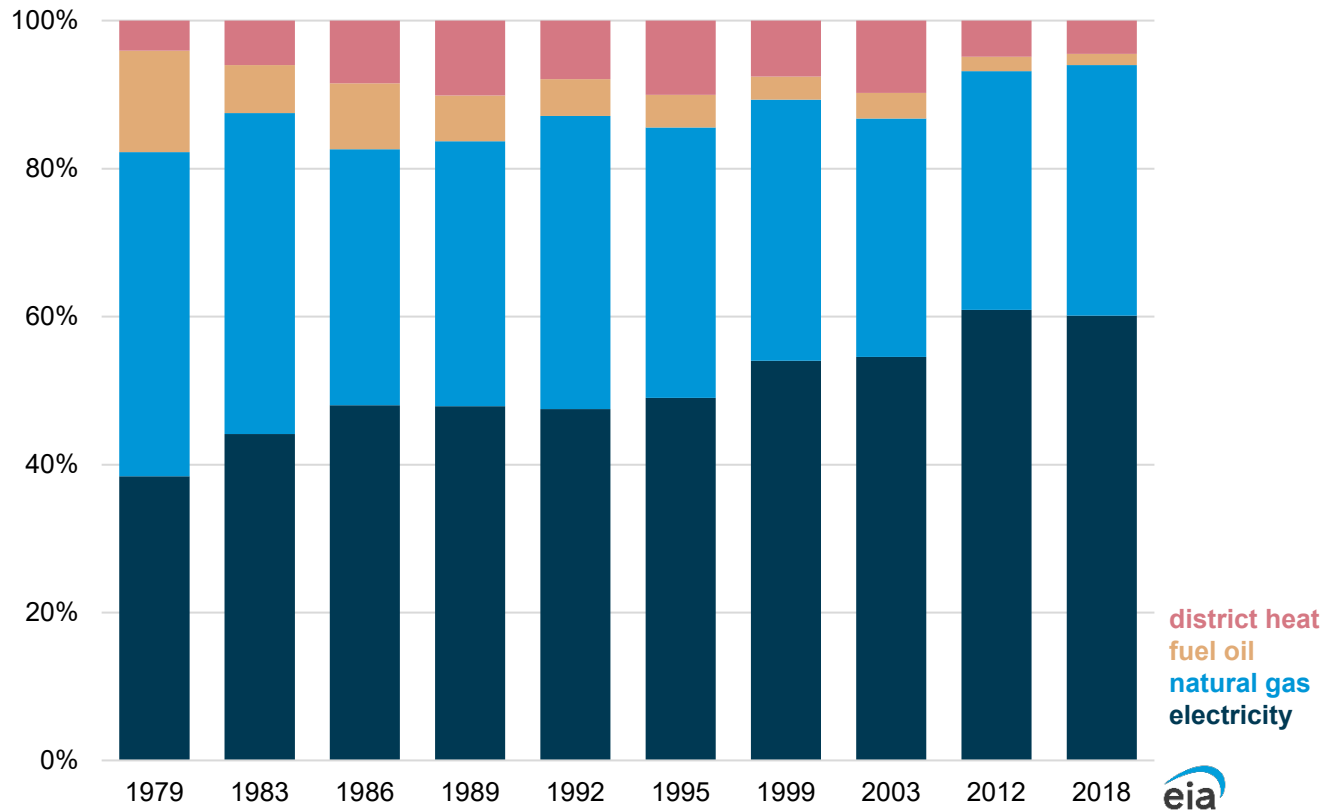
* Change is statistically significant at the 10% significance level.

** Change is statistically significant at the 5% significance level.

Note: [Building Type Definitions](#) on the CBECS web page provides more information about the principal building activities.

Electricity and natural gas continued to be the main energy sources for commercial buildings

Energy consumption by major fuel, 1979–2018
percentage



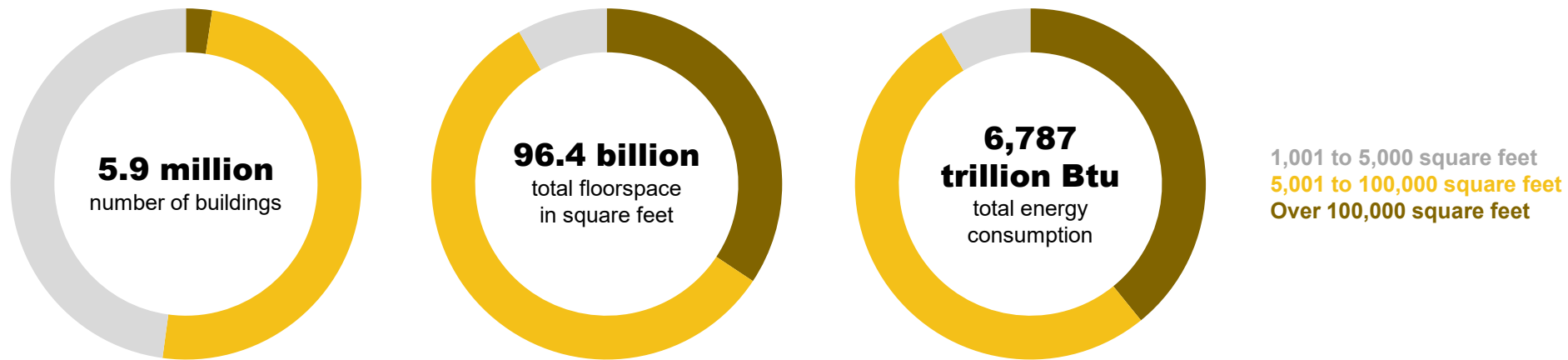
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

- Together, electricity and natural gas accounted for about 94% of energy consumed in 2018.
- Electricity increased its share of energy consumed from 38% in 1979 to 60% in 2018.
- Natural gas continued to account for approximately one-third of energy consumption.
- Fuel oil's share of energy consumption was 1% in 2018, its smallest share since 1979, when CBECS began collecting data.

Snapshot: Commercial Building Energy Consumption in 2018

Large buildings were fewer but consumed over one-third of energy

Number of buildings, square footage, and energy consumption by square footage category, 2018
share of total



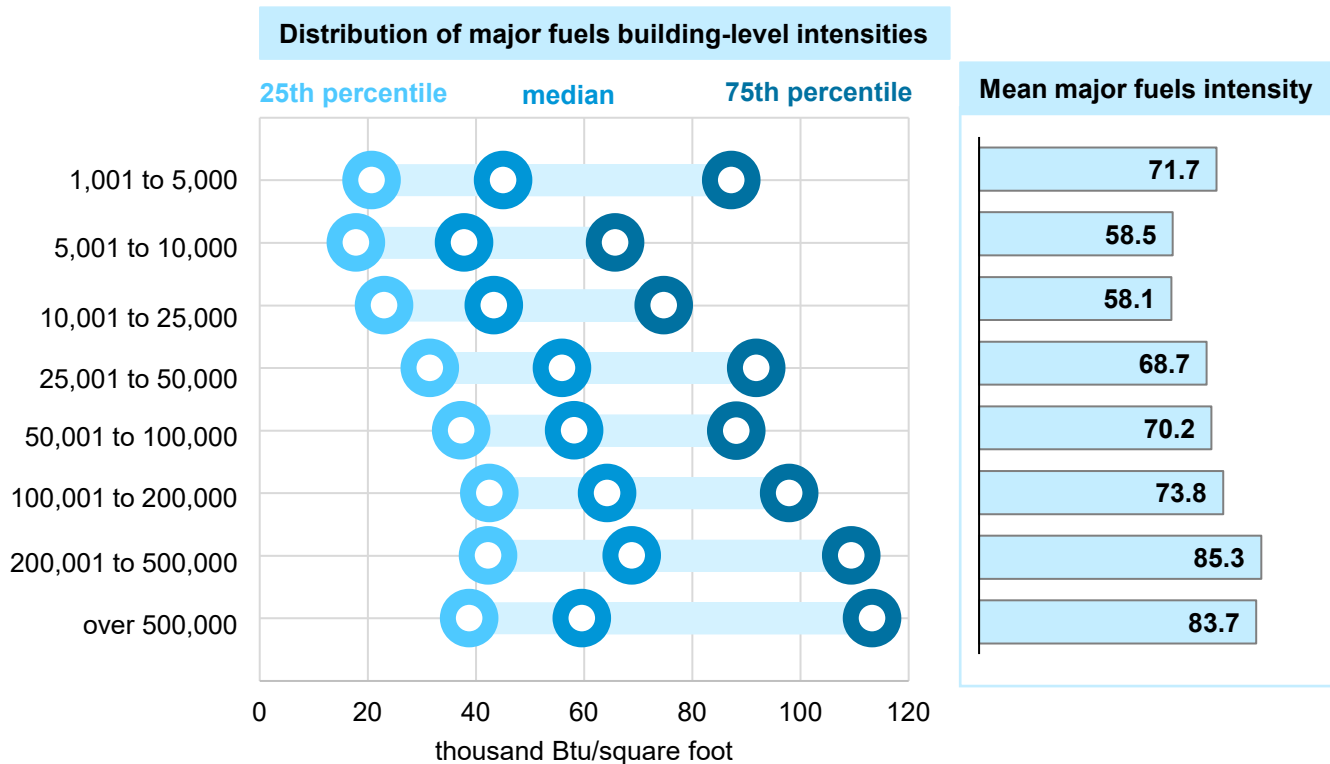
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units



- Buildings over 100,000 square feet accounted for 2% of all commercial buildings and 34% of total commercial floorspace. These buildings consumed 2,659 TBtu, which was 39% of commercial building energy consumption.
- Small buildings (1,001 to 5,000 sf) accounted for almost half the building stock but used only 8% of the energy consumed.

The smallest buildings were more energy intensive than some larger buildings

Major fuels intensities by square footage category, 2018
thousand British thermal units per square foot



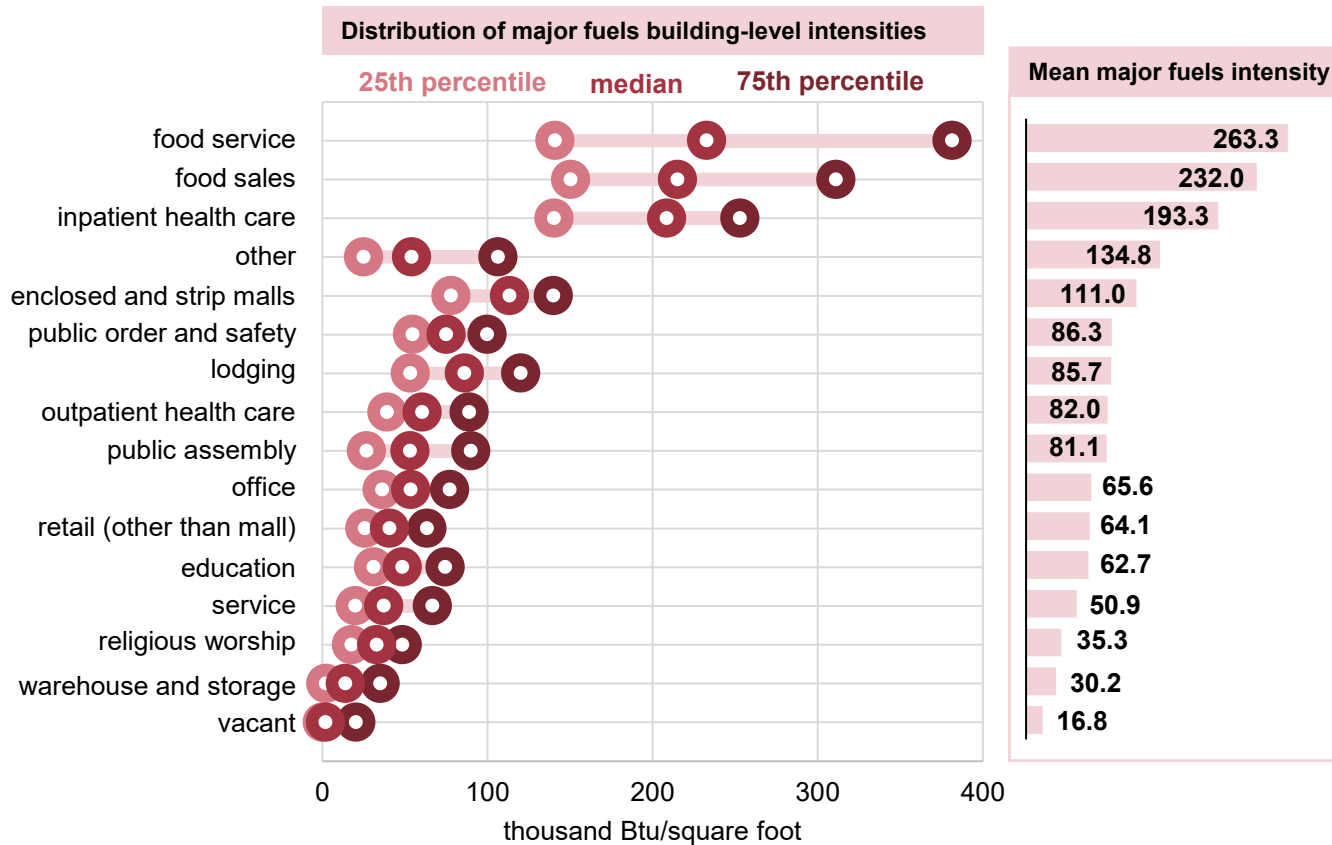
- The smallest buildings (1,001 sf to 5,000 sf) had a significantly higher mean energy intensity than buildings between 5,001 sf and 25,000 sf. Many of the smallest buildings were in more energy-intensive building categories, such as food service and food sales.
- Buildings that were 200,001 sf to 500,000 sf and over 500,000 sf were the most energy intensive (85.3 MBtu/sf and 83.7 MBtu/sf, respectively).
- The largest buildings (over 500,000 sf) had the widest distribution of intensities.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units



Food service, food sales, and inpatient health care buildings were the most energy intensive

Major fuels intensities by principal building activity, 2018
thousand British thermal units per square foot



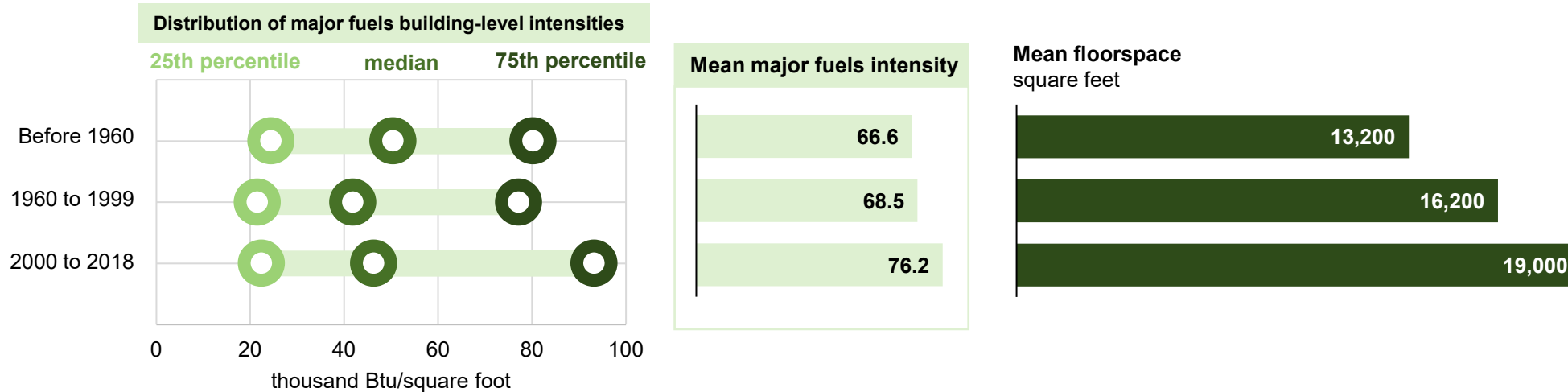
- Food service, food sales, and inpatient health care buildings were the most energy intensive. These buildings also had the widest distribution of intensities.
- Vacant buildings were the least energy intensive, followed by warehouse and storage and religious worship buildings.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units



The newest buildings were the most energy intensive

Major fuels intensities and mean total floorspace by year of construction, 2018
thousand British thermal units per square foot



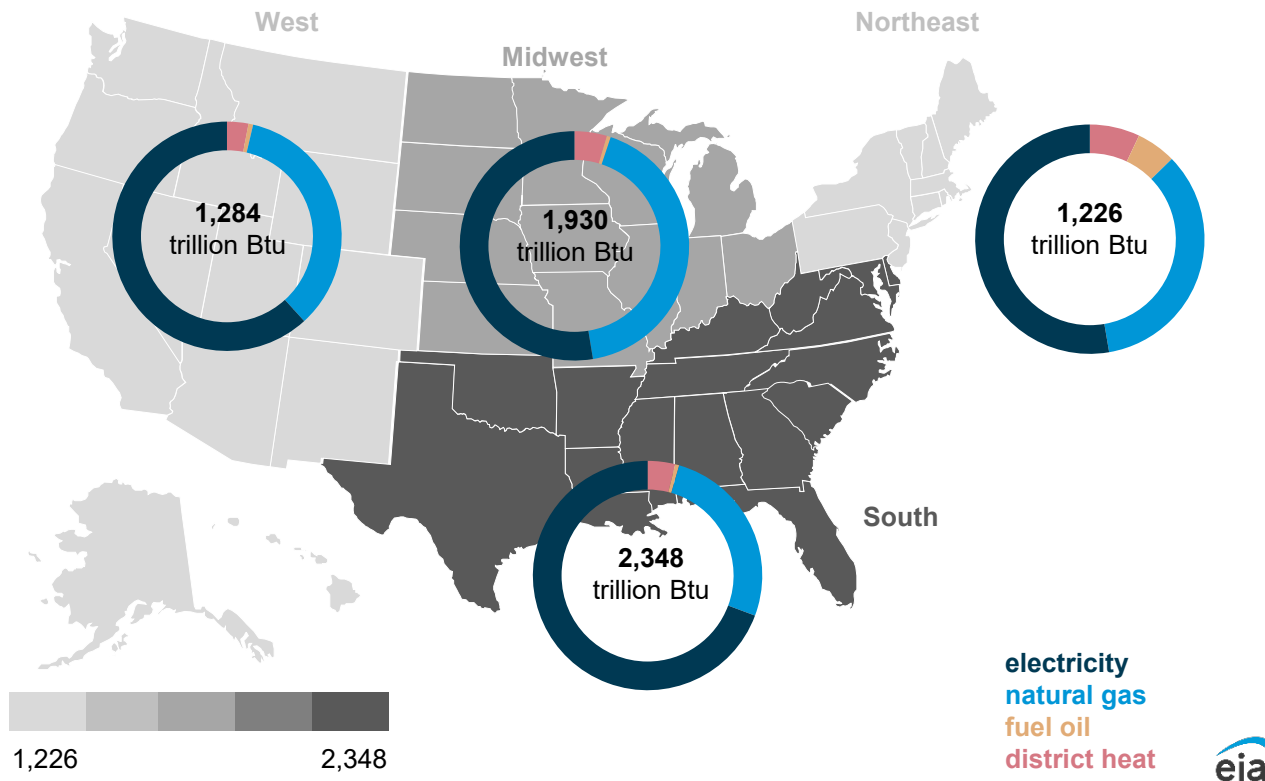
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units

- Buildings constructed since 2000 had a significantly higher mean energy intensity (76.2 MBtu/sf). The newest buildings were also significantly larger than all older buildings (averaging 19,000 sf).
- The oldest buildings (constructed before 1960) were significantly smaller and less energy intensive than buildings constructed since 2000.

Electricity accounted for the most energy consumed across all census regions

Energy consumption by fuel and region, 2018

British thermal units and share of total



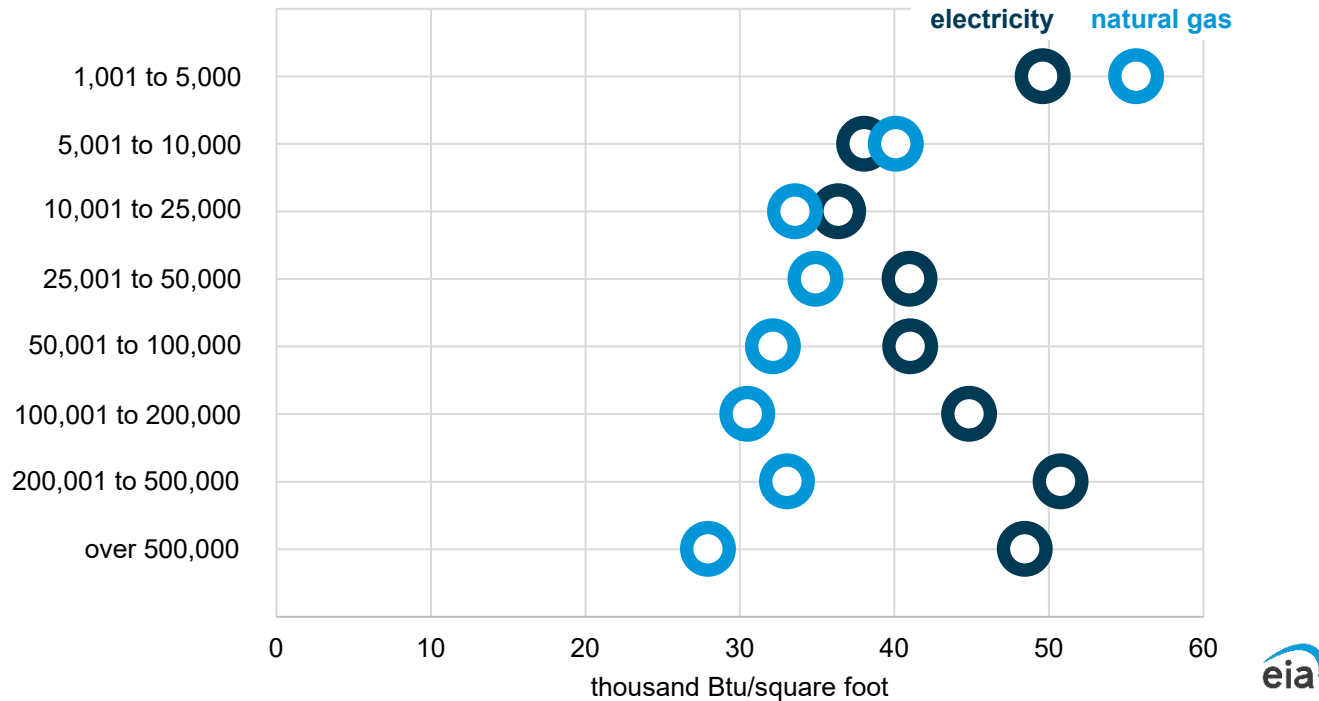
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

Note: Btu = British thermal units

- The South consumed the most energy (2,348 TBtu) and had the largest share of electricity consumption of any census region (69%).
- The Midwest consumed the second-largest amount of energy and had the largest share of natural gas consumption of any census region (42%).
- The Northeast, where fuel oil was primarily used for space heating, was the only census region in which fuel oil accounted for more than 1% of energy consumption.
- The Northeast and the West used similar amounts of energy.

The smallest and largest buildings had about the same electricity intensity

Electricity and natural gas intensities by square footage category, 2018
thousand British thermal units per square foot



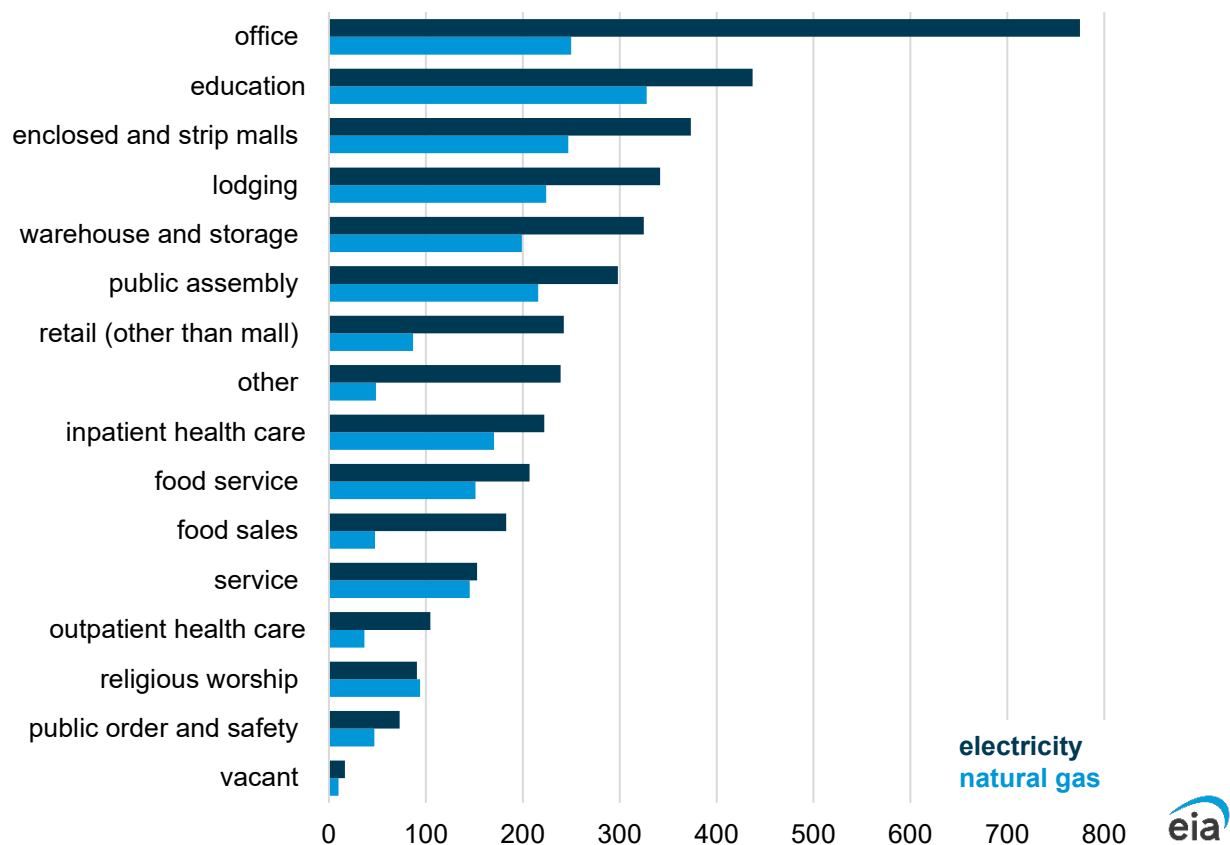
- The smallest (1,001 sf to 5,000 sf) and largest (over 500,000 sf) buildings had about the same electricity intensity.
- The smallest buildings had a natural gas intensity that was almost double the intensity of the largest buildings, 55.7 MBtu/sf compared with 27.9 MBtu/sf.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units

Offices consumed the most electricity, and education buildings consumed the most natural gas

Electricity and natural gas consumption by principal building activity, 2018

trillion British thermal units

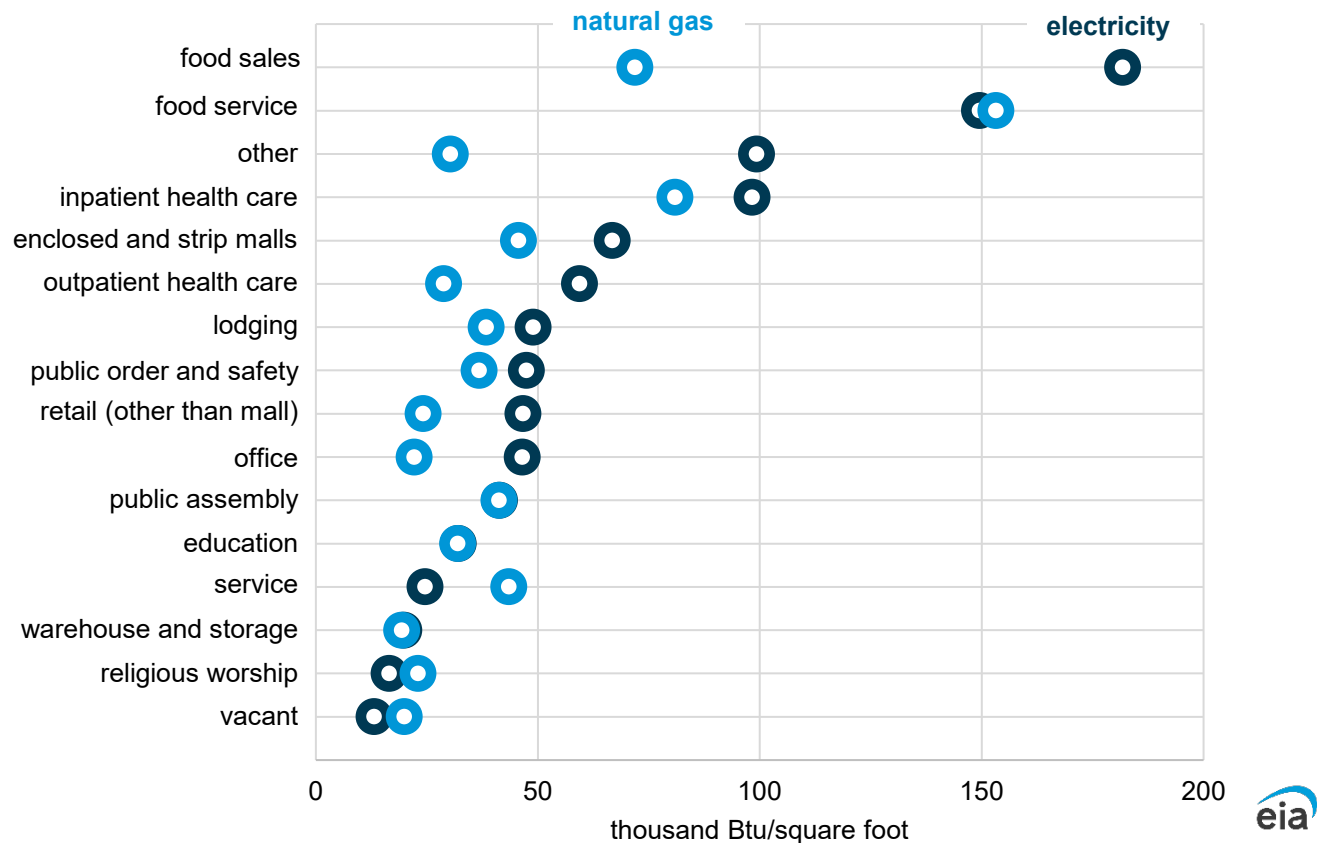


- Office buildings consumed the most electricity (775 Tbtu) and approximately three times more electricity than natural gas (250 Tbtu).
- Education buildings consumed the most natural gas (328 Tbtu).
- Service, religious worship, public order and safety, and vacant were the only building types that did not use significantly more electricity than natural gas.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

The difference in average electricity and natural gas intensities varied across building types

Electricity and natural gas intensities by principal building activity, 2018
thousand British thermal units per square foot

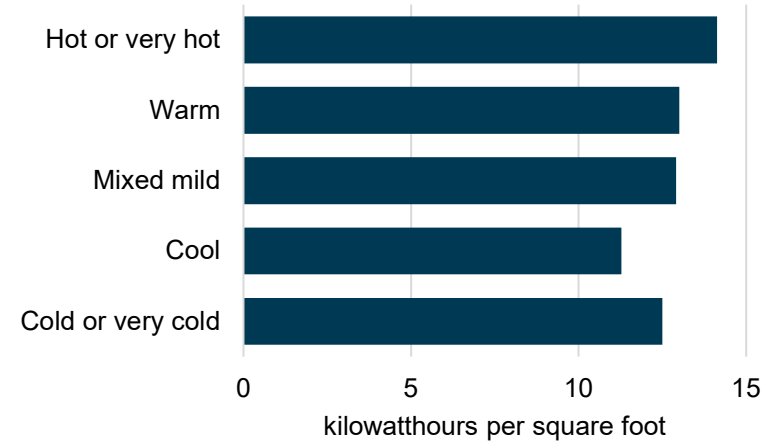


- Food sales buildings had a much higher electricity intensity than natural gas intensity, but these two intensities were almost the same for food service buildings.
- Other types of buildings, which include laboratories and data centers, had a higher electricity intensity than natural gas.
- Service, vacant, and religious worship buildings used natural gas more intensively than electricity.

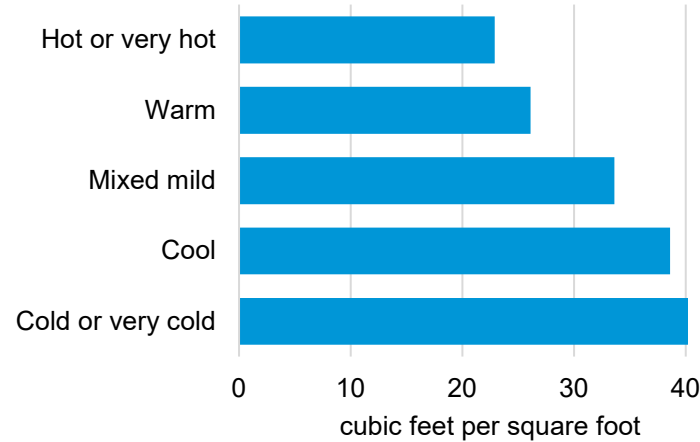
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

Electricity intensity was higher in hotter climates, and natural gas intensity was higher in colder climates

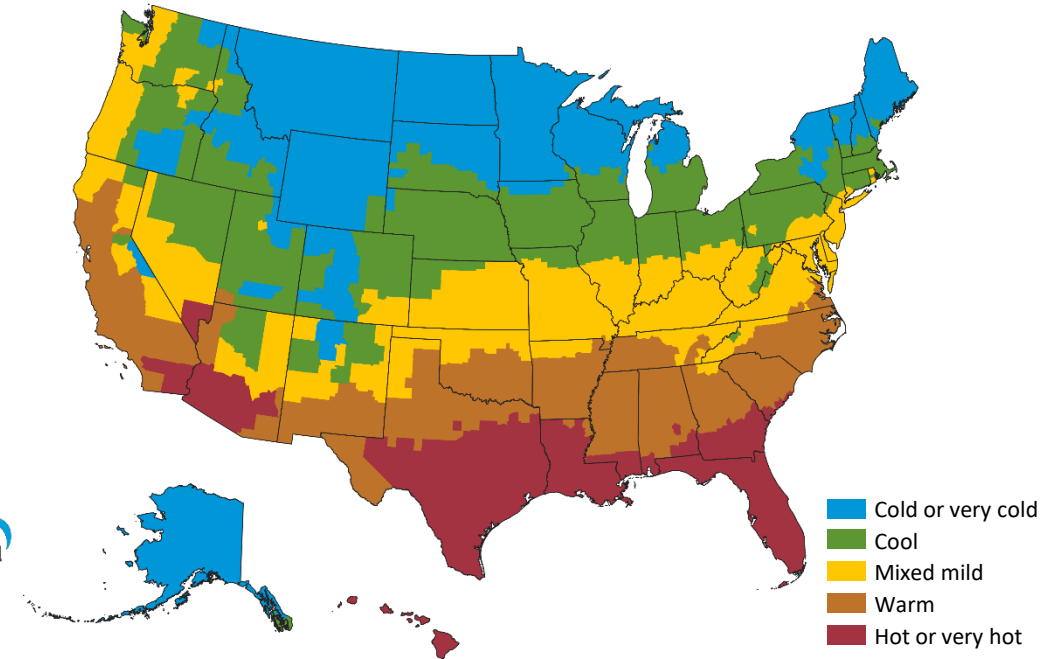
Electricity intensity by climate zone, 2018
kilowatthours per square foot



Natural gas intensity by climate zone, 2018
cubic feet per square foot



U.S. climate zones (2018 CBECS)



Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



- Commercial buildings in the hot or very hot, warm, and mixed mild regions had significantly higher average electricity intensities than those in the cool region.
- Average natural gas intensities increased as climate zones became cooler. Commercial buildings in the cool and cold or very cold climate zones did not differ significantly in natural gas intensity.

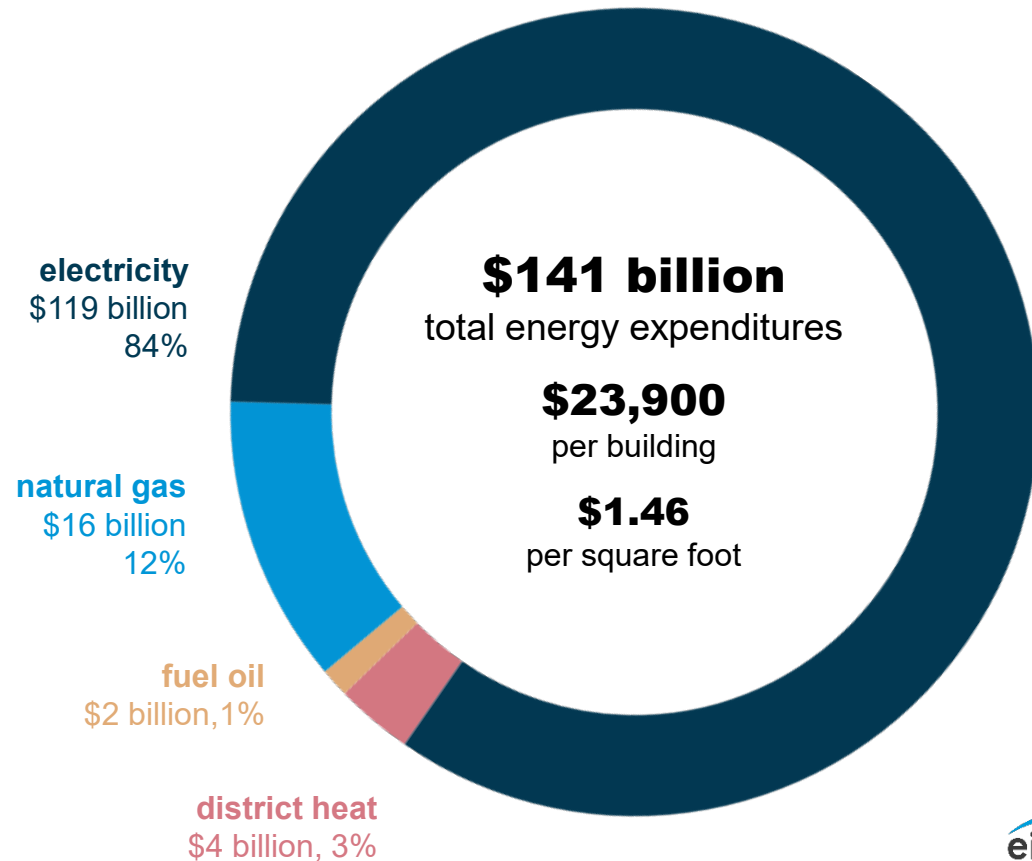
Data source: ANSI/ASHRAE, Standard 169-2021, *Climatic Data for Building Design Standards*

Note: Adapted with permission from Figure A-2, Climate zones for United States counties, ANSI/ASHRAE Standard 169-2021, *Climatic Data for Building Design Standards*, © 2021 ASHRAE.

Snapshot: Commercial Building Energy Expenditures in 2018

Commercial buildings spent \$141 billion on energy in 2018, averaging \$1.46 per square foot

Total commercial building energy expenditures by major fuel, 2018
billion dollars and share of total

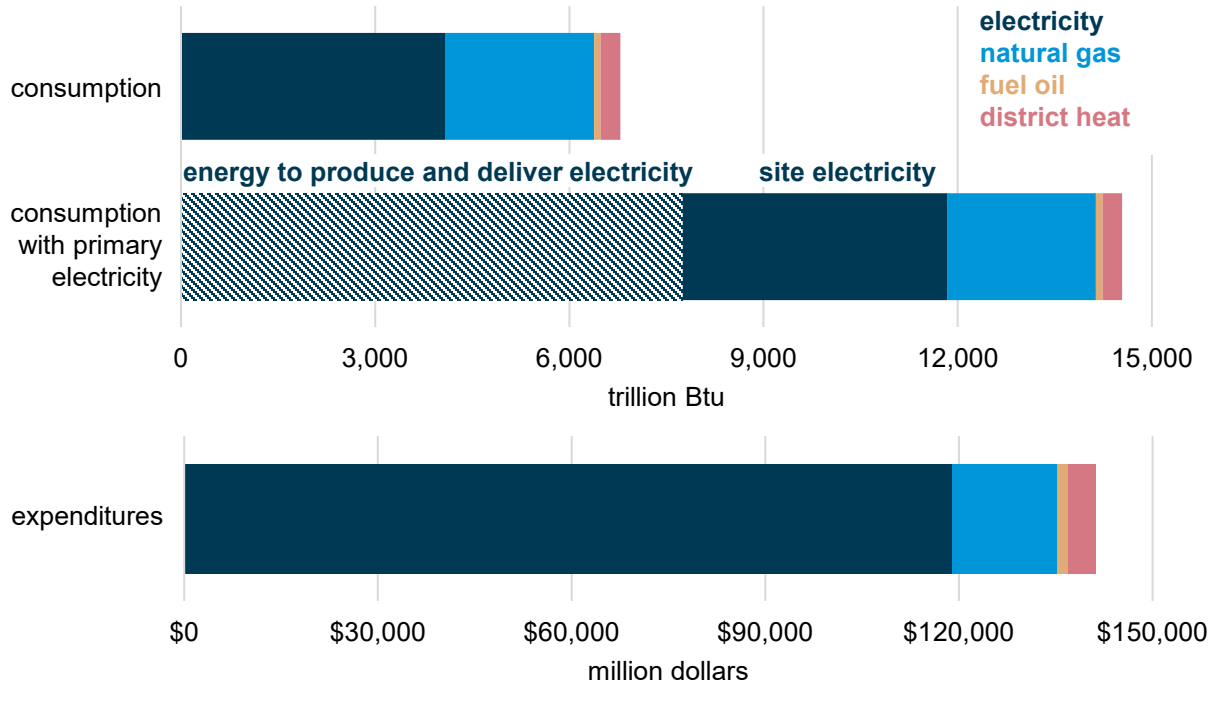


- On average, a commercial building spent \$23,900 on energy during 2018, ranging from \$5,000 per building for the smallest buildings (1,001 to 5,000 sf) to \$1.5 million per building for buildings over 500,000 sf.
- Energy expenditures averaged \$1.46/sf and varied by principal building activity. Food sales and food service buildings spent more than \$5.00/sf, and vacant, warehouse and storage, and religious worship buildings spent less than \$0.75/sf.
- Commercial buildings spent \$119 billion dollars on electricity, or 84% of their total energy expenditures. Natural gas accounted for 12% of total commercial building energy expenditures (\$16 billion).

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

With primary electricity, shares of consumption and expenditures by fuel were similar

Energy consumption and expenditures by major fuel, 2018
trillion British thermal units and million dollars

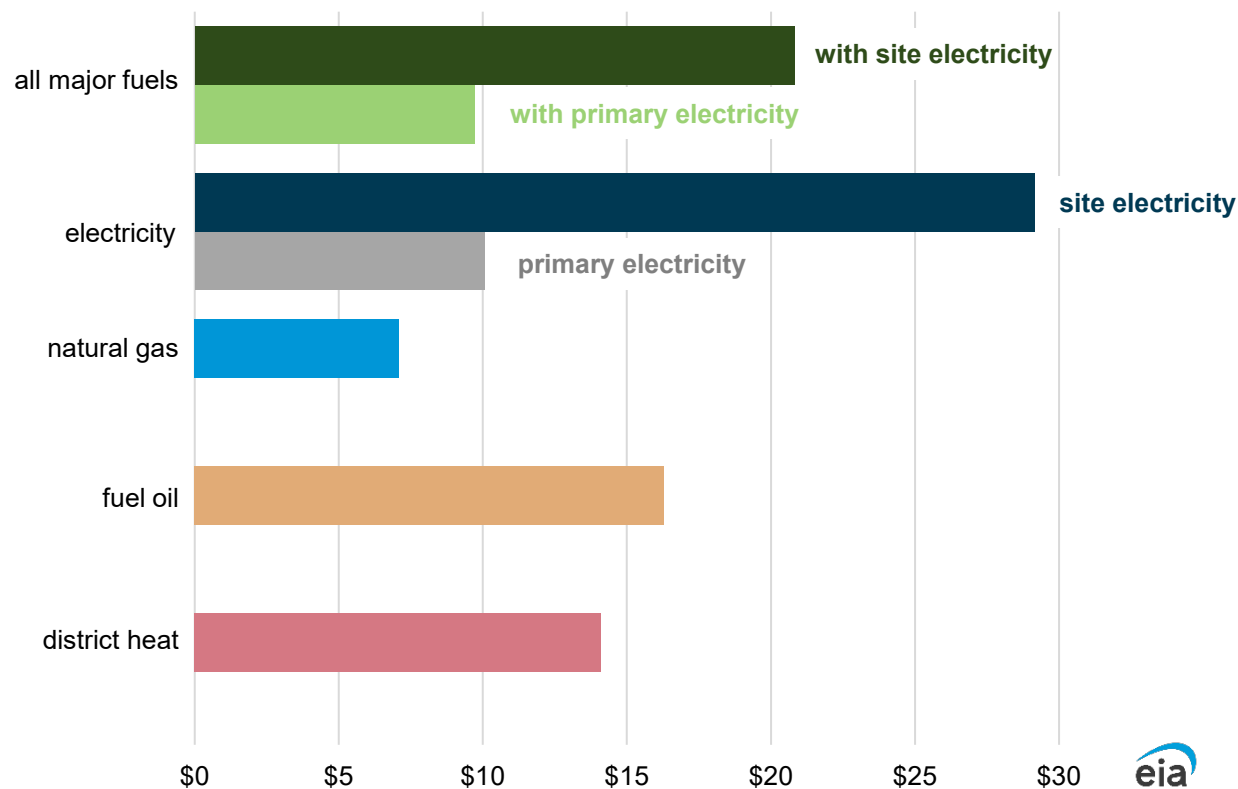


Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

- Energy consumption reflects different physical units (for example, kilowatthours, cubic feet, gallons, etc.) converted to a common unit of heat, called British thermal units (Btu). Btu conversion factors are based on the heat content of each fuel as it is consumed at the building site.
- Primary electricity is site electricity (the amount of electricity that enters a building) plus the energy used to produce and deliver that electricity.
- After adding the energy used to produce and deliver electricity, electricity's share of consumption (81%) was closer to electricity's share of expenditures (84%).
- Because energy consumption was higher with primary electricity, natural gas's share of consumption fell from 34% to 16%, which was also closer to its share of energy expenditures (12%).

Energy expenditures per unit of consumption were lowest for natural gas

Energy expenditures per unit of consumption by major fuel
dollars per million British thermal units



Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

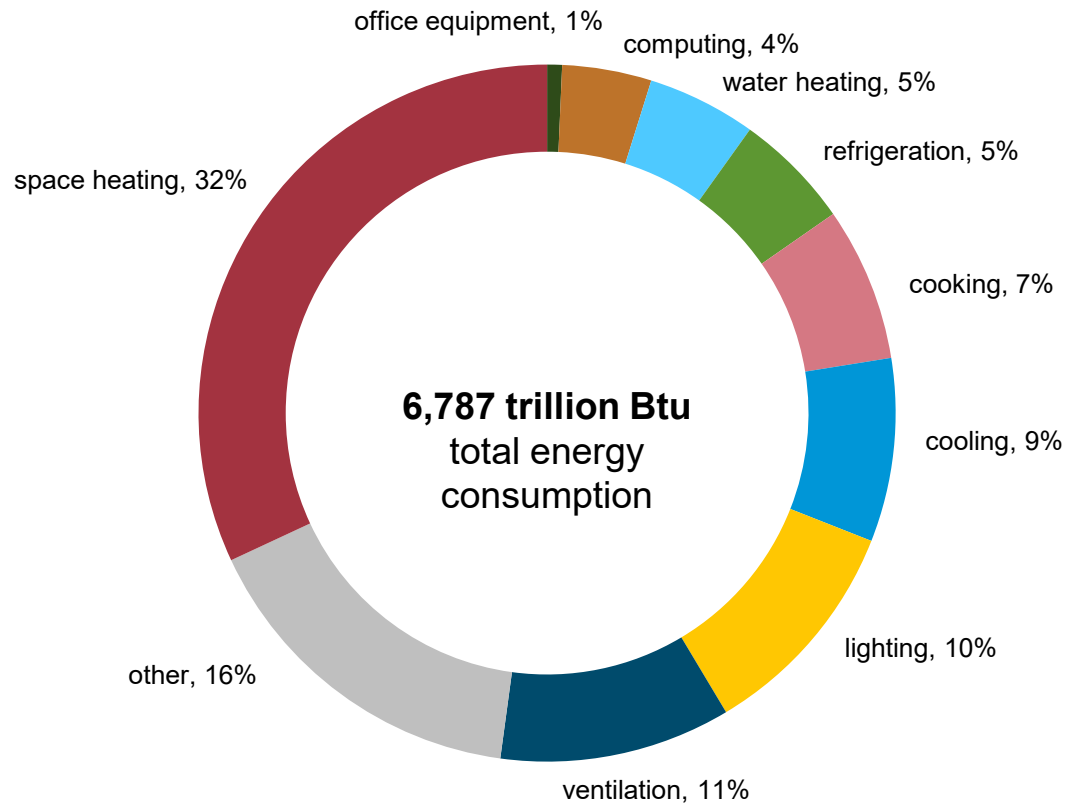
- Commercial buildings spent \$20.81 per million British thermal units (MMBtu) across all major fuels in 2018; natural gas cost the least at \$7.08/MMBtu and site electricity cost the most at \$29.16/MMBtu.
- Energy expenditures per unit of primary electricity (\$10.06/MMBtu) were approximately one-third of site electricity (\$29.16/MMBtu) because primary electricity includes the energy used to produce and deliver electricity.
- Energy expenditures per unit for all major fuels fell by about half (\$9.71/MMBtu) with consumption including primary electricity instead of site electricity.

Snapshot: Commercial Building End-Use Energy Consumption in 2018

An **energy end use** is a use for which energy is consumed in a building. We estimate energy consumption for 10 specific end uses—space heating, cooling, ventilation, water heating, lighting, cooking, refrigeration, office equipment, computing, and other.

Space heating accounted for close to one-third of end-use consumption in 2018

Major fuels consumption by end use, 2018
share of total



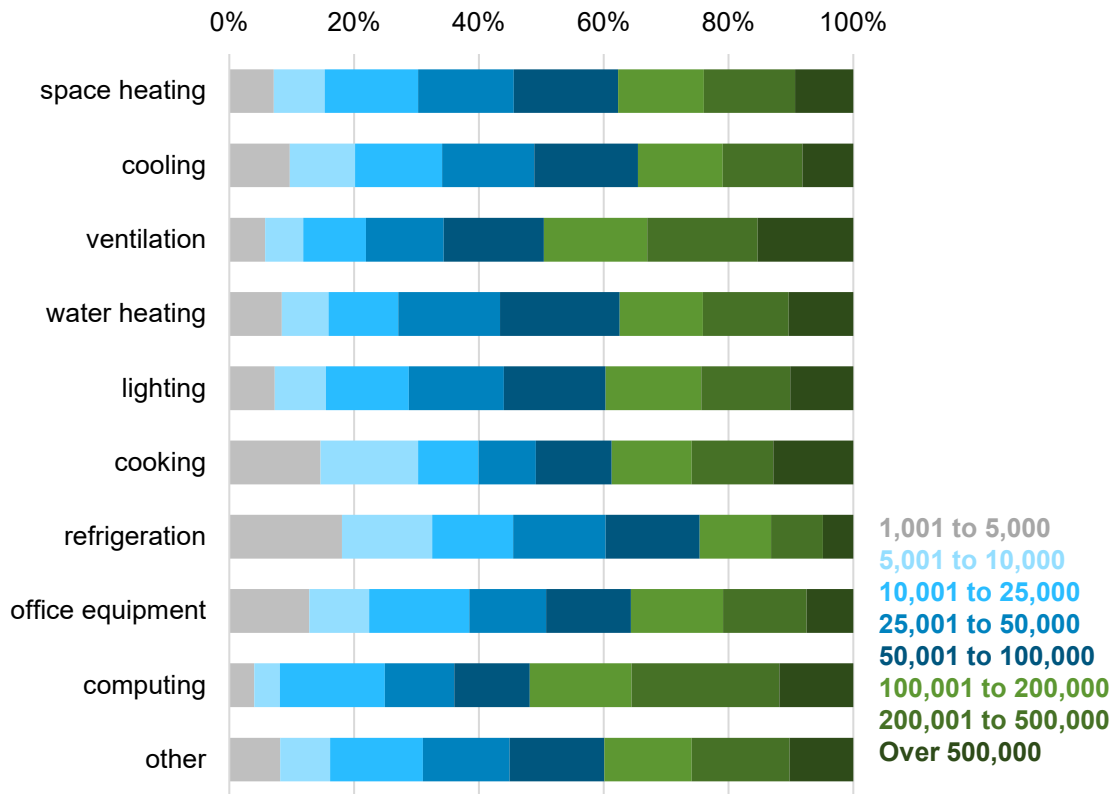
- Space heating was the most common end use in commercial buildings. About 32% (2,167 Tbtu) of energy was consumed for space heating.
- Other, ventilation, and lighting each accounted for 10% or more of total energy consumption. Other end uses can include miscellaneous plug loads, process equipment, motors, air compressors, and natural gas dryers.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units



The share of consumption by end use varied by the size of the building

Major fuels consumption by end use and square footage category, 2018
percentage



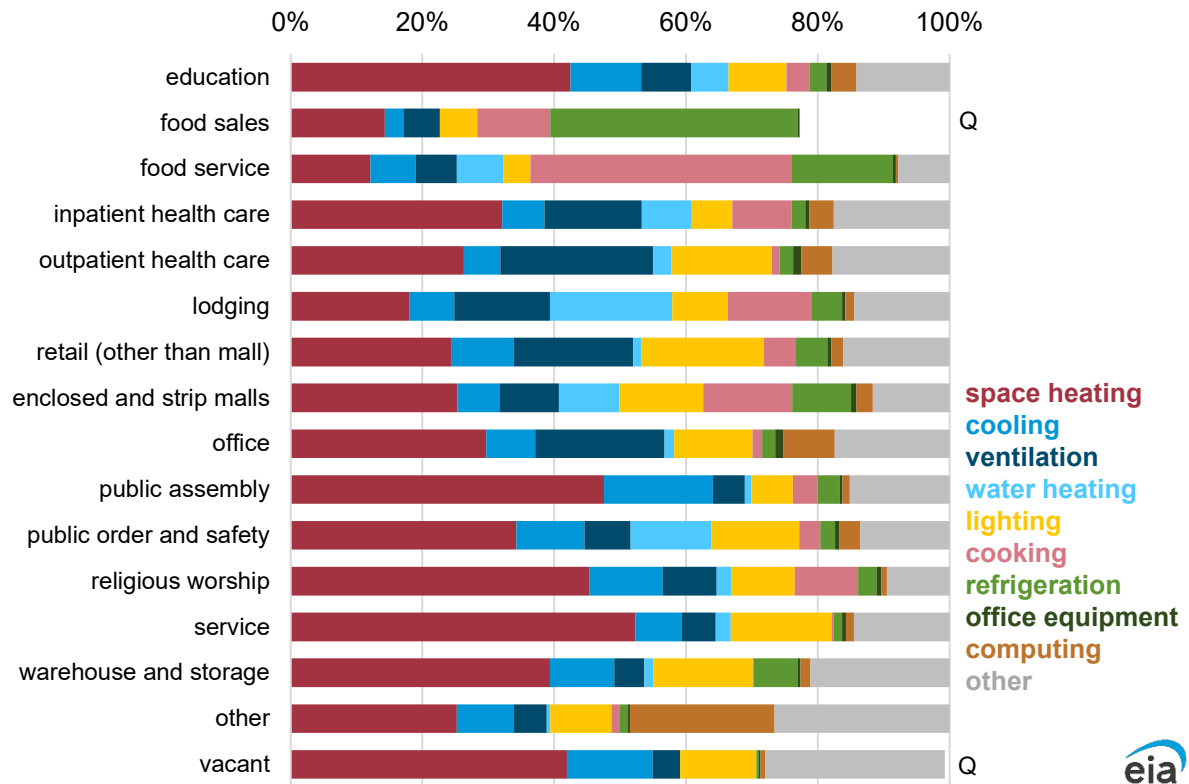
- Larger buildings (over 100,000 sf) accounted for more than one-third of end-use consumption for every end use except refrigeration. These buildings made up at least one-half of ventilation and computing end-use consumption. Only 2% of commercial buildings are larger than 100,000 sf.
- Buildings that were less than 10,000 sf accounted for 30% of cooking and 33% of refrigeration end-use consumption. Many buildings of this size were food sales and food service buildings.



Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

End-use consumption varies greatly among building activities

Major fuels consumption by principal building activity and end use, 2018
percentage

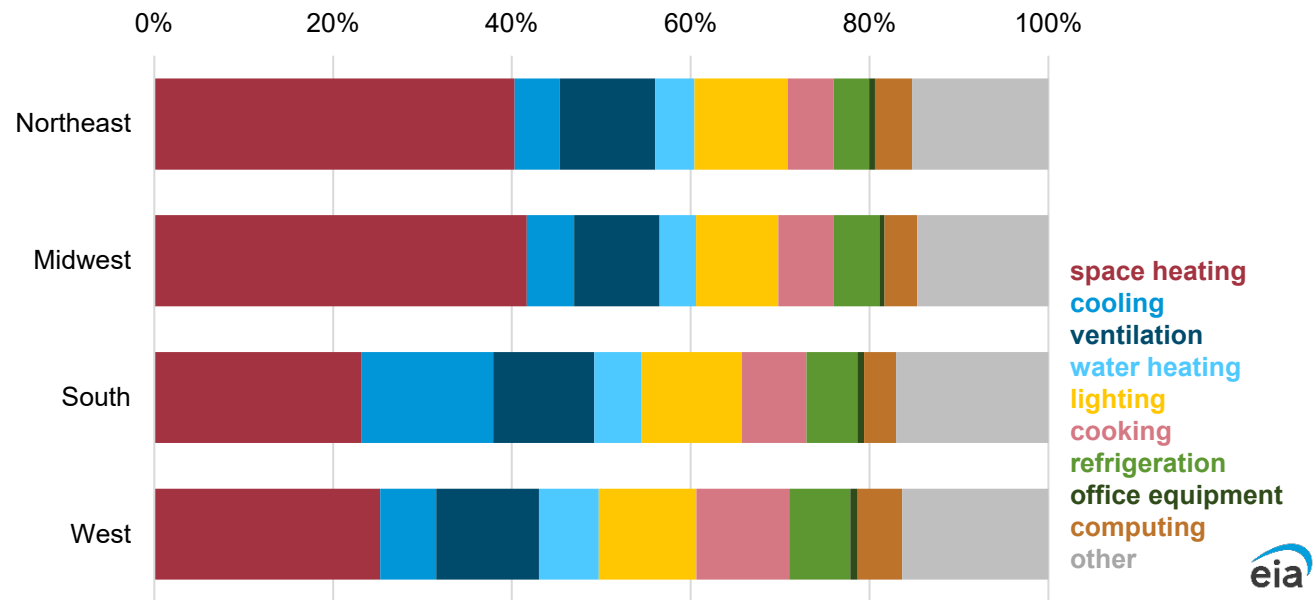


- Space heating accounted for the largest share of end-use consumption for many building activities. Service buildings were the only activity where space heating accounted for more than one-half of their end-use consumption.
- Food sales buildings had the largest share of end-use consumption dedicated to refrigeration (38%), and food service buildings had the largest share of end-use consumption dedicated to cooking (40%).
- Computing, which includes personal computers, laptops, tablets, monitors, and servers, accounted for one-fourth of end-use consumption in *other* buildings. *Other* building activities include data centers, which centralize a large amount of computing.

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
 Q = Data withheld because the relative standard error was greater than 50% or the reporting sample had fewer than 20 buildings. Water heating, computing, and other end uses were withheld for food sales buildings. Water heating and cooking were withheld for vacant buildings.

The share of energy for space heating was highest in the Midwest and Northeast

Major fuels consumption by region and end use, 2018
percentage

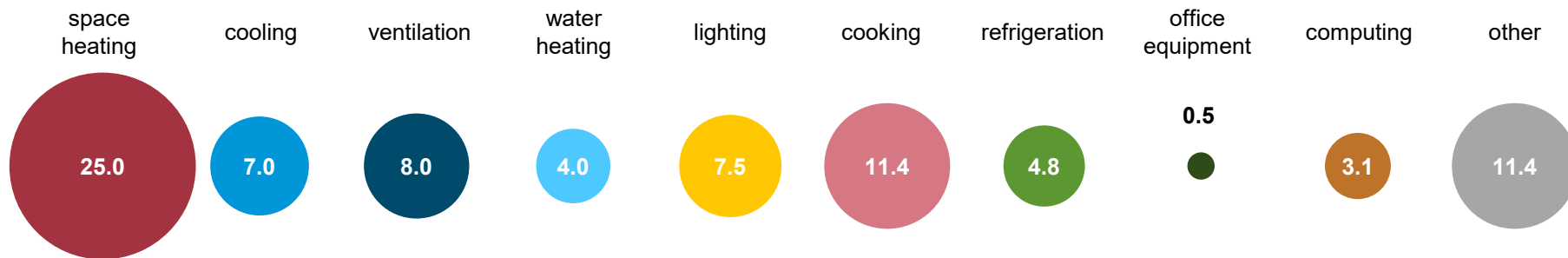


Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

- In both the Midwest and the Northeast, the share of energy used for space heating was more than 40%. In both the South and West, only about one-quarter of energy was for space heating.
- The South had the largest share of energy used for cooling (15%). None of the other regions used more than 6% of energy for cooling.
- All regions used approximately one-tenth of energy for lighting.
- The West had the largest share of energy used for cooking (10%).

Space heating was the most energy intensive end use, and office equipment was the least

Major fuels energy intensity by end use, 2018
thousand British thermal units per square foot



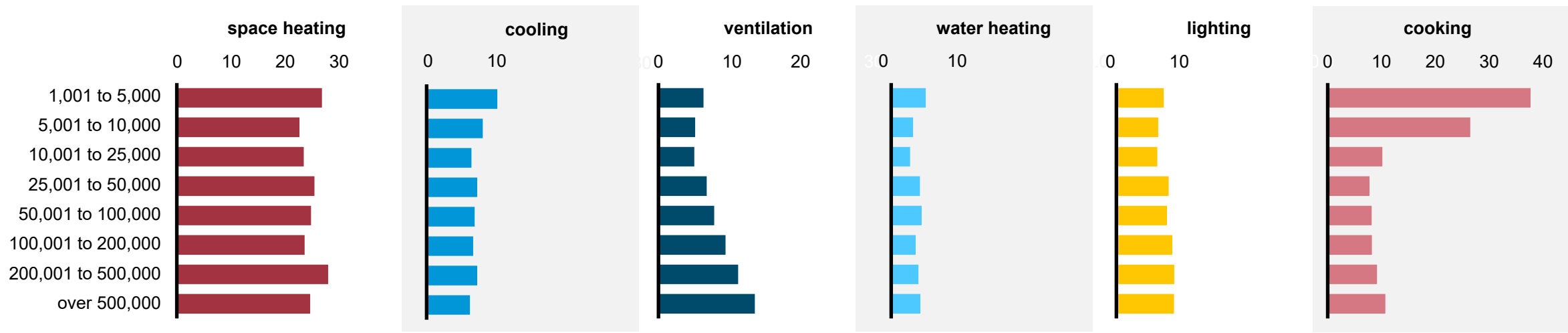
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



- Space heating was the most energy-intensive end use. It consumed 25.0 MBtu/sf in 2018. Other and cooking were the second and third most energy intensive end uses (11.4 MBtu/sf).
- Office equipment was the least energy intensive, consuming 0.5 MBtu/sf. The non-computer-based office equipment includes copiers, printers, fax machines, cash registers, and video displays.

For the smallest buildings, cooking was more energy intensive than space heating

Major fuels energy intensity by square footage category and selected end uses, 2018
thousand British thermal units per square foot



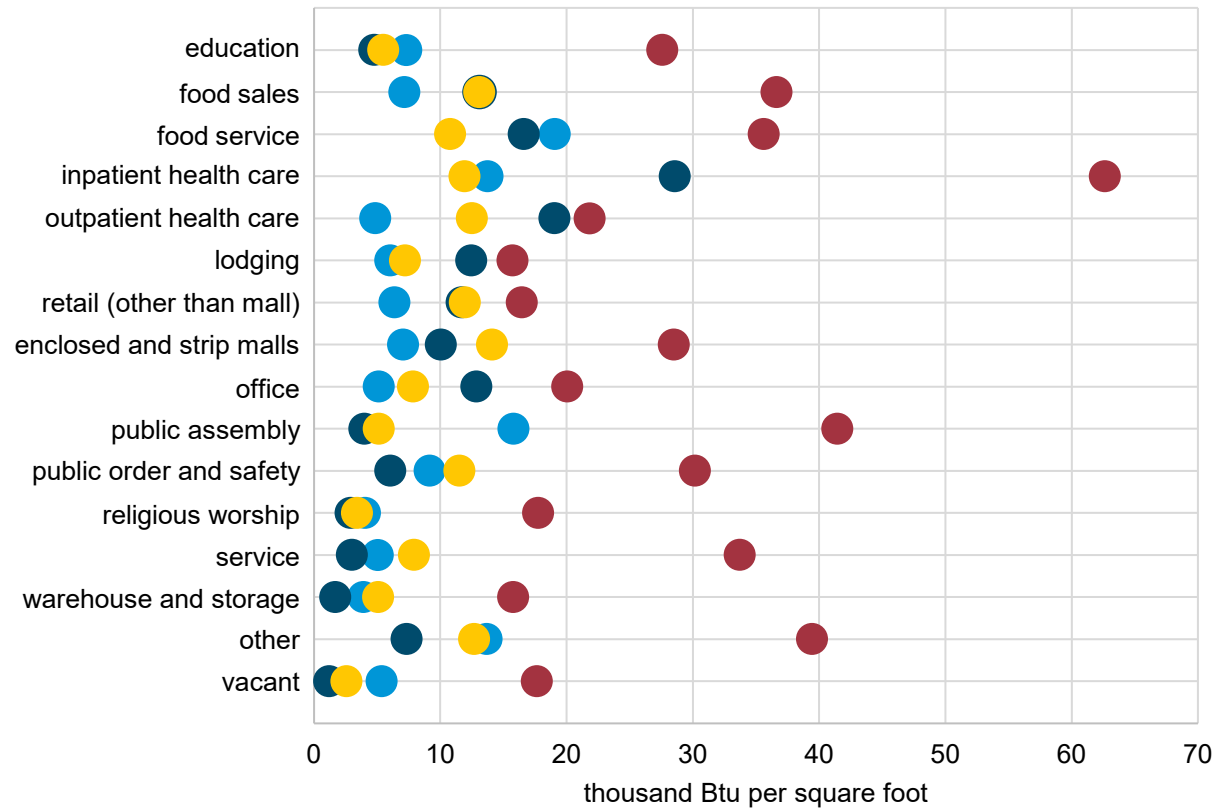
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



- For buildings that were 1,001 sf to 5,000 sf, the cooking energy intensity was 37.7 MBtu/sf and space heating energy intensity was 27.0 MBtu/sf.
- Cooking energy intensity in smaller buildings (less than 10,000 sf) was at least twice as intensive than buildings in every other square footage category.
- Space heating energy intensities were similar across square footage categories. Energy intensities ranged from 22.8 MBtu/sf (5,001 sf to 10,000 sf) to 28.1 MBtu/sf (200,001 sf to 500,000 sf).

Space heating was the most energy intensive for inpatient health care buildings

Major fuels energy intensity by principal building activity and selected end uses, 2018
thousand British thermal units per square foot



- At 62.6 MBtu/sf, space heating was the most energy intensive for inpatient health care buildings. Inpatient health care buildings also had the highest ventilation energy intensity (28.6 MBtu/sf).
- Food service buildings had the highest cooling energy intensity (19.1 MBtu/sf).

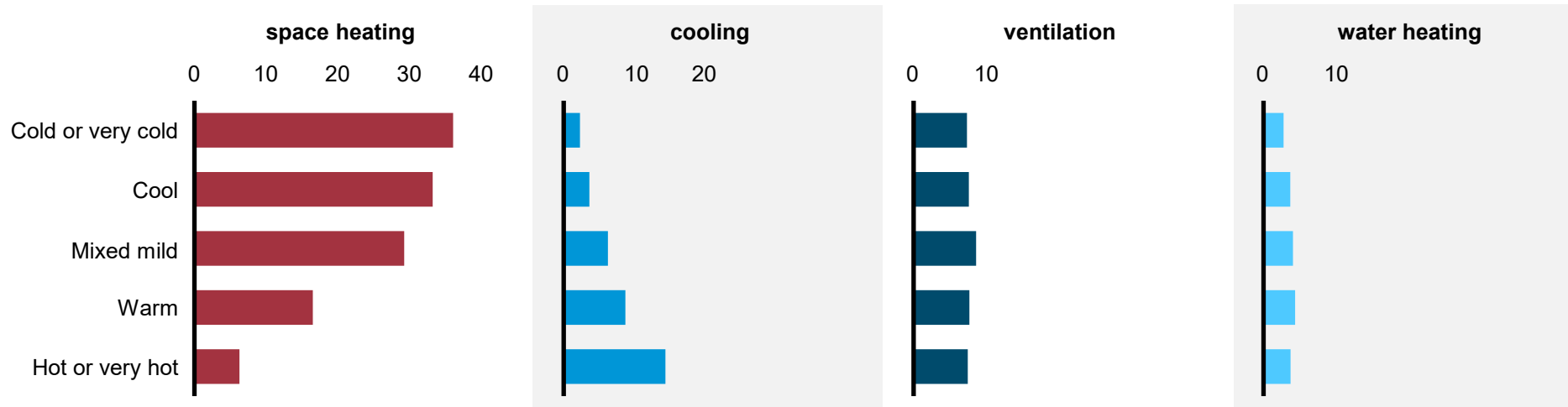
space heating
cooling
ventilation
lighting

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Btu = British thermal units

Space heating was the most energy-intensive end use, especially in colder climates

Major fuels energy intensity by climate zone and selected end uses, 2018

thousand British thermal units per square foot



Note: Climate affects energy consumption for the end uses selected.

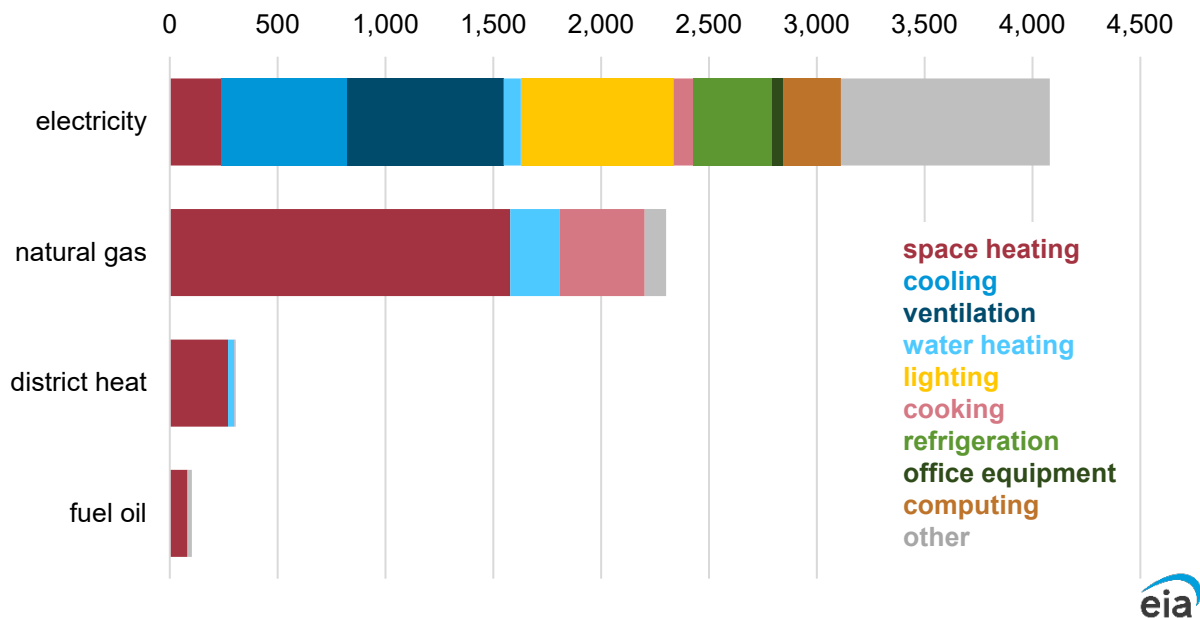
Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*



- Buildings in cold and very cold climates were more than five times more energy intensive for space heating (36.1 MBtu/sf) than buildings in hot or very hot climates (6.3 MBtu/sf).
- Cooling energy intensity was higher in warmer climates. Buildings in hot or very hot climates consumed more than six times more energy for cooling (14.2 MBtu/sf) than buildings in cold or very cold climates (2.3 MBtu/sf).
- Ventilation and water heating energy intensities were similar across climate zones.

Space heating was the most prevalent end use for all fuels except electricity

Energy consumption by major fuel and end use, 2018
trillion British thermal units



Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: The *other* end use category is shown differently here for natural gas, district heat, and fuel oil than for electricity. For natural gas and district heat, the other category includes cooling and all other end uses. For fuel oil, it includes cooling, cooking, and all other end uses.

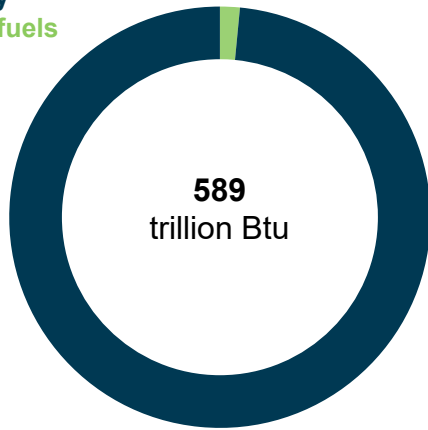
- Although electricity was the most-used energy source (4,081 TBtu), only 239 TBtu (6%) of electricity was used for space heating.
- Electricity was consumed most for cooling, ventilation, lighting, and other end uses, each accounting for over 14% of electricity consumption.
- Natural gas, district heat, and fuel oil had fewer end uses, and space heating made up at least two-thirds of end-use consumption for each fuel except electricity.

Cooling was mostly powered by electricity, while natural gas was used most for heat-related end uses

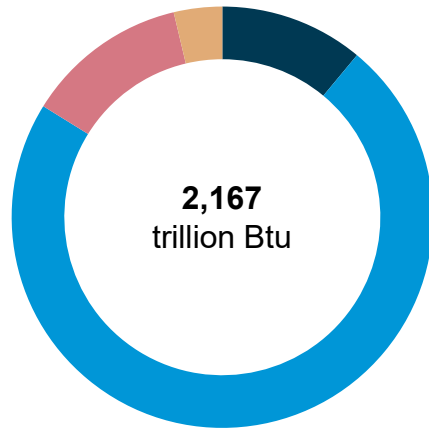
Energy consumption by major fuel and selected end uses, 2018

share of total

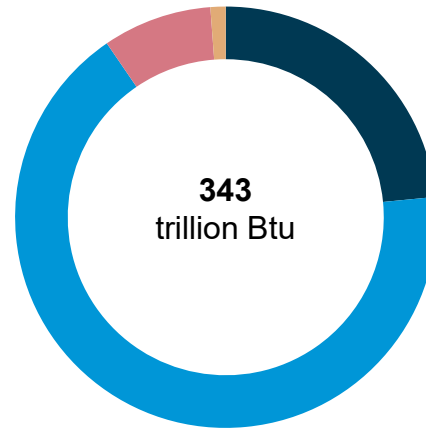
electricity
all other fuels



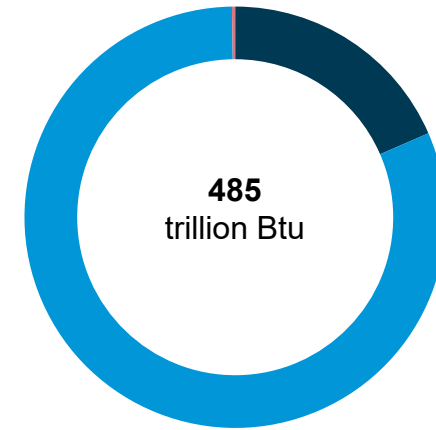
cooling



space heating



water heating



cooking

electricity
natural gas
fuel oil
district heat

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*

Note: Btu = British thermal units

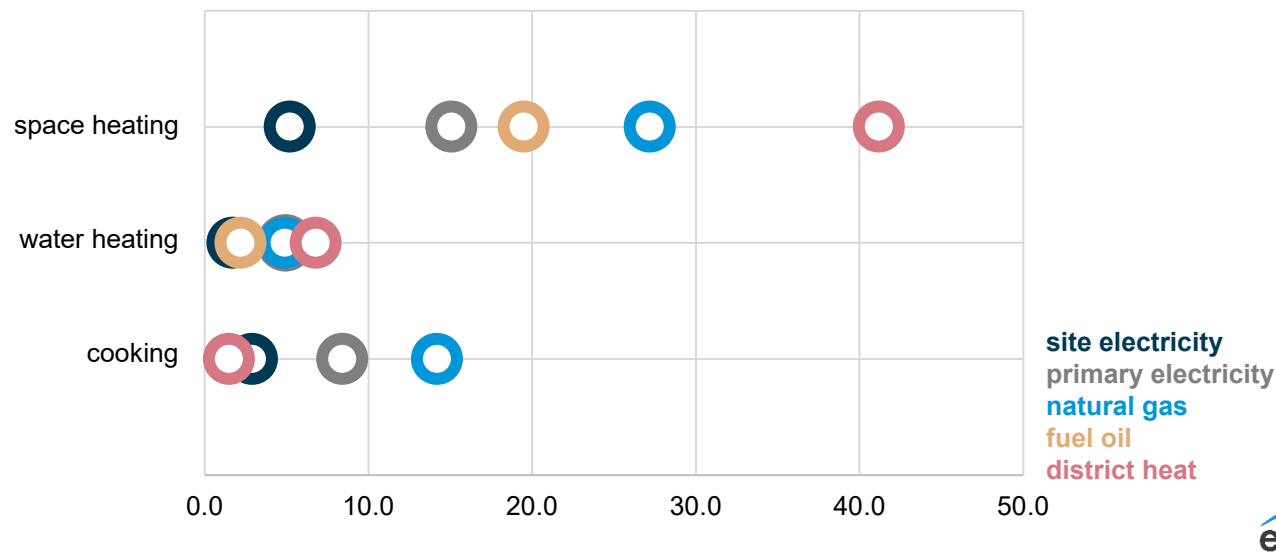


- Electricity accounted for most of the energy used for cooling (98%).
- Natural gas accounted for at least two-thirds of space heating (73%), water heating (67%), and cooking (81%) end-use consumption.

Note: 2018 CBECS did not collect energy consumption data for propane or district chilled water. Propane was reported for space heating in 7% of buildings, accounting for 4% of floorspace. District chilled water was reported for cooling in 1% of buildings, accounting for 4% of floorspace.

Space heating energy intensities were highest for district heat and natural gas

Energy intensity by fuel and selected end uses, 2018
thousand British thermal units per square foot



- Buildings that used district heat for space heating consumed 41.2 MBtu/sf and were approximately 50% more energy intensive than buildings that heated with natural gas (27.2 MBtu/sf).
- Space heating intensity was the lowest for electricity (5.2 MBtu/sf for electricity as it enters a building and 15.1 MBtu/sf when also including the energy consumed to produce and deliver electricity).
- Energy intensities for cooking were the highest for natural gas (14.2 MBtu/sf). Cooking intensities for electricity were second highest (2.9 MBtu/sf for site electricity and 8.4 MBtu/sf for primary electricity).

Data source: U.S. Energy Information Administration, *Commercial Buildings Energy Consumption Survey*
Note: Intensity calculation is conditional on the presence of the energy source and end use. Energy intensity is calculated as the consumption of the fuel for the end use divided by the floorspace in buildings that use the fuel for the particular end use. Site electricity is the amount of electricity that enters a building. Primary electricity is site electricity plus the energy used to produce and deliver that electricity.



References and Additional Information



Additional CBECS information

- [2018 building characteristics tables](https://www.eia.gov/consumption/commercial/data/2018/index.php?view=characteristics)

<https://www.eia.gov/consumption/commercial/data/2018/index.php?view=characteristics>

- [2018 building characteristics flipbook](https://www.eia.gov/consumption/commercial/data/2018/pdf/CBECS_2018_Building_Characteristics_Flipbook.pdf)

https://www.eia.gov/consumption/commercial/data/2018/pdf/CBECS_2018_Building_Characteristics_Flipbook.pdf

- [Guide to the tables](https://www.eia.gov/consumption/commercial/data/2018/guide.php)

<https://www.eia.gov/consumption/commercial/data/2018/guide.php>

- [CBECS terminology](https://www.eia.gov/consumption/commercial/terminology.php)

<https://www.eia.gov/consumption/commercial/terminology.php>

- [CBECS building type definitions](https://www.eia.gov/consumption/commercial/building-type-definitions.php)

<https://www.eia.gov/consumption/commercial/building-type-definitions.php>

- [Frequently asked questions \(FAQs\)](https://www.eia.gov/consumption/commercial/faq.php)

<https://www.eia.gov/consumption/commercial/faq.php>



For more information

U.S. Energy Information Administration homepage | www.eia.gov

Commercial Buildings Energy Consumption Survey | www.eia.gov/cbecs

Today in Energy | www.eia.gov/todayinenergy