

## Chapter 3: Commercial Sector

Chapter 3 focuses on energy use in the commercial sector. Section 3.1 covers primary and site energy consumption in commercial buildings, as well as the delivered energy intensities of various building types and end uses. Section 3.2 provides data on various characteristics of the commercial sector, including floorspace, building types, ownership, and lifetimes. Section 3.3 provides data on commercial building expenditures, including energy prices. Section 3.4 covers environmental emissions from the commercial sector. Section 3.5 briefly addresses commercial building construction and retrofits. Sections 3.6, 3.7, 3.8, 3.9, and 3.10 provide details on select commercial buildings types, specifically office and retail space, medical facilities, educational facilities, and hotels and motels.

In chapter 3, commercial sector floorspace is divided by the intended commercial activity, such as medical facility, office space, and retail space. Buildings owned and/or operated by Federal, state, or municipal governments are included in the commercial building sector and are categorized according to their primary purpose. Energy consumption in Federal buildings is discussed in more detail in chapter 4.

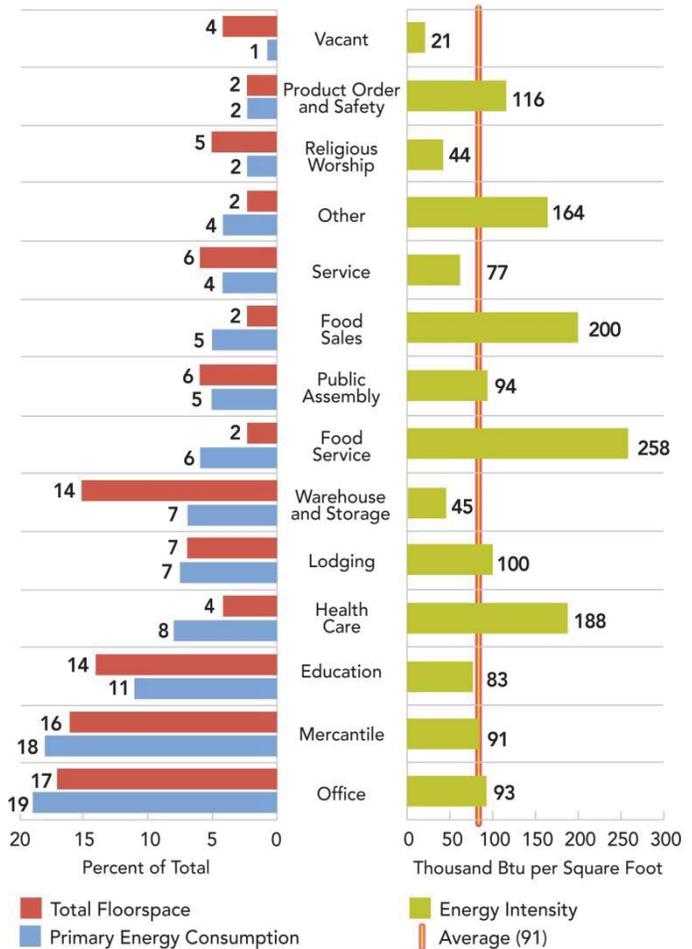
The main points from this chapter are summarized below:

- Commercial buildings represent just under one-fifth of U.S. energy consumption, with office space, retail space, and educational facilities representing about half of commercial sector energy consumption.
- The recession is evidenced by the sharp decrease in energy expenditures in the commercial building sector—a 10% drop. The value of new commercial construction also declined by 22%, the largest percentage drop in the last 30 years. The decline in economic activity had a positive effect on carbon dioxide emissions, which decreased 6%.
- The top three end uses in the commercial sector are space heating, lighting, and space cooling, which represent close to half of commercial site energy consumption.
- Commercial floor space and primary energy consumption grew by 58% and 69%, respectively, between 1980 and 2009. The Energy Information Administration (EIA) projects that they will continue to grow at slower rates between 2009 and 2035, 28% and 22%, respectively. Average energy prices, on the other hand, have been, and are expected to remain, relatively stable.

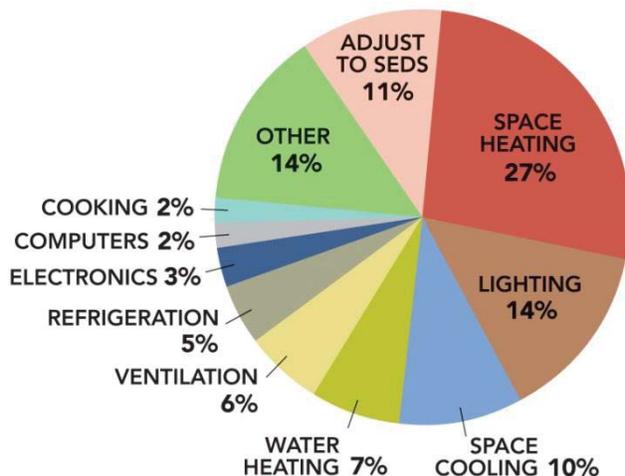
In aggregate, commercial buildings consumed 17.9 quads of primary energy in 2009, representing 46.0% of building energy consumption and 18.9% of U.S. energy consumption. (3.1.1) In comparison, the residential sector consumed 21.0 quads of primary energy, equal to 22.3% of U.S. energy consumption. (2.1.1)

In 2003, the most recent year for which such data are available, office and retail buildings represented the greatest proportions of commercial floor space—17% and 16%, respectively—and 19% and 18%, respectively, of commercial sector energy consumption. Warehouses and storage facilities accounted for 14% of commercial floorspace. (3.2.2) However, the average site energy intensity of these buildings was only 45.2 kBtu per square foot, less than half that of office (92.9 kBtu/ft<sup>2</sup>) and retail spaces (73.9 kBtu/ft<sup>2</sup>). (3.1.13) As a result, they represent only 7% of commercial sector energy consumption. (3.2.2) Other low-energy-intensity buildings include those used for religious worship and those that are vacant. Medical buildings and food sales and service buildings tend to contain energy-intensive end uses, such as scanning, refrigeration, and cooking, and also tend to be occupied more hours per day and more days per week. Therefore, floorspace devoted to health care, food sales, and food service have high site energy intensities (187,700, 199,700, and 258,300 Btu per square foot, respectively). (3.1.13) Thus, while these buildings represent 8.5% of commercial floor space, they represent close to 19% of commercial primary energy consumption. (3.2.2)

### 2003 COMMERCIAL BUILDING FLOORSPACE, ENERGY CONSUMPTION, AND ENERGY INTENSITY, BY BUILDING ACTIVITY



### SITE ENERGY CONSUMPTION BY END USE



Space heating consumed 27% of site energy in the commercial sector in 2010, more than any other end use. Other significant end-uses include lighting (14%) and space cooling (10%). Given that the building types that contribute the most to total commercial sector energy consumption, including office, mercantile, education, and lodging, are occupied many hours per day and, in some cases, 24 hours per day, it is not surprising that space conditioning and lighting account for almost half of commercial energy consumption. (3.1.4)