

UNITS AND CALCULATORS EXPLAINED

British thermal units (Btu)



BASICS

What is a British thermal unit?

A *British thermal unit* (Btu) is a measure of the heat content of fuels or energy sources. It is the quantity of heat required to raise the temperature of one pound of liquid water by 1 degree Fahrenheit at the temperature that water has its greatest density (approximately 39 degrees Fahrenheit).



One British thermal unit (Btu) is approximately equal to the energy released by burning a match.

Source: Stock photography (copyrighted)

A single Btu is very small in terms of the amount of energy a single household or an entire country uses. In 2019, the United States used about 100.2 quadrillion Btu of energy. Written out, 1 quadrillion is a 1 followed by 15 zeros: 1,000,000,000,000,000.

Why use British thermal units?

Energy or heat content can be used to compare energy sources or fuels on an equal basis. Fuels can be converted from physical units of measure (such as weight or volume) to a common unit of measurement of the energy or heat content of each fuel. The U.S. Energy Information Administration (EIA) uses Btu as a unit of energy content.

EIA collects data on the physical amounts (volume or weight) of energy sources produced, imported, exported, and consumed. EIA converts those amounts into Btu equivalents to compare the sources on an equal basis.

For example, the physical volumes of fossil fuels consumed in the United States in 2019 and Btu equivalents were

- Petroleum—7.47 billion barrels—36.72 quadrillion Btu
- Natural gas—31.01 trillion cubic feet—32.10 quadrillion Btu
- Coal—587.34 million short tons—11.32 quadrillion Btu

Sample Btu conversion factors

Energy source/fuel	Physical units and Btu ¹
Electricity	1 kilowatthour = 3,412 Btu
Natural gas	1 cubic foot = 1,037 Btu 1 therm = 100,000 Btu
Motor gasoline	1 gallon = 120,286 Btu ²
Diesel fuel	1 gallon = 137,381 Btu ³
Heating oil	1 gallon = 138,500 Btu ⁴
Propane	1 gallon = 91,452 Btu
Wood	1 cord = 20,000,000 Btu ⁵

¹ Btu factors are for end-use consumption in 2019 from *Monthly Energy Review*, May 2020, excluding wood; preliminary data.

² Finished motor gasoline sold at retail in the United States, including fuel ethanol content.

³ Distillate fuel with 15 parts per million (ppm) sulfur or less sulfur content.

⁴ Distillate fuel with 15 ppm to 500 ppm sulfur content.

⁵ This conversion is an estimate. A cord of wood is a volume unit and does not take wood density or moisture content into account. Wood heat content varies significantly with moisture content.

The Btu conversion factors above are approximations. There are tables with heat contents for fuels and electricity in the [appendices of the *Monthly Energy Review*](#).

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