

Appendix

Metric Conversion Factors, Metric Prefixes, and Other Physical Conversion Factors

Data presented in the *Monthly Energy Review* and in other Energy Information Administration publications are expressed predominately in units that historically have been used in the United States, such as British thermal units, barrels, cubic feet, and short tons. However, because U.S. commerce involves other nations, most of which use metric units of measure, the U.S. Government is committed to the transition to the metric system, as stated in the Metric Conversion Act of 1975 (Public Law 94–168), amended by the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100–418), and Executive Order 12770 of July 25, 1991.

The metric conversion factors presented in Table B1 can be used to calculate the metric-unit equivalents of values expressed in U.S. Customary units. For example, 500 short tons are the equivalent of 453.6 metric tons (500 short tons x 0.9071847 metric tons/short ton = 453.6 metric tons).

In the metric system of weights and measures, the names of multiples and subdivisions of any unit may be derived by combining the name of the unit with prefixes, such as deka, hecto, and kilo, meaning, respectively, 10, 100, 1,000, and deci, centi, and milli, meaning, respectively, one-tenth, one-hundredth, and one-thousandth. Common metric prefixes can be found in Table B2.

The conversion factors presented in Table B3 can be used to calculate equivalents in various physical units commonly used in energy analyses. For example, 10 barrels are the equivalent of 420 U.S. gallons (10 barrels x 42 gallons/barrel = 420 gallons).

Type of Unit	U.S. Unit		Equivalent in	Equivalent in Metric Units		
Mass	1 short ton (2,000 lb)	=	0.907 184 7	metric tons (t)		
Mass	1 long ton	=	1.016 047	metric tons (t)		
	1 pound (lb)	=	0.453 592 37ª	kilograms (kg)		
	1 pound uranium oxide (lb U ₃ O ₈)	=	0.384 647 ^b	kilograms uranium (kgU)		
	1 ounce, avoirdupois (avdp oz)	=	28.349 52	grams (g)		
	Tourice, avoiruupois (avup 02)	-	20.349 52	granis (g)		
Volume	1 barrel of oil (bbl)	=	0.158 987 3	cubic meters (m ³)		
	1 cubic yard (yd ³)	=	0.764 555	cubic meters (m ³)		
	1 cubic foot (ft ³)	=	0.028 316 85	cubic meters (m ³)		
	1 U.S. gallon (gal)	=	3.785 412	liters (L)		
	1 ounce, fluid (fl oz)	=	29.573 53	milliliters (mL)		
	1 cubic inch (in ³)	=	16.387 06	milliliters (mL)		
Length	1 mile (mi)	=	1.609 344ª	kilometers (km)		
	1 yard (yd)	=	0.914 4ª	meters (m)		
	1 foot (ft)	=	0.304 8ª	meters (m)		
	1 inch (in)	=	2.54ª	centimeters (cm)		
Area	1 acre	=	0.404 69	hectares (ha)		
	1 square mile (mi ²)	=	2.589 988	square kilometers (km ²)		
	1 square yard (yd ²)	=	0.836 127 4	square meters (m ²)		
	1 square foot (ft ²)	=	0.092 903 04ª	square meters (m ²)		
	1 square inch (in^2)	=	6.451 6ª	square centimeters (cm ²)		
Energy	1 British thermal unit (Btu)°	=	1,055.055 852 62ª	joules (J)		
	1 calorie (cal)	=	4.186 8ª	joules (J)		
	1 kilowatthour (kWh)	=	3.6ª	megajoules (MJ)		
Temperature ^d	32 degrees Fahrenheit (°F)	=	0ª	degrees Celsius (°C)		
•	212 degrees Fahrenheit (°F)	=	100ª	degrees Celsius (°C)		

Table B1. Metric Conversion Factors

^aExact conversion.

^bCalculated by the Energy Information Administration.

^cThe Btu used in this table is the International Table Btu adopted by the Fifth International Conference on Properties of Steam, London, 1956. ^dTo convert degrees Fahrenheit (^oF) to degrees Celsius (^oC) exactly, subtract 32, then multiply by 5/9.

Notes: • Spaces have been inserted after every third digit to the right of the decimal for ease of reading. • Most metric units belong to the International System of Units (SI), and the liter, hectare, and metric ton are accepted for use with the SI units. For more information about the SI units, see http://physics.nist.gov/cuu/Units/index.html.

Web Page: http://www.eia.doe.gov/emeu/mer/append_b.html.

Sources: • General Services Administration, Federal Standard 376B, *Preferred Metric Units for General Use by the Federal Government* (Washington, DC, January 1993), pp. 9-11, 13, and 16. • U.S. Department of Commerce, National Institute of Standards and Technology, Special Publications 330, 811, and 814. • American National Standards Institute/Institute of Electrical and Electronic Engineers, ANSI/IEEE Std 268-1992, pp. 28 and 29.

Unit Multiple	Prefix	Symbol	Unit Subdivision	Prefix	Symbol
10 ¹	deka	da	10 ⁻¹	deci	d
10 ²	hecto	h	10-2	centi	С
10 ³	kilo	k	10 ⁻³	milli	m
10 ⁶	mega	М	10 ⁻⁶	micro	μ
10 ⁹	giga	G	10-9	nano	n
10 ¹²	tera	Т	10 ⁻¹²	pico	р
10 ¹⁵	peta	Р	10 ⁻¹⁵	femto	f
10 ¹⁸	exa	E	10 ⁻¹⁸	atto	а
10 ²¹	zetta	Z	10 ⁻²¹	zepto	Z
10 ²⁴	yotta	Y	10 ⁻²⁴	yocto	у

Table B2. Metric Prefixes

Web Page: http://www.eia.doe.gov/emeu/mer/append_b.html.

Source: U.S. Department of Commerce, National Institute of Standards and Technology, *The International System of Units (SI)*, NIST Special Publication 330, 1991 Edition (Washington, DC, August 1991), p.10.

Table B3. Other Physical Conversion Factors

Energy Source	Original Unit		Equivalent in Final Units		
Petroleum	1 barrel (bbl)	=	42ª	U.S. gallons (gal)	
Coal	1 short ton	=	2,000ª	pounds (lb)	
	1 long ton	=	2,240ª	pounds (lb)	
	1 metric ton (t)	=	1,000 ^a	kilograms (kg)	
Wood	1 cord (cd)	=	1.25⁵	shorts tons	
	1 cord (cd)	=	128ª	cubic feet (ft ³)	

^aExact conversion.

^bCalculated by the Energy Information Administration.

Web Page: http://www.eia.doe.gov/emeu/mer/append_b.html.

Source: U.S. Department of Commerce, National Institute of Standards and Technology, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*, NIST Handbook 44, 1994 Edition (Washington, DC, October 1993), pp. B-10, C-17 and C-21.