Appendix C. Metric and Other Physical Conversion Factors

Data presented in the State Energy Data System (SEDS) 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 C1 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 C2

The conversion factors presented in Table C3 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).

Table C5. Metric conversion factors

U.S Unit	*multiplied by*	Conversion Factor	*equals*	Metric Unit	U.S. Unit	*multiplied by*	Conversion Factor	*equals*	Metric Unit
Mass					**Volume**				
short tons (2,000 lb)	x	0.9071847	=	metric tons (t)	barrels of oil (b)	x	0.1589873	=	cubic meters (m^3)
long tons	x	1.016047	=	metric tons (t)	cubic yards (yd^3)	x	0.764555	=	cubic meters (m^3)
pounds (lb)	x	0.45359237[a]	=	kilograms (kg)	cubic feet (ft^3)	x	0.02831685	=	cubic meters (m^3)
pounds uranium oxide (lb U_3O_8)	x	0.384647[b]	=	kilograms uranium (kgU)	U.S. gallons (gal)	x	3.785412	=	liters (L)
ounces, avoirdupois (avdp oz)	x	28.34952	=	grams (g)	ounces, fluid (fl oz)	x	29.57353	=	milliliters (mL)
					cubic inches (in^3)	x	16.38706	=	milliliters (mL)
Length					**Area**				
miles (mi)	x	1.609344[a]	=	kilometers (km)	acres	x	0.40469	=	hectares (ha)
yard (yd)	x	0.9144[a]	=	meters (m)	square miles (mi^2)	x	2.589988	=	square kilometers (km^2)
feet (ft)	x	0.3048[a]	=	meters (m)	square yards (yd^2)	x	0.8361274	=	square meters (m^2)
inches (in)	x	2.54[a]	=	centimeters (cm)	square feet (ft^2)	x	0.09290304[a]	=	square meters (m^2)
					square inches (in^2)	x	6.4516[a]	=	square centimeters (cm^2)
Energy					**Temperature**				
British thermal units (Btu)	x	1,055.05585262[a,c]	=	joules (J)	degrees Fahrenheit (˚F)	x	5/9 (after subtracting 32)[a,d]	=	degrees Celsius (˚C)
calories (cal)	x	4.1868[a]	=	joules (J)					
kilowatthours (kWh)	x	3.6[a]	=	megajoules (MJ)					

[a]Exact conversion.

[b]Calculated by the U.S. Energy Information Administration.

[c]The Btu used in this table is the International Table Btu adopted by the Fifth International Conference on Properties of Steam, London, 1956.

[d]To convert degrees Celsius (°C) to degrees Fahrenheit (°F) exactly, multiply by 9/5, then add 32.

Note: Most metric units shown belong to the International System of Units (SI), and the liter, hectare, and metric ton are accepted for use with the SI units.

Sources: General Services Administration, Federal Standard 376B, *Preferred Metric Units for General Use by the Federal Government* (Washington, DC, January 27, 1993), pp. 9–11, 13, and 16. 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.

Table C6. Metric prefixes

Unit Multiple	Prefix	Symbol	Unit Subdivision	Prefix	Symbol
10^{1}	deka	da	10^{-1}	deci	d
10^{2}	hecto	h	10^{-2}	centi	c
10^{3}	kilo	k	10^{-3}	milli	m
10^{6}	mega	M	10^{-6}	micro	µ
10^{9}	giga	G	10^{-9}	nano	n
10^{12}	tera	T	10^{-12}	pico	p
10^{15}	peta	P	10^{-15}	femto	f
10^{18}	exa	E	10^{-18}	atto	a
10^{21}	zetta	Z	10^{-21}	zepto	z
10^{24}	yotta	Y	10^{-24}	yocto	y

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 C7. Other physical conversion factors

Energy Source	Original Unit		Conversion Factor		Final Unit
Petroleum	barrels (b)	x	42[a]	=	U.S. gallons (gal)
Coal	short tons	x	2,000[a]	=	pounds (lb)
	long tons	x	2,240[a]	=	pounds (lb)
	metric tons (t)	x	1,000[a]	=	kilograms (kg)
Wood	cords (cd)	x	1.25[b]	=	short tons
	cords (cd)	x	128[a]	=	cubic feet (ft^3)

[a]Exact conversion.

[b]Calculated by the U.S. Energy Information Administration.

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.