

## Renewable Energy

**Note. Renewable Energy Production and Consumption.** In Tables 1.1, 1.3, and 10.1, renewable energy consumption consists of: conventional hydroelectricity net generation (converted to Btu using the fossil-fuels heat rate—see Table A6); geothermal electricity net generation (converted to Btu using the fossil-fuels heat rate—see Table A6), and geothermal heat pump and geothermal direct use energy; solar thermal and photovoltaic electricity net generation (converted to Btu using the fossil-fuels heat rate—see Table A6), and solar thermal direct use energy; wind electricity net generation (converted to Btu using the fossil-fuels heat rate—see Table A6); wood and wood-derived fuels consumption; biomass waste (municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass) consumption; fuel ethanol (minus denaturant) and biodiesel consumption; and losses and co-products from the production of fuel ethanol and biodiesel. In Tables 1.1, 1.2, and 10.1, renewable energy production is assumed to equal consumption for all renewable energy sources except biofuels (biofuels production comprises biomass inputs to the production of fuel ethanol and biodiesel).

### Table 10.2a Sources

**Residential Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.  
**Residential Sector, Solar/PV:** • 1989–2009: U.S. Energy Information Administration (EIA) estimates based on Form EIA-63A, “Annual Solar Thermal Collector Manufacturers Survey,” and Form EIA-63B, “Annual Photovoltaic Cell/Module Shipments Report.” • 2010 and 2011: EIA estimates based on Form EIA-63B, “Annual Photovoltaic Cell/Module Shipments Report”; Form EIA-63A, “Annual Solar Thermal Collector Manufacturers Survey” (pre-2010 data); and SEIA/GTM Research, *U.S. Solar Market Insight: 2010 Year in Review*.  
**Residential Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980 forward: EIA, Form EIA-457, “Residential Energy Consumption Survey”; and EIA estimates based on Form EIA-457 and regional heating degree-day data.  
**Commercial Sector, Hydroelectric Power:** EIA, *Annual Energy Review (AER)*, Tables 8.2d and A6.  
**Commercial Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.  
**Commercial Sector, Solar/PV:** EIA, AER, Tables 8.2d and A6.  
**Commercial Sector, Wind:** 2009 forward: EIA, AER, Tables 8.2d and A6.  
**Commercial Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980–1983: EIA, *Estimates of U.S. Wood Energy Consumption 1980-1983*, Table ES1. • 1984: EIA estimate based on the 1983 value. • 1985–1988: Values interpolated. • 1989 forward: EIA, AER, Table 8.7c; and EIA estimates based on Form EIA-871, “Commercial Buildings Energy Consumption Survey.”  
**Commercial Sector, Biomass Waste:** EIA, AER, Table 8.7c.

**Commercial Sector, Fuel Ethanol (Minus Denaturant):** EIA, AER, Tables 5.11, 5.13a, and 10.3. Calculated as commercial sector motor gasoline consumption (Table 5.13a) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol (minus denaturant) consumption (Table 10.3).

### Table 10.2b Sources

**Industrial Sector, Hydroelectric Power:** • 1949–1988: U.S. Energy Information Administration (EIA), *Annual Energy Review (AER)*, Tables 8.1 and A6. • 1989 forward: EIA, AER, Tables 8.2d and A6.  
**Industrial Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.  
**Industrial Sector, Solar/PV:** 2010 and 2011: EIA, AER, Tables 8.2d and A6.  
**Industrial Sector, Wind:** 2011: EIA, AER, Tables 8.2d and A6.  
**Industrial Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980–1983: EIA, *Estimates of U.S. Wood Energy Consumption 1980-1983*, Table ES1. • 1984: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 1. • 1985 and 1986: Values interpolated. • 1987: EIA, *Estimates of Biofuels Consumption in the United States During 1987*, Table 2. • 1988: Value interpolated. • 1989 forward: EIA, AER, Table 8.7c; and EIA estimates based on Form EIA-846, “Manufacturing Energy Consumption Survey.”  
**Industrial Sector, Biomass Waste:** • 1981: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see AER, Table 10.2c). • 1982 and 1983: EIA estimates for total waste consumption based on *Estimates of U.S. Biofuels Consumption 1990*, Table 8, minus electric power waste consumption (see AER, Table 10.2c). • 1984: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see AER, Table 10.2c). • 1985 and 1986: Values interpolated. • 1987: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see AER, Table 10.2c). • 1988: Value interpolated. • 1989 forward: EIA, AER, Table 8.7c; and EIA estimates based on information presented in Government Advisory Associates, *Resource Recovery Yearbook* and *Methane Recovery Yearbook*, and information provided by the U.S. Environmental Protection Agency, Landfill Methane Outreach Program.  
**Industrial Sector, Fuel Ethanol (Minus Denaturant):** EIA, AER, Tables 5.11, 5.13b, and 10.3. Calculated as industrial sector motor gasoline consumption (Table 5.13b) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol (minus denaturant) consumption (Table 10.3).  
**Industrial Sector, Losses and Co-products:** EIA, AER, Tables 10.3 and 10.4. Calculated as fuel ethanol losses and co-products (Table 10.3) plus biodiesel losses and co-products (Table 10.4).  
**Transportation Sector, Fuel Ethanol (Minus Denaturant):** EIA, AER, Tables 5.11, 5.13c, and 10.3. Calculated as transportation sector motor gasoline consumption (Table 5.13c) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol (minus denaturant) consumption (Table 10.3).  
**Transportation Sector, Biodiesel:** EIA, AER, Table 10.4.