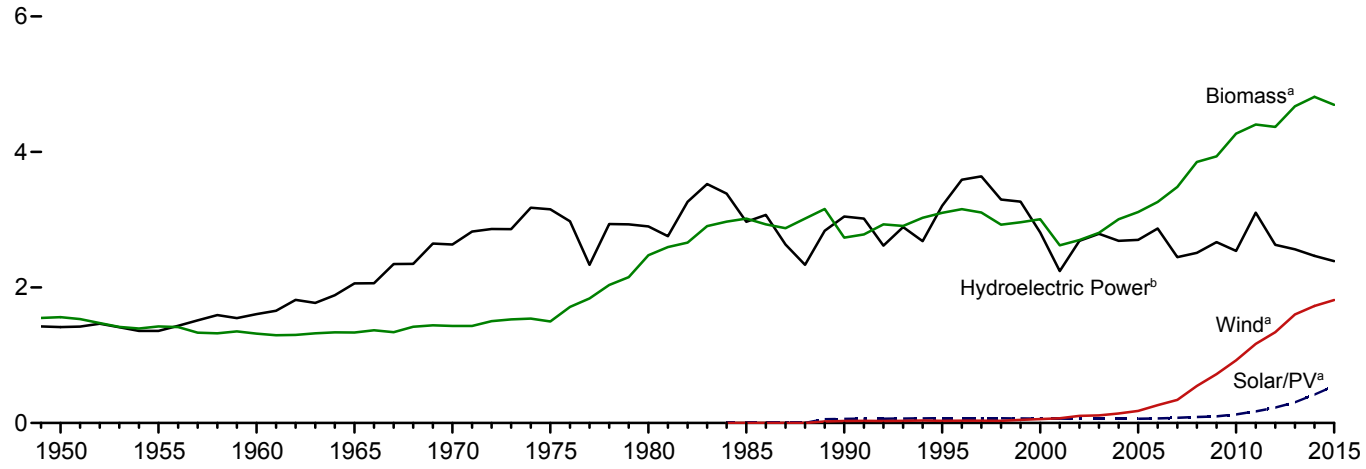
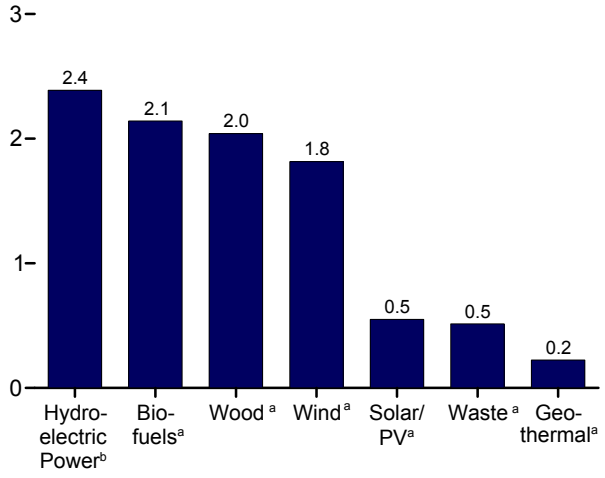
# 10. Renewable Energy

## Figure 10.1 Renewable Energy Consumption
(Quadrillion Btu)

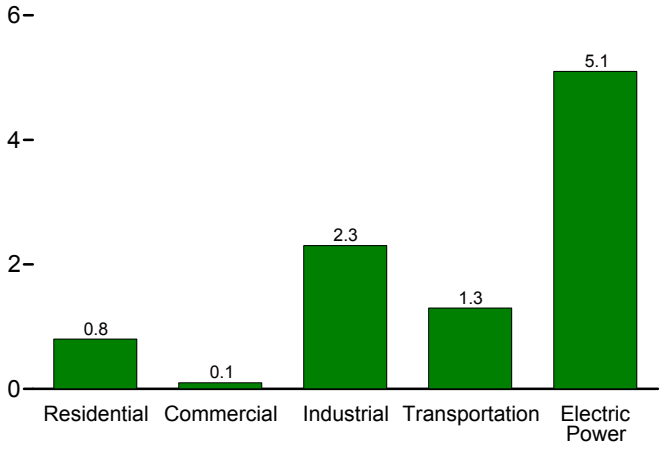
Major Sources, 1949–2015



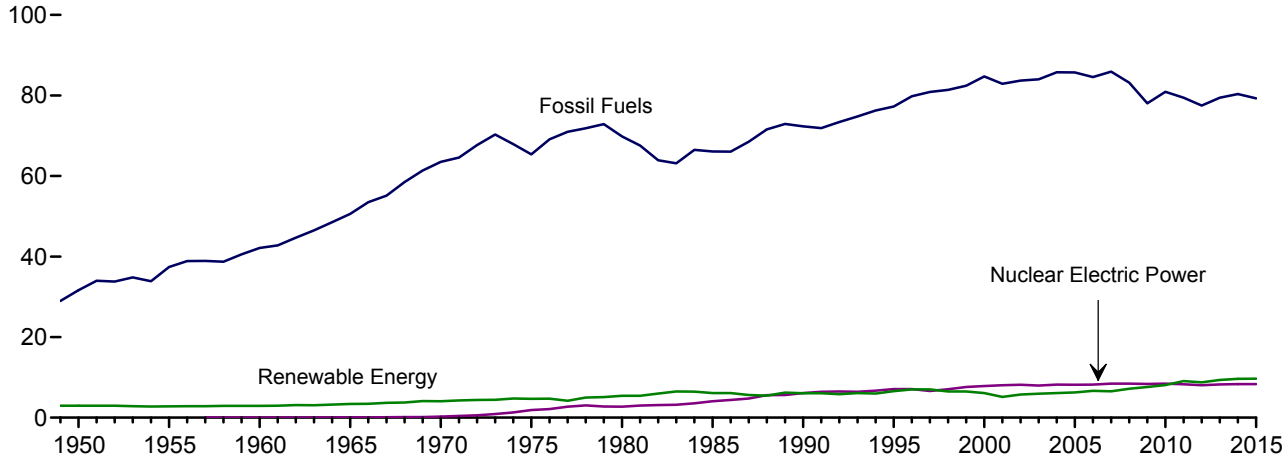

By Source, 2015




By Sector, 2015




Compared With Other Resources, 1949–2015




[a] See Table 10.1 for definition.
[b] Conventional hydroelectric power.

Web Page: http://www.eia.gov/totalenergy/data/monthly/#renewable.
Sources: Tables 1.3 and 10.1–10.2c.

# Table 10.1 Renewable Energy Production and Consumption by Source

(Trillion Btu)

| | Production[a] | | | Consumption | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Biomass | | Total Renewable Energy[d] | Hydroelectric Power[e] | Geothermal[f] | Solar/PV[g] | Wind[h] | Biomass | | | | Total Renewable Energy |
| | Biofuels[b] | Total[c] | | | | | | Wood[i] | Waste[j] | Biofuels[k] | Total | |
| **1950 Total** | **NA** | **1,562** | **2,978** | **1,415** | **NA** | **NA** | **NA** | **1,562** | **NA** | **NA** | **1,562** | **2,978** |
| **1955 Total** | **NA** | **1,424** | **2,784** | **1,360** | **NA** | **NA** | **NA** | **1,424** | **NA** | **NA** | **1,424** | **2,784** |
| **1960 Total** | **NA** | **1,320** | **2,928** | **1,608** | **(s)** | **NA** | **NA** | **1,320** | **NA** | **NA** | **1,320** | **2,928** |
| **1965 Total** | **NA** | **1,335** | **3,396** | **2,059** | **2** | **NA** | **NA** | **1,335** | **NA** | **NA** | **1,335** | **3,396** |
| **1970 Total** | **NA** | **1,431** | **4,070** | **2,634** | **6** | **NA** | **NA** | **1,429** | **2** | **NA** | **1,431** | **4,070** |
| **1975 Total** | **NA** | **1,499** | **4,687** | **3,155** | **34** | **NA** | **NA** | **1,497** | **2** | **NA** | **1,499** | **4,687** |
| **1980 Total** | **NA** | **2,475** | **5,428** | **2,900** | **53** | **NA** | **NA** | **2,474** | **2** | **NA** | **2,475** | **5,428** |
| **1985 Total** | **93** | **3,016** | **6,084** | **2,970** | **97** | **(s)** | **(s)** | **2,687** | **236** | **93** | **3,016** | **6,084** |
| **1990 Total** | **111** | **2,735** | **6,041** | **3,046** | **171** | **59** | **29** | **2,216** | **408** | **111** | **2,735** | **6,041** |
| **1995 Total** | **198** | **3,099** | **6,558** | **3,205** | **152** | **69** | **33** | **2,370** | **531** | **200** | **3,101** | **6,560** |
| **2000 Total** | **233** | **3,006** | **6,104** | **2,811** | **164** | **66** | **57** | **2,262** | **511** | **236** | **3,008** | **6,106** |
| **2001 Total** | **254** | **2,624** | **5,164** | **2,242** | **164** | **64** | **70** | **2,006** | **364** | **253** | **2,622** | **5,163** |
| **2002 Total** | **308** | **2,705** | **5,734** | **2,689** | **171** | **63** | **105** | **1,995** | **402** | **303** | **2,701** | **5,729** |
| **2003 Total** | **401** | **2,805** | **5,946** | **2,793** | **173** | **62** | **113** | **2,002** | **401** | **403** | **2,806** | **5,948** |
| **2004 Total** | **486** | **2,996** | **6,067** | **2,688** | **178** | **63** | **142** | **2,121** | **389** | **498** | **3,008** | **6,079** |
| **2005 Total** | **561** | **3,101** | **6,226** | **2,703** | **181** | **63** | **178** | **2,137** | **403** | **574** | **3,114** | **6,239** |
| **2006 Total** | **716** | **3,212** | **6,594** | **2,869** | **181** | **68** | **264** | **2,099** | **397** | **766** | **3,262** | **6,645** |
| **2007 Total** | **970** | **3,472** | **6,520** | **2,446** | **186** | **76** | **341** | **2,089** | **413** | **983** | **3,485** | **6,533** |
| **2008 Total** | **1,374** | **3,868** | **7,206** | **2,511** | **192** | **89** | **546** | **2,059** | **435** | **1,357** | **3,851** | **7,189** |
| **2009 Total** | **1,570** | **3,953** | **7,641** | **2,669** | **200** | **98** | **721** | **1,931** | **452** | **1,553** | **3,936** | **7,624** |
| **2010 Total** | **1,868** | **4,316** | **8,112** | **2,539** | **208** | **126** | **923** | **1,981** | **468** | **1,821** | **4,270** | **8,066** |
| **2011 Total** | **2,029** | **4,501** | **9,155** | **3,103** | **212** | **171** | **1,168** | **2,010** | **462** | **1,933** | **4,405** | **9,059** |
| **2012 Total** | **1,929** | **4,406** | **8,813** | **2,629** | **212** | **227** | **1,340** | **2,010** | **467** | **1,892** | **4,369** | **8,777** |
| **2013 Total** | **1,981** | **4,647** | **9,330** | **2,562** | **214** | **305** | **1,601** | **2,170** | **496** | **2,007** | **4,673** | **9,356** |
| **2014** January | 170 | 404 | 827 | 206 | 18 | 29 | 170 | 190 | 45 | 163 | 397 | 820 |
| February | 153 | 367 | 709 | 165 | 16 | 27 | 133 | 173 | 41 | 150 | 364 | 706 |
| March | 173 | 406 | 858 | 231 | 18 | 34 | 169 | 189 | 45 | 167 | 401 | 852 |
| April | 170 | 392 | 864 | 242 | 18 | 35 | 177 | 179 | 44 | 167 | 390 | 862 |
| May | 178 | 403 | 860 | 252 | 18 | 38 | 148 | 182 | 43 | 176 | 401 | 858 |
| June | 177 | 406 | 858 | 245 | 18 | 39 | 150 | 186 | 42 | 173 | 402 | 853 |
| July | 183 | 420 | 824 | 232 | 18 | 38 | 116 | 192 | 45 | 180 | 417 | 821 |
| August | 179 | 416 | 758 | 188 | 18 | 39 | 97 | 193 | 43 | 182 | 418 | 761 |
| September | 173 | 396 | 714 | 153 | 18 | 38 | 110 | 182 | 41 | 172 | 394 | 713 |
| October | 179 | 407 | 764 | 163 | 18 | 38 | 138 | 186 | 42 | 180 | 408 | 765 |
| November | 177 | 403 | 811 | 177 | 18 | 34 | 179 | 185 | 42 | 173 | 399 | 808 |
| December | 191 | 428 | 830 | 212 | 18 | 31 | 140 | 194 | 44 | 183 | 420 | 822 |
| **Total** | **2,103** | **4,849** | **9,678** | **2,467** | **214** | **420** | **1,728** | **2,230** | **516** | **2,067** | **4,812** | **9,641** |
| **2015** January | 178 | 403 | 839 | 234 | 20 | 37 | 145 | 181 | 45 | 164 | 390 | 826 |
| February | 162 | 362 | 777 | 217 | 18 | 38 | 142 | 162 | 39 | 156 | 357 | 772 |
| March | 180 | 391 | 840 | 237 | 19 | 47 | 146 | 169 | 43 | 174 | 386 | 834 |
| April | 172 | 378 | 829 | 215 | 18 | 49 | 170 | 164 | 41 | 169 | 375 | 826 |
| May | 183 | 396 | 821 | 192 | 19 | 50 | 164 | 170 | 42 | 185 | 397 | 822 |
| June | 184 | 394 | 782 | 191 | 18 | 50 | 128 | 169 | 42 | 186 | 397 | 785 |
| July | 187 | 409 | 811 | 201 | 19 | 52 | 130 | 177 | 45 | 188 | 410 | 812 |
| August | 184 | 402 | 783 | 185 | 19 | 52 | 124 | 175 | 43 | 188 | 406 | 787 |
| September | 176 | 383 | 734 | 154 | 17 | 47 | 132 | 166 | 41 | 182 | 389 | 740 |
| October | 185 | 396 | 774 | 159 | 18 | 45 | 156 | 168 | 44 | 186 | 397 | 774 |
| November | 181 | 390 | 823 | 184 | 18 | 43 | 187 | 166 | 43 | 179 | 388 | 820 |
| December | 190 | 410 | 881 | 220 | 19 | 41 | 191 | 175 | 46 | 185 | 406 | 876 |
| **Total** | **2,161** | **4,715** | **9,694** | **2,389** | **224** | **550** | **1,816** | **2,040** | **514** | **2,142** | **4,696** | **9,675** |
| **2016** January | 184 | 399 | 881 | 243 | 19 | 44 | 176 | 171 | 44 | 172 | 386 | 869 |
| February | 175 | 375 | 867 | 231 | 18 | 51 | 192 | 159 | 41 | 174 | 374 | 865 |
| **2-Month Total** | **360** | **773** | **1,748** | **474** | **38** | **95** | **368** | **329** | **84** | **346** | **760** | **1,734** |
| **2015 2-Month Total** | **339** | **766** | **1,617** | **451** | **37** | **75** | **287** | **343** | **84** | **320** | **747** | **1,597** |
| **2014 2-Month Total** | **323** | **771** | **1,536** | **371** | **35** | **56** | **304** | **363** | **86** | **313** | **761** | **1,526** |

[a] Production equals consumption for all renewable energy sources except biofuels.
[b] Total biomass inputs to the production of fuel ethanol and biodiesel.
[c] Wood and wood-derived fuels, biomass waste, and total biomass inputs to the production of fuel ethanol and biodiesel.
[d] Hydroelectric power, geothermal, solar thermal/photovoltaic, wind, and biomass.
[e] Conventional hydroelectricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[f] Geothermal electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6), and geothermal heat pump and direct use energy.
[g] Solar thermal and photovoltaic (PV) electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6), and solar thermal direct use energy.
[h] Wind electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[i] Wood and wood-derived fuels.
[j] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).
[k] Fuel ethanol (minus denaturant) and biodiesel consumption, plus losses and co-products from the production of fuel ethanol and biodiesel.

NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Most data for the residential, commercial, industrial, and transportation sectors are estimates. See notes and sources for Tables 10.2a and 10.2b. • See Note, "Renewable Energy Production and Consumption," at end of section. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: Tables 10.2a–10.4.

# Table 10.2a Renewable Energy Consumption: Residential and Commercial Sectors

(Trillion Btu)

| | Residential Sector | | | | Commercial Sector[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Biomass | | | | | | Biomass | | | | |
| | Geo-thermal[b] | Solar/PV[c] | Wood[d] | Total | Hydro-electric Power[e] | Geo-thermal[b] | Solar/PV[f] | Wind[g] | Wood[d] | Waste[h] | Fuel Ethanol[i] | Total | Total |
| **1950 Total** | **NA** | **NA** | **1,006** | **1,006** | **NA** | **NA** | **NA** | **NA** | **19** | **NA** | **NA** | **19** | **19** |
| **1955 Total** | **NA** | **NA** | **775** | **775** | **NA** | **NA** | **NA** | **NA** | **15** | **NA** | **NA** | **15** | **15** |
| **1960 Total** | **NA** | **NA** | **627** | **627** | **NA** | **NA** | **NA** | **NA** | **12** | **NA** | **NA** | **12** | **12** |
| **1965 Total** | **NA** | **NA** | **468** | **468** | **NA** | **NA** | **NA** | **NA** | **9** | **NA** | **NA** | **9** | **9** |
| **1970 Total** | **NA** | **NA** | **401** | **401** | **NA** | **NA** | **NA** | **NA** | **8** | **NA** | **NA** | **8** | **8** |
| **1975 Total** | **NA** | **NA** | **425** | **425** | **NA** | **NA** | **NA** | **NA** | **8** | **NA** | **NA** | **8** | **8** |
| **1980 Total** | **NA** | **NA** | **850** | **850** | **NA** | **NA** | **NA** | **NA** | **21** | **NA** | **NA** | **21** | **21** |
| **1985 Total** | **NA** | **NA** | **1,010** | **1,010** | **NA** | **NA** | **NA** | **NA** | **24** | **NA** | **(s)** | **24** | **24** |
| **1990 Total** | **6** | **56** | **580** | **641** | **1** | **3** | **–** | **–** | **66** | **28** | **(s)** | **94** | **98** |
| **1995 Total** | **7** | **64** | **520** | **591** | **1** | **5** | **–** | **–** | **72** | **40** | **(s)** | **113** | **118** |
| **2000 Total** | **9** | **61** | **420** | **489** | **1** | **8** | **–** | **–** | **71** | **47** | **(s)** | **119** | **128** |
| **2001 Total** | **9** | **59** | **370** | **438** | **1** | **8** | **–** | **–** | **67** | **25** | **(s)** | **92** | **101** |
| **2002 Total** | **10** | **57** | **380** | **448** | **(s)** | **9** | **–** | **–** | **69** | **26** | **(s)** | **95** | **104** |
| **2003 Total** | **13** | **57** | **400** | **470** | **1** | **11** | **–** | **–** | **71** | **29** | **1** | **101** | **113** |
| **2004 Total** | **14** | **57** | **410** | **481** | **1** | **12** | **–** | **–** | **70** | **34** | **1** | **105** | **118** |
| **2005 Total** | **16** | **58** | **430** | **504** | **1** | **14** | **–** | **–** | **70** | **34** | **1** | **105** | **120** |
| **2006 Total** | **18** | **63** | **380** | **462** | **1** | **14** | **–** | **–** | **65** | **36** | **1** | **103** | **118** |
| **2007 Total** | **22** | **70** | **420** | **512** | **1** | **14** | **–** | **–** | **70** | **31** | **2** | **103** | **118** |
| **2008 Total** | **26** | **80** | **470** | **577** | **1** | **15** | **(s)** | **–** | **73** | **34** | **2** | **109** | **125** |
| **2009 Total** | **33** | **89** | **500** | **622** | **1** | **17** | **(s)** | **(s)** | **73** | **36** | **3** | **112** | **129** |
| **2010 Total** | **37** | **114** | **440** | **591** | **1** | **19** | **(s)** | **(s)** | **72** | **36** | **3** | **111** | **130** |
| **2011 Total** | **40** | **153** | **450** | **643** | **(s)** | **20** | **1** | **(s)** | **69** | **43** | **3** | **115** | **136** |
| **2012 Total** | **40** | **186** | **420** | **646** | **(s)** | **20** | **1** | **1** | **61** | **45** | **3** | **108** | **130** |
| **2013 Total** | **40** | **219** | **580** | **839** | **(s)** | **20** | **3** | **1** | **70** | **47** | **3** | **120** | **143** |
| **2014** January | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| February | 3 | 19 | 44 | 67 | (s) | 2 | (s) | (s) | 6 | 3 | (s) | 9 | 11 |
| March | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| April | 3 | 21 | 48 | 72 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| May | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| June | 3 | 21 | 48 | 72 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 13 |
| July | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| August | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| September | 3 | 21 | 48 | 72 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| October | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| November | 3 | 21 | 48 | 72 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| December | 3 | 21 | 49 | 74 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| **Total** | **40** | **252** | **580** | **871** | **(s)** | **20** | **4** | **1** | **73** | **47** | **4** | **124** | **149** |
| **2015** January | 3 | 25 | 37 | 65 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| February | 3 | 23 | 33 | 59 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| March | 3 | 25 | 37 | 65 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| April | 3 | 25 | 35 | 63 | (s) | 2 | 1 | (s) | 6 | 3 | (s) | 10 | 12 |
| May | 3 | 25 | 37 | 65 | (s) | 2 | 1 | (s) | 6 | 3 | (s) | 10 | 12 |
| June | 3 | 25 | 35 | 63 | (s) | 2 | 1 | (s) | 6 | 3 | (s) | 10 | 12 |
| July | 3 | 25 | 37 | 65 | (s) | 2 | 1 | (s) | 6 | 4 | (s) | 10 | 13 |
| August | 3 | 25 | 37 | 65 | (s) | 2 | 1 | (s) | 6 | 3 | (s) | 10 | 12 |
| September | 3 | 25 | 35 | 63 | (s) | 2 | (s) | (s) | 6 | 3 | (s) | 10 | 12 |
| October | 3 | 25 | 37 | 65 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| November | 3 | 25 | 35 | 63 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| December | 3 | 25 | 37 | 65 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| **Total** | **41** | **298** | **432** | **770** | **(s)** | **20** | **5** | **1** | **73** | **45** | **4** | **122** | **149** |
| **2016** January | 4 | 30 | 33 | 66 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 11 | 13 |
| February | 3 | 28 | 31 | 62 | (s) | 2 | (s) | (s) | 6 | 4 | (s) | 10 | 12 |
| **2-Month Total** | **7** | **57** | **63** | **128** | **(s)** | **3** | **1** | **(s)** | **12** | **8** | **1** | **21** | **25** |
| **2015 2-Month Total** | **7** | **48** | **70** | **125** | **(s)** | **3** | **1** | **(s)** | **12** | **8** | **1** | **21** | **25** |
| **2014 2-Month Total** | **6** | **41** | **94** | **141** | **(s)** | **3** | **(s)** | **(s)** | **12** | **8** | **1** | **21** | **24** |

[a] Commercial sector, including commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[b] Geothermal heat pump and direct use energy.

[c] Solar thermal direct use energy, and photovoltaic (PV) electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6). Includes distributed solar thermal and PV energy used in the commercial, industrial, and electric power sectors.

[d] Wood and wood-derived fuels.

[e] Conventional hydroelectricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).

[f] Photovoltaic (PV) electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6) at commercial plants with capacity of 1 megawatt or greater.

[g] Wind electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).

[h] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

[i] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10, consumed by the commercial sector.

NA=Not available. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Data are estimates, except for commercial sector solar/PV, hydroelectric power, wind, and waste. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: See end of section.

# Table 10.2b Renewable Energy Consumption: Industrial and Transportation Sectors

(Trillion Btu)

| | Industrial Sector[a] | | | | | | | | | | Transportation Sector | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Biomass | | | | | | Biomass | | |
| | Hydro-electric Power[b] | Geo-thermal[c] | Solar/ PV[d] | Wind[e] | Wood[f] | Waste[g] | Fuel Ethanol[h] | Losses and Co-products[i] | Total | Total | Fuel Ethanol[j] | Bio-diesel[k] | Total[l] |
| **1950 Total** | **69** | **NA** | **NA** | **NA** | **532** | **NA** | **NA** | **NA** | **532** | **602** | **NA** | **NA** | **NA** |
| **1955 Total** | **38** | **NA** | **NA** | **NA** | **631** | **NA** | **NA** | **NA** | **631** | **669** | **NA** | **NA** | **NA** |
| **1960 Total** | **39** | **NA** | **NA** | **NA** | **680** | **NA** | **NA** | **NA** | **680** | **719** | **NA** | **NA** | **NA** |
| **1965 Total** | **33** | **NA** | **NA** | **NA** | **855** | **NA** | **NA** | **NA** | **855** | **888** | **NA** | **NA** | **NA** |
| **1970 Total** | **34** | **NA** | **NA** | **NA** | **1,019** | **NA** | **NA** | **NA** | **1,019** | **1,053** | **NA** | **NA** | **NA** |
| **1975 Total** | **32** | **NA** | **NA** | **NA** | **1,063** | **NA** | **NA** | **NA** | **1,063** | **1,096** | **NA** | **NA** | **NA** |
| **1980 Total** | **33** | **NA** | **NA** | **NA** | **1,600** | **NA** | **NA** | **NA** | **1,600** | **1,633** | **NA** | **NA** | **NA** |
| **1985 Total** | **33** | **NA** | **NA** | **NA** | **1,645** | **230** | **1** | **42** | **1,918** | **1,951** | **50** | **NA** | **50** |
| **1990 Total** | **31** | **2** | **–** | **–** | **1,442** | **192** | **1** | **49** | **1,684** | **1,717** | **60** | **NA** | **60** |
| **1995 Total** | **55** | **3** | **–** | **–** | **1,652** | **195** | **2** | **86** | **1,934** | **1,992** | **112** | **NA** | **112** |
| **2000 Total** | **42** | **4** | **–** | **–** | **1,636** | **145** | **1** | **99** | **1,881** | **1,928** | **135** | **NA** | **135** |
| **2001 Total** | **33** | **5** | **–** | **–** | **1,443** | **129** | **3** | **108** | **1,681** | **1,719** | **141** | **1** | **142** |
| **2002 Total** | **39** | **5** | **–** | **–** | **1,396** | **146** | **3** | **130** | **1,676** | **1,720** | **168** | **2** | **170** |
| **2003 Total** | **43** | **3** | **–** | **–** | **1,363** | **142** | **4** | **168** | **1,678** | **1,724** | **228** | **2** | **230** |
| **2004 Total** | **33** | **4** | **–** | **–** | **1,476** | **132** | **6** | **201** | **1,815** | **1,851** | **286** | **3** | **290** |
| **2005 Total** | **32** | **4** | **–** | **–** | **1,452** | **148** | **7** | **227** | **1,834** | **1,870** | **327** | **12** | **339** |
| **2006 Total** | **29** | **4** | **–** | **–** | **1,472** | **130** | **10** | **280** | **1,892** | **1,925** | **442** | **33** | **475** |
| **2007 Total** | **16** | **5** | **–** | **–** | **1,413** | **145** | **10** | **369** | **1,937** | **1,957** | **557** | **45** | **602** |
| **2008 Total** | **17** | **5** | **–** | **–** | **1,339** | **143** | **12** | **519** | **2,012** | **2,034** | **786** | **39** | **825** |
| **2009 Total** | **18** | **4** | **–** | **–** | **1,178** | **154** | **13** | **603** | **1,948** | **1,971** | **894** | **41** | **935** |
| **2010 Total** | **16** | **4** | **(s)** | **–** | **1,273** | **168** | **17** | **727** | **2,185** | **2,205** | **1,041** | **33** | **1,075** |
| **2011 Total** | **17** | **4** | **(s)** | **(s)** | **1,309** | **165** | **17** | **756** | **2,246** | **2,268** | **1,045** | **113** | **1,158** |
| **2012 Total** | **22** | **4** | **(s)** | **(s)** | **1,339** | **159** | **17** | **711** | **2,226** | **2,253** | **1,045** | **115** | **1,162** |
| **2013 Total** | **33** | **4** | **(s)** | **(s)** | **1,312** | **187** | **18** | **709** | **2,226** | **2,264** | **1,072** | **182** | **1,278** |
| **2014** January | 1 | (s) | (s) | (s) | 113 | 16 | 1 | 63 | 193 | 195 | 87 | 10 | 99 |
| February | 1 | (s) | (s) | (s) | 102 | 15 | 1 | 56 | 175 | 176 | 82 | 10 | 93 |
| March | 1 | (s) | (s) | (s) | 112 | 17 | 1 | 62 | 192 | 193 | 88 | 14 | 103 |
| April | 1 | (s) | (s) | (s) | 107 | 17 | 1 | 62 | 187 | 188 | 89 | 12 | 104 |
| May | 1 | (s) | (s) | (s) | 109 | 15 | 1 | 64 | 190 | 191 | 94 | 15 | 110 |
| June | 1 | (s) | (s) | (s) | 111 | 15 | 1 | 64 | 190 | 192 | 92 | 16 | 108 |
| July | 1 | (s) | (s) | (s) | 114 | 16 | 1 | 65 | 196 | 198 | 96 | 15 | 113 |
| August | 1 | (s) | (s) | (s) | 115 | 15 | 1 | 64 | 195 | 197 | 95 | 19 | 117 |
| September | 1 | (s) | (s) | (s) | 107 | 14 | 1 | 62 | 185 | 186 | 89 | 19 | 109 |
| October | 1 | (s) | (s) | (s) | 110 | 17 | 1 | 64 | 192 | 193 | 96 | 16 | 115 |
| November | 1 | (s) | (s) | (s) | 109 | 16 | 1 | 64 | 190 | 191 | 92 | 17 | 108 |
| December | 1 | (s) | (s) | (s) | 116 | 17 | 1 | 68 | 202 | 204 | 94 | 18 | 113 |
| **Total** | **12** | **4** | **(s)** | **1** | **1,325** | **190** | **14** | **757** | **2,287** | **2,304** | **1,093** | **181** | **1,291** |
| **2015** January | 1 | (s) | (s) | (s) | 116 | 16 | 1 | 65 | 199 | 200 | 90 | 7 | 97 |
| February | 1 | (s) | (s) | (s) | 103 | 14 | 1 | 59 | 176 | 178 | 83 | 11 | 96 |
| March | 1 | (s) | (s) | (s) | 106 | 16 | 1 | 65 | 188 | 190 | 94 | 12 | 108 |
| April | 1 | (s) | (s) | (s) | 106 | 17 | 1 | 61 | 185 | 187 | 90 | 14 | 106 |
| May | 1 | (s) | (s) | (s) | 108 | 17 | 1 | 65 | 192 | 193 | 98 | 18 | 118 |
| June | 1 | (s) | (s) | (s) | 106 | 16 | 1 | 65 | 189 | 190 | 97 | 20 | 119 |
| July | 1 | (s) | (s) | (s) | 111 | 17 | 1 | 67 | 196 | 197 | 99 | 18 | 120 |
| August | 1 | (s) | (s) | (s) | 109 | 16 | 1 | 65 | 191 | 193 | 100 | 19 | 121 |
| September | 1 | (s) | (s) | (s) | 105 | 16 | 1 | 63 | 185 | 186 | 96 | 19 | 117 |
| October | 1 | (s) | (s) | (s) | 107 | 17 | 1 | 66 | 191 | 192 | 98 | 17 | 118 |
| November | 1 | (s) | (s) | (s) | 105 | 16 | 1 | 65 | 187 | 188 | 94 | 14 | 112 |
| December | 1 | (s) | (s) | (s) | 110 | 17 | 1 | 68 | 196 | 198 | 95 | 17 | 115 |
| **Total** | **13** | **4** | **(s)** | **1** | **1,290** | **195** | **15** | **776** | **2,275** | **2,293** | **1,133** | **188** | **1,347** |
| **2016** January | 1 | (s) | (s) | (s) | 110 | 16 | 1 | 66 | 193 | 195 | 90 | 13 | 104 |
| February | 1 | (s) | (s) | (s) | 101 | 15 | 1 | 62 | 180 | 181 | 93 | 15 | 110 |
| **2-Month Total** | **2** | **1** | **(s)** | **(s)** | **212** | **30** | **2** | **128** | **373** | **376** | **183** | **28** | **214** |
| **2015 2-Month Total** | **2** | **1** | **(s)** | **(s)** | **218** | **30** | **2** | **124** | **375** | **378** | **173** | **19** | **193** |
| **2014 2-Month Total** | **2** | **1** | **(s)** | **(s)** | **215** | **32** | **2** | **119** | **368** | **371** | **169** | **20** | **191** |

[a] Industrial sector, including industrial combined-heat-and-power (CHP) and industrial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 7.

[b] Conventional hydroelectricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).

[c] Geothermal heat pump and direct use energy.

[d] Photovoltaic (PV) electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6) at industrial plants with capacity of 1 megawatt or greater.

[e] Wind electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).

[f] Wood and wood-derived fuels.

[g] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

[h] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10, consumed by the industrial sector.

[i] Losses and co-products from the production of fuel ethanol and biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol and biodiesel—these are included in the industrial sector consumption statistics for the appropriate energy source.

[j] The fuel ethanol (minus denaturant) portion of motor fuels, such as E10 and E85, consumed by the transportation sector.

[k] Although there is biodiesel use in other sectors, all biodiesel consumption is assigned to the transportation sector.

[l] Beginning in 2009, includes imports minus stock change of other renewable diesel fuel and other renewable fuels. See "Renewable Diesel Fuel (Other)" and "Renewable Fuels (Other)" in Glossary.

NA=Not available. – =No data reported. (s)=Less than 0.5 trillion Btu.

Notes: • Data are estimates, except for industrial sector hydroelectric power in 1949–1978 and 1989 forward, solar/PV, and wind. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: See end of section.

# Table 10.2c Renewable Energy Consumption: Electric Power Sector

(Trillion Btu)

| | Hydro-electric Power[a] | Geo-thermal[b] | Solar/PV[c] | Wind[d] | Biomass | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | Wood[e] | Waste[f] | Total | |
| **1950 Total** | **1,346** | **NA** | **NA** | **NA** | **5** | **NA** | **5** | **1,351** |
| **1955 Total** | **1,322** | **NA** | **NA** | **NA** | **3** | **NA** | **3** | **1,325** |
| **1960 Total** | **1,569** | **(s)** | **NA** | **NA** | **2** | **NA** | **2** | **1,571** |
| **1965 Total** | **2,026** | **2** | **NA** | **NA** | **3** | **NA** | **3** | **2,031** |
| **1970 Total** | **2,600** | **6** | **NA** | **NA** | **1** | **2** | **4** | **2,609** |
| **1975 Total** | **3,122** | **34** | **NA** | **NA** | **(s)** | **2** | **2** | **3,158** |
| **1980 Total** | **2,867** | **53** | **NA** | **NA** | **3** | **2** | **4** | **2,925** |
| **1985 Total** | **2,937** | **97** | **(s)** | **(s)** | **8** | **7** | **14** | **3,049** |
| **1990 Total** | **3,014** | **161** | **4** | **29** | **129** | **188** | **317** | **3,524** |
| **1995 Total** | **3,149** | **138** | **5** | **33** | **125** | **296** | **422** | **3,747** |
| **2000 Total** | **2,768** | **144** | **5** | **57** | **134** | **318** | **453** | **3,427** |
| **2001 Total** | **2,209** | **142** | **6** | **70** | **126** | **211** | **337** | **2,763** |
| **2002 Total** | **2,650** | **147** | **6** | **105** | **150** | **230** | **380** | **3,288** |
| **2003 Total** | **2,749** | **146** | **5** | **113** | **167** | **230** | **397** | **3,411** |
| **2004 Total** | **2,655** | **148** | **6** | **142** | **165** | **223** | **388** | **3,339** |
| **2005 Total** | **2,670** | **147** | **6** | **178** | **185** | **221** | **406** | **3,406** |
| **2006 Total** | **2,839** | **145** | **5** | **264** | **182** | **231** | **412** | **3,665** |
| **2007 Total** | **2,430** | **145** | **6** | **341** | **186** | **237** | **423** | **3,345** |
| **2008 Total** | **2,494** | **146** | **9** | **546** | **177** | **258** | **435** | **3,630** |
| **2009 Total** | **2,650** | **146** | **9** | **721** | **180** | **261** | **441** | **3,967** |
| **2010 Total** | **2,521** | **148** | **12** | **923** | **196** | **264** | **459** | **4,064** |
| **2011 Total** | **3,085** | **149** | **17** | **1,167** | **182** | **255** | **437** | **4,855** |
| **2012 Total** | **2,606** | **148** | **40** | **1,339** | **190** | **262** | **453** | **4,586** |
| **2013 Total** | **2,529** | **151** | **83** | **1,600** | **207** | **262** | **470** | **4,833** |
| **2014** January | 205 | 13 | 7 | 170 | 21 | 24 | 45 | 440 |
| February | 164 | 11 | 8 | 133 | 20 | 22 | 42 | 359 |
| March | 230 | 13 | 12 | 169 | 22 | 24 | 46 | 469 |
| April | 241 | 12 | 14 | 177 | 18 | 23 | 41 | 485 |
| May | 251 | 13 | 16 | 148 | 17 | 24 | 41 | 469 |
| June | 244 | 12 | 18 | 150 | 22 | 24 | 45 | 470 |
| July | 231 | 13 | 17 | 116 | 23 | 25 | 48 | 423 |
| August | 187 | 13 | 17 | 97 | 23 | 24 | 46 | 361 |
| September | 152 | 12 | 17 | 109 | 21 | 22 | 43 | 334 |
| October | 162 | 13 | 16 | 138 | 20 | 22 | 42 | 371 |
| November | 176 | 13 | 13 | 179 | 22 | 22 | 44 | 425 |
| December | 211 | 13 | 10 | 140 | 22 | 23 | 45 | 419 |
| **Total** | **2,454** | **151** | **165** | **1,726** | **251** | **279** | **530** | **5,026** |
| **2015** January | 233 | 14 | 11 | 145 | 22 | 24 | 46 | 450 |
| February | 215 | 13 | 15 | 142 | 21 | 21 | 42 | 427 |
| March | 235 | 14 | 21 | 146 | 20 | 22 | 42 | 458 |
| April | 213 | 13 | 24 | 170 | 17 | 22 | 38 | 458 |
| May | 191 | 14 | 24 | 164 | 19 | 22 | 41 | 434 |
| June | 190 | 13 | 25 | 128 | 21 | 22 | 43 | 400 |
| July | 200 | 14 | 26 | 130 | 23 | 24 | 48 | 417 |
| August | 184 | 14 | 26 | 124 | 24 | 24 | 47 | 395 |
| September | 154 | 12 | 22 | 132 | 20 | 22 | 41 | 362 |
| October | 158 | 13 | 19 | 156 | 18 | 23 | 41 | 387 |
| November | 183 | 13 | 18 | 187 | 20 | 23 | 43 | 444 |
| December | 219 | 13 | 15 | 191 | 22 | 25 | 46 | 485 |
| **Total** | **2,376** | **159** | **246** | **1,814** | **246** | **274** | **520** | **5,116** |
| **2016** January | 242 | 14 | 14 | 176 | 21 | 24 | 45 | 491 |
| February | 229 | 13 | 23 | 192 | 21 | 22 | 43 | 500 |
| **2-Month Total** | **471** | **26** | **37** | **368** | **42** | **46** | **88** | **991** |
| **2015 2-Month Total** | **448** | **27** | **27** | **287** | **43** | **45** | **88** | **877** |
| **2014 2-Month Total** | **369** | **24** | **15** | **303** | **41** | **46** | **87** | **799** |

[a] Conventional hydroelectricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[b] Geothermal electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[c] Solar thermal and photovoltaic (PV) electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[d] Wind electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6).
[e] Wood and wood-derived fuels.
[f] Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • The electric power sector comprises electricity-only and combined-heat-and-power (CHP) plants within the NAICS 22 category whose primary business is to sell electricity, or electricity and heat, to the public. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual data beginning in 1949 and monthly data beginning in 1973.

Sources: Tables 7.2b, 7.4b, and A6.

# Table 10.3 Fuel Ethanol Overview

| | Feed-stock[a] | Losses and Co-products[b] | Dena-turant[c] | Production[d] | | | Trade[d] Net Imports[e] | Stocks[d,f] | Stock Change[d,g] | Consumption[d] | | | *Consump-tion Minus Denaturant*[h] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TBtu | TBtu | Mbbl | Mbbl | MMgal | TBtu | Mbbl | Mbbl | Mbbl | Mbbl | MMgal | TBtu | *TBtu* |
| **1981 Total** | **13** | **6** | **40** | **1,978** | **83** | **7** | **NA** | **NA** | **NA** | **1,978** | **83** | **7** | ***7*** |
| **1985 Total** | **93** | **42** | **294** | **14,693** | **617** | **52** | **NA** | **NA** | **NA** | **14,693** | **617** | **52** | ***51*** |
| **1990 Total** | **111** | **49** | **356** | **17,802** | **748** | **63** | **NA** | **NA** | **NA** | **17,802** | **748** | **63** | ***62*** |
| **1995 Total** | **198** | **86** | **647** | **32,325** | **1,358** | **115** | **387** | **2,186** | **-207** | **32,919** | **1,383** | **117** | ***114*** |
| **2000 Total** | **233** | **99** | **773** | **38,627** | **1,622** | **138** | **116** | **3,400** | **-624** | **39,367** | **1,653** | **140** | ***137*** |
| **2001 Total** | **253** | **108** | **841** | **42,028** | **1,765** | **150** | **315** | **4,298** | **898** | **41,445** | **1,741** | **148** | ***144*** |
| **2002 Total** | **307** | **130** | **1,019** | **50,956** | **2,140** | **182** | **306** | **6,200** | **1,902** | **49,360** | **2,073** | **176** | ***171*** |
| **2003 Total** | **400** | **168** | **1,335** | **66,772** | **2,804** | **238** | **292** | **5,978** | **-222** | **67,286** | **2,826** | **240** | ***233*** |
| **2004 Total** | **482** | **201** | **1,621** | **81,058** | **3,404** | **289** | **3,542** | **6,002** | **24** | **84,576** | **3,552** | **301** | ***293*** |
| **2005 Total** | **550** | **227** | **1,859** | **92,961** | **3,904** | **331** | **3,234** | **5,563** | **-439** | **96,634** | **4,059** | **344** | ***335*** |
| **2006 Total** | **683** | **280** | **2,326** | **116,294** | **4,884** | **414** | **17,408** | **8,760** | **3,197** | **130,505** | **5,481** | **465** | ***453*** |
| **2007 Total** | **907** | **368** | **3,105** | **155,263** | **6,521** | **553** | **10,457** | **10,535** | **1,775** | **163,945** | **6,886** | **584** | ***569*** |
| **2008 Total** | **1,286** | **518** | **4,433** | **221,637** | **9,309** | **790** | **12,610** | **14,226** | **3,691** | **230,556** | **9,683** | **821** | ***800*** |
| **2009 Total** | **1,503** | **602** | **5,688** | **260,424** | **10,938** | **928** | **4,720** | **16,594** | **2,368** | **262,776** | **11,037** | **936** | ***910*** |
| **2010 Total** | **1,823** | **726** | **6,506** | **316,617** | **13,298** | **1,127** | **-9,115** | **17,941** | **1,347** | **306,155** | **12,858** | **1,090** | ***1,061*** |
| **2011 Total** | **1,904** | **754** | **6,649** | **331,646** | **13,929** | **1,181** | **-24,365** | **18,238** | **297** | **306,984** | **12,893** | **1,093** | ***1,065*** |
| **2012 Total** | **1,801** | **709** | **6,264** | **314,714** | **13,218** | **1,120** | **-5,891** | **20,350** | **2,112** | **306,711** | **12,882** | **1,092** | ***1,064*** |
| **2013 Total** | **1,805** | **707** | **6,181** | **316,493** | **13,293** | **1,126** | **-5,761** | **16,424** | **-3,926** | **314,658** | **13,216** | **1,120** | ***1,092*** |
| **2014** January | 160 | 62 | 558 | 28,194 | 1,184 | 100 | -2,024 | 17,153 | 729 | 25,441 | 1,069 | 91 | *88* |
| February | 144 | 56 | 498 | 25,269 | 1,061 | 90 | -1,473 | 16,865 | -288 | 24,084 | 1,012 | 86 | *84* |
| March | 160 | 62 | 544 | 28,120 | 1,181 | 100 | -1,985 | 17,310 | 445 | 25,690 | 1,079 | 91 | *89* |
| April | 158 | 61 | 551 | 27,733 | 1,165 | 99 | -1,202 | 17,610 | 300 | 26,231 | 1,102 | 93 | *91* |
| May | 164 | 64 | 565 | 28,888 | 1,213 | 103 | -704 | 18,330 | 720 | 27,464 | 1,153 | 98 | *95* |
| June | 163 | 63 | 524 | 28,629 | 1,202 | 102 | -1,278 | 18,785 | 455 | 26,896 | 1,130 | 96 | *93* |
| July | 167 | 65 | 542 | 29,413 | 1,235 | 105 | -1,495 | 18,696 | -89 | 28,007 | 1,176 | 100 | *97* |
| August | 163 | 64 | 534 | 28,665 | 1,204 | 102 | -1,283 | 18,218 | -478 | 27,860 | 1,170 | 99 | *97* |
| September | 158 | 62 | 509 | 27,807 | 1,168 | 99 | -1,346 | 18,724 | 506 | 25,955 | 1,090 | 92 | *90* |
| October | 163 | 64 | 502 | 28,644 | 1,203 | 102 | -1,919 | 17,341 | -1,383 | 28,108 | 1,181 | 100 | *98* |
| November | 163 | 63 | 540 | 28,588 | 1,201 | 102 | -2,081 | 17,035 | -306 | 26,813 | 1,126 | 95 | *93* |
| December | 175 | 68 | 609 | 30,831 | 1,295 | 110 | -1,580 | 18,739 | 1,704 | 27,547 | 1,157 | 98 | *96* |
| **Total** | **1,938** | **755** | **6,476** | **340,781** | **14,313** | **1,212** | **-18,371** | **18,739** | **2,315** | **320,095** | **13,444** | **1,139** | ***1,111*** |
| **2015** January | 168 | 65 | 588 | 29,755 | 1,250 | 106 | -1,630 | 20,543 | 1,804 | 26,321 | 1,105 | 94 | *91* |
| February | 152 | 59 | 534 | 26,788 | 1,125 | 95 | -1,992 | 20,979 | 436 | 24,360 | 1,023 | 87 | *84* |
| March | 167 | 65 | 567 | 29,489 | 1,239 | 105 | -1,992 | 20,865 | -114 | 27,611 | 1,160 | 98 | *96* |
| April | 158 | 61 | 527 | 27,910 | 1,172 | 99 | -1,529 | 20,787 | -78 | 26,459 | 1,111 | 94 | *92* |
| May | 168 | 65 | 545 | 29,666 | 1,246 | 106 | -1,532 | 20,120 | -667 | 28,801 | 1,210 | 102 | *100* |
| June | 168 | 65 | 528 | 29,684 | 1,247 | 106 | -1,428 | 20,029 | -91 | 28,347 | 1,191 | 101 | *99* |
| July | 172 | 66 | 539 | 30,256 | 1,271 | 108 | -1,802 | 19,594 | -435 | 28,889 | 1,213 | 103 | *100* |
| August | 168 | 65 | 523 | 29,621 | 1,244 | 105 | -830 | 19,259 | -335 | 29,126 | 1,223 | 104 | *101* |
| September | 162 | 63 | 519 | 28,543 | 1,199 | 102 | -933 | 18,904 | -355 | 27,965 | 1,175 | 99 | *97* |
| October | 171 | 66 | 566 | 30,139 | 1,266 | 107 | -1,583 | 18,889 | -15 | 28,571 | 1,200 | 102 | *99* |
| November | 168 | 65 | 580 | 29,594 | 1,243 | 105 | -952 | 19,945 | 1,056 | 27,586 | 1,159 | 98 | *96* |
| December | 176 | 68 | 625 | 31,075 | 1,305 | 111 | -1,721 | 21,438 | 1,493 | 27,861 | 1,170 | 99 | *97* |
| **Total** | **1,998** | **774** | **6,641** | **352,520** | **14,806** | **1,254** | **-17,924** | **21,438** | **2,699** | **331,897** | **13,940** | **1,181** | ***1,152*** |
| **2016** January | 171 | 66 | 615 | 30,319 | 1,273 | 108 | -2,073 | 23,168 | 1,730 | 26,516 | 1,114 | 94 | *92* |
| February | 162 | 62 | 583 | 28,678 | 1,204 | 102 | -1,595 | 23,004 | -164 | 27,247 | 1,144 | 97 | *94* |
| **2-Month Total** | **333** | **128** | **1,198** | **58,997** | **2,478** | **210** | **-3,668** | **23,004** | **1,566** | **53,763** | **2,258** | **191** | ***186*** |
| **2015 2-Month Total** | **320** | **124** | **1,122** | **56,543** | **2,375** | **201** | **-3,622** | **20,979** | **2,240** | **50,681** | **2,129** | **180** | ***176*** |
| **2014 2-Month Total** | **304** | **118** | **1,056** | **53,463** | **2,245** | **190** | **-3,497** | **16,865** | **441** | **49,525** | **2,080** | **176** | ***172*** |

[a] Total corn and other biomass inputs to the production of undenatured ethanol used for fuel ethanol.
[b] Losses and co-products from the production of fuel ethanol. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol—these are included in the industrial sector consumption statistics for the appropriate energy source.
[c] The amount of denaturant in fuel ethanol produced.
[d] Includes denaturant.
[e] Through 2009, data are for fuel ethanol imports only; data for fuel ethanol exports are not available. Beginning in 2010, data are for fuel ethanol imports minus fuel ethanol (including industrial alcohol) exports.
[f] Stocks are at end of period.
[g] A negative value indicates a decrease in stocks and a positive value indicates an increase.
[h] Consumption of fuel ethanol minus denaturant. Data for fuel ethanol minus denaturant are used to develop data for "Renewable Energy/Biomass" in Tables 10.1–10.2b, as well as in Sections 1 and 2.

NA=Not available.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Fuel ethanol data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by the approximate heat content of fuel ethanol—see Table A3. • Through 1980, data are not available. For 1981–1992, data are estimates. For 1993–2008, only data for feedstock, losses and co-products, and denaturant are estimates. Beginning in 2009, only data for feedstock, and losses and co-products, are estimates. • See "Denaturant," "Ethanol," "Fuel Ethanol," and "Fuel Ethanol Minus Denaturant" in Glossary. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 1981.

Sources: See end of section.

# Table 10.4 Biodiesel and Other Renewable Fuels Overview

| | Biodiesel | | | | | | | | | | | | | Other Renewable Fuels[f] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Feedstock[a] | Losses and Co-products[b] | Production | | | Trade | | | Stocks[d] | Stock Change[e] | Consumption | | | |
| | | | | | | Imports | Exports | Net Imports[c] | | | | | | |
| | TBtu | TBtu | Mbbl | MMgal | TBtu | Mbbl | Mbbl | Mbbl | Mbbl | Mbbl | Mbbl | MMgal | TBtu | TBtu |
| **2001 Total** | **1** | **(s)** | **204** | **9** | **1** | **81** | **41** | **40** | **NA** | **NA** | **244** | **10** | **1** | **NA** |
| **2002 Total** | **1** | **(s)** | **250** | **10** | **1** | **197** | **57** | **140** | **NA** | **NA** | **390** | **16** | **2** | **NA** |
| **2003 Total** | **2** | **(s)** | **338** | **14** | **2** | **97** | **113** | **-17** | **NA** | **NA** | **322** | **14** | **2** | **NA** |
| **2004 Total** | **4** | **(s)** | **666** | **28** | **4** | **101** | **128** | **-27** | **NA** | **NA** | **639** | **27** | **3** | **NA** |
| **2005 Total** | **12** | **(s)** | **2,162** | **91** | **12** | **214** | **213** | **1** | **NA** | **NA** | **2,163** | **91** | **12** | **NA** |
| **2006 Total** | **32** | **(s)** | **5,963** | **250** | **32** | **1,105** | **856** | **250** | **NA** | **NA** | **6,213** | **261** | **33** | **NA** |
| **2007 Total** | **63** | **1** | **11,662** | **490** | **62** | **3,455** | **6,696** | **-3,241** | **NA** | **NA** | **8,422** | **354** | **45** | **NA** |
| **2008 Total** | **88** | **1** | **16,145** | **678** | **87** | **7,755** | **16,673** | **-8,918** | **NA** | **NA** | **7,228** | **304** | **39** | **NA** |
| **2009 Total** | **67** | **1** | **12,281** | **516** | **66** | **1,906** | **6,546** | **-4,640** | **711** | **711** | **[g] 7,663** | **322** | **41** | **(s)** |
| **2010 Total** | **44** | **1** | **8,177** | **343** | **44** | **564** | **2,588** | **-2,024** | **672** | **-39** | **6,192** | **260** | **33** | **(s)** |
| **2011 Total** | **125** | **2** | **23,035** | **967** | **123** | **890** | **1,799** | **-908** | **2,005** | **[h] 1,028** | **21,099** | **886** | **113** | **(s)** |
| **2012 Total** | **128** | **2** | **23,588** | **991** | **126** | **853** | **3,056** | **-2,203** | **1,984** | **-20** | **21,406** | **899** | **115** | **3** |
| **2013 Total** | **176** | **2** | **32,368** | **1,359** | **173** | **8,152** | **4,675** | **3,477** | **3,810** | **1,825** | **34,020** | **1,429** | **182** | **24** |
| **2014** January | 9 | (s) | 1,727 | 73 | 9 | 222 | 134 | 88 | 3,708 | -101 | 1,916 | 80 | 10 | 2 |
| February | 10 | (s) | 1,801 | 76 | 10 | 161 | 141 | 20 | 3,726 | 18 | 1,803 | 76 | 10 | 1 |
| March | 13 | (s) | 2,361 | 99 | 13 | 240 | 91 | 149 | 3,604 | -122 | 2,632 | 111 | 14 | 2 |
| April | 12 | (s) | 2,223 | 93 | 12 | 135 | 261 | -126 | 3,402 | -202 | 2,299 | 97 | 12 | 3 |
| May | 14 | (s) | 2,531 | 106 | 14 | 133 | 208 | -75 | 3,135 | -267 | 2,724 | 114 | 15 | 2 |
| June | 14 | (s) | 2,645 | 111 | 14 | 235 | 263 | -28 | 2,798 | -337 | 2,953 | 124 | 16 | (s) |
| July | 16 | (s) | 2,926 | 123 | 16 | 493 | 320 | 173 | 3,082 | 284 | 2,815 | 118 | 15 | 2 |
| August | 16 | (s) | 2,987 | 125 | 16 | 571 | 264 | 307 | 2,786 | -297 | 3,590 | 151 | 19 | 2 |
| September | 15 | (s) | 2,754 | 116 | 15 | 352 | 136 | 216 | 2,293 | -492 | 3,462 | 145 | 19 | 1 |
| October | 16 | (s) | 2,928 | 123 | 16 | 507 | 40 | 467 | 2,641 | 347 | 3,048 | 128 | 16 | 2 |
| November | 14 | (s) | 2,610 | 110 | 14 | 989 | 65 | 924 | 3,084 | 444 | 3,091 | 130 | 17 | (s) |
| December | 16 | (s) | 2,958 | 124 | 16 | 540 | 51 | 489 | 3,131 | 46 | 3,401 | 143 | 18 | 1 |
| **Total** | **165** | **2** | **30,452** | **1,279** | **163** | **4,578** | **1,974** | **2,604** | **3,131** | **-679** | **33,735** | **1,417** | **181** | **18** |
| **2015** January | 9 | (s) | 1,706 | 72 | 9 | 372 | 22 | 350 | 3,713 | [i] 677 | 1,379 | 58 | 7 | (s) |
| February | 10 | (s) | 1,827 | 77 | 10 | 416 | 23 | 393 | 3,827 | 114 | 2,105 | 88 | 11 | 1 |
| March | 13 | (s) | 2,323 | 98 | 12 | 311 | 190 | 121 | 3,996 | 169 | 2,275 | 96 | 12 | 1 |
| April | 14 | (s) | 2,565 | 108 | 14 | 294 | 240 | 54 | 3,950 | -45 | 2,664 | 112 | 14 | 2 |
| May | 15 | (s) | 2,755 | 116 | 15 | 307 | 255 | 52 | 3,464 | -487 | 3,294 | 138 | 18 | 2 |
| June | 16 | (s) | 2,897 | 122 | 16 | 673 | 263 | 410 | 2,948 | -516 | 3,823 | 161 | 20 | 2 |
| July | 16 | (s) | 2,875 | 121 | 15 | 1,157 | 255 | 902 | 3,284 | 336 | 3,441 | 145 | 18 | 3 |
| August | 16 | (s) | 2,933 | 123 | 16 | 858 | 275 | 583 | 3,227 | -57 | 3,573 | 150 | 19 | 2 |
| September | 14 | (s) | 2,553 | 107 | 14 | 927 | 200 | 727 | 2,948 | -279 | 3,558 | 149 | 19 | 3 |
| October | 14 | (s) | 2,537 | 107 | 14 | 863 | 161 | 702 | 2,981 | 33 | 3,206 | 135 | 17 | 3 |
| November | 14 | (s) | 2,521 | 106 | 14 | 701 | 76 | 625 | 3,458 | 477 | 2,669 | 112 | 14 | 3 |
| December | 14 | (s) | 2,573 | 108 | 14 | 1,078 | 133 | 945 | 3,815 | 357 | 3,160 | 133 | 17 | 3 |
| **Total** | **163** | **2** | **30,064** | **1,263** | **161** | **7,957** | **2,093** | **5,864** | **3,815** | **[i] 779** | **35,149** | **1,476** | **188** | **25** |
| **2016** January | 14 | (s) | 2,490 | 105 | 13 | 211 | 42 | 169 | 4,036 | 221 | 2,437 | 102 | 13 | 1 |
| February | 14 | (s) | 2,503 | 105 | 13 | 287 | 55 | 232 | 3,937 | -99 | 2,834 | 119 | 15 | 2 |
| **2-Month Total** | **27** | **(s)** | **4,992** | **210** | **27** | **498** | **98** | **400** | **3,937** | **122** | **5,271** | **221** | **28** | **3** |
| **2015 2-Month Total** | **19** | **(s)** | **3,533** | **148** | **19** | **788** | **45** | **743** | **3,827** | **792** | **3,484** | **146** | **19** | **1** |
| **2014 2-Month Total** | **19** | **(s)** | **3,528** | **148** | **19** | **383** | **275** | **108** | **3,726** | **-83** | **3,719** | **156** | **20** | **3** |

[a] Total vegetable oil and other biomass inputs to the production of biodiesel—calculated by multiplying biodiesel production by 5.433 million Btu per barrel. See "Biodiesel Feedstock" entry in the "Thermal Conversion Factor Source Documentation" at the end of Appendix A.

[b] Losses and co-products from the production of biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of biodiesel—these are included in the industrial sector consumption statistics for the appropriate energy source.

[c] Net imports equal imports minus exports.

[d] Stocks are at end of period. Through 2010, includes stocks at bulk terminals only. Beginning in 2011, includes stocks at bulk terminals and biodiesel production plants.

[e] A negative value indicates a decrease in stocks and a positive value indicates an increase.

[f] Imports minus stock change of other renewable diesel fuel and other renewable fuels. See "Renewable Diesel Fuel (Other)" and "Renewable Fuels (Other)" in Glossary.

[g] In 2009, because of incomplete data coverage and differing data sources, a "Balancing Item" amount of 733 thousand barrels (653 thousand barrels in January 2009; 80 thousand barrels in February 2009) is used to balance biodiesel supply and disposition.

[h] Derived from the final 2010 stocks value for bulk terminals and biodiesel production plants (977 thousand barrels), not the final 2010 value for bulk terminals only (672 thousand barrels) that is shown under "Stocks."

[i] Derived from the preliminary 2014 stocks value (3,036 thousand barrels), not the final 2014 value (3,131 thousand barrels) that is shown under "Stocks."

NA=Not available. (s)=Less than 0.5 trillion Btu and greater than -0.5 trillion Btu.

Notes: • Mbbl = thousand barrels. MMgal = million U.S. gallons. TBtu = trillion Btu. • Biodiesel data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to Btu by multiplying by 5.359 million Btu per barrel (the approximate heat content of biodiesel—see Table A1). • Through 2000, data are not available. Beginning in 2001, data not from U.S. Energy Information Administration (EIA) surveys are estimates. • Totals may not equal sum of components due to independent rounding. • Geographic coverage is the 50 states and the District of Columbia.

Web Page: See http://www.eia.gov/totalenergy/data/monthly/#renewable (Excel and CSV files) for all available annual and monthly data beginning in 2001.

Sources: See end of section.

# 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 by multiplying by the total fossil fuels heat rate factors in Table A6); geothermal electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6), and geothermal heat pump and geothermal direct use energy; solar thermal and photovoltaic electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6), and solar thermal direct use energy; wind electricity net generation (converted to Btu by multiplying by the total fossil fuels heat rate factors in 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

1989–2011: Annual estimates by the U.S Energy Information Administration (EIA) based on data from Oregon Institute of Technology, Geo-Heat Center.
2012–2014: Annual estimates assumed by EIA to be equal to that of 2011.
2015 and 2016: Annual estimates are from EIA, *Short-Term Energy Outlook (STEO).*
(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

### Residential Sector, Solar/PV

1989–2009: Annual estimates are based on EIA, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey," and Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."
2010–2013: Annual estimates are based on EIA, 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.*
2014 forward: Annual estimates are from EIA, STEO.
(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

### Residential Sector, Wood

1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2.
1980–2013: Annual estimates are based on EIA, Form EIA-457, "Residential Energy Consumption Survey"; and National Oceanic and Atmospheric Administration regional heating degree-day data.
2014: Annual estimate assumed by EIA to be equal to that of 2013.
2015 and 2016: Annual estimates are from EIA, STEO.
(For 1973 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

### Residential Sector, Total Renewable Energy

1949–1988: Residential sector total renewable energy consumption is equal to residential sector wood consumption.
1989 forward: Residential sector total renewable energy consumption is the sum of the residential sector consumption values for geothermal, solar/PV, and wood.

### Commercial Sector, Hydroelectric Power

1989 forward: Commercial sector conventional hydroelectricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms, are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Commercial Sector, Geothermal

1989–2011: Annual estimates by EIA based on data from Oregon Institute of Technology, Geo-Heat Center.
2012 forward: Annual estimates assumed by EIA to be equal to that of 2011.
(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

### Commercial Sector, Solar/PV

2008 forward: Commercial sector solar thermal and photovoltaic (PV) electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Commercial Sector, Wind

2009 forward: Commercial sector wind electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Commercial Sector, Wood

1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2.
1980–1983: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption 1980 –1983,* Table ES1.
1984: Annual estimate assumed by EIA to be equal to that of 1983.
1985–1988: Annual estimates interpolated by EIA.

(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)
1989 forward: Monthly/annual commercial sector combined-heat-and-power (CHP) wood consumption data are from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. Annual estimates for commercial sector non-CHP wood consumption are based on EIA, Form EIA-871, "Commercial Buildings Energy Consumption Survey" (for 2014 forward, the annual estimates are assumed by EIA to be equal to that of 2013). For 1989 forward, monthly estimates for commercial sector non-CHP wood consumption are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month. Commercial sector total wood consumption is the sum of commercial sector CHP and non-CHP wood consumption.

### Commercial Sector, Biomass Waste
1989 forward: Table 7.4c.

### Commercial Sector, Fuel Ethanol (Minus Denaturant)
1981 forward: The commercial sector share of motor gasoline consumption is equal to commercial sector motor gasoline consumption from Table 3.7a divided by motor gasoline product supplied from Table 3.5. Commercial sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multplied by the commercial sector share of motor gasoline consumption.

### Commercial Sector, Total Biomass
1949–1980: Commercial sector total biomass consumption is equal to commercial sector wood consumption.
1981–1988: Commercial sector total biomass consumption is the sum of the commercial sector consumption values for wood and fuel ethanol (minus denaturant).
1989 forward: Commercial sector total biomass consumption is the sum of the commercial sector consumption values for wood, waste, and fuel ethanol (minus denaturant).

### Commercial Sector, Total Renewable Energy
1949–1988: Commercial sector total renewable energy consumption is equal to commercial sector total biomass consumption.
1989–2007: Commercial sector total renewable energy consumption is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, and total biomass.
2008: Commercial sector total renewable energy consumption is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, solar/PV, and total biomass.
2009 forward: Commercial sector total renewable energy is the sum of the commercial sector consumption values for conventional hydroelectric power, geothermal, solar/PV, wind, and total biomass.

## Table 10.2b Sources

### Industrial Sector, Hydroelectric Power
1949 forward: Industrial sector conventional hydroelectricity net generation data from Table 7.2c are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Industrial Sector, Geothermal
1989–2009: Annual estimates by the U.S. Energy Information Administration (EIA) based on data from Oregon Institute of Technology, Geo-Heat Center.
2010 forward: Annual estimates assumed by EIA to be equal to that of 2009.
(For 1989 forward, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)

### Industrial Sector, Solar/PV
2010 forward: Industrial sector solar thermal and photovoltaic (PV) electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Industrial Sector, Wind
2011 forward: Industrial sector wind electricity net generation data from EIA, Form EIA-923, "Power Plant Operations Report," are converted to Btu by multiplying by the total fossil fuels heat rate factors in Table A6.

### Industrial Sector, Wood
1949–1979: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2.
1980–1983: Annual estimates are from EIA, *Estimates of U.S. Wood Energy Consumption 1980 –1983,* Table ES1.
1984: Annual estimate is from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 1.
1985 and 1986: Annual estimates interpolated by EIA.
1987: Annual estimate is from EIA, *Estimates of Biofuels Consumption in the United States During 1987*, Table 2.
1988: Annual estimate interpolated by EIA.
(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)
1989 forward: Monthly/annual industrial sector combined-heat-and-power (CHP) wood consumption data are from EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. Annual estimates for industrial sector non-CHP wood consumption are based on EIA, Form EIA-846, "Manufacturing Energy Consumption Survey" (for 2014, the annual estimate is assumed by EIA to be equal to that of 2013; for 2015, the annual estimate is from EIA, STEO; for 2016, the annual estimate is assumed by EIA to be equal to that of 2015). For 1989 forward, monthly estimates for industrial sector non-CHP wood consumption are created by dividing the annual estimates by

the number of days in the year and then multiplying by the number of days in the month. Industrial sector total wood consumption is the sum of industrial sector CHP and non-CHP wood consumption.

### Industrial Sector, Biomass Waste

1981: Annual estimate is calculated as total waste consumption (from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER Table 10.2c).
1982 and 1983: Annual estimates are calculated as total waste consumption (based on *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).
1984: Annual estimate is calculated as total waste consumption (from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).
1985 and 1986: Annual estimates interpolated by EIA.
1987: Annual estimate is calculated as total waste consumption (from EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8) minus electric power sector waste consumption (from MER, Table 10.2c).
1988: Annual estimate interpolated by EIA.
(For 1973–1988, monthly estimates are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month.)
1989 forward: Monthly/annual industrial sector combined-heat-and-power (CHP) consumption data are from Table 7.4c. Annual estimates for industrial sector non-CHP waste consumption are 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 (for 2014, the annual estimate is assumed by EIA to be equal to that of 2013; for 2015, the annual estimate is from EIA, STEO; for 2016, the annual estimate is assumed by EIA to be equal to that of 2015). For 1989, forward, monthly estimates for industrial sector non-CHP waste consumption are created by dividing the annual estimates by the number of days in the year and then multiplying by the number of days in the month. Industrial sector total waste consumption is the sum of industrial sector CHP and non-CHP waste consumption.

### Industrial Sector, Fuel Ethanol (Minus Denaturant)

1981 forward: The industrial sector share of motor gasoline consumption is equal to industrial sector motor gasoline consumption from Table 3.7b divided by motor gasoline product supplied from Table 3.5. Industrial sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multiplied by the industrial sector share of motor gasoline consumption.

### Industrial Sector, Biomass Losses and Co-products

1981 forward: Calculated as fuel ethanol losses and co-products from Table 10.3 plus biodiesel losses and co-products from Table 10.4.

### Industrial Sector, Total Biomass

1949–1980: Industrial sector total biomass consumption is equal to industrial sector wood consumption.
1981 forward: Industrial sector total biomass consumption is the sum of the industrial sector consumption values for wood, waste, fuel ethanol (minus denaturant), and biomass losses and co-products.

### Industrial Sector, Total Renewable Energy

1949–1988: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power and total biomass.
1989–2009: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, and total biomass.
2010: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, solar/PV, and total biomass.
2011 forward: Industrial sector total renewable energy consumption is the sum of the industrial sector consumption values for conventional hydroelectric power, geothermal, solar/PV, wind, and total biomass.

### Transportation Sector, Fuel Ethanol (Minus Denaturant)

1981 forward: The transportation sector share of motor gasoline consumption is equal to transportation sector motor gasoline consumption from Table 3.7c divided by motor gasoline product supplied from Table 3.5. Transportation sector fuel ethanol (minus denaturant) consumption is equal to fuel ethanol (minus denaturant) consumption from Table 10.3 multiplied by the transportation sector share of motor gasoline consumption.

### Transportation Sector, Biodiesel

2001 forward: Table 10.4. Transportation sector biodiesel consumption is assumed to equal total biodiesel consumption.

### Transportation Sector, Other Renewable Fuels

2009 forward: Table 10.4.

### Transportation Sector, Total Renewable Energy

1981–2000: Transportation sector total renewable energy consumption is equal to transportation sector fuel ethanol (minus denaturant) consumption.
2001–2008: Transportation sector total renewable energy consumption is the sum of the transportation sector consumption values for fuel ethanol (minus denaturant) and biodiesel.
2009 forward: Transportation sector total renewable energy consumption is the sum of the transportation sector consumption values for fuel ethanol (minus denaturant), biodiesel, and other renewable fuels.

## Table 10.3 Sources

### Feedstock
1981 forward: Calculated as fuel ethanol production (in thousand barrels) minus denaturant, and then multiplied by the fuel ethanol feedstock factor—see Table A3.

### Losses and Co-products
1981 forward: Calculated as fuel ethanol feedstock plus denaturant minus fuel ethanol production.

### Denaturant
1981–2008: Data in thousand barrels for petroleum denaturant in fuel ethanol produced are estimated as 2% of fuel ethanol production; these data are converted to Btu by multiplying by 4.645 million Btu per barrel (the estimated quantity-weighted factor of pentanes plus and conventional motor gasoline used as denaturant).
2009–2014: U.S. Energy Information Administration (EIA), *Petroleum Supply Annual (PSA)*, annual reports, Table 1. Data in thousand barrels for net production of pentanes plus at renewable fuels and oxygenate plants are multiplied by -1; these data are converted to Btu by multiplying by 4.620 million Btu per barrel (the approximate heat content of pentanes plus). Data in thousand barrels for net production of conventional motor gasoline and motor gasoline blending components at renewable fuels and oxygenate plants are multiplied by -1; these data are converted to Btu by multiplying by 5.253 million Btu per barrel (the approximate heat content of conventional motor gasoline). Total denaturant is the sum of the values for pentanes plus, conventional motor gasoline, and motor gasoline blending components.
2015 and 2016: EIA, *Petroleum Supply Monthly (PSM),* monthly reports, Table 1. Data in thousand barrels for net production of pentanes plus at renewable fuels and oxygenate plants are multiplied by -1; these data are converted to Btu by multiplying by 4.620 million Btu per barrel (the approximate heat content of pentanes plus). Data in thousand barrels for net production of conventional motor gasoline and motor gasoline blending components at renewable fuels and oxygenate plants are multiplied by -1; these data are converted to Btu by multiplying by 5.253 million Btu per barrel (the approximate heat content of conventional motor gasoline). Total denaturant is the sum of the values for pentanes plus, conventional motor gasoline, and motor gasoline blending components.

### Production
1981–1992: Fuel ethanol production is assumed to equal fuel ethanol consumption—see sources for "Consumption."
1993–2004: Calculated as fuel ethanol consumption plus fuel ethanol stock change minus fuel ethanol net imports. These data differ slightly from the original production data from EIA, Form EIA-819, "Monthly Oxygenate Report," and predecessor form, which were not reconciled and updated to be consistent with the final balance.
2005–2008: EIA, Form EIA-819, "Monthly Oxygenate Report."
2009–2014: EIA, PSA, annual reports, Table 1, data for net production of fuel ethanol at renewable fuels and oxygenate plants.
2015 and 2016: EIA, PSM, monthly reports, Table 1, data for net production of fuel ethanol at renewable fuels and oxygenate plants.

### Trade, Stocks, and Stock Change
1992–2014: EIA, PSA, annual reports, Table 1.
2015 and 2016: EIA, PSM, monthly reports, Table 1.

### Consumption
1981–1989: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 10; and interpolated values for 1982, 1983, 1985, 1986, and 1988.
1990–1992: EIA, *Estimates of U.S. Biomass Energy Consumption 1992*, Table D2; and interpolated value for 1991.
1993–2004: EIA, PSA, annual reports, Tables 2 and 16. Calculated as 10% of oxygenated finished motor gasoline field production (Table 2), plus fuel ethanol refinery input (Table 16).
2005–2008: EIA, PSA, annual reports, Tables 1 and 15. Calculated as motor gasoline blending components adjustments (Table 1), plus finished motor gasoline adjustments (Table 1), plus fuel ethanol refinery and blender net inputs (Table 15).
2009–2014: EIA, PSA, annual reports, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments.
2015 and 2016: EIA, PSM, monthly reports, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments.

### Consumption Minus Denaturant
1981 forward: Calculated as fuel ethanol consumption minus the amount of denaturant in fuel ethanol consumed. Denaturant in fuel ethanol consumed is estimated by multiplying denaturant in fuel ethanol produced by the fuel ethanol consumption-to-production ratio.

## Table 10.4 Sources

### Biodiesel Feedstock
2001 forward: Calculated as biodiesel production in thousand barrels multiplied by 5.433 million Btu per barrel (the biodiesel feedstock factor—see Table A3).

### Biodiesel Losses and Co-products
2001 forward: Calculated as biodiesel feedstock minus biodiesel production.

### Biodiesel Production
2001–2005: U.S. Department of Agriculture, Commodity Credit Corporation, Bioenergy Program records. Annual data are derived from quarterly data. Monthly data are estimated by dividing the annual data by the number of days

in the year and then multiplying by the number of days in the month.

2006: U.S. Department of Commerce, U.S. Census Bureau, "M311K—Fats and Oils: Production, Consumption, and Stocks," data for soybean oil consumed in methyl esters (biodiesel). In addition, the U.S. Energy Information Administration (EIA) estimates that 14.4 million gallons of yellow grease were consumed in methyl esters (biodiesel).

2007: U.S. Department of Commerce, U.S. Census Bureau, "M311K—Fats and Oils: Production, Consumption, and Stocks," data for all fats and oils consumed in methyl esters (biodiesel).

2008: EIA, *Monthly Biodiesel Production Report,* December 2009 (release date October 2010), Table 11. Monthly data for 2008 are estimated based on U.S. Department of Commerce, U.S. Census Bureau, M311K data, multiplied by the EIA 2008 annual value's share of the M311K 2008 annual value.

2009 and 2010: EIA, *Monthly Biodiesel Production Report,* monthly reports, Table 1.

2011–2014: EIA, *Petroleum Supply Annual (PSA),* annual reports, Table 1, data for renewable fuels except fuel ethanol.

2015 and 2016: EIA, *Petroleum Supply Monthly (PSM),* monthly reports, Table 1, data for renewable fuels except fuel ethanol.

## Biodiesel Trade

2001–2011: For imports, U.S. Department of Agriculture, data for the following Harmonized Tariff Schedule codes: 3824.90.40.20, "Fatty Esters Animal/Vegetable Mixture" (data through June 2010); and 3824.90.40.30, "Biodiesel/Mixes" (data for July 2010–2011). For exports, U.S. Department of Agriculture, data for the following Schedule B codes: 3824.90.40.00, "Fatty Substances Animal/Vegetable/Mixture" (data through 2010); and 3824.90.40.30, "Biodiesel <70%" (data for 2011). (The data above are converted from pounds to gallons by dividing by 7.4.) Although these categories include products other than biodiesel (such as biodiesel coprocessed with petroleum feedstocks; and products destined for soaps, cosmetics, and other items), biodiesel is the largest component. In the absence of other reliable data for biodiesel trade, EIA sees these data as good substitutes.

2012–2014: EIA, PSA, annual reports, Tables 25 and 31, data for biomass-based diesel fuel.

2015 and 2016: EIA, PSM, monthly reports, Tables 37 and 49, data for biomass-based diesel fuel.

## Biodiesel Stocks and Stock Change

2009 forward: EIA, biodiesel data from EIA-22M, "Monthly Biodiesel Production Survey"; and biomass-based diesel fuel data from EIA-810, "Monthly Refinery Report," EIA-812, "Monthly Product Pipeline Report," and EIA-815, "Monthly Bulk Terminal and Blender Report."

## Biodiesel Consumption

2001–2008: Calculated as biodiesel production plus biodiesel net imports.

January and February 2009: EIA, PSA, Table 1, data for refinery and blender net inputs of renewable fuels except fuel ethanol.

March 2009 forward: Calculated as biodiesel production plus biodiesel net imports minus biodiesel stock change.

## Other Renewable Fuels

2009 forward: Imports data for "Other Renewable Diesel Fuel" are from EIA, PSA Table 25 and PSM Table 37 (data are converted to Btu by multiplying by the other renewable diesel fuel heat content factor in Table A1). Imports data for "Other Renewable Fuels" are from EIA, PSA Table 25 and PSM Table 37 (data are converted to Btu by multiplying by the biodiesel heat content factor in Table A1). Stock change data for "Other Renewable Diesel Fuel" are from EIA, EIA-810, "Monthly Refinery Report," EIA-812, "Monthly Product Pipeline Report," and EIA-815, "Monthly Bulk Terminal and Blender Report" (data are converted to Btu by multiplying by the other renewable diesel heat content factor in Table A1). "Other Renewable Fuels" in Table 10.4 is calculated as other renewable diesel fuel imports plus other renewable fuels imports minus other renewable diesel fuel stock change.

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