

# Appendix A

## British Thermal Unit Conversion Factors

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## British Thermal Unit Conversion Factors

The thermal conversion factors presented in the following tables can be used to estimate the heat content in British thermal units (Btu) of a given amount of energy measured in physical units, such as barrels or cubic feet. For example, 10 barrels of asphalt has a heat content of approximately 66.36 million Btu (10 barrels x 6.636 million Btu per barrel = 66.36 million Btu).

The heat content rates (i.e., thermal conversion factors) provided in this section represent the gross (or higher or upper) energy content of the fuels. Gross heat content rates are applied in all Btu calculations for the *Monthly Energy Review* and are commonly used in energy calculations in the United States; net (or lower) heat content rates are typically used in European energy calculations. The difference between the two rates is the amount of energy that is consumed to vaporize water that is created during the combustion process. Generally, the difference ranges from 2% to 10%, depending on the specific fuel and its hydrogen content. Some fuels, such as unseasoned wood, can be more than 40% different in their gross and net heat content rates. See "Heat Content" and "British Thermal Unit (Btu)" in the Glossary for more information.

In general, the annual thermal conversion factors presented in Tables A2 through A6 are computed from final annual data or from the best available data and labeled "preliminary." Often, the current year's factors are labeled "estimate," and are set equal to the previous year's values until data become available to calculate the factors. The source of each factor is described in the section entitled "Thermal Conversion Factor Source Documentation," which follows Table A6 in this appendix.

**Table A1. Approximate Heat Content of Petroleum and Biofuels**

(Million Btu per Barrel, Except as Noted)

| Commodity                                     | Heat Content       | Commodity                                      | Heat Content       |
|-----------------------------------------------|--------------------|------------------------------------------------|--------------------|
| Asphalt and Road Oil                          | 6.636              | Motor Gasoline (Finished)—see Tables A2 and A3 |                    |
| Aviation Gasoline (Finished)                  | 5.048              | Motor Gasoline Blending Components (MGBC)      |                    |
| Aviation Gasoline Blending Components         | 5.048              | Through 2006                                   | 5.253              |
| Crude Oil—see Table A2                        |                    | Beginning in 2007                              | 5.222              |
| Distillate Fuel Oil—see Table A3 for averages |                    | Oxygenates (excluding Fuel Ethanol)            | 4.247              |
| 15 ppm sulfur and under                       | 5.770              | Petrochemical Feedstocks                       |                    |
| Greater than 15 ppm to 500 ppm sulfur         | 5.817              | Naphtha Less Than 401°F                        | 5.248              |
| Greater than 500 ppm sulfur                   | 5.825              | Other Oils Equal to or Greater Than 401°F      | 5.825              |
| Hydrocarbon Gas Liquids                       |                    | Petroleum Coke—see Table A3 for averages       |                    |
| Natural Gas Liquids                           |                    | Total, through 2003                            | 6.024              |
| Ethane                                        | 2.783              | Catalyst, beginning in 2004                    | <sup>a</sup> 6.287 |
| Propane                                       | 3.841              | Marketable, beginning in 2004                  | 5.719              |
| Normal Butane                                 | 4.353              | Residual Fuel Oil                              | 6.287              |
| Isobutane                                     | 4.183              | Special Naphthas                               | 5.248              |
| Natural Gasoline (Pentanes Plus)              | 4.638              | Still Gas                                      |                    |
| Refinery Olefins                              |                    | Through 2015                                   | <sup>b</sup> 6.000 |
| Ethylene                                      | 2.436              | Beginning in 2016                              | <sup>a</sup> 6.287 |
| Propylene                                     | 3.835              | Unfinished Oils                                | 5.825              |
| Butylene                                      | 4.377              | Waxes                                          | 5.537              |
| Isobutylene                                   | 4.355              | Miscellaneous Products                         | 5.796              |
| Hydrogen                                      | <sup>c</sup> 6.287 | Other Hydrocarbons                             | 5.825              |
| Jet Fuel, Kerosene Type                       | 5.670              | Biofuels, Fuel Ethanol—see Table A3            |                    |
| Jet Fuel, Naphtha Type                        | 5.355              | Biofuels, Biodiesel                            | 5.359              |
| Kerosene                                      | 5.670              | Biofuels, Renewable Diesel Fuel                | 5.494              |
| Lubricants                                    | 6.065              | Biofuels, Other                                | 5.359              |

<sup>a</sup> Per residual fuel oil equivalent barrel (6.287 million Btu per barrel).

<sup>b</sup> Per fuel oil equivalent barrel (6.000 million Btu per barrel).

<sup>c</sup> Hydrogen has a gross heat content of 323.6 Btu per standard cubic foot (at 60 degrees Fahrenheit and 1 atmosphere), and 6.287 million Btu per residual fuel oil equivalent barrel. For hydrogen, barrels can be converted to standard cubic feet by multiplying by 19,426 standard cubic feet per barrel of residual fuel oil equivalent.

Note: The values in this table are for gross heat contents. See "Heat Content" in Glossary.

Web Page: <http://www.eia.gov/totalenergy/data/monthly/#appendices>.

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.

**Table A2. Approximate Heat Content of Petroleum Production, Imports, and Exports**  
(Million Btu per Barrel)

|            | Production             |                                        | Imports                |                             |                             |                    | Exports                |                             |                             |                    |
|------------|------------------------|----------------------------------------|------------------------|-----------------------------|-----------------------------|--------------------|------------------------|-----------------------------|-----------------------------|--------------------|
|            |                        |                                        | Crude Oil <sup>a</sup> | Petroleum Products          |                             | Total <sup>d</sup> | Crude Oil <sup>a</sup> | Petroleum Products          |                             | Total <sup>d</sup> |
|            | Crude Oil <sup>a</sup> | Natural Gas Plant Liquids <sup>b</sup> |                        | Motor Gasoline <sup>c</sup> | Total Products <sup>d</sup> |                    |                        | Motor Gasoline <sup>e</sup> | Total Products <sup>d</sup> |                    |
| 1950 ..... | 5.800                  | 4.470                                  | 5.943                  | 5.253                       | 6.263                       | 6.080              | 5.800                  | 5.253                       | 5.751                       | 5.766              |
| 1955 ..... | 5.800                  | 4.346                                  | 5.924                  | 5.253                       | 6.234                       | 6.040              | 5.800                  | 5.253                       | 5.765                       | 5.768              |
| 1960 ..... | 5.800                  | 4.253                                  | 5.911                  | 5.253                       | 6.161                       | 6.021              | 5.800                  | 5.253                       | 5.835                       | 5.834              |
| 1965 ..... | 5.800                  | 4.197                                  | 5.872                  | 5.253                       | 6.123                       | 5.997              | 5.800                  | 5.253                       | 5.742                       | 5.743              |
| 1970 ..... | 5.800                  | 4.090                                  | 5.822                  | 5.253                       | 6.088                       | 5.985              | 5.800                  | 5.253                       | 5.811                       | 5.810              |
| 1975 ..... | 5.800                  | 3.923                                  | 5.821                  | 5.253                       | 5.935                       | 5.858              | 5.800                  | 5.253                       | 5.747                       | 5.748              |
| 1980 ..... | 5.800                  | <sup>b</sup> 3.864                     | 5.812                  | 5.253                       | 5.748                       | 5.796              | 5.800                  | 5.253                       | 5.841                       | 5.820              |
| 1981 ..... | 5.800                  | 3.860                                  | 5.818                  | 5.253                       | 5.659                       | 5.775              | 5.800                  | 5.253                       | 5.837                       | 5.821              |
| 1982 ..... | 5.800                  | 3.798                                  | 5.826                  | 5.253                       | 5.664                       | 5.775              | 5.800                  | 5.253                       | 5.829                       | 5.820              |
| 1983 ..... | 5.800                  | 3.755                                  | 5.825                  | 5.253                       | 5.677                       | 5.774              | 5.800                  | 5.253                       | 5.800                       | 5.800              |
| 1984 ..... | 5.800                  | 3.745                                  | 5.823                  | 5.253                       | 5.613                       | 5.745              | 5.800                  | 5.253                       | 5.867                       | 5.850              |
| 1985 ..... | 5.800                  | 3.752                                  | 5.832                  | 5.253                       | 5.572                       | 5.736              | 5.800                  | 5.253                       | 5.819                       | 5.814              |
| 1986 ..... | 5.800                  | 3.733                                  | 5.903                  | 5.253                       | 5.624                       | 5.808              | 5.800                  | 5.253                       | 5.839                       | 5.832              |
| 1987 ..... | 5.800                  | 3.742                                  | 5.901                  | 5.253                       | 5.599                       | 5.820              | 5.800                  | 5.253                       | 5.860                       | 5.858              |
| 1988 ..... | 5.800                  | 3.751                                  | 5.900                  | 5.253                       | 5.618                       | 5.820              | 5.800                  | 5.253                       | 5.842                       | 5.840              |
| 1989 ..... | 5.800                  | 3.764                                  | 5.906                  | 5.253                       | 5.641                       | 5.833              | 5.800                  | 5.253                       | 5.869                       | 5.857              |
| 1990 ..... | 5.800                  | 3.758                                  | 5.934                  | 5.253                       | 5.614                       | 5.849              | 5.800                  | 5.253                       | 5.838                       | 5.833              |
| 1991 ..... | 5.800                  | 3.740                                  | 5.948                  | 5.253                       | 5.636                       | 5.873              | 5.800                  | 5.253                       | 5.827                       | 5.823              |
| 1992 ..... | 5.800                  | 3.739                                  | 5.953                  | 5.253                       | 5.623                       | 5.877              | 5.800                  | 5.253                       | 5.774                       | 5.777              |
| 1993 ..... | 5.800                  | 3.735                                  | 5.954                  | 5.253                       | 5.539                       | 5.866              | 5.800                  | 5.253                       | 5.681                       | 5.693              |
| 1994 ..... | 5.800                  | 3.728                                  | 5.950                  | 5.253                       | 5.416                       | 5.835              | 5.800                  | 5.253                       | 5.693                       | 5.704              |
| 1995 ..... | 5.800                  | 3.728                                  | 5.938                  | 5.253                       | 5.345                       | 5.830              | 5.800                  | 5.253                       | 5.692                       | 5.703              |
| 1996 ..... | 5.800                  | 3.703                                  | 5.947                  | 5.253                       | 5.373                       | 5.828              | 5.800                  | 5.253                       | 5.663                       | 5.678              |
| 1997 ..... | 5.800                  | 3.686                                  | 5.954                  | 5.253                       | 5.333                       | 5.836              | 5.800                  | 5.253                       | 5.663                       | 5.678              |
| 1998 ..... | 5.800                  | 3.694                                  | 5.953                  | 5.253                       | 5.314                       | 5.833              | 5.800                  | 5.253                       | 5.505                       | 5.539              |
| 1999 ..... | 5.800                  | 3.663                                  | 5.942                  | 5.253                       | 5.291                       | 5.815              | 5.800                  | 5.253                       | 5.530                       | 5.564              |
| 2000 ..... | 5.800                  | 3.648                                  | 5.959                  | 5.253                       | 5.309                       | 5.823              | 5.800                  | 5.253                       | 5.529                       | 5.542              |
| 2001 ..... | 5.800                  | 3.652                                  | 5.976                  | 5.253                       | 5.330                       | 5.838              | 5.800                  | 5.253                       | 5.637                       | 5.641              |
| 2002 ..... | 5.800                  | 3.646                                  | 5.971                  | 5.253                       | 5.362                       | 5.845              | 5.800                  | 5.253                       | 5.517                       | 5.519              |
| 2003 ..... | 5.800                  | 3.659                                  | 5.970                  | 5.253                       | 5.381                       | 5.845              | 5.800                  | 5.253                       | 5.628                       | 5.630              |
| 2004 ..... | 5.800                  | 3.636                                  | 5.981                  | 5.253                       | 5.429                       | 5.853              | 5.800                  | 5.253                       | 5.532                       | 5.539              |
| 2005 ..... | 5.800                  | 3.638                                  | 5.977                  | 5.253                       | 5.436                       | 5.835              | 5.800                  | 5.253                       | 5.504                       | 5.513              |
| 2006 ..... | 5.800                  | 3.622                                  | 5.980                  | 5.253                       | 5.431                       | 5.836              | 5.800                  | <sup>e</sup> 5.219          | 5.415                       | 5.423              |
| 2007 ..... | 5.800                  | 3.609                                  | 5.985                  | 5.222                       | 5.483                       | 5.857              | 5.800                  | 5.188                       | 5.465                       | 5.471              |
| 2008 ..... | 5.800                  | 3.614                                  | 5.990                  | 5.222                       | 5.459                       | 5.861              | 5.800                  | 5.215                       | 5.587                       | 5.591              |
| 2009 ..... | 5.800                  | 3.598                                  | 5.988                  | 5.222                       | 5.509                       | 5.878              | 5.800                  | 5.221                       | 5.674                       | 5.677              |
| 2010 ..... | 5.800                  | 3.573                                  | 5.989                  | 5.222                       | 5.545                       | 5.892              | 5.800                  | 5.214                       | 5.601                       | 5.604              |
| 2011 ..... | 5.800                  | 3.573                                  | 6.008                  | 5.222                       | 5.538                       | 5.905              | 5.800                  | 5.216                       | 5.526                       | 5.530              |
| 2012 ..... | 5.800                  | 3.588                                  | 6.165                  | 5.222                       | 5.501                       | 6.035              | 5.800                  | 5.217                       | 5.520                       | 5.526              |
| 2013 ..... | 5.800                  | 3.629                                  | 6.010                  | 5.222                       | 5.497                       | 5.899              | 5.800                  | 5.216                       | 5.470                       | 5.482              |
| 2014 ..... | 5.800                  | 3.640                                  | 6.035                  | 5.222                       | 5.518                       | 5.929              | 5.800                  | 5.218                       | 5.369                       | 5.406              |
| 2015 ..... | 5.717                  | 3.669                                  | 6.065                  | 5.222                       | 5.504                       | 5.941              | 5.682                  | 5.218                       | 5.279                       | 5.319              |
| 2016 ..... | 5.722                  | 3.632                                  | 6.053                  | 5.222                       | 5.491                       | 5.929              | 5.724                  | 5.218                       | 5.184                       | 5.245              |
| 2017 ..... | 5.723                  | 3.612                                  | 6.050                  | 5.222                       | 5.489                       | 5.930              | 5.738                  | <sup>e</sup> 5.222          | 5.151                       | 5.258              |
| 2018 ..... | 5.706                  | 3.591                                  | 6.063                  | 5.222                       | <sup>d</sup> 5.491          | <sup>d</sup> 5.938 | 5.721                  | 5.222                       | <sup>d</sup> 5.088          | <sup>d</sup> 5.259 |
| 2019 ..... | 5.698                  | 3.607                                  | 6.061                  | 5.222                       | 5.464                       | 5.908              | 5.708                  | 5.222                       | 5.022                       | 5.263              |
| 2020 ..... | 5.691                  | 3.593                                  | 6.066                  | 5.222                       | 5.513                       | 5.927              | 5.709                  | 5.222                       | 4.924                       | 5.220              |
| 2021 ..... | 5.690                  | 3.585                                  | 6.067                  | 5.222                       | 5.508                       | 5.905              | 5.725                  | 5.222                       | 4.861                       | 5.161              |
| 2022 ..... | 5.684                  | 3.575                                  | 6.085                  | 5.222                       | 5.519                       | 5.928              | 5.721                  | 5.222                       | 4.866                       | 5.187              |
| 2023 ..... | 5.689                  | 3.575                                  | 6.064                  | 5.222                       | 5.471                       | 5.922              | 5.729                  | 5.222                       | 4.805                       | 5.174              |
| 2024 ..... | 5.689                  | 3.578                                  | 6.062                  | 5.222                       | 5.455                       | 5.929              | 5.719                  | 5.222                       | 4.804                       | 5.154              |
| 2025 ..... | <sup>P</sup> 5.689     | <sup>P</sup> 3.568                     | <sup>P</sup> 6.062     | <sup>P</sup> 5.222          | <sup>P</sup> 5.437          | <sup>P</sup> 5.924 | <sup>P</sup> 5.716     | <sup>P</sup> 5.222          | <sup>P</sup> 4.739          | <sup>P</sup> 5.102 |
| 2026 ..... | <sup>E</sup> 5.689     | <sup>E</sup> 3.568                     | <sup>E</sup> 6.062     | <sup>E</sup> 5.222          | <sup>E</sup> 5.437          | <sup>E</sup> 5.924 | <sup>E</sup> 5.716     | <sup>E</sup> 5.222          | <sup>E</sup> 4.739          | <sup>E</sup> 5.102 |

<sup>a</sup> Includes lease condensate.

<sup>b</sup> Natural gas processing plant production of natural gas liquids (ethane, propane, normal butane, isobutane, and natural gasoline). Through 1980, also includes natural gas processing plant production of finished petroleum products (aviation gasoline, distillate fuel oil, jet fuel, kerosene, motor gasoline, special naphthas, and miscellaneous products).

<sup>c</sup> Excludes fuel ethanol, methyl tertiary butyl ether (MTBE), and other oxygenates blended into motor gasoline.

<sup>d</sup> Through 2017, the imports and exports factors are developed using old hydrocarbon gas liquids heat content values shown in Table A1 of the September 2019 *Monthly Energy Review* (MER). Beginning in 2018, the factors are developed using heat content values shown in Table A1 of the current MER.

<sup>e</sup> For 2006–2016, includes MTBE blended into motor gasoline; excludes MTBE in other years. For all years, excludes fuel ethanol and other non-MTBE oxygenates blended into motor gasoline.

P=Preliminary. E=Estimate.

Note: The values in this table are for gross heat contents. See "Heat Content" in Glossary.

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

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.

**Table A3. Approximate Heat Content of Petroleum Consumption and Fuel Ethanol**  
(Million Btu per Barrel)

|            | Total Petroleum <sup>a</sup> Consumption by Sector |                         |                         |                               |                               |                      | Distillate Fuel Oil Consumption <sup>i</sup> | Hydrocarbon Gas Liquids Consumption <sup>g</sup> | Motor Gasoline (Finished) Consumption <sup>h</sup> | Petroleum Coke Consumption <sup>j</sup> | Fuel Ethanol <sup>k</sup> | Fuel Ethanol Feedstock Factor <sup>k</sup> |
|------------|----------------------------------------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|----------------------|----------------------------------------------|--------------------------------------------------|----------------------------------------------------|-----------------------------------------|---------------------------|--------------------------------------------|
|            | Residential                                        | Commercial <sup>b</sup> | Industrial <sup>b</sup> | Transportation <sup>b,c</sup> | Electric Power <sup>d,e</sup> | Total <sup>b,c</sup> |                                              |                                                  |                                                    |                                         |                           |                                            |
| 1950 ..... | 5.473                                              | 5.817                   | 5.927                   | 5.461                         | 6.254                         | 5.642                | 5.825                                        | 3.810                                            | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1955 ..... | 5.470                                              | 5.781                   | 5.847                   | 5.407                         | 6.254                         | 5.581                | 5.825                                        | 3.810                                            | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1960 ..... | 5.418                                              | 5.781                   | 5.772                   | 5.387                         | 6.267                         | 5.542                | 5.825                                        | 3.810                                            | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1965 ..... | 5.365                                              | 5.761                   | 5.695                   | 5.386                         | 6.267                         | 5.517                | 5.825                                        | <sup>g</sup> 3.810                               | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1970 ..... | 5.262                                              | 5.709                   | 5.579                   | 5.393                         | 6.252                         | 5.499                | 5.825                                        | 3.731                                            | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1975 ..... | 5.255                                              | 5.649                   | 5.490                   | 5.392                         | 6.250                         | 5.489                | 5.825                                        | 3.671                                            | 5.253                                              | 6.024                                   | NA                        | NA                                         |
| 1980 ..... | 5.322                                              | 5.752                   | 5.340                   | 5.441                         | 6.254                         | 5.472                | 5.825                                        | 3.669                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.586                                      |
| 1981 ..... | 5.284                                              | 5.693                   | 5.268                   | 5.433                         | 6.258                         | 5.440                | 5.825                                        | 3.632                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.562                                      |
| 1982 ..... | 5.267                                              | 5.699                   | 5.211                   | 5.423                         | 6.258                         | 5.406                | 5.825                                        | 3.588                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.539                                      |
| 1983 ..... | 5.141                                              | 5.592                   | 5.214                   | 5.416                         | 6.255                         | 5.396                | 5.825                                        | 3.535                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.515                                      |
| 1984 ..... | 5.308                                              | 5.658                   | 5.167                   | 5.418                         | 6.251                         | 5.385                | 5.825                                        | 3.580                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.492                                      |
| 1985 ..... | 5.264                                              | 5.598                   | 5.159                   | 5.423                         | 6.247                         | 5.377                | 5.825                                        | 3.584                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.469                                      |
| 1986 ..... | 5.269                                              | 5.632                   | 5.237                   | 5.426                         | 6.257                         | 5.410                | 5.825                                        | 3.631                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.446                                      |
| 1987 ..... | 5.241                                              | 5.594                   | 5.203                   | 5.429                         | 6.249                         | 5.395                | 5.825                                        | 3.663                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.423                                      |
| 1988 ..... | 5.259                                              | 5.598                   | 5.196                   | 5.433                         | 6.250                         | 5.402                | 5.825                                        | 3.643                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.400                                      |
| 1989 ..... | 5.195                                              | 5.549                   | 5.190                   | 5.438                         | <sup>d</sup> 6.240            | 5.403                | 5.825                                        | 3.679                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.377                                      |
| 1990 ..... | 5.146                                              | 5.554                   | 5.219                   | 5.442                         | 6.244                         | 5.403                | 5.825                                        | 3.630                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.355                                      |
| 1991 ..... | 5.096                                              | 5.529                   | 5.130                   | 5.441                         | 6.246                         | 5.375                | 5.825                                        | 3.626                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.332                                      |
| 1992 ..... | 5.126                                              | 5.514                   | 5.133                   | 5.443                         | 6.238                         | 5.369                | 5.825                                        | 3.643                                            | 5.253                                              | 6.024                                   | 3.564                     | 6.309                                      |
| 1993 ..... | 5.103                                              | <sup>b</sup> 5.505      | <sup>b</sup> 5.140      | <sup>b</sup> 5.413            | 6.230                         | <sup>b</sup> 5.354   | 5.825                                        | 3.628                                            | <sup>h</sup> 5.217                                 | 6.024                                   | 3.564                     | 6.287                                      |
| 1994 ..... | 5.097                                              | 5.513                   | 5.115                   | 5.413                         | 6.213                         | 5.344                | <sup>f</sup> 5.820                           | 3.657                                            | 5.214                                              | 6.024                                   | 3.564                     | 6.264                                      |
| 1995 ..... | 5.062                                              | 5.476                   | 5.084                   | 5.409                         | 6.187                         | 5.326                | 5.820                                        | 3.641                                            | 5.204                                              | 6.024                                   | 3.564                     | 6.242                                      |
| 1996 ..... | 4.997                                              | 5.431                   | 5.076                   | 5.416                         | 6.194                         | 5.323                | 5.820                                        | 3.629                                            | 5.211                                              | 6.024                                   | 3.564                     | 6.220                                      |
| 1997 ..... | 4.988                                              | 5.389                   | 5.083                   | 5.410                         | 6.198                         | 5.322                | 5.820                                        | 3.627                                            | 5.205                                              | 6.024                                   | 3.564                     | 6.198                                      |
| 1998 ..... | 4.974                                              | 5.363                   | 5.101                   | 5.406                         | 6.210                         | 5.335                | 5.819                                        | 3.619                                            | 5.203                                              | 6.024                                   | 3.564                     | 6.176                                      |
| 1999 ..... | 4.902                                              | 5.289                   | 5.052                   | 5.406                         | 6.204                         | 5.313                | 5.819                                        | 3.628                                            | 5.202                                              | 6.024                                   | 3.564                     | 6.167                                      |
| 2000 ..... | 4.908                                              | 5.313                   | 5.015                   | 5.415                         | 6.188                         | 5.311                | 5.819                                        | 3.610                                            | 5.201                                              | 6.024                                   | 3.564                     | 6.159                                      |
| 2001 ..... | 4.936                                              | 5.323                   | 5.104                   | 5.405                         | 6.199                         | 5.331                | 5.819                                        | 3.604                                            | 5.201                                              | 6.024                                   | 3.564                     | 6.151                                      |
| 2002 ..... | 4.885                                              | 5.291                   | 5.053                   | 5.404                         | 6.172                         | 5.309                | 5.819                                        | 3.588                                            | 5.199                                              | 6.024                                   | 3.564                     | 6.143                                      |
| 2003 ..... | 4.920                                              | 5.313                   | 5.108                   | 5.400                         | 6.182                         | 5.326                | 5.819                                        | 3.610                                            | 5.197                                              | 6.024                                   | 3.564                     | 6.106                                      |
| 2004 ..... | 4.952                                              | 5.324                   | 5.106                   | 5.407                         | 6.134                         | 5.330                | 5.818                                        | 3.591                                            | 5.196                                              | <sup>i</sup> 5.982                      | 3.564                     | 6.069                                      |
| 2005 ..... | 4.915                                              | 5.360                   | 5.143                   | 5.408                         | 6.126                         | 5.342                | 5.818                                        | 3.589                                            | 5.192                                              | 5.982                                   | 3.564                     | 6.032                                      |
| 2006 ..... | 4.886                                              | 5.296                   | 5.120                   | 5.405                         | 6.038                         | 5.323                | 5.803                                        | 3.551                                            | 5.185                                              | 5.987                                   | 3.564                     | 5.995                                      |
| 2007 ..... | 4.833                                              | 5.270                   | 5.079                   | 5.376                         | 6.064                         | 5.293                | 5.784                                        | 3.544                                            | 5.142                                              | 5.996                                   | 3.564                     | 5.959                                      |
| 2008 ..... | 4.772                                              | 5.156                   | 5.103                   | 5.342                         | 6.013                         | 5.268                | 5.780                                        | 3.549                                            | 5.106                                              | 5.992                                   | 3.564                     | 5.922                                      |
| 2009 ..... | 4.664                                              | 5.217                   | 4.959                   | <sup>c</sup> 5.320            | 5.987                         | <sup>c</sup> 5.218   | 5.781                                        | 3.487                                            | 5.090                                              | 6.017                                   | 3.564                     | 5.901                                      |
| 2010 ..... | 4.664                                              | 5.195                   | 4.920                   | 5.316                         | 5.956                         | 5.204                | 5.778                                        | 3.489                                            | 5.067                                              | 6.059                                   | 3.562                     | 5.880                                      |
| 2011 ..... | 4.657                                              | 5.176                   | 4.887                   | 5.315                         | 5.900                         | 5.193                | 5.776                                        | 3.423                                            | 5.063                                              | 6.077                                   | 3.561                     | 5.859                                      |
| 2012 ..... | 4.714                                              | 5.126                   | 4.843                   | 5.306                         | 5.925                         | 5.176                | 5.774                                        | 3.440                                            | 5.062                                              | 6.084                                   | 3.560                     | 5.838                                      |
| 2013 ..... | 4.648                                              | 5.053                   | 4.801                   | 5.302                         | 5.892                         | 5.157                | 5.774                                        | 3.468                                            | 5.060                                              | 6.089                                   | 3.560                     | 5.831                                      |
| 2014 ..... | 4.664                                              | 5.016                   | 4.804                   | 5.300                         | 5.906                         | 5.161                | 5.773                                        | 3.439                                            | 5.059                                              | 6.100                                   | 3.559                     | 5.825                                      |
| 2015 ..... | 4.721                                              | 5.050                   | 4.767                   | 5.302                         | 5.915                         | 5.154                | 5.773                                        | 3.461                                            | 5.057                                              | 6.085                                   | 3.558                     | 5.818                                      |
| 2016 ..... | 4.631                                              | 5.022                   | 4.799                   | 5.303                         | 5.885                         | 5.161                | 5.773                                        | 3.424                                            | 5.055                                              | 6.104                                   | 3.558                     | 5.811                                      |
| 2017 ..... | 4.623                                              | 5.006                   | 4.769                   | 5.305                         | 5.893                         | 5.153                | 5.772                                        | 3.400                                            | 5.053                                              | 6.132                                   | 3.556                     | 5.804                                      |
| 2018 ..... | 4.620                                              | 4.971                   | 4.664                   | 5.309                         | 5.896                         | 5.122                | 5.772                                        | 3.381                                            | 5.054                                              | 6.122                                   | 3.553                     | 5.797                                      |
| 2019 ..... | 4.540                                              | 4.962                   | 4.646                   | 5.307                         | 5.900                         | 5.111                | 5.771                                        | 3.401                                            | 5.052                                              | 6.132                                   | 3.555                     | 5.790                                      |
| 2020 ..... | 4.536                                              | 4.889                   | 4.534                   | 5.301                         | 5.883                         | 5.054                | 5.770                                        | 3.349                                            | 5.052                                              | 6.130                                   | 3.557                     | 5.784                                      |
| 2021 ..... | 4.611                                              | 4.909                   | 4.524                   | 5.307                         | 5.883                         | 5.067                | 5.770                                        | 3.369                                            | 5.050                                              | 6.135                                   | 3.555                     | 5.777                                      |
| 2022 ..... | 4.596                                              | 4.942                   | 4.441                   | 5.314                         | 5.902                         | 5.058                | 5.770                                        | 3.229                                            | 5.049                                              | 6.164                                   | 3.553                     | 5.777                                      |
| 2023 ..... | 4.621                                              | 4.957                   | 4.388                   | 5.308                         | 5.931                         | 5.039                | 5.770                                        | 3.224                                            | 5.049                                              | 6.153                                   | 3.554                     | 5.777                                      |
| 2024 ..... | 4.617                                              | 4.943                   | 4.310                   | 5.307                         | 5.939                         | 5.012                | 5.770                                        | 3.210                                            | 5.050                                              | 6.219                                   | 3.553                     | 5.777                                      |
| 2025 ..... | <sup>E</sup> 4.607                                 | <sup>E</sup> 4.931      | <sup>E</sup> 4.281      | <sup>E</sup> 5.310            | <sup>P</sup> 5.930            | <sup>P</sup> 5.001   | <sup>P</sup> 5.770                           | <sup>P</sup> 3.195                               | <sup>P</sup> 5.047                                 | <sup>P</sup> 6.198                      | <sup>P</sup> 3.554        | 5.717                                      |
| 2026 ..... | <sup>E</sup> 4.607                                 | <sup>E</sup> 4.931      | <sup>E</sup> 4.281      | <sup>E</sup> 5.310            | <sup>E</sup> 5.930            | <sup>E</sup> 5.001   | <sup>E</sup> 5.770                           | <sup>E</sup> 3.195                               | <sup>E</sup> 5.047                                 | <sup>E</sup> 6.198                      | <sup>E</sup> 3.554        | 5.717                                      |

<sup>a</sup> Petroleum products supplied, including natural gas plant liquids and crude oil burned directly as fuel. Quantity-weighted averages of the petroleum products included in each category are calculated by using heat content values for individual products shown in Tables A1 and A3.

<sup>b</sup> Beginning in 1993, includes fuel ethanol blended into motor gasoline.

<sup>c</sup> Beginning in 2009, includes biodiesel and renewable diesel fuel blended into distillate fuel oil.

<sup>d</sup> 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

<sup>e</sup> Electric power sector factors are weighted average heat contents for distillate fuel oil, petroleum coke, and residual fuel oil; they exclude other liquids.

<sup>f</sup> There is a discontinuity in this time series between 1993 and 1994; beginning in 1994, the single constant factor is replaced by a quantity-weighted factor.

Quantity-weighted averages of the sulfur-content categories of distillate fuel oil are calculated by using heat content values shown in Table A1. Excludes biodiesel and renewable diesel fuel blended into distillate fuel oil.

<sup>g</sup> Quantity-weighted averages of the major components of hydrocarbon gas liquids are calculated by using heat content values shown in Table A1. The factor for 1967 is used as the estimated factor for 1949–1966.

<sup>h</sup> Through 1992, excludes oxygenates. Beginning in 1993, includes fuel ethanol blended into motor gasoline; and for 1993–2006, also includes methyl tertiary butyl ether (MTBE) and other oxygenates blended into motor gasoline.

<sup>i</sup> There is a discontinuity in this time series between 2003 and 2004; beginning in 2004, the single constant factor is replaced by a quantity-weighted factor. Quantity-weighted averages of the two categories of petroleum coke are calculated by using heat content values shown in Table A1.

<sup>j</sup> Includes denaturant (petroleum added to ethanol to make it undrinkable). Fuel ethanol factors are weighted average heat contents for undenatured ethanol (3.539 million Btu per barrel) and products used as denaturant (natural gasoline, finished motor gasoline, and motor gasoline blending components—see Tables A1 and A3 for factors). The factor for 2009 is used as the estimated factor for 1980–2008.

<sup>k</sup> Corn input to the production of undenatured ethanol (million Btu corn per barrel undenatured ethanol), used as the factor to estimate total biomass inputs to the production of undenatured ethanol. Ethanol yields (gallons undenatured ethanol per bushel of corn) range from 2.5 in 1980 to 2.88 in 2025—see "Fuel Ethanol Feedstock" sources in the "Thermal Conversion Factor Source Documentation," which follows Table A6. Corn is assumed to have a gross heat content of 0.392 million Btu per bushel. Undenatured ethanol is assumed to have a gross heat content of 3.539 million Btu per barrel.

<sup>P</sup>=Preliminary. <sup>E</sup>=Estimate. NA=Not available.

Note: The heat content values in this table are for gross heat contents. See "Heat Content" in Glossary.

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

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.

**Table A4. Approximate Heat Content of Natural Gas**  
(Btu per Cubic Foot)

|            | Production         |                    | Consumption <sup>a</sup>     |                                    |                    | Imports            | Exports            |
|------------|--------------------|--------------------|------------------------------|------------------------------------|--------------------|--------------------|--------------------|
|            | Marketed           | Dry                | End-Use Sectors <sup>b</sup> | Electric Power Sector <sup>c</sup> | Total              |                    |                    |
| 1950 ..... | 1,119              | 1,035              | 1,035                        | 1,035                              | 1,035              | --                 | 1,035              |
| 1955 ..... | 1,120              | 1,035              | 1,035                        | 1,035                              | 1,035              | 1,035              | 1,035              |
| 1960 ..... | 1,107              | 1,035              | 1,035                        | 1,035                              | 1,035              | 1,035              | 1,035              |
| 1965 ..... | 1,101              | 1,032              | 1,032                        | 1,032                              | 1,032              | 1,032              | 1,032              |
| 1970 ..... | 1,102              | 1,031              | 1,031                        | 1,031                              | 1,031              | 1,031              | 1,031              |
| 1975 ..... | 1,095              | 1,021              | 1,020                        | 1,026                              | 1,021              | 1,026              | 1,014              |
| 1980 ..... | 1,098              | 1,026              | 1,024                        | 1,035                              | 1,026              | 1,022              | 1,013              |
| 1981 ..... | 1,103              | 1,027              | 1,025                        | 1,035                              | 1,027              | 1,014              | 1,011              |
| 1982 ..... | 1,107              | 1,028              | 1,026                        | 1,036                              | 1,028              | 1,018              | 1,011              |
| 1983 ..... | 1,115              | 1,031              | 1,031                        | 1,030                              | 1,031              | 1,024              | 1,010              |
| 1984 ..... | 1,109              | 1,031              | 1,030                        | 1,035                              | 1,031              | 1,005              | 1,010              |
| 1985 ..... | 1,112              | 1,032              | 1,031                        | 1,038                              | 1,032              | 1,002              | 1,011              |
| 1986 ..... | 1,110              | 1,030              | 1,029                        | 1,034                              | 1,030              | 997                | 1,008              |
| 1987 ..... | 1,112              | 1,031              | 1,031                        | 1,032                              | 1,031              | 999                | 1,011              |
| 1988 ..... | 1,109              | 1,029              | 1,029                        | 1,028                              | 1,029              | 1,002              | 1,018              |
| 1989 ..... | 1,107              | 1,031              | 1,032                        | 1,028                              | 1,031              | 1,004              | 1,019              |
| 1990 ..... | 1,105              | 1,029              | 1,029                        | 1,027                              | 1,029              | 1,012              | 1,018              |
| 1991 ..... | 1,108              | 1,030              | 1,031                        | 1,025                              | 1,030              | 1,014              | 1,022              |
| 1992 ..... | 1,110              | 1,030              | 1,031                        | 1,025                              | 1,030              | 1,011              | 1,018              |
| 1993 ..... | 1,106              | 1,027              | 1,027                        | 1,025                              | 1,027              | 1,020              | 1,016              |
| 1994 ..... | 1,105              | 1,028              | 1,029                        | 1,025                              | 1,028              | 1,022              | 1,011              |
| 1995 ..... | 1,106              | 1,026              | 1,027                        | 1,021                              | 1,026              | 1,021              | 1,011              |
| 1996 ..... | 1,109              | 1,026              | 1,027                        | 1,020                              | 1,026              | 1,022              | 1,011              |
| 1997 ..... | 1,107              | 1,026              | 1,027                        | 1,020                              | 1,026              | 1,023              | 1,011              |
| 1998 ..... | 1,109              | 1,031              | 1,033                        | 1,024                              | 1,031              | 1,023              | 1,011              |
| 1999 ..... | 1,107              | 1,027              | 1,028                        | 1,022                              | 1,027              | 1,022              | 1,006              |
| 2000 ..... | 1,107              | 1,025              | 1,026                        | 1,021                              | 1,025              | 1,023              | 1,006              |
| 2001 ..... | 1,105              | 1,028              | 1,029                        | 1,026                              | 1,028              | 1,023              | 1,010              |
| 2002 ..... | 1,103              | 1,024              | 1,025                        | 1,020                              | 1,024              | 1,022              | 1,008              |
| 2003 ..... | 1,103              | 1,028              | 1,029                        | 1,025                              | 1,028              | 1,025              | 1,009              |
| 2004 ..... | 1,104              | 1,026              | 1,026                        | 1,027                              | 1,026              | 1,025              | 1,009              |
| 2005 ..... | 1,104              | 1,028              | 1,028                        | 1,028                              | 1,028              | 1,025              | 1,009              |
| 2006 ..... | 1,103              | 1,028              | 1,028                        | 1,028                              | 1,028              | 1,025              | 1,009              |
| 2007 ..... | 1,102              | 1,027              | 1,027                        | 1,027                              | 1,027              | 1,025              | 1,009              |
| 2008 ..... | 1,100              | 1,027              | 1,027                        | 1,027                              | 1,027              | 1,025              | 1,009              |
| 2009 ..... | 1,101              | 1,025              | 1,025                        | 1,025                              | 1,025              | 1,025              | 1,009              |
| 2010 ..... | 1,098              | 1,023              | 1,023                        | 1,022                              | 1,023              | 1,025              | 1,009              |
| 2011 ..... | 1,142              | 1,022              | 1,022                        | 1,021                              | 1,022              | 1,025              | 1,009              |
| 2012 ..... | 1,091              | 1,024              | 1,025                        | 1,022                              | 1,024              | 1,025              | 1,009              |
| 2013 ..... | 1,101              | 1,027              | 1,028                        | 1,025                              | 1,027              | 1,025              | 1,009              |
| 2014 ..... | 1,116              | 1,032              | 1,033                        | 1,029                              | 1,032              | 1,025              | 1,009              |
| 2015 ..... | 1,124              | 1,037              | 1,038                        | 1,035                              | 1,037              | 1,025              | 1,009              |
| 2016 ..... | 1,128              | 1,037              | 1,039                        | 1,034                              | 1,037              | 1,025              | 1,009              |
| 2017 ..... | 1,129              | 1,036              | 1,037                        | 1,034                              | 1,036              | 1,025              | 1,009              |
| 2018 ..... | 1,134              | 1,036              | 1,038                        | 1,033                              | 1,036              | 1,025              | 1,009              |
| 2019 ..... | 1,140              | 1,038              | 1,040                        | 1,034                              | 1,038              | 1,025              | 1,009              |
| 2020 ..... | 1,145              | 1,037              | 1,039                        | 1,034                              | 1,037              | 1,025              | 1,009              |
| 2021 ..... | 1,146              | 1,037              | 1,039                        | 1,034                              | 1,037              | 1,025              | 1,009              |
| 2022 ..... | 1,149              | 1,036              | 1,038                        | 1,033                              | 1,036              | 1,025              | 1,009              |
| 2023 ..... | 1,157              | 1,036              | 1,038                        | 1,033                              | 1,036              | 1,025              | 1,009              |
| 2024 ..... | 1,167              | 1,037              | 1,039                        | 1,034                              | 1,037              | 1,025              | 1,009              |
| 2025 ..... | <sup>E</sup> 1,167 | <sup>P</sup> 1,036 | <sup>P</sup> 1,037           | <sup>P</sup> 1,034                 | <sup>P</sup> 1,036 | <sup>E</sup> 1,025 | <sup>E</sup> 1,009 |
| 2026 ..... | <sup>E</sup> 1,167 | <sup>E</sup> 1,036 | <sup>E</sup> 1,037           | <sup>E</sup> 1,034                 | <sup>E</sup> 1,036 | <sup>E</sup> 1,025 | <sup>E</sup> 1,009 |

<sup>a</sup> Consumption factors are for natural gas, plus a small amount of supplemental gaseous fuels.

<sup>b</sup> Residential, commercial, industrial, and transportation sectors.

<sup>c</sup> 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

P=Preliminary. E=Estimate. --=Not applicable.

Note: The values in this table are for gross heat contents. See "Heat Content" in Glossary.

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

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.

**Table A5. Approximate Heat Content of Coal and Coal Coke**  
(Million Btu per Short Ton)

|            | Coal                    |                                  |                                                 |                     |                     |                                      |                     |                     |                     | Coal Coke           |
|------------|-------------------------|----------------------------------|-------------------------------------------------|---------------------|---------------------|--------------------------------------|---------------------|---------------------|---------------------|---------------------|
|            | Production <sup>a</sup> | Waste Coal Supplied <sup>b</sup> | Consumption                                     |                     |                     |                                      |                     | Imports             | Exports             | Imports and Exports |
|            |                         |                                  | Residential and Commercial Sectors <sup>c</sup> | Industrial Sector   |                     | Electric Power Sector <sup>e,f</sup> | Total               |                     |                     |                     |
|            |                         |                                  |                                                 | Coke Plants         | Other <sup>d</sup>  |                                      |                     |                     |                     |                     |
| 1950 ..... | 25.090                  | NA                               | 24.461                                          | 26.798              | 24.820              | 23.937                               | 24.989              | 25.020              | 26.788              | 24.800              |
| 1955 ..... | 25.201                  | NA                               | 24.373                                          | 26.794              | 24.821              | 24.056                               | 24.982              | 25.000              | 26.907              | 24.800              |
| 1960 ..... | 24.906                  | NA                               | 24.226                                          | 26.791              | 24.609              | 23.927                               | 24.713              | 25.003              | 26.939              | 24.800              |
| 1965 ..... | 24.775                  | NA                               | 24.028                                          | 26.787              | 24.385              | 23.780                               | 24.537              | 25.000              | 26.973              | 24.800              |
| 1970 ..... | 23.842                  | NA                               | 23.203                                          | 26.784              | 22.983              | 22.573                               | 23.440              | 25.000              | 26.982              | 24.800              |
| 1975 ..... | 22.897                  | NA                               | 22.261                                          | 26.782              | 22.436              | 21.642                               | 22.506              | 25.000              | 26.562              | 24.800              |
| 1980 ..... | 22.415                  | NA                               | 22.543                                          | 26.790              | 22.690              | 21.295                               | 21.947              | 25.000              | 26.384              | 24.800              |
| 1985 ..... | 21.870                  | NA                               | 22.646                                          | 26.798              | 22.020              | 20.959                               | 21.366              | 25.000              | 26.307              | 24.800              |
| 1986 ..... | 21.913                  | NA                               | 22.947                                          | 26.798              | 22.198              | 21.084                               | 21.462              | 25.000              | 26.292              | 24.800              |
| 1987 ..... | 21.922                  | NA                               | 23.404                                          | 26.799              | 22.381              | 21.136                               | 21.517              | 25.000              | 26.291              | 24.800              |
| 1988 ..... | 21.823                  | NA                               | 23.571                                          | 26.799              | 22.360              | 20.900                               | 21.328              | 25.000              | 26.299              | 24.800              |
| 1989 ..... | 21.765                  | <sup>b</sup> 10.391              | 23.650                                          | 26.800              | 22.347              | <sup>e</sup> 20.898                  | 21.307              | 25.000              | 26.160              | 24.800              |
| 1990 ..... | 21.822                  | 9.303                            | 23.137                                          | 26.799              | 22.457              | 20.779                               | 21.197              | 25.000              | 26.202              | 24.800              |
| 1991 ..... | 21.681                  | 10.758                           | 23.114                                          | 26.799              | 22.460              | 20.730                               | 21.120              | 25.000              | 26.188              | 24.800              |
| 1992 ..... | 21.682                  | 10.396                           | 23.105                                          | 26.799              | 22.250              | 20.709                               | 21.068              | 25.000              | 26.161              | 24.800              |
| 1993 ..... | 21.418                  | 10.638                           | 22.994                                          | 26.800              | 22.123              | 20.677                               | 21.010              | 25.000              | 26.335              | 24.800              |
| 1994 ..... | 21.394                  | 11.097                           | 23.112                                          | 26.800              | 22.068              | 20.589                               | 20.929              | 25.000              | 26.329              | 24.800              |
| 1995 ..... | 21.326                  | 11.722                           | 23.118                                          | 26.800              | 21.950              | 20.543                               | 20.880              | 25.000              | 26.180              | 24.800              |
| 1996 ..... | 21.322                  | 12.147                           | 23.011                                          | 26.800              | 22.105              | 20.547                               | 20.870              | 25.000              | 26.174              | 24.800              |
| 1997 ..... | 21.296                  | 12.158                           | 22.494                                          | 26.800              | 22.172              | 20.518                               | 20.830              | 25.000              | 26.251              | 24.800              |
| 1998 ..... | 21.418                  | 12.639                           | 21.620                                          | 27.426              | 23.164              | 20.516                               | 20.881              | 25.000              | 26.800              | 24.800              |
| 1999 ..... | 21.070                  | 12.552                           | 23.880                                          | 27.426              | 22.489              | 20.490                               | 20.818              | 25.000              | 26.081              | 24.800              |
| 2000 ..... | 21.072                  | 12.360                           | 25.020                                          | 27.426              | 22.433              | 20.511                               | 20.828              | 25.000              | 26.117              | 24.800              |
| 2001 ..... | <sup>a</sup> 20.772     | 12.169                           | 24.909                                          | 27.426              | 22.622              | 20.337                               | 20.671              | 25.000              | 25.998              | 24.800              |
| 2002 ..... | 20.673                  | 12.165                           | 22.962                                          | 27.426              | 22.562              | 20.238                               | 20.541              | 25.000              | 26.062              | 24.800              |
| 2003 ..... | 20.499                  | 12.360                           | 22.242                                          | 27.425              | 22.468              | 20.082                               | 20.387              | 25.000              | 25.972              | 24.800              |
| 2004 ..... | 20.424                  | 12.266                           | 22.324                                          | 27.426              | 22.473              | 19.980                               | 20.290              | 25.000              | 26.108              | 24.800              |
| 2005 ..... | 20.348                  | 12.093                           | 22.342                                          | 26.279              | 22.178              | 19.988                               | 20.246              | 25.000              | 25.494              | 24.800              |
| 2006 ..... | 20.310                  | 12.080                           | 22.066                                          | 26.271              | 22.050              | 19.931                               | 20.181              | 25.000              | 25.453              | 24.800              |
| 2007 ..... | 20.340                  | 12.090                           | 22.069                                          | 26.329              | 22.371              | 19.909                               | 20.168              | 25.000              | 25.466              | 24.800              |
| 2008 ..... | 20.208                  | 12.121                           | <sup>c</sup> 23.035                             | 26.281              | 22.304              | 19.713                               | 19.979              | 25.000              | 25.399              | 24.800              |
| 2009 ..... | 19.963                  | 12.076                           | 22.852                                          | 26.334              | 21.823              | 19.521                               | 19.741              | 25.000              | 25.633              | 24.800              |
| 2010 ..... | 20.173                  | 11.960                           | 22.611                                          | 26.295              | 21.846              | 19.623                               | 19.870              | 25.000              | 25.713              | 24.800              |
| 2011 ..... | 20.142                  | 11.604                           | 22.099                                          | 26.299              | 21.568              | 19.341                               | 19.600              | 25.000              | 25.645              | 24.800              |
| 2012 ..... | 20.215                  | 11.539                           | 21.300                                          | 28.636              | 21.449              | 19.211                               | 19.544              | 23.128              | 24.551              | 24.800              |
| 2013 ..... | 20.182                  | 11.103                           | 21.233                                          | 28.705              | 21.600              | 19.174                               | 19.513              | 22.379              | 24.605              | 24.800              |
| 2014 ..... | 20.146                  | 11.474                           | 21.307                                          | 28.458              | 21.525              | 19.290                               | 19.611              | 22.187              | 25.032              | 24.800              |
| 2015 ..... | 19.880                  | 11.527                           | 20.699                                          | 28.526              | 21.258              | 19.146                               | 19.482              | 22.633              | 25.048              | 24.800              |
| 2016 ..... | 19.977                  | 11.496                           | 20.078                                          | 28.608              | 21.055              | 19.153                               | 19.459              | 22.327              | 25.655              | 24.800              |
| 2017 ..... | 20.025                  | 11.438                           | 19.467                                          | 28.673              | 20.802              | 18.981                               | 19.303              | 21.489              | 24.628              | 24.800              |
| 2018 ..... | 20.160                  | 11.419                           | 19.269                                          | 28.608              | 20.739              | 18.915                               | 19.258              | 20.415              | 24.294              | 24.800              |
| 2019 ..... | 20.053                  | 11.513                           | 19.084                                          | 28.629              | 20.721              | 18.903                               | 19.292              | 20.558              | 24.584              | 24.800              |
| 2020 ..... | 19.845                  | 11.268                           | 18.297                                          | 28.717              | 20.425              | 18.882                               | 19.260              | 20.347              | 24.969              | 24.800              |
| 2021 ..... | 19.933                  | 11.268                           | 18.399                                          | 28.666              | 20.578              | 18.941                               | 19.331              | 20.295              | 24.216              | 24.800              |
| 2022 ..... | 20.100                  | 11.268                           | 18.083                                          | 28.669              | 20.388              | 18.792                               | 19.180              | 21.447              | 24.346              | 24.800              |
| 2023 ..... | 20.172                  | 11.268                           | 17.375                                          | 28.859              | 20.490              | 18.717                               | 19.185              | 21.929              | 24.055              | 24.800              |
| 2024 ..... | 20.469                  | 11.268                           | 17.198                                          | 28.932              | 20.358              | 18.792                               | 19.254              | 23.445              | 24.225              | 24.800              |
| 2025 ..... | <sup>P</sup> 20.383     | <sup>P</sup> 11.268              | <sup>P</sup> 17.041                             | <sup>P</sup> 28.917 | <sup>P</sup> 20.325 | <sup>P</sup> 18.774                  | <sup>P</sup> 19.167 | <sup>P</sup> 23.115 | <sup>P</sup> 24.439 | <sup>P</sup> 24.800 |
| 2026 ..... | <sup>E</sup> 20.383     | <sup>E</sup> 11.268              | <sup>E</sup> 17.041                             | <sup>E</sup> 28.917 | <sup>E</sup> 20.325 | <sup>E</sup> 18.774                  | <sup>E</sup> 19.167 | <sup>E</sup> 23.115 | <sup>E</sup> 24.439 | <sup>E</sup> 24.800 |

<sup>a</sup> Beginning in 2001, includes a small amount of refuse recovery (coal recaptured from a refuse mine, and cleaned to reduce the concentration of noncombustible materials).

<sup>b</sup> Waste coal (including fine coal, coal obtained from a refuse bank or slurry dam, anthracite culm, bituminous gob, and lignite waste) consumed by the electric power and industrial sectors. Beginning in 1989, waste coal supplied is counted as a supply-side item to balance the same amount of waste coal included in "Consumption."

<sup>c</sup> Through 2007, used as the thermal conversion factor for coal consumption by the residential and commercial sectors. Beginning in 2008, used as the thermal conversion factor for coal consumption by the commercial sector only.

<sup>d</sup> Includes transportation. Excludes coal synfuel plants.

<sup>e</sup> 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. Through 1988, data are for electric utilities only; beginning in 1989, data are for electric utilities and independent power producers.

<sup>f</sup> Electric power sector factors are for anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and, beginning in 1998, coal synfuel.

P=Preliminary. E=Estimate. NA=Not available.

Note: The values in this table are for gross heat contents. See "Heat Content" in Glossary.

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

Sources: See "Thermal Conversion Factor Source Documentation," which follows Table A6.

**Table A6. Approximate Heat Rates for Electricity, and Heat Content of Electricity**  
(Btu per Kilowatthour)

|            | Approximate Heat Rates <sup>a</sup> for Electricity Net Generation |                        |                          |                                   |                      | Thermal Conversion Factor for Noncombustible Renewable Energy <sup>l,k</sup> | Heat Content <sup>j</sup> of Electricity <sup>k</sup> |
|------------|--------------------------------------------------------------------|------------------------|--------------------------|-----------------------------------|----------------------|------------------------------------------------------------------------------|-------------------------------------------------------|
|            | Fossil Fuels <sup>b</sup>                                          |                        |                          |                                   | Nuclear <sup>h</sup> |                                                                              |                                                       |
|            | Coal <sup>c</sup>                                                  | Petroleum <sup>d</sup> | Natural Gas <sup>e</sup> | Total Fossil Fuels <sup>f,g</sup> |                      |                                                                              |                                                       |
| 1950 ..... | NA                                                                 | NA                     | NA                       | 14,030                            | --                   | 3,412                                                                        | 3,412                                                 |
| 1955 ..... | NA                                                                 | NA                     | NA                       | 11,699                            | --                   | 3,412                                                                        | 3,412                                                 |
| 1960 ..... | NA                                                                 | NA                     | NA                       | 10,760                            | 11,629               | 3,412                                                                        | 3,412                                                 |
| 1965 ..... | NA                                                                 | NA                     | NA                       | 10,453                            | 11,804               | 3,412                                                                        | 3,412                                                 |
| 1970 ..... | NA                                                                 | NA                     | NA                       | 10,494                            | 10,977               | 3,412                                                                        | 3,412                                                 |
| 1975 ..... | NA                                                                 | NA                     | NA                       | 10,406                            | 11,013               | 3,412                                                                        | 3,412                                                 |
| 1980 ..... | NA                                                                 | NA                     | NA                       | 10,388                            | 10,908               | 3,412                                                                        | 3,412                                                 |
| 1981 ..... | NA                                                                 | NA                     | NA                       | 10,453                            | 11,030               | 3,412                                                                        | 3,412                                                 |
| 1982 ..... | NA                                                                 | NA                     | NA                       | 10,454                            | 11,073               | 3,412                                                                        | 3,412                                                 |
| 1983 ..... | NA                                                                 | NA                     | NA                       | 10,520                            | 10,905               | 3,412                                                                        | 3,412                                                 |
| 1984 ..... | NA                                                                 | NA                     | NA                       | 10,440                            | 10,843               | 3,412                                                                        | 3,412                                                 |
| 1985 ..... | NA                                                                 | NA                     | NA                       | 10,447                            | 10,622               | 3,412                                                                        | 3,412                                                 |
| 1986 ..... | NA                                                                 | NA                     | NA                       | 10,446                            | 10,579               | 3,412                                                                        | 3,412                                                 |
| 1987 ..... | NA                                                                 | NA                     | NA                       | 10,419                            | 10,442               | 3,412                                                                        | 3,412                                                 |
| 1988 ..... | NA                                                                 | NA                     | NA                       | 10,324                            | 10,602               | 3,412                                                                        | 3,412                                                 |
| 1989 ..... | NA                                                                 | NA                     | NA                       | 10,432                            | 10,583               | 3,412                                                                        | 3,412                                                 |
| 1990 ..... | NA                                                                 | NA                     | NA                       | 10,402                            | 10,582               | 3,412                                                                        | 3,412                                                 |
| 1991 ..... | NA                                                                 | NA                     | NA                       | 10,436                            | 10,484               | 3,412                                                                        | 3,412                                                 |
| 1992 ..... | NA                                                                 | NA                     | NA                       | 10,342                            | 10,471               | 3,412                                                                        | 3,412                                                 |
| 1993 ..... | NA                                                                 | NA                     | NA                       | 10,309                            | 10,504               | 3,412                                                                        | 3,412                                                 |
| 1994 ..... | NA                                                                 | NA                     | NA                       | 10,316                            | 10,452               | 3,412                                                                        | 3,412                                                 |
| 1995 ..... | NA                                                                 | NA                     | NA                       | 10,312                            | 10,507               | 3,412                                                                        | 3,412                                                 |
| 1996 ..... | NA                                                                 | NA                     | NA                       | 10,340                            | 10,503               | 3,412                                                                        | 3,412                                                 |
| 1997 ..... | NA                                                                 | NA                     | NA                       | 10,213                            | 10,494               | 3,412                                                                        | 3,412                                                 |
| 1998 ..... | NA                                                                 | NA                     | NA                       | 10,197                            | 10,491               | 3,412                                                                        | 3,412                                                 |
| 1999 ..... | NA                                                                 | NA                     | NA                       | 10,226                            | 10,450               | 3,412                                                                        | 3,412                                                 |
| 2000 ..... | NA                                                                 | NA                     | NA                       | 10,201                            | 10,429               | 3,412                                                                        | 3,412                                                 |
| 2001 ..... | 10,378                                                             | 10,742                 | 10,051                   | 10,333                            | 10,443               | 3,412                                                                        | 3,412                                                 |
| 2002 ..... | 10,314                                                             | 10,641                 | 9,533                    | 10,173                            | 10,442               | 3,412                                                                        | 3,412                                                 |
| 2003 ..... | 10,297                                                             | 10,610                 | 9,207                    | 10,125                            | 10,422               | 3,412                                                                        | 3,412                                                 |
| 2004 ..... | 10,331                                                             | 10,571                 | 8,647                    | 10,016                            | 10,428               | 3,412                                                                        | 3,412                                                 |
| 2005 ..... | 10,373                                                             | 10,631                 | 8,551                    | 9,999                             | 10,436               | 3,412                                                                        | 3,412                                                 |
| 2006 ..... | 10,351                                                             | 10,809                 | 8,471                    | 9,919                             | 10,435               | 3,412                                                                        | 3,412                                                 |
| 2007 ..... | 10,375                                                             | 10,794                 | 8,403                    | 9,884                             | 10,489               | 3,412                                                                        | 3,412                                                 |
| 2008 ..... | 10,378                                                             | 11,015                 | 8,305                    | 9,854                             | 10,452               | 3,412                                                                        | 3,412                                                 |
| 2009 ..... | 10,414                                                             | 10,923                 | 8,160                    | 9,760                             | 10,459               | 3,412                                                                        | 3,412                                                 |
| 2010 ..... | 10,415                                                             | 10,984                 | 8,185                    | 9,756                             | 10,452               | 3,412                                                                        | 3,412                                                 |
| 2011 ..... | 10,444                                                             | 10,829                 | 8,152                    | 9,716                             | 10,464               | 3,412                                                                        | 3,412                                                 |
| 2012 ..... | 10,498                                                             | 10,991                 | 8,039                    | 9,516                             | 10,479               | 3,412                                                                        | 3,412                                                 |
| 2013 ..... | 10,459                                                             | 10,713                 | 7,948                    | 9,541                             | 10,449               | 3,412                                                                        | 3,412                                                 |
| 2014 ..... | 10,428                                                             | 10,814                 | 7,907                    | 9,509                             | 10,459               | 3,412                                                                        | 3,412                                                 |
| 2015 ..... | 10,495                                                             | 10,687                 | 7,869                    | 9,314                             | 10,458               | 3,412                                                                        | 3,412                                                 |
| 2016 ..... | 10,493                                                             | 10,811                 | 7,863                    | 9,228                             | 10,459               | 3,412                                                                        | 3,412                                                 |
| 2017 ..... | 10,465                                                             | 10,834                 | 7,803                    | 9,208                             | 10,459               | 3,412                                                                        | 3,412                                                 |
| 2018 ..... | 10,481                                                             | 11,095                 | 7,811                    | 9,098                             | 10,455               | 3,412                                                                        | 3,412                                                 |
| 2019 ..... | 10,551                                                             | 11,205                 | 7,725                    | 8,899                             | 10,442               | 3,412                                                                        | 3,412                                                 |
| 2020 ..... | 10,655                                                             | 11,259                 | 7,725                    | 8,767                             | 10,446               | 3,412                                                                        | 3,412                                                 |
| 2021 ..... | 10,583                                                             | 11,224                 | 7,689                    | 8,844                             | 10,429               | 3,412                                                                        | 3,412                                                 |
| 2022 ..... | 10,689                                                             | 11,166                 | 7,740                    | 8,813                             | 10,448               | 3,412                                                                        | 3,412                                                 |
| 2023 ..... | 10,745                                                             | 11,465                 | 7,721                    | 8,630                             | 10,452               | 3,412                                                                        | 3,412                                                 |
| 2024 ..... | 10,777                                                             | 11,200                 | 7,754                    | 8,617                             | 10,443               | 3,412                                                                        | 3,412                                                 |
| 2025 ..... | E 10,777                                                           | E 11,200               | E 7,754                  | E 8,617                           | E 10,443             | 3,412                                                                        | 3,412                                                 |
| 2026 ..... | E 10,777                                                           | E 11,200               | E 7,754                  | E 8,617                           | E 10,443             | 3,412                                                                        | 3,412                                                 |

<sup>a</sup> The values in columns 1–5 of this table are for net heat rates. See "Heat Rate" in Glossary.  
<sup>b</sup> Through 2000, heat rates are for fossil-fueled steam-electric plants at electric utilities. Beginning in 2001, heat rates are for all fossil-fueled plants at electric utilities and electricity-only independent power producers.  
<sup>c</sup> Includes anthracite, bituminous coal, subbituminous coal, lignite, and, beginning in 2002, waste coal and coal synfuel.  
<sup>d</sup> Includes distillate fuel oil, residual fuel oil, jet fuel, kerosene, petroleum coke, and waste oil.  
<sup>e</sup> Includes natural gas and supplemental gaseous fuels.  
<sup>f</sup> Includes coal, petroleum, natural gas, and, beginning in 2001, other fossil gases (blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels).  
<sup>g</sup> Through 2000, used as the thermal conversion factor for wood and waste electricity net generation at electric utilities; beginning in 2001, Btu data for wood and waste at electric utilities are available from surveys.  
<sup>h</sup> Used as the thermal conversion factor for nuclear electricity net generation.  
<sup>i</sup> Technology-based geothermal heat rates are no longer used in Btu calculations in this report. For technology-based geothermal heat rates for 1960–2010, see the *Annual Energy Review 2010*, Table A6.  
<sup>j</sup> See "Heat Content" in Glossary.  
<sup>k</sup> The value of 3,412 Btu per kilowatthour, which is the heat content of electricity, is a constant. It is used as the thermal conversion factor for electricity net generation from noncombustible renewable energy (hydro, geothermal, solar thermal, photovoltaic, and wind), electricity sales to ultimate customers, and electricity imports and exports.  
<sup>l</sup> E=Estimate. NA=Not available. —=Not applicable.  
Web Page: See <http://www.eia.gov/totalenergy/data/monthly/#appendices> (Excel and CSV files) for all available annual data beginning in 1949.  
Sources: See "Thermal Conversion Factor Source Documentation," which follows this table.

## Approximate Heat Content of Petroleum and Natural Gas Liquids

**Asphalt.** The U.S. Energy Information Administration (EIA) adopted the thermal conversion factor of 6.636 million British thermal units (Btu) per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956*.

**Aviation Gasoline Blending Components.** Assumed by EIA to be 5.048 million Btu per barrel or equal to the thermal conversion factor for **Aviation Gasoline (Finished)**.

**Aviation Gasoline (Finished).** EIA adopted the thermal conversion factor of 5.048 million Btu per barrel as adopted by the Bureau of Mines from the Texas Eastern Transmission Corporation publication *Competition and Growth in American Energy Markets 1947–1985*, a 1968 release of historical and projected statistics.

**Butylene.** EIA estimated the thermal conversion factor to be 4.377 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook, NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Crude Oil Exports.** • 1949–2014: Assumed by EIA to be 5.800 million Btu per barrel or equal to the thermal conversion factor for crude oil produced in the United States. See **Crude Oil Production**. • 2015 forward: Calculated annually by EIA based on conversion of American Petroleum Institute (API) gravity ranges of crude oil exports as reported in trade data from the U.S. Census Bureau. Specific gravity (SG) =  $141.5 / (131.5 + \text{API gravity})$ . The higher heating value (HHV) in million Btu per barrel =  $\text{SG} * (7.801796 - 1.3213 * \text{SG}^2)$ .

**Crude Oil Imports.** Calculated annually by EIA as the average of the thermal conversion factors for each type of crude oil imported weighted by the quantities imported. Thermal conversion factors for each type were calculated on a foreign country basis, by determining the average American Petroleum Institute (API) gravity of crude oil imported from each foreign country from Form ERA-60 in 1977 and converting average API gravity to average Btu content by using National Bureau of Standards, Miscellaneous Publication No. 97, *Thermal Properties of Petroleum Products*, 1933.

**Crude Oil Production.** • 1949–2014: EIA adopted the thermal conversion factor of 5.800 million Btu per barrel as reported in a Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.” • 2015 forward: Calculated annually by EIA based on conversion of American Petroleum Institute (API) gravity ranges of crude oil production as reported on Form EIA-914, “Monthly Crude Oil, Lease Condensate, and Natural Gas Production Report.” Specific gravity (SG) =  $141.5 / (131.5 + \text{API gravity})$ . The higher heating value (HHV) in million Btu per barrel =  $\text{SG} * (7.801796 - 1.3213 * \text{SG}^2)$ .

**Distillate Fuel Oil Consumption.** • 1949–1993: EIA adopted the Bureau of Mines thermal conversion factor of 5.825 million Btu per barrel as reported in a Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.” • 1994 forward: Calculated by EIA as the annual quantity-weighted average of the conversion factors for **Distillate Fuel Oil, 15 ppm Sulfur and Under** (5.770 million Btu per barrel), **Distillate Fuel Oil, Greater Than 15 ppm to 500 ppm Sulfur** (5.817 million Btu per barrel), and **Distillate Fuel Oil, Greater Than 500 ppm Sulfur** (5.825 million Btu per barrel).

**Distillate Fuel Oil, 15 ppm Sulfur and Under.** EIA adopted the thermal conversion factor of 5.770 million Btu per barrel (137,380 Btu per gallon) for U.S. conventional diesel from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Distillate Fuel Oil, Greater Than 15 ppm to 500 ppm Sulfur.** EIA adopted the thermal conversion factor of 5.817 million Btu per barrel (138,490 Btu per gallon) for low-sulfur diesel from U.S. Department of Energy, Argonne Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Distillate Fuel Oil, Greater Than 500 ppm Sulfur.** EIA adopted the Bureau of Mines thermal conversion factor of 5.825 million Btu per barrel as reported in a Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.”

**Ethane.** EIA estimated the thermal conversion factor to be 2.783 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook*, *NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Ethylene.** EIA adopted the thermal conversion factor of 2.436 million Btu per barrel (0.058 million Btu per gallon) as published in the Federal Register EPA; 40 CFR part 98; e-CRF; Table C1; April 5, 2019. The ethylene higher heating value is determined at 41 degrees Fahrenheit at saturation pressure.

**Hydrocarbon Gas Liquids.** • 1949–1966: EIA used the 1967 factor. • 1967 forward: Calculated annually by EIA as the average of the thermal conversion factors for all hydrocarbon gas liquids consumed (see Table A1) weighted by the quantities consumed. The component products of hydrocarbon gas liquids are ethane, propane, normal butane, isobutane, natural gasoline (pentanes plus), and refinery olefins (ethylene, propylene, butylene, and isobutylene). For 1967–1980, quantities consumed are from EIA, Energy Data Reports, “Petroleum Statement, Annual.” For 1981 forward, quantities consumed are from EIA, *Petroleum Supply Annual*.

**Hydrogen.** EIA estimated a thermal conversion factor of 323.6 Btu per standard cubic foot (at 60 degrees Fahrenheit and 1 atmosphere), based on data published by the National Research Council and National Academy of Engineering, in Appendix H of *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs*, 2004. EIA also assumed a thermal conversion factor of 6.287 million Btu per residual fuel oil equivalent barrel or equal to the thermal conversion factor for **Residual Fuel Oil**.

**Isobutane.** EIA estimated the thermal conversion factor to be 4.183 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook*, *NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Isobutylene.** EIA estimated the thermal conversion factor to be 4.355 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook*, *NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Jet Fuel, Kerosene-Type.** EIA adopted the Bureau of Mines thermal conversion factor of 5.670 million Btu per barrel for “Jet Fuel, Commercial” as published by the Texas Eastern Transmission Corporation in the report *Competition and Growth in American Energy Markets 1947–1985*, a 1968 release of historical and projected statistics.

**Jet Fuel, Naphtha-Type.** EIA adopted the Bureau of Mines thermal conversion factor of 5.355 million Btu per barrel for “Jet Fuel, Military” as published by the Texas Eastern Transmission Corporation in the report *Competition and Growth in American Energy Markets 1947–1985*, a 1968 release of historical and projected statistics.

**Kerosene.** EIA adopted the Bureau of Mines thermal conversion factor of 5.670 million Btu per barrel as reported in a Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.”

**Lubricants.** EIA adopted the thermal conversion factor of 6.065 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual*, 1956.

**Miscellaneous Products.** EIA adopted the thermal conversion factor of 5.796 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual*, 1956.

**Motor Gasoline Blending Components.** • 1949–2006: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel for “Gasoline, Motor Fuel” as published by the Texas Eastern Transmission Corporation in Appendix V of *Competition and Growth in American Markets 1947–1985*, a 1968 release of historical and projected statistics. • 2007 forward: EIA adopted the thermal conversion factor of 5.222 million Btu per barrel (124,340 Btu per gallon) for gasoline blendstock from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Motor Gasoline Exports.** • 1949–2005: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel for “Gasoline, Motor Fuel” as published by the Texas Eastern Transmission Corporation in Appendix V of *Competition and Growth in American Energy Markets 1947–1985*, a 1968 release of historical and projected statistics. • 2006 forward: Calculated by EIA as the annual quantity-weighted average of the conversion factors for gasoline blendstock and the methyl tertiary butyl ether (MTBE) blended into motor gasoline exports. The factor for gasoline

blendstock is 5.253 million Btu per barrel in 2006 and 5.222 million Btu per barrel beginning in 2007 (see **Motor Gasoline Blending Components**). For MTBE, EIA adopted the thermal conversion factor of 4.247 million Btu per barrel (101,130 Btu per gallon) from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Motor Gasoline (Finished) Consumption.** • 1949–1992: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel for “Gasoline, Motor Fuel” as published by the Texas Eastern Transmission Corporation in Appendix V of *Competition and Growth in American Markets 1947-1985*, a 1968 release of historical and projected statistics. • 1993–2006: Calculated by EIA as the annual quantity-weighted average of the conversion factors for gasoline blendstock and the oxygenates blended into motor gasoline. The factor for gasoline blendstock is 5.253 million Btu per barrel (the motor gasoline factor used for previous years). The factors for fuel ethanol are shown in Table A3 (see **Fuel Ethanol, Denatured**). The following factors for other oxygenates are from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025—methyl tertiary butyl ether (MTBE): 4.247 million Btu per barrel (101,130 Btu per gallon); tertiary amyl methyl ether (TAME): 4.560 million Btu per barrel (108,570 Btu per gallon); ethyl tertiary butyl ether (ETBE): 4.390 million Btu per barrel (104,530 Btu per gallon); methanol: 2.738 million Btu per barrel (65,200 Btu per gallon); and butanol: 4.555 million Btu per barrel (108,458 Btu per gallon). • 2007 forward: Calculated by EIA as the annual quantity-weighted average of the conversion factors for gasoline blendstock and fuel ethanol blended into motor gasoline. The factor for gasoline blendstock is 5.222 million Btu per barrel (124,340 Btu per gallon), which is from the GREET model (see above). The factors for fuel ethanol are shown in Table A3 (see **Fuel Ethanol, Denatured**).

**Motor Gasoline Imports.** • 1949–2006: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel for “Gasoline, Motor Fuel” as published by the Texas Eastern Transmission Corporation in Appendix V of *Competition and Growth in American Energy Markets 1947–1985*, a 1968 release of historical and projected statistics. • 2007 forward: EIA adopted the thermal conversion factor of 5.222 million Btu per barrel (124,340 Btu per gallon) for gasoline blendstock from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Natural Gas Plant Liquids Production.** Calculated annually by EIA as the average of the thermal conversion factors for each natural gas plant liquid produced weighted by the quantities produced.

**Natural Gasoline.** EIA estimated the thermal conversion factor to be 4.638 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook, NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute. EIA assumes a natural gasoline ratio of 29% isopentane, 29% neopentane, 20% normal pentane, 13% normal hexane, 4% cyclohexane, 3% benzene, and 2% toluene in these calculations.

**Normal Butane.** EIA estimated the thermal conversion factor to be 4.353 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook, NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Other Hydrocarbons.** Assumed by EIA to be 5.825 million Btu per barrel or equal to the thermal conversion factor for **Unfinished Oils**.

**Oxygenates (Excluding Fuel Ethanol).** EIA adopted the thermal conversion factor of 4.247 million Btu per barrel (101,130 Btu per gallon) for methyl tertiary butyl ether (MTBE) from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

**Petrochemical Feedstocks, Naphtha Less Than 401 Degrees Fahrenheit.** Assumed by EIA to be 5.248 million Btu per barrel or equal to the thermal conversion factor for **Special Naphthas**.

**Petrochemical Feedstocks, Other Oils Equal to or Greater Than 401 Degrees Fahrenheit.** Assumed by EIA to be 5.825 million Btu per barrel or equal to the thermal conversion factor for **Distillate Fuel Oil**.

**Petrochemical Feedstocks, Still Gas.** Assumed by EIA to be equal to the thermal conversion factor for **Still Gas**.

**Petroleum Coke, Catalyst.** Assumed by EIA to be 6.287 million Btu per barrel or equal to the thermal conversion factor for **Residual Fuel Oil**.

**Petroleum Coke, Marketable.** EIA adopted the thermal conversion factor of 5.719 million Btu per barrel, calculated by dividing 28,595,925 Btu per short ton for petroleum coke (from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025) by 5.0 barrels per short ton (as given in the Bureau of Mines Form 6-1300-M and successor EIA forms).

**Petroleum Coke, Total.** • 1949–2003: EIA adopted the thermal conversion factor of 6.024 million Btu per barrel as reported in Btu per short ton in the Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.” The Bureau of Mines calculated this factor by dividing 30.120 million Btu per short ton, as given in the referenced Bureau of Mines internal memorandum, by 5.0 barrels per short ton, as given in the Bureau of Mines Form 6-1300-M and successor EIA forms. • 2004 forward: Calculated by EIA as the annual quantity-weighted average of the conversion factors for **Petroleum Coke, Catalyst** (6.287 million Btu per barrel) and **Petroleum Coke, Marketable** (5.719 million Btu per barrel).

**Petroleum Consumption, Commercial Sector.** Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed by the commercial sector weighted by the estimated quantities consumed by the commercial sector. The quantities of petroleum products consumed by the commercial sector are estimated in the State Energy Data System—see documentation at [http://www.eia.gov/state/seds/sep\\_use/notes/use\\_petrol.pdf](http://www.eia.gov/state/seds/sep_use/notes/use_petrol.pdf).

**Petroleum Consumption, Electric Power Sector.** Calculated annually by EIA as the average of the thermal conversion factors for distillate fuel oil, petroleum coke, and residual fuel oil consumed by the electric power sector weighted by the quantities consumed by the electric power sector. Data are from Form EIA-923, “Power Plant Operations Report,” and predecessor forms.

**Petroleum Consumption, Industrial Sector.** Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed by the industrial sector weighted by the estimated quantities consumed by the industrial sector. The quantities of petroleum products consumed by the industrial sector are estimated in the State Energy Data System—see documentation at [http://www.eia.gov/state/seds/sep\\_use/notes/use\\_petrol.pdf](http://www.eia.gov/state/seds/sep_use/notes/use_petrol.pdf).

**Petroleum Consumption, Residential Sector.** Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed by the residential sector weighted by the estimated quantities consumed by the residential sector. The quantities of petroleum products consumed by the residential sector are estimated in the State Energy Data System—see documentation at [http://www.eia.gov/state/seds/sep\\_use/notes/use\\_petrol.pdf](http://www.eia.gov/state/seds/sep_use/notes/use_petrol.pdf).

**Petroleum Consumption, Total.** Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed weighted by the quantities consumed.

**Petroleum Consumption, Transportation Sector.** Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed by the transportation sector weighted by the estimated quantities consumed by the transportation sector. The quantities of petroleum products consumed by the transportation sector are estimated in the State Energy Data System—see documentation at [http://www.eia.gov/state/seds/sep\\_use/notes/use\\_petrol.pdf](http://www.eia.gov/state/seds/sep_use/notes/use_petrol.pdf).

**Petroleum Products Exports.** Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product exported weighted by the quantities exported.

**Petroleum Products Imports.** Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product imported weighted by the quantities imported.

**Plant Condensate.** • 1973–1983: Estimated to be 5.418 million Btu per barrel by EIA from data provided by McClanahan Consultants, Inc., Houston, Texas.

**Propane.** EIA estimated the thermal conversion factor to be 3.841 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook*, *NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Propylene.** EIA estimated the thermal conversion factor to be 3.835 million Btu per barrel, based on data for enthalpy of combustion from the National Institute of Standards and Technology, *NIST Chemistry WebBook*, *NIST Standard Reference Database Number 69*, 2018; and data for density of liquids at 60 degrees Fahrenheit and equilibrium pressure from the American Petroleum Institute.

**Residual Fuel Oil.** EIA adopted the thermal conversion factor of 6.287 million Btu per barrel as reported in the Bureau of Mines internal memorandum, “Bureau of Mines Standard Average Heating Values of Various Fuels, Adopted January 3, 1950.”

**Road Oil.** EIA adopted the Bureau of Mines thermal conversion factor of 6.636 million Btu per barrel, which was assumed to be equal to that of **Asphalt** and was first published by the Bureau of Mines in the *Petroleum Statement, Annual, 1970*.

**Special Naphthas.** EIA adopted the Bureau of Mines thermal conversion factor of 5.248 million Btu per barrel, which was assumed to be equal to that of the total gasoline (aviation and motor) factor and was first published in the *Petroleum Statement, Annual, 1970*.

**Still Gas.** • 1949–2015: EIA adopted the Bureau of Mines estimated thermal conversion factor of 6.000 million Btu per barrel, first published in the *Petroleum Statement, Annual, 1970*. • 2016 forward: Assumed by EIA to be 6.287 million Btu per barrel or equal to the thermal conversion factor for **Residual Fuel Oil**.

**Total Petroleum Exports.** Calculated annually by EIA as the average of the thermal conversion factors for crude oil and each petroleum product exported weighted by the quantities exported. See **Crude Oil Exports** and **Petroleum Products Exports**.

**Total Petroleum Imports.** Calculated annually by EIA as the average of the thermal conversion factors for each type of crude oil and petroleum product imported weighted by the quantities imported. See **Crude Oil Imports** and **Petroleum Products Imports**.

**Unfinished Oils.** EIA assumed the thermal conversion factor to be 5.825 million Btu per barrel, the average of all natural gas or equal to that for **Distillate Fuel Oil** and first published it in EIA’s *Annual Report to Congress, Volume 3, 1977*.

**Unfractionated Stream.** • 1979–1982: EIA assumed the thermal conversion factor to be 3.800 million Btu per barrel, the average of all natural gas plant liquids calculated on their contribution to total barrels produced.

**Waxes.** EIA adopted the thermal conversion factor of 5.537 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956*.

## Approximate Heat Content of Biofuels

**Biodiesel.** EIA estimated the thermal conversion factor for biodiesel to be 5.359 million Btu per barrel, or 17,253 Btu per pound.

**Biodiesel Feedstock.** EIA used soybean oil input to the production of biodiesel (million Btu soybean oil per barrel biodiesel) as the factor to estimate total biomass inputs to the production of biodiesel. EIA assumed that 7.65 pounds of soybean oil are needed to produce one gallon of biodiesel, and 5.433 million Btu of soybean oil are needed to produce one barrel of biodiesel. EIA also assumed that soybean oil has a gross heat content of 16,909 Btu per pound, or 5.483 million Btu per barrel.

**Ethanol (Undenatured).** EIA adopted the thermal conversion factor of 3.539 million Btu per barrel published in “Oxygenate Flexibility for Future Fuels,” a paper presented by William J. Piel of the ARCO Chemical Company at the National Conference on Reformulated Gasolines and Clean Air Act Implementation, Washington, DC, October 1991.

**Fuel Ethanol (Denatured).** • 1981–2008: EIA used the 2009 factor. • 2009 forward: Calculated by EIA as the annual quantity-weighted average of the thermal conversion factors for undenatured ethanol (3.539 million Btu per barrel), natural gasoline used as denaturant (4.638 million Btu per barrel), and conventional motor gasoline and motor gasoline blending components used as denaturant (5.253 million Btu per barrel). The quantity of ethanol consumed is from EIA’s *Petroleum Supply Annual* (PSA) and *Petroleum Supply Monthly* (PSM), Table 1, data for renewable fuels and oxygenate plant net production of fuel ethanol. The quantity of natural gasoline used as denaturant is from PSA/PSM, Table 1, data for renewable fuels and oxygenate plant net production of natural gasoline, multiplied by -1. The quantity of conventional motor gasoline and motor gasoline blending components used as denaturant is from PSA/PSM, Table 1, data for renewable fuels and oxygenate plant net production of conventional motor gasoline and motor gasoline blending components, multiplied by -1.

**Fuel Ethanol Feedstock.** EIA used corn input to the production of undenatured ethanol (million Btu corn per barrel undenatured ethanol) as the annual factor to estimate total biomass inputs to the production of undenatured ethanol. EIA used the following observed ethanol yields (in gallons undenatured ethanol per bushel of corn) from U.S.

Department of Agriculture: 2.5 in 1980, 2.666 in 1998, 2.68 in 2002; and from University of Illinois at Chicago, Energy Resources Center, “2012 Corn Ethanol: Emerging Plant Energy and Environmental Technologies”: 2.78 in 2008, and 2.82 in 2012. EIA used the following weighted-average ethanol yields (in gallons undenatured ethanol per bushel of corn) from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025: 2.85 in 2021–2024, and 2.88 in 2025. EIA estimated the ethanol yields in other years. EIA also assumed that corn has a gross heat content of 0.392 million Btu per bushel.

**Other Biofuels.** EIA assumed the thermal conversion factor to be 5.359 million Btu per barrel or equal to the thermal conversion factor for **Biodiesel**.

**Renewable Diesel Fuel.** EIA adopted the thermal conversion factor of 5.494 million Btu per barrel (130,817 Btu per gallon) for renewable diesel II (UOP-HDO) from U.S. Department of Energy, Argonne National Laboratory, “The Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model” (GREET), version R&D GREET1\_2025, December 2025.

## Approximate Heat Content of Natural Gas

**Natural Gas Consumption, Electric Power Sector.** Calculated annually by EIA by dividing the heat content of natural gas consumed by the electric power sector by the quantity consumed. Data are from Form EIA-923, “Power Plant Operations Report,” and predecessor forms.

**Natural Gas Consumption, End-Use Sectors.** Calculated annually by EIA by dividing the heat content of natural gas consumed by the end-use sectors (residential, commercial, industrial, and transportation) by the quantity consumed. The heat content of natural gas consumed by the end-use sectors is calculated as the total heat content of natural gas consumed minus the heat content of natural gas consumed by the electric power sector. The quantity of natural gas consumed by the end-use sectors is calculated as the total quantity of natural gas consumed minus the quantity of natural gas consumed by the electric power sector. Data are from Form EIA-176, “Annual Report of Natural and Supplemental Gas Supply and Disposition”; and Form EIA-923, “Power Plant Operations Report,” and predecessor forms.

**Natural Gas Consumption, Total.** • 1949–1962: EIA adopted the thermal conversion factor of 1,035 Btu per cubic foot as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956*. • 1963–1979: EIA adopted the thermal conversion factor calculated annually by the American Gas Association (AGA) and published in *Gas Facts*, an AGA annual publication. • 1980 forward: Calculated annually by EIA by dividing the total heat content of natural gas consumed by the total quantity consumed.

**Natural Gas Exports.** • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for dry natural gas consumed (see **Natural Gas Consumption, Total**). • 1973 forward: Calculated annually by EIA by dividing the heat content of natural gas exported by the quantity exported. For 1973–1995, data are from Form FPC-14, “Annual Report for Importers and Exporters of Natural Gas.” Beginning in 1996, data are from U.S. Department of Energy, Office of Fossil Energy, *Natural Gas Imports and Exports*.

**Natural Gas Imports.** • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for dry natural gas consumed (see **Natural Gas Consumption, Total**). • 1973 forward: Calculated annually by EIA by dividing the heat content of natural gas imported by the quantity imported. For 1973–1995, data are from Form FPC-14, “Annual Report for Importers and Exporters of Natural Gas.” Beginning in 1996, data are from U.S. Department of Energy, Office of Fossil Energy, *Natural Gas Imports and Exports*.

**Natural Gas Production, Dry.** Assumed by EIA to be equal to the thermal conversion factor for dry natural gas consumed. See **Natural Gas Consumption, Total**.

**Natural Gas Production, Marketed.** Calculated annually by EIA by dividing the heat content of dry natural gas produced (see **Natural Gas Production, Dry**) and natural gas liquids produced (see **Natural Gas Liquids Production**) by the total quantity of marketed natural gas produced.

## Approximate Heat Content of Coal and Coal Coke

**Coal Coke Imports and Exports.** EIA adopted the Bureau of Mines estimate of 24.800 million Btu per short ton.

**Coal Consumption, Electric Power Sector.** Calculated annually by EIA by dividing the heat content of coal consumed by the electric power sector by the quantity consumed. Data are from Form EIA-923, “Power Plant Operations Report,” and predecessor forms.

**Coal Consumption, Industrial Sector, Coke Plants.** • 1949–2011: Calculated annually by EIA based on the reported volatility (low, medium, or high) of coal received by coke plants. (For 2011, EIA used the following volatility factors, in million Btu per short ton: low volatile—26.680; medium volatile—27.506; and high volatile—25.652.) Data are from Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants,” and predecessor forms. • 2012 forward: Calculated annually by EIA by dividing the heat content of coal received by coke plants by the quantity received. Through June 2014, data are from Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants”; beginning in July 2014, data are from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”).

**Coal Consumption, Industrial Sector, Other.** • 1949–2007: Calculated annually by EIA by dividing the heat content of coal received by manufacturing plants by the quantity received. Data are from Form EIA-3, “Quarterly Coal Consumption and Quality Report—Manufacturing Plants,” and predecessor forms. • 2008 forward: Calculated annually by EIA by dividing the heat content of coal received by manufacturing, gasification, and liquefaction plants by the quantity received. Data are from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”).

**Coal Consumption, Residential and Commercial Sectors.** • 1949–1999: Calculated annually by EIA by dividing the heat content of coal received by the residential and commercial sectors by the quantity received. Data are from Form EIA-6, “Coal Distribution Report,” and predecessor forms. • 2000–2007: Calculated annually by EIA by dividing the heat content of coal consumed by commercial combined-heat-and-power (CHP) plants by the quantity consumed. Data are from Form EIA-923, “Power Plant Operations Report,” and predecessor forms. • 2008 forward: Calculated annually by EIA by dividing the heat content of coal received by commercial and institutional users by the quantity received. Data are from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”).

**Coal Consumption, Total.** Calculated annually by EIA by dividing the total heat content of coal consumed by all sectors by the total quantity consumed.

**Coal Exports.** • 1949–2011: Calculated annually by EIA by dividing the heat content of steam coal and metallurgical coal exported by the quantity exported. Data are from U.S. Department of Commerce, U.S. Census Bureau, “Monthly Report EM 545,” and predecessor forms. • 2012 forward: Calculated annually by EIA by dividing the heat content of steam coal and metallurgical coal exported by the quantity exported. The average heat content of steam coal is derived from receipts data from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”), and Form EIA-923, “Power Plant Operations Report.” Through June 2014, the average heat content of metallurgical coal is derived from receipts data from Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants”; beginning in July 2014, the average heat content of metallurgical coal is derived from receipts data from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”). Data for export quantities are from U.S. Department of Commerce, U.S. Census Bureau, “Monthly Report EM 545.”

**Coal Imports.** • 1949–1963: Calculated annually by EIA by dividing the heat content of coal imported by the quantity imported. Data are from U.S. Department of Commerce, U.S. Census Bureau, “Monthly Report IM 145,” and predecessor forms. • 1964–2011: Assumed by EIA to be 25.000 million Btu per short ton. • 2012 forward: Calculated annually by EIA by dividing the heat content of coal imported (received) by the quantity imported (received). Data are from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”); Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants” (data through June 2014); and Form EIA-923, “Power Plant Operations Report.”

**Coal Production.** • 1949–2011: Calculated annually by EIA by dividing the heat content of domestic coal (excluding waste coal) received by the quantity received. Data are from Form EIA-3, “Quarterly Coal Consumption and Quality Report—Manufacturing and Transformation/Processing Coal Plants and Commercial and Institutional Users”; Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants”; Form EIA-923, “Power Plant Operations Report”; and predecessor forms. • 2012 forward: Calculated annually by EIA by dividing the heat content of domestic coal (excluding waste coal) received and exported by the quantity received and exported. Data are from Form EIA-3, “Quarterly Survey

of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”); Form EIA-5, “Quarterly Coal Consumption and Quality Report—Coke Plants” (data through June 2014); Form EIA-923, “Power Plant Operations Report”; U.S. Department of Commerce, U.S. Census Bureau, “Monthly Report EM 545”; and predecessor forms.

**Waste Coal Supplied.** • 1989–2000: Calculated annually by EIA by dividing the heat content of waste coal consumed by the quantity consumed. Data are from Form EIA-860B, “Annual Electric Generator Report—Nonutility,” and predecessor form. • 2001 forward: Calculated by EIA by dividing the heat content of waste coal received (or consumed) by the quantity received (or consumed). Receipts data are from Form EIA-3, “Quarterly Survey of Industrial, Commercial, and Institutional Coal Users” (formerly called “Quarterly Survey of Non-Electric Sector Coal Data”), and predecessor forms. Consumption data are from Form EIA-923, “Power Plant Operations Report,” and predecessor forms.

## Table A6 Sources

**Approximate Heat Rates for Electricity Net Generation, Coal.** • 2001 forward: Calculated annually by EIA by using fuel consumption and net generation data reported on Form EIA-923, “Power Plant Operations Report,” and predecessor forms. The computation includes data for all electric utilities and electricity-only independent power producers using anthracite, bituminous coal, subbituminous coal, lignite, and beginning in 2002, waste coal and coal synfuel.

**Approximate Heat Rates for Electricity Net Generation, Petroleum.** • 2001 forward: Calculated annually by EIA by using fuel consumption and net generation data reported on Form EIA-923, “Power Plant Operations Report,” and predecessor forms. The computation includes data for all electric utilities and electricity-only independent power producers using distillate fuel oil, residual fuel oil, jet fuel, kerosene, petroleum coke, and waste oil.

**Approximate Heat Rates for Electricity Net Generation, Natural Gas.** • 2001 forward: Calculated annually by EIA by using fuel consumption and net generation data reported on Form EIA-923, “Power Plant Operations Report,” and predecessor forms. The computation includes data for all electric utilities and electricity-only independent power producers using natural gas and supplemental gaseous fuels.

**Approximate Heat Rates for Electricity Net Generation, Total Fossil Fuels.** • 1949–1955: The weighted annual average heat rate for fossil-fueled steam-electric power plants in the United States, as published by EIA in *Thermal-Electric Plant Construction Cost and Annual Production Expenses—1981* and *Steam-Electric Plant Construction Cost and Annual Production Expenses—1978*. • 1956–1988: The weighted annual average heat rate for fossil-fueled steam-electric power plants in the United States, as published in EIA, *Electric Plant Cost and Power Production Expenses 1991*, Table 9. • 1989–2000: Calculated annually by EIA by using heat rate data reported on Form EIA-860, “Annual Electric Generator Report,” and predecessor forms; and net generation data reported on Form EIA-759, “Monthly Power Plant Report.” The computation includes data for all electric utility steam-electric plants using fossil fuels. • 2001 forward: Calculated annually by EIA by using fuel consumption and net generation data reported on Form EIA-923, “Power Plant Operations Report,” and predecessor forms. The computation includes data for all electric utilities and electricity-only independent power producers using coal, petroleum, natural gas, and other fossil gases (blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels).

**Approximate Heat Rates for Electricity Net Generation, Nuclear.** • 1957–1984: Calculated annually by dividing the total heat content consumed in nuclear generating units by the total (net) electricity generated by nuclear generating units. The heat content and electricity generation were reported on Form FERC-1, “Annual Report of Major Electric Utilities, Licensees, and Others”; Form EIA-412, “Annual Report of Public Electric Utilities”; and predecessor forms. For 1982, the factors were published in EIA, *Historical Plant Cost and Annual Production Expenses for Selected Electric Plants 1982*, page 215. For 1983 and 1984, the factors were published in EIA, *Electric Plant Cost and Power Production Expenses 1991*, Table 13. • 1985 forward: Calculated annually by EIA by using the heat rate data reported on Form EIA-860, “Annual Electric Generator Report,” and predecessor forms.

**Thermal Conversion Factor for Noncombustible Renewable Energy.** There is no generally accepted practice for measuring the thermal conversion rates for power plants that generate electricity from hydro, geothermal, solar thermal, photovoltaic, and wind energy sources. Therefore, EIA uses the heat content of electricity, 3,412 Btu per kilowatthour. See Appendix E for more information.

**Heat Content of Electricity.** The value of 3,412 Btu per kilowatthour, which is the heat content of electricity, is a constant. It is used as the thermal conversion factor for electricity net generation from noncombustible renewable energy (hydro, geothermal, solar thermal, photovoltaic, and wind), electricity sales to ultimate customers, and electricity imports and exports.

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