

Section 7. Total Energy

Total Energy

The preceding sections of this documentation describe how State end-use consumption estimates are made by individual energy source in the State Energy Data System (SEDS). This section describes how all energy sources are added in Btu to create end-use sector and total energy consumption estimates.

In general, total energy consumed by the four end-use sectors by State and the U.S. total include the following energy sources:

- coal (CL)
- natural gas (NG)
- all petroleum products (PA), which includes fuel ethanol blended into motor gasoline for 1993 forward
- fuel ethanol (EN) for 1960 through 1992
- electricity from conventional hydroelectric power (HY)
- wood (WD)
- waste (WS), which includes non-biomass waste prior to 2001
- geothermal direct use energy and geothermal heat pumps (GE)
- solar thermal direct use energy, and photovoltaic electricity net generation (SO)
- electricity sales (ES)

In addition, electrical system energy losses (LO) are included in the total energy consumption of the end-use sectors.

To prevent double counting of supplemental gaseous fuels (SF), which are accounted for in the fossil fuels from which they are derived, and in natural gas, they are removed from total energy for the residential, commercial, and industrial sectors.

Specific details for each of the end-use sectors are described below.

Residential Sector

Solar thermal direct use energy, and photovoltaic electricity net generation for the residential and commercial sectors combined (SOHCB) is included in the residential sector only because the individual sector use cannot be identified:

$$\text{TERCB} = \text{CLRCB} + \text{NGRCB} + \text{PARCB} + \text{WDRCB} + \text{GERCB} + \text{SOHCB} + \text{ESRCB} + \text{LORCB} - \text{SFRCB}$$

Commercial Sector

From 1960 through 1992:

$$\text{TECCB} = \text{CLCCB} + \text{NGCCB} + \text{PACCB} + \text{ENCCB} + \text{HYCCB} + \text{WDCCB} + \text{WSCCB} + \text{GECCB} + \text{ESCCB} + \text{LOCCB} - \text{SFCCB}$$

From 1993 forward:

$$\text{TECCB} = \text{CLCCB} + \text{NGCCB} + \text{PACCB} + \text{HYCCB} + \text{WDCCB} + \text{WSCCB} + \text{GECCB} + \text{ESCCB} + \text{LOCCB} - \text{SFCCB}$$

Industrial Sector

For the industrial sector, the U.S. calculations in SEDS are slightly different from the State calculations. The industrial sector includes net imports of coal coke (CCNIBUS) in the U.S. total but not in the individual State estimates ("ZZ" in the variable name represents the two-letter State code that differs for each State) because no reliable means of allocating the U.S. amount to the States has been developed. In addition, the industrial sector

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includes energy losses and co-products from the production of fuel ethanol (ENLCB) in the U.S. total. Individual State estimates are not available because reliable State allocators have not been identified.

From 1960 through 1992:

$$\text{TEICBUS} = \text{CLICBUS} + \text{CCNIBUS} + \text{NGICBUS} + \text{PAICBUS} + \text{ENICBUS} + \text{HYICBUS} + \text{WDICBUS} + \text{WSICBUS} + \text{GEICBUS} + \text{ESICBUS} + \text{LOICBUS} + \text{ENLCBUS} - \text{SFINBUS}$$

$$\text{TEICBZZ} = \text{CLICBZZ} + \text{NGICBZZ} + \text{PAICBZZ} + \text{ENICBZZ} + \text{HYICBZZ} + \text{WDICBZZ} + \text{WSICBZZ} + \text{GEICBZZ} + \text{ESICBZZ} + \text{LOICBZZ} - \text{SFINBZZ}$$

From 1993 forward:

$$\text{TEICBUS} = \text{CLICBUS} + \text{CCNIBUS} + \text{NGICBUS} + \text{PAICBUS} + \text{HYICBUS} + \text{WDICBUS} + \text{WSICBUS} + \text{GEICBUS} + \text{ESICBUS} + \text{LOICBUS} + \text{ENLCBUS} - \text{SFINBUS}$$

$$\text{TEICBZZ} = \text{CLICBZZ} + \text{NGICBZZ} + \text{PAICBZZ} + \text{HYICBZZ} + \text{WDICBZZ} + \text{WSICBZZ} + \text{GEICBZZ} + \text{ESICBZZ} + \text{LOICBZZ} - \text{SFINBZZ}$$

Transportation Sector

From 1960 through 1992:

$$\text{TEACB} = \text{CLACB} + \text{NGACB} + \text{PAACB} + \text{ENACB} + \text{ESACB} + \text{LOACB}$$

From 1993 forward:

$$\text{TEACB} = \text{CLACB} + \text{NGACB} + \text{PAACB} + \text{ESACB} + \text{LOACB}$$

Total Energy Consumption

Total energy consumption by State is defined in SEDS as the sum of all energy sources consumed by the energy-use sectors. This includes all primary energy sources consumed by the four end-use sectors and the electric power sector, as well as net interstate sales of electricity (ELISBZZ) and net imports of electricity (ELNIBZZ).

The U.S. total energy calculations in SEDS are slightly different from the State calculations. They do not include net interstate flow of electricity (which is zero for the U.S. total), and include net imports of coal coke.

From 1960 through 1992:

$$\text{TETCBUS} = \text{CLTCBUS} + \text{CCNIBUS} + \text{NGTCBUS} + \text{PATCBUS} + \text{ENTCBUS} + \text{NUETBUS} + \text{HYTCBUS} + \text{WDTCBUS} + \text{WSTCBUS} + \text{GETCBUS} + \text{SOTCBUS} + \text{WYTCBUS} + \text{ELNIBUS} + \text{ENLCBUS} - \text{SFTCBUS}$$

$$\text{TETCBZZ} = \text{CLTCBZZ} + \text{NGTCBZZ} + \text{PATCBZZ} + \text{ENTCBZZ} + \text{NUETBZZ} + \text{HYTCBZZ} + \text{WDTCBZZ} + \text{WSTCBZZ} + \text{GETCBZZ} + \text{SOTCBZZ} + \text{WYTCBZZ} + \text{ELNIBZZ} + \text{ELISBZZ} - \text{SFTCBZZ}$$

From 1993 forward:

$$\text{TETCBUS} = \text{CLTCBUS} + \text{CCNIBUS} + \text{NGTCBUS} + \text{PATCBUS} + \text{NUETBUS} + \text{HYTCBUS} + \text{WDTCBUS} + \text{WSTCBUS} + \text{GETCBUS} + \text{SOTCBUS} + \text{WYTCBUS} + \text{ELNIBUS} + \text{ENLCBUS} - \text{SFTCBUS}$$

$$\text{TETCBZZ} = \text{CLTCBZZ} + \text{NGTCBZZ} + \text{PATCBZZ} + \text{NUETBZZ} + \text{HYTCBZZ} + \text{WDTCBZZ} + \text{WSTCBZZ} + \text{GETCBZZ} + \text{SOTCBZZ} + \text{WYTCBZZ} + \text{ELNIBZZ} + \text{ELISBZZ} - \text{SFTCBZZ}$$

As a cross-check that is not used in the report tables, total energy consumed is also calculated in SEDS as the sum of the consumption by the four end-use sectors for each State and U.S. total:

$$\text{TESSB} = \text{TERCB} + \text{TECCB} + \text{TEICB} + \text{TEACB}$$

The slight discrepancies between TESSB and TETCB are caused by independent rounding of the components.

$$\text{TNCCB} = \text{TECCB} - \text{LOCCB}$$

$$\text{TNACB} = \text{TEACB} - \text{LOACB}$$

Additional Calculations

A few data series are combined for display in the "Other" column in tables titled "Energy Consumption Estimates by Source." They include net electricity imports, fuel ethanol estimates not covered in the motor gasoline data (before 1993), losses and co-products from the production of fuel ethanol (U.S. only), and an adjustment to remove double-counting of supplemental gaseous fuels, which are included in both natural gas and the other fossil fuels from which they are mostly derived, but should be counted only once in the total. The variables are calculated for each State and the United States in billion Btu as follows:

From 1960 through 1992:

$$\text{OTTCBUS} = \text{ELNIBUS} + \text{ENTCBUS} + \text{ENLCBUS} - \text{SFTCBUS}$$

$$\text{OTTCBZZ} = \text{ELNIBZZ} + \text{ENTCBZZ} - \text{SFTCBZZ}$$

From 1993 forward:

$$\text{OTTCBUS} = \text{ELNIBUS} + \text{ENLCBUS} - \text{SFTCBUS}$$

$$\text{OTTCBZZ} = \text{ELNIBZZ} - \text{SFTCBZZ}$$

Total Net Energy

A set of totals is calculated to estimate consumption in the four major end use sectors excluding each sector's share of all electrical system energy losses that are incurred in the generation, transmission, and distribution of electricity. This series is total net energy consumed and is represented by "TN."

Total net energy consumed by the residential, commercial, industrial, and transportation sectors are calculated:

$$\text{TNRCB} = \text{TERCB} - \text{LORCB}$$

$$\text{TNICB} = \text{TEICB} - \text{LOICB}$$

Total Energy Consumed per Capita

The energy consumed per person residing in each State and in the United States is estimated by dividing the total energy series ("TE") by the resident population as published by the U.S. Department of Commerce, Bureau of the Census. The U.S. total population may be revised more frequently than the State population estimates, so the sum of the available States' population data may not equal the U.S. totals. Therefore, the U.S. total population is input into SEDS instead of being calculated as the sum of the States' values. The variable names for the series are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

TPOPPZZ = resident population of each State; and

TPOPPUS = resident population of the United States.

Estimated energy consumption per capita for each State and the United States, in million Btu, is represented by "TETPB" and is calculated:

$$\text{TETPB} = \text{TETCB} / \text{TPOPP}$$

The residential, commercial, industrial, and transportation sectors' energy consumption per capita are estimated:

$$\text{TERPB} = \text{TERCB} / \text{TPOPP}$$

$$\text{TECPB} = \text{TECCB} / \text{TPOPP}$$

$$\text{TEIPB} = \text{TEICB} / \text{TPOPP}$$

$$\text{TEAPB} = \text{TEACB} / \text{TPOPP}$$

Data Sources

TPOPPUS — Resident population of the United States. July 1 estimates for all years.

- 1960 through 1989: U.S. Department of Commerce, Bureau of the Census <http://www.census.gov/popest/archives/1990s/popclockest.txt>.

- 1990 through 1999: U.S. Department of Commerce, Bureau of the Census, Internet Release http://www.census.gov/popest/archives/2000s/vintage_2001/CO-EST2001-12/.
- 2000 forward: <http://www.census.gov/popest/states/NST-ann-est.html>.

TPOPPZZ — Resident population by State. July 1 estimates for all years.

- 1960 and 1970: U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States, 1980*, Section 1 Population, "No. 10. Resident Population--States: 1950 to 1979".
- 1980: U.S. Department of Commerce, Bureau of the Census, <http://www.census.gov/popest/archives/1980s/s5yr8090.txt>.
- 1960 through 1989: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports*, "Population Estimates and Projections," Series P-25. Specific publication numbers and table numbers:
 - 1961 through 1969: Number 460, Table 1.
 - 1971 through 1979: Number 957, Table 4.
 - 1981 through 1989: Number 1058, Table 3.
- 1990 through 1999: U.S. Department of Commerce, Bureau of the Census, Internet Release http://www.census.gov/popest/archives/2000s/vintage_2001/CO-EST2001-12/index.html.
- 2000 forward: <http://www.census.gov/popest/states/NST-ann-est.html>.

Total Energy Consumed per Real Dollar of Gross Domestic Product

Total energy consumed per chained (2000) dollar of output by State and the United States is estimated by dividing the total energy series ("TE") by real gross domestic product (GDP) as published by the U.S. Department of Commerce, Bureau of Economic Analysis, beginning in 1977. The U.S. real GDP is extracted from the same data source as the State data. This series does not match the national account GDP series. For details, see BEA Regional Economic Accounts: Methodologies, <http://www.bea.gov/regional/methods.cfm>.

For 1977 through 1989, BEA does not provide the real GDP by State estimates. However, BEA's quantity indexes for real GDP by State (2000=100.000) are used to calculate real GDP from 1977 to 1989. For 1990 through 1996, BEA reports real GDP by State based on the Standard Industrial Classification (SIC). For 1997 forward, BEA reports real GDP by State based on the North American Industry Classification System (NAICS). Given this discontinuity in the GDP by States series at 1997, users of these data are strongly cautioned against appending the two data series in an attempt to construct a single time series of GDP by State estimates.

The variable names for the series are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

GDPRXUS = real gross domestic product of the United States in million chained (2000) dollars.; and

GDPRXZZ = real gross domestic product by State in million chained (2000) dollars.

Estimated energy consumption per real chained (2000) dollar for each State and the United States, in thousand Btu per chained (2000) dollar, is represented by "TETGR" and is calculated:

$$\text{TETGR} = \text{TETCB} / \text{GDPRX}$$

Data Sources

GDPRXUS — Real gross domestic product of the United States in million chained (2000) dollars.

- 1977 through 1996: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=SIC>.
- 1997 forward: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=NAICS>.

GDPRXZZ — Real gross domestic product by State in million chained (2000) dollars.

- 1977 through 1996: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=SIC>.
- 1997 forward: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=NAICS>.