Section 7. Total energy

The preceding sections of this document describe how the U. S. Energy Information Administration (EIA) estimates state-level energy consumption by individual source in the State Energy Data System (SEDS). This section describes how SEDS sums all energy sources in Btu to create total energy consumption and end-use consumption estimates.

Total energy consumption

SEDS defines total energy consumption by state as the sum of all energy sources consumed. The total includes all primary energy sources used directly by the energy-consuming sectors (residential, commercial, industrial, transportation, and electric power), as well as net interstate flow of electricity (ELISB) and net imports of electricity (ELNIB).

Energy sources can be categorized as non-renewable and renewable sources:

Non-renewable sources

- coal (CL)
- net imports of coal coke (United States only)
- natural gas excluding supplemental gaseous fuels (NN)
- petroleum products excluding biofuels (PM)
- nuclear electric power (NU)

Renewable sources

- biodiesel (BD)
- fuel ethanol minus denaturant (EM)
- geothermal direct use energy and geothermal heat pumps (GE)
- conventional hydroelectric power (HY)
- renewable diesel (B1)
- solar thermal direct use energy and photovoltaic electricity net generation (SO)
- electricity produced by wind (WY)
- wood and wood-derived fuels (WD)
- biomass waste (WS)
- other biofuels (BO) (United States only)

Sections 2 through 4 describe the definitions and calculations for the total consumption of each fossil fuel energy source (coal, natural gas, and petroleum). Section 5 describes renewable energy total consumption (RETCB). Section 6 describes nuclear electric power (NUETB), net imports of electricity (ELNIB), and net interstate flow of electricity (ELISB).

SEDS calculates total consumption of fossil fuels in billion Btu (FFTCB) for each state and the United States as:

FFTCBZZ = CLTCBZZ + NNTCBZZ + PMTCBZZ
FFTCBUS = CLTCBUS + CCNIBUS + NNTCBUS + PMTCBUS

SEDS calculates total energy consumption in billion Btu (TETCB) for each state and the United States as:

TETCBZZ = FFTCBZZ + NUETBZZ + RETCBZZ + ELNIBZZ + ELISBZZ
TETCBUS = FFTCBUS + NUETBUS + RETCBUS + ELNIBUS

Total energy consumption by end use

Total energy consumption for each of the four end-use sectors (residential, commercial, industrial, and transportation) is the sum of all energy sources consumed by the sector. Each sector total includes primary energy consumed directly by the sector, electricity sales to the sector (sales to ultimate customers), and electrical system energy losses (which are allocated proportionally to the electricity sales sent to each sector).

Unless otherwise specified, EIA publishes energy data in the same way as they are consumed; that is, natural gas includes supplemental gaseous fuels that are commingled with the natural gas, and petroleum products include biofuels that are blended into the products.

In general, total energy consumed by the four end-use sectors by state and for the United States as a whole include the following:

- coal (CL)
- natural gas (NG), which includes supplemental gaseous fuels
- all petroleum products (PA), which include biofuels blended into motor gasoline, distillate fuel oil, and any other petroleum products
- geothermal direct use energy and geothermal heat pumps (GE)
- conventional hydroelectric power (HY)
- solar thermal direct use energy and photovoltaic electricity net generation (SO)
- wood (WD)
- biomass waste (WS)
- electricity sales (ES)
- electrical system energy losses (LO)

To adjust for the underreporting of fuel ethanol in motor gasoline consumption before 1993 and biodiesel in distillate fuel oil consumption before 2009, SEDS adds fuel ethanol consumption to total consumption for the commercial, industrial, and transportation sectors before 1993 and biodiesel consumption to total consumption for the transportation sector before 2009. Fuel ethanol data before 1981 and biodiesel data before 2001 are not available and EIA assumes them to be zero.

SEDS removes supplemental gaseous fuels (SF) from total energy for the residential, commercial, industrial, and electric power sectors to prevent double counting. SEDS accounts for supplemental gaseous fuels as part of the fossil fuels that they are derived from, and also as part of natural gas.

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

Residential sector

1960 forward:

TERCB = CLRCB + NGRCB + PARCB + GERCB + SORCB + WDRCB + ESRCB + LORCB - SFRCB

Commercial sector

1960 through 1992:

TECCB = CLCCB + NGCCB + PACCB + EMCCB + GECCB + HYCCB + SOCCB + WWCCB + ESCCB + LOCCB - SFCCB

1993 forward:

TECCB = CLCCB + NGCCB + PACCB + GECCB + HYCCB + SOCCB + WWCCB + WYCCB + ESCCB + LOCCB - SFCCB

Industrial sector

The industrial sector includes energy losses and co-products from the production of fuel ethanol (EMLCB) and biodiesel (BDLCB). It includes net imports of coal coke (CCNIBUS) in the U.S. total but not in the individual state estimates because there is no reliable method to allocate amounts to the states.

1960 through 1992:

TEICBUS = CLICBUS + CCNIBUS + NGICBUS + PAICBUS + EMICBUS + EMLCBUS + GEICBUS + HYICBUS + SOICBUS + WWICBUS + ESICBUS + LOICBUS - SFINBUS

TEICBZZ = CLICBZZ + NGICBZZ + PAICBZZ + EMICBZZ + EMLCBZZ + GEICBZZ + HYICBZZ + SOICBZZ + WWICBZZ + ESICBZZ + LOICBZZ - SFINBZZ

1993 forward:

TEICBUS = CLICBUS + CCNIBUS + NGICBUS + PAICBUS + BFLCBUS + GEICBUS + HYICBUS + SOICBUS + WWICBUS + WYICBUS + ESICBUS + LOICBUS - SFINBUS

TEICBZZ = CLICBZZ + NGICBZZ + PAICBZZ + BFLCBZZ + GEICBZZ + HYICBZZ + SOICBZZ + WWICBZZ + WYICBZZ + ESICBZZ + LOCIBZZ - SFINBZZ

Transportation sector

1960 through 1992:

TEACB = CLACB + NGACB + PAACB + EMACB + ESACB + LOACB

1993 through 2008:

TEACB = CLACB + NGACB + PAACB + BDACB + EMACB + ESACB + LOACB

2009 forward:

TEACB = CLACB + NGACB + PAACB + ESACB + LOACB

Total end-use sector energy consumption

Total end-use sector energy consumption is the sum of the four end-use sectors' energy consumption, represented by the 3rd and 4th characters "TX":

TETXB = TEACB + TECCB + TEICB + TERCB

SEDS calculates TETXB as the sum of: (1) the direct consumption of primary energy sources by end-use sector; (2) the electricity sales to ultimate customers by end-use sector; and (3) the losses incurred through the generation, transmission, and distribution of electricity, which SEDS allocates to the four end-use sectors proportionally to electricity sales by end-use sector. On the other hand, TETCB is the sum of the total consumption of each primary energy source, which includes both direct end-use consumption and consumption by the electric power sector for electricity. Independent rounding of the components causes minor differences between TETXB and TETCB.

End-use energy consumption

SEDS calculates end-use energy consumption estimates in the four end-use sectors as the sum of the primary energy consumed within each sector and the amount of electricity sales to ultimate customers from the electric power sector sold to each sector. End-use energy consumption excludes each sector's share of electrical system energy losses from the electric power sector that occur during the generation, transmission, and distribution of electricity to end users. This series is called end-use energy consumption and represented by "TN."

SEDS calculates end-use energy consumption in the residential, commercial, industrial, and transportation sectors as:

TNRCB = TERCB - LORCB
TNCCB = TECCB - LOCCB
TNICB = TEICB - LOICB
TNACB = TEACB - LOACB

Total end-use energy consumption is the sum of the sectors:

TNTCB = TNRCB + TNCCB + TNICB + TNACB

Total energy consumption per capita

SEDS estimates the energy consumed per person residing in each state and in the United States by dividing the total energy series ("TE") by the resident population, as published by the U.S. Department of Commerce, Census Bureau. Before 1980, the U.S. total population estimates may be revised more frequently than the state population estimates, so the sum of the available states' population estimates may not equal the U.S. totals. Therefore, SEDS uses the U.S. total population estimates instead of the sum of the states' values. See energy indicators technical notes for more information on population data at https://www.eia.gov/state/seds/seds-technical-notes-complete.php. 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 estimates of each state; and
TPOPPUS = resident population estimates of the United States.

Estimated energy consumption per capita for each state and the United States, in million Btu, (TETPB) is:

TETPB = TETCB / TPOPP

SEDS estimates total energy consumption per capita for the four end-use sectors as:

TERPB = TERCB / TPOPP
TECPB = TECCB / TPOPP
TEIPB = TEICB / TPOPP
TEAPB = TEACB / TPOPP

Data sources

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

- 1960 through 2009: U.S. Department of Commerce, Census Bureau, National Intercensal Tables, https://www.census.gov/programs-surveys/popest/data/tables.All.html.
- 2010 forward: U.S. Department of Commerce, Census Bureau, National Population Totals, https://www.census.gov/programs-surveys/popest/data/tables.All.html.

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

- 1960 through 2009: U.S. Department of Commerce, Census Bureau, State Intercensal Tables, https://www.census.gov/programs-surveys/popest/data/tables.All.html.
- 2010 forward: U.S. Department of Commerce, Census Bureau, State Population Totals, https://www.census.gov/programs-surveys/popest/data/tables.All.html.

Total energy consumption per real dollar of gross domestic product

For 1997 forward, SEDS estimates total energy consumption per dollar of real gross domestic product (GDP) as total energy consumption (TETCB) divided by real GDP (GDPRX) from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).

BEA publishes both national-level and state-level real GDP data in its "Regional Economic Accounts" dataset. However, there is a difference in the coverage between the two series. The difference between the sum of the states' GDP and the U.S-level GDP reflects federal military and civilian activity located overseas. For details, see BEA's Regional Economic Accounts: Methodologies at https://www.bea.gov/regional/methods.cfm.

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 (2017) dollars; and
GDPRXZZ = real gross domestic product by state in million chained (2017) dollars.

Estimated energy consumption per real chained (2017) dollar for each state and the United States, in thousand Btu per chained (2017) dollar, (TETGR) is:

TETGR = TETCB / GDPRX

Data sources

GDPRXZZ — Real gross domestic product by state and the United States in million chained (2017) dollars.

- 1997 forward: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, https://apps.bea.gov/itable/?ReqID=70&step=1, select Annual Gross Domestic Product by State, Gross Domestic Product (GDP) summary (SAGDP1), All Areas, and Real GDP (millions of chained 2017 dollars).