

Section 5. Total energy

The preceding sections of this document describe how the U.S. Energy Information Administration (EIA) estimates state-level CO₂ emissions from energy consumption by source in the State Energy Data System (SEDS). This section describes how SEDS sums all energy sources in million metric tons (MMmt) of CO₂ to calculate total fossil fuel and total energy CO₂ emissions estimates.

Total energy CO₂ emissions by fuel

SEDS calculates total fossil fuels CO₂ emissions in million metric tons (FFTCE) for each state and the United States as ("ZZ" in the variable name is used to represent the two-letter state code):

$$\begin{aligned}\text{FFTCEZZ} &= \text{CLTCEZZ} + \text{NNTCEZZ} + \text{PMTCEZZ} \\ \text{FFTCEUS} &= \text{CLTCEUS} + \text{CCNIEUS} + \text{NNTCEUS} + \text{PMTCEUS}\end{aligned}$$

Total energy-related CO₂ emissions in million metric tons (TETCE) for each state and the United States are equal to total fossil fuels CO₂ emissions:

$$\text{TETCE} = \text{FFTCE}$$

Total energy CO₂ emissions by sector

SEDS calculates total CO₂ emissions of fossil fuels in million metric tons for each sector as the sum of all the fuels within the sector.

SEDS calculates residential sector total fossil fuel CO₂ emissions in million metric tons (FFRCE) for each state and the United States as the sum of total CO₂ emissions from each fossil fuel within the sector:

$$\text{FFRCE} = \text{CLRCE} + \text{NNRCE} + \text{PMRCE}$$

SEDS calculates commercial sector total fossil fuel CO₂ emissions in million metric tons (FFCCE) for each state and the United States as the sum of total CO₂ emissions from each fossil fuel within the sector:

$$\text{FFCCE} = \text{CLCCE} + \text{NNCCE} + \text{PMCCE}$$

SEDS calculates industrial sector total fossil fuel CO₂ emissions in

million metric tons (FFICE) for each state and the United States as the sum of total CO₂ emissions from each fossil fuel within the sector using these formulas ("ZZ" in the variable name is used to represent the two-letter state code):

$$\begin{aligned}\text{FFICEZZ} &= \text{CLICEZZ} + \text{NNICEZZ} + \text{PMICEZZ} \\ \text{FFICEUS} &= \text{CLICEUS} + \text{CCNIEUS} + \text{NNICEUS} + \text{PMICEUS}\end{aligned}$$

SEDS calculates transportation sector total fossil fuel CO₂ emissions in million metric tons (FFACE) for each state and the United States as the sum of total CO₂ emissions from each fossil fuel within the sector:

$$\text{FFACE} = \text{CLACE} + \text{NNACE} + \text{PMACE}$$

SEDS calculates electric power sector total fossil fuel CO₂ emissions in million metric tons (FFEIE) for each state and the United States as the sum of total CO₂ emissions from each fossil fuel within the sector:

$$\text{FFEIE} = \text{CLEIE} + \text{NNEIE} + \text{PMEIE}$$

For each sector, total energy-related CO₂ emissions are equal to fossil fuel CO₂ emissions:

$$\begin{aligned}\text{TERCE} &= \text{FFRCE} \\ \text{TECCE} &= \text{FFCCE} \\ \text{TEICE} &= \text{FFICE} \\ \text{TEACE} &= \text{FFACE} \\ \text{TEEIE} &= \text{FFEIE}\end{aligned}$$

Per capita energy-related CO₂ emissions

We can divide the total CO₂ emissions for a state by the state's population to examine the CO₂ emissions on a per capita (per person) basis. In addition to population density, there are other factors that affect a state's per capita CO₂ emissions, including: weather/climate, structure of the state economy, energy sources, building standards, and state policies to reduce emissions.

SEDS calculates per capita energy-related CO₂ emissions in metric tons (CDTPR) for each state and the United States using the same formula:

$$\text{CDTPR} = \text{TETCE} / (\text{TPOPP} / 1000)$$

See the SEDS energy indicators technical notes for more information on residential population at <https://www.eia.gov/state/seds/seds-technical-notes-complete.php>.

Carbon intensity of energy supply

The carbon intensity of energy supply (total CO₂ emissions per Btu of total energy consumption) reflects the energy fuel mix within a state. The states with more carbon-intensive energy consumption tend to be the states with high per capita emissions. The states with less carbon-intensive energy supply tend to be those states with relatively more carbon neutral electricity generation from sources like nuclear, wind, hydropower, and solar.

SEDS calculates carbon intensity of energy supply (CDTCR) in metric tons of CO₂ emissions per billion Btu of total energy consumption (TETCB) less net interstate flow of electricity (ELISB), with unit conversion, for each state and the United States using the formula:

$$\text{CDTCR} = \text{TETCE} / ((\text{TETCB} - \text{ELISB}) / 1,000,000)$$

See the SEDS consumption technical notes for total energy consumption estimates at <https://www.eia.gov/state/seds/seds-technical-notes-complete.php?sid=US>.

Carbon intensity of the economy

Carbon intensity of the economy measures total CO₂ emissions against the total sum output of the entire economy in terms of gross domestic product (GDP). States with the highest carbon intensity of their economies, as measured in metric tons of CO₂ per real chained 2017 dollar of state GDP, are also the states with the highest values of energy intensity and carbon intensity of that energy supply. The states with the lowest carbon intensity of economic activity are also states that appear on the lower end of both energy intensity and the carbon intensity of that energy supply. We use inflation-adjusted (real) GDP data to compare across time series.

SEDS calculates carbon intensity of the economy in metric tons of CO₂ per million chained (2017) dollars of state GDP (CDTCR) for each state and the United States using the formula:

$$\text{CDEGR} = \text{TETCE} / (\text{GDPRX} / 1,000,000)$$

See the SEDS energy indicators technical notes for more information on GDP data at <https://www.eia.gov/state/seds/seds-technical-notes-complete.php>.