

U.S. Energy System

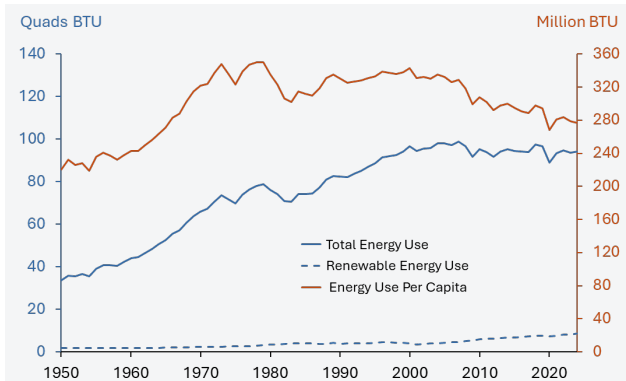
Energy is essential to modern life, powering systems that provide food, shelter, transportation, and employment. In 2023, U.S. customers spent \$1.6T on energy, 5.7% of GDP, or \$4,657 per person, a 10% decrease from 2022.¹ Energy production and use contribute to global climate change, acid rain, air pollution, smog, radioactive waste, and habitat destruction.² Heavy reliance on fossil fuels poses major energy security concerns.

Patterns of Use

Demand

- The U.S. has 4% of the world's population, uses 16% of the world's energy, and produces 15% of world GDP.^{4,5} In comparison, the EU has 6% of the world's population, uses 9% of its energy, and accounts for 15% of its GDP.^{4,5} China has 18% of the world's population, uses 27% of its energy, and contributes 19% of its GDP.^{4,5}
- Daily per capita energy use in the U.S. includes 2.5 gal oil, 6.59 lbs coal, and 265 ft³ natural gas.^{3,4} Daily electricity use is 12 kWh per capita in the residential sector.^{3,4}
- In 2024, U.S. energy consumption rose 6% from 2020, but remained 4% below its 2005 peak.³
- Energy efficiency gains in any sector may be offset by increases in use, a phenomenon called the rebound effect.⁶

U.S. Energy Use by Year³

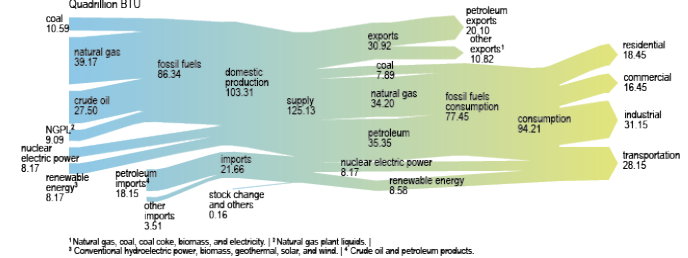


Supply

- U.S. DOE estimates 71% of U.S. energy will come from fossil fuels in 2050,⁸ inconsistent with IPCC carbon reduction goals.⁹
- Renewable energy use is projected to grow at an average annual rate of 3.5% from 2024 to 2050, compared to -0.2% for total energy use.⁸ At this pace, renewables would provide 22% of U.S. energy use by 2050.⁸
- Canada, Mexico, and Saudi Arabia are the largest suppliers of U.S. oil imports. In 2023, 16% of U.S. oil imports were from OPEC (Organization of the Petroleum Exporting Countries) members, and 10% was from the Persian Gulf,¹⁰ which holds 49% of world oil reserves (15% in Saudi Arabia alone).³⁵

- Since 2020, the U.S. has been a net exporter of petroleum. In 2024, it exported 10.76M bbl/d and imported 8.42M bbl/d.³

U.S. Energy Flow, 2023⁷

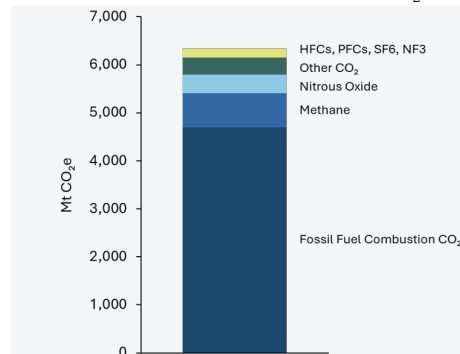


See [U.S. Energy System Factsheet](#) online for full-size

Life Cycle Impacts

- The primary environmental impacts of the U.S. energy system are from fossil fuel combustion, which emits CO₂, NO_x, SO₂, VOCs, PM, and Hg.
- Methane leakage from oil and natural gas infrastructure (e.g., fracking wells, pipelines) is estimated at 13 Mt/yr, 2.3% of U.S. gross natural gas production.¹¹ Given methane's global warming potential of almost 30, this leakage is equivalent to 387 Mt CO₂, 6.1% of total U.S. CO₂e emissions in 2022.^{12,13}
- In 2022, U.S. greenhouse gas (GHG) emissions were 3% below 1990 levels, with 74% from fossil fuel combustion.¹³ The U.S. made up 14% of world energy-related emissions in 2023,¹⁴ and are projected to decrease 21% by 2035 from 2024.⁸
- Other energy sources also have environmental implications; Nuclear power generates radioactive waste and requires significant energy for plant construction and uranium mining. Large hydroelectric power plants cause habitat degradation and fish mortality. Wind turbines alter landscapes and can cause bird and bat mortality.¹⁵

U.S. GHG Emissions by Gas in 2022 (Mt CO₂e)¹³



Solutions and Sustainable Actions

Use less

- Reducing energy use offers both environmental benefits and cost savings for individuals, businesses, and governments.
- Living in smaller houses, living closer to work, and using public transportation reduce energy use. See factsheets on [carbon footprint](#), [personal transportation](#), and [residential buildings](#).

Increase Efficiency

- An aggressive commitment to energy efficiency could reduce U.S. carbon emissions by 57% (2,500 Mt) by 2050.¹⁶
- Additional information on energy efficiency can be found at the following organizations' websites:

General: [U.S. DOE Energy Efficiency and Renewable Energy](#)

Residential & Commercial: [U.S. EPA Energy Star](#)

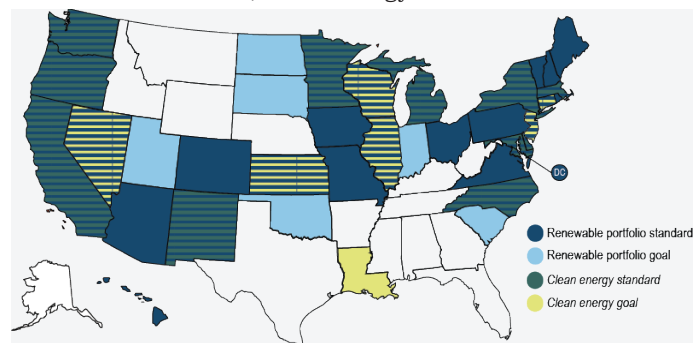
Transportation: [U.S. DOE and EPA Fuel Economy Guide](#)

Industrial: [U.S. EPA Energy Star](#) recommended practices to decrease water and energy use and reduce emissions.

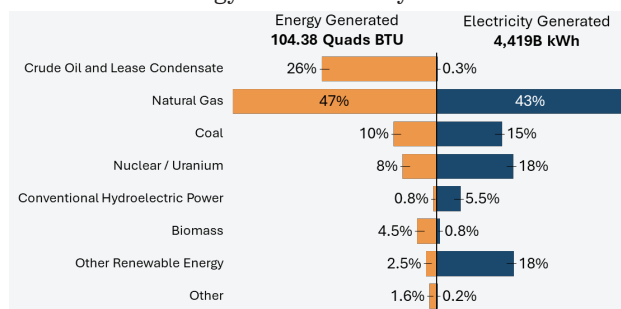
Increase Renewables

- In 2022, annual U.S. renewable energy generation surpassed coal for the first time in history. By 2025, domestic solar generation is projected to increase by 75%, and wind by 11%.³⁷
- U.S. wind capacity grew from 45 GW in 2010 to 147 GW in 2023.¹⁷ If expanded to 224 GW by 2030 (deemed feasible by the U.S. DOE), wind could supply 20% of projected electricity demand.¹⁸
- The U.S. has an estimated 463,400 TWh of renewable energy technical potential—more than 100 times the 4,000 TWh of electricity used in 2020. In 2020, only 0.2% of this potential was used for electricity production.³⁸
- Solar photovoltaic (PV) modules covering 0.6% of U.S. land area could meet national electricity demand.¹⁹
- The U.S. joined 132 other countries in the Global Renewables and Energy Efficiency Pledge, committing to triple global installed renewable capacity to 11,000 GW by 2030.²⁰
- Carbon cap-and-trade policies could support renewable energy by placing a price on carbon and raising the cost of fossil fuel energy generation.²⁵
- The growth of renewable energy was spurred by a 2.5¢/kWh federal production tax credit (PTC) and the 30% energy investment tax credit (ITC).²⁶
- The Inflation Reduction Act (IRA) extended the ITC and PTC of 2.75¢/kWh for eligible renewable energy systems through 2027.^{27,34} Federal tax credits cut energy-efficiency home upgrade costs by up to 30% or \$3,200 annually and provided a 30% credit for clean energy equipment, such as rooftop solar, geothermal heat pumps, and energy storage.²⁸
- In 2023, taxpayers received more than \$6B in residential clean energy credits, and over \$2B in energy efficiency home improvement credits.²⁹ These credits are available through 2025.^{34, 36}
- Roughly half of renewable electricity growth in the U.S. since 2000 is attributable to state Renewable Portfolio Standards (RPS), which require a portion of electricity to come from renewable sources.³¹
- As of April 2025, 35 states, D.C., and 4 U.S. territories have Renewable Portfolio Standards or goals and 18 states have adopted Clean Energy Standards or goals, which mandate certain levels of carbon-free generation and may include some non-renewables such as nuclear fuels.^{30, 32}

States with Renewable/Clean Energy Standards or Goals³⁰



U.S. Sources of Energy and Electricity⁸



Encourage Supportive Public Policy

- 107 parties representing 108 countries and 82% of global GHG emissions have adopted net-zero targets: 29 in law (e.g., the U.K.), 61 in policy documents (e.g., the U.S.), 17 as pledges.²¹
- Fossil fuel subsidies remain a major barrier to clean energy.²² Global fossil fuel subsidies reached a record \$7T in 2022, with \$760B from the U.S.²³ The U.S. Congress allocated \$6.1B in tax relief to oil and gas industries for FY2024-2028.²⁴
- State governments also support renewable energy through a variety of policies and incentives, including rebate, grant, and loan programs; building energy and efficiency standards; solar and wind permitting; and financial incentives such as tax credits, deductions, exemptions, feed-in tariffs, net metering, and Property Assessed Clean Energy (PACE) programs.³³ See [Renewable Energy Factsheet](#).
- Under the Inflation Reduction Act, eligible new electric, plug-in hybrid, and fuel cell electric vehicles qualified for a federal tax credit of up to \$7,500 through 2032. Recent legislation reverts this to September 2025.^{39,40} See [Personal Transportation Factsheet](#).