



Milestones: Energy Transitions in U.S. History

from the energy history animation at us.sankey.rdcep.org

- 1800** In Colonial America, virtually all U.S. energy use was wood burned in fireplaces to heat homes. Because open fireplaces are wasteful, residential heating in the U.S. consumed about three times as much per capita energy as all European usage.
- 1807** The first major use of the steam engine in America was in steamboats, an American invention. After Robert Fulton demonstrated his “Clermont” in 1807, wood-burning steamboats revolutionized transport in the U.S. interior, but also stripped river- and lake-sides of timber. Ocean-going shipping, by contrast, was dominated by sail power as late as the 1890s.
- 1814** The first recognizable “factory” in the U.S. was built in 1814: the Lowell textile mills in Massachusetts, powered by waterwheels on the Charles River. Most mechanical power in early U.S. industry came from waterwheels. Wood and charcoal were burnt for heat (especially in ironmaking), but engines played little role in industry until after 1850.
- 1829** The first steam locomotive in the U.S. was imported to Pennsylvania in 1829 to haul empty coal cars uphill on a “gravity railroad”, a task usually done by horses. The experiment was unsuccessful, but the Baltimore & Ohio Co. kicked off the American railroad era soon after by replacing horses with a U.S.-built locomotive for passenger service from Baltimore to Ellicott's Mills, MD.
- 1850** The 1840s mark the turning point when power from horses, which had dominated U.S. transportation energy use, was finally surpassed by steam engines (burning mostly wood).
- 1859** The U.S. oil industry was born with the drilling of the first U.S. oil well in Titusville, Pennsylvania, in 1859, to provide kerosene for household lighting. Most U.S. houses at the time were lit by lamps that burnt liquid fuels such as whale oil, coal oil, or camphine (made primarily from turpentine from pine trees).
- 1862** During and after the Civil War, U.S. railroad construction was spurred by government actions, including the 1862 Pacific Railroad Act that authorized land grants and loans. The rapidly expanding railroad network carried coal from Appalachia across the U.S., and by the late 1880s, coal use exceeded that of wood. Railroads dominated U.S. transportation for the next fifty years.
- 1877** The fast-expanding railroad industry produced bitter and violent labor disputes with its workers. Wage cuts in 1877 touched off the Great Railroad Strike, paralyzing the country. More strikes followed in coal and steel and were also brutally suppressed.
- 1882** In 1882, Thomas Edison provided the first public electricity sales in the U.S., lighting Appleton, Wisconsin with direct current (DC) from a hydroelectric plant on the Fox River and parts of lower Manhattan from coal-fired steam engines. By the 1890s, alternating current (AC) became the nation's standard instead.
- 1887** Booming energy-related industries became monopolies under the “Robber Baron” industrialists who controlled oil, steel, and railroads. Congress intervened when prices surged,



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regulating railroads with the Interstate Commerce Act of 1887 and breaking up Rockefeller's Standard Oil with the Sherman Anti-Trust Act of 1890.

- 1890** Windmill sales jumped in the late 1880s as settlers of the dry Great Plains used them to pump water for livestock. Later, wind power was even used to generate electricity on some farms and ranches, until the electrical grid reached rural areas in the 1930s and 1940s.
- 1897** The celebration of the new Niagara Power Station #1 in January 1897 marked the end of the "War of the Currents". Nikolai Tesla and George Westinghouse established Tesla's alternating current (AC) as the world standard by transmitting hydropower a record 26 miles from Niagara Falls to Buffalo, NY.
- 1901** Drilling at Spindletop Hill set off the world's largest-ever gusher in January 1901 and began the Texas oil boom. By 1902 the U.S. was the world's largest crude oil producer, a status it held until the 1970s.
- 1908** The introduction of the Ford Model T in 1908 helped spur the use of petroleum (oil) for transportation. At the time, oil went almost entirely to industry and households (as kerosene for lighting), but by the late 1920s, oil was used primarily in transportation.
- 1918** The Age of Coal in the U.S. was 1900-1925, when coal dominated energy use in every sector. U.S. per capita coal usage peaked in 1918 at 5300 W/cap.; by the mid-1950s it had fallen by half.
- 1929** After the 1929 stock market crash, U.S. energy use fell dramatically during the Great Depression. Energy use recovered during the New Deal era, but did not return to 1929 levels until the U.S. entry into WWII.
- 1933** Roosevelt's New Deal construction projects helped double U.S. hydropower between 1933-1945. The Tennessee Valley Authority (TVA) was founded in 1933 and helped electrify the U.S. rural South. Hoover Dam on the Colorado River, still the tallest concrete dam in the U.S., was completed in 1936.
- 1947** During WWII the U.S. War Emergency Pipelines company built the largest oil pipeline in the world, the 24" Big Inch running 1200 miles from Texas to New Jersey and Pennsylvania. The Big Inch was auctioned off in 1947 and converted to natural gas, helping trigger the expansion of natural gas use and more pipeline projects. About half the U.S. gas transmission network was built between 1950-1970.
- 1949** The first gas turbine for electricity generation in the U.S. was installed in 1949 in Oklahoma City, OK, by General Electric. Before 1949, use of natural gas for electricity involved boiling water to drive a slow-starting and less efficient steam turbine.
- 1950** In the early 1950s the last remaining coal-fired steam locomotives in the U.S. were retired and the train network was fully converted to diesel. From this point on transportation in the U.S. has been essentially entirely powered by oil.

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- 1956** The modern U.S. highway system was created by the Federal-Aid Highway Act of 1956, which funded construction of 41,000 miles of interstate highways and cemented the dominance of motor vehicles in carrying passengers and freight.
- 1957** The first commercial nuclear power plant was completed in 1957 as part of an Eisenhower administration program. The first privately financed nuclear plant, the Dresden Generating Station in Illinois, began operation three years later, in 1960.
- 1960** The 1960s and 1970s saw tremendous growth in the U.S. electrical sector. Much of existing U.S. electricity transmission infrastructure dates from this period.
- 1965** On November 9, 1965, a failed electrical relay near Niagara Falls triggered cascading shutdowns that left 30 million people without electricity. The Great Northeast Blackout led to the first coordinated effort to manage the U.S. electrical system, with utilities forming the North American Electric Reliability Council (NERC).
- 1973** The OPEC oil crisis of 1973 caused world oil prices to quadruple and drove efforts to consume less. U.S. per capita petroleum consumption fell sharply from its peak in the 1970s at over 5800 W/capita, and even today (in 2019) remains 30% lower.
- 1978** The National Energy Act (NEA), a legislative response to the 1973 energy crisis, included the first federal subsidy of corn-based ethanol for transportation, and a Clean Air Act waiver allowed blending gasoline with 10% ethanol. Ethanol now provides about 5% of total U.S. transportation energy (in 2019).
- 1979** A partial meltdown at the Three Mile Island Nuclear Generation Station in Pennsylvania in 1979 halted expansion of the U.S. nuclear industry. Ongoing construction projects were completed, but no new nuclear licenses were granted again until 2012.
- 1987** Use of natural gas for electricity generation began rising again in 1987 after Congress repealed the Power Plant and Industrial Fuel Use Act. The 1978 act, passed in response to the OPEC crisis, had banned any new power plants burning oil or natural gas.
- 1992** The federal Energy Policy Act of 1992 effectively deregulated the electric power sector, but also enacted the first production tax credit (PTC) for renewables, crediting wind generators with 1.5 cents/kWh. The PTC helped kick off the U.S. wind industry.
- 2003** In the late 1990s George Mitchell's oil & gas company finally succeeded in extracting natural gas from shale with hydraulic fracturing; their techniques were soon copied. From about 2003, fracking slashed the cost of natural gas and expanded supply, and cheap gas has increasingly replaced coal in the U.S. electric sector.
- 2018** Fracking allowed U.S. crude oil production to double between 2008 and 2018, when the U.S. overtook Saudi Arabia to become once again the world's largest crude oil producer.
- 2019** Two of the six largest U.S. coal mines, the Eagle Butte and Belle Ayr in Wyoming, filed for bankruptcy in 2019 and shut down. Over a third of U.S. coal mines have closed since 2008.