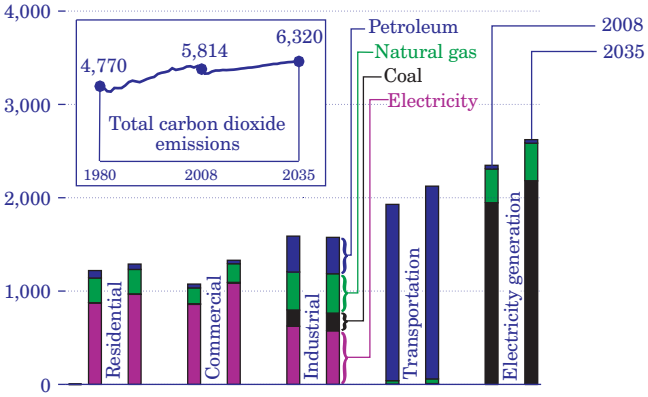
Growth of carbon dioxide emissions slows in the projections

Figure 93. Carbon dioxide emissions by sector and fuel, 2008 and 2035 (million metric tons)



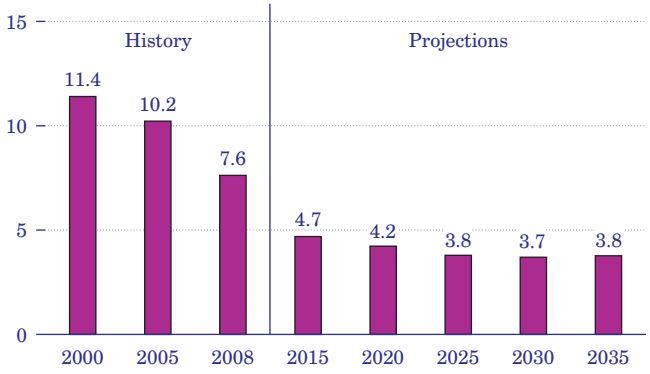
Federal and State energy policies recently enacted will stimulate increased use of renewable technologies and efficiency improvements in the future, slowing the growth of energy-related CO_2 emissions through 2035. In the Reference case, emissions do not exceed pre-recession 2007 levels until 2025. In 2035, energy-related CO_2 emissions total 6,320 million metric tons, about 6 percent higher than in 2007 and 9 percent higher than in 2008 (Figure 93). On average, emissions in the Reference case grow by 0.3 percent per year from 2008 to 2035, compared with 0.8 percent per year from 1980 to 2008.

Shares of the fossil fuels responsible for energy-related CO_2 emissions—coal, natural gas, and petroleum—do not vary substantially from 2008 to 2035. Petroleum, used mainly in the transportation sector, remains the largest source of CO_2 emissions, accounting for 42 percent of the total in 2008 and 41 percent in 2035. CAFE standards and RFS requirements reduce consumption and slow the growth of CO_2 emissions from petroleum. The coal share of CO_2 emissions rises from 37 percent in 2008 to 38 percent in 2035; the natural gas share is stable at 21 percent.

In 2008, 41 percent of total CO_2 emissions came from electricity generation. With its high carbon content and 48-percent share of generation, coal accounted for 82 percent of power sector CO_2 emissions. Given the uncertainty over future GHG regulations, higher capital costs for coal-fired technologies, and new RPS programs in many States, coal's share of generation falls to 44 percent in 2035. In addition, higher fuel costs and improved efficiency slow the overall growth of electricity demand and associated emissions.

Sulfur dioxide emissions decrease due to the Clean Air Interstate Rule

Figure 94. Sulfur dioxide emissions from electricity generation, 2000-2035 (million short tons)



In December 2008, the U.S. Court of Appeals for the District of Columbia Circuit temporarily reinstated CAIR, which includes a cap-and-trade system for SO_2 and NO_x emissions. The decision also required the EPA to develop new rules to correct flaws cited in the Court's July 2008 ruling that vacated CAIR, but because *AEO2010* considers only current rules and regulations, the projections for SO_2 and NO_x emissions are based on the current version of CAIR.

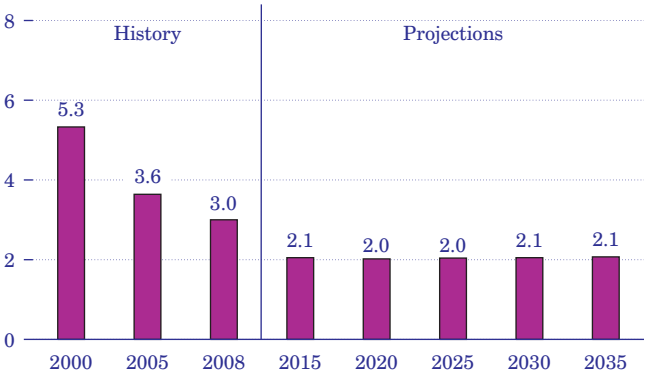
To comply with CAIR, SO_2 emissions in 2035 are 50 percent below the 2008 total (Figure 94). Reductions are achieved by more use of low-sulfur coal and flue gas desulfurization (FGD) scrubbers. From 2009 to 2035, coal-fired plants with about 81 gigawatts total capacity are retrofitted with scrubbers. Emissions vary from year to year, because CAIR allows utilities to bank unused allowances at the end of a year and use them in future years. In the 2030-2035 period, the amounts of banked allowances applied by utilities allow actual emissions to rise slightly.

SO_2 allowance prices increase from over $230 per ton in 2008 to almost $1,500 per ton in the later years of the projection. The price increase is a result of declining emissions caps, which lead to higher prices when allowances become scarce.

In addition to CAIR, implementation of a GHG emissions control policy could significantly reduce SO_2 emissions by forcing the retirement of older, less efficient coal-fired plants without FGD equipment.

Nitrogen oxide emissions also decline in the Reference case

Figure 95. Nitrogen oxide emissions from electricity generation, 2000-2035 (million short tons)



With the temporary reinstatement of CAIR, the annual NO_x emissions market officially began operating in 2009 (although provisions in the current CAIR are temporary until the EPA releases the court-ordered replacement rule). In *AEO2010,* NO_x emissions decline from 3.0 million short tons in 2008 to 2.0 million short tons in 2017, then rise slowly after 2018, when more banked allowances are used to meet the cap (Figure 95).

To reduce NO_x emissions, coal-fired power plants can be retrofitted with selective catalytic converter (SCR), selective noncatalytic converter, or low-NO_x burner technologies. In the Reference case, 168 gigawatts of total capacity is retrofitted with one or another of the three technologies. The amounts differ in the High and Low Economic Growth cases. Higher economic growth increases demand for electricity, and more plants are retrofitted. Lower growth has the opposite effect. In 2035, the NO_x allowance price, which is $3,268 per ton in the Reference case, is higher in High Economic Growth case (because more investment is required to comply with the cap) and lower in the Low Economic Growth Case, where demand for electricity is lower.

At the beginning of 2009, the EPA introduced an annual market for NO_x emissions to complement the existing seasonal market. So far, allowance prices in the annual market have been significantly higher than in the seasonal market, suggesting that the annual program may be more binding.

78. The National Bureau of Economic Research defines a recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." However, the shorthand version of a recession is often given as two consecutive quarters of negative growth in GDP. In December 2008, the National Bureau of Economic Research declared that the United States had entered a recession in December 2007.
79. The industrial sector includes manufacturing, agriculture, construction, and mining. The energy-intensive manufacturing sectors include food, paper, bulk chemicals, petroleum refining, glass, cement, steel, and aluminum.
80. Air-Conditioning, Heating, and Refrigeration Institute, "Agreement on Legislative and Regulatory Strategy for Amending Federal Energy Efficiency Standards, Test Procedures, Metrics and Building Code Provisions for Residential Central Air Conditioners, Heat Pumps, Weatherized and Non-Weatherized Furnaces and Related Matters" (October 13, 2009), web site http://www.ahrinet.org/Admin/Pages/Util/ShowDoc.aspx?doc=1635.
81. S.C. Davis and S.W. Diegel, *Transportation Energy Data Book: Edition 25*, ORNL-6974 (Oak Ridge, TN, May 2006), Chapter 4, "Light Vehicles and Characteristics," web site http://cta.ornl.gov/data/chapter4.shtml.
82. The factors that influence decisionmaking on capacity additions include electricity demand growth, the need to replace inefficient plants, the costs and operating efficiencies of different generation options, fuel prices, State RPS programs, and the availability of Federal tax credits for some technologies.
83. Unless otherwise noted, the term "capacity" in the discussion of electricity generation indicates utility, nonutility, and CHP capacity. Costs reflect the average of regional costs, except that a representative region is used to estimate costs for wind plants.
84. Detailed qualifications for each of the 35 State programs represented in the AEO2010 modeling include eligible technologies, funding limits, and penalties for noncompliance.
85. For example, drilling permits are not currently being issued in the State of New York, where concerns have been raised about potential risks to drinking water supplies.
86. Leasing in the Eastern Gulf of Mexico is restricted until 2022 under the Gulf of Mexico Energy Security Act of 2006.
87. One gallon of ethanol is equal to 0.65 gallon of regular gasoline.
88. The Motiva plant in Port Arthur, TX, and the Marathon project in Garyville, LA.