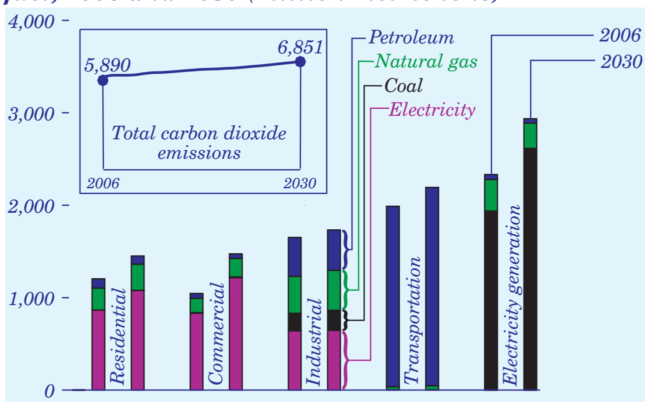
Rising Energy Consumption Increases Carbon Dioxide Emissions

Figure 97. Carbon dioxide emissions by sector and fuel, 2006 and 2030 (million metric tons)

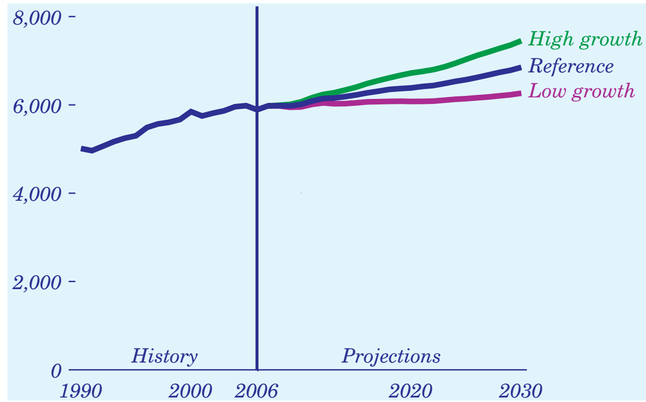


Without capture and sequestration, CO_2 emissions from the combustion of fossil fuels are proportional to the carbon content of the fuel. Coal has the highest carbon content and natural gas the lowest, with petroleum in between. In the *AEO2008* reference case, the shares of these fuels change slightly from 2006 to 2030, with more coal and less oil and natural gas. The combined share of renewable and nuclear energy grow from 15 percent in 2006 to 20 percent in 2030. As a result, CO_2 emissions increase by 16 percent over the period, as compared with a 19-percent increase in total energy use (Figure 97). At the same time, the economy becomes less carbon intensive: the percentage increase in CO_2 emissions is one-fifth the increase in GDP, and emissions per capita decline by 5 percent over the 24-year period.

The factors that influence growth in CO_2 emissions are the same as those that drive increases in fossil energy demand. Among the most significant are population and economic growth; increased penetration of computers, electronics, appliances, and office equipment; increases in commercial floorspace; increases in highway, rail, and air travel; and continued reliance on coal for electric power generation. The increases in demand for energy services are partially offset by efficiency improvements and shifts toward less energy-intensive industries. New CO_2 mitigation programs, more rapid improvements in technology, or more rapid adoption of voluntary CO_2 emissions reduction programs could result in lower CO_2 emissions levels than projected here.

Emissions Projections Change With Economic Growth Assumptions

Figure 98. Carbon dioxide emissions, 1990-2030 (million metric tons)



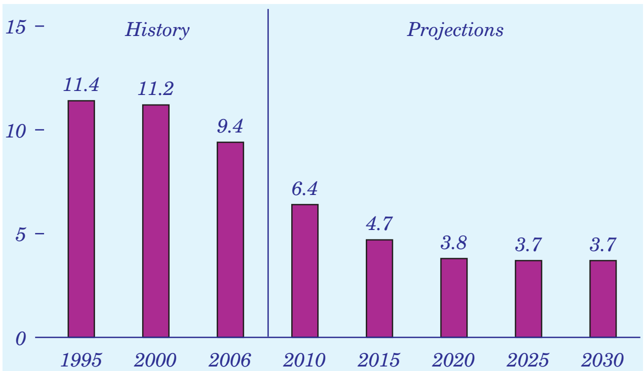
Higher growth in population, labor force, and productivity is assumed in the high growth case than in the reference case, leading to higher industrial output, higher disposable income, lower inflation, and lower interest rates. The low growth case assumes the reverse. In the high and low growth cases, GDP varies by about 14 percent and population by about 8 percent from the reference case projections for 2030.

Alternative projections for industrial output, commercial floorspace, housing, and transportation in the population and economic growth cases influence the demand for energy and result in variations in CO_2 emissions (Figure 98). Emissions in 2030 are 9 percent lower in the low growth case and 9 percent higher in the high growth case than in the reference case. The strength of the relationship between economic growth and emissions varies by end-use sector. It is strongest for the industrial sector and, to a lesser extent, the transportation sector, where economic activity strongly influences energy use and emissions, and where fuel choices are limited. It is weaker in the commercial and residential sectors, where population and building characteristics have large influences and vary less across the three cases.

Changes in electricity sales across the cases affect the amount of new, more efficient generating capacity required, reducing somewhat the sensitivity of energy use to GDP. However, the choice of coal for most new baseload capacity increases CO_2 intensity in the high growth case while decreasing it in the low growth case, offsetting the effects of changes in efficiency across the cases.

Clean Air Interstate Rule Reduces Sulfur Dioxide Emissions

Figure 99. Sulfur dioxide emissions from electricity generation, 1995-2030 (million short tons)



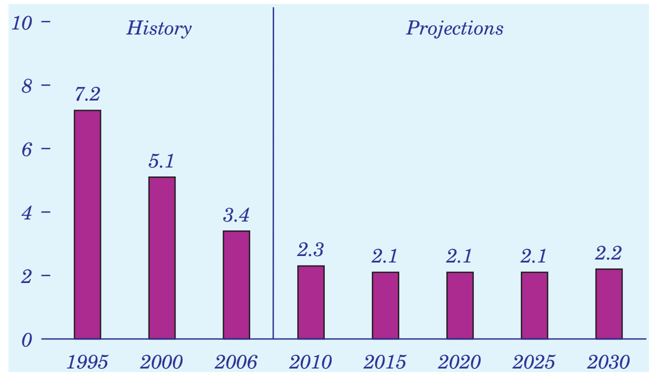
SO_2 emissions are expected to fall as CAIR takes effect [*88*]. States can achieve mandated emissions reductions in two ways: by requiring power plants to participate in the EPA's national cap and trade program or by requiring them to meet State-specific emissions milestones through more stringent measures chosen by the State.

In the *AEO2008* reference case, national SO_2 emissions from electricity generation fall from 9.4 million short tons in 2006 to 3.7 million short tons in 2030 (Figure 99). The reduction results from both the use of lower sulfur coal and the addition of flue gas desulfurization equipment on 125 gigawatts of existing capacity. SO_2 allowance prices rise steadily throughout the early years of the projection, to more than $1,000 per ton in 2020. After 2020, allowance prices slowly decline, settling below $500 in 2030.

SO_2 emissions are not greatly affected by economic growth, as shown in the *AEO2008* high economic growth case. Because many new coal-fired power plants are equipped to remove SO_2 before beginning operation, the allowance prices are no higher than in the reference case. Fuel price assumptions have a greater effect on SO_2 allowance prices. With more CTL plants expected to be constructed in the high price case, potential emissions from coal combustion increase; however, CTL plants are expected to have SO_2 capture equipment that is more efficient than the equipment on advanced pulverized coal plants. Thus, in the later years of the projection, SO_2 allowance prices are slightly lower in the high price case than in the reference case.

Nitrogen Oxide Emissions Also Fall As CAIR Takes Effect

Figure 100. Nitrogen oxide emissions from electricity generation, 1995-2030 (million short tons)



CAIR also mandates NO_x emission reductions in 28 States and the District of Columbia [*89*]. The required reductions are intended to reduce the formation of ground-level ozone, for which NO_x emissions are a major precursor. As with the CAIR-mandated SO_2 reductions, each State can determine a preferred method for reducing NO_x emissions. *AEO2008* assumes that all the States covered by CAIR will participate in interstate trading of allowances.

In the *AEO2008* reference case, national NO_x emissions from the electric power sector fall from 3.4 million short tons in 2006 to 2.2 million short tons in 2030 (Figure 100). Because the CAIR caps are inflexible, different assumptions in the high and low economic growth and high and low price cases have little affect on cumulative NO_x emissions. The projections for cumulative NO_x emissions over the projection period are lowest in the low economic growth case—0.5 percent lower than in the reference case.

After mandatory compliance begins, NO_x allowance prices range between $2,500 and $3,400 per ton emitted in the reference case, tending to rise as the emission caps tighten. In 2030, selective catalytic reduction equipment is projected to have been added on an additional 98 gigawatts of coal-fired generating capacity in the reference case. In the high economic growth case, NO_x allowances are more costly. The construction of more coal-fired power plants to meet a higher level of demand for electricity, and the resulting need for additional retrofits, pushes allowance prices to approximately $3,800 in 2025, after which the price stabilizes.